FPID #430029-2-21-01

ETDM No. 14230

Atlantic Isle at West of SR A1A
Bridge No. 874218
Project Development and Environment Study

Draft

Conceptual Drainage Report

FDOT District Six
1000 NW 111th Avenue
Miami, Florida 33172

Atlantic Isle Bridge (Bridge No. 874218)
Atlantic Avenue, Sunny Isles Beach, FL
Miami-Dade County, FL

November 2023

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by the Federal Highway Administration and FDOT.

FINAL DRAFT

CONCEPTUAL DRAINAGE REPORT

Florida Department of Transportation

District Six

Atlantic Isle at West of SR A1A, Bridge No. 874218

Atlantic Avenue, 0.25 miles west of SR A1A

Miami-Dade County, Florida

Financial Management Number: 430029-2-22-01

ETDM Number: 14413

November 2023

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES AND EXHIBITS

ACRONYMS AND ABBREVIATIONS

ac-ft	acre-foot (acre-feet)
CIP	cast-in-place
CSLE	Culvert Service Life Estimator
DERM	Department of Environmental Resources Management
DHW	Design high water
DRER	Department of Regulatory and Economic Resources (Miami-Dade)
ETDM	Efficient Transportation Decision Making
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FIRM	Flood Insurance Rate Maps
GIS	Geographic Information Systems
MHHW	mean higher-high water
MHW	mean high water
mph	mile(s) per hour
NAVD88	North American Vertical Datum of 1988
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PD&E	Project Development and Environment
ROW	right-of-way
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Office
SR	State Road
TTC	temporary traffic control
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

The Florida Department of Transportation (FDOT), District Six, is conducting a Project Development and Environment (PD&E) Study to address the deficiencies of the existing Atlantic Isle Bridge (Bridge No. 874218). The Atlantic Isle Bridge is a historic bridge located on Atlantic Island just west of State Road (SR) A1A (Collins Avenue), within the City of Sunny Isles Beach in Miami-Dade County, Florida. The limits of the proposed project encompass the bridge (along Atlantic Avenue) and approaches for a distance of approximately 0.009 mile. **Figure 1-1** presents the Project Location Map.

Figure 1-1 Project Location Map

1.1 PURPOSE AND NEED

The purpose of the project is to address the structural and functional deficiencies of the existing bridge in order to provide a safe and functional route for the surrounding community/traveling public. According to a bridge inspection conducted on September 26, 2022, the Atlantic Isle Bridge [Bridge Identification Number 874218] has been determined to be 'Functionally Obsolete', with a Sufficiency Rating of 40.9 and a Health Index of 60.39. The Sufficiency Rating and Health Index values vary from 0 [worst] to 100 [best].

The bridge also has weight restrictions and limitations with an existing Bridge Load Posting Sign for single unit (SU) and Class 1 Trucks at 12 Tons and 21 Tons, respectively. The load posting on the bridge poses a significant issue for the residents of Atlantic Isle since garbage trucks, as well as trucks transporting concrete, building materials/demolition debris, and other urban goods, may not be within an adequate weight range to cross the bridge. As trucks are restricted to smaller loads when crossing the bridge and are forced to make several circuitous trips to transport freight, unnecessary truck traffic is being added to the surrounding roadway network. In some cases, fire trucks, emergency vehicles, delivery or moving vans, and construction vehicles also exceed the posted bridge load limit. Overweight vehicles accessing neighboring properties must complete a crossover requiring special procedures such as the use of flagmen in order to proceed. Given these conditions, the bridge does not meet the current transportation needs of the community.

1.1.1 Bridge Deficiencies

As previously noted, the bridge has a sufficiency rating of 40.9 and a health index of 60.39. Existing functional deficiencies observed during the bridge inspection in September 2022 include substandard traffic barriers, multi-directional cracks in the asphalt overlay, and missing oolitic limestone on some areas of the north face of the arch. The southwest corner along the underside edge and the south side of the arch have spalls and delamination with exposed steel and areas of corrosion stains throughout the length of the arch along the fallen coral rock. In addition, the arch underside has a core hole at the center of the mid-span and exhibits delamination at random locations.

1.1.2 Modal Interrelationships

The project's surrounding land use is residential. The two bridges at the entrance of Atlantic Island (reconstructed in 1993) are approximately 0.14 mile from the intersection at Atlantic Avenue and include a barrier-separated pedestrian pathway on the south side of the bridges that connects to the existing sidewalk along SR A1A. There are no existing pedestrian or bicycle facilities along Atlantic Avenue or Atlantic Isles on the island, but field reviews confirmed that pedestrians on Atlantic Avenue use the roadway pavement and bridge. No bus service is available on Atlantic Island, but the Sunny Isles Beach Shuttle includes three routes (Orange Line #1, Orange Line #2, and Blue Line #3) that operate along SR A1A, and a bus stop (Bus Stop #40) is located just outside the community on the west side of SR A1A just south of Atlantic Avenue. The Miami-Dade County Transit service also has Limited-Stop Service and North-South Local Stop Service along SR A1A, but there are no stops that serve Atlantic Island.

1.1.3 Emergency Evacuation

Atlantic Isles and Atlantic Avenue are not identified as designated evacuation routes. However, they are the only existing roadways and are needed to effectively evacuate Atlantic Island. Residents along Atlantic Avenue could exit Atlantic Island in an emergency without using Atlantic Isle Bridge by driving the opposite direction of travel along the one-way road. However, it would be difficult for large emergency vehicles to make turnaround movements on Atlantic Avenue. The bridge provides evacuation function based on the existing roadway network.

1.2 PROJECT DESCRIPTION

The Atlantic Isle Bridge was constructed in c. 1925 and is located on Atlantic Avenue which is approximately 0.25 miles in length and is a one-way eastbound, undivided roadway that serves residential traffic and service vehicles. Atlantic Isle is a two-way, east-west residential roadway that intersects with Atlantic Avenue and is located on the south side of the Atlantic Isle Lagoon. There are approximately 14 residential properties along Atlantic Avenue that use the bridge to access their properties on the one-way roadway. The functional classification for both facilities is local road. The roadways on Atlantic Island are owned, operated, and maintained by the City of Sunny Isles Beach including the Atlantic Isle Bridge.

The Atlantic Isle Bridge spans approximately 60 feet over a narrow channel between the Lake of the Isles (Atlantic Isle Lagoon) and Biscayne Bay. The west and east bridge approaches are approximately 16 feet wide. The bridge typical section is approximately 20 feet wide with one 10-foot-wide travel lane in the center, and includes a planter easement, curbs, and barrier walls on both sides. Bicyclists and pedestrians must share the 10-foot-wide travel lane to cross the bridge as no sidewalks are provided on the existing facility.

The bridge is open to vehicular traffic that meets posted weight restrictions and is used for access to the residential properties on Atlantic Avenue. The Atlantic Avenue roadway typical section east and west of the bridge consists of 16 feet of pavement utilized by one-way traffic with curb and gutter on the outside. The posted speed limit along Atlantic Isle and Atlantic Avenue is 20 miles per hour. **Figure 1-2** shows the current traffic pattern at the project location, as well as the project study area. The project study area is within the historic triangular landscape of the Atlantic Island Park [Florida Master Site File (FMSF) No. 8DA6433], which is both privately and publicly owned.

Figure 1-2 Project Study Area

1.3 PROJECT BACKGROUND

In 2016, FDOT conducted a feasibility study to identify bridge rehabilitation alternatives to better serve the needs of the community and to preserve the service life of the Atlantic Isle Bridge. The results of the feasibility study are documented in the *Atlantic Isle Lagoon Bridge Proof of Concept Report* finalized in September 2016. The 2016 *Proof of Concept Report* evaluated several alternatives to rehabilitate the bridge which included reusing the existing concrete arch, replacing the existing arch with a new CIP reinforced concrete arch, reconstructing the existing bridge with a new precast concrete structure, and preserving the existing bridge with minor repairs but without any bridge rehabilitation. The study resulted in the identification of a preferred alternative to reuse the existing concrete arch.

Based on the feasibility study, FDOT prepared rehabilitation design plans based on the preferred alternative. The location of foundations was coordinated with the FDOT District Six geotechnical and maintenance staff. Results from borings and excavations were not conclusive at the bridge approaches, and excavation of both approaches were required to complete the rehabilitation design plans. However, since excavation of the bridge approaches had the potential to have an adverse effect on the bridge, FDOT discontinued the bridge rehabilitation design until further study of a range of alternatives could be analyzed for environmental effects. In 2016, a CRAS was conducted for the rehabilitation of the bridge. The CRAS resulted in the determination that the Atlantic Island Bridge (8DA6433) was National Register-eligible under Criteria A and C in the areas of Community Planning and Development and Architecture for its association with the development of the Atlantic Island subdivision and Sunny Isles Beach, as well as its unique design. The SHPO concurred on the determination of eligibility on August 23, 2016. However, the project was placed on hold due to the complexities of testing the bridge approaches.

Subsequently, FDOT initiated the current PD&E Study in September 2020 to fully evaluate all potential alternatives including a replacement alternative. Prior to the initiation of the PD&E Study, an Efficient Transportation Decision Making (ETDM) Programming Screen was completed in February 2020. An updated CRAS was conducted in 2022 to incorporate all potential alternatives during the current PD&E Study. The 2022 CRAS resulted in the confirmation that the Atlantic Island Bridge (8DA6433) remained National Register-eligible and resulted in the documentation and identification of three additional National Register properties (the Atlantic Island Resource Group (8DA19241), with two contributing resources, the Lake of the Isles (8DA15824) and Atlantic Island Park (8DA15825).

Alternatives evaluated for the current PD&E Study, included the No Action and Build Alternatives. Potential build alternatives include the Rehabilitation Alternative (Build Alternative #1) or the Replacement Alternative (Build Alternative #2) of the bridge. The following provides an assessment of each alternative.

1.3.1 No-Action Alternative

The No-Action Alternative maintains the existing bridge and roadway approaches in their existing condition and includes no rehabilitation of the existing bridge superstructure or substructure. The No-Action Alternative involves minor maintenance repairs in an attempt to extend the functional use of the bridge as recommended by routine bridge inspections until future inspections require reduced loading capacity or bridge closure. In the existing condition, the bridge is functionally obsolete. The bridge rating is below a sufficiency rating of 50 and is eligible for replacement per FHWA policy. The bridge is nearing the end of its service life and displays exposed rebar and multiple instances of cracking, delamination, and spalls, which vary in size and severity on the soffit and sides of the bridge. The exterior oolitic limestone-covered walls also show cracks up to 1 inch wide. The posted weight restrictions would be maintained in the No-Action Alternative and increased as needed based on future maintenance inspections. A geotechnical investigation performed in March 2021 was initiated to determine the size and type of the existing foundations; however, the investigation was inconclusive, and the bridge was classified as having “unknown foundations.” The remaining service life of the bridge is unknown because of the age of the structure (approximately 95 years) and the bridge will continue to deteriorate even with routine maintenance. Similarly, the aesthetic appearance (oolitic limestone) will continue to deteriorate. The No-Action Alternative would not preserve the aesthetic façade or the historic integrity of the bridge. The No Action Alternative does not meet the project's purpose and need, it is not recommended as the Preferred Alternative.

1.3.2 Build Alternative #1-Rehabilitation Alternative

The Rehabilitation Alternative (Build Alternative #1) involves rehabilitation of the existing bridge superstructure, providing a new CIP reinforced concrete arch structure, and maintaining one-way travel on the bridge. The roadway width will be maintained, but the typical section and vertical roadway geometry will be impacted to accommodate the retrofitted structure depth. Because of the age, unknown size, and type of the existing bridge foundations, this alternative is anticipated to require the new arch to be supported on new deep foundations. The proposed new arch would extend beyond the ends of the existing concrete arch and foundations to avoid the existing foundation removal costs and the associated risks that could impact the adjacent residential property foundations and structures. A new bridge substructure (abutments and foundations) would be constructed to support the rehabilitated bridge superstructure. During construction, the existing substructure and the superstructure will remain to support the existing concrete arch and exterior limestone façade.

The proposed arch and foundations would provide a new load-carrying structure that meets design live load requirements in accordance with current FDOT guidelines and would allow the posted bridge loading restrictions to be removed. The proposed arch and new foundations also would support the load of the existing portions of the bridge remaining in place. The new structural arch would connect to the existing arch and façade from above the existing foundations, rendering the existing foundations redundant and eliminating the inherent uncertainty of the unknown load-carrying capacity of the existing foundations. Therefore, future deterioration of the existing foundations would have no adverse impact on the rehabilitated bridge. The design life of the new arch and foundations of the rehabilitated bridge would be 75 years. The longevity of the retained portions of the existing bridge would be dependent on the commitment to repair and maintain the mostly non-structural oolitic limestone façade and underside stucco of the existing arch.

The Rehabilitation Alternative requires temporary roadway widening and a turnout along Atlantic Avenue to maintain two-way access during construction. The turnout would be temporary and removed after rehabilitation of the bridge is complete. The temporary roadway turnout is proposed west of the bridge to accommodate maintenance of traffic. The temporary turnout would require temporary walls (either gravity or sheet pile wall-types). All wall options would require excavation of the soil or installation via driving or vibratory methods near the waterline of the Atlantic Isle Lagoon. The wall is considered temporary and could be removed following completion of the bridge construction work and elimination of the temporary turnouts.

1.3.1 Build Alternative #2-Replacement Alternative

The Replacement Alternative (Build Alternative #2) involves replacing the entire bridge to address the structural and functional deficiencies of the existing superstructure and substructure to enhance operations and remove load restrictions. This would require demolition of the existing bridge and replacement of the bridge at the same location to minimize overall environmental impacts. The proposed bridge typical section would be approximately 27 feet wide to accommodate one 10-foot-wide travel lane, one 8-foot-wide shared use path, 3-foot-wide shoulders, and concrete traffic railings on both sides. A raised sidewalk would separate pedestrians from vehicular traffic.

New approach retaining walls would replace the existing retaining walls. A new, non-structural oolitic limestone façade would be placed along the exterior faces of the traffic railings and retaining walls to provide aesthetics similar to the existing bridge. A slightly longer bridge span may be required to span over portions of the existing unknown foundations which may not be able to be removed, in order to eliminate potential conflicts and enhance constructability. Limestone rock fill with roadway pavement will be placed on the new arch structure. New approach retaining walls will replace the existing retaining walls. In addition, a new rubble oolitic limestone façade would be placed along the exterior faces of the vertical shape barriers and retaining walls to mimic the existing structure. New bridge approach slabs are anticipated and would be the standard length of 20 feet each.

The Replacement Alternative requires temporary roadway widening and a turnout along Atlantic Avenue to maintain two-way access during construction. The turnout would be temporary and removed after rehabilitation of the bridge is complete. The temporary roadway turnout is proposed west of the bridge to accommodate maintenance of traffic. The temporary turnout would require temporary walls (either gravity or sheet pile wall-types). All wall options would require excavation of the soil or installation via driving or vibratory methods near the waterline of the Lake of the Isles (Atlantic Isle Lagoon). The wall is considered temporary and could be removed following completion of the bridge construction work and elimination of the temporary turnouts.

1.3.2 Temporary Traffic Control

Both Build Alternatives involve consideration of temporary traffic control (TTC) during construction. Temporary roadway widening for both Build Alternatives is required to maintain two-way access along Atlantic Avenue west of the bridge during construction. For these alternatives, a temporary roadway turnout is proposed west of the bridge to accommodate turn-around traffic. The temporary turnout would require temporary walls for both Build Alternatives. Either gravity or sheet pile wall types would be required. All wall options would require excavation of the soil or installation via driving or vibratory methods near the waterline of the Atlantic Isle Lagoon. For both alternatives, the wall is considered temporary and could be removed after completion of the bridge construction work and elimination of the temporary turnouts. **Figure 1-3** illustrates the potential roadway section through the gravity wall limits.

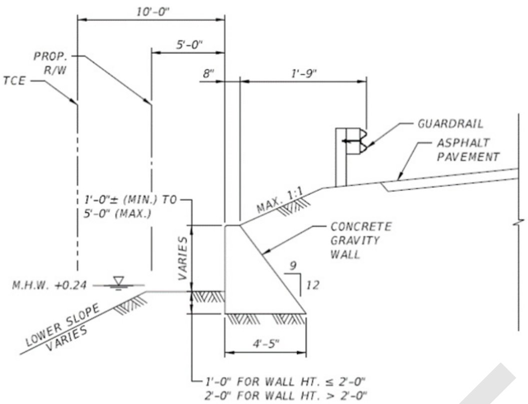


Figure 1-3 Roadway Section Through Gravity Wall Limits

1.3.3 ROW Considerations

For both Build Alternatives, the proposed improvements would be constructed within the existing ROW. However, to accommodate temporary bi-directional access during construction, Atlantic Avenue would require widening, and additional temporary ROW at the turnout locations would be needed (refer to the concept plans in Appendix B). Both Build Alternatives require minor widening of Atlantic Avenue, which is proposed on the south side of the roadway to avoid ROW acquisition from the residences to the north. Approximately 0.02 acre of temporary ROW is estimated to accommodate the TTC for both Build Alternatives.

1.3.4 Preferred Alternative

After the Alternatives Public Meeting held on June 23, 2022, and follow-up meetings/presentations with the City of Sunny Isles Beach, and City of Sunny Isles Beach Historic Preservation Board, FDOT has selected Build Alternative 2 as the Preferred Alternative. The Preferred Alternative was selected because of public input, lower risks and cost, and improved bridge functionality and safety. The No-Action Alternative remains an alternative throughout the PD&E Study and forms a basis for comparison to the Build Alternatives.

This alternative will not require any ROW, however 0.03 acres of temporary ROW from one privately owned parcel and one City owned parcel is needed. No residences or businesses will be displaced as a result of the Preferred Alternative. **Appendix A** presents the Preferred Alternative concept plans.

1.4 REPORT PURPOSE

This Conceptual Drainage Report identifies the project's drainage requirements and possible challenges that may affect drainage and will help determine the overall stormwater management approach. This report also includes a preliminary drainage analysis and data that will support drainage in the design phase for the project.

The primary vertical datum for this report and other calculations for the project are based on North American Vertical Datum (NAVD) of 1988. The conversion to the National Geodetic Vertical Datum (NGVD) is as follows:

NAVD88 = NGVD29 - 1.55 feet

2.0 EXISTING CONDITIONS

2.1 EXISTING ROADWAY CONDITIONS

2.1.1 Existing Roadway Typical Section

The western roadway approach of Atlantic Avenue to the Atlantic Isle Bridge is 16 feet wide and approximately 610 feet in length. The roadway is bordered by a type “F” curb and gutter and drainage inlets on both sides of the roadway, as well as existing lighting on the north side. The total right-of-way (ROW) width is 60 feet, with approximately 13 feet of horizontal clearance from the south side of the roadway to the tree line surrounding the Atlantic Isle Lagoon.

The eastern roadway departure of Atlantic Avenue from the Atlantic Isle Bridge is 16 feet wide and approximately 180 feet in length. Like the west approach, the roadway is bordered by a type “F” curb and gutter and drainage inlets on both sides of the roadway, as well as existing lighting on the north side. The total ROW width is 60 feet, with approximately 15 feet of horizontal clearance from the south side of the roadway to the tree line surrounding the Atlantic Isle Lagoon. Additionally, the east and west intersections of Atlantic Avenue and Atlantic Isles have no stop or yield conditions, which poses a safety issue. The existing typical section for Atlantic Avenue is presented on Figure **2-1**.

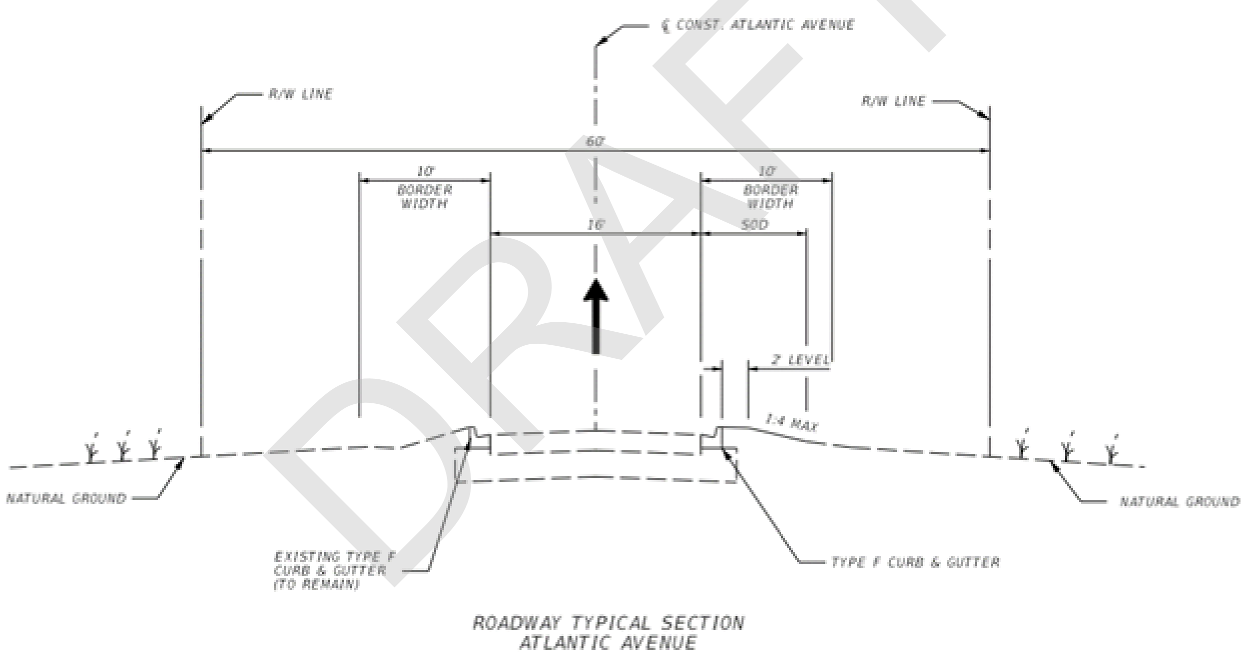


Figure 2-1. Existing Atlantic Avenue Roadway Typical Section

2.1.2 Right-of-Way

The entire length of Atlantic Avenue, including the Atlantic Isle Bridge, has an existing ROW width of 60 feet, 30 feet on each side of the roadway centerline alignment. Figure 22 presents a map of the City of Sunny Isle Beach ROW limits and the private property lines. ROW limits for this project were determined from the June 2008 City of Sunny Isles Beach Atlantic Isles Roadway and Utility Improvements As-Built Plans (CGA Project 05-4893), ROW survey, and survey data from the 2016 feasibility study noted previously.

2.2 EXISTING BRIDGE CONDITIONS

Within the project study limits, the only structure is the Atlantic Isle Bridge (Bridge No. 874218). **Figure 2-2** provides a view of the bridge from the western end. The existing bridge spans over the Atlantic Isle Lagoon.

Figure 2-2. Atlantic Isle Lagoon Bridge – Northeastern View

2.2.1 Existing Bridge Typical Section

The existing bridge typical section, as depicted on **Figure 2-3**, the existing bridge typical section consists of one 10-foot-wide traffic lane and 8-inch-wide raised curbs on both sides. The overall width of the bridge is 20 feet, which accommodates the one-way travel lane centered over the bridge with type "D" curbs and a 2.5-foot-wide planter easement with a bed of river rock stone between the curb and the concrete arch walls on each side. The bridge spans approximately 43 feet over the waterway. The concrete arch walls rise above the roadway to provide parapets, which also serve as traffic barriers. The posted speed limit in the vicinity of the bridge is 20 mph.

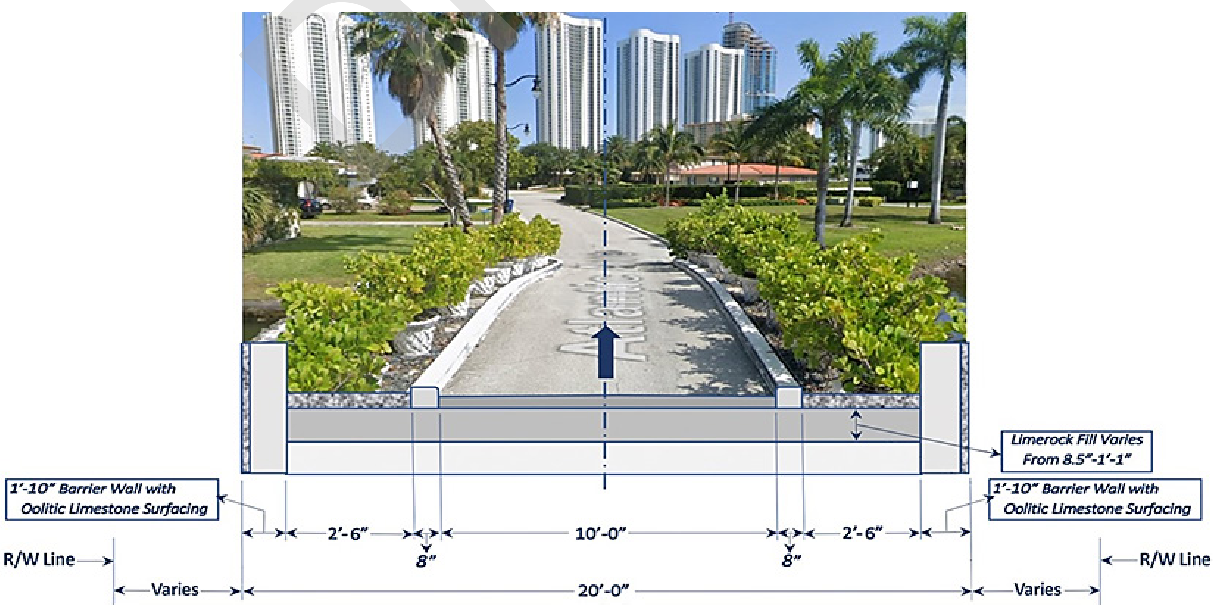


Figure 2-3. Existing Atlantic Avenue Bridge Typical Section

2.2.2 Type of Structure, Current Conditions, and Year of Construction

The Atlantic Isle Bridge has a span length of approximately 43 feet. The bridge is a filled spandrel CIP reinforced concrete arch, with spandrel walls extending vertically to form the bridge parapets. The superstructure type is unknown since there are no existing As-Built plans or other detailed information available. Table 2-1 presents additional bridge characteristics.

Table 2-1 Summary of Existing Bridge Characteristics

Year Built	Mile Post*	Bridge Length* (ft)	Max. Span Length* (ft)	Superstructure Type	Substructure Type	No. of Spans	Bridge Width (ft)	Traffic Railing Type
1925	0.26	43	43	Cast-in place reinforced concrete arch	Unknown	1	20	Spandrel Wall Parapets

2.3 GEOTECHNICAL CONSIDERATIONS

2.3.1 Soils Information

Two separate Geotechnical Exploration tests were performed at different core boring locations for soils information along the Atlantic Avenue/Isles and at the bridge approaches. The first exploration includes the Corrosion Classification test summarized in Table 2-2 below. Corrosion series test was performed on a water sample collected from the performed SPT Boring RW-2. The testing was performed in accordance with Florida Method, Designations FM5-550 through FM5-553 and included pH, chlorides and sulfates contents, and resistivity testing. The second test information concerning the site and the structural subsurface conditions in the area of the proposed bridge rehabilitation or replacement based on the available test borings, presents our findings and evaluation, and includes the following items; and provide an evaluation of the suitability of the in-situ materials and preliminary recommendations for different foundation alternatives. Exhibit B includes an excerpt of the geotechnical test reports. **Figure 2-4** shows test boring locations.

Table 2-2 Summary of Environmental Classification

BOR #	Location (Lat/Long)	Sample Depth (ft)	pH	Resistivity (ohms-cm)	Sulfates (ppm)	Chlorides (ppm)
RW-2	25.92758 / -80.12662	2	8.0	16.0	77.0	1204.0

ppm = parts per million

The results show that both steel and concrete substructures will be in an Extremely Aggressive environment. Due to their locations, the superstructures are considered to be in an Extremely Aggressive environment.

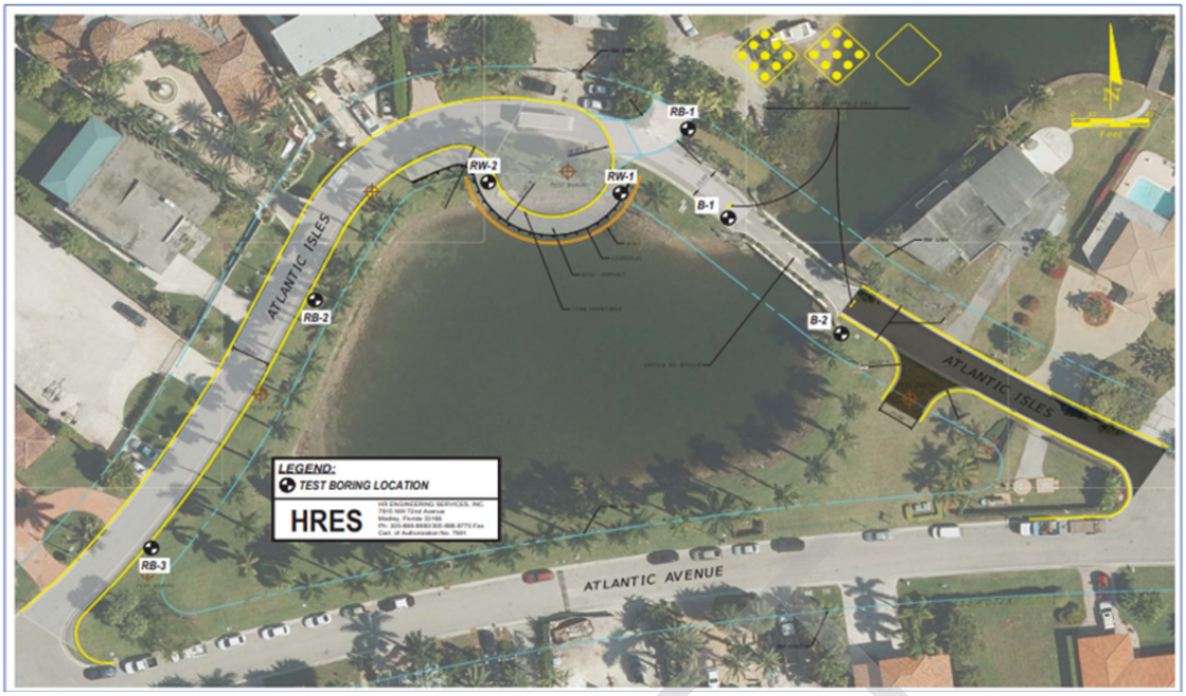


Figure 2-4 Core Boring Locations

3.0 STORM WATER MANAGEMENT

3.1 EXISTING PERMITS

The original construction of the Atlantic Avenue Bridge No. 874218 resulted from the following permitting agreements for storm drainage from local Miami-Dade Department of Regulatory and Economic Resources (MD-RER) with emergency overflows into the Intracoastal Waterway.

(MD-RER) Existing Permits

- Class II Permit Agreement Number OF-484 dated March 2, 1993
- Class II Permit Agreement Number OF-484 dated May 20, 1993
- Class II Drainage Construction Permit No. 2008-CLII-PER-00021

SFWMD Existing Permits

- There are no known SFWMD ERPs for the existing bridge and drainage system. This project was presented at the July 2022 interagency meeting to SFWMD. See Appendix I for a copy of the Interagency Meeting Minutes.

3.2 REQUIRED PERMITS

Based on the above two alternatives of this PD&E study, the anticipated permits will involve coordination with South Florida Water Management District (SFWMD), Miami-Dade County Department of Regulatory and Economic Resources (MDC DRER), Florida Department of Environmental Protection (FDEP), and the United States Coast Guard (USCG).

A. South Florida Water Management District (SFWMD)

a. **Environmental Resource Permit (ERP)**:

- For temporary and permanent impacts to surface waters and/or jurisdictional wetlands and drainage improvements to address additional impervious area.
- Impacts to natural resources will require assessment to determine if seagrass or mangrove impacts may occur at the bridge if minor construction staging and/or widening is warranted.

b. **Water Use Permit:**

- Dewatering requirements to be determined and permitted by the contractor. provide

B. Miami-Dade County Department of Regulatory and Economic Resources/DRER

Class I: Required for mangrove impacts and construction activities performed in, on or upon tidal water or coastal wetlands located within MDC. The Class I is needed since the project corridor is not a part of the State Roadway System and is regulated under the authority of MDC. Construction related activities that extends beyond FDOT Right of Way and encroaches within the Atlantic Isles Lagoon is anticipated to warrant a Class I permit review.

Class II: Required to control stormwater discharge to any surface water in MDC. Stormwater runoff generated from the widened roadway may also require MDC Class II permit authorization in addition to the SFWMD ERP since the corridor is located off the FDOT State Roadway system.

C. Class V: Required for any dewatering of groundwater, surface water or water which has entered into an underground facility, excavation or trench. Dewatering requirements to be determined during construction and permitted by contractor.

D. Florida Department of Environmental Protection (FDEP)

All projects with soil disturbing activities 1 acre or greater (excluding milling and resurfacing) will be governed by the FDEP NPDES Stormwater Construction Generic Permit (CGP). This permit constitutes authorization to discharge stormwater associated with large and small construction activities to surface waters of the state, including through a Municipal Separate Storm Sewer System (MS4).

a. **National Pollutant Discharge Elimination System (NPDES**): required for soil disturbance exceeding 1-acre.

b. **Sovereign Submerged Lands Easement (SSL):** Lands located ten feet (10’) waterward of the ordinary or mean high water line or beneath tidally influenced waters.

E. U.S. Army Corps of Engineers (USACE)

Section 10/404: Required for temporary and permanent impacts to tidal Waters of the U.S. This project requires minor dredge and/or fill impacts due to the bridge rehabilitation/reconstruction and widening that are over and adjacent to surface waters, respectively. Dredge-and-fill impacts extending below the mean high-water line warrant a USACE Section 10/404 authorization. **Table 3-1** summarizes the different environmental permitting requirements along with the representative regulatory agencies.

Table 3-1 Permits Required

Alternatives	SFWMD ERP	USACE Section 404 & USACE Section 10	FDEP NPDES	MDC DRER Class I	MDC DRER Class II	SSL Easement
Alternative 1: Bridge Rehabilitation	X	X	X	X		
Alternative 2: Bridge Replacement	X	X	X	X	X	X

* Contractor shall be responsible for obtaining FDEP NPDES CGP and state/local water use permit(s) for dewatering activities (if required).

3.3 LAND USE EVALUATION

The following land use table indicates the pre vs post condition of the total area contributing to the existing drainage system. For Build Alternative 2 (Bridge Replacement), an additional impervious area together with the increase of the total area can be found in the post development condition. This is due to the fact that the reconstruction of the bridge would require an increase in the total area contributing to the exiting drainage system.

Table 3-2 Land Use Summary

Development	Pervious Area (acres)	Impervious Area (acres)	Total Area (acres)
Pre	1.57	3.06	4.63
Post	1.57	3.08	**4.65**
Additional Impervious Area	**0.02**		

3.4 WATER QUALITY CRITERIA

SFWMD requires that all projects meet state water quality standards. To ensure that these criteria are met, the transportation improvements must meet the following volumetric retention/detention requirements, as described in the SFWMD Environmental Resource Permit Information Manual, Applicant's Handbook Volumes 1 & 2.

1. For wet detention systems, the first inch of runoff from the project or the total runoff from 2.5 inches' times the percent impervious, whichever is greater, would be detained on-site. A wet detention system is a system that maintains the control elevation at the seasonal high ground water level and does not lose more than ½ inch of detention volume in 24 hours.

2. Dry detention systems are required to provide only 75 percent of the required wet detention volume. Dry detention systems must maintain the control elevation at least one foot above the seasonal high ground water elevation; and

3. Retention systems are required to provide only 50 percent of the wet detention volume. Projects with more than 50 percent imperviousness, which discharge to the receiving water bodies, shall be conveyed through baffles, skimmers, or other devices which inhibit the discharge of oil and grease to and from retention/detention areas.

4. **The project discharges into Biscayne Bay, OFW, and WBID 3226H**1 (Intracoastal Waterway [Miami-Dade County Northern Segment]), a verified impaired waterbody for nutrients including total nitrogen and Chlorophyll-a. An additional 50% treatment volume and a pre vs post nutrient analysis is required by SFWMD.

3.5 STORMWATER QUALITY CALCULATIONS

A preliminary water quality calculation was made to evaluate the current condition of the existing water treatment system Atlantic Isle has, and it was determined that the system was substandard selected and constructed, meaning that the pre and post conditions would not be able to be treated by the existing water treatment system following the minimum requirements. Calculations from previous DRER permit can be found in Exhibit A-2.

Moreover, the post development condition was calculated following the SFWMD and DRER criteria. The most critical criteria were determined by DRER, requiring a minimum volume to be treated of 0.717 ac-ft for a frequency of 10 years. That volume would require a system twice bigger than the current water treatment system, which is a Vortechs Model 5000. According to CONTECH (Vortechnics ®), the model to be used to comply with this minimum Volume would be a model 11000. See Appendix G and Exhibit A-2 for more information.

However, although upgrading the capability of the existing water treatment system is a need, during an interagency meeting conducted with SFWMD on June 2022, it was determined that the upgrade of the current system is not required since it was originally accepted to be constructed as indicated in the plans submitted to SFWMD. In that case, since the current system has no capacity for additional impervious area, that area shall be treated by a proposed water treatment system.

The impervious area and the total area of the drainage system would be increased by 0.02 acres. The project will need to provide additional water treatment and mitigation before discharging into the bay. The system proposed during this phase would be French Drains or Continues Deflective (hydrodynamic) Separators (CDS).

Regarding French Drains, a percolation test would have to be conducted in order to determine the conductivity of the soil; moreover, due to the fact that this is a tidal influence location, the engineer will have to evaluate how feasible would be to construct French drains in this area.

On the other hand, CDS have demonstrated to provide a good level of treatment to stormwater, and it is used to meet trash Total Maximum Daily Load (TMDL) requirements, for inlet and outlet pollution control, and as pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and Low Impact Development designs. The selection of CDS and the number of them to comply with the minimum water quality and the warning stages will have to be determined together with the manufacturer, who will be providing the specifications and certifications of the control structure. For more information about operation, design, performance, and maintenance of CDS, refer to Exhibit C.

3.6 WATER QUANTITY CRITERIA

SFWMD has instituted numerous guidelines for water quantity. It is anticipated that the proposed stormwater management systems for this project will adhere to the following thresholds:

- limited offsite discharge rate not causing adverse impacts to the existing offsite properties.
- historic discharge rates
- rates determined in previous SFWMD permit actions
- rates specified in SFWMD criteria (SFWMD Permit Information Manual – Application 2)

However, since this project discharges to the intracoastal waterway, which is tidally influenced & downstream of any control structures, peak offsite discharge rates are not typically considered. The typical drainage consideration would be peak flood stages.

3.7 FEMA FLOODPLAIN ANALYSIS

The proposed bridge will perform hydraulically in a manner equal to or greater than the existing bridge. Backwater surface elevations are not expected to increase. As a result, there will be no significant adverse impacts on natural and beneficial floodplain values. There will be no significant change in floodplain risk, nor will there be a significant change in the potential for interruption, termination of emergency service, or emergency evacuation routes. Therefore, the encroachment is not significant if the bridge height is expected to remain the same and does not impede the floodplain at this location. A bridge hydraulic report will be prepared during the design phase to verify the replacement bridge height.

According to the revised 2009 Flood Insurance Rate Maps (FIRM) Community Panels 12086C0142L and 12086C0161L, the project study area is located within Flood Zone AE, where the base flood elevation has been determined to be 8 feet NGVD88 (6.45 feet NAVD). Refer to Appendix C for the FIRM Map.

3.7.1 Design High Water

The design high water (DHW) for coastal areas of Miami-Dade County and Monroe County is determined as follows using equation 3.2.3.4-1 of the FDOT *Exfiltration Trench Reference Manual* (FDOT 2020).

- DHW = (mean higher-high water [MHHW] elevation) + ([year of project design – 2001] * 0.00784) + (20* 0.00784).

Per the FDOT D6 *Design Guideline* (FDOT 2022), the approach used to determine the DHW for the project is either the value of equation 3.2.3.4-1- or 1-foot NAVD, whichever is higher.

- Assuming year of project design 2027
- MHHW = 0.38 FT-NAVD See Appendix E for MHHW
- DHW = 0.38 + (2027-2001) *0.00784 + (20*0.00784)

= 0.74 FT-NAVD

However, FDOT District 6 Drainage Department determined and adopted in 2018 a value of **2.00 foot-NAVD for the DHW** level within tidal influences areas. This criterion was developed during the development the *GIS Screening of State Highways Impacted by the Design High Water and Base Clearance Requirements in Miami-Dade County, FL Technical Memorandum* (FDOT 2018). That means the value to be considered as the DHW level for this project is 2.00 FT-NAVD. For more information about this study, refer to Appendix E-2.

3.7.2 Receiving Water Body

The water bodies include Biscayne Bay via the Intracoastal Waterway, where Biscayne Bay is classified as an Outstanding Florida Water and an Aquatic Preserve.

3.8 WELLFIELDS

No wellfields are located in the vicinity of the project limits. See Appendix A, Wellfield Map.

3.9 OUTSTANDING FLORIDA WATER (OFW)

The project limits are within the specified boundaries of the Biscayne Bay watershed, which is classified as an Outstanding Florida Water (OFW). This designation influences the water quality criteria applied to the project and the location of proposed outfalls. The South Florida Water Management District (SFWMD) requires an additional fifty percent treatment for systems that discharge directly into an Outstanding Florida Water. The entire watershed discharges into OFW; this criterion is paramount when calculating pre versus post discharge rates and selecting the preferred stormwater management facility.

3.10 WETLANDS AND SURFACE WATERS

The project study area includes an existing tidally influenced lagoon and narrow channel. The lagoon is connected to Biscayne Bay by the channel on the northeast point of the island. Several mangroves have established along the western shoreline of the channel and sapling red mangroves were documented colonizing the shallow banks of portions of the lagoon. No other natural features exist within the project study area because the remainder of the island consists of private residences.

The existing tidal waters have the potential to contain protected marine resources such as seagrasses and corals, as well as other EFH. Therefore, a benthic survey and shoreline characterization of the lagoon and channel area was performed in July 2020. This survey was conducted to document existing conditions and identify the presence or absence of natural resources and EFH, as well as any habitat for/presence of any threatened or endangered species (refer to **Figure 3-1**).

The survey identified mangrove resources along the western shoreline of the lagoon, as well as along the western bank of the channel adjacent to the bridge. The mangroves in the lagoon are small, immature red mangrove saplings (*Rhizophora mangle*) growing around the shorelines and slightly encroaching into the lagoon. Along the western bank of the channel, mature trees of both red and white mangrove (*Laguncularia racemosa*) were identified. Sparse and discontinuous occurrences of paddle grass (*Halophila decipiens*) were documented within the middle area of the lagoon. Shoal grass (*Halodule wrightii*) was found along some of the shallower shoreline areas of the lagoon where coverage ranged from sparse to dense. Other marine resources included green macroalgae (*Halimeda*), barnacles, and fish species.

Moreover, the engineering firm of Ribbeck Engineering Inc. was retained to provide engineering recommendations on scour potential for this bridge. Based on the description of the proposed works, and existing site conditions, it is our professional opinion that the proposed single span arch bridge construction will not be subject to scour condition. The following observations formed the basis of our opinion:

1. The existing canal is not a conveyance canal, but a manmade canal that was excavated to provide water connection between Atlantic Isle Lagoon (small lagoon) to the shallow water of Biscayne Bay Aquatic Preserve.
2. The proposed bridge has no associated significant watershed that will cause extreme flows to this canal.
3. The proposed bridge spans the width of the canal at its location, and the proposed abutments are set slightly outside the alignment of the existing abutments. Therefore, no canal contraction exists which will cause either contraction scour, or abutment scour.
4. The proposed bridge is a single span bridge with no piers in the canal. Therefore, no local or pier scour exists, and the installation of ripraps is not needed.
5. The proposed bridge low member elevation is slightly higher than the existing low member elevation. The bridge opening area at design water elevation of 2.00 NAVD is maintained.
6. The proposed bridge is located in FEMA flood zone AE with a static base flood elevation (BFE) of 8.00 NGVD (Firm ID 12086C0142L) and is outside the storm surge induced velocity area (VE). Therefore, storm induced velocity scour is not present.

These determinations are based on procedures and guidelines listed on HEC-18 “Hydraulic Engineering Circular No. 18 – Evaluating Scour at Bridges”.

Figure 3-1 Benthic Survey Results Map from June 24, 2020

4.0 DRAINAGE BASINS

4.1 EXISTING DRAINAGE SYSTEM

The existing roadway drainage consists generally of curb and gutter with valley gutter inlets and pipes that collect and convey the stormwater runoff. The existing bridge typical section allows for stormwater runoff from the bridge to sheet flow to Atlantic Avenue on each side of the bridge. The bridge has a crest vertical curve that conveys water to either end and then to the nearest curb inlet on Atlantic Avenue. conveyed via After being collected by curb inlets, stormwater drainage from the bridge drains directly into the Intracoastal Waterway after being treated.

Prior to discharge into the Intracoastal Waterway, stormwater runoff collected is conveyed toward an existing pollution control device (Contech Vortechs® Stormwater Treatment Model 5000). The treated runoff ultimately discharges into the Intracoastal Waterway via a 24-inch corrugated metal pipe. It is important to note that the existing stormwater treatment system does not meet current water quality criteria for DRER and SFWMD.

4.1.1 Existing Water Quality Treatment Calculations

The existing water quality treatment calculations for the Atlantic Avenue and Atlantic Isle drainage basin were referenced from the City of Sunny Isles Beach, FL Atlantic Isles Roadway and Utility Improvements as-built Project No. 05-4893 (refer to Exhibit A-2). No basin map was available to verify existing water quality calculations.

4.2 PROPOSED DRAINAGE SYSTEM

The existing drainage configuration will stay the same for the proposed condition; however, new drainage structures are anticipated to avoid any runoff encroachment beyond the maximum allowable spread. These drainage structures would be connected to the existing system. It is noted that the proposed bridge profile gradeline consists of (+) 8.001% and (-) 7.981%.

Because of the roadway widening during TTC, existing curb inlets would be temporary relocated.

The proposed drainage system would include, but is not limited to, the following:

- Placing additional drainage structures and pipes as needed to avoid runoff encroachment
- Cross-slope correction to eliminate localized ponding issues.

Moreover, as indicated in previous sections, an assessment about the current capacity of the treatment system is recommended. However, as indicated during an Interagency Coordination Meeting with SFWMD, the treatment would be required just to the additional impervious area.

4.3 OPTIONAL PIPE MATERIAL ANALYSIS

An optional pipe material analysis needs to be performed using FDOT's CSLE program with soil parameters provided by the geotechnical report for the study area. The FDOT-specified minimum required Design Service Life for this type of application is 100 years.

4.4 DESIGN REQUIREMENTS

The proposed stormwater treatment system will comply with the following requirements as noted in the FDOT *Drainage Manual* (FDOT 2023).

- Using storm event frequency of 10 years in the appropriate zone and excluding minor losses, the storm sewer system shall provide a minimum clearance of 1 foot from the hydraulic gradeline to the gutter elevation.
- The minimum pipe velocity shall be 2.5 feet per second.
- The minimum pipe diameter shall be 18 inches.
- Maximum distance between pipe access shall be 300 feet for pipe diameters of 18 inches, 400 feet for pipe diameters of 24 to 36 inches, and 500 feet for pipe diameters of 42 inches or larger.
- Install stormwater exfiltration systems at least 2 feet from parallel underground utilities and 20 feet from existing large trees that will remain in place.
- The calculated spread at each curb inlet shall be less than one-half of the width of the travel lane.
- Optional pipe material shall provide 100-year service life.
- Coastal projects must include a sea level rise analysis to evaluate the impacts to design. The data is determined by the National Water Level Observation Network and managed by the National Oceanic Atmospheric Administration (NOAA).
- For this report, the NOAA Station ID 8723170 in Miami Beach, Florida, will be used.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The drainage analysis was performed to meet criteria of agencies having jurisdiction within the study area, and found the following:

- The existing water quality treatment calculations used to select the pollution control structure (the Vortechs Model 5000) must be re-evaluated to consider the most stringent water criteria between SFWMD and DRER. Also, the allowable stormwater discharge capacity into the North Biscayne Bay must be verified by the project design firm. Water treatment and discharge attenuation is proposed in this report – refer to Appendix G. However, according to SFWMD, the water treatment for this project would be required just to the additional impervious area for this project.

- The proposed collection and conveyance drainage systems shall be adequate to meet FDOT spread criteria and to contain the stormwater runoff within the warning stages (grate elevation) of structure nodes for the 10-year storms.

- No riprap is needed around embankment under proposed bridge according to scour analysis.

- A widening is recommended along Atlantic Avenue during TTC to accommodate traffic and temporary relocation of drainage structures to collect the runoff. This would not adversely affect the existing drainage condition.

- Based on the evaluation of the existing drainage condition, the stormwater management facilities required to meet DRER criteria can be accommodated within the existing ROW.

6.0 REFERENCES

Florida Department of Transportation (FDOT). 2016. *Atlantic Isle Lagoon Bridge Proof of Concept Report*. December. Prepared by Hardesty and Hanover, LLC. September.

Florida Department of Transportation (FDOT). 2018. *Technical Memorandum, Rehabilitation of Bridge 874218 Atlantic Isle at West of SR A1A.* Prepared by Bolton Perez & Associates. May.

Florida Department of Transportation (FDOT). 2020. *District 6 Exfiltration Trench Reference Manual Final*. February. Prepared by A.D.A. Engineering Inc.

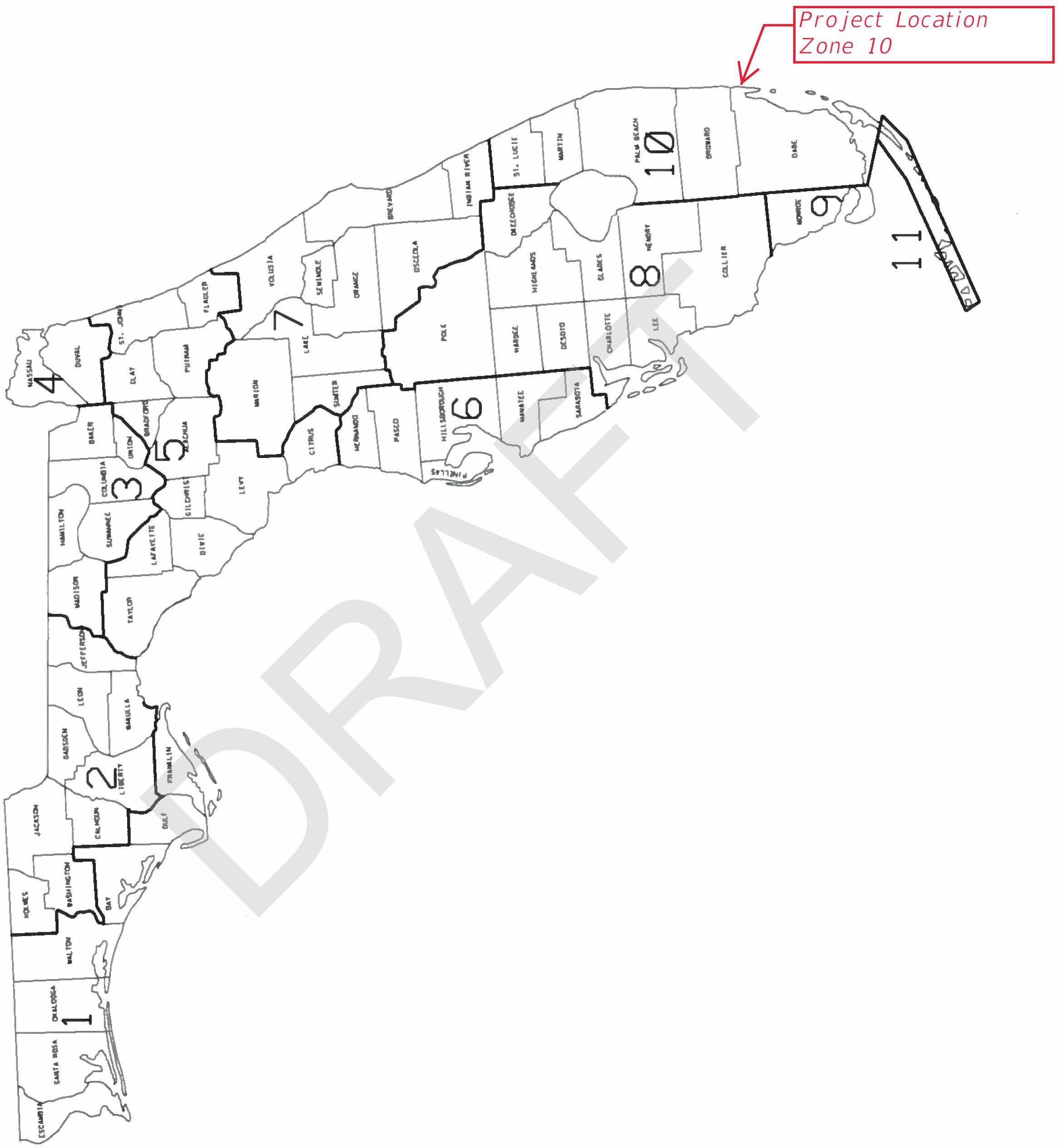
Florida Department of Transportation (FDOT). 2021. *Preliminary Report of a Geotechnical Exploration – Structures (Revision 2) Atlantic Isle Bridge (Bridge No. 874218) Rehabilitation or Replacement*. Prepared by HR Engineering Services, Inc. March 10.

Florida Department of Transportation (FDOT). 2023. *Drainage Manual*. Office of Design, Drainage Section. January.

South Florida Water Management District (SFWMD). 2020. *Environmental Resource Permit Information Manual*. Volumes 1 and II. December 22.

APPENDIX A - AIDS

ZONES FOR PRECIPITATION IDF CURVES DEVELOPED BY THE DEPARTMENT



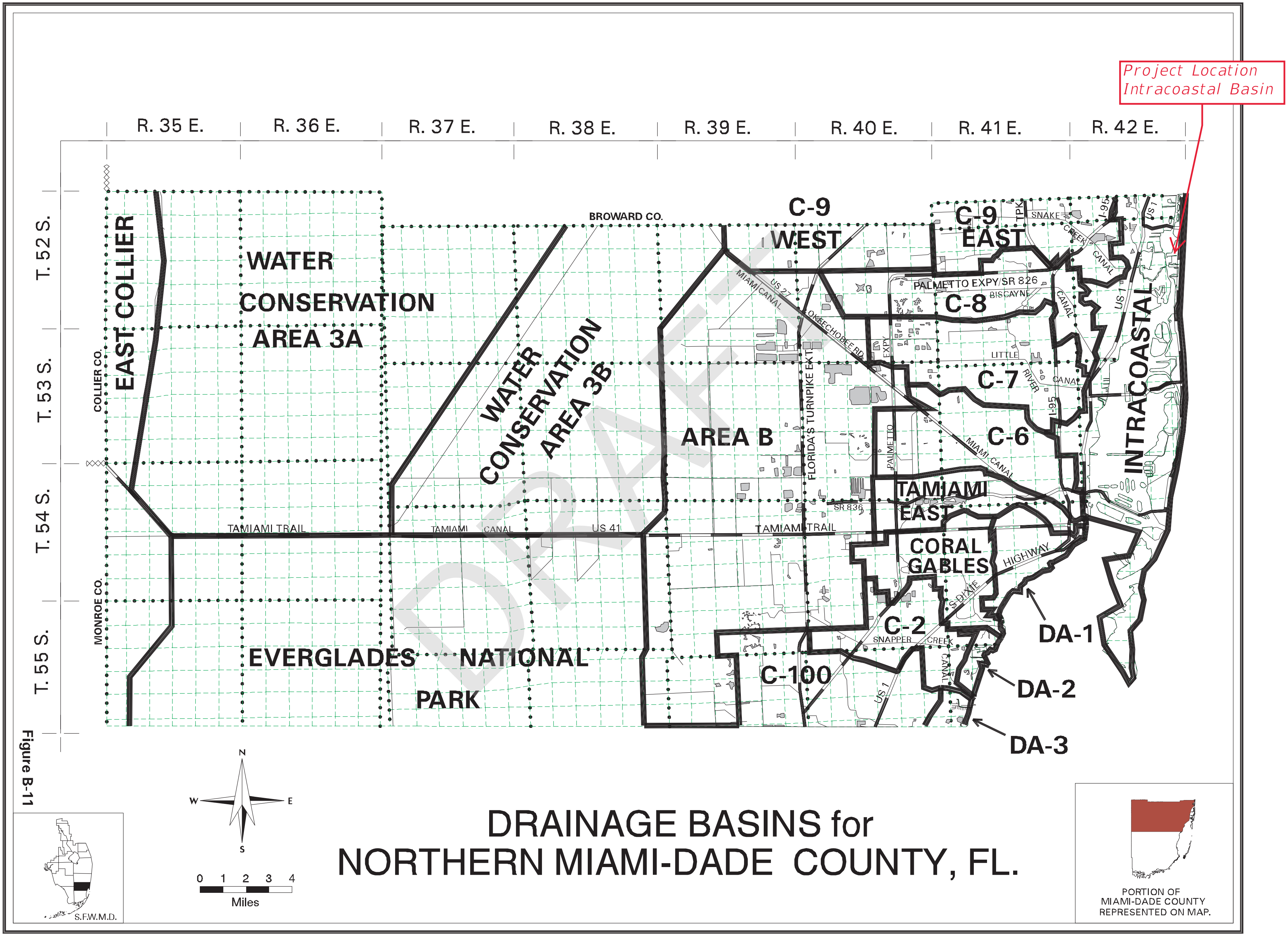
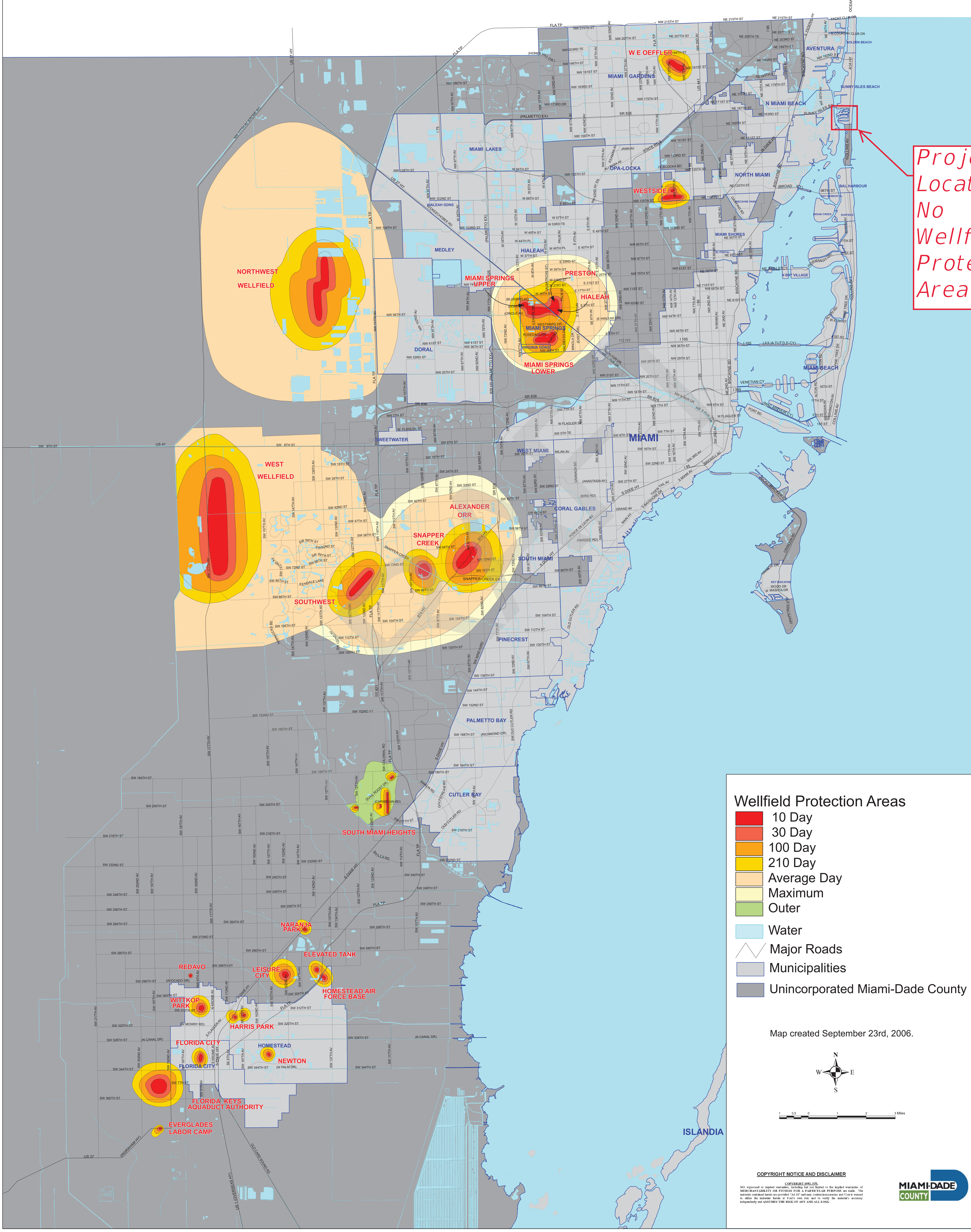

Project Location
Intracoastal Basin
R. 35 E.
R. 36 E.
R. 37 E.
R. 38 E.
R. 39 E.
R. 40 E.
R. 41 E.
R. 42 E.
T. 52 S.
T. 53 S.
T. 54 S.
T. 55 S.
COLLIER CO.
MONROE CO.
BROWARD CO.
EAST COLLIER
WATER CONSERVATION AREA 3A
WATER CONSERVATION AREA 3B
AREA B
C-9 WEST
C-9 EAST
C-8
C-7
C-6
TAMIAMI EAST
CORAL GABLES
C-2
C-100
INTRACOASTAL
DA-1
DA-2
DA-3
EVERGLADES NATIONAL PARK
TAMIAMI TRAIL
TAMIAMI CANAL
US 41
US 27
US 1
I-95
TPK
MIAMI CANAL
OKEECHOBEE RD
FLORIDA'S TURNPIKE EXT
PALMETTO EXPY/SR 826
PALMETTO
SR 836
SNAKE CREEK CANAL
BISCAYNE CANAL
LITTLE RIVER CANAL
SNAPPER CREEK CANAL
S. DIXIE HIGHWAY
DRAFT
N
S
E
W
0 1 2 3 4
Miles
S.F.W.M.D.
PORTION OF MIAMI-DADE COUNTY REPRESENTED ON MAP.
DRAINAGE BASINS for
NORTHERN MIAMI-DADE COUNTY, FL.

Figure B-11

Miami-Dade County

Wellfield Protection Areas



APPENDIX B - CONCEPT PLANS - PREFERRED ALTERNATIVE

CONTRACT PLANS COMPONENTS

STRUCTURES

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

CONTRACT PLANS

FINANCIAL PROJECT ID 430029-2-22-01

MIAMI-DADE COUNTY (87674)

ATLANTIC AVENUE BRIDGE REPLACEMENT

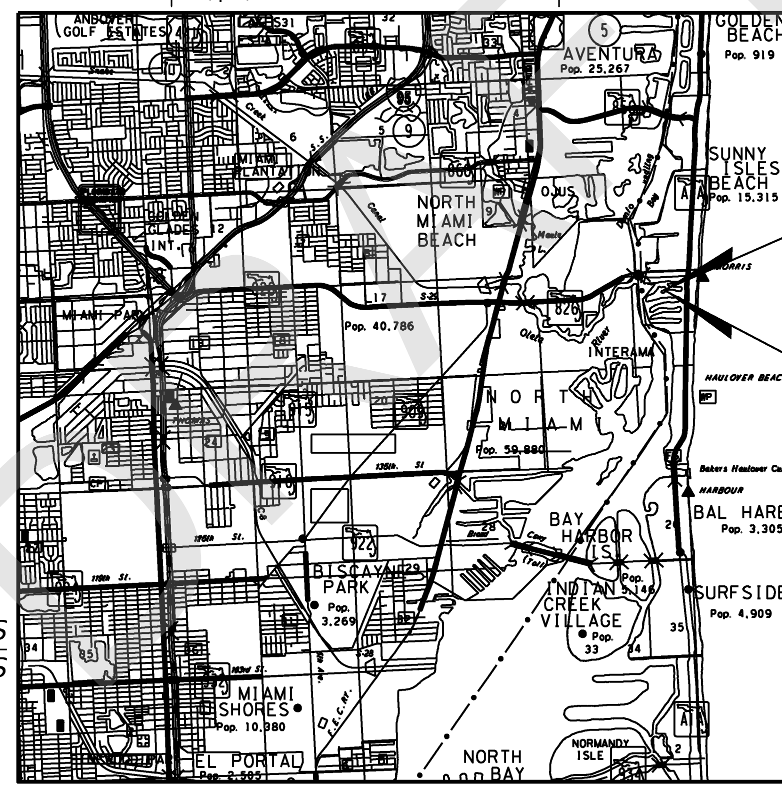
INDEX OF ROADWAY PLANS

TO FT. LAUDERDALE

R-41-E / R-42-E

TO HOLLYWOOD

T-51-S / T-52-S



BEGIN PROJECT
BEGIN BRIDGE
STA. 113+43.93
MP 0.255

END PROJECT
END BRIDGE
STA. 113+89.93
MP 0.264

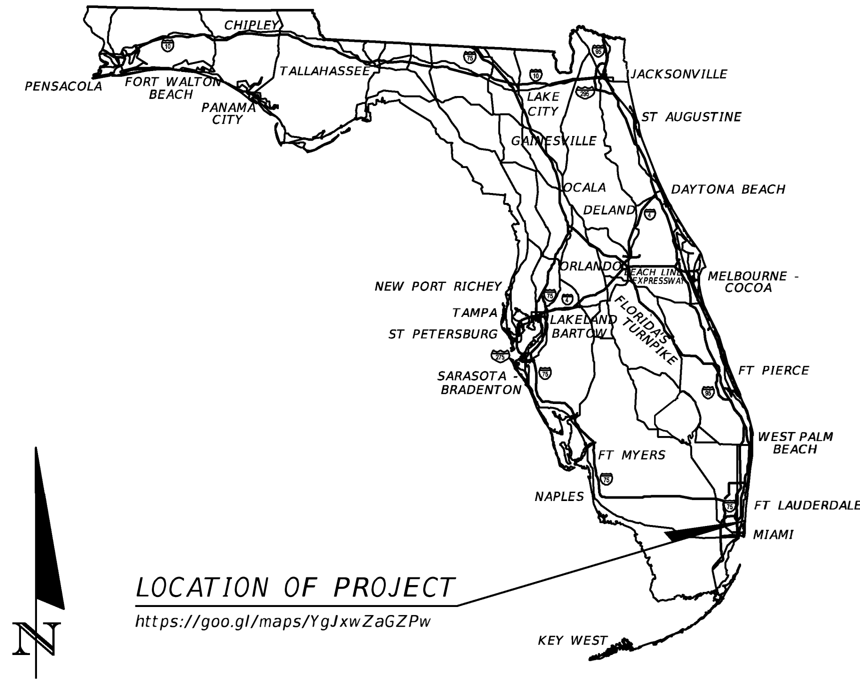
T-52-S / T-53-S

T-52-S / T-53-S

R-41-E / R-42-E

TO MIAMI

N



LOCATION OF PROJECT
https://goo.gl/maps/YgJxwZaGZPw

GOVERNING STANDARD PLANS:

Florida Department of Transportation, FY 22/23 Standard Plans for Road and Bridge Construction and applicable Interim Revisions (IRs).

Standard Plans for Road Construction and associated IRs are available at the following website: http://www.fdot.gov/design/standardplans

APPLICABLE IRs: IR___-___-__

Standard Plans for Bridge Construction are included in the Structures Plans Component

GOVERNING STANDARD SPECIFICATIONS:

Florida Department of Transportation, July 2022 Standard Specifications for Road and Bridge Construction at the following website: http://www.fdot.gov/programmanagement/Implemented/SpecBooks

DRAFT CONCEPT
NOT FOR CONSTRUCTION
NOVEMBER 2023

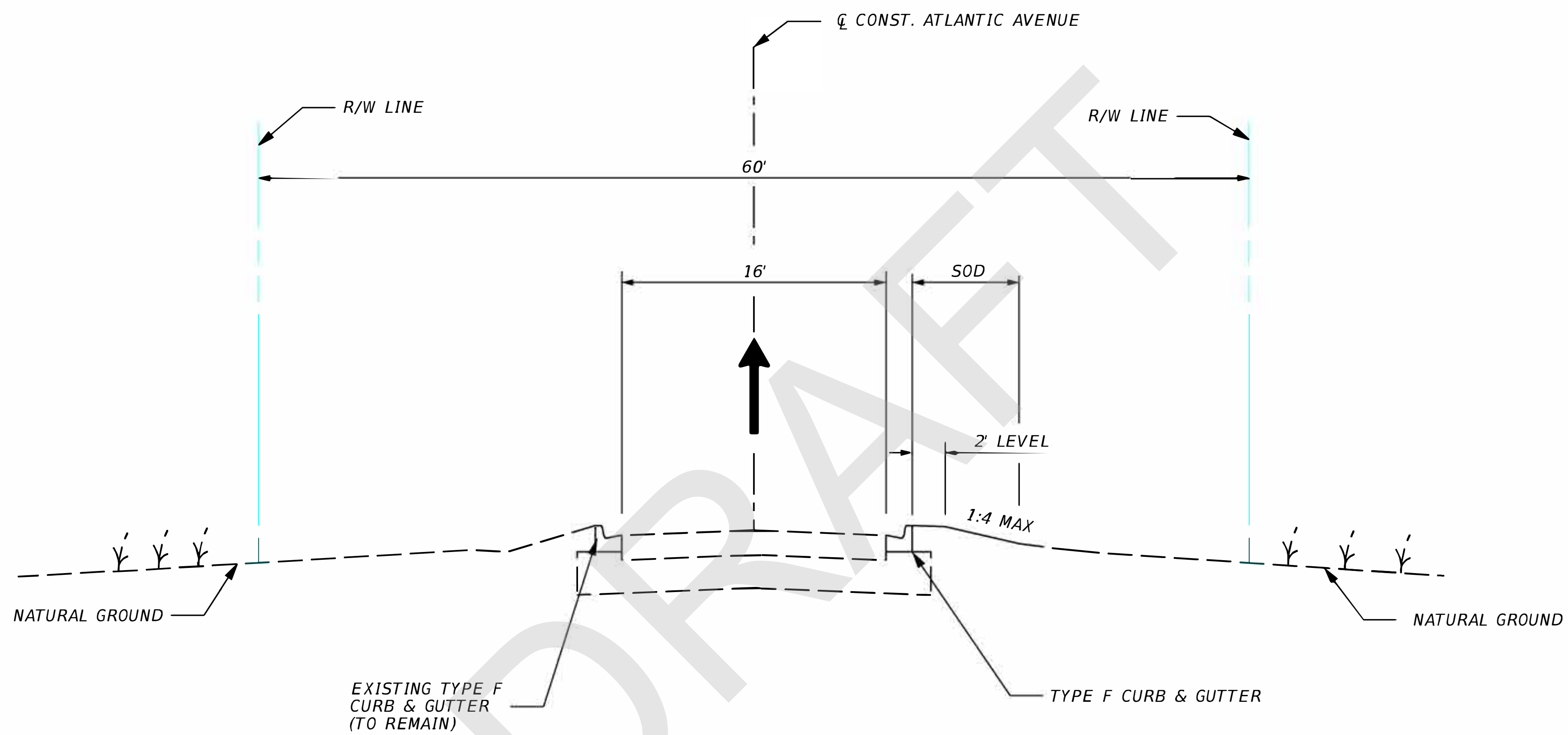
ROADWAY PLANS ENGINEER OF RECORD:

ALEJANDRO M. MEITIN, P.E.
P.E. NO.: 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146
CONTRACT NO.: C9U43
VENDOR NO.: F 954081636

FDOT PROJECT MANAGER:

VICTORIA VOGT

CONSTRUCTION CONTRACT NO.	FISCAL YEAR	SHEET NO.
		1



ROADWAY TYPICAL SECTION
ATLANTIC AVENUE
STA. 108+00 TO STA. 113+13.93
STA. 114+19.93 TO 115+80.00

TRAFFIC DATA

CURRENT YEAR = 2019 AADT = 605
K = 8.18% D = 51.1% T = 5.18% (24 HOUR)
DESIGN SPEED = 25 MPH
POSTED SPEED = 20 MPH

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ALEJANDRO G. MEITIN, P.E.
P.E. LICENSE NUMBER 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

SR NO.	COUNTY	FINANCIAL PROJECT ID
	MIAMI-DADE	430029-2-22-01

TYPICAL SECTION

SHEET NO. 2

CURVE DATA EXISTING1	
PI STA.	= 108+14.96
Δ	= 43° 18' 26" (LT)
D	= 11° 06' 39"
T	= 204.73
L	= 389.77
R	= 515.67
PC STA.	= 106+10.23
PT STA.	= 110+00.00

CURVE DATA EXISTING2	
PI STA.	= 110+42.45
Δ	= 7° 24' 30" (RT)
D	= 8° 44' 20"
T	= 42.45
L	= 84.77
R	= 655.64
PC STA.	= 110+00.00
PT STA.	= 110+84.78

CURVE DATA EXISTING3	
PI STA.	= 111+30.30
Δ	= 49° 50' 05" (RT)
D	= 58° 27' 54"
T	= 45.53
L	= 85.24
R	= 98.00
PC STA.	= 110+84.78
PT STA.	= 111+70.02

CURVE DATA EXISTING4	
PI STA.	= 112+40.28
Δ	= 47° 56' 54" (RT)
D	= 36° 15' 47"
T	= 70.26
L	= 132.22
R	= 158.00
PC STA.	= 111+70.02
PT STA.	= 113+02.24

CURVE DATA EXISTING5	
PI STA.	= 115+52.99
Δ	= 12° 52' 22" (LT)
D	= 4° 10' 56"
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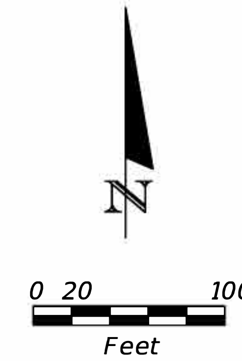
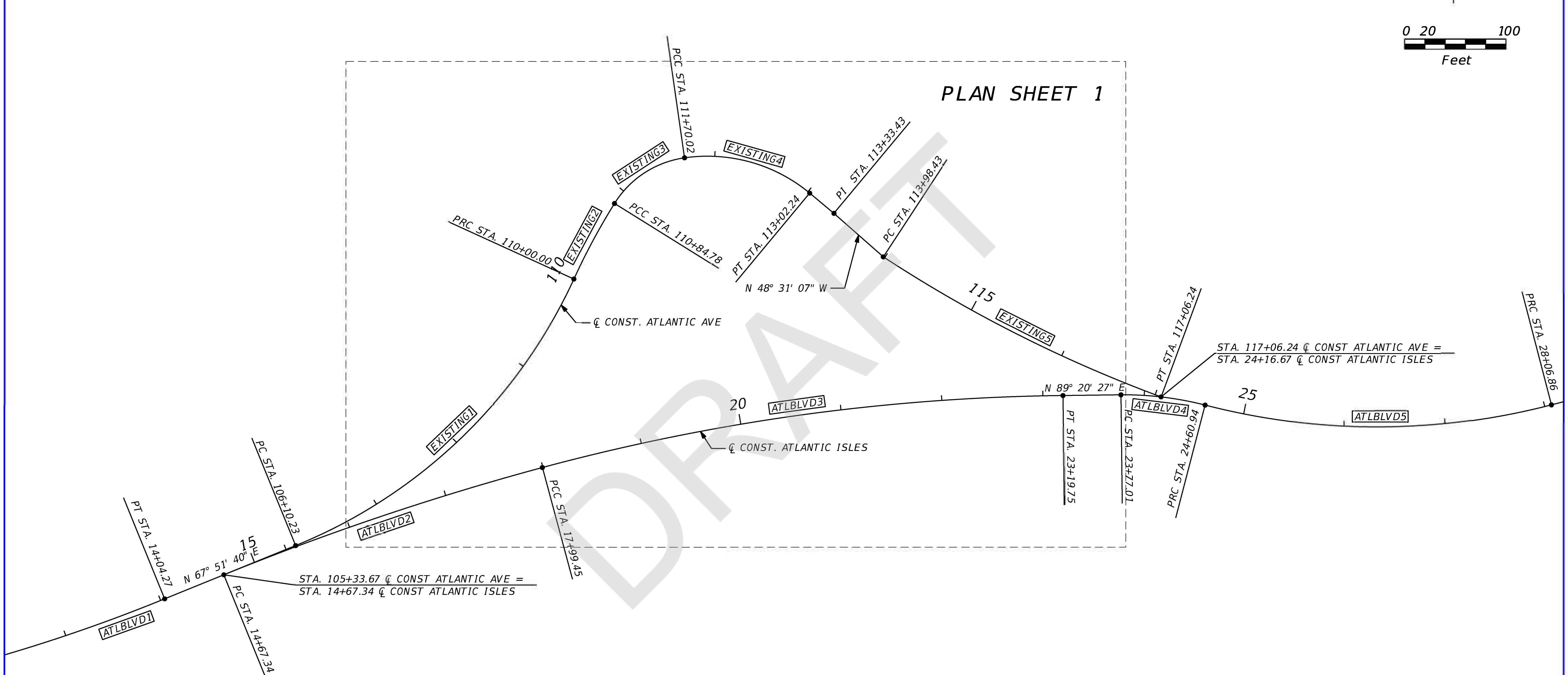
L	= 307.80
R	= 1,370.00
PC STA.	= 113+98.43
PT STA.	= 117+06.24





CURVE DATA ATLBLVD1	
PI STA.	= 12+03.11
Δ	= 13° 42' 48" (LT)
D	= 3° 23' 32"
T	= 203.11
L	= 404.27
R	= 1,689.10
PC STA.	= 10+00.00
PT STA.	= 14+04.27

CURVE DATA ATLBLVD2	
PI STA.	= 16+33.61
Δ	= 7° 02' 19" (RT)
D	= 2° 07' 10"
T	= 166.26
L	= 332.11
R	= 2,703.38
PC STA.	= 14+67.34
PT STA.	= 17+99.45

CURVE DATA ATLBLVD3	
PI STA.	= 20+60.99
Δ	= 14° 26' 28" (RT)
D	= 2° 46' 32"
T	= 261.53
L	= 520.30
R	= 2,064.31
PC STA.	= 17+99.45
PT STA.	= 23+19.75

CURVE DATA ATLBLVD4	
PI STA.	= 24+19.23
Δ	= 15° 14' 20" (RT)
D	= 18° 09' 21"
T	= 42.22
L	= 83.93
R	= 315.58
PC STA.	= 23+77.01
PT STA.	= 24+60.94

CURVE DATA ATLBLVD5	
PI STA.	= 26+37.72
Δ	= 29° 05' 57" (LT)
D	= 8° 24' 44"
T	= 176.77
L	= 345.91
R	= 681.10
PC STA.	= 24+60.94
PT STA.	= 28+06.86

REVISIONS

DATE	DESCRIPTION	DATE	DESCRIPTION

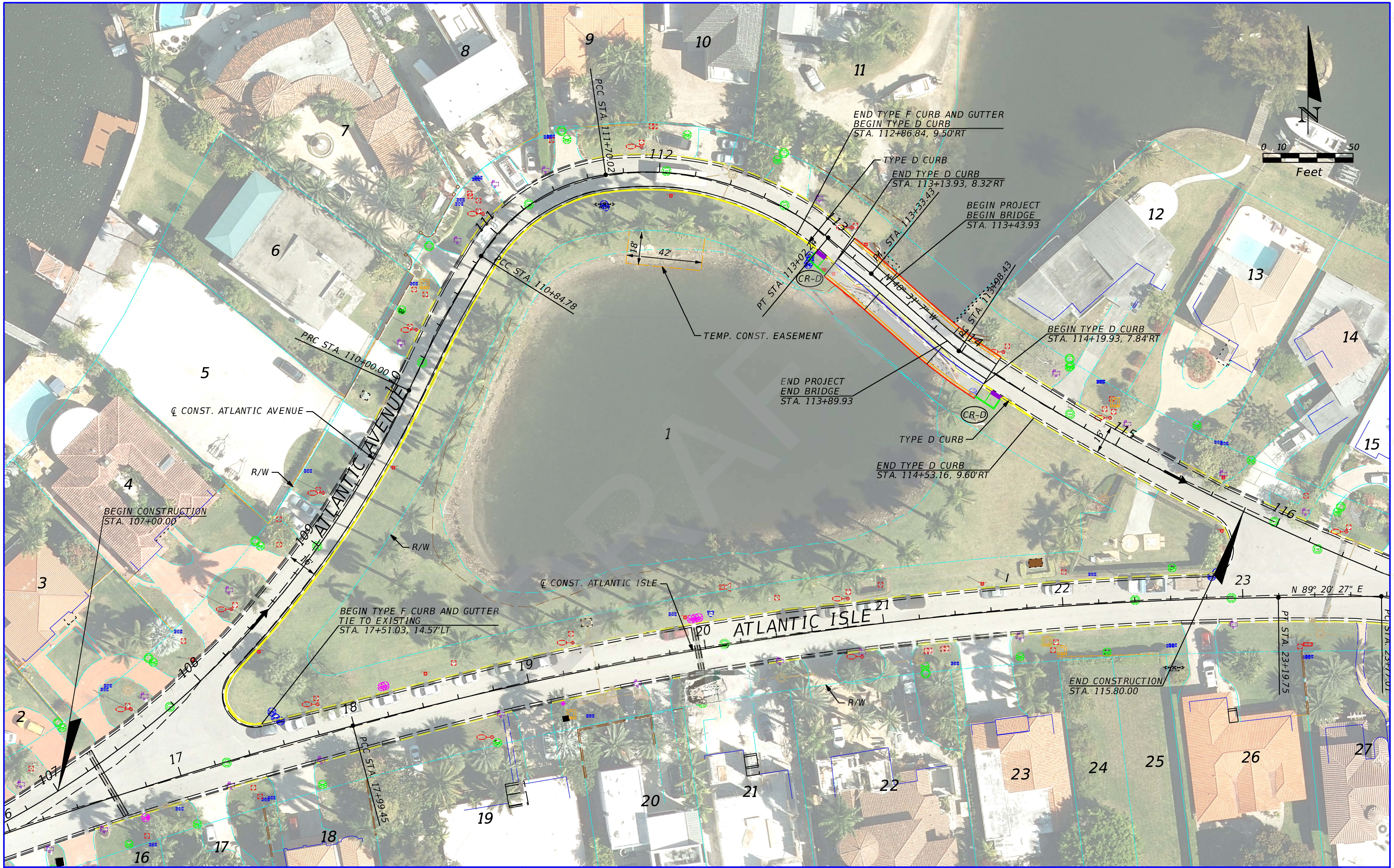
ALEX MEITIN, P.E.
P.E. LICENSE NUMBER 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

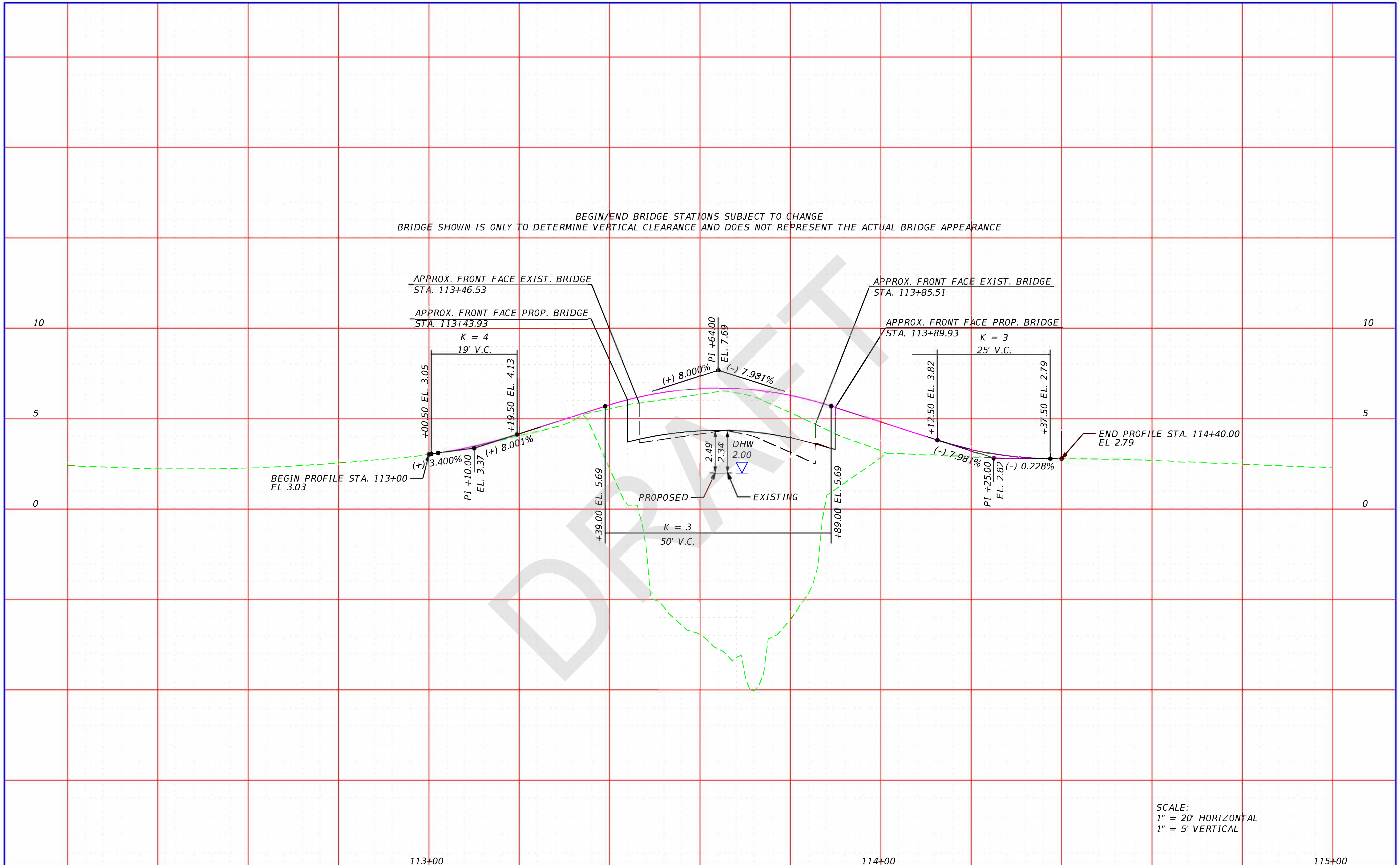
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
	MIAMI-DADE	430029-2-22-01

PROJECT LAYOUT

SHEET NO. 3



REVISIONS							
DATE	DESCRIPTION	DATE	DESCRIPTION	ALEJANDRO G. MEITIN, P.E. P.E. LICENSE NUMBER 44744 JACOBS ENGINEERING GROUP, INC. 3150 SW 38TH AVE, SUITE 700 MIAMI, FL 33146	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION	PLAN SHEET BRIDGE REPLACEMENT (ALT 2)	SHEET NO.
					SR NO. / COUNTY: MIAMI-DADE / FINANCIAL PROJECT ID: 430029-2-22-01		4



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ALEX MEITIN, P.E.
P.E. LICENSE NUMBER 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-01

PROFILE SHEET
BRIDGE REPLACEMENT (ALT 2)

SHEET NO.
5

BRANCHTD 4/10/2023 1:35:35 PM Default C:\Users\branchtd\Downloads\CADD\CADD\VERIFIED_SeanK\RDY\PROFRD02_Jacobs.dgn

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED DURING DAYTIME ONLY FROM 8:00 AM TO 8:00 PM.

2. PCMS MESSAGES SHALL BE PLACED ACCORDING TO THE PLANS AND SHALL DISPLAY THE FOLLOWING MESSAGES:

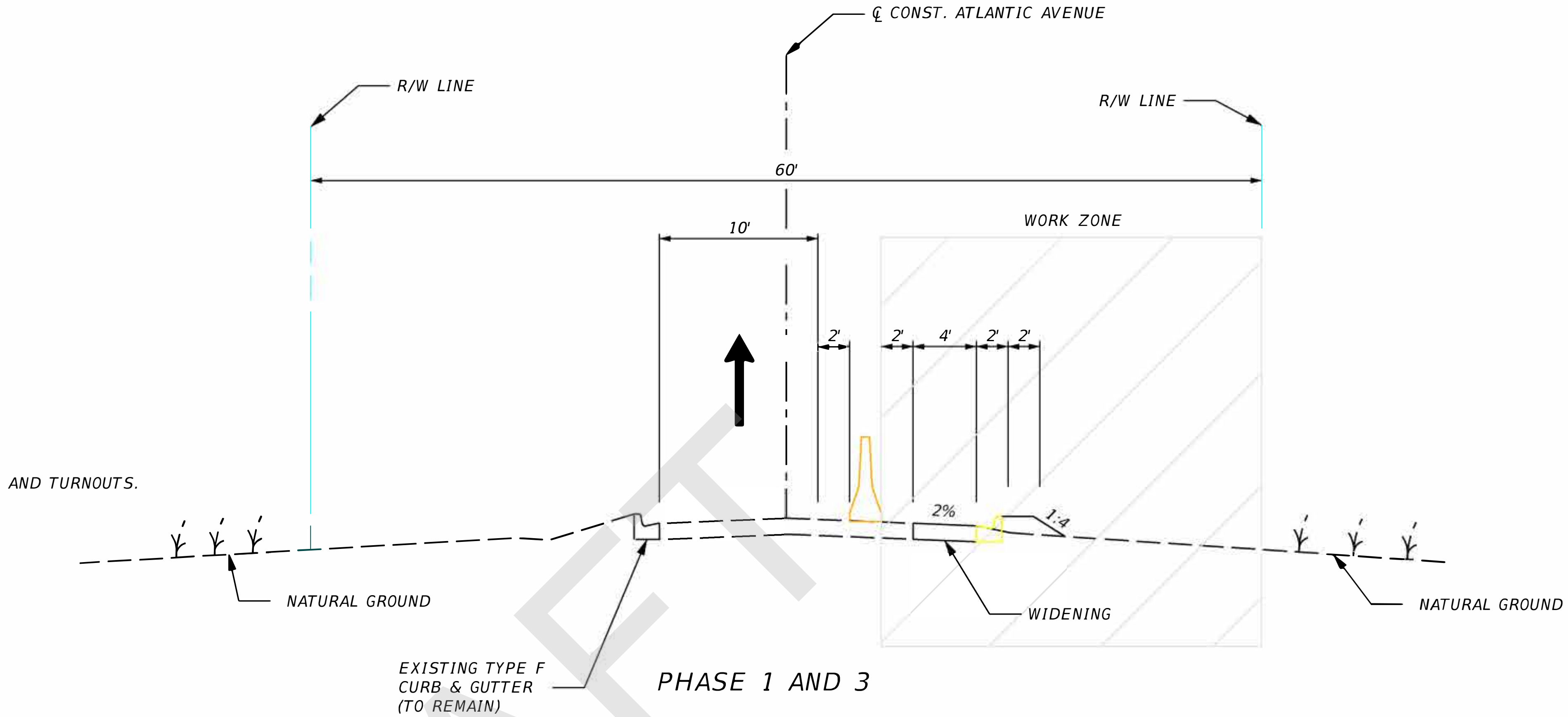
MESSAGE 1	MESSAGE 2
CONST STARTS MM/DD	BRIDGE CLOSED

3. REGULATORY SPEED SHALL BE 20 MPH FOR ALL PHASES OF TEMPORARY TRAFFIC CONTROL PLANS.

PHASE 1

THE INTENT OF THIS PHASE IS TO CONSTRUCT TEMPORARY WIDENING.

1. INSTALL TEMPORARY CONCRETE BARRIER WALL.
2. SHIFT TRAFFIC TO THE LEFT SIDE OF THE ROADWAY.
3. CONSTRUCT TEMPORARY DRAINAGE, TEMPORARY CURB & GUTTER, WIDENING AND TURNOUTS.
4. REMOVE TEMPORARY CONCRETE BARRIER WALL.
5. ALLOW FOR TWO-WAY TRAFFIC.



PHASE 1 AND 3

PHASE 2

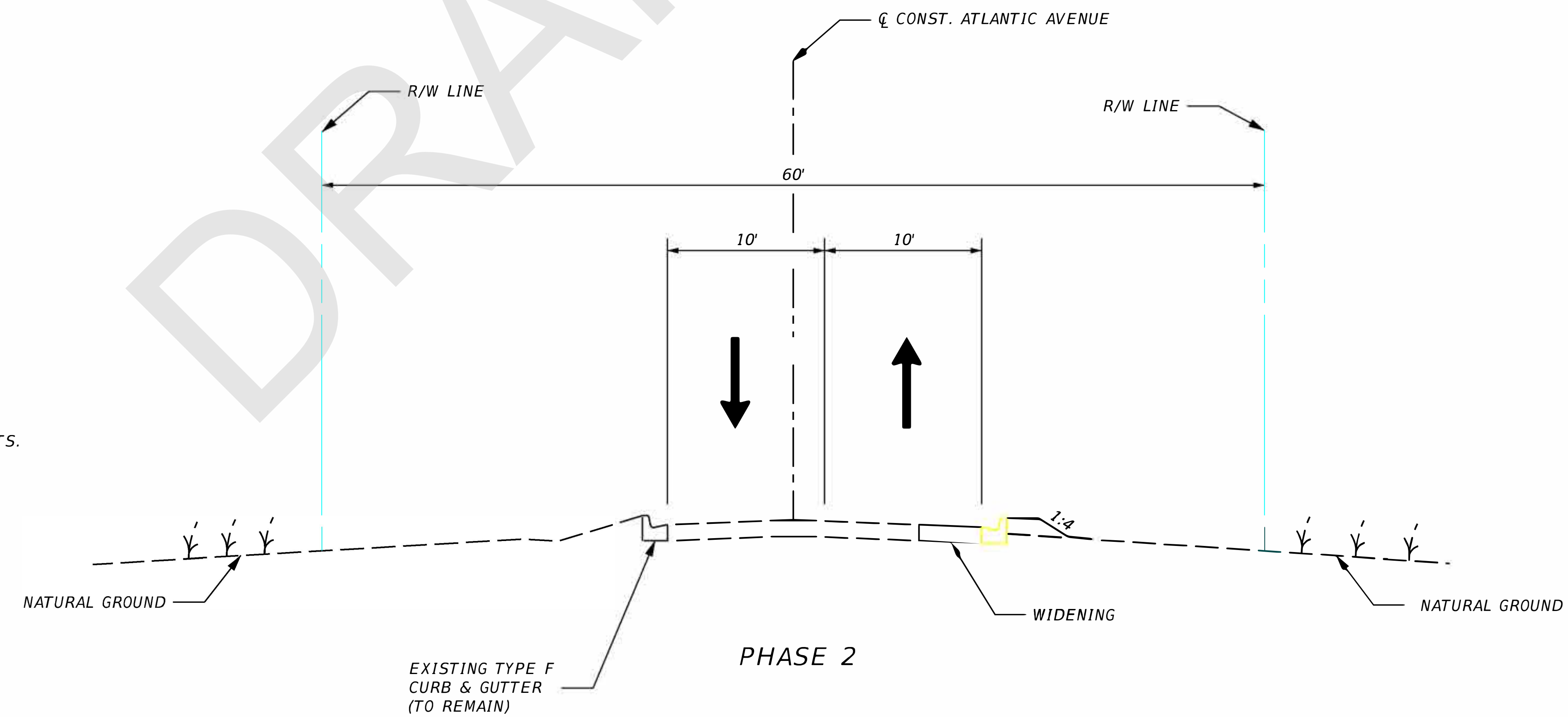
THE INTENT OF THIS PHASE IS TO DEMO AND CONSTRUCT THE NEW BRIDGE.

1. CLOSE THE BRIDGE TO TRAFFIC.
2. DEMOLISH EXISTING BRIDGE.
3. CONSTRUCT NEW BRIDGE.

PHASE 3

THE INTENT OF THIS PHASE IS TO REMOVE THE TEMPORARY WIDENING.

1. INSTALL TEMPORARY CONCRETE BARRIER WALL.
2. SHIFT TRAFFIC TO THE LEFT SIDE OF THE ROADWAY.
3. REMOVE TEMPORARY CURB & GUTTER, DRAINAGE, WIDENING AND TURNOUTS.
4. CONSTRUCT NEW CURB AND GUTTER.
5. REMOVE TEMPORARY CONCRETE BARRIER WALL.
6. ALLOW FOR TWO-WAY TRAFFIC.



PHASE 2

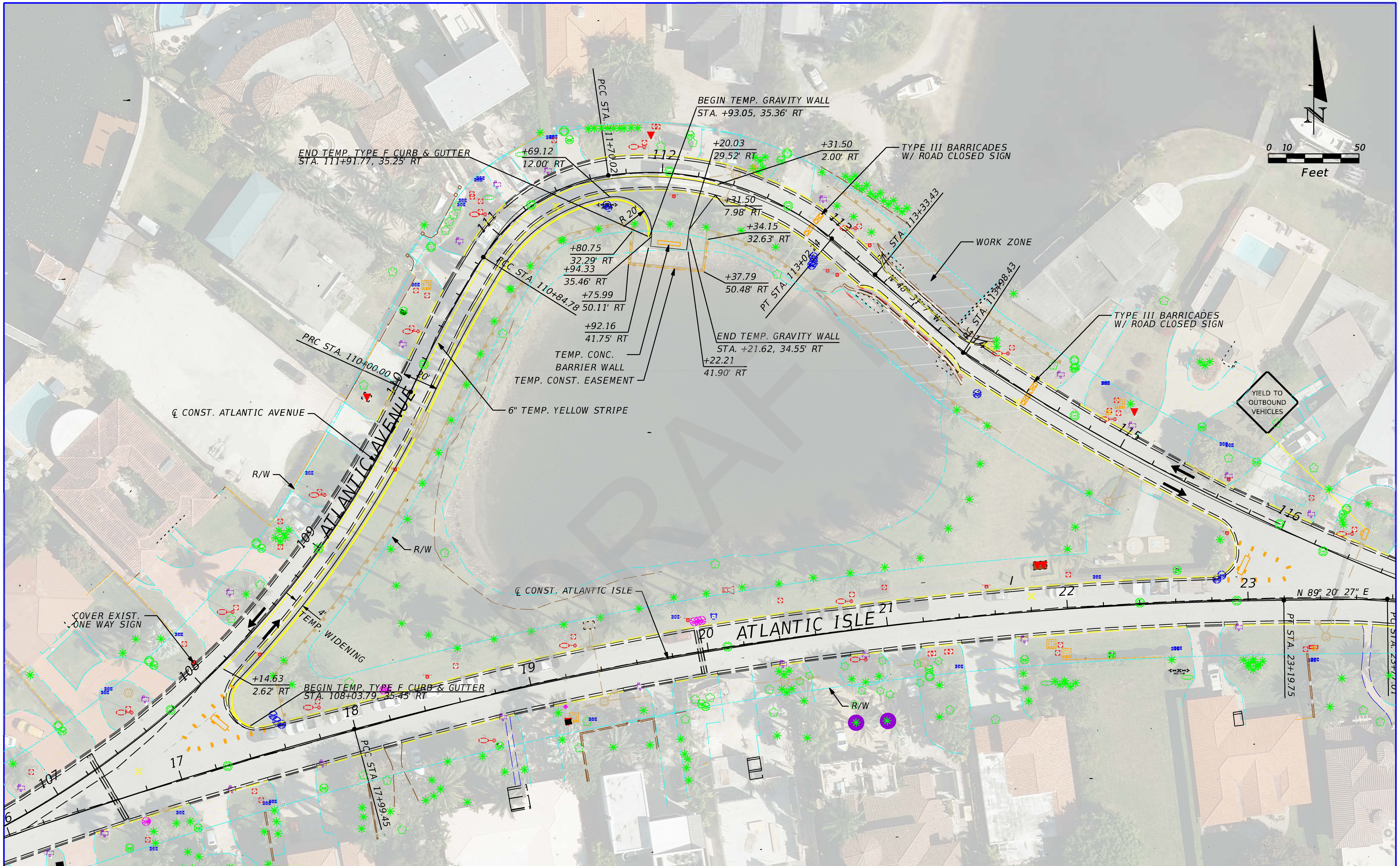
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ALEJANDRO G. MEITIN, P.E.
P.E. LICENSE NUMBER 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
SR NO.	COUNTY	FINANCIAL PROJECT ID
	MIAMI-DADE	430029-2-22-01

TTCP TYPICAL SECTION
ALT 1 AND ALT 2

SHEET NO. 6



THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

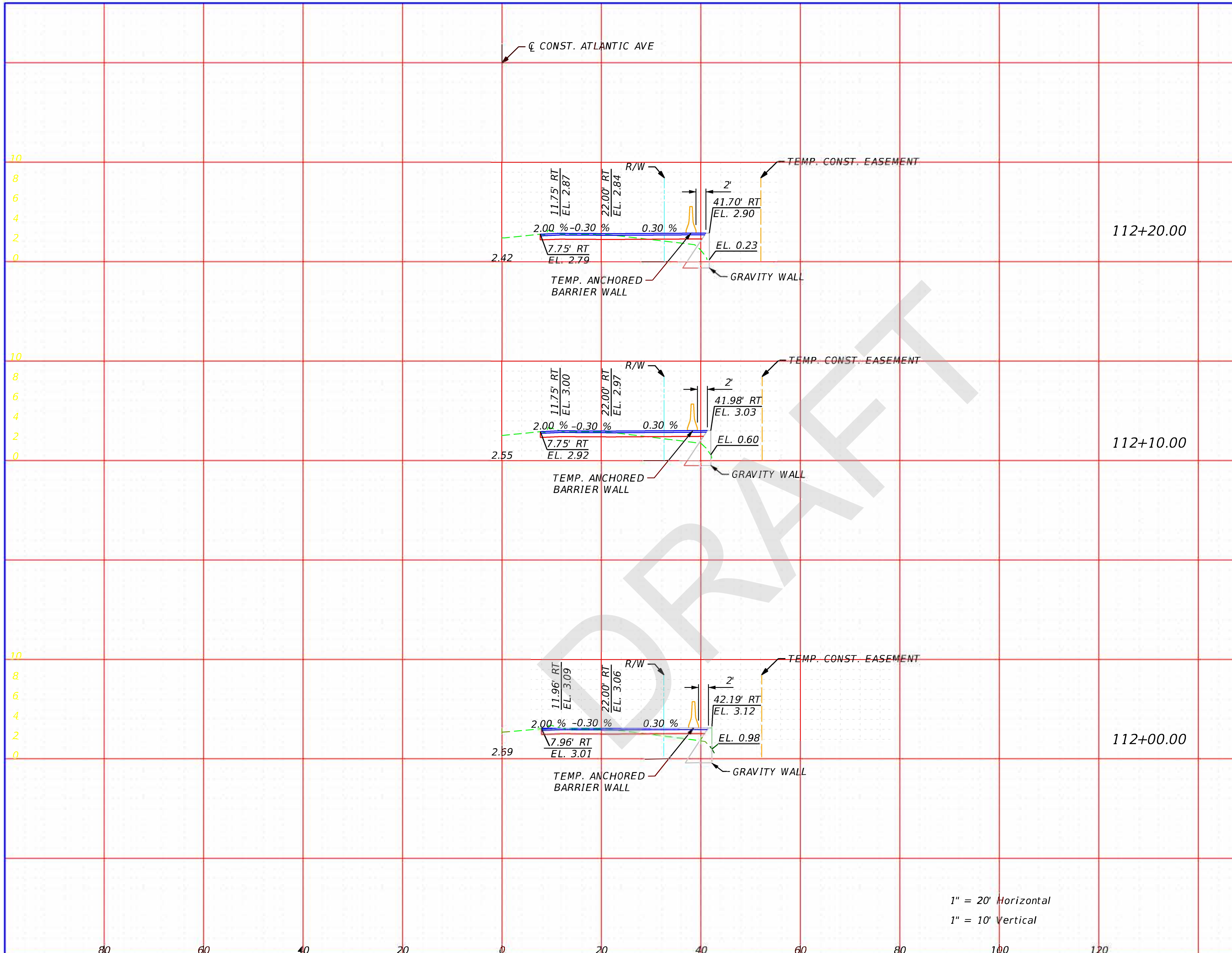
ALEX MEITIN, P.E.
P.E. LICENSE NUMBER 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
	MIAMI-DADE	430029-2-22-01

TRAFFIC CONTROL PLAN
BRIDGE REPLACEMENT (ALT 2)

SHEET NO.
7



Subsoil Exc.		Regular Exc.		Embankment	
A	V	A	V	A	V

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

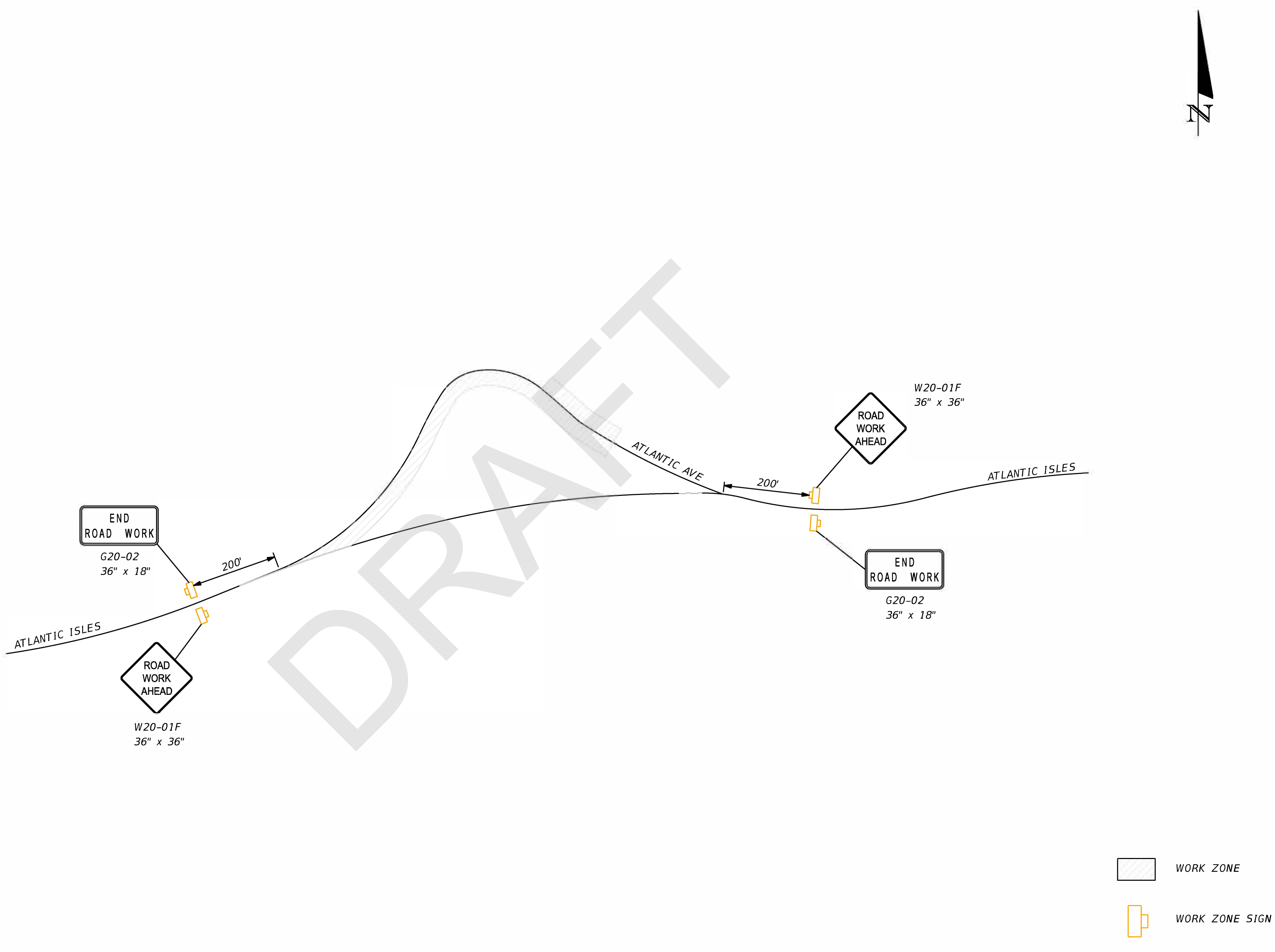
ALEX MEITIN, P.E.
P.E. LICENSE NUMBER 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

SR NO.	COUNTY	FINANCIAL PROJECT ID
N/A	MIAMI-DADE	430029-2-22-01

TTCP CROSS SECTIONS
BRIDGE REPLACEMENT (ALT 2)

SHEET NO. 8



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ALEJANDRO G. MEITIN, P.E.
P.E. LICENSE NUMBER 44744
JACOBS ENGINEERING GROUP, INC.
3150 SW 38TH AVE, SUITE 700
MIAMI, FL 33146

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

SR NO.	COUNTY	FINANCIAL PROJECT ID
	MIAMI-DADE	430029-2-22-01

ADVANCE WARNING DETAIL BRIDGE REPLACEMENT (ALT 2)

SHEET NO.
9

INDEX OF STRUCTURE PLANS

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

CONTRACT PLANS

FINANCIAL PROJECT ID 430029-2-21-01
(FEDERAL FUNDS)

MIAMI-DADE COUNTY (87674)

STRUCTURE PLANS

STRUCTURE SHOP DRAWINGS
TO BE SUBMITTED TO:
HNTB CORPORATION
161 N.W. 6TH STREET, SUITE 1000
MIAMI, FL. 33136
P: (305) 551-8100 F: (305) 551-2800

GOVERNING STANDARDS & SPECIFICATIONS:
FLORIDA DEPARTMENT OF TRANSPORTATION,
DESIGN STANDARDS DATED FY 2023-24,
AND STANDARD SPECIFICATIONS FOR ROAD AND
BRIDGE CONSTRUCTION DATED FY 2023-24,
AS AMENDED BY CONTRACT DOCUMENTS.

PLANS PREPARED BY:
HNTB CORPORATION
161 N.W. 6TH STREET, SUITE 1000
MIAMI, FL. 33136
P: (305) 551-8100 F: (305) 551-2800

APPLICABLE DESIGN STANDARDS MODIFICATIONS: MM-DD-YY
For Design Standards Modifications click on "Design Standards"
at the following Web site: http://www.dot.state.fl.us/rddesign/

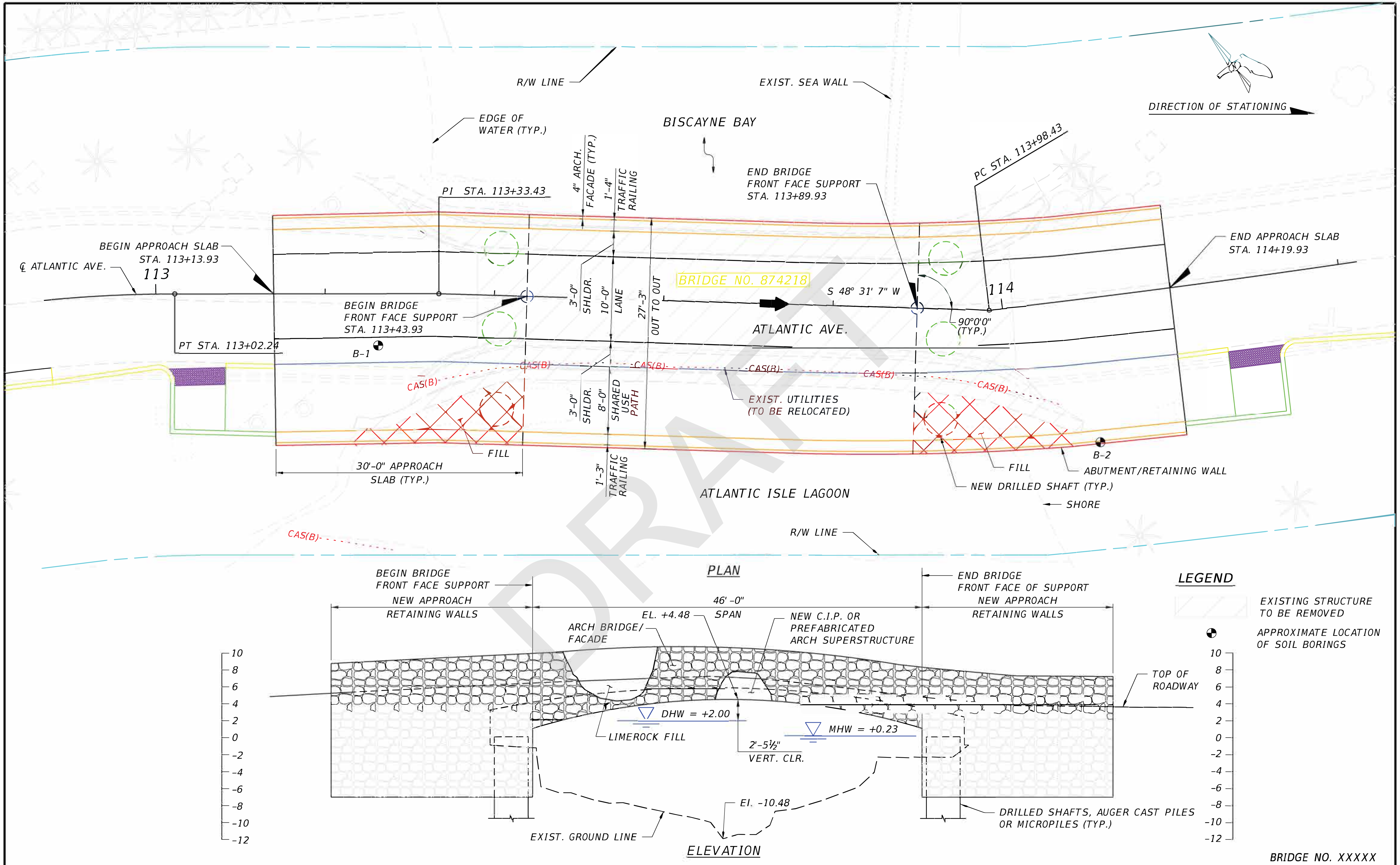
NOTE: THE SCALE OF THESE PLANS MAY
HAVE CHANGED DUE TO REPRODUCTION.

STRUCTURE PLANS
ENGINEER OF RECORD: FENG LIU

P.E. NO.: 65738

FDOT PROJECT MANAGER : VICTORIA VOGT

FISCAL YEAR	SHEET NO.
	B1



NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

BRIDGE NO. XXXXX

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

JACOBS ENGINEERING GROUP
200 W. FORSYTH STREET, SUITE 1520
JACKSONVILLE, FL 32202

DRAWN BY: XSD
CHECKED BY: JGL
DESIGNED BY: CAM
CHECKED BY: FL

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
N/A	MIAMI-DADE	430029-2-21-02

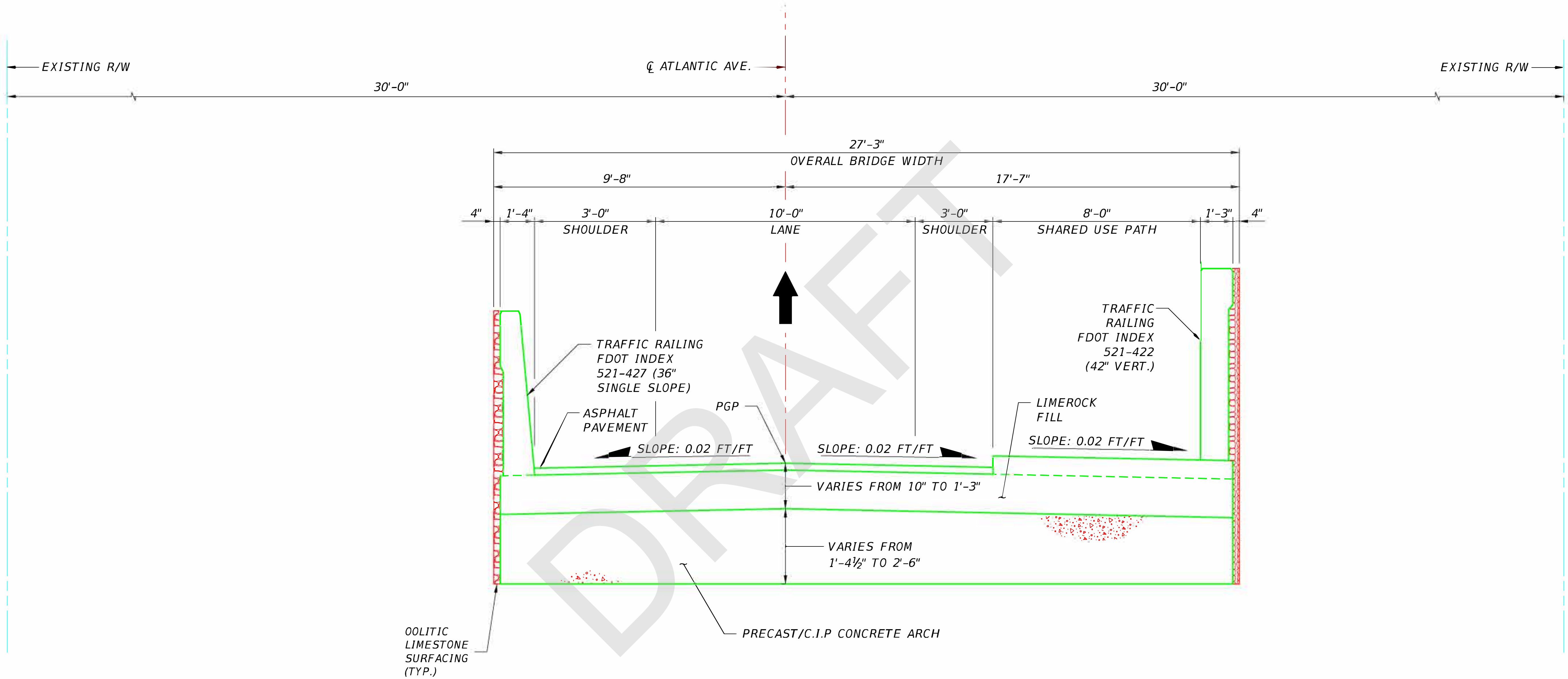
SHEET TITLE: ALTERNATIVE 2 - BRIDGE REPLACEMENT
PLAN AND ELEVATION

PROJECT NAME: ATLANTIC AVE. OVER OCEAN CANAL

REF. DWG. NO.

SHEET NO. B1-1

egunders 1/17/2024 2:23:09 PM ...\B1PlanElev-Replacement-01.dgn



TYPICAL SECTION

BRIDGE NO. XXXXX

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

JACOBS ENGINEERING GROUP
200 W. FORSYTH STREET, SUITE 1520
JACKSONVILLE, FL 32202

DRAWN BY: GNJ
CHECKED BY: XSD
DESIGNED BY: CAM
CHECKED BY: FL

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
N/A	MIAMI-DADE	430029-2-22-02

SHEET TITLE: BRIDGE REPLACEMENT (ALT 2)
TYPICAL SECTION

PROJECT NAME: ATLANTIC AVE. OVER OCEAN CANAL

REF. DWG. NO.

SHEET NO. B1-2

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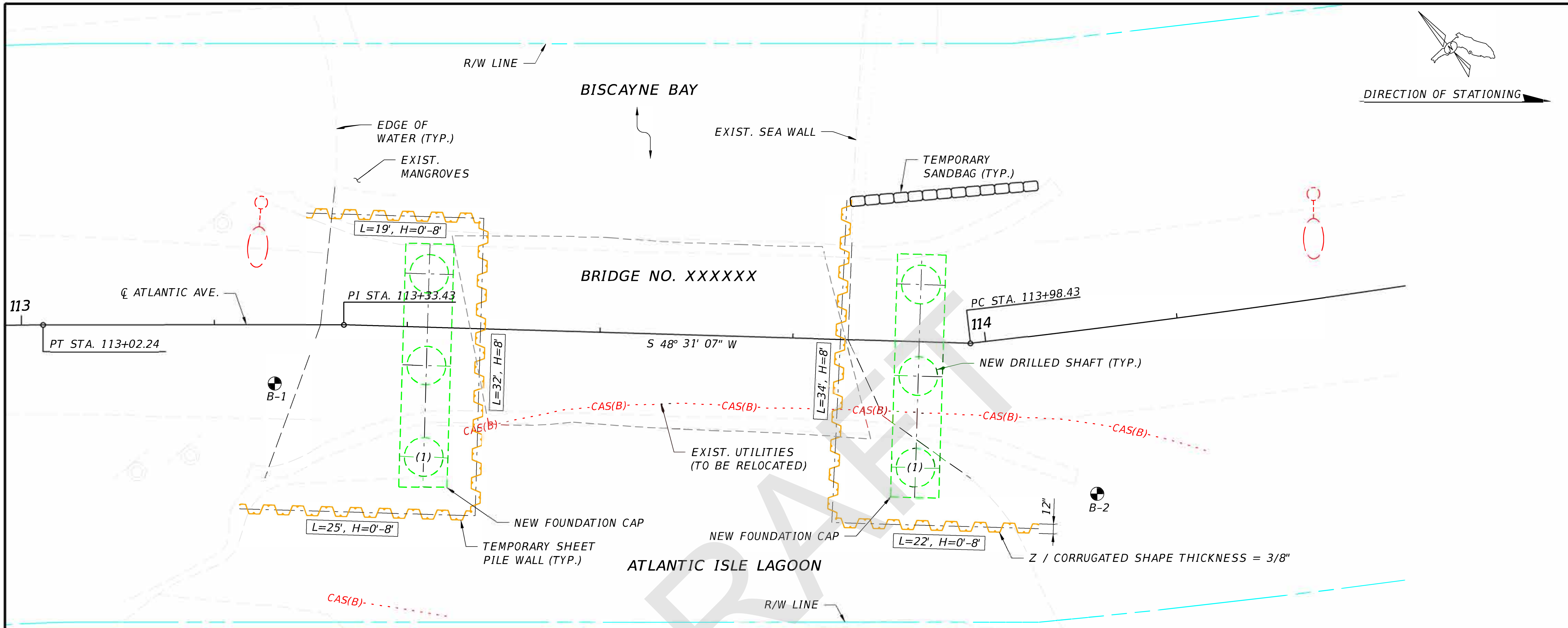
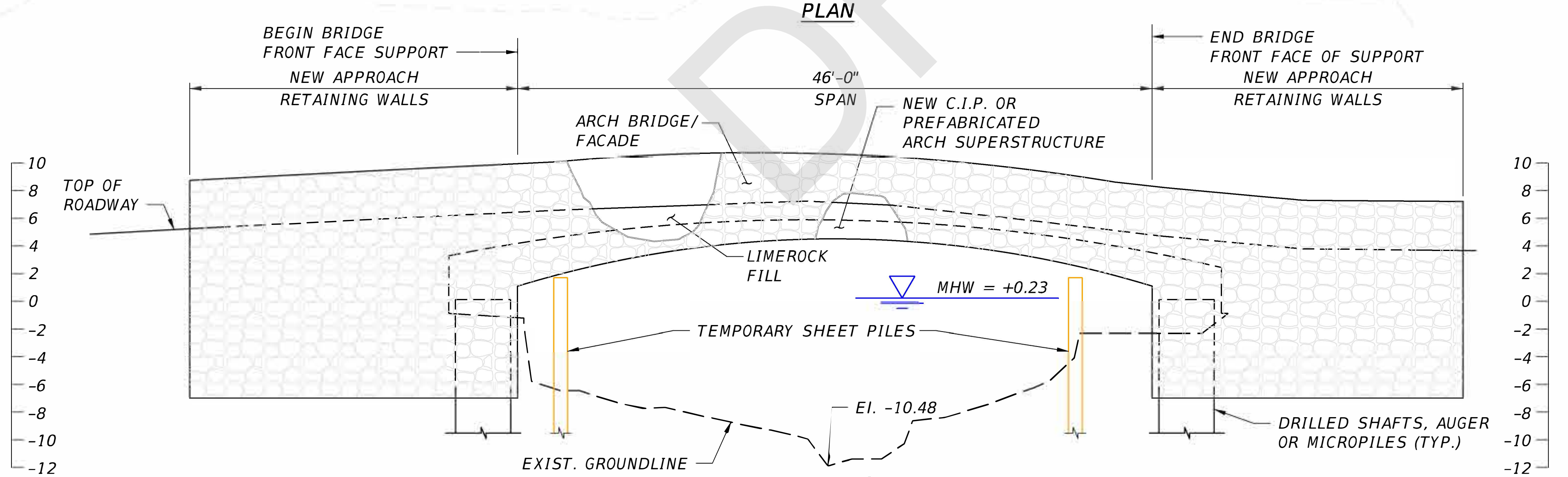


PLAN



ELEVATION

LEGEND

◐ = APPROXIMATE LOCATION OF SOIL BORINGS

NOTE:
1. EXISTING BRIDGE 874218 TO BE COMPLETELY REMOVED INCLUDING FOUNDATIONS.

2. TEMPORARY SHEET PILING SHOWN WILL BE REMOVED PRIOR TO CONSTRUCTION OF THE ARCH AND SUPERSTRUCTURE.

TEMPORARY SHEET PILE:			
LENGTH:	AT BEGIN BRIDGE	= 76 LF	51 SHEETS
	AT END BRIDGE	= 56 LF	37 SHEETS
	TOTAL	= 132 LF	88 SHEETS

H= HEIGHT ABOVE CANAL BOTTOM.

(1) DRILLED SHAFT WATERWARD OF EXISTING BRIDGE.

BRIDGE NO. 874218

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

JACOBS ENGINEERING GROUP
200 W. FORSYTH STREET, SUITE 1520
JACKSONVILLE, FL 32202

DRAWN BY: EAG
CHECKED BY: RLM
DESIGNED BY: BAG
CHECKED BY: RLM

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

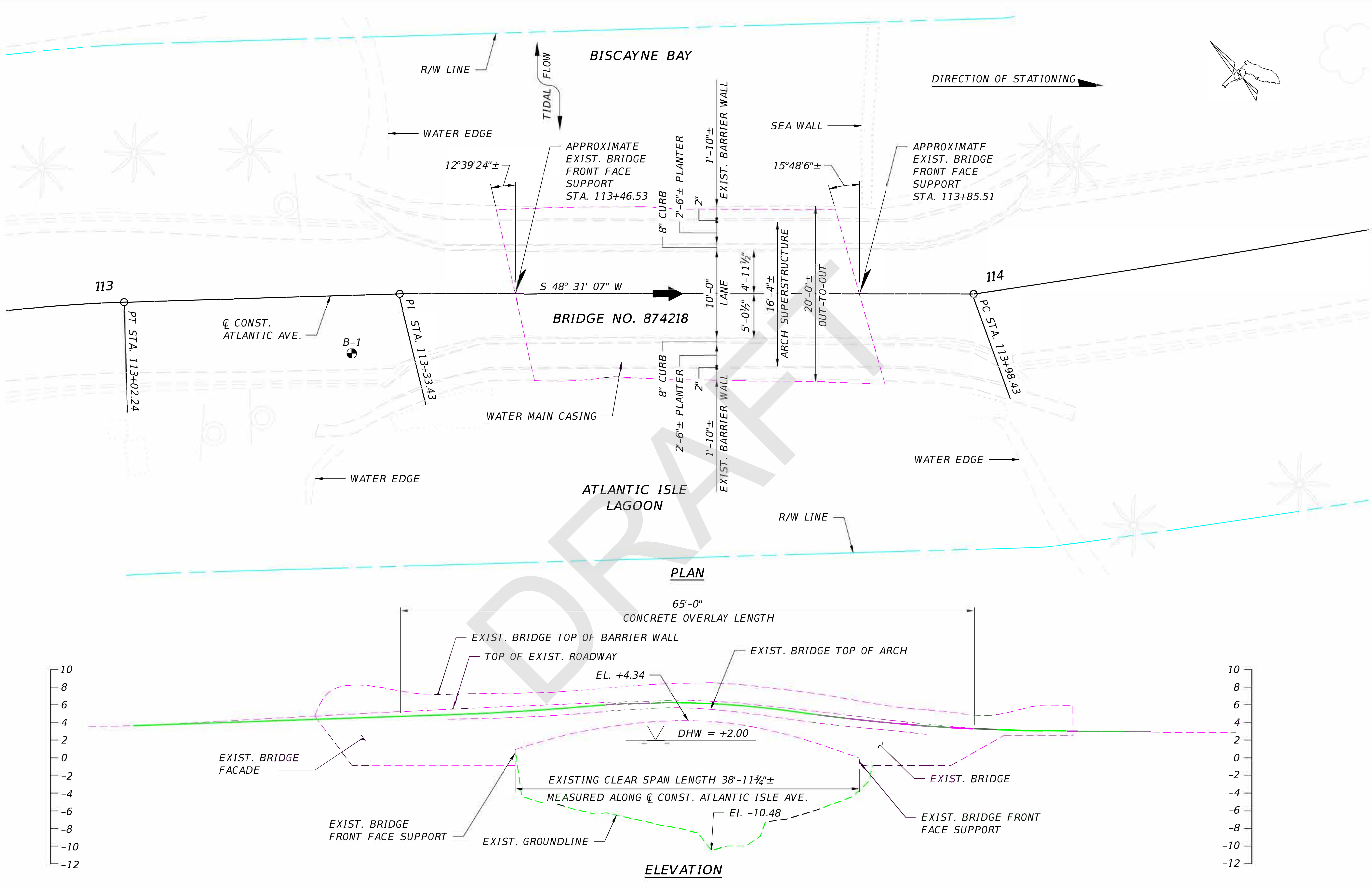
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
N/A	MIAMI-DADE	430029-2-21-02

SHEET TITLE:
ALTERNATIVE 2 - BRIDGE REPLACEMENT
CONSTRUCTABILITY CONCEPT

PROJECT NAME:
ATLANTIC AVE. OVER OCEAN CANAL

REF. DWG. NO.

SHEET NO.
B1-3



NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

REVISIONS						JACOBS ENGINEERING GROUP 200 W. FORSYTH STREET, SUITE 1520 JACKSONVILLE, FL 32202	DRAWN BY: EAG CHECKED BY: RLM DESIGNED BY: BAG CHECKED BY: RLM	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			SHEET TITLE: EXISTING BRIDGE PLAN AND ELEVATION	REF. DWG. NO.
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION			ROAD NO.	COUNTY	FINANCIAL PROJECT ID	PROJECT NAME:	SHEET NO.
								N/A	MIAMI-DADE	430029-2-21-02	ATLANTIC AVE. OVER OCEAN CANAL	B1-4

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APPENDIX C - FEMA FIRM MAPS

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The **projection** used in the preparation of this map was Florida State Plane east zone (FIPSZONE 0901). The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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

Base map information shown on this FIRM was provided in digital format by the Miami-Dade County Information Technology Department. These data were compiled at a scale of 1:3,600 from digital orthophotography dated 2001. Additional base map information was provided by the Cities of Aventura, Coral Gables, and Homestead, the Town of Cutler Bay, and Miami-Dade County.

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

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

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

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

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) LEGEND

11-16-1990 CBRS Area

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER NOVEMBER 16, 1990, IN DESIGNATED CBRS AREAS.

11-16-1991 Otherwise Protected Area (OPA)

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER NOVEMBER 16, 1991, IN DESIGNATED OPAs WITHIN THE CBRS.

Boundaries of the John H. Chafee Coastal Barrier Resources System (CBRS) shown on this FIRM were transferred from the official CBRS source map(s) for this area and are depicted on this FIRM for informational purposes only. The official CBRS maps are enacted by Congress via the Coastal Barrier Resources Act, as amended, and maintained by the U.S. Fish and Wildlife Service (FWS). The official CBRS maps used to determine whether or not an area is located within the CBRS are available for download at http://www.fws.gov. For an official determination of whether or not an area is located within the CBRS, or for any questions regarding the CBRS, please contact the FWS field office for this area at (772) 562-3909.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

(A)———(A)	Cross section Line
(23)- - - - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
2476000mN	1000-meter Universal Transverse Mercator grid values, zone 17
600000 FT	5000-foot grid ticks: Florida State Plane coordinate system, East zone (FIPSZONE 0901), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
●M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
January 20, 1993

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
16, 1994 - July 17, 1995 - for description of revision, see Notice to Users
urance Study report.
- to reflect revised shoreline, to incorporate previously issued Letters of
ect updated topographic information, to add and change Base Flood
corporate limits, to change zone designations, to add roads and road
nd change Special Flood Hazard Areas

p revision history prior to countywide mapping, refer to the Community
ocated in the Flood Insurance Study report for this jurisdiction.

ood insurance is available in this community, contact your Insurance
tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0142L

FIRM

FLOOD INSURANCE RATE MAP

MIAMI-DADE COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 142 OF 1031

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AVENTURA, CITY OF	120676	0142	L
MIAMI - DADE COUNTY	120635	0142	L
NORTH MIAMI BEACH, CITY OF	120656	0142	L
NORTH MIAMI, CITY OF	120655	0142	L
SUNNY ISLES BEACH, CITY OF	120688	0142	L

- NOTE -
THIS MAP INCLUDES BOUNDARIES OF THE COASTAL BARRIER RESOURCES SYSTEM ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT ENABLING LEGISLATION.

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

MAP NUMBER
12086C0142L

MAP REVISED
SEPTEMBER 11, 2009

Federal Emergency Management Agency

APPENDIX D - SOIL MAP

United States Department of Agriculture

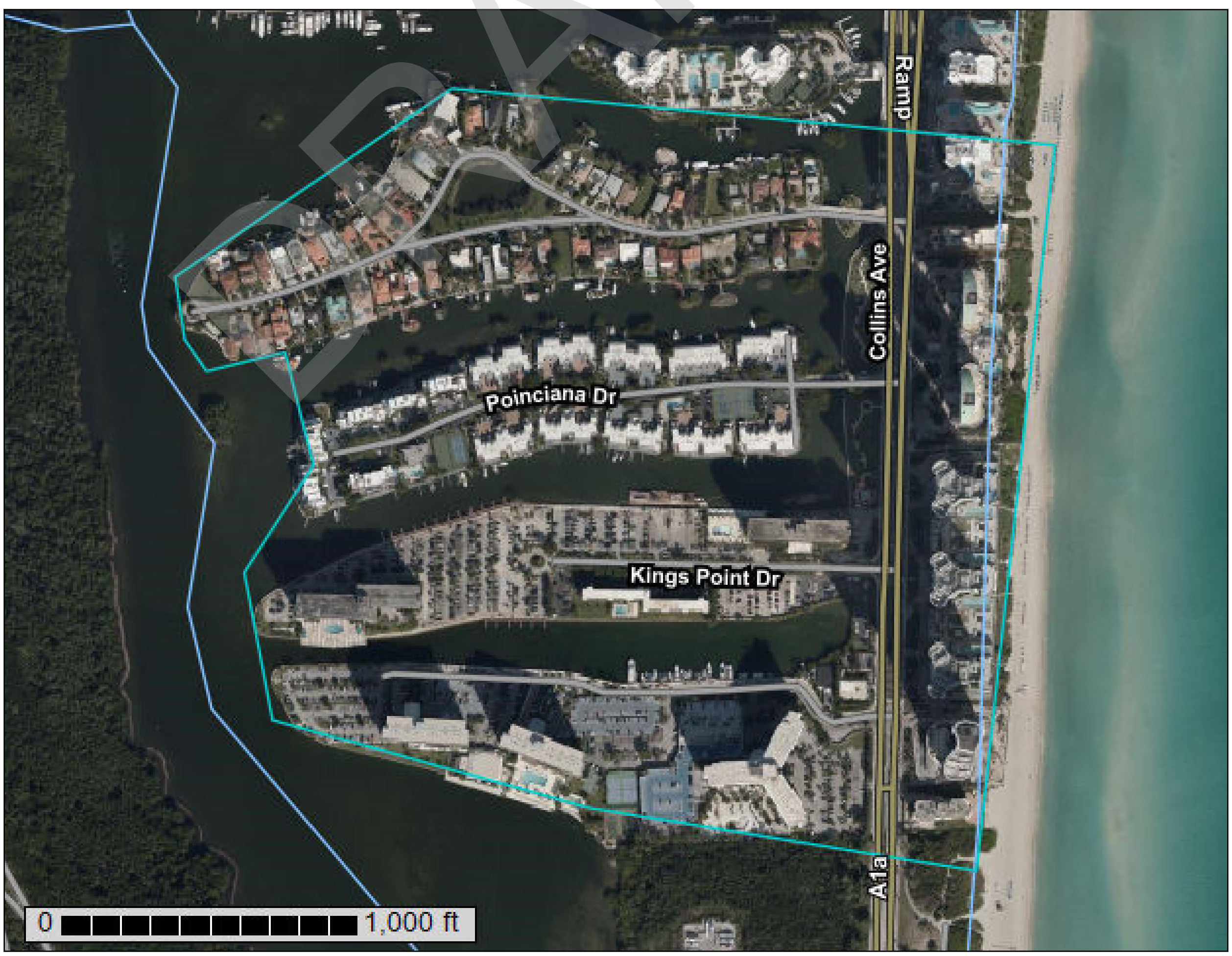
NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

Miami-Dade County Area, Florida



March 30, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


80° 7' 57" W
80° 7' 4" W
25° 55' 44" N
25° 55' 13" N
586900
587000
587100
587200
587300
587400
587500
587600
587700
587800
587900
588000
588100
588200
588300
2868100
2868000
2867900
2867800
2867700
2867600
2867500
2867400
2867300
2867200
99
15
100
51
42
Atlantic Isle
Ramp
Collins Ave
Bayview Dr
A1a
Soil Map may not be valid at this scale.
Map Scale: 1:6,800 if printed on A landscape (11" x 8.5") sheet.
Meters
0
100
200
400
600
Feet
0
300
600
1200
1800
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Miami-Dade County Area, Florida
Survey Area Data: Version 13, Aug 25, 2021

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

Date(s) aerial images were photographed: Dec 6, 2019—Mar 24, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
15	Urban land, 0 to 2 percent slopes	94.7	69.9%
42	Udorthents, limestone substratum-Urban land complex, 0 to 5 percent slopes	0.1	0.1%
51	Beach complex, tidal-Urban land complex, 0 to 3 percent slopes	4.3	3.1%
99	Water	34.7	25.6%
100	Waters of the Atlantic Ocean	1.7	1.2%
Totals for Area of Interest		**135.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Miami-Dade County Area, Florida

15—Urban land, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2z9t5
Elevation: 0 to 30 feet
Mean annual precipitation: 55 to 70 inches
Mean annual air temperature: 68 to 81 degrees F
Frost-free period: 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills on marine terraces, ridges on marine terraces, knolls on marine terraces, rises on marine terraces, flatwoods on marine terraces
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope, riser, rise, talf
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: No parent material

Interpretive groups

Land capability classification (irrigated): None specified
Forage suitability group: Forage suitability group not assigned (G155XB999FL)
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: Unranked

Minor Components

Hallandale

Percent of map unit: 3 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Sunny isles

Percent of map unit: 3 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL), South Florida Flatwoods (R155XY003FL)

Hydric soil rating: No

Dade

Percent of map unit: 3 percent
Landform: Ridges on marine terraces
Landform position (three-dimensional): Interfluve, tread, rise
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Shallow or moderately deep, sandy or loamy soils on rises and ridges of mesic uplands (G156AC521FL)
Hydric soil rating: No

Naranja

Percent of map unit: 3 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Forage suitability group not assigned (G156AC999FL)
Hydric soil rating: No

Margate

Percent of map unit: 3 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Concave
Other vegetative classification: Sandy soils on stream terraces, flood plains, or in depressions (G156AC145FL)
Hydric soil rating: Yes

42—Udorthents, limestone substratum-Urban land complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2z9t3
Elevation: 0 to 10 feet
Mean annual precipitation: 55 to 70 inches
Mean annual air temperature: 77 to 81 degrees F
Frost-free period: 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread, talf, rise
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy human-transported material over limestone

Typical profile

^C - 0 to 30 inches: very gravelly sand
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 20 to 50 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Forage suitability group: Forage suitability group not assigned (G156AC999FL)
Other vegetative classification: Forage suitability group not assigned (G156AC999FL)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: No parent material

Interpretive groups

Land capability classification (irrigated): None specified
Forage suitability group: Forage suitability group not assigned (G155XB999FL)
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: Unranked

Minor Components

Dade

Percent of map unit: 5 percent

Landform: Ridges on marine terraces
Landform position (three-dimensional): Interfluve, tread, rise
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Shallow or moderately deep, sandy or loamy soils on rises and ridges of mesic uplands (G156AC521FL)
Hydric soil rating: No

Hallandale

Percent of map unit: 3 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Margate

Percent of map unit: 2 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Concave
Other vegetative classification: Sandy soils on stream terraces, flood plains, or in depressions (G156AC145FL)
Hydric soil rating: Yes

51—Beach complex, tidal-Urban land complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2z9v2
Elevation: 0 to 10 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 77 to 81 degrees F
Frost-free period: 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Beaches, tidal: 50 percent
Urban land: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beaches, Tidal

Setting

Landform: Beaches on islands
Landform position (three-dimensional): Rise

Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Beach sand

Properties and qualities

Slope: 0 to 3 percent
Drainage class: Poorly drained
Runoff class: Very high
Depth to water table: About 0 to 80 inches
Frequency of flooding: Very frequent

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Forage suitability group: Forage suitability group not assigned (G156AC999FL)
Other vegetative classification: Forage suitability group not assigned (G156AC999FL)
Hydric soil rating: Unranked

Description of Urban Land

Setting

Landform: Flats on islands
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: No parent material

Interpretive groups

Land capability classification (irrigated): None specified
Forage suitability group: Forage suitability group not assigned (G155XB999FL)
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: Unranked

Minor Components

Bahiahonda

Percent of map unit: 5 percent
Landform: Dunes on beaches, ridges on beaches
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Forage suitability group not assigned (G156AC999FL)
Hydric soil rating: No

99—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified

Forage suitability group: Forage suitability group not assigned (G156AC999FL)

Other vegetative classification: Forage suitability group not assigned (G156AC999FL)

Hydric soil rating: Unranked

100—Waters of the Atlantic Ocean

Map Unit Composition

Waters of the atlantic ocean: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waters Of The Atlantic Ocean

Interpretive groups

Land capability classification (irrigated): None specified

Forage suitability group: Forage suitability group not assigned (G156AC999FL)

Other vegetative classification: Forage suitability group not assigned (G156AC999FL)

Hydric soil rating: Unranked

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Miami-Dade County Area, Florida														
Map unit symbol and soil name	**Pct. of map unit**	**Hydrologic group**	**Depth**	**USDA texture**	**Classification**		**Pct Fragments**		**Percentage passing sieve number—**				**Liquid limit**	**Plasticity index**
					Unified	**AASHTO**	**>10 inches**	**3-10 inches**	**4**	**10**	**40**	**200**		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
42—Udorthents, limestone substratum-Urban land complex, 0 to 5 percent slopes														
Udorthents	50	A	0-30	Very gravelly sand	SP-SM, GP	A-1-a, A-3	0- 0- 0	0-12- 17	33-41-79	30-39-78	20-30-65	1- 3- 10	0-0 -0	NP
			30-40	Bedrock	—	—	—	—	—	—	—	—	—	—

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APPENDIX E-1 - DHW RESOURCES

Datums for 8723050, NORTH MIAMI BEACH FL

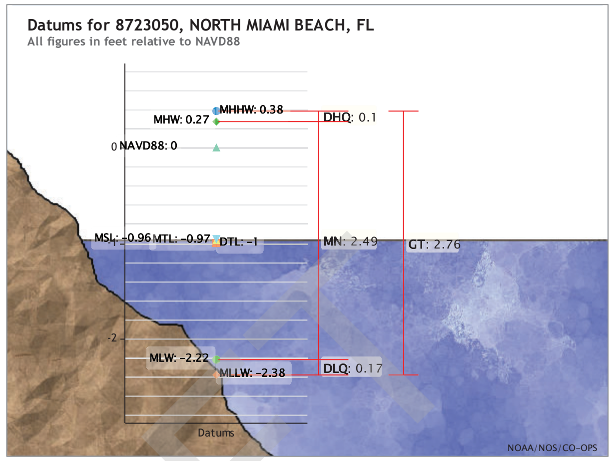
NOTICE: All data values are relative to the NAVD88.

Elevations on NAVD88

Station: 8723050, NORTH MIAMI BEACH, FL
Status: Accepted (Apr 17 2003)
Units: Feet
Control Station: 8723170 Miami Beach, FL
T.M.: 75
Epoch: (/datum_options.html#NTDE) 1983-2001
Datum: NAVD88

Datum	Value	Description
MHHW (/datum_options.html#MHHW)	0.38	Mean Higher-High Water
MHW (/datum_options.html#MHW)	0.27	Mean High Water
MTL (/datum_options.html#MTL)	-0.97	Mean Tide Level
MSL (/datum_options.html#MSL)	-0.96	Mean Sea Level
DTL (/datum_options.html#DTL)	-1.00	Mean Diurnal Tide Level
MLW (/datum_options.html#MLW)	-2.22	Mean Low Water
MLLW (/datum_options.html#MLLW)	-2.38	Mean Lower-Low Water
NAVD88 (/datum_options.html)	0.00	North American Vertical Datum of 1988
STND (/datum_options.html#STND)	-4.40	Station Datum
GT (/datum_options.html#GT)	2.76	Great Diurnal Range
MN (/datum_options.html#MN)	2.49	Mean Range of Tide
DHQ (/datum_options.html#DHQ)	0.10	Mean Diurnal High Water Inequality
DLQ (/datum_options.html#DLQ)	0.17	Mean Diurnal Low Water Inequality
HWI (/datum_options.html#HWI)	0.79	Greenwich High Water Interval (in hours)
LWI (/datum_options.html#LWI)	6.97	Greenwich Low Water Interval (in hours)
Max Tide (/datum_options.html#MAXTIDE)	1.93	Highest Observed Tide
Max Tide Date & Time (/datum_options.html#MAXTIDEDT)	10/25/1973 07:24	Highest Observed Tide Date & Time
Min Tide (/datum_options.html#MINTIDE)	-3.78	Lowest Observed Tide
Min Tide Date & Time (/datum_options.html#MINTIDEDT)	06/29/1973 12:42	Lowest Observed Tide Date & Time
HAT (/datum_options.html#HAT)		Highest Astronomical Tide
HAT Date & Time		HAT Date and Time
LAT (/datum_options.html#LAT)		Lowest Astronomical Tide
LAT Date & Time		LAT Date and Time

Tidal Datum Analysis Periods
05/01/1973 - 04/30/1974



Showing datums for

8723050 NORTH MIAMI BEA...

Datum

NAVD88

Data Units
- Feet
- Meters

Epoch
- Present (1983-2001)
- Superseded (1960-1978)

Submit

Show nearby stations

Products available at 8723050 NORTH MIAMI BEACH, FL

TIDES/WATER LEVELS
- Water Levels
- NOAA Tide Predictions (/noaatidepredictions.html?id=8723050)
- Harmonic Constituents
- Sea Level Trends
- Datums (/datums.html?id=8723050)
- Bench Mark Sheets (/benchmarks.html?id=8723050)
- Extreme Water Levels (/est/est_station.shtml?stnid=8723050)
- Reports (/reports.html?id=8723050)

METEOROLOGICAL/OTHER
- Meteorological Observations
- Water Temp/Conductivity

PORTS®
- This station is not a member of PORTS®

OPERATIONAL FORECAST SYSTEMS
- This station is not a member of OFS

INFORMATION
- Station Home Page (/stationhome.html?id=8723050)
- Data Inventory (/inventory.html?id=8723050)
- Measurement Specifications (/measure.html)

APPENDIX E-2 - FDOT D6 MINIMUM DHW

Revised on 08/31/2016

Meeting Minutes

Project:	Roadway Profile Master Plan - East of the Salinity Control Line
Subject:	Seasonal High Water Elevation Confirmation
Date:	Monday, August 15, 2016
	2:00 p.m. – 2:30 p.m.
Location:	FDOT District 6, Drainage Office

Name	Association	Phone	E-Mail
Ricardo Salazar	FDOT	305-470-5264	Ricardo.salazar@dot.state.fl.us
Mohammad Shahed Pervez	HDR	304-728-7446	Mohammad.pervez@hdrinc.com

Introduction:

Mohammad opened the meeting with describing the assignment under the project. The following topics are discussed:

- **Project Extent:** The project extent is east of the Salinity Control line for state roads. Mr. Salazar mentioned the segments of state roads east of the salinity control line must follow the criteria of 2.0 ft-NAVD for tailwater elevation and 1.0 ft-NAVD for design high water elevation. Refer to attachment no. 1 for project extent and list of the state road segments.

- **Basis of having 2.0' NAVD as Tailwater Elevation:** Mr. Salazar explained this value was set as a tailwater elevation based on a recent analysis performed using the latest high tide peaks from the Virginia Key gauge station data taken from a period of last year (2015) from September to November. Refer to attachment no. 2 for the analysis that supports the proposed Tailwater Elevation.

  In a follow-up telephone conversation at a later date (08/18/2016) Mr. Salazar mentioned that there are two Reports funded by FDOT Central Office available on the similar topic; however, the methodology used to determine the tailwater mentioned in the above paragraph provides more realistic and reasonable approach for this region which was also discussed with Tallahassee office. The reports are included in attachment no.3 and 4.

- **Base Clearance Criteria:** Mr. Pervez referred to FDOT Criteria for Base Clearance (Table 2.6.3, PPM Vol. 1). Mr. Salazar advised to use the above mentioned table to identify the base clearance for different type of facilities. 1.0 ft-NAVD to be used as design high water elevation.

- **Datum Conversion:** To simplify this study Mr. Salazar advised to use (-) 1.50' as a conversion factor while converting ft-NGVD to ft-NAVD datum.

- **General Discussion:** For stormwater management design at the east of Salinity Control Line Mr. Salazar also mentioned:

  - The French Drain invert shall be designed based on the Design High Water (DHW) as 1.0 ft-NAVD.

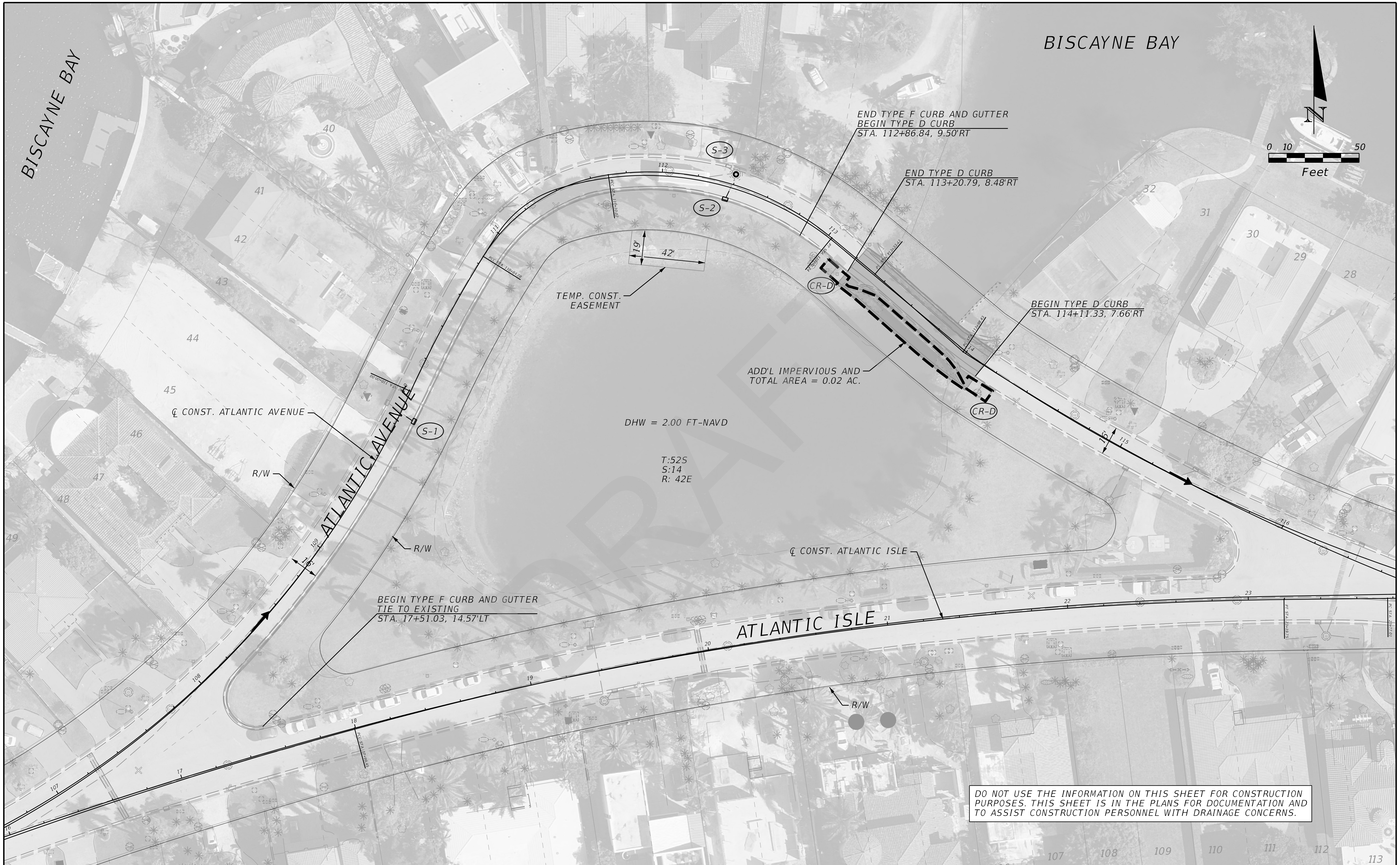
  - The bottom elevation of the dry pond shall be designed as 2.0 ft-NAVD minimum using the DHW of 1.0 ft-NAVD.

  - When variable tailwater elevation to be used for design calculations with ICPR analysis, initial boundary stage of 1.0 ft-NAVD to a maximum boundary peak water elevation of 2.0 ft-NAVD to be used.

<u>Attachments:</u>

1. Map showing the Project Extent and list of state road segments within the project limit.
2. FDOT District Six Analysis on Tail water elevation determination
3. FDOT_BDK75_977-63_Final_Technical_Report - Short Term Actions_Reduced.pdf
4. Methodology for the Assessment of Sea Level Rise - FDOT – 2012.pdf

APPENDIX F - DRAINAGE MAP



DO NOT USE THE INFORMATION ON THIS SHEET FOR CONSTRUCTION PURPOSES. THIS SHEET IS IN THE PLANS FOR DOCUMENTATION AND TO ASSIST CONSTRUCTION PERSONNEL WITH DRAINAGE CONCERNS.

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

FDOT DISTRICT SIX
NATHAN V. PULIDO, P.E.
1000 N.W. 111TH AVENUE
MIAMI, FLORIDA 33172
P.E. NO. 51479

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
	MIAMI-DADE	430029-2-22-01

DRAINAGE MAP (ALT 2)

SHEET NO. 4

APPENDIX G - WATER QUALITY

ATLANTIC ISLE LAGOON BRIDGE No. 874218
PROJECT DEVELOPMENT & ENVIRONMENTAL (PD&E) STUDY
FM No. 430029-2-22-02
PRE-DEVELOPMENT WATER QUALITY CALCULATIONS

FDOT

SITE INFORMATION

Total Drainage Area (A_T), acres =	4.63
Exist. Impervious Area (A_{imp}), acres =	3.06
Exixt. Pervious Area (A_{perv}), acres =	1.57
Runoff Coefficient for Imp. Area (C1) =	0.90
Runoff Coefficient for Perv. Area (C2) =	0.30
Weighted Runoff Coeffiient(C) =	0.70
Design Storm Frequency (F), years =	10
Min. Time of Concentration (t_c), min	20

SFWMD CRITERIA

Water Quality Required (V_{SFWMD}): Wet detention volume shall be provided for the first inch of runoff from the developed project, or the total runoff of 2.5 inches times the percentage of imperviousness, whichever is greater plus an additional 50 percent since Biscayne Bay is an OFW

$1"/12 \times A_T \times 1.5 =$	**0.579**	ac-ft	
$2.5"/12 \times A_{imp} \times 1.5 =$	**0.956**	ac-ft	Minimum water quality required

DERM CRITERIA

Water Quality Required (V_{DRER}): (100 % of the first 1" of runoff from the farthest hydrologic point must be retained on site)

Time to Generate 1" of Runoff ($t_{1"}$), min =	$t_{1"} = \dfrac{2940 \times F^{-0.11}}{(308.5 \times C) - 60.5(0.5895 + F^{-0.67})}$	=	13.72	min
Total Time of Concentration (T_T), min =	$T_T = t_c + t_{1"}$ = 33.72 min			
Storm Intensity (Dade County Rainfall Intensity-Duratio-Frequency Curves) (i), in/hr =	$i = \dfrac{308.5}{48.6F^{-0.11} + T_T(0.5895 + F^{-0.67})}$	=	4.76	in/hr
V_{DRER}:	$V_{DRER} = 60 \times C \times i \times A_T \times T_T$ = 31060 ft^3	=	**0.71**	ac-ft
Runoff:	$Q_{1"} = C \times i \times A_T$ = **15.35** cfs			

DERM criteria is the more critical water treatment required, and it will be the one to be used to select the Vortechs.

EXIST. VORTECH® TREATMENT STRUCTURE CAPACITY

Exixting Vortech®	Dimension, ft	Treatment Capacity, cfs	Required Treatment, cfs	Surplus, cfs	
5000	13x7	8.5	15.35	-6.85	***Not complying***

Return Period, Years	Time to Generate 1" of Runoff ($t_{1"}$), min	Total Time of Concentration (T_T), min	Intensity (i), in/hr	Peak Runoff (Q), cfs	Treatment Structure Peak Capacity, cfs	Required By-pass Capacity, cfs
25	11.98	31.98	5.44	17.56	8.50	9.06
100	10.04	30.04	6.38	20.57	8.50	12.07

ATLANTIC ISLE LAGOON BRIDGE No. 874218
PROJECT DEVELOPMENT & ENVIRONMENTAL (PD&E) STUDY
FM No. 430029-2-22-02
POST DEVELOPMENT WATER QUALITY CALCULATIONS

FDOT

SITE INFORMATION	
Total Drainage Area (A_T), acres =	4.65
Exist. Impervious Area (A_{imp}), acres =	3.06
Add. Impervious Area (A_{imp}), acres =	**0.02**
Prop. Impervious Area (A_{imp}), acres =	3.08
Prop. Pervious Area (A_{perv}), acres =	1.57
Runoff Coefficient for Imp. Area (C1) =	0.90
Runoff Coefficient for Perv. Area (C2) =	0.30
Weighted Runoff Coeffiient(C) =	0.70
Design Storm Frequency (F), years =	**10**
Min. Time of Concentration (t_c), min	20

SFWMD CRITERIA

Water Quality Required (V_{SFWMD}): Wet detention volume shall be provided for the first inch of runoff from the developed project, or the total runoff of 2.5 inches times the percentage of imperviousness, whichever is greater plus an additional 50 percent since Biscayne Bay is an OFW

$1"/12 \times A_T =$	0.388	ac-ft
$2.5"/12 \times A_{imp} =$	0.642	ac-ft

DERM CRITERIA

Water Quality Required (V_{DRER}): (100 % of the first 1" of runoff from the farthest hydrologic point must be retained on site)

Time to Generate 1" of Runoff ($t_{1"}$), min = $t_{1"} = \frac{2940 \times F^{-0.11}}{(308.5 \times C) - 60.5(0.5895 + F^{-0.67})} =$ 13.70 min

Total Time of Concentration (T_T), min = $T_T = t_c + t_{1"}$ = 33.70 min

Storm Intensity (Dade County Rainfall Intensity-Duratio-Frequency Curves) (i), in/hr = $i = \frac{308.5}{48.6F^{-0.11} + T_T(0.5895 + F^{-0.67})}$ = 4.76 in/hr

V_{DRER}: $V_{DRER} = 60 \times C \times i \times A_T \times T_T$ = 31221 ft^3 = 0.717 ac-ft

Runoff: $Q_{1"} = C \times i \times A_T$ = **15.44** cfs

DERM criteria is the more critical water treatment required, and it will be the one to be used to select the Vortechs.

PROPOSED VORTECH® TREATMENT STRUCTURE CAPACITY

Proposed Vortech® Model	Dimensions ft	Treatment Capacity, cfs	Required Treatment, cfs	Surplus, cfs	
11000	16x10	17.5	**15.44**	2.06	***Complying***

Return Period, Years	Time to Generate 1" of Runoff ($t_{1"}$), min	Total Time of Concentration (T_T), min	Intensity (i), in/hr	Peak Runoff (Q), cfs	Treatment Structure Peak Capacity, cfs	Required By-pass, cfs
25	11.96	31.96	5.45	17.66	17.50	0.16
100	10.02	30.02	6.38	20.69	17.50	3.19

APPENDIX H - SCOUR ANALYSIS

RIBBECK Engineering, Inc.

January 11, 2023

Nathan V. Pulido, P.E.

District Drainage Engineer
Florida Department of Transportation – District 6 Adam Leigh Cann Building
1000 NW 111th Avenue – Room 6211
Miami, FL 33172

Subject: **Atlantic Isle over Ocean Canal Bridge Replacement in the City of Sunny Isles Beach.**

Dear Mr. Pulido,

The Florida Department of Transportation District Six is conducting a PDE study for the eventual replacement of the Atlantic Isle single span concrete arch bridge over Ocean Canal with a new single span concrete arch bridge. The engineering firm of Ribbeck Engineering Inc. have been retained to provide engineering recommendations on scour potential for this bridge.

The existing bridge is located along Atlantic Isle where it crosses Ocean Canal. This short canal links Biscayne Bay Aquatic Preserve with a small man-made lagoon referred to as "Atlantic Isle Lagoon". This short canal and associated lagoon are tidally influenced. Ocean Canal is about 39 feet wide at the existing bridge. The north east shore of the canal is bordered by a low-lying concrete seawall. The north west shore has no seawall and is overgrown by mangroves. The south east and south west shores are vegetated by well-maintained sods. The existing concrete arch bridge is skewed in reference to Ocean Canal, has a width of 20 feet, and provides a clearance of +/- 3.22 feet above the mean high tide elevation of +1.00 NAVD or +/- 2.22 feet above FDOT tail water elevation of +2.00 NAVD. The apex elevation of the bridge ceiling is estimated at +4.22 NAVD. The existing bridge plan and elevation is depicted in figure 1.

The proposed bridge will replace the existing bridge by a wider and slightly higher concrete arch bridge. The new bridge will have a span of 46 feet, and will not be skewed in reference to Ocean Canal. The new bridge will also have a width of 27.25 feet, and provides a clearance of +/- 3.51 feet above the mean high tide elevation of +1.00 NAVD or +/- 2.51 feet above FDOT tail water elevation of +2.00 NAVD. The apex elevation of the bridge ceiling is estimated at +4.51 NAVD, slightly higher than the existing bridge apex ceiling elevation. The proposed bridge plan and elevation is depicted in figure 2.

The new bridge as recommended by the structural consultant will be either cast in place or prefabricated. The construction of the vertical face abutments (east and west) will require the installation of temporary sheet piles. The temporary sheet pile walls are needed for the construction of the bridge drill shaft and abutment walls. As depicted in figure 2, the north west proposed temporary sheet piles will be installed within the limits of the existing bridge, thus avoiding impacts to the mangroves.

The existing canal will remain close to its original surface minus the removal of the existing bridge abutments located within the footprint of the proposed bridge.

Based on the description of the proposed works, and existing site conditions, it is our professional opinion that the proposed single span arch bridge construction will not be subject to scour condition. The following observations formed the basis of our opinion:

1. The existing canal is not a conveyance canal, but a manmade canal that was excavated to provide water connection between Atlantic Isle Lagoon (small lagoon) to the shallow water of Biscayne Bay Aquatic Preserve.
2. The proposed bridge has no associated significant watershed that will cause extreme flows to this canal.
3. The proposed bridge spans the width of the canal at its location, and the proposed abutments are set slightly outside the alignment of the existing abutments. Therefore, no canal contraction exists which will cause either contraction scour, or abutment scour.
4. The proposed bridge is a single span bridge with no piers in the canal. Therefore, no local or pier scour exists.
5. The proposed bridge low member elevation is slightly higher than the existing low member elevation. The bridge opening area at design water elevation of 2.00 NAVD is maintained.
6. The proposed bridge is located in FEMA flood zone AE with a static base flood elevation (BFE) of 8.00 NGVD (Firm ID 12086C0142L) and is outside the storm surge induced velocity area (VE). Therefore, storm induced velocity scour is not present.

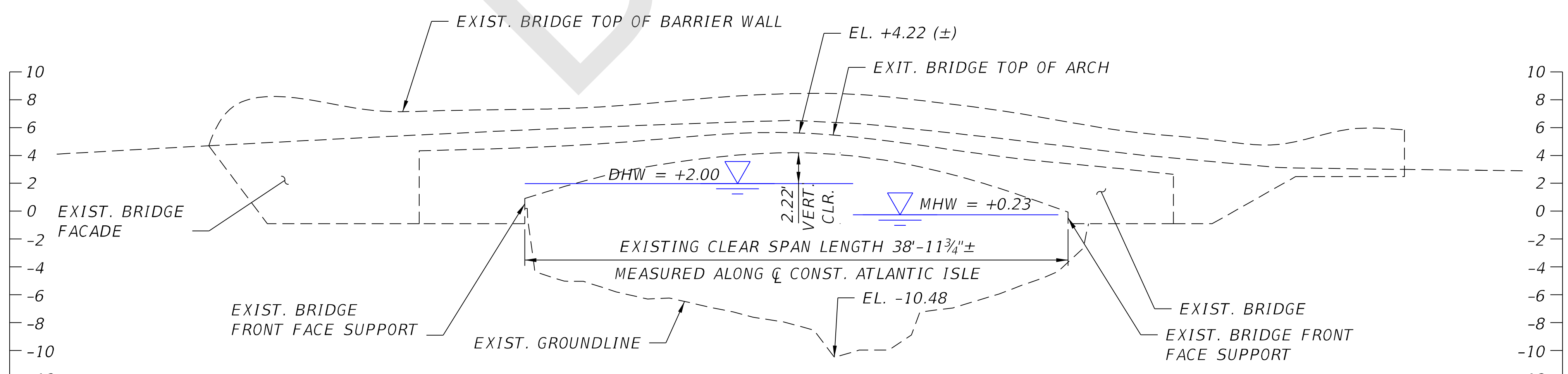
These determinations are based on procedures and guidelines listed on HEC-18 “Hydraulic Engineering Circular No. 18 – Evaluating Scour at Bridges”.

We hope this letter satisfies your concern about the scours for the proposed concrete arch bridge.

Sincerely,

Carlos Ribbeck, P.E.
FL License No. 50543

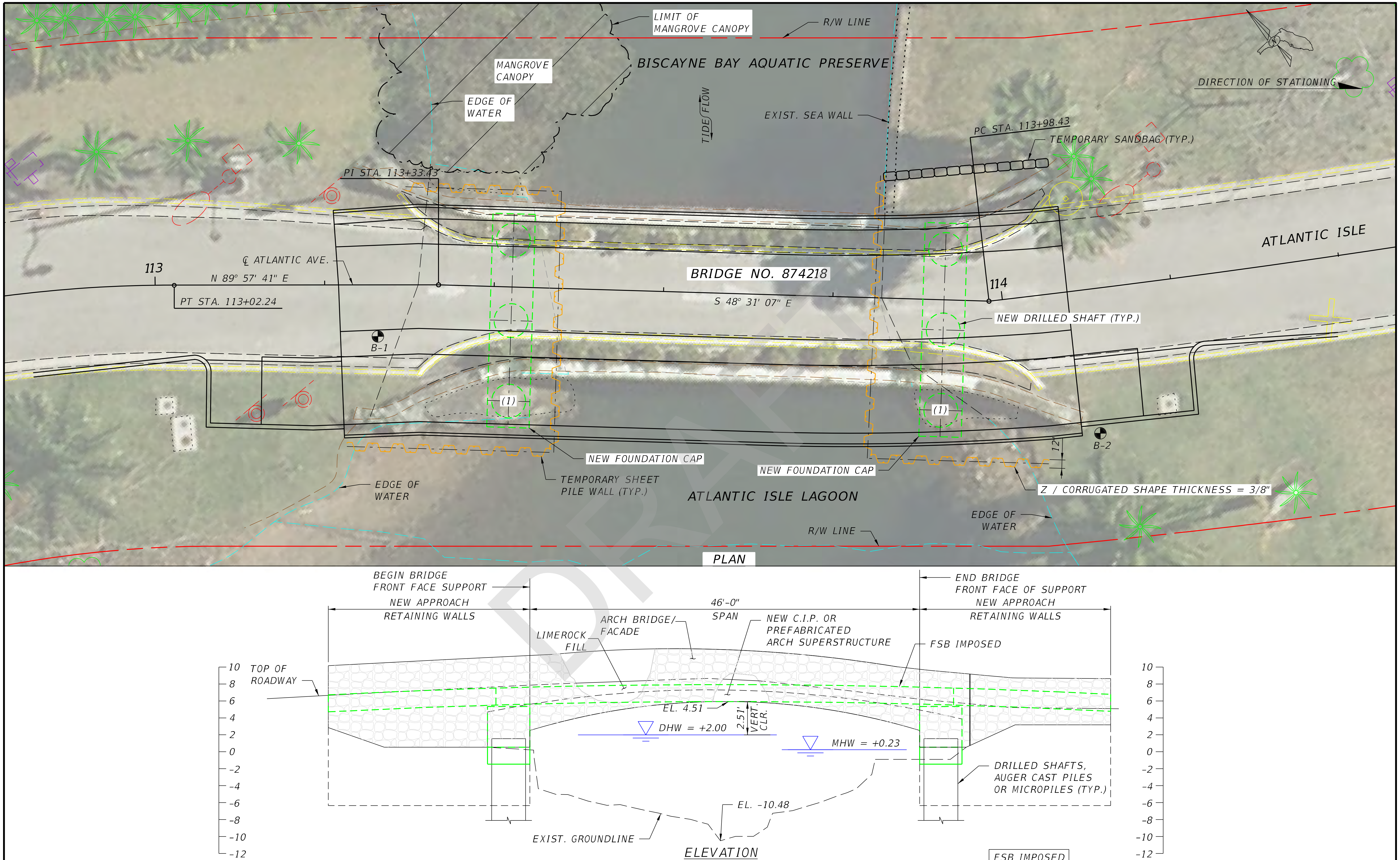
Ribbeck Engineering Inc. ◙ 14335 SW 120th Street ◙ Suite 205 ◙ Miami, Fl 33186
Phone: 305-383-5909 ◙ Fax: 305-383-5979 ◙ CA # 27592



ELEVATION

EXIST. BRIDGE
PLAN AND ELEVATION
ATLANTIC ISLE OVER OCEAN CANAL

FIG. 1



ALTERNATIVE 2 - BRIDGE REPLACEMENT
CONSTRUCTABILITY CONCEPT
ATLANTIC ISLE OVER OCEAN CANAL

FIG. 2

APPENDIX I -
INTERAGENCY MEETING MINUTE

FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT IV and VI INTERAGENCY MEETING MINUTES

TO: James Poole (FDOT IV), and Meeting attendees

FROM: Jennifer Shipley, Miller Legg (on behalf of FDOT, District IV)

MEETING DATE: Thursday, July 21, 2022

LOCATION: TEAMS hosted by South Florida Water Management District (SFWMD) 3301 Gun Club Road, West Palm Beach, Florida

SUBJECT: FDOT July Interagency Meeting Minutes

Meeting Summary:

- One (1) project was discussed at this month's Interagency Meeting from District 6. District 4 and Florida Turnpike (FTE) did not have any projects to discuss for this meeting.
- The interagency meeting was hosted by SFWMD via TEAMS. Some attendees may only have attended via phone. Roll call was performed at the start of each meeting.

District 6

9:00 – 10:00 AM: Miami-Dade County, Atlantic Isle at West of SR A1A (Bridge# 874218) PD&E (FM 430029-2), *presented by Amanda Montgomery, PWS of WGI.* 60 min.

- ***A**gencies Requested: SFWMD Environmental Resources and Surface Water Management, USACE, NMFS*

9:00 to 10:00 AM

Atlantic Isle at West of SR A1A (Bridge# 874218) PD&E (FM 430029-2)

presented by WGI

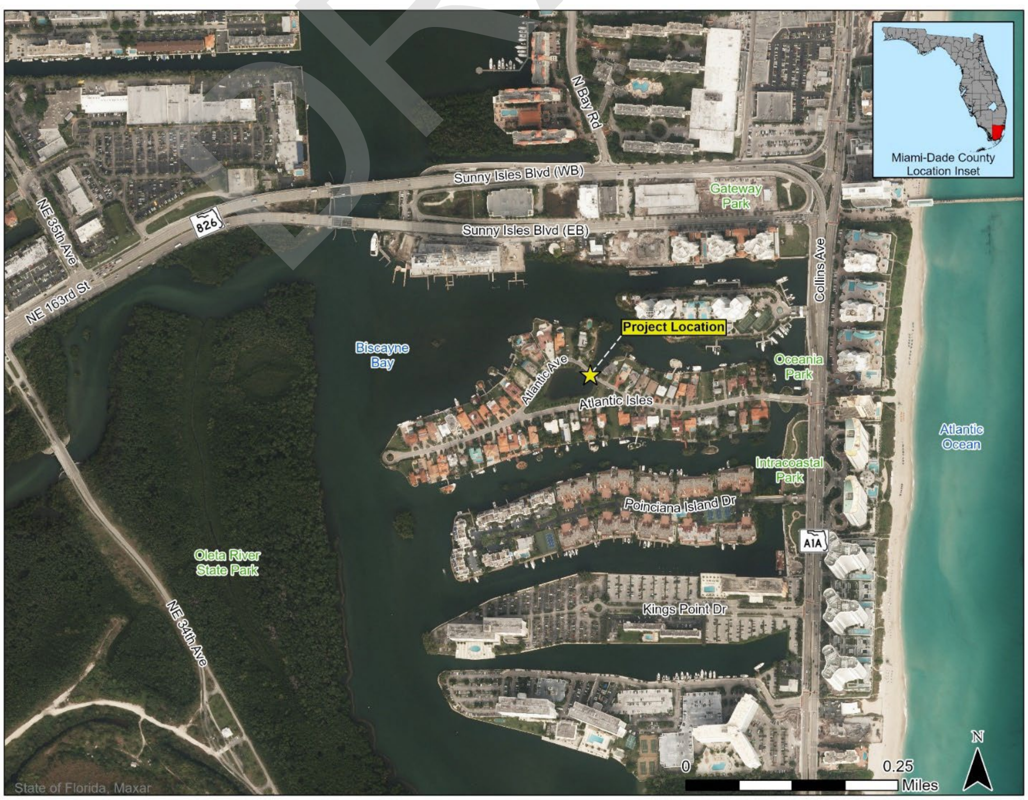
FLORIDA DEPARTMENT OF TRANSPORTATION
INTERAGENCY MEETING MINUTES

9:00 – 10:00 am: (D6) Atlantic Isle at West of SR A1A (Bridge# 874218)

AGENDA SUMMARY:

PROJECT INFO

1. FPID/FM Number: **430029-2-22-02**
2. FDOT Project Name: Atlantic Isle at West of SR A1A (Bridge# 874218)
3. FDOT Project Manager: Nicholas Danu, FDOT D6
   FDOT Drainage Liaison: Nathaniel Pulido, P.E., FDOT D6
   FDOT PLEMO Liaison: Joy Castro, Stantec Consulting Services, Inc.
4. Consultant/Company Name and Contact information: Amanda Montgomery, PWS, WGI
5. SR/Local Name: Atlantic Isle
6. County: Miami-Dade County
7. Project Limits (provide location map and figures):



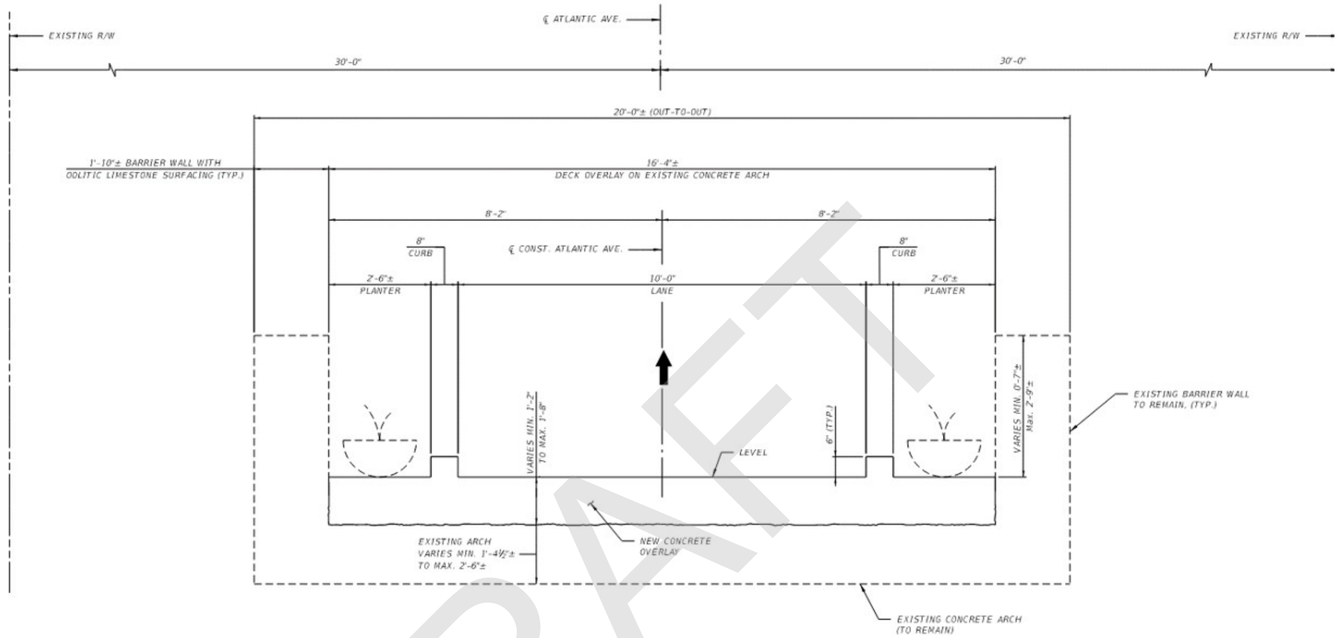
8. General Project Scope (include stage of project - PD&E, Design, Design/Build, Construction, etc.): **The FDOT D6 is conducting a Project Development and Environment (PD&E) Study (FM No. 430029-2-22-01) for Atlantic Isle Bridge (Bridge No. 874218). The Atlantic Isle Bridge is a historic bridge located on Atlantic Island just west of State Road (SR) A1A (Collins Avenue), within the City of Sunny Isles Beach in Miami-Dade County. Bridge No. 874218, a one-way bridge, was constructed in 1925 and is located along Atlantic Isle Avenue and spans 43-feet over the narrow channel between Lake of the Isles and Biscayne Bay. The PD&E Study evaluates a range of alternatives to address the purpose and need for the project, including rehabilitation, replacement, and no-build options for the bridge, as well as potential conversion of the existing structure to a pedestrian bridge. The purpose of the project is to address the structural and functional deficiencies of the existing bridge to provide a safe and usable route for the surrounding community and traveling public.**

Existing Bridge Typical Section

- Build Alternative 1: Bridge Rehabilitation
  This alternative involves rehabilitation of the existing bridge superstructure, providing a new CIP reinforced concrete arch structure, and maintaining one-way travel on the bridge. The roadway width will be maintained, but the typical section and vertical roadway geometry will be impacted to accommodate the retrofitted structure depth. The proposed new arch would extend beyond the ends of the existing concrete arch and foundations to avoid the existing foundation removal costs and the associated risks that could impact the adjacent residential property foundations and structures. A new bridge substructure (abutments and foundations) would be constructed to support the rehabilitated bridge superstructure. During construction, the existing substructure and the superstructure will remain to support the existing concrete arch and exterior limestone façade. With the bridge rehabilitation, one-way travel on the bridge would be maintained. The rehabilitated bridge typical section would remain as is, consisting of a single 10-foot-wide travel lane, 8-inch-wide curbs, 2.5-

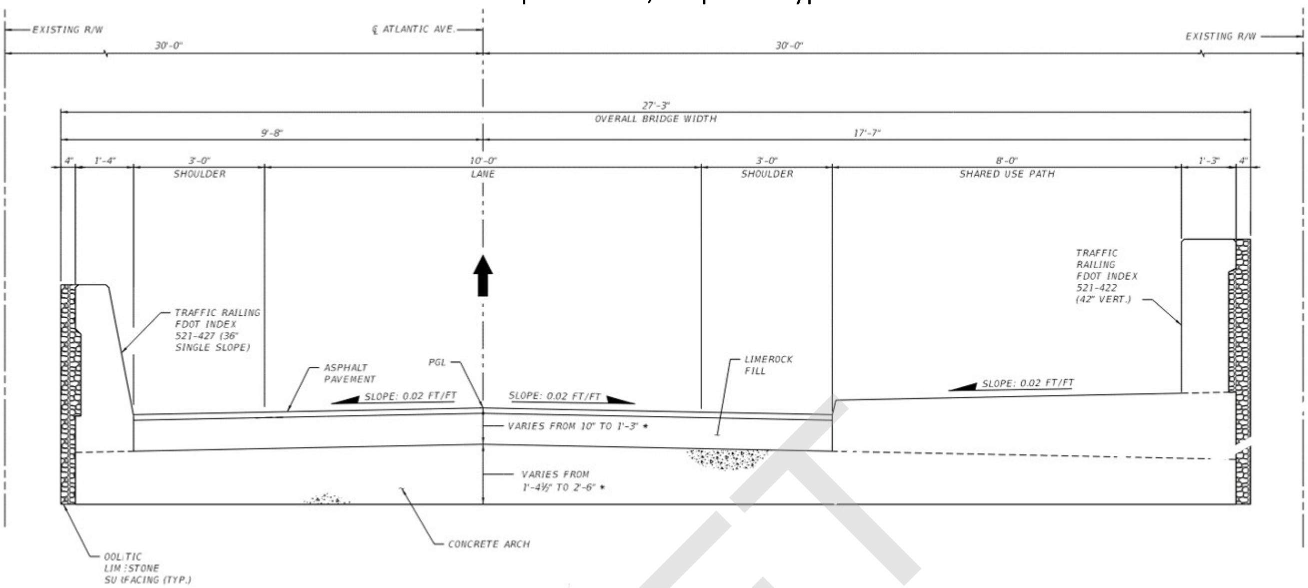
foot-wide planter easements, and 1-foot 10-inch-wide barriers on each side of the bridge. The vertical direction of the typical section will be impacted since the roadway profile will be higher at the bridge section to accommodate the additional thickness of the new structural arch.

Build Alternative 1 – Rehabilitation, Proposed Typical Section



- <u>Build Alternative 2: Bridge Replacement</u>
  The replacement alternative involves replacing the entire bridge to address the structural and functional deficiencies of the existing superstructure and substructure to enhance operations and remove load restrictions. This would require demolition of the existing bridge and replacement of the bridge at the same location to minimize overall environmental impacts. The proposed bridge typical section would be approximately 27 feet wide to accommodate one 10-foot-wide travel lane, one 8-foot-wide shared use path, 3-foot-wide shoulders, and concrete traffic railings on both sides. A raised sidewalk would separate pedestrians from vehicular traffic.

Build Alternative 2 – Replacement, Proposed Typical Section



9. Anticipated Permits: **USACE Section 10 Permit, SFWMD Individual ERP (SSL Easement may be required), DERM Class II Permit, DERM Class I Permit**

10. Provide specific agenda discussion topics (i.e. goal of meeting):

- **Drainage:**

a. **Identify applicable water quantity criteria requirements. Project will discharges into Biscayne Bay, OFW, and WBID 3226H1 (ICWW [Miami-Dade County Northern Segment]), a verified impaired waterbody for nutrients including total nitrogen and Chlorophyll-a**

11. Requested Attendees (SFWMD - Environmental Resources, Surface Water Management, Water Use, ROW; USACE; USFWS; NMFS, etc.): **ERP, SWM, USACE, NMFS**

12. Does your project include impacts to any environmental resources? If yes, please answer Questions a- d:

a. Have wetland and/or protected species impacts been identified? If so define the impact amount and type:
A benthic survey and shoreline characterization of the tidal lagoon and channel area was performed in July 2020. This survey was conducted to document existing conditions and identify the presence or absence of natural resources and EFH, as well as any habitat for/presence of any threatened or endangered species.

The Atlantic Island Bridge is located within the Biscayne Bay Aquatic Preserve, which is designated as an Outstanding Florida Water. Also present within the project area is a tidally influenced lagoon and a small canal that connects the lagoon to Biscayne Bay. Seagrasses have been identified within the lagoon, and mangroves are present along the western shoreline of the lagoon as well as along the western bank of the small

canal adjacent to the Atlantic Island Bridge. Impact acreages are still being evaluated, but it should be noted that Build Alternative 2 (Replacement) has a larger footprint than Build Alternative 1, so increased shading impacts are anticipated with this alternative.

Table 1. Listed Species Potentially Occurring in the Project Area		
Species Name	**Listing Status**	**Occurrence Potential**
Birds		
Wood stork (*Mycteria americana*)	FT	Low
Piping plover (*Charadrius melodus*)	FT	Low
Tricolored heron (*Egretta tricolor*)	ST	Moderate
Little blue heron (*Egretta caerulea*)	ST	Moderate
Roseate spoonbill (*Ajaia ajaja*)	ST	Low
Reddish egret (*Egretta rufescens*)	ST	Low
Black skimmer (*Rynchops niger*)	ST	Low
Least tern (*Sterna antillarum*)	ST	Low
Mammals		
Florida bonneted bat (*Eumops floridanus*)	FE	Low
West Indian manatee (*Trichechus manatus*)	FT	High
Reptiles		
American Crocodile (*Crocodylus acutus*)	FT	Low
Green sea turtle (*Chelonia mydas*)	FT	Low

Kemp's Ridley sea turtle (*Lepidochelys kempii)*	FE	Low
Leatherback sea turtle (*Dermochelys coriacea)*	FE	Low
Hawksbill sea turtle (*Eretmochyles imbricata*)	FE	Low
Loggerhead sea turtle (*Caretta caretta*)	FT	Low
Fish		
Smalltooth sawfish (*Pristis pectinata*)	FE	Low
Giant Manta Ray (*Manta birostris*)	FT	Low
Corals		
Elkhorn coral (*Acropora palmata*)	FT	Low
Staghorn coral (*Acropora cervicornis*)	FT	Low

*__Note__: FE: Federally Endangered; FT: Federally Threatened; ST: State Threatened

b. Have the project representatives discussed the wetland and/or protected species impacts with PL&EM? (List the PL&EM person who you discussed with and the date of the meeting/discussion):

An existing tidally influenced lagoon has been identified within the project area, and a small canal connects the lagoon to Biscayne Bay. Several mangroves have established along the western shoreline of the canal and sapling red mangroves were documented colonizing the shallow banks of portions of the lagoon. No other natural features exist within the project area as the remainder of the island consists of private residential properties.

It is anticipated that the Standard Manatee Conditions for In-Water Work and Sea Turtle and Smalltooth Sawfish Construction Conditions will be required for work proposed in, on, or over the waters in the project study area. With these conditions in place, along with the fact that the project improvements are expected to be constructed primarily within the existing right-of-way with only minor impacts to the south side of Atlantic Avenue, the lagoon, and/or channel, <u>it is anticipated that this project will not result in significant adverse impacts to protected species</u>.

Potential temporary and permanent impacts to wetland resources, essential fish habitat, and protected species/habitat are being evaluated, and effect determinations will be documented for all protected species and their habitat in the Natural Resource Evaluation (NRE) that is being prepared for this project. The NRE will be submitted as appropriate to NMFS, USFWS, and FWC for review and concurrence.

c. During the meeting/discussion with PL&EM did project representatives discuss avoidance and minimization criteria? Has PL&EM concurred these criteria were applied? (For District IV projects, participation in this interagency meeting is not permitted if elimination and reduction has not been explored with PL&EM): **Avoidance and minimization criteria are being developed as part of the ongoing analysis.**

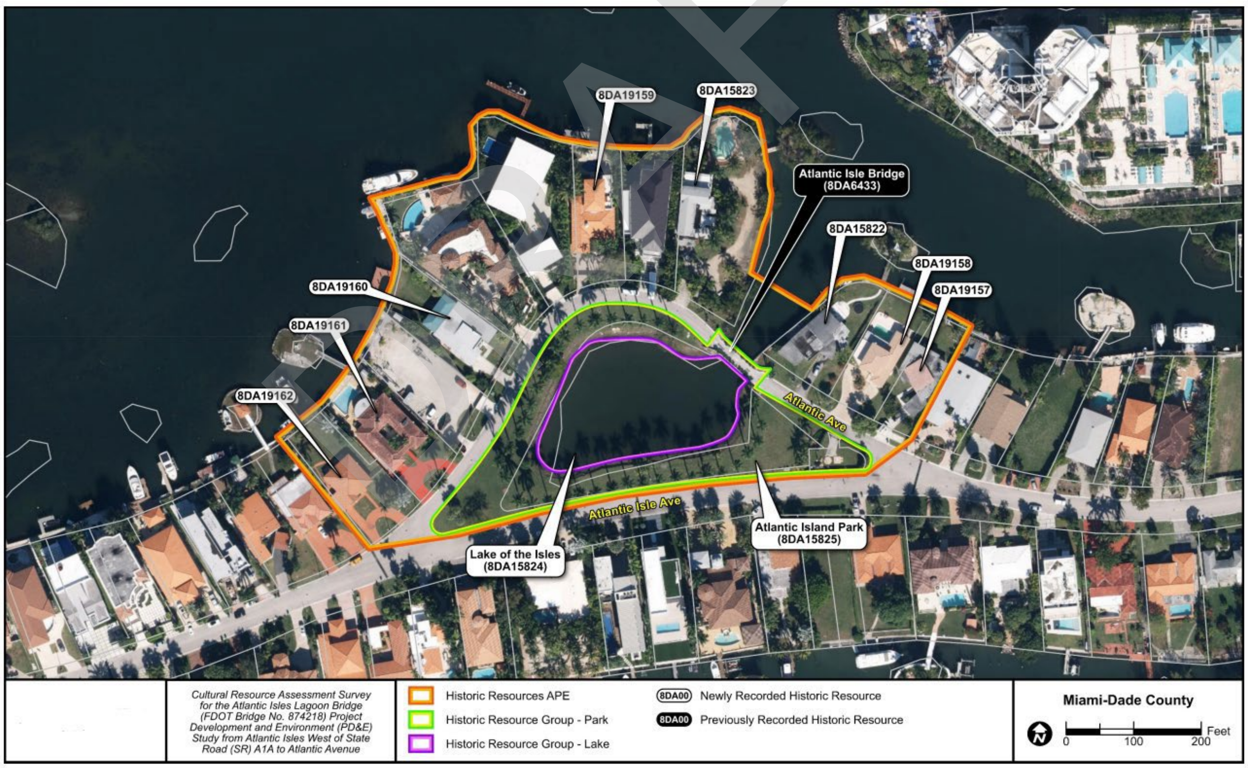
d. Have mitigation options for unavoidable impacts been discussed with PL&EM, and concurrence on the amount and type been achieved? (For District IV projects, participation in this interagency meeting is not permitted if options for unavoidable impacts been discussed with PL&EM): **Mitigation options are being developed as part of the ongoing analysis and will be submitted for concurrence as appropriate.**

PRIOR COORDINATION

13. Has the project approach been discussed with:
    - **a.** FDOT Drainage Liaison? **Yes, Nathaniel Pulido, P.E., FDOT D6 District Drainage Engineer**
    - **b.** PLEMO Liaison? **Yes, Steven Craig James, FDOT D6 District Environmental Manager and Barbara Cullhane, FDOT D6 District Cultural Resources Coordinator**

14. Have you coordinated with Cultural Resource Manager to determine if a SHPO concurrence letter has been received and can be included in the application?

The FDOT D6 conducted a Cultural Resource Assessment Survey (CRAS) in 2020. SHPO Concurrence was issued in February 2022. Please refer to the below figure and summary of findings:



The historic resources survey resulted in the identification of 12 historic resources within the historic resources APE, one of which was previously recorded. The previously recorded Atlantic Island Bridge (8DA6433) was documented in 2016 and determined eligible for listing in the National Register by the SHPO on August 23, 2016 under Criteria A and C in the areas of

Community Planning and Development and Architecture for its association with the development of the Atlantic Island subdivision and Sunny Isles Beach, as well as its unique

design. No changes to the bridge were observed since it was last recorded and the FMSF form was not updated during the current survey.

The 11 newly recorded historic resources include eight historic buildings (8DA15822-8DA15823, 8DA19157-8DA19162), two historic designed landscape features (8DA15824-8DA15825), and one historic designed landscape (8DA19241). The Atlantic Island Resource Group (8DA19241), a designed landscape, is considered eligible for listing in the National Register under Criteria A and C in the areas of Community Planning and Development and Landscape Architecture. The two landscape features, the Lake of the Isles (8DA15824) and Atlantic Island Park (8DA15825), are considered a contributing part of the resource group, along with the previously recorded National Register-eligible Atlantic Island Bridge (8DA6433).

The eight newly recorded historic buildings (8DA15822-8DA15823, 8DA19157-8DA19162) exhibit common architectural styles and design types found in South Florida. Many of the structures feature alterations or modifications which diminish their historic physical integrity including replaced windows, doors, or exterior material, the addition of non-historic exterior ornament, or additions to the historic structure. <u>Research conducted during this study did not identify known associations with significant people or historical events</u>.

Analysis of aerial photographs revealed that the area surrounding the project APE was not largely developed until the 1960s, with more than half of the lots in the subdivision containing the APE remaining undeveloped by 1968. While every lot within the subdivision is now developed, this construction mainly occurred after the early 1970s. Furthermore, a later wave of development in the 1990s and 2000s resulted in several adjacent historic parcels with large additions which have altered the appearance of any historic buildings or contain modern buildings constructed as infill. Based on field observations, it does not appear that there are any potential residential historic districts that may contain any of the buildings within the APE at this time. Therefore, <u>these eight newly recorded historic resources are considered ineligible for listing in the National Register, either individually or as part of a historic district</u>.

15. Have you coordinated with the Contamination Coordinator to determine if there are contamination concerns in the event a dewatering permit is required? **A contamination review of the FDOT ETDM EST, which contains GIS layers of the U.S. Environmental Protection Agency (EPA), FDEP, and MDC DRER, was performed. A field review was also conducted in March 2021. Based on the review, <u>there are no known contaminated sites</u> within the appropriate buffers of the project study area. Because of the age of the existing bridge, an inspection for asbestos-containing materials and metal-based coatings was completed. No coatings suspected of containing heavy metals were found, so no samples were taken or tested, and no asbestos was detected in any of the materials sampled for this purpose. No contamination impacts are anticipated as a result of this project.**

16. Have you coordinated with Natural Resource Manager to determine if a USFWS concurrence letter has been received and can be included in the application? **The NRE is currently being developed and will be submitted to USFWS, NMFS, and FWC as appropriate for review and concurrence.**

17. For projects going into the permitting phase: Has a pre-application meeting been held or any preliminary correspondence been made by FDOT PM or Consultant with the regulatory

agencies/reviewers? Specify the agencies and dates when meetings were held: **N/A.**

18. For project in the permitting phase, please provide any application numbers and the reviewer's name: **N/A.**

19. Anticipated Permits (or, if you already applied for or received any permits, please include the application/permit numbers): **DERM Class I Permit, DERM Class II Permit, SFWMD Individual ERP (FDEP SSL Easement may be required), USACE Section 10 Permit.**

MEETING INFO

20. Discussion Time Needed: **60 minutes**

PROJECT MEETING SUMMARY:

ATTENDEES:

Name	Organization	Email Address
Dustin Wood	SFWMD	duwood@sfwmd.gov
Wayne Blythe	SFWMD	wblythe@sfwmd.gov
Barb Conmy	SFWMD - ERP	bconmy@sfwmd.gov
Suzanne Haverson	SFWMD - 408	shalvers@sfwmd.gov
Michelle Gilbert	USACE	michelle.l.gilbert@usace.army.mil
Veronica Beech	USACE	Veronica.C.Beech@usace.army.mil
Kurtis Gregg	NMFS	kurtis.gregg@noaa.gov
Kylie Shives	FDOT – Permit Coord	kylie.shivers@dot.state.fl.us
Michel Marceau	FDOT	marceau.michel@dot.state.fl.us
Sheyla Pastora	FDOT	sheyla.pastora@dot.state.fl.us
Nicholas Danu	FDOT	nicholas.danu@dot.state.fl.us
Katherine Bernabeo	FDOT	Katherine.bernabeo@dot.state.fl.us
Barbara Culhane	FDOT	Barbara.Culhane@dot.state.fl.us
Amanda Montgomery	WGI for FDOT	amanda.montgomery@dot.state.fl.us
Colleen Ross	Jacobs	colleen.ross@jacobs.com
Joy Castro	Stantec	joy.castro@stantec.com

The Project meeting started around 9:00 am and was completed by 10:00 am. After roll call of attendees, the overall project scope, limits, and approach were reviewed and presented by Colleen Ross of Jacobs and the Drainage reviewed by Sheyla Pastora and Marceau Michel of FDOT. The Project was described as an off-system one-lane bridge PD&E project to improve structural integrity. The project is in PD&E stage and not programmed for final design and construction. It is an off-system bridge where federal funds are being requested. The City will be responsible to pay 25% of the costs because it is an off-system bridge. A Memorandum of Agreement will be required.

It was noted the bridge straddles two different water body types, an artificial lagoon to the southwest created during the housing development and Biscayne Bay to the northeast. Two alternatives are being explored under the PD&E process a Bridge Rehabilitation Alternative and a Bridge Replacement Alternative. Both alternatives were briefly described as follows:

1. Bridge Rehabilitation Alternative:
    a. Bridge decking replaced through an overlay of existing decking
    b. Keep existing bridge piers in place, but adding two new piers on the upland portion.
    c. No in water work. All work from the road with temporary structural members added the bridge while working.
    d. Current hydraulic opening remains the same
2. Bridge Replacement Alternative:
    a. Remove old bridge and replace with new one lane bridge with added 8’ shared use path
    b. New design criteria would be followed: 3’ shoulders and barrier for shared use path
    c. Bridge footprint would widen to the southwest to accommodate path

d. New piers would be located outside of existing piers
e. 2-foot debris requirement would be met under the bridge.
f. Sea level rise design highwater will be taken into consideration
g. Some in-water work may be required.

Consultant indicated conceptual drainage is still being explored dependent upon this meeting discussion. They have located a Miami-Dade Class 2 DERM permit for the current bridge, however they have not located a SFWMD permit. Currently the bridge drains into Biscayne Bay through an outfall on Atlantic Isles. Consultant is inquiring if there are any known SFWMD permits as they have not found any permit or information on the maximum allowable discharge of this outfall. They are seeking this information to design the conceptual drainage. Also, will Nitrogen and Chlorophyll A criteria be required?

The anticipated permits were outlined and discussed in further detail with the agencies as follows.

SFWMD:

- Dustin Wood of SFWMD of Engineering Group indicated he has not located an existing SFWMD permit for this area. Therefore, the criteria required will be dependent upon how the proposed work is permitted. This is dependent upon the applicability of an exemption or use of General Permit from the environmental group.
    - If it is not exempt, Water Quality and Water Quantity will always be required.
        - General Permit (GP) – only submit what is required and show how GP applies
        - Individual Permit (IP) – submit all elements of the drainage to show conditions are met
- Barb Conmy of SFWMD Environmental Group indicated an exemption for the Replacement Alternative is unlikely due to the addition of the 8' shared use path and different configuration.
- SFWMD indicated they are considering the possibility of several different General Permits, but will have to discuss further if anything will move it to an Individual Permit. Some items they will be reviewing include:
    - 62-330.051 GP for Artificial Waterways: may not apply as there is an artificial waterway only on one side
    - 62.330.443 GP for Minor Bridge Work: there are thresholds to be under for utilization such as total dredge and fill to be 0.5 acres of wetland and surface water. Not more than 0.5 acres new structures, not over Johnson seagrasses. If Replacement Alternative does not meet these thresholds would be an Individual permit. If it does meet the 0.5 acre threshold, the addition of the shared us path would have to be demonstrated as necessary as a safety or design standard. (Collen indicated that the safety criteria is 3' shoulder so may not apply if providing 8').
    - Sovern Submerged Land (SSL) will need to be considered. Title determination should be requested if not known.
- SFWMD was in agreement that the addition of the 8-foot shared use path could move the Replacement Alternative permitting into an Individual Permit rather than a General Permit.
- SFWMD inquired on the length of the bridge and top of bank (TOB). Consultant indicated for the Rehabilitation Alternative the length of work activity is being determined b/c have to go outside to miss the existing piers but the top of bank will remain the same. The Replacement Alternative will be a 46' bridge with an altered TOP and will be on the plans.
- Water Quantity/Quantity criteria was discussed as follows:
    - If a GP is applicable, need to show how meet the GP criteria

  - If an IP is applicable, need to show that all conditions of the criteria are met. This includes Table 1 and 2.
  - Suggest using the County permit and survey as a baseline.
  - SFWMD confirmed that Appendix E pre/post nutrient criteria will apply.
  - Consultant indicated preliminary calculations do not meet the criteria as replacement has a small amount of additional impervious and will increase the discharge and trying to improve the treatment system. System was constructed in 2002. Any information that SFWMD might have regarding requirements/lack of permitting in that area would be helpful.
  - SFWMD indicated they would not ask them to retrofit the entire system. Additional storage volume should be shown in the application, and storage and attenuation volume of the new impervious area will be required. If it is an IP, quality and quantity will need to be shown.
  - Consultant indicated in the PD&E documents, they will indicate to follow general criteria from the manual.
- Encourage coordination with the SFWMD Env group for species if project is determined to need an Individual Permit based on the environmental resources discussed below with the USACE/NMFS.

USACE:

- Environmental Resources: Joy Castro of Stantec reviewed the environmental resources.
  - A benthic survey was performed in 2020 and shown in the exhibit of the Agenda. Seagrasses were present in the artificial lagoon area and were sparce ranged from sparce to dense. The species present were primarily paddle and shoal grass, but no Johnsons seagrasses were observed. Mangroves were present and shown in yellow. Some mangrove saplings are present and shown in pink.
  - No corals were found in the lagoon, so anticipate no impacts.
  - Request a future informal meeting with Kurtis Gregg to review the approach on Natural Resource Evaluation (NRE). The potential temporary and permanent impacts are still being analyzed with each Alternative, but will be presented during the above requested meeting.
  - Performed a bonneted bat analysis on the bridge.
  - Potential Manatees in the lagoon will be covered in NRE.
- Nationwide: Amanda inquired if the Replacement Alternative could fall into a Nationwide?
  - Veronica of USACE indicated it could be a Nationwide 14 or 23 or possibly Regional General (SAJ-92). This would be dependent upon the location of the impacts and the quantity of Fill.
- Seagrasses: Amanda inquired if there will updates to critical habitat for Johnsons for delisting?
  - USACE indicated they will not review Johnsons as an Endangered Species Act (ESA) species but it will be reviewed from Essential Fish Habitat (EFH)

- NMFS Comments:
  - Kurtis indicates a Section 7 review will be required which includes sea turtles, giant manta ray, smalltooth sawfish, etc due to location to the Haulover Inlet south of the project area.
  - Will want to see conservation of seagrasses. Do not differentiate from Artificial and Natural waters regarding species presence.
- Contamination/Cultural Resources/Cultural

  - Do not anticipate any contamination concerns as it is a residential island. No spills seen.
  - The bridge is historic and the lagoon are green area (Atlantic Isle Park) are also of historical significance.
  - Concurrence has been received form SHIPO. Determining if it is an adverse affect. Will supply the documentation.
- FDOT confirmed the project is eligible for federally funds b/c of the bridge condition. The LEAD consultation will be USACE.

EXHIBIT A-1 -
MDC CLASS II DRAINAGE CONSTRUCTION PERMIT

Department of Environmental Resources Management
Water Control Section
701 NW 1st Court, Suite 400
Miami, FL 33136-3912
305-372-6681

Class II Drainage Construction Permit

Permit Number:	2008-CLII-PER-00021	**Commencement Date:**	06/27/2008
DERM Project Manager:	Camilo P. Ignacio	**Expiration Date:**	06/26/2010

Permittee

Calvin Giordano & Associates, Inc.
Ronnie S Navarro
1800 Eller Drive, Suite 600
Ft. Lauderdale, FL 33316

Contractor

Tenex Enterprises, Inc.
Hamid Fouladi
850 SW 14th Ct.
Pompano Beach, FL 33060

Bond

Bond Amount: N/A
Type of Bond: Waived
Bond Number: N/A

Engineer

Engineer: John Messerian
Company: Calvin. Giordano & Associates, Inc.
Phone: 954-951-7781

Application Name: Atlantic Isle Utility & Roadway Improvement

Folio:

Project Location: Atlantic Boulevard & Collins Avenue, City of Sunny Isles Beach, Florida, Section 14-52-42.

Project Description: Utility and roadway improvements of Atlantic Boulevard from Collins Avenue to the east at Atlantic Isles.

Proposed Work: Drainage improvements consisting of new inlets, pipes, with Vortechs Model 5000 for water quality pretreatment, and discharge into the Biscayne Bay using an existing 24" outfall pipe.

THE ABOVE NAMED PERMITTEE IS HEREBY AUTHORIZED TO PERFORM THE WORK SHOWN ON THE APPLICATION AND APPROVED DRAWINGS, PLANS, AND OTHER DOCUMENTS ATTACHED HERETO OR ON FILE WITH THE DEPARTMENT AND MADE PART HEREOF, SUBJECT TO THE ATTACHED GENERAL AND SPECIAL CONDITIONS.

THIS PERMIT AND PLANS SHALL BE KEPT ON SITE DURING ALL PHASES OF CONSTRUCTION

Special Permit Conditions

1. Class V Permit is required for any dewatering activity.

2. If any contamination is encountered on site during construction the contractor shall immediately cease subsurface disturbance and notify DERM by calling (305)372-6955, (305) 372-6700, or (305) 372-6681.

3. See General Permit Conditions.

THIS PERMIT AND PLANS SHALL BE KEPT ON SITE DURING ALL PHASES OF CONSTRUCTION

General Permit Conditions

1. This permit must be kept on site during all phases of construction and must be made available to the inspector or DERM personnel upon demand during site inspection.

2. All work shall be performed in accordance with the above referenced plans and in accordance with the attached special and general conditions. If a general condition conflicts with the special condition(s) in this document, the special condition shall be the controlling condition for the work authorized by this permit.

3. This permit only authorizes the work described in the Project Description and Water Quality Treatment and Permitted Work. Any additional work not shown in this permit or on the approved paving and drainage plans shall require additional DERM Water Control Section Approval.

4. Any deviation from the approved plans for this project shall be submitted in writing to and approved by DERM Water Control Section prior to the commencement of this project. The contractor and the permittee shall take whatever remedial action necessary to bring the project into compliance with permit and approved plans upon determination by DERM that the structure or constructed elevations and/or grading is not in compliance with current standards or public policy.

5. DERM shall be notified no later than forty eight (48) hours and no earlier than five (5) days prior to the commencement of work authorized by this permit, unless otherwise noted by the reviewer or staff engineer. The permittee and/or contractor may notify DERM by calling (305) 372-6681 or by submitting the attached Notice of Commencement of Construction via hand delivery, U.S. Mail, or by facsimile at (305) 372-6489.

6. The engineer has been retained by the permittee to provide inspections throughout the construction period and shall prepare a set of reproducible record prints of drawings showing changes made during the construction process based upon marked-up prints, drawings and other data furnished by the contractor to the engineer.

7. The Permittee shall furnish at his expense all survey information required for proper control of the work. For excavation work, such as canals, this will include cross-sections to be made every ten (10) days during the period of when the work is in progress, unless otherwise specified by the Water Control Engineer. Cross sections and other as-built drawings shall be prepared in accordance with good engineering practice and certified as correct by a registered engineer.

8. Miami-Dade County will appoint such inspectors as are needed to supervise the execution of the work contemplated under this Permit Agreement. The inspector's duties and functions are purely supervisory and their decisions are to be binding only in the absence of the Water Control Engineer, and shall be subject to his review. When in the judgment of the inspectors the performance of the work is not in accordance with the requirements of this permit agreement, they shall have the power to stop the work, including all related site development work, which shall not be resumed until the Water Control Engineer has rendered his decision upon the matter in dispute.

9. Any work found not in accordance with permit requirements must be corrected before the Permittee may resume any other part of the work. Delay in completion of the work due to this cause will be considered an acceptable reason for an extension of time.

10. Upon bona fide complaints of residents in the vicinity of the work concerning excessive noise,

Miami-Dade County reserves the right to impose the requirement that no work be done on Sunday or any day between the hours of 11:00 p.m. and 7:00 a.m. except such work as is necessary for the proper care and protection of the work already performed.

11. All alterations, relocations and other incidental work including utility adjustments that may be required

to carry out the purpose and intent of this Permit Agreement shall be performed at the Permittee's expense after approval by the Water Control Engineer.

12. It is agreed that the first priority in the Permittee's development program will be given to provision of adequate drainage connections through the property. The Contractor shall conduct his operations in a manner that will insure that the primary purpose of drainage is served at all times. Temporary construction or blockage of channels for construction purposes will be allowed only upon express permission by the Water Control Engineer, and must be removed immediately upon his demand.

13. All engineering drawings submitted for either a Class II or Class III Permit involving construction activities in or along the banks of any surface body of water, shall show turbidity control device outlined on the permit plan set. Turbidity barriers shall be installed in-place before the commencement of work. The latter shall include both exploratory work and actual work. In order to minimize inadvertent collapse of barrier structure, barrier sheathing shall also be anchored along the bottom hem with a weighted chain -like device. At all times, the turbidity barrier device shall be maintained in a proper functional position during the entire construction phase.

14. The Permittee or Contractor shall be responsible for securing any and all permits not included within this permit, which may be required in connection with the Class II, III, or VI Permit. The issuance of this permit does not relieve the Contractor or Permittee from above responsibility.

15. This permit does not eliminate the necessity to obtain any required federal, state, local, and special district authorizations prior to the start of any activity approved by this permit. This permit does not convey to the permittee or create any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the permittee, or convey any rights or privileges other than those specified in the permit and Chapter 24, Miami-Dade County Code.

16. The permittee shall hold and save Miami-Dade County harmless from any and all damages, claims, or liabilities which may arise by reason the construction, alteration, operation, maintenance, removal, abandonment or use of any system authorized by thus permit.

17. Agencies other than the Department of Environmental Resources Management from which approval may be necessary (as checked):

___ South Florida Water Management District, for any use of District Right-of-Way.
___ Miami-Dade County Fire Department, for use of explosives.
___ Miami-Dade County Public Works Department, Highway Division, for approval of bridge and roadway construction plans.
___ Florida State Department, Highway Division, for approval of bridge construction plans.
___ Florida State Department of Transportation District Office, Miami, for work within SRD Right-of-Way.
___ Miami-Dade County Public Works Department, Permit Section, for construction permit to install structures (bridge, culvert, catch basin, storm drain, etc.) within canal road Right-of-Way and on-site.
___ Miami-Dade County Building & Zoning Department, for permit to install on private property only, bulkheads, retaining walls, piers, docks and boat slips incidental to the principal work covered by this Permit Agreement, and for clearing, leveling, grading, excavating and filling on said property.

18. This Permit is issued for disposal of excess stormwater runoff only after that portion of the runoff containing the majority of pollutants has been fully restrained on-site, and may be rescinded if a detrimental effect is found on the receiving water body for reasons of malfunction, inadequate maintenance or other reasons. Therefore, in order to maintain this permit active, the Permittee is required to provide regular maintenance and must submit to this office, on a yearly basis, a certification that the system has been maintained and is operating efficiently.

19. In addition, the Permittee hereby agrees to allow access to the site to staff personnel of the Department of Environmental Resources Management, if so required for inspection, at any time after the completion of the job and the closing of this permit.

20. The Permittee shall be responsible to establish adequate measures and control during construction

THIS PERMIT AND PLANS SHALL BE KEPT ON SITE DURING ALL PHASES OF CONSTRUCTION

to ensure that sedimentation and/or turbidity problems shall not impact adjacent site, public right-of-ways and their drainage facilities. Said measures shall be used also to prevent siltation of the constructed drainage system during site development.

21. Silt Screens, hay bales or other such sediment control measures shall be utilized during construction. The selected sediment control measures shall be utilized landward of the canal water body. All areas shall be stabilized and vegetated immediately after construction to prevent erosion into the canal or water body.

22. If prehistoric or historic artifacts, such as pottery or ceramics, stone tools or metal implements, dugout canoes, or any physical remains that could be attributed with Native American cultures, or early colonial or American settlement are encountered at any time within the project area, the permitted project should cease all activities involving subsurface disturbance in the immediate vicinity of such discoveries. The permittee, contractor, or other designee, should contact the Florida Department of State, Division of Historical Resources, Review and Compliance Section at (850) 245-6333 or (800) 847-7278, as well as the appropriate permitting agency office. Project activities should not resume without verbal and/or written authorization from the Division of Historical Resources. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, Florida Statues.

23. A NPDES (National Pollutant Discharge Elimination System) Stormwater Permit may be required as per Rule 62-621.300(4), F.A.C. for the proposed construction activity. Please contact the Florida Department of Environmental Protection NPDES Stormwater Section at (805) 921-9904 or www.dep.state.fl.us/water/stormwater/NPDES.

24. Any construction in areas designated, as manatee protection area must comply with the Standard Manatee Construction Conditions. Any collision with and /or injury to a manatee shall be reported to the Florida Fish and Wildlife Conservation Commission at 1-888-404-FWCC or the U.S. Fish and Wildlife Service at 1-561-562-3909.

THIS PERMIT AND PLANS SHALL BE KEPT ON SITE DURING ALL PHASES OF CONSTRUCTION

MIAMI-DADE COUNTY

OFFICIAL RECEIPT
MIAMI-DADE COUNTY FLORIDA

No. 6232765

RECEIVED FROM: CITY OF SUNNY ISLES BEACH

DATE: 06 / 01 / 09 (MONTH / DAY / YEAR)

ADDRESS: ____________________ (STREET ADDRESS)

____________ (CITY) ______ (STATE) ______ (ZIP)

CASH $ ______ . ____

CHECKS $ 1,000 . 00

TOTAL $ 1,000 . 00

AMOUNT OF: 1,000 DOLLARS, AND 00 CENTS

FOR PAYMENT OF: CLASS 2 RENEW CK 3435

THIS RECEIPT NOT VALID UNLESS DATED, COMPLETED AND SIGNED BY AUTHORIZED EMPLOYEE OF DEPARTMENT.

DEPT.: DERM BY: JJ

FOR OFFICE USE ONLY

TRANS	SUBSIDIARY	INDEX CODE	SUBOBJECT	AMOUNT

107.01-1 6/04

Fee Description: **Amount:**

1 Class II Permit Renewal $1,000.00

2 ____________ 7

3 ____________ ______

Total: 1,000.00

Payment Method:

☐ Cash

☐ Check/Money Order for the amount of $________ payable to MIAMI DADE BOARD OF COUNTY COMMISION

☐ MasterCard ☐ Visa

Expiration Date (month/year) ________ Total Request: ________

Credit Card # *(Please do not Leave Space Between Numbers)*

Signature: ____________

Telephone #: Work ____________ Fax: ____________

Checked By: JJ Date: 06/01/09.

OFFICE OF ADMINISTRATIVE SERVICES

EXHIBIT A-2 - EXISTING WATER QUALITY CALCULATION

WATER QUALITY CALCULATIONS

Calvin, Giordano & Associates, Inc.
EXCEPTIONAL SOLUTIONS
An Employee Owned Company
1800 Eller Drive, Suite 600, Fort Lauderdale, Florida 33316
Phone: 954.921.7781 • Fax: 954.921.8807

Certificate of Authorization No. 514

PREPARED FOR

ATLANTIC ISLES ROADWAY AND UTILITY IMPROVEMENTS PROJECT

CGA PROJECT No.	**05-4893**
Date Prepared	**5/19/2008**
Revision 1	2/11/2008
Revision 2	
Revision 3	
Revision 4	
Revision 5	

ENGINEER OF RECORD

5/20/08

RONNIE S. NAVARRO, P.E.
Florida Registration No. 67642

RONNIE S. NAVARRO LICENSE NO. 67642 STATE OF FLORIDA PROFESSIONAL ENGINEER

ATLANTIC ISLES ROADWAY & UTILITY IMPROVEMENTS
(Quality Volume calculations and Vortechs Treatment Structure Selection)

SITE INFORMATION

Total Drainage Area (A) =	**4.63**	acres.
Impervious Area (A_{imp})=	**3.06**	acres.
Pervious Area (A_{perv})=	**1.57**	acres.

Weighted Runoff Coefficient (C):

Runoff Coefficient Impervious (C1) =	**0.90**	
Runoff Coefficient Pervious (C2) =	**0.30**	
C = [(A1 x C1) + (A2 x C2)] / A=	**0.70**	
Design storm frequency, F=	**5.00**	Years
Minimum time of Concentration, t_{tc}=	**20**	Min.

The IDF relation used by DERM, $I = 308.5/(48.6T^{-0.11} + t(0.5895 + T^{-0.67})$

Intensity, I = 5.20 (Inch/Hour)

DERM WATER QUALITY CRITERIA

1 The first inch of runoff from the entire project site.

WATER QUALITY VOLUME COMPUTATIONS:

1. Compute the first inch of runoff from the entire developed project site:
   = 4.6 (ac-inch)

Required treament volume per DERM criteria, Q_{treat} = 16806.9 (ft3)

Time to generate treatment runoff volume (min.),

$$t_{1"} = \frac{\frac{h}{C} * (9.45 * F^{-0.11})}{1 - \frac{h}{C} * (0.115 + 0.1945 F^{-0.67})}$$

t	Duration of a storm in minutes to generate 1" Runoff
t_c	Time of Concentration (min.)
C	Coefficient
A	Drainage Area (Ac)
I	Rainfall Intensity (inch/hr)
Q_{treat}	Quality runoff volume (ac-inch)
h	Quality runoff volume depth (inch)

$t_{1"}$= 15.4 (min.)

t_c (min.)	$t_{1"}$ (min.)	t (min.)	Q_{treat} (ft^3)	Q_{treat} (cfs)
20	**15.4**	35.4	16807	7.92

Treament volume, Q_{treat} = 7.92 (cfs)

VORTECH® TREATMENT STRUCTURE SELECTION:

Vortech® Model	Dimension (ft)	Treatment Capacity (cfs)	Required Treatment(cfs)
2000	10x4	2.80	7.92

Return Period (Yrs)	Intensity (Inch/Hr)	Peak Runoff (cfs)	Treatment Structure Peak Capacity (cfs)	Required by-pass capacity (cfs)	Comment
25	6.40	20.64	8.50	12.14	
100	10.53	33.97	8.50	25.47	

WEIR CALCULATIONS FOR WATER QUALITY

Rectangular Weir

Weir Coefficient C=	3.00	
Min. Discharge (Q)=	7.92	cfs
Design Discharge (Q)=	8.50	cfs
Weir Height (H1)=	0.75	Ft.
Weir Crest Length (L1)=	4.36	Ft.

Horizontal Crested Weir Equation

$Q = C^* \ L1^* \ H1^{3/2}$

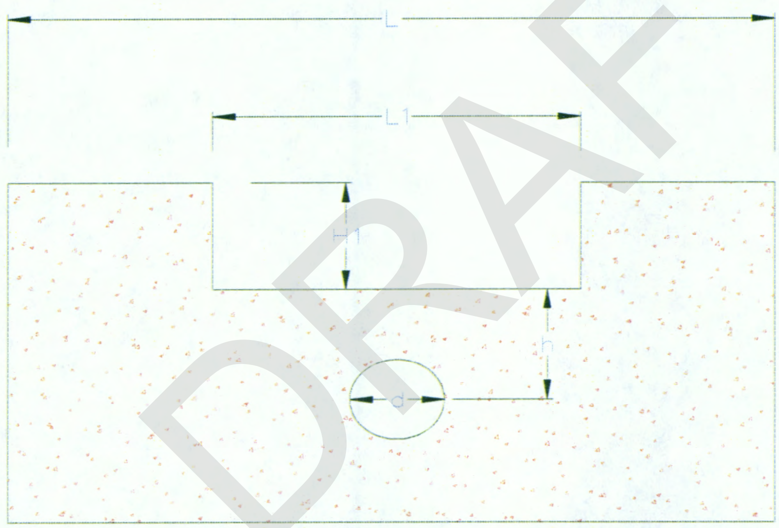
Orifice

Orifice Equation

$Q = C_d{}^*A^*(2gh)^{½}$

$A = \Pi^* d^2/4$

Design Head (h)=	5.0	ft
Orifice Diameter (d)=	3.0	Inch
Orifice Flow Area (sft)=	0.05	sft
Orifice Coeffficient, $C_{d=}$	0.6	
Discharge (Q)=	0.53	cfs



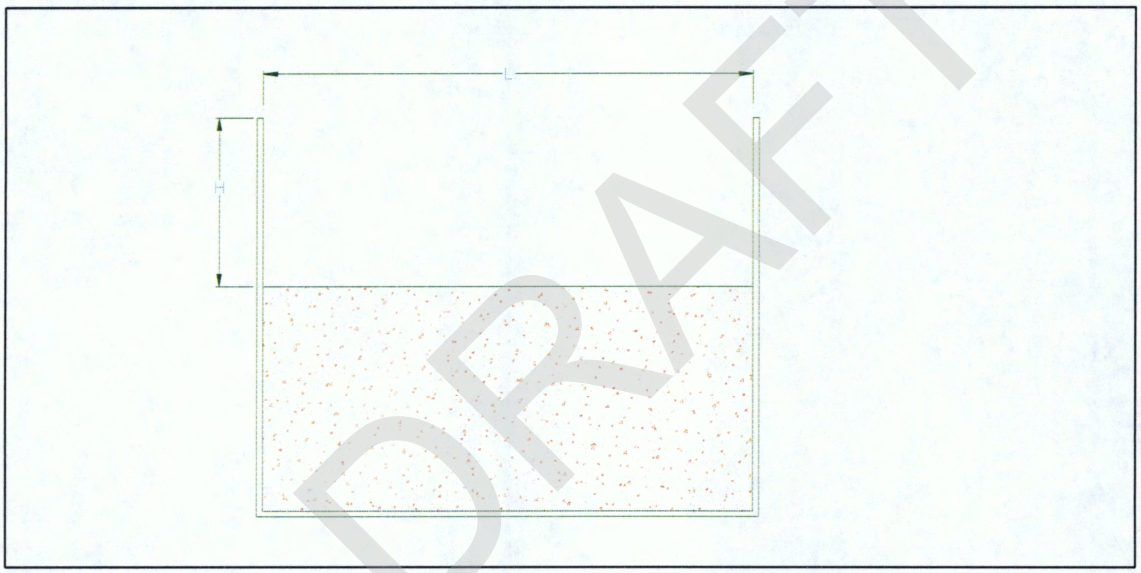
Req. L1 (ft)	Required L (ft)	Provided H1 (ft)
4.36	4.50	0.75

CALCULATIONS BY-PASS WEIR

Weir Coefficient C=	3.00	
100 year min. By-Pass Discharge (Q)=	25.47	cfs
Design Discharge (Q)=	25.50	cfs
Weir Height (H1)=	1.50	Ft.
Weir Crest Length (L1)=	4.63	Ft.

Horizontal Crested Weir Equation
$Q = C^* L1^* H1^{3/2}$

Return Period (Yrs)	Peak Runoff (cfs)	Treatment Structure Peak Capacity (cfs)	Req. By-Pass Discharge (cfs)	Provided Weir Discharge Capacity (cfs)	Req. L (ft)	Required H (ft)	Provided L (ft)
100	33.97	8.50	25.47	25.50	4.63	1.50	5.00



Atlantic Isles Roadway and Utility Improvements
City of Sunny Isles Beach

REFERENCES:

1. Vortech System Product Literature

2. Tideflex Check Valve

Vortechnics
A CONTECH Company

Vortechs® System

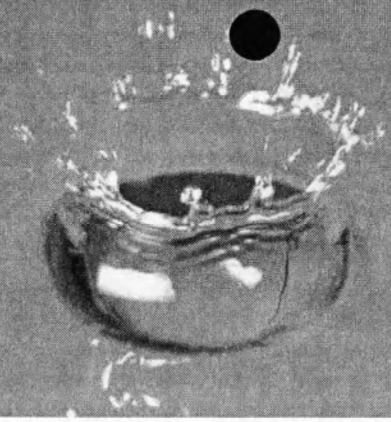
Product Literature

Committed to Clean Water™

Vortechnics, Inc. • 200 Enterprise Drive • Scarborough, ME 04074
phone 207.885.9830 • fax 207.885.9825 • toll free 877.907.8676 • web vortechnics.com

Vortechs® System

The proven stormwater treatment leader



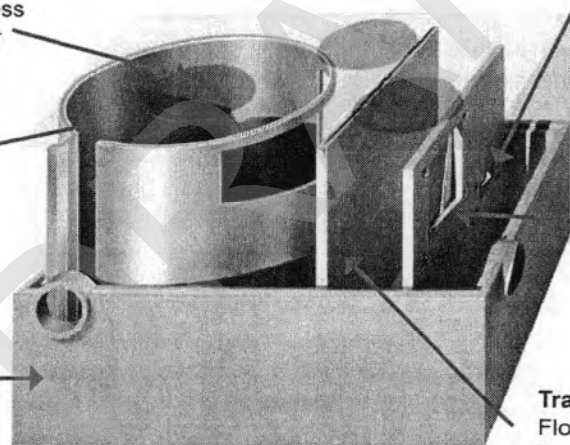
Vortechnics®
A CONTECH Company

Get proven, reliable stormwater treatment every time.

The Vortechs® System is the proven stormwater solution chosen by engineers, contractors, regulators, developers and conservation organizations to meet water quality challenges and to ensure that urban runoff is as clean as possible.

The EPA award-winning design efficiently removes contaminated sediment, floating hydrocarbons, and debris from stormwater. The Vortechs® System's swirl-concentrator and flow controls work together to eliminate turbulence and to provide positive removal efficiencies throughout the full range of operation. With the most comprehensive lab, field and third party testing in the industry, the Vortechs® System delivers proven results and site-specific solutions for all applications and rainfall conditions.

Vortechs® System Features and Benefits



Best standalone treatment technology on the market.

The pollutants targeted by most stormwater regulations are sediment, hydrocarbons and debris. While other technologies are useful in removing some of these pollutants, the Vortechs® System is the best standalone solution for addressing all of the target pollutants. Other technologies have inherent design limitations that can compromise treatment efficiency, diminish flow rate capacity and/or obstruct maintenance access. For more than 15 years, Vortechs® Systems have proven their versatility and adaptability on more than 4,000 successful installations in North America.

Advantages of the Vortechs® System

- **Treats Full Range of Flows**
- **Easy Maintenance**
- **Meets Treatment Needs of Commercial, Residential and Municipal Sites**
- **Shallow System Profile**
- **Customizable Design**
- **Optimizes Surface Use of Real Estate on High Value Sites**
- **Easy Installation**
- **20-Year Warranty**
- **Performance Verified Through Lab, Field and Third Party Testing**

Learn More! Call 877.907.8676 or visit us at www.vortechnics.com

Committed to Clean Water™

Vortechs® System: a System Sized for Every Application

When you specify a Vortechs® System, the Vortechnics team will customize the design to fit your site's unique parameters and provide you with an effective, cost-efficient solution.

Each Vortechs® System is custom designed based on:

- » Removal Efficiency Goals
- » Drainage Area
- » Regional Rainfall Intensity Distribution
- » Design Flow
- » Site Runoff Coefficient and Time of Concentration
- » Anticipated Pollutant Characteristics

Vortechs® System Sizing Methodology: the Rational Rainfall Method™

Differences in local climate and topography make every site unique, so it is important to take these factors into consideration when choosing a stormwater treatment system. Therefore Vortechnics developed the Rational Rainfall Method™ to accurately design each Vortechs® System. The sizing methodology combines site-specific information, including local historical precipitation records, with laboratory-generated performance data corroborated by third party field studies, ensuring accurate long-term performance.

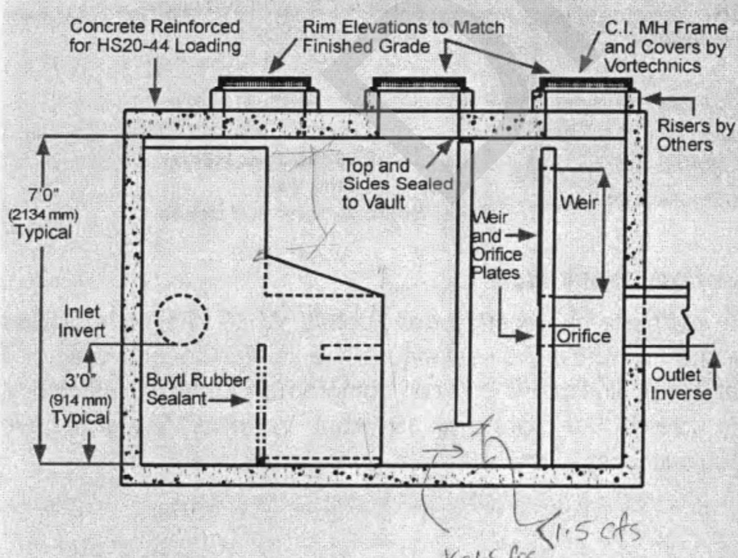
Short duration rain gauge records from across the United States and Canada were analyzed by Vortechnics to determine the percent of the total annual rainfall that fell at a range of intensities. One trend was consistent at all sites: the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for a specific site, are translated into flow rates using the Rational Rainfall Method™. Based on the flow rates calculated for each intensity, an operating rate within a proposed Vortechs® System is determined. Finally, a removal efficiency is selected for each operating rate based on anticipated pollutant characteristics and on full-scale laboratory tests. The relative removal efficiencies at each operating rate are summed to produce a net annual pollutant removal efficiency estimate.

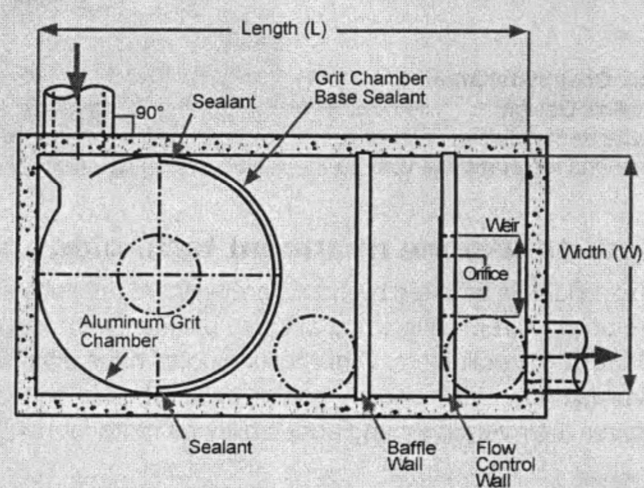
Vortechnics typically selects a system size that will provide an 80 percent annual total suspended solids (TSS) load reduction based on laboratory-generated performance curves for 50-micron sediment particles, however the Rational Rainfall Method™ can accommodate other removal efficiencies or particle sizes. It can also be used to estimate annual hydrocarbon load reductions.

Once a system size is established, the internal elements of the system are designed based on information provided by the site engineer. Flow control sizes and shapes, sump depth, spill storage capacity, sediment storage volume and inlet and outlet orientation are determined for each system. In addition, bypass weir calculations are made for offline systems.

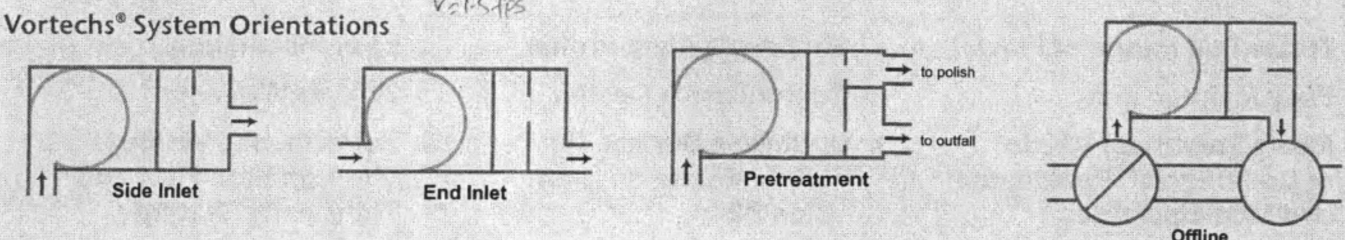
Typical Vortechs® System Elevation View



Typical Vortechs® System Plan View



Vortechs® System Orientations



Specifying a Vortechs® System

Nine precast models are available to treat flow rates from 1.6 cfs to 25 cfs. Sites that generate larger flows can be treated using cast-in-place systems. Vortechs® Systems can be configured in both online and offline orientations depending on water quality objectives and site constraints. They can also be designed to accommodate various inlet and outlet pipe orientations. To provide a tangential inlet to the swirl chamber, the inlet pipe must enter at a corner and at a 90 degree angle to the inlet wall. Outlet pipes can exit the end or the side of the system at most angles.

Standard Vortechs® System models, peak treatment flow rates, and dimensions are listed below. For assistance with a detailed design, please fill out our Specifier's Worksheet, which is available online at www.vortechnics.com or by calling 877.907.8676. In most cases a site plan will be required for Vortechnics® to complete the design process.

Vortechs® Model	Grit Chamber Diameter		Peak Treatment Flow		Approximate Size	
	ft	m	cfs	l/s	ft	m
1000	3	0.9	1.6	45	9 x 3	2.7 x 0.9
2000	4	1.2	2.8	80	10 x 4	3.1 x 1.2
3000	5	1.5	4.5	130	11 x 5	3.4 x 1.5
$\boxed{4000}$	6	1.8	6.0	170	12 x 6	3.7 x 1.8
5000	7	2.1	8.5	240	13 x 7	4.0 x 2.1
7000	8	2.4	11	310	14 x 8	4.3 x 2.4
9000	9	2.7	14	400	15 x 9	4.6 x 2.7
11000	10	3.0	17.5	500	16 x 10	4.9 x 3.0
16000	12	3.7	25	710	18 x 12	5.5 x 3.7

Engineering Notes

» For online Vortechs® Systems without a bypass, sizing criteria is based on providing one square foot of grit chamber surface area for each 100 gpm of peak treatment storm flow rate. For more details about Vortechnics sizing criteria refer to Vortechnics Technical Bulletin 3 available at www.vortechnics.com.

» The sizing information above is representative of typical Vortechs® Systems. Construction details may vary depending on the specific application. Any alterations to the sizing chart specifications will appear on Vortechnics dimensional and shop drawings. Contact Vortechnics for the weight of a specific Vortechs® System.

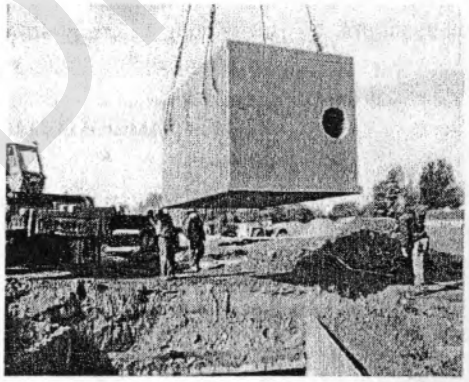
» Treatment flow rates greater than 25 cfs can be accommodated using Vortechs® Systems that are constructed on-site using cast-in-place concrete structures. Contact Vortechnics for details.

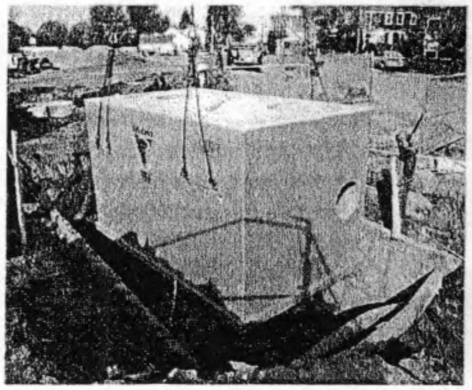
Installing a Vortechs® System

The Vortechnics team's superior technical support and customer service continues throughout the bidding process and installation of every Vortechs® System.

The Vortechs® System is the only hydrodynamic separator in the industry with a horizontal design. This unique shallow profile can greatly reduce overall project costs, saving both time and money during installation. Because the Vortechs® System requires no on-site assembly, and a Vortechnics representative is always on-site during installation, most Vortechs® System installations are completed in under two hours.

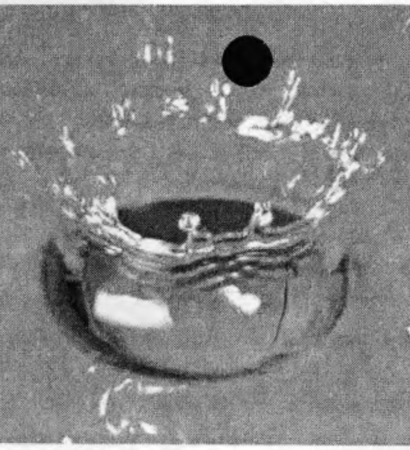
Vortechnics has set the industry standard with its emphasis on research and development, customization and ease of installation and maintenance. Vortechnics has installed thousands of systems throughout the U.S. and Canada, ensuring that millions of people are able to enjoy the benefits of cleaner, safer water.





Vortechs® System

The proven stormwater treatment leader

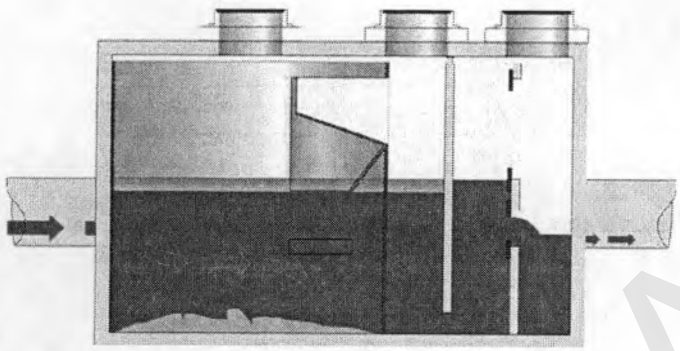


Vortechnics
A CONTECH Company

Vortechs® System Operation

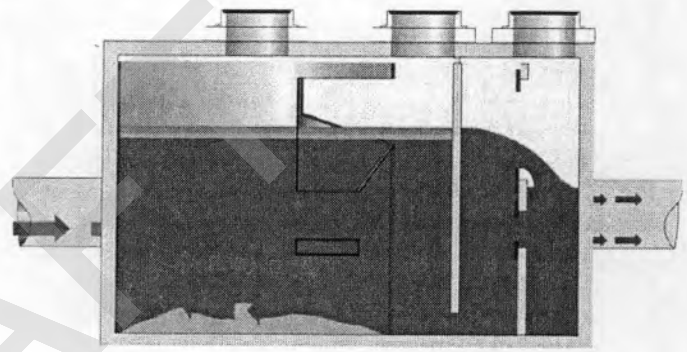
Visit www.vortechnics.com to see an animated Vortechs® System in action!

Low Intensity Storm



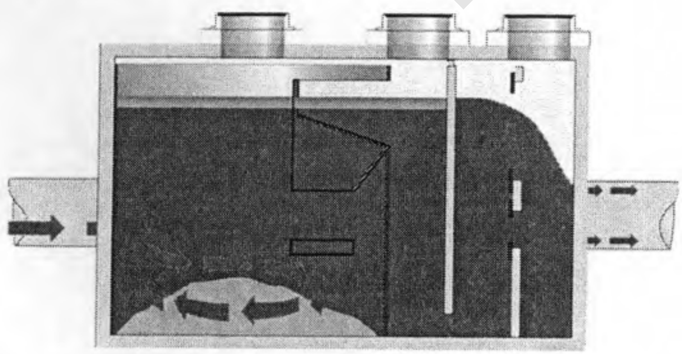
Most storm events (85 percent) do not exceed the two-month storm intensity. During this low intensity storm flow, the water level within the Vortechs® System will rise above the top of the inlet pipe, reducing inflow velocity and turbulence. Oil and fine sediments are usually washed off paved surfaces during these events, and the Vortechs® System treatment efficiencies are in the 80 to 90 percent range for typical urban runoff sediment.

Medium Intensity Storm



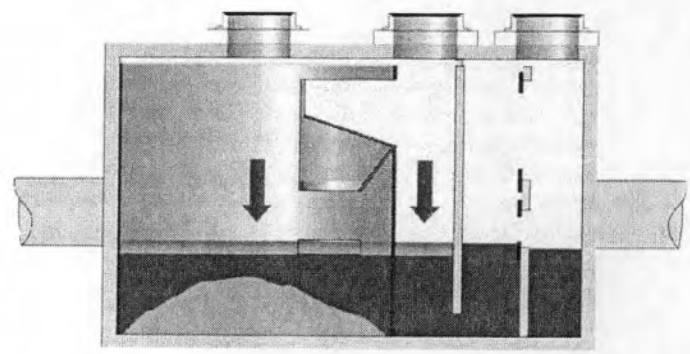
During a medium intensity storm, which occurs with a frequency of one to two years, remaining oil washes off pavement, and larger sediment particles and debris are now transported into the Vortechs® System. As flow increases, the water level rises above the low flow control and the tank begins to fill. With the inlet submerged, the oily layer is above the influent flow path, preventing re-entrainment of floating pollutants. Swirling action increases at this stage, which increases sediment removal rates.

High Intensity Storm



High intensity storms are infrequent, and storm flows have sufficient energy to wash off the largest sediment particles and pieces of debris. When the high flow control approaches full discharge within the Vortechs® System, storm drains are flowing at peak capacity. The Vortechs® System can accommodate flows up to the specified design storm (i.e. 10-year storm). Treatment efficiencies remain constant during this phase.

Storm Subsidence



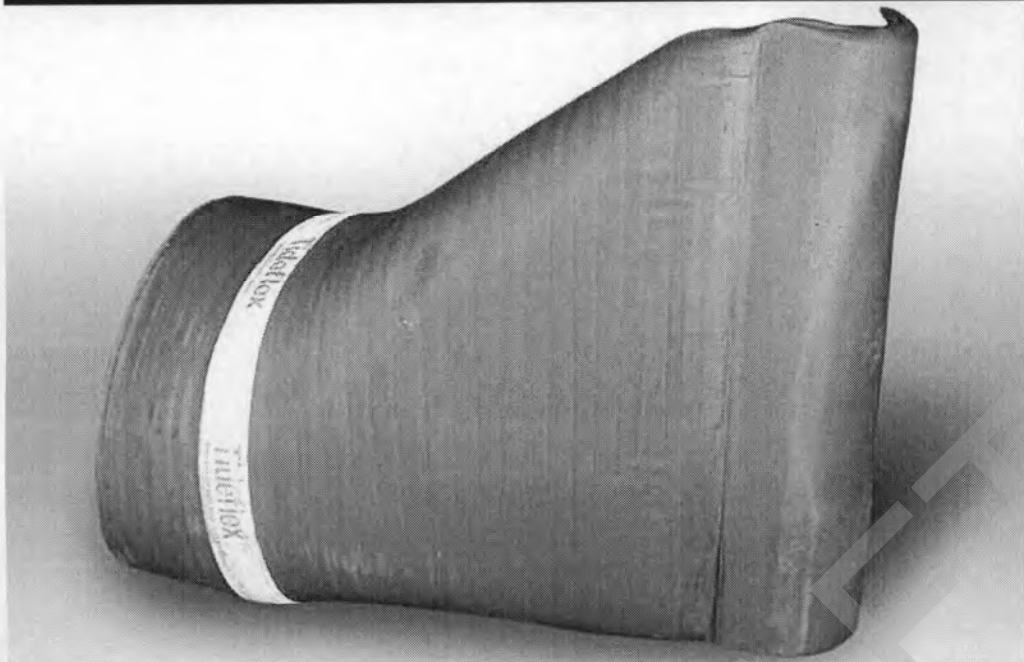
Treated runoff is decanted out of the Vortechs® System at a controlled rate, restoring the water level to a low, dry-weather volume. This reveals a conical pile of accumulated sediment in the center of the grit chamber. Besides facilitating inspection and cleaning, the low water level significantly reduces maintenance costs by reducing pump-out volume.

The Tideflex® Check Valve:

For *Reliable* Backflow Protection!

In 1984, the U.S. Environmental Protection Agency commissioned us to develop and test an alternative to flapgate valves, stating that, "Increasing the reliability and performance of tidegates has a beneficial impact on the general pollution abatement program for the nation's waterways." The elastomer "duckbill" Tideflex® Check Valve was specifically designed to eliminate the operational and maintenance problems associated with flapgate check valves, including corrosion of mechanical parts, freezing open or shut, warping and clogging due to trapped debris. The EPA rigorously tested the Tideflex® valve for two years and found that Tideflex® showed significant improvement over flapgate valves in terms of leakage inflow, entrapment of debris, capability to self clean and susceptibility to marine fouling. Today, hundreds of thousands of Tideflex® valves are installed and performing reliably worldwide.

The TF-1 Check Valve.
20 Years Of Proven Performance And Reliability



The TF-1 is the latest innovation in Tideflex® check valve technology

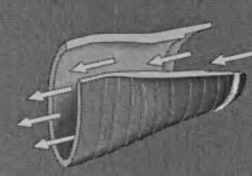
20 years of proven field operation, research and development, and continued engineering enhancements have combined to make the TF-1 today's most reliable check valve. The bill design is formed in a curve that returns to a closed position every time, achieving the tightest possible seal for backflow applications, particularly at low flow rates. The eccentric flat-bottom design allows installation where the

invert of the pipe is close to the floor, and the stronger engineered spine provides long-term performance while handling long-term water weight. When you specify the patented Tideflex TF-1 Curved Bill Check valve, you're guaranteed a proven record or maintenance-free backflow prevention.

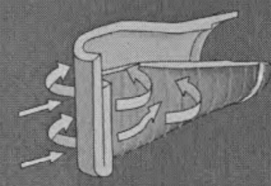
Engineered Features:

- **Eccentric flat-bottom design.**
- **No moving or mechanical parts.**
- **100% elastomer construction.**
- **Curved Bill design enhances sealing**
- **Low headloss for low-lying areas.**
- **Sensitive enough to open with as little as 1" of water pressure.**
- **Custom-built to your flow specifications.**
- **Cost-effective, reliable replacement for traditional flapgates.**
- **Silent, non-slamming.**
- **Self-draining, eliminates standing water.**

Principle of Operation



The Tideflex® Check Valve opens with positive pressure.



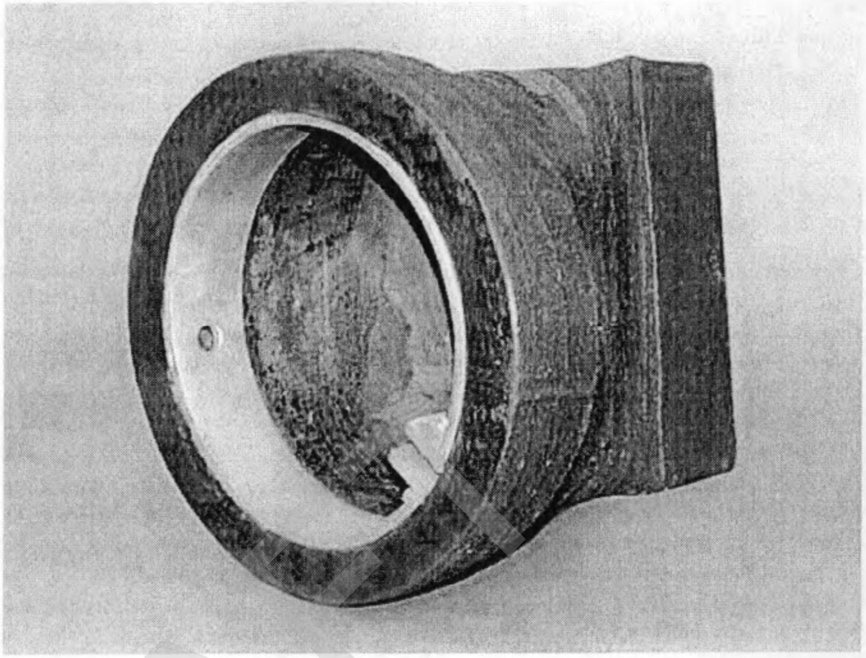
Reverse pressure seals the curve bill of the Tideflex® to prevent backflow.

Series 37G

- Fits inside pipe I.D.
- Fastened with internal expansion clamp.
- Features all-elastomer, maintenance-free design.
- Is custom-built to customer specifications.
- Closes on entrapped solids.

Materials of Construction

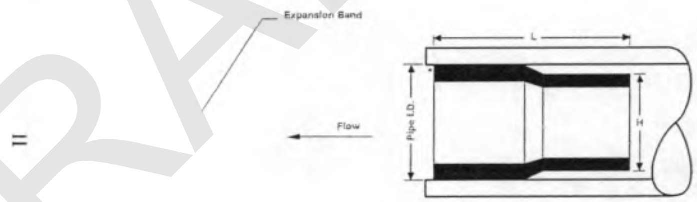
- Valves are available in pure gum rubber, neoprene, Hypalon*, buna-N, Viton* and EPDM.
- Stainless steel expansion clamps.



The Series 37G InLine Check Valve was developed specifically for installations where clearance below the invert of a pipe is insufficient to clear the flange of the standard Series 37. The 37G effectively has a zero face-to-face dimension since it can be completely slipped into an existing pipe. Piping modifications are not required to provide space for the valve. The Series 37G design uses the slip-on principle in reverse.

A special clamp that expands outward is provided to secure the valve to the inside of a pipe, enabling the valve to be installed easily on the outlet pipe from a manhole, such as in a CSO system.

The pressure drop of the Series 37G is increased because of the smaller I.D. required to fit the check valve in the line. Tideflex® Technologies recommends the valves be pinned to the pipe. Each clamp has four pre-drilled holes to allow installation of anchors/bolts. Contact our engineering staff for additional information.



Dimensions Series 37G Check Valve

Nominal Size* (Pipe I.D.)	Length L	Height of Bill H	Max. Backpressure (psi) Standard Tideflex®	Max. Backpressure (psi) With Saddle Support
2	5	1 7/8	150	CONTACT FACTORY
3	5 1/2	2 7/8	100	
4	7	3 7/8	75	
6	11	5 7/8	75	
8	12 1/2	7 7/8	60	
10	15 1/2	9 7/8	45	
12	18 1/2	11 7/8	35	
14	22	13 3/4	25	
16	23	15 3/4	20	
18	24	17 3/4	15	
20	32	19 3/4	10	
24	37	23 3/4	10*	
30	41	29 3/4	8	
36	47	35 3/4	8	
42	49	41 1/2	5	
48	52	47 1/2	5	
54	57	53 1/2	5	
60	64	59 1/2	5	
72	73	71 1/2	5	

Dimensions are subject to change due to customized construction

Contact engineering staff to verify overall dimensions.

** Other sizes available; consult factory. Valves are also made for non-standard pipe I.D.'s.*

EXHIBIT A-3 - EXISTING PLANS

MIAMI-DADE COUNTY
Carlos Alvarez, Mayor

Department of Environmental Resources Management
Environmental Resources Regulation Division
701 NW 1st Court, 6th Floor
Miami, Florida 33136-3912
T 305-372-6567 F 305-372-6407

miamidade.gov

June 27, 2008

Karl Kennedy, P.E.
Calvin, Giordano & Associates, Inc.
1800 Eller Drive, Suite 600
Fort Lauderdale, Florida 33316

Re: Class II Permit No. 2008-CLII-PER-00021
Project: Atlantic Boulevard Utility Improvements

Dear Mr. Kennedy:

Enclosed is a copy of Class II Permit 2008-CLII-PER-00021, pursuant to the provisions of Section 24-48 of the Miami-Dade County Code. Please call to notify this office no later than forty eight (48) hours and no earlier than five (5) days prior to the commencement of work authorized by this permit, by submitting the attached Notice of Commencement of Construction via hand delivery, U.S. Mail, or by facsimile at (305) 372-6489.

If you have any questions, please contact Camilo P. Ignacio of this office at (305) 372-6681.

Sincerely,

J.M. (Manny) Tobon, P.E.
Chief, Water Control Section

CPI:cpi

Enclosure

DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT
ENVIRONMENTAL RESOURCES REGULATION DIVISION
Water Control Section
701 N.W. 1ST Court, Suite 600
Miami, FL 33136
Phone: 305-372-6681 Fax: 305-372-6489

NOTICE OF COMMENCEMENT OF CONSTRUCTION

Permit Number: 2008-CLVI-PER-00021

Issue Date: June 27, 2008

Expiration Date: June 26, 2009

Project Name: Atlantic Boulevard Utility Improvements

Location: Atlantic Boulevard & Collins Avenue, Sunny Isles Beach

Permittee: City of Sunny Isles Beach

Contact Person: c/o Calvin, Giordano & Associates, Inc.
Ronnie S. Navarro, P.E.

Address: 1800 Eller Drive, Suite 600
Fort Lauderdale, Florida 33316

Telephone No.: 954-921-7781

Contractor:

Contact Person:

Telephone No.:

License No.:

MUST BE FILLED IN BY PERMITTEE OR CONTRACTOR:

START DATE:	
DATE OF COMPLETION:	

MIAMI-DADE COUNTY

Department of Environmental Resources Management
Water Control Section
701 NW 1st Court, Suite 400
Miami, FL 33136-3912
305-372-6681

Class II Drainage Construction Permit

Permit Number:	2008-CLII-PER-00021	**Commencement Date:**	06/27/2008
DERM Project Manager:	Camilo P. Ignacio	**Expiration Date:**	06/26/2009

Permittee

Calvin Giordano & Associates, Inc.
Ronnie S Navarro
1800 Eller Drive, Suite 600
Ft. Lauderdale, FL 33316

Contractor

Bond

Bond Amount: N/A
Type of Bond: Waived
Bond Number: N/A

Engineer

Engineer: John Messerian
Company: Calvin. Giordano & Associates, Inc.
Phone: 954-951-7781

Application Name: Atlantic Isle Utility & Roadway Improvement

Folio:

Project Location: Atlantic Boulevard & Collins Avenue, City of Sunny Isles Beach, Florida, Section 14-52-42.

Project Description: Utility and roadway improvements of Atlantic Boulevard from Collins Avenue to the east at Atlantic Isles.

Proposed Work: Drainage improvements consisting of new inlets, pipes, with Vortechs Model 5000 for water quality pretreatment, and discharge into the Biscayne Bay using an existing 24" outfall pipe.

THE ABOVE NAMED PERMITTEE IS HEREBY AUTHORIZED TO PERFORM THE WORK SHOWN ON THE APPLICATION AND APPROVED DRAWINGS, PLANS, AND OTHER DOCUMENTS ATTACHED HERETO OR ON FILE WITH THE DEPARTMENT AND MADE PART HEREOF, SUBJECT TO THE ATTACHED GENERAL AND SPECIAL CONDITIONS.

THIS PERMIT AND PLANS SHALL BE KEPT ON SITE DURING ALL PHASES OF CONSTRUCTION

Special Permit Conditions

1. Class V Permit is required for any dewatering activity.

2. If any contamination is encountered on site during construction the contractor shall immediately cease subsurface disturbance and notify DERM by calling (305)372-6955, (305) 372-6700, or (305) 372-6681.

3. See General Permit Conditions.

THIS PERMIT AND PLANS SHALL BE KEPT ON SITE DURING ALL PHASES OF CONSTRUCTION

DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT
Environmental Resources Regulation Division
Water Control Section

Drainage Inspection Report

Dewatering/Class II/III/VI/ERP/Other II Inspector: MA

Date: Feb 4, 2010 Weather: Fair/Sunny ✓ Raining today ____ or Rained previous day ____

Permit No.: 2008-CLI1-PER-00021 Project: Atlantic Blvd Drainage Imp.

Location: ATlantic Isle Jurisdiction: Sunny Isle

Contractor: ______ Contact Person: ______ Tel.: ______

Activity Status: __ Drainage construction in progress / __Completed/Final Inspection

Depth of French Drain: ______ ft Control Weir: (Y) / (N) / (NA) Baffle: (Y) / (N)

Silt Fence/Barrier: (Y) / (N) Berm: (Y) / (N) Hay Bales: (Y) / (N) Erosion: (Y) / (N)

Outfall Turbidity Curtain: (Y) / (N)

Location of discharge: __ Onsite __ Offsite: __ Street catch basin / __ (bay) / (canal) / (lake)

Turbidity Discharge: ______ NTU Turbidity Sample taken: (Y) / (N)

Checklist for BMP's and Controls for Sediment and Erosion at Construction Sites

1 Are there any sensitive areas on site (bodies of water, existing storm sewers, native habitats, specimen size native trees, etc)? Yes ______ No______

2 If "Yes", are these areas being protected from sediment runoff, does any turbidity exist, or materials discharging to those sites? Yes ____ No ______

3 If materials or turbidity present in the bodies of water, document and issue corrective notice. Any samples taken? Yes ______ No ______

4 Are any materials being discharged off-site, into streets and rights-of-way, or onto neighboring properties (Example: sediment flowing offsite at entrances or exits, building materials blowing off-site, any other discharges to bodies of water or existing storm sewers or Rights-Of-Way?
Yes ___ No ___ If yes, describe offsite discharges: ______

5 Are any structural or non-structural controls in place on the site?

Straw bales ____ perimeter controls ____ berms ____
Turbidity booms ____ Filter fabric ____ silt fences ____
Inlet or outlet protection devices ______

Are all of the BMP's checked above in working condition? Yes ______ No ____

Are all of the BMP's checked above being maintained? Yes ________ No______

Verbal Cease and Desist issued for any non-compliance? Yes ______No ______

Field Notice Issued: (Y) / (N) UCVN: ______________________

Pictures taken : ~~(Y)~~ / (N)

Inspector's Notes: ____

Water control structure & CDS system are in place

Class II Permit No. 2008-CLII-PER-00021
Project Name: Atlantic Blvd. Drainage Improvement
Location: Atlantic Isle, Sunny Isles
Date: February 4, 2010

Inspection By: MA

CITY OF SUNNY ISLES BEACH, FL
ATLANTIC ISLES ROADWAY AND UTILITY IMPROVEMENTS

MAY 2008

DRAFT

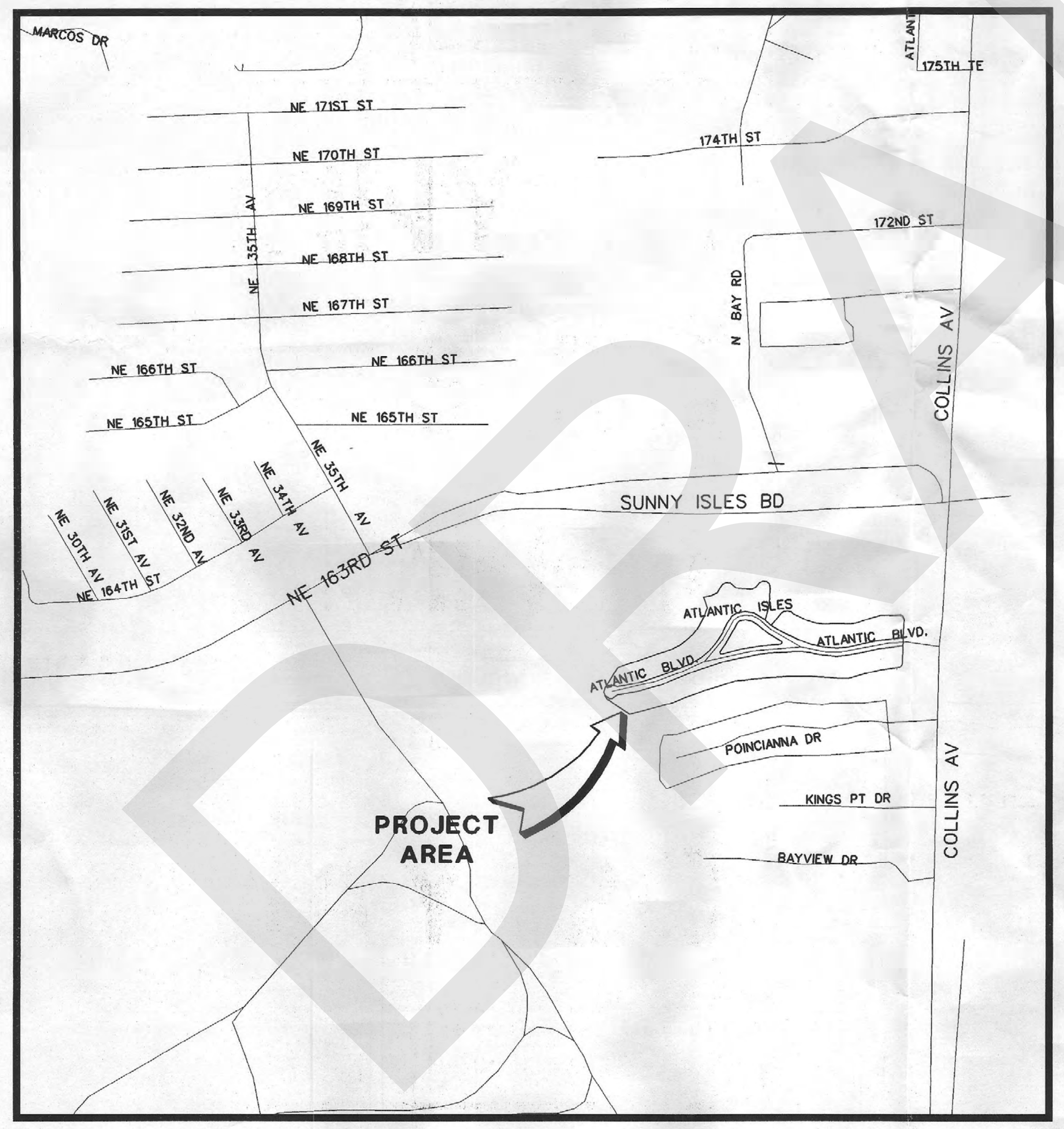
CGA PROJECT No.: 05-4893
FILE No.: 054893-C-COVER.dwg

Dade County Department of
ENVIRONMENTAL RESOURCES MANAGEMENT
Water Control Section

Drainage improvements along Atlantic Blvd from Collins Avenue to Atlantic Isles consisting of inlets and pipes with Vortechs 5000 water quality treatment and outfall to the Biscayne Bay in Sec. 14-52-42

CHECK	RECOMMENDED	APPROVED
Cay	CM	[signature]
Date 6/27/08	File No. 2008-CL11-PER-00021	Sheet 1 of 10

INDEX OF SHEETS



LOCATION MAP

SECTION 11, TWP. 52 S, RNG. 42 E
SCALE 1"=1,000'
N

CITY COMMISSION

MAYOR:	NORMAN S. EDELCUP
VICE MAYOR:	LEWIS J. THALER
COMMISSIONER:	ROSLYN BREZIN
COMMISSIONER:	GERRY GOODMAN
COMMISSIONER:	GEORGE "BUD" SCHOLL
CITY MANAGER:	JOHN SZERLAG

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MAY 2 1 2008

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1800 Eller Drive Suite 600
Fort Lauderdale, Florida 33316
954.921.7781 954.921.8807 fax
Certificate of Authorization 514

ENGINEER OF RECORD
RONNIE S. NAVARRO, P.E.
FLORIDA REGISTRATION No. 67642

PERMIT ONLY

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SUNSHINE STATE ONE CALL OF FLORIDA, INC.

MAY 2 0 2008

CGA PROJECT No.: 05-4893
FILE No.: 054893-C-COVER.dwg

STORM SEWER PROFILE
PROFILE VIEW: HORIZONTAL 1"=20' VERTICAL 1"=2'

NOTE:

1. STORM DRAINAGE CONFLICTS WITH SANITARY SEWERS, FORCE MAIN AND WATER LINES ARE ADDRESSED ON SHEETS C22-C28 (SEWER PLANS AND PROFILES).
2. PROVIDE POLLUTION RETARDANT BAFFLES (PRB's) AT ALL OUTFALL PIPES WITHIN EACH CATCH BASIN.
3. ALL JOINTS WITHIN DRAINAGE SYSTEM TO BE WATER TIGHT.

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CITY OF SUNNY ISLES BEACH, FL
ATLANTIC ISLES ROADWAY AND UTILITY IMPROVEMENTS

PAVING, GRADING AND DRAINAGE PLAN AND PROFILE

ENGINEER OF RECORD: RONNIE S. NAVARRO, P.E. FLORIDA REG. No. 67642
DATE: MAY 2 0 2008

SCALE: AS SHOWN
PROJECT No: 05-4893
CAD FILE: 05-4893-C-STRM-PROF.DWG
SHEET: C11

STORM SEWER PROFILE

PROFILE VIEW: HORIZONTAL 1"=20' VERTICAL 1"=2'

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CITY OF SUNNY ISLES BEACH, FL
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AND UTILITY IMPROVEMENTS

PAVING, GRADING AND
DRAINAGE PLAN AND PROFILE

ENGINEER OF RECORD: RONNIE S. NAVARRO, P.E.
FLORIDA REG. No. 67642
DATE: MAY 2 6 2008

SCALE: AS SHOWN
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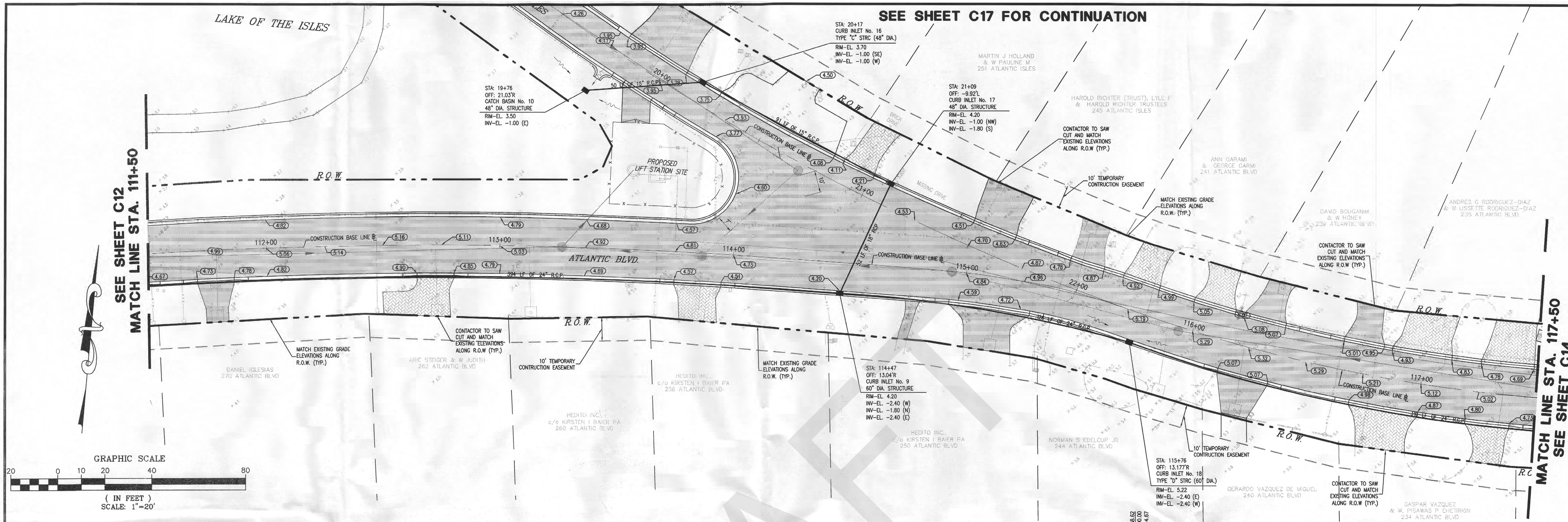

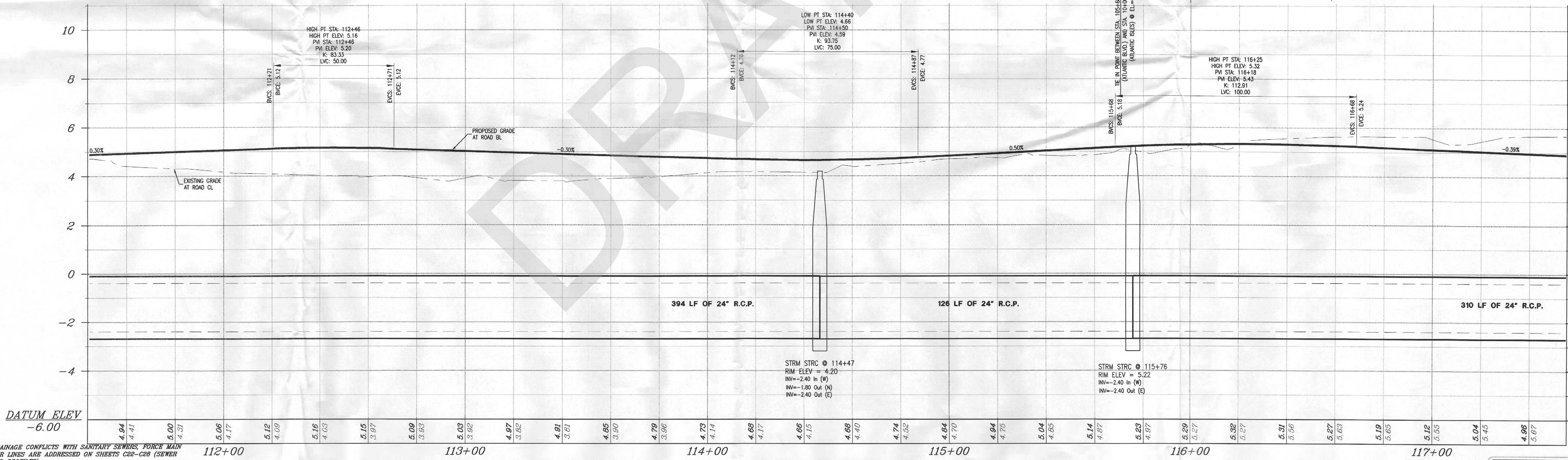

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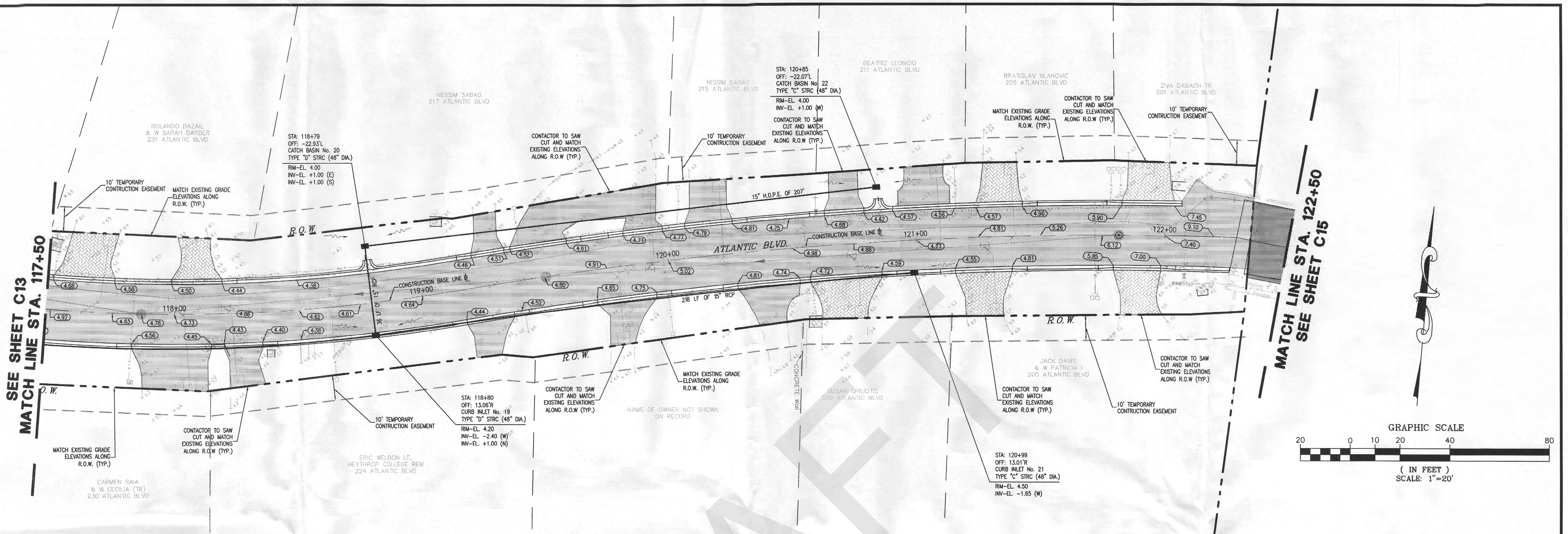
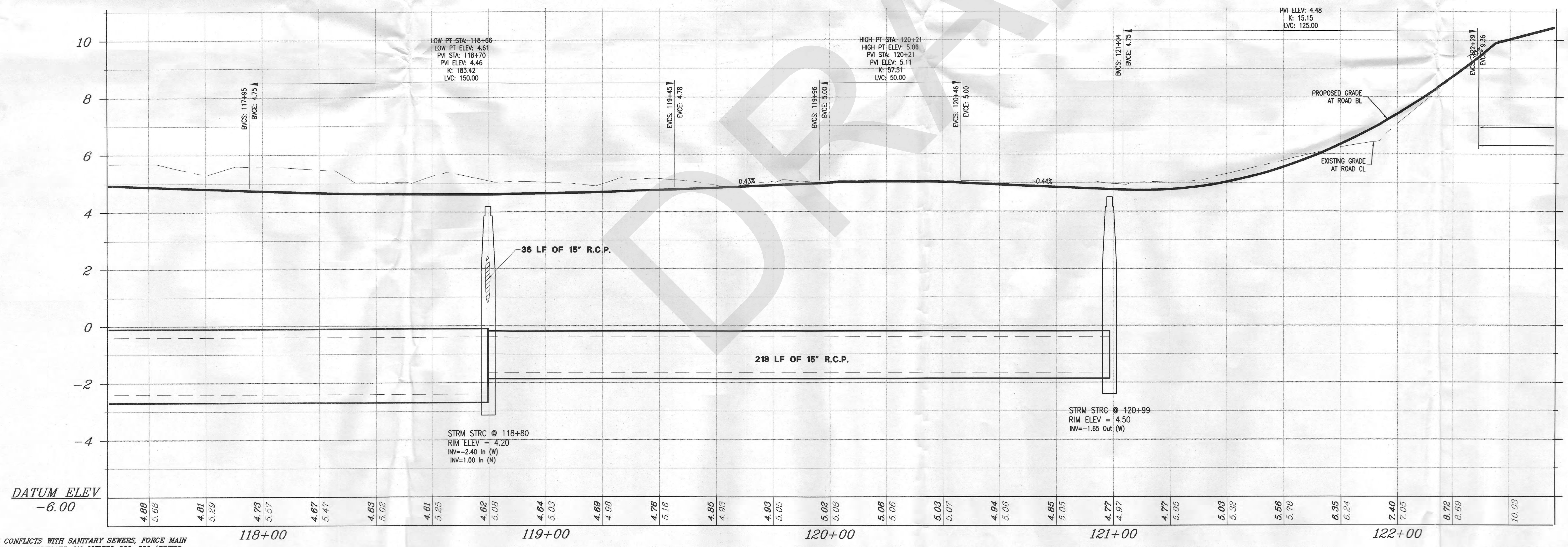
CAD FILE: 05-4893-C-STRM-PROF.DWG
SHEET: C13 OF





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FLORIDA REG. No. 67642

DATE: MAY 20 2008

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PROJECT No 05-4893
CAD FILE 05-4893-C-STRM-PROF.DWG
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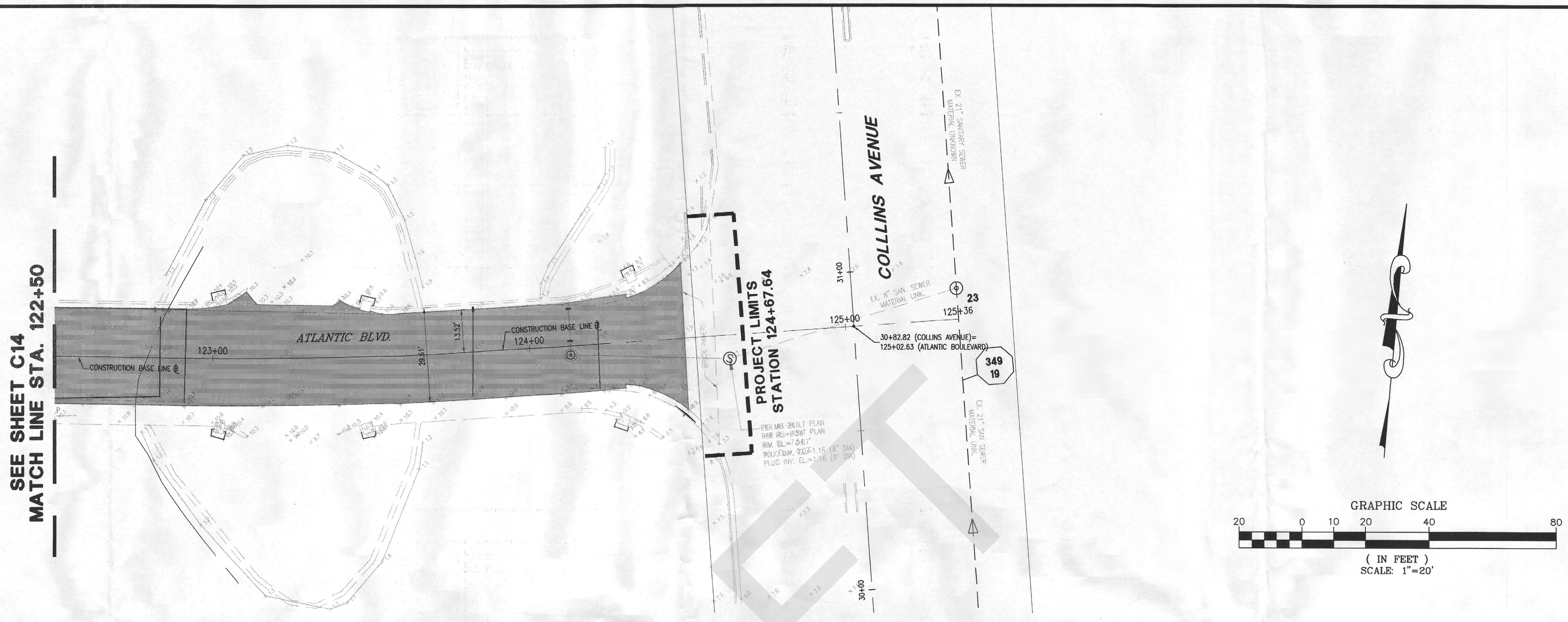

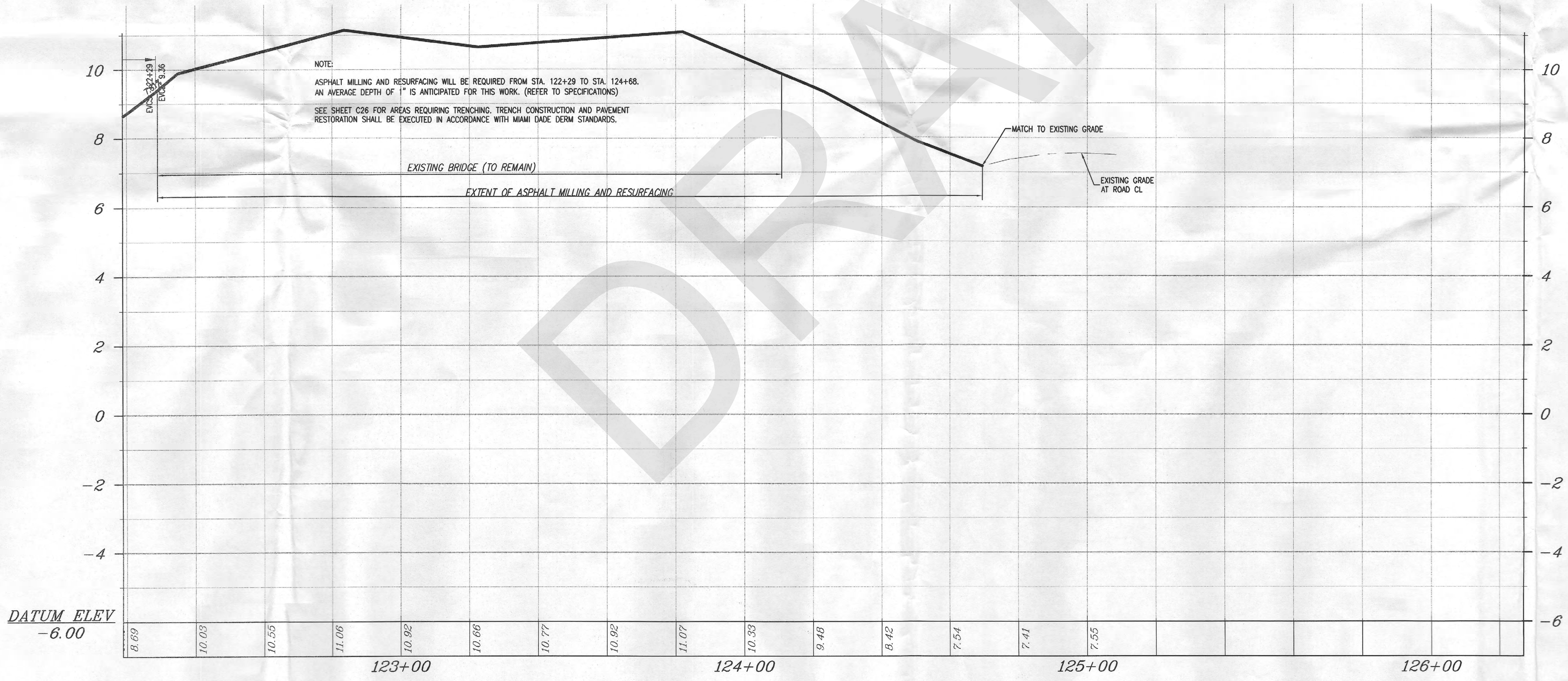

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ENGINEER OF RECORD: RONNIE S. NAVARRO, P.E.
FLORIDA REG. No. 67642
DATE: MAY 20 2008

RONNIE S. NAVARRO LICENSE STATE OF FLORIDA

SCALE	AS SHOWN
PROJECT No	05-4893
CAD FILE	05-4893-C-STRM-PROF.DWG
SHEET	C15
OF	

STORM SEWER PROFILE
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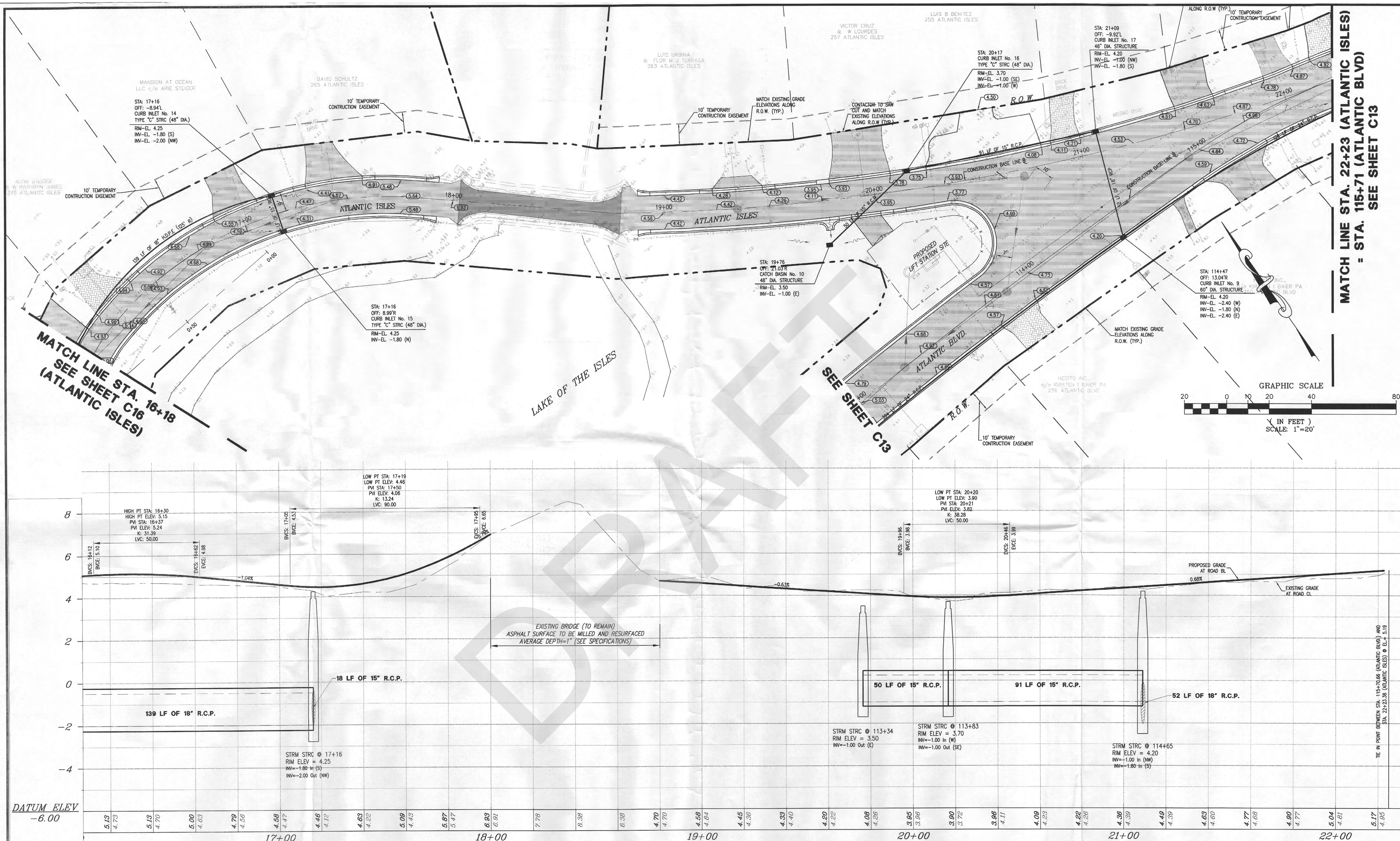
CAD FILE: 05-4893-C-STRM-PROF.DWG
SHEET: C16 OF



STORM SEWER PROFILE

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PAVING, GRADING AND DRAINAGE PLAN AND PROFILE

ENGINEER OF RECORD: RONNIE S. NAVARRO, P.E.
FLORIDA REG. No. 67642
DATE:

SCALE: AS SHOWN
PROJECT No: 05-4893
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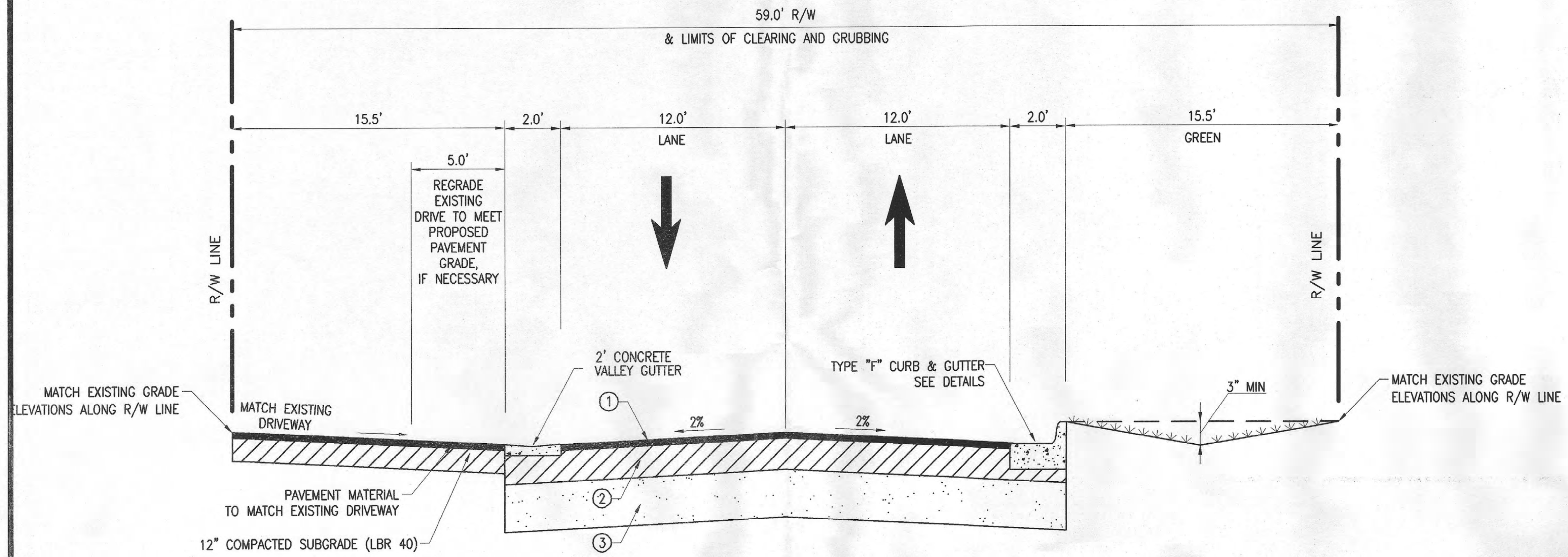
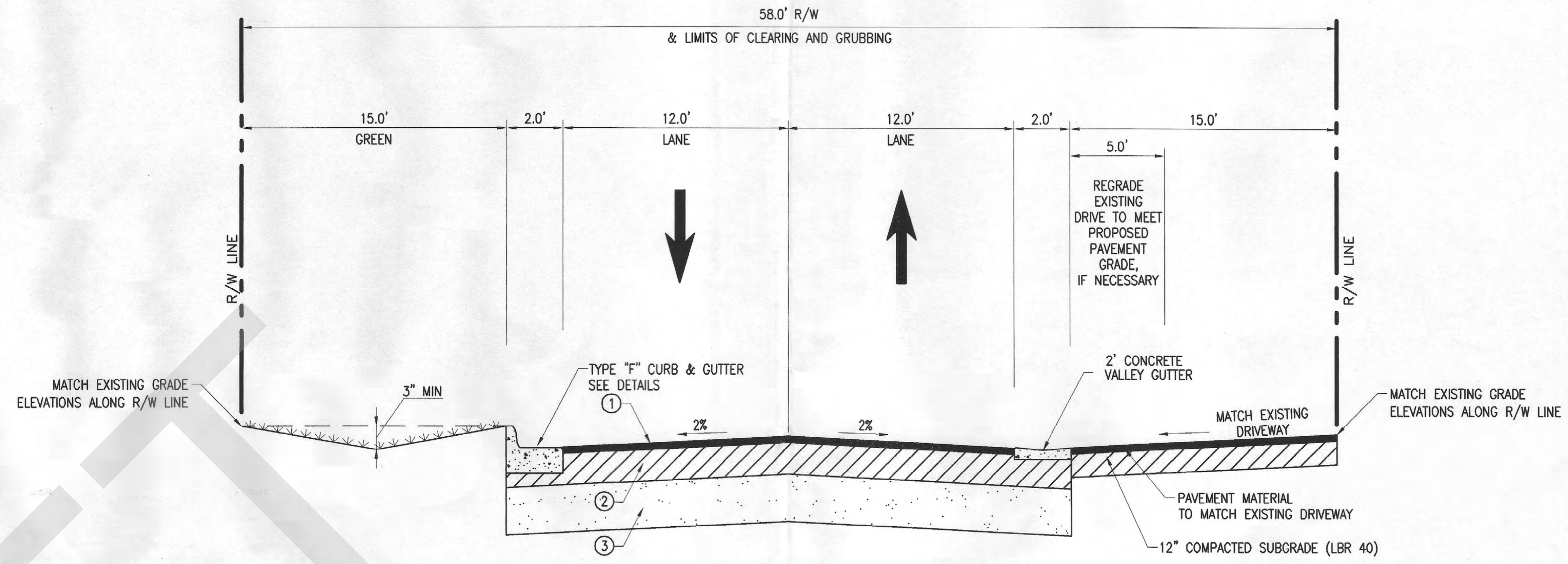
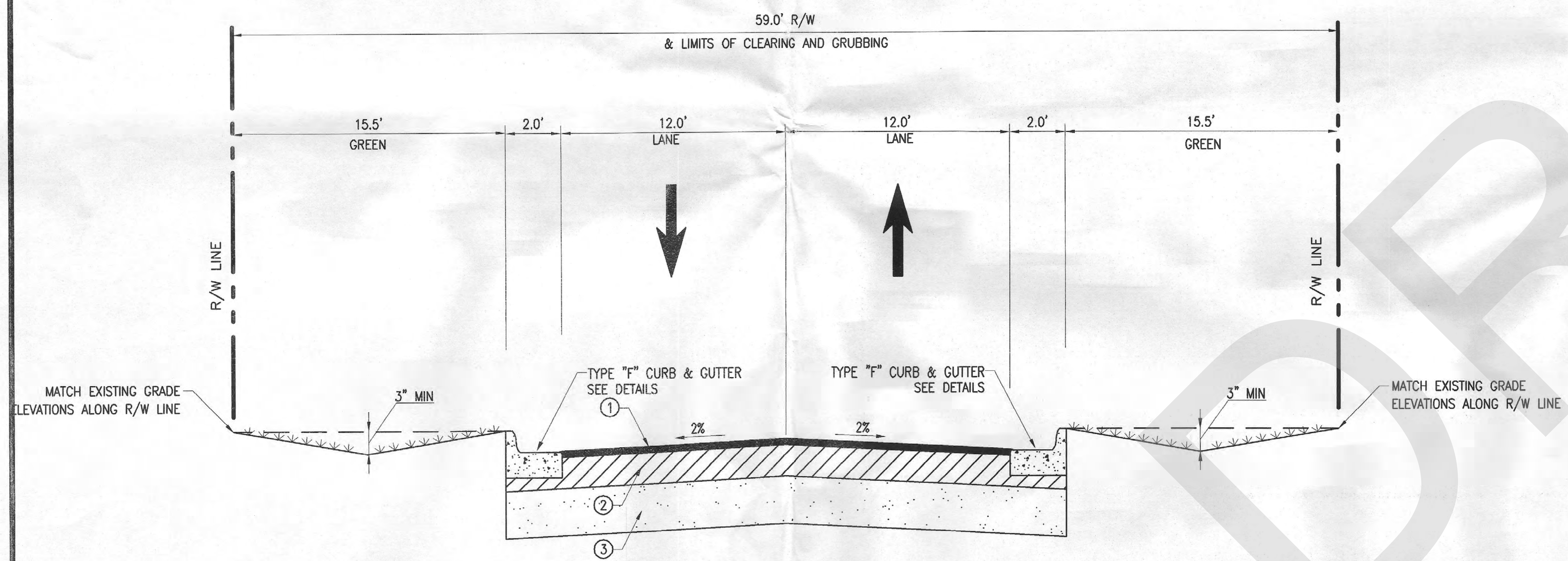


PROPOSED ATLANTIC BOULEVARD
TYPICAL SECTION BASED ON
EXISTING 59' R.O.W.
STA. 105+50
NOT TO SCALE

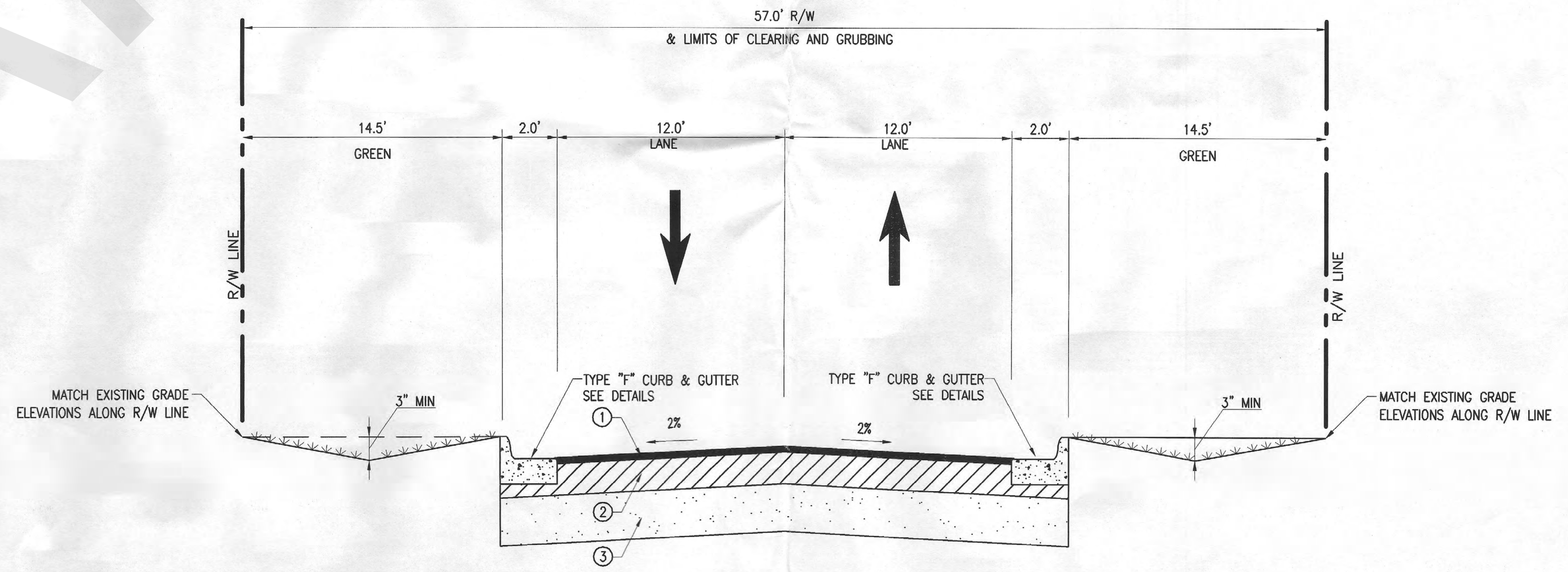


NOTES:
1. 2" SP-12.5 ASPHALT CONCRETE IN TWO LIFTS OF 1" ASPHALT CONCRETE
2. 8" LIME ROCK BASE (LBR 100)
3. 12" STABILIZED SUBGRADE (LBR 40)

PROPOSED ATLANTIC BOULEVARD
TYPICAL SECTION BASED ON
EXISTING 58' R.O.W.
STA. 112+75
NOT TO SCALE



PROPOSED ATLANTIC ISLES
TYPICAL SECTION BASED ON
EXISTING 59' R.O.W.
STA. 16+75
NOT TO SCALE



PROPOSED ATLANTIC BOULEVARD
TYPICAL SECTION BASED ON
EXISTING 57' R.O.W.
STA. 118+75
NOT TO SCALE

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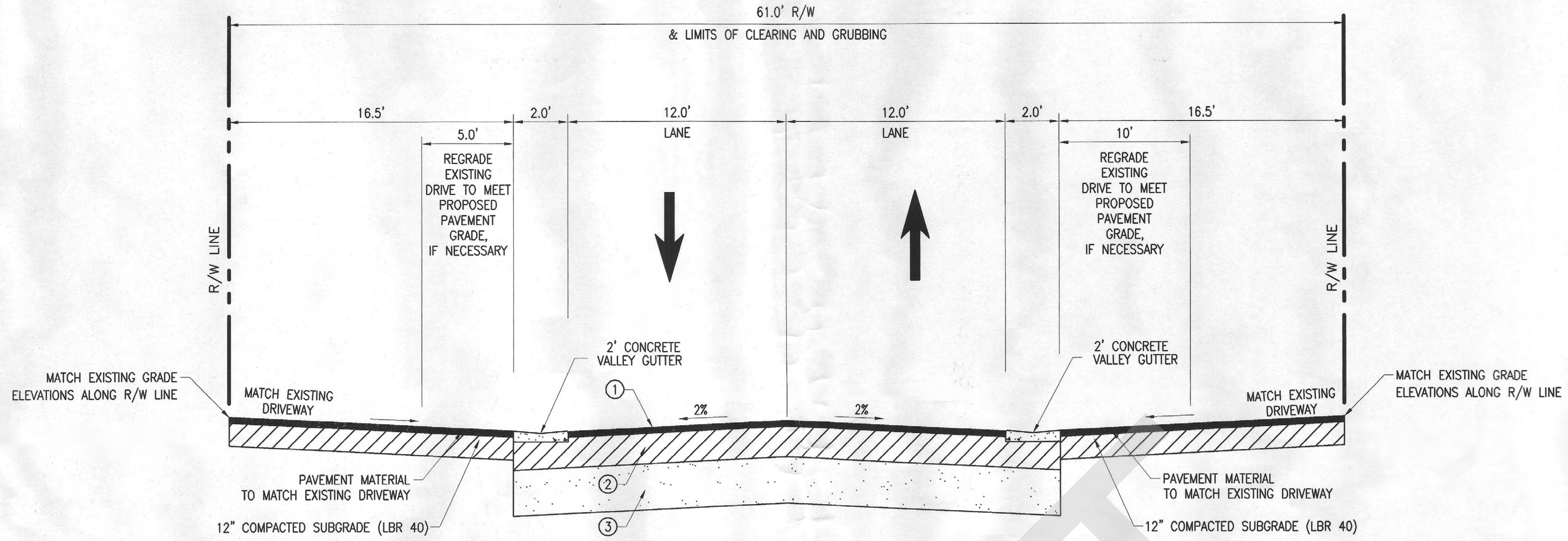
CITY OF SUNNY ISLES BEACH, FL
ATLANTIC ISLES ROADWAY
AND UTILITY IMPROVEMENTS

TYPICAL ROAD SECTIONS

ENGINEER OF RECORD: RONNIE S. NAVARRO, P.E.
FLORIDA REG. No. 67642
DATE: MAY 21 2008

SCALE: N.T.S.
PROJECT No: 05-4893
CAD FILE: 03-4197-C200-C205-STRM-PLN
SHEET: C18
OF



PROPOSED ATLANTIC BOULEVARD TYPICAL SECTION BASED ON EXISTING 61' R.O.W. STA. 121+30

NOT TO SCALE

NOTES:

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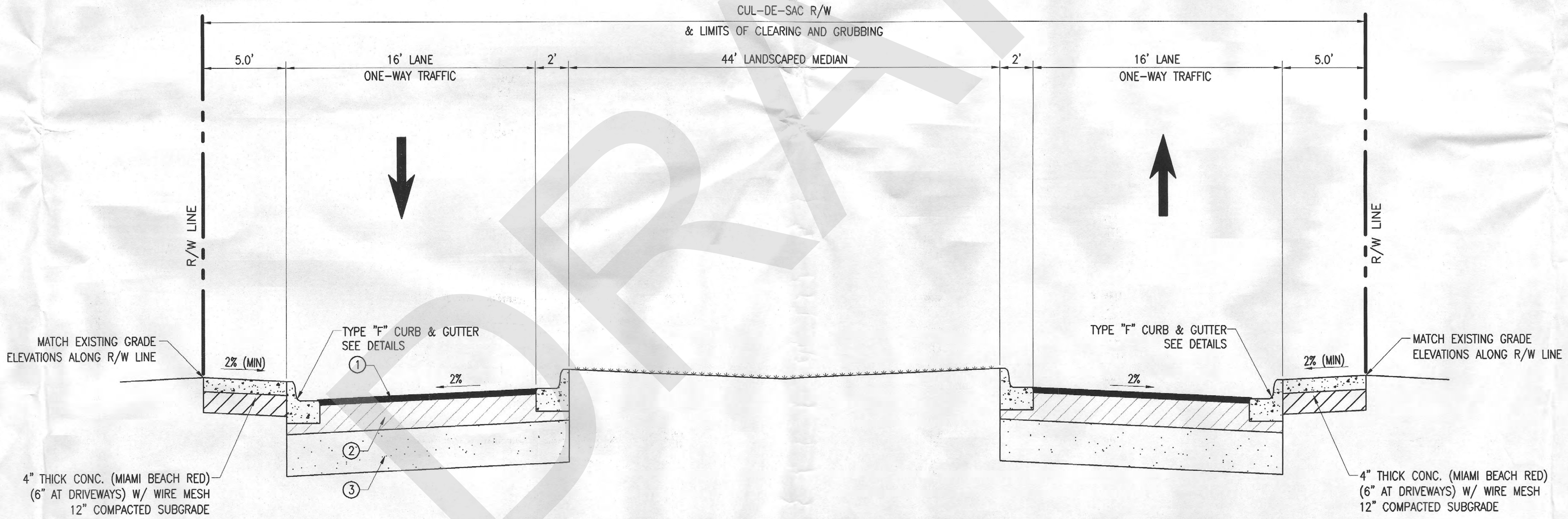

PROPOSED CUL DE SAC ATLANTIC BOULEVARD

NOT TO SCALE

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ATLANTIC ISLES ROADWAY AND UTILITY IMPROVEMENTS

TYPICAL ROAD SECTIONS

ENGINEER OF RECORD: RONNIE S. NAVARRO, P.E.
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DATE:

SCALE N.T.S.
PROJECT No 05-4893
CAD FILE 03-4197-C200-C205-STRM-PLN
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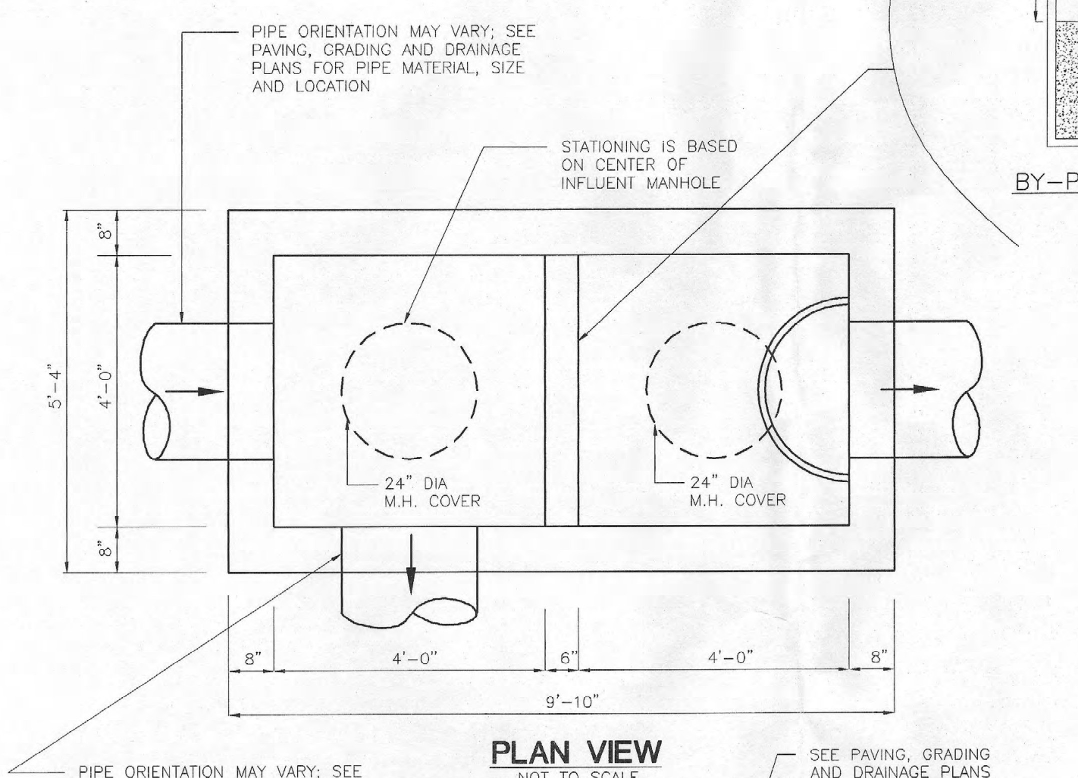
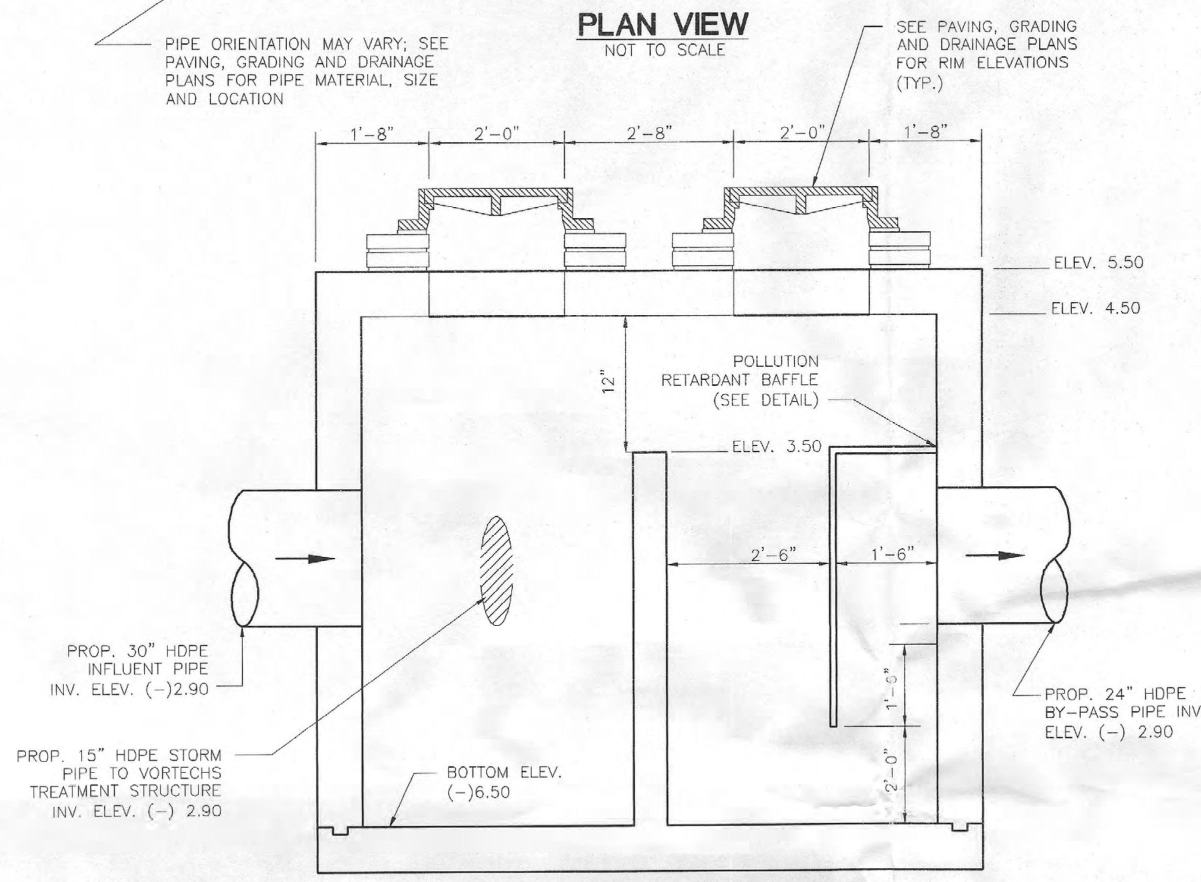


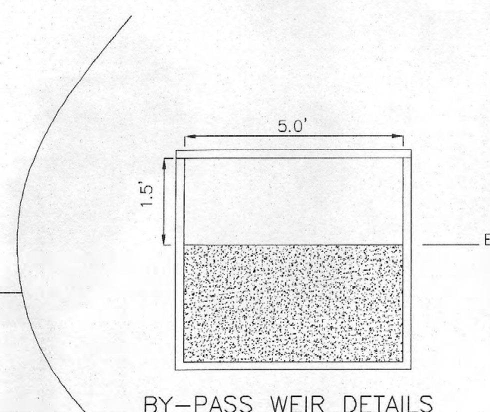
PLAN VIEW
NOT TO SCALE



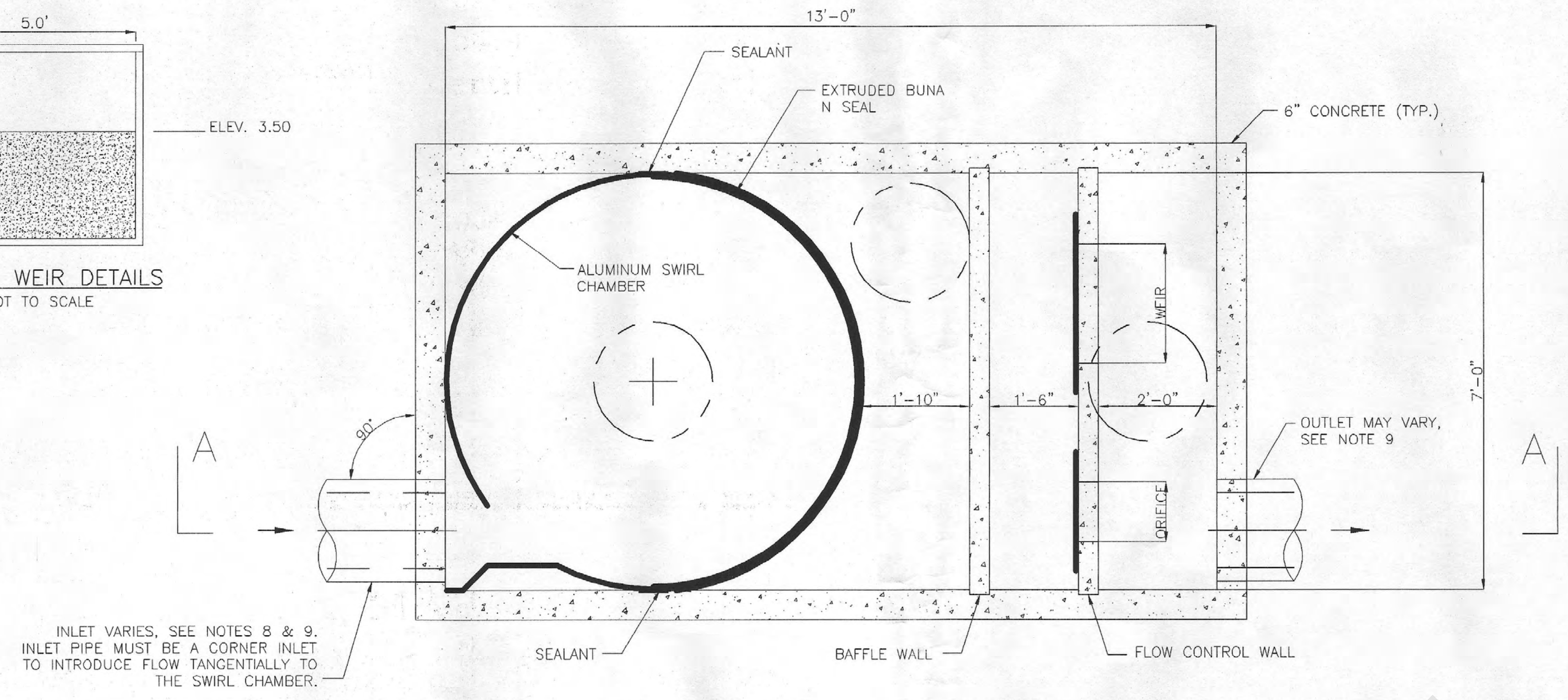
CROSS-SECTION
NOT TO SCALE

CONTROL STRUCTURE DETAIL

MANHOLE TYPE J-7 (4'x8.5') WITH BAFFLE WALL. SEE FDOT INDEX NO. 200 & 201 FOR ADDITIONAL DETAILS.



BY-PASS WEIR DETAILS
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

NOTES:

1. STORMWATER TREATMENT SYSTEM (SWTS) SHALL HAVE:

   PEAK TREATMENT CAPACITY: 8.5 CFS
   SEDIMENT STORAGE: 3.25 CU YD
   SEDIMENT CHAMBER DIA: 7' MIN

2. SWTS SHALL BE CONTAINED IN ONE RECTANGULAR STRUCTURE

4. SWTS SHALL RETAIN FLOATABLES AND TRAPPED SEDIMENT UP TO AND INCLUDING PEAK TREATMENT CAPACITY

5. SWTS INVERTS IN AND OUT ARE TYPICALLY AT THE SAME ELEVATION

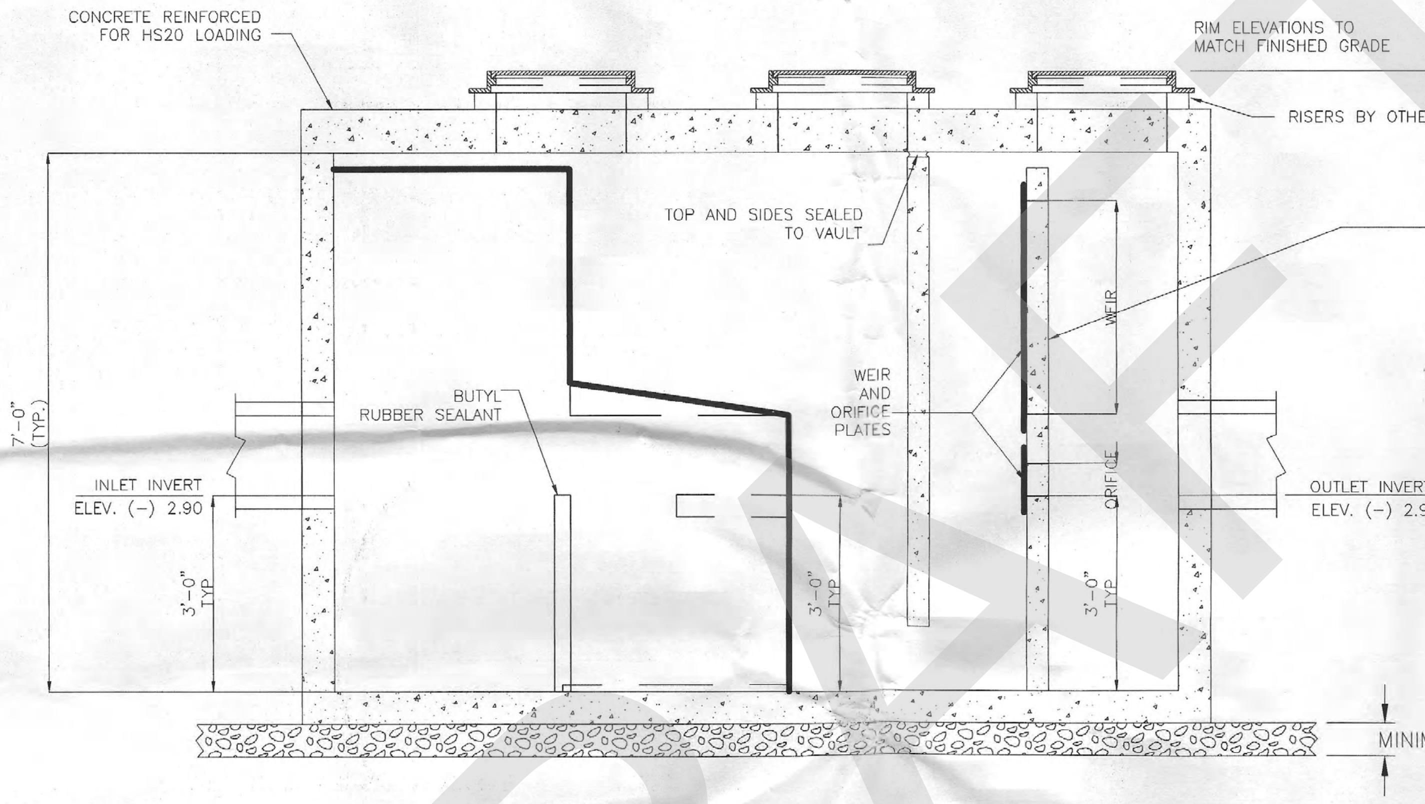
6. SWTS SHALL NOT BE COMPROMISED BY EFFECTS OF DOWNSTREAM TAILWATER

7. SWTS SHALL HAVE NO INTERNAL COMPONENTS THAT OBSTRUCT MAINTENANCE ACCESS

8. INLET PIPE MUST BE PERPENDICULAR TO THE STRUCTURE

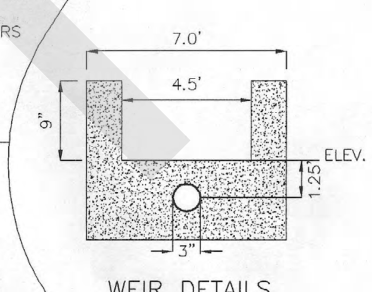
9. PIPE ORIENTATION MAY VARY; SEE SITE PLAN FOR SIZE AND LOCATION

10. VORTECHS SYSTEMS BY CONTECH STORMWATER SOLUTIONS; PORTLAND, OR (800)548-4667; SCARBOROUGH, ME (877) 907-8676; LINTHICUM, MD (866) 740-3318.

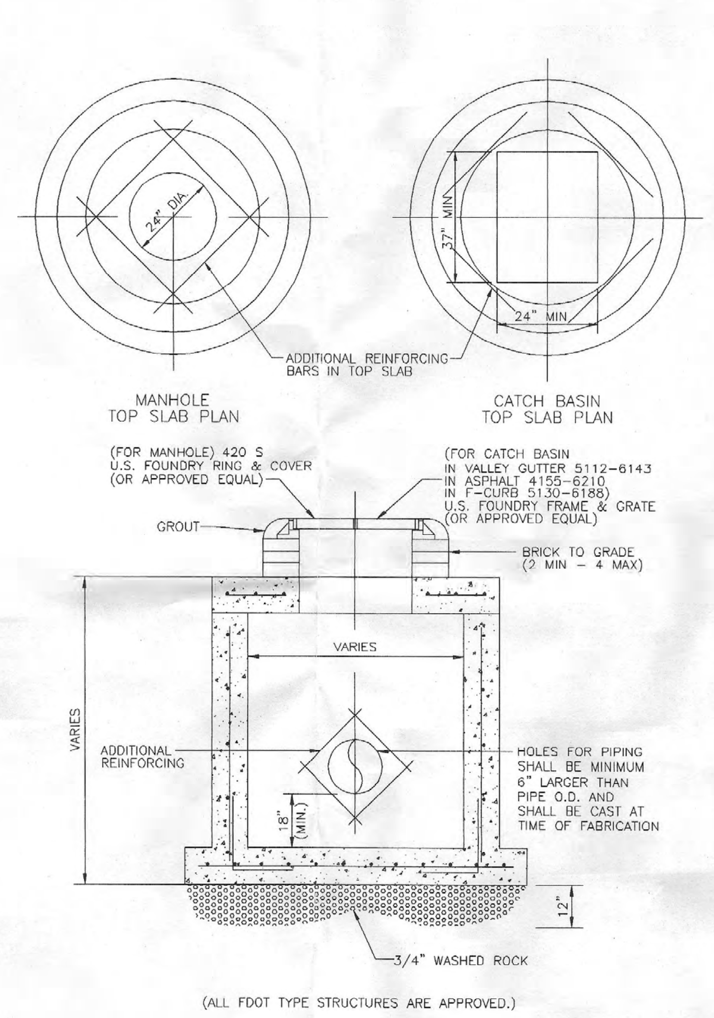


SECTION A - A
NOT TO SCALE

VORTECHS MODEL 5000
STORMWATER TREATMENT SYSTEM DETAILS

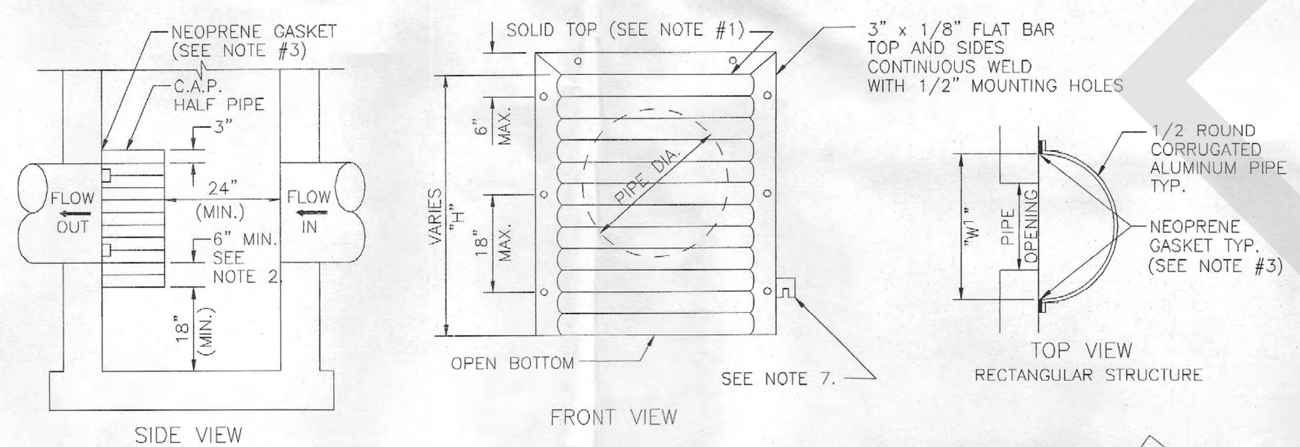


WEIR DETAILS
NOT TO SCALE



(ALL FDOT TYPE STRUCTURES ARE APPROVED.)

PRECAST CATCH BASIN AND MANHOLE DETAIL

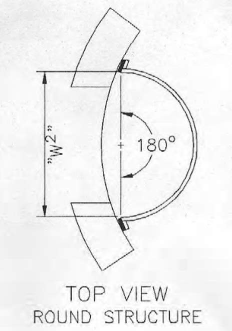


PIPE DIA.	W[1] (IN)	W[2] (IN)	T (GAUGE)	H (IN)
15"	21"	21"	16	VARIES
18"	24"	24"	16	VARIES
21"	30"	30"	16	VARIES
24"	30"	36"	16	VARIES
30"	36"	42"	14	VARIES
36"	42"	48"	14	VARIES
42"	48"	54"	14	VARIES
48"	54"	60"	14	VARIES
54"	60"	66"	14	VARIES

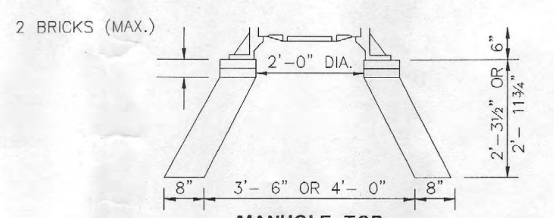
1. RECTANGULAR STRUCTURE
2. ROUND STRUCTURE

NOTES:

1. ALUMINUM SHEET OF SAME THICKNESS (GAUGE) AS PIPE SHALL BE WELDED TO CLOSE OPENING AT THE TOP.
2. THE BOTTOM ELEVATION OF THE POLLUTION RETARDANT BAFFLE MUST BE AT LEAST 2' BELOW CONTROL ELEVATION.
3. NEOPRENE ADHESIVE BACKED GASKET, OR APPROVED EQUAL (1" x 2") SHALL BE INSTALLED ON THE SIDES AND TOP OF ALL BAFFLES.
4. POLLUTION RETARDANT BAFFLE TO BE FASTENED IN PLACE WITH 3/8"x4" STAINLESS STEEL "RED HEADS", OR APPROVED EQUAL.
5. ALL EXFILTRATION TRENCHES SHALL HAVE A POLLUTION RETARDANT BAFFLE AT EACH CONNECTION POINT TO A STRUCTURE (SEE EXFILTRATION TRENCH DETAIL).
6. FIBERGLASS BAFFLES ARE NOT PERMITTED.
7. MOUNTING BRACKETS MAY BE ADDED TO FLAT BARS TO EASE INSTALLATION IN ROUND STRUCTURES. SPACING TO MATCH HOLES IN FLAT BARS.

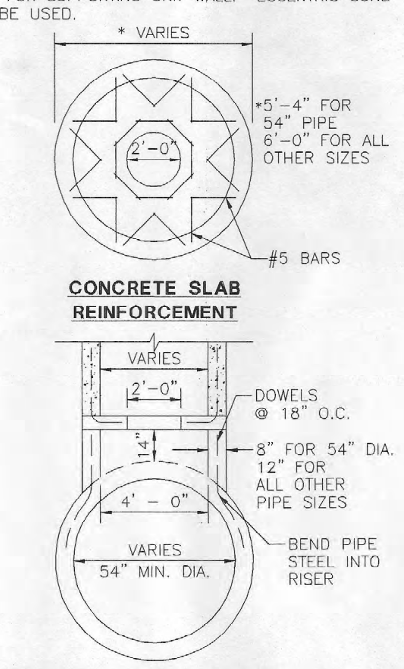


POLLUTION RETARDANT BAFFLE DETAIL

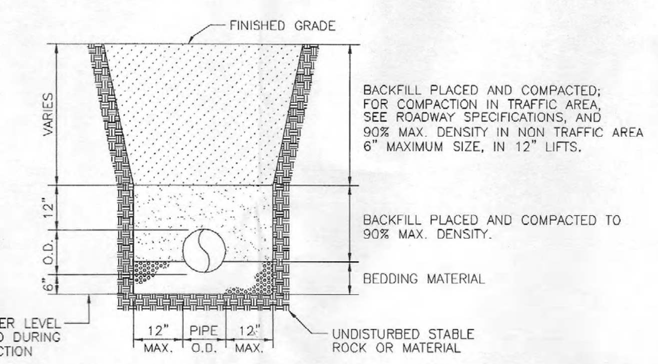


MANHOLE TOP

NOTE: UNIT MAY BE PRECAST OR CAST IN PLACE CONCRETE CONSTRUCTION. WALL THICKNESS & STEEL SAME AS USED FOR SUPPORTING UNIT WALL. ECCENTRIC CONE MAY BE USED.



REINF. CONC. INLET OR MANHOLE ON PRECAST CONCRETE RISER



NOTES:

1. WHERE SOIL CONDITION CANNOT BE MAINTAINED AS SHOWN ABOVE, PROVIDE APPROVED MEANS OF CONSTRUCTION.
2. WHERE REQUIRED SHEETING AND SHORING SHALL BE IN ACCORDANCE WITH THE LOCAL GOVERNMENTAL AGENCY.
3. MUCK OR OTHER UNSUITABLE MATERIAL SHALL BE COMPLETELY REMOVED.
4. WHEN THE PIPE IS LAID IN THE PREPARED TRENCH, TRUE TO LINE AND GRADE, THE PIPE BARREL SHALL RECEIVE CONTINUOUS UNIFORM SUPPORT. WHERE NECESSARY, COURSE SAND, PEA ROCK OR 3/4" LIMESTONE GRAVEL SHALL BE USED TO PROVIDE UNIFORM BEDDING.
5. JOINTS MAY BE REQUIRED TO BE WRAPPED AT THE DISCRETION OF THE DISTRICT AND THE SITE CONDITIONS.
6. BACKFILL MATERIAL SHALL BE NON-COHESIVE AND NON-PLASTIC SOIL THAT IS FREE OF ALL DEBRIS, LUMPS, WOOD BROKEN PAVING OR ANY ORGANIC OR UNSUITABLE MATERIAL. BACKFILL MATERIAL PLACED WITHIN 12" OF THE PIPE SHALL CONTAIN NO ROCKS OR STONES LARGER THAN 3-1/2" INCHES IN DIAMETER. NO ROCKS OR STONES LARGER THAN 6" IN DIAMETER WILL BE PERMITTED IN THE REMAINING BACKFILL UNLESS OTHERWISE SPECIFIED.
7. TRENCH BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 90 PERCENT OF THE MAXIMUM DRY DENSITY DETERMINED BY AASHTO T-180. BACKFILL AND COMPACTION SHALL BE IN ACCORDANCE TO THE STANDARD ENGINEERING DESIGN REQUIRED BY THE LOCAL GOVERNMENTAL AGENCY.

TRENCH EXCAVATION DETAIL

CALL 48 HOURS BEFORE YOU DIG IN FLORIDA
IT'S THE LAW!
1-800-432-4770
SUNSHINE STATE ONE CALL OF FLORIDA, INC.

DRAFT

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

DESIGNED
DATE
DRAWN
DATE
CHECKED
DATE

Calvin, Giordano & Associates, Inc.
Engineers Surveyors Planners
1800 Eller Drive, Suite 600
Fort Lauderdale, Florida 33316
Phone: 954.921.7781 Fax 954.921.8807
Certificate of Authorization 514

CITY OF SUNNY ISLES BEACH, FL
ATLANTIC ISLES ROADWAY
AND UTILITY IMPROVEMENTS

DRAINAGE DETAILS

ENGINEER OF RECORD: RONNIE S. NAVARRO, P.E.
FLORIDA REG. No. 67642
DATE:

SCALE: N.T.S.
PROJECT No: 05-4893
CAD FILE: 05-4893-C-DTLS.DWG
SHEET: C20
OF

EXHIBIT B-1 -
GEOTECHNICAL STUDY - MAY 2020

May 29, 2020

Mr. Adrian Viala, P.E.
Assistant District Geotechnical Engineer
Florida Department of Transportation
District 4 and 6 Materials Office
14200 West State Road 84
Davie, Florida 33325

Subject: Preliminary Report of a Geotechnical Exploration – Roadway Soil Survey (Revised)
PD&E Study for Atlantic Isle Lagoon Bridge – Atlantic Avenue
City of Sunny Isles
Florida Department of Transportation, District 6
Contract No. C-9Y98, FPID No. 250730-3-32-01
FPID No. 430029-2-22-02
T.W.O. No. 77
Miami-Dade County, Florida
HRES Project No. HR20-1583R

Dear Adrian:

HR Engineering Services, Inc. (HRES) is pleased to provide this Preliminary Report of a Geotechnical Exploration - Roadway Soil Survey (Revised) for the subject PD&E study. This report presents our understanding of the project, outlines our exploratory procedures, and documents the field test data.

We have enjoyed assisting you on this project and look forward to serving as your geotechnical consultant on the remainder of this project and on future projects. If you have any questions concerning this report, please call our office at (305) 888-8880.

Sincerely,

HR ENGINEERING SERVICES, INC.
(Certificate of Authorization No. 7991)

HERNANDO R. RAMOS
LICENSE
No 42045
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY
Hernando R Ramos
2020.06.01 11:58:57 -04'00'
ON THE DATE ADJACENT TO THE SEAL

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

Paola Vargas, E.I.
MAT Staff Geotechnical Engineer

Hernando R. Ramos, P.E.
MAT Chief Geotechnical Engineer
Florida Registration 42045

Distribution: Addressee (1)
File (1)

HR Engineering Services, Inc.
7815 N.W. 72nd Avenue
Medley, Florida 33166

Table of Contents

Page #

APPENDIX A:

APPENDIX B:

APPENDIX C:

1.0 INTRODUCTION

The purpose of this geotechnical exploration was to obtain preliminary information concerning the site and subsurface conditions along the proposed PD&E study. The study consists of providing a roadway improvement solution to eliminate vehicular traffic over the historical bridge that is planned to become a pedestrian bridge. This report discusses our exploratory and testing procedures, presents our findings and includes the following items:

Field Services

- Performed three (3) SPT borings for the roadway widening/improvements to depths ranging from 20 to 22 feet, measured from the existing ground surface. The test borings subsurface information is presented on the Report of Core Borings and Soils Information Table in Appendix A.
- Performed two (2) SPT borings for the new bulkhead wall system down to a depth of 50 feet (only showing 20 feet) , measured from the ground surface was utilized to help characterize the subsurface condition along the proposed roadway improvements. The test borings subsurface information is presented on the Report of Core Borings in Appendix A.
- Two (2) SPT borings performed for the historical bridge were available (performed to 80 feet, only showing 20 feet), measured from the ground surface was utilized to help characterize the subsurface condition along the proposed roadway improvements. The test borings subsurface information is presented on the Report of Core Borings in Appendix A.
- A brief description of our field testing procedures.

Evaluation

- Review of Miami-Dade County USDA Soil Survey Maps.
- Review of USGS Quadrangle Map.
- Review of Miami-Dade County USGS Water Level Maps.
- A general review of existing surface features and site conditions.
- Report of Core Borings and Soils Information Table.
- Roadway Soils Survey.
- Preliminary roadway construction recommendations.

Laboratory Testing

- The results of laboratory tests performed on selected soil samples obtained from the test borings.
- A brief description of our laboratory testing procedures.

2.0 PROJECT INFORMATION

2.1 General

Project information for this subsurface exploration has been provided to us by various members of the design team. Additional information has been provided during telephone conversations.

During our geotechnical study, we have been furnished with the following project-related plans and information:

- Proposed Alternatives 2A and 2B – Atlantic Isle Lagoon Bridge – Atlantic Avenue
  Prepared by: FDOT District 6 PLEMO
  Dated: 03/24/2020

2.2 Project Description

The PD&E study consists of providing a roadway improvement solution to eliminate vehicular traffic over the 1925 historical bridge that is planned to become a pedestrian bridge. This report provides preliminary recommendations for the construction of the roadway.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Field Exploration

The field exploration was conducted by HRES. The locations of the test borings are provided in the Summary of Test Boring Locations in Appendix A. The Report of Core Borings and the Soils Information Table in Appendix A summarize the approximate boundary between soil types. In some instances, the transition between material types may be gradual. A brief description of the exploratory sampling techniques used is presented in the Field Testing Procedures section in Appendix A. A discussion of the subsurface conditions encountered along the project alignment is provided in Section 4.2 of this report.

3.2 Laboratory Testing

3.2.1 Soil Testing

In order to aid in classifying and estimate engineering characteristics of the subsurface materials encountered, laboratory classification tests were performed on representative soil samples obtained from the test borings. The laboratory testing program included the following:

- 15 Fines Content Tests
- 17 Organic Content Tests
- 17 Moisture Content Tests

The soil laboratory test results were classified following the AASHTO Classification System. The test results are presented in Appendix B.

The Summary of Laboratory Test Results also includes the laboratory testing performed by HRES for a previous project. The testing consists of 2 sieve analyses, 1 fines content test, 3 organic content tests and 6 moisture content tests.

3.2.2 Corrosivity Classification Testing

HRES performed one (1) corrosion series test on a water sample collected from the performed SPT Boring RW-2. The testing was performed in accordance with Florida Method, Designations FM5-550 through FM5-553 and included pH, chlorides and sulfates contents, and resistivity testing. The

Florida Department of Transportation Requirements Manual, Section 1.3 Environmental Classifications outlines the ranges of groundwater chemical properties considered corrosive to reinforced concrete substructure. In addition, that section environmentally classifies the superstructure based on factors located near the proposed structure(s). Based on this classification, an environment may be Slightly Aggressive, Moderately Aggressive, or Extremely Aggressive.

The following table summarizes the laboratory test results:

Table 3.2.2: Summary of Corrosion Classification Tests Results

Test No.	Latitude	Longitude	Test Date	Sample Depth, ft.	Soil/ Water	pH	Chlorides ppm	Sulfate ppm	Resistivity ohms-cm	Substructure Environmental Classification	
										Steel	Concrete
RW-2	25.92758	-80.12662	05/19/20	2.0	Water	8.0	1,204	77	16	EA	EA

The results show that both steel and concrete substructures will be in an Extremely Aggressive environment. Due to their locations, the superstructures are considered to be in an Extremely Aggressive environment.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 SITE CONDITIONS

The site conditions were observed by a Geotechnical Engineer during the month of May, 2020.

4.2 SUBSURFACE CONDITIONS

4.2.1 Miami-Dade County Soil Survey Map

The Soil Map of Miami-Dade County Area, Florida, published by the United States Department of Agriculture (USDA) was reviewed for general near-surface soil information within the general project vicinity. This information indicates that there are two (2) mapping units in the vicinity of the project. The map soil units encountered are as follows:

Table 4.2.1 Miami-Dade County Soil Survey

Miami-Dade County Area, Florida (FL686)		
Map Unit Symbol	**Map Unit Name**	**Typical Profile**
15	Urban land, 0 to 2 percent slopes (94.2% of AOI)	Not Reported
99	Water (5.8% of AOI)	-

A reproduction of the USDA map for the project area is included in Appendix A.

4.2.2 USGS Quadrangle Map

The North Miami Quadrangle, Florida-Dade Topographic Map (1994) published by the United States Geological Survey (USGS) was reviewed for general existing ground surface elevations in the project area. Based on the map, the existing ground elevations in the project vicinity range from 3.5 to 8.5 feet, NAVD88 (5 to 10 feet, NGVD29). A reproduction of the USGS Quadrangle Map for the project area is included in Appendix A.

4.2.3 Generalized Subsurface Conditions Encountered Along the Alignment

A total of seven different layers of materials were observed during the performance of the boreholes. Stratum 1a is asphalt. Stratum 1b is topsoil. Stratum 2 consists of silty fine sand with some limerock. Stratum 3 consists of fine sand occasionally with traces of limerock. Stratum 4 consists of silty fine sand occasionally with traces of limerock. Stratum 5 consists of organic silty fine sand or organic to highly organic sandy silt. Stratum 5 consists of the natural limestone. For a detailed subsurface condition at a particular borehole location, please refer to the Report of Core Borings and the Soils Information Table in Appendix A.

4.2.4 Groundwater Conditions

The groundwater levels in the borings were measured at the time of drilling. Groundwater levels in the test borings were encountered at depths ranging from 1.5 to 4.3 feet. A Seasonal High Ground Water Table (SHGWT) of 2.0 feet, (NAVD88) is recommended for design.

Fluctuation in the observed groundwater levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff, storm surge and other site-specific factors. Since groundwater level variations are anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based on the assumption that variations will occur.

5.0 PRELIMINARY ROADWAY CONSTRUCTION RECOMMENDATIONS

5.1 BASIS FOR RECOMMENDATIONS

The following preliminary construction recommendations are based upon our understanding of the conceptual design information available at the writing of this report and the data gathered during our subsurface exploration. The stratification of the subsurface materials underlying the site may vary within even short lateral distances; therefore, any subsurface condition encountered which differs from those documented in this study should be reported to us so that our recommendations can be reviewed.

5.2 SUITABILITY OF IN-SITU MATERIALS

The following is a summary of the subsurface information provided by the borings and their suitability.

Stratum 1a – This Stratum consists of asphaltic concrete.

Stratum 1b – This Stratum consists of dark brown organic silty fine sand (topsoil, A-8). No laboratory testing was performed on this material. This material is unsuitable for use as stabilized subgrade or fill material and should be removed.

Stratum 2 – This stratum consists of light brown silty fine sand with some limerock (A-1-b). Laboratory testing on this material consisted of 1 sieve analysis and 1 moisture content test. The fines content was 11 percent and the moisture content was 12 percent. This material appears suitable for use as a general fill when utilized in accordance with FDOT Index 120-001. It cannot be used as base material.

Stratum 3 – This Stratum consists of brown to gray fine sand with traces limerock (A-3). Laboratory testing on this material consisted of 1 sieve analysis, 1 fines content test, 1 organic content test and 3 moisture content tests. The fines content ranged from 7 to 8 percent, the organic content was 4 percent and the moisture content ranged from 33 to 47 percent. This material appears suitable for use in the embankment when utilized in accordance with FDOT Index 120-001. It cannot be used as stabilized subgrade or base material.

Stratum 4 – This Stratum consists of brown silty fine sand occasionally with traces of limerock (A-2-4). Laboratory testing on this material consisted of 4 fines content tests, 4 organic content tests and 4 moisture content tests. The fines content ranged from 19 to 32 percent, the organic content ranged from 3 to 4 percent and the moisture content ranged from 35 to 70 percent. This material appears suitable for use in the embankment when utilized in accordance with Standard Plan Index 120-001. However, this material is likely to retain excess moisture and be difficult to dry and compact. It should be used in the embankment above the water level existing at the time of construction. It cannot be used as stabilized subgrade or base material.

Stratum 5 – This Stratum consists of dark brown organic silty fine sand or organic to highly organic sandy silt (A-8). Laboratory testing on this material consisted of 11 fines content tests, 15 organic content tests and 15 moisture content tests. The fines content ranged from 21 to 75 percent, organic content ranged from 6 to 58 percent and the moisture content ranged from 45 to 506 percent. The organic material was found under the Atlantic Avenue roadway and the areas to be widened; from depths ranging from 4 feet to 8 feet and extended to depths ranging from 13 to 15 feet. The range in depth of these materials is summarized in Table 5.2:

Table 5.2: Unsuitable Material Encountered –Stratum 5

Boring No.	Range in Depth, ft.	Organic Material Thickness, ft.	Organic Content, %
RB-1	4.5-6.0	1.5	25
	8.0-10.0	2.0	8
	10.0-11.5	1.5	9
RB-2	4.0-7.0	3.0	14
	7.0-10.0	3.0	9
RB-3	8.0-10.0	2.0	11
RW-1	4.0-4.5	0.5	7
	4.5-6.0	1.5	19
	8.0-10.0	2.0	25
RW-2	4.0-6.0	2.0	7
	8.0-8.5	0.5	6
	8.5-10.0	2.0	42
B-1	4.0-13.0	9.0	40
B-2	4.0-8.0	4.0	17
	10.0-15.0	5.0	58

This material is unsuitable for use in the embankment and as stabilized subgrade and based on its high organic content, it should be removed in accordance with FDOT Index 120-002. However, due to its thickness and difficulty of removal, the organic material can be left in place.

As construction alternative for removal, geosynthetic reinforcement should be used under the new pavement section. The geosynthetic reinforcement will not eliminate the total settlements due to the placement of new fills; however, it will reduce the differential settlements between the old and new embankments.

Stratum 6 – This stratum consists of the natural limestone. This material appears suitable for use as general fill when utilized in accordance with FDOT Index 120-001. This material typically offers a high resistance to excavation. Special equipment and breaking tools may be required to excavate it. This material is also difficult to dewater due to its high porosity and permeability.

5.3 Settlement and Vibration Monitoring

Construction vibrations associated with sheetpile installation and compaction equipment may occur. Due to the present poor structural capacity of the historical arch bridge, construction vibrations are not allowed.

Settlement and vibration monitoring of existing bridge and all nearby existing structures should be performed in accordance with Section 108 of the FDOT Standard Specifications.

5.4 Construction Plans and Specifications Review

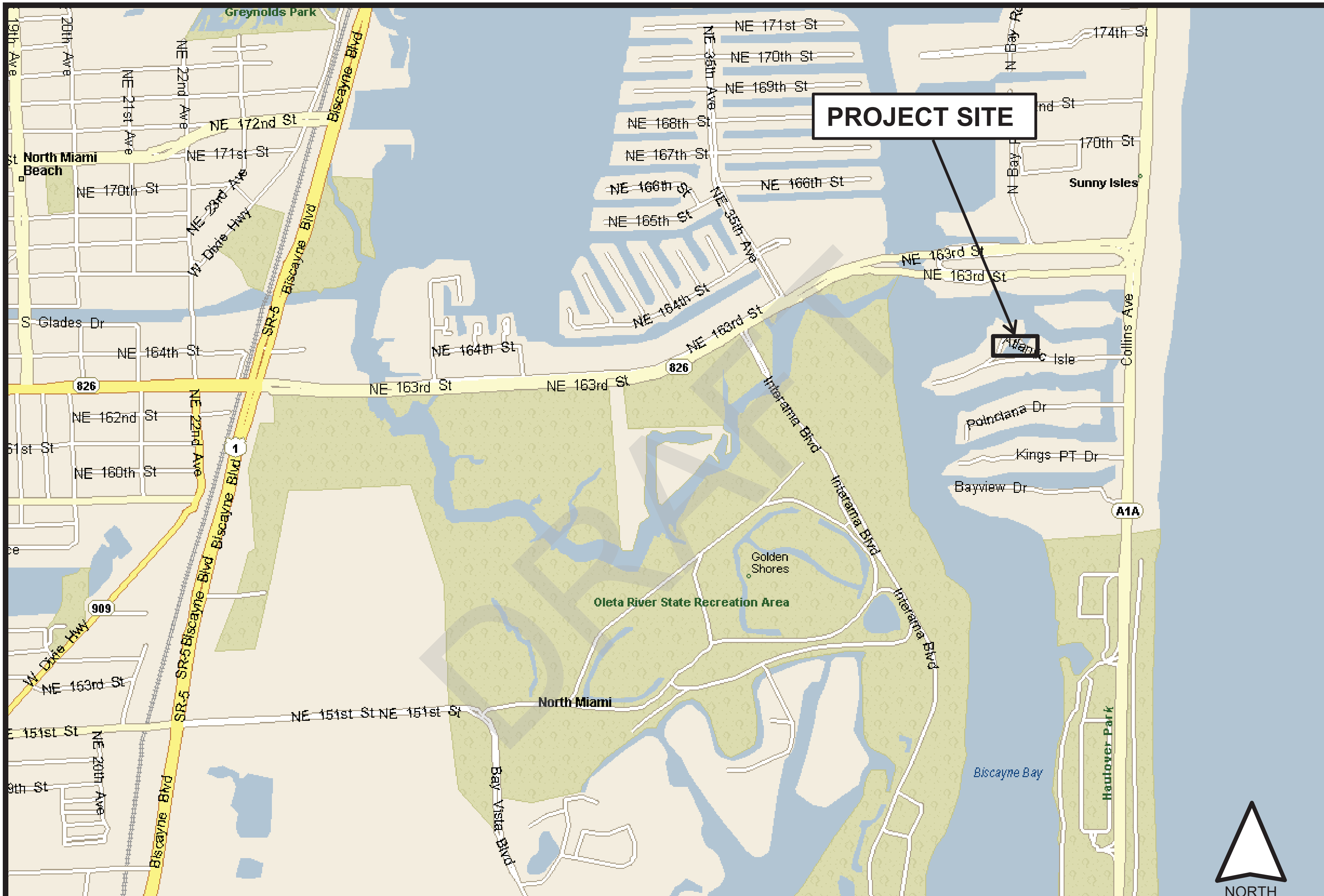
It is recommended that this office be provided the opportunity to make a general review of the earthwork plans and special provisions prepared from the recommendations presented in this report. We would then suggest any modifications so that our recommendations are properly interpreted and implemented.

6.0 REPORT LIMITATIONS

The preliminary scope of the investigation was intended to evaluate the subsurface conditions along the proposed roadway improvements for the PD&E phase of the project. The preliminary analyses and preliminary recommendations submitted in this report are based upon the preliminary data obtained from the test borings performed at the locations indicated. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature or location of the proposed improvement.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic material in the soil, groundwater, or surface water within or beyond the site studied.

APPENDIX A



ATLANTIC ISLE LAGOON BRIDGE FPID No. 430029-2-22-02 FLORIDA DEPARTMENT OF TRANSPORTATION – DISTRICT 6 MIAMI-DADE COUNTY, FLORIDA	**HRES** **HR Engineering Services, Inc.**	**SITE LOCATION MAP** A-1 DRAWN BY: PV — DATE: 05/29/20 PROJECT No: HR20-1583R — SCALE: NTS

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

FDOT District 6 PLEMO
Project Development
1000 NW 111th Avenue
Miami, Florida 33172
www.fdot.gov

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

FIELD EXPLORATION PLAN

SHEET NO.
A-2

$USER$ $DATE$ $TIME$ $MODELNAME$ $FILE$

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,040 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 15, 30, 60, 90

Feet: 0, 50, 100, 200, 300

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

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
CERTIFICATE OF AUTHORIZATION 7991

DRAWN BY:	ME 03-18
CHECKED BY:	PV 03-18
DESIGNED BY:	PV 03-18
CHECKED BY:	HRR 03-18

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

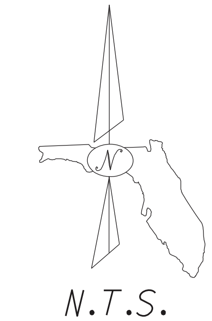
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE: MIAMI-DADE COUNTY AREA SOIL SURVEY MAP

PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. **A-3**



REVISIONS										
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	HERNANDO R. RAMOS, P.E. P.E. LICENSE NUMBER 42045 HR ENGINEERING SERVICES, INC 7815 NW 72ND AVENUE MEDLEY, FLORIDA 33166 CERTIFICATE OF AUTHORIZATION 7991	DRAWN BY: ME 03-18 CHECKED BY: PV 03-18 DESIGNED BY: PV 03-18 CHECKED BY: HRR 03-18	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION	SHEET TITLE: USGS QUADRANGLE MAP	REF. DWG. NO.
								ROAD NO.: NONE / COUNTY: MIAMI-DADE / FINANCIAL PROJECT ID: 430029-2-22-02	PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE	SHEET NO. A-4

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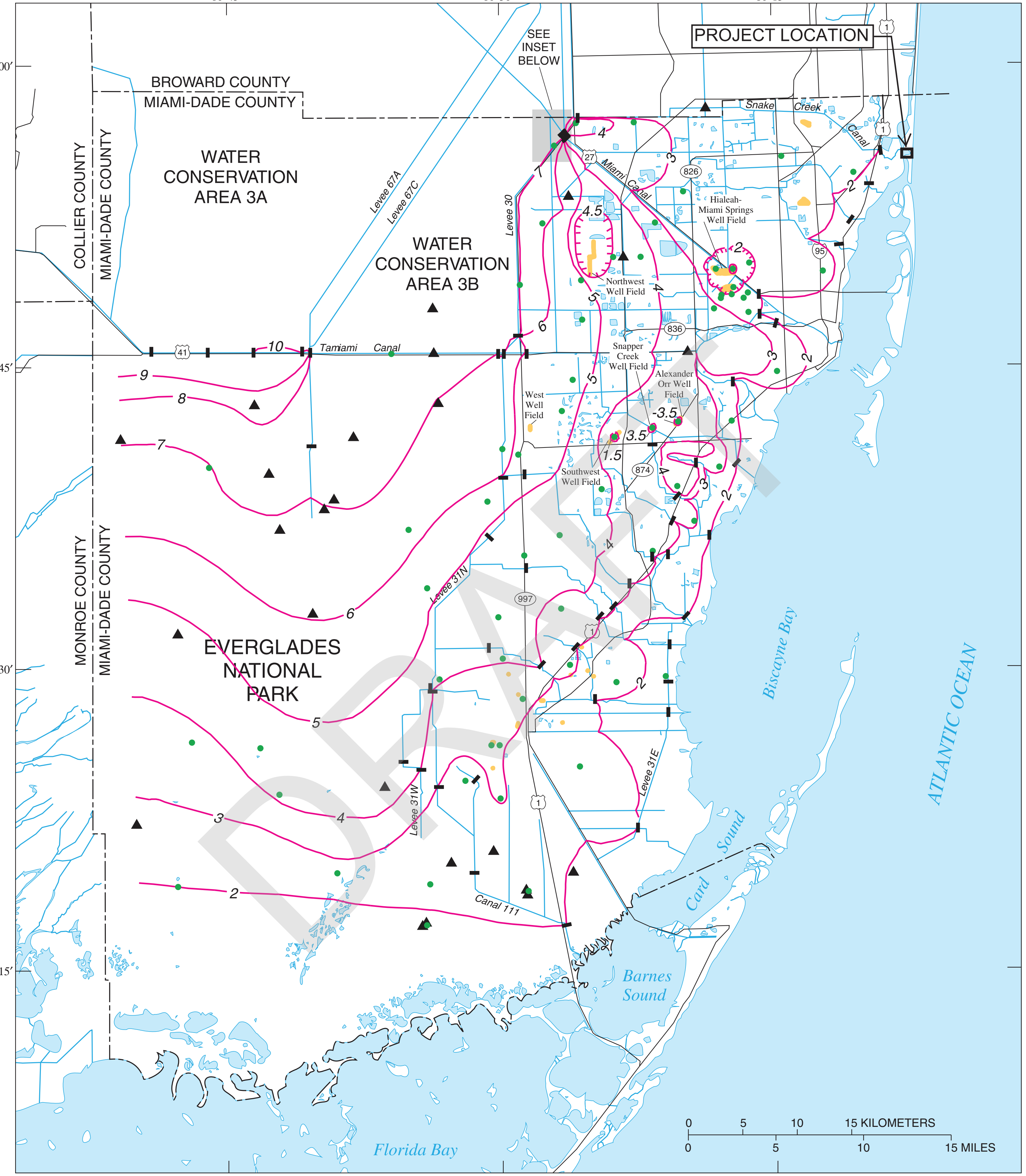

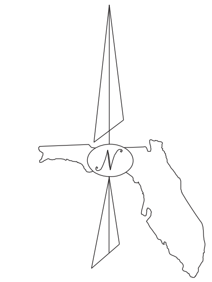

N.T.S.

AVERAGE OCTOBER WATER LEVELS 1990-99

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DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
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DRAWN BY: ME 03-18
CHECKED BY: PV 03-18
DESIGNED BY: PV 03-18
CHECKED BY: HRR 03-18

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

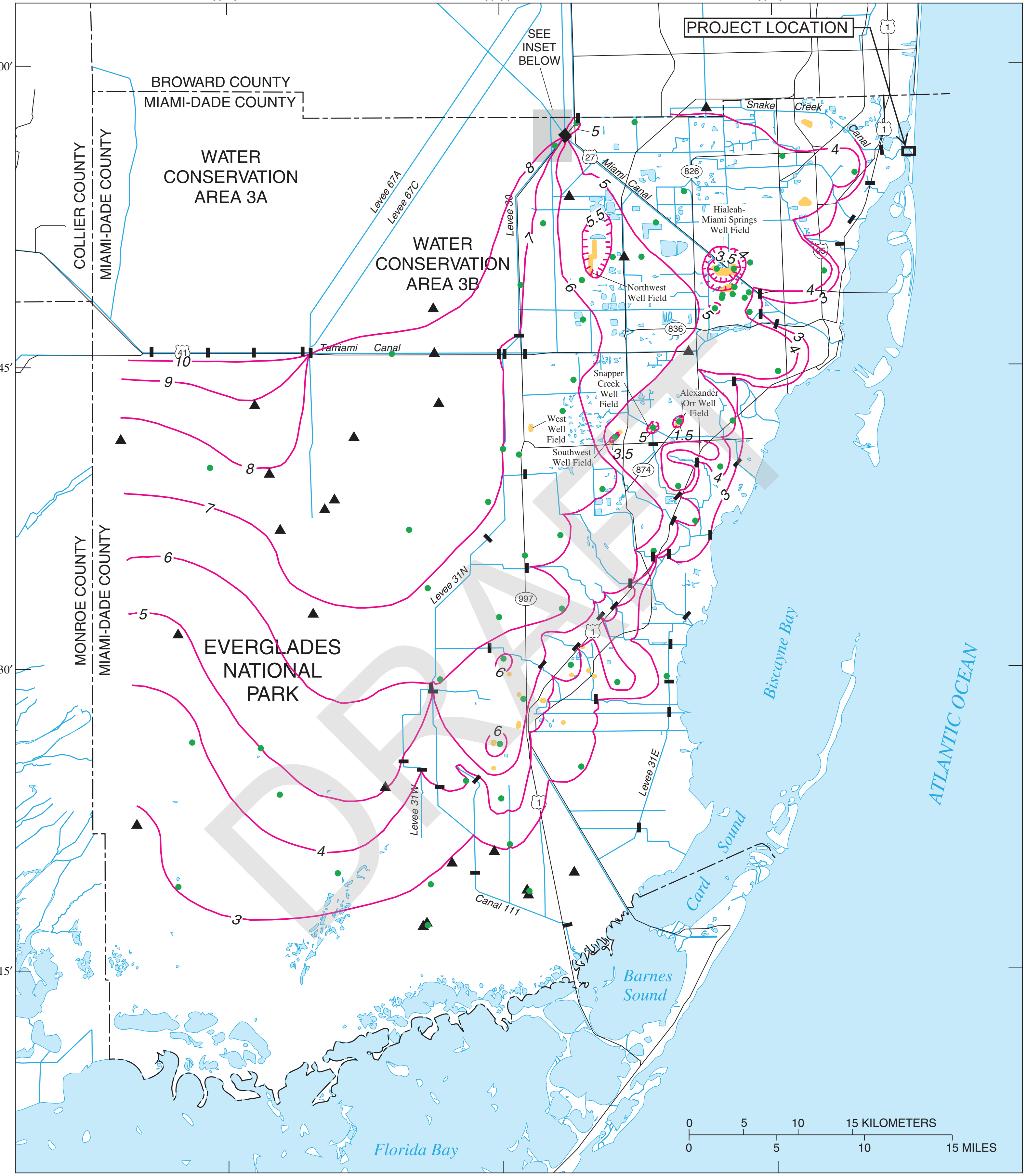
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

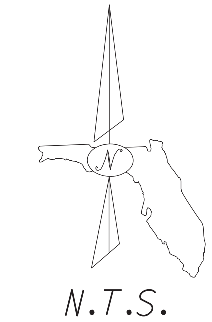
SHEET TITLE: USGS AVERAGE OCTOBER WATER LEVELS (1990-1999)

PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. A-5





AVERAGE YEARLY HIGH WATER LEVELS 1990-99

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
CERTIFICATE OF AUTHORIZATION 7991

DRAWN BY:	ME 03-18
CHECKED BY:	PV 03-18
DESIGNED BY:	PV 03-18
CHECKED BY:	HRR 03-18

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE:
USGS AVERAGE YEARLY HIGH WATER LEVELS (1990-1999)

PROJECT NAME:
ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO.
A-6

HRESUser 3/21/2018 2:03:46 PM \\HRES5\Drive5\HR16-1211R-2 Atlantic Isles Bridge\USGS AVERAGE HIGH WATER LEVELS.d

DATA ENTRY SHEET

Project FM# - 43002922202 , District: D6

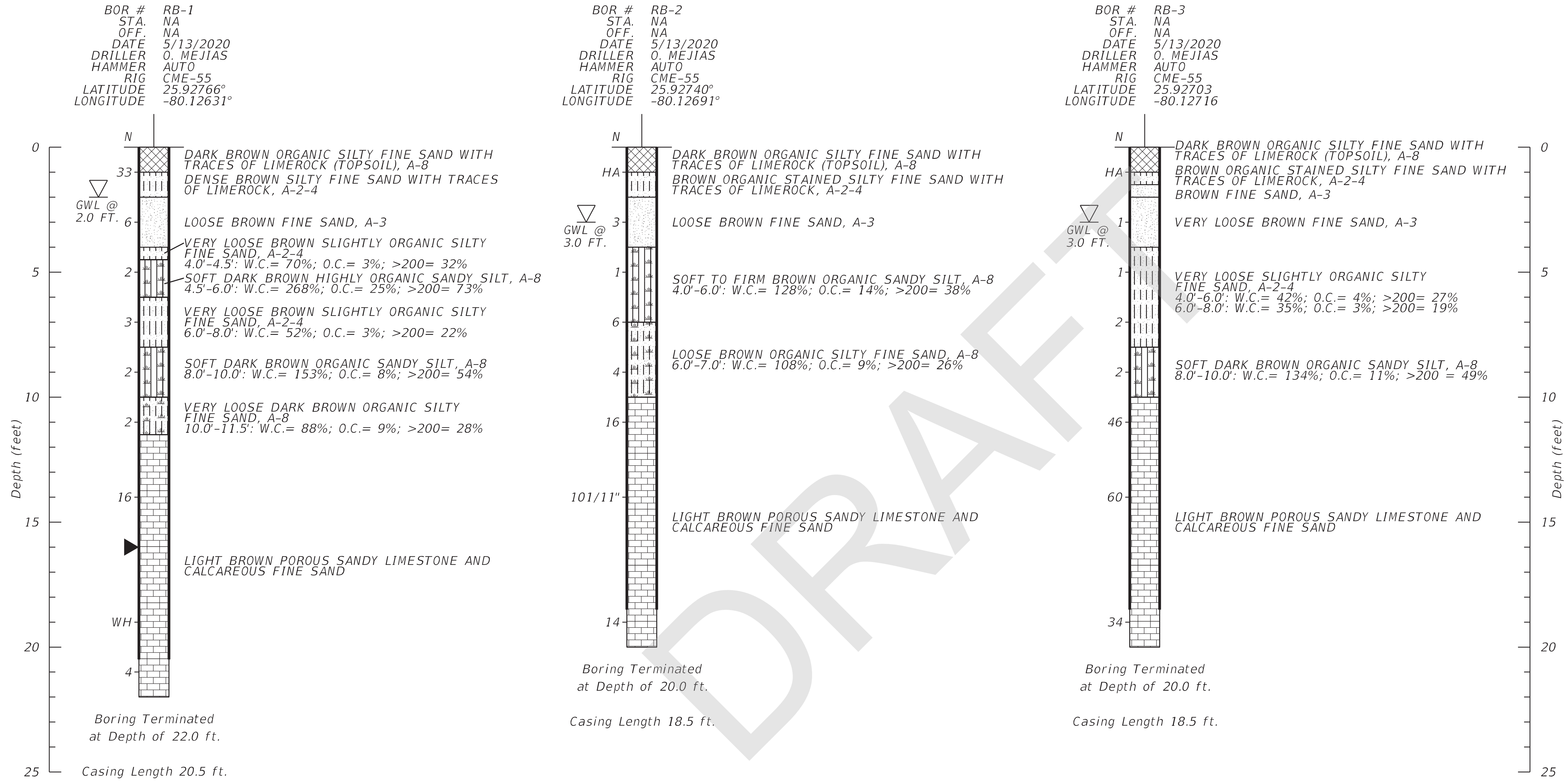
ATLANTIC ISLE LAGOON BRIDGE

Miami-Dade County, Florida

Note: RED- Locations Coordinates are not correct, Falls Out of County Boundary. Please confirm co-ordiantes.

Copy Data from Column C to K and Past with Ctrl+V on SharePoint

Test No.	Test Type	Latitude	Longitude	Test Date MM/DD/YYYY	Elevation ft.	Groundwater Depth ft.	Percolation Test Results	PDF Name
RB-1	Roadway Boring	25.92766	-80.12631	5/13/2020		2.0		4300292D6C4aHR.05292020.1
RB-2	Roadway Boring	25.92740	-80.12691	5/13/2020		3.0		4300292D6C4aHR.05292020.1
RB-3	Roadway Boring	25.92703	-80.12716	5/13/2020		3.0		4300292D6C4aHR.05292020.1
RW-1	Structural Boring	25.92756	-80.12643	5/12/2020		1.5		4300292D6C4aHR.05292020.2
RW-2	Structural Boring	25.92758	-80.12662	5/12/2020		2.0		4300292D6C4aHR.05292020.2
B-1	Structural Boring	25.92751	-80.12623	12/5/2017		4.3		4300292D6C4aHR.05292020.3
B-2	Structural Boring	25.92733	-80.12606	12/4/2017		1.9		4300292D6C4aHR.05292020.3



LEGEND

TOPSOIL
SILTY SAND
SAND
SANDY SILT
LIMESTONE
ORGANIC SILTY SAND
ORGANIC SANDY SILT

GROUND WATER LEVEL AT BORING COMPLETION

WATER LOSS (100%)

NA: NOT AVAILABLE

HA: HAND AUGER

B.T. BORING TERMINATED

N: STANDARD PENETRATION RESISTANCE (AUTOMATIC HAMMER)

WH: WEIGHT OF HAMMER

W.C.: WATER CONTENT

O.C.: ORGANIC CONTENT

>200: PERCENT PASSING #200 SIEVE

HAMMER WEIGHT = 140 LB

DROP HEIGHT = 30 IN

THE TEST BORINGS WERE PERFORMED BY HRES USING A CME-55 TRUCK MOUNTED RIG.

GRANULAR MATERIALS:

DENSITY	SPT N-VALUE (BLOWS/12 INCHES)
VERY LOOSE	<3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	>40

SILTS AND CLAYS:

CONSISTENCY	SPT N-VALUE (BLOWS/12 INCHES)
VERY SOFT	<1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	>24

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: EXTREMELY AGGRESSIVE
STEEL: EXTREMELY AGGRESSIVE
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

Resistivity ohms-cm	pH	Sulfates ppm	Chlorides ppm
16	8.0	77	1,204

VERTICAL SCALE: 0 5
HORIZONTAL SCALE: NTS
HRES PROJECT No.: HR20-1583R

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC.
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
CERTIFICATE OF AUTHORIZATION 7991

DRAWN BY: PV 05-20
CHECKED BY: HRR 05-20
DESIGNED BY: PB 05-20
CHECKED BY: HRR 05-20

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

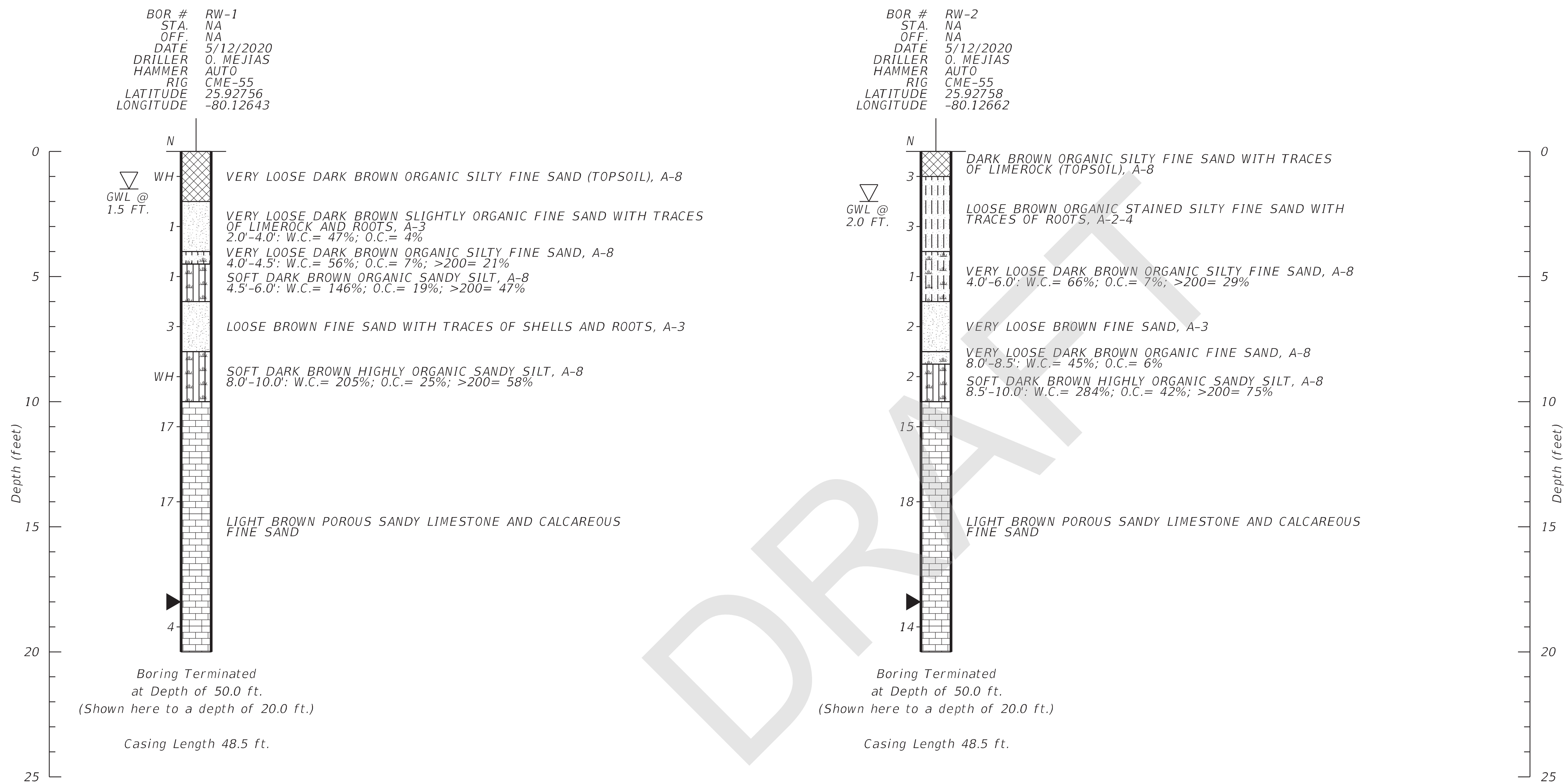
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. A-8



LEGEND

TOPSOIL
SILTY SAND
SAND
SILT
LIMESTONE
ORGANIC SILTY SAND
ORGANIC SANDY SILT
ORGANIC SAND

GROUND WATER LEVEL AT BORING COMPLETION

WATER LOSS (100%)

NA: NOT AVAILABLE
HA: HAND AUGER
B.T. BORING TERMINATED
N: STANDARD PENETRATION RESISTANCE (AUTOMATIC HAMMER)
WH: WEIGHT OF HAMMER
W.C.: WATER CONTENT
O.C.: ORGANIC CONTENT
>200: PERCENT PASSING #200 SIEVE

HAMMER WEIGHT = 140 LB
DROP HEIGHT = 30 IN

THE TEST BORINGS WERE PERFORMED BY HRES USING A CME-55 TRUCK MOUNTED RIG.

GRANULAR MATERIALS:

DENSITY	SPT N-VALUE (BLOWS/12 INCHES)
VERY LOOSE	<3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	>40

SILTS AND CLAYS:

CONSISTENCY	SPT N-VALUE (BLOWS/12 INCHES)
VERY SOFT	<1
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FIRM	3-6
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VERY STIFF	12-24
HARD	>24

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: EXTREMELY AGGRESSIVE
STEEL: EXTREMELY AGGRESSIVE
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

Resistivity ohms-cm	pH	Sulfates ppm	Chlorides ppm
16	8.0	77	1,204

VERTICAL SCALE: 0 5
HORIZONTAL SCALE: NTS
HRES PROJECT No.: HR20-1583R

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REVISIONS

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7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

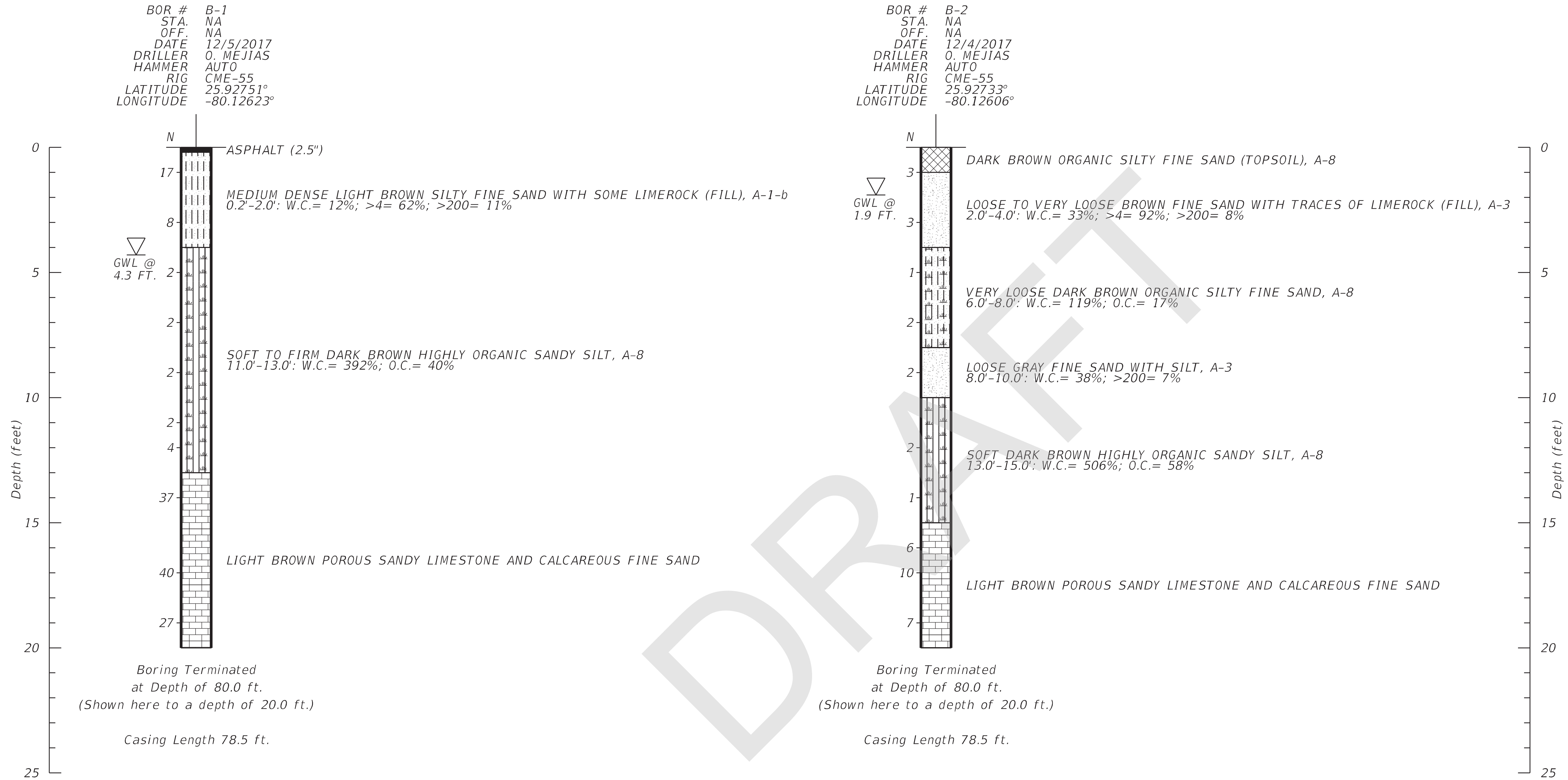
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. A-9



LEGEND

TOPSOIL
SILTY SAND
SAND
SILT
LIMESTONE
ORGANIC SILTY SAND
ORGANIC SANDY SILT

GROUND WATER LEVEL AT BORING COMPLETION

WATER LOSS (100%)

NA: NOT AVAILABLE

HA: HAND AUGER

B.T. BORING TERMINATED

N: STANDARD PENETRATION RESISTANCE (AUTOMATIC HAMMER)

W.C.: WATER CONTENT

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>200: PERCENT PASSING #200 SIEVE

HAMMER WEIGHT = 140 LB

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THE TEST BORINGS WERE PERFORMED BY HRES USING A CME-55 TRUCK MOUNTED RIG.

GRANULAR MATERIALS:

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VERY DENSE	>40

SILTS AND CLAYS:

CONSISTENCY	SPT N-VALUE (BLOWS/12 INCHES)
VERY SOFT	<1
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VERY STIFF	12-24
HARD	>24

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
CONCRETE: EXTREMELY AGGRESSIVE
STEEL: EXTREMELY AGGRESSIVE
SUPERSTRUCTURE: EXTREMELY AGGRESSIVE

Resistivity ohms-cm	pH	Sulfates ppm	Chlorides ppm
16	8.0	77	1,204

VERTICAL SCALE: 0 5
HORIZONTAL SCALE: NTS
HRES PROJECT No.: HR20-1583R

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
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7815 NW 72ND AVENUE
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CERTIFICATE OF AUTHORIZATION 7991

DRAWN BY: PV 05-20
CHECKED BY: HRR 05-20
DESIGNED BY: PB 05-20
CHECKED BY: HRR 05-20

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE: REPORT OF CORE BORINGS

PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. A-10

SOILS INFORMATION TABLE
ATLANTIC ISLE LAGOON BRIDGE
FLORIDA DEPARTMENT OF TRANSPORTATION - DISTRICT 6
FINANCIAL PROJECT ID No. 430029-2-22-02
MIAMI-DADE COUNTY, FLORIDA
HR ENGINEERING SERVICES, INC.
HRES PROJECT No. HR20-1583R
MAY 29, 2020

TEST No.	STATION	OFFSET ft.	REFERENCE BASELINE	RANGE IN DEPTH, ft.	STRATUM	APPROXIMATE GROUNDWATER DEPTH ft.
RB-1	NA	NA	NA	0.0 - 1.0	1b	2.0
				1.0 - 2.0	4	
				2.0 - 4.0	3	
				4.0 - 4.5	4	
				4.5 - 5.0	5	
				5.0 - 8.0	4	
				8.0 - 11.5	5	
				11.5 - 22.0	6	
RW-1	NA	NA	NA	0.0 - 2.0	1b	1.5
				2.0 - 4.0	3	
				4.0 - 6.0	5	
				6.0 - 8.0	3	
				8.0 - 10.0	5	
				10.0 - 20.0	6	
RW-2	NA	NA	NA	0.0 - 1.0	1b	2.0
				1.0 - 4.0	4	
				4.0 - 6.0	5	
				6.0 - 8.0	3	
				8.0 - 10.0	5	
				10.0 - 20.0	6	
RB-2	NA	NA	NA	0.0 - 1.0	1b	3.0
				1.0 - 2.0	4	
				2.0 - 4.0	3	
				4.0 - 10.0	5	
				10.0 - 20.0	6	
RB-3	NA	NA	NA	0.0 - 1.0	1b	3.0
				1.0 - 1.5	4	
				1.5 - 4.0	3	
				4.0 - 8.0	4	
				8.0 - 10.0	5	
				10.0 - 20.0	6	

SOILS INFORMATION TABLE
ATLANTIC ISLE LAGOON BRIDGE
FLORIDA DEPARTMENT OF TRANSPORTATION - DISTRICT 6
FINANCIAL PROJECT ID No. 430029-2-22-02
MIAMI-DADE COUNTY, FLORIDA
HR ENGINEERING SERVICES, INC.
HRES PROJECT No. HR20-1583R
MAY 29, 2020

TEST No.	STATION	OFFSET ft.	REFERENCE BASELINE	RANGE IN DEPTH, ft.	STRATUM	APPROXIMATE GROUNDWATER DEPTH ft.
B-1	NA	NA	BL ATLANTIC AVENUE	0.0 - 0.2	1a	4.3
				0.2 - 4.0	2	
				4.0 - 13.0	5	
				13.0 - 20.0	6	
B-2	NA	NA	BL ATLANTIC AVENUE	0.0 - 1.0	1b	1.9
				1.0 - 4.0	3	
				4.0 - 8.0	5	
				8.0 - 10.0	3	
				10.0 - 15.0	5	
				15.0 - 20.0	6	

SOILS INFORMATION LEGEND

STRATUM : 1a Asphaltic Concrete
STRATUM : 1b Topsoil, A-8
STRATUM : 2 Silty fine SAND with some limerock, A-1-b
STRATUM : 3 Fine SAND occasionally with traces of limerock, A-3
STRATUM : 4 Silty fine SAND occasionally with traces of limerock, A-2-4
STRATUM : 5 Organic silty fine SAND or Organic to Highly Organic sandy silt, A-8
STRATUM : 6 Porous sandy LIMESTONE and calcareous fine sand

FIELD TESTING PROCEDURES

Test Borings - The test borings were made in general accordance with ASTM-D-1586, "Penetration Test and Split-Barrel Sampling of Soils." The borings were advanced using a 3-inch ID casing and a rotary drilling process. At regular intervals, the drilling tools were removed and soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated six inches and then driven an additional foot with blows of a 140-lb hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance". The penetration resistance, when properly interpreted, is an index to the soil strength and density.

Representative portions of the soil samples, obtained from the sampler, were placed in glass jars and transported to our laboratory. An engineer then examined the samples in order to confirm the field classifications.

Hand Auger Borings – Auger borings were advanced manually using a hand-auger tool. The soils encountered were identified in the field from cuttings brought to the surface by the augering process.

APPENDIX B

SUMMARY OF LABORATORY TEST RESULTS
ATLANTIC ISLE LAGOON BRIDGE
FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 6
MIAMI-DADE COUNTY, FLORIDA

FPID No. 430029-2-22-02

HR ENGINEERING SERVICES, INC.

HRES PROJECT No. HR20-1583R

MAY 29, 2020

Test No.	AASHTO Class.	Stratum No.	Sample Depth (ft)	Grain Size Distribution - Percent Passing									Organic Loss of Ignition, %	Moisture Content %	Material in Sample, %		
				1"	3/4"	3/8"	No. 4	No. 10	No. 40	No. 60	No. 100	No. 200			Gravel	Sand	Fines
RB-1	A-2-4	4	4.0-4.5	-	-	-	-	-	-	-	-	32	3	70	-	-	32
RB-1	A-8	5	4.5-6.0	-	-	-	-	-	-	-	-	73	25	268	-	-	73
RB-1	A-2-4	4	6.0-8.0	-	-	-	-	-	-	-	-	22	3	52	-	-	22
RB-1	A-8	5	8.0-10.0	-	-	-	-	-	-	-	-	54	8	153	-	-	54
RB-1	A-8	5	10.0-11.5	-	-	-	-	-	-	-	-	28	9	88	-	-	28
RB-2	A-8	5	4.0-6.0	-	-	-	-	-	-	-	-	38	14	128	-	-	38
RB-2	A-8	5	6.0-7.0	-	-	-	-	-	-	-	-	26	9	108	-	-	26
RB-3	A-2-4	4	4.0-6.0	-	-	-	-	-	-	-	-	27	4	42	-	-	27
RB-3	A-2-4	4	6.0-8.0	-	-	-	-	-	-	-	-	19	3	35	-	-	19
RB-3	A-8	5	8.0-10.0	-	-	-	-	-	-	-	-	49	11	134	-	-	49
RW-1	A-3	3	2.0-4.0	-	-	-	-	-	-	-	-	-	4	47	-	-	-
RW-1	A-8	5	4.0-4.5	-	-	-	-	-	-	-	-	21	7	56	-	-	21
RW-1	A-8	5	4.5-6.0	-	-	-	-	-	-	-	-	47	19	146	-	-	47
RW-1	A-8	5	8.0-10.0	-	-	-	-	-	-	-	-	58	25	205	-	-	58
RW-2	A-8	5	4.0-6.0	-	-	-	-	-	-	-	-	29	7	66	-	-	29
RW-2	A-8	5	8.0-8.5	-	-	-	-	-	-	-	-	-	6	45	-	-	-
RW-2	A-8	5	8.5-10.0	-	-	-	-	-	-	-	-	75	42	284	-	-	75

SUMMARY OF LABORATORY TEST RESULTS
ATLANTIC ISLE LAGOON BRIDGE
FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 6
MIAMI-DADE COUNTY, FLORIDA
FPID No. 430029-2-22-02
HR ENGINEERING SERVICES, INC.
HRES PROJECT No. HR20-1583R
MAY 29, 2020

Test No.	AASHTO Class.	Stratum No.	Sample Depth (ft)	Grain Size Distribution - Percent Passing									Organic Loss of Ignition, %	Moisture Content %	Material in Sample, %		
				1"	3/4"	3/8"	No. 4	No. 10	No. 40	No. 60	No. 100	No. 200			Gravel	Sand	Fines
B-1	A-1-b	2	0.2-2.0	100	100	78	62	50	35	26	16	11	-	12	38	51	11
B-1	A-8	5	11.0-13.0	-	-	-	-	-	-	-	-	-	40	392	-	-	-
B-2	A-3	3	2.0-4.0	100	95	94	92	81	51	34	18	8	-	33	8	84	8
B-2	A-8	5	6.0-8.0	-	-	-	-	-	-	-	-	-	17	119	-	-	-
B-2	A-3	3	8.0-10.0	-	-	-	-	-	-	-	-	7	-	38	-	-	7
B-2	A-8	5	13.0-15.0	-	-	-	-	-	-	-	-	-	58	506	-	-	-

DATE OF SURVEY:	DECEMBER, 2017 AND MAY, 2020
SURVEY MADE BY:	HR ENGINEERING SERVICES, INC.
SUBMITTED BY:	HERNANDO RAMOS, P.E.

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH

DISTRICT:	6
ROAD NO.:	--
COUNTY:	MIAMI-DADE

FINANCIAL PROJECT ID : 430029-2-22-02
PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

SURVEY BEGINS STA. : N/A SURVEY ENDS STA. : N/A

REFERENCE: ℄ ATLANTIC AVENUE

	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS PERCENT PASS (%)						ATTERBERG LIMITS (%)					CORROSION TEST RESULTS				
STRATUM NO.	NO. OF TESTS	% ORGANIC	NO. OF TESTS	MOISTURE CONTENT	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	AASHTO GROUP	DESCRIPTION	NO. OF TESTS	RESISTIVITY ohm-cm	CHLORIDE ppm	SULFATES ppm	pH
1a	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ASPHALT					
1b	--	--	--	--	--	--	--	--	--	--	--	--	--	A-8	ORGANIC SILTY FINE SAND (TOPSOIL)					
2	--	--	1	12	1	50	35	26	16	11	--	--	--	A-1-b	SILTY FINE SAND WITH SOME LIMEROCK (FILL)					
3	1	4	3	47-33	2	81	51	34	18	8-7	--	--	--	A-3	FINE SAND WITH TRACES OF LIMEROCK					
4	4	4-3	4	70-35	4	--	--	--	--	32-19	--	--	--	A-2-4	SILTY FINE SAND OCCASIONALLY WITH TRACES OF LIMEROCK					
5	15	58-6	15	506-45	11	--	--	--	--	75-21	--	--	--	A-8	ORGANIC SILTY FINE SAND OR ORGANIC TO HIGHLY ORGANIC SANDY SILT					
6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	POROUS SANDY LIMESTONE AND CALCAREOUS FINE SAND					
																1 (1)	16	1,204	77	8.0

(1): WATER SAMPLE WAS TAKEN FROM TEST BORING RW-2.

EMBANKMENT AND SUBGRADE MATERIAL

STRATA BOUNDARIES ARE APPROXIMATE. MAKE FINAL CHECK AFTER GRADING.

∇ - WATER TABLE ENCOUNTERED

GNE - GROUNDWATER NOT ENCOUNTERED

THE SYMBOL "--" REPRESENTS NO TESTING PERFORMED.

THE MATERIAL FROM STRATUM NUMBER 1a IS ASPHALT OR CONCRETE.

THE MATERIAL FROM STRATUM NUMBER 1b IS A-8 MATERIAL (TOPSOIL) AND IS UNSUITABLE FOR USE AS STABILIZED SUBGRADE OR FILL MATERIAL AND SHALL BE REMOVED.

THE MATERIAL FROM STRATUM NUMBER 2 IS A-1-b MATERIAL AND IS SUITABLE FOR USE AS GENERAL FILL WHEN UTILIZED IN ACCORDANCE WITH FDOT STANDARD PLAN 120-001. IT CANNOT BE USED AS BASE MATERIAL.

THE MATERIAL FROM STRATUM NUMBER 3 IS A-3 MATERIAL AND APPEARS SATISFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH FDOT STANDARD PLAN 120-001.

THE MATERIAL FROM STRATUM NUMBER 4 IS A-2-4 MATERIAL AND IS SUITABLE FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH INDEX 120-001. HOWEVER, THIS MATERIAL IS LIKELY TO RETAIN EXCESS MOISTURE AND BE DIFFICULT TO DRY AND COMPACT. IT SHALL BE USED IN THE EMBANKMENT ABOVE THE WATER LEVEL EXISTING AT THE TIME OF CONSTRUCTION.

THE MATERIAL FROM STRATUM NUMBER 5 IS A-8 MATERIAL. THIS MATERIAL IS UNSUITABLE FOR USE IN THE EMBANKMENT AND AS STABILIZED SUBGRADE. ONE LAYER OF GEOSYNTHETIC REINFORCEMENT SHALL BE PLACED UNDER THE NEW BASE.

THE MATERIAL FROM STRATUM NUMBER 6 IS THE NATURAL LIMESTONE. THIS MATERIAL APPEARS SUITABLE FOR USE AS GENERAL FILL AND AS STABILIZED SUBGRADE WHEN UTILIZED IN ACCORDANCE WITH FDOT STANDARD PLAN 120-001. THIS MATERIAL TYPICALLY OFFERS A HIGH RESISTANCE TO EXCAVATION. SPECIAL EQUIPMENT AND BREAKING TOOLS MAY BE REQUIRED TO EXCAVATE IT. THIS MATERIAL IS ALSO DIFFICULT TO DEWATER DUE TO ITS HIGH POROSITY AND PERMEABILITY.

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC.
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
CERTIFICATE OF AUTHORIZATION 7991

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

ROADWAY SOILS SURVEY

SHEET NO. GR-1

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-1 **Sample No.:** 3A **Depth:** 4.0'-4.5'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	303.20
Wt. of Dry Soil + Can, grams	182.40
Wt. of Can, grams No. 851	9.00
Wt. of Dry Soil, grams	173.40
Wt. of Moisture, grams	120.80
Water Content, w%	70%
Date Sample Placed in Furnace:	05/20/20
Time in / out of furnace (minimum 6 hrs):	05/20/20 6:00 AM TO 05/20/20 12:00 PM
Weight of Crucible & Oven-Dried Sample:	29.50
Weight of Crucible and Sample After Ignition:	29.20
Weight of Crucible: No. 11	18.30
Weight of Oven-Dried Soil:	11.20
Weight Loss due to Ignition:	0.30
Percent Organics:	3%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-2-4

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR20-1583R

Boring No.: RB-1 Sample No.: 3A Depth: 4.0'-4.5'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	303.20
Wt. of Dry Soil + Can, grams	182.40
Wt. of Can, grams No. 851	9.00
Wt. of Dry Soil, grams	173.40
Wt. of Moisture, grams	120.80
Water Content, w%	70%
Wt. of Dry Soil + Can Before Wash, grams	171.20
Wt. of Can, grams No. 851	9.00
Wt. of Dry Soil Before Wash, grams	162.20
Time in / Out of Oven :	05/19/20 8:00 PM TO 05/20/20 8:00 PM
Wt. of Dry Soil + Can After Wash, grams	119.40
Wt. of Dry Soil After Wash, grams	110.40
Total Loss, grams	51.80
Percent Finer Than No. 200 Sieve	32%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)

Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,

HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

AASHTO Classification:

A-2-4

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R
Boring No.: RB-1   Sample No.: 3B   Depth: 4.5'-6.0'
Date: 05/18/20

Technician:		E.M.				
Date Sample Placed in Oven:		05/18/2020				
Time in / Out of Oven :		05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams		244.90				
Wt. of Dry Soil + Can, grams		73.20				
Wt. of Can, grams	No. 852	9.10				
Wt. of Dry Soil, grams		64.10				
Wt. of Moisture, grams		171.70				
Water Content, w%		268%				
Date Sample Placed in Furnace:		05/20/20				
Time in / out of furnace (minimum 6 hrs):		05/20/20	6:00 AM	TO	05/20/20	12:00 PM
Weight of Crucible & Oven-Dried Sample:		26.80				
Weight of Crucible and Sample After Ignition:		24.00				
Weight of Crucible:	No. 13	15.70				
Weight of Oven-Dried Soil:		11.10				
Weight Loss due to Ignition:		2.80				
Percent Organics:		25%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R

Boring No.: RB-1   Sample No.: 3B   Depth: 4.5'-6.0'

Date: 05/18/20

Technician:			E.M.				
Date Sample Placed in Oven:			05/18/2020				
Time in / Out of Oven :			05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams			244.90				
Wt. of Dry Soil + Can, grams			73.20				
Wt. of Can, grams	No.	852	9.10				
Wt. of Dry Soil, grams			64.10				
Wt. of Moisture, grams			171.70				
Water Content, w%			268%				
Wt. of Dry Soil + Can Before Wash, grams			61.80				
Wt. of Can, grams	No.	852	9.10				
Wt. of Dry Soil Before Wash, grams			52.70				
Time in / Out of Oven :			05/19/20	8:00 PM	TO	05/20/20	8:00 PM
Wt. of Dry Soil + Can After Wash, grams			23.40				
Wt. of Dry Soil After Wash, grams			14.30				
Total Loss, grams			38.40				
Percent Finer Than No. 200 Sieve			73%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-1 **Sample No.:** 4 **Depth:** 6.0'-8.0'

Date: 05/18/20

Technician:			E.M.
Date Sample Placed in Oven:			05/18/2020
Time in / Out of Oven :			05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams			577.50
Wt. of Dry Soil + Can, grams			382.60
Wt. of Can, grams	No.	853	9.00
Wt. of Dry Soil, grams			373.60
Wt. of Moisture, grams			194.90
Water Content, w%			52%
Date Sample Placed in Furnace:			05/20/20
Time in / out of furnace (minimum 6 hrs):			05/20/20 6:00 AM TO 05/20/20 12:00 PM
Weight of Crucible & Oven-Dried Sample:			27.10
Weight of Crucible and Sample After Ignition:			26.80
Weight of Crucible:	No.	28	15.60
Weight of Oven-Dried Soil:			11.50
Weight Loss due to Ignition:			0.30
Percent Organics:			3%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,

HR Engineering Services, Inc.

AASHTO Classification:
A-2-4

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE　　Project No.: HR20-1583R

Boring No.: RB-1　　Sample No.: 4　　Depth: 6.0'-8.0'

Date: 05/18/20

Technician:		E.M.
Date Sample Placed in Oven:		05/18/2020
Time in / Out of Oven :		05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams		577.50
Wt. of Dry Soil + Can, grams		382.60
Wt. of Can, grams	No. 853	9.00
Wt. of Dry Soil, grams		373.60
Wt. of Moisture, grams		194.90
Water Content, w%		52%
Wt. of Dry Soil + Can Before Wash, grams		370.90
Wt. of Can, grams	No. 853	9.00
Wt. of Dry Soil Before Wash, grams		361.90
Time in / Out of Oven :		05/19/20 8:00 PM TO 05/20/20 8:00 PM
Wt. of Dry Soil + Can After Wash, grams		290.90
Wt. of Dry Soil After Wash, grams		281.90
Total Loss, grams		80.00
Percent Finer Than No. 200 Sieve		22%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

AASHTO Classification:
A-2-4

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-1 **Sample No.:** 5 **Depth:** 8.0'-10.0'

Date: 05/18/20

Technician:			E.M.				
Date Sample Placed in Oven:			05/18/2020				
Time in / Out of Oven :			05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams			170.90				
Wt. of Dry Soil + Can, grams			71.70				
Wt. of Can, grams	No.	854	6.80				
Wt. of Dry Soil, grams			64.90				
Wt. of Moisture, grams			99.20				
Water Content, w%			153%				
Date Sample Placed in Furnace:			05/20/20				
Time in / out of furnace (minimum 6 hrs):			05/20/20	6:00 AM	TO	05/20/20	12:00 PM
Weight of Crucible & Oven-Dried Sample:			26.30				
Weight of Crucible and Sample After Ignition:			25.40				
Weight of Crucible:	No.	54	15.00				
Weight of Oven-Dried Soil:			11.30				
Weight Loss due to Ignition:			0.90				
Percent Organics:			8%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R

Boring No.: RB-1   Sample No.: 5   Depth: 8.0'-10.0'

Date: 05/18/20

Technician:		E.M.				
Date Sample Placed in Oven:		05/18/2020				
Time in / Out of Oven :		05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams		170.90				
Wt. of Dry Soil + Can, grams		71.70				
Wt. of Can, grams No.	854	6.80				
Wt. of Dry Soil, grams		64.90				
Wt. of Moisture, grams		99.20				
Water Content, w%		153%				
Wt. of Dry Soil + Can Before Wash, grams		60.30				
Wt. of Can, grams No.	854	6.80				
Wt. of Dry Soil Before Wash, grams		53.50				
Time in / Out of Oven :		05/19/20	8:00 PM	TO	05/20/20	8:00 PM
Wt. of Dry Soil + Can After Wash, grams		31.60				
Wt. of Dry Soil After Wash, grams		24.80				
Total Loss, grams		28.70				
Percent Finer Than No. 200 Sieve		54%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

AASHTO Classification:
A-8

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R
Boring No.: RB-1   Sample No.: 6A   Depth: 10.0'-11.5'
Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	322.30
Wt. of Dry Soil + Can, grams	174.30
Wt. of Can, grams No. 855	6.80
Wt. of Dry Soil, grams	167.50
Wt. of Moisture, grams	148.00
Water Content, w%	88%
Date Sample Placed in Furnace:	05/20/20
Time in / out of furnace (minimum 6 hrs):	05/20/20 6:00 AM TO 05/20/20 12:00 PM
Weight of Crucible & Oven-Dried Sample:	27.80
Weight of Crucible and Sample After Ignition:	26.80
Weight of Crucible: No. 83	16.30
Weight of Oven-Dried Soil:	11.50
Weight Loss due to Ignition:	1.00
Percent Organics:	9%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification: **A-8**

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR20-1583R

Boring No.: RB-1 Sample No.: 6A Depth: 10.0'-11.5'

Date: 05/18/20

Technician:			E.M.				
Date Sample Placed in Oven:			05/18/2020				
Time in / Out of Oven :			05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams			322.30				
Wt. of Dry Soil + Can, grams			174.30				
Wt. of Can, grams	No.	855	6.80				
Wt. of Dry Soil, grams			167.50				
Wt. of Moisture, grams			148.00				
Water Content, w%			88%				
Wt. of Dry Soil + Can Before Wash, grams			162.70				
Wt. of Can, grams	No.	855	6.80				
Wt. of Dry Soil Before Wash, grams			155.90				
Time in / Out of Oven :			05/19/20	8:00 PM	TO	05/20/20	8:00 PM
Wt. of Dry Soil + Can After Wash, grams			119.70				
Wt. of Dry Soil After Wash, grams			112.90				
Total Loss, grams			43.00				
Percent Finer Than No. 200 Sieve			28%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-2 **Sample No.:** 4 **Depth:** 4.0'-6.0'

Date: 05/18/20

Technician:			E.M.				
Date Sample Placed in Oven:			05/18/2020				
Time in / Out of Oven :			05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams			114.90				
Wt. of Dry Soil + Can, grams			54.30				
Wt. of Can, grams	No.	856	6.90				
Wt. of Dry Soil, grams			47.40				
Wt. of Moisture, grams			60.60				
Water Content, w%			128%				
Date Sample Placed in Furnace:			05/20/20				
Time in / out of furnace (minimum 6 hrs):			05/20/20	6:00 AM	TO	05/20/20	12:00 PM
Weight of Crucible & Oven-Dried Sample:			27.00				
Weight of Crucible and Sample After Ignition:			25.40				
Weight of Crucible:	No.	165	15.70				
Weight of Oven-Dried Soil:			11.30				
Weight Loss due to Ignition:			1.60				
Percent Organics:			14%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-2 **Sample No.:** 4 **Depth:** 4.0'-6.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	114.90
Wt. of Dry Soil + Can, grams	54.30
Wt. of Can, grams No. 856	6.90
Wt. of Dry Soil, grams	47.40
Wt. of Moisture, grams	60.60
Water Content, w%	128%
Wt. of Dry Soil + Can Before Wash, grams	42.80
Wt. of Can, grams No. 856	6.90
Wt. of Dry Soil Before Wash, grams	35.90
Time in / Out of Oven :	05/19/20 8:00 PM TO 05/20/20 8:00 PM
Wt. of Dry Soil + Can After Wash, grams	29.10
Wt. of Dry Soil After Wash, grams	22.20
Total Loss, grams	13.70
Percent Finer Than No. 200 Sieve	38%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

AASHTO Classification: A-8

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-2 **Sample No.:** 5A **Depth:** 6.0'-7.0'

Date: 05/18/20

Technician:			E.M.			
Date Sample Placed in Oven:			05/18/2020			
Time in / Out of Oven :		05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams			534.30			
Wt. of Dry Soil + Can, grams			261.20			
Wt. of Can, grams	No. 857		9.10			
Wt. of Dry Soil, grams			252.10			
Wt. of Moisture, grams			273.10			
Water Content, w%			108%			
Date Sample Placed in Furnace:			05/20/20			
Time in / out of furnace (minimum 6 hrs):		05/20/20	6:00 AM	TO	05/20/20	12:00 PM
Weight of Crucible & Oven-Dried Sample:			26.70			
Weight of Crucible and Sample After Ignition:			25.70			
Weight of Crucible:	No. 209		15.40			
Weight of Oven-Dried Soil:			11.30			
Weight Loss due to Ignition:			1.00			
Percent Organics:			9%			

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-2 **Sample No.:** 5A **Depth:** 6.0'-7.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	534.30
Wt. of Dry Soil + Can, grams	261.20
Wt. of Can, grams No. 857	9.10
Wt. of Dry Soil, grams	252.10
Wt. of Moisture, grams	273.10
Water Content, w%	108%
Wt. of Dry Soil + Can Before Wash, grams	249.90
Wt. of Can, grams No. 857	9.10
Wt. of Dry Soil Before Wash, grams	240.80
Time in / Out of Oven :	05/19/20 8:00 PM TO 05/20/20 8:00 PM
Wt. of Dry Soil + Can After Wash, grams	187.20
Wt. of Dry Soil After Wash, grams	178.10
Total Loss, grams	62.70
Percent Finer Than No. 200 Sieve	26%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-3 **Sample No.:** 5 **Depth:** 4.0'-6.0'

Date: 05/18/20

Technician:			E.M.					
Date Sample Placed in Oven:			05/18/2020					
Time in / Out of Oven :			05/18/20	5:00 PM	TO	05/19/20	5:00 PM	
Wt. of Wet Soil + Can, grams			399.60					
Wt. of Dry Soil + Can, grams			284.00					
Wt. of Can, grams	No.	858	9.00					
Wt. of Dry Soil, grams			275.00					
Wt. of Moisture, grams			115.60					
Water Content, w%			42%					
Date Sample Placed in Furnace:			05/20/20					
Time in / out of furnace (minimum 6 hrs):			05/20/20	6:00 AM	TO	05/20/20	12:00 PM	
Weight of Crucible & Oven-Dried Sample:			27.30					
Weight of Crucible and Sample After Ignition:			26.80					
Weight of Crucible:	No.	227	16.00					
Weight of Oven-Dried Soil:			11.30					
Weight Loss due to Ignition:			0.50					
Percent Organics:			4%					

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-2-4

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R

Boring No.: RB-3   Sample No.: 5   Depth: 4.0'-6.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	399.60
Wt. of Dry Soil + Can, grams	284.00
Wt. of Can, grams No. 858	9.00
Wt. of Dry Soil, grams	275.00
Wt. of Moisture, grams	115.60
Water Content, w%	42%
Wt. of Dry Soil + Can Before Wash, grams	272.60
Wt. of Can, grams No. 858	9.00
Wt. of Dry Soil Before Wash, grams	263.60
Time in / Out of Oven :	05/19/20 8:00 PM TO 05/20/20 8:00 PM
Wt. of Dry Soil + Can After Wash, grams	201.50
Wt. of Dry Soil After Wash, grams	192.50
Total Loss, grams	71.10
Percent Finer Than No. 200 Sieve	27%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-2-4

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-3 **Sample No.:** 6 **Depth:** 6.0'-8.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	464.20
Wt. of Dry Soil + Can, grams	347.30
Wt. of Can, grams No. 859	8.80
Wt. of Dry Soil, grams	338.50
Wt. of Moisture, grams	116.90
Water Content, w%	35%
Date Sample Placed in Furnace:	05/20/20
Time in / out of furnace (minimum 6 hrs):	05/20/20 6:00 AM TO 05/20/20 12:00 PM
Weight of Crucible & Oven-Dried Sample:	28.60
Weight of Crucible and Sample After Ignition:	28.30
Weight of Crucible: No. 234	17.50
Weight of Oven-Dried Soil:	11.10
Weight Loss due to Ignition:	0.30
Percent Organics:	3%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-2-4

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR20-1583R

Boring No.: RB-3 Sample No.: 6 Depth: 6.0'-8.0'

Date: 05/18/20

Technician:		E.M.
Date Sample Placed in Oven:		05/18/2020
Time in / Out of Oven :		05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams		464.20
Wt. of Dry Soil + Can, grams		347.30
Wt. of Can, grams No.	859	8.80
Wt. of Dry Soil, grams		338.50
Wt. of Moisture, grams		116.90
Water Content, w%		35%
Wt. of Dry Soil + Can Before Wash, grams		335.60
Wt. of Can, grams No.	859	8.80
Wt. of Dry Soil Before Wash, grams		326.80
Time in / Out of Oven :		05/19/20 8:00 PM TO 05/20/20 8:00 PM
Wt. of Dry Soil + Can After Wash, grams		272.10
Wt. of Dry Soil After Wash, grams		263.30
Total Loss, grams		63.50
Percent Finer Than No. 200 Sieve		19%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

AASHTO Classification:
A-2-4

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
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Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R

Boring No.: RB-3   Sample No.: 7   Depth: 8.0'-10.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	407.80
Wt. of Dry Soil + Can, grams	179.10
Wt. of Can, grams No. 860	8.90
Wt. of Dry Soil, grams	170.20
Wt. of Moisture, grams	228.70
Water Content, w%	134%
Date Sample Placed in Furnace:	05/20/20
Time in / out of furnace (minimum 6 hrs):	05/20/20 6:00 AM TO 05/20/20 12:00 PM
Weight of Crucible & Oven-Dried Sample:	28.20
Weight of Crucible and Sample After Ignition:	26.90
Weight of Crucible: No. 299	16.50
Weight of Oven-Dried Soil:	11.70
Weight Loss due to Ignition:	1.30
Percent Organics:	11%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,

HR Engineering Services, Inc.

AASHTO Classification: A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
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Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RB-3 **Sample No.:** 7 **Depth:** 8.0'-10.0'

Date: 05/18/20

Technician:		E.M.				
Date Sample Placed in Oven:		05/18/2020				
Time in / Out of Oven :		05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams		407.80				
Wt. of Dry Soil + Can, grams		179.10				
Wt. of Can, grams No.	860	8.90				
Wt. of Dry Soil, grams		170.20				
Wt. of Moisture, grams		228.70				
Water Content, w%		134%				
Wt. of Dry Soil + Can Before Wash, grams		166.30				
Wt. of Can, grams No.	860	8.90				
Wt. of Dry Soil Before Wash, grams		157.40				
Time in / Out of Oven :		05/19/20	8:00 PM	TO	05/20/20	8:00 PM
Wt. of Dry Soil + Can After Wash, grams		89.00				
Wt. of Dry Soil After Wash, grams		80.10				
Total Loss, grams		77.30				
Percent Finer Than No. 200 Sieve		49%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RW-1 **Sample No.:** 2 **Depth:** 2.0'-4.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	394.70
Wt. of Dry Soil + Can, grams	271.00
Wt. of Can, grams No. 864	6.80
Wt. of Dry Soil, grams	264.20
Wt. of Moisture, grams	123.70
Water Content, w%	47%
Date Sample Placed in Furnace:	05/21/20
Time in / out of furnace (minimum 6 hrs):	05/21/20 8:00 AM TO 05/21/20 2:00 PM
Weight of Crucible & Oven-Dried Sample:	27.60
Weight of Crucible and Sample After Ignition:	27.10
Weight of Crucible: No. 83	16.30
Weight of Oven-Dried Soil:	11.30
Weight Loss due to Ignition:	0.50
Percent Organics:	4%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,

HR Engineering Services, Inc.

AASHTO Classification:
A-3

Hernando R. Ramos, P.E.
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7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE — Project No.: HR20-1583R

Boring No.: RW-1 — Sample No.: 3A — Depth: 4.0'-4.5'

Date: 05/18/20

Technician:			E.M.			
Date Sample Placed in Oven:			05/18/2020			
Time in / Out of Oven :	05/18/20	5:00 PM	TO	05/19/20	5:00 PM	
Wt. of Wet Soil + Can, grams			337.90			
Wt. of Dry Soil + Can, grams			218.50			
Wt. of Can, grams No. 865			6.90			
Wt. of Dry Soil, grams			211.60			
Wt. of Moisture, grams			119.40			
Water Content, w%			56%			
Date Sample Placed in Furnace:			05/21/20			
Time in / out of furnace (minimum 6 hrs):	05/21/20	8:00 AM	TO	05/21/20	2:00 PM	
Weight of Crucible & Oven-Dried Sample:			27.10			
Weight of Crucible and Sample After Ignition:			26.30			
Weight of Crucible: No. 165			15.80			
Weight of Oven-Dried Soil:			11.30			
Weight Loss due to Ignition:			0.80			
Percent Organics:			7%			

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

AASHTO Classification: A-8

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

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Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR20-1583R

Boring No.: RW-1 Sample No.: 3A Depth: 4.0'-4.5'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	337.90
Wt. of Dry Soil + Can, grams	218.50
Wt. of Can, grams No. 865	6.90
Wt. of Dry Soil, grams	211.60
Wt. of Moisture, grams	119.40
Water Content, w%	56%
Wt. of Dry Soil + Can Before Wash, grams	208.20
Wt. of Can, grams No. 865	6.90
Wt. of Dry Soil Before Wash, grams	201.30
Time in / Out of Oven :	05/20/20 3:00 PM TO 05/21/20 3:00 PM
Wt. of Dry Soil + Can After Wash, grams	165.20
Wt. of Dry Soil After Wash, grams	158.30
Total Loss, grams	43.00
Percent Finer Than No. 200 Sieve	21%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
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HR ENGINEERING SERVICES, INC.
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Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RW-1 **Sample No.:** 3B **Depth:** 4.5'-6.0'

Date: 05/18/20

Technician:			E.M.				
Date Sample Placed in Oven:			05/18/2020				
Time in / Out of Oven :			05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams			367.40				
Wt. of Dry Soil + Can, grams			153.10				
Wt. of Can, grams	No.	866	6.80				
Wt. of Dry Soil, grams			146.30				
Wt. of Moisture, grams			214.30				
Water Content, w%			146%				
Date Sample Placed in Furnace:			05/21/20				
Time in / out of furnace (minimum 6 hrs):			05/21/20	8:00 AM	TO	05/21/20	2:00 PM
Weight of Crucible & Oven-Dried Sample:			26.90				
Weight of Crucible and Sample After Ignition:			24.70				
Weight of Crucible:	No.	209	15.40				
Weight of Oven-Dried Soil:			11.50				
Weight Loss due to Ignition:			2.20				
Percent Organics:			19%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
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REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R

Boring No.: RW-1   Sample No.: 3B   Depth: 4.5'-6.0'

Date: 05/18/20

Technician:		E.M.				
Date Sample Placed in Oven:		05/18/2020				
Time in / Out of Oven :		05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams		367.40				
Wt. of Dry Soil + Can, grams		153.10				
Wt. of Can, grams No.	866	6.80				
Wt. of Dry Soil, grams		146.30				
Wt. of Moisture, grams		214.30				
Water Content, w%		146%				
Wt. of Dry Soil + Can Before Wash, grams		143.90				
Wt. of Can, grams No.	866	6.80				
Wt. of Dry Soil Before Wash, grams		137.10				
Time in / Out of Oven :		05/20/20	3:00 PM	TO	05/21/20	3:00 PM
Wt. of Dry Soil + Can After Wash, grams		79.60				
Wt. of Dry Soil After Wash, grams		72.80				
Total Loss, grams		64.30				
Percent Finer Than No. 200 Sieve		47%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

AASHTO Classification: A-8

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

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Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RW-1 **Sample No.:** 5 **Depth:** 8.0'-10.0'

Date: 05/18/20

Technician:			E.M.				
Date Sample Placed in Oven:			05/18/2020				
Time in / Out of Oven :			05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams			76.50				
Wt. of Dry Soil + Can, grams			31.00				
Wt. of Can, grams	No.	510	8.80				
Wt. of Dry Soil, grams			22.20				
Wt. of Moisture, grams			45.50				
Water Content, w%			205%				
Date Sample Placed in Furnace:			05/21/20				
Time in / out of furnace (minimum 6 hrs):			05/21/20	8:00 AM	TO	05/21/20	2:00 PM
Weight of Crucible & Oven-Dried Sample:			28.60				
Weight of Crucible and Sample After Ignition:			25.80				
Weight of Crucible:	No.	234	17.50				
Weight of Oven-Dried Soil:			11.10				
Weight Loss due to Ignition:			2.80				
Percent Organics:			25%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,

HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR20-1583R

Boring No.: RW-1 Sample No.: 5 Depth: 8.0'-10.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	76.50
Wt. of Dry Soil + Can, grams	31.00
Wt. of Can, grams No. 510	8.80
Wt. of Dry Soil, grams	22.20
Wt. of Moisture, grams	45.50
Water Content, w%	205%
Wt. of Dry Soil + Can Before Wash, grams	20.10
Wt. of Can, grams No. 510	8.80
Wt. of Dry Soil Before Wash, grams	11.30
Time in / Out of Oven :	05/20/20 3:00 PM TO 05/21/20 3:00 PM
Wt. of Dry Soil + Can After Wash, grams	13.60
Wt. of Dry Soil After Wash, grams	4.80
Total Loss, grams	6.50
Percent Finer Than No. 200 Sieve	58%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

AASHTO Classification:
A-8

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
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REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R

Boring No.: RW-2   Sample No.: 3   Depth: 4.0'-6.0'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	500.20
Wt. of Dry Soil + Can, grams	304.40
Wt. of Can, grams No. 861	8.80
Wt. of Dry Soil, grams	295.60
Wt. of Moisture, grams	195.80
Water Content, w%	66%
Date Sample Placed in Furnace:	05/21/20
Time in / out of furnace (minimum 6 hrs):	05/21/20 8:00 AM TO 05/21/20 2:00 PM
Weight of Crucible & Oven-Dried Sample:	26.90
Weight of Crucible and Sample After Ignition:	26.10
Weight of Crucible: No. 13	15.70
Weight of Oven-Dried Soil:	11.20
Weight Loss due to Ignition:	0.80
Percent Organics:	7%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification: A-8

Hernando R. Ramos, P.E.
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HR ENGINEERING SERVICES, INC.
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REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR20-1583R

Boring No.: RW-2 Sample No.: 3 Depth: 4.0'-6.0'

Date: 05/18/20

Technician:		E.M.
Date Sample Placed in Oven:		05/18/2020
Time in / Out of Oven :		05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams		500.20
Wt. of Dry Soil + Can, grams		304.40
Wt. of Can, grams No.	861	8.80
Wt. of Dry Soil, grams		295.60
Wt. of Moisture, grams		195.80
Water Content, w%		66%
Wt. of Dry Soil + Can Before Wash, grams		294.90
Wt. of Can, grams No.	861	8.80
Wt. of Dry Soil Before Wash, grams		286.10
Time in / Out of Oven :		05/20/20 3:00 PM TO 05/21/20 3:00 PM
Wt. of Dry Soil + Can After Wash, grams		212.70
Wt. of Dry Soil After Wash, grams		203.90
Total Loss, grams		82.20
Percent Finer Than No. 200 Sieve		29%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
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REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR20-1583R

Boring No.: RW-2 Sample No.: 5A Depth: 8.0'-8.5'

Date: 05/18/20

Technician:	E.M.
Date Sample Placed in Oven:	05/18/2020
Time in / Out of Oven :	05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams	292.90
Wt. of Dry Soil + Can, grams	204.50
Wt. of Can, grams No. 861	8.80
Wt. of Dry Soil, grams	195.70
Wt. of Moisture, grams	88.40
Water Content, w%	45%
Date Sample Placed in Furnace:	05/21/20
Time in / out of furnace (minimum 6 hrs):	05/21/20 8:00 AM TO 05/21/20 2:00 PM
Weight of Crucible & Oven-Dried Sample:	26.80
Weight of Crucible and Sample After Ignition:	26.10
Weight of Crucible: No. 28	15.60
Weight of Oven-Dried Soil:	11.20
Weight Loss due to Ignition:	0.70
Percent Organics:	6%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
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HR ENGINEERING SERVICES, INC.

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REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR20-1583R

Boring No.: RW-2   Sample No.: 5B   Depth: 8.5'-10.0'

Date: 05/18/20

Technician:		E.M.
Date Sample Placed in Oven:		05/18/2020
Time in / Out of Oven :		05/18/20 5:00 PM TO 05/19/20 5:00 PM
Wt. of Wet Soil + Can, grams		184.00
Wt. of Dry Soil + Can, grams		54.50
Wt. of Can, grams	No. 863	8.90
Wt. of Dry Soil, grams		45.60
Wt. of Moisture, grams		129.50
Water Content, w%		284%
Date Sample Placed in Furnace:		05/21/20
Time in / out of furnace (minimum 6 hrs):		05/21/20 8:00 AM TO 05/21/20 2:00 PM
Weight of Crucible & Oven-Dried Sample:		26.30
Weight of Crucible and Sample After Ignition:		21.60
Weight of Crucible:	No. 54	15.00
Weight of Oven-Dried Soil:		11.30
Weight Loss due to Ignition:		4.70
Percent Organics:		42%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,

HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

AASHTO Classification:
A-8

HR ENGINEERING SERVICES, INC.
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Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR20-1583R

Boring No.: RW-2 **Sample No.:** 5B **Depth:** 8.5'-10.0'

Date: 05/18/20

Technician:		E.M.				
Date Sample Placed in Oven:		05/18/2020				
Time in / Out of Oven :		05/18/20	5:00 PM	TO	05/19/20	5:00 PM
Wt. of Wet Soil + Can, grams		184.00				
Wt. of Dry Soil + Can, grams		54.50				
Wt. of Can, grams No.	863	8.90				
Wt. of Dry Soil, grams		45.60				
Wt. of Moisture, grams		129.50				
Water Content, w%		284%				
Wt. of Dry Soil + Can Before Wash, grams		44.10				
Wt. of Can, grams No.	863	8.90				
Wt. of Dry Soil Before Wash, grams		35.20				
Time in / Out of Oven :		05/20/20	3:00 PM	TO	05/21/20	3:00 PM
Wt. of Dry Soil + Can After Wash, grams		17.70				
Wt. of Dry Soil After Wash, grams		8.80				
Total Loss, grams		26.40				
Percent Finer Than No. 200 Sieve		75%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

GRAIN SIZE DATA SHEET

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR16-1211R-2

Boring No.: B-1   Sample No.: 1B   Depth: 0.2'-2.0'

Date: 03/28/2018   Tested By: E.M.

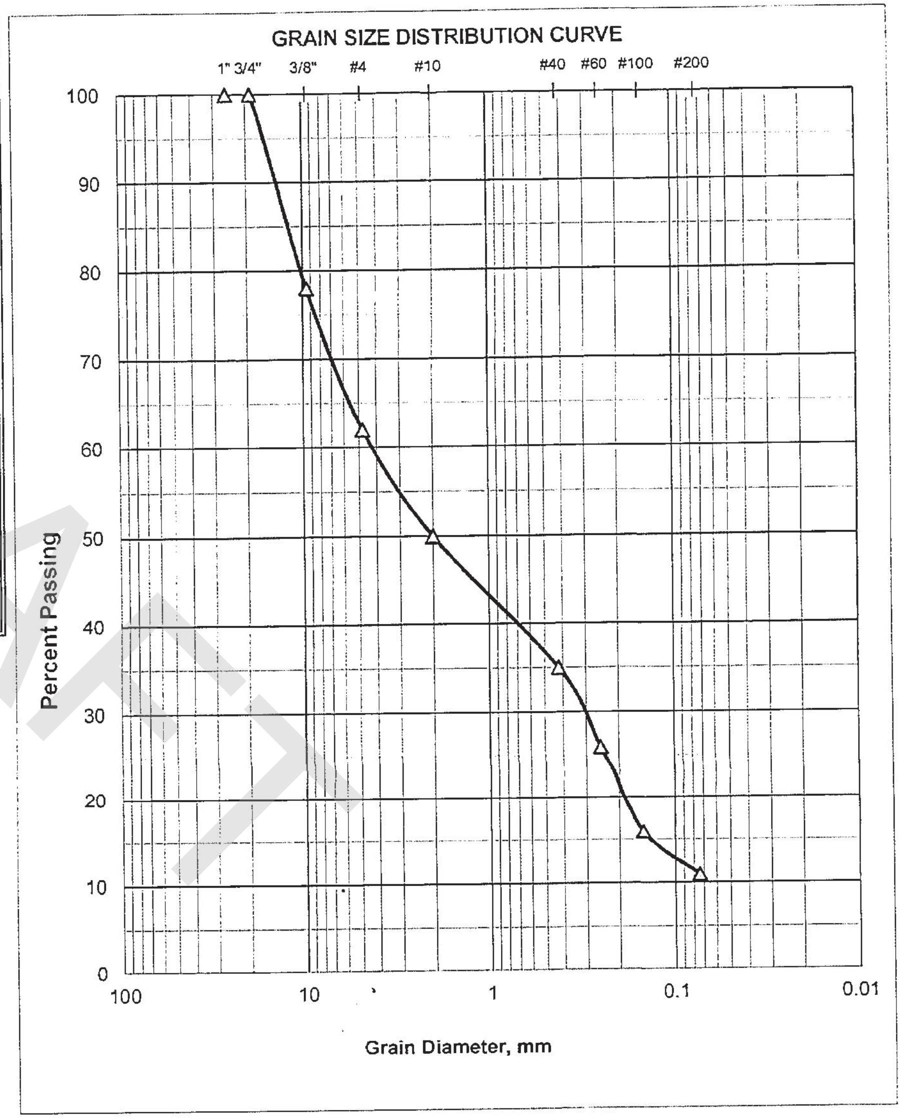
Sieve Size	Particle Size, mm.	Weight on Sieve, gr.	Accumulated Weight, gr.	Percent Retained	Percent Passing	REMARKS
1	25.70	0.00	0.00	0	100	AASHTO Classification: A-1-b
3/4"	19.00	0.00	0.00	0	100	
3/8"	9.51	78.40	78.40	22	78	
4	4.76	59.30	137.70	38	62	
10	2.00	44.10	181.80	50	50	
40	0.420	54.00	235.80	65	35	
60	0.250	32.20	268.00	74	26	
100	0.149	36.70	304.70	84	16	
200	0.074	18.10	322.80	89	11	
PAN						

Total Dry Weight Before Wash, (gr) = 363.40

Percent Finer than No. 200 Sieve by Wash Method= 11%

Sieve Analysis Test performed in general accordance with ASTM C 136 (AASHTO T 27 or T 311)
Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)

Material in Sample (%)		
Gravel	≤ No. 4	38
Coarse Sand	>No. 4-≤ No. 40	27
Fine Sand	>No. 40-≤ No. 200	24
Silt and Clays	>No. 200	11
Water Content		12%



Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE — Project No.: HR16-1211R-2

Boring No.: B-1 — Sample No.: 6 — Depth: 11.0'-13.0'

Date: 03/26/18

Technician:	E.M.
Date Sample Placed in Oven:	03/26/2018
Time in / Out of Oven :	03/26/18 6:00 PM TO 03/27/18 6:00 PM
Wt. of Wet Soil + Can, grams	253.20
Wt. of Dry Soil + Can, grams	58.60
Wt. of Can, grams No. 301	9.00
Wt. of Dry Soil, grams	49.60
Wt. of Moisture, grams	194.60
Water Content, w%	392%
Date Sample Placed in Furnace:	03/28/18
Time in / out of furnace (minimum 6 hrs):	03/28/18 6:00 AM TO 03/28/18 12:00 PM
Weight of Crucible & Oven-Dried Sample:	29.60
Weight of Crucible and Sample After Ignition:	25.10
Weight of Crucible: No. 115	18.30
Weight of Oven-Dried Soil:	11.30
Weight Loss due to Ignition:	4.50
Percent Organics:	40%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

GRAIN SIZE DATA SHEET

Project Name: ATLANTIC ISLE BRIDGE — Project No.: HR16-1211R-2
Boring No.: B-2 — Sample No.: 2 — Depth: 2.0'-4.0'
Date: 03/28/2018 — Tested By: E.M.

Sieve Size	Particle Size, mm.	Weight on Sieve, gr.	Accumulated Weight, gr.	Percent Retained	Percent Passing	REMARKS
1	25.70	0.00	0.00	0	100	
3/4"	19.00	15.70	15.70	5	95	
3/8"	9.51	1.30	17.00	6	94	
4	4.76	6.80	23.80	8	92	AASHTO Classification:
10	2.00	31.80	55.60	19	81	A-3
40	0.420	85.10	140.70	49	51	
60	0.250	48.90	189.60	66	34	
100	0.149	47.20	236.80	82	18	
200	0.074	26.80	263.60	92	8	
PAN						

Total Dry Weight Before Wash, (gr) = 287.50

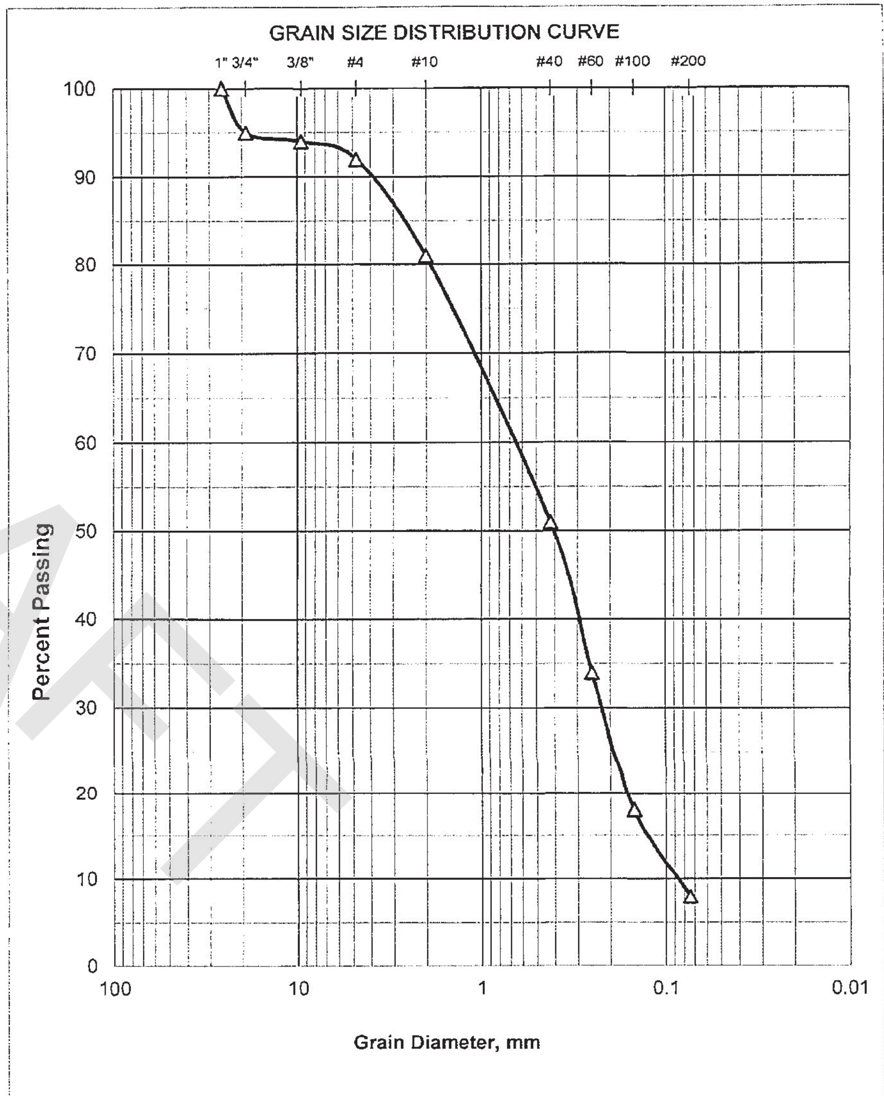
Percent Finer than No. 200 Sieve by Wash Method= 8%

Sieve Analysis Test performed in general accordance with ASTM C 136 (AASHTO T 27 or T 311)
Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)

Material in Sample (%)		
Gravel	≤ No. 4	8
Coarse Sand	>No. 4-≤ No. 40	41
Fine Sand	>No. 40-≤ No. 200	43
Silt and Clays	>No. 200	8
Water Content		33%

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045



HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR16-1211R-2

Boring No.: B-2 Sample No.: 4 Depth: 6.0'-8.0'

Date: 03/26/18

Technician:	E.M.					
Date Sample Placed in Oven:	03/26/2018					
Time in / Out of Oven :	03/26/18	6:00 PM	TO	03/27/18	6:00 PM	
Wt. of Wet Soil + Can, grams	492.30					
Wt. of Dry Soil + Can, grams	229.50					
Wt. of Can, grams No. 303	9.00					
Wt. of Dry Soil, grams	220.50					
Wt. of Moisture, grams	262.80					
Water Content, w%	119%					
Date Sample Placed in Furnace:	03/28/18					
Time in / out of furnace (minimum 6 hrs):	03/28/18	6:00 AM	TO	03/28/18	12:00 PM	
Weight of Crucible & Oven-Dried Sample:	26.70					
Weight of Crucible and Sample After Ignition:	24.80					
Weight of Crucible: No. 209	15.40					
Weight of Oven-Dried Soil:	11.30					
Weight Loss due to Ignition:	1.90					
Percent Organics:	17%					

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

AASHTO Classification:
A-8

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR16-1211R-2

Boring No.: B-2   Sample No.: 5   Depth: 8.0'-10.0'

Date: 03/26/18

Technician:		E.M.				
Date Sample Placed in Oven:		03/26/2018				
Time in / Out of Oven :		03/26/18	6:00 PM	TO	03/27/18	6:00 PM
Wt. of Wet Soil + Can, grams		390.70				
Wt. of Dry Soil + Can, grams		286.30				
Wt. of Can, grams No.	304	9.00				
Wt. of Dry Soil, grams		277.30				
Wt. of Moisture, grams		104.40				
Water Content, w%		38%				
Wt. of Dry Soil + Can Before Wash, grams		286.30				
Wt. of Can, grams No.	304	9.00				
Wt. of Dry Soil Before Wash, grams		277.30				
Time in / Out of Oven :		03/27/18	8:30 PM	TO	03/28/18	8:30 PM
Wt. of Dry Soil + Can After Wash, grams		265.80				
Wt. of Dry Soil After Wash, grams		256.80				
Total Loss, grams		20.50				
Percent Finer Than No. 200 Sieve		7%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

AASHTO Classification:
A-3

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR16-1211R-2

Boring No.: B-2 Sample No.: 7 Depth: 13.0'-15.0'

Date: 03/26/18

Technician:	E.M.
Date Sample Placed in Oven:	03/26/2018
Time in / Out of Oven :	03/26/18 6:00 PM TO 03/27/18 6:00 PM
Wt. of Wet Soil + Can, grams	347.20
Wt. of Dry Soil + Can, grams	64.70
Wt. of Can, grams No. 305	8.90
Wt. of Dry Soil, grams	55.80
Wt. of Moisture, grams	282.50
Water Content, w%	506%
Date Sample Placed in Furnace:	03/28/18
Time in / out of furnace (minimum 6 hrs):	03/28/18 6:00 AM TO 03/28/18 12:00 PM
Weight of Crucible & Oven-Dried Sample:	29.60
Weight of Crucible and Sample After Ignition:	23.10
Weight of Crucible: No. 11	18.30
Weight of Oven-Dried Soil:	11.30
Weight Loss due to Ignition:	6.50
Percent Organics:	58%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

AASHTO Classification:
A-8

CORROSION DATA ENTRY SHEET

Project FM# - 43002922202 , District: D6

ATLANTIC ISLE LAGOON BRIDGE

Miami-Dade County, Florida

Copy Data from Column C to P and
Past with Ctrl+V on SharePoint

Data Entry from Coulmn B to L											
Test_No.	Latitude	Longitude	Test Date	Sample Depth - ft.	Soil/Water	pH	Chloride (ppm)	Sulfate (ppm)	Resistivity (Ohm-cm)	Env. Class Steel	Env. Class Concrete
RW-2	25.9275800	-80.1266200	5/19/20	2.00	**Water**	8.0	1204.0	77.0	16.0	Extremely Aggressive	Extremely Aggressive

LABORATORY TESTING PROCEDURES

Grain Size Distribution – The grain size tests were performed to determine the particle size and distribution of sample tested. Each sample was dried, weighed, and washed over a # 200 mesh sieve. The dried sample was then passed through a standard set nested sieves to determine the grain size distribution of the soil particles coarser than the # 200 sieves. This test was conducted in general accordance with ASTM C-136.

Organic Content (Organic Loss on Ignition) – The amount of organic material in the sample was determined in this test, by measuring the loss due to ignition. The sample was first dried and weighed, then ignited and reweighed. The amount of organic material is expressed as a percentage of the soil weight. The test was conducted in general accordance with ASTM D-2974.

Percent Fines Content – In this test, the sample was dried and then washed over a # 200 mesh sieve. The percentage of soil by weight passing the sieve is the percentage of fines or portion of the sample in the silt and clay size range. This test was conducted in general accordance with ASTM D-1140.

Moisture Content – The moisture content (water content) is the ratio, expressed as a percentage of the weight of water in a given mass of soil to the weight of the soil particles. This test was conducted in general accordance with ASTM D-2216.

APPENDIX C

GTR REVIEW CHECKLIST FOR SITE INVESTIGATION

A. Site Investigation Information

Since the most important step in the geotechnical design process is to conduct an adequate site investigation, presentation of the subsurface information in the geotechnical report and on the plans deserves careful attention.

Geotechnical Report Text (Introduction) (Pgs. 10-1 to 10-4)	Yes	No	Unknown or N/A
1. Is the general location of the investigation described and/or a vicinity map included?	✓		
2. Is scope and purpose of the investigation summarized?	✓		
3. Is concise description given of geologic setting and topography of area?	✓		
4. Are the field explorations and laboratory tests on which the report is based listed?	✓		
5. Is the general description of subsurface soil, rock, and groundwater conditions given?	✓		
*6. Is the following information included with the geotechnical report (typically included in the report appendices):			
a. Test hole logs? (Pgs. 2-24 to 2-32)	✓		
b. Field test data?	✓		
c. Laboratory test data? (Pgs. 4-22 to 4-23)	✓		
d. Photographs (if pertinent)?			✓
Plan and Subsurface Profile (Pgs. 2-19, 3-9 to 3-12, 10-13)			
*7. Is a plan and subsurface profile of the investigation site provided?	✓		
8. Are the field explorations located on the plan view?	✓		

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

A.	Site Investigation Information (Cont.)	Yes	No	Unknown or N/A
*9.	Does the conducted site investigation meet minimum criteria outlined in Table 2?	✓		
10.	Are the explorations plotted and correctly numbered on the profile at their true elevation and location?	✓		
11.	Does the subsurface profile contain a word description and/or graphic depiction of soil and rock types?	✓		
12.	Are groundwater levels and date measured shown on the subsurface profile?	✓		
	Subsurface Profile or Field Boring Log (Pgs. 2-14, 2-15, 2-24 to 2-31)			
13.	Are sample types and depths recorded?	✓		
*14.	Are SPT blow count, percent core recovery, and RQD values shown?	✓		
15.	If cone penetration tests were made, are plots of cone resistance and friction ratio shown with depth?			
	Laboratory Test Data (Pgs. 4-6, 4-22, 4-23)			
*16.	Were lab soil classification tests such as natural moisture content, gradation, Atterberg limits, performed on selected representative samples to verify field visual soil identification?	✓		
17.	Are laboratory test results such as shear strength (Pg. 4-14), consolidation (Pg. 4-9), etc., included and/or summarized?			✓

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

EXHIBIT B-2 -
GEOTECHNICAL STUDY - MARCH 2022

March 10, 2021

Mr. Adrian Viala, P.E.
Assistant District Geotechnical Engineer
Florida Department of Transportation
District 4 and 6 Materials Office
14200 West State Road 84
Davie, Florida 33325

Subject: Preliminary Report of a Geotechnical Exploration – Structures (Revision 2)
Atlantic Isle Bridge (Bridge No. 874218) Rehabilitation or Replacement
Florida Department of Transportation, District 6
Contract No. C-9Y98, Contract FPID No. 250730-3-32-01
Project FPID No. 430029-2-22-02
City of Sunny Isles
Miami-Dade County, Florida
T.W.O. No. 79
HRES Project No. HR20-1583R

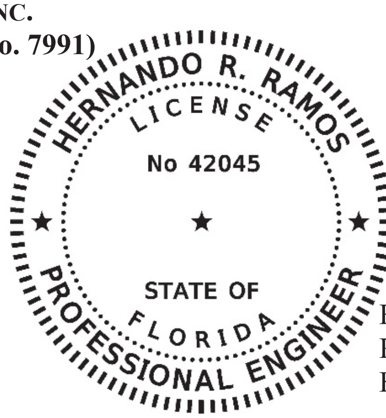
Dear Adrian:

HR Engineering Services, Inc. (HRES) is presenting this Preliminary Report of a Geotechnical Exploration – Structures (Revision 2) – for the subject project. This preliminary report presents our understanding of the project, outlines our exploratory procedures, and documents the field and laboratory test data obtained for the proposed project.

We have enjoyed assisting you on this project and look forward to serving as your geotechnical consultant on the remainder of this project and on future projects. If you have any questions concerning this report, please call our office at (305) 888-8880.

Sincerely,

HR ENGINEERING SERVICES, INC.
(Certificate of Authorization No. 7991)



THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY
Hernando R Ramos
2021.03.11 16:58:20 -05'00'
ON THE DATE ADJACENT TO THE SEAL

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

Paola Vargas, P.E.
Geotechnical Engineer
Florida Registration 90928

Hernando R. Ramos, P.E.
Principal Geotechnical Engineer
Florida Registration 42045

Distribution: Addressee (1)
File (1)

TABLE OF CONTENTS

APPENDIX A:

APPENDIX B:

APPENDIX C:

APPENDIX D:

1.0 INTRODUCTION

The purpose of this geotechnical evaluation was to obtain information concerning the site and subsurface conditions in the area of the proposed bridge rehabilitation or replacement, and provide an evaluation of the suitability of the in-situ materials and preliminary recommendations for different foundation alternatives. This report discusses the subsurface conditions based on the available test borings, presents our findings and evaluation, and includes the following items:

Field Services

- Two (2) test borings performed by HRES for a previous study were available. Each boring was performed to a depth of 80 measured from the existing ground surface. The test boring subsurface information is presented in the Report of Core Borings in Appendix A.

Evaluation

- Review of Miami-Dade County USDA Soil Survey Maps.
- Review of USGS Quadrangle Map (1994) for North Miami, Florida.
- Review of Miami-Dade County USGS Water Level Maps.
- A general review of area and site geologic conditions.
- A general review of existing surface features and site conditions.
- Report of core borings which illustrate the estimated subsurface conditions in the area of the existing bridge.
- An evaluation of the different foundation systems for support of the bridge structure.
- Drilled shafts/augercast Piles/micropile axial compression capacities.
- Soil/rock parameters for drilled shafts/augercast piles/micropile lateral analyses.
- Driven pile axial compression capacities.
- Soil/rock parameters for driven pile lateral analysis.

Laboratory Testing

- The results of laboratory tests performed on selected soil samples obtained from the test borings.
- A brief description of our laboratory testing procedures.

2.0 PROJECT INFORMATION

2.1 General

Project information for this subsurface exploration has been provided to us by various members of the design team. Additional information has been provided during telephone conversations.

During our geotechnical study, we have been furnished with the following project-related plans and information:

- Conceptual bridge rehabilitation plans for:

  Atlantic Isle Bridge
  Bridge 874218
  Prepared by: HNTB Corporation
  Printed Date: 09/17/2020

2.2 Project Description

The project consists of the rehabilitation or replacement of the existing 1925 historical arch bridge located in Atlantic Isle, Miami, Florida. There are 2 alternatives for the project:

Alternative 1: Consists of building a new bridge deck on top of the existing arch bridge while keeping the existing structural shell.

Alternative 2: Consists of the replacement of the existing bridge by a new structure.

This report provides the foundation recommendations for both alternatives.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

The field exploration was conducted by HRES. The locations of the test borings are provided in the Summary of Test Boring Locations in Appendix A and at the approximate locations shown on the Field Exploration Plan in Appendix A.

The Report of Core Borings in Appendix A summarize the approximate boundary between soil types. In some instances, the transition between material types may be gradual. A discussion of the subsurface conditions encountered along the project alignment is provided in Section 4.2 of this report.

3.2 LABORATORY TESTING

3.2.1 Soil Testing

In order to aid in classifying and estimate engineering characteristics of the subsurface materials encountered, laboratory classification tests were performed on representative soil samples obtained from the test borings performed for the project. The laboratory testing program included the following:

- 2 Grain Size Analyses
- 1 Fines Content Test
- 3 Organic Content Tests

In addition, a total of 6 moisture content tests were performed in conjunction with the classification tests. The laboratory test results are presented in Appendix B.

3.2.2 Corrosivity Classification Testing

HRES did not perform corrosion testing. Based on the location of the bridge to the Biscayne Bay, an Extremely Aggressive Environment is recommended for both steel and concrete substructures. Due to the proximity of the ocean, the superstructures are also considered to be in an Extremely Aggressive environment.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Site Conditions

The site conditions were observed by a Geotechnical Engineer during the month of December, 2017.

4.2 Subsurface Conditions

4.2.1 Miami-Dade County Soil Survey Map

The Soil Map of Miami-Dade County Area, Florida, published by the United States Department of Agriculture (USDA) was reviewed for general near-surface soil information within the general project vicinity. This information indicates that there are two (2) mapping units in the vicinity of the project. The map soil units encountered are as follows:

Table 4.2.1 Miami-Dade County Soil Survey

Miami-Dade County Area, Florida (FL686)		
Map Unit Symbol	**Map Unit Name**	**Typical Profile**
15	Urban land (55.1% of AOI)	Not Reported
99	Water (44.9% of AOI)	100 percent water

Based on the information from the USDA map, it appears that unsuitable materials are not present within the study area. A reproduction of the USDA map for the project area is included in Appendix A.

4.2.2 USGS Quadrangle Map

The North Miami Quadrangle, Florida-Dade Topographic Map (1994) published by the United States Geological Survey (USGS) was reviewed for general existing ground surface elevations in the project area. Based on the map, the existing ground elevations in the project vicinity range from 5 to 10 feet, NGVD29. A reproduction of the USGS Quadrangle Map for the project area is included in Appendix A.

4.2.3 General

A graphical representation of the subsurface conditions encountered by the test borings drilled for the proposed bridge is shown on the Report of Core Borings in Appendix A. These profiles and the following soil/rock conditions highlight the major subsurface stratification. The boring profiles on this sheet should be consulted for a detailed description of the soil/rock conditions encountered at each boring location. When reviewing the subsurface profiles, it should be understood that the soil/rock conditions may vary between and away from the boring locations.

4.2.4 Geologic Conditions

The project is located on the southern flank of the Florida Plateau, a stable, carbonate platform. In the study, the upper 200 feet of this platform is composed predominately of limestone and quartz sand. The sediments were deposited during several glacial and interglacial stages during the Pleistocene Epoch. Within the explored depths of this study, two distinct geological formations were encountered. These formations are the Miami Limestone Formation and the Fort Thompson Formation.

4.2.5 Miami Limestone

The Miami Limestone underlies the silt and organic soils and roadway fills. The Miami Limestone was encountered by the bridge borings from an average elevation of -8.0 feet to -12.0 feet, NAVD88.

The Miami Limestone can be described as a soft tan white porous to very porous fossiliferous quartz sandy fine-grained slightly oolitic limestone. The solution channels in the limestone may be up to 2 inches in diameter at some locations, are filled with quartz fine sand and uncemented calcareous materials. The limestone varies in both thickness and competency within the investigated area.

The Miami Limestone was deposited in a shallow near shore marine carbonate bank environment. Spherical carbonate sand grains called oolites formed and were deposited in this environment. Near shore, processes transported quartz sand into the area and reworked some of the carbonate material. Encrusting organisms called bryozoans were locally abundant and formed patches on the substrate. After sea level receded, the carbonate deposit was exposed to fresh water and the cementation process was initiated. The degree of cementation, and therefore the competency of the rock, was influenced by both the abundance and the type of calcareous material in the original deposit. Humic and carbonic acids percolating downward through the material etched slots up to 4 feet deep in the surface of the stratum.

4.2.6 Fort Thompson Formation

Underlying The Miami Limestone Formation, The Fort Thompson Formation was generally encountered. The Fort Thompson Formation is composed of sediments of variable lithologies. The lithologies include non-fossiliferous quartz fine sand, fossiliferous quartz sandy limestone, coralline limestone, freshwater limestone, and quartz sandstone. These lithologies alternate abruptly in thickness and lateral extent.

The Fort Thompson limestone grades downward into a gray quartz and calcareous fine to medium sand. This sand has been cemented to varying degrees by carbonate material leached out of the overlying limestone. The cementation commonly takes the form of hard spherical sandstone nodules 1 to 2 inches in diameter occurring in a sand matrix. Sandstone lenses within the sand layer are the result of a more complete cementation.

4.2.7 Generalized Subsurface Conditions Encountered at the Bridge Location

For a detailed subsurface condition at a particular borehole location, please refer to the Report of Core Borings in Appendix A.

4.2.8 Groundwater Conditions

The groundwater levels in the borings were measured at the time of drilling. Groundwater levels in the test boring were encountered at an approximate elevation of 0.5 feet, NAVD88. A Seasonal High Ground Water Table (SHGWT) of 2.0 feet, (NAVD88) is recommended for design.

Fluctuation in the observed groundwater levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff, storm surge and other site-specific factors. Since groundwater level variations are anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based on the assumption that variations will occur.

5.0 SUMMARY OF FOUNDATION ALTERNATIVES

5.1 General

Our preliminary foundation alternatives for support of the proposed bridge include shallow and deep foundations. Other types of foundation support have been evaluated for the proposed bridge. It is important to note that the bridge is located near residences which may preclude the use of some of the foundation support alternatives presented below due to vibration/noise issues. The following foundation alternatives are as follows:

- Shallow Foundations: Based on the results of the test borings available, a shallow foundation alternative is not feasible for support of the bridge end bents since the test borings encountered an organic to highly organic layer down to an approximate elevation of -12.5 feet, NAVD88 followed by a relatively weak to strong limestone. The organic materials will cause large foundation settlements; therefore, this foundation alternative is not recommended.

- Geosynthetic Reinforced Soil Integrated Bridge System (GRS-IBS): This is also a shallow foundation alternative. This foundation alternative is not feasible due to the organic to highly organic layer down to elevation -12.5 feet, NAVD88. The organic materials will cause large foundation settlements; therefore, this foundation alternative is not recommended.

- Steel H-Piles or Pipe Piles: The advantage of this type of piles is the relatively low vibration during driving when compared to concrete driven piles. However, the disadvantage in this project is that these piles provide relatively lower axial capacities when compared to concrete driven piles; also, the difficulty to estimate the length of the piles due to the uncertainty of determining the pile tip elevation during pile installation in addition to the extremely aggressive environment that may require sacrificial thickness to be added to the H pile sections.

- Augercast Piles (ACIP): The advantage of this type of piles is the relatively low to no vibration during construction. This type of foundation is recommended for Alternative 1 (Rehabilitation) since vibration could damage the existing historic arch bridge and adjacent residences. It can also be used for the replacement bridge alternative. However, there are site conditions that may present this alternative not favorable for ACIP piles. These adverse conditions include constructability issues regarding the proximity of the canal water to the end bent construction. Augercast piles require to be installed on ground having the water level a minimum of one to two pile diameters below ground to help build a grout head. Since the groundwater elevation is very close to the ground surface, the head needed for the installation of the ACIP may not be sufficient. Also, the organic to highly organic layer will not provide resistance to the pressurized grout producing a bulge during installation.

These construction issues can be resolved by installing permanent steel casings at pile locations with enough diameter to allow the construction of augercast piles inside the permanent steel casings. The top of the casing could be left two-pile diameter about ground and the tip of the casings installed at -15 feet, NAVD88. The pile installation requires a collection system of the cuttings, slurry and extra pumped grout to avoid contamination of the canal. If all these issues can be solved, augercast piles could be a feasible alternative.

- Drilled Shafts: The advantage of this type of foundation is the relatively low to no vibration (when using an oscillating/rotator casing installation) during construction. This type of foundation is recommended for Alternative 1 (Rehabilitation) since vibration could damage the existing historic arch bridge and adjacent residences. It can also be used for the replacement bridge alternative.

  This type of foundation provides high axial and lateral capacities; however, it is recommended to provide shaft redundancy. It may require a minimum of 3 shafts per end bent.

  The surface conditions encountered by the borings (organic materials down to elevation -12.5 feet and high-water elevation due to the proximity of the canal) require the use of permanent casing down to elevation -15 feet, NAVD88.

  In addition, due to the weak limestone layer (with low "N" values) encountered immediately under the organic material which may present stability issues during construction, each shaft may require a temporary casing down to elevation -41 feet, NAVD88. Below elevation -41 feet, the limestone is more competent. Similar to augercast piles, the installation of drilled shafts will require a collection system of the cuttings, slurry and extra pumped concrete to avoid contamination of the canal.

- Micropiles: The advantage of this type of foundation is the relatively low to no vibration during construction. This type of foundation is recommended for Alternative 1 (Rehabilitation) since vibration could damage the existing historic arch bridge and adjacent residences. It can also be used for the replacement bridge alternative. Similar to augercast piles, the installation of micropiles will require a collection system of the cuttings, slurry and extra pumped grout to avoid contamination of the canal.

This type of foundation provides high axial capacity; however, it provides low lateral capacities, especially since the upper organic materials encountered to elevation -12.5 feet, NAVD88 don't provide any lateral support. It will require a permanent casing to at least -15 feet, NAVD88. The lateral capacity issue can be resolved by installing a large group of micropiles.

- Concrete Driven Piles: Concrete driven piles are only recommended for Alternative 2 (Replacement) for foundation support of the new bridge structure. However, this alternative present greater vibration and noise issues when compared with the other foundation alternatives and should be used with extreme caution.

  This foundation system will provide the required axial and lateral capacities for the project and will be less impacted by the site environment, including corrosion, highwater elevation and proximity of the new bents to the canal. The pile installation will require preforming down to elevation at least 34 feet, NAVD88.

  A permanent steel casing installed to elevation -15 feet, NAVD88 will be needed at each pile location to help keep the preformed holes open (to avoid collapse of the organic soils in the hole) before installing each pile and the backfilling of the annulus between the piles and the preformed holes. Due to the potential of high vibration levels during concrete pile installation, the steel casing may need to be installed at deeper elevations to help minimize the damage to nearby residences.

  All adjacent residences will need to be monitored for settlement and vibration during casing and pile installation.

6.0 PRELIMINARY FOUNDATION EVALUATION

6.1 Basis of Evaluation

Our foundation recommendations are based upon the previously presented project information and the structural conditions along with the data obtained in this exploration. The field and laboratory data have been compared with previous performances of similar structures bearing on and within soil/rock conditions similar to those encountered in this exploration. If the project information is incorrect or changes, please contact us so that our evaluation and recommendations can be reviewed.

In our evaluation of the subject project, we addressed the following geotechnical design and construction considerations:

- Alternative 1: Drilled shafts, augercast piles and micropiles are viable alternatives for foundation support of the bridge structure rehabilitation. Due to the extremely aggressive environment, 48-inch diameter drilled shafts, 30-inch diameter augercast piles and 9.625-inch diameter micropile were included in the foundation analyses.

- Alternative 2: Providing that the vibration caused by pile installation can be controlled, 24-inch square prestressed concrete driven piles are a viable alternative for foundation support of the bridge structure replacement. The axial compression analyses are also included. Drilled shaft/augercast pile/Micropiles foundation types are also recommended for support of the new bridge.

6.2 Alternative 1 – Augercast Piles, Drilled Shafts and Micropiles

6.2.1 General

Drilled shafts and augercast piles with diameters of 48 and 30 inches, respectively and micropile with 9.625-inch diameter were considered for the support of the proposed bridge retrofit. These deep foundation systems are able to develop the necessary capacity to support the factored design loads when bearing in lower medium to hard limestone layers.

6.2.2 Drilled Shafts, Augercast Piles and Micropiles Axial Compression Capacity Analyses

Drilled shafts, augercast piles and micropiles installed in median to hard limestone derive their axial load capacities from two components; shear transfer between the concrete and soil/rock interface, and end bearing or point resistance at the base of the shaft/pile.

The drilled shaft/augercast pile/micropile axial capacity analyses neglected the end bearing resistance. In addition, the side friction resistance in sand and soft limestone (Ns<25 blows/ft) were not considered in the axial capacity analyses. The side friction resistance in the rock layer was estimated as follows:

> f_s = 0.1 N (tsf) (FDOT Soils and Foundation Handbook)
>
> Where,
>
> f_s = ultimate unit side friction resistance.
>
> N = SPT N-value (blows/ft.) $\geq$25
>
> Based on the handbook, the maximum value of f_s is 5 tsf. However, we limited it to 4 tsf (i.e., maximum N=40) for this study.

When using the Load Resistance Factor Design method (LRFD), a resistance factor, ø is applied to the ultimate mobilized shaft capacity to yield the factored shaft/pile resistance capacity.

For redundant drilled shafts/augercast piles the resistance factor is 0.6. For micropiles, the resistance factor is 0.55.

For non-redundant drilled shafts, the resistance factor is 0.5, when using side friction only. Non-redundant augercast piles and micropiles are not allowed.

Drilled shaft/augercast pile and micropile tip elevations, axial compression capacities and capacity vs. tip elevation graphs are presented in Appendix C.

6.2.3 Drilled Shaft/Augercast Pile/Micropile – Soil/Rock Parameters for Lateral Analysis

A lateral loading analysis may be performed to estimate the lateral soil/rock resistance of drilled shaft/augercast pile and micropiles at each end bent.

A table of soil/rock parameters for drilled shaft /augercast pile and micropile lateral analysis is presented in Appendix C. It is understood that computer program FB-MultiPier, developed by University of Florida Bridge Software Institute (BSI) will be used to perform the lateral loading analyses.

The parameters were estimated from accepted FDOT correlations with SPT N_s (N values obtained using a safety hammer). SPT N values obtained using an automatic hammer, SPT Na, were converted to safety hammer values, SPT Ns, by multiplying by a factor of 1.24. The following formulas and correlations with SPT (Ns) values were used:

<u>Sands, Fills and Soft Limestone modeled as Sand:</u>

- Friction Angle, ϕ = Ns/4+28˚ (Maximum of 38˚).
- Unit Weight γ=105pcf*friction angle of soil/30˚
- Modulus of Elasticity, E=30,000Ns (psf).
- Shear Modulus G=E/2(1+ν), where Poisson ratio, ν=0.3.
- Side friction (τ_f) estimated using β-Method for drilled shafts and micropiles.
- Modulus of subgrade reaction (k), estimated using Graphs B7 and from the FB-MultiPier Help Manual

<u>Limestone (modeled as rock):</u>

- Unit Weight = 120pcf.
- Side Friction, τ_f=0.1Ns (tsf).
- Unconfined compressive strength (qu), estimated using McVay's Equation for side friction, $(1/2(qu*qt)^{1/2}$ by equating to 0.1 Ns (tsf) and assuming qt=20% of qu.
- Shear Modulus G=E/2(1+ν), where Poisson ratio, ν=0.2 and the Modulus of Elasticity, E = 115qu.

The test borings performed show a thick organic layer ranging from approximate elevation +1.8. to -12.5 feet, NAVD88 and a permanent steel casing installed to -15 feet, NAVD88. For the purpose of lateral analysis, the design ground elevation should be considered at -15 feet, NAVD88.

6.3 ALTERNATIVE 2 - DRIVEN PILES

6.3.1 General

Drilled shafts, augercast piles, micropiles and driven 24-inch square prestressed concrete piles are feasible alternatives for the support of the new bridge. Drilled shafts/augercast piles/micropiles have been discussed in Alternative 1. This section only refers to driven concrete piles.

Driven piles are able to develop the necessary capacity to support the factored design loads when bearing in the natural limestone. As mentioned before, a permanent steel casing is required to be installed to elevation -15 feet, NAVD88 to help maintain the preformed hole open from collapsed organic soils.

6.3.2 Driven Pile Axial Compression Capacity Analysis

In order to evaluate the capacity of the driven pile foundations, a static analysis using the design methodology presented in FDOT Research Bulletin 121 (RB-121) developed by Professor J.H. Schmertmann, was performed. A computerized version of this method, entitled *FB-Deep v.2.06,* was used. This method generates an allowable pile capacity through the use of empirical correlations with standard penetration test (SPT) "N" values, and soil/rock end bearing and side friction curves generated for given soil/rock types. The ultimate mobilized pile capacity (Davison pile capacity) is calculated as the sum of the ultimate side friction plus one-third of the ultimate end bearing. When using the Load Resistance Factor Design method (LRFD), the estimated Davisson capacity is used to predict the ultimate bearing capacity of the pile. A resistance factor, ø is applied to the Davisson capacity to yield the factored pile resistance capacity. This resistance factor may be taken as 0.65 (with dynamic testing of ≥5% of piles) or 0.75 (with dynamic testing of 100% of piles) when using *FB-Deep* Davisson capacity as design methodology for axial compression. To help minimize vibration, 100% dynamic testing is recommended.

Pile tip elevations and capacities are provided in the *FB-Deep* computer analysis printouts presented in Appendix C.

6.3.3 Driven Pile – Soil/Rock Parameters for Lateral Analysis

A driven pile lateral analysis is required in order to determine the pile lateral loading capacity and the pile minimum tip elevation at each bridge bent support. The bridges designer is responsible for these lateral load analyses. Our recommended soil stratigraphy and the parameters to be used for the lateral analyses, based on the available subsurface exploration are presented in Appendix C. Any computer software approved by the FDOT may be used, however, we are assuming that FB-MultiPier software by University of Florida, Bridge Software Institute will be used.

The soil elastic and strength parameters provided have been estimated from correlations with the Standard Penetration Test (SPT) values (N, blows/ft) obtained from the field exploration. The modulus of elasticity (E) was estimated from correlations with SPT N_s (N values obtained using a safety hammer). Similarly, the internal friction angle (ϕ) was estimated from accepted FDOT correlations with N_s values. SPT N values obtained using an automatic hammer, SPT Na, were converted to safety hammer values, SPT Ns, by multiplying by a factor of 1.24. The following correlations with SPT Ns values were used:

- Friction Angle, ϕ = Ns/4+28˚ for sands and limestone with Ns < 10 blows/foot (modeled as sand). Maximum friction angle of 34˚.
- Limestone with Ns > 10 blows/foot was modeled as sandy gravel with ϕ = Ns/4+33˚. Maximum friction angle of 40˚.
- For sands, fills, and weak limestone modeled as sand or sandy gravel, the Modulus of Elasticity, E was estimated as E=30,000Ns (psf).
- The Shear Modulus, G was estimated as G=E/2(1+ν), where, ν is Poisson ratio (ν=0.3 for sands, fills, and 0.2 for limestone modeled as sandy gravel).
- Unit skin friction of sands and limerock fill, τ_f=0.019Ns (tsf).
- Unit skin friction of limestone, τ_f=0.01Ns (tsf)
- Unit weight of sands and fills was estimated as γ=105pcf*friction angle of soil/30˚.
- Unit weight of limestone was assumed as 120 pcf.
- The ultimate end bearing of the sand layer was estimated as q_{ult} =6.4Ns (ksf).
- The ultimate end bearing of the limestone layer was estimated as q_{ult} = 7.2Ns (ksf).
- Modulus of subgrade reaction, k (pci) was estimated using FDOT Soils and Foundation Handbook.

6.4 Downdrag at Bridge Abutments

Alternative 1:

The drilled shafts/augercast piles or micropiles may be installed within the existing bridge abutments. Since the additional fill volume placed over the existing embankment at these locations will be small, no significant settlements are expected at these locations. Hence, downdrag is expected to be negligible.

Alternative 2:

As in Alternative 1, the driven piles at both end bents of the proposed new bridge will be installed within the area occupied by the existing bridge abutments. Hence, downdrag is expected to be negligible.

6.5 Scour

Alternative 1 and 2:

Due to the close proximity to the Biscayne Bay, scour is expected. The designer might consider beneficial to use a revetment system to protect the end bents.

6.6 Permanent Casing

Alternative 1:

A permanent casing should be installed down to elevation -15 feet, NAVD88 (about 2.5 feet into the natural limestone) as an attempt to prevent the cave-in of the organic layer at each shaft/pile location. For the drilled shaft alternative, a temporary casing may be needed during shaft installation due to the soft limestone encountered down to elevation -41 feet, NAVD88 to prevent cave-ins. Below this elevation, the limestone appears to be more competent (high "N" values).

The installation of all casings for drilled shafts will require the use oscillation/rotator casing installation to minimize noise and vibration and avoid damage to the historical arch bridge and adjacent residences.

Alternative 2:

A permanent casing should be installed down to elevation -15 feet, NAVD88 (about 2.5 feet into the natural limestone) as an attempt to prevent the cave-in of the organic layer at each concrete pile location. The casing diameter should be 36 inches. As mentioned before, the tip of the steel casing may need to go lower to help reduce the potential high vibration levels during concrete pile driving.

6.7 Preforming

Alternative 2:

Based on the information from Borings B-1 and B-2, a hard layer of limestone is observed down to an approximately elevation -34 feet, NAVD88. This layer might be hard to penetrate during driving and present refusal before reaching the minimum tip elevation. Due to organic layer encountered approximately elevation -12.5 feet, NAVD88, HRES recommends preforming down to elevation -34 feet, NAVD88. Due to possible vibration levels during pile driving, this preforming elevation may require revision.

6.8 Settlement and Vibration Monitoring

Construction vibrations associated with casing installation, pile driving and compaction equipment and others will occur. Settlement and vibration monitoring of existing bridge and all nearby existing structures should be performed in accordance with Section 108 of the FDOT Standard Specifications. HRES anticipates the following buildings will need to be monitored:

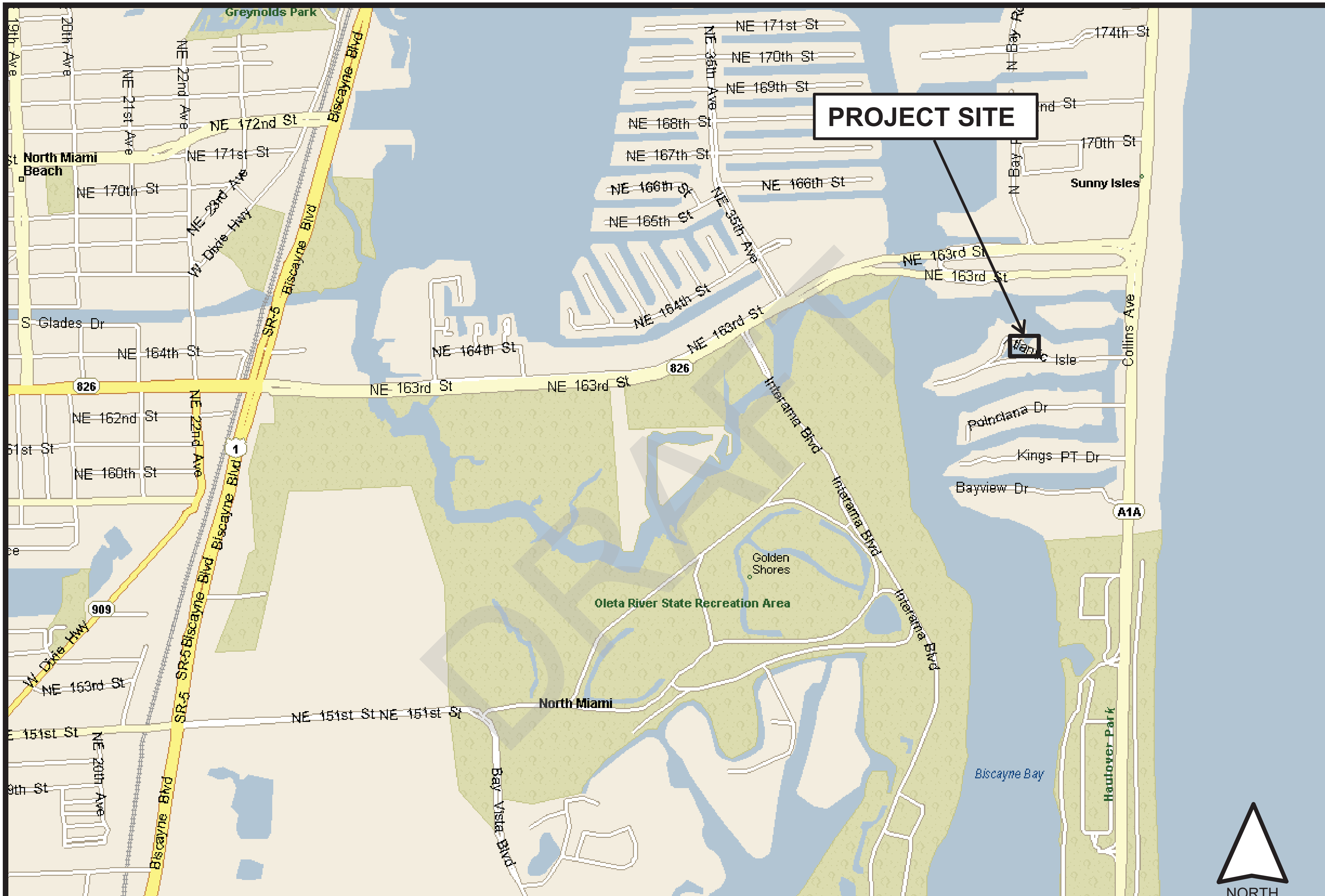
- 263 Atlantic Avenue, North Miami Beach, FL 33160
- 265 Atlantic Avenue, North Miami Beach, FL 33160
- Miami-Dade County Water and Sewer Department Pump Station
- Any other structure that may be identified by the Structural Engineer should be added to this list.

All existing structures in the vicinity of pile driving and compaction operations should be monitored for settlement and vibration.

6.9 CONSTRUCTION PLANS AND SPECIFICATIONS REVIEW

It is recommended that this office be provided the opportunity to make a general review of the earthwork plans and special provisions prepared from the recommendations presented in this report. We would then suggest any modifications so that our recommendations are properly interpreted and implemented.

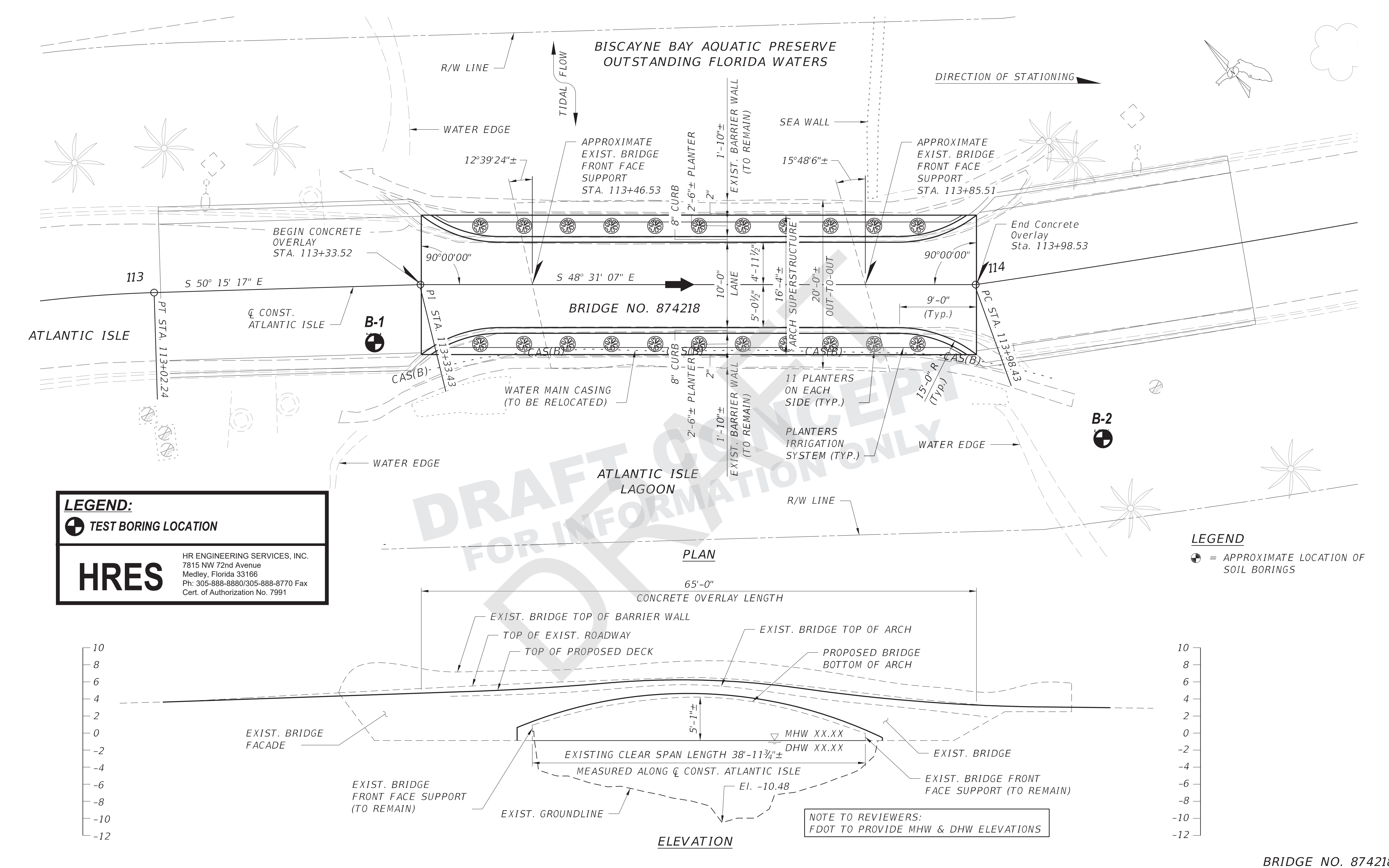
APPENDIX A



ATLANTIC ISLE BRIDGE
FPID No. 430029-2-22-02
FLORIDA DEPARTMENT OF TRANSPORTATION – DISTRICT 6
MIAMI-DADE COUNTY, FLORIDA

HRES
HR Engineering Services, Inc.

SITE LOCATION MAP	A-1
DRAWN BY: PV	DATE: 02/24/21
PROJECT No: HR20-1583R	SCALE: NTS



NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

BRIDGE NO. 874218

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HNTB CORPORATION
5900 N. ANDREWS AVE., SUITE 400
FORT LAUDERDALE, FL. 33309
P: (305) 551-8100 F: (305) 551-2800

DRAWN BY:	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
CHECKED BY:			
DESIGNED BY:	ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CHECKED BY:	N/A	MIAMI-DADE	430029-2-22-02

SHEET TITLE: FIELD EXPLORATION PLAN

PROJECT NAME: ATLANTIC ISLE AVE OVER OCEAN CANAL

REF. DWG. NO.

SHEET NO. A-2

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,040 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 15, 30, 60, 90

Feet: 0, 50, 100, 200, 300

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

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
CERTIFICATE OF AUTHORIZATION 7991

DRAWN BY:	ME 03-18
CHECKED BY:	PV 03-18
DESIGNED BY:	PV 03-18
CHECKED BY:	HRR 03-18

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

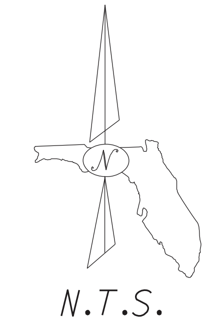
SHEET TITLE: MIAMI-DADE COUNTY AREA SOIL SURVEY MAP

PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. A-3

HRESUser 4/7/2020 9:51:55 AM D:\DRIVE3\Paola\HR20-1583R Atlantic Isle Bridge\MIAMIDADE COUNTY SOIL MAP.dgn



REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
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HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
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DRAWN BY: ME 03-18
CHECKED BY: PV 03-18
DESIGNED BY: PV 03-18
CHECKED BY: HRR 03-18

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

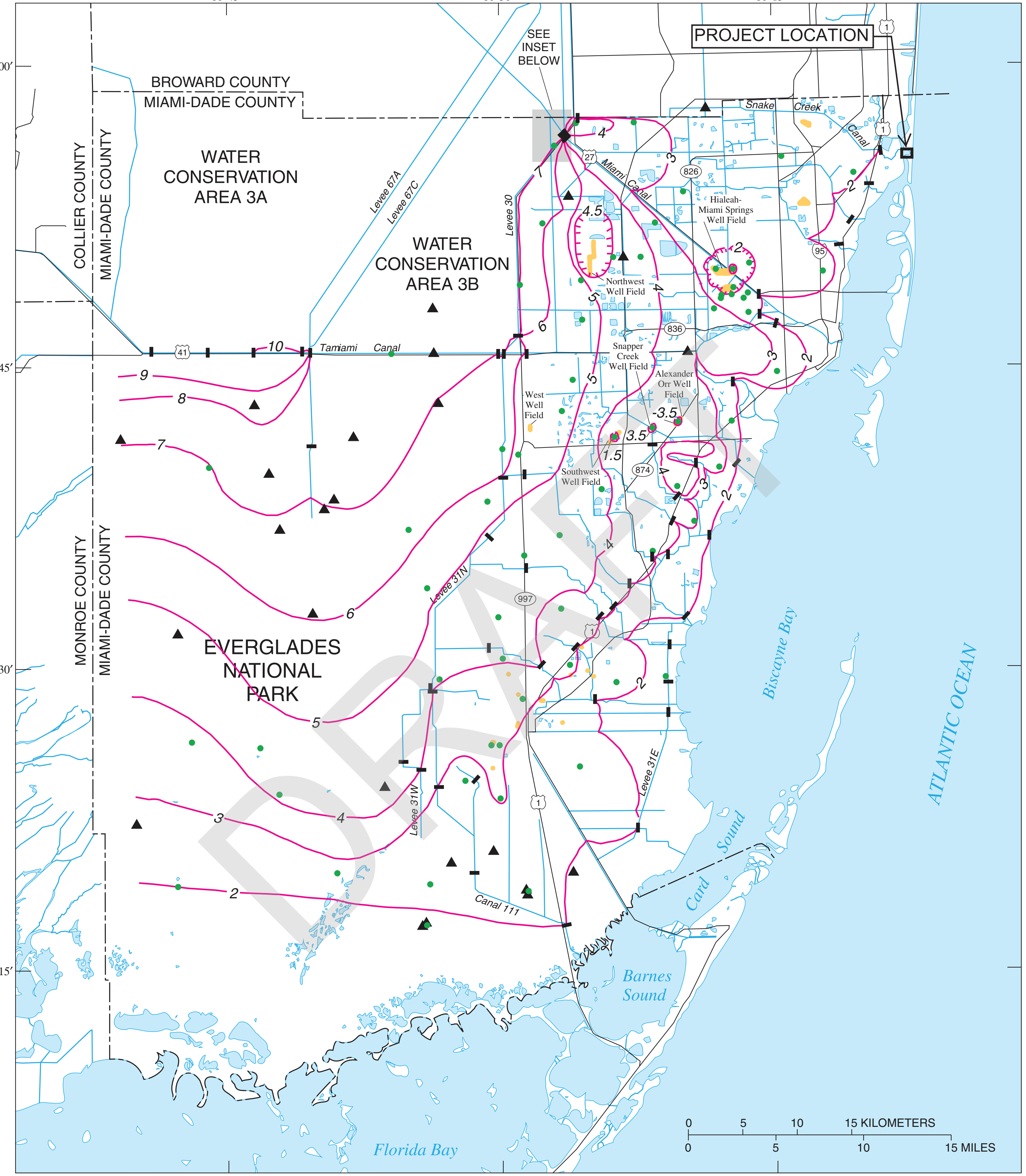
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE: USGS QUADRANGLE MAP

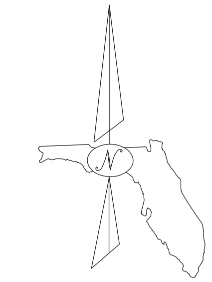
PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. A-4



AVERAGE OCTOBER WATER LEVELS 1990-99



N.T.S.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
CERTIFICATE OF AUTHORIZATION 7991

DRAWN BY: ME 03-18
CHECKED BY: PV 03-18
DESIGNED BY: PV 03-18
CHECKED BY: HRR 03-18

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE:
USGS AVERAGE OCTOBER WATER LEVELS (1990-1999)

PROJECT NAME:
ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO.
A-5

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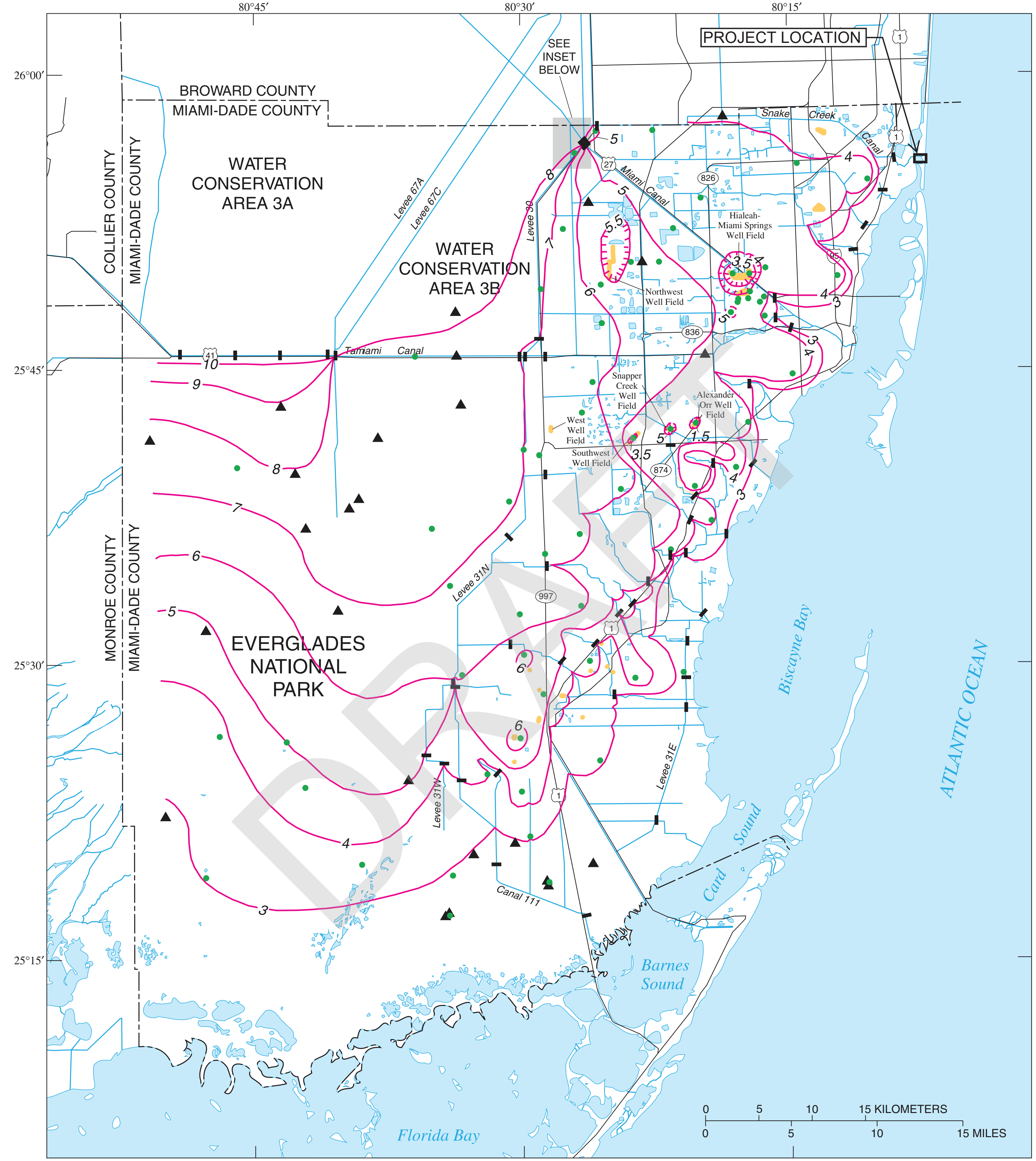

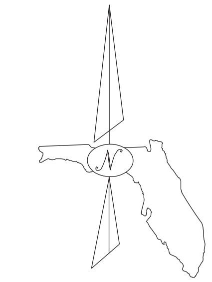

AVERAGE YEARLY HIGH WATER LEVELS 1990-99

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166
CERTIFICATE OF AUTHORIZATION 7991

DRAWN BY: ME 03-18
CHECKED BY: PV 03-18
DESIGNED BY: PV 03-18
CHECKED BY: HRR 03-18

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
NONE	MIAMI-DADE	430029-2-22-02

SHEET TITLE: USGS AVERAGE YEARLY HIGH WATER LEVELS (1990-1999)

PROJECT NAME: ATLANTIC ISLE LAGOON BRIDGE

REF. DWG. NO.

SHEET NO. A-6

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DATA ENTRY SHEET

Project FM# - 43002922202 , District: D6

ATLANTIC ISLE BRIDGE

Miami-Dade County, Florida

Note: RED- Locations Coordinates are not correct, Falls Out of County Boundary. Please confirm co-ordiantes.

**Copy Data from Column C to K and
Past with Ctrl+V on SharePoint**

Test No.	Test Type	Latitude	Longitude	Test Date MM/DD/YYYY	Elevation ft.	Groundwater Depth ft.	Percolation Test Results	PDF Name
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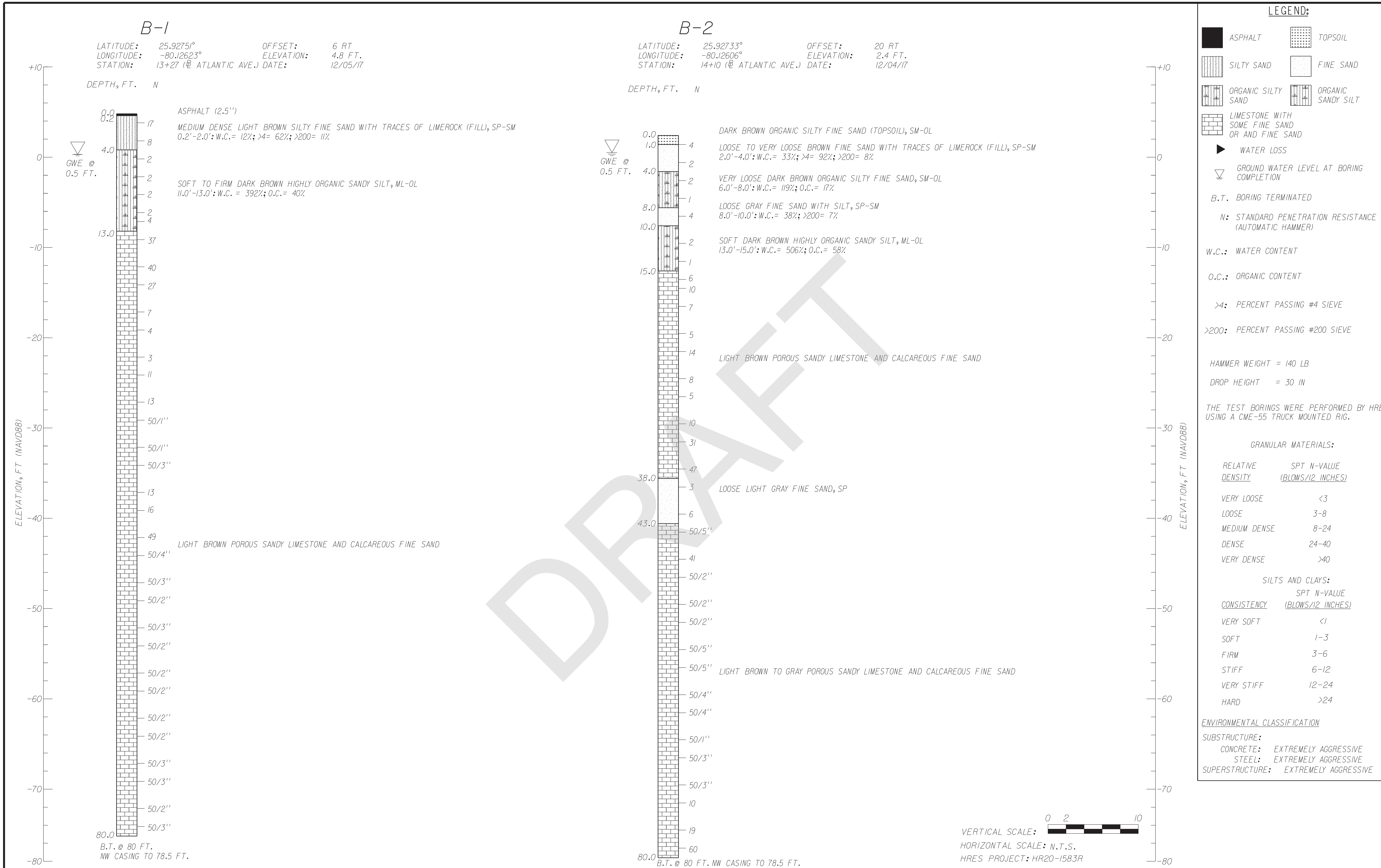
B-2	Structural Boring	25.92733	-80.12606	12/4/2017	2.4	1.9		4300292D6C4aHR.02242021.1



THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HERNANDO R. RAMOS, P.E.
P.E. LICENSE NUMBER 42045
HR ENGINEERING SERVICES, INC
7815 NW 72ND AVENUE
MEDLEY, FLORIDA 33166

DRAWN BY: ME 12-17	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			SHEET TITLE: REPORT OF CORE BORINGS
CHECKED BY: SS 12-17				
DESIGNED BY: SS 12-17	ROAD NO.	COUNTY	FINANCIAL PROJECT ID	PROJECT NAME: ATLANTIC ISLE BRIDGE
CHECKED BY: HRR 12-17	-	MIAMI-DADE	430029-2-22-02	

REF. DWG. NO.

SHEET NO. A-8

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FIELD TESTING PROCEDURES

Test Borings - The test borings were made in general accordance with ASTM-D-1586, "Penetration Test and Split-Barrel Sampling of Soils." The borings were advanced using a 3-inch ID casing and a rotary drilling process. Water or bentonite drilling fluid was circulated in the boreholes to flush the cuttings. At regular intervals, the drilling tools were removed and soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated six inches and then driven an additional foot with blows of a 140-lb hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance". The penetration resistance, when properly interpreted, is an index to the soil strength and density.

Representative portions of the soil samples, obtained from the sampler, were placed in glass jars and transported to our laboratory. An engineer then examined the samples in order to confirm the field classifications.

APPENDIX B

SUMMARY OF LABORATORY TEST RESULTS
ATLANTIC ISLE BRIDGE
FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 6

MIAMI-DADE COUNTY, FLORIDA
FPID No. 430029-2-22-02
HR ENGINEERING SERVICES, INC.
HRES PROJECT No. HR20-1583R
FEBRUARY 22, 2021

Test No.	USCS Class.	Sample Depth (ft)	Grain Size Distribution - Percent Passing								Organic Loss of Ignition, %	Moisture Content %	Material in Sample, %		
			3/4"	3/8"	No. 4	No. 10	No. 40	No. 60	No. 100	No. 200			Gravel	Sand	Fines
B-1	SP-SM	0.2-2.0	100	78	62	50	35	26	16	11	-	12	38	51	11
B-1	ML-OL	11.0-13.0	-	-	-	-	-	-	-	-	40	392	-	-	-
B-2	SP-SM	2.0-4.0	95	94	92	81	51	34	18	8	-	33	8	84	8
B-2	SM-OL	6.0-8.0	-	-	-	-	-	-	-	-	17	119	-	-	-
B-2	SP-SM	8.0-10.0	-	-	-	-	-	-	-	7	-	38	-	-	7
B-2	ML-OL	13.0-15.0	-	-	-	-	-	-	-	-	58	506	-	-	-

LABORATORY TESTING PROCEDURES

Grain Size Distribution – The grain size tests were performed to determine the particle size and distribution of sample tested. Each Sample was dried, weighed, and washed over a # 200 mesh sieve. The dried sample was then passed through a standard set nested sieves to determine the grain size distribution of the soil particles coarser than the # 200 sieves. This test was conducted in general accordance with ASTM D-22.

Percent Fines Content – In this test, the sample is dried and then washed over a # 200 mesh sieve. The percentage of soil by weight passing the sieve is the percentage of fines or portion of the sample in the silt and clay size range. This test was conducted in general accordance with ASTM D-1140.

Percent Organics (Organic Loss on Ignition) – The amount of organic material in the sample was determined in this test, by measuring the loss due to ignition. The sample was first dried and weighed, then ignited and reweighed. The amount of organic material is expressed as a percentage of the soil weight. This test was conducted in general accordance with ASTM D-2974.

Water Content – The water content is the ratio, expressed as a percentage of the weight of water in a given mass of soil to the weight of the soil particles. This test was conducted in general accordance with ASTM D-2216.

HR ENGINEERING SERVICES, INC.
7815 N.W. 72nd Avenue - Medley, Florida 33166
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GRAIN SIZE DATA SHEET

Project Name: ATLANTIC ISLE BRIDGE — Project No.: HR16-1211R-2

Boring No.: B-1 — Sample No.: 1B — Depth: 0.2'-2.0'

Date: 03/28/2018 — Tested By: E.M.

Sieve Size	Particle Size, mm.	Weight on Sieve, gr.	Accumulated Weight, gr.	Percent Retained	Percent Passing	REMARKS
1	25.70	0.00	0.00	0	100	
3/4"	19.00	0.00	0.00	0	100	
3/8"	9.51	78.40	78.40	22	78	
4	4.76	59.30	137.70	38	62	USCS Classification:
10	2.00	44.10	181.80	50	50	
40	0.420	54.00	235.80	65	35	SP-SM
60	0.250	32.20	268.00	74	26	
100	0.149	36.70	304.70	84	16	
200	0.074	18.10	322.80	89	11	
PAN						

Total Dry Weight Before Wash, (gr) = 363.40

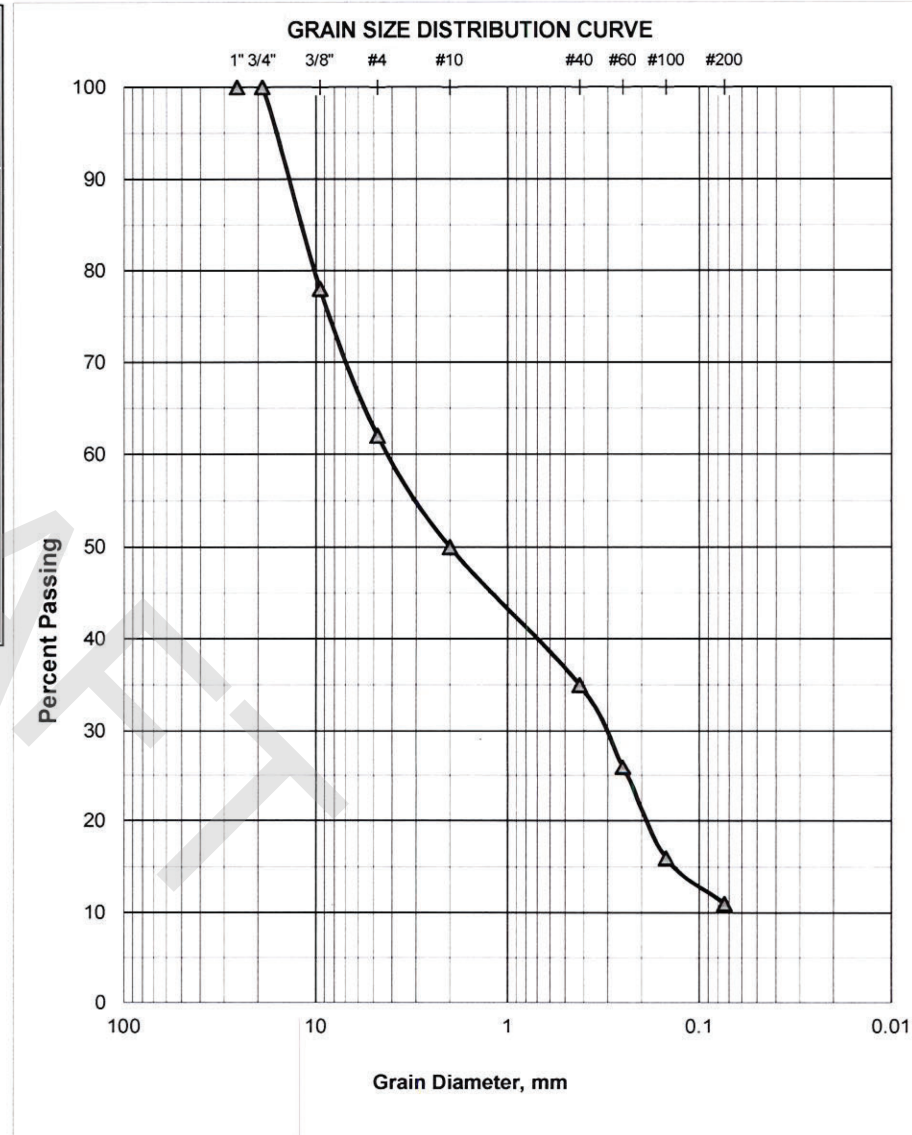
Percent Finer than No. 200 Sieve by Wash Method= 11%

Sieve Analysis Test performed in general accordance with ASTM C 136 (AASHTO T 27 or T 311)
Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)

Material in Sample (%)		
Gravel	≤ No. 4	38
Coarse Sand	>No. 4-≤ No. 40	27
Fine Sand	>No. 40-≤ No. 200	24
Silt and Clays	>No. 200	11
Water Content		12%

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045



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REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR16-1211R-2

Boring No.: B-1 **Sample No.:** 6 **Depth:** 11.0'-13.0'

Date: 03/26/18

Technician:		E.M.				
Date Sample Placed in Oven:		03/26/2018				
Time in / Out of Oven :		03/26/18	6:00 PM	TO	03/27/18	6:00 PM
Wt. of Wet Soil + Can, grams		253.20				
Wt. of Dry Soil + Can, grams		58.60				
Wt. of Can, grams	No. 301	9.00				
Wt. of Dry Soil, grams		49.60				
Wt. of Moisture, grams		194.60				
Water Content, w%		392%				
Date Sample Placed in Furnace:		03/28/18				
Time in / out of furnace (minimum 6 hrs):		03/28/18	6:00 AM	TO	03/28/18	12:00 PM
Weight of Crucible & Oven-Dried Sample:		29.60				
Weight of Crucible and Sample After Ignition:		25.10				
Weight of Crucible:	No. 115	18.30				
Weight of Oven-Dried Soil:		11.30				
Weight Loss due to Ignition:		4.50				
Percent Organics:		40%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

USCS Classification:
ML-OL

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.
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GRAIN SIZE DATA SHEET

Project Name: ATLANTIC ISLE BRIDGE   Project No.: HR16-1211R-2
Boring No.: B-2   Sample No.: 2   Depth: 2.0'-4.0'
Date: 03/28/2018   Tested By: E.M.

Sieve Size	Particle Size, mm.	Weight on Sieve, gr.	Accumulated Weight, gr.	Percent Retained	Percent Passing	REMARKS
1	25.70	0.00	0.00	0	100	
3/4"	19.00	15.70	15.70	5	95	
3/8"	9.51	1.30	17.00	6	94	
4	4.76	6.80	23.80	8	92	USCS Classification:
10	2.00	31.80	55.60	19	81	
40	0.420	85.10	140.70	49	51	SP-SM
60	0.250	48.90	189.60	66	34	
100	0.149	47.20	236.80	82	18	
200	0.074	26.80	263.60	92	8	
PAN						

Total Dry Weight Before Wash, (gr) = **287.50**

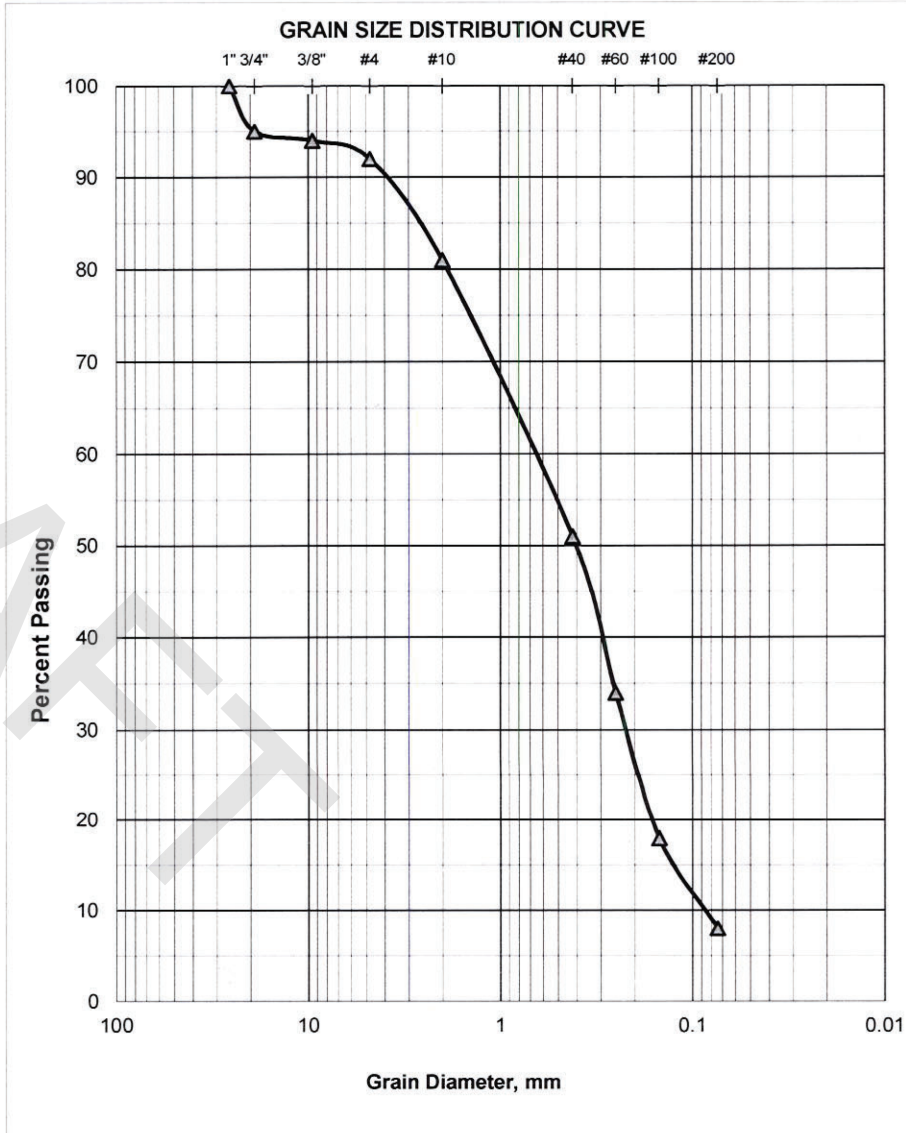
Percent Finer than No. 200 Sieve by Wash Method= **8%**

Sieve Analysis Test performed in general accordance with ASTM C 136 (AASHTO T 27 or T 311)
Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)

Material in Sample (%)		
Gravel	≤ No. 4	8
Coarse Sand	>No. 4-≤ No. 40	41
Fine Sand	>No. 40-≤ No. 200	43
Silt and Clays	>No. 200	8
Water Content		33%

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045



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REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR16-1211R-2

Boring No.: B-2 Sample No.: 4 Depth: 6.0'-8.0'

Date: 03/26/18

Technician:	E.M.
Date Sample Placed in Oven:	03/26/2018
Time in / Out of Oven :	03/26/18 6:00 PM TO 03/27/18 6:00 PM
Wt. of Wet Soil + Can, grams	492.30
Wt. of Dry Soil + Can, grams	229.50
Wt. of Can, grams No. 303	9.00
Wt. of Dry Soil, grams	220.50
Wt. of Moisture, grams	262.80
Water Content, w%	119%
Date Sample Placed in Furnace:	03/28/18
Time in / out of furnace (minimum 6 hrs):	03/28/18 6:00 AM TO 03/28/18 12:00 PM
Weight of Crucible & Oven-Dried Sample:	26.70
Weight of Crucible and Sample After Ignition:	24.80
Weight of Crucible: No. 209	15.40
Weight of Oven-Dried Soil:	11.30
Weight Loss due to Ignition:	1.90
Percent Organics:	17%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

USCS Classification:
SM-OL

Hernando R. Ramos, P.E.
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REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: ATLANTIC ISLE BRIDGE Project No.: HR16-1211R-2

Boring No.: B-2 Sample No.: 5 Depth: 8.0'-10.0'

Date: 03/26/18

Technician:			E.M.				
Date Sample Placed in Oven:			03/26/2018				
Time in / Out of Oven :			03/26/18	6:00 PM	TO	03/27/18	6:00 PM
Wt. of Wet Soil + Can, grams			390.70				
Wt. of Dry Soil + Can, grams			286.30				
Wt. of Can, grams	No.	304	9.00				
Wt. of Dry Soil, grams			277.30				
Wt. of Moisture, grams			104.40				
Water Content, w%			38%				
Wt. of Dry Soil + Can Before Wash, grams			286.30				
Wt. of Can, grams	No.	304	9.00				
Wt. of Dry Soil Before Wash, grams			277.30				
Time in / Out of Oven :			03/27/18	8:30 PM	TO	03/28/18	8:30 PM
Wt. of Dry Soil + Can After Wash, grams			265.80				
Wt. of Dry Soil After Wash, grams			256.80				
Total Loss, grams			20.50				
Percent Finer Than No. 200 Sieve			7%				

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Fines Content Test performed in general accordance with ASTM D 1140

Respectfully Submitted,
HR Engineering Services, Inc.

USCS Classification:
SP-SM

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Florida Registration No. 42045

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REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: ATLANTIC ISLE BRIDGE **Project No.:** HR16-1211R-2

Boring No.: B-2 **Sample No.:** 7 **Depth:** 13.0'-15.0'

Date: 03/26/18

Technician:		E.M.
Date Sample Placed in Oven:		03/26/2018
Time in / Out of Oven :		03/26/18 6:00 PM TO 03/27/18 6:00 PM
Wt. of Wet Soil + Can, grams		347.20
Wt. of Dry Soil + Can, grams		64.70
Wt. of Can, grams	No. 305	8.90
Wt. of Dry Soil, grams		55.80
Wt. of Moisture, grams		282.50
Water Content, w%		506%
Date Sample Placed in Furnace:		03/28/18
Time in / out of furnace (minimum 6 hrs):		03/28/18 6:00 AM TO 03/28/18 12:00 PM
Weight of Crucible & Oven-Dried Sample:		29.60
Weight of Crucible and Sample After Ignition:		23.10
Weight of Crucible:	No. 11	18.30
Weight of Oven-Dried Soil:		11.30
Weight Loss due to Ignition:		6.50
Percent Organics:		58%

Moisture Content Test performed in general accordance with ASTM D 2216 (AASHTO T 265)
Organic Content Test performed in general accordance with ASTM D 2974 (AASHTO T 267)

Respectfully Submitted,
HR Engineering Services, Inc.

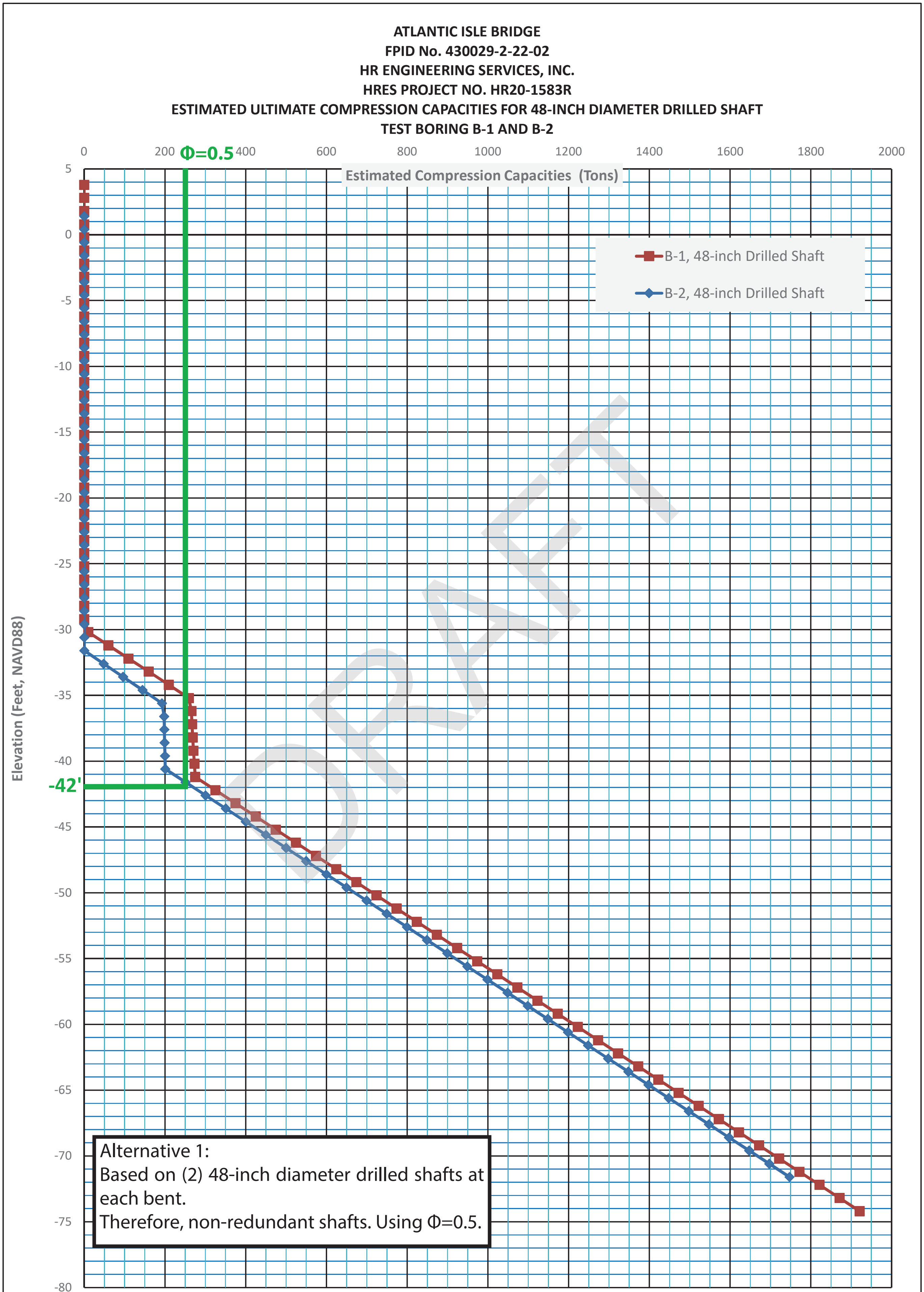
USCS Classification:
ML-OL

Hernando R. Ramos, P.E.
Florida Registration No. 42045

APPENDIX C

ALTERNATIVE 1

REHABILITATION OF EXISTING BRIDGE
DRILLED SHAFT/AUGERCAST PILE/MICROPILE


ATLANTIC ISLE BRIDGE
FPID No. 430029-2-22-02
HR ENGINEERING SERVICES, INC.
HRES PROJECT NO. HR20-1583R
ESTIMATED ULTIMATE COMPRESSION CAPACITIES FOR 48-INCH DIAMETER DRILLED SHAFT
TEST BORING B-1 AND B-2
Estimated Compression Capacities (Tons)
Elevation (Feet, NAVD88)
B-1, 48-inch Drilled Shaft
B-2, 48-inch Drilled Shaft
Φ=0.5
-42'
DRAFT
Alternative 1:
Based on (2) 48-inch diameter drilled shafts at each bent.
Therefore, non-redundant shafts. Using Φ=0.5.

Florida Bridge Software Institute　　　　　　　　　Date: March 05, 2021
Shaft and Pile Analysis (FB-Deep v.2.06)　　　　　　Time: 15:17:49

General Information:

Input file: .....evised II 02-18-21\Bridge\FB-DEEP\Drilled Shaft\B-1_48 inch.in
Project number: HR20-1583R
Job name: Atlantic Isle Bridge
Engineer: Chollada
Units: English

Analysis Information:

Analysis Type: Drilled Shaft Analysis

Soil Information:

Boring date: 12/05/17
Boring number: B-1
Station number: 13+27　Offset: 6.0 RT

Ground Elevation: 4.80(ft)
Water table Elevation = 0.50(ft)

Rock side-friction is calculated using: McVay's method
Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	Elevation (ft)	SPT Blows (Blows/ft)	Unit Weight (pcf)	Soil Type
1	0.00	4.80	N/A	0.00	5- Cavity layer
2	2.00	2.80	N/A	0.00	5- Cavity layer
3	4.00	0.80	N/A	0.00	5- Cavity layer
4	6.00	-1.20	N/A	120.00	5- Cavity layer
5	8.00	-3.20	N/A	120.00	5- Cavity layer
6	10.00	-5.20	N/A	120.00	5- Cavity layer
7	12.00	-7.20	N/A	120.00	5- Cavity layer
8	13.00	-8.20	N/A	120.00	5- Cavity layer
9	13.00	-8.20	N/A	120.00	5- Cavity layer
10	15.00	-10.20	N/A	120.00	5- Cavity layer
11	18.00	-13.20	N/A	120.00	5- Cavity layer
12	21.00	-16.20	N/A	120.00	5- Cavity layer
13	23.00	-18.20	N/A	120.00	5- Cavity layer
14	25.00	-20.20	N/A	120.00	5- Cavity layer
15	28.00	-23.20	N/A	120.00	5- Cavity layer
16	30.00	-25.20	N/A	120.00	5- Cavity layer
17	33.00	-28.20	N/A	120.00	5- Cavity layer
18	34.80	-30.00	N/A	120.00	5- Cavity layer
19	34.80	-30.00	N/A	120.00	4- Lime Stone/Very shelly sand
20	38.00	-33.20	N/A	120.00	4- Lime Stone/Very shelly sand
21	40.00	-35.20	N/A	120.00	4- Lime Stone/Very shelly sand
22	40.10	-35.30	13.00	120.00	3- Clean sand
23	42.00	-37.20	13.00	120.00	3- Clean sand
24	44.00	-39.20	16.00	120.00	3- Clean sand
25	45.90	-41.10	16.00	120.00	3- Clean sand
26	46.00	-41.20	N/A	120.00	4- Lime Stone/Very shelly sand
27	48.00	-43.20	N/A	120.00	4- Lime Stone/Very shelly sand
28	50.00	-45.20	N/A	120.00	4- Lime Stone/Very shelly sand
29	53.00	-48.20	N/A	120.00	4- Lime Stone/Very shelly sand
30	55.00	-50.20	N/A	120.00	4- Lime Stone/Very shelly sand
31	58.00	-53.20	N/A	120.00	4- Lime Stone/Very shelly sand
32	60.00	-55.20	N/A	120.00	4- Lime Stone/Very shelly sand
33	63.00	-58.20	N/A	120.00	4- Lime Stone/Very shelly sand
34	65.00	-60.20	N/A	120.00	4- Lime Stone/Very shelly sand
35	68.00	-63.20	N/A	120.00	4- Lime Stone/Very shelly sand
36	70.00	-65.20	N/A	120.00	4- Lime Stone/Very shelly sand
37	73.00	-68.20	N/A	120.00	4- Lime Stone/Very shelly sand
38	75.00	-70.20	N/A	120.00	4- Lime Stone/Very shelly sand
39	78.00	-73.20	N/A	120.00	4- Lime Stone/Very shelly sand
40	80.00	-75.20	N/A	120.00	4- Lime Stone/Very shelly sand

ID	Cu-DIR (tsf)	qu (tsf)	qt (tsf)	Em (ksi)	qb (tsf)
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A

14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	N/A	17.75	3.55	0.00	0.00
20	N/A	17.75	3.55	0.00	0.00
21	N/A	17.75	3.55	0.00	0.00
22	N/A	N/A	N/A	N/A	N/A
23	N/A	N/A	N/A	N/A	N/A
24	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
26	N/A	17.75	3.55	0.00	0.00
27	N/A	17.75	3.55	0.00	0.00
28	N/A	17.75	3.55	0.00	0.00
29	N/A	17.75	3.55	0.00	0.00
30	N/A	17.75	3.55	0.00	0.00
31	N/A	17.75	3.55	0.00	0.00
32	N/A	17.75	3.55	0.00	0.00
33	N/A	17.75	3.55	0.00	0.00
34	N/A	17.75	3.55	0.00	0.00
35	N/A	17.75	3.55	0.00	0.00
36	N/A	17.75	3.55	0.00	0.00
37	N/A	17.75	3.55	0.00	0.00
38	N/A	17.75	3.55	0.00	0.00
39	N/A	17.75	3.55	0.00	0.00
40	N/A	17.75	3.55	0.00	0.00

ID	RQD F.M.	S.R.I.	Rock Recovery
1	N/A	N/A	N/A
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A
9	N/A	N/A	N/A
10	N/A	N/A	N/A
11	N/A	N/A	N/A
12	N/A	N/A	N/A
13	N/A	N/A	N/A
14	N/A	N/A	N/A
15	N/A	N/A	N/A
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A
19	1.00	ROUGH	1.000
20	1.00	ROUGH	1.000
21	1.00	ROUGH	1.000
22	N/A	N/A	N/A
23	N/A	N/A	N/A
24	N/A	N/A	N/A
25	N/A	N/A	N/A
26	1.00	ROUGH	1.000
27	1.00	ROUGH	1.000
28	1.00	ROUGH	1.000
29	1.00	ROUGH	1.000
30	1.00	ROUGH	1.000
31	1.00	ROUGH	1.000
32	1.00	ROUGH	1.000
33	1.00	ROUGH	1.000
34	1.00	ROUGH	1.000
35	1.00	ROUGH	1.000
36	1.00	ROUGH	1.000
37	1.00	ROUGH	1.000
38	1.00	ROUGH	1.000
39	1.00	ROUGH	1.000
40	1.00	ROUGH	1.000

Drilled Shaft Data:
==================

Unit weight of concrete = 150.00(pcf), Concrete Slump = 6.00(in)
Modulus of Elasticity of concrete = 4000.00(ksi)

Shaft Geometry:

ID	Length (ft)	Tip Elev. (ft)	Case Len. (ft)	Diameter (in)	Base Diam. (in)	Bell Len. (ft)
1	1.00	3.80	0.00	48.00	48.00	0.00
2	2.00	2.80	0.00	48.00	48.00	0.00
3	3.00	1.80	0.00	48.00	48.00	0.00
4	4.00	0.80	0.00	48.00	48.00	0.00
5	5.00	-0.20	0.00	48.00	48.00	0.00
6	6.00	-1.20	0.00	48.00	48.00	0.00
7	7.00	-2.20	0.00	48.00	48.00	0.00
8	8.00	-3.20	0.00	48.00	48.00	0.00

9	9.00	-4.20	0.00	48.00	48.00	0.00
10	10.00	-5.20	0.00	48.00	48.00	0.00
11	11.00	-6.20	0.00	48.00	48.00	0.00
12	12.00	-7.20	0.00	48.00	48.00	0.00
13	13.00	-8.20	0.00	48.00	48.00	0.00
14	14.00	-9.20	0.00	48.00	48.00	0.00
15	15.00	-10.20	0.00	48.00	48.00	0.00
16	16.00	-11.20	0.00	48.00	48.00	0.00
17	17.00	-12.20	0.00	48.00	48.00	0.00
18	18.00	-13.20	0.00	48.00	48.00	0.00
19	19.00	-14.20	0.00	48.00	48.00	0.00
20	20.00	-15.20	0.00	48.00	48.00	0.00
21	21.00	-16.20	0.00	48.00	48.00	0.00
22	22.00	-17.20	0.00	48.00	48.00	0.00
23	23.00	-18.20	0.00	48.00	48.00	0.00
24	24.00	-19.20	0.00	48.00	48.00	0.00
25	25.00	-20.20	0.00	48.00	48.00	0.00
26	26.00	-21.20	0.00	48.00	48.00	0.00
27	27.00	-22.20	0.00	48.00	48.00	0.00
28	28.00	-23.20	0.00	48.00	48.00	0.00
29	29.00	-24.20	0.00	48.00	48.00	0.00
30	30.00	-25.20	0.00	48.00	48.00	0.00
31	31.00	-26.20	0.00	48.00	48.00	0.00
32	32.00	-27.20	0.00	48.00	48.00	0.00
33	33.00	-28.20	0.00	48.00	48.00	0.00
34	34.00	-29.20	0.00	48.00	48.00	0.00
35	35.00	-30.20	0.00	48.00	48.00	0.00
36	36.00	-31.20	0.00	48.00	48.00	0.00
37	37.00	-32.20	0.00	48.00	48.00	0.00
38	38.00	-33.20	0.00	48.00	48.00	0.00
39	39.00	-34.20	0.00	48.00	48.00	0.00
40	40.00	-35.20	0.00	48.00	48.00	0.00
41	41.00	-36.20	0.00	48.00	48.00	0.00
42	42.00	-37.20	0.00	48.00	48.00	0.00
43	43.00	-38.20	0.00	48.00	48.00	0.00
44	44.00	-39.20	0.00	48.00	48.00	0.00
45	45.00	-40.20	0.00	48.00	48.00	0.00
46	46.00	-41.20	0.00	48.00	48.00	0.00
47	47.00	-42.20	0.00	48.00	48.00	0.00
48	48.00	-43.20	0.00	48.00	48.00	0.00
49	49.00	-44.20	0.00	48.00	48.00	0.00
50	50.00	-45.20	0.00	48.00	48.00	0.00
51	51.00	-46.20	0.00	48.00	48.00	0.00
52	52.00	-47.20	0.00	48.00	48.00	0.00
53	53.00	-48.20	0.00	48.00	48.00	0.00
54	54.00	-49.20	0.00	48.00	48.00	0.00
55	55.00	-50.20	0.00	48.00	48.00	0.00
56	56.00	-51.20	0.00	48.00	48.00	0.00
57	57.00	-52.20	0.00	48.00	48.00	0.00
58	58.00	-53.20	0.00	48.00	48.00	0.00
59	59.00	-54.20	0.00	48.00	48.00	0.00
60	60.00	-55.20	0.00	48.00	48.00	0.00
61	61.00	-56.20	0.00	48.00	48.00	0.00
62	62.00	-57.20	0.00	48.00	48.00	0.00
63	63.00	-58.20	0.00	48.00	48.00	0.00
64	64.00	-59.20	0.00	48.00	48.00	0.00
65	65.00	-60.20	0.00	48.00	48.00	0.00
66	66.00	-61.20	0.00	48.00	48.00	0.00
67	67.00	-62.20	0.00	48.00	48.00	0.00
68	68.00	-63.20	0.00	48.00	48.00	0.00
69	69.00	-64.20	0.00	48.00	48.00	0.00
70	70.00	-65.20	0.00	48.00	48.00	0.00
71	71.00	-66.20	0.00	48.00	48.00	0.00
72	72.00	-67.20	0.00	48.00	48.00	0.00
73	73.00	-68.20	0.00	48.00	48.00	0.00
74	74.00	-69.20	0.00	48.00	48.00	0.00
75	75.00	-70.20	0.00	48.00	48.00	0.00
76	76.00	-71.20	0.00	48.00	48.00	0.00
77	77.00	-72.20	0.00	48.00	48.00	0.00
78	78.00	-73.20	0.00	48.00	48.00	0.00
79	79.00	-74.20	0.00	48.00	48.00	0.00

Drilled Shaft Capacity (sorted by shaft diameter):

Strength reduction factors: Skin-friction = 1.00, End-bearing = 0.00

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	48.00	1.00	0.000	0.000	0.000
2	48.00	2.00	0.000	0.000	0.000
3	48.00	3.00	0.000	0.000	0.000
4	48.00	4.00	0.000	0.000	0.000
5	48.00	5.00	0.000	0.000	0.000
6	48.00	6.00	0.000	0.000	0.000
7	48.00	7.00	0.000	0.000	0.000
8	48.00	8.00	0.000	0.000	0.000
9	48.00	9.00	0.000	0.000	0.000
10	48.00	10.00	0.000	0.000	0.000
11	48.00	11.00	0.000	0.000	0.000

12	48.00	12.00	0.000	0.000	0.000
13	48.00	13.00	0.000	0.000	0.000
14	48.00	14.00	0.000	0.000	0.000
15	48.00	15.00	0.000	0.000	0.000
16	48.00	16.00	0.000	0.000	0.000
17	48.00	17.00	0.000	0.000	0.000
18	48.00	18.00	0.000	0.000	0.000
19	48.00	19.00	0.000	0.000	0.000
20	48.00	20.00	0.000	0.000	0.000
21	48.00	21.00	0.000	0.000	0.000
22	48.00	22.00	0.000	0.000	0.000
23	48.00	23.00	0.000	0.000	0.000
24	48.00	24.00	0.000	0.000	0.000
25	48.00	25.00	0.000	0.000	0.000
26	48.00	26.00	0.000	0.000	0.000
27	48.00	27.00	0.000	0.000	0.000
28	48.00	28.00	0.000	0.000	0.000
29	48.00	29.00	0.000	0.000	0.000
30	48.00	30.00	0.000	0.000	0.000
31	48.00	31.00	0.000	0.000	0.000
32	48.00	32.00	0.000	0.000	0.000
33	48.00	33.00	0.000	0.000	0.000
34	48.00	34.00	0.000	0.000	0.000
35	48.00	35.00	9.975	0.000	9.975
36	48.00	36.00	59.851	0.000	59.851
37	48.00	37.00	109.728	0.000	109.728
38	48.00	38.00	159.604	0.000	159.604
39	48.00	39.00	209.480	0.000	209.480
40	48.00	40.00	259.356	0.000	259.356
41	48.00	41.00	265.543	0.000	265.543
42	48.00	42.00	267.073	0.000	267.073
43	48.00	43.00	268.801	0.000	268.801
44	48.00	44.00	270.722	0.000	270.722
45	48.00	45.00	272.826	0.000	272.826
46	48.00	46.00	275.110	0.000	275.110
47	48.00	47.00	324.986	0.000	324.986
48	48.00	48.00	374.862	0.000	374.862
49	48.00	49.00	424.738	0.000	424.738
50	48.00	50.00	474.615	0.000	474.615
51	48.00	51.00	524.491	0.000	524.491
52	48.00	52.00	574.367	0.000	574.367
53	48.00	53.00	624.243	0.000	624.243
54	48.00	54.00	674.119	0.000	674.119
55	48.00	55.00	723.995	0.000	723.995
56	48.00	56.00	773.872	0.000	773.872
57	48.00	57.00	823.748	0.000	823.748
58	48.00	58.00	873.624	0.000	873.624
59	48.00	59.00	923.500	0.000	923.500
60	48.00	60.00	973.376	0.000	973.376
61	48.00	61.00	1023.253	0.000	1023.253
62	48.00	62.00	1073.129	0.000	1073.129
63	48.00	63.00	1123.005	0.000	1123.005
64	48.00	64.00	1172.881	0.000	1172.881
65	48.00	65.00	1222.757	0.000	1222.757
66	48.00	66.00	1272.633	0.000	1272.633
67	48.00	67.00	1322.510	0.000	1322.510
68	48.00	68.00	1372.386	0.000	1372.386
69	48.00	69.00	1422.262	0.000	1422.262
70	48.00	70.00	1472.138	0.000	1472.138
71	48.00	71.00	1522.014	0.000	1522.014
72	48.00	72.00	1571.891	0.000	1571.891
73	48.00	73.00	1621.767	0.000	1621.767
74	48.00	74.00	1671.643	0.000	1671.643
75	48.00	75.00	1721.519	0.000	1721.519
76	48.00	76.00	1771.395	0.000	1771.395
77	48.00	77.00	1821.272	0.000	1821.272
78	48.00	78.00	1871.148	0.000	1871.148
79	48.00	79.00	1921.024	0.000	1921.024

Drilled Shaft Capacity at User-Defined Settlement (sorted by shaft diameter):

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***** Capacity is NOT modified by the strength reduction factors *****

User-Defined Settlement = 0.00%

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	48.00	1.00	0.000	0.000	0.000
2	48.00	2.00	0.000	0.000	0.000
3	48.00	3.00	0.000	0.000	0.000
4	48.00	4.00	0.000	0.000	0.000
5	48.00	5.00	0.000	0.000	0.000
6	48.00	6.00	0.000	0.000	0.000
7	48.00	7.00	0.000	0.000	0.000
8	48.00	8.00	0.000	0.000	0.000
9	48.00	9.00	0.000	0.000	0.000
10	48.00	10.00	0.000	0.000	0.000
11	48.00	11.00	0.000	0.000	0.000

12	48.00	12.00	0.000	0.000	0.000
13	48.00	13.00	0.000	0.000	0.000
14	48.00	14.00	0.000	0.000	0.000
15	48.00	15.00	0.000	0.000	0.000
16	48.00	16.00	0.000	0.000	0.000
17	48.00	17.00	0.000	0.000	0.000
18	48.00	18.00	0.000	0.000	0.000
19	48.00	19.00	0.000	0.000	0.000
20	48.00	20.00	0.000	0.000	0.000
21	48.00	21.00	0.000	0.000	0.000
22	48.00	22.00	0.000	0.000	0.000
23	48.00	23.00	0.000	0.000	0.000
24	48.00	24.00	0.000	0.000	0.000
25	48.00	25.00	0.000	0.000	0.000
26	48.00	26.00	0.000	0.000	0.000
27	48.00	27.00	0.000	0.000	0.000
28	48.00	28.00	0.000	0.000	0.000
29	48.00	29.00	0.000	0.000	0.000
30	48.00	30.00	0.000	0.000	0.000
31	48.00	31.00	0.000	0.000	0.000
32	48.00	32.00	0.000	0.000	0.000
33	48.00	33.00	0.000	0.000	0.000
34	48.00	34.00	0.000	0.000	0.000
35	48.00	35.00	-nan(ind)	-nan(ind)	-nan(ind)
36	48.00	36.00	-nan(ind)	-nan(ind)	-nan(ind)
37	48.00	37.00	-nan(ind)	-nan(ind)	-nan(ind)
38	48.00	38.00	-nan(ind)	-nan(ind)	-nan(ind)
39	48.00	39.00	-nan(ind)	-nan(ind)	-nan(ind)
40	48.00	40.00	-nan(ind)	-nan(ind)	-nan(ind)
41	48.00	41.00	-nan(ind)	0.000	-nan(ind)
42	48.00	42.00	-nan(ind)	0.000	-nan(ind)
43	48.00	43.00	-nan(ind)	0.000	-nan(ind)
44	48.00	44.00	-nan(ind)	0.000	-nan(ind)
45	48.00	45.00	-nan(ind)	0.000	-nan(ind)
46	48.00	46.00	-nan(ind)	-nan(ind)	-nan(ind)
47	48.00	47.00	-nan(ind)	-nan(ind)	-nan(ind)
48	48.00	48.00	-nan(ind)	-nan(ind)	-nan(ind)
49	48.00	49.00	-nan(ind)	-nan(ind)	-nan(ind)
50	48.00	50.00	-nan(ind)	-nan(ind)	-nan(ind)
51	48.00	51.00	-nan(ind)	-nan(ind)	-nan(ind)
52	48.00	52.00	-nan(ind)	-nan(ind)	-nan(ind)
53	48.00	53.00	-nan(ind)	-nan(ind)	-nan(ind)
54	48.00	54.00	-nan(ind)	-nan(ind)	-nan(ind)
55	48.00	55.00	-nan(ind)	-nan(ind)	-nan(ind)
56	48.00	56.00	-nan(ind)	-nan(ind)	-nan(ind)
57	48.00	57.00	-nan(ind)	-nan(ind)	-nan(ind)
58	48.00	58.00	-nan(ind)	-nan(ind)	-nan(ind)
59	48.00	59.00	-nan(ind)	-nan(ind)	-nan(ind)
60	48.00	60.00	-nan(ind)	-nan(ind)	-nan(ind)
61	48.00	61.00	-nan(ind)	-nan(ind)	-nan(ind)
62	48.00	62.00	-nan(ind)	-nan(ind)	-nan(ind)
63	48.00	63.00	-nan(ind)	-nan(ind)	-nan(ind)
64	48.00	64.00	-nan(ind)	-nan(ind)	-nan(ind)
65	48.00	65.00	-nan(ind)	-nan(ind)	-nan(ind)
66	48.00	66.00	-nan(ind)	-nan(ind)	-nan(ind)
67	48.00	67.00	-nan(ind)	-nan(ind)	-nan(ind)
68	48.00	68.00	-nan(ind)	-nan(ind)	-nan(ind)
69	48.00	69.00	-nan(ind)	-nan(ind)	-nan(ind)
70	48.00	70.00	-nan(ind)	-nan(ind)	-nan(ind)
71	48.00	71.00	-nan(ind)	-nan(ind)	-nan(ind)
72	48.00	72.00	-nan(ind)	-nan(ind)	-nan(ind)
73	48.00	73.00	-nan(ind)	-nan(ind)	-nan(ind)
74	48.00	74.00	-nan(ind)	-nan(ind)	-nan(ind)
75	48.00	75.00	-nan(ind)	-nan(ind)	-nan(ind)
76	48.00	76.00	-nan(ind)	-nan(ind)	-nan(ind)
77	48.00	77.00	-nan(ind)	-nan(ind)	-nan(ind)
78	48.00	78.00	-nan(ind)	-nan(ind)	-nan(ind)
79	48.00	79.00	-nan(ind)	-nan(ind)	-nan(ind)

General Information:

Input file: .....evised II 02-18-21\Bridge\FB-DEEP\Drilled Shaft\B-2_48 inch.in
Project number: HR20-1583R
Job name: Atlantic Isle Bridge
Engineer: Chollada
Units: English

Analysis Information:

Analysis Type: Drilled Shaft Analysis

Soil Information:

Boring date: 12/04/17
Boring number: B-2
Station number: 14+10 Offset: 20.0 RT

Ground Elevation: 2.40(ft)
Water table Elevation = 0.50(ft)

Rock side-friction is calculated using: McVay's method
Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	Elevation (ft)	SPT Blows (Blows/ft)	Unit Weight (pcf)	Soil Type
1	0.00	2.40	N/A	0.00	5- Cavity layer
2	2.00	0.40	N/A	0.00	5- Cavity layer
3	4.00	-1.60	N/A	0.00	5- Cavity layer
4	6.00	-3.60	N/A	120.00	5- Cavity layer
5	8.00	-5.60	N/A	120.00	5- Cavity layer
6	10.00	-7.60	N/A	120.00	5- Cavity layer
7	13.00	-10.60	N/A	120.00	5- Cavity layer
8	15.00	-12.60	N/A	120.00	5- Cavity layer
9	16.00	-13.60	N/A	120.00	5- Cavity layer
10	17.00	-14.60	N/A	120.00	5- Cavity layer
11	18.00	-15.60	N/A	120.00	5- Cavity layer
12	20.00	-17.60	N/A	120.00	5- Cavity layer
13	23.00	-20.60	N/A	120.00	5- Cavity layer
14	25.00	-22.60	N/A	120.00	5- Cavity layer
15	28.00	-25.60	N/A	120.00	5- Cavity layer
16	30.00	-27.60	N/A	120.00	5- Cavity layer
17	32.40	-30.00	N/A	120.00	5- Cavity layer
18	32.40	-30.00	10.00	120.00	3- Clean sand
19	33.00	-30.60	10.00	120.00	3- Clean sand
20	34.00	-31.60	N/A	120.00	4- Lime Stone/Very shelly sand
21	35.00	-32.60	N/A	120.00	4- Lime Stone/Very shelly sand
22	38.00	-35.60	N/A	120.00	4- Lime Stone/Very shelly sand
23	38.10	-35.70	3.00	101.26	3- Clean sand
24	40.00	-37.60	3.00	101.26	3- Clean sand
25	42.00	-39.60	6.00	104.51	3- Clean sand
26	42.90	-40.50	6.00	104.51	3- Clean sand
27	43.00	-40.60	N/A	120.00	4- Lime Stone/Very shelly sand
28	45.00	-42.60	N/A	120.00	4- Lime Stone/Very shelly sand
29	48.00	-45.60	N/A	120.00	4- Lime Stone/Very shelly sand
30	50.00	-47.60	N/A	120.00	4- Lime Stone/Very shelly sand
31	53.00	-50.60	N/A	120.00	4- Lime Stone/Very shelly sand
32	55.00	-52.60	N/A	120.00	4- Lime Stone/Very shelly sand
33	58.00	-55.60	N/A	120.00	4- Lime Stone/Very shelly sand
34	60.00	-57.60	N/A	120.00	4- Lime Stone/Very shelly sand
35	62.00	-59.60	N/A	120.00	4- Lime Stone/Very shelly sand
36	65.00	-62.60	N/A	120.00	4- Lime Stone/Very shelly sand
37	68.00	-65.60	N/A	120.00	4- Lime Stone/Very shelly sand
38	70.00	-67.60	N/A	120.00	4- Lime Stone/Very shelly sand
39	73.00	-70.60	N/A	120.00	4- Lime Stone/Very shelly sand
40	75.00	-72.60	10.00	120.00	3- Clean sand
41	78.00	-75.60	19.00	120.00	3- Clean sand
42	80.00	-77.60	N/A	120.00	4- Lime Stone/Very shelly sand

ID	Cu-DIR (tsf)	qu (tsf)	qt (tsf)	Em (ksi)	qb (tsf)
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A

12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A
14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	N/A	N/A	N/A	N/A	N/A
20	N/A	17.19	3.40	0.00	0.00
21	N/A	17.19	3.40	0.00	0.00
22	N/A	17.75	3.55	0.00	0.00
23	N/A	N/A	N/A	N/A	N/A
24	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
26	N/A	N/A	N/A	N/A	N/A
27	N/A	17.75	3.55	0.00	0.00
28	N/A	17.75	3.55	0.00	0.00
29	N/A	17.75	3.55	0.00	0.00
30	N/A	17.75	3.55	0.00	0.00
31	N/A	17.75	3.55	0.00	0.00
32	N/A	17.75	3.55	0.00	0.00
33	N/A	17.75	3.55	0.00	0.00
34	N/A	17.75	3.55	0.00	0.00
35	N/A	17.75	3.55	0.00	0.00
36	N/A	17.75	3.55	0.00	0.00
37	N/A	17.75	3.55	0.00	0.00
38	N/A	17.75	3.55	0.00	0.00
39	N/A	17.75	3.55	0.00	0.00
40	N/A	N/A	N/A	N/A	N/A
41	N/A	N/A	N/A	N/A	N/A
42	N/A	17.75	3.55	0.00	0.00

ID	RQD F.M.	S.R.I.	Rock Recovery
1	N/A	N/A	N/A
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A
9	N/A	N/A	N/A
10	N/A	N/A	N/A
11	N/A	N/A	N/A
12	N/A	N/A	N/A
13	N/A	N/A	N/A
14	N/A	N/A	N/A
15	N/A	N/A	N/A
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A
19	N/A	N/A	N/A
20	1.00	ROUGH	1.000
21	1.00	ROUGH	1.000
22	1.00	ROUGH	1.000
23	N/A	N/A	N/A
24	N/A	N/A	N/A
25	N/A	N/A	N/A
26	N/A	N/A	N/A
27	1.00	ROUGH	1.000
28	1.00	ROUGH	1.000
29	1.00	ROUGH	1.000
30	1.00	ROUGH	1.000
31	1.00	ROUGH	1.000
32	1.00	ROUGH	1.000
33	1.00	ROUGH	1.000
34	1.00	ROUGH	1.000
35	1.00	ROUGH	1.000
36	1.00	ROUGH	1.000
37	1.00	ROUGH	1.000
38	1.00	ROUGH	1.000
39	1.00	ROUGH	1.000
40	N/A	N/A	N/A
41	N/A	N/A	N/A
42	1.00	ROUGH	1.000

Drilled Shaft Data:
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Unit weight of concrete = 150.00(pcf), Concrete Slump = 6.00(in)
Modulus of Elasticity of concrete = 4000.00(ksi)

Shaft Geometry:

ID	Length (ft)	Tip Elev. (ft)	Case Len. (ft)	Diameter (in)	Base Diam. (in)	Bell Len. (ft)
1	1.00	1.40	0.00	48.00	48.00	0.00
2	2.00	0.40	0.00	48.00	48.00	0.00

3	3.00	-0.60	0.00	48.00	48.00	0.00
4	4.00	-1.60	0.00	48.00	48.00	0.00
5	5.00	-2.60	0.00	48.00	48.00	0.00
6	6.00	-3.60	0.00	48.00	48.00	0.00
7	7.00	-4.60	0.00	48.00	48.00	0.00
8	8.00	-5.60	0.00	48.00	48.00	0.00
9	9.00	-6.60	0.00	48.00	48.00	0.00
10	10.00	-7.60	0.00	48.00	48.00	0.00
11	11.00	-8.60	0.00	48.00	48.00	0.00
12	12.00	-9.60	0.00	48.00	48.00	0.00
13	13.00	-10.60	0.00	48.00	48.00	0.00
14	14.00	-11.60	0.00	48.00	48.00	0.00
15	15.00	-12.60	0.00	48.00	48.00	0.00
16	16.00	-13.60	0.00	48.00	48.00	0.00
17	17.00	-14.60	0.00	48.00	48.00	0.00
18	18.00	-15.60	0.00	48.00	48.00	0.00
19	19.00	-16.60	0.00	48.00	48.00	0.00
20	20.00	-17.60	0.00	48.00	48.00	0.00
21	21.00	-18.60	0.00	48.00	48.00	0.00
22	22.00	-19.60	0.00	48.00	48.00	0.00
23	23.00	-20.60	0.00	48.00	48.00	0.00
24	24.00	-21.60	0.00	48.00	48.00	0.00
25	25.00	-22.60	0.00	48.00	48.00	0.00
26	26.00	-23.60	0.00	48.00	48.00	0.00
27	27.00	-24.60	0.00	48.00	48.00	0.00
28	28.00	-25.60	0.00	48.00	48.00	0.00
29	29.00	-26.60	0.00	48.00	48.00	0.00
30	30.00	-27.60	0.00	48.00	48.00	0.00
31	31.00	-28.60	0.00	48.00	48.00	0.00
32	32.00	-29.60	0.00	48.00	48.00	0.00
33	33.00	-30.60	0.00	48.00	48.00	0.00
34	34.00	-31.60	0.00	48.00	48.00	0.00
35	35.00	-32.60	0.00	48.00	48.00	0.00
36	36.00	-33.60	0.00	48.00	48.00	0.00
37	37.00	-34.60	0.00	48.00	48.00	0.00
38	38.00	-35.60	0.00	48.00	48.00	0.00
39	39.00	-36.60	0.00	48.00	48.00	0.00
40	40.00	-37.60	0.00	48.00	48.00	0.00
41	41.00	-38.60	0.00	48.00	48.00	0.00
42	42.00	-39.60	0.00	48.00	48.00	0.00
43	43.00	-40.60	0.00	48.00	48.00	0.00
44	44.00	-41.60	0.00	48.00	48.00	0.00
45	45.00	-42.60	0.00	48.00	48.00	0.00
46	46.00	-43.60	0.00	48.00	48.00	0.00
47	47.00	-44.60	0.00	48.00	48.00	0.00
48	48.00	-45.60	0.00	48.00	48.00	0.00
49	49.00	-46.60	0.00	48.00	48.00	0.00
50	50.00	-47.60	0.00	48.00	48.00	0.00
51	51.00	-48.60	0.00	48.00	48.00	0.00
52	52.00	-49.60	0.00	48.00	48.00	0.00
53	53.00	-50.60	0.00	48.00	48.00	0.00
54	54.00	-51.60	0.00	48.00	48.00	0.00
55	55.00	-52.60	0.00	48.00	48.00	0.00
56	56.00	-53.60	0.00	48.00	48.00	0.00
57	57.00	-54.60	0.00	48.00	48.00	0.00
58	58.00	-55.60	0.00	48.00	48.00	0.00
59	59.00	-56.60	0.00	48.00	48.00	0.00
60	60.00	-57.60	0.00	48.00	48.00	0.00
61	61.00	-58.60	0.00	48.00	48.00	0.00
62	62.00	-59.60	0.00	48.00	48.00	0.00
63	63.00	-60.60	0.00	48.00	48.00	0.00
64	64.00	-61.60	0.00	48.00	48.00	0.00
65	65.00	-62.60	0.00	48.00	48.00	0.00
66	66.00	-63.60	0.00	48.00	48.00	0.00
67	67.00	-64.60	0.00	48.00	48.00	0.00
68	68.00	-65.60	0.00	48.00	48.00	0.00
69	69.00	-66.60	0.00	48.00	48.00	0.00
70	70.00	-67.60	0.00	48.00	48.00	0.00
71	71.00	-68.60	0.00	48.00	48.00	0.00
72	72.00	-69.60	0.00	48.00	48.00	0.00
73	73.00	-70.60	0.00	48.00	48.00	0.00
74	74.00	-71.60	0.00	48.00	48.00	0.00

Drilled Shaft Capacity (sorted by shaft diameter):
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Strength reduction factors: Skin-friction = 1.00, End-bearing = 0.00

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	48.00	1.00	0.000	0.000	0.000
2	48.00	2.00	0.000	0.000	0.000
3	48.00	3.00	0.000	0.000	0.000
4	48.00	4.00	0.000	0.000	0.000
5	48.00	5.00	0.000	0.000	0.000
6	48.00	6.00	0.000	0.000	0.000
7	48.00	7.00	0.000	0.000	0.000
8	48.00	8.00	0.000	0.000	0.000
9	48.00	9.00	0.000	0.000	0.000
10	48.00	10.00	0.000	0.000	0.000

11	48.00	11.00	0.000	0.000	0.000
12	48.00	12.00	0.000	0.000	0.000
13	48.00	13.00	0.000	0.000	0.000
14	48.00	14.00	0.000	0.000	0.000
15	48.00	15.00	0.000	0.000	0.000
16	48.00	16.00	0.000	0.000	0.000
17	48.00	17.00	0.000	0.000	0.000
18	48.00	18.00	0.000	0.000	0.000
19	48.00	19.00	0.000	0.000	0.000
20	48.00	20.00	0.000	0.000	0.000
21	48.00	21.00	0.000	0.000	0.000
22	48.00	22.00	0.000	0.000	0.000
23	48.00	23.00	0.000	0.000	0.000
24	48.00	24.00	0.000	0.000	0.000
25	48.00	25.00	0.000	0.000	0.000
26	48.00	26.00	0.000	0.000	0.000
27	48.00	27.00	0.000	0.000	0.000
28	48.00	28.00	0.000	0.000	0.000
29	48.00	29.00	0.000	0.000	0.000
30	48.00	30.00	0.000	0.000	0.000
31	48.00	31.00	0.000	0.000	0.000
32	48.00	32.00	0.000	0.000	0.000
33	48.00	33.00	0.039	0.000	0.039
34	48.00	34.00	0.276	0.000	0.276
35	48.00	35.00	48.311	0.000	48.311
36	48.00	36.00	96.346	0.000	96.346
37	48.00	37.00	144.381	0.000	144.381
38	48.00	38.00	192.415	0.000	192.415
39	48.00	39.00	197.892	0.000	197.892
40	48.00	40.00	198.493	0.000	198.493
41	48.00	41.00	199.155	0.000	199.155
42	48.00	42.00	199.879	0.000	199.879
43	48.00	43.00	200.846	0.000	200.846
44	48.00	44.00	250.722	0.000	250.722
45	48.00	45.00	300.599	0.000	300.599
46	48.00	46.00	350.475	0.000	350.475
47	48.00	47.00	400.351	0.000	400.351
48	48.00	48.00	450.227	0.000	450.227
49	48.00	49.00	500.103	0.000	500.103
50	48.00	50.00	549.980	0.000	549.980
51	48.00	51.00	599.856	0.000	599.856
52	48.00	52.00	649.732	0.000	649.732
53	48.00	53.00	699.608	0.000	699.608
54	48.00	54.00	749.484	0.000	749.484
55	48.00	55.00	799.360	0.000	799.360
56	48.00	56.00	849.237	0.000	849.237
57	48.00	57.00	899.113	0.000	899.113
58	48.00	58.00	948.989	0.000	948.989
59	48.00	59.00	998.865	0.000	998.865
60	48.00	60.00	1048.741	0.000	1048.741
61	48.00	61.00	1098.618	0.000	1098.618
62	48.00	62.00	1148.494	0.000	1148.494
63	48.00	63.00	1198.370	0.000	1198.370
64	48.00	64.00	1248.246	0.000	1248.246
65	48.00	65.00	1298.122	0.000	1298.122
66	48.00	66.00	1347.999	0.000	1347.999
67	48.00	67.00	1397.875	0.000	1397.875
68	48.00	68.00	1447.751	0.000	1447.751
69	48.00	69.00	1497.627	0.000	1497.627
70	48.00	70.00	1547.503	0.000	1547.503
71	48.00	71.00	1597.379	0.000	1597.379
72	48.00	72.00	1647.256	0.000	1647.256
73	48.00	73.00	1697.132	0.000	1697.132
74	48.00	74.00	1747.008	0.000	1747.008

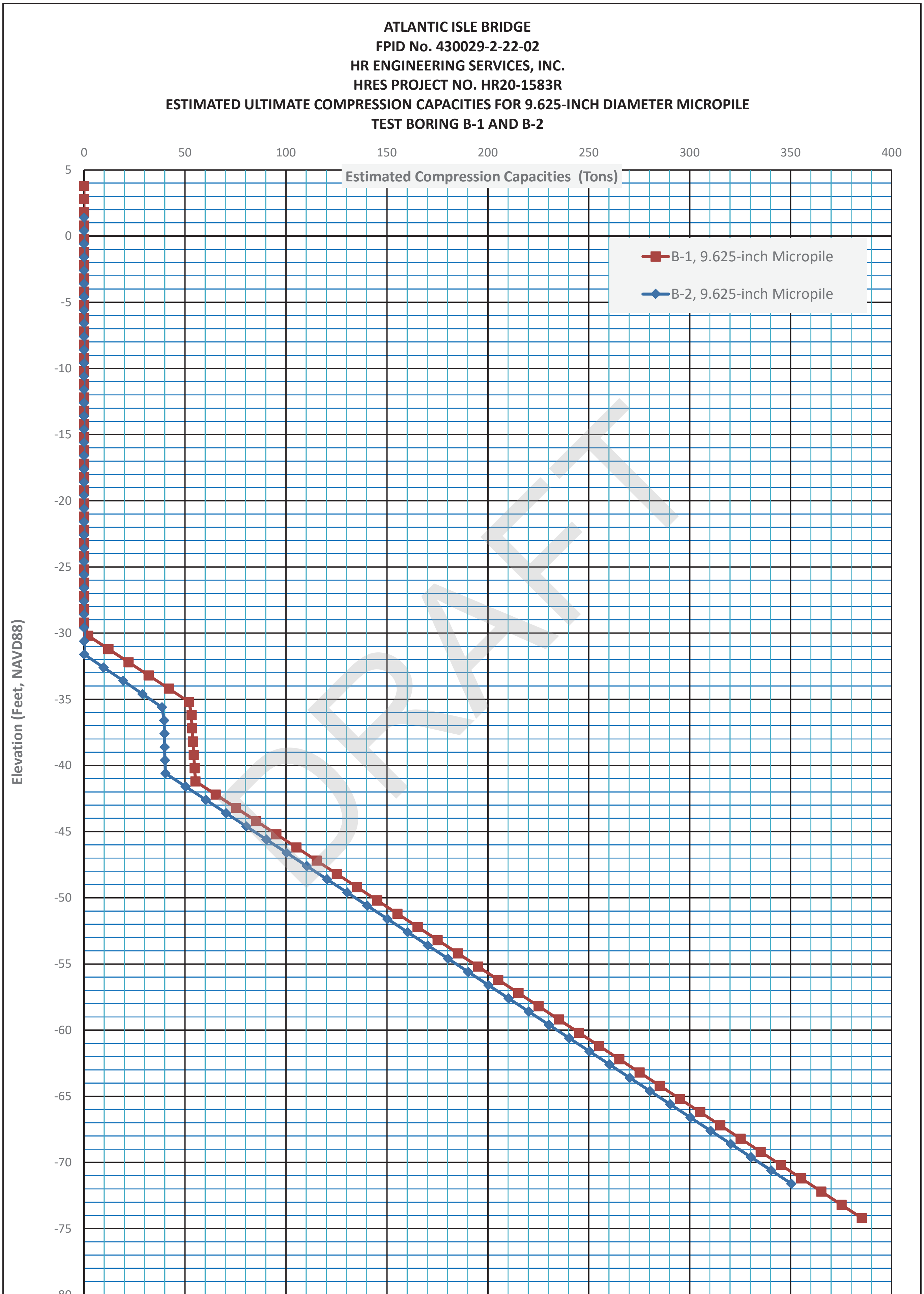
Drilled Shaft Capacity at User-Defined Settlement (sorted by shaft diameter):

***** Capacity is NOT modified by the strength reduction factors *****

User-Defined Settlement = 0.00%

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	48.00	1.00	0.000	0.000	0.000
2	48.00	2.00	0.000	0.000	0.000
3	48.00	3.00	0.000	0.000	0.000
4	48.00	4.00	0.000	0.000	0.000
5	48.00	5.00	0.000	0.000	0.000
6	48.00	6.00	0.000	0.000	0.000
7	48.00	7.00	0.000	0.000	0.000
8	48.00	8.00	0.000	0.000	0.000
9	48.00	9.00	0.000	0.000	0.000
10	48.00	10.00	0.000	0.000	0.000
11	48.00	11.00	0.000	0.000	0.000
12	48.00	12.00	0.000	0.000	0.000
13	48.00	13.00	0.000	0.000	0.000
14	48.00	14.00	0.000	0.000	0.000
15	48.00	15.00	0.000	0.000	0.000

16	48.00	16.00	0.000	0.000	0.000
17	48.00	17.00	0.000	0.000	0.000
18	48.00	18.00	0.000	0.000	0.000
19	48.00	19.00	0.000	0.000	0.000
20	48.00	20.00	0.000	0.000	0.000
21	48.00	21.00	0.000	0.000	0.000
22	48.00	22.00	0.000	0.000	0.000
23	48.00	23.00	0.000	0.000	0.000
24	48.00	24.00	0.000	0.000	0.000
25	48.00	25.00	0.000	0.000	0.000
26	48.00	26.00	0.000	0.000	0.000
27	48.00	27.00	0.000	0.000	0.000
28	48.00	28.00	0.000	0.000	0.000
29	48.00	29.00	0.000	0.000	0.000
30	48.00	30.00	0.000	0.000	0.000
31	48.00	31.00	0.000	0.000	0.000
32	48.00	32.00	0.000	0.000	0.000
33	48.00	33.00	0.000	0.000	0.000
34	48.00	34.00	0.000	0.000	0.000
35	48.00	35.00	0.000	0.000	0.000
36	48.00	36.00	0.000	0.000	0.000
37	48.00	37.00	0.000	0.000	0.000
38	48.00	38.00	0.000	0.000	0.000
39	48.00	39.00	0.000	0.000	0.000
40	48.00	40.00	0.000	0.000	0.000
41	48.00	41.00	0.000	0.000	0.000
42	48.00	42.00	0.000	0.000	0.000
43	48.00	43.00	0.000	0.000	0.000
44	48.00	44.00	0.000	0.000	0.000
45	48.00	45.00	0.000	0.000	0.000
46	48.00	46.00	0.000	0.000	0.000
47	48.00	47.00	0.000	0.000	0.000
48	48.00	48.00	0.000	0.000	0.000
49	48.00	49.00	0.000	0.000	0.000
50	48.00	50.00	0.000	0.000	0.000
51	48.00	51.00	0.000	0.000	0.000
52	48.00	52.00	0.000	0.000	0.000
53	48.00	53.00	0.000	0.000	0.000
54	48.00	54.00	0.000	0.000	0.000
55	48.00	55.00	0.000	0.000	0.000
56	48.00	56.00	0.000	0.000	0.000
57	48.00	57.00	0.000	0.000	0.000
58	48.00	58.00	0.000	0.000	0.000
59	48.00	59.00	0.000	0.000	0.000
60	48.00	60.00	0.000	0.000	0.000
61	48.00	61.00	0.000	0.000	0.000
62	48.00	62.00	0.000	0.000	0.000
63	48.00	63.00	0.000	0.000	0.000
64	48.00	64.00	0.000	0.000	0.000
65	48.00	65.00	0.000	0.000	0.000
66	48.00	66.00	0.000	0.000	0.000
67	48.00	67.00	0.000	0.000	0.000
68	48.00	68.00	0.000	0.000	0.000
69	48.00	69.00	0.000	0.000	0.000
70	48.00	70.00	0.000	0.000	0.000
71	48.00	71.00	0.000	0.000	0.000
72	48.00	72.00	0.000	0.000	0.000
73	48.00	73.00	0.000	0.000	0.000
74	48.00	74.00	0.000	0.000	0.000


ATLANTIC ISLE BRIDGE
FPID No. 430029-2-22-02
HR ENGINEERING SERVICES, INC.
HRES PROJECT NO. HR20-1583R
ESTIMATED ULTIMATE COMPRESSION CAPACITIES FOR 9.625-INCH DIAMETER MICROPILE
TEST BORING B-1 AND B-2
Estimated Compression Capacities (Tons)
Elevation (Feet, NAVD88)
B-1, 9.625-inch Micropile
B-2, 9.625-inch Micropile
0
50
100
150
200
250
300
350
400
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
-75
-80
DRAFT

General Information:
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Input file: .....Revised II 02-18-21\Bridge\FB-DEEP\Micropile\B-1_9.625 inch.in
Project number: HR20-1583R
Job name: Atlantic Isle Bridge
Engineer: Chollada
Units: English

Analysis Information:
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Analysis Type: Drilled Shaft Analysis

Soil Information:
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Boring date: 12/05/17
Boring number: B-1
Station number: 13+27 Offset: 6.0 RT

Ground Elevation: 4.80(ft)
Water table Elevation = 0.50(ft)

Rock side-friction is calculated using: McVay's method
Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	Elevation (ft)	SPT Blows (Blows/ft)	Unit Weight (pcf)	Soil Type
1	0.00	4.80	N/A	0.00	5- Cavity layer
2	2.00	2.80	N/A	0.00	5- Cavity layer
3	4.00	0.80	N/A	0.00	5- Cavity layer
4	6.00	-1.20	N/A	120.00	5- Cavity layer
5	8.00	-3.20	N/A	120.00	5- Cavity layer
6	10.00	-5.20	N/A	120.00	5- Cavity layer
7	12.00	-7.20	N/A	120.00	5- Cavity layer
8	13.00	-8.20	N/A	120.00	5- Cavity layer
9	13.00	-8.20	N/A	120.00	5- Cavity layer
10	15.00	-10.20	N/A	120.00	5- Cavity layer
11	18.00	-13.20	N/A	120.00	5- Cavity layer
12	21.00	-16.20	N/A	120.00	5- Cavity layer
13	23.00	-18.20	N/A	120.00	5- Cavity layer
14	25.00	-20.20	N/A	120.00	5- Cavity layer
15	28.00	-23.20	N/A	120.00	5- Cavity layer
16	30.00	-25.20	N/A	120.00	5- Cavity layer
17	33.00	-28.20	N/A	120.00	5- Cavity layer
18	34.80	-30.00	N/A	120.00	5- Cavity layer
19	34.80	-30.00	N/A	120.00	4- Lime Stone/Very shelly sand
20	38.00	-33.20	N/A	120.00	4- Lime Stone/Very shelly sand
21	40.00	-35.20	N/A	120.00	4- Lime Stone/Very shelly sand
22	40.10	-35.30	13.00	120.00	3- Clean sand
23	42.00	-37.20	13.00	120.00	3- Clean sand
24	44.00	-39.20	16.00	120.00	3- Clean sand
25	45.90	-41.10	16.00	120.00	3- Clean sand
26	46.00	-41.20	N/A	120.00	4- Lime Stone/Very shelly sand
27	48.00	-43.20	N/A	120.00	4- Lime Stone/Very shelly sand
28	50.00	-45.20	N/A	120.00	4- Lime Stone/Very shelly sand
29	53.00	-48.20	N/A	120.00	4- Lime Stone/Very shelly sand
30	55.00	-50.20	N/A	120.00	4- Lime Stone/Very shelly sand
31	58.00	-53.20	N/A	120.00	4- Lime Stone/Very shelly sand
32	60.00	-55.20	N/A	120.00	4- Lime Stone/Very shelly sand
33	63.00	-58.20	N/A	120.00	4- Lime Stone/Very shelly sand
34	65.00	-60.20	N/A	120.00	4- Lime Stone/Very shelly sand
35	68.00	-63.20	N/A	120.00	4- Lime Stone/Very shelly sand
36	70.00	-65.20	N/A	120.00	4- Lime Stone/Very shelly sand
37	73.00	-68.20	N/A	120.00	4- Lime Stone/Very shelly sand
38	75.00	-70.20	N/A	120.00	4- Lime Stone/Very shelly sand
39	78.00	-73.20	N/A	120.00	4- Lime Stone/Very shelly sand
40	80.00	-75.20	N/A	120.00	4- Lime Stone/Very shelly sand

ID	Cu-DIR (tsf)	qu (tsf)	qt (tsf)	Em (ksi)	qb (tsf)
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A

14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	N/A	17.75	3.55	0.00	0.00
20	N/A	17.75	3.55	0.00	0.00
21	N/A	17.75	3.55	0.00	0.00
22	N/A	N/A	N/A	N/A	N/A
23	N/A	N/A	N/A	N/A	N/A
24	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
26	N/A	17.75	3.55	0.00	0.00
27	N/A	17.75	3.55	0.00	0.00
28	N/A	17.75	3.55	0.00	0.00
29	N/A	17.75	3.55	0.00	0.00
30	N/A	17.75	3.55	0.00	0.00
31	N/A	17.75	3.55	0.00	0.00
32	N/A	17.75	3.55	0.00	0.00
33	N/A	17.75	3.55	0.00	0.00
34	N/A	17.75	3.55	0.00	0.00
35	N/A	17.75	3.55	0.00	0.00
36	N/A	17.75	3.55	0.00	0.00
37	N/A	17.75	3.55	0.00	0.00
38	N/A	17.75	3.55	0.00	0.00
39	N/A	17.75	3.55	0.00	0.00
40	N/A	17.75	3.55	0.00	0.00

ID	RQD F.M.	S.R.I.	Rock Recovery
1	N/A	N/A	N/A
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A
9	N/A	N/A	N/A
10	N/A	N/A	N/A
11	N/A	N/A	N/A
12	N/A	N/A	N/A
13	N/A	N/A	N/A
14	N/A	N/A	N/A
15	N/A	N/A	N/A
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A
19	1.00	ROUGH	1.000
20	1.00	ROUGH	1.000
21	1.00	ROUGH	1.000
22	N/A	N/A	N/A
23	N/A	N/A	N/A
24	N/A	N/A	N/A
25	N/A	N/A	N/A
26	1.00	ROUGH	1.000
27	1.00	ROUGH	1.000
28	1.00	ROUGH	1.000
29	1.00	ROUGH	1.000
30	1.00	ROUGH	1.000
31	1.00	ROUGH	1.000
32	1.00	ROUGH	1.000
33	1.00	ROUGH	1.000
34	1.00	ROUGH	1.000
35	1.00	ROUGH	1.000
36	1.00	ROUGH	1.000
37	1.00	ROUGH	1.000
38	1.00	ROUGH	1.000
39	1.00	ROUGH	1.000
40	1.00	ROUGH	1.000

Drilled Shaft Data:

Unit weight of concrete = 150.00(pcf), Concrete Slump = 6.00(in)
Modulus of Elasticity of concrete = 4000.00(ksi)

Shaft Geometry:

ID	Length (ft)	Tip Elev. (ft)	Case Len. (ft)	Diameter (in)	Base Diam. (in)	Bell Len. (ft)
1	1.00	3.80	0.00	9.63	9.63	0.00
2	2.00	2.80	0.00	9.63	9.63	0.00
3	3.00	1.80	0.00	9.63	9.63	0.00
4	4.00	0.80	0.00	9.63	9.63	0.00
5	5.00	-0.20	0.00	9.63	9.63	0.00
6	6.00	-1.20	0.00	9.63	9.63	0.00
7	7.00	-2.20	0.00	9.63	9.63	0.00
8	8.00	-3.20	0.00	9.63	9.63	0.00

9	9.00	-4.20	0.00	9.63	9.63	0.00
10	10.00	-5.20	0.00	9.63	9.63	0.00
11	11.00	-6.20	0.00	9.63	9.63	0.00
12	12.00	-7.20	0.00	9.63	9.63	0.00
13	13.00	-8.20	0.00	9.63	9.63	0.00
14	14.00	-9.20	0.00	9.63	9.63	0.00
15	15.00	-10.20	0.00	9.63	9.63	0.00
16	16.00	-11.20	0.00	9.63	9.63	0.00
17	17.00	-12.20	0.00	9.63	9.63	0.00
18	18.00	-13.20	0.00	9.63	9.63	0.00
19	19.00	-14.20	0.00	9.63	9.63	0.00
20	20.00	-15.20	0.00	9.63	9.63	0.00
21	21.00	-16.20	0.00	9.63	9.63	0.00
22	22.00	-17.20	0.00	9.63	9.63	0.00
23	23.00	-18.20	0.00	9.63	9.63	0.00
24	24.00	-19.20	0.00	9.63	9.63	0.00
25	25.00	-20.20	0.00	9.63	9.63	0.00
26	26.00	-21.20	0.00	9.63	9.63	0.00
27	27.00	-22.20	0.00	9.63	9.63	0.00
28	28.00	-23.20	0.00	9.63	9.63	0.00
29	29.00	-24.20	0.00	9.63	9.63	0.00
30	30.00	-25.20	0.00	9.63	9.63	0.00
31	31.00	-26.20	0.00	9.63	9.63	0.00
32	32.00	-27.20	0.00	9.63	9.63	0.00
33	33.00	-28.20	0.00	9.63	9.63	0.00
34	34.00	-29.20	0.00	9.63	9.63	0.00
35	35.00	-30.20	0.00	9.63	9.63	0.00
36	36.00	-31.20	0.00	9.63	9.63	0.00
37	37.00	-32.20	0.00	9.63	9.63	0.00
38	38.00	-33.20	0.00	9.63	9.63	0.00
39	39.00	-34.20	0.00	9.63	9.63	0.00
40	40.00	-35.20	0.00	9.63	9.63	0.00
41	41.00	-36.20	0.00	9.63	9.63	0.00
42	42.00	-37.20	0.00	9.63	9.63	0.00
43	43.00	-38.20	0.00	9.63	9.63	0.00
44	44.00	-39.20	0.00	9.63	9.63	0.00
45	45.00	-40.20	0.00	9.63	9.63	0.00
46	46.00	-41.20	0.00	9.63	9.63	0.00
47	47.00	-42.20	0.00	9.63	9.63	0.00
48	48.00	-43.20	0.00	9.63	9.63	0.00
49	49.00	-44.20	0.00	9.63	9.63	0.00
50	50.00	-45.20	0.00	9.63	9.63	0.00
51	51.00	-46.20	0.00	9.63	9.63	0.00
52	52.00	-47.20	0.00	9.63	9.63	0.00
53	53.00	-48.20	0.00	9.63	9.63	0.00
54	54.00	-49.20	0.00	9.63	9.63	0.00
55	55.00	-50.20	0.00	9.63	9.63	0.00
56	56.00	-51.20	0.00	9.63	9.63	0.00
57	57.00	-52.20	0.00	9.63	9.63	0.00
58	58.00	-53.20	0.00	9.63	9.63	0.00
59	59.00	-54.20	0.00	9.63	9.63	0.00
60	60.00	-55.20	0.00	9.63	9.63	0.00
61	61.00	-56.20	0.00	9.63	9.63	0.00
62	62.00	-57.20	0.00	9.63	9.63	0.00
63	63.00	-58.20	0.00	9.63	9.63	0.00
64	64.00	-59.20	0.00	9.63	9.63	0.00
65	65.00	-60.20	0.00	9.63	9.63	0.00
66	66.00	-61.20	0.00	9.63	9.63	0.00
67	67.00	-62.20	0.00	9.63	9.63	0.00
68	68.00	-63.20	0.00	9.63	9.63	0.00
69	69.00	-64.20	0.00	9.63	9.63	0.00
70	70.00	-65.20	0.00	9.63	9.63	0.00
71	71.00	-66.20	0.00	9.63	9.63	0.00
72	72.00	-67.20	0.00	9.63	9.63	0.00
73	73.00	-68.20	0.00	9.63	9.63	0.00
74	74.00	-69.20	0.00	9.63	9.63	0.00
75	75.00	-70.20	0.00	9.63	9.63	0.00
76	76.00	-71.20	0.00	9.63	9.63	0.00
77	77.00	-72.20	0.00	9.63	9.63	0.00
78	78.00	-73.20	0.00	9.63	9.63	0.00
79	79.00	-74.20	0.00	9.63	9.63	0.00

Drilled Shaft Capacity (sorted by shaft diameter):

Strength reduction factors: Skin-friction = 1.00, End-bearing = 0.00

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	9.63	1.00	0.000	0.000	0.000
2	9.63	2.00	0.000	0.000	0.000
3	9.63	3.00	0.000	0.000	0.000
4	9.63	4.00	0.000	0.000	0.000
5	9.63	5.00	0.000	0.000	0.000
6	9.63	6.00	0.000	0.000	0.000
7	9.63	7.00	0.000	0.000	0.000
8	9.63	8.00	0.000	0.000	0.000
9	9.63	9.00	0.000	0.000	0.000
10	9.63	10.00	0.000	0.000	0.000
11	9.63	11.00	0.000	0.000	0.000

12	9.63	12.00	0.000	0.000	0.000
13	9.63	13.00	0.000	0.000	0.000
14	9.63	14.00	0.000	0.000	0.000
15	9.63	15.00	0.000	0.000	0.000
16	9.63	16.00	0.000	0.000	0.000
17	9.63	17.00	0.000	0.000	0.000
18	9.63	18.00	0.000	0.000	0.000
19	9.63	19.00	0.000	0.000	0.000
20	9.63	20.00	0.000	0.000	0.000
21	9.63	21.00	0.000	0.000	0.000
22	9.63	22.00	0.000	0.000	0.000
23	9.63	23.00	0.000	0.000	0.000
24	9.63	24.00	0.000	0.000	0.000
25	9.63	25.00	0.000	0.000	0.000
26	9.63	26.00	0.000	0.000	0.000
27	9.63	27.00	0.000	0.000	0.000
28	9.63	28.00	0.000	0.000	0.000
29	9.63	29.00	0.000	0.000	0.000
30	9.63	30.00	0.000	0.000	0.000
31	9.63	31.00	0.000	0.000	0.000
32	9.63	32.00	0.000	0.000	0.000
33	9.63	33.00	0.000	0.000	0.000
34	9.63	34.00	0.000	0.000	0.000
35	9.63	35.00	2.000	0.000	2.000
36	9.63	36.00	12.001	0.000	12.001
37	9.63	37.00	22.003	0.000	22.003
38	9.63	38.00	32.004	0.000	32.004
39	9.63	39.00	42.005	0.000	42.005
40	9.63	40.00	52.006	0.000	52.006
41	9.63	41.00	53.247	0.000	53.247
42	9.63	42.00	53.554	0.000	53.554
43	9.63	43.00	53.900	0.000	53.900
44	9.63	44.00	54.285	0.000	54.285
45	9.63	45.00	54.707	0.000	54.707
46	9.63	46.00	55.165	0.000	55.165
47	9.63	47.00	65.166	0.000	65.166
48	9.63	48.00	75.168	0.000	75.168
49	9.63	49.00	85.169	0.000	85.169
50	9.63	50.00	95.170	0.000	95.170
51	9.63	51.00	105.171	0.000	105.171
52	9.63	52.00	115.173	0.000	115.173
53	9.63	53.00	125.174	0.000	125.174
54	9.63	54.00	135.175	0.000	135.175
55	9.63	55.00	145.176	0.000	145.176
56	9.63	56.00	155.177	0.000	155.177
57	9.63	57.00	165.179	0.000	165.179
58	9.63	58.00	175.180	0.000	175.180
59	9.63	59.00	185.181	0.000	185.181
60	9.63	60.00	195.182	0.000	195.182
61	9.63	61.00	205.183	0.000	205.183
62	9.63	62.00	215.185	0.000	215.185
63	9.63	63.00	225.186	0.000	225.186
64	9.63	64.00	235.187	0.000	235.187
65	9.63	65.00	245.188	0.000	245.188
66	9.63	66.00	255.190	0.000	255.190
67	9.63	67.00	265.191	0.000	265.191
68	9.63	68.00	275.192	0.000	275.192
69	9.63	69.00	285.193	0.000	285.193
70	9.63	70.00	295.194	0.000	295.194
71	9.63	71.00	305.196	0.000	305.196
72	9.63	72.00	315.197	0.000	315.197
73	9.63	73.00	325.198	0.000	325.198
74	9.63	74.00	335.199	0.000	335.199
75	9.63	75.00	345.200	0.000	345.200
76	9.63	76.00	355.202	0.000	355.202
77	9.63	77.00	365.203	0.000	365.203
78	9.63	78.00	375.204	0.000	375.204
79	9.63	79.00	385.205	0.000	385.205

Drilled Shaft Capacity at User-Defined Settlement (sorted by shaft diameter):

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***** Capacity is NOT modified by the strength reduction factors *****

User-Defined Settlement = 0.00%

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	9.63	1.00	0.000	0.000	0.000
2	9.63	2.00	0.000	0.000	0.000
3	9.63	3.00	0.000	0.000	0.000
4	9.63	4.00	0.000	0.000	0.000
5	9.63	5.00	0.000	0.000	0.000
6	9.63	6.00	0.000	0.000	0.000
7	9.63	7.00	0.000	0.000	0.000
8	9.63	8.00	0.000	0.000	0.000
9	9.63	9.00	0.000	0.000	0.000
10	9.63	10.00	0.000	0.000	0.000
11	9.63	11.00	0.000	0.000	0.000

12	9.63	12.00	0.000	0.000	0.000
13	9.63	13.00	0.000	0.000	0.000
14	9.63	14.00	0.000	0.000	0.000
15	9.63	15.00	0.000	0.000	0.000
16	9.63	16.00	0.000	0.000	0.000
17	9.63	17.00	0.000	0.000	0.000
18	9.63	18.00	0.000	0.000	0.000
19	9.63	19.00	0.000	0.000	0.000
20	9.63	20.00	0.000	0.000	0.000
21	9.63	21.00	0.000	0.000	0.000
22	9.63	22.00	0.000	0.000	0.000
23	9.63	23.00	0.000	0.000	0.000
24	9.63	24.00	0.000	0.000	0.000
25	9.63	25.00	0.000	0.000	0.000
26	9.63	26.00	0.000	0.000	0.000
27	9.63	27.00	0.000	0.000	0.000
28	9.63	28.00	0.000	0.000	0.000
29	9.63	29.00	0.000	0.000	0.000
30	9.63	30.00	0.000	0.000	0.000
31	9.63	31.00	0.000	0.000	0.000
32	9.63	32.00	0.000	0.000	0.000
33	9.63	33.00	0.000	0.000	0.000
34	9.63	34.00	0.000	0.000	0.000
35	9.63	35.00	-nan(ind)	-nan(ind)	-nan(ind)
36	9.63	36.00	-nan(ind)	-nan(ind)	-nan(ind)
37	9.63	37.00	-nan(ind)	-nan(ind)	-nan(ind)
38	9.63	38.00	-nan(ind)	-nan(ind)	-nan(ind)
39	9.63	39.00	-nan(ind)	-nan(ind)	-nan(ind)
40	9.63	40.00	-nan(ind)	-nan(ind)	-nan(ind)
41	9.63	41.00	-nan(ind)	0.000	-nan(ind)
42	9.63	42.00	-nan(ind)	0.000	-nan(ind)
43	9.63	43.00	-nan(ind)	0.000	-nan(ind)
44	9.63	44.00	-nan(ind)	0.000	-nan(ind)
45	9.63	45.00	-nan(ind)	0.000	-nan(ind)
46	9.63	46.00	-nan(ind)	-nan(ind)	-nan(ind)
47	9.63	47.00	0.000	0.000	0.000
48	9.63	48.00	0.000	0.000	0.000
49	9.63	49.00	0.000	0.000	0.000
50	9.63	50.00	0.000	0.000	0.000
51	9.63	51.00	0.000	0.000	0.000
52	9.63	52.00	0.000	0.000	0.000
53	9.63	53.00	0.000	0.000	0.000
54	9.63	54.00	0.000	0.000	0.000
55	9.63	55.00	0.000	0.000	0.000
56	9.63	56.00	0.000	0.000	0.000
57	9.63	57.00	0.000	0.000	0.000
58	9.63	58.00	0.000	0.000	0.000
59	9.63	59.00	0.000	0.000	0.000
60	9.63	60.00	0.000	0.000	0.000
61	9.63	61.00	0.000	0.000	0.000
62	9.63	62.00	0.000	0.000	0.000
63	9.63	63.00	0.000	0.000	0.000
64	9.63	64.00	0.000	0.000	0.000
65	9.63	65.00	0.000	0.000	0.000
66	9.63	66.00	0.000	0.000	0.000
67	9.63	67.00	0.000	0.000	0.000
68	9.63	68.00	0.000	0.000	0.000
69	9.63	69.00	0.000	0.000	0.000
70	9.63	70.00	0.000	0.000	0.000
71	9.63	71.00	0.000	0.000	0.000
72	9.63	72.00	0.000	0.000	0.000
73	9.63	73.00	0.000	0.000	0.000
74	9.63	74.00	0.000	0.000	0.000
75	9.63	75.00	0.000	0.000	0.000
76	9.63	76.00	0.000	0.000	0.000
77	9.63	77.00	0.000	0.000	0.000
78	9.63	78.00	0.000	0.000	0.000
79	9.63	79.00	0.000	0.000	0.000

General Information:
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Input file: .....Revised II 02-18-21\Bridge\FB-DEEP\Micropile\B-2_9.625 inch.in
Project number: HR20-1583R
Job name: Atlantic Isle Bridge
Engineer: Chollada
Units: English

Analysis Information:
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Analysis Type: Drilled Shaft Analysis

Soil Information:
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Boring date: 12/04/17
Boring number: B-2
Station number: 14+10 Offset: 20.0 RT

Ground Elevation: 2.40(ft)
Water table Elevation = 0.50(ft)

Rock side-friction is calculated using: McVay's method
Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	Elevation (ft)	SPT Blows (Blows/ft)	Unit Weight (pcf)	Soil Type
1	0.00	2.40	N/A	0.00	5- Cavity layer
2	2.00	0.40	N/A	0.00	5- Cavity layer
3	4.00	-1.60	N/A	0.00	5- Cavity layer
4	6.00	-3.60	N/A	120.00	5- Cavity layer
5	8.00	-5.60	N/A	120.00	5- Cavity layer
6	10.00	-7.60	N/A	120.00	5- Cavity layer
7	13.00	-10.60	N/A	120.00	5- Cavity layer
8	15.00	-12.60	N/A	120.00	5- Cavity layer
9	16.00	-13.60	N/A	120.00	5- Cavity layer
10	17.00	-14.60	N/A	120.00	5- Cavity layer
11	18.00	-15.60	N/A	120.00	5- Cavity layer
12	20.00	-17.60	N/A	120.00	5- Cavity layer
13	23.00	-20.60	N/A	120.00	5- Cavity layer
14	25.00	-22.60	N/A	120.00	5- Cavity layer
15	28.00	-25.60	N/A	120.00	5- Cavity layer
16	30.00	-27.60	N/A	120.00	5- Cavity layer
17	32.40	-30.00	N/A	120.00	5- Cavity layer
18	32.40	-30.00	10.00	120.00	3- Clean sand
19	33.00	-30.60	10.00	120.00	3- Clean sand
20	34.00	-31.60	N/A	120.00	4- Lime Stone/Very shelly sand
21	35.00	-32.60	N/A	120.00	4- Lime Stone/Very shelly sand
22	38.00	-35.60	N/A	120.00	4- Lime Stone/Very shelly sand
23	38.10	-35.70	3.00	101.26	3- Clean sand
24	40.00	-37.60	3.00	101.26	3- Clean sand
25	42.00	-39.60	6.00	104.51	3- Clean sand
26	42.90	-40.50	6.00	104.51	3- Clean sand
27	43.00	-40.60	N/A	120.00	4- Lime Stone/Very shelly sand
28	45.00	-42.60	N/A	120.00	4- Lime Stone/Very shelly sand
29	48.00	-45.60	N/A	120.00	4- Lime Stone/Very shelly sand
30	50.00	-47.60	N/A	120.00	4- Lime Stone/Very shelly sand
31	53.00	-50.60	N/A	120.00	4- Lime Stone/Very shelly sand
32	55.00	-52.60	N/A	120.00	4- Lime Stone/Very shelly sand
33	58.00	-55.60	N/A	120.00	4- Lime Stone/Very shelly sand
34	60.00	-57.60	N/A	120.00	4- Lime Stone/Very shelly sand
35	62.00	-59.60	N/A	120.00	4- Lime Stone/Very shelly sand
36	65.00	-62.60	N/A	120.00	4- Lime Stone/Very shelly sand
37	68.00	-65.60	N/A	120.00	4- Lime Stone/Very shelly sand
38	70.00	-67.60	N/A	120.00	4- Lime Stone/Very shelly sand
39	73.00	-70.60	N/A	120.00	4- Lime Stone/Very shelly sand
40	75.00	-72.60	10.00	120.00	3- Clean sand
41	78.00	-75.60	19.00	120.00	3- Clean sand
42	80.00	-77.60	N/A	120.00	4- Lime Stone/Very shelly sand

ID	Cu-DIR (tsf)	qu (tsf)	qt (tsf)	Em (ksi)	qb (tsf)
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A

12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A
14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	N/A	N/A	N/A	N/A	N/A
20	N/A	17.19	3.40	0.00	0.00
21	N/A	17.19	3.40	0.00	0.00
22	N/A	17.75	3.55	0.00	0.00
23	N/A	N/A	N/A	N/A	N/A
24	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
26	N/A	N/A	N/A	N/A	N/A
27	N/A	17.75	3.55	0.00	0.00
28	N/A	17.75	3.55	0.00	0.00
29	N/A	17.75	3.55	0.00	0.00
30	N/A	17.75	3.55	0.00	0.00
31	N/A	17.75	3.55	0.00	0.00
32	N/A	17.75	3.55	0.00	0.00
33	N/A	17.75	3.55	0.00	0.00
34	N/A	17.75	3.55	0.00	0.00
35	N/A	17.75	3.55	0.00	0.00
36	N/A	17.75	3.55	0.00	0.00
37	N/A	17.75	3.55	0.00	0.00
38	N/A	17.75	3.55	0.00	0.00
39	N/A	17.75	3.55	0.00	0.00
40	N/A	N/A	N/A	N/A	N/A
41	N/A	N/A	N/A	N/A	N/A
42	N/A	17.75	3.55	0.00	0.00

ID	RQD F.M.	S.R.I.	Rock Recovery
1	N/A	N/A	N/A
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A
9	N/A	N/A	N/A
10	N/A	N/A	N/A
11	N/A	N/A	N/A
12	N/A	N/A	N/A
13	N/A	N/A	N/A
14	N/A	N/A	N/A
15	N/A	N/A	N/A
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A
19	N/A	N/A	N/A
20	1.00	ROUGH	1.000
21	1.00	ROUGH	1.000
22	1.00	ROUGH	1.000
23	N/A	N/A	N/A
24	N/A	N/A	N/A
25	N/A	N/A	N/A
26	N/A	N/A	N/A
27	1.00	ROUGH	1.000
28	1.00	ROUGH	1.000
29	1.00	ROUGH	1.000
30	1.00	ROUGH	1.000
31	1.00	ROUGH	1.000
32	1.00	ROUGH	1.000
33	1.00	ROUGH	1.000
34	1.00	ROUGH	1.000
35	1.00	ROUGH	1.000
36	1.00	ROUGH	1.000
37	1.00	ROUGH	1.000
38	1.00	ROUGH	1.000
39	1.00	ROUGH	1.000
40	N/A	N/A	N/A
41	N/A	N/A	N/A
42	1.00	ROUGH	1.000

Drilled Shaft Data:
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Unit weight of concrete = 150.00(pcf), Concrete Slump = 6.00(in)
Modulus of Elasticity of concrete = 4000.00(ksi)

Shaft Geometry:

ID	Length (ft)	Tip Elev. (ft)	Case Len. (ft)	Diameter (in)	Base Diam. (in)	Bell Len. (ft)
1	1.00	1.40	0.00	9.63	9.63	0.00
2	2.00	0.40	0.00	9.63	9.63	0.00

3	3.00	-0.60	0.00	9.63	9.63	0.00
4	4.00	-1.60	0.00	9.63	9.63	0.00
5	5.00	-2.60	0.00	9.63	9.63	0.00
6	6.00	-3.60	0.00	9.63	9.63	0.00
7	7.00	-4.60	0.00	9.63	9.63	0.00
8	8.00	-5.60	0.00	9.63	9.63	0.00
9	9.00	-6.60	0.00	9.63	9.63	0.00
10	10.00	-7.60	0.00	9.63	9.63	0.00
11	11.00	-8.60	0.00	9.63	9.63	0.00
12	12.00	-9.60	0.00	9.63	9.63	0.00
13	13.00	-10.60	0.00	9.63	9.63	0.00
14	14.00	-11.60	0.00	9.63	9.63	0.00
15	15.00	-12.60	0.00	9.63	9.63	0.00
16	16.00	-13.60	0.00	9.63	9.63	0.00
17	17.00	-14.60	0.00	9.63	9.63	0.00
18	18.00	-15.60	0.00	9.63	9.63	0.00
19	19.00	-16.60	0.00	9.63	9.63	0.00
20	20.00	-17.60	0.00	9.63	9.63	0.00
21	21.00	-18.60	0.00	9.63	9.63	0.00
22	22.00	-19.60	0.00	9.63	9.63	0.00
23	23.00	-20.60	0.00	9.63	9.63	0.00
24	24.00	-21.60	0.00	9.63	9.63	0.00
25	25.00	-22.60	0.00	9.63	9.63	0.00
26	26.00	-23.60	0.00	9.63	9.63	0.00
27	27.00	-24.60	0.00	9.63	9.63	0.00
28	28.00	-25.60	0.00	9.63	9.63	0.00
29	29.00	-26.60	0.00	9.63	9.63	0.00
30	30.00	-27.60	0.00	9.63	9.63	0.00
31	31.00	-28.60	0.00	9.63	9.63	0.00
32	32.00	-29.60	0.00	9.63	9.63	0.00
33	33.00	-30.60	0.00	9.63	9.63	0.00
34	34.00	-31.60	0.00	9.63	9.63	0.00
35	35.00	-32.60	0.00	9.63	9.63	0.00
36	36.00	-33.60	0.00	9.63	9.63	0.00
37	37.00	-34.60	0.00	9.63	9.63	0.00
38	38.00	-35.60	0.00	9.63	9.63	0.00
39	39.00	-36.60	0.00	9.63	9.63	0.00
40	40.00	-37.60	0.00	9.63	9.63	0.00
41	41.00	-38.60	0.00	9.63	9.63	0.00
42	42.00	-39.60	0.00	9.63	9.63	0.00
43	43.00	-40.60	0.00	9.63	9.63	0.00
44	44.00	-41.60	0.00	9.63	9.63	0.00
45	45.00	-42.60	0.00	9.63	9.63	0.00
46	46.00	-43.60	0.00	9.63	9.63	0.00
47	47.00	-44.60	0.00	9.63	9.63	0.00
48	48.00	-45.60	0.00	9.63	9.63	0.00
49	49.00	-46.60	0.00	9.63	9.63	0.00
50	50.00	-47.60	0.00	9.63	9.63	0.00
51	51.00	-48.60	0.00	9.63	9.63	0.00
52	52.00	-49.60	0.00	9.63	9.63	0.00
53	53.00	-50.60	0.00	9.63	9.63	0.00
54	54.00	-51.60	0.00	9.63	9.63	0.00
55	55.00	-52.60	0.00	9.63	9.63	0.00
56	56.00	-53.60	0.00	9.63	9.63	0.00
57	57.00	-54.60	0.00	9.63	9.63	0.00
58	58.00	-55.60	0.00	9.63	9.63	0.00
59	59.00	-56.60	0.00	9.63	9.63	0.00
60	60.00	-57.60	0.00	9.63	9.63	0.00
61	61.00	-58.60	0.00	9.63	9.63	0.00
62	62.00	-59.60	0.00	9.63	9.63	0.00
63	63.00	-60.60	0.00	9.63	9.63	0.00
64	64.00	-61.60	0.00	9.63	9.63	0.00
65	65.00	-62.60	0.00	9.63	9.63	0.00
66	66.00	-63.60	0.00	9.63	9.63	0.00
67	67.00	-64.60	0.00	9.63	9.63	0.00
68	68.00	-65.60	0.00	9.63	9.63	0.00
69	69.00	-66.60	0.00	9.63	9.63	0.00
70	70.00	-67.60	0.00	9.63	9.63	0.00
71	71.00	-68.60	0.00	9.63	9.63	0.00
72	72.00	-69.60	0.00	9.63	9.63	0.00
73	73.00	-70.60	0.00	9.63	9.63	0.00
74	74.00	-71.60	0.00	9.63	9.63	0.00

Drilled Shaft Capacity (sorted by shaft diameter):
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Strength reduction factors: Skin-friction = 1.00, End-bearing = 0.00

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	9.63	1.00	0.000	0.000	0.000
2	9.63	2.00	0.000	0.000	0.000
3	9.63	3.00	0.000	0.000	0.000
4	9.63	4.00	0.000	0.000	0.000
5	9.63	5.00	0.000	0.000	0.000
6	9.63	6.00	0.000	0.000	0.000
7	9.63	7.00	0.000	0.000	0.000
8	9.63	8.00	0.000	0.000	0.000
9	9.63	9.00	0.000	0.000	0.000
10	9.63	10.00	0.000	0.000	0.000

11	9.63	11.00	0.000	0.000	0.000
12	9.63	12.00	0.000	0.000	0.000
13	9.63	13.00	0.000	0.000	0.000
14	9.63	14.00	0.000	0.000	0.000
15	9.63	15.00	0.000	0.000	0.000
16	9.63	16.00	0.000	0.000	0.000
17	9.63	17.00	0.000	0.000	0.000
18	9.63	18.00	0.000	0.000	0.000
19	9.63	19.00	0.000	0.000	0.000
20	9.63	20.00	0.000	0.000	0.000
21	9.63	21.00	0.000	0.000	0.000
22	9.63	22.00	0.000	0.000	0.000
23	9.63	23.00	0.000	0.000	0.000
24	9.63	24.00	0.000	0.000	0.000
25	9.63	25.00	0.000	0.000	0.000
26	9.63	26.00	0.000	0.000	0.000
27	9.63	27.00	0.000	0.000	0.000
28	9.63	28.00	0.000	0.000	0.000
29	9.63	29.00	0.000	0.000	0.000
30	9.63	30.00	0.000	0.000	0.000
31	9.63	31.00	0.000	0.000	0.000
32	9.63	32.00	0.000	0.000	0.000
33	9.63	33.00	0.008	0.000	0.008
34	9.63	34.00	0.055	0.000	0.055
35	9.63	35.00	9.687	0.000	9.687
36	9.63	36.00	19.319	0.000	19.319
37	9.63	37.00	28.951	0.000	28.951
38	9.63	38.00	38.583	0.000	38.583
39	9.63	39.00	39.681	0.000	39.681
40	9.63	40.00	39.802	0.000	39.802
41	9.63	41.00	39.935	0.000	39.935
42	9.63	42.00	40.080	0.000	40.080
43	9.63	43.00	40.274	0.000	40.274
44	9.63	44.00	50.275	0.000	50.275
45	9.63	45.00	60.276	0.000	60.276
46	9.63	46.00	70.278	0.000	70.278
47	9.63	47.00	80.279	0.000	80.279
48	9.63	48.00	90.280	0.000	90.280
49	9.63	49.00	100.281	0.000	100.281
50	9.63	50.00	110.282	0.000	110.282
51	9.63	51.00	120.284	0.000	120.284
52	9.63	52.00	130.285	0.000	130.285
53	9.63	53.00	140.286	0.000	140.286
54	9.63	54.00	150.287	0.000	150.287
55	9.63	55.00	160.288	0.000	160.288
56	9.63	56.00	170.290	0.000	170.290
57	9.63	57.00	180.291	0.000	180.291
58	9.63	58.00	190.292	0.000	190.292
59	9.63	59.00	200.293	0.000	200.293
60	9.63	60.00	210.295	0.000	210.295
61	9.63	61.00	220.296	0.000	220.296
62	9.63	62.00	230.297	0.000	230.297
63	9.63	63.00	240.298	0.000	240.298
64	9.63	64.00	250.299	0.000	250.299
65	9.63	65.00	260.301	0.000	260.301
66	9.63	66.00	270.302	0.000	270.302
67	9.63	67.00	280.303	0.000	280.303
68	9.63	68.00	290.304	0.000	290.304
69	9.63	69.00	300.305	0.000	300.305
70	9.63	70.00	310.307	0.000	310.307
71	9.63	71.00	320.308	0.000	320.308
72	9.63	72.00	330.309	0.000	330.309
73	9.63	73.00	340.310	0.000	340.310
74	9.63	74.00	350.311	0.000	350.311

Drilled Shaft Capacity at User-Defined Settlement (sorted by shaft diameter):
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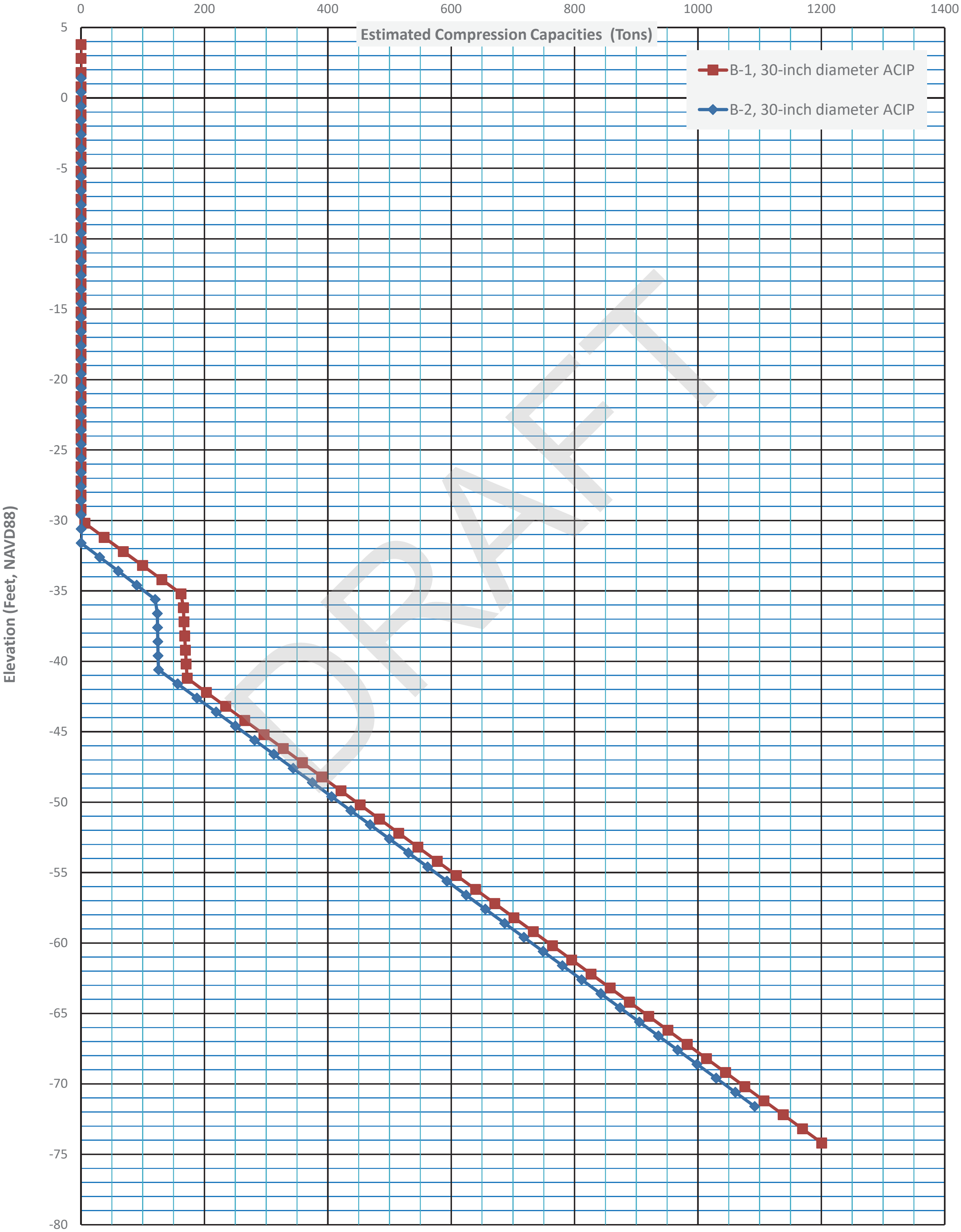
***** Capacity is NOT modified by the strength reduction factors *****

User-Defined Settlement = 0.00%

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	9.63	1.00	0.000	0.000	0.000
2	9.63	2.00	0.000	0.000	0.000
3	9.63	3.00	0.000	0.000	0.000
4	9.63	4.00	0.000	0.000	0.000
5	9.63	5.00	0.000	0.000	0.000
6	9.63	6.00	0.000	0.000	0.000
7	9.63	7.00	0.000	0.000	0.000
8	9.63	8.00	0.000	0.000	0.000
9	9.63	9.00	0.000	0.000	0.000
10	9.63	10.00	0.000	0.000	0.000
11	9.63	11.00	0.000	0.000	0.000
12	9.63	12.00	0.000	0.000	0.000
13	9.63	13.00	0.000	0.000	0.000
14	9.63	14.00	0.000	0.000	0.000
15	9.63	15.00	0.000	0.000	0.000

16	9.63	16.00	0.000	0.000	0.000
17	9.63	17.00	0.000	0.000	0.000
18	9.63	18.00	0.000	0.000	0.000
19	9.63	19.00	0.000	0.000	0.000
20	9.63	20.00	0.000	0.000	0.000
21	9.63	21.00	0.000	0.000	0.000
22	9.63	22.00	0.000	0.000	0.000
23	9.63	23.00	0.000	0.000	0.000
24	9.63	24.00	0.000	0.000	0.000
25	9.63	25.00	0.000	0.000	0.000
26	9.63	26.00	0.000	0.000	0.000
27	9.63	27.00	0.000	0.000	0.000
28	9.63	28.00	0.000	0.000	0.000
29	9.63	29.00	0.000	0.000	0.000
30	9.63	30.00	0.000	0.000	0.000
31	9.63	31.00	0.000	0.000	0.000
32	9.63	32.00	0.000	0.000	0.000
33	9.63	33.00	0.000	0.000	0.000
34	9.63	34.00	0.000	0.000	0.000
35	9.63	35.00	0.000	0.000	0.000
36	9.63	36.00	0.000	0.000	0.000
37	9.63	37.00	0.000	0.000	0.000
38	9.63	38.00	0.000	0.000	0.000
39	9.63	39.00	0.000	0.000	0.000
40	9.63	40.00	0.000	0.000	0.000
41	9.63	41.00	0.000	0.000	0.000
42	9.63	42.00	0.000	0.000	0.000
43	9.63	43.00	0.000	0.000	0.000
44	9.63	44.00	0.000	0.000	0.000
45	9.63	45.00	0.000	0.000	0.000
46	9.63	46.00	0.000	0.000	0.000
47	9.63	47.00	0.000	0.000	0.000
48	9.63	48.00	0.000	0.000	0.000
49	9.63	49.00	0.000	0.000	0.000
50	9.63	50.00	0.000	0.000	0.000
51	9.63	51.00	0.000	0.000	0.000
52	9.63	52.00	0.000	0.000	0.000
53	9.63	53.00	0.000	0.000	0.000
54	9.63	54.00	0.000	0.000	0.000
55	9.63	55.00	0.000	0.000	0.000
56	9.63	56.00	0.000	0.000	0.000
57	9.63	57.00	0.000	0.000	0.000
58	9.63	58.00	0.000	0.000	0.000
59	9.63	59.00	0.000	0.000	0.000
60	9.63	60.00	0.000	0.000	0.000
61	9.63	61.00	0.000	0.000	0.000
62	9.63	62.00	0.000	0.000	0.000
63	9.63	63.00	0.000	0.000	0.000
64	9.63	64.00	0.000	0.000	0.000
65	9.63	65.00	0.000	0.000	0.000
66	9.63	66.00	0.000	0.000	0.000
67	9.63	67.00	0.000	0.000	0.000
68	9.63	68.00	0.000	0.000	0.000
69	9.63	69.00	0.000	0.000	0.000
70	9.63	70.00	0.000	0.000	0.000
71	9.63	71.00	0.000	0.000	0.000
72	9.63	72.00	0.000	0.000	0.000
73	9.63	73.00	0.000	0.000	0.000
74	9.63	74.00	0.000	0.000	0.000

ATLANTIC ISLE BRIDGE
FPID No. 430029-2-22-02
HR ENGINEERING SERVICES, INC.
HRES PROJECT NO. HR20-1583R
ESTIMATED ULTIMATE COMPRESSION CAPACITIES FOR 30-INCH DIAMETER AUGERCAST PILES
TEST BORING B-1 AND B-2



General Information:
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Input file: ..... Bridge\Revised II 02-18-21\Bridge\FB-DEEP\ACIP\B-1_30 inch.in
Project number: HR20-1583R
Job name: Atlantic Isle Bridge
Engineer: Chollada
Units: English

Analysis Information:
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Analysis Type: Drilled Shaft Analysis

Soil Information:
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Boring date: 12/05/17
Boring number: B-1
Station number: 13+27 Offset: 6.0 RT

Ground Elevation: 4.80(ft)
Water table Elevation = 0.50(ft)

Rock side-friction is calculated using: McVay's method
Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	Elevation (ft)	SPT Blows (Blows/ft)	Unit Weight (pcf)	Soil Type
1	0.00	4.80	N/A	0.00	5- Cavity layer
2	2.00	2.80	N/A	0.00	5- Cavity layer
3	4.00	0.80	N/A	0.00	5- Cavity layer
4	6.00	-1.20	N/A	120.00	5- Cavity layer
5	8.00	-3.20	N/A	120.00	5- Cavity layer
6	10.00	-5.20	N/A	120.00	5- Cavity layer
7	12.00	-7.20	N/A	120.00	5- Cavity layer
8	13.00	-8.20	N/A	120.00	5- Cavity layer
9	13.00	-8.20	N/A	120.00	5- Cavity layer
10	15.00	-10.20	N/A	120.00	5- Cavity layer
11	18.00	-13.20	N/A	120.00	5- Cavity layer
12	21.00	-16.20	N/A	120.00	5- Cavity layer
13	23.00	-18.20	N/A	120.00	5- Cavity layer
14	25.00	-20.20	N/A	120.00	5- Cavity layer
15	28.00	-23.20	N/A	120.00	5- Cavity layer
16	30.00	-25.20	N/A	120.00	5- Cavity layer
17	33.00	-28.20	N/A	120.00	5- Cavity layer
18	34.80	-30.00	N/A	120.00	5- Cavity layer
19	34.80	-30.00	N/A	120.00	4- Lime Stone/Very shelly sand
20	38.00	-33.20	N/A	120.00	4- Lime Stone/Very shelly sand
21	40.00	-35.20	N/A	120.00	4- Lime Stone/Very shelly sand
22	40.10	-35.30	13.00	120.00	3- Clean sand
23	42.00	-37.20	13.00	120.00	3- Clean sand
24	44.00	-39.20	16.00	120.00	3- Clean sand
25	45.90	-41.10	16.00	120.00	3- Clean sand
26	46.00	-41.20	N/A	120.00	4- Lime Stone/Very shelly sand
27	48.00	-43.20	N/A	120.00	4- Lime Stone/Very shelly sand
28	50.00	-45.20	N/A	120.00	4- Lime Stone/Very shelly sand
29	53.00	-48.20	N/A	120.00	4- Lime Stone/Very shelly sand
30	55.00	-50.20	N/A	120.00	4- Lime Stone/Very shelly sand
31	58.00	-53.20	N/A	120.00	4- Lime Stone/Very shelly sand
32	60.00	-55.20	N/A	120.00	4- Lime Stone/Very shelly sand
33	63.00	-58.20	N/A	120.00	4- Lime Stone/Very shelly sand
34	65.00	-60.20	N/A	120.00	4- Lime Stone/Very shelly sand
35	68.00	-63.20	N/A	120.00	4- Lime Stone/Very shelly sand
36	70.00	-65.20	N/A	120.00	4- Lime Stone/Very shelly sand
37	73.00	-68.20	N/A	120.00	4- Lime Stone/Very shelly sand
38	75.00	-70.20	N/A	120.00	4- Lime Stone/Very shelly sand
39	78.00	-73.20	N/A	120.00	4- Lime Stone/Very shelly sand
40	80.00	-75.20	N/A	120.00	4- Lime Stone/Very shelly sand

ID	Cu-DIR (tsf)	qu (tsf)	qt (tsf)	Em (ksi)	qb (tsf)
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A

14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	N/A	17.75	3.55	0.00	0.00
20	N/A	17.75	3.55	0.00	0.00
21	N/A	17.75	3.55	0.00	0.00
22	N/A	N/A	N/A	N/A	N/A
23	N/A	N/A	N/A	N/A	N/A
24	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
26	N/A	17.75	3.55	0.00	0.00
27	N/A	17.75	3.55	0.00	0.00
28	N/A	17.75	3.55	0.00	0.00
29	N/A	17.75	3.55	0.00	0.00
30	N/A	17.75	3.55	0.00	0.00
31	N/A	17.75	3.55	0.00	0.00
32	N/A	17.75	3.55	0.00	0.00
33	N/A	17.75	3.55	0.00	0.00
34	N/A	17.75	3.55	0.00	0.00
35	N/A	17.75	3.55	0.00	0.00
36	N/A	17.75	3.55	0.00	0.00
37	N/A	17.75	3.55	0.00	0.00
38	N/A	17.75	3.55	0.00	0.00
39	N/A	17.75	3.55	0.00	0.00
40	N/A	17.75	3.55	0.00	0.00

ID	RQD F.M.	S.R.I.	Rock Recovery
1	N/A	N/A	N/A
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A
9	N/A	N/A	N/A
10	N/A	N/A	N/A
11	N/A	N/A	N/A
12	N/A	N/A	N/A
13	N/A	N/A	N/A
14	N/A	N/A	N/A
15	N/A	N/A	N/A
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A
19	1.00	ROUGH	1.000
20	1.00	ROUGH	1.000
21	1.00	ROUGH	1.000
22	N/A	N/A	N/A
23	N/A	N/A	N/A
24	N/A	N/A	N/A
25	N/A	N/A	N/A
26	1.00	ROUGH	1.000
27	1.00	ROUGH	1.000
28	1.00	ROUGH	1.000
29	1.00	ROUGH	1.000
30	1.00	ROUGH	1.000
31	1.00	ROUGH	1.000
32	1.00	ROUGH	1.000
33	1.00	ROUGH	1.000
34	1.00	ROUGH	1.000
35	1.00	ROUGH	1.000
36	1.00	ROUGH	1.000
37	1.00	ROUGH	1.000
38	1.00	ROUGH	1.000
39	1.00	ROUGH	1.000
40	1.00	ROUGH	1.000

Drilled Shaft Data:

Unit weight of concrete = 150.00(pcf), Concrete Slump = 6.00(in)
Modulus of Elasticity of concrete = 4000.00(ksi)

Shaft Geometry:

ID	Length (ft)	Tip Elev. (ft)	Case Len. (ft)	Diameter (in)	Base Diam. (in)	Bell Len. (ft)
1	1.00	3.80	0.00	30.00	30.00	0.00
2	2.00	2.80	0.00	30.00	30.00	0.00
3	3.00	1.80	0.00	30.00	30.00	0.00
4	4.00	0.80	0.00	30.00	30.00	0.00
5	5.00	-0.20	0.00	30.00	30.00	0.00
6	6.00	-1.20	0.00	30.00	30.00	0.00
7	7.00	-2.20	0.00	30.00	30.00	0.00
8	8.00	-3.20	0.00	30.00	30.00	0.00

9	9.00	-4.20	0.00	30.00	30.00	0.00
10	10.00	-5.20	0.00	30.00	30.00	0.00
11	11.00	-6.20	0.00	30.00	30.00	0.00
12	12.00	-7.20	0.00	30.00	30.00	0.00
13	13.00	-8.20	0.00	30.00	30.00	0.00
14	14.00	-9.20	0.00	30.00	30.00	0.00
15	15.00	-10.20	0.00	30.00	30.00	0.00
16	16.00	-11.20	0.00	30.00	30.00	0.00
17	17.00	-12.20	0.00	30.00	30.00	0.00
18	18.00	-13.20	0.00	30.00	30.00	0.00
19	19.00	-14.20	0.00	30.00	30.00	0.00
20	20.00	-15.20	0.00	30.00	30.00	0.00
21	21.00	-16.20	0.00	30.00	30.00	0.00
22	22.00	-17.20	0.00	30.00	30.00	0.00
23	23.00	-18.20	0.00	30.00	30.00	0.00
24	24.00	-19.20	0.00	30.00	30.00	0.00
25	25.00	-20.20	0.00	30.00	30.00	0.00
26	26.00	-21.20	0.00	30.00	30.00	0.00
27	27.00	-22.20	0.00	30.00	30.00	0.00
28	28.00	-23.20	0.00	30.00	30.00	0.00
29	29.00	-24.20	0.00	30.00	30.00	0.00
30	30.00	-25.20	0.00	30.00	30.00	0.00
31	31.00	-26.20	0.00	30.00	30.00	0.00
32	32.00	-27.20	0.00	30.00	30.00	0.00
33	33.00	-28.20	0.00	30.00	30.00	0.00
34	34.00	-29.20	0.00	30.00	30.00	0.00
35	35.00	-30.20	0.00	30.00	30.00	0.00
36	36.00	-31.20	0.00	30.00	30.00	0.00
37	37.00	-32.20	0.00	30.00	30.00	0.00
38	38.00	-33.20	0.00	30.00	30.00	0.00
39	39.00	-34.20	0.00	30.00	30.00	0.00
40	40.00	-35.20	0.00	30.00	30.00	0.00
41	41.00	-36.20	0.00	30.00	30.00	0.00
42	42.00	-37.20	0.00	30.00	30.00	0.00
43	43.00	-38.20	0.00	30.00	30.00	0.00
44	44.00	-39.20	0.00	30.00	30.00	0.00
45	45.00	-40.20	0.00	30.00	30.00	0.00
46	46.00	-41.20	0.00	30.00	30.00	0.00
47	47.00	-42.20	0.00	30.00	30.00	0.00
48	48.00	-43.20	0.00	30.00	30.00	0.00
49	49.00	-44.20	0.00	30.00	30.00	0.00
50	50.00	-45.20	0.00	30.00	30.00	0.00
51	51.00	-46.20	0.00	30.00	30.00	0.00
52	52.00	-47.20	0.00	30.00	30.00	0.00
53	53.00	-48.20	0.00	30.00	30.00	0.00
54	54.00	-49.20	0.00	30.00	30.00	0.00
55	55.00	-50.20	0.00	30.00	30.00	0.00
56	56.00	-51.20	0.00	30.00	30.00	0.00
57	57.00	-52.20	0.00	30.00	30.00	0.00
58	58.00	-53.20	0.00	30.00	30.00	0.00
59	59.00	-54.20	0.00	30.00	30.00	0.00
60	60.00	-55.20	0.00	30.00	30.00	0.00
61	61.00	-56.20	0.00	30.00	30.00	0.00
62	62.00	-57.20	0.00	30.00	30.00	0.00
63	63.00	-58.20	0.00	30.00	30.00	0.00
64	64.00	-59.20	0.00	30.00	30.00	0.00
65	65.00	-60.20	0.00	30.00	30.00	0.00
66	66.00	-61.20	0.00	30.00	30.00	0.00
67	67.00	-62.20	0.00	30.00	30.00	0.00
68	68.00	-63.20	0.00	30.00	30.00	0.00
69	69.00	-64.20	0.00	30.00	30.00	0.00
70	70.00	-65.20	0.00	30.00	30.00	0.00
71	71.00	-66.20	0.00	30.00	30.00	0.00
72	72.00	-67.20	0.00	30.00	30.00	0.00
73	73.00	-68.20	0.00	30.00	30.00	0.00
74	74.00	-69.20	0.00	30.00	30.00	0.00
75	75.00	-70.20	0.00	30.00	30.00	0.00
76	76.00	-71.20	0.00	30.00	30.00	0.00
77	77.00	-72.20	0.00	30.00	30.00	0.00
78	78.00	-73.20	0.00	30.00	30.00	0.00
79	79.00	-74.20	0.00	30.00	30.00	0.00

Drilled Shaft Capacity (sorted by shaft diameter):
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Strength reduction factors: Skin-friction = 1.00, End-bearing = 0.00

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	30.00	1.00	0.000	0.000	0.000
2	30.00	2.00	0.000	0.000	0.000
3	30.00	3.00	0.000	0.000	0.000
4	30.00	4.00	0.000	0.000	0.000
5	30.00	5.00	0.000	0.000	0.000
6	30.00	6.00	0.000	0.000	0.000
7	30.00	7.00	0.000	0.000	0.000
8	30.00	8.00	0.000	0.000	0.000
9	30.00	9.00	0.000	0.000	0.000
10	30.00	10.00	0.000	0.000	0.000
11	30.00	11.00	0.000	0.000	0.000

12	30.00	12.00	0.000	0.000	0.000
13	30.00	13.00	0.000	0.000	0.000
14	30.00	14.00	0.000	0.000	0.000
15	30.00	15.00	0.000	0.000	0.000
16	30.00	16.00	0.000	0.000	0.000
17	30.00	17.00	0.000	0.000	0.000
18	30.00	18.00	0.000	0.000	0.000
19	30.00	19.00	0.000	0.000	0.000
20	30.00	20.00	0.000	0.000	0.000
21	30.00	21.00	0.000	0.000	0.000
22	30.00	22.00	0.000	0.000	0.000
23	30.00	23.00	0.000	0.000	0.000
24	30.00	24.00	0.000	0.000	0.000
25	30.00	25.00	0.000	0.000	0.000
26	30.00	26.00	0.000	0.000	0.000
27	30.00	27.00	0.000	0.000	0.000
28	30.00	28.00	0.000	0.000	0.000
29	30.00	29.00	0.000	0.000	0.000
30	30.00	30.00	0.000	0.000	0.000
31	30.00	31.00	0.000	0.000	0.000
32	30.00	32.00	0.000	0.000	0.000
33	30.00	33.00	0.000	0.000	0.000
34	30.00	34.00	0.000	0.000	0.000
35	30.00	35.00	6.235	0.000	6.235
36	30.00	36.00	37.407	0.000	37.407
37	30.00	37.00	68.580	0.000	68.580
38	30.00	38.00	99.752	0.000	99.752
39	30.00	39.00	130.925	0.000	130.925
40	30.00	40.00	162.098	0.000	162.098
41	30.00	41.00	165.964	0.000	165.964
42	30.00	42.00	166.921	0.000	166.921
43	30.00	43.00	168.000	0.000	168.000
44	30.00	44.00	169.201	0.000	169.201
45	30.00	45.00	170.516	0.000	170.516
46	30.00	46.00	171.944	0.000	171.944
47	30.00	47.00	203.116	0.000	203.116
48	30.00	48.00	234.289	0.000	234.289
49	30.00	49.00	265.461	0.000	265.461
50	30.00	50.00	296.634	0.000	296.634
51	30.00	51.00	327.807	0.000	327.807
52	30.00	52.00	358.979	0.000	358.979
53	30.00	53.00	390.152	0.000	390.152
54	30.00	54.00	421.325	0.000	421.325
55	30.00	55.00	452.497	0.000	452.497
56	30.00	56.00	483.670	0.000	483.670
57	30.00	57.00	514.842	0.000	514.842
58	30.00	58.00	546.015	0.000	546.015
59	30.00	59.00	577.188	0.000	577.188
60	30.00	60.00	608.360	0.000	608.360
61	30.00	61.00	639.533	0.000	639.533
62	30.00	62.00	670.705	0.000	670.705
63	30.00	63.00	701.878	0.000	701.878
64	30.00	64.00	733.051	0.000	733.051
65	30.00	65.00	764.223	0.000	764.223
66	30.00	66.00	795.396	0.000	795.396
67	30.00	67.00	826.569	0.000	826.569
68	30.00	68.00	857.741	0.000	857.741
69	30.00	69.00	888.914	0.000	888.914
70	30.00	70.00	920.086	0.000	920.086
71	30.00	71.00	951.259	0.000	951.259
72	30.00	72.00	982.432	0.000	982.432
73	30.00	73.00	1013.604	0.000	1013.604
74	30.00	74.00	1044.777	0.000	1044.777
75	30.00	75.00	1075.949	0.000	1075.949
76	30.00	76.00	1107.122	0.000	1107.122
77	30.00	77.00	1138.295	0.000	1138.295
78	30.00	78.00	1169.467	0.000	1169.467
79	30.00	79.00	1200.640	0.000	1200.640

Drilled Shaft Capacity at User-Defined Settlement (sorted by shaft diameter):
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***** Capacity is NOT modified by the strength reduction factors *****

User-Defined Settlement = 0.00%

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	30.00	1.00	0.000	0.000	0.000
2	30.00	2.00	0.000	0.000	0.000
3	30.00	3.00	0.000	0.000	0.000
4	30.00	4.00	0.000	0.000	0.000
5	30.00	5.00	0.000	0.000	0.000
6	30.00	6.00	0.000	0.000	0.000
7	30.00	7.00	0.000	0.000	0.000
8	30.00	8.00	0.000	0.000	0.000
9	30.00	9.00	0.000	0.000	0.000
10	30.00	10.00	0.000	0.000	0.000
11	30.00	11.00	0.000	0.000	0.000

12	30.00	12.00	0.000	0.000	0.000
13	30.00	13.00	0.000	0.000	0.000
14	30.00	14.00	0.000	0.000	0.000
15	30.00	15.00	0.000	0.000	0.000
16	30.00	16.00	0.000	0.000	0.000
17	30.00	17.00	0.000	0.000	0.000
18	30.00	18.00	0.000	0.000	0.000
19	30.00	19.00	0.000	0.000	0.000
20	30.00	20.00	0.000	0.000	0.000
21	30.00	21.00	0.000	0.000	0.000
22	30.00	22.00	0.000	0.000	0.000
23	30.00	23.00	0.000	0.000	0.000
24	30.00	24.00	0.000	0.000	0.000
25	30.00	25.00	0.000	0.000	0.000
26	30.00	26.00	0.000	0.000	0.000
27	30.00	27.00	0.000	0.000	0.000
28	30.00	28.00	0.000	0.000	0.000
29	30.00	29.00	0.000	0.000	0.000
30	30.00	30.00	0.000	0.000	0.000
31	30.00	31.00	0.000	0.000	0.000
32	30.00	32.00	0.000	0.000	0.000
33	30.00	33.00	0.000	0.000	0.000
34	30.00	34.00	0.000	0.000	0.000
35	30.00	35.00	-nan(ind)	-nan(ind)	-nan(ind)
36	30.00	36.00	-nan(ind)	-nan(ind)	-nan(ind)
37	30.00	37.00	-nan(ind)	-nan(ind)	-nan(ind)
38	30.00	38.00	-nan(ind)	-nan(ind)	-nan(ind)
39	30.00	39.00	-nan(ind)	-nan(ind)	-nan(ind)
40	30.00	40.00	-nan(ind)	-nan(ind)	-nan(ind)
41	30.00	41.00	-nan(ind)	0.000	-nan(ind)
42	30.00	42.00	-nan(ind)	0.000	-nan(ind)
43	30.00	43.00	-nan(ind)	0.000	-nan(ind)
44	30.00	44.00	-nan(ind)	0.000	-nan(ind)
45	30.00	45.00	-nan(ind)	0.000	-nan(ind)
46	30.00	46.00	-nan(ind)	-nan(ind)	-nan(ind)
47	30.00	47.00	-nan(ind)	-nan(ind)	-nan(ind)
48	30.00	48.00	-nan(ind)	-nan(ind)	-nan(ind)
49	30.00	49.00	-nan(ind)	-nan(ind)	-nan(ind)
50	30.00	50.00	-nan(ind)	-nan(ind)	-nan(ind)
51	30.00	51.00	-nan(ind)	-nan(ind)	-nan(ind)
52	30.00	52.00	-nan(ind)	-nan(ind)	-nan(ind)
53	30.00	53.00	-nan(ind)	-nan(ind)	-nan(ind)
54	30.00	54.00	-nan(ind)	-nan(ind)	-nan(ind)
55	30.00	55.00	-nan(ind)	-nan(ind)	-nan(ind)
56	30.00	56.00	-nan(ind)	-nan(ind)	-nan(ind)
57	30.00	57.00	-nan(ind)	-nan(ind)	-nan(ind)
58	30.00	58.00	-nan(ind)	-nan(ind)	-nan(ind)
59	30.00	59.00	-nan(ind)	-nan(ind)	-nan(ind)
60	30.00	60.00	-nan(ind)	-nan(ind)	-nan(ind)
61	30.00	61.00	-nan(ind)	-nan(ind)	-nan(ind)
62	30.00	62.00	-nan(ind)	-nan(ind)	-nan(ind)
63	30.00	63.00	-nan(ind)	-nan(ind)	-nan(ind)
64	30.00	64.00	-nan(ind)	-nan(ind)	-nan(ind)
65	30.00	65.00	-nan(ind)	-nan(ind)	-nan(ind)
66	30.00	66.00	-nan(ind)	-nan(ind)	-nan(ind)
67	30.00	67.00	-nan(ind)	-nan(ind)	-nan(ind)
68	30.00	68.00	-nan(ind)	-nan(ind)	-nan(ind)
69	30.00	69.00	-nan(ind)	-nan(ind)	-nan(ind)
70	30.00	70.00	-nan(ind)	-nan(ind)	-nan(ind)
71	30.00	71.00	-nan(ind)	-nan(ind)	-nan(ind)
72	30.00	72.00	-nan(ind)	-nan(ind)	-nan(ind)
73	30.00	73.00	-nan(ind)	-nan(ind)	-nan(ind)
74	30.00	74.00	-nan(ind)	-nan(ind)	-nan(ind)
75	30.00	75.00	-nan(ind)	-nan(ind)	-nan(ind)
76	30.00	76.00	-nan(ind)	-nan(ind)	-nan(ind)
77	30.00	77.00	-nan(ind)	-nan(ind)	-nan(ind)
78	30.00	78.00	-nan(ind)	-nan(ind)	-nan(ind)
79	30.00	79.00	-nan(ind)	-nan(ind)	-nan(ind)

General Information:

Input file: ..... Bridge\Revised II 02-18-21\Bridge\FB-DEEP\ACIP\B-2_30 inch.in
Project number: HR20-1583R
Job name: Atlantic Isle Bridge
Engineer: Chollada
Units: English

Analysis Information:

Analysis Type: Drilled Shaft Analysis

Soil Information:

Boring date: 12/04/17
Boring number: B-2
Station number: 14+10 Offset: 20.0 RT

Ground Elevation: 2.40(ft)
Water table Elevation = 0.50(ft)

Rock side-friction is calculated using: McVay's method
Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	Elevation (ft)	SPT Blows (Blows/ft)	Unit Weight (pcf)	Soil Type
1	0.00	2.40	N/A	0.00	5- Cavity layer
2	2.00	0.40	N/A	0.00	5- Cavity layer
3	4.00	-1.60	N/A	0.00	5- Cavity layer
4	6.00	-3.60	N/A	120.00	5- Cavity layer
5	8.00	-5.60	N/A	120.00	5- Cavity layer
6	10.00	-7.60	N/A	120.00	5- Cavity layer
7	13.00	-10.60	N/A	120.00	5- Cavity layer
8	15.00	-12.60	N/A	120.00	5- Cavity layer
9	16.00	-13.60	N/A	120.00	5- Cavity layer
10	17.00	-14.60	N/A	120.00	5- Cavity layer
11	18.00	-15.60	N/A	120.00	5- Cavity layer
12	20.00	-17.60	N/A	120.00	5- Cavity layer
13	23.00	-20.60	N/A	120.00	5- Cavity layer
14	25.00	-22.60	N/A	120.00	5- Cavity layer
15	28.00	-25.60	N/A	120.00	5- Cavity layer
16	30.00	-27.60	N/A	120.00	5- Cavity layer
17	32.40	-30.00	N/A	120.00	5- Cavity layer
18	32.40	-30.00	10.00	120.00	3- Clean sand
19	33.00	-30.60	10.00	120.00	3- Clean sand
20	34.00	-31.60	N/A	120.00	4- Lime Stone/Very shelly sand
21	35.00	-32.60	N/A	120.00	4- Lime Stone/Very shelly sand
22	38.00	-35.60	N/A	120.00	4- Lime Stone/Very shelly sand
23	38.10	-35.70	3.00	101.26	3- Clean sand
24	40.00	-37.60	3.00	101.26	3- Clean sand
25	42.00	-39.60	6.00	104.51	3- Clean sand
26	42.90	-40.50	6.00	104.51	3- Clean sand
27	43.00	-40.60	N/A	120.00	4- Lime Stone/Very shelly sand
28	45.00	-42.60	N/A	120.00	4- Lime Stone/Very shelly sand
29	48.00	-45.60	N/A	120.00	4- Lime Stone/Very shelly sand
30	50.00	-47.60	N/A	120.00	4- Lime Stone/Very shelly sand
31	53.00	-50.60	N/A	120.00	4- Lime Stone/Very shelly sand
32	55.00	-52.60	N/A	120.00	4- Lime Stone/Very shelly sand
33	58.00	-55.60	N/A	120.00	4- Lime Stone/Very shelly sand
34	60.00	-57.60	N/A	120.00	4- Lime Stone/Very shelly sand
35	62.00	-59.60	N/A	120.00	4- Lime Stone/Very shelly sand
36	65.00	-62.60	N/A	120.00	4- Lime Stone/Very shelly sand
37	68.00	-65.60	N/A	120.00	4- Lime Stone/Very shelly sand
38	70.00	-67.60	N/A	120.00	4- Lime Stone/Very shelly sand
39	73.00	-70.60	N/A	120.00	4- Lime Stone/Very shelly sand
40	75.00	-72.60	10.00	120.00	3- Clean sand
41	78.00	-75.60	19.00	120.00	3- Clean sand
42	80.00	-77.60	N/A	120.00	4- Lime Stone/Very shelly sand

ID	Cu-DIR (tsf)	qu (tsf)	qt (tsf)	Em (ksi)	qb (tsf)
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A

12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A
14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	N/A	N/A	N/A	N/A	N/A
20	N/A	17.19	3.40	0.00	0.00
21	N/A	17.19	3.40	0.00	0.00
22	N/A	17.75	3.55	0.00	0.00
23	N/A	N/A	N/A	N/A	N/A
24	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
26	N/A	N/A	N/A	N/A	N/A
27	N/A	17.75	3.55	0.00	0.00
28	N/A	17.75	3.55	0.00	0.00
29	N/A	17.75	3.55	0.00	0.00
30	N/A	17.75	3.55	0.00	0.00
31	N/A	17.75	3.55	0.00	0.00
32	N/A	17.75	3.55	0.00	0.00
33	N/A	17.75	3.55	0.00	0.00
34	N/A	17.75	3.55	0.00	0.00
35	N/A	17.75	3.55	0.00	0.00
36	N/A	17.75	3.55	0.00	0.00
37	N/A	17.75	3.55	0.00	0.00
38	N/A	17.75	3.55	0.00	0.00
39	N/A	17.75	3.55	0.00	0.00
40	N/A	N/A	N/A	N/A	N/A
41	N/A	N/A	N/A	N/A	N/A
42	N/A	17.75	3.55	0.00	0.00

ID	RQD F.M.	S.R.I.	Rock Recovery
1	N/A	N/A	N/A
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	N/A	N/A	N/A
8	N/A	N/A	N/A
9	N/A	N/A	N/A
10	N/A	N/A	N/A
11	N/A	N/A	N/A
12	N/A	N/A	N/A
13	N/A	N/A	N/A
14	N/A	N/A	N/A
15	N/A	N/A	N/A
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A
19	N/A	N/A	N/A
20	1.00	ROUGH	1.000
21	1.00	ROUGH	1.000
22	1.00	ROUGH	1.000
23	N/A	N/A	N/A
24	N/A	N/A	N/A
25	N/A	N/A	N/A
26	N/A	N/A	N/A
27	1.00	ROUGH	1.000
28	1.00	ROUGH	1.000
29	1.00	ROUGH	1.000
30	1.00	ROUGH	1.000
31	1.00	ROUGH	1.000
32	1.00	ROUGH	1.000
33	1.00	ROUGH	1.000
34	1.00	ROUGH	1.000
35	1.00	ROUGH	1.000
36	1.00	ROUGH	1.000
37	1.00	ROUGH	1.000
38	1.00	ROUGH	1.000
39	1.00	ROUGH	1.000
40	N/A	N/A	N/A
41	N/A	N/A	N/A
42	1.00	ROUGH	1.000

Drilled Shaft Data:

Unit weight of concrete = 150.00(pcf), Concrete Slump = 6.00(in)
Modulus of Elasticity of concrete = 4000.00(ksi)

Shaft Geometry:

ID	Length (ft)	Tip Elev. (ft)	Case Len. (ft)	Diameter (in)	Base Diam. (in)	Bell Len. (ft)
1	1.00	1.40	0.00	30.00	30.00	0.00
2	2.00	0.40	0.00	30.00	30.00	0.00

3	3.00	-0.60	0.00	30.00	30.00	0.00
4	4.00	-1.60	0.00	30.00	30.00	0.00
5	5.00	-2.60	0.00	30.00	30.00	0.00
6	6.00	-3.60	0.00	30.00	30.00	0.00
7	7.00	-4.60	0.00	30.00	30.00	0.00
8	8.00	-5.60	0.00	30.00	30.00	0.00
9	9.00	-6.60	0.00	30.00	30.00	0.00
10	10.00	-7.60	0.00	30.00	30.00	0.00
11	11.00	-8.60	0.00	30.00	30.00	0.00
12	12.00	-9.60	0.00	30.00	30.00	0.00
13	13.00	-10.60	0.00	30.00	30.00	0.00
14	14.00	-11.60	0.00	30.00	30.00	0.00
15	15.00	-12.60	0.00	30.00	30.00	0.00
16	16.00	-13.60	0.00	30.00	30.00	0.00
17	17.00	-14.60	0.00	30.00	30.00	0.00
18	18.00	-15.60	0.00	30.00	30.00	0.00
19	19.00	-16.60	0.00	30.00	30.00	0.00
20	20.00	-17.60	0.00	30.00	30.00	0.00
21	21.00	-18.60	0.00	30.00	30.00	0.00
22	22.00	-19.60	0.00	30.00	30.00	0.00
23	23.00	-20.60	0.00	30.00	30.00	0.00
24	24.00	-21.60	0.00	30.00	30.00	0.00
25	25.00	-22.60	0.00	30.00	30.00	0.00
26	26.00	-23.60	0.00	30.00	30.00	0.00
27	27.00	-24.60	0.00	30.00	30.00	0.00
28	28.00	-25.60	0.00	30.00	30.00	0.00
29	29.00	-26.60	0.00	30.00	30.00	0.00
30	30.00	-27.60	0.00	30.00	30.00	0.00
31	31.00	-28.60	0.00	30.00	30.00	0.00
32	32.00	-29.60	0.00	30.00	30.00	0.00
33	33.00	-30.60	0.00	30.00	30.00	0.00
34	34.00	-31.60	0.00	30.00	30.00	0.00
35	35.00	-32.60	0.00	30.00	30.00	0.00
36	36.00	-33.60	0.00	30.00	30.00	0.00
37	37.00	-34.60	0.00	30.00	30.00	0.00
38	38.00	-35.60	0.00	30.00	30.00	0.00
39	39.00	-36.60	0.00	30.00	30.00	0.00
40	40.00	-37.60	0.00	30.00	30.00	0.00
41	41.00	-38.60	0.00	30.00	30.00	0.00
42	42.00	-39.60	0.00	30.00	30.00	0.00
43	43.00	-40.60	0.00	30.00	30.00	0.00
44	44.00	-41.60	0.00	30.00	30.00	0.00
45	45.00	-42.60	0.00	30.00	30.00	0.00
46	46.00	-43.60	0.00	30.00	30.00	0.00
47	47.00	-44.60	0.00	30.00	30.00	0.00
48	48.00	-45.60	0.00	30.00	30.00	0.00
49	49.00	-46.60	0.00	30.00	30.00	0.00
50	50.00	-47.60	0.00	30.00	30.00	0.00
51	51.00	-48.60	0.00	30.00	30.00	0.00
52	52.00	-49.60	0.00	30.00	30.00	0.00
53	53.00	-50.60	0.00	30.00	30.00	0.00
54	54.00	-51.60	0.00	30.00	30.00	0.00
55	55.00	-52.60	0.00	30.00	30.00	0.00
56	56.00	-53.60	0.00	30.00	30.00	0.00
57	57.00	-54.60	0.00	30.00	30.00	0.00
58	58.00	-55.60	0.00	30.00	30.00	0.00
59	59.00	-56.60	0.00	30.00	30.00	0.00
60	60.00	-57.60	0.00	30.00	30.00	0.00
61	61.00	-58.60	0.00	30.00	30.00	0.00
62	62.00	-59.60	0.00	30.00	30.00	0.00
63	63.00	-60.60	0.00	30.00	30.00	0.00
64	64.00	-61.60	0.00	30.00	30.00	0.00
65	65.00	-62.60	0.00	30.00	30.00	0.00
66	66.00	-63.60	0.00	30.00	30.00	0.00
67	67.00	-64.60	0.00	30.00	30.00	0.00
68	68.00	-65.60	0.00	30.00	30.00	0.00
69	69.00	-66.60	0.00	30.00	30.00	0.00
70	70.00	-67.60	0.00	30.00	30.00	0.00
71	71.00	-68.60	0.00	30.00	30.00	0.00
72	72.00	-69.60	0.00	30.00	30.00	0.00
73	73.00	-70.60	0.00	30.00	30.00	0.00
74	74.00	-71.60	0.00	30.00	30.00	0.00

Drilled Shaft Capacity (sorted by shaft diameter):
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Strength reduction factors: Skin-friction = 1.00, End-bearing = 0.00

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	30.00	1.00	0.000	0.000	0.000
2	30.00	2.00	0.000	0.000	0.000
3	30.00	3.00	0.000	0.000	0.000
4	30.00	4.00	0.000	0.000	0.000
5	30.00	5.00	0.000	0.000	0.000
6	30.00	6.00	0.000	0.000	0.000
7	30.00	7.00	0.000	0.000	0.000
8	30.00	8.00	0.000	0.000	0.000
9	30.00	9.00	0.000	0.000	0.000
10	30.00	10.00	0.000	0.000	0.000

11	30.00	11.00	0.000	0.000	0.000
12	30.00	12.00	0.000	0.000	0.000
13	30.00	13.00	0.000	0.000	0.000
14	30.00	14.00	0.000	0.000	0.000
15	30.00	15.00	0.000	0.000	0.000
16	30.00	16.00	0.000	0.000	0.000
17	30.00	17.00	0.000	0.000	0.000
18	30.00	18.00	0.000	0.000	0.000
19	30.00	19.00	0.000	0.000	0.000
20	30.00	20.00	0.000	0.000	0.000
21	30.00	21.00	0.000	0.000	0.000
22	30.00	22.00	0.000	0.000	0.000
23	30.00	23.00	0.000	0.000	0.000
24	30.00	24.00	0.000	0.000	0.000
25	30.00	25.00	0.000	0.000	0.000
26	30.00	26.00	0.000	0.000	0.000
27	30.00	27.00	0.000	0.000	0.000
28	30.00	28.00	0.000	0.000	0.000
29	30.00	29.00	0.000	0.000	0.000
30	30.00	30.00	0.000	0.000	0.000
31	30.00	31.00	0.000	0.000	0.000
32	30.00	32.00	0.000	0.000	0.000
33	30.00	33.00	0.025	0.000	0.025
34	30.00	34.00	0.172	0.000	0.172
35	30.00	35.00	30.194	0.000	30.194
36	30.00	36.00	60.216	0.000	60.216
37	30.00	37.00	90.238	0.000	90.238
38	30.00	38.00	120.260	0.000	120.260
39	30.00	39.00	123.682	0.000	123.682
40	30.00	40.00	124.058	0.000	124.058
41	30.00	41.00	124.472	0.000	124.472
42	30.00	42.00	124.924	0.000	124.924
43	30.00	43.00	125.529	0.000	125.529
44	30.00	44.00	156.702	0.000	156.702
45	30.00	45.00	187.874	0.000	187.874
46	30.00	46.00	219.047	0.000	219.047
47	30.00	47.00	250.219	0.000	250.219
48	30.00	48.00	281.392	0.000	281.392
49	30.00	49.00	312.565	0.000	312.565
50	30.00	50.00	343.737	0.000	343.737
51	30.00	51.00	374.910	0.000	374.910
52	30.00	52.00	406.082	0.000	406.082
53	30.00	53.00	437.255	0.000	437.255
54	30.00	54.00	468.428	0.000	468.428
55	30.00	55.00	499.600	0.000	499.600
56	30.00	56.00	530.773	0.000	530.773
57	30.00	57.00	561.946	0.000	561.946
58	30.00	58.00	593.118	0.000	593.118
59	30.00	59.00	624.291	0.000	624.291
60	30.00	60.00	655.463	0.000	655.463
61	30.00	61.00	686.636	0.000	686.636
62	30.00	62.00	717.809	0.000	717.809
63	30.00	63.00	748.981	0.000	748.981
64	30.00	64.00	780.154	0.000	780.154
65	30.00	65.00	811.326	0.000	811.326
66	30.00	66.00	842.499	0.000	842.499
67	30.00	67.00	873.672	0.000	873.672
68	30.00	68.00	904.844	0.000	904.844
69	30.00	69.00	936.017	0.000	936.017
70	30.00	70.00	967.190	0.000	967.190
71	30.00	71.00	998.362	0.000	998.362
72	30.00	72.00	1029.535	0.000	1029.535
73	30.00	73.00	1060.707	0.000	1060.707
74	30.00	74.00	1091.880	0.000	1091.880

Drilled Shaft Capacity at User-Defined Settlement (sorted by shaft diameter):
===
***** Capacity is NOT modified by the strength reduction factors *****

User-Defined Settlement = 0.00%

ID	Diameter (in)	Length (ft)	Skin Fric. (tons)	End Bearing (tons)	Capacity (tons)
1	30.00	1.00	0.000	0.000	0.000
2	30.00	2.00	0.000	0.000	0.000
3	30.00	3.00	0.000	0.000	0.000
4	30.00	4.00	0.000	0.000	0.000
5	30.00	5.00	0.000	0.000	0.000
6	30.00	6.00	0.000	0.000	0.000
7	30.00	7.00	0.000	0.000	0.000
8	30.00	8.00	0.000	0.000	0.000
9	30.00	9.00	0.000	0.000	0.000
10	30.00	10.00	0.000	0.000	0.000
11	30.00	11.00	0.000	0.000	0.000
12	30.00	12.00	0.000	0.000	0.000
13	30.00	13.00	0.000	0.000	0.000
14	30.00	14.00	0.000	0.000	0.000
15	30.00	15.00	0.000	0.000	0.000

16	30.00	16.00	0.000	0.000	0.000
17	30.00	17.00	0.000	0.000	0.000
18	30.00	18.00	0.000	0.000	0.000
19	30.00	19.00	0.000	0.000	0.000
20	30.00	20.00	0.000	0.000	0.000
21	30.00	21.00	0.000	0.000	0.000
22	30.00	22.00	0.000	0.000	0.000
23	30.00	23.00	0.000	0.000	0.000
24	30.00	24.00	0.000	0.000	0.000
25	30.00	25.00	0.000	0.000	0.000
26	30.00	26.00	0.000	0.000	0.000
27	30.00	27.00	0.000	0.000	0.000
28	30.00	28.00	0.000	0.000	0.000
29	30.00	29.00	0.000	0.000	0.000
30	30.00	30.00	0.000	0.000	0.000
31	30.00	31.00	0.000	0.000	0.000
32	30.00	32.00	0.000	0.000	0.000
33	30.00	33.00	0.000	0.000	0.000
34	30.00	34.00	0.000	-nan(ind)	-nan(ind)
35	30.00	35.00	-nan(ind)	-nan(ind)	-nan(ind)
36	30.00	36.00	-nan(ind)	-nan(ind)	-nan(ind)
37	30.00	37.00	-nan(ind)	-nan(ind)	-nan(ind)
38	30.00	38.00	-nan(ind)	-nan(ind)	-nan(ind)
39	30.00	39.00	-nan(ind)	0.000	-nan(ind)
40	30.00	40.00	-nan(ind)	0.000	-nan(ind)
41	30.00	41.00	-nan(ind)	0.000	-nan(ind)
42	30.00	42.00	-nan(ind)	0.000	-nan(ind)
43	30.00	43.00	-nan(ind)	-nan(ind)	-nan(ind)
44	30.00	44.00	-nan(ind)	-nan(ind)	-nan(ind)
45	30.00	45.00	-nan(ind)	-nan(ind)	-nan(ind)
46	30.00	46.00	-nan(ind)	-nan(ind)	-nan(ind)
47	30.00	47.00	-nan(ind)	-nan(ind)	-nan(ind)
48	30.00	48.00	-nan(ind)	-nan(ind)	-nan(ind)
49	30.00	49.00	-nan(ind)	-nan(ind)	-nan(ind)
50	30.00	50.00	-nan(ind)	-nan(ind)	-nan(ind)
51	30.00	51.00	-nan(ind)	-nan(ind)	-nan(ind)
52	30.00	52.00	-nan(ind)	-nan(ind)	-nan(ind)
53	30.00	53.00	-nan(ind)	-nan(ind)	-nan(ind)
54	30.00	54.00	-nan(ind)	-nan(ind)	-nan(ind)
55	30.00	55.00	-nan(ind)	-nan(ind)	-nan(ind)
56	30.00	56.00	-nan(ind)	-nan(ind)	-nan(ind)
57	30.00	57.00	-nan(ind)	-nan(ind)	-nan(ind)
58	30.00	58.00	-nan(ind)	-nan(ind)	-nan(ind)
59	30.00	59.00	-nan(ind)	-nan(ind)	-nan(ind)
60	30.00	60.00	-nan(ind)	-nan(ind)	-nan(ind)
61	30.00	61.00	-nan(ind)	-nan(ind)	-nan(ind)
62	30.00	62.00	-nan(ind)	-nan(ind)	-nan(ind)
63	30.00	63.00	-nan(ind)	-nan(ind)	-nan(ind)
64	30.00	64.00	-nan(ind)	-nan(ind)	-nan(ind)
65	30.00	65.00	-nan(ind)	-nan(ind)	-nan(ind)
66	30.00	66.00	-nan(ind)	-nan(ind)	-nan(ind)
67	30.00	67.00	-nan(ind)	-nan(ind)	-nan(ind)
68	30.00	68.00	-nan(ind)	-nan(ind)	-nan(ind)
69	30.00	69.00	-nan(ind)	-nan(ind)	-nan(ind)
70	30.00	70.00	-nan(ind)	-nan(ind)	-nan(ind)
71	30.00	71.00	-nan(ind)	-nan(ind)	-nan(ind)
72	30.00	72.00	-nan(ind)	-nan(ind)	-nan(ind)
73	30.00	73.00	-nan(ind)	-nan(ind)	-nan(ind)
74	30.00	74.00	-nan(ind)	-nan(ind)	-nan(ind)

SOIL/ROCK PARAMETERS FOR LATERAL ANALYSIS OF DRILLED SHAFT/AUGERCAST PILE/MICROPILE WITH FB-MULTIPIER

ATLANTIC ISLES BRIDGE

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 6

FINANCIAL PROJECT ID No. 430029-2-22-02

MIAMI-DADE COUNTY, FLORIDA

HR ENGINEERING SERVICES. INC.

HRES PROJECT No. HR20-1583R

FEBRUARY 24, 2021

Bent	Foundation Type	Borings	Layer No.	Top of Layer Elev. (ft.)	Bottom of Layer Elev. (ft.)	Soil Description	Soil Type	Average SPT N (blows/ft)	Lateral					Axial			Torsional					Tip	
									Soil Model	Internal Friction Angle (Deg.)	Total Unit Weight (lb/ft^3)	Lateral Soil Modulus, (lb/in^3)	Unconfined Compressive Strength, qu (psf)	Soil Model	Total Unit Weight (lb/ft3)	Ult. Unit Skin Friction (psf)	Soil Model	Internal Friction Angle (Deg.)	Total Unit Weight (lb/ft3)	Shear Modulus (k/in^2)	Torsional Shear Stress (lb/ft^2)	Soil Model	Undrained Shear Strength (lb/ft^2)
End Bents 1 and 2	Drilled Shaft/ Micropile	B-1 and B-2	1	-15.0	-30.6	Soft Limestone	Cohesionless	10	Sand Reese	30	120	20	-	Drilled Shaft Sand	120	-	Hyperbolic	30	120	0.8	600	Drilled Shaft Clay	0
			2	-30.6	-35.6	Limestone	Rock	40	Limestone (McVay)	-	120	-	35776	DS Limestone (McVay)	120	8000	Hyperbolic	0	120	11.9	8000	Drilled Shaft Clay	0
			3	-35.6	-40.6	Sand	Cohesionless	9	Sand Reese	30	105	20	-	Drilled Shaft Sand	105	-	Hyperbolic	30	105	0.7	600	Drilled Shaft Clay	0
			4	-40.6	-70.0	Limestone	Rock	40	Limestone (McVay)	-	120	-	35776	DS Limestone (McVay)	120	8000	Hyperbolic	0	120	11.9	8000	Drilled Shaft Clay	0

Notes:

ϕ = 28+N(safety)/4 for sand and soft limestone.

γ = 105*ϕ/30 for sand and 120 pcf for limestone.

Axial unit skin friction and Torsional shear stress estimated using β-Method for drilled shafts in sand and soft limestone and fs=0.1 N (tsf) in limestone,

Lateral soil modulus (k) was estimated using FDOT Soils and Foundation Handbook -sand and soft limestone

Shear Modulus G = E/2(1+ν)

E(ksf) = 30*N for sand and soft limestone and , E = 115qu for limestone ν = 0.3 for sand and soft limestone, 0.2 for limestone.

qu for limestone estimated by equating the side friction obtained by 0.1 N (tsf) and McVay's equation (0.5 (qu.qt)^.5). It is assumed that qt=20% of qu.

Clay with Cu value of 0 has been provided for tip modeling (no tip contribution on DS/MP axial capacity). A Cu value, as required for analysis convergence, may be used for lateral stability analysis purposes.

Note: Since submerged conditions are likely to exist when the design load condition occurs, make no distinction between dry and submerged conditions.

Friction Angles in Sand

The following typical correlation may be used to estimate the soil friction angle, φ:

$$\varphi = N/4 + 28$$

As an alternative, the procedure described in 6.1.1.5 Friction Angle vs. SPT-N shall be used. The maximum Φ value shall be limited to 35 degrees for silty sand (A-2-4) and 38 degrees for clean sand (A-3), unless higher friction angles are statistically supported by laboratory shear strength test results.

Walls founded on berms

When walls are founded through compacted select fill berm, include the portion of the pile with less than 2.5D horizontal soil cover (face-of-pile to face-of-slope) in the unsupported length, and design the portion of the pile with more than 2.5D soil cover as though founded in level ground.

Clay

Use the LPILE or COM624 program guideline to determine k and ε_{50} values. However, limit the properties of clay to stiff clay or weaker (design values for undrained shear strength shall not exceed 2000 psf and the ε_{50} shall not be less than 0.007), unless laboratory stress-strain measurements indicate otherwise.

Rock

The results of SPT borings are most often used for designing sound wall foundations in shallow limestone strata. Less conservative designs require more vigorous sampling and testing to demonstrate that less conservative design values are appropriate in all locations. In the absence of a comprehensive, vigorous sampling and testing program, the design based on SPT borings shall be as follows:

Rock material with N-values less than 10 blows/foot shall be modeled as sand. Rock material with N-values between 10 and 25 blows/foot shall be modeled as sandy gravel:

Friction Angle, $\varphi = N/4 + 33$

The maximum friction angle value shall be limited to 40 degrees, unless higher friction angles are statistically supported by laboratory shear strength test results.

Rock material with N-values of 25 blows/foot or more:

- Use the LPILE or COM624 program guideline to model p-y curves of weak rock.

Modeling rock as stiff clay will be acceptable, provided reasonable conservatism in the selection of k and undrained shear strength are adopted.

AXIAL LOAD RESISTANCE (doesn't normally control the design of sound barrier foundations)

Side Resistance in Sands

Side resistance in cohesionless soils shall be computed by the FHWA Method (Beta Method) specified in the Publication FHWA-IF-99-025 (August, 1999) for drilled shafts as follows:

$$f_s = P'_v \ \beta_c$$
$$\beta_c = \beta * N/15 \text{ where } \beta_c \leq \beta$$
$$\beta = 1.5 - 0.135\,(z)^{0.5} \ \text{(z, depth in ft)} \ \text{ where } 1.2 \geq \beta \geq 0.25$$

where f_s = Ultimate unit side resistance
The maximum value of f_s shall be limited to 2.1 tsf, unless load test results indicate otherwise.
P'_v = Effective vertical stress

Side Resistance in Rock:

When limestone and calcareous rock cores are obtained for laboratory testing, ultimate unit side resistance shall be estimated as discussed in Appendix A.

When rock cores and laboratory testing are not available, use the following approach:

- If SPT N-value in rock is less than 25 blows / foot, assume sand behavior.
- If SPT N-value in rock is greater than or equal to 25 blows / foot, use the following:
  $f_s = 0.1$ N (tsf) where $f_s \leq 5.0$ tsf

Side Resistance in Clay

Model inorganic clays and silts in accordance with FHWA methods. Shear strength values should be estimated from UU tests, unconfined tests, vane tests, etc. If only SPT tests are available, Consultants are expected to use reasonable judgment in the selection of undrained shear strength from correlations available in the literature.

The shear strength of clay estimated from SPT-N values or CPT results shall not exceed 2000 psf, unless laboratory stress-strain measurements indicate otherwise.

Side resistance shall be computed by the FHWA Method (Alpha Method) specified in the Publication FHWA-IF-99-025 (August, 1999) for drilled shafts as follows:

$$f_s = \alpha \ S_u$$

11.4.3 Young's Modulus

The young's modulus, of soils, can be obtained from following empirical equations:

For Sand

$$E = \alpha * p_a * N_{60} \quad \text{(psf)}$$

Eqn: 11.4.A

where

α = 5 for sands with fines
10 for clean normally consolidated sand
15 for clean overconsolidated sand

p_a = atmospheric pressure (≈ 2000 psf)

N_{60} = corrected SPT blow-count (blows/ft)

Use $\alpha = 15$

$\therefore E = 30{,}000 \cdot N_{60}$ psf

$= \underline{30 \cdot N_{60}}$ ksf

$$E = k * B * (1 - \upsilon^2) \quad \text{(psf)}$$

Eqn: 11.4.B

where

k = subgrade modulus (pcf)

B = width of pile (ft)

υ = poisson's ratio

$$E = k * z \quad \text{(psf)}$$

Eqn: 11.4.C

where

k = subgrade modulus (pcf)

z = depth below ground surface (ft)

For Clay

$$E = \beta * C_u \quad \text{(psf)}$$

Eqn: 11.4.D

Shear Modulus

The shear modulus, G of soils, is a function of soil type, past loading, and geological history. It is recommended that G be obtained from insitu tests such as dilatometer, CPT and SPT.

G can be computed from Young's Modulus , E and Poisson's ratio , ν, from the following correlation:

Eqn. b11 $$G = \frac{E}{2(1+\nu)}$$

In the case of no insitu data is available the following guide is provided:

Eqn. b12 $$G = \frac{0.5 * k * z}{(1+\nu)}$$ for sand

Eqn. b13 $$G = \frac{50 * Cu}{(1+\nu)}$$ for Clay

where

k = soil modulus (F/L3)
z = depth below ground surface (L)
Cu = undrained shear strength (F/L2)
or a spatial average, for the values of GM should be used for any soil profile.

DRAFT

Poisson's Ratio

The following typical values may be used for the Poisson's ratio ν for soils:

ν = 0.2 to 0.3 for sand
= 0.4 to 0.5 for clay

or a spatial average, for the values of ν over depth may be used for soils consisting of both sand and clay.

GENERAL

In order to accommodate the post supports and reinforcement with the required cover, the normal foundation diameter is approximately 30 inches. It is generally desirable and efficient to limit foundation depths to 25 or 30 feet. If the design indicates a 30 inch diameter foundation will need to be longer than 30 feet, a larger diameter foundation should be considered.

NOISE BARRIER FOUNDATIONS

See Section 8.2.4.1

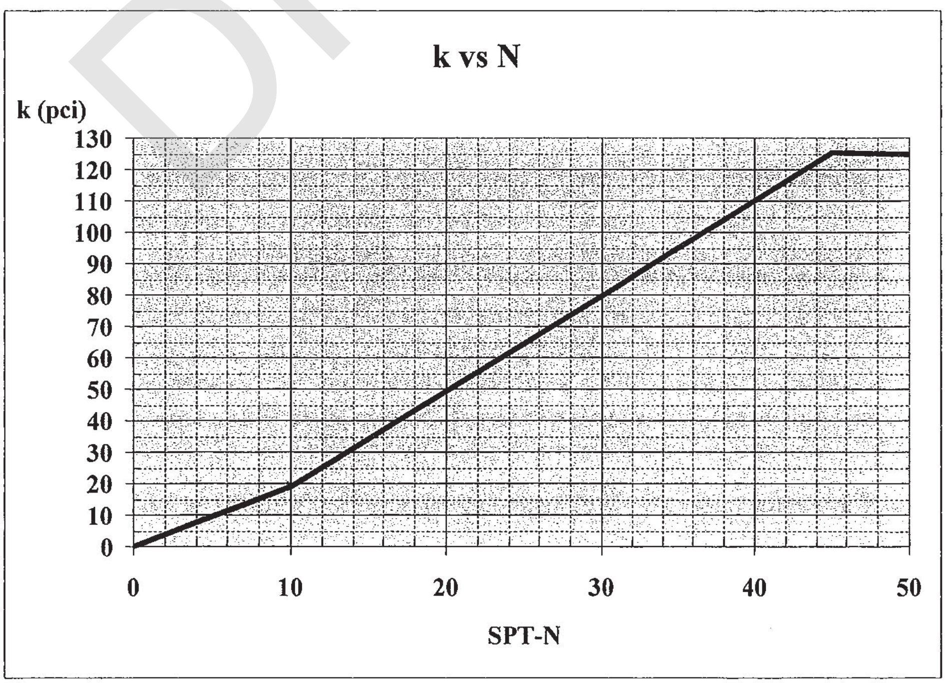
LATERAL LOAD RESISTANCE

Use a Load Factor in accordance with the latest AASHTO LRFD Bridge Design Specifications.

When required, computer programs such as FBPier, LPILE, or COM624 may be used to determine the deflections and rotations.

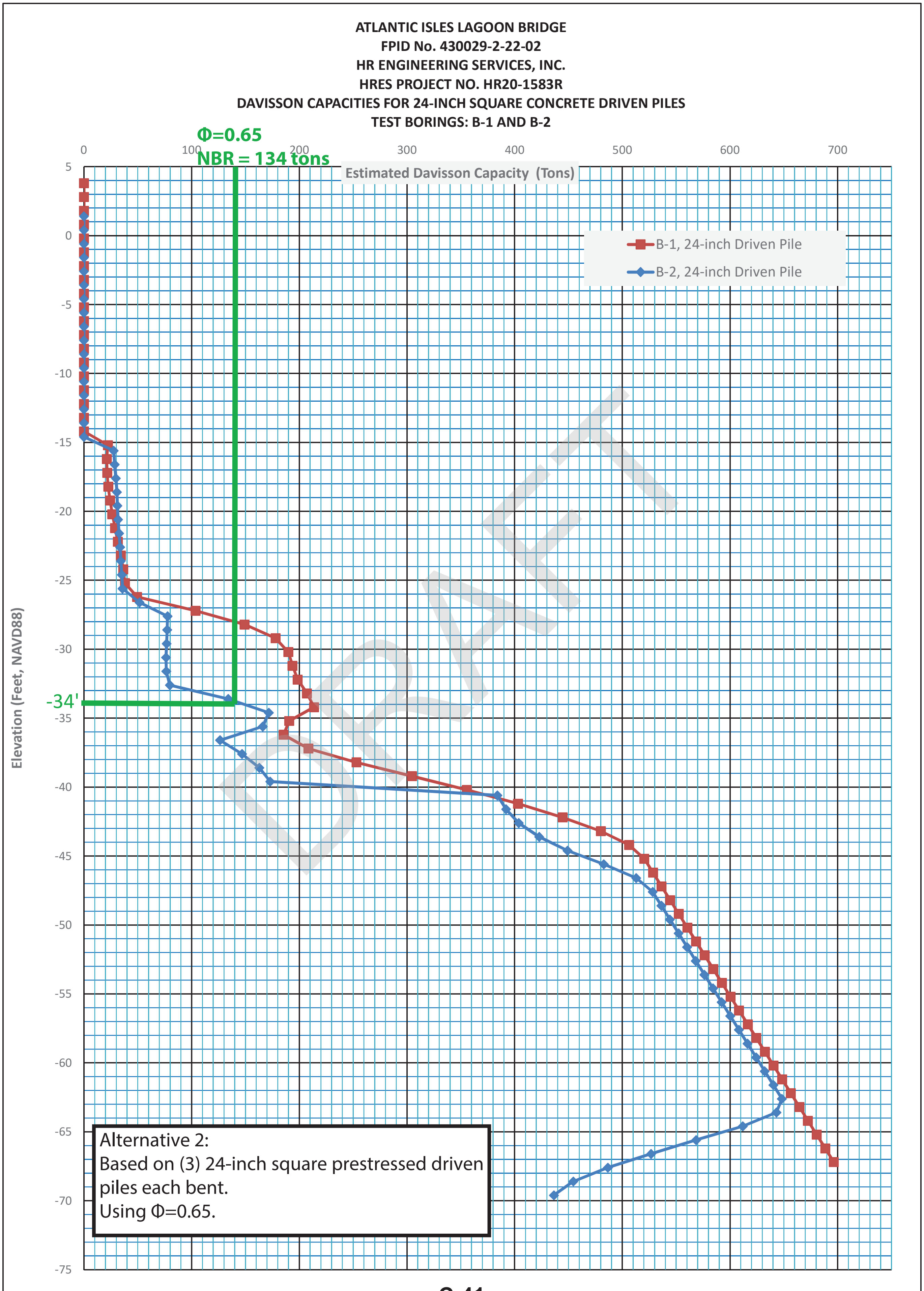
<u>k values in Sands.</u>

For structures subject to lateral loads due to a storm event, k values input into FBPier, LPILE, or COM624 shall not exceed the following values in pounds per cubic inch, without lateral load tests:



ALTERNATIVE 2

BRIDGE REPLACEMENT
DRIVEN PILE


ATLANTIC ISLES LAGOON BRIDGE
FPID No. 430029-2-22-02
HR ENGINEERING SERVICES, INC.
HRES PROJECT NO. HR20-1583R
DAVISSON CAPACITIES FOR 24-INCH SQUARE CONCRETE DRIVEN PILES
TEST BORINGS: B-1 AND B-2
Φ=0.65
NBR = 134 tons
Estimated Davisson Capacity (Tons)
Elevation (Feet, NAVD88)
B-1, 24-inch Driven Pile
B-2, 24-inch Driven Pile
-34'
DRAFT
0
100
200
300
400
500
600
700
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
-75
Alternative 2:
Based on (3) 24-inch square prestressed driven piles each bent.
Using Φ=0.65.

General Information:
====================
Input file: .....tic Isles Lagoon Bridge\Revised 02-18-21\Bridge\FB-DEEP\B-1.in
Project number: HR20-1583R
Job name: Atlantic Isles Lagoon Bridge
Engineer: CS
Units: English

Analysis Information:
=====================
Analysis Type: SPT

Soil Information:
=================
Boring date: 12/05/17,   Boring Number: B-1
Station number: 13+27 (BL ATLANTIC AVE.) Offset: 6.0 RT

Ground Elevation: 4.800(ft)

Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	17.00	5- Cavity layer
2	2.00	17.00	5- Cavity layer
3	4.00	8.00	5- Cavity layer
4	6.00	2.00	5- Cavity layer
5	8.00	2.00	5- Cavity layer
6	10.00	2.00	5- Cavity layer
7	12.00	2.00	5- Cavity layer
8	13.00	4.00	5- Cavity layer
9	15.00	37.00	5- Cavity layer
10	18.00	40.00	5- Cavity layer
11	19.80	40.00	5- Cavity layer
12	19.80	8.00	4- Lime Stone/Very shelly sand
13	23.00	7.00	4- Lime Stone/Very shelly sand
14	25.00	4.00	4- Lime Stone/Very shelly sand
15	28.00	3.00	4- Lime Stone/Very shelly sand
16	30.00	8.00	4- Lime Stone/Very shelly sand
17	33.00	8.00	4- Lime Stone/Very shelly sand
18	35.00	8.00	4- Lime Stone/Very shelly sand
19	38.00	8.00	4- Lime Stone/Very shelly sand
20	38.80	8.00	4- Lime Stone/Very shelly sand
21	38.80	100.00	4- Lime Stone/Very shelly sand
22	40.00	100.00	4- Lime Stone/Very shelly sand
23	43.00	13.00	4- Lime Stone/Very shelly sand
24	45.00	16.00	4- Lime Stone/Very shelly sand
25	48.00	49.00	4- Lime Stone/Very shelly sand
26	50.00	100.00	4- Lime Stone/Very shelly sand
27	53.00	100.00	4- Lime Stone/Very shelly sand
28	55.00	100.00	4- Lime Stone/Very shelly sand
29	58.00	100.00	4- Lime Stone/Very shelly sand
30	60.00	100.00	4- Lime Stone/Very shelly sand
31	63.00	100.00	4- Lime Stone/Very shelly sand
32	65.00	100.00	4- Lime Stone/Very shelly sand
33	68.00	100.00	4- Lime Stone/Very shelly sand
34	70.00	100.00	4- Lime Stone/Very shelly sand
35	73.00	100.00	4- Lime Stone/Very shelly sand
36	75.00	100.00	4- Lime Stone/Very shelly sand
37	78.00	100.00	4- Lime Stone/Very shelly sand
38	80.00	100.00	4- Lime Stone/Very shelly sand

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	4.80	-15.00	19.80	14.60	5-Void
2	-15.00	-75.20	60.20	61.79	4-Limestone, Very Shelly Sand

Driven Pile Data:
=================
Pile unit weight = 150.00(pcf), Section Type: Square

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)
24.00	1.00	3.80
24.00	2.00	2.80

24.00	3.00	1.80
24.00	4.00	0.80
24.00	5.00	-0.20
24.00	6.00	-1.20
24.00	7.00	-2.20
24.00	8.00	-3.20
24.00	9.00	-4.20
24.00	10.00	-5.20
24.00	11.00	-6.20
24.00	12.00	-7.20
24.00	13.00	-8.20
24.00	14.00	-9.20
24.00	15.00	-10.20
24.00	16.00	-11.20
24.00	17.00	-12.20
24.00	18.00	-13.20
24.00	19.00	-14.20
24.00	20.00	-15.20
24.00	21.00	-16.20
24.00	22.00	-17.20
24.00	23.00	-18.20
24.00	24.00	-19.20
24.00	25.00	-20.20
24.00	26.00	-21.20
24.00	27.00	-22.20
24.00	28.00	-23.20
24.00	29.00	-24.20
24.00	30.00	-25.20
24.00	31.00	-26.20
24.00	32.00	-27.20
24.00	33.00	-28.20
24.00	34.00	-29.20
24.00	35.00	-30.20
24.00	36.00	-31.20
24.00	37.00	-32.20
24.00	38.00	-33.20
24.00	39.00	-34.20
24.00	40.00	-35.20
24.00	41.00	-36.20
24.00	42.00	-37.20
24.00	43.00	-38.20
24.00	44.00	-39.20
24.00	45.00	-40.20
24.00	46.00	-41.20
24.00	47.00	-42.20
24.00	48.00	-43.20
24.00	49.00	-44.20
24.00	50.00	-45.20
24.00	51.00	-46.20
24.00	52.00	-47.20
24.00	53.00	-48.20
24.00	54.00	-49.20
24.00	55.00	-50.20
24.00	56.00	-51.20
24.00	57.00	-52.20
24.00	58.00	-53.20
24.00	59.00	-54.20
24.00	60.00	-55.20
24.00	61.00	-56.20
24.00	62.00	-57.20
24.00	63.00	-58.20
24.00	64.00	-59.20
24.00	65.00	-60.20
24.00	66.00	-61.20
24.00	67.00	-62.20
24.00	68.00	-63.20
24.00	69.00	-64.20
24.00	70.00	-65.20
24.00	71.00	-66.20
24.00	72.00	-67.20

Driven Pile Capacity:
====================

Section Type: Square
Pile Width: 24.00 (in)

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	24.0	0.00	0.00	0.00	0.00	0.00
2.00	24.0	0.00	0.00	0.00	0.00	0.00
3.00	24.0	0.00	0.00	0.00	0.00	0.00
4.00	24.0	0.00	0.00	0.00	0.00	0.00
5.00	24.0	0.00	0.00	0.00	0.00	0.00
6.00	24.0	0.00	0.00	0.00	0.00	0.00

7.00	24.0	0.00	0.00	0.00	0.00	0.00
8.00	24.0	0.00	0.00	0.00	0.00	0.00
9.00	24.0	0.00	0.00	0.00	0.00	0.00
10.00	24.0	0.00	0.00	0.00	0.00	0.00
11.00	24.0	0.00	0.00	0.00	0.00	0.00
12.00	24.0	0.00	0.00	0.00	0.00	0.00
13.00	24.0	0.00	0.00	0.00	0.00	0.00
14.00	24.0	0.00	0.00	0.00	0.00	0.00
15.00	24.0	0.00	0.00	0.00	0.00	0.00
16.00	24.0	0.00	0.00	0.00	0.00	0.00
17.00	24.0	0.00	0.00	0.00	0.00	0.00
18.00	24.0	0.00	0.00	0.00	0.00	0.00
19.00	24.0	0.00	0.00	0.00	0.00	0.00
20.00	24.0	0.16	21.99	22.15	11.07	66.13
21.00	24.0	0.93	20.19	21.12	10.56	61.49
22.00	24.0	1.67	19.82	21.50	10.75	61.14
23.00	24.0	2.38	20.26	22.64	11.32	63.17
24.00	24.0	3.00	21.17	24.17	12.08	66.50
25.00	24.0	3.47	22.84	26.31	13.15	71.98
26.00	24.0	3.85	24.97	28.82	14.41	78.77
27.00	24.0	4.20	27.28	31.48	15.74	86.03
28.00	24.0	4.51	29.75	34.26	17.13	93.76
29.00	24.0	4.94	31.66	36.60	18.30	99.93
30.00	24.0	5.60	32.30	37.91	18.95	102.51
31.00	24.0	6.40	42.97	49.37	24.68	135.30
32.00	24.0	7.19	96.30	103.49	51.74	296.08
33.00	24.0	7.99	141.18	149.16	74.58	431.52
34.00	24.0	8.78	169.18	177.96	88.98	516.31
35.00	24.0	9.57	180.29	189.86	94.93	550.43
36.00	24.0	10.37	183.37	193.73	96.87	560.47
37.00	24.0	11.16	187.28	198.44	99.22	572.99
38.00	24.0	11.95	195.18	207.13	103.57	597.49
39.00	24.0	14.19	199.57	213.76	106.88	612.91
40.00	24.0	22.19	168.47	190.66	95.33	527.60
41.00	24.0	29.07	156.27	185.34	92.67	497.87
42.00	24.0	33.71	174.72	208.43	104.22	557.87
43.00	24.0	36.12	216.93	253.06	126.53	686.92
44.00	24.0	37.49	267.18	304.67	152.33	839.03
45.00	24.0	39.00	316.60	355.60	177.80	988.80
46.00	24.0	41.13	362.02	403.16	201.58	1127.20
47.00	24.0	44.36	400.29	444.64	222.32	1245.22
48.00	24.0	48.67	431.39	480.07	240.03	1342.85
49.00	24.0	54.32	452.04	506.36	253.18	1410.43
50.00	24.0	61.53	458.92	520.45	260.23	1438.29
51.00	24.0	69.53	458.92	528.45	264.23	1446.29
52.00	24.0	77.53	458.92	536.45	268.23	1454.29
53.00	24.0	85.53	458.92	544.45	272.23	1462.29
54.00	24.0	93.53	458.92	552.45	276.23	1470.29
55.00	24.0	101.53	458.92	560.45	280.23	1478.29
56.00	24.0	109.53	458.92	568.45	284.23	1486.29
57.00	24.0	117.53	458.92	576.45	288.23	1494.29
58.00	24.0	125.53	458.92	584.45	292.23	1502.29
59.00	24.0	133.53	458.92	592.45	296.23	1510.29
60.00	24.0	141.53	458.92	600.45	300.23	1518.29
61.00	24.0	149.53	458.92	608.45	304.23	1526.29
62.00	24.0	157.53	458.92	616.45	308.23	1534.29
63.00	24.0	165.53	458.92	624.45	312.23	1542.29
64.00	24.0	173.53	458.92	632.45	316.23	1550.29
65.00	24.0	181.53	458.92	640.45	320.23	1558.29
66.00	24.0	189.53	458.92	648.45	324.23	1566.29
67.00	24.0	197.53	458.92	656.45	328.23	1574.29
68.00	24.0	205.53	458.92	664.45	332.23	1582.29
69.00	24.0	213.53	458.92	672.45	336.23	1590.29
70.00	24.0	221.53	458.92	680.45	340.23	1598.29
71.00	24.0	229.53	458.92	688.45	344.23	1606.29
72.00	24.0	237.53	458.92	696.45	348.23	1614.29

NOTES
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1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 3 x THE MOBILIZED END BEARING.
   EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 2 x THE MOBILIZED END BEARING.

General Information:

Input file: ..... Bridge\Revised II 02-18-21\Bridge\FB-DEEP\Driven Piles\B-2.in
Project number: HR20-1583R
Job name: Atlantic Isles Lagoon Bridge
Engineer: CS
Units: English

Analysis Information:

Analysis Type: SPT

Soil Information:

Boring date: 12/04/17, Boring Number: B-2
Station number: 14+10 (BL ATLANTIC AVE.) Offset: 20.0 RT

Ground Elevation: 2.400(ft)

Hammer type: Automatic Hammer, Correction factor = 1.24

ID	Depth (ft)	No. of Blows (Blows/ft)	Soil Type
1	0.00	4.00	5- Cavity layer
2	2.00	4.00	5- Cavity layer
3	4.00	2.00	5- Cavity layer
4	6.00	2.00	5- Cavity layer
5	8.00	1.00	5- Cavity layer
6	10.00	4.00	5- Cavity layer
7	13.00	2.00	5- Cavity layer
8	15.00	1.00	5- Cavity layer
9	17.40	6.00	5- Cavity layer
10	17.40	8.00	4- Lime Stone/Very shelly sand
11	18.00	8.00	4- Lime Stone/Very shelly sand
12	20.00	7.00	4- Lime Stone/Very shelly sand
13	23.00	5.00	4- Lime Stone/Very shelly sand
14	25.00	8.00	4- Lime Stone/Very shelly sand
15	28.00	8.00	4- Lime Stone/Very shelly sand
16	30.00	5.00	4- Lime Stone/Very shelly sand
17	33.00	8.00	4- Lime Stone/Very shelly sand
18	35.00	8.00	4- Lime Stone/Very shelly sand
19	36.40	8.00	4- Lime Stone/Very shelly sand
20	36.40	47.00	4- Lime Stone/Very shelly sand
21	38.00	47.00	4- Lime Stone/Very shelly sand
22	38.00	3.00	3- Clean sand
23	40.00	3.00	3- Clean sand
24	42.00	6.00	3- Clean sand
25	42.90	6.00	3- Clean sand
26	43.00	100.00	4- Lime Stone/Very shelly sand
27	44.00	100.00	4- Lime Stone/Very shelly sand
28	48.00	41.00	4- Lime Stone/Very shelly sand
29	50.00	100.00	4- Lime Stone/Very shelly sand
30	53.00	100.00	4- Lime Stone/Very shelly sand
31	55.00	100.00	4- Lime Stone/Very shelly sand
32	58.00	100.00	4- Lime Stone/Very shelly sand
33	60.00	100.00	4- Lime Stone/Very shelly sand
34	62.00	100.00	4- Lime Stone/Very shelly sand
35	65.00	100.00	4- Lime Stone/Very shelly sand
36	68.00	100.00	4- Lime Stone/Very shelly sand
37	70.00	100.00	4- Lime Stone/Very shelly sand
38	73.00	100.00	4- Lime Stone/Very shelly sand
39	75.00	10.00	4- Lime Stone/Very shelly sand
40	78.00	19.00	4- Lime Stone/Very shelly sand
41	80.00	60.00	4- Lime Stone/Very shelly sand

Blowcount Average Per Soil Layer

Layer Num.	Starting Elevation (ft)	Bottom Elevation (ft)	Thickness (ft)	Average Blowcount (Blows/ft)	Soil Type
1	2.40	-15.00	17.40	2.55	5-Void
2	-15.00	-35.60	20.60	10.16	4-Limestone, Very Shelly Sand
3	-35.60	-40.60	5.00	3.60	3-Clean Sand
4	-40.60	-77.60	37.00	85.14	4-Limestone, Very Shelly Sand

Driven Pile Data:

Pile unit weight = 150.00(pcf), Section Type: Square

Pile Geometry:

Width (in)	Length (ft)	Tip Elev. (ft)
24.00	1.00	1.40
24.00	2.00	0.40
24.00	3.00	-0.60
24.00	4.00	-1.60
24.00	5.00	-2.60
24.00	6.00	-3.60
24.00	7.00	-4.60
24.00	8.00	-5.60
24.00	9.00	-6.60
24.00	10.00	-7.60
24.00	11.00	-8.60
24.00	12.00	-9.60
24.00	13.00	-10.60
24.00	14.00	-11.60
24.00	15.00	-12.60
24.00	16.00	-13.60
24.00	17.00	-14.60
24.00	18.00	-15.60
24.00	19.00	-16.60
24.00	20.00	-17.60
24.00	21.00	-18.60
24.00	22.00	-19.60
24.00	23.00	-20.60
24.00	24.00	-21.60
24.00	25.00	-22.60
24.00	26.00	-23.60
24.00	27.00	-24.60
24.00	28.00	-25.60
24.00	29.00	-26.60
24.00	30.00	-27.60
24.00	31.00	-28.60
24.00	32.00	-29.60
24.00	33.00	-30.60
24.00	34.00	-31.60
24.00	35.00	-32.60
24.00	36.00	-33.60
24.00	37.00	-34.60
24.00	38.00	-35.60
24.00	39.00	-36.60
24.00	40.00	-37.60
24.00	41.00	-38.60
24.00	42.00	-39.60
24.00	43.00	-40.60
24.00	44.00	-41.60
24.00	45.00	-42.60
24.00	46.00	-43.60
24.00	47.00	-44.60
24.00	48.00	-45.60
24.00	49.00	-46.60
24.00	50.00	-47.60
24.00	51.00	-48.60
24.00	52.00	-49.60
24.00	53.00	-50.60
24.00	54.00	-51.60
24.00	55.00	-52.60
24.00	56.00	-53.60
24.00	57.00	-54.60
24.00	58.00	-55.60
24.00	59.00	-56.60
24.00	60.00	-57.60
24.00	61.00	-58.60
24.00	62.00	-59.60
24.00	63.00	-60.60
24.00	64.00	-61.60
24.00	65.00	-62.60
24.00	66.00	-63.60
24.00	67.00	-64.60
24.00	68.00	-65.60
24.00	69.00	-66.60
24.00	70.00	-67.60
24.00	71.00	-68.60
24.00	72.00	-69.60

Driven Pile Capacity:
=====================

Section Type: Square
Pile Width: 24.00 (in)

Test Pile Length (ft)	Pile Width (in)	Ultimate Side Friction (tons)	Mobilized End Bearing (tons)	Estimated Davisson Capacity (tons)	Allowable Pile Capacity (tons)	Ultimate Pile Capacity (tons)
1.00	24.0	0.00	0.00	0.00	0.00	0.00
2.00	24.0	0.00	0.00	0.00	0.00	0.00
3.00	24.0	0.00	0.00	0.00	0.00	0.00
4.00	24.0	0.00	0.00	0.00	0.00	0.00
5.00	24.0	0.00	0.00	0.00	0.00	0.00
6.00	24.0	0.00	0.00	0.00	0.00	0.00
7.00	24.0	0.00	0.00	0.00	0.00	0.00
8.00	24.0	0.00	0.00	0.00	0.00	0.00
9.00	24.0	0.00	0.00	0.00	0.00	0.00
10.00	24.0	0.00	0.00	0.00	0.00	0.00
11.00	24.0	0.00	0.00	0.00	0.00	0.00
12.00	24.0	0.00	0.00	0.00	0.00	0.00
13.00	24.0	0.00	0.00	0.00	0.00	0.00
14.00	24.0	0.00	0.00	0.00	0.00	0.00
15.00	24.0	0.00	0.00	0.00	0.00	0.00
16.00	24.0	0.00	0.00	0.00	0.00	0.00
17.00	24.0	0.00	0.00	0.00	0.00	0.00
18.00	24.0	0.48	27.14	27.61	13.81	81.89
19.00	24.0	1.24	27.27	28.51	14.26	83.05
20.00	24.0	1.96	27.66	29.62	14.81	84.94
21.00	24.0	2.63	27.96	30.59	15.29	86.51
22.00	24.0	3.22	27.84	31.06	15.53	86.73
23.00	24.0	3.75	27.92	31.67	15.84	87.52
24.00	24.0	4.32	28.31	32.63	16.31	89.25
25.00	24.0	5.04	28.44	33.48	16.74	90.35
26.00	24.0	5.83	28.44	34.27	17.14	91.15
27.00	24.0	6.63	28.44	35.06	17.53	91.94
28.00	24.0	7.42	28.44	35.86	17.93	92.73
29.00	24.0	8.14	43.41	51.55	25.77	138.37
30.00	24.0	8.71	68.88	77.59	38.79	215.35
31.00	24.0	9.26	68.11	77.37	38.68	213.59
32.00	24.0	9.90	66.83	76.73	38.37	210.40
33.00	24.0	10.64	65.53	76.18	38.09	207.24
34.00	24.0	11.44	64.97	76.40	38.20	206.34
35.00	24.0	12.23	67.57	79.80	39.90	214.93
36.00	24.0	13.02	120.89	133.92	66.96	375.71
37.00	24.0	16.14	155.47	171.61	85.80	482.54
38.00	24.0	20.80	145.28	166.08	83.04	456.65
39.00	24.0	21.37	105.08	126.45	63.22	336.61
40.00	24.0	21.93	124.82	146.75	73.38	396.40
41.00	24.0	22.64	140.18	162.82	81.41	443.17
42.00	24.0	23.44	149.52	172.96	86.48	472.01
43.00	24.0	25.10	358.92	384.02	192.01	1101.85
44.00	24.0	33.10	358.92	392.02	196.01	1109.85
45.00	24.0	40.61	363.08	403.69	201.85	1129.86
46.00	24.0	47.14	375.58	422.72	211.36	1173.89
47.00	24.0	52.68	396.42	449.10	224.55	1241.93
48.00	24.0	57.24	425.59	482.82	241.41	1333.99
49.00	24.0	62.29	450.59	512.87	256.44	1414.05
50.00	24.0	69.31	458.92	528.23	264.11	1446.07
51.00	24.0	77.31	458.92	536.23	268.11	1454.07
52.00	24.0	85.31	458.92	544.23	272.11	1462.07
53.00	24.0	93.31	458.92	552.23	276.11	1470.07
54.00	24.0	101.31	458.92	560.23	280.11	1478.07
55.00	24.0	109.31	458.92	568.23	284.11	1486.07
56.00	24.0	117.31	458.92	576.23	288.11	1494.07
57.00	24.0	125.31	458.92	584.23	292.11	1502.07
58.00	24.0	133.31	458.92	592.23	296.11	1510.07
59.00	24.0	141.31	458.92	600.23	300.11	1518.07
60.00	24.0	149.31	458.92	608.23	304.11	1526.07
61.00	24.0	157.31	458.92	616.23	308.11	1534.07
62.00	24.0	165.31	458.92	624.23	312.11	1542.07
63.00	24.0	173.31	458.92	632.23	316.11	1550.07
64.00	24.0	181.31	458.92	640.23	320.11	1558.07
65.00	24.0	189.31	458.92	648.23	324.11	1566.07
66.00	24.0	197.31	445.85	643.16	321.58	1534.86
67.00	24.0	205.31	406.65	611.95	305.98	1425.24
68.00	24.0	213.31	355.20	568.51	284.25	1278.90
69.00	24.0	221.31	305.41	526.72	263.36	1137.54
70.00	24.0	229.31	257.28	486.58	243.29	1001.14
71.00	24.0	237.31	217.10	454.40	227.20	888.59
72.00	24.0	245.31	191.15	436.46	218.23	818.76

NOTES

1. MOBILIZED END BEARING IS 1/3 OF THE ORIGINAL RB-121 VALUES.

2. DAVISSON PILE CAPACITY IS AN ESTIMATE BASED ON FAILURE CRITERIA, AND EQUALS ULTIMATE SIDE FRICTION PLUS MOBILIZED END BEARING.

3. ALLOWABLE PILE CAPACITY IS 1/2 THE DAVISSON PILE CAPACITY.

4. ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS 3 x THE MOBILIZED END BEARING.
EXCEPTION: FOR H-PILES TIPPED IN SAND OR LIMESTONE, THE ULTIMATE PILE CAPACITY IS ULTIMATE SIDE FRICTION PLUS

SOIL/ROCK PARAMETERS FOR LATERAL ANALYSIS WITH FB-MULTIPIER FOR DRIVEN PILES

ATLANTIC ISLE BRIDGE OVER OCEAN CANAL

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 6
FINANCIAL PROJECT ID No. 430029-2-22-02
MIAMI-DADE COUNTY, FLORIDA
HR ENGINEERING SERVICES. INC.
HRES PROJECT No. HR20-1583R

FEBRUARY 24, 2021

End Bent	Pile Size (in)	Test Boring No.	Layer No.	Range of Elevation, ft		Soil Description	Soil Type	SPT N_{avg} Auto	SPT N_{avg} Safety	Lateral					Axial					Torsion				Tip			
				From	To					Soil Model	Angle of Internal Friction, ϕ (Deg.)	Total Unit Weight, γ (pcf)	Subgrade Modulus, k (pci)	Unconfined Compressive Strength (psf)	Soil Model	Total Unit Weight, γ (pcf)	Shear Modulus, G (ksi)	Poisson's Ratio, ν	Ult. Skin Friction (psf)	Soil Model	Total Unit Weight, γ (pcf)	Shear Modulus, G (ksi)	Torsional Shear Stress (psf)	Soil Model	Shear Modulus, G (ksi)	Poisson's Ratio, ν	24-inch Pile Axial Bearing Failure (kips)
1 and 2	24	B1 and B-2	1	-15.0	-34.0	Limestone	Cohesionless	8	10	Sand (Reese)	30	120	20	--	Driven Pile	120	2.9	0.2	198	Hyperbolic	120	2.9	198	Driven Pile (McVay)	2.9	0.2	286
			2	-34.0	-40.0	Sand	Cohesionless	7	9	Sand (Reese)	30	106	17	--	Driven Pile	106	0.7	0.3	330	Hyperbolic	106	0.7	330	Driven Pile (McVay)	0.7	0.3	222
			3	-40.0	-70.0	Limestone	Cohesionless	40	50	Sand (Reese)	34	120	125	--	Driven Pile	120	14.4	0.2	992	Hyperbolic	120	14.4	992	Driven Pile (McVay)	14.4	0.2	1428

Preforming Elevation (ft) : -34 Preforming is required to this elevation
Pile Size (in) : 24

Notes:

Friction Angle

ϕ = 28+N(safety)/4 with maximum of 34° for fill and sand
ϕ = 33+N(safety)/4 with maximum of 40° for limestone or sandstone

Total Unit Weight

γ = 105*ϕ/30 with maximum 119 pcf for sand and fill
γ = 120 pcf for limestone and sandstone

Subgrade Modulus

The subgrade modulus (k) for cohesionless material was estimated using the FB-Multipier Help Manual Figure 12.3b.

Shear Modulus (G)

G (ksi) = E/[2(1+ν)]
E (psf) = 30000*N(safety) for fill and sand , from FB-Multipier Manual
E (psf) = 100000*N (safety) for rock, from see below

For $qt \approx 0.2\,qu$

From $f = 0.5\sqrt{qu \times qt}$ and $fs = 0.2N\ (ksf)$

$f = 0.5\sqrt{qu \times 0.2qu}$

$f = 0.224\,qu$

$f = 0.224\,qu = 0.2N$

So $qu = 0.894N$

$Es = 115qu$

$Es = 115 \times 0.894\,N$

$Es = 103\,N$ Use $Es = 100\,N$

Poisson's Ratio (ν)

ν=0.3 for sand and fill
ν=0.2 for limestone and sandstone

Ultimate Skin Friction and Torsional Shear Stress

t_f = 0.019 N(safety) (tsf) = 38N (psf) for sand and fill
t_f = 0.01 N(safety) (tsf) = 20N (psf) for limestone and sandstone

Pile Axial Bearing Failure

Pile Axial Bearing Failure (kips) = q_{ult}*Pile Tip Area
End Bearing (q_{ult}) = 6.4N(safety) in ksf for sand and fill
End Bearing (q_{ult}) = 7.2N(safety) in ksf for limestone and sandstone

HNTB The HNTB Companies Infrastructure Solutions	Made FL	Date 2/22/2021	Job Number 70078
	Checked CAM	Date 2/24/2021	
For 430029-2 Atlantic Isle Ave over Ocean Canal	Backchk'd FL	Date 2/25/2021	Sheet No. 1

Estimated Bridge Foundation Loads for Bridge Replacement Alternative

Loads on Driven Piles Alternative

Loads per pile based on (3) piles at Each End Bent

End Bent	Factored		Service	
	Axial (tons)	Lateral (tons)	Axial (tons)	Lateral (tons)
1	87	20	54	13
2	87	20	54	13

Loads on Drilled Shafts Alternative

Loads per drilled shaft based on (2) 48" diameter drilled shafts at each End Bent

End Bent	Factored		Service	
	Axial (tons)	Lateral (tons)	Axial (tons)	Lateral (tons)
1	125	30	78	19
2	125	30	78	19

APPENDIX D

"GTR REVIEW CHECKLIST" (PILE FOUNDATIONS)

G. Structure Foundations - Piles (Pages 224-311)

In addition to the basic information listed in Section A, if pile support is recommended or given as an alternate, conclusions/recommendations should be provided in the project geotechnical report for the following:

		Yes	No	Unknown or N/A
*1.	Is the recommended pile type given (displacement, nondisplacement, pipe pile, concrete pile, H-pile, etc.) with valid reasons given for choice and/or exclusion? (Pages 224-226)	☑	☐	☐
2.	Do you consider the recommended pile type(s) to be the most suitable and economical?	☑	☐	☐
*3.	Are estimated pile lengths and estimated tip elevations given for the recommended allowable pile design loads?	☐	☐	☑
4.	Do you consider the recommended design loads to be reasonable?	☐	☐	☑
5.	Has pile group settlement been estimated (only of practical significance for friction pile groups ending in cohesive soil)? (Pages 245-247)	☐	☐	☑
6.	If a specified or minimum pile tip elevation is recommended, is a clear reason given for the required tip elevation, such as underlying soft layers, scour, downdrag, piles uneconomically long, etc.?	☑	☐	☐
*7.	Has design analysis (wave equation analysis) verified that the recommended pile section can be driven to the estimated or specified tip elevation without damage (especially applicable where dense gravel-cobble-boulder layers or other obstructions have to be penetrated)?	☐	☐	☑
8.	Where scour piles are required, have pile design and driving criteria been established based on mobilizing the full pile design capacity below the scour zone?	☐	☐	☑

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

G. Pile Foundations - Piles (Cont.)	Yes	No	Unknown or N/A
9. Where lateral load capacity of large diameter piles is an important design consideration, are p-y curves (load vs. deflection) or soil parameters given in the geotechnical report to allow the structural engineer to evaluate lateral load capacity of all piles?	☑	☐	☐
*10. For pile supported bridge abutments over soft ground:			
a. Has abutment pile downdrag load been estimated and solutions such as bitumen coating considered in design? Not generally required if surcharging of the fill is being performed. (Pages 248-251)	☑	☐	☐
b. Is bridge approach slab recommended to moderate differential settlement between bridge ends and fill?	☐	☐	☑
c. If the majority of subsoil settlement will not be removed prior to abutment construction (by surcharging), has estimate been made of the amount of abutment rotation that can occur due to lateral squeeze of soft subsoil? (Pages 114-115)	☐	☐	☑
d. Does the geotechnical report specifically alert the structural designer to the estimated horizontal abutment movement?	☐	☐	☑
11. If bridge project is large, has pile load test program been recommended? (Pages 299-302)	☐	☐	☑
12. For a major structure in high seismic risk area, has assessment been made of liquefaction potential of foundation soil during design earthquake (note: only loose saturated sands and silts are "susceptible" to liquefaction)?	☐	☐	☑

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

G. Structure Foundations - Piles - (Cont.)

13. Construction Considerations: (Pages 279-311)

Have the following important construction considerations been adequately addressed?

	Yes	No	Unknown or N/A
a. Pile driving details such as: boulders or obstructions which may be encountered during driving - need for preaugering, jetting, spudding, need for pile tip reinforcement, driving shoes, etc.?	☑	☐	☐
b. Excavation requirements - safe slope for open excavations, need for sheeting or shoring? Fluctuation of groundwater table?	☑	☐	☐
c. Have effects of pile driving operation on adjacent structures been evaluated - such as protection against damage caused by footing excavations or pile driving vibrations?	☑	☐	☐
d. Is preconstruction condition survey to be made of adjacent structures to prevent unwarranted damage claims?	☑	☐	☐
e. On large pile driving projects have other methods of pile driving control been considered such as dynamic testing or wave equation analysis?	☐	☐	☑

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.