Appendix A
Engineering Report

TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS

Draft Final Engineering Appendix
February 19, 2010

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Acronyms

A

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials

B

BASE PLANS	Plans for Modification to SR 90 (Project Invitation No. W912EP-08-R-0025), August 2008
BMPs	Best Management Practices

C

C_c	Coefficient of Consolidation
C_r	Coefficient of Recompression
C_s	Coefficient of Secondary Compression
C&SF	Central and South Florida
CDS	Continuous Deflective Separation
CERP	Comprehensive Everglades Restoration Plan
cfs	cubic feet per second
CIPC	Cast-In-Place Concrete
CMP	Corrugated Metal Pipe
CPT	Cone Penetration Test
CSOP	Combined Structural and Operational Plan
CSSS	Cape Sable Seaside Sparrow
CWE	Control Water Elevation

D

DHW	Design High Water
DOI	Department of the Interior
DSL	Design Service Life

E

e_o	Void Ratio
EA	Environmental Assessment
E&D	Engineering and Design
EDC	Embedded Data Collector
EIS	Environmental Impact Statement
EL	Elevation
ERP	Environmental Resource Permit
ESAL	Equivalent Single Axle Load
ENP	Everglades National Park

F

FAC	Federal Administrative Code
FBT	Florida Bulb Tee
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEIS	Final Environmental Impact Statement
FFA	Flood Frequency Analysis
FPL	Florida Power and Light
fps	feet per second
ft	feet

G

GDM	General Design Memorandum
GPR	Ground Penetrating Radar
GRR	General Reevaluation Report

H

HOOH	Home Office Overhead

I

ICPR	Interconnected Pond Routing

J

JOOH	Jobsite Office Overhead

L

L-29C	L-29 Canal
LBR	Limerock Bearing Ratio
LF	Linear feet
LOS	Level of Service
LRFD	Load and Resistance Factor Design
LRR	Limited Reevaluation Report

M

MCACES	Micro-Computer Aided Cost Estimating System
MOT	Maintenance of Traffic
Mr	Resilient Modulus
MSE	Mechanically Stabilized Earth
MWD	Modified Water Deliveries

N

NESRS	Northeast Shark River Slough
NGVD29	National Geodetic Vertical Datum 1929
NPS	National Park Service
NSM	Natural Systems Model
NTP	Notice to Proceed

O

OBG	Optional Base Group

P

pcf	pounds per cubic foot
PDA	Pile Driving Analyzer
PED	Preconstruction Engineering and Design
PPC	Precast, Prestressed Concrete
PPM	FDOT Plans Preparation Manual
psf	pounds per square foot
psi	pounds per square inch

Q

Qn	Nominal Bearing Resistance

R

RGRR	Revised General Reevaluation Report
ROD	Record of Decision
ROW	Right-of-Way
RPMs	Reflective Pavement Markers

S

S&A	Supervision & Administration
SEIS	Supplemental Environmental Impact Statement
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model (2x2)
SHS	State Highway System
SIP	Stay-In-Place
SN	Structural Number
SPT	Standard Penetration Test

T

TCE	Temporary Construction Easement
TTMNS	Tamiami Trail Modifications: Next Steps

U

USACE	U.S. Army Corps of Engineers

W

WCA	Water Conservation Area
WBS	Work Breakdown Structure
WRAP	Wetland Rapid Assessment Procedure

1.0 General

1.1 Introduction

This study assesses alternatives for additional bridging to State Road 90/U.S. Hwy 41 (Tamiami Trail) in Miami-Dade County, Florida, between milepost 13.500 and 24.650 (**Figure 2-1**) to allow additional hydraulic conveyance from the L-29 Canal (L-29C), along the north side of the road and into the Everglades National Park (ENP). The purpose of this Engineering Appendix is to support the Environmental Impact Statement (EIS) for Tamiami Trail Modifications: Next Steps (TTMNS). The alternatives to be evaluated were provided by the U.S. Army Corps of Engineers (USACE) and reflect a Design High Water (DHW) elevation of 9.70 feet-NGVD29 and a bridge Control Water Elevation (CWE) of 8.75 feet-NGVD29; DHW and CWE design criteria are consistent with the design criteria utilized within the November 2005 Revised General Reevaluation Report (RGRR) reference document.

This study examines a total of ten alternatives (Alternatives 1, 2A, 2B, 4, 5, 6A, 6B, 6C, 6D and 6E). Alternative 6E was selected as the preferred alternative and consists of approximately 5.4 miles of girder bridges separated into 4 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C, and adding down ramps at Everglades Safari and Coopertown.

The project corridor extends from approximately structure S-333 on the west to structure S-334 on the east, except for Alternatives 2A, 6A, 6B and 6E where the project extends to the L-31 North Bridge. The Florida Department of Transportation (FDOT) is responsible for maintaining this portion of Tamiami Trail.

The cost estimates developed for this study were completed utilizing updated material quotes and available unit prices. FDOT average unit prices from 2008 were compared with recent project bid-tabs to determine the most current unit costs. Therefore costs provided in this report are in Fiscal Year 2010 dollars and are then escalated for inflation or mid-point date of construction. The escalation is performed according to procedures detailed in USACE publication EM 1110-2-1304. They should only be used for comparative purposes and not be used for budgeting. The cost estimates for all alternatives were computed in Microsoft Excel format. A cost estimate for the preferred alternative (Alternative 6E) was developed in Micro-Computer Aided Cost Estimating System (MCACES) MII format. See Section 11.0 for further discussion of the cost estimates developed for this study.

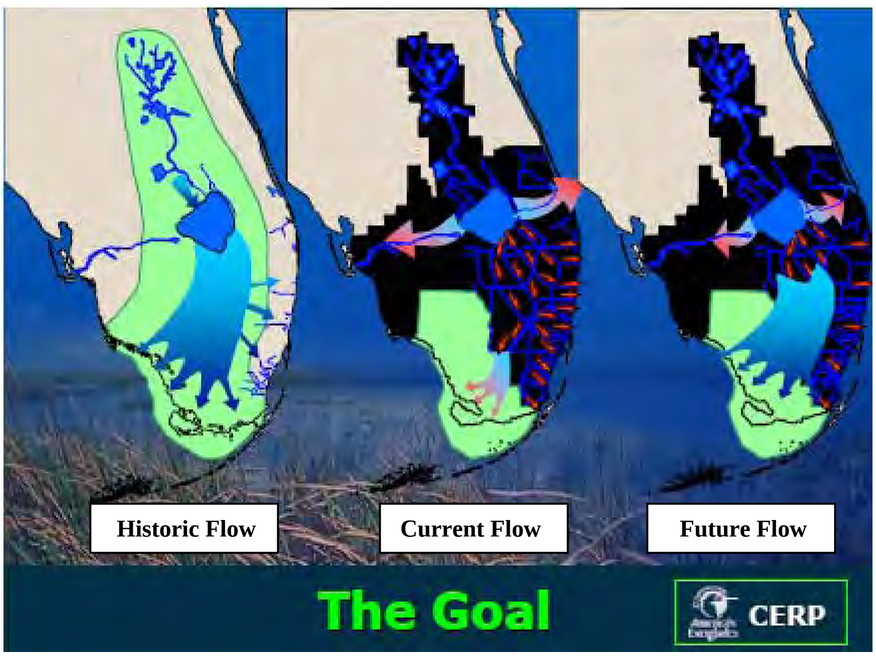
Plans for Modification to Tamiami Trail (Project Invitation No. W912EP-08-R-0025), for a 1-mile bridge construction project on the east end of the study area, with an anticipated construction start date in October 2009, is assumed as existing condition in this study. Design plans for this construction project are referred as ***BASE PLANS*** in this report.

Authorization for this project is provided by the 2009 Omnibus Appropriations Act, Public Law 111-8, 123 Stat. 709. This legislation requires the Department of the Interior “to immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the Modified Water Deliveries to Everglades National Park Project (16 U.S.C. § 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail (U.S. Highway 41) to restore more natural water flow to Everglades National Park and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and Water Conservation Areas" (2009 Omnibus Appropriations Act). Thus, the authority for this federal action is neither the Everglades National Park Protection and Expansion Act of 1989 nor the Water Resources Development Act of 2000.

1.2 Purpose

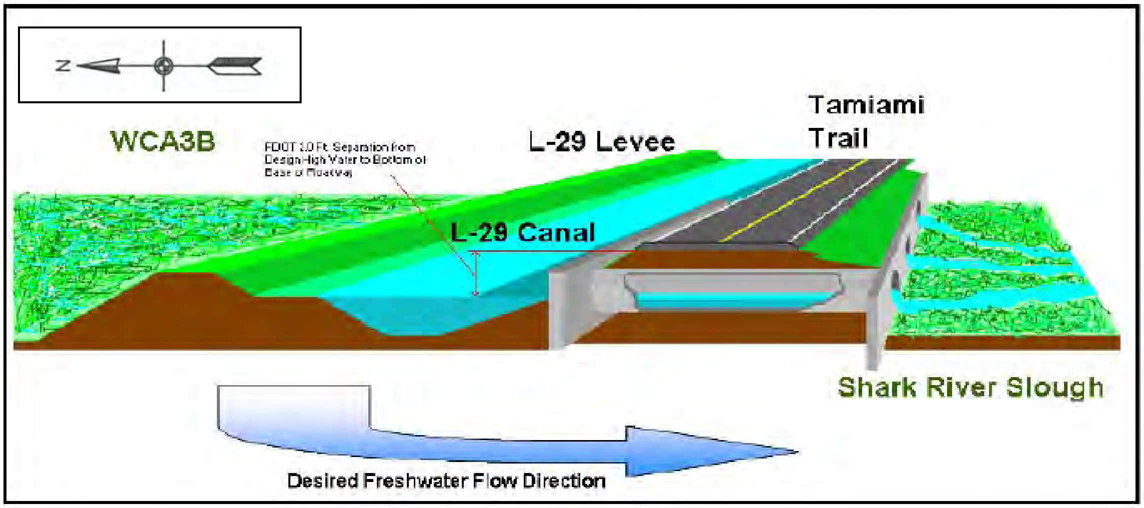
The purpose of this project is to restore more natural water flow to the ENP and Florida Bay. The proposed improvements will allow for higher water stages in the L-29C without further degrading the Tamiami Trail roadway base. Future construction of the Comprehensive Everglades Restoration Plan (CERP) and other project elements, especially storage reservoirs, seepage buffers and decompartmentalization of Water Conservation Area (WCA)-3, may allow for future higher volume releases to increase in frequency and duration. No higher water stages in the L-29C are anticipated for the Tamiami Trail than the current design assumes.

Figure 1-1: The Goal



Construction completion of Tamiami Trail in 1928 and the L-29C in 1962 have acted as a dam to block water flow to the south. Future volume and culvert stage increase for the L-29C to allow additional hydraulic conveyance from L-29C (along the north side of the road) into the ENP will reduce the roadway base clearance and likely cause roadway failure. See **Figure 1-2**. This study assesses the USACE alternatives for preliminary feasibility design, analysis and cost comparison in the study area limits.

Figure 1-2: Cross-Section of Tamiami Trail



1.3 References and Prior Reports

The following prior planning and design efforts and reports were used as references for developing this report:

1. 1992 General Design Memorandum-Modified Water Deliveries to ENP Central and Southern Florida Projects

2. 2002 and 2006 Interim Operational Plan for protection of the Cape Sable Seaside Sparrow (CSSS), Final EIS and Record of Decision (ROD), July 2002, Final Supplemental EIS and ROD (May, 2007)

3. Modified Water Deliveries (MWD) to ENP, 8.5 Square Mile Area, General Re-evaluation Report (GRR) and Final EIS, July 2000, (ROD signed December 6, 2000)

4. MWD to ENP, 2005 RGRR/Supplemental Environmental Impact Statement (SEIS), Tamiami Trail, December 2005 (ROD signed January 25, 2006)

5. MWD to ENP, Final Limited Reevaluation Report and Environmental Assessment (EA), June 2008

6. Plans for Modification to SR 90 (BASE PLANS) (Project Invitation No. W912EP-08-R-0025), August 2008

1.4 Tamiami Trail Construction History

Construction of the original Tamiami Trail was completed in 1928 by the Florida State Road Department. The roadway embankment was constructed by excavating the underlying limestone, forming what is now the L-29C on the north side and placing the rock directly on top of the existing muck. Over time, the muck consolidated to a thickness of two to three feet. The granular embankment varies from three to six feet thick. A rock base surface treatment was applied as the driving surface.

In the mid-1940's, 21 timber bridges were added within the limits of this project as part of a larger 38-bridge project along the Tamiami Trail in Dade County. Each bridge was approximately 45 feet long and spaced approximately ½-mile apart.

In the early 1950's, the bridges were replaced with the current culverts.

In 1968, the shoulders were widened and north side guardrail was added in 1970.

Drawings from 1993 indicate previous placement of a nominal four-inch asphalt overlay and guardrail along the south side, presumably in the 1980's. In 1993, trees along the north side of the roadway were removed, additional widening of the shoulders was conducted and the roadway was resurfaced (2-inch mill and 2.5-inch asphalt overlay).

The current roadway profile is variable, suggesting that the existing peat layer within the roadbed foundation has consolidated unevenly. Roadway plan sets obtained from FDOT archives were reviewed. The plans pertinent to this project include:

Job Number Year Scope

8711-109 **~1946** Addition of 39 45-foot long bridges, 21 within the project area

8711-109 **~1951** Replacement of 21 bridges within project area with culverts

8711-3501 **~1969** Widening (addition of 4 feet of pavement on the south side; 2-foot southern centerline shift; increase in width of travel lanes from 10 feet to 12 feet

8711-3901 **~1970** Addition of north guard rail

87110-3506 **~1993** Widening of left and right shoulder pavement (approximately 6 inches of aggregate base, approximately 4 inches of structural asphaltic concrete and 5/8 inches of friction course). Addition of asphaltic concrete from the edge of structural shoulder to the outside of the guardrail on both the north and south sides of the road. Resurfacing (2-inch mill and 2.5-inch asphalt overlay) of entire roadway. Removal of trees on the north side of road.

2.0 Hydrology and Hydraulics Analysis

2.1 Introduction

This report summarizes *Appendix D: Annexure A of the 2005 RGRR/SEIS for Tamiami Trail* in Miami-Dade County, Florida. The stated purpose of the 2005 RGRR is to identify means to enable conveyance of the authorized flow of water from WCA-3B and the L-29C located north of Tamiami Trail roadway, to North East Shark River Slough (NESRS) and ENP, located south of Tamiami Trail as provided by the 1992 General Design Memorandum/Final Environmental Impact Statement (FEIS), and to provide for appropriate measures so that increased water associated with the MWD project will not adversely affect structural integrity of the Tamiami Trail. Presently, a section of the Tamiami Trail, between milepost 13.500 and 24.650, limits the hydrologic connection between the slough and its water source, two WCAs to the north (**Figure 2-1**). With demolishing the roadway an unfeasible solution, the RGRR/SEIS assessed alternatives to restore hydrologic conditions via a three-step approach:

1. Identify the expected flow volume to ENP based on Combined Structural and Operational Plan (CSOP) modeling. Ensure that WCA-3A and WCA-3B can provide sufficient water to convey the average annual water flow volume authorized for NESRS. Identify a methodology to ensure that Tamiami Trail roadway and proposed bridge design provides adequate conveyance for delivery of the average annual water flow volume from L-29C to NESRS. The L-29C is an intermediate connector between the WCAs and NESRS.

2. Employ the Natural Systems Model (NSM) to calculate DHW and CWE to modify the existing Tamiami Trail design.

3. Given the DHW and CWE, employ the USACE RMA-2 model to assess 11 Tamiami Trail design alternatives that — based on stage, velocity, and flow distribution — would restore the hydrologic connection between the WCAs and the NESRS.

To accomplish step one above, Annexure A evaluated five alternatives as part of the CSOP to modify the current operating system. Once modified, the system would provide sufficient annual flow volumes from WCA-3A and WCA-3B via L-29C to the NESRS. In step two, the NSM provided two controlling water surface elevations — roadway DHW and CWE — to modify the Tamiami Trail roadway design. Each of the 11 alternatives (step three) involved elevating the Tamiami Trail via a series of bridges. Evaluating each alternative, then, involved an assessment of different bridge locations and configurations to identify the best bridge design from a cost-benefit approach.

Following this introduction, Section 2.2 provides a background of the Tamiami Trail project, and Section 2.3 describes existing conditions along the roadway. Section 2.4 provides a summary of CSOP alternatives. Section 2.5 describes NSM modeling, and Section 2.6 discusses the alternatives for Tamiami Trail modifications. Section 2.7 summarizes the RMA-2 modeling and results for all the bridge alternatives. Section 2.8 describes distribution of flows in the NESRS under different climatic conditions, and Section 2.9 concludes the 2005 RGRR hydrology and hydraulics analysis conducted by the USACE for the Tamiami Trail study. Section 2.10 provides an outline of 6 Action Alternatives based on recommended modifications of Alternatives 10, 12, 13, 14 and 17 analyzed in the 2005 RGRR.

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Figure 2-1: Study Area

2.2 Background of Tamiami Trail Project

The Everglades National Park Protection and Expansion Act (December 1989) authorizes the Secretary of the Army to improve water deliveries to the ENP and take steps to restore natural hydrologic conditions within the ENP. A 1992 General Design Memorandum (GDM) and EIS recommended transferring water into the ENP from two WCAs — WCA-3A and WCA-3B — to the L-29C. This recommendation rested on the assumption that existing culverts under the Tamiami Trail had adequate capacity to convey the water flow. However, subsequent hydrologic analyses revealed these culverts required stages higher than 7.5 ft-NGVD in the L-29C canal to convey enough water to restore the NESRS, an area of interest within the ENP. At present, Tamiami Trail can withstand a maximum prolonged stage level of 7.5 ft-NGVD; stages higher than 7.5 ft-NGVD would likely cause progressive road failure under certain storm conditions. Hence, the 2005 RGRR/SEIS evaluated different alternatives (1) to improve water deliveries and restore the natural hydrologic conditions in the NESRS and (2) to allow the Tamiami Trail to maintain the vehicular link, without threat of failure, between the west and east coasts of Florida.

The restoration of natural hydrologic conditions would require satisfying the following three conditions:

1. Location — The historic path of Shark River Slough requires restoration by bringing WCA-3B and NESRS into the flowway and thus connecting WCA-3A to the NESRS and ENP.

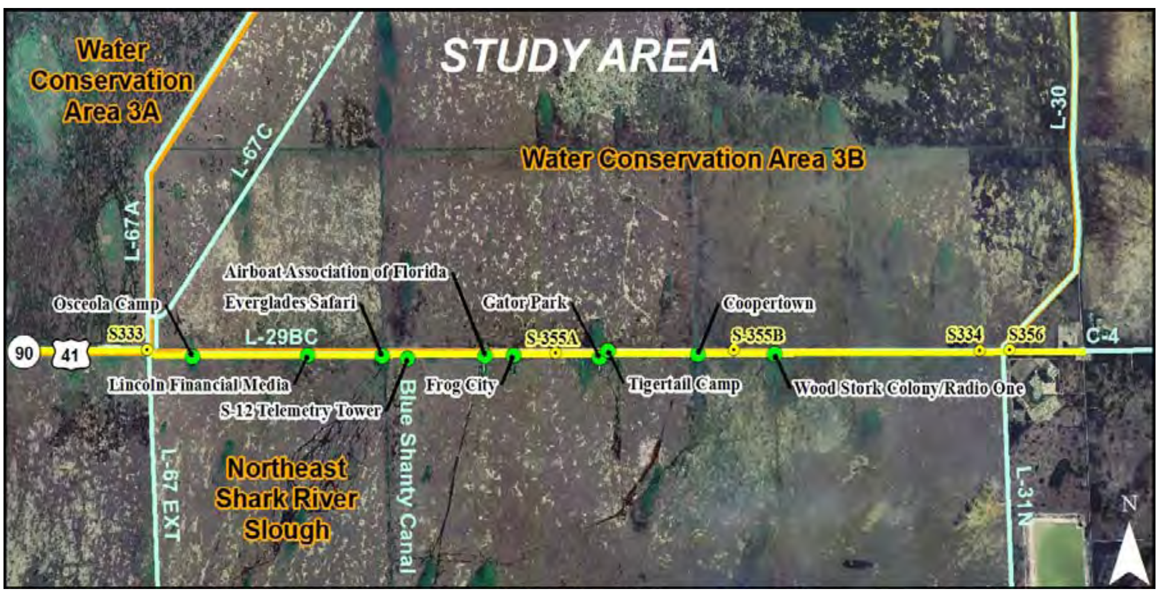
2. Timing — Water flow through the restored Shark River Slough should reflect local meteorological conditions, including the extremes of natural droughts and floods, and annual variations in seasonal and long-term cycles.

3. Volume — The volume of water delivered should restore the natural hydroperiod of NESRS and reflect the naturally available supplies based on local meteorological conditions, except in cases where operations of the Central & South Florida (C&SF) project for other authorized project purposes necessitate increased or decreased deliveries.

2.3 Existing Conditions, Structure Operations and Constraints

WCA-3A and WCA-3B receive water either from rainfall or from Lake Okeechobee through a series of canals and structures. The USACE maintains water control structures — S-333, S-334, S-355A, S-355B, and S-356 — along the levees of WCA-3A and WCA-3B to regulate flow into L-29C (**Figure 2-2**). The L-29 Levee and L-29C run parallel and north of Tamiami Trail, acting as a divide between the WCA-3B and the NESRS. Water flows out of L-29C into the NESRS under Tamiami Trail through 55 culverts with sizes varying between 42 inches and 60 inches. The average invert elevation of the culverts vary from 2.2 ft- NGVD to 4.9 ft-NGVD.

Figure 2-2: **Location of Structures along L-29C**



Inflows from WCA-3A through structure S-333 and outflow discharges at structure S-334 control the water surface elevations in L-29C. WCA-3A discharges a maximum of 1,350 cubic feet per second (cfs) through structure S-333 — a single-gated spillway — into L-29C. Structure S-334, another single-gated spillway, discharges a maximum of 1,230 cfs from L-29C into the L-31N Canal. Conditions permitting, structures S-355A and S-355B can augment flows from WCA-3B to L-29C. The USACE had operational permits for S-355A and S-355B until approximately 2004 and the structures were operated under limited duration 'testing' prior to 2009. However, S-355A and S-355B were infrequently operated until 2009. In 2009, USACE received temporary water quality permits for operation of these two structures. The pump station (structure S-356) pumps water from the L-31N Canal into the L-29C, but the pump station is not currently utilized without an approved operating plan and necessary operational permits.

Water flow from the culverts under Tamiami Trail is subject to high expansion losses and very high resistance from the downstream marsh. The high hydraulic head required to deliver the required water volume could undermine the subbase of the Tamiami Trail. The average spacing between existing culverts (0.56 miles) constitutes point discharges into the NESRS instead of a more desirable historical sheet flow. The compounded head loss from the culverts and downstream marsh creates increased tailwater conditions in L-29C. This condition, in turn, affects the discharge capability of structures S-333, S-355A and S-355B.

Water managers currently limit the stage in L-29C to a maximum elevation of 7.5 ft-NGVD. Limiting the stages at gage G-3273, located within the ENP, to an elevation 6.8 ft-NGVD additionally constrains discharges into L-29C. This stage limitation at G-3273 was originally established to provide protection to the developed portions of the East Everglades, including the 8.5 square mile area. The current stage limitations in L-29C and resistance to flow though the marsh terrain in ENP severely limit discharges into the NESRS.

2.4 Combined Structural and Operational Plan (CSOP)

The alternatives analyzed during the CSOP study (2003-2007) each provided the annual volume of water to the NESRS that was envisioned with the 1992 MWD GDM, while concurrently seeking to maintain other authorized purposes of the MWD project and C-111 Canal project. All CSOP alternatives assumed removal of the L-67 extension canal, consistent with the 1992 GDM. The suite of alternatives further included modifications to the L-67A and L-67C levees, construction of additional water control structures, passive weir structures, spreader canals, and altering operations of the existing water control structures. The South Florida Water Management Model (SFWMM or 2x2) model was utilized to simulate each CSOP alternative and generate time series output of stages and flows for evaluation. At the time of preparation of the 2005 Tamiami Trail RGRR report, the CSOP study had not concluded or identified a recommended plan; subsequent to preparation of the 2005 RGRR, the CSOP study was postponed pending resolution of the MWD Tamiami Trail bridge recommended plan. However, due to uncertainties involved in selecting the appropriate alternative from the CSOP study, the USACE and FDOT decided to use the stages from NSM model to modify the Tamiami Trail design for the 2005 RGRR report.

The CSOP study evaluated five alternative plans to maximize flow from WCA-3A and WCA-3B to NESRS. Alternative 2, the West Bookend Run, provided the largest volume of flow to NESRS. Flow and stage boundary conditions from this alternative were utilized for the RMA-2 modeling effort.

2.5 Natural Systems Model (NSM)

The South Florida Water Management District (SFWMD) model NSM Version 4.6.2 attempts to simulate the hydrologic response of the pre-drainage Everglades using recent (1965 – 2000) records of rainfall and other climatic inputs to predict flow and stage conditions between Lake Istokpoga to Florida Bay. In addition, NSM provides restoration stage and duration targets for the Greater Everglades System. NSM takes into account rainfall, evapotranspiration, topography, subsidence, and hydrologic and hydraulic factors within its model domain. For the Tamiami Trail project, NSM accounts for possible seepage and conveyance feature configurations considered in the CSOP and the subsequent CERP WCA-3A/3B decompartmentalization project, and provides stages at Tamiami Trail to calculate DHW, CWE and design overtopping elevation. The DHW elevation is the design high water elevation for road base clearance and CWE provides a stage value that determines the required low bridge chord elevations for inspection purposes. The alternatives listed in Section 2.6 take into account the DHW, CWE, and the 100-year water surface elevation.

Figure 2-3 as obtained from Figure 5 from the 2005 RGRR shows the frequency curve for the NSM model, as well as the 0.05 and 0.95 confidence limits and the Weibull plot positions of the model input data. **Table 2-1** as obtained from Table 5 of the 2005 RGRR includes annual maximums for each model run. **Figure 2-4** as obtained from Figure 7 of the 2005 RGRR compares the stage hydrographs from the NSM model period of record with the stages for various return period frequency that was obtained using stage data with the Log Pearson Type III distribution of the Flood Frequency Analysis (FFA) program. From the visual inspection of the stage hydrograph it appears that this frequency analysis appears to approximate the return frequency of the NSM model appropriately. **Figure 2-5** as obtained from Figure 8 of the 2005 RGRR shows the occurrence frequency of any given stage during the modeled period of record for NSM (13,149 days).

FFA with annual maximum stages from NSM provides a DHW elevation of 9.7 ft-NGVD, an elevation that corresponds to a 20-year/24-hour stage. The average of 36-year period of peak annual stages corresponds to a CWE of 8.75 ft-NGVD. The DHW for overtopping corresponds to a 100-year water surface elevation of 10.1ft-NGVD.

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Figure 2-3: Natural System Model (NSM) Frequency Curve – Model Results Next to Tamiami Trail (L-29C)

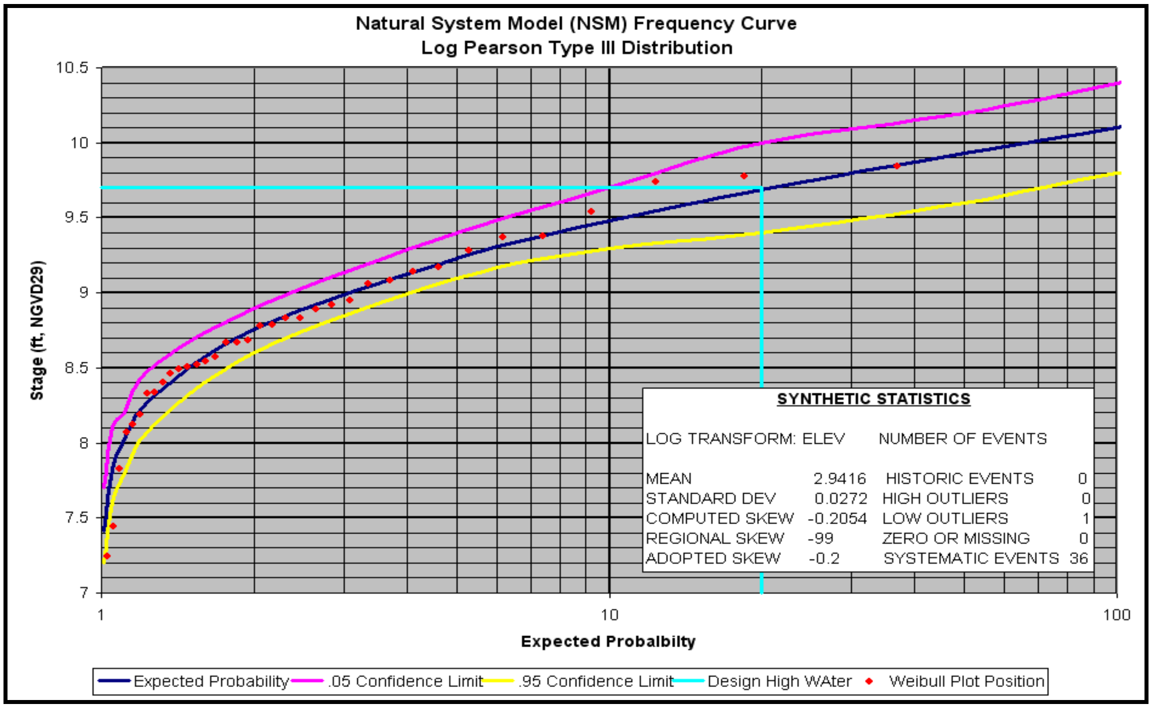

Figure 2-4: Comparison of NSM Frequency Analysis with NSM Stage Hydrograph

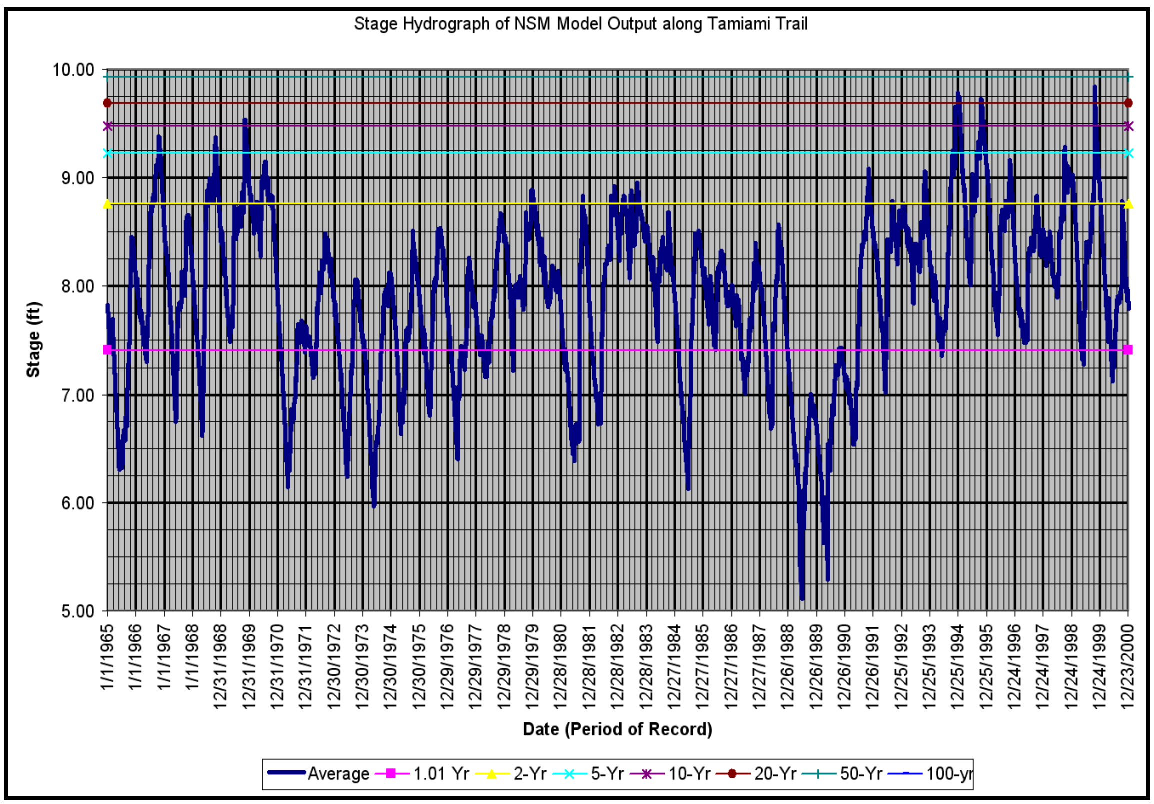

Figure 2-5: NSM Frequency of Occurrence within the Modeled Period of Record

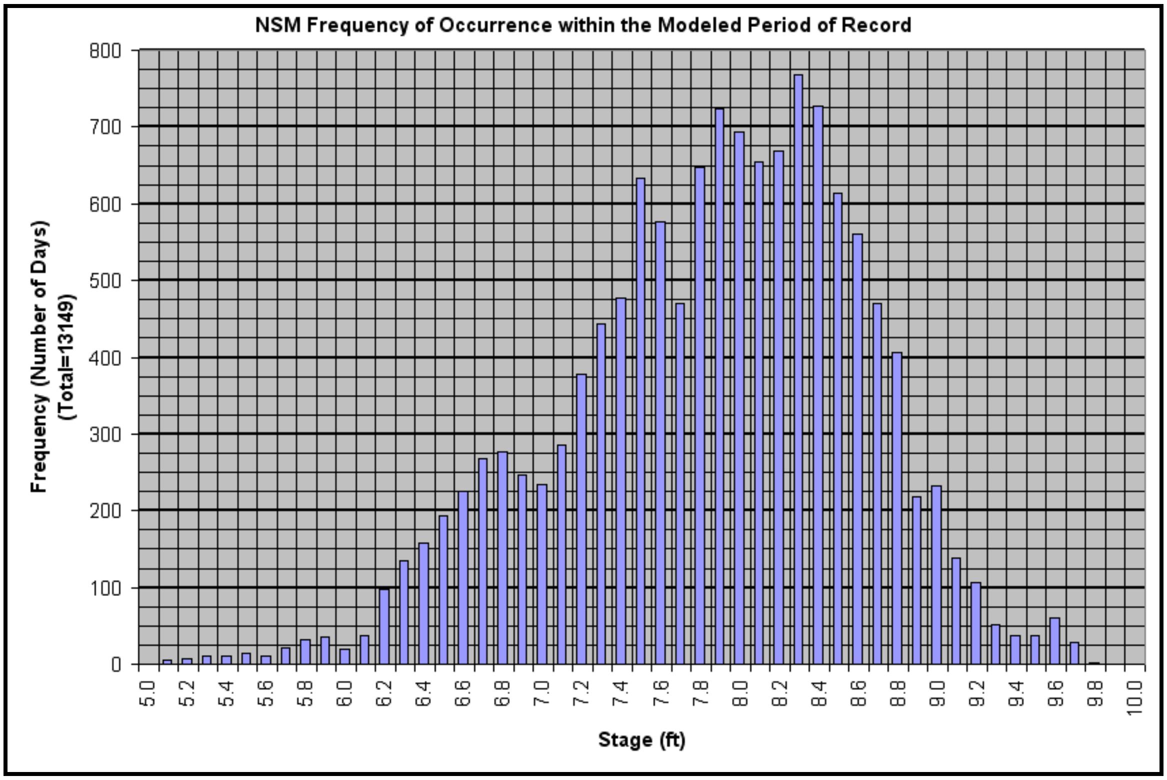

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Table 2-1: Yearly Peak Stages from Evaluated Model Runs

Year	NSM	CERP0	CERP1	ALT7R5	West Brook	East Brook	Alt 3	Alt 4	Alt 5
1965	8.46	8.31	8.31	7.66	8.33	8.37	8.27	8.11	8.04
1966	9.38	8.95	8.94	7.93	8.85	8.91	8.60	8.60	8.59
1967	8.66	8.52	8.48	7.80	8.30	8.43	8.46	8.11	8.14
1968	9.37	9.08	9.08	8.03	9.10	9.05	8.76	8.78	8.75
1969	9.54	9.22	9.21	8.17	9.32	9.12	8.95	9.02	9.07
1970	9.14	8.96	8.94	7.98	8.97	8.98	8.65	8.74	8.74
1971	7.87	7.87	7.83	7.35	8.03	7.18	7.51	7.67	7.66
1972	8.49	8.45	8.40	7.97	8.26	8.65	8.49	8.20	8.11
1973	8.06	7.77	7.74	7.56	7.41	7.76	7.99	7.43	7.51
1974	8.13	8.18	8.17	7.76	8.01	7.85	8.10	7.74	7.66
1975	8.51	8.41	8.36	8.05	8.26	8.50	8.45	8.14	8.02
1976	8.53	8.42	8.39	7.81	8.27	8.47	8.48	8.16	8.11
1977	8.26	7.81	7.80	7.62	7.75	7.75	8.10	7.64	7.72
1978	8.67	8.51	8.47	7.86	8.35	8.55	8.46	8.27	8.16
1979	8.89	8.46	8.46	7.92	8.50	8.69	8.51	8.41	8.40
1980	8.82	8.42	8.42	7.98	8.34	8.65	8.45	8.36	8.27
1981	8.83	8.46	8.46	7.74	8.38	8.53	8.50	8.27	8.27
1982	8.92	8.78	8.76	8.01	8.67	8.73	8.51	8.50	8.46
1983	8.95	8.72	8.68	8.04	8.89	8.94	8.50	8.62	8.67
1984	8.68	8.33	8.30	7.96	8.17	8.28	8.42	8.06	8.04
1985	8.51	8.16	8.14	7.85	8.16	8.08	8.32	7.95	7.83
1986	8.33	8.34	8.31	7.88	8.20	8.54	8.39	8.13	8.03
1987	8.40	8.02	7.99	7.85	8.02	8.28	8.40	8.01	8.06
1988	8.57	8.23	8.18	7.74	7.98	8.34	8.40	8.00	8.09
1989	7.29	7.42	7.43	6.48	6.53	6.57	6.64	6.69	6.34
1990	7.43	7.08	6.99	7.18	6.70	7.32	7.23	6.78	6.80
1991	9.08	8.63	8.64	7.54	8.45	8.42	8.47	8.28	8.18
1992	8.78	8.35	8.33	7.86	8.22	8.70	8.43	8.34	8.38
1993	9.06	8.48	8.47	7.77	8.32	8.55	8.46	8.32	8.31
1994	9.78	9.40	9.40	8.11	9.71	9.18	9.25	9.67	9.36
1995	9.75	9.51	9.50	8.23	9.70	9.05	8.96	9.21	9.26
1996	9.17	8.77	8.75	7.87	8.79	8.90	8.51	8.49	8.53
1997	8.83	8.66	8.64	7.77	8.42	8.65	8.47	8.30	8.32
1998	9.28	9.00	8.99	7.97	9.04	9.05	8.55	8.75	8.75
1999	9.84	9.84	9.82	8.59	9.75	9.51	9.29	9.51	9.49
2000	8.78	8.60	8.60	7.86	8.45	8.47	8.53	8.54	8.39
Maximum Stage	9.84	9.84	9.82	8.59	9.75	9.51	9.29	9.67	9.49
	NSM	CERP0	CERP1	ALT7R5	West Brook	East Brook	Alt 3	Alt 4	Alt 5

Data presented in **Table 2-1** are from Annex A: Hydrology and Hydraulics Report, Design of High Water Calculations for Tamiami Trail and RMA-2 Modeling of North East Shark River Slough.

2.6 2005 RGRR Alternatives for Tamiami Trail Roadway Modifications

In the 2005 RGRR, USACE formulated 11 alternatives to replace the existing Tamiami Trail with a new roadway to withstand the elevated stages from L-29C. The alternatives include 11 different combinations of bridge locations and bridge opening lengths to pass flow from L-29C to the NESRS. The RMA-2 model first simulated existing conditions (the No Action alternative) to provide a comparative baseline for the 11 action alternatives. With the results of the No Action alternative as a backdrop, the RMA-2 model then simulated each of the 11 Tamiami Trail action alternatives for its capability to pass increased amounts of flow into the NESRS and to provide a more natural flow pattern (sheet flow) with a minimal change in velocities. Each alternative involves removal of the roadway within the footprint of the bridges and reconstruction with an asphalt overlay of the un-bridged portion of the road to raise the road profile.

The identified alternatives include the following:

- No Action Alternative – Existing Conditions
- Alternative 9 – 3,000-foot long bridge in the western region of the project area
- Alternative 10 – 4-mile long bridge in the central region of the project area
- Alternative 11 – 4-mile long bridge at the eastern end of the project area
- Alternative 12 – 3-mile long bridge in the western region of the project area
- Alternative 13 – 2-mile long bridge in the western region of the project area
- Alternative 14 – 2-mile long bridge at the western region of the project area and a 1-mile long bridge at the eastern end of the project area
- Alternative 15 – 1.3-mile long bridge at the western region of the project area and a 0.7-mile long bridge at the eastern end of the project area
- Alternative 16 – Three 3,000-foot long bridges one each in the western, central and eastern portion of the project area
- Alternative 17 – 10.7-mile long bridge within the existing Right-of-Way (ROW)
- * Alternative – 1-mile long bridge at the western end of the project and 1-mile long bridge at the eastern end of the project area
- * Alternative – 2-mile long bridge at the western end of the project and 2-mile long bridge at the eastern end of the project area

* Unnumbered alternatives in the Annexure A

2.7 RMA-2 Modeling and Results

The complex nature of the NESRS floodway and the goals set forth for evaluating the alternatives required a model to analyze multi-directional flow patterns and provide flow velocities and depths. The RMA-2 model — a two-dimensional depth-averaged hydrodynamic computer model capable of computing stages, velocities, and distribution of flow over time — considers flow expansion losses, velocities, and flow distributions through various culvert and bridge configurations. The model utilizes land features, hydraulic roughness coefficients, and topographic data. The existing culvert locations were approximated as gaps through Tamiami Trail. **Figure 2-6** shows the RMA-2 model boundary.

For each alternative, USACE used a RMA-2 model to simulate flow between L-29C and the NESRS; calculate stages, velocities, and flow distributions for 1-, 2-, 5-, 10-, 20-, 25-, 50- and 100-year return period discharges; and show the effect of different bridge widths and locations on velocities, stages, and flow distribution. The USACE performed steady state simulations and calculated the return period discharges based on a frequency analysis of the CSOP west bookend model run. The flow and stage boundaries for the RMA-2 modeling were obtained from the West Bookend Run (CSOP Alternative 2). This run was selected because it put the largest volume of water into the NESRS.

Comparison of velocities for the 100-year return period discharge at the center of the proposed bridge shows 4 out of the 12 alternatives exceeded the maximum velocity of 0.1-foot per second (fps). Similarly, for the 1-year return period discharge one alternative exceeded the maximum velocity of 0.1 feet per second (fps). **Figure 2-7** and **Figure 2-8** compare the velocity at the center of the bridge for the 1-year and 100-year return period with the marsh velocity at a distance of approximately 10,000 feet downstream of the road from the 10.7-mile bridge option. Results show Alternative 17 has least impact on velocities at Tamiami Trail and the marsh for the 1- and 100-year events.

Areas of velocity impact correspond to areas just downstream of Tamiami Trail and east of structure S-333 with velocities greater than 0.1 fps. Comparison of results for all alternatives show areas of impact vary from 8 acres to 411 acres with Alternative 17 producing the least area of impact and Alternative 9 producing the maximum area of impact.

Results indicate the backwater effect from highly resistant marsh in the ENP acts as the main controlling factor for stages in the L-29C. The length of bridge opening affects the backwater effect. A comparison of stage differences between L-29C and 10,000 feet downstream of Tamiami Trail for various bridge lengths show that bridge length affects the getaway capacity of the downstream marsh, and the longer the bridge the more efficient the marsh becomes at moving water south into the NESRS. The L-29C acts as a stage equalizer upstream of Tamiami Trail, and this increased stage propagates into WCA-3B as water discharges through structure S-355 and potentially other passive structures in L-29C. The length and location of bridge opening governs the distribution of flows. **Figure 2-9** show plots from the RMA-2 model runs comparing the stage difference between the L-29C and 10,000 feet downstream (ΔH) in the marsh for the various bridge lengths considered.

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Figure 2-6: RMA-2 Model Mesh Boundaries

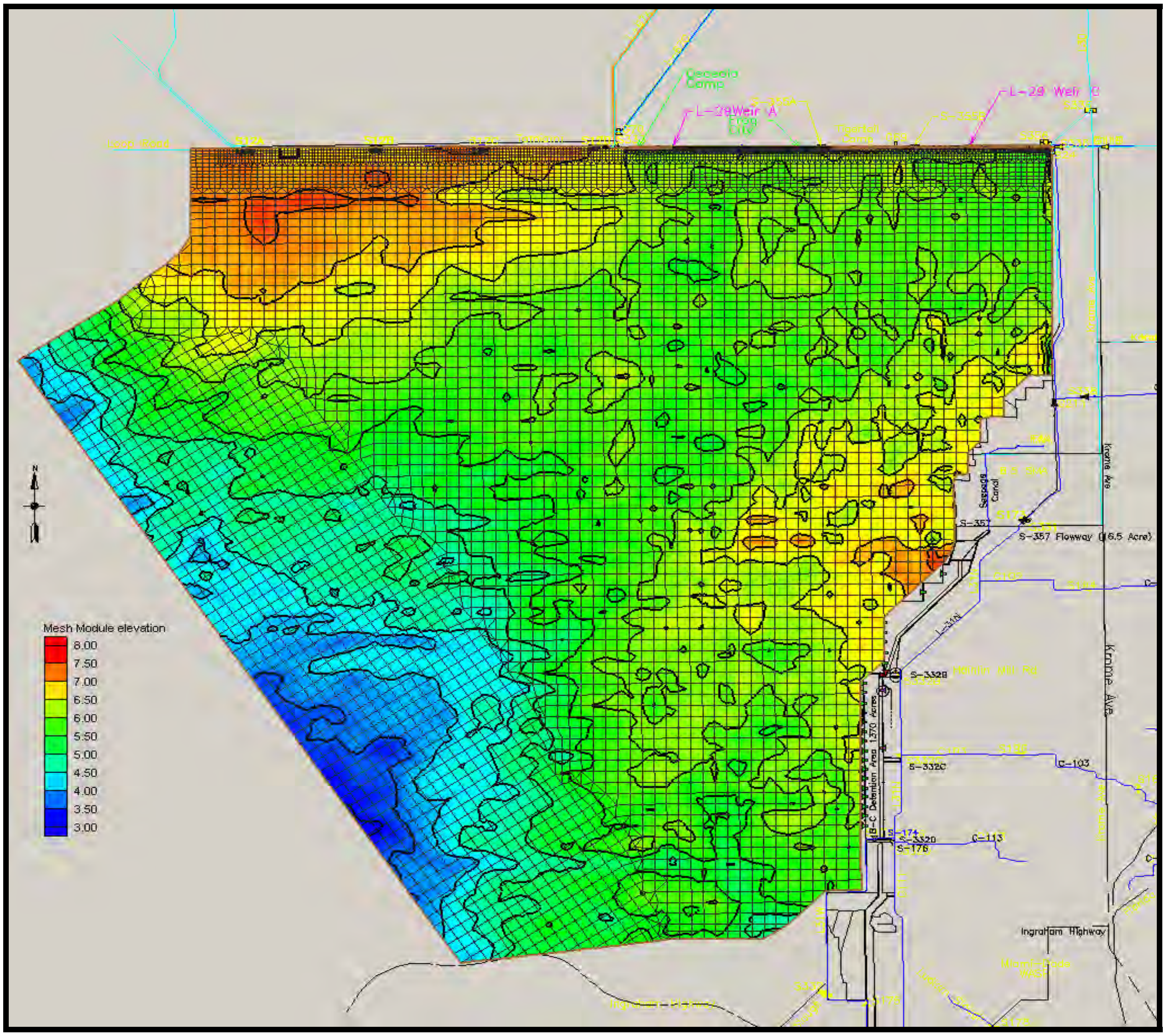

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Figure 2-7: Flow Velocity vs. Downstream Distance 1 Year Return Frequency

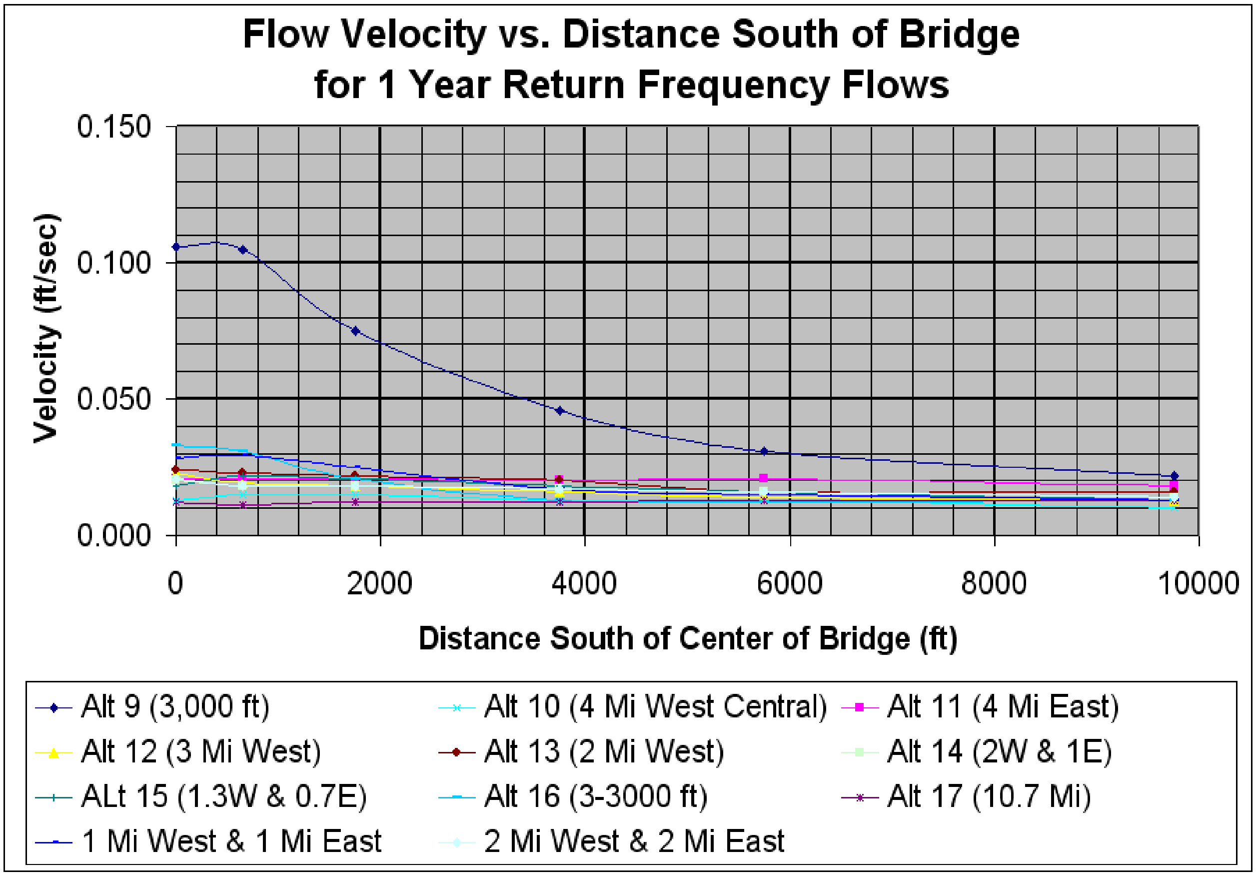

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Figure 2-8: Flow Velocity vs. Downstream Distance 100 Year Return Frequency

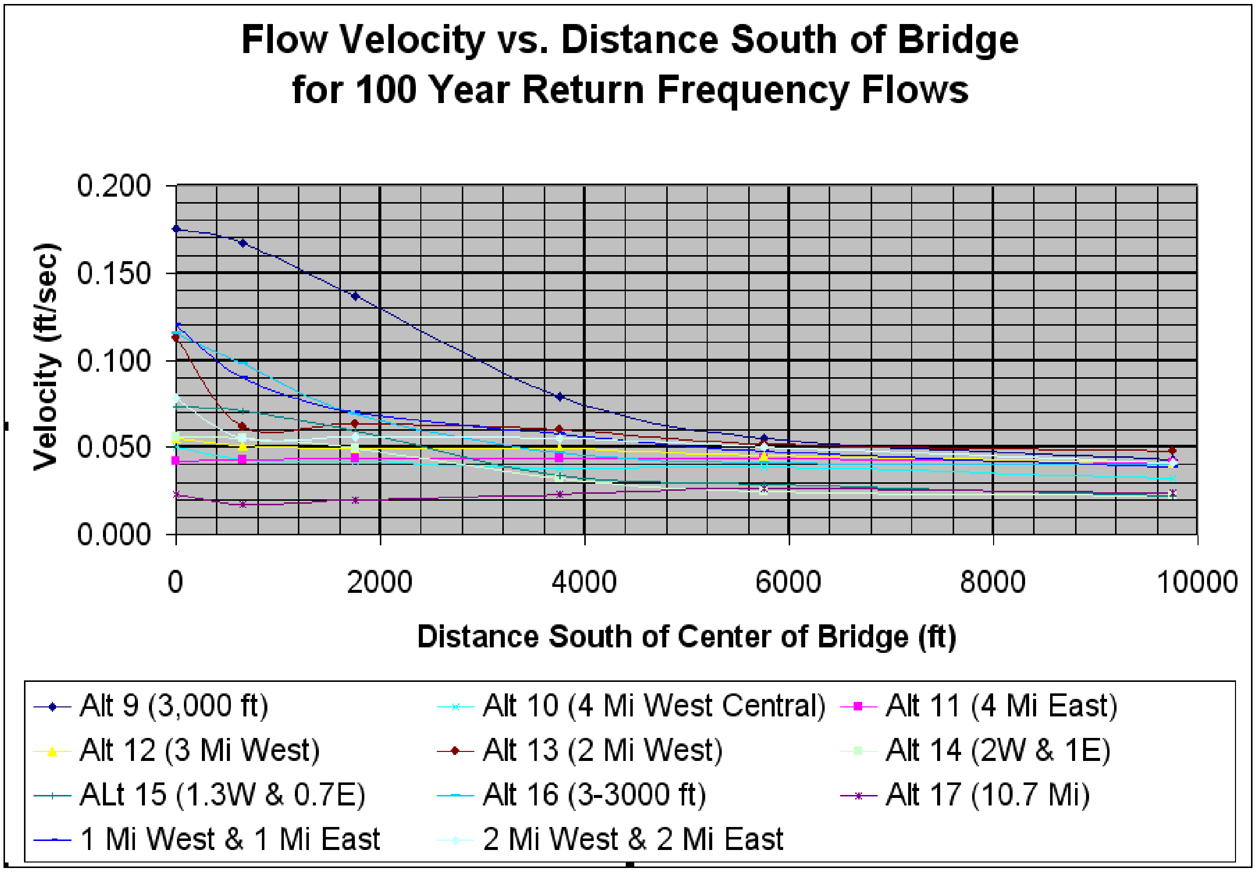

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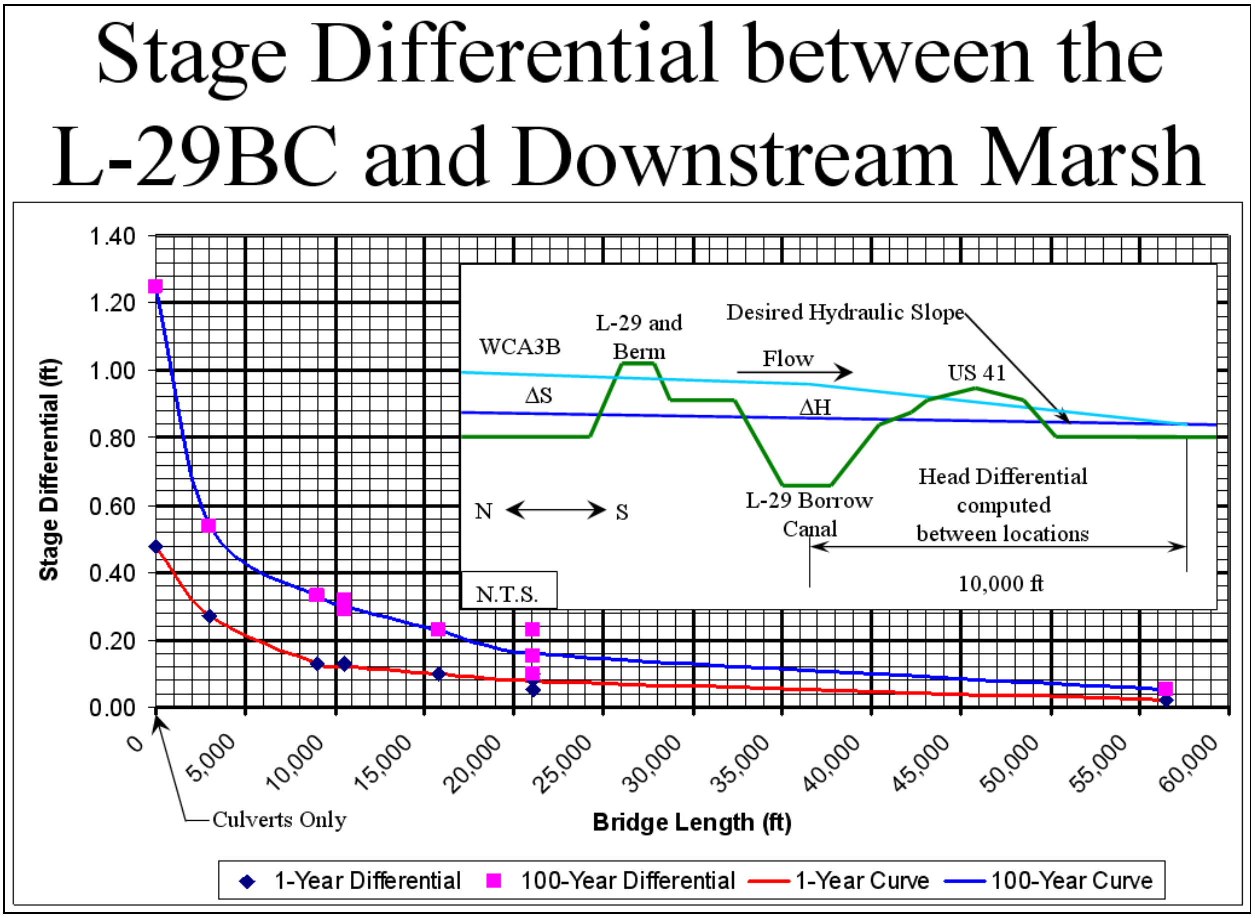
Figure 2-9: Stage Differential between the L-29C and Downstream Marsh



2.8 Distribution of Water in NESRS During Average, High and Dry Seasons

A complete restoration of the NESRS requires assessing conveyance of water and distribution of flows through the marsh within the NESRS. Elevations within NESRS marsh vary from 5.6 ft-NVGD to 7.2 ft-NGVD. Due to variations in marsh elevations, the ground topography within the NESRS consists of sloughs with varying conveyance capacity. Ideally, the entire marsh would exhibit a uniform depth to ensure uniformly distributed flow and conveyance. The distribution of flow within the NESRS becomes uniform when the water depth increases and relative depth difference reduces. Water must reach the deep sloughs, commensurate with the capacity of marsh to handle water flow volumes during wet, dry, and average seasons to redevelop and maintain open water vegetation in the sloughs.

For average and wet season conditions, The NSM predicts stages in the NESRS to range from about 4 ft-NGVD (about 2 feet below ground surface elevation) to 9 ft-NGVD with a median stage of 7.5 ft-NGVD. **Figure 2-3** shows a relative median stage of 7.5 ft-NGVD compared to ground elevations located about 1,000 feet downstream of Tamiami

Trail. Depth of flow averages about 1.1 feet with a maximum depth of about 1.9 feet and a minimum depth of about 0.3 feet with the water level less than 0.5 feet above the elevation of the highest ridges.

For dry season conditions, water can flow only through deep sloughs within the marsh. The connection provided by bridge alignment with deeper portions of the NESRS facilitates uniform distribution of sheet flow where it would have occurred historically. During dry season, a bridge would provide a better connection, higher capacity, and hydraulic connectivity than the existing culverts. A bridge would also:

- Provide an improved spatial distribution of water within NESRS; improve natural recession rates; and reduce the frequency of abnormal dry outs for the deepest sloughs in NESRS.

- Facilitate the movement of fish into the L-29C through the deepest portions of the NESRS during dry outs which allows for rapid repopulation of these sloughs.

- Reduce unnatural predation around the culverts due to their limited area.

The reader of this summary should note that **Figure 2-10** shows six bridge alternatives for Tamiami Trail proposed in 2009 as requested by USACE. None of the RMA-2 alternative bridge configurations documented in the 2005 Tamiami Trail project study report are consistent with the 2009 proposed alternatives for Tamiami Trail. **Figure 2-10** shows the 2009 alternatives for visualization purposes only. See Section 2.10 for further discussion of the proposed bridge alternatives.

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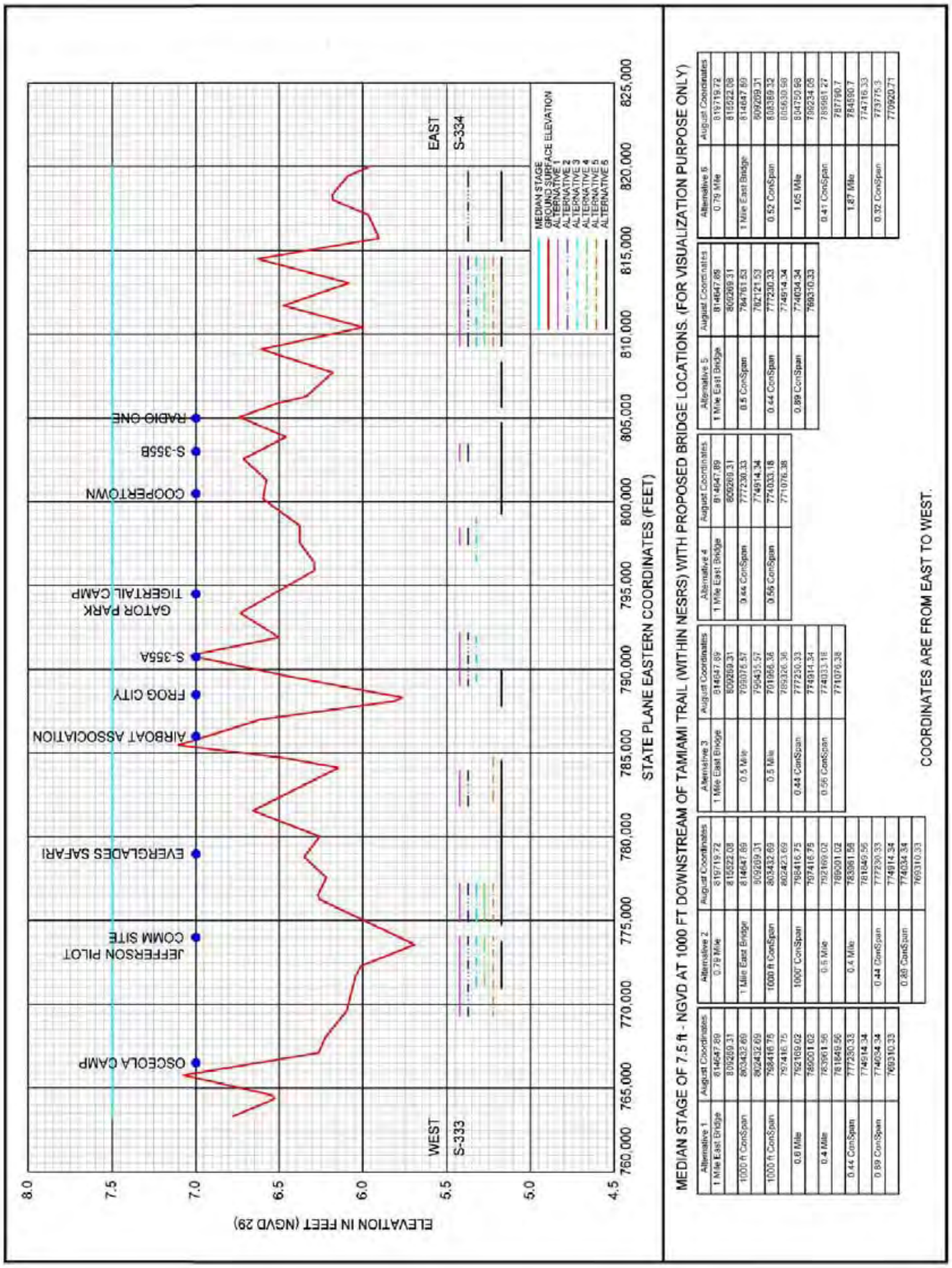
Figure 2-10: 2009 Bridge Alternatives Transposed Over Topographic Data South of Tamiami Trail



2.9 Conclusion of the 2005 RGRR Study

The 2005 RGRR study on Tamiami Trail formulates a plan to modify existing water control structure operations and the Tamiami Trail roadway design to allow the required average annual volume of water sheet flow from the WCA into L-29C and eventually into the NESRS. CSOP plan evaluated five alternatives to deliver the required volume of water to the L-29C. The NSM model provided water control elevations required to design the proposed bridges along Tamiami Trail. The 2005 RGRR study evaluated 11 bridge configurations along the proposed roadway, with the selected bridge to replace any existing culverts within the selected bridge's footprint. All alternatives from the 2005 RGRR study can convey the required volume of water without any damage to Tamiami Trail. Results from the RMA-2 modeling study illustrate the importance of selecting the appropriate bridge location and length of openings to restore the NESRS. The size of opening under Tamiami Trail will affect the velocity between the bridge and marsh. Results from the RMA-2 model show longer bridges helps to minimize the differences in velocity between the bridge and the marsh. Velocities greater than 0.1 fps produced by short bridge openings can prove extremely destructive to the ridge and slough environment of the NESRS immediately south of the Tamiami Trail. Bridge location plays a critical part in uniformly distributing flows with minimal velocity differences between the roadway and marsh within the ENP. Further, bridge location with respect to the location of the deep sloughs within the NESRS also plays a critical role for establishing conveyance from L-29C to the NESRS. The USACE ranks each alternative based on its capability to pass flows with minimal areas of impacts, change in velocity between the roadway and marsh, and distribution of flows.
Results from the 2005 RGRR hydraulic analysis showed Alternative 17, a 10.7-mile long bridge, provides the maximum bridge opening for connectivity across the entire width of the NESRS, and for minimal velocity and stage differences between roadway and marsh.

2.10 Basis of Design for the Modifications to the Tamiami Trail Roadway

Subsequent to the 2005 RGRR report, USACE finalized a Limited Reevaluation Report (LRR) in 2008. The 2008 LRR recommends construction of a 1-mile bridge located in the eastern portion of the 2005 RGRR's Tamiami Trail project area. The 1-mile bridge is the base condition and is considered the "No-Action" alternative for further studies. In 2009, the Department of the Interior (DOI) directed the National Park Service (NPS) to reevaluate alternatives from the 2005 RGRR. All alternatives evaluated were modified to include the 1-mile bridge recommended by the 2008 LRR. Alternatives 9 through 17 were reevaluated during the initial scoping process and alternatives 10, 12, 13, 14, 17 were retained for analyses in the EIS. Alternatives 9, 11, 15, and 16 were eliminated from further consideration. The basis for elimination of those alternatives is provided in the NPS report. No new hydrologic modeling was provided for evaluation of the modified alternatives. Modifications were proposed to the retained alternatives and they were renumbered for ease of discussion in the EIS. The modified alternatives are as follows:

- No Action Alternative (2008 LRR Preferred/Recommended Alternative): This alternative consists of construction of a 1-mile eastern bridge with the remaining road raised to allow an increase in the allowable stage in L-29C from 7.5 ft-NGVD to 8.5 ft-NGVD.

- Action Alternative 1 (2000 RGRR Alternative 10): This Alternative consists of approximately 1.9 miles of girder bridges separated into 4 sections and approximately 0.3 mile of precast arch-type bridge culverts with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C.

- Action Alternative 2 (Modified Alternative 1B): This Alternative has been split into A and B, detailed below.

- Action Alternative 2A is approximately 3.1 miles of girder bridges separated into 6 sections and approximately 0.3 mile of precast arch-type bridge culverts with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C.

- Action Alternative 2B is approximately 2.4 miles of girder bridges separated into 5 sections and approximately 0.3 mile of precast arch-type bridge culverts with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C.

- Action Alternative 3 (2005 RGRR Alternative 12): This Alternative consists of approximately 2.0 miles of girder bridges separated into 2 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C. This alternative has been eliminated from further consideration.

- Action Alternative 4 (2005 RGRR Alternative 13): This Alternative consists of approximately 1.0 miles of girder bridges separated into 2 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C.

- Action Alternative 5 (2005 RGRR Alternative 14): This Alternative consists of approximately 1.5 miles of girder bridges separated into 3 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C.

- Action Alternative 6 (2005 RGRR Alternative 17): This alternative was separated into five alternatives, detailed below.

- Action Alternative 6A: This Alternative consists of approximately 5.1 miles of girder bridges separated into 6 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C.

- Action Alternative 6B: This alternative is the same as 6A, but adds down ramps at Everglades Safari and Coopertown.

- Action Alternative 6C: This Alternative consists of approximately 4.4 miles of girder bridges separated into 5 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C, and adding down ramps at Everglades Safari and Coopertown.

- Action Alternative 6D: This Alternative consists of approximately 4.7 miles of girder bridges separated into 3 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C, and adding down ramps at Everglades Safari and Coopertown.

- Action Alternative 6E: This Alternative consists of approximately 5.4 miles of girder bridges separated into 4 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C, and adding down ramps at Everglades Safari and Coopertown.

USACE has selected Action Alternative 6E as the preferred alternative. Details of the Alternative 6E girder bridges are shown in Section 7.0 of this report.

Construction of the easternmost 0.66 mile bridge proposed in Alternatives 2A, 6A, 6B, and 6E require degrading the road bed to natural grade. NESRS lands bordering L-31 are highly porous. This porous material will allow water to seep from west to east through the L-31 levee. Therefore, current operational criteria for S-331, G-211, S-173, S-356, S-332C, and S-332D must be reviewed and possibly revised to insure that seepage into lands east of L-31C is not significantly increased.

3.0 Surveying and Mapping

A conceptual level topographic survey was conducted in 2000, consisting of a cross-section every mile and a centerline elevation every 500 feet. The centerline elevation varied from 10.06 to 11.92 feet-NGVD29 along the majority of the project. At the west end, the roadway rose considerably to 15.0 feet to connect to the Tamiami Trail west of S-333. The average elevation for the study corridor, excluding the data above 12.0 feet (rise at the west end), is 10.95 feet. This figure was rounded to 11.0 feet for development of the concept alternatives.

No formal boundary survey information was available from the FDOT or the ENP, and no property boundary survey was performed as part of this analysis. Instead, maintenance ROW lines from FDOT maintenance ROW maps were interpreted as permanent ROW lines, and used to determine impacts to property beyond existing ROW.

A “specific purpose elevation survey” was conducted in 2005 by the NPS to determine finished floor and other key structure elevations for Everglades Safari, Coopertown, Jefferson Pilot Communications, Gator Park and Radio One Communications. In addition to structure elevations, these surveys included only limited planimetric information. Coupled with county property records and aerial photography, these surveys were used for informal impact determinations as a result of the bridge and roadway construction. Separately, property impacts as a result of planned DHW are discussed in the Real Estate Appendix.

Survey of the corridor was conducted for the 1-mile bridge BASE PLANS project. This survey will be updated with as-built information upon the completion of construction. Additional topographic, planimetric and property boundary survey will be conducted on an as-needed basis in the Preconstruction Engineering and Design (PED) phase of the project.

4.0 Geotechnical

4.1 Regional and Site Geology

The regional geology in the area of the project consists of surficial deposits of organic soils and materials including soft peat and organic silts several feet in thickness. Small amounts of clastic deposits generally consisting of fine quartz and carbonate sands, silts, and clays are also present in the surficial deposits. Underlying the surficial organic deposits are the bedrock Miami Oolite and the Ft. Thompson formation Pleistocene deposits. The Tamiami formation of the Miocence age unconformably underlies the Pleistocene deposits.

The Miami Oolite limestone underlying the surficial soft peat is approximately 15 feet to 40 feet thick in the project area with a top elevations in the range of EL +6.0 To EL +0.0. This limestone is generally soft to moderately hard and moderately to highly weathered. Shallow solution cavities are located along the top of the formation and are typically filled with soft peat and sand. The Ft. Thompson Formation, which generally underlies the Miami Oolite limestone, consist of soft to moderately hard clayey limestone and sandstone with some soft layers of silty, clayey and shelly sands. Near surface Miami limestone can typically be excavated with backhoe type equipment. However, the Ft. Thompson Formation can be difficult to excavate with typical construction equipment. However, excavations for shallow foundations are not anticipated to extend into the Ft. Thompson Formation. The Tamiami formation consists of fossiliferious sands, sandy clay to clayey sands, and poorly consolidated sandy fossiliferous limestone.

4.2 Previous Geotechnical Investigations

Several investigations and geotechnical reports have been previously performed for this project and were provided for the current study. The geotechnical investigations included previously performed Standard Penetration Test (SPT) borings, Cone Penetrometer Test (CPT) soundings, auger borings, rock cores, and pavement cores. Various laboratory testing including grain size determinations, Atterberg limits, organic content, natural moisture content, consolidation tests, and unconfined compressive strength have been performed previously for this project. A summary of the provided geotechnical investigation is presented below:

- *Corrected Final Report of Geotechnical Engineering Evaluation, performed by MACTEC Engineering and Consulting, Inc., June 12, 2008. This report included 38 SPT borings to 80 feet and 21 SPT borings to 20 feet. The purpose of this investigation was to determine the subsurface conditions within the area of the proposed bridges.*

- *Peat Delineation Geotechnical Report, performed by Wolf Technologies, Inc. October, 2005. This report included 30 SPT borings, 290 CPT soundings and pavement cores. The borings and soundings were performed to depths of 7 to 13 feet. The key purpose of this investigation was to determine the location and thickness of the peat layer at the project.*

- *Interim Report of Geotechnical Evaluation, performed by MACTEC Engineering and Consulting, Inc., August 29, 2007. This interim report presented preliminary* *pile capacities for 24-inch square prestressed concrete piles for three bridges that were previously proposed along the Tamiami Trail alignment.*

- *Phase 2 Geotechnical Investigation Final Report, performed by Wolf-WPC, Inc., December 20, 2007. This investigation included the performance of 20 SPT borings to 80 feet, 24 CPT soundings to 80 feet, and 27 asphalt cores with shallow SPT borings.*

- *Geotechnical Data Report, prepared by the Jacksonville District USACE, July 11, 2008. The report contained the results of 61 SPT Borings performed throughout the study area.*

4.3 Selection of Preliminary Design Parameters

Preliminary design parameters were selected based on previously performed laboratory tests and field testing (SPT and CPT soundings) discussed in Section 4.2. At the study area, the granular embankment overlying the peat depots varies from approximately 3 to 6 feet in thickness. The embankment material was obtained from materials dredged from the L-29C. The embankment material consist of mixed coarse to fine limestone pieces, fine to medium sand and silty sand. The existing pavement generally consists of an asphaltic concrete layer between 1.5 inches (within the shoulder area) to 11 inches (within the roadway mainline area) in thickness underlain by a base course layer approximately 3 inches within the shoulder to 10.5 inches in thickness at the roadway mainline. Peat and organic silt is encountered under the embankment (up to 8 feet thick) and is generally 3 to 6 feet in thickness. Soft to very hard limestone underlies the peat layer. This limestone layer is thickest at the eastern portion of the study area and thins to a thickness of about 24 feet at the western end of the study area. Poorly graded sand and silty sand with some layers of shell is generally encountered below the limestone layer. The groundwater level was encountered at the previously performed borings at depths ranging between 2.5 to 6 feet below the existing roadway embankment from the elevation of the roadway.

4.4 Preliminary Foundation Design

4.4.1 Bridge Structures

The proposed girder bridge structures will be supported on 24-inch square Precast, Prestressed Concrete Piles (PPC). Static pile capacities were estimated for the foundation system following FDOT procedures using SPT N-values obtained in the limestone from the borings performed for this study. The pile ultimate end bearing and ultimate side friction soil resistance were based on corrections as given in the FDOT research bulletin (RB-121). These corrections are the same used by the computer program FB-Deep to calculate driven pile capacities. FB-Deep was not used to compute the driven pile capacities presented in this study but will be used during final design. The scour elevation was assumed to be at the peat/limestone interface. A scour analysis was not performed during this study. For this study, the scour elevation was assumed to be at EL +2.0. A minimum pile penetration of 20 feet into limestone material was considered where applicable. The minimum tip elevation was also established considering requirements for lateral stability, and the end bearing resistance requirements for the piles.

A factored design load of 167 tons per pile was used based on a factor of 1.3 for the dead load of the bridge of 1,500 kips, a factor of 1.75 for a live load on the bridge of 410 kips using 8 piles per bridge. Based on our static bearing capacity analysis, the estimated Davisson pile capacities for 24-inch PPC at the bridges exceed the Nominal Bearing Resistance (Qn) of 256 tons at tip elevations ranging between EL -41.0 to EL -90.0 at bridge locations A1, B1, B2, C1, and E1. At bridge locations G, H1, I1, and J1, the estimated Davisson pile capacities exceed the required nominal bearing resistance of 256 at the minimum tip elevation of EL -18.0 bearing at a minimum tip penetration of 20 feet into the near surface limestone layer. A summary of the pile capacity analysis is included in **Table 4-1**:

Table 4-1: Pile Capacity Summary Table

Bridge Location	Approximate Station Range		Pile Size	Davisson Capacity (Tons)	Factored Design Load (Tons)	Phi (Ø) Factor	Nominal Bearing Resistance, Qn (Tons)	Tip Elevation (ft)
A1	809+00	838+00	24"	300	167	0.65	256	-88
B1	841+73	845+00	24"	432	167	0.65	256	-90
B1	845+00	865+52	24”	260	167	0.65	256	-41
B2	845+75	910+00	24"	260	167	0.65	256	-41
B2	910+00	944+49	24”	256	167	0.65	256	-44
C1	911+88	938+28	24"	256	167	0.65	256	-44
E1	977+00	998+00	24"	256	167	0.65	256	-44
G	1091+00	1147+00	24"	288	167	0.65	256	-18
H1	1121+00	1136+00	24"	288	167	0.65	256	-18
I1	1154+00	1183+00	24"	288	167	0.65	256	-18
J1	1252+00	1288+00	24"	288	167	0.65	256	-18

The soil resistance correlations used for the pile capacity calculations are included in Calculation Sheet G-4.2. Pile capacity curves showing Davisson Capacity relative to pile tip elevation are included in Calculation Sheets G-4.3a to G-4.3d.

A lateral analysis was also performed with the aid of the computer program L-pile 5.0 by Ensoft, Inc. to calculate the pipe tip deflection, maximum moment and shear force developed in the pile. The near surface limestone will be required to be preformed to install the 24-inch square PCC piles. Pile perform holes should be at least 2-inches in diameter greater, but no more than 6-inches in diameter greater, than the diagonal pile size. After the piles are installed the annular space between the pile and limestone should be completely filled with grout to establish lateral confinement around the pile. In the L-pile model the strength of the grout was conservatively assumed to be 50 psi as the installed grout may not be of high quality. The results of the lateral analysis indicate that minimal deflections will occur at the pile head with piles tipped to the recommended tip elevations. The results of the pile capacity calculations and lateral analysis are included in Calculation Sheet G-4.3.

4.4.2 Precast Arch-Type Bridge Culverts

As discussed in Sections 4.1 and 4.3, a peat layer several feet in thickness overlies the limestone surface. At the precast arch-type bridge Cast-In-Place Concrete (CIPC) foundations, the peat layer should be excavated to the limestone surface. It is estimated that top of limestone (also the assumed scour elevation) will be encountered at least at EL +2.0 at the precast arch-type bridge culvert foundations. The interior foundations for the precast arch-type bridge culverts are 51 feet long and 8.5 feet wide socketed into the bedrock to EL +0.0. A bearing depth of at least 2.0 feet into limestone is recommended. For the bearing capacity calculations a friction angle of 38 degrees and a total unit weight of 127 pounds per cubic foot (pcf) were used for the limestone layer. With these footing dimensions, a foundation bearing pressure of approximately 8,500 pounds per square foot (psf) is suitable considering the allowable bearing capacity of the limestone bearing layer. It is noted that the lateral loads are small relative to the foundation size and compressive loads; thus, load eccentricity is assumed to be insignificant to the foundation design. In addition, uplift loads are not anticipated at the precast arch-type bridge culvert foundations. A bearing capacity calculation is provided in Calculation Sheet G-4.4.

4.5 Roadway Settlement

As discussed in Sections 4.1 and 4.3, peat generally 3 feet to approximately 6 feet in thickness is located below the existing roadway embankment. A settlement analysis was performed to estimate the consolidation of the peat layer due to the weight of the materials placed over the roadway. In peat, secondary settlement (creep) may be significant and can continue for a long period after the completion of primary settlement. For the settlement calculations, it is assumed that secondary settlement begins at the completion of the primary settlement that is experienced due to elevating the roadway during the base condition. The end of construction for the alternatives presented in this study is estimated to be 5 years after the construction of the base condition for the settlement calculations.

Settlement analysis was performed at eight locations along the Tamiami Trail alignment. The locations were selected based on differing peat thicknesses at each section and consolidation parameters obtained from the previous geotechnical investigations presented in this report. At the selected cross sections, the peat ranges in thickness between about 2 to 5.3 feet.

For settlement calculations the Coefficient of Consolidation (C_c), Coefficient of Recompression (C_r), and Void Ratio (e_o) was estimated. In addition, the Coefficient of Secondary Compression (C_s) for the peat layer was estimated using imperial correlations based on the natural moisture content of the peat which ranged between 85 and 545 percent. The following ranges of design parameters were used based on a review of the provided laboratory data:

Table 4-2: Peat Consolidation Parameters Summary Table

Consolidation Parameter	Range(1)
Coefficient of Consolidation (C_c)	1.27 to 6.55
Coefficient of Recompression (C_r)	0.22 to 0.76
Coefficient of Secondary Compression (C_s)	0.0085 to 0.0545
Void Ratio (e_o)	1.614 to 12.309

(1) Values are dimensionless

The preliminary design parameters used for the settlement calculations are included on Calculation sheets G-4.1a to G-4.1g.

Due to the fill needed to raise the roadway above the base condition elevation (approximately 3 feet) primary settlement of the roadway is estimated to be less than approximately 2 inches and should be nearly completed during construction. Based on the calculations, secondary settlement of less than one inch is calculated for the reconstructed roadway. However, it is noted that settlement of peat can vary greatly based on the natural moisture content, previous consolidation history, and other factors such as lateral spread. Settlement plates should be placed on the north side of the roadway during construction where the existing roadway embankment will remain to monitor settlement prior to the placement of the structural course of the pavement. It is recommended that the settlement records obtained during construction of the base condition project be reviewed to refine the settlement estimates of the roadway. The settlement calculations performed are included in Calculation Sheets G-4.1a to G-4.1g.

It is noted that the higher fill areas at the bridge approaches and the portions of the roadway where new embankment is constructed over virgin peat which has not been previously consolidated will experience large primary and secondary settlements. Within these areas the existing peat layer will be over excavated to the limestone layer and backfilled with a granular structural fill. The areas of peat that will be required to be over excavated and replaced are located within the area of the project which will not require disruption of existing traffic on Tamiami Trail.

4.6 Anticipated Construction Techniques, Limitations and Problems

Preforming (pre-boring) is anticipated to be required for the PPC piles for the bridge piles to achieve the minimum pile tip elevation. The pile perform holes should be at least 2-inches in diameter or greater (but no more than 6-inches in diameter greater) than the diagonal pile size. Temporary casing will likely be required above the limestone to prevent collapse of the overlying peat and granular soils. After the pile is installed the annular space between the pile and limestone should be completely filled with grout to establish lateral confinement around the pile. The piles should be driven or seated with a steam, air, hydraulic or diesel hammer providing a minimum energy per blow as determined by the engineer. It is expected that all PPC piles will be required to be driven with Embedded Data Collector (EDC) gauges or Pile Driving Analyzer (PDA) instrumentation. Pile driving should be as continuous as possible. Care should be taken not to overstress the piles during driving.

The groundwater level was encountered at the previously performed borings at depths generally ranging between 2.5 to 6 feet below the existing roadway embankment at the elevation of the roadway. It should be noted that groundwater may be higher than that recorded during the previously performed borings as the seasonal groundwater level in the area is expected to be raised as a result of construction of the base condition allowing the groundwater level around the roadway to rise. Because of the need for construction of the precast arch-type bridge culvert foundations in the dry (at the top of the limestone elevation), it will be necessary to dewater the excavations for the precast arch-type bridge culvert foundations. After the removal of the surficial peat at the foundation excavations, earth berms can be constructed around the culvert foundations to control the horizontal flow of groundwater into the excavation. During wet periods, the limestone may be very transmissive causing groundwater to infiltrate up into the excavation from the limestone. Mud slabs may need to be constructed at the bottom of the excavation to allow the excavations to be dewatered. Dewatering pumps then could be placed within the excavation to sufficiently dewater the excavation. It is anticipated that the near surface Miami Limestone can be excavated using an excavator or backhoe equipment.

4.7 Potential Borrow Sites and Disposal Sites

Borrow materials are anticipated to be obtained from one of several commercial facilities on Krome Avenue east and south of the project area. These commercial facilities or the South Dade landfill (southeast of the project at 23707 SW 97th Avenue) could serve as potential material disposal sites. No specific commercial facilities are selected at this time. Excavated and crushed limestone and clean sandy borrow materials having American Association of State Highway and Transportation Officials (AASHTO) classifications of A1-a and/or A-3 are considered suitable materials for the embankment borrow material. After the roadway embankment is constructed, grass vegetative cover will provide for surficial stabilization of the embankment surface and erosion protection.

4.8 Potential Sources of Concrete Materials

Several commercial concrete plants are located east of the project site and south of the intersection of Tamiami Trail and Krome Avenue. No specific commercial suppliers of concrete materials are identified at this time. Due to the proximity of the commercial suppliers along Krome Avenue and the relatively uncongested level of traffic along Krome Avenue and Tamiami Trial in the vicinity of the study area, it is anticipated that concrete delivery for the project will be within acceptable time limits.

5.0 Environmental Engineering

When feasible and cost effective, environmentally renewable construction materials will be used and project refuse (embankment, asphalt, etc.) will be reused during construction.

Erosion will be minimized and transport of sediment offsite will be prohibited during construction through the use of Best Management Practices (BMPs).

The roadway and bridge approach sections will require a 10-foot Temporary Construction Easement (TCE) on the south side of the roadway. The girder bridges and precast arch-type bridge culverts will require a 50-foot TCE. All TCE's will be restored to original condition upon completion of construction activities.

The proposed bridges and precast arch-type bridge culverts are designed to maximize hydraulic opening and promote a more natural water flow that will permit environmentally advantageous conveyance of the MWD to the ENP project flows and to mitigate the impact of the resulting higher water surface elevations in the L-29C.

6.0 Civil Design

6.1 Existing Conditions

6.1.1 Wetlands

Wetlands begin immediately south of Tamiami Trail. Several small privately owned parcels south of Tamiami Trail are classified as non-wetlands and constitute fill placed on wetlands. Dominant wetland communities adjacent to the project area, as mapped by the SFWMD include sawgrass, cattail, broadleaf and floating emergents, mix of shallow open water, shrubland mix, pond apple/willow mix and Brazilian pepper/shrubland mix.

The wetlands were evaluated in December, 2000 using the Wetland Rapid Assessment Procedure (WRAP). The WRAP is a functional evaluation of wetland sites, which, when combined with professional judgment, provides a consistent evaluation of wetland sites by establishing a numerical score for a site based on ecological and anthropogenic variables. The acreage of each wetland habitat type is then multiplied by the WRAP score for that site to derive "functional units" for comparison purposes.

The WRAP results of five areas within the project limits included scores ranging from a high of 0.70 for the sawgrass/emergent marsh and forested wetland (pond apple/willow) habitat types to a low of 0.48 for cattail dominated habitat. For perspective, a wetland habitat type with a score of 0.70 means that the wetland is functioning at 70 percent of its theoretical maximum potential of 1.0. Lower scores were primarily due to the proximity of the ENP wetlands to the road and the general lack of a minimum 30-foot buffer between the road and wetlands. The wetlands immediately south of Tamiami Trail are of lower quality. Except for those wetlands fringing the roadway and those wetlands dominated by nuisance and exotic vegetation, the quality of wetlands in the project area is generally good.

From a 2003 U.S. Fish and Wildlife Service Coordination Act report, wetlands within the project area are infested to varying degrees with exotic vegetation such as Brazilian Pepper (*Schinus Terebinthifolius*), Australian Pine (*Casuarina spp.*), Melaleuca Quinquenervia, Common Reed (*Phragmites Australis*) and Napier Grass (*Pennisetum Purpureum*). Exotic infestation is most evident along the perimeter of the Tamiami Trail corridor and adjacent disturbed areas where dredge and fill activities have taken place.

6.1.2 Culverts

There are 55 culvert cross drains (19 sets of single or multi-barrel Corrugated Metal Pipe (CMP) culverts) within the project corridor that convey flow from the L-29C on the north side of the roadway to the wetlands on the south. The L-29C also provides flood protection and water for Miami. See **Table 6-1**. Using FDOT's Culvert Service Life Estimator program, the existing reinforced concrete pipe culverts under this segment of Tamiami Trail have an estimated remaining service life in excess of 300 years (design service life of 360 years less in-service period of approximately 54 years). The service life was estimated based on parameters obtained at two boring locations along the existing alignment and at two depths within each boring. Parameters considered for the service life include the corrosion rate, potential for abrasion and other site factors. Corrosion indicators include pH, resistivity, sulfates and chlorides.

An FDOT Culvert Survey Report issued in May, 1999 found the existing culverts to be in good condition with no observed structural problems. The existing culverts were visually inspected by FDOT in April, 2004 and were found to be generally clear of debris and vegetation.

The FDOT requires that culverts be designed for a projected maintenance free time period or a Design Service Life (DSL) appropriate for the culvert function and highway type. The projected service life of pipe material options shall provide as a minimum the DSL. The DSL for cross drains under Tamiami Trail is 50 years based on the roadway classification, which in this case is a "major facility" because the traffic volume is greater than 1,600 vehicles per day Average Annual Daily Traffic (AADT).

Existing culverts located at proposed bridge or precast arch-type bridge culverts will be removed. Due to the proposed roadway offset and elevation, culverts to remain will be extended to the south (in-kind) and receive new endwalls. Improvements are not proposed for the existing endwalls along the L-29C.

Table 6-1: Inventory of Culverts

FDOT HEADWALL STRUCTURE NAME		STATION OF CL	DIST. FROM U/S TO D/S STRUCTURE (ft)	ROAD EL (ft)	PIPE LENGTH (ft)	PIPE DIA. (in)	INLET INVERT EL (ft)	AVG. INLET INVERT EL (ft)	OUTLET INVERT EL (ft)	AVG. OUTLET INVERT EL (ft)	TOP OF CULV. EL (ft)
U/S	D/S										
COE S-333		732+10.0	-	-	-	-	-	-	-	-	-
S-I	S-2	752+57.0			61.6	54	4.68		5.02		
S-I	S-2	752+65.0	3,083.5	10.90	61.6	54	4.76	4.7	5.04	5.0	9.2
S-1	S-2	752+72.0			61.6	54	4.68		4.90		
S-3	S-4	793+69.0			61.0	60	4.35		4.59		
S-3	S-4	793+77.0	4,045.0	10.95	61.0	60	4.09	4.4	4.55	4.5	9.4
S-3	S-4	793+86.0			61.0	60	4.69		4.38		
S-5	S-6	833+46.5			61.0	60	3.76		4.06		
S-5	S-6	833+55.0	3,507.0	10.76	61.0	60	3.80	3.8	4.20	4.2	8.8
S-5	S-6	833+64.0			61.0	60	3.89		4.34		
S-7	S-8	863+83.0			62.0	54	3.82		3.89		
S-7	S-8	863+91.0	2,809.5	10.77	62.0	54	3.86	3.8	3.99	4.0	8.3
S-7	S-8	863+98.5			62.0	54	3.85		4.06		

FDOT HEADWALL STRUCTURE NAME		STATION OF CL	DIST. FROM U/S TO D/S STRUCTURE (ft)	ROAD EL (ft)	PIPE LENGTH (ft)	PIPE DIA. (in)	INLET INVERT EL (ft)	AVG. INLET INVERT EL (ft)	OUTLET INVERT EL (ft)	AVG. OUTLET INVERT EL (ft)	TOP OF CULV. EL (ft)
U/S	D/S										
S-9	-	889+65.5			85.0	60	4.25		-		
S-9	-	889+74.0	3,121.5	10.86	85.0	60	4.16	4.2	-		9.2
S-9	-	889+82.5			85.0	60	4.28		-		
S-IO	S-11	926+27.0			60.5	48	3.79		4.06		
S-IO	S-11	926+34.0	3,116.5	10.79	60.5	48	3.23	3.6	3.99	4.1	7.6
S-IO	S-11	926+40.5			60.5	48	3.73		4.13		
S-12	S-13	951+99.0			61.5	60	4.14		4.05		
S-12	S-13	952+07.0	3,071.0	10.94	61.5	60	4.09	4.1	4.02	4.0	9.1
S-12	S-13	952+16.0			61.5	60	4.08		4.03		
S-14	S-15	987+67.5			61.0	54	4.90		4.95		
S-14	S-15	987+76.0	3,715.5	10.87	61.0	54	5.02	4.9	4.90	4.9	9.4
S-14	S-15	987+84.5			61.0	54	4.91		4.73		
S-16	S-17	1026+30.0			62.7	60	1.93		2.36		
S-16	S-17	1026+38.0	2,648.0	10.66	62.7	60	2.42		2.35	2.4	7.2
S-16	S-17	1026+46.0			62.7	60	2.20	2.2	2.42		
S-16	S-17	1026+55.5			62.7	60	2.18		2.34		
S-18	S-19	1040+63.5			62.0	60	3.02		3.11		
S-18	S-19	1040+72.0	2,157.9	10.58	62.0	60	2.85	3.0	3.08	3.1	8.0
S-18	S-19	1040+80.5			62.0	60	3.08		3.22		
S-20	S-21	1069+54.8			61.0	48	4.08		4.08		
S-20	S-21	1069+61.7	2,946.5	10.65	61.0	48	4.11	4.1	4.06	4.1	8.1
S-20	S-21	1069+68.0			61.0	48	4.16		4.03		
S-22	S-23	1099+65.0	1,750.4	11.20	61.5	60	2.90	2.9	3.05	3.1	8.6
S-24	S-25	1104+53.5			60.5	60	3.84		3.71		
S-24	S-25	1104+62.5	1,461.2	11.13	60.5	60	3.72	3.8	3.55	3.6	8.8
S-24	S-25	1104+71.0			60.5	60	3.76		3.65		
S-26	S-27	1128+87.3	2,592.8	11.10	60.2	54	3.60	3.5	3.80	3.8	8.0
S-26	S-27	1128+95.0			60.2	54	3.48		3.81		
S-28	S-29	1156+40.0			62.8	60	4.14		4.25		
S-28	S-29	1156+48.0	2,774.3	11.22	62.8	60	4.02	4.1	4.08	4.2	9.1
S-28	S-29	1156+57.0			62.8	60	4.14		4.22		
S-30	S-31	1184+37.5			61.0	48	3.48		3.35		
S-30	S-31	1184+43.5	3,256.4	10.78	61.0	48	3.65	3.6	3.32	3.6	7.6
S-30	S-31	1184+50.0			61.0	48	3.70		4.02		
S-32	S-33	1221+54.0			60.7	48	3.35		3.32		
S-32	S-33	1221+60.7	3,620.0	10.92	60.7	48	3.34	3.4	3.31	3.3	7.4
S-32	S-33	1221+67.9			60.7	48	3.43		3.34		
S-34	S-35	1256+76.0			61.5	42	4.07		4.09		
S-34	S-35	1256+83.5	3,040.4	11.32	61.5	42	4.15	4.1	4.08	4.1	7.6
S-34	S-35	1256+89.0			61.5	42	4.13		4.05		
S-36	S-37	1282+34.8			62.0	48	3.82		3.92		
S-36	S-37	1282+41.4	2,060.8	11.58	62.0	48	3.84	3.8	3.95	3.9	7.8
S-36	S-37	1282+48.4			62.0	48	3.76		3.95		
COE S-334		1298+05.0	781.8	-	-	-	-	-	-	-	-

6.1.3 Drainage and Runoff Treatment

The roadway provides adequate stormwater drainage in accordance with FDOT standards for safety to the motoring public. The existing roadway does not have a stormwater runoff collection or conveyance system except at the 1-mile BASE PLAN bridge. Runoff from the existing roadway pavement flows off the road and down the embankment into L-29C on the north side of the roadway, or into the wetlands on the south side. No water quality or attenuation of runoff is provided for the roadway. Water quality treatment is provided for runoff from the 1-mile BASE PLAN bridge via Continuous Deflective Separation (CDS) units at the bridge approaches.

6.1.4 Functional Classification

Within the project study limits, Tamiami Trail is functionally classified by FDOT as a rural arterial. The portion of Tamiami Trail within the project limits is maintained by the FDOT, District 6, Miami, Florida.

6.1.5 Typical Sections

The existing typical section for Tamiami Trail consists of two 12-foot travel lanes, one in each direction with 4 to 5 feet of paved shoulder on both sides. Total outside shoulder width is 10 to 12 feet on the north and 8 feet on the south. Guardrail is located on the outside edges of the shoulders. The existing posted limit is 55 mph. See Plates CP-301 to CP-304 for the BASE PLAN typical sections.

6.1.6 Right of Way

Within the project limits, the majority of the existing ROW width varies from 58 feet to 75 feet. The existing ROW widens to 95 feet for approximately 450 feet at the west end of the project. The existing ROW offset from the existing centerline is 32 feet to 45 feet on the north and 24 feet to 30 feet on the south.

6.1.7 Horizontal and Vertical Alignment

After the BASE PLANS construction is complete, the horizontal alignment on Tamiami Trail will satisfy the following FDOT Plans Preparation Manual (PPM) Volume 1 requirements.

- Maximum horizontal curvature: Table 2.8.3 of the PPM indicates that for a rural environment (e_{max}=0.10) and a design speed of 60 mph, the maximum curvature allowed by State Highway System (SHS) criteria is $5^{o}15'00"$.

- Maximum deflections without horizontal curves: For the design speed of 60 mph, Table 2.8.1a of the PPM indicates a maximum deflection without horizontal curves for arterials without curb and gutter of $0^{o}45'00"$.

- Lane width: Table 2.1.1 of the PPM indicates a minimum through lane width of 12 feet for 2-lane rural roadways.

- Shoulder width: For 2-lane arterials without shoulder gutter, Table 2.3.3 of the PPM indicates a minimum full shoulder width of 10 feet and a minimum paved shoulder width of 5 feet for average volume highways.

- Border width: For arterials with design speeds greater than 45 mph and flush shoulders, Table 2.5.1 of the PPM indicates a minimum border width of 40 feet. This criterion is not currently satisfied, as the existing ROW is minimal. Guardrail is present on both sides of the roadway for the length of the project.

After the BASE PLANS construction is complete, the vertical alignment on Tamiami Trail will satisfy the following PPM Volume 1 requirements.

- Maximum grade: The maximum grade permitted for a rural arterial with a 60 mph design speed is 3% according to Table 2.6.1 of the PPM. The maximum grade for the bridge access ramps with a design speed under 20 mph is 6% to 8%.

- Maximum change in grade without vertical curves: The maximum change in grade permitted without a vertical curve for a 60 mph design speed is 0.4% (1.20% for 20 mph design speed) according to Table 2.6.2 of the PPM. Minimum K values for a design speed of 60 mph for the crest and sag conditions are 245 and 136, respectively. The minimum length curve for a crest is 400 feet and for a sag curve is 300 feet according to Tables 2.8.5 and 2.8.6 of the PPM. Vertical curves are present where required.

- Grade datum: The required roadway base clearance above DHW elevation for rural 2-lane roadways with a Design Year AADT greater than 1,500 is 2 feet according to Table 2.6.3 of the PPM.   The FDOT Flexible Pavement Manual requires a 25% modulus reduction for 2 feet of base clearance and no reduction for 3 feet of base clearance.

- Stopping sight distance: For a design speed of 60 mph and grades of 2% or less, Table 2.7.1 of the PPM indicates a minimum stopping sight distance of 570 feet.

- Cross slope: Figure 2.1.1 of the PPM requires 2% pavement cross slope.

6.1.8 Crash Data

Information relating to crash frequency within the study area from 2002 to 2006 was obtained from the FDOT. The data include economic losses, injuries and fatalities that have occurred within the project limits. Recent crash history data rank left-turn and hit guardrail crash types as the most common type of collision within the project limits. “Careless driving” is the most common contributing cause of crashes and fatalities followed by “fail to yield.”

6.1.9 Roadway Lighting

There is no existing roadway lighting along Tamiami Trail within the project limits.

6.1.10 Pavement Conditions

In July 2000, Terracon Consulting conducted a pavement condition investigation of the existing roadway. This investigation included a Ground Penetrating Radar (GPR) survey and pavement distress survey of the project area. GPR survey results indicate an asphalt thickness range of 2 inches on the shoulders to 12 inches on the roadway. The distress survey, which measured cracking (alligator, block and combined), raveling and rutting, indicated an average rating of 6, on a 0-10 scale, with 10 being excellent. This rating is based on both a review of the FDOT's existing pavement condition database (1976 to 1999; database rates cracking, rutting and ride) and an independent distress survey described above.

A visual survey of the project corridor was conducted in September, 2009. Additional pavement cracking was observed, with an estimated pavement distress rating of less than 6.

The BASE PLANs are assumed as existing condition for this project. The BASE PLAN typical section shows a structural course layer of 4 to 7½ inches for roadway and 3 to 6 inches for shoulders. Modifications per the BASE PLAN have an anticipated opening year of 2013. Pavement is expected to be in good condition after the completion of the project. See Plates CP-301 to CP-304 for the BASE PLAN typical sections.

6.2 Traffic

6.2.1 Existing Traffic Volumes

Existing traffic data for 2008 are 5,200 AADT, with 11.55% trucks. Using Highway Capacity Manual procedures for two-lane roads, the 2008 Level of Service (LOS) for traffic was calculated to be LOS B. No dedicated left turns, dedicated passing lanes, median buffers or roadway lighting currently exist within the project corridor. No other formal determinations were performed regarding existing traffic capacity. The project corridor is understood to provide sufficient capacity in accordance with FDOT policies.

6.2.2 Traffic Volume Projections

Projected FDOT traffic data for the assumed opening year for this project of 2018 are 5,800 AADT. Assuming a linear growth rate during the service life, the traffic data for the assumed design year of 2038 are 7,200 AADT. Using Highway Capacity Manual procedures for 2-lane undivided rural roads and less than 5,000 population, the 2038 LOS for traffic was calculated to be LOS B.

AADT projections for the design year have been trending downward. The current design year AADT projection categorizes Tamiami Trail as a low volume highway. This study assumes a typical section for an average volume highway. As per PPM, page 1-8, Standards for Low and High Volume Highways, a 2-lane rural arterial facility with projected design year AADT between 9,000 and 14,000 is classified as an average volume highway. Shoulder width and pavement thickness are the two design elements affected by this assumption.

6.3 Design Controls and Standards

6.3.1 Design Assumptions

The following assumptions and constraints are incorporated into the project alternatives.

1. Design includes the least-cost facilities required to satisfy design requirements, while limiting encroachment into the ENP and private property to a practical minimum.

2. Modifications to Tamiami Trail will satisfy FDOT and AASHTO prescriptive geometric and engineering criteria, but are not intended to improve traffic capacity.

3. Vehicular access to private parcels will remain during and after construction to the greatest extent practical. Where adjacent to a new bridge, one bridge down ramp will be provided to each private parcel to remain.

4. The ValuJet Flight 592 memorial, located immediately east of S-333, will remain undisturbed.

5. The westernmost bridge approach must end no less than ½-mile east of the Osceola Indian Camp.

6. The bridges/precast arch-type bridge culverts will be located south of the existing roadway alignment to reduce construction cost by allowing for two-lane Maintenance of Traffic (MOT) during all phases of construction, avoiding impacts to L-29C and avoiding increased quantities and unit rates associated with construction in the L-29C.

7. The existing roadway embankment is to be removed for the length of the bridges/precast arch-type bridge culverts to the level of the underlying limestone, assumed to be elevation 2.0.

8. Existing muck is to be removed for the length of the offset roadway, roadway alignment transitions and bridge/precast arch-type bridge culverts to the level of the underlying limestone, assumed to be elevation 2.0.

9. Existing CMP culverts unaffected by bridge/precast arch-type bridge culverts or roadway alignment transition construction will remain in place and will be extended as necessary. Any remainder will be removed along with the existing embankment.

10. The proposed roadway centerline will be offset 12 feet south of the existing roadway centerline. The proposed bridge/precast arch-type bridge culvert centerline will be offset 48.5 feet south of the existing roadway centerline.

11. The roadway transitions will be normal crown to the greatest extent possible. Some roadway transitions will be superelevated to allow for private property access with the smallest ROW requirement.

6.3.2 Design Criteria

The reconstruction of Tamiami Trail will be designed in accordance with the PPM, Volumes I and II (January 2010) and Roadway and Traffic Design Standards (2010) and AASHTO's A Policy on Geometric Design of Highways and Streets and other roadway and traffic design standards. **Table 6-2** presents the roadway design criteria established for each design element.

Table 6-2: Design Elements and Standards

Design Element	Design Standard	Source(s)
Design Vehicle	WB-62FL	PPM, Pg. 1-20
Design Year	2038	USACE
Design Speed	60 mph	FDOT PPM, Table 1.9.1
Posted Speed	55 mph	USACE
Maximum Degree of Curve	$0^o15'$	FDOT PPM, Table 2.8.4 (e MAX – 0.02)
Length of Horizontal Curves	At least 500 ft for 5^0 angle At least 900 ft for 1^0 angle	FDOT PPM, 2.8.1.1
Minimum Stopping Sight Distance	570 ft	FDOT PPM, Table 2.7.1
Decision Sight Distance	990 ft	2004 AASHTO, Exhibit 3-3, Page 116
Maximum Shoulder "Roll-Over" Maximum Lane "Roll-Over"	7% 4%	FDOT Roadway & Traffic Design Standard Index No. 510, AASHTO pg. 316
Maximum Superelevation	2.5% (superelevated approaches only)	FDOT PPM, Table 2.9.1 Min Radius of 7,120'
Maximum Profile Grade Tamiami Trail Down Ramps (Access Ramps)	 3% 5%	FDOT PPM, Table 2.6.1
Maximum Change in Grade without Vertical Curve Tamiami Trail Down Ramps	 0.40% 0.80%	FDOT PPM, Table 2.6.2
Crest Vertical Curve Tamiami Trail Down Ramps	 K=245, min. length 400 ft K=70, min. length 100 ft	FDOT PPM, Table 2.8.5
Sag Vertical Curve Tamiami Trail Down Ramps	 K=136, min. length 300 ft K=64, min. length 200 ft	FDOT PPM, Table 2.8.6
Minimum Vertical Clearance over water	6 ft	FDOT Drainage Manual, Section 4.6.1

Design Element	Design Standard	Source(s)
Lane Widths Tamiami Trail Down Ramps (two-lane)	12 ft – tangent 24 ft – tangent	FDOT PPM, Tables 2.1.1, 2.1.2 and 2.1.3
Shoulder Width – Roadway – Outside (or Right) Tamiami Trail Down Ramps	Total Paved 11.5 ft 5 ft 11.5 ft 5 ft	BASE PLANS, FDOT PPM, Table 2.3.3 (exceeded)
Shoulder Width – Bridge Structures – Outside Tamiami Trail	10 ft	BASE PLANS, FDOT PPM, Figure 2.0.2 (exceeded)
Clear Zone Width When Guardrail is provided	36 ft Shoulder width plus 2ft	FDOT PPM, Table 2.11.11 FDOT PPM, Figure 2.11.1
Border Width	40 ft guardrail is provided	FDOT PPM, Table 2.5.2

6.3.3 Design Exceptions/Variations

A design exception is required when the design criteria applied falls below the minimums established by AASHTO. A design variation is required when the design criteria applied falls below the minimums established by FDOT and the deviation is not covered by the design exception.

It should be noted that the design exception/variation assessments contained in this report are based on available information including record plans and prior reports. These analyses are not intended to replace more detailed evaluations during design that are based on detailed survey data of actual field conditions.

Table 6-3 presents 18 design elements and specifies whether AASHTO or FDOT design criteria are satisfied, or if a design exception/variation is required for the specified design element for the proposed improvements.

Table 6-3: Design Exceptions/Variations

Design Criteria	Design Exception ≤ AASHTO	Design Variation ≤ FDOT
1. Design Speeds	S	S
2. Mainline Lane Widths	S	S
3. Shoulder Widths	S	S
4. Bridge Widths	S	S
5. Structural Capacity	S	S
6. Vertical Clearance	NA	NA
7. Grades	S	S

Design Criteria	Design Exception ≤ AASHTO	Design Variation ≤ FDOT
8. Cross Slope	S	S
9. Superelevation	S	S
10. Horizontal Alignment	S	S
11. Vertical Alignment	S	S
12. Stopping Sight Distance	S	S
13. Horizontal Clearance	NA	NA
Other Design Elements		
14. Border Width	NA	R
15. Median Width	NA	NA
16. Length of Horizontal Curve	S	S
17. Length of Vertical Curve	S	S
18. Base Clearance	NA	S

Note: S – Satisfied, R – Required, NA – Not applicable

6.3.3.1 Border Width Variation

FDOT states that a border width of 40 feet applies to arterials with a design speed greater than 45 mph. In AASHTO's A Policy on Geometric Design of Highways and Streets (2004), page 463, it is stated that the border width should not be less than 15 feet. The proposed border width varies from 24 feet to 63.59 feet. According to section 23.9 of the PPM, Volume I, border width is not one of the AASHTO critical design elements therefore a design variation is required.

6.3.4 Drainage and Runoff Treatment

Roadway drainage conditions will equal or exceed current conditions and will not adversely impact performance of the existing culverts. The edge of shoulder elevation will be higher than the 100-year flood elevation.

The reconstructed roadway will include a 6.5-foot grassed shoulder in addition to a 5-foot paved shoulder. While not tied to a formal numerical treatment standard, this measure is expected to provide more filtering for sediments and oils than exists today. Detention basins are not included in the project alternatives.

For background, the water quality regulatory requirements are set by the Florida Department of Environmental Protection (FDEP) in accordance with the Regulation of Stormwater Discharge or 62-25, Florida Administrative Code (FAC). Formal runoff treatment facilities could significantly increase the footprint and cost of the reconstructed roadway. Footprint increases could include wetland impacts that are counter to the ecological restoration goals of the project.

During construction, erosion and sediment control BMPs, designed to specific site conditions, will be used to retain sediment on-site.

6.4 Construction Sequencing and Maintenance of Traffic

6.4.1 Roadway, Down Ramps and Bridges/Precast Arch-Type Bridge Culverts

Roadway Construction will be phased as indicated in Plate C-2. MOT for this project involves construction of temporary pavement on the existing westbound shoulder to maintain two-way traffic during reconstruction. Once traffic is shifted to the proposed roadway, the existing pavement will be demolished. Phases I through V below describe MOT during construction.

<u>Phase I</u>

1. Reduce posted speed to 45 mph
2. Construct temporary overbuild on existing four-foot eastbound shoulder to match existing cross slope
3. Place temporary barrier wall and attenuator
4. Construct temporary pavement on existing westbound shoulder to match existing cross slope of travel lanes

<u>Phase II</u>

1. Construct temporary overbuild on eastbound roadway to match
2. Shift traffic and maintain two-way traffic
3. Excavate unsuitable material to limestone
4. Construct proposed eastbound roadway and shoulder
5. Construct temporary overbuild on eastbound paved shoulder
6. Construct temporary pavement on eastbound unpaved shoulder
7. Construct temporary Mechanically Stabilized Earth (MSE) walls (if needed)
8. Construct bridge/precast arch-type bridge culverts
9. Construct down ramps (access ramps)
10. Extend culverts

<u>Phase III</u>

1. Place temporary striping and Reflective Pavement Markers (RPMs), relocate/place temporary barrier wall and attenuators
2. Maintain westbound traffic on existing road
3. Shift eastbound traffic to proposed roadway
4. Construct proposed westbound roadway

Phase IV

1. Shift westbound traffic to proposed roadway
2. Shift westbound and eastbound traffic to bridge/precast arch-type bridge culverts
3. Construct remaining portion of proposed westbound roadway and shoulder
4. Modify culverts (if needed)
5. Demolish existing roadway (in place)
6. Remove temporary overbuild on eastbound paved shoulder and temporary pavement on eastbound unpaved shoulder to match proposed roadway typical section
7. Place sodding on westbound unpaved shoulder

Phase V

1. Place sodding on eastbound unpaved shoulder
2. Construct friction course on all areas
3. Place final striping and signing
4. Open all lanes to traffic

6.4.2 Staging Areas

Existing federal and state owned property near S-333 (five acres) and S-334 (two acres) within the project limits is available for use as staging areas for construction equipment, materials and construction employee parking. The ValuJet 592 memorial adjacent to S-333 will be protected during construction. The Miami Field Station gets their borrow material for work on the levees from SFWMD property near the L-31 North Bridge at the east end of the corridor. Shifting of the existing roadway travel lanes will create narrow longitudinal areas along the length of the corridor, with materials moved to the work site on an “as needed, just-in-time” basis.

6.5 Alternative Analysis

6.5.1 Study Alternatives

This study examines a total of ten alternatives (Alternatives 1, 2A, 2B, 4, 5, 6A, 6B, 6C, 6D and 6E). Roadway, alignment transitions, down ramps, bridge and precast arch-type bridge culvert lengths and types for each alternative are identified in **Table 6-4**. During the course of this study, Alternative 3 was eliminated per direction of the USACE. The total estimated construction cost for each alternative is presented for comparison purposes only.

Table 6-4: Alternative Comparison

Evaluation Criteria	Alternative									
	1	2A	2B	4	5	6A	6B	6C	6D	6E(3)
Roadway at 12-foot Offset (feet)	27,820	17,992	21,642	40,060	34,783	13,847	13,847	17,391	17,429	13,928
Alignment Transitions (feet)	11,280	16,210	14,680	5,080	7,680	11,320	11,320	9,940	8,180	9,560
Bridge (feet)	10,016	16,262	12,793	5,354	8,031	26,675	26,675	23,163	24,885	28,354
Precast Arch-Type Bridge Culverts (feet)	1,378	1,378	1,378	0	0	0	0	0	0	0
Total Length (feet)(1)	50,494	51,842	50,494	50,494	50,494	51,842	51,842	50,494	50,494	51,842
Total Length (miles)(1)	9.56	9.82	9.56	9.56	9.56	9.82	9.82	9.56	9.56	9.82
Number of Bridges	4	6	5	2	3	6	6	5	3	4
Number of Precast Arch-Type Bridge Culverts	1	1	1	0	0	0	0	0	0	0
Number of Down Ramps	0	0	0	0	0	0	2	2	2	2
Estimated Total Project Cost (x$1 M)(2)	$136.0	$157.5	$151.8	$90.2	$108.6	$238.0	$238.5	$215.2	$222.2	$279.2

(1) Excludes 1-mile BASE PLANS bridge
(2) Refer to Section 11.0 for cost estimate details
(3) Preferred Alternative

6.5.2 Down Ramp Options

Bridge down ramp (access ramp) options were developed for the purpose of maintaining access to Everglades Safari and Coopertown for Alternatives 6B, 6C, 6D and 6E. Refer to Section 7.1.4 for bridge down ramp details.

Four down ramp options were developed for Everglades Safari. Option 4 (Modified Parallel Down Ramp) was selected as the preferred option. Refer to Plates DR-E1 to DR-E4 for the Everglades Safari down ramp options that were considered.

Five down ramp options were developed for Coopertown. Option 5 (Parallel Down Ramp with Existing Frontage Road) was selected as the preferred option. Refer to Plates DR-C1 to DR-C5 for the Coopertown down ramp options that were considered.

6.6 Recommended Alternative (Alternative 6E)

Alternative 6E was selected as the preferred alternative and consists of approximately 5.4 miles of girder bridges separated into 4 sections with the remaining Tamiami Trail roadway raised to allow a stage of 9.7 ft-NGVD in L-29C, and adding down ramps at Everglades Safari and Coopertown.

6.6.1 Typical Section

6.6.1.1 Roadway

The typical section consists of two 12-foot wide travel lanes, 5-foot paved shoulders on each side of the roadway and 6.5-foot grassed shoulders along the outside of the paved shoulders, aligned with the proposed roadway centerline. The travel lanes are on a 2% cross slope and the shoulders are on a 6% cross slope. Guardrail is present along both sides of the roadway for the length of the project. See Plate C-1 for the proposed typical section.

No dedicated left turn lanes, dedicated passing lanes, median buffers or roadway lighting are proposed.

6.6.1.2 Alignment Transition

The roadway alignment transition typical section includes two 12-foot wide travel lanes, 5-foot paved shoulders on each side of the roadway and 6.5-foot grassed shoulders along the outside of the paved shoulders, aligned with the proposed centerline. The majority of the alignment transitions are on a 2% cross slope and the shoulders are on a 6% cross slope. Some transitions are superelevated to shorten their length to maintain access to existing private parcels. Superelevated transitions are on a 2.5% maximum cross slope and the shoulders are on a 4.5% and 6.0% cross slope on high side and low side respectively. Crowned alignment transitions are 1,850 feet long and superelevated alignment transitions are 1,250 feet long from begin of superelevation transition to begin of structure. See Plates C-3 and C-4 for normal crown and superelevated alignment transition details.

6.6.2 Pavement Design

The flexible pavement design is based on future traffic loading and the new embankment subgrade Resilient Modulus (Mr).

The open-to-traffic date is assumed to be 2018, with a planning horizon year of 2038. Using a linear project based on the last 10 years of the AADT, the 2018 AADT is estimated to be 5,800 and the 2038 AADT is estimated to be 7,200. 2038 traffic statistics were estimated as follows: K30=8.07%, D30=66%, T=11.5%, LOS=B. This level is considered acceptable for this facility. The Equivalent 18-kip Single Axle Load (ESAL) is 4.9 million, based on the 2038 traffic projection, 90% reliability and a 0.96 factor for rural arterials.

A design Mr of 12,000 pounds per square inch (psi) was used for new embankment material as this is the Mr used for the new embankment material for the base condition. The Mr was reduced by 25% to 9,000 psi as discussed in the 2008 FDOT Flexible Pavement Design Manual for 2-foot base clearance. Three-foot base clearance could be used with no reduction in Mr, but would require additional ROW at all roadway and alignment transition sections. The proposed pavement design uses two-foot base clearance.

A pavement section Structural Number (SN) of 4.20 is required for a 20-year forecast 4.9 million ESAL, a subgrade Mr of 9,000 psi (for new A-1 or A-3 embankment material) and 90% reliability. The proposed pavement design provides a SN of 4.30.

The pavement design, including separate shoulder requirements, will be refined during the PED phase.

The recommended resurfacing interval for this pavement section is 10 years, at the low end of the 10 to 15-year interval typical in Florida. The typical pavement section for new construction is shown in presented in **Figure 6-1**.

Figure 6-1: Pavement Section (New Construction)

¾" Friction Course FC-5 (Traffic C)
3.5" Type SP Structural Course (Traffic C), SN = 1.54
10" Limerock, (OBG 9), LBR 100, SN = 1.8
12" Type B, LBR 40, SN = 0.96
A-1 or A-3 Embankment, (Design Mr = 9,000 psi)

6.6.3 Roadway Plan Sheets and Horizontal Alignment

Refer to Plates P-1 to P-29 for roadway plan sheets and horizontal alignment for the preferred alternative (Alternative 6E).

6.6.4 Relocation

Five existing utilities are installed within the project corridor. Four will be affected by the proposed construction. Two buried telephone/fiber optic lines run behind the guardrail on the south side of the roadway (AT&T Florida and AT&T Long Distance). AT&T buried copper lines run along the north side of the roadway. A 12 kV Florida Power and Light (FPL) overhead electric line and a buried telephone/fiber optic line (Qwest) run along the embankment. The Qwest line should not be affected by the proposed improvements. FPL lateral power lines extend south from the distribution line along L-29C to customers on the south side of Tamiami Trail. These lines will likely require temporary or permanent adjustment due to the proposed improvements.

Utilities within the proposed typical section will need to be relocated so as to remain behind the future guardrail location. Utility relocations will be coordinated with each utility owner. As the affected utilities appear to lie within the ROW, their relocation costs are not included in the cost estimates. The estimated cost of relocating the two affected telecommunications utilities is $3.5 to $4.0 million, assuming that they are abandoned in place. Only a cost of allowance for coordinating these relocations is included in the project cost estimate.

Communication with the fiber optic utilities indicates that the likely relocation plan for the embankment sections will be to construct new facilities, coordinated with roadway construction and to abandon existing facilities in place. For the bridge segments, the utilities will be mounted on the bridge superstructure. Relocation plans will be finalized during the PED phase. Relocations will be integrated into the overall project construction schedule.

6.6.5 Impact to ROW, Easements and Borrow and Disposal Sites

Within the project limits, the majority of the existing ROW width varies from 58 feet to 75 feet. The existing ROW widens to 95 feet for approximately 450 feet at the west end of the project. The existing ROW offset from the existing centerline is 32 feet to 45 feet on the north and 24 feet to 30 feet on the south.

For the roadway, the existing ROW to the south ranges from 24 to 30 feet from the roadway centerline, with an average of approximately 29 feet. As a result of raising the road, the average proposed ROW will increase to 23.5 feet beyond the existing average (i.e. 52.5 feet from the existing roadway centerline). The raised roadway includes a proposed ROW that ranges from 15.4 to 23.5 feet beyond the existing ROW. The bridges include a proposed ROW that is approximately 43 feet beyond the existing ROW. The roadway alignment transitions include a proposed ROW that varies from 15.4 to 76.5 feet beyond the existing ROW.

The roadway and bridge approach sections will require a 10-foot TCE on the south side of the roadway. The girder bridges and precast arch-type bridge culverts will require a 50-foot TCE. All TCE's will be restored to original condition upon completion of construction activities.

No impacts to borrow or disposal sites are proposed.

6.6.6 Wetland Impacts

The preferred alternative (Alternative 6E) includes an estimated wetland loss, in acres, on the south side of the project as shown in **Table 6-5**.

Table 6-5: Wetland Impacts

Project Element	Permanent Impact Area (acre)	Temporary Impact Area (acre)
Roadway	7.5	3.2
Transitions	11.5	2.2
Bridges	27.3	32.5
Down Ramps	1.8	2.2
Total	48.1	40.1

The area of the existing roadbed to be removed is 33.8 acres. Both this area and the open area immediately below the bridges (approximately 30.6 acres) are considered flow way. Any permanent wetland creation associated with this flow way is not recognized in this study. Existing topographic and property boundary survey data are insufficient for a more accurate estimate of wetland loss. Wetland loss will be revisited in the PED phase.

Except for private parcels along the project corridor, these wetland loss estimates largely coincide with real estate impacts to the ENP. Refer to the Real Estate Appendix for additional information.

6.6.7 Traffic Control Plans

Refer to Section 6.4.1 and Plate C-2 for proposed traffic control sequencing.

7.0 Structural Requirements

7.1 Structure Location Types

7.1.1 Structure Locations

Structure locations, lengths and types for each alternative are identified in **Table 7-1**. During the course of this study, Alternative 3 and all structures at Location F were eliminated from the study per direction of the USACE.

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Table 7-1: Structure Alternatives

Location	Alt. 1	Alt. 2A	Alt. 2B	Alt. 4	Alt. 5
Osceola Camp					
Structure Location A	A1, Girder Bridge 2,974.50 ft	A1, Girder Bridge 2,974.50 ft	A1, Girder Bridge 2,974.50 ft	A1, Girder Bridge 2,974.50 ft	A1, Girder Bridge 2,974.50 ft
Jefferson Pilot					
Structure Location B	B1, Girder Bridge 2,379.60 ft	B1, Girder Bridge 2,379.60 ft	B1, Girder Bridge 2,379.60 ft	B1, Girder Bridge 2,379.60 ft	B1, Girder Bridge 2,379.60 ft
Everglades Safari / SFWMD Tower					
Structure Location C	C1, Girder Bridge 2,677.05 ft	C1,Girder Bridge 2,677.05 ft	C1, Girder Bridge 2,677.05 ft		C1, Girder Bridge 2,677.05 ft
Airboat Association					
Frog City	E1, Girder Bridge 1,983.00 ft	E1, Girder Bridge 1,983.00 ft	E1, Girder Bridge 1,983.00 ft		
Structure Location E					
Gator Park / Tiger Camp					
Coopertown					
Structure Location F					
Structure Location G					
Structure Location H	H1, Precast Arch-Type Bridge Culverts 1,377.00 ft	H1, Precast Arch-Type Bridge Culverts 1,377.00 ft	H1, Precast Arch-Type Bridge Culverts 1,377.00 ft		
Radio One					
Structure Location I		I1, Girder Bridge 2,776.20 ft	I1, Girder Bridge 2,776.20 ft		
Existing Structure					
Structure Location J		J1, Girder Bridge 3,470.25 ft			

Blank cells denote no structure

<table>
<tr><th>Location</th><th>Alt. 6A</th><th>Alt. 6B</th><th>Alt. 6C</th><th>Alt. 6D</th><th>Alt. 6E</th></tr>
<tr><td>Osceola Camp</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Structure Location A</td><td>A1, Girder Bridge 2,974.50 ft</td><td>A1, Girder Bridge 2,974.50 ft</td><td>A1, Girder Bridge 2,974.50 ft</td><td rowspan="5">A2*, Girder Bridge 13,682.70 ft</td><td rowspan="5">A2*, Girder Bridge 13,682.70 ft</td></tr>
<tr><td>Jefferson Pilot</td><td></td><td></td><td></td></tr>
<tr><td>Structure Location B</td><td rowspan="3">B2, Girder Bridge 9,915.00 ft</td><td rowspan="3">B2*, Girder Bridge 9,915.00 ft</td><td rowspan="3">B2*, Girder Bridge 9,915.00 ft</td></tr>
<tr><td>Everglades Safari / SFWMD Tower</td></tr>
<tr><td>Structure Location C</td></tr>
<tr><td>Airboat Association</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Frog City</td><td rowspan="2">E1, Girder Bridge 1,983.00 ft</td><td rowspan="2">E1, Girder Bridge 1,983.00 ft</td><td rowspan="2">E1, Girder Bridge 1,983.00 ft</td><td rowspan="2">E1, Girder Bridge 1,983.00 ft</td><td rowspan="2">E1, Girder Bridge 1,983.00 ft</td></tr>
<tr><td>Structure Location E</td></tr>
<tr><td>Gator Park / Tiger Camp</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Coopertown</td><td rowspan="4">G1, Girder Bridge 5,552.40 ft</td><td rowspan="4">G1*, Girder Bridge 5,552.40 ft</td><td rowspan="4">G1*,Girder Bridge 5,552.40 ft</td><td rowspan="6">G2*, Girder Bridge 9,220.95 ft</td><td rowspan="6">G2*, Girder Bridge 9,220.95 ft</td></tr>
<tr><td>Structure Location F</td></tr>
<tr><td>Structure Location G</td></tr>
<tr><td>Structure Location H</td></tr>
<tr><td>Radio One</td><td></td><td></td><td></td></tr>
<tr><td>Structure Location I</td><td>I1, Girder Bridge 2,776.20 ft</td><td>I1, Girder Bridge 2,776.20 ft</td><td>I1, Girder Bridge 2,776.20 ft</td></tr>
<tr><td>Existing Structure</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Structure Location J</td><td>J1, Girder Bridge 3,470.25 ft</td><td>J1, Girder Bridge 3,470.25 ft</td><td></td><td></td><td>J1, Girder Bridge 3,470.25 ft</td></tr>
</table>

Blank cells denote no structure
* Denotes structures with bridge access ramps

7.1.2 Girder Bridges

Structures identified as girder bridges are 47.08 feet wide with a clear distance of 44.00 feet between inside parapet faces. The bridges include two 12-foot travel lanes with 10-foot shoulders and outside barriers. Both the travel lane and shoulder are on a 2% cross slope.

The structural system for the proposed bridge structures is based on the least cost structure identified in Appendix D of the 2005 RGRR/SEIS. The proposed girder bridge structures are Florida Bulb Tee (FBT) 72 beams with a composite CIPC deck, supported on pile bents at 99.15-foot spacing using 24-inch square precast prestressed concrete piles in to rock. Other structure types considered in the RGRR/SEIS included AASHTO beams types IV, V, & VI with CIPC deck and 18 and 24-inch PPC piles (with pre-drilling); and Florida bulb tees 72 and 78 with CIPC deck and 3-foot diameter drilled shafts.

FPL splice boxes are required every half mile of bridge to allow utilities to be installed. Splice boxes are supported by enlarging an intermediate bent to provide a 6-foot x 10-foot space at one end of the bent with an additional pile beneath it. This design is based on the existing 1-mile bridge BASE PLANS.

7.1.3 Precast Arch-Type Bridge Culverts

Structures identified as precast arch-type bridge culverts are 48 feet wide with a clear distance of 46 feet between inside faces of the spandrel walls and a 9.05-foot vertical rise. The arches are supported on CIPC footings socketed into the bedrock. The typical road section of two 12-foot travel lanes with 10-foot shoulders sits on subgrade above the arches.

7.1.4 Bridge Down Ramps

The bridge down ramp typical section includes two 12-foot travel lanes with 5-foot shoulders and outside barriers. Radii of 50 feet are provided between the access road and Tamiami Trail travel lanes. These connections provide access from the bridged areas to properties south of the existing Tamiami Trail roadway.

The down ramps were considered as frontage road connections with the same design criteria as collector streets.

The elevated portion of the down ramps will be girder bridges supported on pile bents. Varying span lengths will be used to support the ramps along curves. A CIPC slab was considered for the curves, but the difficulty associated with using falsework in the soft soil around the site to support formwork made this option undesirable.

7.1.5 Existing Culvert Extension

Existing pipe culvert extensions are considered incidental to structure design and are discussed in Section 6.1.2.

7.2 Design Criteria

Structures are designed in accordance with the current version of AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications (Fourth Edition 2007, with 2008 Interim), and the FDOT Structures Manual (January 2009).

7.2.1 Material Properties

• Concrete:	
Substructure	f'c = 5,500 psi
Bridge deck and approach slabs	f'c = 4,500 psi
Prestressed beams	f'c = 8,500 psi
Precast Arch-Type Bridge Culverts	f'c = 4,000 psi
where fc =28-day concrete compressive strength	
• Reinforcing Steel ASTM A615 Grade 60	fy = 60,000 psi
• Prestressing Strands ASTM A416 Grade 270	fu = 270,000 psi
• Steel Sheet Piles ASTM A328	fy = 39,000 psi

7.3 Horizontal and Vertical Alignment

The bridge horizontal and vertical alignments will satisfy the requirements specified for the roadway. Lane and shoulder widths will match the roadway.

A 48.5 feet offset from the centerline of the bridge to the centerline of the existing roadway was established to allow a minimum area for cranes to construct the bridge. Installation of the prestressed piles and pile bent cap construction is assumed to be performed from a temporary haul road south of the existing roadway, with temporary islands at each pile bent or from a temporary trestle.

7.4 Vertical Clearances

The vertical profile of the bridges was set to meet the following criteria:

- Clearance above 100-year flood (EL +10.1): 0.00 feet
- Floating debris clearance above DHW (EL +9.70): 2.00 feet
- Maintenance and inspection clearance above CWE (EL+8.75): 6.00 feet
- Navigation clearance: not applicable

This criteria result in a low chord EL +14.75 for girder bridges and a high point of intrados EL +11.1 for precast arch-type bridge culverts.

7.5 Exposure Conditions

The environment exposure classification for the bridges is considered slightly aggressive for the superstructure, and moderately aggressive for the substructure.

7.6 Design Loads

- Dead Loads:
  Unit weight of reinforced concrete 150 pcf
  Traffic railing barrier 420 plf
  SIP Forms 20 psf
- Live Loads:
  HL-93 design truck or design tandem, and design lane load
  FL 120 permit vehicle (Strength II check only)
- Wind Load:
  Per the AASHTO LRFD code with an increase in pressure by 20% per the FDOT Structures Design Guidelines (as applicable for the South Florida location).
- Other Loads:
  Per the AASHTO LRFD code.

7.7 Drainage and Runoff Treatment

Bridges and down ramps will include a runoff treatment system as described in the Supplemental Hydraulic Modified Water Deliveries Analyses Drainage Report. Runoff from a 4-inch per hour intensity storm must not encroach on the travel, turning or auxiliary lanes adjacent to barrier walls. The bridge deck drainage comprises four independent systems that collect and convey storm runoff for the southwest, southeast, northwest and northeast segments of the bridge. Each system consists of scupper drains at approximately 200-foot spacing and two shoulder gutter inlets. The scupper drains are connected to drainage pipes that are hung from the bridge decking on the north and south sides of each bridge. The shoulder gutter inlets and scupper drains are connected to CDS units constructed on the adjacent roadway approach segments where water quality treatment takes place prior to discharge through minimum 24-inch outfall pipes. Two CDS units will be installed at each bridge and down ramp touchdown point. The final design of the drainage system will use the Interconnected Pond Routing (ICPR) computer model to simulate the proposed conditions of the four independent treatment systems for each bridge. Runoff from the roadway pavement on the precast arch-type bridge culverts flows off the road and across a six-foot wide grass strip prior to discharge. Runoff is discharged into the adjacent canal on the north side of the roadway or into the wetlands on the south side after passing through scuppers on the precast arch-type bridge culvert barrier walls.

8.0 Electrical and Mechanical Requirements (Utilities)

Refer to Section 6.6.4 for discussion of existing utilities within the project limits.

9.0 Environmental Objective and Requirements (Permitting)

The following permits are expected prior to the construction of project features. Other permit requirements may be identified in the PED phase.

- Highway Easement Deed (previously obtained)

- FDEP Environmental Resource Permit (ERP)

10.0 Operation and Maintenance

FDOT will operate and maintain the Tamiami Trail roadway and bridge/precast arch-type bridge culvert structures. The SFWMD will maintain the areas under the proposed bridges.

11.0 Cost Estimates

This is a cost and schedule summary of the alternative analysis for the Tamiami Trail Feasibility Study. This includes the alternatives cost estimates in an Excel spreadsheet format, the preferred alternative in MCACES MII format, a construction schedule summary table, a detailed construction schedule for the preferred alternative in Microsoft Project format, supporting documents and applicable material quotes. The preferred alternative estimate is structured in accordance with USACE Civil Works Work Breakdown Structure (WBS).

11.1 Quantities and Cost Estimates

Quantities were computed by the design team based on the current layout and location for the alternatives being considered. The Cost Estimates were completed utilizing updated material quotes and available unit prices. FDOT average unit prices from 2008 were compared with recent project bid-tabs to determine the most current unit costs. Therefore costs provided in this report are in Fiscal Year 2010 dollars and are then escalated for inflation or mid-point date of construction. The escalation is performed according to procedures detailed in USACE publication EM 1110-2-1304. The factor in the Excel spreadsheet is based on the same factor used in the MII file. They should only be used for comparative purposes and not be used for budgeting. The cost estimates for these alternatives were computed in Microsoft Excel format. Detailed cost breakdown estimates for these alternatives considered under this project can be found in the supporting documentation and calculations of this report.

11.2 General Mark-ups

The only mark-up applied to these Excel estimates is a 25% contingency. It is generally accepted that FDOT unit prices used for calculating the cost estimates have already factored in general contractor mark-ups for profit, Jobsite Office Overhead (JOOH), Home Office Overhead (HOOH) and bond. The costs of each alternative developed are to be used to establish a means of comparison between alternatives.

A percentage of the total construction costs without contingency were added for Engineering & Design (E&D) and Supervision & Administration (S&A). These percentages are listed below:

- E&D – 10%
- S&A – 10%

For the Preferred Alternative, an MII estimate is provided. For this estimate, the labor rates are based on the National Labor Library. The mark-ups were applied in the MII file and they are as follows:

- Jobsite Office Overhead (JOOH) – 10%
- Home Office Overhead (HOOH) – 8%
- Profit – 0% (to the Prime Contractor)
- Bond – 1%
- E&D – 10%
- S&A – 10%

11.3 General Assumptions

The general assumptions used for the cost and construction durations presented in this report at this time include:

- This estimate is based on fair market value for Fiscal Year 2010 and is an estimated cost of time and materials and not a prediction of contractor's low bid.

- This project will follow a traditional Design-Bid-Build acquisition and will not be a minority set-aside project.

- Fuel costs were included for the preferred alternative (Alternative 6E) in the MII file as $2.90 per gallon for gasoline, $2.26 per gallon for off-road diesel, and $2.72 per gallon for on-road diesel.

11.4 Construction Cost Estimates

A summary of the cost estimates is listed in **Table 11-1**.

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Table 11-1: Summary of Estimated Construction Costs

Summary of Estimated Construction Costs						
Alternative	Construction Cost	E&D	S&A	Escalation	Contingency	Total Project Cost
Alt. 1	$88.6 M	$8.9 M	$8.9 M	$7.4 M	$22.1 M	$136.0 M
Alt. 2A	$102.7 M	$10.3 M	$10.3 M	$8.6 M	$25.7 M	$157.5 M
Alt. 2B	$98.9 M	$9.9 M	$9.9 M	$8.3 M	$24.7 M	$151.8 M
Alt. 4	$58.8 M	$5.9 M	$5.9 M	$4.9 M	$14.7 M	$90.2 M
Alt. 5	$70.8 M	$7.1 M	$7.1 M	$5.9 M	$17.7 M	$108.6 M
Alt. 6A	$155.1 M	$15.5 M	$15.5 M	$13.0 M	$38.8 M	$238.0 M
Alt. 6B	$155.5 M	$15.5 M	$15.5 M	$13.1 M	$38.9 M	$238.5 M
Alt. 6C	$140.3 M	$14.0 M	$14.0 M	$11.8 M	$35.14 M	$215.2 M
Alt. 6D	$144.8 M	$14.5 M	$14.5 M	$12.2 M	$36.2 M	$222.2 M
Alt. 6E(1)	$184.8 M	$14.4 M	$14.4 M	$19.3 M	$46.2 M	$279.2 M

(1)Preferred alternative

12.0 Schedule of Design and Construction

A single construction contract is anticipated, with a construction period estimated to be 43.8 months. This construction period does not address variables that could affect the construction duration, including but not limited to, design changes, unforeseen construction means and methods and the ability to secure/procure materials, equipment and labor. This period does not include an allowance for design, ROW acquisition and other pre-construction activities.

12.1 Construction Durations

Construction schedules and durations in this report are for the alternative analysis for the Tamiami Trail Feasibility Study. Details and calculations for each schedule can be found in the supporting documentation and calculations of this report. These schedules encompass construction operations only and do not include proposed land acquisition, design and preparation of plans and specifications, funding activities or other non-construction related items.

The schedule is based on a standard 6 to 10-hour/day work week for the majority of the project. The roadway will utilize night crews and bridge work would be completed with day crews. Average production rates were applied to quantities provided to determine these durations. The use of multiple crews was used when calculating schedule durations as it should be easy for a contractor to mobilize more than one crew on this project.

The Notice to Proceed date (NTP) was assumed to be January 2, 2013. This is due to the current scheduled completion for the 1-mile BASE PLANS Bridge in December, 2012. This project cannot start until after the completion of the 1-mile Bridge Project. This allows a short time for contractor mobilization.

The construction of the roadway was averaged throughout the project alternatives and a standard rate of 29 Linear Feet (LF) per day per crew was used. It was assumed that the contractor would utilize two crews for the roadway work; one started on opposite ends of the project limits. For Alternatives 4 & 5, it was assumed that there would be less mobilization/demobilization time as the roadway sections are longer. Therefore, it is assumed that crews could tackle bigger sections of roadway work per phase and the production rate was increased to be 33 LF per day per crew. These rates factor in weather days and federal holidays.

For this alternative analysis submittal, it was assumed that the staging of the bridges could accommodate two crews working at one time. Therefore, two bridges are being constructed at one time during the project. The construction of the bridges was averaged throughout the project alternatives and a standard rate of 33 LF per day per crew was used. Staging of the bridge work such as driving piles, steel reinforcing, form work and concrete pouring, can better be accomplished with further detailed scheduling at the final submittal. This rate factors in weather days and federal holidays.

Table 12-1 presents a summary of the durations for the alternative analysis for the Tamiami Trail Feasibility Study.

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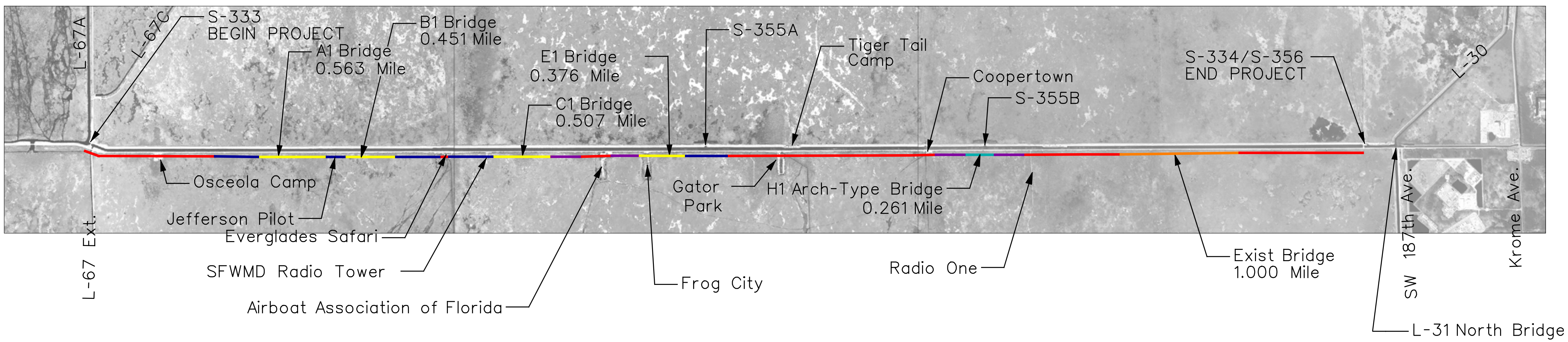
Table 12-1: Summary of Estimated Construction Durations

Summary of Estimated Construction Durations	
Alternative	**Project Duration**
Alternative 1	3.57 years
Alternative 2A	3.16 years
Alternative 2B	3.22 years
Alternative 4	3.77 years
Alternative 5	3.55 years
Alternative 6A	3.52 years
Alternative 6B	3.52 years
Alternative 6C	3.57 years
Alternative 6D	3.71 years
Alternative 6E[(1)]	3.67 years

[(1)]Preferred alternative



ALTERNATIVE 1

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)

ALTERNATIVE 1
LENGTH OF PROJECT

CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	27,820.00	5.27	
APPROACHES	11,280.00	1.64	
BRIDGES	10,016.00	1.90	4
ARCH-TYPE BRIDGE	1378.00	0.26	1
TOTAL LENGTH OF PROJECT*	55,774.00	10.56	

* INCLUDES EXIST 1 MILE BRIDGE

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

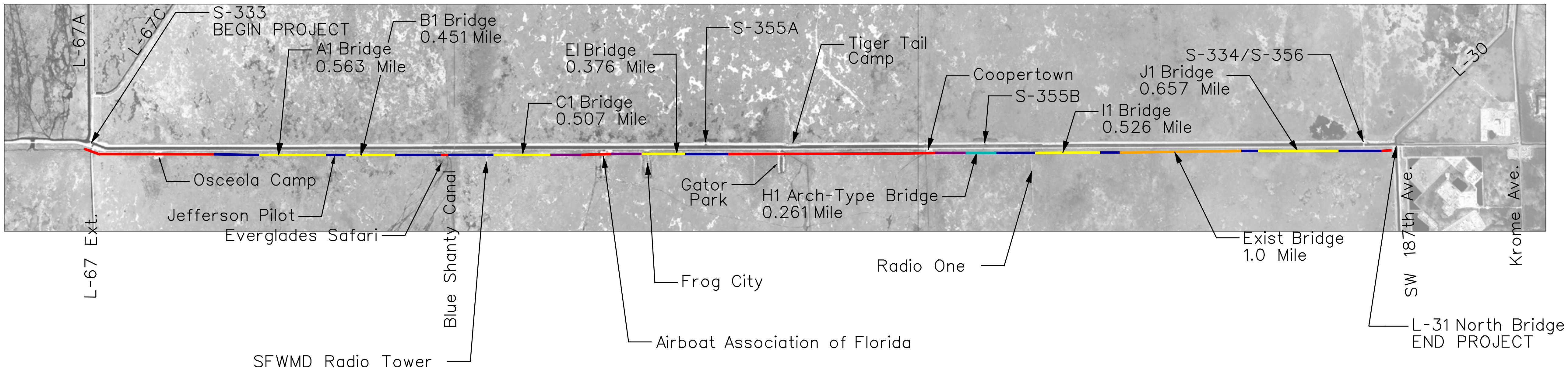
Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ALTERNATIVE 1

Scale: AS SHOWN
PLATE NO.
A-1



ALTERNATIVE 2A

ALTERNATIVE 2A LENGTH OF PROJECT			
CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	17,992.00	3.41	
APPROACHES	16,210.00	2.82	
BRIDGES	16,262.40	3.08	6
ARCH-TYPE BRIDGE	1378.00	0.26	1
TOTAL LENGTH OF PROJECT*	57,122.00	10.82	

* INCLUDES EXIST 1 MILE BRIDGE

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
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No. | Symbol | Zone | Description

HNTB
PADRAIC T. HEMPHILL
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Dated:
Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ALTERNATIVE 2A

Scale: AS SHOWN
PLATE NO.
A-2A

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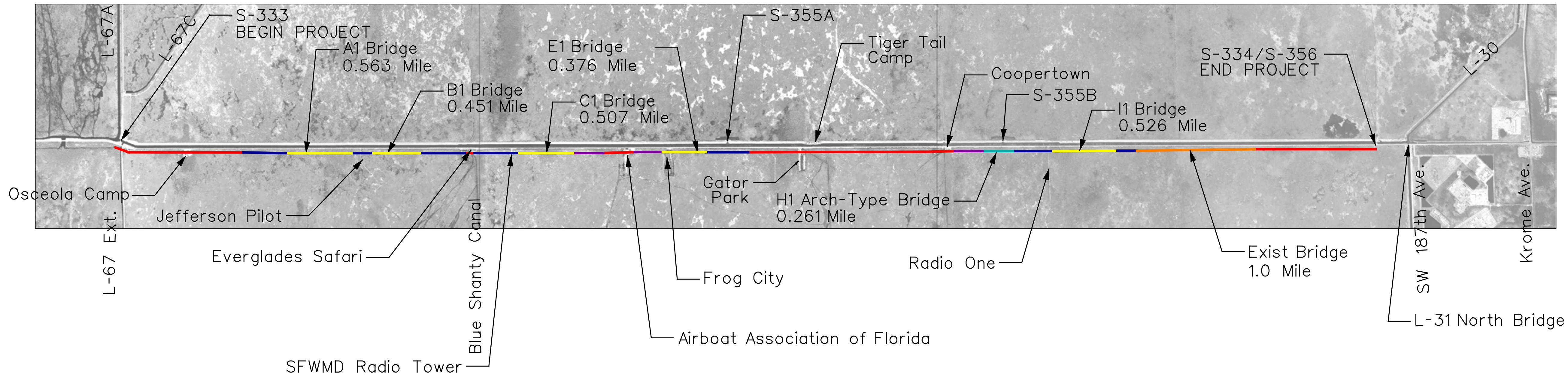

Legend

ALTERNATIVE 2B

ALTERNATIVE 2B
LENGTH OF PROJECT

CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	21,642.00	4.01	
APPROACHES	14,680.00	2.53	
BRIDGES	12,793.00	2.42	5
ARCH-TYPE BRIDGE	1,378.00	0.26	1
TOTAL LENGTH OF PROJECT*	55,774.00	10.56	

* INCLUDES EXIST 1 MILE BRIDGE

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
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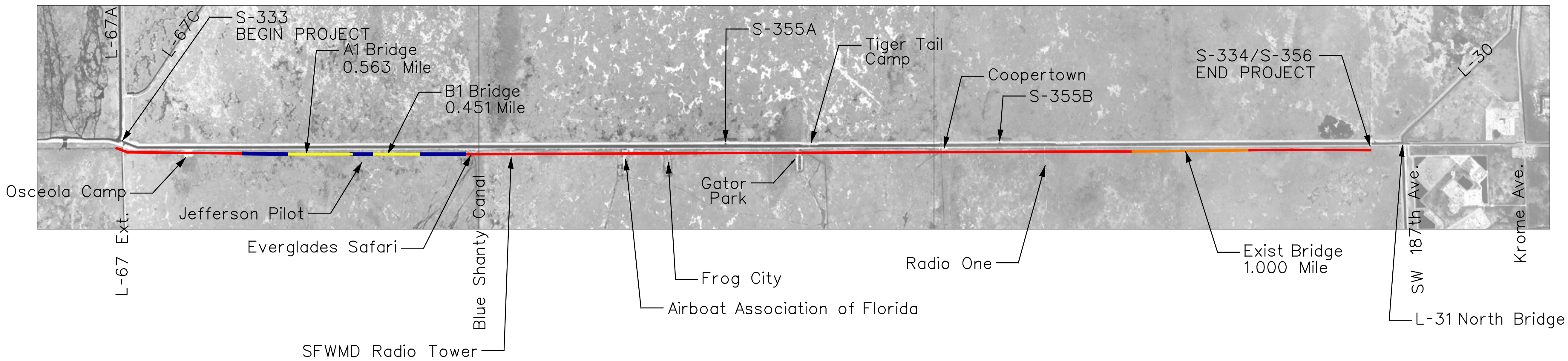
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ALTERNATIVE 2B

Scale: AS SHOWN
PLATE NO.
A-2B



ALTERNATIVE 4

ALTERNATIVE 4 LENGTH OF PROJECT			
CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	40,060.00	7.59	
APPROACHES	5,080.00	0.96	
BRIDGES	5,354.00	1.01	2
ARCH-TYPE BRIDGE	0.00	0.00	0
TOTAL LENGTH OF PROJECT*	55,774.00	10.56	

* INCLUDES EXIST 1 MILE BRIDGE

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
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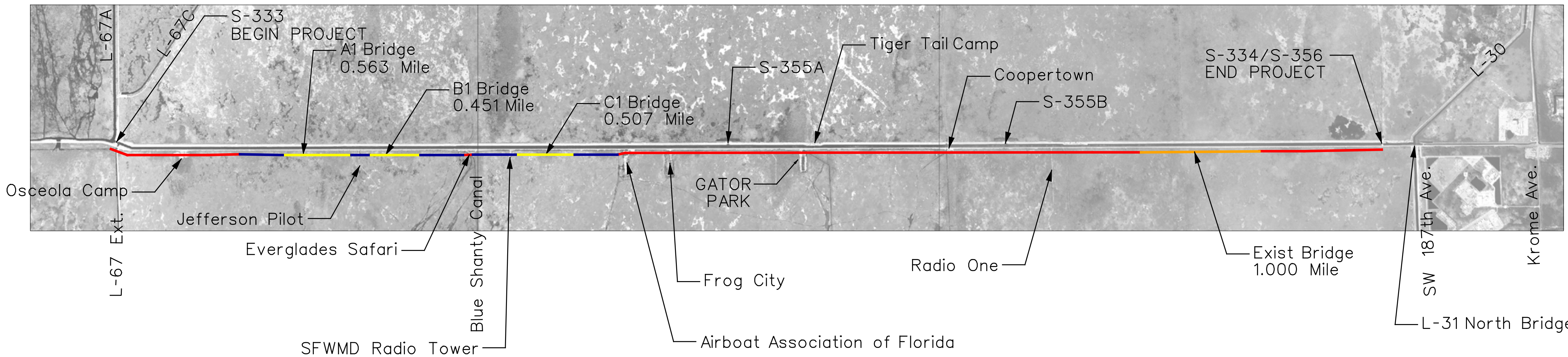
Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ALTERNATIVE 4

Scale: AS SHOWN
PLATE NO.
A-4



ALTERNATIVE 5

ALTERNATIVE 5 LENGTH OF PROJECT			
CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	34,783.00	6.59	
APPROACHES	7,680.00	1.46	
BRIDGES	8,031.00	1.52	3
ARCH-TYPE BRIDGE	0.00	0.00	0
TOTAL LENGTH OF PROJECT*	55,774.00	10.56	

* INCLUDES EXIST 1 MILE BRIDGE

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
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7077 BONNEVAL ROAD, SUITE 600
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JACKSONVILLE, FLORIDA

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Inv. No.
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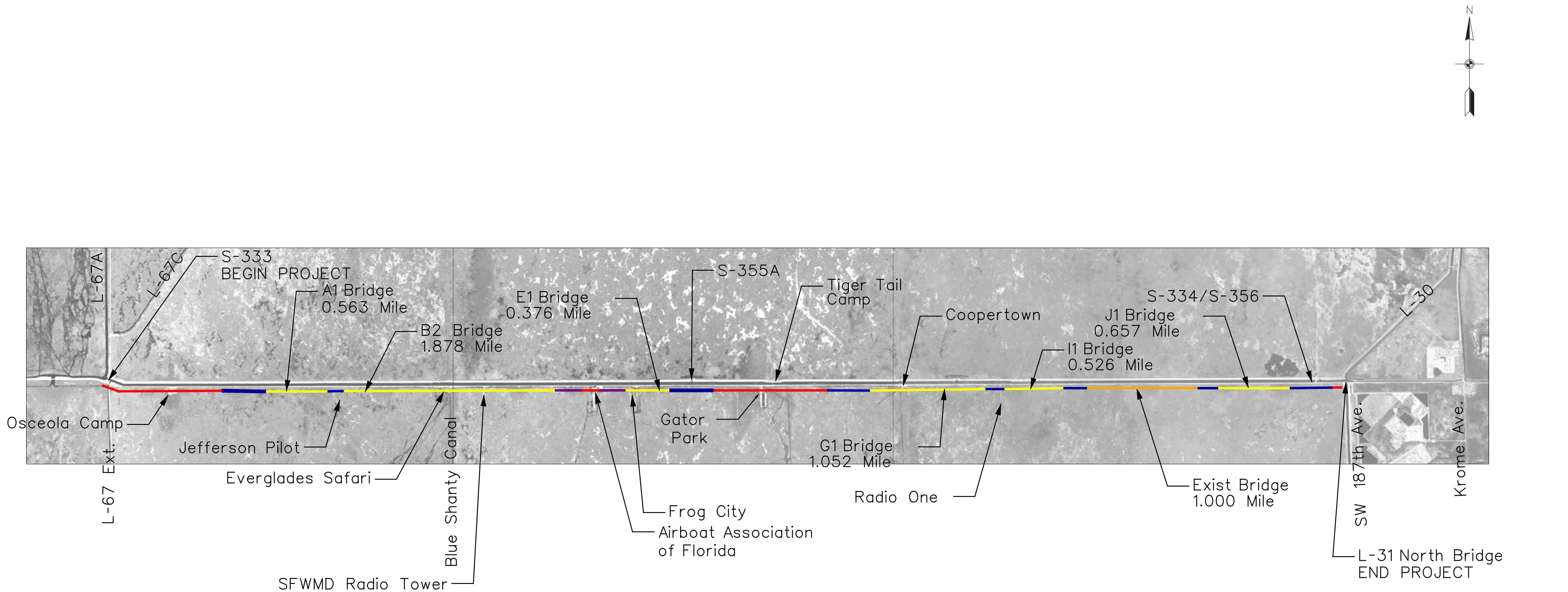
D.O.FILE NO.
Dated:
Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90 ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ALTERNATIVE 5

Scale: AS SHOWN
PLATE NO.
A-5



ALTERNATIVE 6A

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)

ALTERNATIVE 6A
LENGTH OF PROJECT

CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	13,847.00	2.62	
APPROACHES	11,320.00	2.14	
BRIDGES	26,675.00	5.05	6
ARCH-TYPE BRIDGE	0.00	0.00	0
TOTAL LENGTH OF PROJECT*	57,122.00	10.82	

* INCLUDES EXIST 1 MILE BRIDGE

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
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Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:
Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ALTERNATIVE 6A

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PLATE NO.
A-6A

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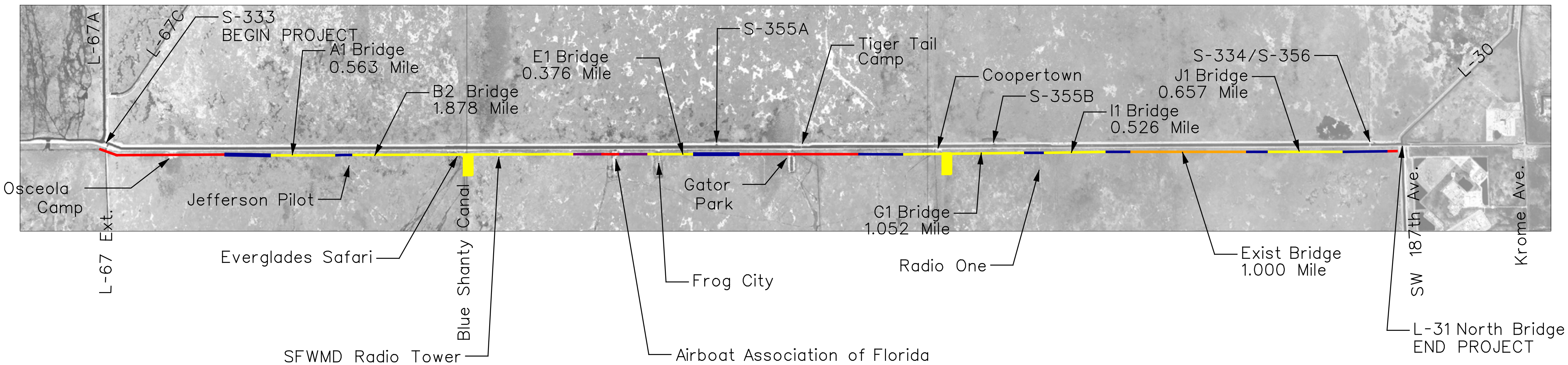

ALTERNATIVE 6B

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)
- Bridge Access Ramp

ALTERNATIVE 6B
LENGTH OF PROJECT

CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	13,847.00	2.62	
APPROACHES	11,320.00	2.14	
BRIDGES	26,675.00	5.05	6
ARCH-TYPE BRIDGE	0.00	0.00	0
TOTAL LENGTH OF PROJECT*	57,122.00	10.82	

* INCLUDES EXIST 1 MILE BRIDGE

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
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HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dated: February 2010

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ALTERNATIVE 6B

Scale: AS SHOWN

PLATE NO.
A-6B

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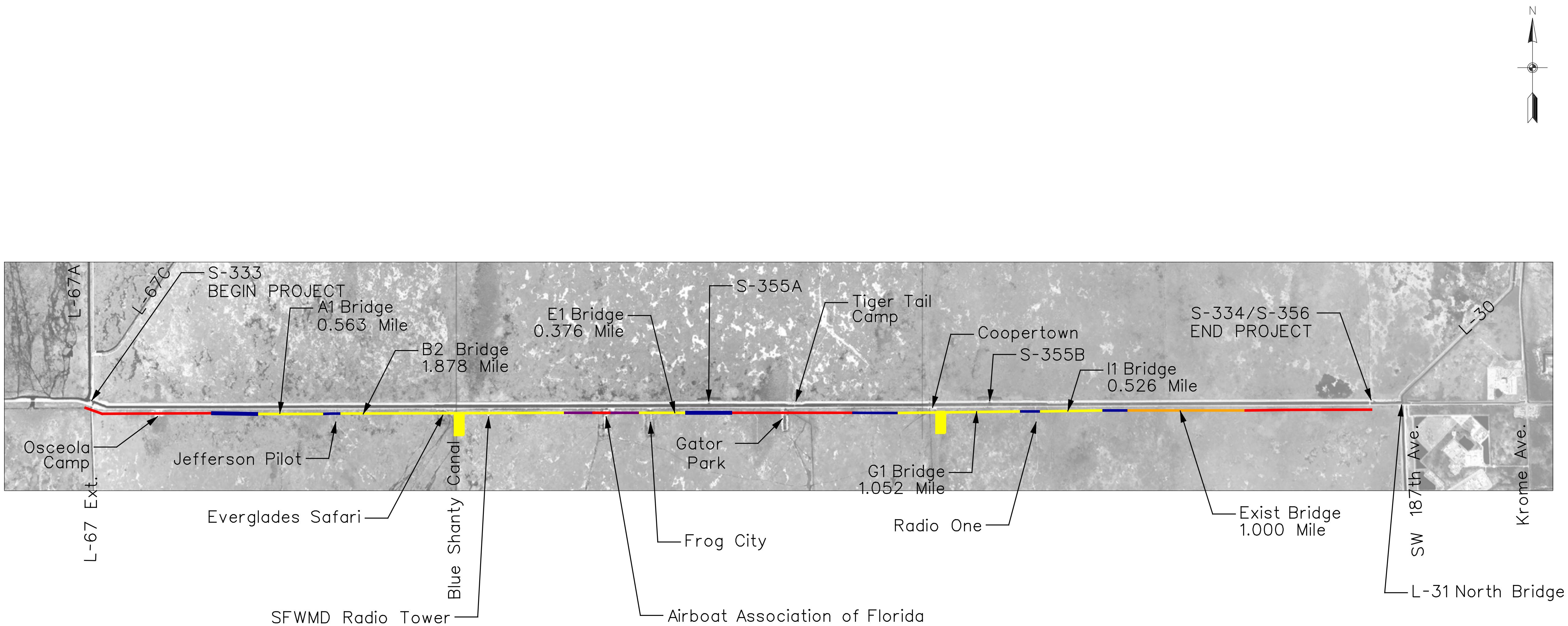

ALTERNATIVE 6C

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)
- Bridge Access Ramp

ALTERNATIVE 6C
LENGTH OF PROJECT

CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	17,391.00	3.29	
APPROACHES	9,940.00	1.88	
BRIDGES	23,163.00	4.39	5
ARCH-TYPE BRIDGE	0.00	0.00	0
TOTAL LENGTH OF PROJECT*	55,774.00	10.56	

* INCLUDES EXIST 1 MILE BRIDGE

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

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Inv. No.
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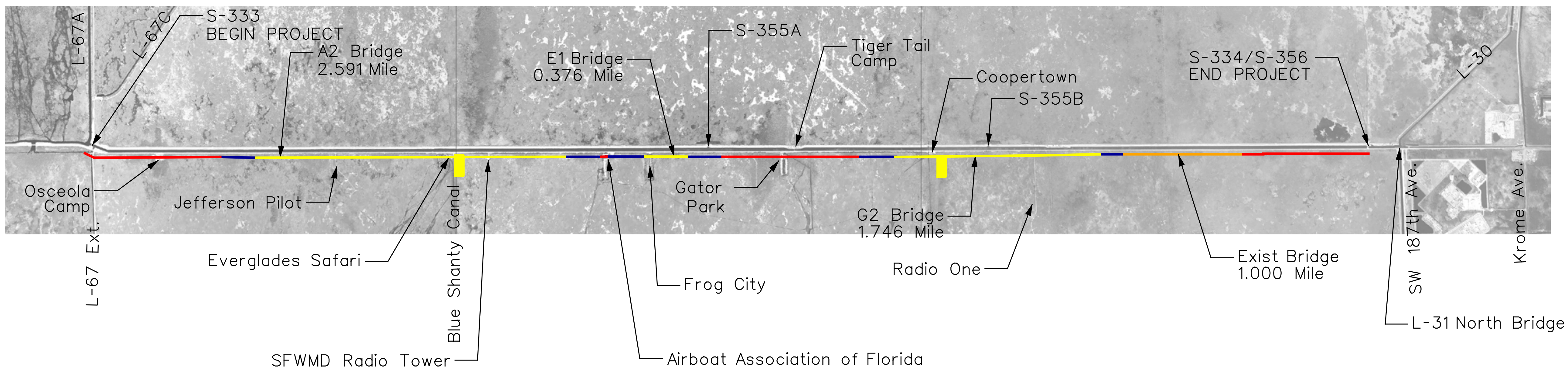
Dated:
Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90 ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ALTERNATIVE 6C

Scale: AS SHOWN
PLATE NO.
A-6C

ALTERNATIVE 6D



ALTERNATIVE 6D LENGTH OF PROJECT			
CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	17,429.00	3.30	
APPROACHES	8,180.00	1.55	
BRIDGES	24,885.00	4.71	3
ARCH-TYPE BRIDGE	0.00	0.00	0
TOTAL LENGTH OF PROJECT*	55,774.00	10.56	

* INCLUDES EXIST 1 MILE BRIDGE

Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)
- Bridge Access Ramp

2500' 0 5000'
SCALE: 1"=5000'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No. | Symbol | Zone | Description

HNTB
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JACKSONVILLE, FLORIDA

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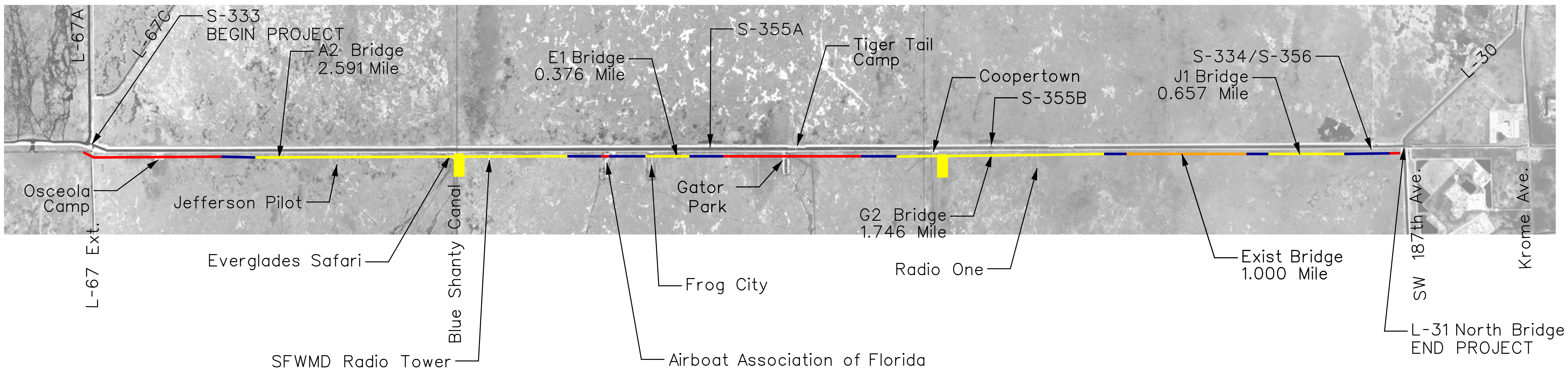
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ALTERNATIVE 6D

Scale: AS SHOWN
PLATE NO.
A-6D



Legend

- Roadway
- Bridge
- Arch-Type Bridge
- Existing Bridge
- Approach to Bridge/Arch-Type Bridge
- Approach to Bridge/Arch-Type Bridge (Superelevated)
- Bridge Access Ramp

ALTERNATIVE 6E LENGTH OF PROJECT			
CATEGORY	LINEAR FEET	MILES	COUNT
ROADWAY	13,928.00	2.64	
APPROACHES	9,560.00	1.81	
BRIDGES	28,354.00	5.37	4
ARCH-TYPE BRIDGE	0.00	0.00	0
TOTAL LENGTH OF PROJECT*	57,122.00	10.82	

* INCLUDES EXIST 1 MILE BRIDGE

ALTERNATIVE 6E

(PREFERRED ALTERNATIVE)

2500' 0 5000'
SCALE: 1"=5000'-0"

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Jacksonville District
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MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ALTERNATIVE 6E

Scale: AS SHOWN
PLATE NO.
A-6E

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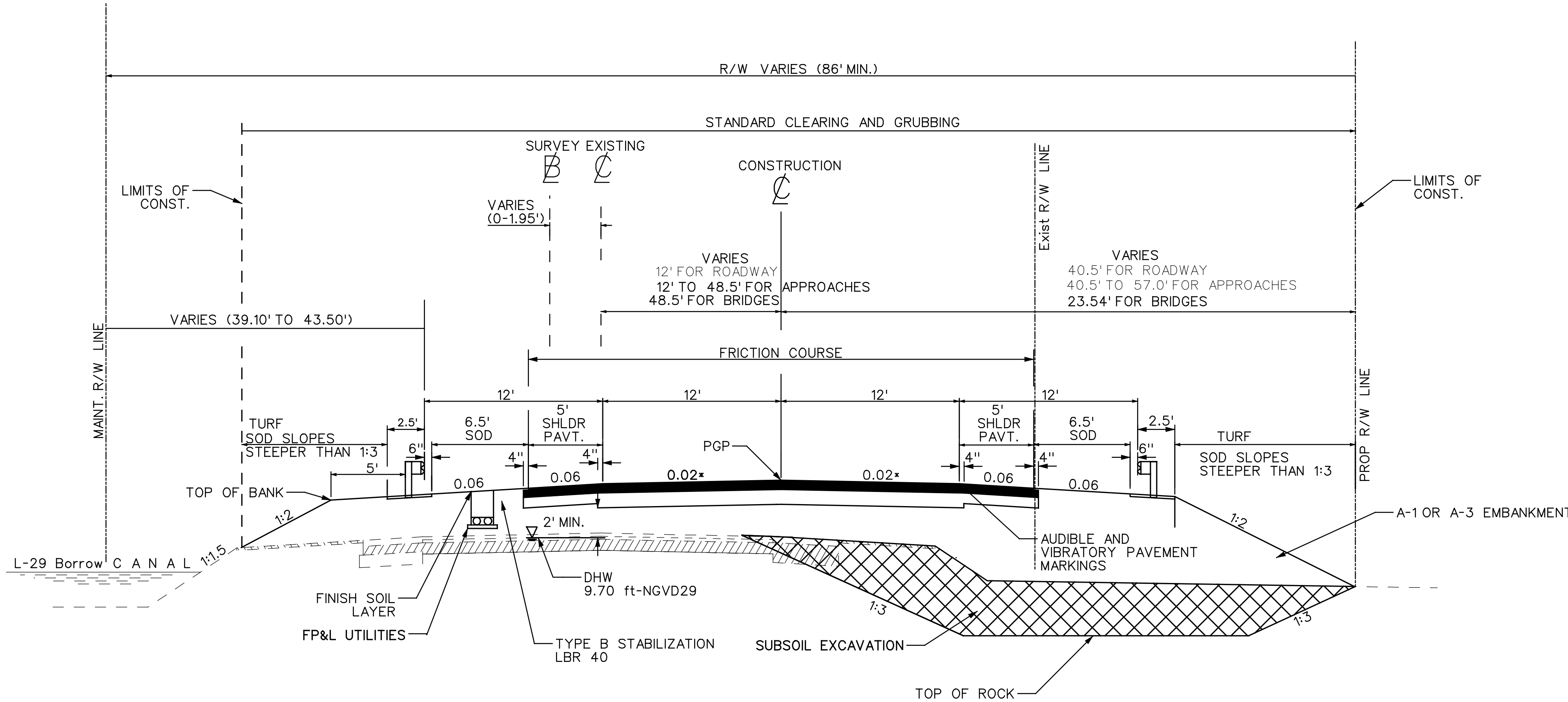


ROADWAY TYPICAL SECTION
U.S. 41 (S.R. 90)

2' BASE CLEARANCE

*SUPERELEVATION IS 0.025 AT CONSTRAINED BRIDGE APPROACHES

TRAFFIC DATA

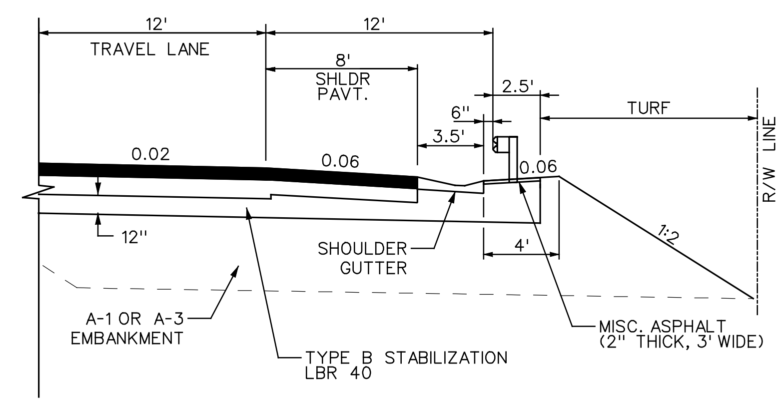
CURRENT YEAR ESTIMATE = 2008 AADT = 5,200
OPENING YEAR ESTIMATE = 2018 AADT = 5,800
DESIGN YEAR ESTIMATE = 2038 AADT = 7,200
K = 8.07% D = 66% T = 13% (24 hr)
DESIGN HOUR T = 11.5%
DESIGN SPEED = 60 MPH
POSTED SPEED = 55 MPH

RECONSTRUCTION

OPTIONAL BASE GROUP 9 WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (3 1/2")
AND FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)

SHOULDER PAVEMENT

OPTIONAL BASE GROUP 5 WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (3")
FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)



SHOULDER GUTTER SECTION
U.S. 41 (S.R. 90)

US Army Corps of Engineers
Jacksonville District
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HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dated: February 2010

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

TYPICAL SECTION

Scale: AS SHOWN
PLATE NO.
C-1

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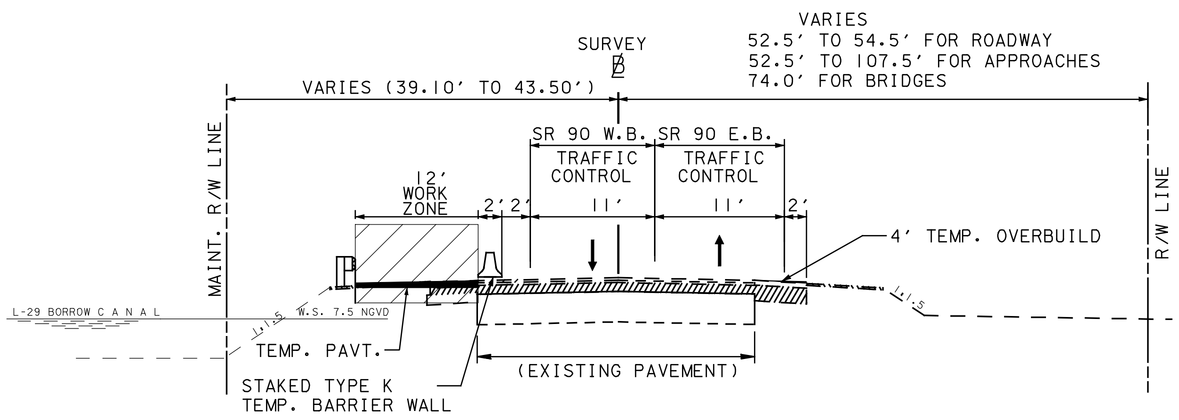
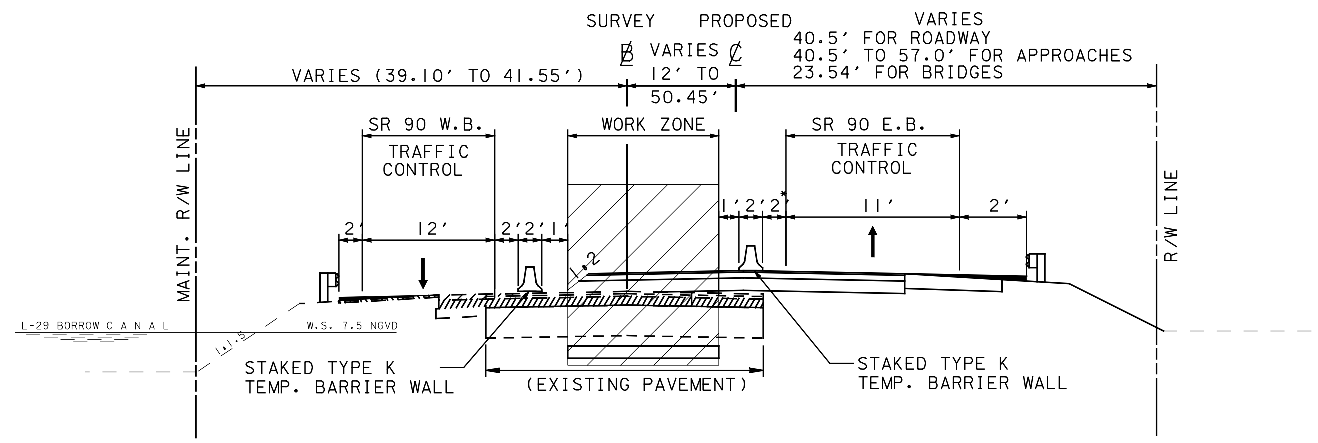
MAINTENANCE OF TRAFFIC PHASING TYPICAL SECTION

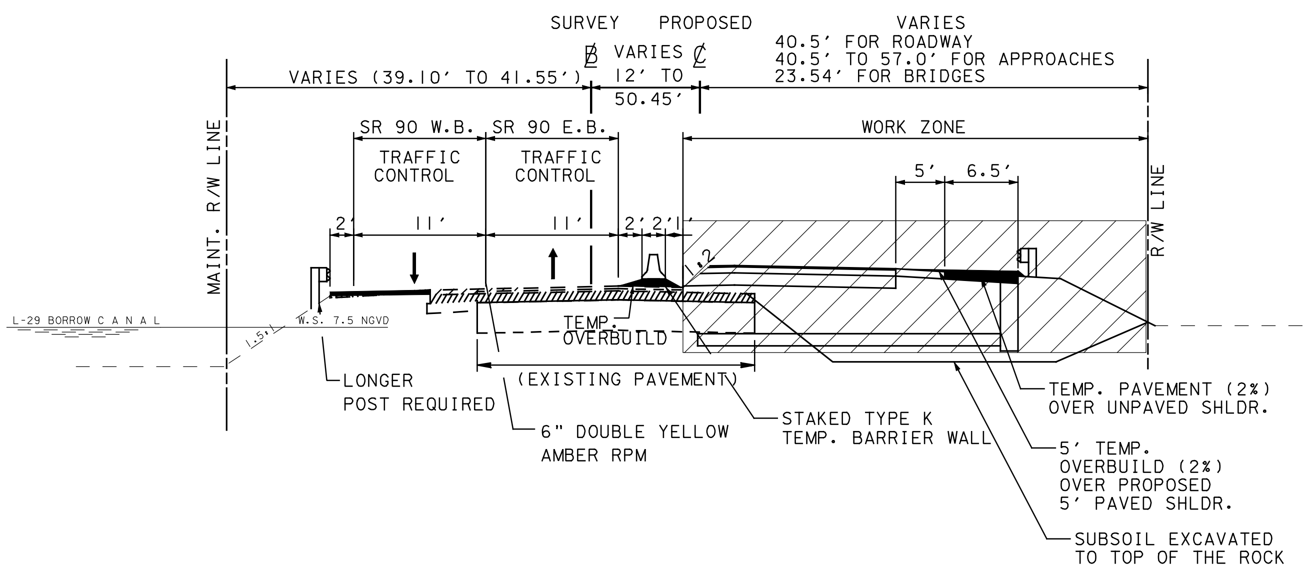


PHASE 1

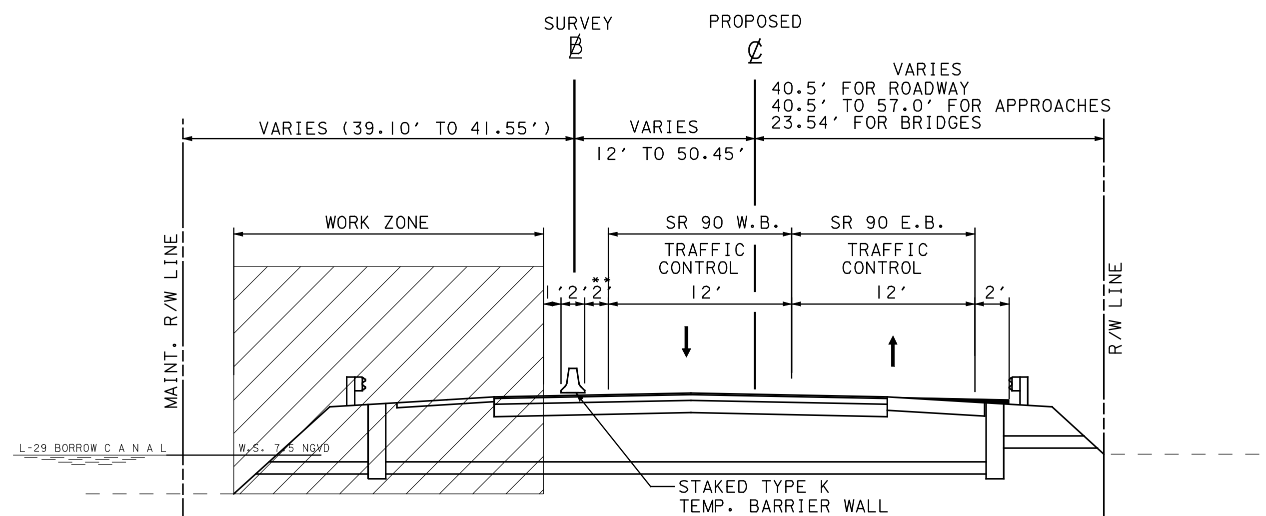


* 1' FROM STA 1167+08.77 TO STA 1174+22.94

PHASE 3



PHASE 2



** 1' FROM STA 1257+96.77 TO STA 1267+33.53

PHASE 4

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No. | Symbol | Zone | Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE (904) 296-0207

HNTB

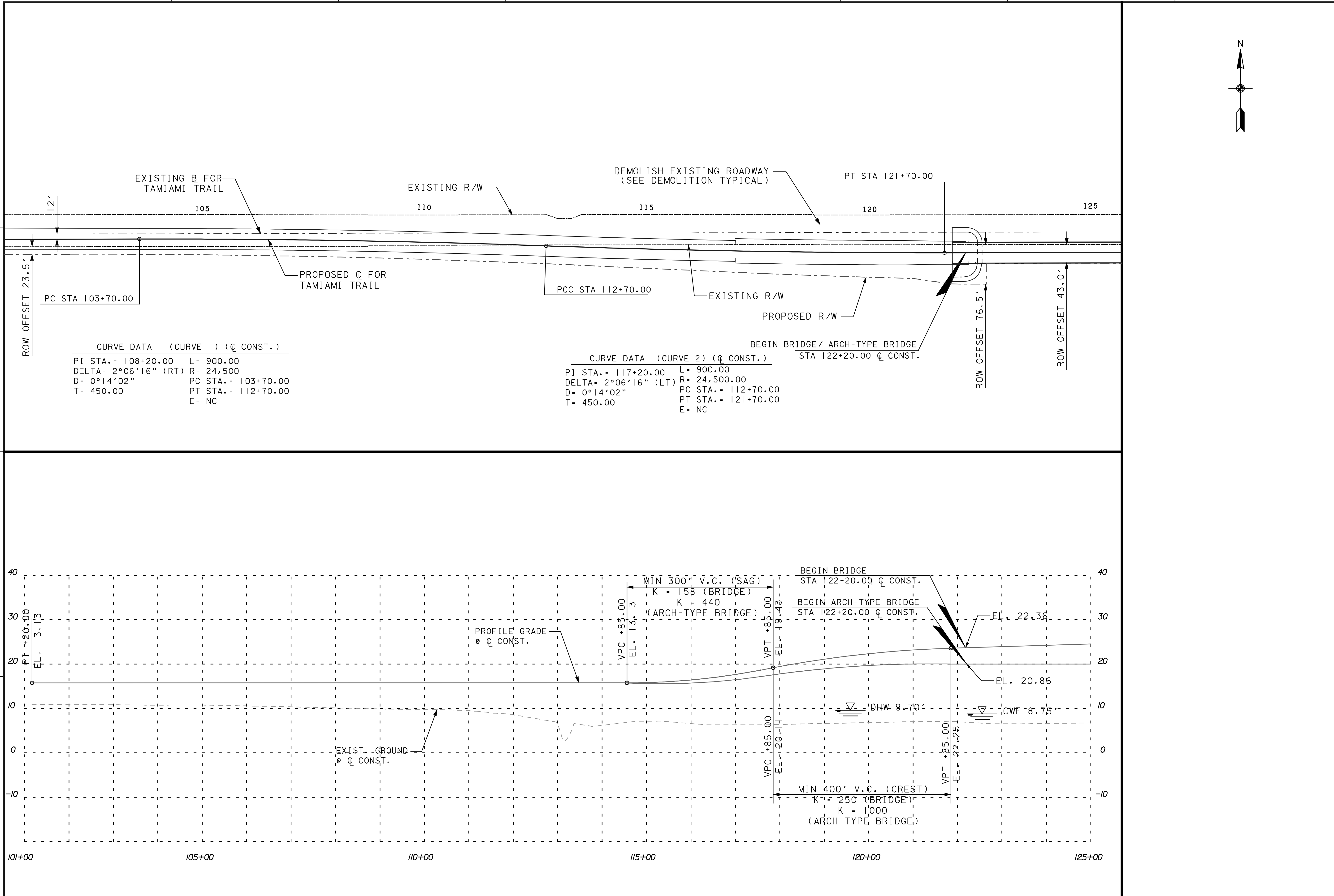
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: FEBRUARY 2010
D.O.FILE NO.
Dated:

REFERENCE FILES:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
PHASING TYPICAL SECTIONS

Scale: AS SHOWN
PLATE NO.
C-2



US Army Corps of Engineers
JACKSONVILLE DISTRICT
SAFETY ON THIS JOB DEPENDS ON YOU

NO.	SYMBOL	ZONE	DESCRIPTION

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

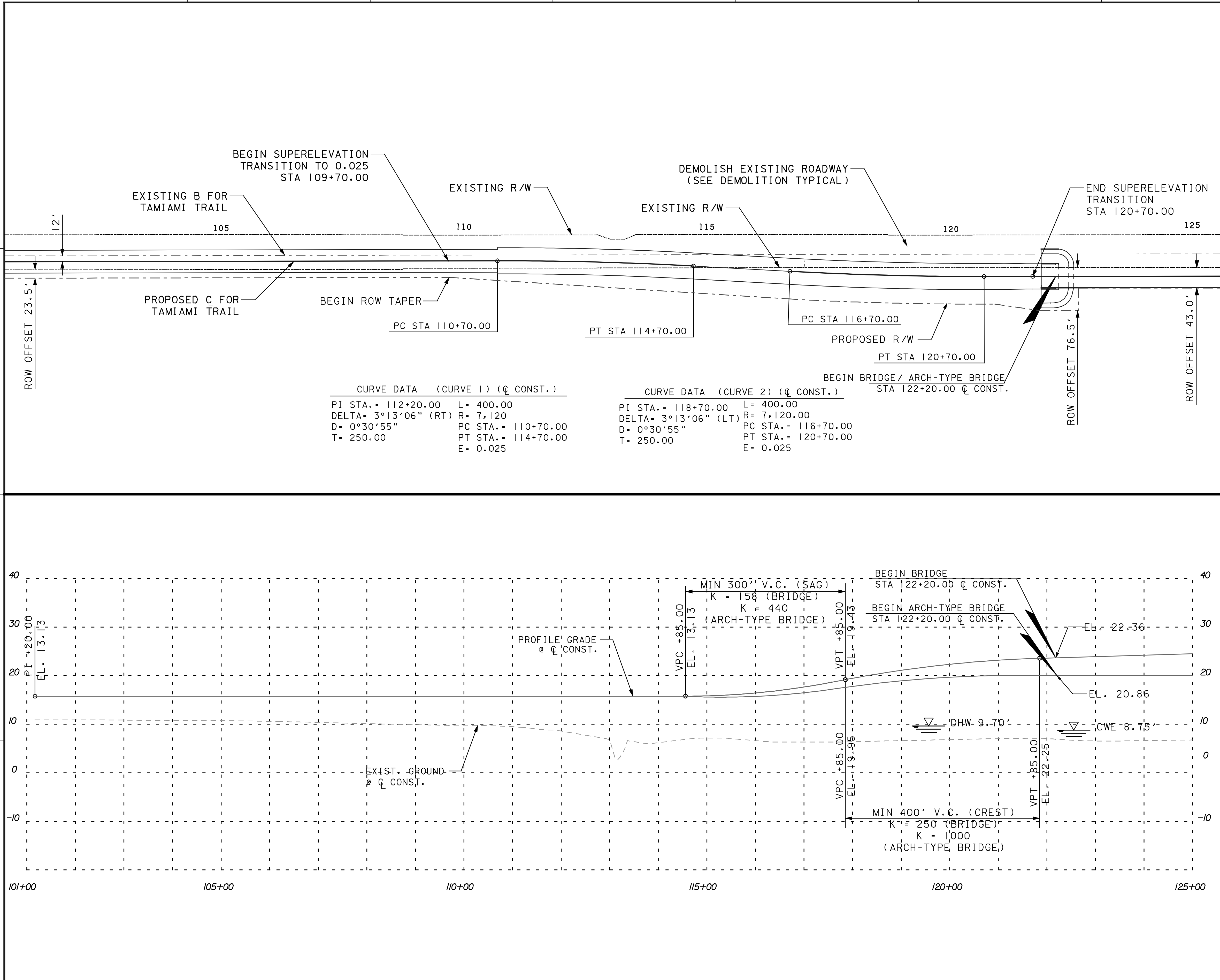
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DESIGNED BY: AJS
CKD BY: PTH
DWN BY: AJS
INV. NO.
DATED: FEBRUARY 2010
D.O. FILE NO.
DATED:
REFERENCE FILES:
FILE NAME:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
TYPICAL ALIGNMENT AT APPROACHES
NORMAL CROWN

SCALE: N.T.S.
PLATE NO.
C-3



US Army Corps of Engineers
JACKSONVILLE DISTRICT
SAFETY ON THIS JOB DEPENDS ON YOU

NO.	SYMBOL	ZONE	DESCRIPTION

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DESIGNED BY: AJS
CKD BY: PTH
DWN BY: AJS
INV. NO.
DATED: FEBRUARY 2010
D.O.FILE NO.
DATED:

REFERENCE FILES:
FILE NAME:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

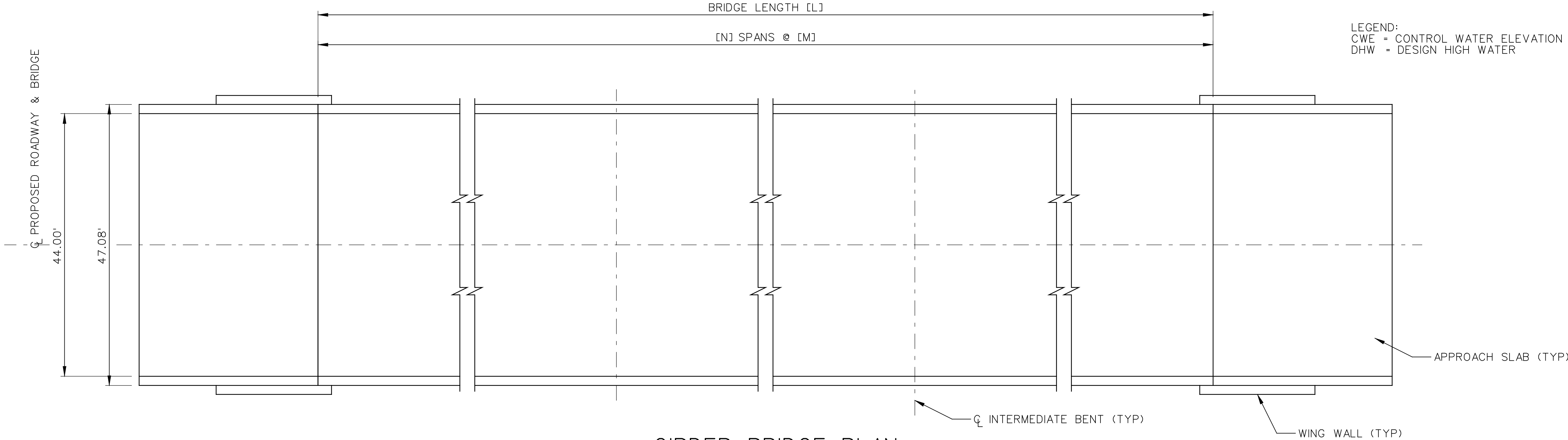
MODIFICATIONS TO STATE ROAD NO. 90
TYPICAL ALIGNMENT AT APPROACHES
SUPERELEVATED

SCALE: N.T.S.
PLATE NO.
C-4

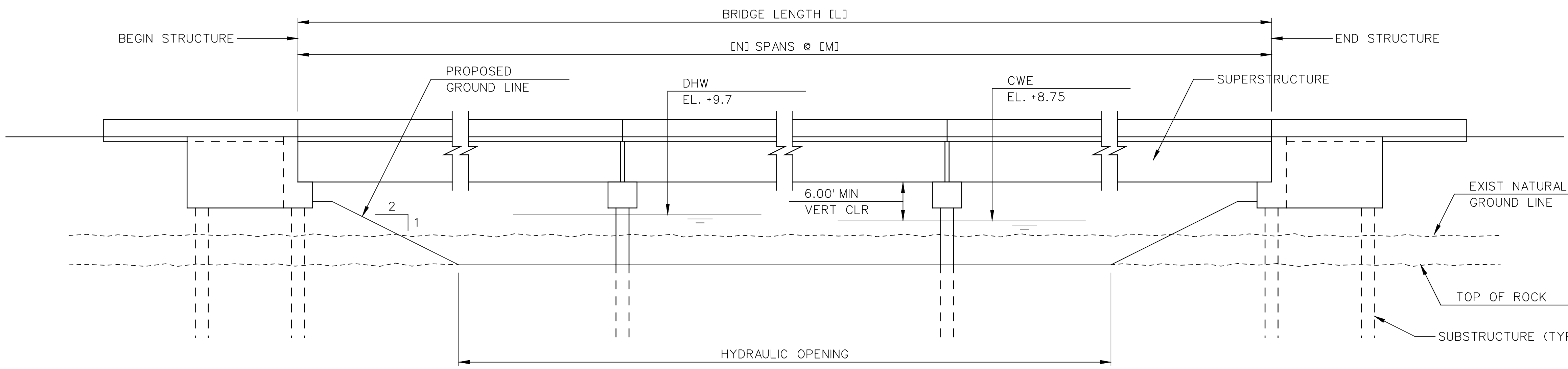
NOTES:

1. SEE PLATE S-2 FOR TYPICAL SECTION.
2. SEE CIVIL PLANS FOR STRUCTURE LOCATIONS.

LEGEND:
CWE = CONTROL WATER ELEVATION
DHW = DESIGN HIGH WATER



GIRDER BRIDGE PLAN



GIRDER BRIDGE ELEVATION

BRIDGE ID	BRIDGE LENGTH [L]	HYDRAULIC OPENING	NUMBER OF SPANS [N]	SPAN LENGTHS [M]	SUPERSTRUCTURE TYPE	SUBSTRUCTURE TYPE
A1	2,974.50'	2,925.00'	30	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
A2	13,682.70'	13,633.20'	138	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
B1	2,379.60'	2,330.10'	24	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
B2	9,915.00'	9,865.50'	100	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
C1	2,677.05'	2,627.55'	27	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
E1	1,983.00'	1,933.50'	20	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
G1	5,552.40'	5,502.90'	56	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
G2	9,220.95'	9,171.45	93	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
I1	2,776.20'	2,726.70'	28	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES
J1	3,470.25'	3,420.75'	35	99.15'	4 - FBT 72	8 - 24" SQ. PPC PILES

GIRDER BRIDGE DATA

10' 0 10' 20'

SCALE: 1"=10'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

MARK MATHU
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: M. MATHU
Ckd by: A. JOHNS
Dwn by: M. MATHU
A. JOHNS
Inv. No.
Dated: DECEMBER 2009
D.O.FILE NO.
Dated:

Reference files:
DGN
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90

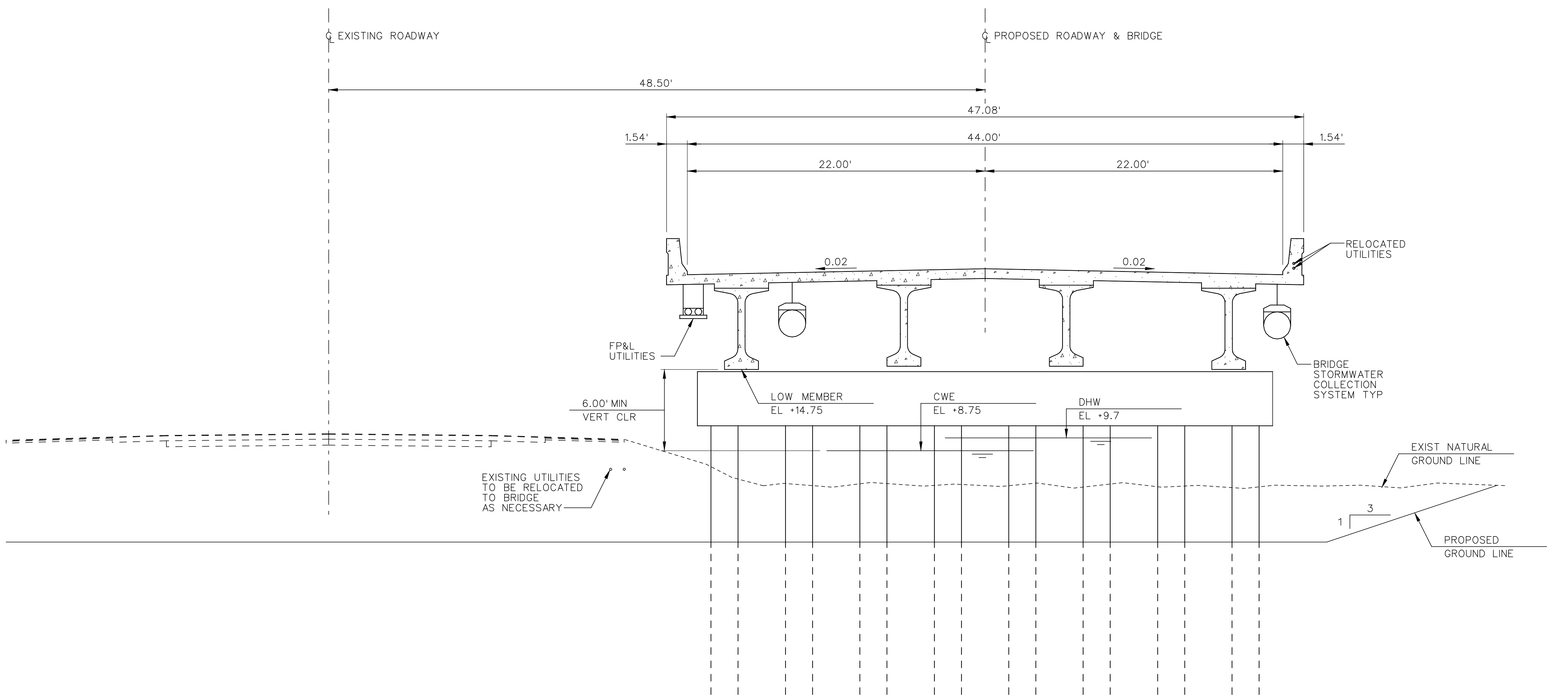
STRUCTURAL

GIRDER BRIDGE
PLAN AND ELEVATION

Scale: AS SHOWN

PLATE NO.

S-1



GIRDER BRIDGE SECTION LOOKING EAST

24" 12" 0 2' 4' 6' 8' 10'

SCALE: 1/4 "=1'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

MARK MATHU
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: M. MATHU
Ckd by: A. JOHNS
Dwn by: M. MATHU
A. JOHNS
Inv. No.
Dated: DECEMBER 2009
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Dated:

Reference files:
DGN
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90

STRUCTURAL

GIRDER BRIDGE SECTION

Scale: AS SHOWN

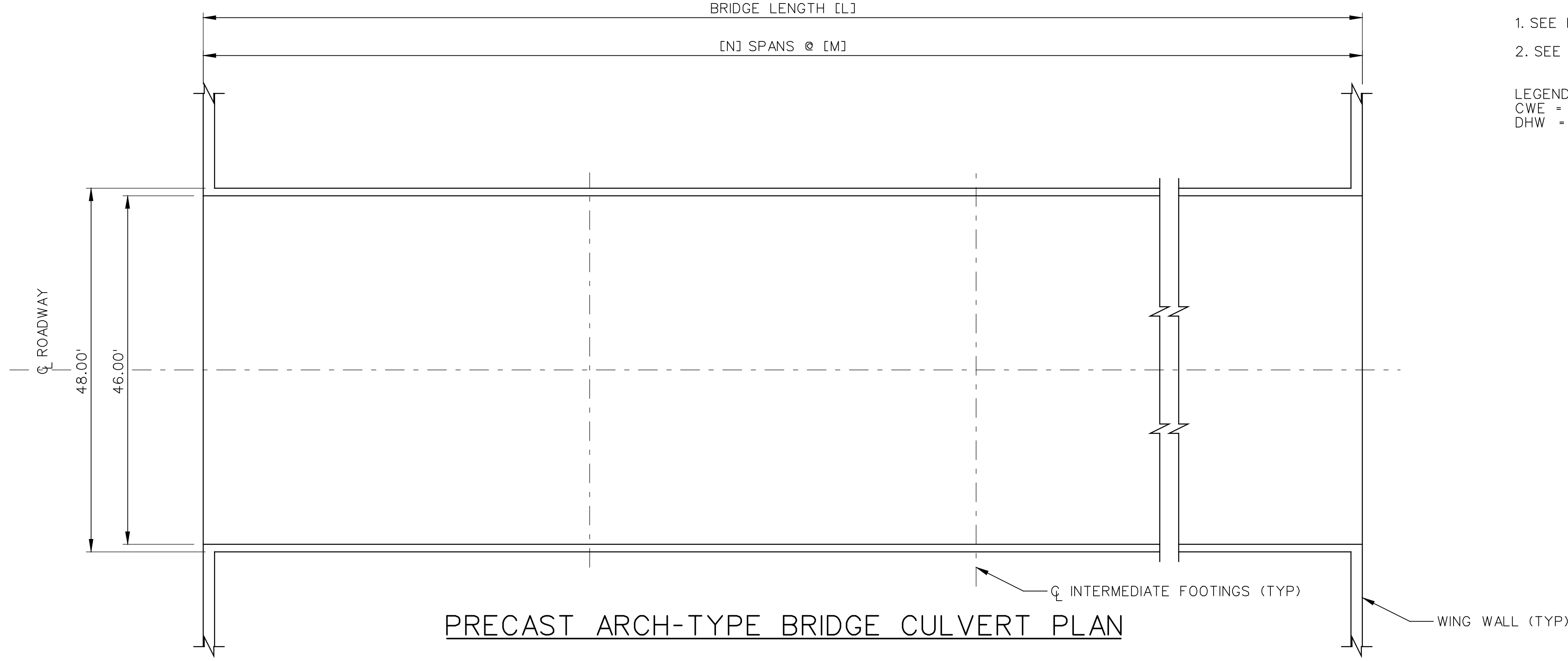
PLATE NO.

S-2

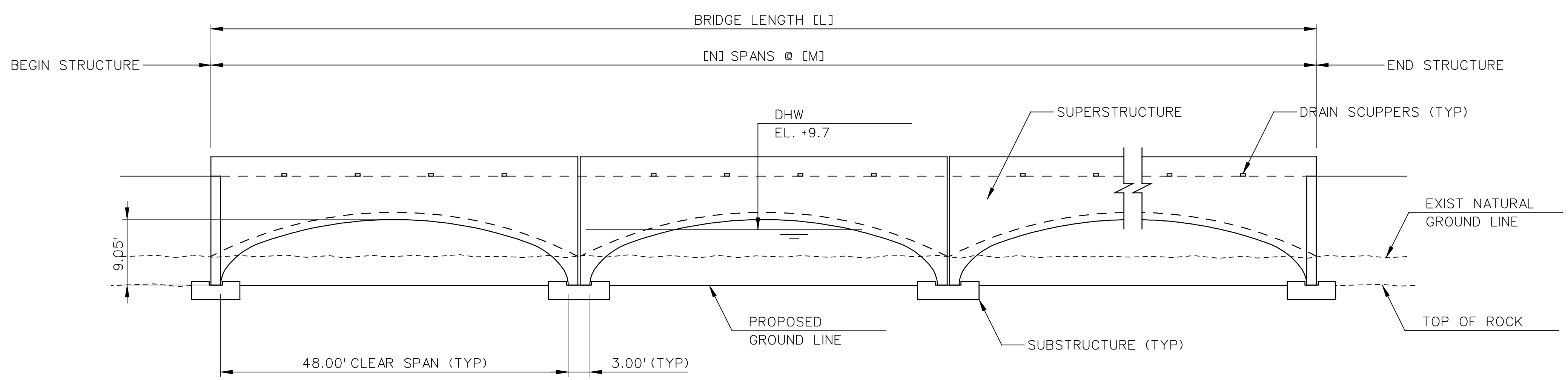
NOTES:

1. SEE PLATE S-4 FOR TYPICAL SECTION.
2. SEE CIVIL PLANS FOR STRUCTURE LOCATIONS.

LEGEND:
CWE = CONTROL WATER ELEVATION
DHW = DESIGN HIGH WATER



PRECAST ARCH-TYPE BRIDGE CULVERT PLAN



PRECAST ARCH-TYPE BRIDGE CULVERT ELEVATION

BRIDGE ID	BRIDGE LENGTH [L]	HYDRAULIC OPENING	NUMBER OF SPANS [N]	SPAN LENGTHS [M]	SUPERSTRUCTURE TYPE	SUBSTRUCTURE TYPE
H1	1,377.00'	---	27	51.00'	12 - CONC ARCH	8.50' X 51.00' FOOTING

PRECAST ARCH-TYPE BRIDGE CULVERT DATA

10' 0 10' 20'

SCALE: 1"=10'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
MARK MATHU
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: M. MATHU
Ckd by: A. JOHNS
Dwn by: M. MATHU
A. JOHNS
Inv. No.
Dated: DECEMBER 2009
D.O.FILE NO.
Dated:

Reference files:
DGN
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90

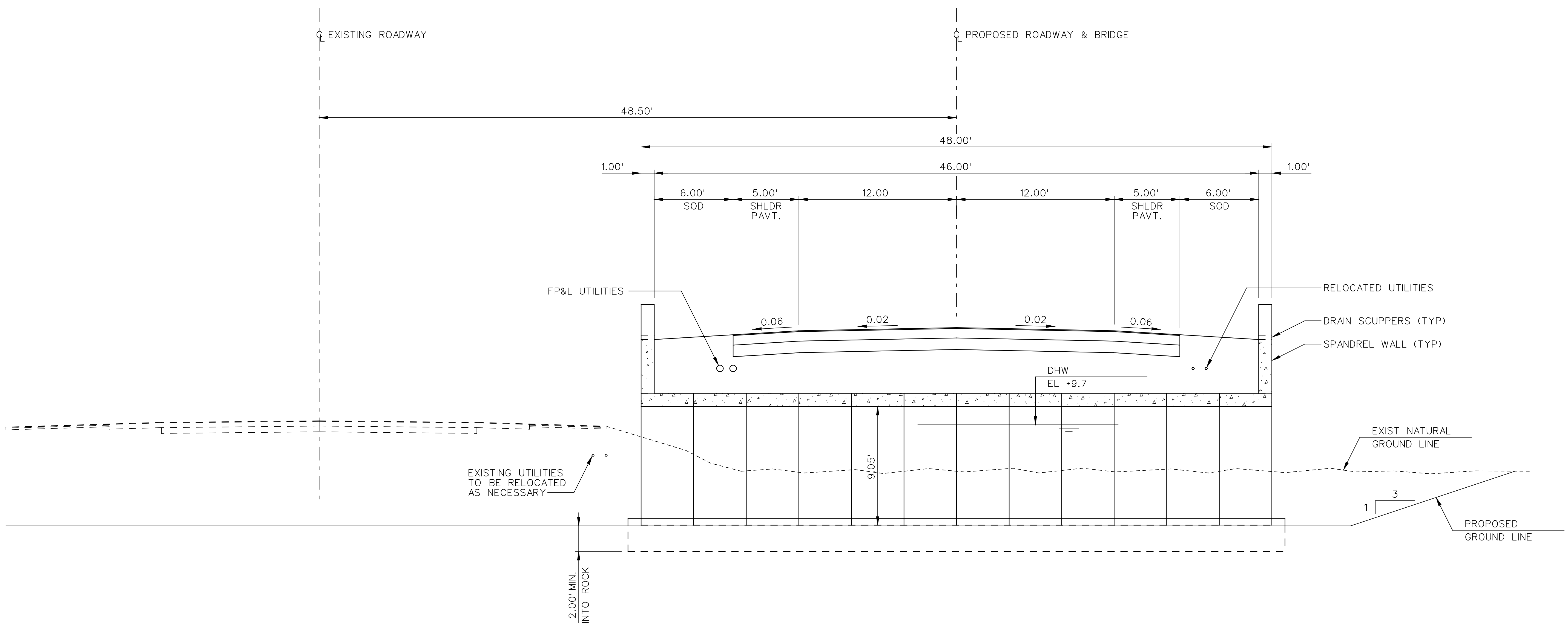
STRUCTURAL

PRECAST ARCH-TYPE BRIDGE CULVERT
PLAN AND ELEVATION

Scale: AS SHOWN

PLATE NO.

S-3



PRECAST ARCH-TYPE BRIDGE CULVERT SECTION LOOKING EAST

SCALE: 1/4 "=1'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

MARK MATHU
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

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A. JOHNS
Inv. No.
Dated: DECEMBER 2009
D.O.FILE NO.
Dated:

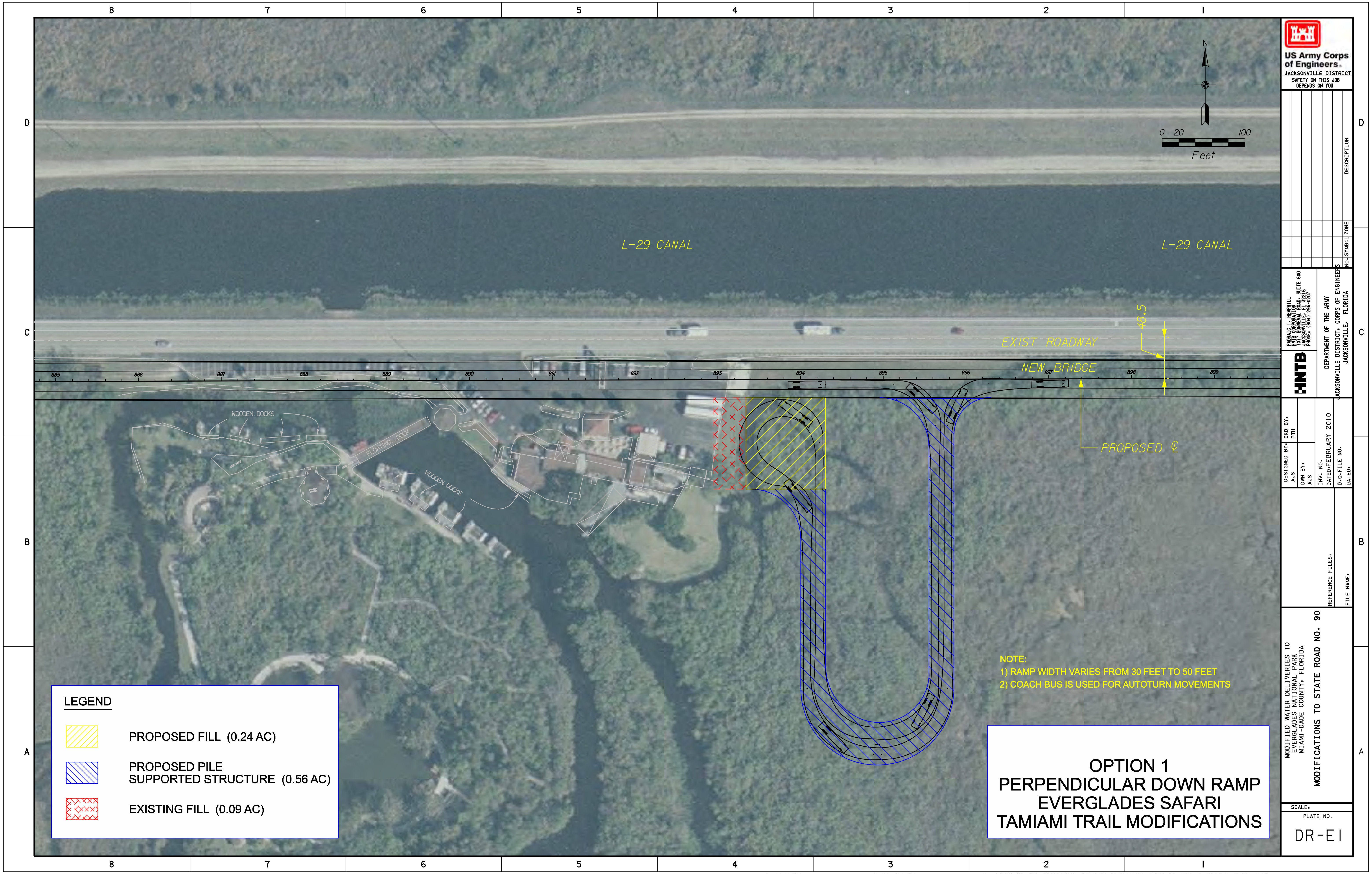
Reference files:
DGN
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90

STRUCTURAL
PRECAST ARCH-TYPE BRIDGE CULVERT
SECTION

Scale: AS SHOWN
PLATE NO.
S-4



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LEGEND

(yellow hatch)	PROPOSED FILL (0.32 AC)
(blue hatch)	PROPOSED PILE SUPPORTED STRUCTURE (1.22 AC)
(red hatch)	EXISTING FILL (0.13 AC)

NOTE:
1) RAMP WIDTHS ARE 15 FEET
2) COACH BUS IS USED FOR AUTOTURN MOVEMENTS

OPTION 2
DIAMOND INTERCHANGE
EVERGLADES SAFARI
TAMIAMI TRAIL MODIFICATIONS

US Army Corps of Engineers®
JACKSONVILLE DISTRICT
SAFETY ON THIS JOB DEPENDS ON YOU

DESCRIPTION
NO. SYMBOL ZONE

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DESIGNED BY: AJS
CKD BY: PTH
DWN BY: AJS
INV. NO.
DATED: FEBRUARY 2010
D.O. FILE NO.
DATED:
REFERENCE FILES:
FILE NAME:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90

SCALE:
PLATE NO.
DR-E2

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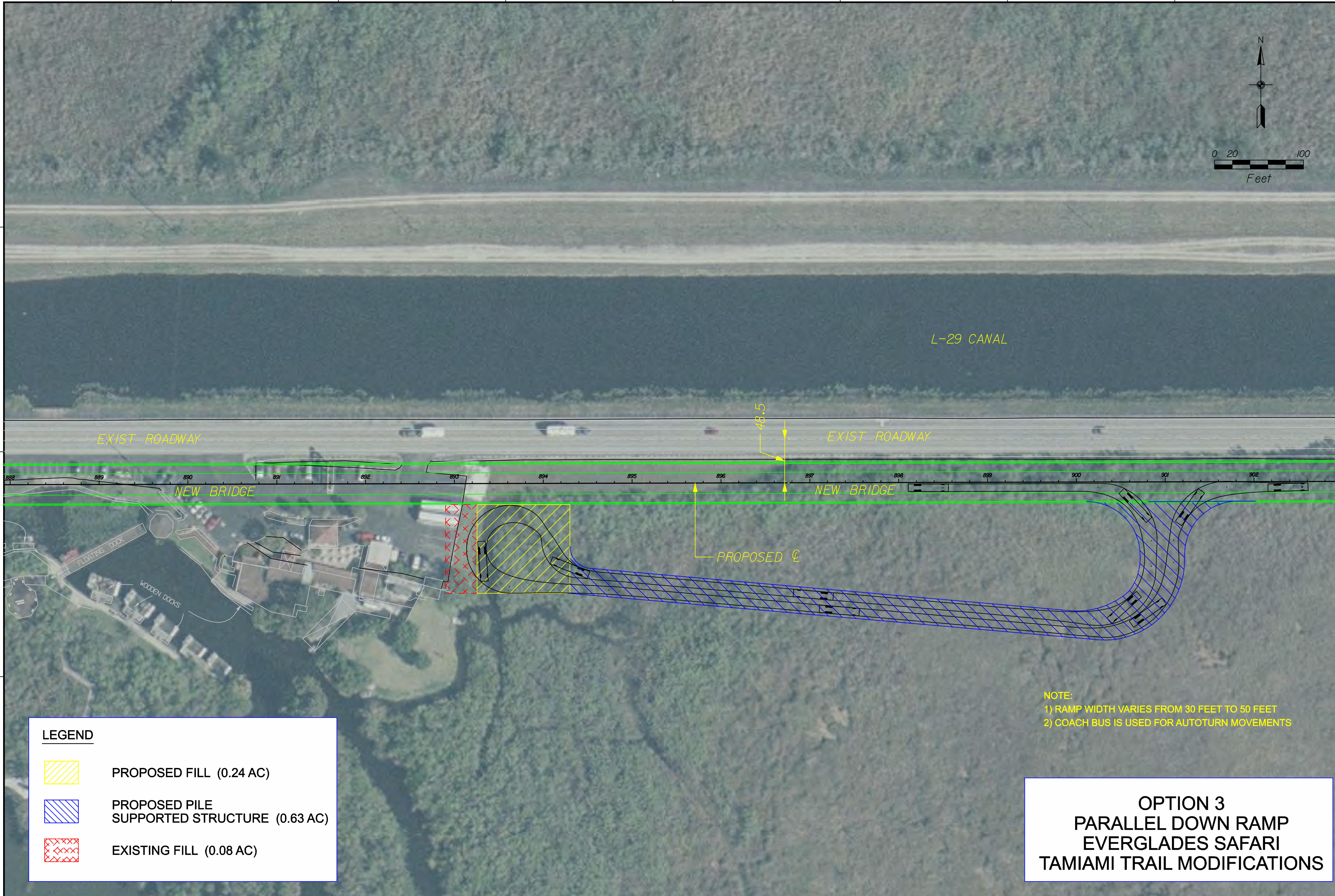


OPTION 3
PARALLEL DOWN RAMP
EVERGLADES SAFARI
TAMIAMI TRAIL MODIFICATIONS

US Army Corps of Engineers
JACKSONVILLE DISTRICT
SAFETY ON THIS JOB DEPENDS ON YOU

DESCRIPTION | NO. | SYMBOL | ZONE

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

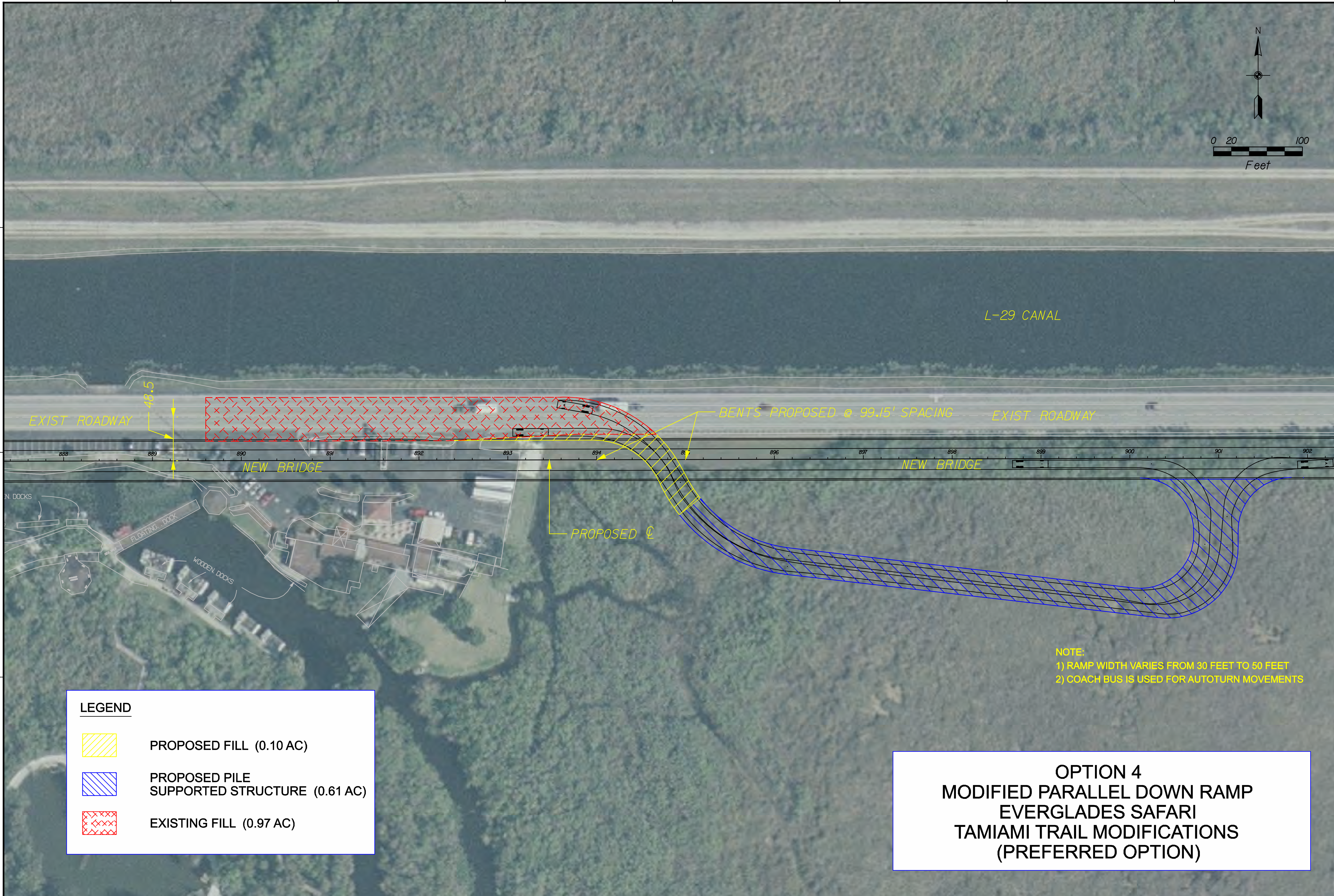
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DESIGNED BY: AJS
CKD BY: PTH
DWN BY: AJS
INV. NO.
DATED: FEBRUARY 2010
D.O. FILE NO.
DATED:
REFERENCE FILES:
FILE NAME:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90

SCALE:
PLATE NO.
DR-E3



OPTION 4
MODIFIED PARALLEL DOWN RAMP
EVERGLADES SAFARI
TAMIAMI TRAIL MODIFICATIONS
(PREFERRED OPTION)

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: AJS
Inv. No.
Dated: JANUARY 2010
D.O.FILE NO.
Dated:

REFERENCE FILES:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
DOWN RAMP OPTIONS

Scale: AS SHOWN
PLATE NO.
DR-E4

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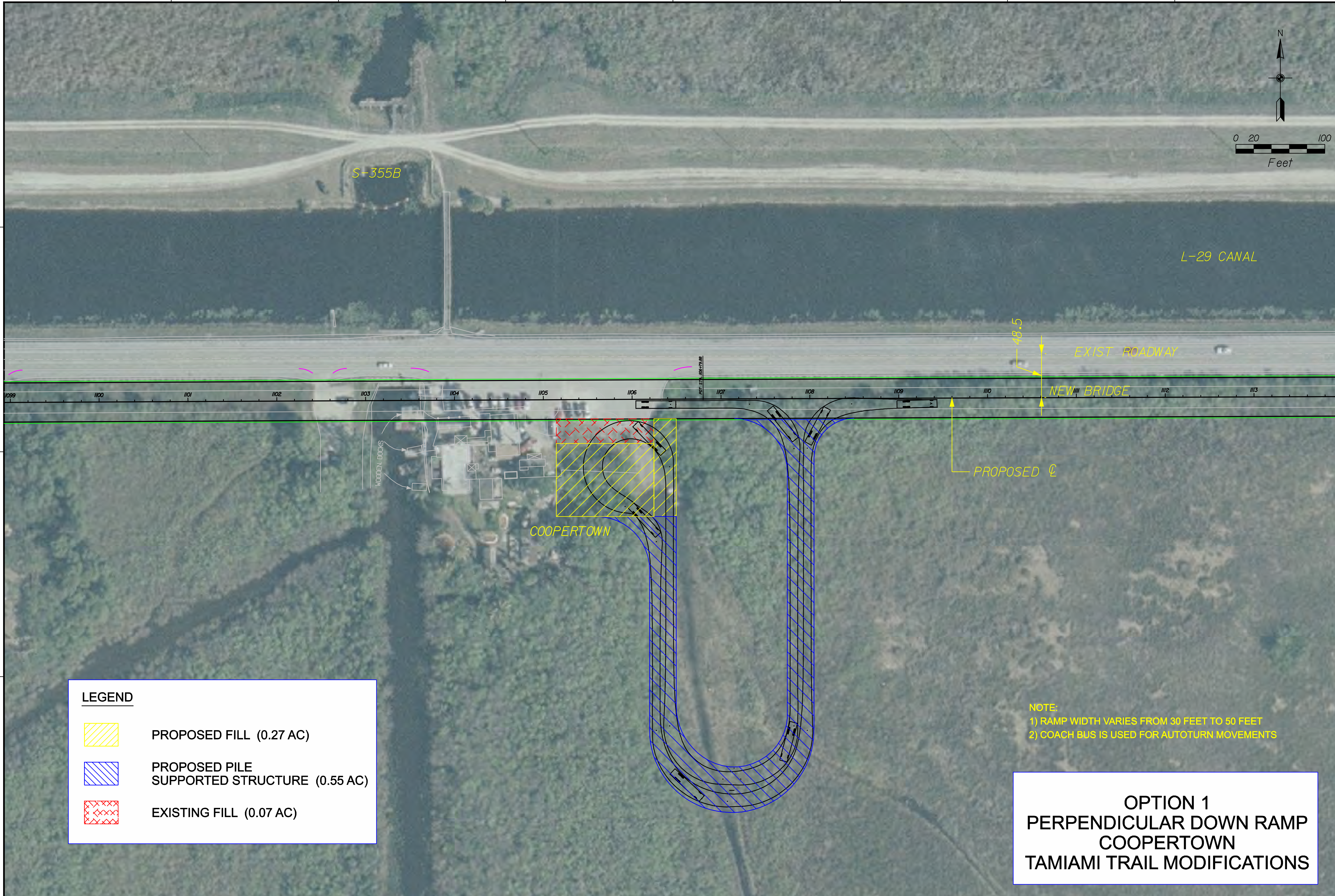

LEGEND

PROPOSED FILL (0.27 AC)

PROPOSED PILE SUPPORTED STRUCTURE (0.55 AC)

EXISTING FILL (0.07 AC)

NOTE:
1) RAMP WIDTH VARIES FROM 30 FEET TO 50 FEET
2) COACH BUS IS USED FOR AUTOTURN MOVEMENTS

OPTION 1
PERPENDICULAR DOWN RAMP
COOPERTOWN
TAMIAMI TRAIL MODIFICATIONS

US Army Corps of Engineers
JACKSONVILLE DISTRICT
SAFETY ON THIS JOB DEPENDS ON YOU

DESCRIPTION
NO. SYMBOL ZONE

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DESIGNED BY: AJS
CKD BY: PTH
DWN BY: AJS
INV. NO.
DATED: FEBRUARY 2010
D.O. FILE NO.
DATED:
REFERENCE FILES:
FILE NAME:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90

SCALE:
PLATE NO.
DR-C1

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LEGEND

PROPOSED FILL (0.28 AC)

PROPOSED PILE SUPPORTED STRUCTURE (1.23 AC)

EXISTING FILL (0.27 AC)

NOTE:
1) RAMP WIDTHS ARE 15 FEET
2) COACH BUS IS USED FOR AUTOTURN MOVEMENTS

OPTION 2
DIAMOND INTERCHANGE
COOPERTOWN
TAMIAMI TRAIL MODIFICATIONS

US Army Corps of Engineers®
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

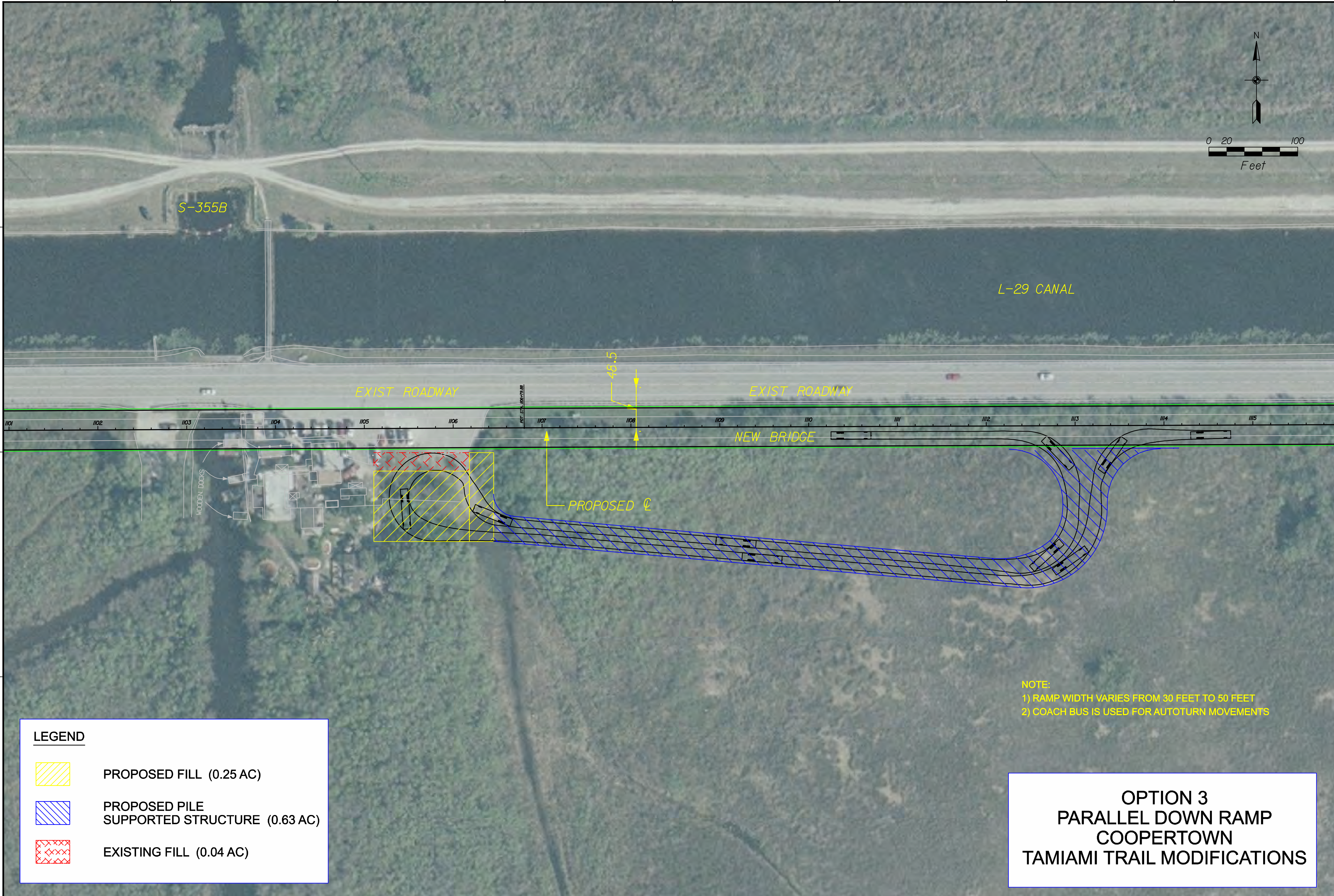
Designed by: AJS
Ckd by: PTH
Dwn by: AJS
Inv. No.
Dated: JANUARY 2010
D.O.FILE NO.
Dated:

REFERENCE FILES:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
DOWN RAMP OPTIONS

Scale: AS SHOWN
PLATE NO.
DR-C2



LEGEND

- PROPOSED FILL (0.25 AC)
- PROPOSED PILE SUPPORTED STRUCTURE (0.63 AC)
- EXISTING FILL (0.04 AC)

NOTE:
1) RAMP WIDTH VARIES FROM 30 FEET TO 50 FEET
2) COACH BUS IS USED FOR AUTOTURN MOVEMENTS

OPTION 3
PARALLEL DOWN RAMP
COOPERTOWN
TAMIAMI TRAIL MODIFICATIONS

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

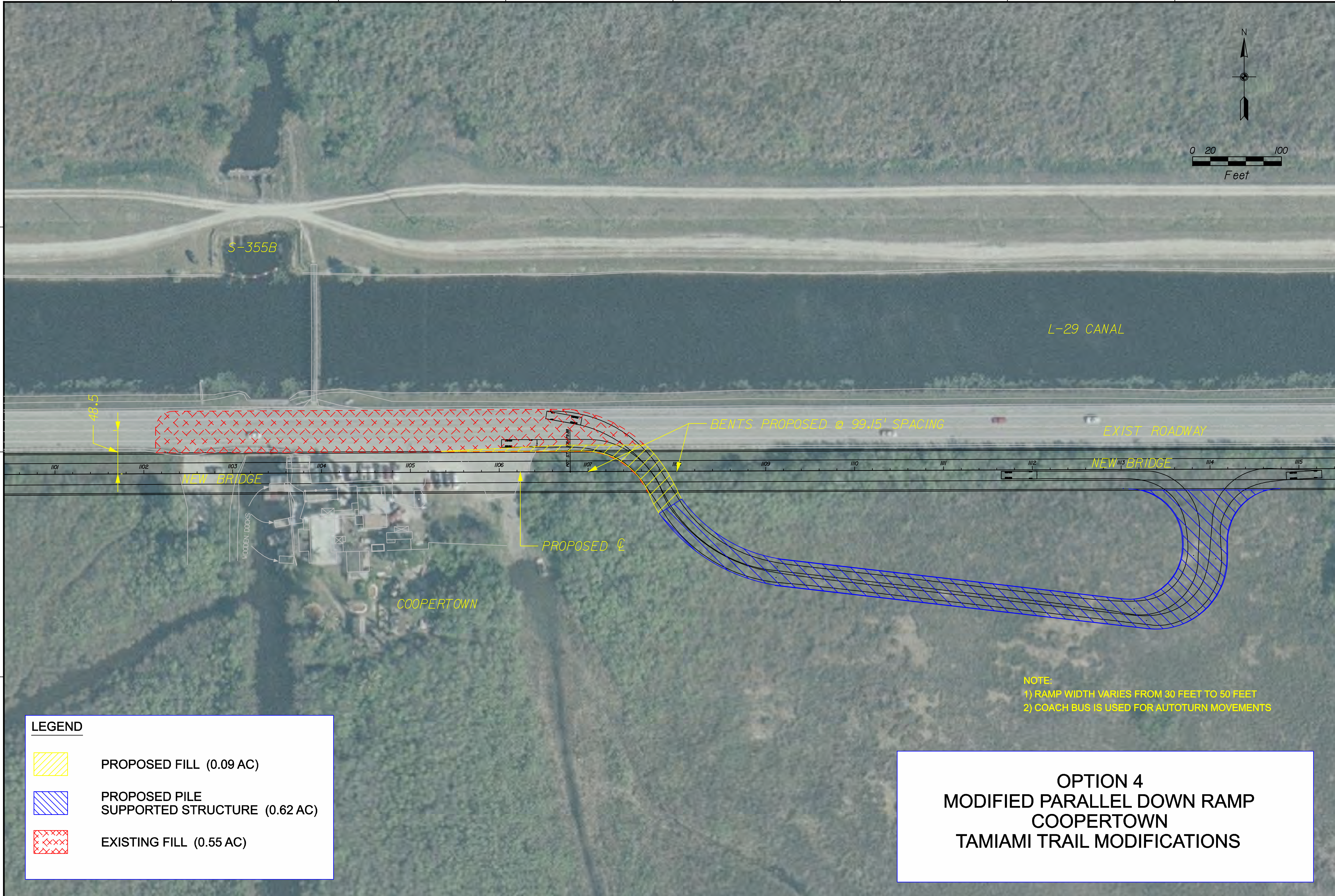
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Dwn by: AJS
Ckd by: PTH
Inv. No.
Dated: JANUARY 2010
D.O.FILE NO.
Dated:
REFERENCE FILES:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
DOWN RAMP OPTIONS

Scale: AS SHOWN
PLATE NO.
DR-C3



US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

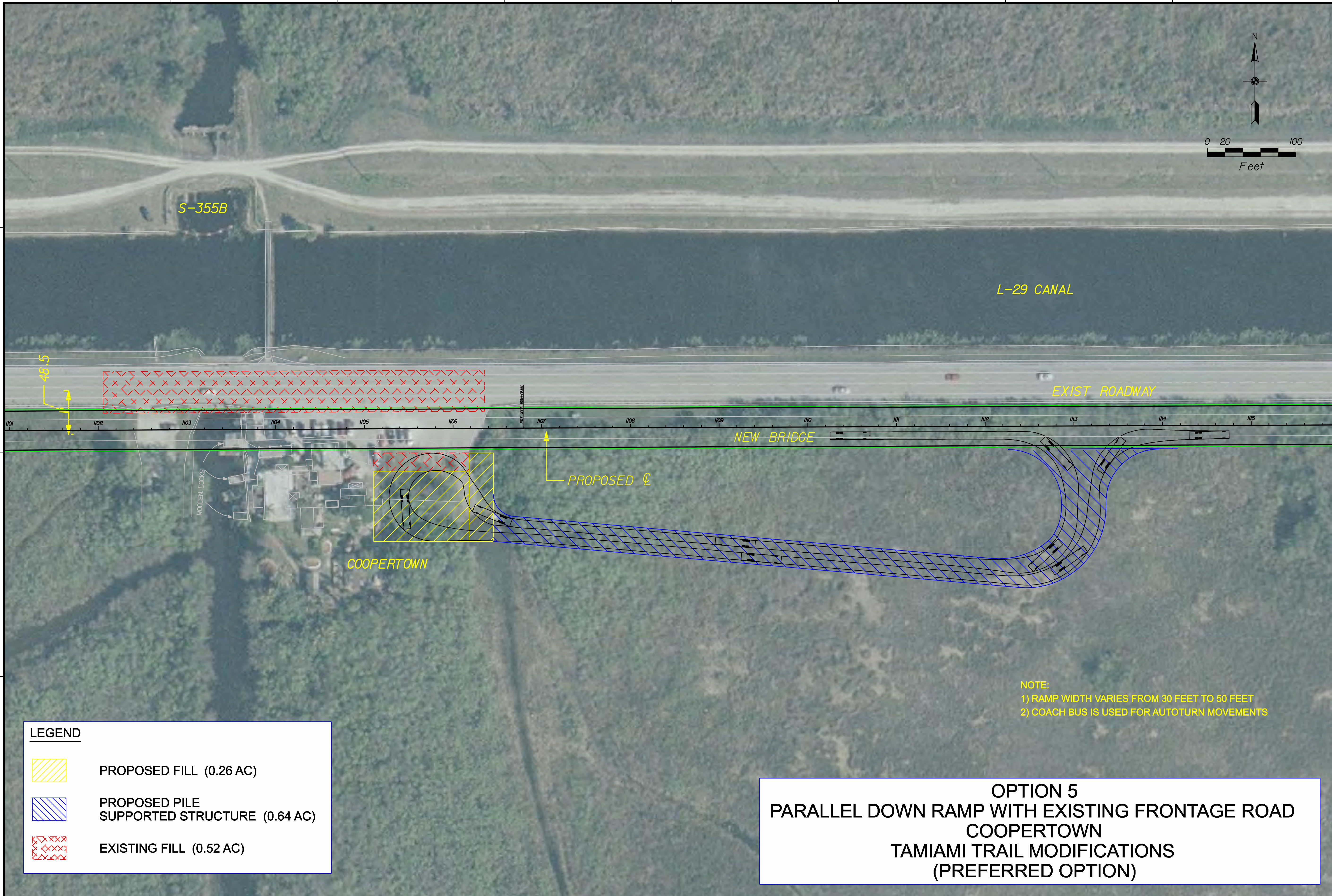
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

HNTB

Designed by: AJS
Dwn by: AJS
Ckd by: PTH
Dated: JANUARY 2010

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
DOWN RAMP OPTIONS

Scale: AS SHOWN
PLATE NO.
DR-C4



OPTION 5
PARALLEL DOWN RAMP WITH EXISTING FRONTAGE ROAD
COOPERTOWN
TAMIAMI TRAIL MODIFICATIONS
(PREFERRED OPTION)

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

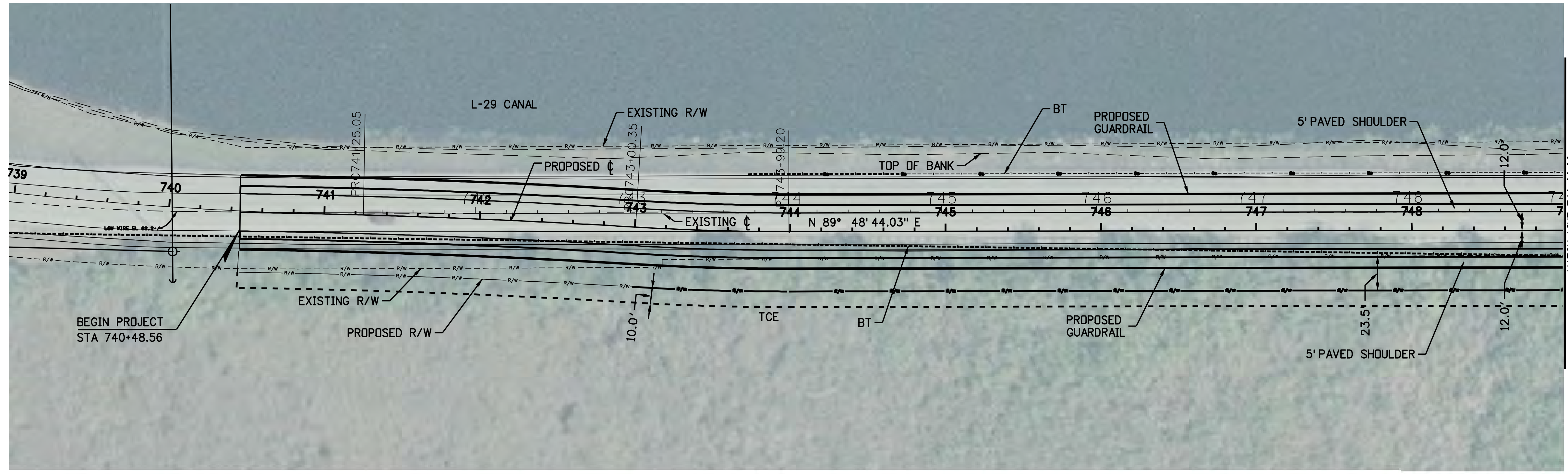
Designed by: AJS
Ckd by: PTH
Dwn by: AJS
Inv. No.
Dated: JANUARY 2010
D.O.FILE NO.
Dated:

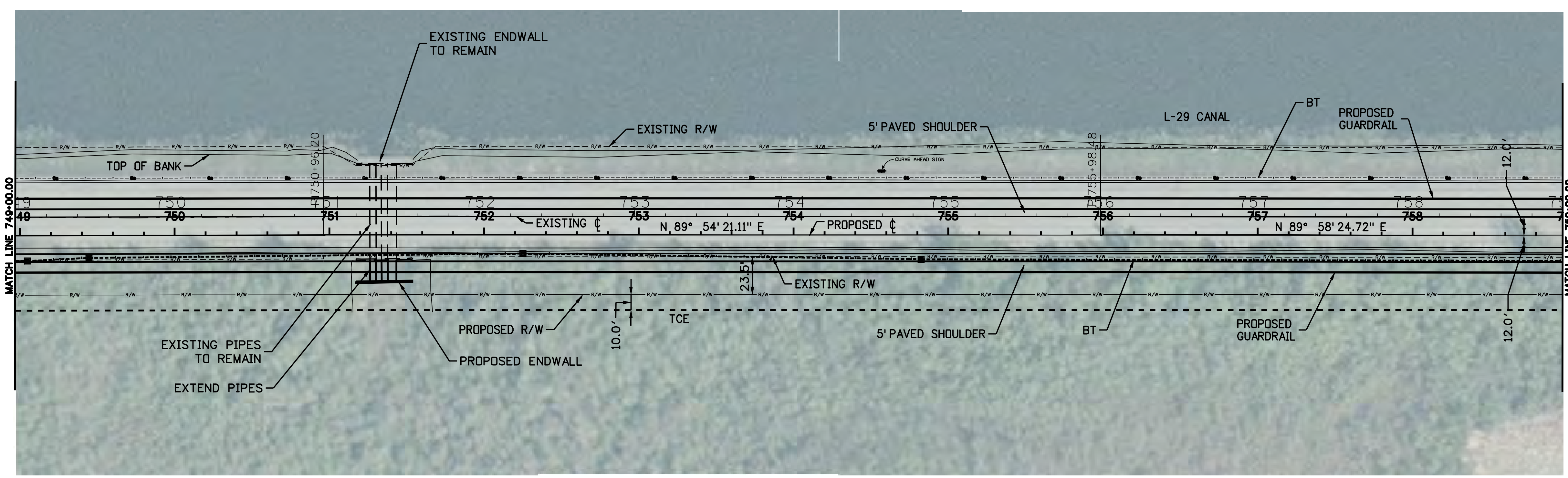
REFERENCE FILES:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
DOWN RAMP OPTIONS

Scale: AS SHOWN
PLATE NO.
DR-C5





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No. | Symbol | Zone | Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

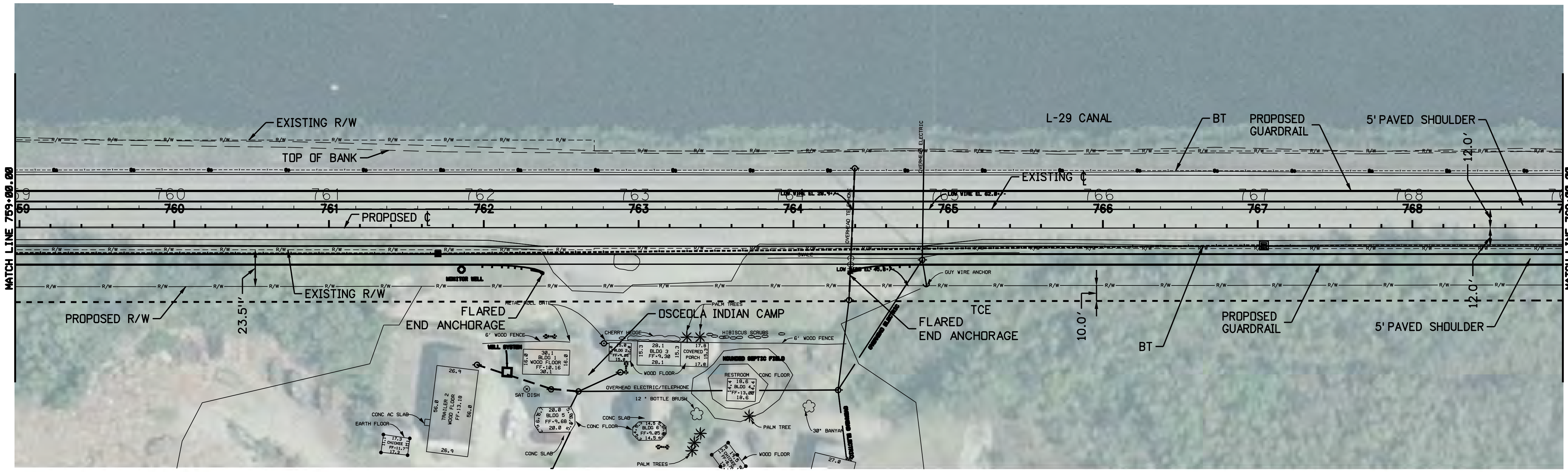
ROADWAY PLAN
STA 749+00 TO STA 759+00

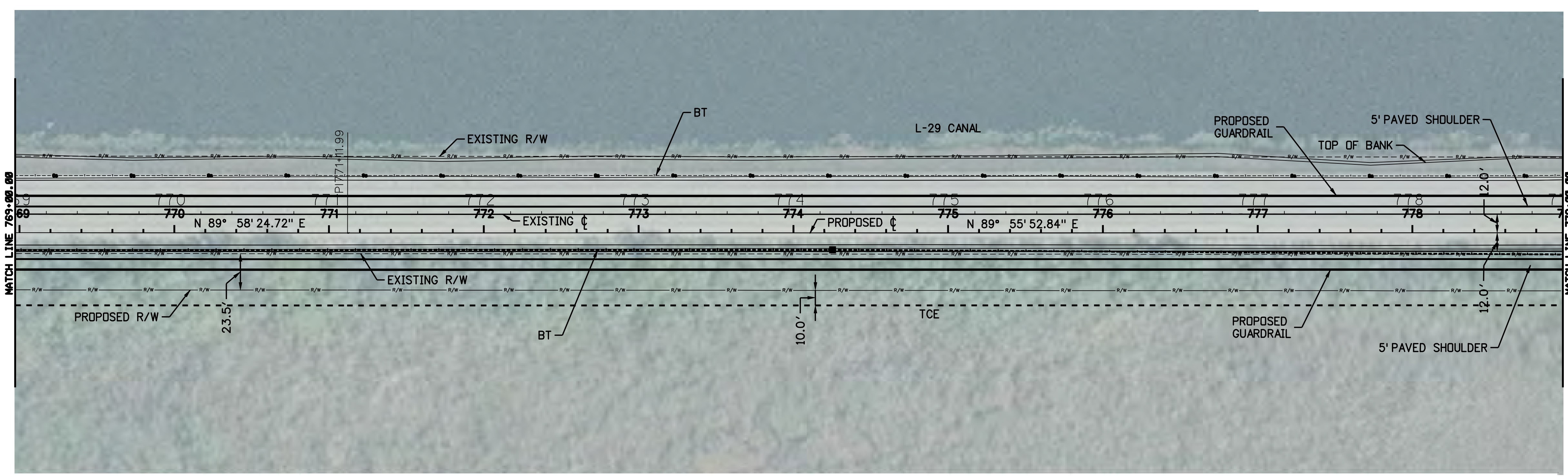
Scale: AS SHOWN

PLATE NO.

P-1

17-FEB-2010 15:03 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD01.dgn





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

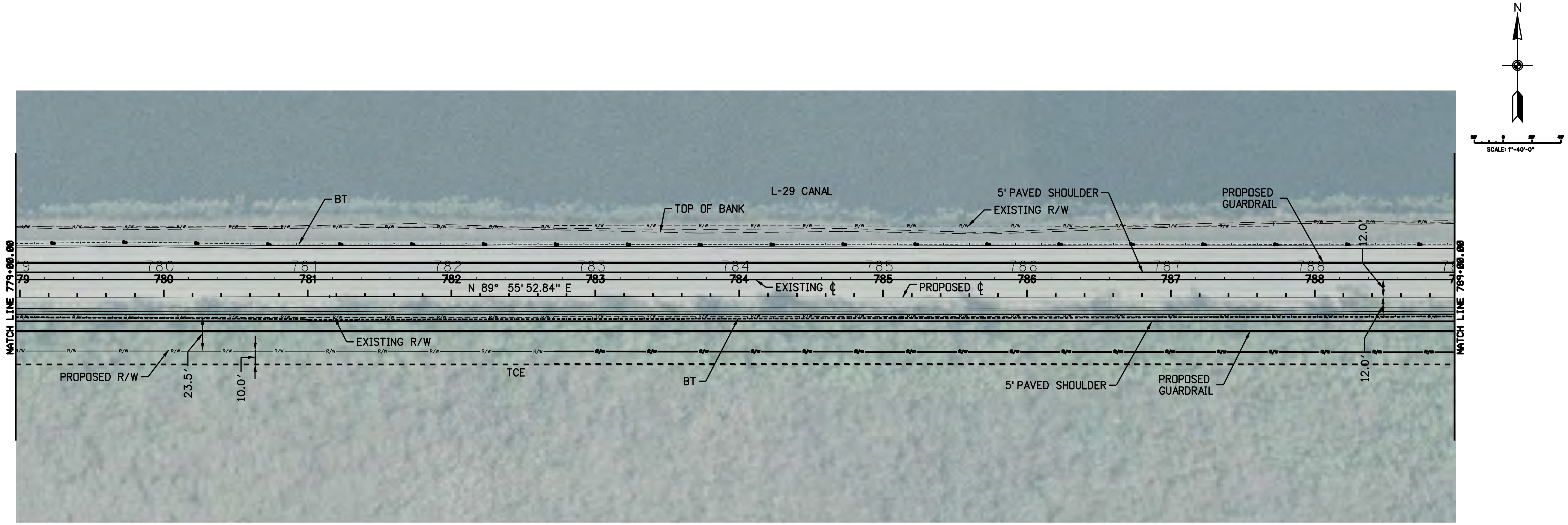
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

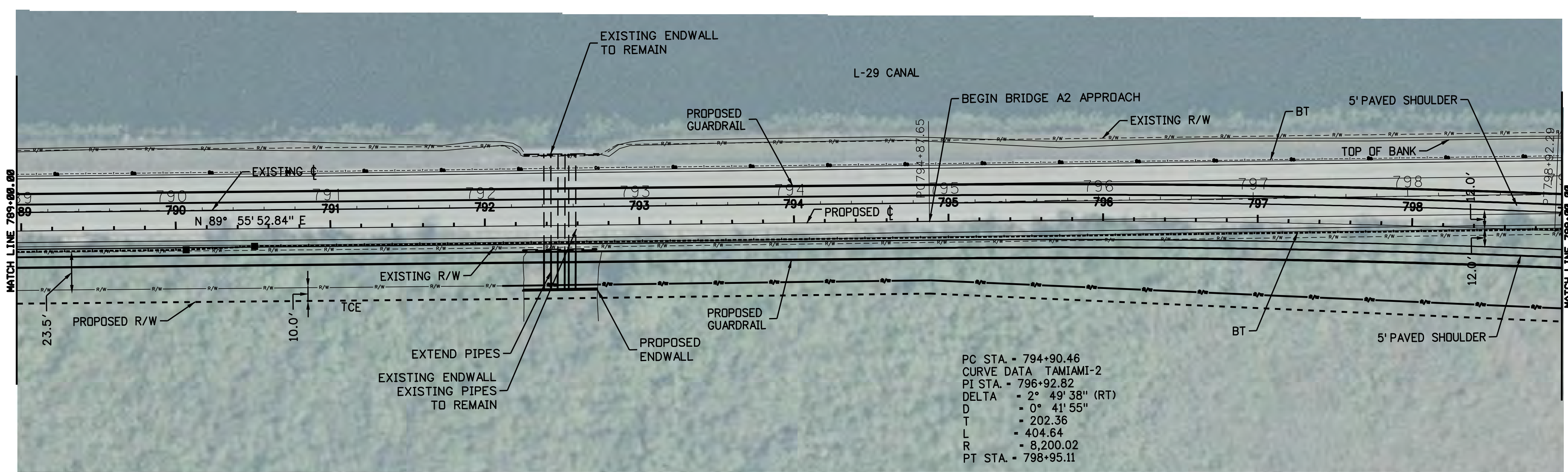
ROADWAY PLAN
STA 759+00 TO STA 779+00

Scale: AS SHOWN

PLATE NO.
P-2

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU





No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

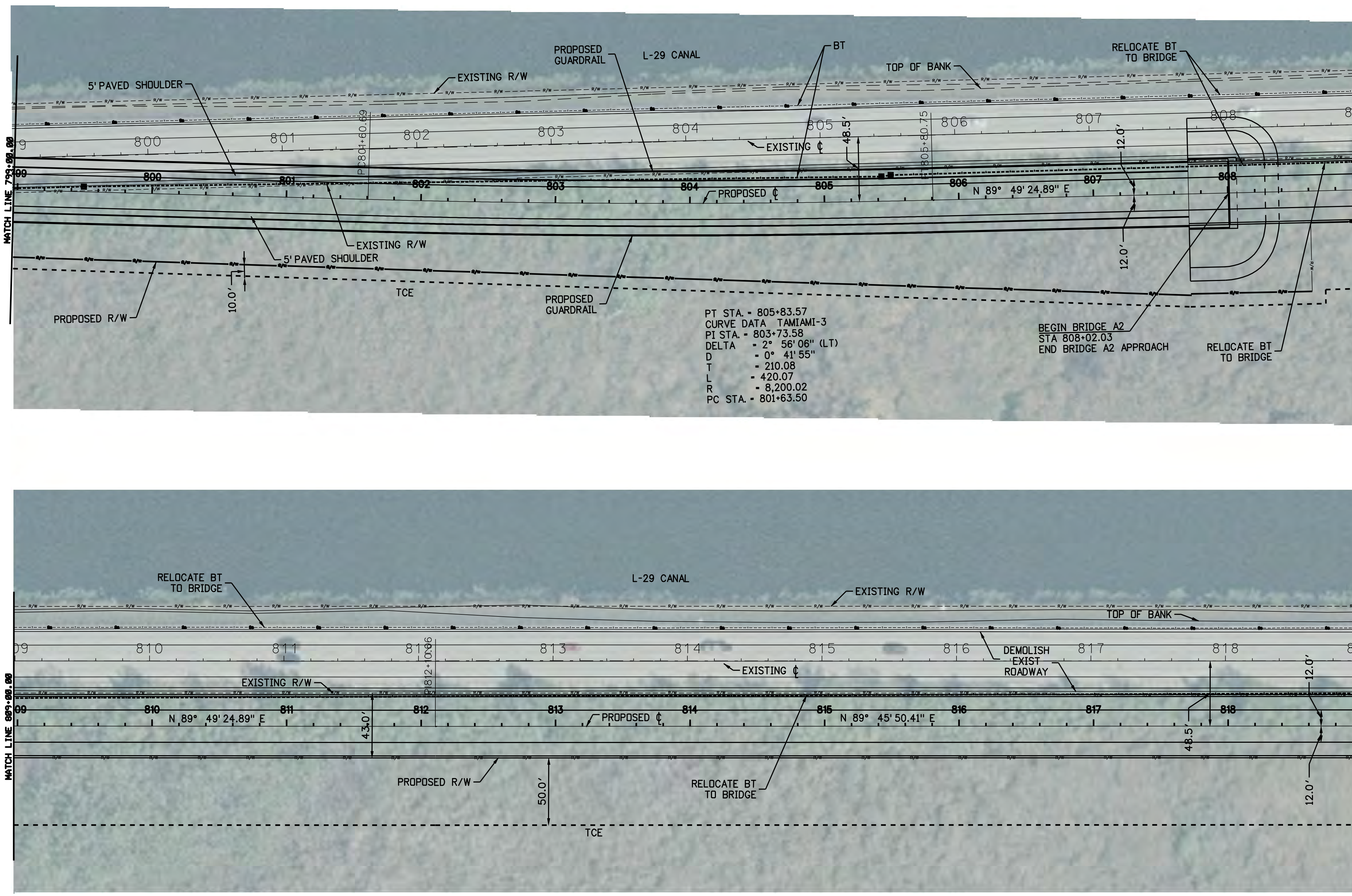
Designed by: AJS
Ckd by: PTH
Dwn by: ----
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 779+00 TO 799+00

Scale: AS SHOWN
PLATE NO.
P-3

17-FEB-2010 15:04 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD03.dgn



US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

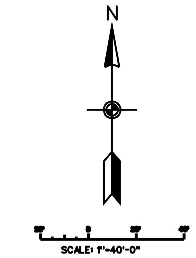
HNTB

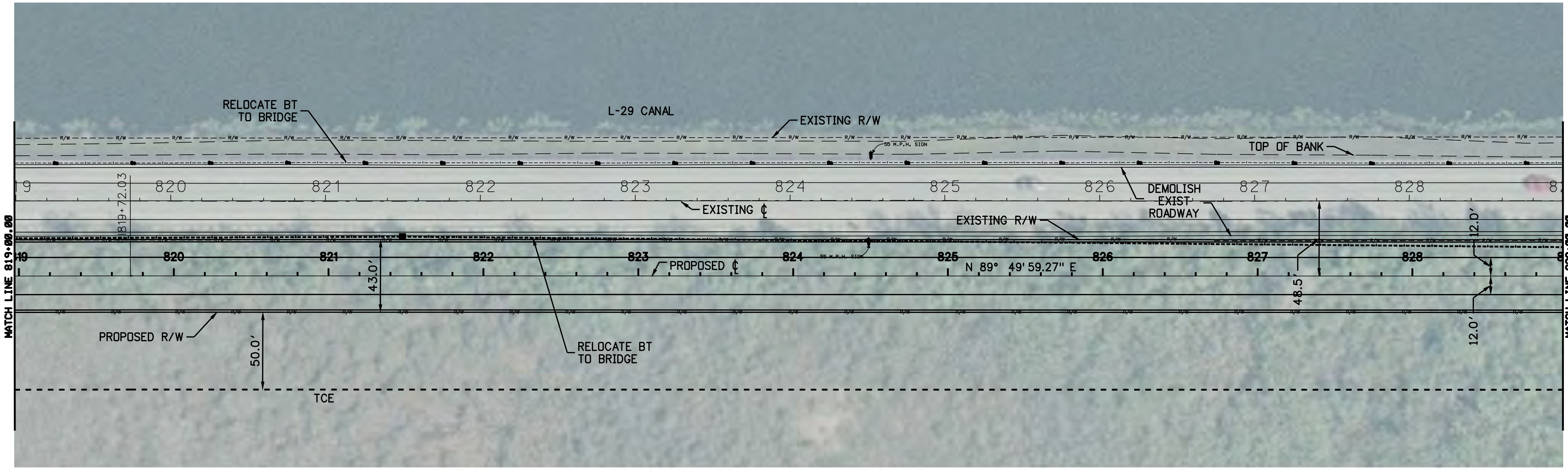
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

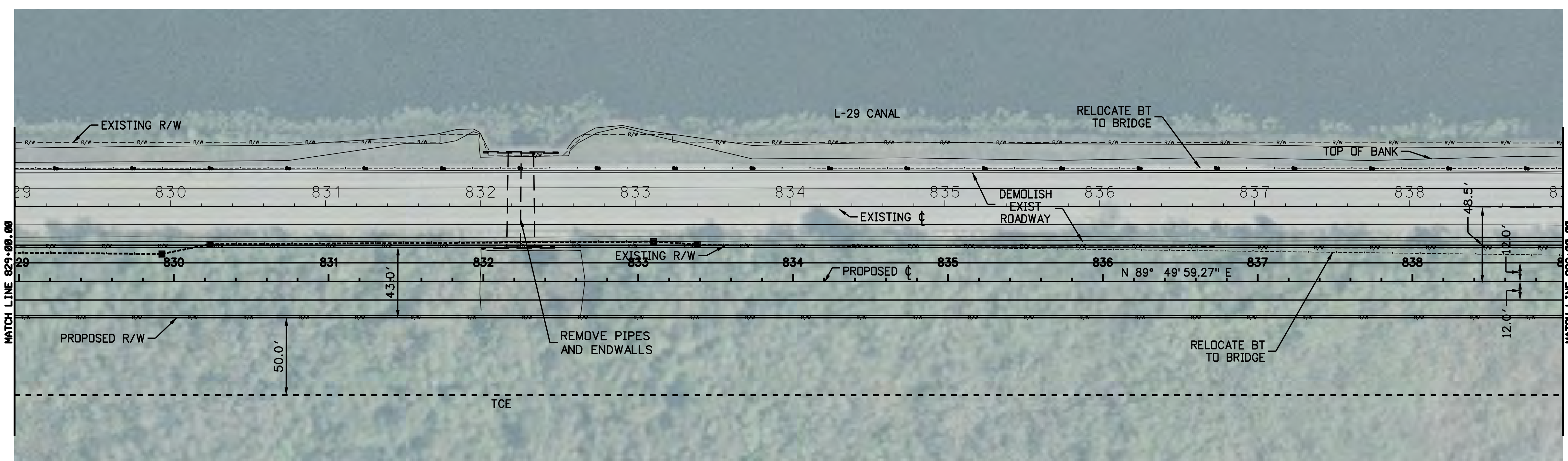
Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:
Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 799+00 TO 819+00

Scale: AS SHOWN
PLATE NO.
P-4







US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

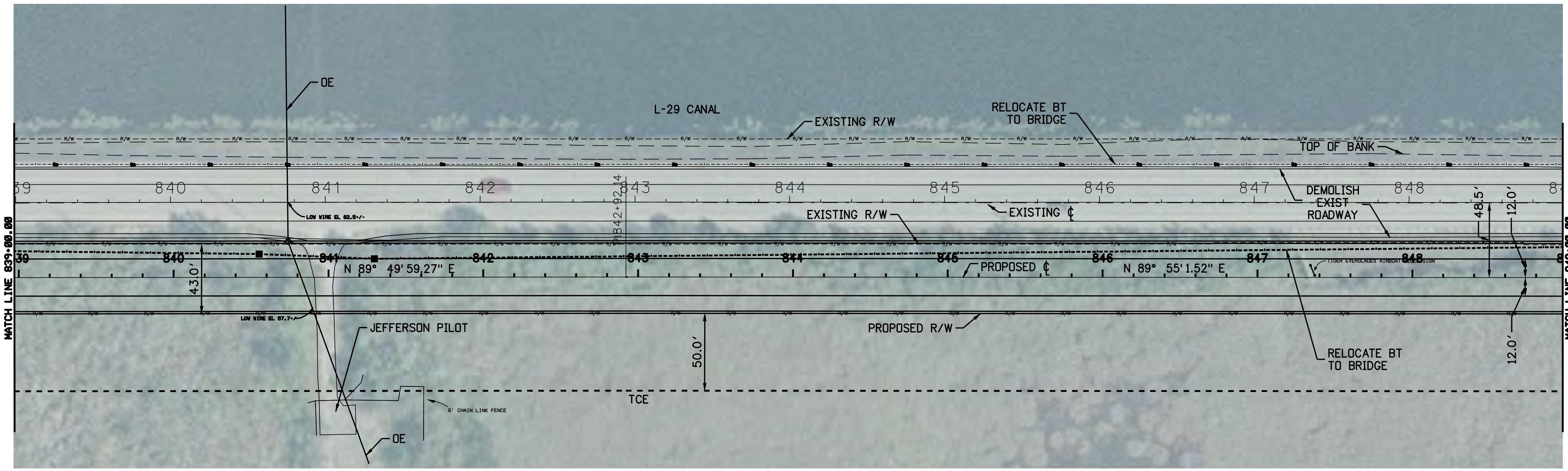
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

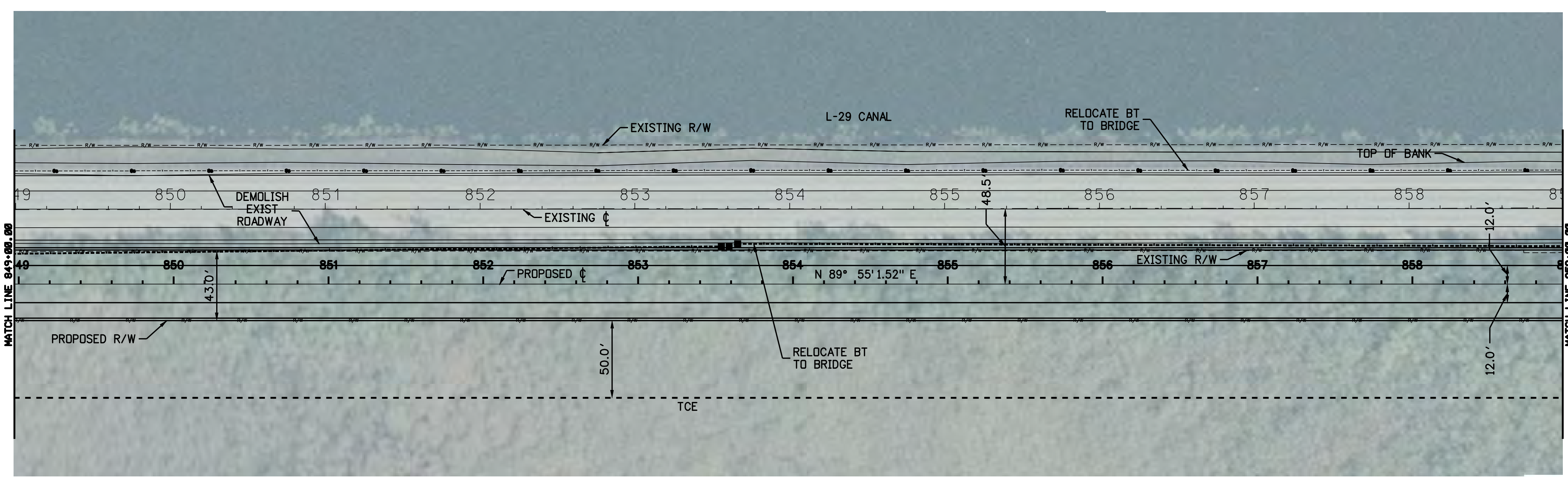
Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 819+00 TO 839+00

Scale: AS SHOWN
PLATE NO.
P-5





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

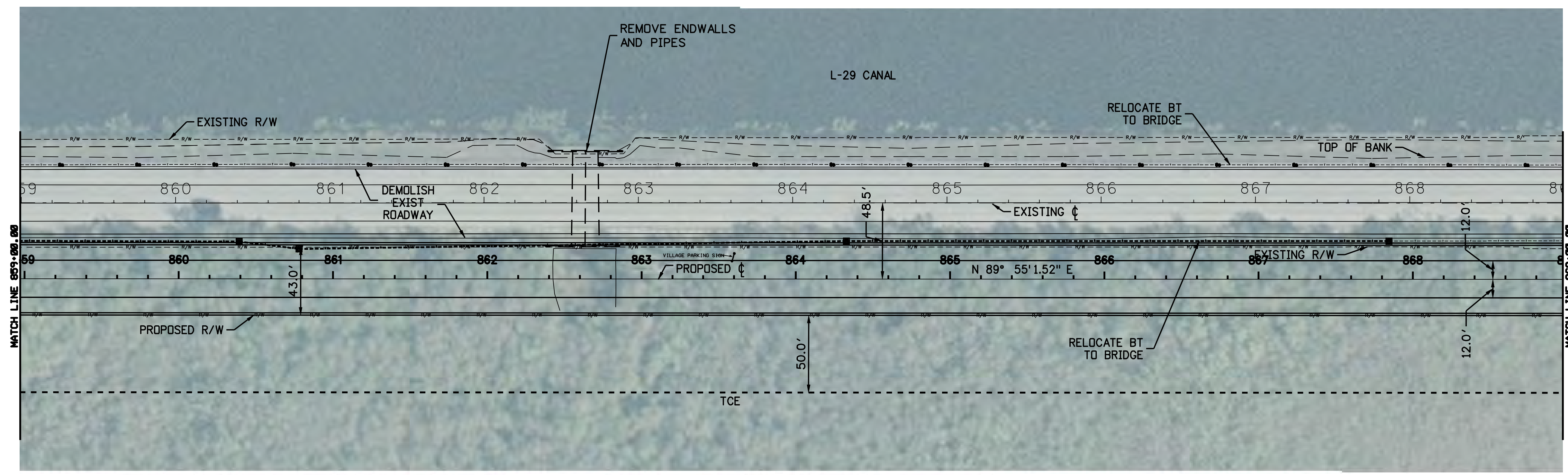
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

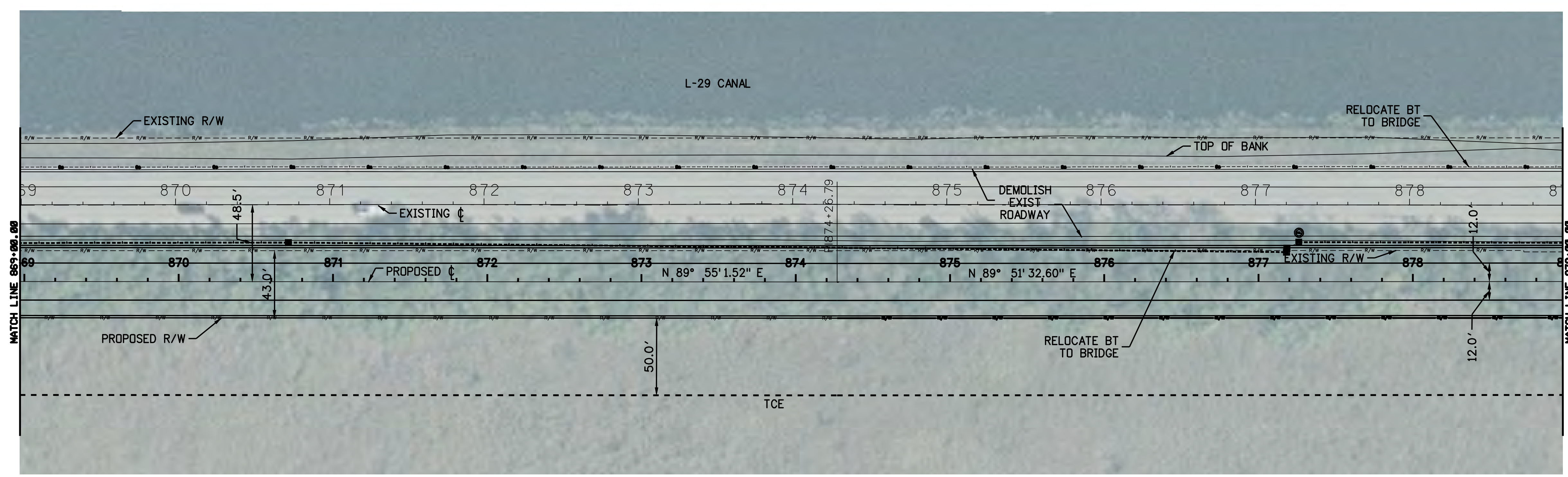
ROADWAY PLAN
STA 839+00 TO 859+00

Scale: AS SHOWN

PLATE NO.

P-6





US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

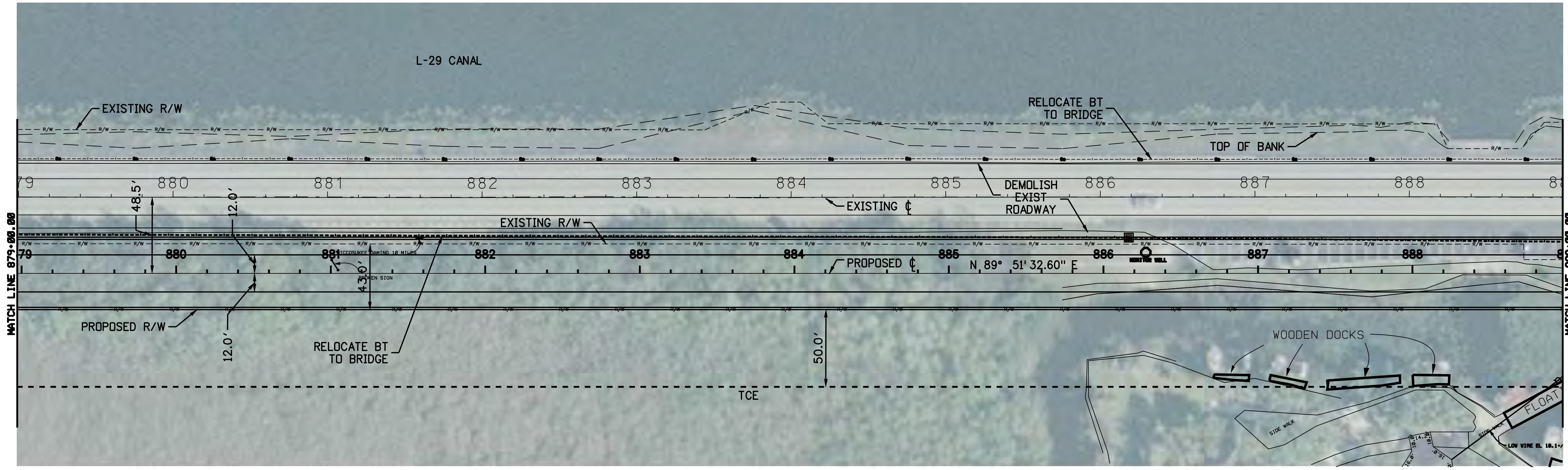
Reference files:
File name:

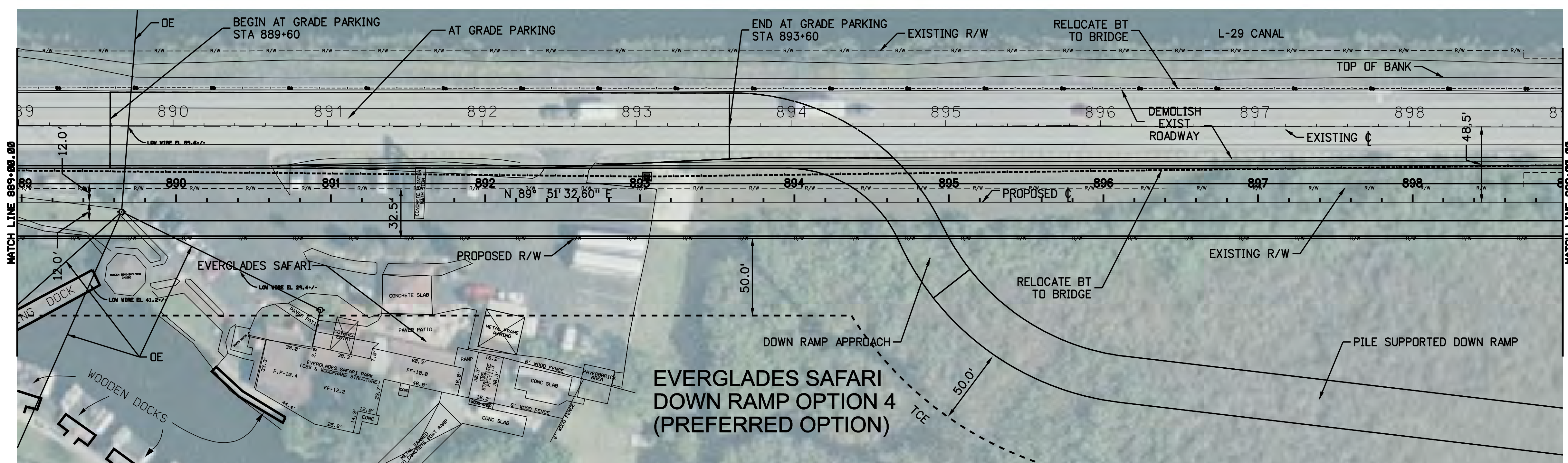
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 859+00 TO 879+00

Scale: AS SHOWN
PLATE NO.
P-7

SCALE: 1"=40'-0"





EVERGLADES SAFARI
DOWN RAMP OPTION 4
(PREFERRED OPTION)

N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

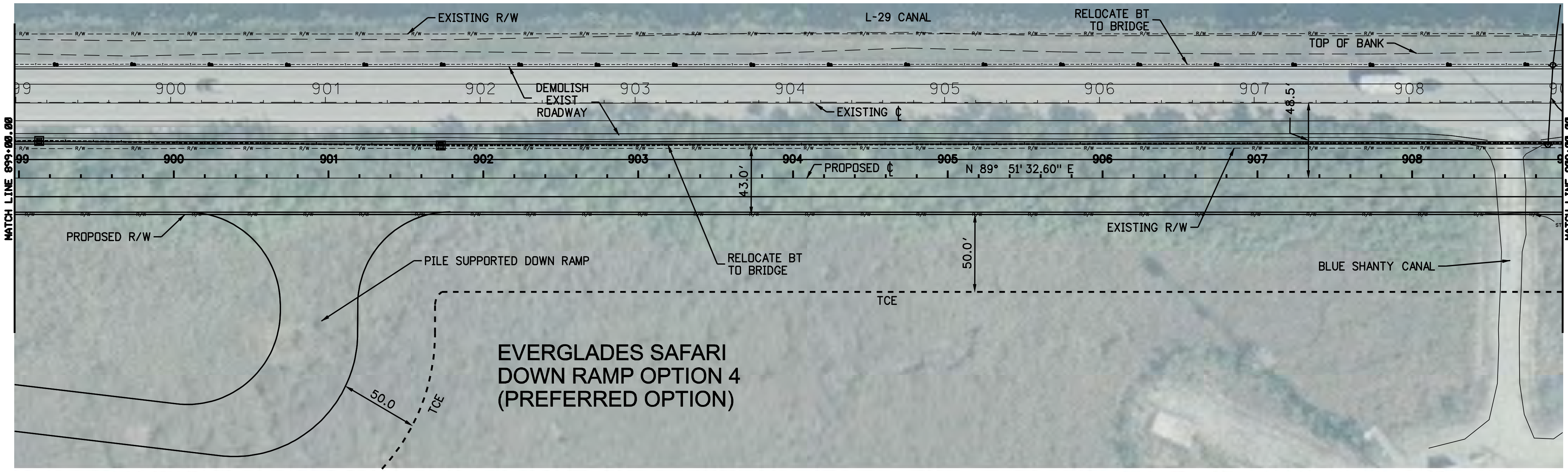
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

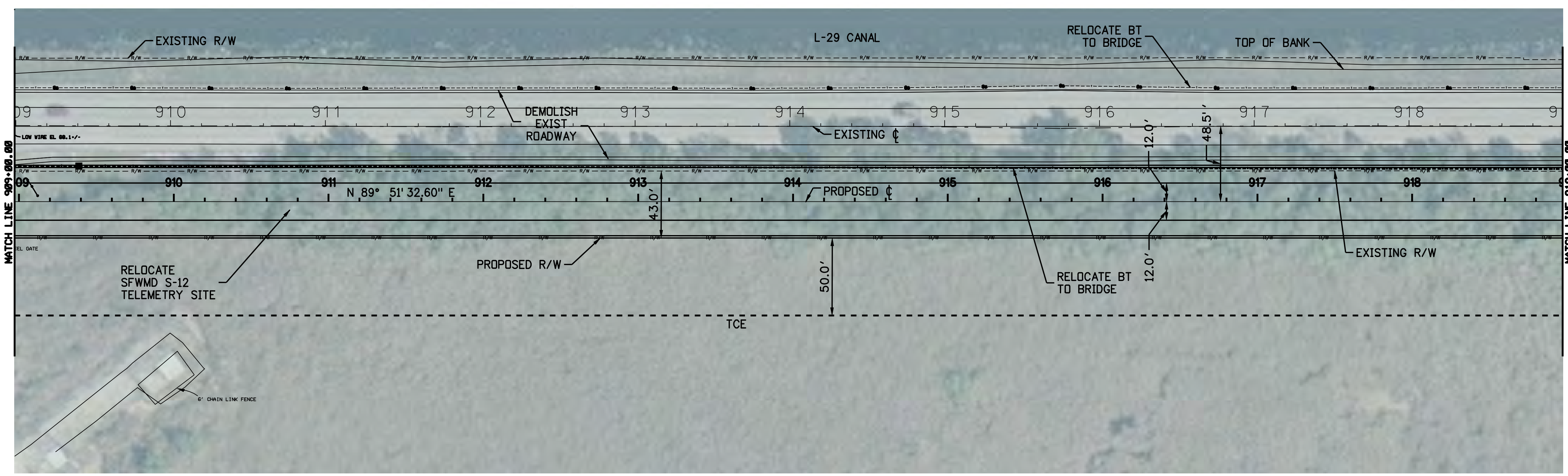
ROADWAY PLAN
STA 879+00 TO 899+00

Scale: AS SHOWN

PLATE NO.

P-8





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by:
Inv. No.
Dated: February 2010

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

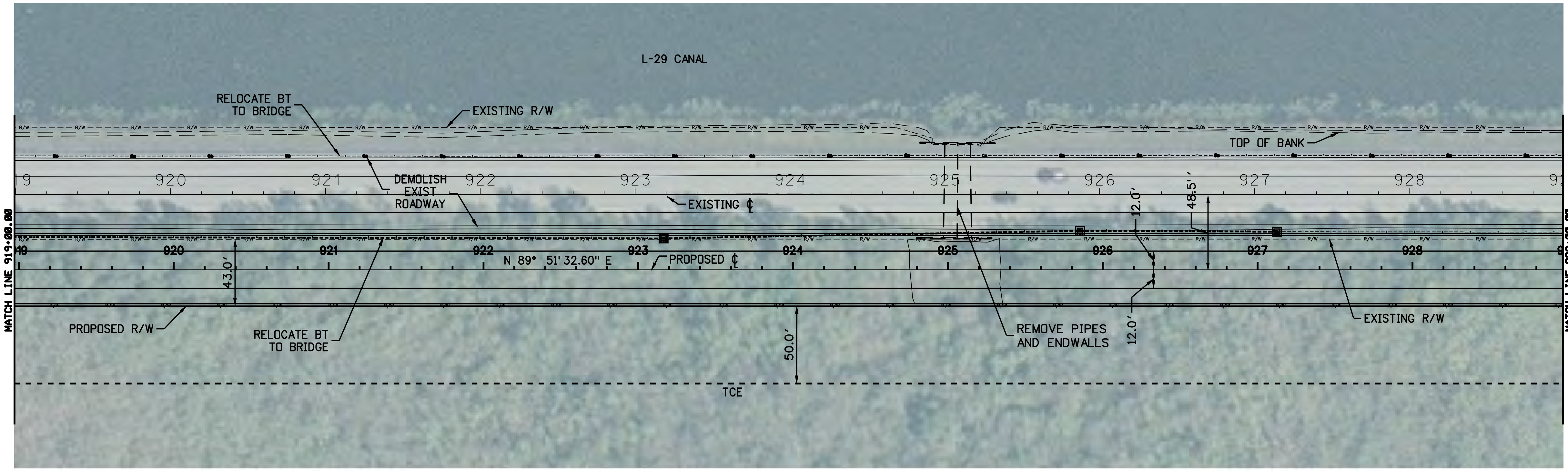
ROADWAY PLAN
STA 899+00 TO 919+00

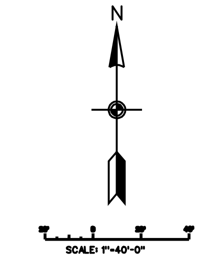
Scale: AS SHOWN

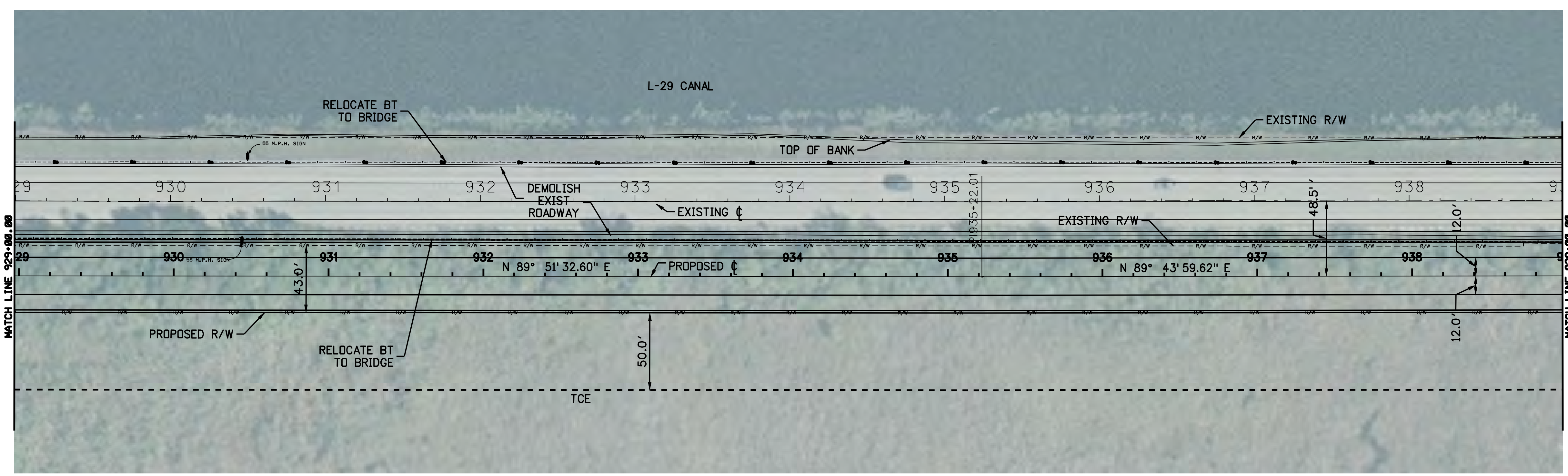
PLATE NO.

P-9

17-FEB-2010 15:07 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD09.dgn







US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 919+00 TO 939+00

Scale: AS SHOWN

PLATE NO.

P-10

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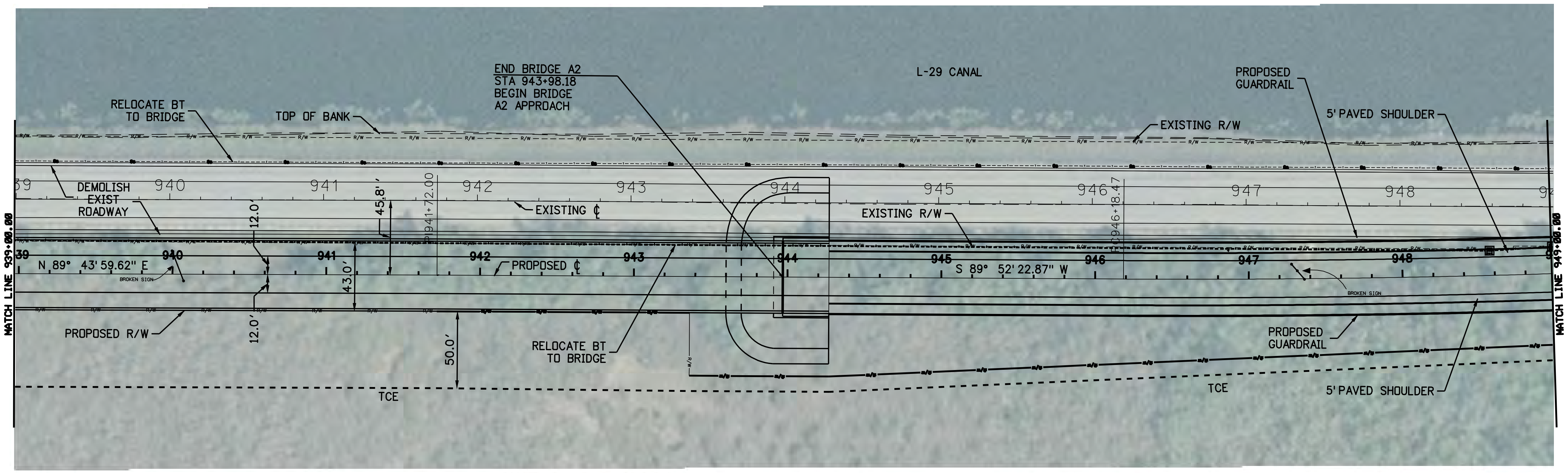
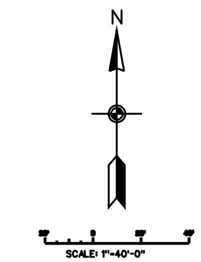
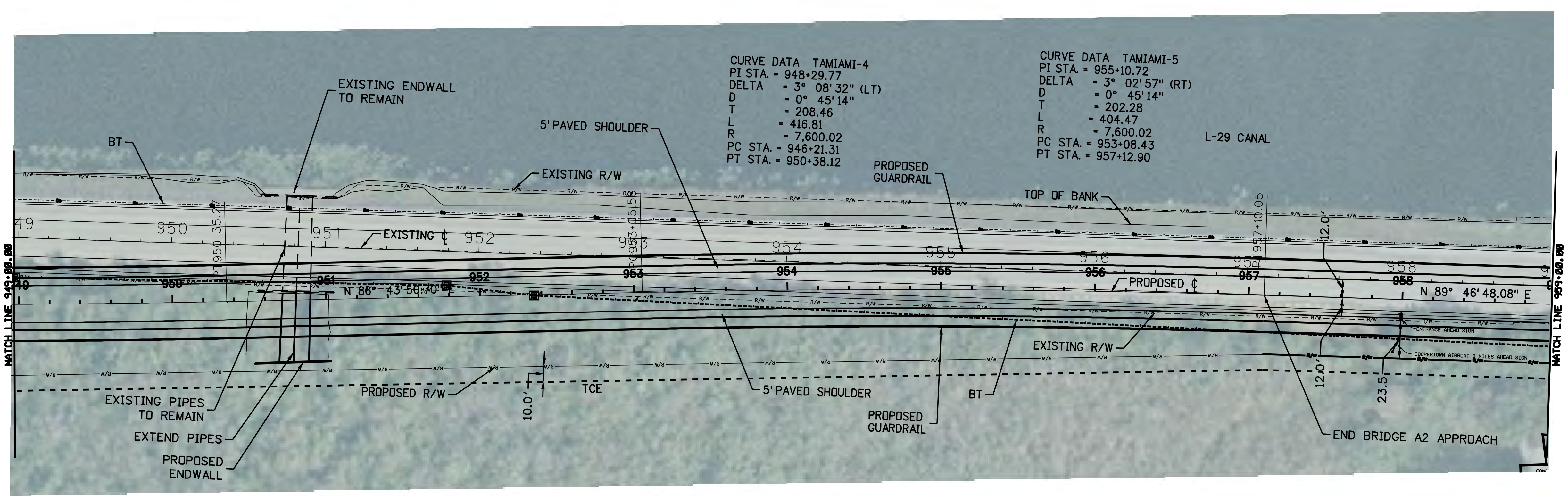






US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

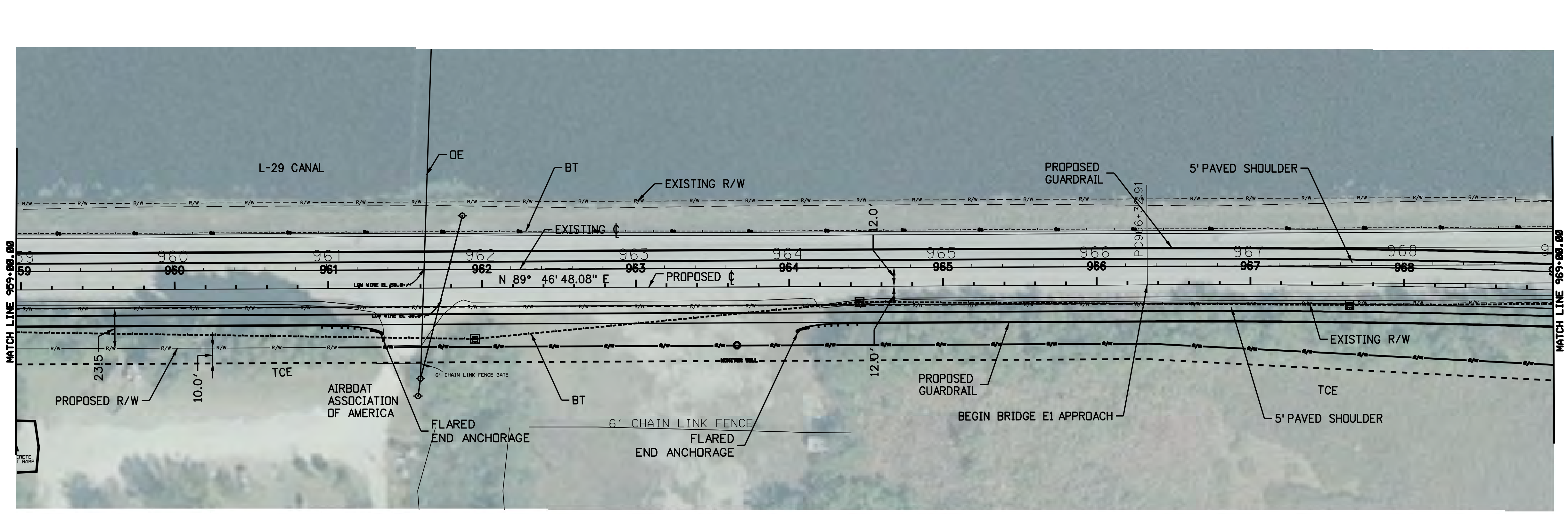
Reference files:
File name:

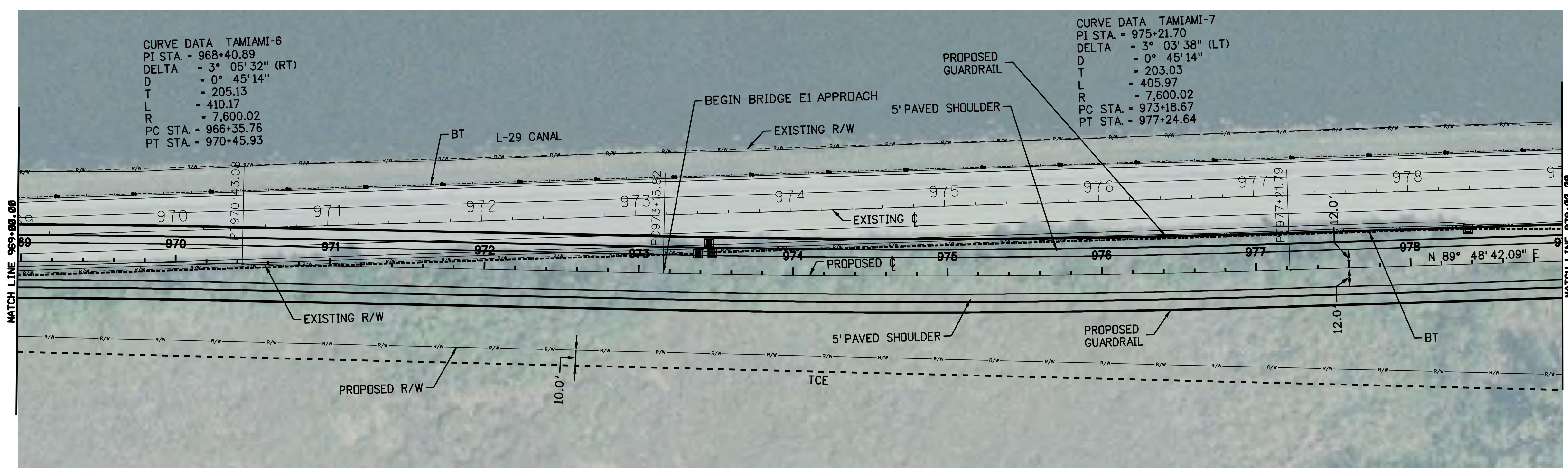
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 939+00 TO 959+00

Scale: AS SHOWN
PLATE NO.
P-11





SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No. | Symbol | Zone | Description

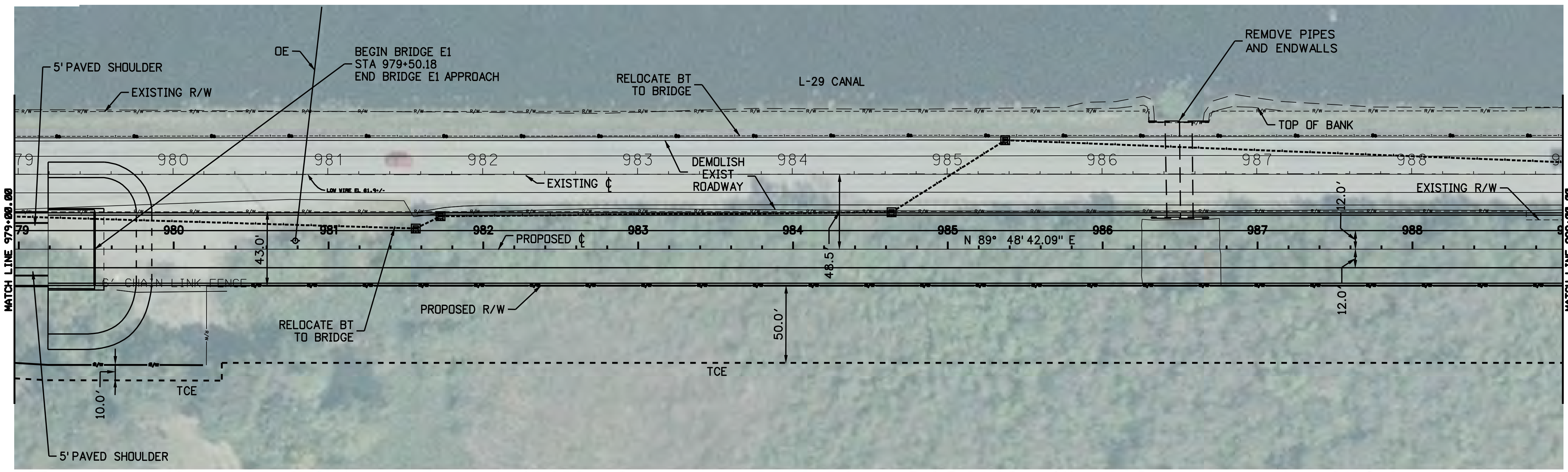
HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

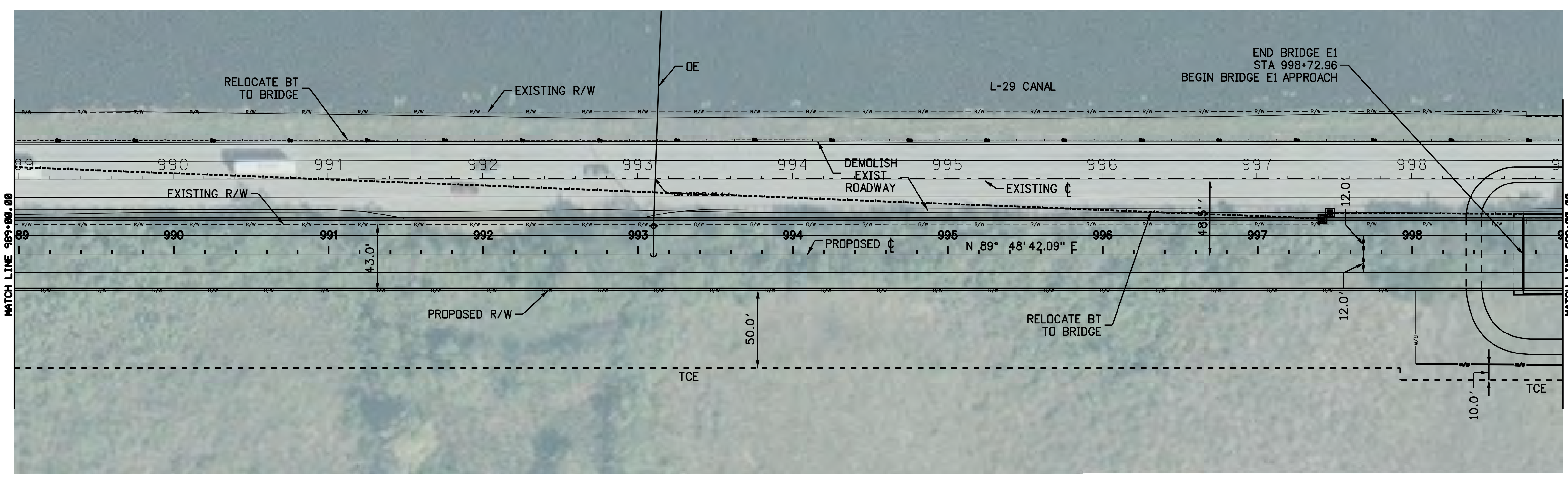
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

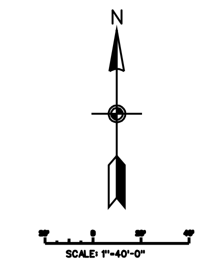
Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
DAFILE NO.
Dated:
Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 959+00 TO 979+00

Scale: AS SHOWN
PLATE NO.
P-12







US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

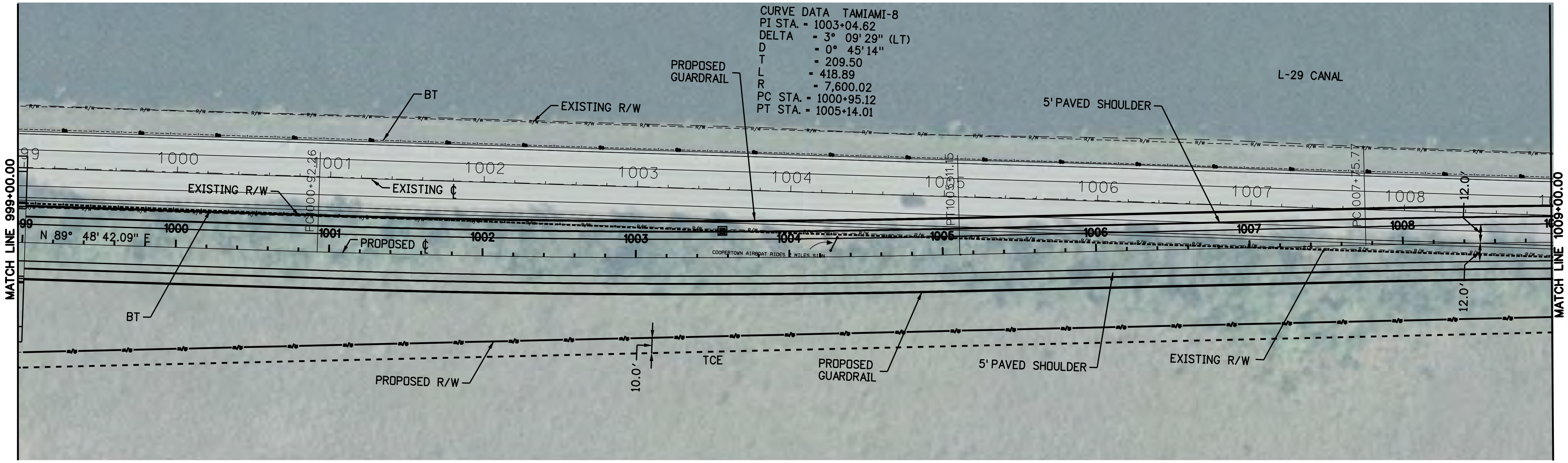
Reference files:
File name:

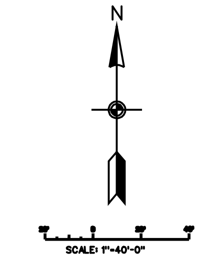
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

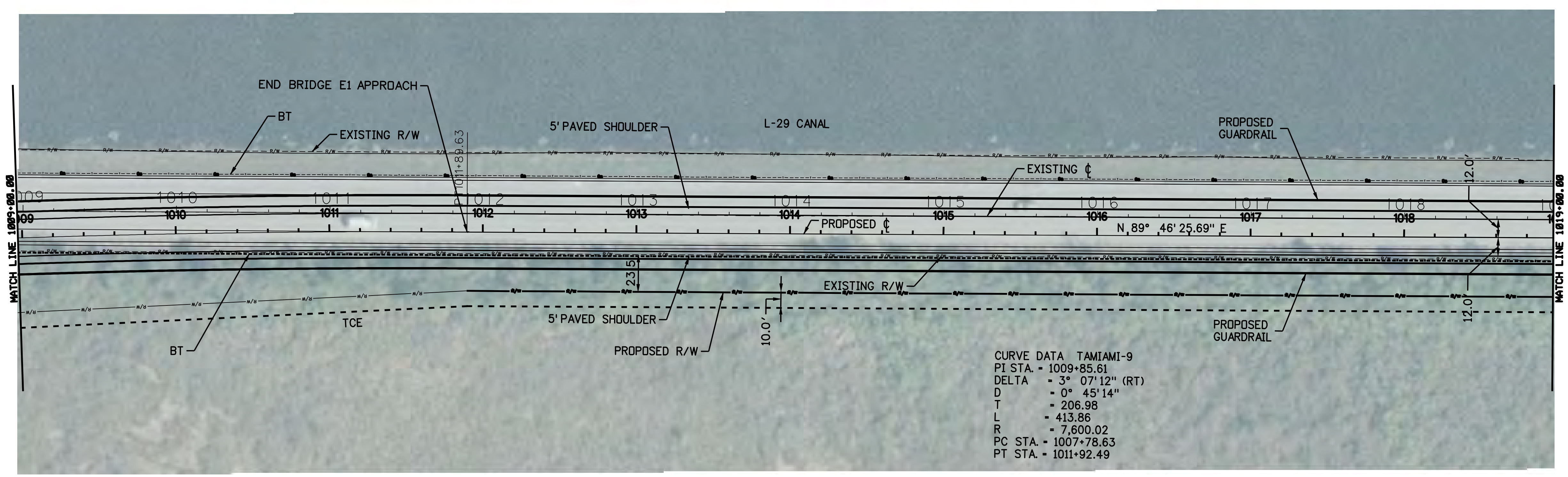
ROADWAY PLAN
STA 979+00 TO 999+00

Scale: AS SHOWN
PLATE NO.
P-13

17-FEB-2010 15:08 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD13.dgn







US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

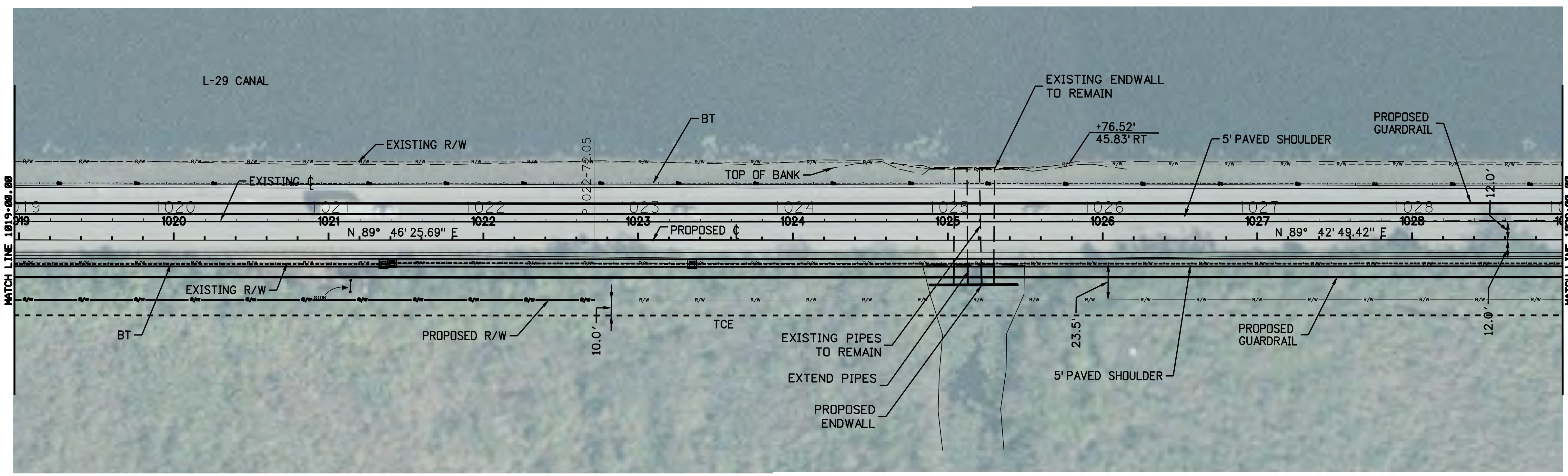
Reference files:
File name:

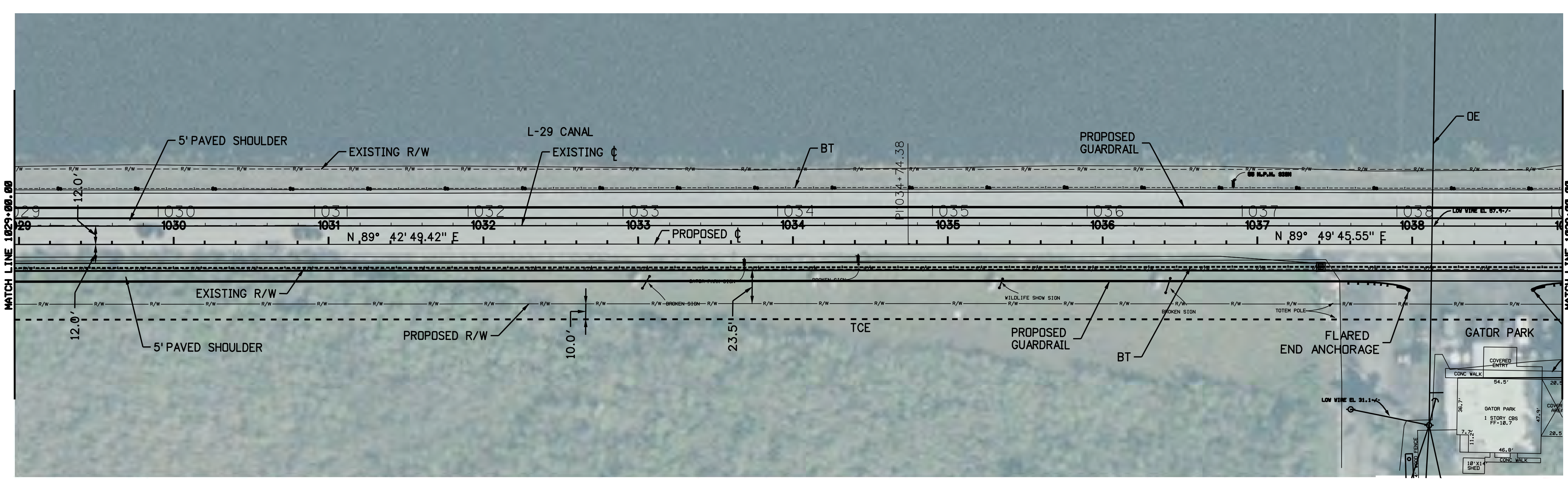
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 999+00 TO 1019+00

Scale: AS SHOWN
PLATE NO.
P-14





N

SCALE: 1"=40'-0"

US Army Corps of Engineers®
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

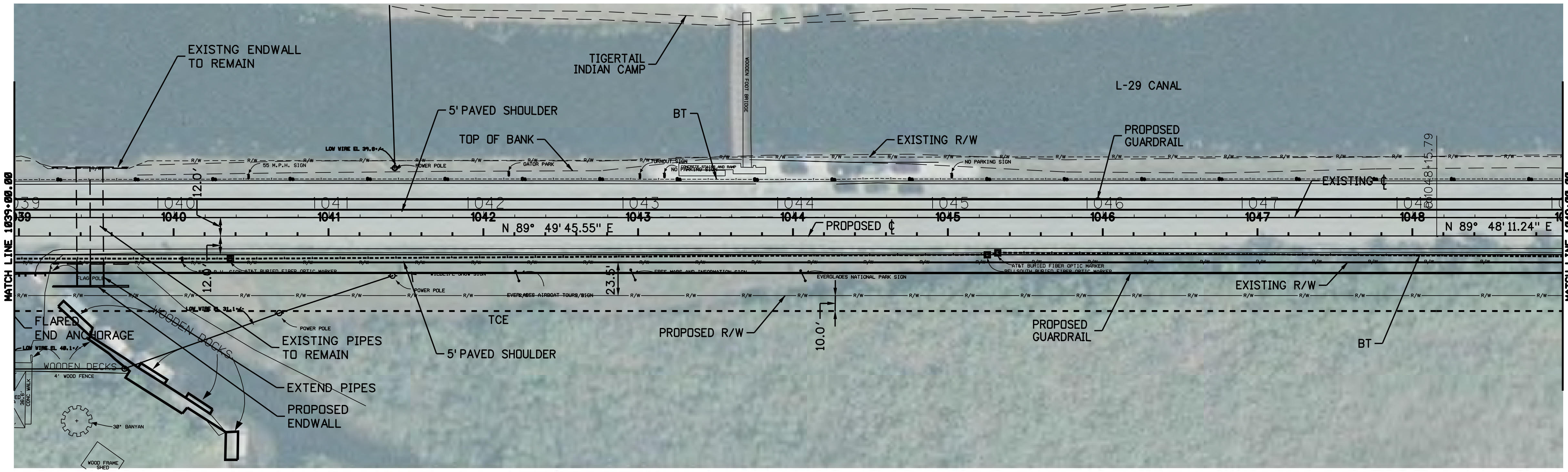
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

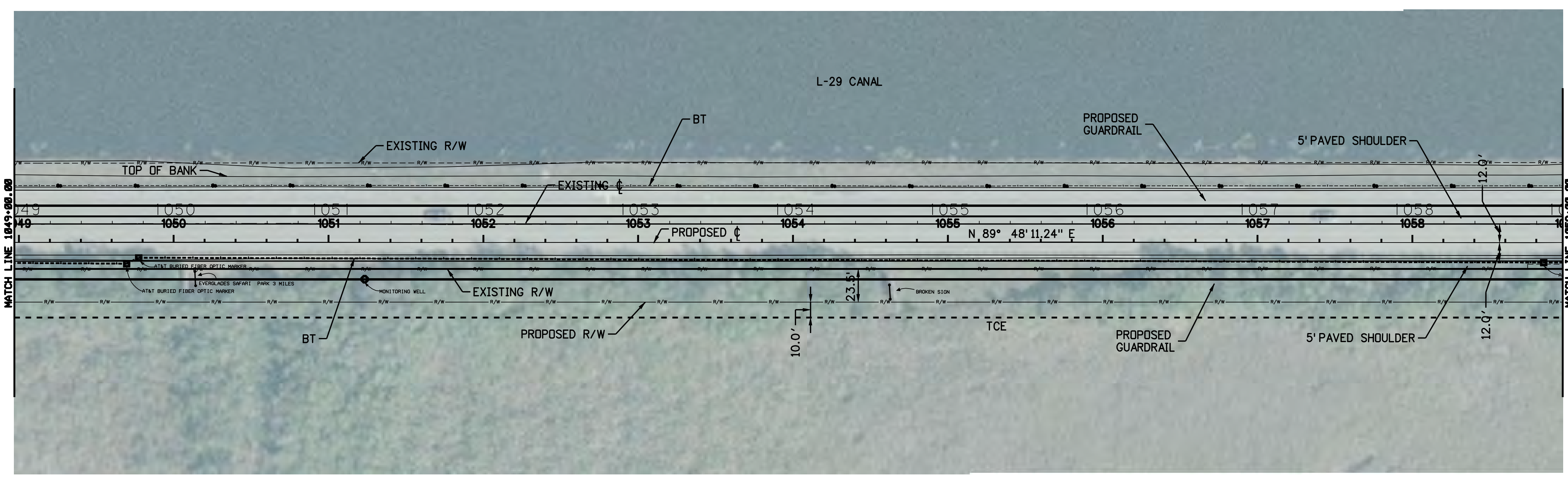
Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1019+00 TO 1039+00

Scale: AS SHOWN
PLATE NO.
P-15





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

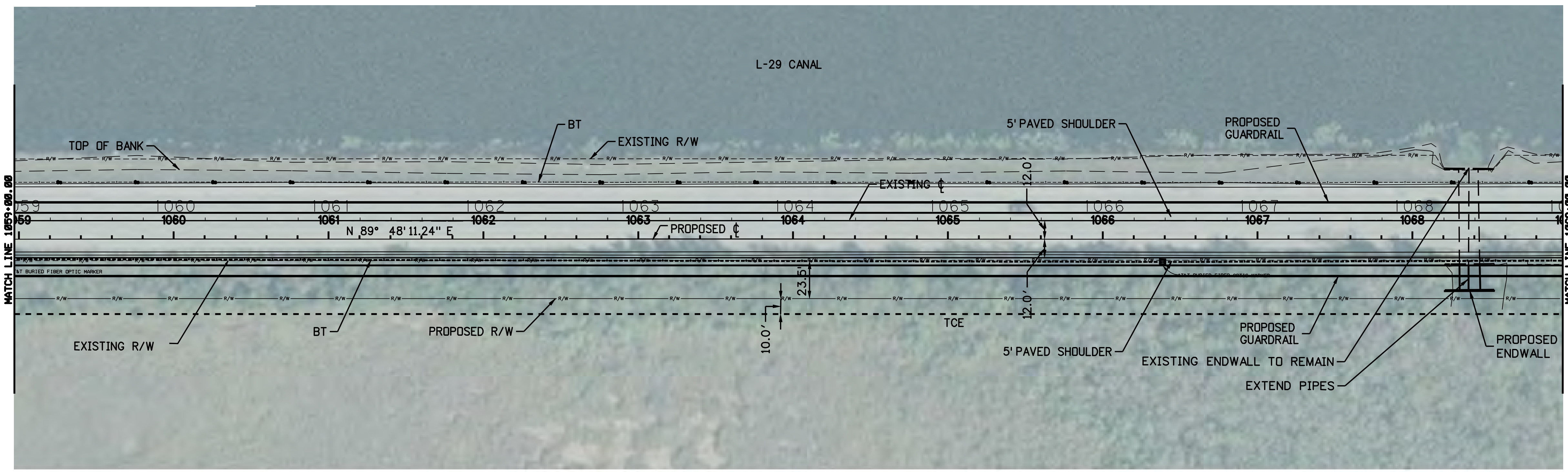
Designed by: AJS
Dwn by: ---
Ckd by: PTH
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1039+00 TO 1059+00

Scale: AS SHOWN
PLATE NO.
P-16

17-FEB-2010 15:10 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD16.dgn



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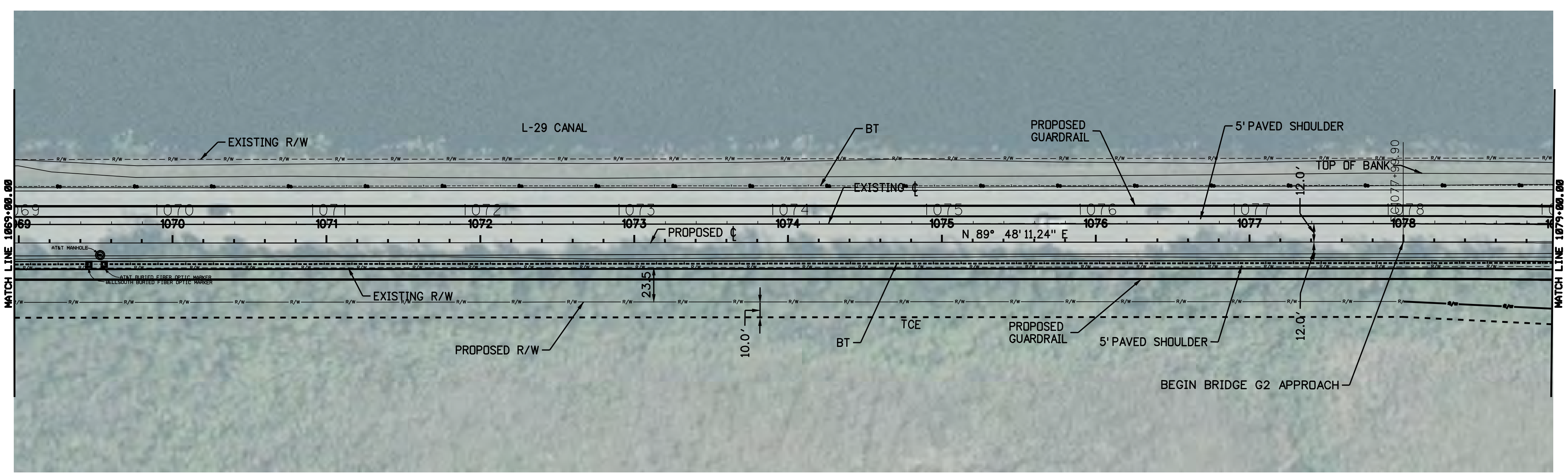
SCALE: 1"=40'-0"



US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
JACKSONVILLE, FL
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

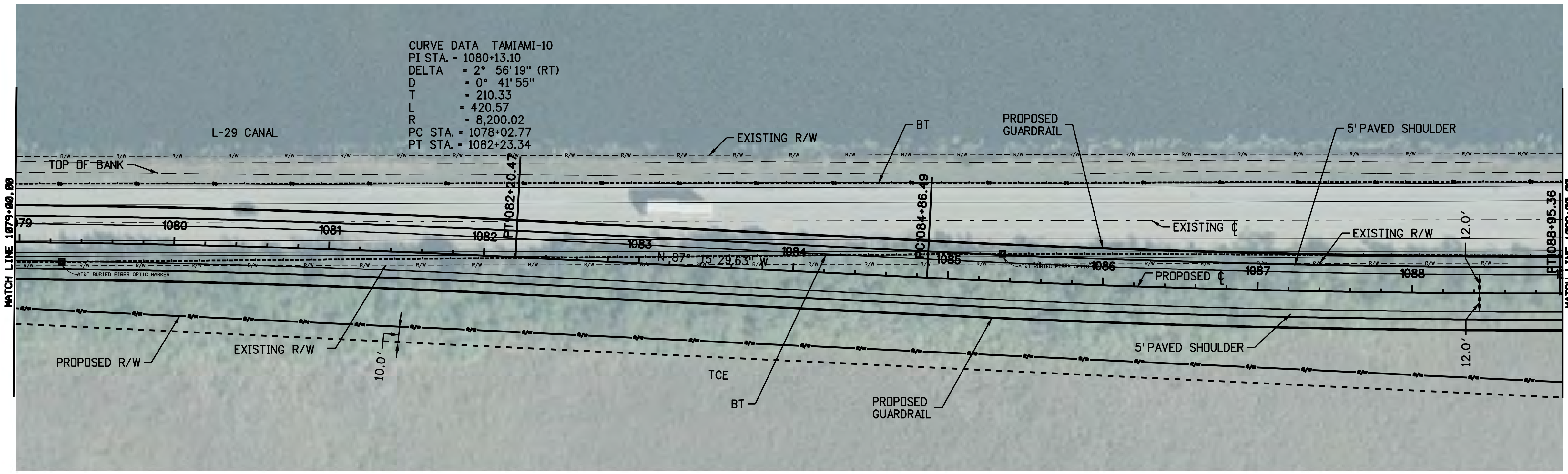
Designed by: AJS
Dwn by: ---
Ckd by: PTH
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

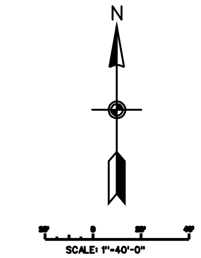
Reference files:
File name:

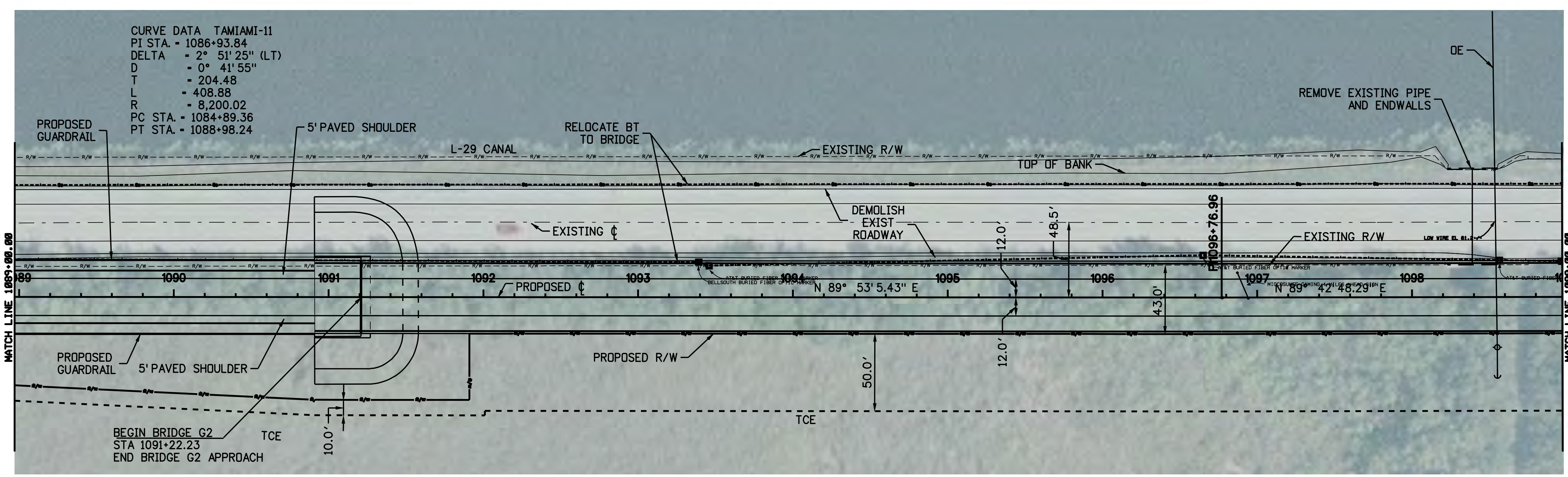
MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 1059+00 TO 1079+00

Scale: AS SHOWN
PLATE NO.
P-17







US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

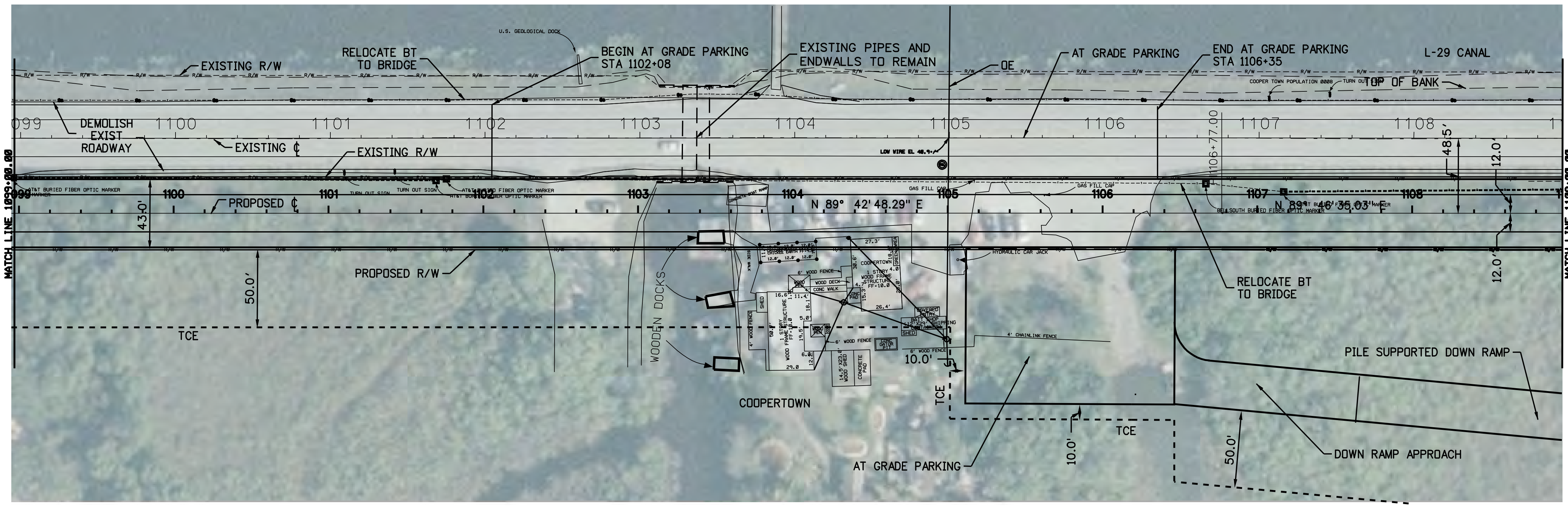
Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.A.FILE NO.
Dated:

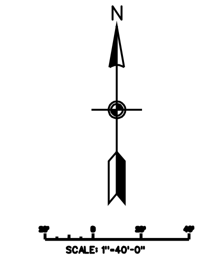
Reference files:
File name:

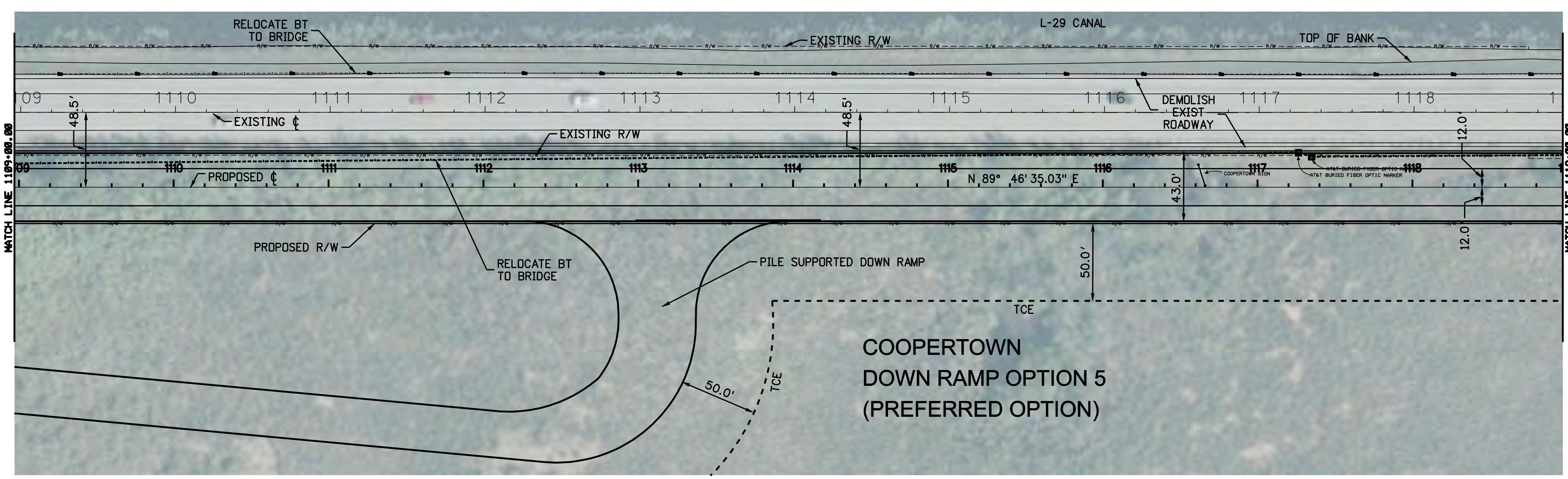
MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1079+00 TO 1099+00

Scale: AS SHOWN
PLATE NO.
P-18

17-FEB-2010 15:10 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD18.dgn







COOPERTOWN
DOWN RAMP OPTION 5
(PREFERRED OPTION)

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

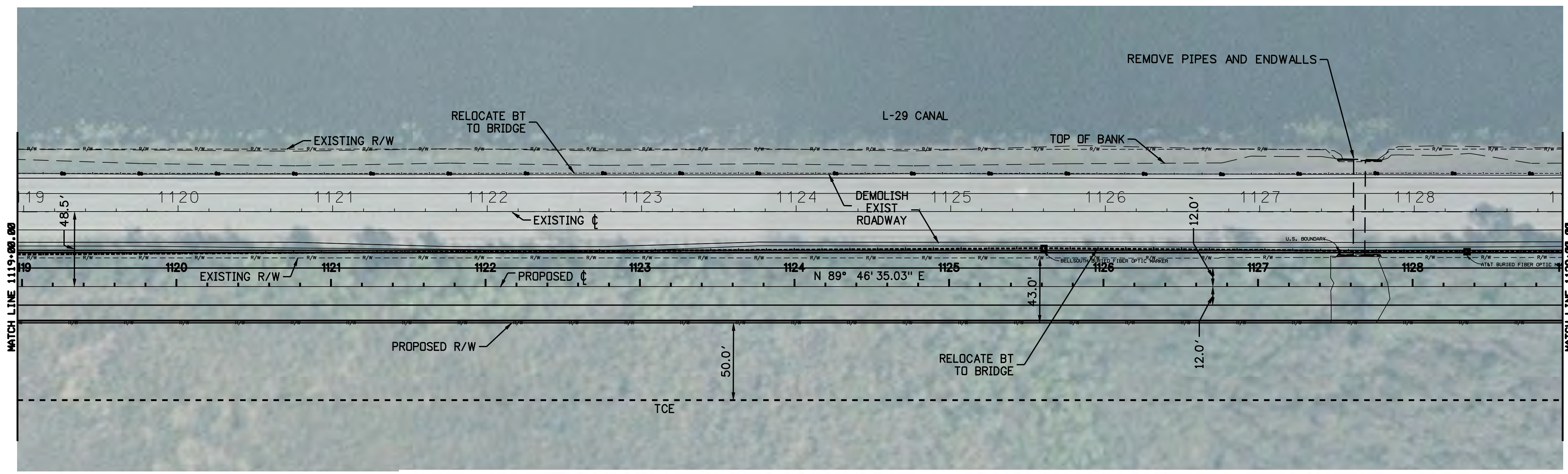
Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1099+00 TO 1119+00

Scale: AS SHOWN
PLATE NO.
P-19

8 7 6 5 4 3 2 1

D



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SCALE: 1"=40'-0"

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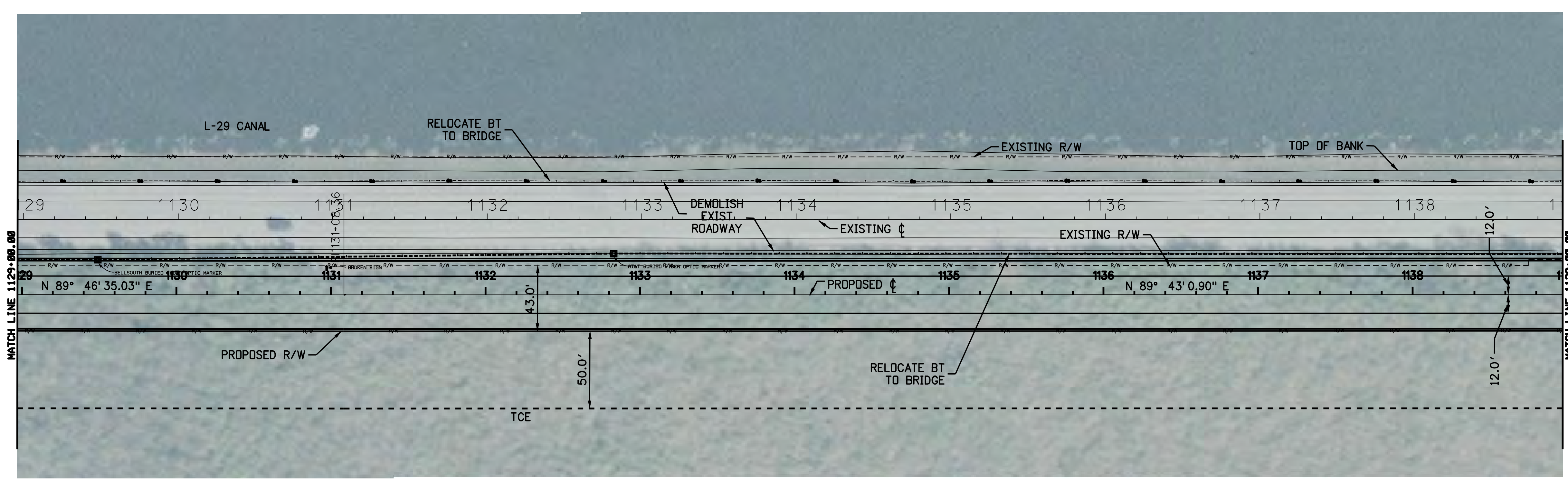


A

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

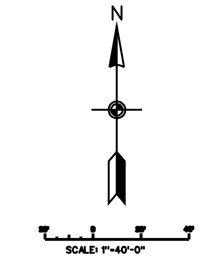
Reference files:
File name:

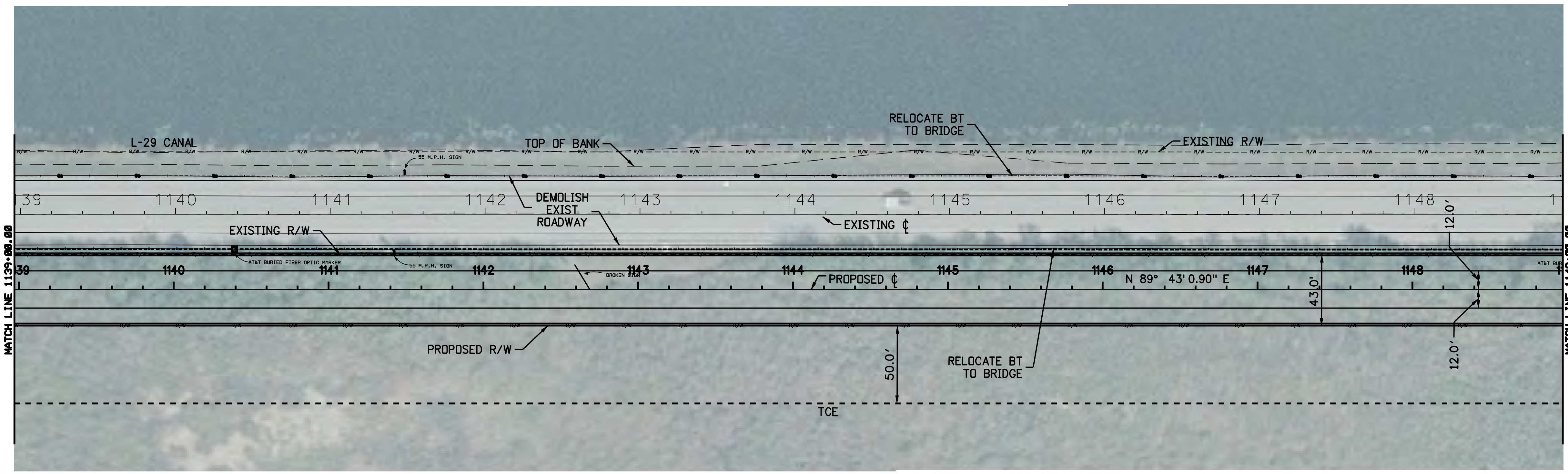
MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1119+00 TO 1139+00

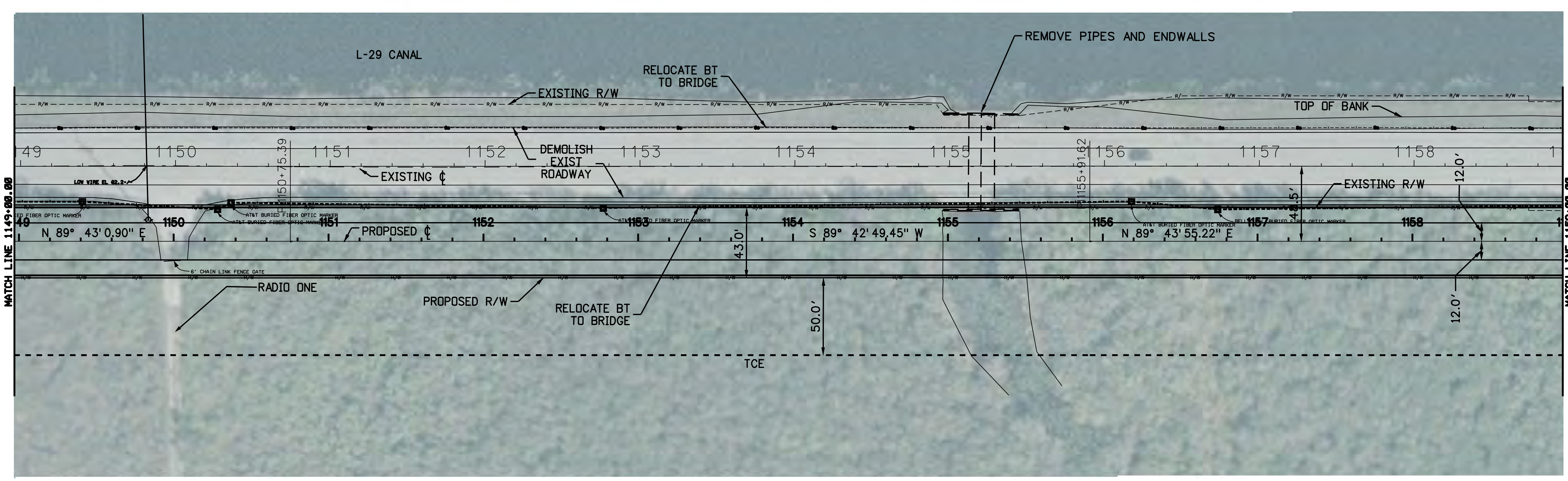
Scale: AS SHOWN
PLATE NO.
P-20

8 7 6 5 4 3 2 1

17-FEB-2010 15:11 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD20.dgn







US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE (904) 296-0207

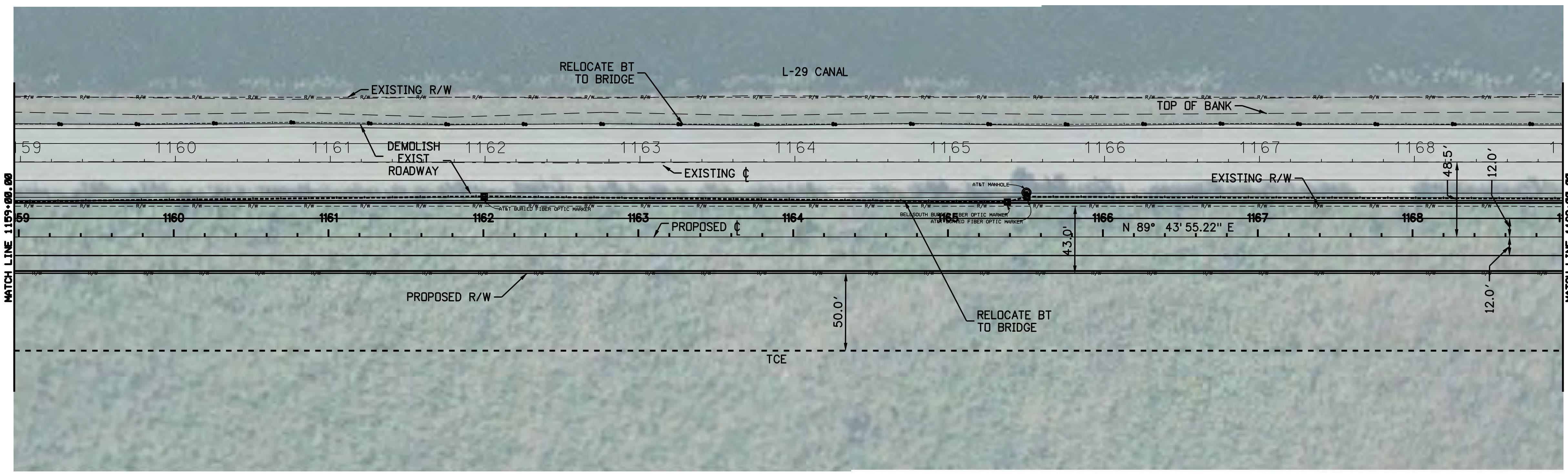
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

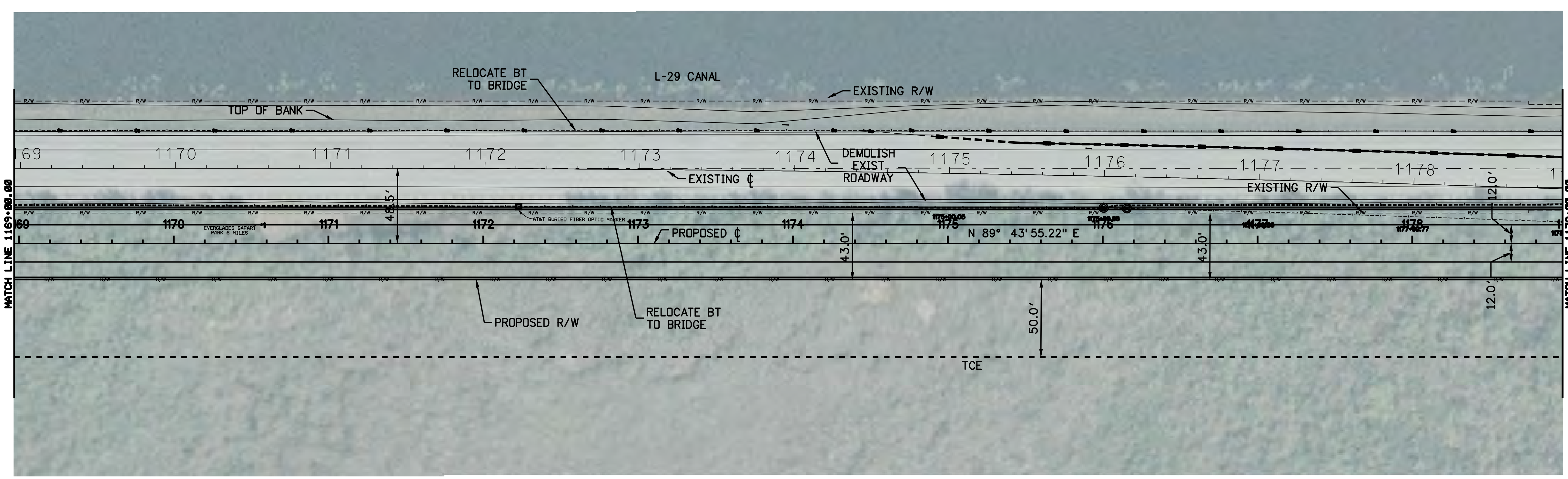
Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1139+00 TO 1159+00

Scale: AS SHOWN
PLATE NO.
P-21





US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

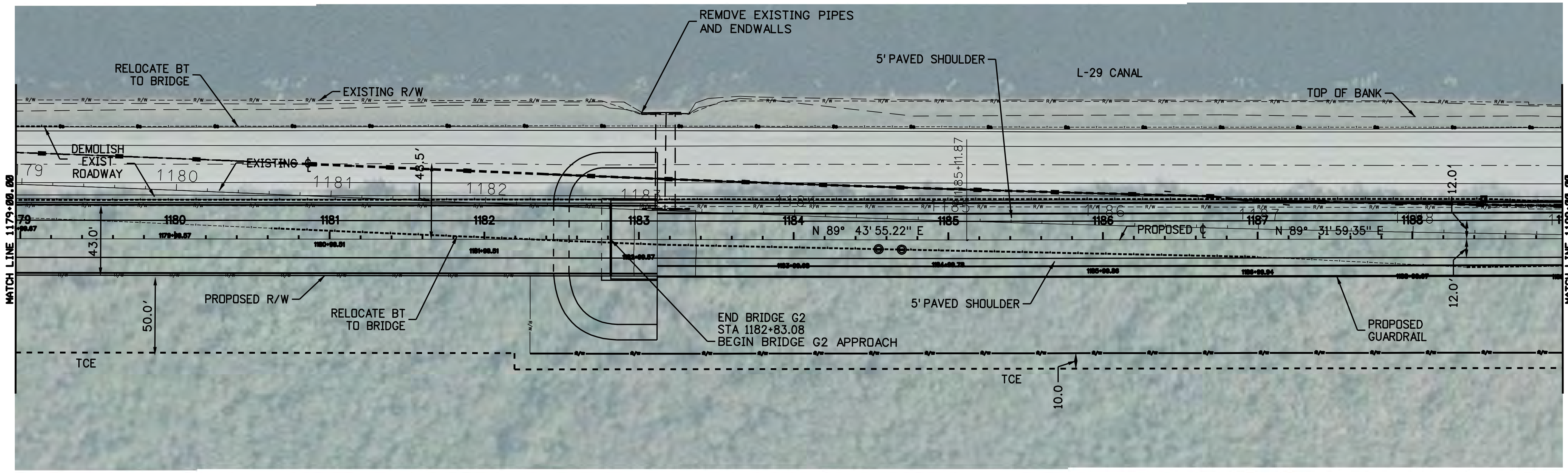
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

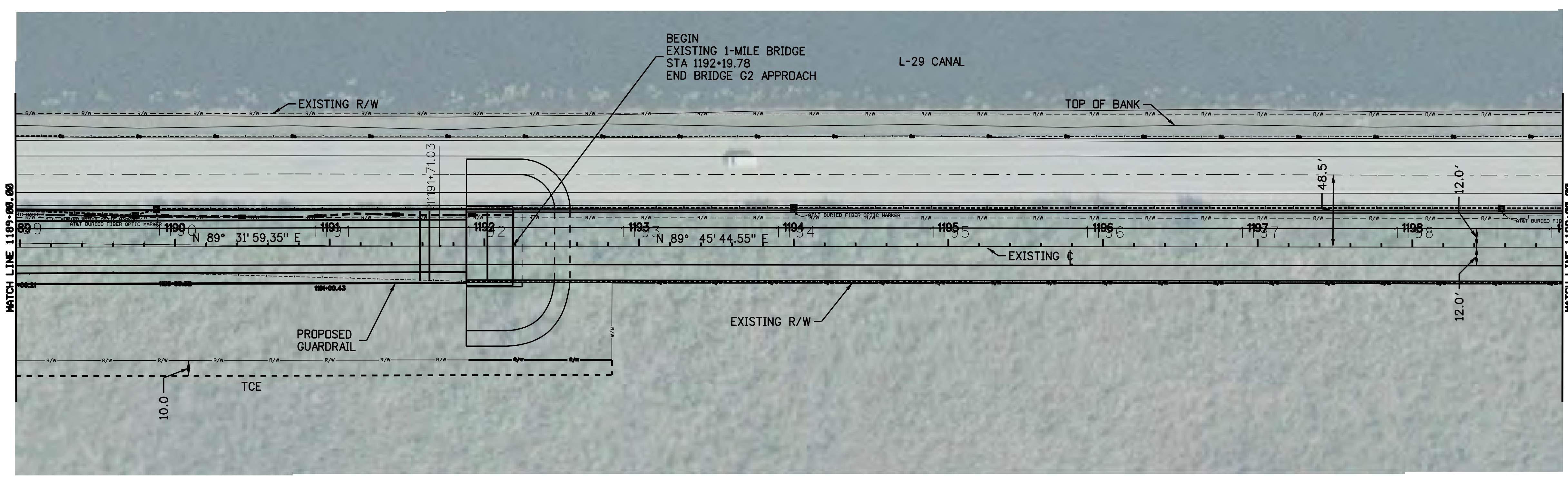
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 1159+00 TO 1179+00

Scale: AS SHOWN
PLATE NO.
P-22

17-FEB-2010 15:12 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD22.dgn





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

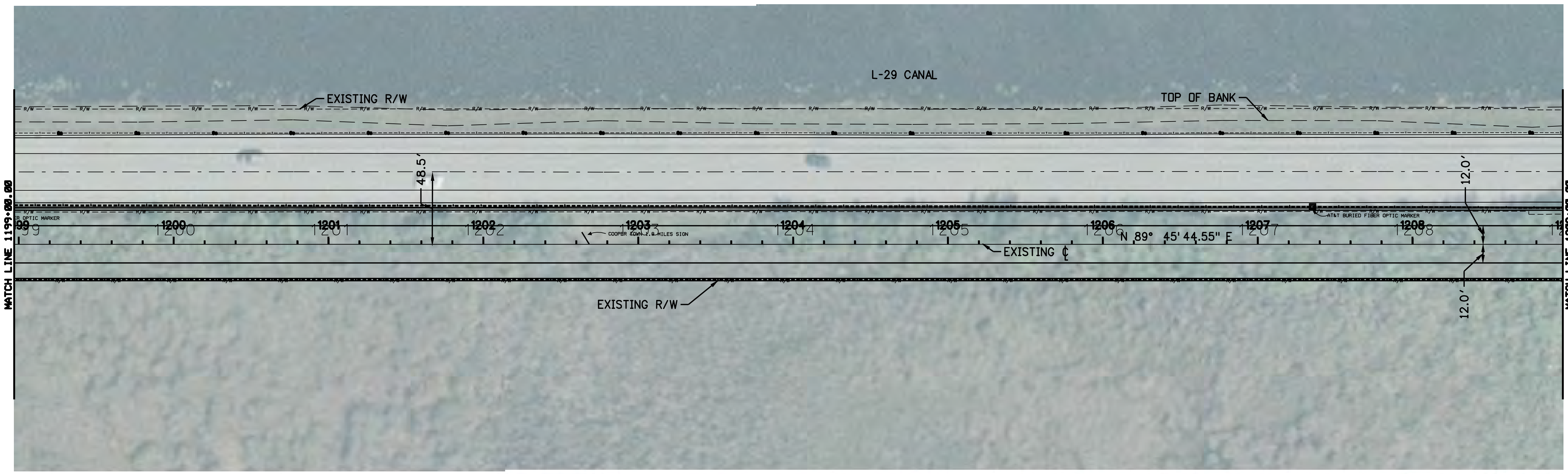
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

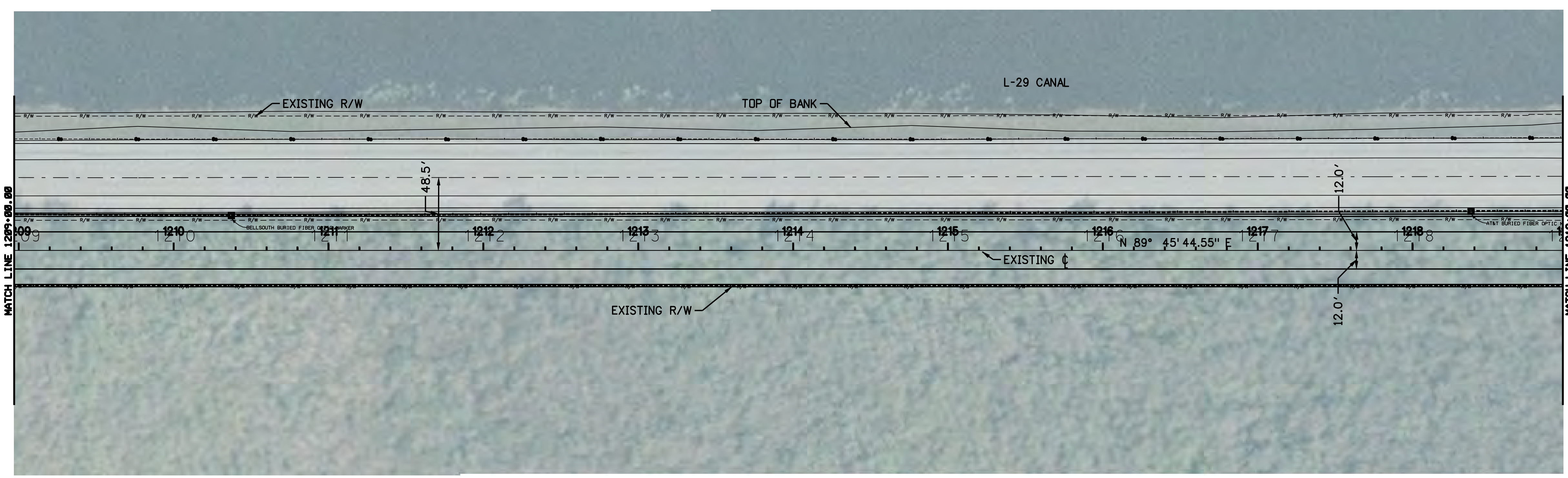
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

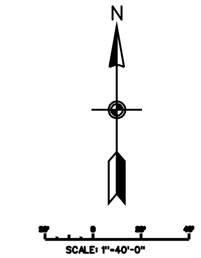
ROADWAY PLAN
STA 1179+00 TO 1199+00

Scale: AS SHOWN
PLATE NO.
P-23

17-FEB-2010 15:12 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD23.dgn







US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

HNTB

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA

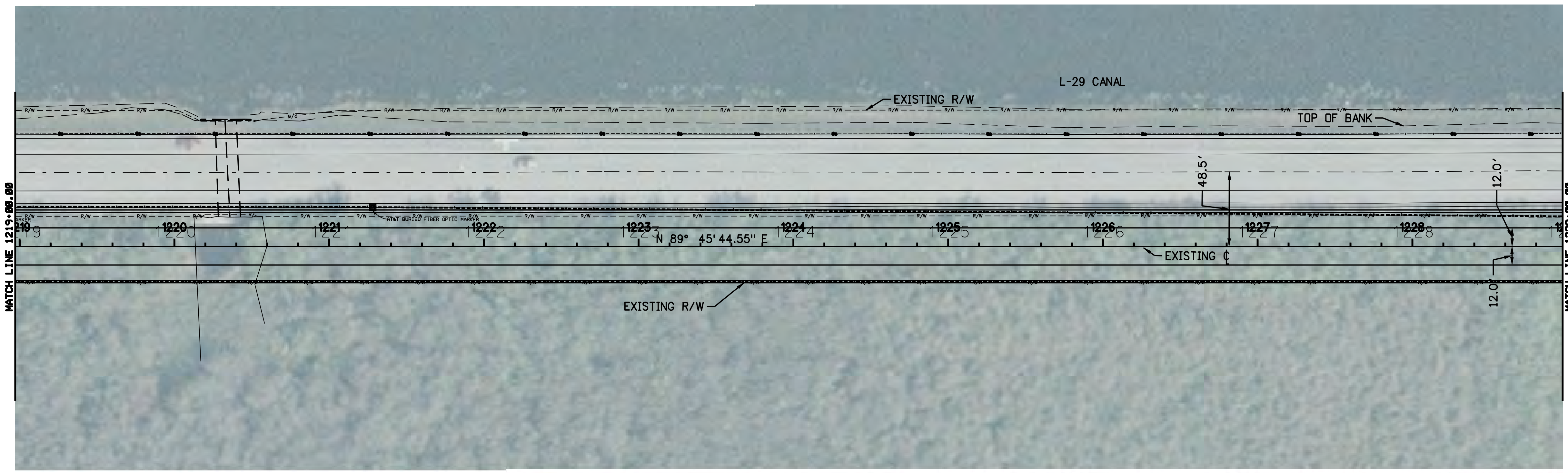
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

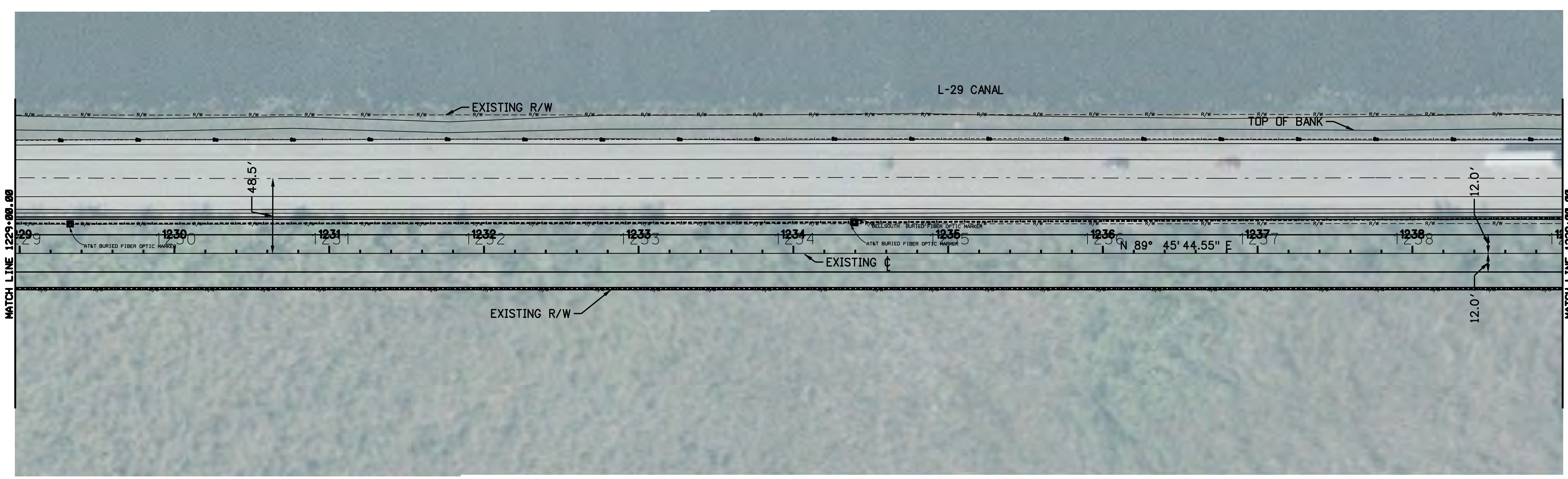
ROADWAY PLAN
STA 1199+00 TO 1219+00

Scale: AS SHOWN

PLATE NO.

P-24





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

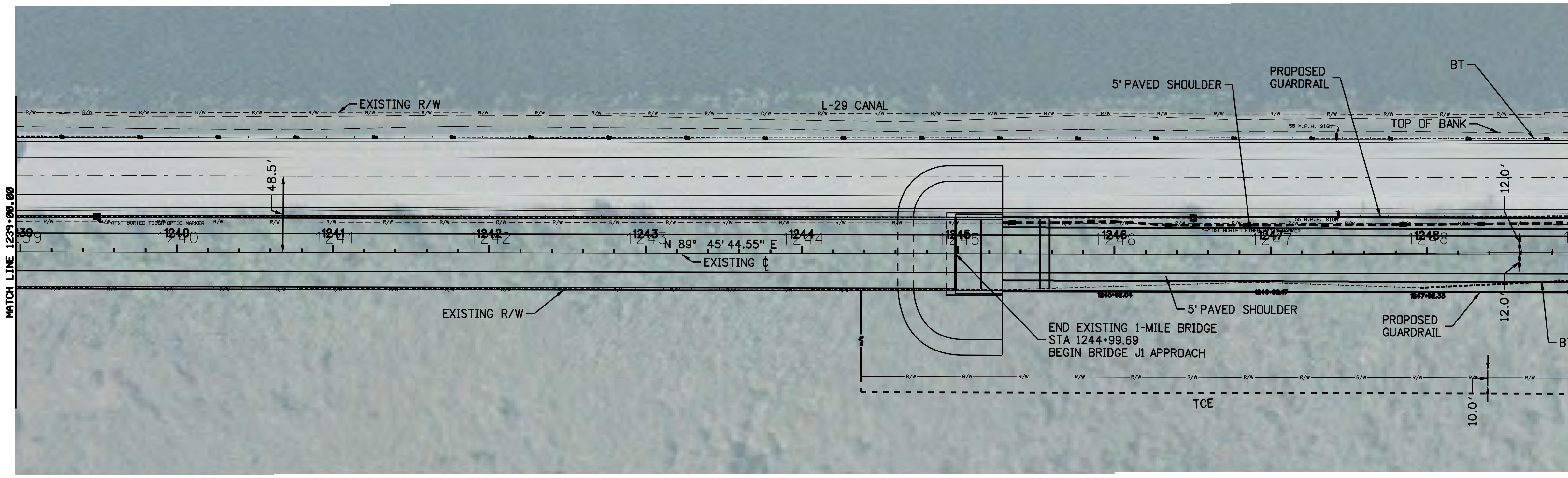
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 1219+00 TO 1239+00

Scale: AS SHOWN

PLATE NO.

P-25



N

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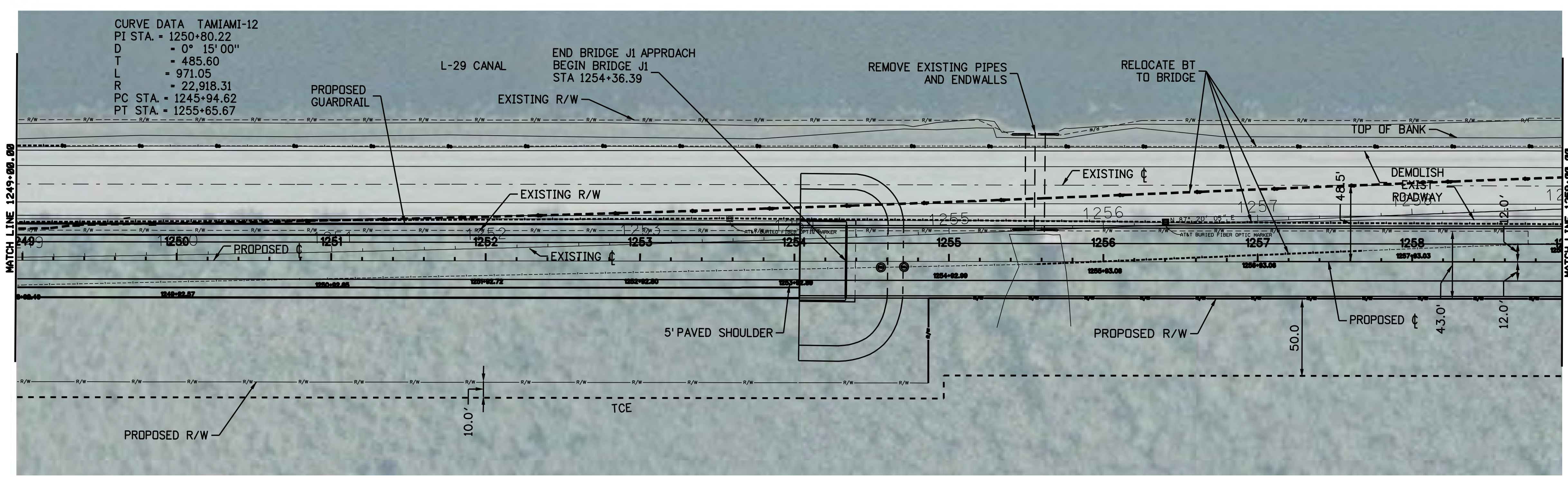


US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

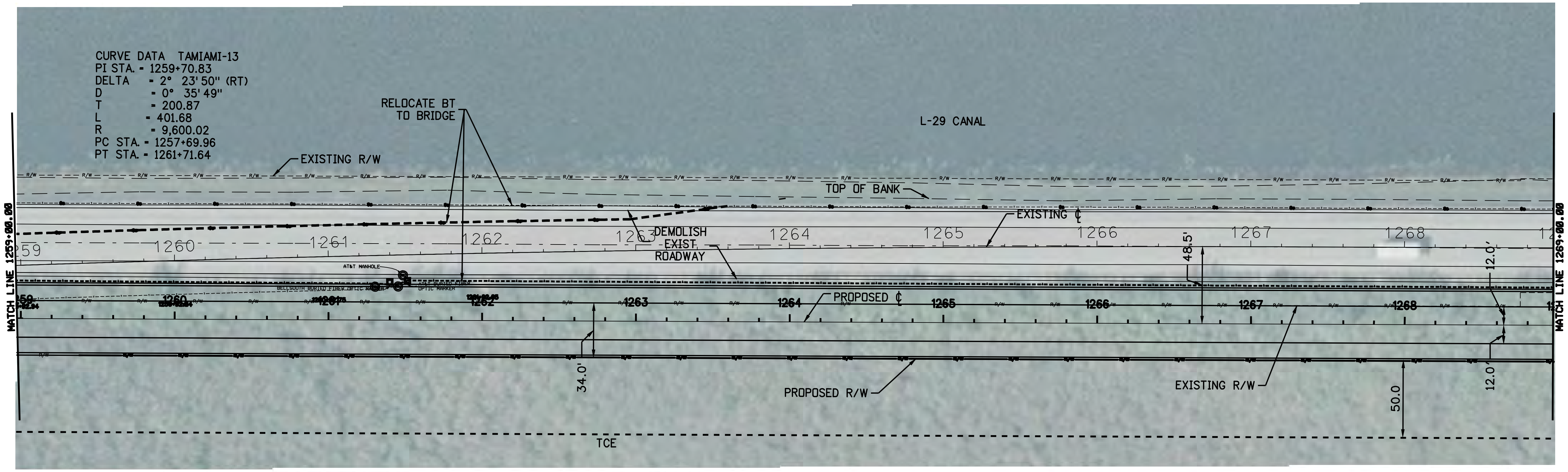
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

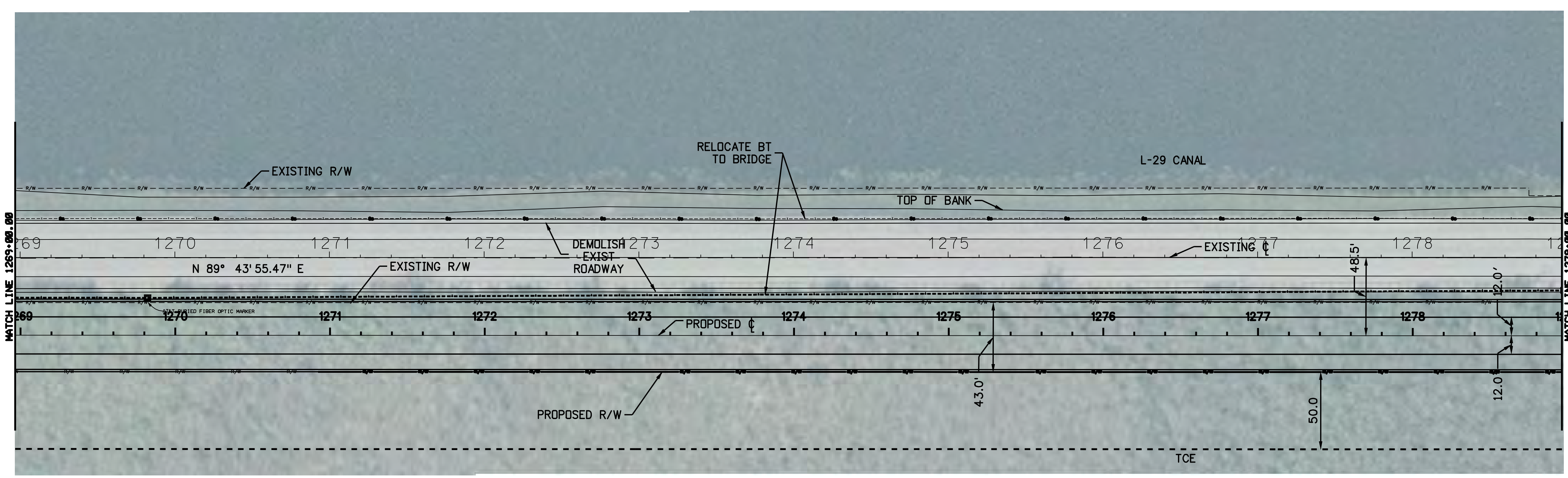
ROADWAY PLAN
STA 1239+00 TO 1259+00

Scale: AS SHOWN

PLATE NO.

P-26





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

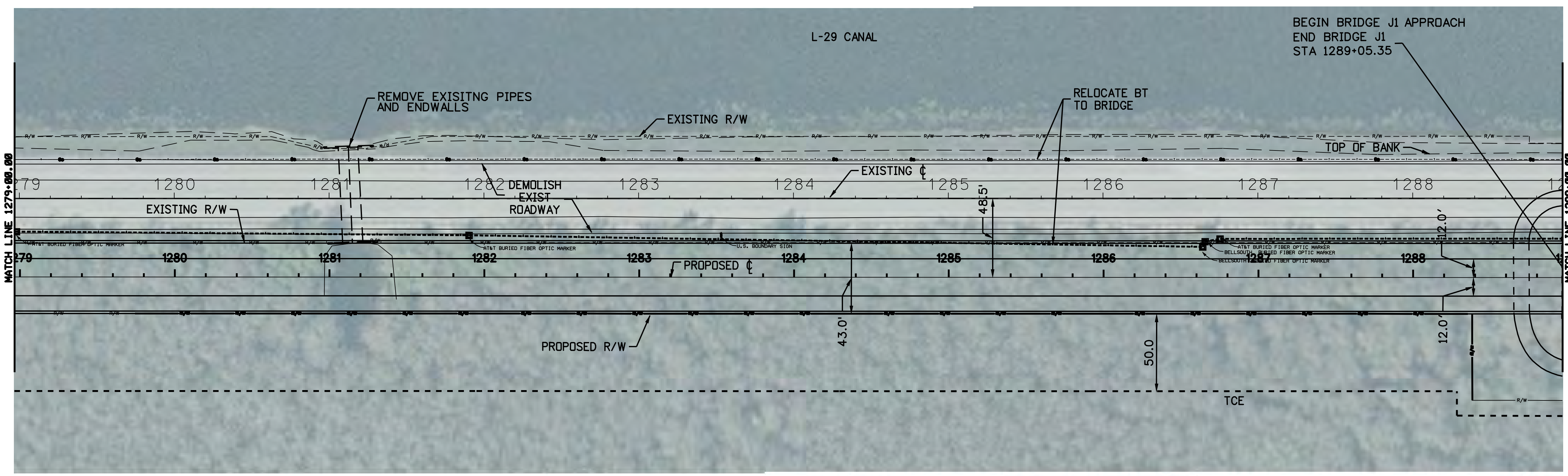
HNTB
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

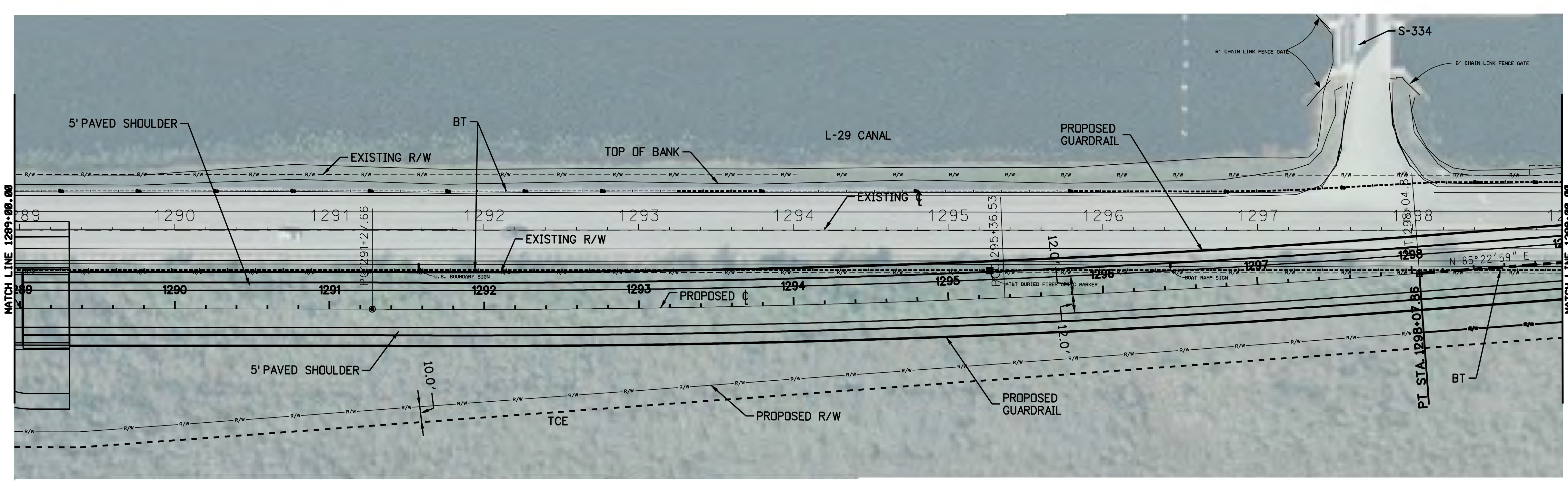
Designed by: AJS
Ckd by: PTH
Dated: February 2010

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1259+00 TO 1279+00

Scale: AS SHOWN
PLATE NO.
P-27

17-FEB-2010 15:14 \\LKMw00\pmwork\Jobs\45889_TamiamiTrail\roadway\PLANRD27.dgn





N

SCALE: 1"=40'-0"

US Army Corps
of Engineers
Jacksonville District
SAFETY ON THIS JOB
DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB
PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

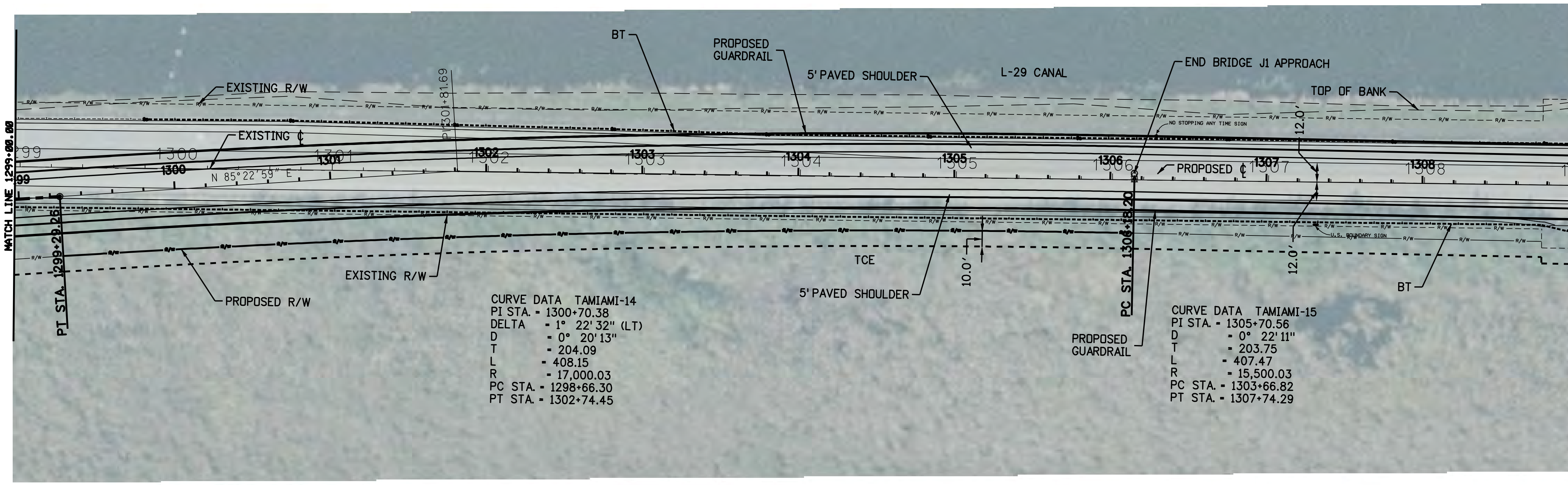
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

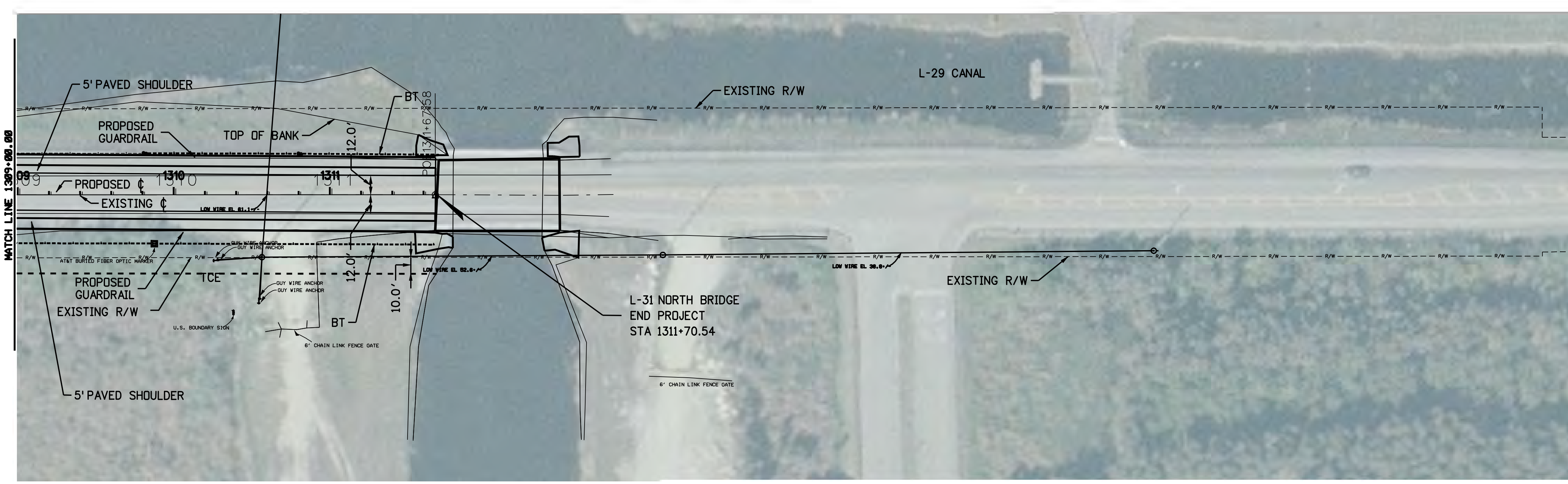
Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
D.O.FILE NO.
Dated:

Reference files:
File name:

MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)
ROADWAY PLAN
STA 1279+00 TO 1299+00

Scale: AS SHOWN
PLATE NO.
P-28





N

SCALE: 1"=40'-0"

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No.	Symbol	Zone	Description

HNTB

PADRAIC T. HEMPHILL
HNTB CORPORATION
7077 BONNEVAL ROAD, SUITE 600
JACKSONVILLE, FL 32216
PHONE: (904) 296-0207

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: AJS
Ckd by: PTH
Dwn by: ---
Inv. No.
Dated: February 2010
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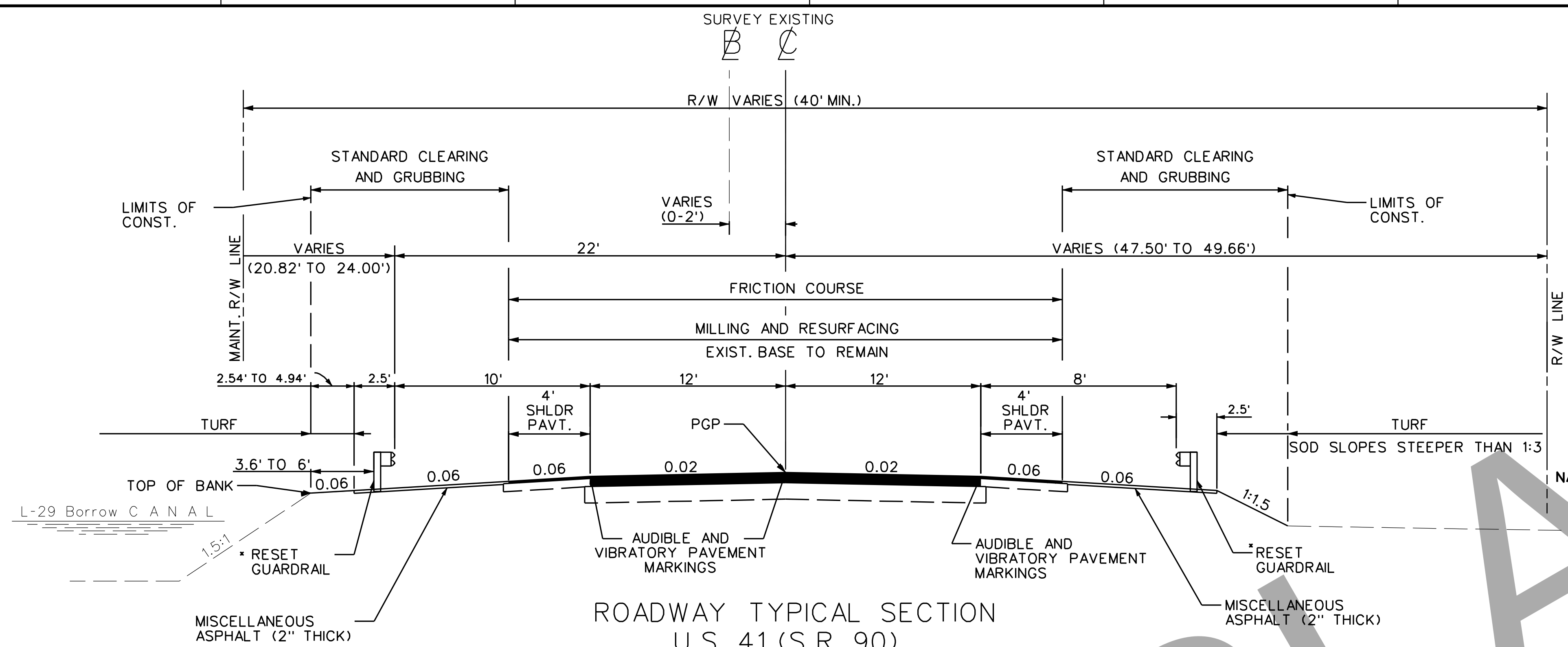
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
ALTERNATIVE 6E (PREFERRED ALTERNATIVE)

ROADWAY PLAN
STA 1299+00 TO 1311+70.54

Scale: AS SHOWN

PLATE NO.
P-29



ROADWAY TYPICAL SECTION
U.S. 41 (S.R. 90)
STA 744+08.69 TO STA 1167+96.00
STA 1269+49.39 TO STA 1311+67.27
SCALE: NTS

TRAFFIC DATA
STA 744+08.69 TO STA 1167+96.00
STA 1269+49.39 TO STA 1311+67.27

CURRENT YEAR ESTIMATE = 2007 AADT = 5,900
OPENING YEAR ESTIMATE = 2011 AADT = 7,100
DESIGN YEAR ESTIMATE = 2031 AADT = 10,200
K = 7.39% D = 50% T = 13% (24 hr)
DESIGN HOUR T = 11.5%
DESIGN SPEED = 60 MPH
POSTED SPEED = 55 MPH

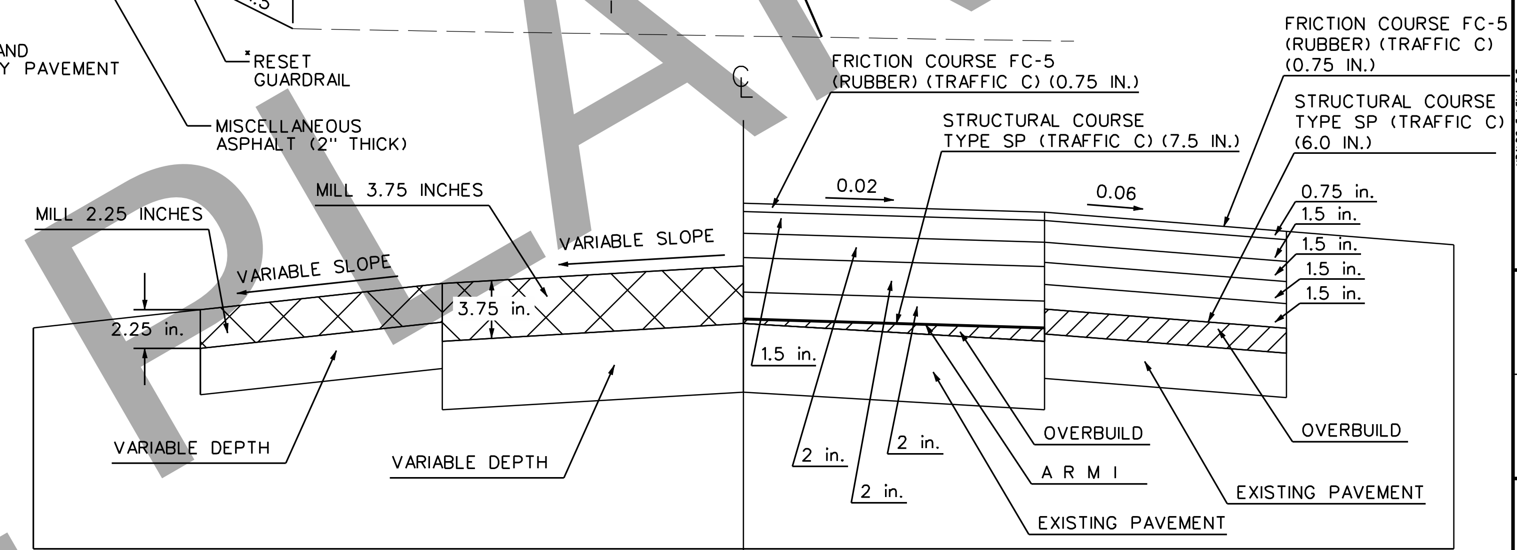
DESIGN HIGH WATER EL.= 8.50 NGVD 29

* NOTE TO CONTRACTOR:
CONTRACTOR MUST REPLACE ANY BROKEN OR DETERIORATED WOODEN BLOCK WITH NEW MATERIAL WHEN RESETTING GUARDRAIL. CONTRACTOR MUST REPLACE ANY DAMAGED GUARDRAIL PANELS WITH NEW SECTIONS OF MATERIAL.

NOTE:
PLACE THE FINAL LAYER OF THE STRUCTURAL COURSE OF THE PAVEMENT AFTER THE SETTLEMENT BECOMES LESS THAN 0.002 FEET PER DAY. THIS WILL PERMIT MAKING ADJUSTMENTS IN THE THICKNESS TO MAKE UP FOR ANY UNEVEN SETTLEMENT. THIS WOULD ONLY NEED TO BE DONE OVER AREAS THAT ARE OVER EXISTING EMBANKMENT. THE PORTION OVER THE NEW EMBANKMENT WHERE THE UNSUITABLE MATERIAL HAS BEEN REMOVED COULD BE PAVED WITH THE FULL DEPTH OF THE STRUCTURALCOURSE SINCE DIFFERENTIAL SETTLEMENT IS NOT EXPECTED IN THOSE AREAS.

REFER TO SPECIFICATION DOCUMENT FOR USE OF SETTLEMENT INSTRUMENTATION TO DETERMINE WHEN SETTLEMENT IS COMPLETED.

MILLING AND RESURFACING
STA 744+08.69 TO STA 765+09.91
STA 788+99.96 TO STA 794+11.66
STA 907+72.05 TO STA 927+43.26
STA 990+62.53 TO STA 1007+23.45
STA 1080+97.19 TO STA 1085+95.32
STA 1088+38.09 TO STA 1092+29.57
STA 1103+00.00 TO STA 1128+92.88
STA 1147+25.20 TO STA 1153+48.51
STA 1154+28.51 TO STA 1157+58.54
STA 1163+78.28 TO STA 1167+96.00
STA 1269+49.39 TO STA 1311+67.27



MILLING AND RESURFACING DETAIL
N.T.S.

1. MILL AND RESURFACE.
2. USE OVERBUILD AS REQUIRED TO CORRECT LONGITUDINALGRADE AND CROSS SLOPE.
3. PLACE ASPHALT RUBBER MEMBRANE INTERLAYER (ARMI) OVER MILLED AND MILLED/OVERBUILT SURFACE PRIOR TO PLACEMENT OF STRUCTURAL COURSE.
4. PLACE 1.5 INCHES MINIMUM INITIAL LIFT OF TYPE SP STRUCTURAL COURSE OVER ARMI
5. EXISTING PAVEMENT AND REQUIRED MILLING ARE SHOWN ON LEFT SIDE OF SECTION, AND PROPOSED PAVEMENT IS SHOWN ON RIGHT SIDE OF SECTION. IN GENERAL, EXISTING PAVEMENT, MILLING AND PROPOSED PAVEMENT ARE SYMETRICAL ABOUT CENTERLINE.

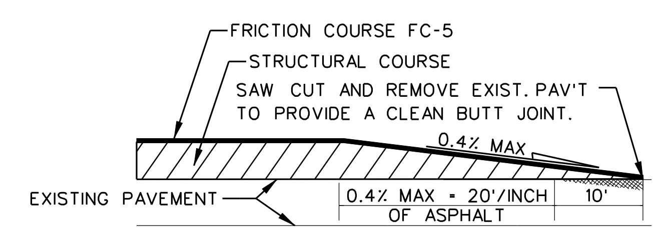
MILLING
MILL EXISTING ASPHALT PAVEMENT (3.75" AVG. DEPTH)

SHOULDER MILLING
MILL EXISTING SHOULDER (2.25" AVG. DEPTH)

OVERBUILD
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (1/4" to 1/2" THICKNESS)

RESURFACING
ARMI (1/2")
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (7 1/2")
FRICTION COURSE FC-5 (TRAFFIC C) (3/4 ") (RUBBER)

SHOULDER RESURFACING
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (6")
FRICTION COURSE FC-5 (TRAFFIC C) (3/4 ") (RUBBER)



LONGITUDINAL SECTION FEATHERING DETAIL
BEGIN AND END PROJECT
N.T.S.

1. TO BE USED AT ALL POINTS WHERE CONNECTIONS ARE MADE TO EXISTING PAVEMENT AND / OR WHERE DIRECTED BY THE ENGINEER.
2. LENGTH OF FEATHERING ON SIDESTREETS SHALL BE DETERMINED AS DIRECTED BY THE ENGINEER.

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: T.J.T. | Dwn by: F.H. | Ckd by: U.F.L.
Inv. No. W912EP-08-R-0025
Dated: AUGUST 2008
D.O.FILE NO.
Reference files: MDSR90-C-BSBRDR.DGN
File name: 114911-MDSR90-CP301.DGN

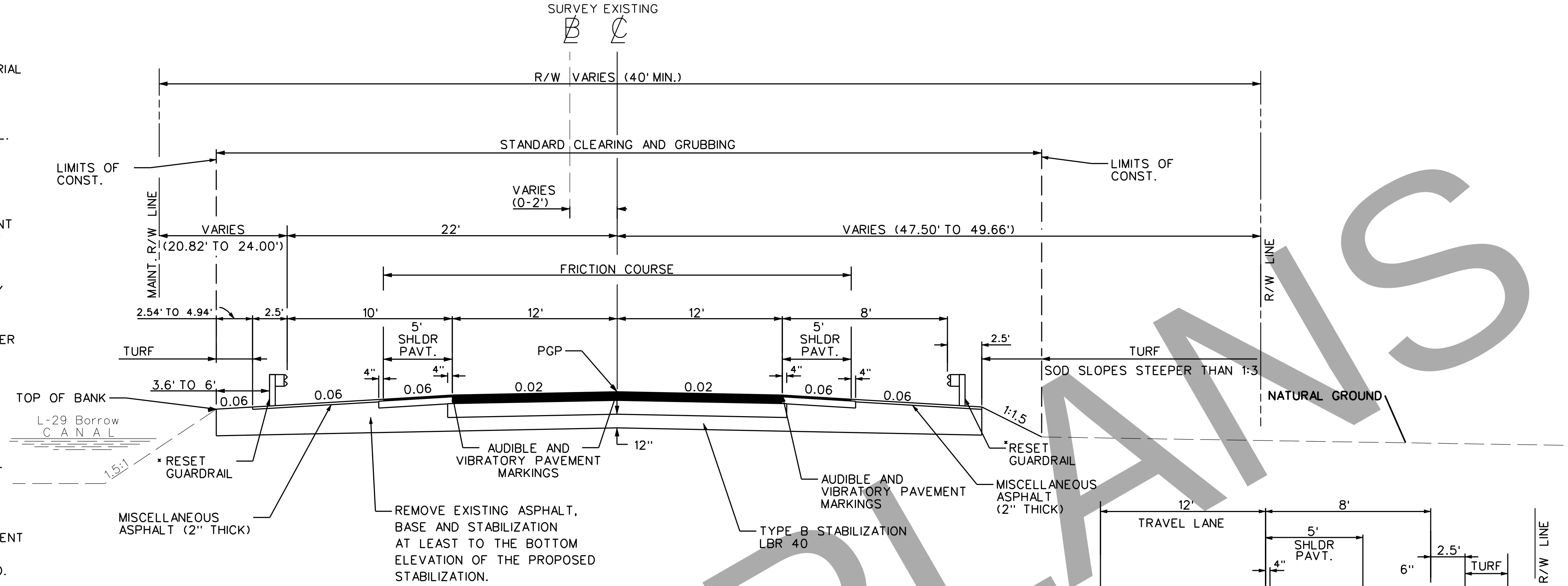
MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
CIVIL
TYPICAL SECTIONS

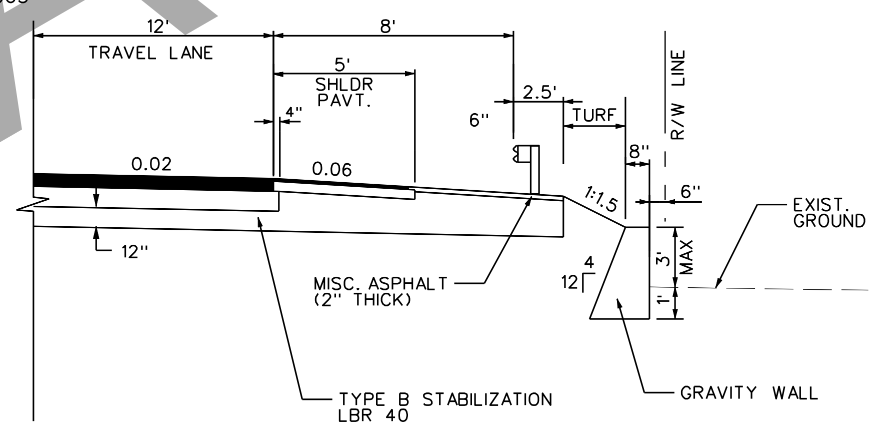
Scale: AS SHOWN
DRAWING NO.
CP 301

* NOTE TO CONTRACTOR:
CONTRACTOR MUST REPLACE ANY BROKEN OR DETERIORATED WOODEN BLOCK WITH NEW MATERIAL WHEN RESETTING GUARDRAIL. CONTRACTOR MUST REPLACE ANY DAMAGED GUARDRAIL PANELS WITH NEW SECTIONS OF MATERIAL.

NOTE:
PLACE THE FINAL LAYER OF THE STRUCTURAL COURSE OF THE PAVEMENT AFTER THE SETTLEMENT BECOMES LESS THAN 0.002 FEET PER DAY. THIS WILL PERMIT MAKING ADJUSTMENTS IN THE THICKNESS TO MAKE UP FOR ANY UNEVEN SETTLEMENT.
THIS WOULD ONLY NEED TO BE DONE OVER AREAS THAT ARE OVER EXISTING EMBANKMENT. THE PORTION OVER THE NEW EMBANKMENT WHERE THE UNSUITABLE MATERIAL HAS BEEN REMOVED COULD BE PAVED WITH THE FULL DEPTH OF THE STRUCTURALCOURSE SINCE DIFFERENTIAL SETTLEMENT IS NOT EXPECTED IN THOSE AREAS.

REFER TO SPECIFICATION DOCUMENT FOR USE OF SETTLEMENT INSTRUMENTATION TO DETERMINE WHEN SETTLEMENT IS COMPLETED.





TRAFFIC DATA
STA 765+09.91 TO STA 1163+78.28

CURRENT YEAR ESTIMATE = 2007 AADT = 5,900
OPENING YEAR ESTIMATE = 2011 AADT = 7,100
DESIGN YEAR ESTIMATE = 2031 AADT = 10,200
K = 7.39% D = 50% T = 13% (24 hr)
DESIGN HOUR T = 11.5%
DESIGN SPEED = 60 MPH
POSTED SPEED = 55 MPH

DESIGN HIGH WATER EL.= 8.50 NGVD 29

ROADWAY TYPICAL SECTION
U.S. 41 (S.R. 90)
STA 765+09.91 TO STA 1163+78.28

SCALE: NTS

RECONSTRUCTION
STA 765+09.91 TO STA 788+99.96
STA 794+11.66 TO STA 907+72.05
STA 927+43.26 TO STA 990+62.53
STA 1007+23.45 TO STA 1080+97.19
STA 1085+95.32 TO STA 1088+38.09
STA 1092+29.57 TO STA 1103+00.00
STA 1128+92.88 TO STA 1147+25.20
STA 1153+48.51 TO STA 1154+28.51
STA 1157+58.54 TO STA 1163+78.28

RECONSTRUCTION
OPTIONAL BASE GROUP 11 (TYPE B-12.5 ONLY) (7") WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (5 1/2")
AND FRICTION COURSE FC-5 (TRAFFIC C) (3/4 ") (RUBBER)

RECONSTRUCTION SHOULDER PAVEMENT
OPTIONAL BASE GROUP 5 (TYPE B-12.5 ONLY) (4 1/2") WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (3")
FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)

GRAVITY WALL SECTION SECTION
U.S. 41 (S.R. 90)

STA 776+84.26 TO STA 781+12.09
STA 782+67.81 TO STA 785+32.83
STA 794+79.00 TO STA 798+52.05
STA 802+74.00 TO STA 818+27.00
STA 820+06.65 TO STA 826+74.00
STA 830+11.50 TO STA 831+21.97
STA 833+28.05 TO STA 834+54.05
STA 844+64.75 TO STA 845+50.79
STA 846+65.56 TO STA 848+74.00
STA 854+68.88 TO STA 856+07.80
STA 940+75.51 TO STA 941+16.94
STA 952+51.25 TO STA 957+98.07
STA 958+74.00 TO STA 961+05.00
STA 964+32.67 TO STA 978+29.10
STA 982+10.82 TO STA 988+74.02
STA 998+74.00 TO STA 1001+41.18
STA 1004+92.21 TO STA 1006+27.09
STA 1010+59.57 TO STA 1011+40.11
STA 1015+16.62 TO STA 1017+91.72
STA 1026+63.16 TO STA 1027+32.36
STA 1058+74.02 TO STA 1067+43.38
STA 1097+36.44 TO STA 1098+52.56
STA 1100+01.64 TO STA 1101+53.62
STA 1138+74.00 TO STA 1145+09.16
STA 1146+46.42 TO STA 1147+13.97
STA 1170+19.43 TO STA 1170+41.72
STA 1182+63.00 TO STA 1183+01.+30
STA 1268+75.44 TO STA 1269+49.40

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

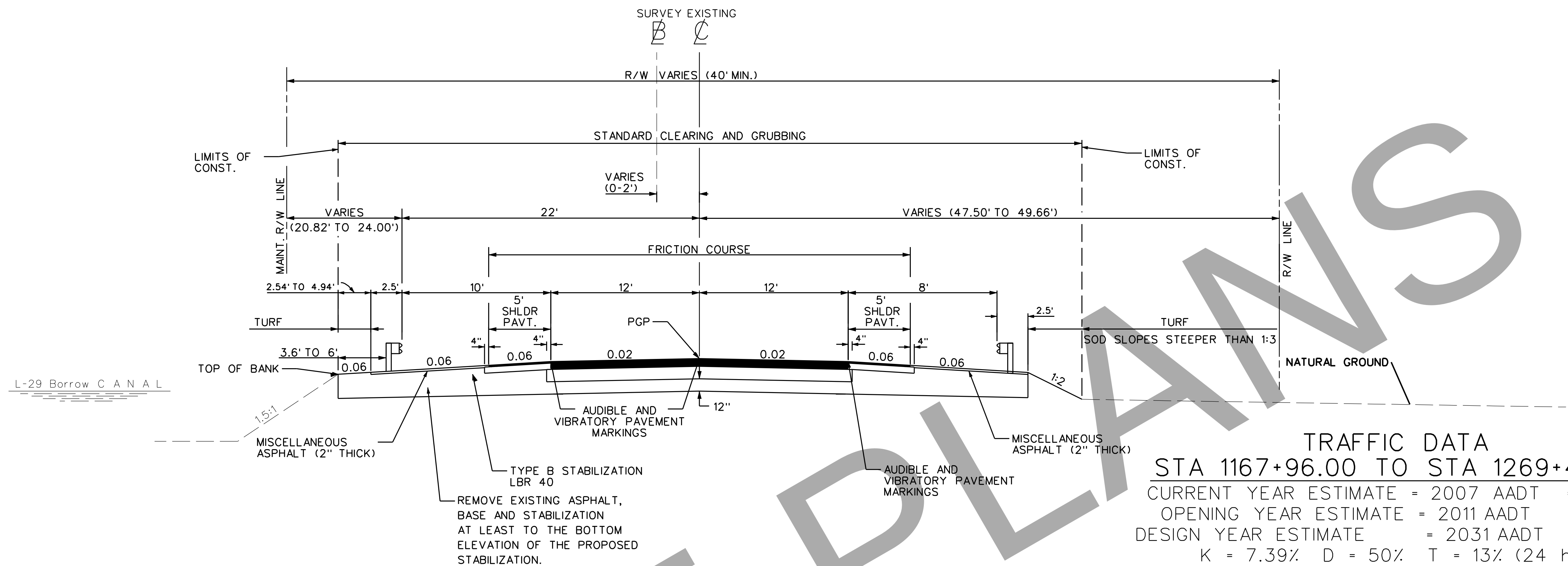
No.	Symbol	Zone	Description

EAC Consulting, Inc.
UBALDO F. LENA, P.E.
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: T.J.T. Ckd by: U.F.L.
Dwn by: F.H.
Inv. No. W912EP-08-R-0025
Dated: AUGUST 2008
D.O.FILE NO.
Dated:
Reference files: MDSR90-G-BSBRDR.DGN
File name: 114911-MDSR90-CP302.DGN

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
CIVIL
TYPICAL SECTIONS

Scale: AS SHOWN
DRAWING NO.
CP 302



ROADWAY TYPICAL SECTION

U.S. 41 (S.R. 90)
STA 1167+96.00 TO STA 1170+41.76
STA 1268+33.74 TO STA 1269+49.39

SCALE: NTS

TRAFFIC DATA
STA 1167+96.00 TO STA 1269+49.39

CURRENT YEAR ESTIMATE = 2007 AADT = 5,900
OPENING YEAR ESTIMATE = 2011 AADT = 7,100
DESIGN YEAR ESTIMATE = 2031 AADT = 10,200
K = 7.39% D = 50% T = 13% (24 hr)
DESIGN HOUR T = 11.5%
DESIGN SPEED = 60 MPH
POSTED SPEED = 55 MPH

DESIGN HIGH WATER EL.= 9.70 NGVD 29

NOTE:
PLACE THE FINAL LAYER OF THE STRUCTURAL COURSE OF THE PAVEMENT AFTER THE SETTLEMENT BECOMES LESS THAN 0.002 FEET PER DAY. THIS WILL PERMIT MAKING ADJUSTMENTS IN THE THICKNESS TO MAKE UP FOR ANY UNEVEN SETTLEMENT. THIS WOULD ONLY NEED TO BE DONE OVER AREAS THAT ARE OVER EXISTING EMBANKMENT. THE PORTION OVER THE NEW EMBANKMENT WHERE THE UNSUITABLE MATERIAL HAS BEEN REMOVED COULD BE PAVED WITH THE FULL DEPTH OF THE STRUCTURALCOURSE SINCE DIFFERENTIAL SETTLEMENT IS NOT EXPECTED IN THOSE AREAS.

REFER TO SPECIFICATION DOCUMENT FOR USE OF SETTLEMENT INSTRUMENTATION TO DETERMINE WHEN SETTLEMENT IS COMPLETED.

NEW CONSTRUCTION

OPTIONAL BASE GROUP 11 (TYPE B-12.5 ONLY) (7") WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (5 1/2")
AND FRICTION COURSE FC-5 (TRAFFIC C) (3/4 ") (RUBBER)

SHOULDER PAVEMENT

OPTIONAL BASE GROUP 5 (TYPE B-12.5 ONLY) (4 1/2") WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (3")
FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No. | Symbol | Zone | Description

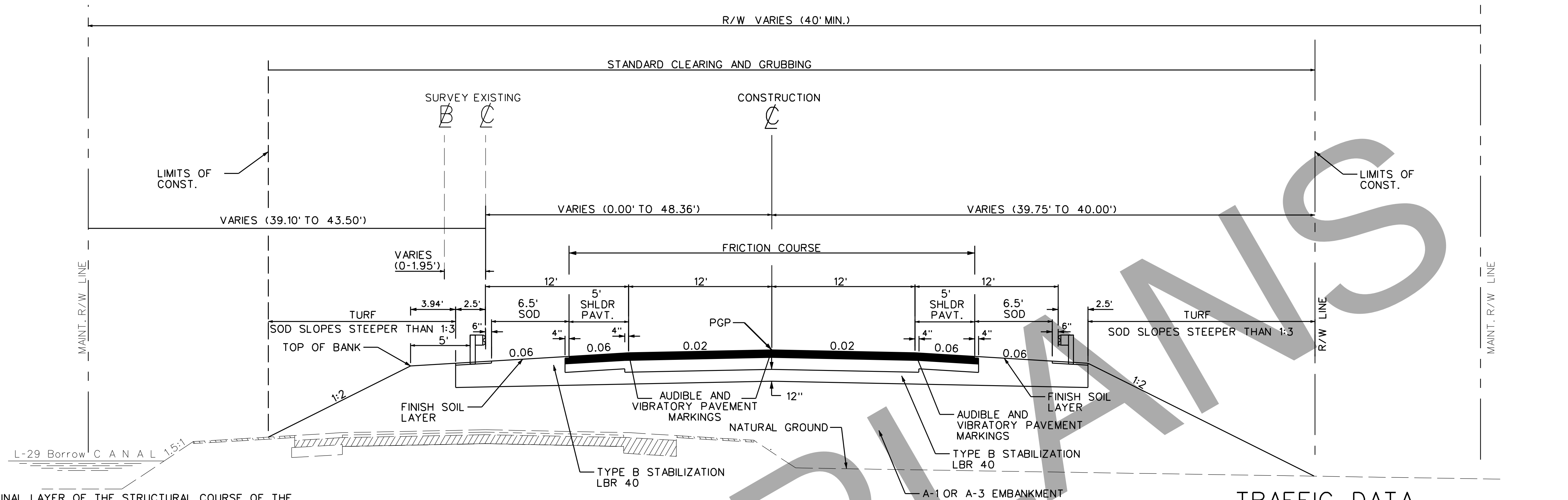
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: T.J.T. | Ckd by: U.F.L.
Dwn by: F.H.
Inv. No. W912EP-08-R-0025
Dated: AUGUST 2008
D.O.FILE NO.
Dated:

Reference files: MDSR90-C-BSBRDR.DGN
File name: 114911-MDSR90-CP303.DGN

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
CIVIL
TYPICAL SECTIONS

Scale: AS SHOWN
DRAWING NO.
CP 303



NOTE:
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ROADWAY TYPICAL SECTION
U.S. 41 (S.R. 90)
STA 1170+41.76 TO STA 1192+18.00
STA 1244+98.00 TO STA 1268+33.74

SCALE: NTS

TRAFFIC DATA
STA 1170+41.76 TO STA 1268+33.74

CURRENT YEAR ESTIMATE = 2007 AADT = 5,900
OPENING YEAR ESTIMATE = 2011 AADT = 7,100
DESIGN YEAR ESTIMATE = 2031 AADT = 10,200
K = 7.39% D = 50% T = 13% (24 hr)
DESIGN HOUR T = 11.5%
DESIGN SPEED = 60 MPH
POSTED SPEED = 55 MPH

DESIGN HIGH WATER EL.= 9.70 NGVD 29

NEW CONSTRUCTION
STA 1170+41.76 TO STA 1186+33.32
STA 1250+81.90 TO STA 1268+33.74

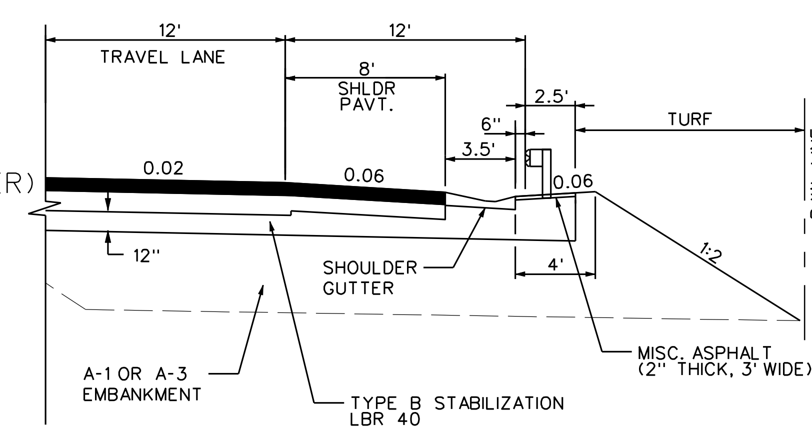
NEW CONSTRUCTION
OPTIONAL BASE GROUP 10 WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (4")
AND FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)

SHOULDER PAVEMENT
OPTIONAL BASE GROUP 5 WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (3")
FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)

NEW CONSTRUCTION
STA 1186+33.32 TO STA 1192+18.00
STA 1244+98.00 TO STA 1250+81.90

NEW CONSTRUCTION
OPTIONAL BASE GROUP 9 WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (3")
AND FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)

SHOULDER PAVEMENT
OPTIONAL BASE GROUP 5 WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC C) (3")
FRICTION COURSE FC-5 (TRAFFIC C) (3/4") (RUBBER)



SHOULDER GUTTER SECTION
U.S. 41 (S.R. 90)
STA 1187+00 TO STA 1191+88
STA 1245+28 TO STA 1249+00

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No. | Symbol | Zone | Description

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: T.J.T.
Dwn by: L.M.
Ckd by: U.F.L.
Inv. No. W912EP-08-R-0025
Dated: AUGUST 2008
D.O.FILE NO.
Dated:

Reference files: MDSR90-G-BSBRDR.DGN
File name: 114911-MDSR90-CP304.DGN

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK
MIAMI-DADE COUNTY, FLORIDA
MODIFICATIONS TO STATE ROAD NO. 90
CIVIL
TYPICAL SECTIONS

Scale: AS SHOWN
DRAWING NO.
CP 304