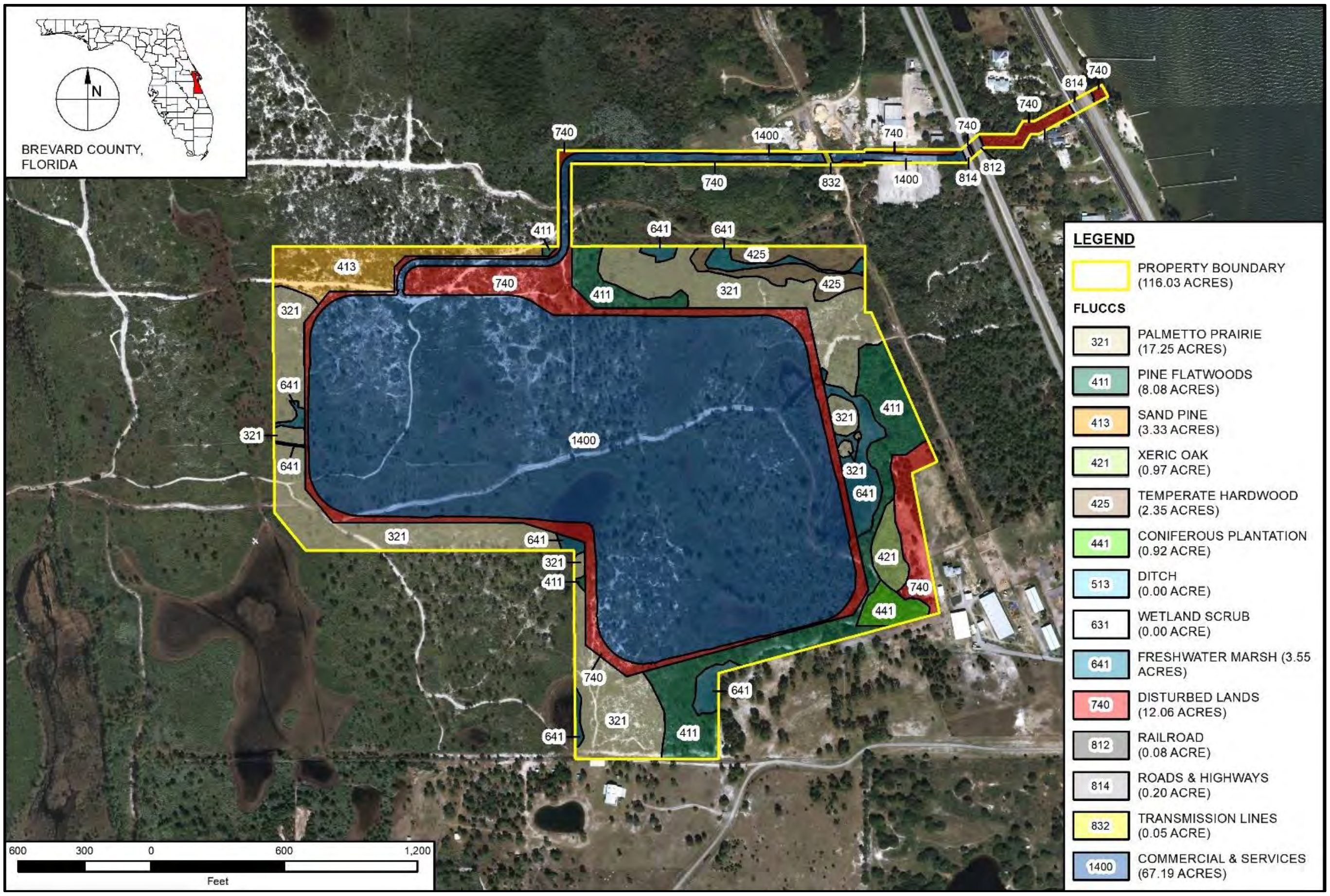
FLORIDA INLAND NAVIGATION DISTRICT
Dredged Material Management Area BV-24A
Brevard County, Florida



Environmental Resource Permit Application
December 2017

To be submitted to the
Florida Department of Environmental Protection

Prepared by:

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Environmental Resource Permit Application
December 2017

SECTION A: GENERAL INFORMATION FOR ALL ACTIVITIES

PART 1: NAME, APPLICATION TYPE, LOCATION, AND DESCRIPTION OF ACTIVITY

A. Name of project, including phase if applicable:

Florida Inland Navigation District (FIND) Dredged Material Management Area (DMMA) BV-24A

B. This is for (check all that apply):

☒ Construction or operation of ***new*** works, activities and/ or a stormwater management system

☐ ***Conceptual Approval*** of proposed works, activities and/ or a stormwater management system

☐ Modification or Alteration of ***existing*** works activities and / or a stormwater management system. Provide the existing DEP or WMD permit #, if known: _____ Note: Minor modifications do not require completion of this form, and may instead be requested by letter.

☐ ***Maintenance or repair*** of works, activities and/ or stormwater management system previously permitted by the DEP or WMD Provide existing permit #, if known: _____

☐ Abandonment or removal of works, activities and/ or stormwater management system Provide existing DEP or WMD permit #, if known: _____

☐ Operation of an ***existing unpermitted*** stormwater management system.

☐ Construction of additional phases of a permitted work, activity and/ or stormwater management system.

Provide the existing DEP or WMD permit #, if known: _____

C. ***List the type of activities proposed. Check all that apply, and provide the supplemental information requested in each of the referenced application sections.*** *Please also reference Applicant's Handbooks I and II for the type of information that may be needed.*

☐ Activities associated with one single-family residence, duplex, triplex, or quadruplex that do not qualify for an exemption or a General Permit: ***Provide the information requested in Section B. Do not complete Section C.***

☒ Activities within wetlands or surface waters, or within 25 feet of a wetland or surface water, (not including the activities associated with an individual residence). *Examples include dredging, filling, outfall structures, docks, piers, over-water structures, shoreline stabilization, mitigation, reclamation, restoration/enhancement.* ***Provide the information requested in Section C.***

☐ Activities within navigable or flowing surface waters such as a multi-slip dock or marina, dry storage facility, dredging, bridge, breakwaters, reefs, or other offshore structures: ***In addition to Section C, also provide the information requested in Section D.***

☒ Activities that are (or may be) located within, on or over state-owned submerged lands (*See Chapter 18-21, F.A.C. https://www.flrules.org/gateway/ChapterHome.asp?Chapter=18-21*): ***In addition to Section B or C, also provide the information requested in Section F***

☒ Construction or alteration of a stormwater management system serving residential, commercial, transportation, industrial, agricultural, or other land uses, or a solid waste facility (excluding mines that are regulated by DEP). ***Provide the information requested in Section E.***

☐ Creation or modification of Mitigation Bank (refer to Chapter 62-342, F.A.C. https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-342): ***Provide the information requested in Section G.***

☐ Mines (as defined in Section 2.0 of Applicant's Handbook Volume I) that are regulated by the DEP: ***Provide the information requested in Section H.***

☐ Other, describe: Please contact the Agency to determine which additional sections of the application are needed. See Attachment 1 for Agency contacts.

D. Describe in general terms the proposed project, system, works, or other activities. For permit modifications, please briefly describe the changes requested to the permit:

The proposed project involves the construction of a 64.72-acre Dredged Material Management Area (DMMA) located in southern Brevard County, just west of the Intracoastal Waterway. The long-term storage facility will provide capacity for the management of 1,035,818 cubic yards of sediments dredged from Reach VI of the Intracoastal Waterway in Brevard County. See Attachment 1: Management Plan – DMMA BV-24A for more information.

E. For activities in, on, or over wetlands or other surface waters, check the type of federal dredge and fill permit requested (if known): ☒Individual ☐Programmatic General permit #: SAJ
☐General ☐Nationwide permit #: NWP ☐Not Applicable ☐Not sure

F. Project/Activity Street/Road Address or other location: **Between 4460 and 4850 Old Dixie Highway**

City: **Grant** County(ies): **Brevard** Zip: **32949**

Note: For utility, road, or ditch/canal activities, provide a starting and ending point using street names and nearest house numbers or provide length of project in miles along named streets or highways.

G. Project location map and Section, Township, and Range information (use additional sheets if needed): *Please attach a location map showing the location and boundaries of the proposed activity in relation to major intersections or other landmarks. The map should also contain a north arrow and a graphic scale; show Section(s), Township(s), and Range(s); and must be of sufficient detail to allow a person unfamiliar with the site to find it.*

See Figure 1: Location Map provided in Attachment 2: Permit Drawings.

Section(s): **20,21** Township: **29 S** Range: **38 E**

H. Latitude (DMS): **27° 56' 33.941" N** Longitude (DMS): **80° 32' 26.314" W** (Taken from central location of the activity). Explain source for obtaining latitude and longitude (i.e. U.S.G.S. Quadrangle Map, GPS, online resource): **Esri ArcMap**

I. Tax Parcel Identification Number(s):

See Table 2.1: BV-24A Property Ownership and Figure 2.2 Parcel Map provided in Attachment 3: Phase I Environmental Site Assessment for relevant tax parcel information including identification numbers and ownership. Note: Tax Information provided in this attachment was verified September 2017.

J. Directions to Site (from major roads; include distances and landmarks as applicable):

Heading South on I-95, take exit 173 and turn left onto Malabar Road, heading east. Continue for 1.6 miles, turning right onto Weber Road. From here travel 3.1 miles until the end of Weber Road, and then turn left onto Valkaria Road. Continue 2.1 miles until Valkaria Road begins to curve; at which point take a slight right onto Hideaway Lane. Continue down Hideaway Lane for 0.3 miles until the road curves to the right.

From here a locked gate can be seen. After proceeding through the gate, travel 0.63 miles then turn right (heading south) and travel 0.8 miles. Turn left (heading east) and travel 0.5 miles over a very rough sand path to the western border of the DMMA property.

(Please Note: the access roads are comprised of unimproved sand and use of a live GPS is recommended to locate the property.)

K. Project area or phase area:

77.30 acres; including the DMMA containment basin and associated access road/pipeline, stormwater drainage system and clearing limits.

L. Name of waterbody(ies) (if known) in which activities will occur or into which the system will discharge:

Part of the project will occur on the banks of the Indian River (within the Malabar to Vero Beach Aquatic Preserve) with the construction of a stormwater discharge structure. After construction and between maintenance dredging operations, the site will retain the volume of the required design storm and required storage for systems discharging to Outstanding Florida Waters. Stormwater discharge will occur only as a result of events greater than the design storm. During dredging, the facility will receive dredged material from the Intracoastal Waterway (ICWW) through a pipe, dewater the sediments, and discharge the decanted water through a permanent pipeline to the Indian River.

The following questions (M-O) are not applicable to activities related to a single-family residence, including private single-family residential docks, piers, seawalls or boat ramps.

M. Is it part of a larger plan of development or sale? ☐ yes ☒ no

N. Impervious or semi-impervious area excluding wetlands and other surface waters (if applicable):

4.35 acres or 189,617 square feet; of which 0.17 acre consist of the existing Old Dixie Highway, F.E.C. Railroad and US Highway 1. The remaining 4.18 acres to be constructed consist of a stabilized access road and perimeter road, a stabilized ramp, 2 concrete spillways, 2 concrete mitered end structures and rip-rap stabilizing the outfall structure.

O. Volume of water the system is capable of impounding (if applicable):

The DMMA is designed to impound dredged material; its purpose is hold water only until it meets ambient water quality. For this reason, the site design incorporates adjustable weirs which allow dredging contractors to raise water levels to the minimum elevations required to maintain discharge water quality during a dredging project. The weir system and operational specifications require the contractor maintain a minimum freeboard of 2 feet at all times. The maximum ponding depth of water for the site is 5 feet, as referenced in Attachment 1 (Management Plan). Therefore, the maximum volume of water the DMMA will hold at any time is 218 acre-feet.

PART 2: SUPPLEMENTAL INFORMATION, AND PERMIT HISTORY

A. Is this an application to modify an existing Environmental Resource Permit, or to construct or implement part of a multi-phase project, such as a project with a Conceptual Approval permit? ☐ Yes ☒ No

AGENCY	DATE	PERMIT/APPLICATION NO.	PROJECT NAME

B. Indicate if there have been any ***pre-application meeting(s)*** or other discussions about the proposed project, system or activity. If so, please provide the date(s), location(s) of the meeting, and the name(s) of Agency staff that attended the meeting(s):

Scrub-Jay Avoidance & Minimization Consultation Meetings

AGENCY	DATE	LOCATION	MEETING ATTENDEES
USFWS	3/5/15	On-site BV-24/BV-24A	Tod Mecklenborg
FIND	3/5/15	On-site BV-24/BV-24A	Mark Tamblyn
Taylor Engineering	3/5/15	On-site BV-24/BV-24A	David Stites
Normandeau Ass.	3/5/15	On-site BV-24/BV-24A	Adam Kent
Brevard County	3/5/15	On-site BV-24/BV-24A	Chris O'Hara, Mike Knight, Jenny Ashbury
Dynamac Co.	3/5/15	On-site BV-24/BV-24A	David Breininger
USFWS	6/26/15	USFWS NFESO	Tod Mecklenborg, Tony Daly-Crews, Annie Dziergowski
Taylor Engineering	6/26/15	USFWS NFESO	David Stites
Normandeau Ass.	6/26/15	USFWS NFESO	Adam Kent
USFWS	7/15/15	On-site BV-24/BV-24A	Tod Mecklenborg, Tony Daly-Crews

FDEP Pre-Application Meeting

AGENCY	DATE	LOCATION	MEETING ATTENDEES
FDEP	8/16/17	FDEP Orlando Office	Kim Eisele, Leo Angelero, Randall Cunningham
FIND	8/16/17	FDEP Orlando Office	Mark Tamblyn (Teleconference)
Taylor Engineering	8/16/17	FDEP Orlando Office	David Stites, Robert Doll (Teleconference)

USACE Pre-Application Meeting

AGENCY	DATE	LOCATION	MEETING ATTENDEES
FIND	8/30/17	USACE Cocoa Office	Mark Tamblyn
USACE	8/30/17	USACE Cocoa Office	Jim Carr, Cory Meyer
Taylor Engineering	8/30/17	USACE Cocoa Office	David Stites, Kierstin Masse

C. ***Attach a depiction (plan and section views), which clearly shows the works or other activities proposed to be constructed.*** Use multiple sheets, if necessary, a scale sufficient to show the location and type of works, and include a north arrow and a key to any symbols used. ***Specific information to be included in the plans is based on the activities proposed and is further described in Sections B-H***. However, supplemental information may be required based on the specific circumstances or location of the proposed works or other activities.

   See Attachment 2: Permit Drawings for plan and section views of DMMA BV-24A and associated works.

D. Processing Fee: ***Please submit the application processing fee along with this application form and supplemental information*.** Processing fees vary based on the size of the activity, the type of permit applied for, and the reviewing Agency. Please reference Attachment 3 to determine the appropriate fee.

   The processing fee will be submitted as soon as possible after this application has been submitted electronically. Per correspondence from Kimberly Eisele of the FDEP Central District, the permit application fee for this project will be $5,000.

PART 3: APPLICANT AND ASSOCIATED PARTIES INFORMATION

Instructions: Permits are only issued to entities having sufficient real property interest as described in Section 4.2.3 (d) of Applicant's Handbook Volume I. Please attach evidence of sufficient real property interest over the land upon which the activities subject to the application will be conducted, including mitigation (if applicable). Refer to Section 4.2.3 (d) for acceptable ownership or real property interest documentation. For corporations, list a person who is a registered agent or officer of the corporation who has the legal authority to bind the corporation.

A. APPLICANT (ENTITY MUST HAVE SUFFICIENT REAL PROPERTY INTEREST) ☐ **THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION**		
Name: Last: **Crosley**	First: **Mark**	Middle:
Title: **Executive Director**	Company: **Florida Inland Navigation District**	
Address: **1314 Marcinski Road**		
City: **Jupiter**	State: **Florida**	Zip: **33477**
Home Telephone:	Work Telephone: **(561) 627-3386**	
Cell Phone:	Fax: **(561) 624-6480**	
E-mail Address: **mcrosley@aicw.org**		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

B. LAND OWNER(S) (IF DIFFERENT OR IN ADDITION TO APPLICANT) ☐ **CHECK HERE IF LAND OWNER IS ALSO A CO-APPLICANT**		
Name: Last:	First:	Middle:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:	Fax:	
E-mail Address:		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

C. OPERATION AND MAINTENANCE ENTITY	**(see Applicant's Handbook I, Section 12.3)**		
Entity Name: **See Applicant**	Contact: Last:	First:	Middle:
Title:	Company:		
Address:			
City:	State:	Zip:	
Home Telephone:	Work Telephone:		
Cell Phone:	Fax:		
E-mail Address:			
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐			

D. CO-APPLICANT (IF DIFFERENT OR IN ADDITION TO APPLICANT AND OWNER)		
Name: Last:	First:	Middle:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:	Fax:	
E-mail Address:		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

E. ENGINEERING CONSULTANT ☒THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION		
Name: Last: **Armbruster**	First: **Jon**	Middle:
Title: **Vice President - Waterfront**	Company: **Taylor Engineering, Inc.**	
Address: **10151 Deerwood Park Boulevard, Building 300, Suite 300**		
City: **Jacksonville**	State: **Florida**	Zip: **32256**
Home Telephone:	Work Telephone: **(904) 731-7040**	
Cell Phone:	Fax: **(904) 731-9847**	
E-mail Address: **jarmbruster@taylorengineering.com**		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

F. ENVIRONMENTAL CONSULTANT ☒ THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION		
Name: Last: **Masse**	First: **Kierstin**	Middle: **E.**
Title: **Environmental Scientist**	Company: **Taylor Engineering, Inc.**	
Address: **10151 Deerwood Park Boulevard, Building 300, Suite 300**		
City: **Jacksonville**	State: **Florida**	Zip: **32256**
Home Telephone:	Work Telephone: **(904) 731-7040**	
Cell Phone:	Fax: **(904) 731-9847**	
E-mail Address: **kmasse@taylorengineering.com**		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

G. AGENT AUTHORIZED TO SECURE PERMIT (IF DIFFERENT FROM CONSULTANT) ☐ THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION		
Name: Last:	First:	Middle:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:	Fax:	
E-mail Address:		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

If necessary, please add additional pages for other contacts and property owners related to this project.

PART 4: SIGNATURES AND AUTHORIZATION TO ACCESS PROPERTY

Instructions: For multiple applicants please provide a separate Part 4 for each applicant. For corporations, the application must be signed by a person authorized to bind the corporation. A person who has sufficient real property interest (see Section 4.2.3 (d) of Applicant's Handbook Volume I) is required in (B) to authorize access to the property, except when the applicant has the power of eminent domain.

A. By signing this application form, I am applying for the permit and any proprietary authorizations identified above, according to the supporting data and other incidental information filed with this application. I am familiar with the information contained in this application and represent that such information is true, complete and accurate. I understand this is an application and not a permit, and that work prior to approval is a violation. I understand that this application and any permit issued or proprietary authorization issued pursuant thereto, does not relieve of any obligation for obtaining any other required federal, state, water management district or local permit prior to commencement of construction. I agree to operate and maintain the permitted system unless the permitting agency authorizes transfer of the permit to a different responsible operation and maintenance entity. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S. and 18 U.S.C. Section 1001.

Mark Crosley		12-13-17
Typed/Printed Name of Applicant or Applicant's Authorized Agent	Signature of Applicant or Applicant's Authorized Agent	Date

Executive Director, Florida Inland Navigation District

(Corporate Title if applicable)

B. CERTIFICATION OF SUFFICIENT REAL PROPERTY INTEREST AND AUTHORIZATION FOR STAFF TO ACCESS THE PROPERTY:
I certify that:

☒ ***I possess sufficient real property interest in or control, as defined in Section 4.2.3 (d) of Applicant's Handbook Volume I,*** over the land upon which the activities described in this application are proposed and I have legal authority to grant permission to access those lands. I hereby grant permission, evidenced by my signature below, for staff of the Agency and the U.S. Army Corps of Engineers to access, inspect, and sample the lands and waters of the property as necessary for the review of the proposed works and other activities specified in this application. I authorize these agents or personnel to enter the property as many times as may be necessary to make such review, inspection, and/ or sampling. Further, I agree to provide entry to the project site for such agents or personnel to monitor and inspect permitted work if a permit is granted.

OR

☐ I represent an entity having ***the power of eminent domain and condemnation authority***, and I/we shall make appropriate arrangements to enable staff of the Agency and the U.S. Army Corps of Engineers to access, inspect, and sample the property as described above.

Mark Crosley		12-13-17
Typed/Printed Name	Signature	Date

Executive Director, Florida Inland Navigation District

(Corporate Title if applicable)

C. DESIGNATION OF AUTHORIZED AGENT (IF APPLICABLE):

I hereby designate and authorize **Jon Armbruster, P.E.** to act on my behalf, or on behalf of my corporation, as the agent in the processing of this application for the permit and/or proprietary authorization indicated above; and to furnish, on request, supplemental information in support of the application. In addition, I authorize the above-listed agent to bind me, or my corporation, to perform any requirements which may be necessary to procure the permit or authorization indicated above. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S. and 18 U.S.C. Section 1001.

Mark Crosley		12-21-17
Typed/Printed Name of Applicant	Signature of Applicant	Date

Executive Director, Florida Inland Navigation District

(Corporate Title if applicable)

(9.25.13)

SECTION C: SUPPLEMENTAL INFORMATION FOR WORKS OR OTHER ACTIVITIES IN, ON, OR OVER WETLANDS AND/OR OTHER SURFACE WATERS

(Note: This section is not required if all the proposed activities are covered in Section B.)

Instructions: This section is for ERP applications that do not involve activities associated with an individual single-family residence, duplex, triplex or quadruplex. For those activities, please use Section B. This form is to be completed if the proposed work or activity will occur in, on, over, or within 25 feet of a wetland or other surface water. The supplemental information required by this section is in addition to the information required by Section A of the ERP application.

PART 1: WETLAND OR OTHER SURFACE WATER IMPACT SUMMARY

1. Describe the basic purpose of the project or activity:

   The proposed project involves the construction of a 64.72-acre dredged material management area (DMMA) located in southern Brevard County, just west of the Atlantic Intracoastal Waterway (ICWW). This long-term storage facility will provide the capacity for dewatering and storing sediments dredged to maintain navigation within Reach VI of the ICWW in Brevard County. During dredging, the facility will receive dredged material from the Intracoastal Waterway (ICWW) through a pipe, dewater the sediments, and discharge the decanted water through a permanent pipeline to the Indian River. After construction and in between maintenance dredging operations, storm water in excess of the permitted design capacity of the storm water management system will discharge via an emergency overflow structure along the western shoreline of the Indian River.

2. Total area of work (dredging, filling, construction, alteration, or removal) in, on, or over wetlands or other surface waters:

   427,672 sq. ft.; 9.818 acres; including both permanent and temporary impacts. See Table 1: Project Wetland and Other Surface Water Impact Summary provided within this permit application package for more information.

   For the proposed project, impacts to wetlands or other surface waters will occur along the shoreline via the installation and use of a single storm water discharge structure; as well as within the property via land clearing, the construction of the DMMA itself and groundwater drawdowns. For permitting purposes, permanent fill and groundwater drawdown impacts within the BV-24A property were determined by the limits of the proposed DMMA or the one-foot groundwater drawdown contour, whichever resulted in the greatest impact. The overflow structure will be designed for storm water volumes in excess of the retention capacity of the DMMA. Additionally, the structure will be designed to maintain water quality standards for the treatment of decanted water discharged within Outstanding Florida Waters as designated by SJRWMD basis of design.

   See Attachment 2: Permit Drawings, Figures 8 & 22 for more information about the placement of the discharge structure. See Figure 6 Existing Conditions also provided in Attachment 2 for existing wetland locations. Figure 10: Wetland Impacts depicts both state and federal jurisdictional wetland impacts that occur as a result of the proposed project. Please Note: Wetlands have been delineated on all applicable sheets within Attachment 2: Permit Drawings.

3. Total volume of material in wetlands or other surface waters:

   a. to be dredged: **9,496.07 cubic yards**
   b. to be filled: **40,735.15 cubic yards**

4. Identify the seasonal high-water level (SHWL) and wetland normal pool elevations for each wetland or surface water within the project site. For tidal wetlands and/or surface waters provide the elevation of mean high and mean low water. Include an aerial photograph showing the location of each sampling location, dates, datum, and methods used to determine these elevations.

   Within the project site, the seasonal high ground water level ranges from 15 to 21 feet (NAVD). See Attachment 4: Groundwater Model Calibration Figure for more information regarding the groundwater elevations used as a basis for modeling groundwater drawdown.

   At the point of storm water discharge in the Indian River Lagoon, FDEP identifies a Safe Upland Line Elevation of 1.1-ft NGVD29 (-0.301-ft NAVD88). See Attachment 5 for more information regarding the safe upland line determination.

5. Name of waterbody(ies) (if applicable & if known) in which work will occur?

   Part of the proposed project will occur on the banks of the Indian River (within the Malabar to Vero Beach Aquatic Preserve) with the construction of a storm water discharge structure.

6. Is the activity proposed in an Outstanding Florida Water or Aquatic Preserve?

   ☒ yes, name: **Malabar to Vero Beach Aquatic Preserve** ☐ no ☐ I don't know

7. Has there ever been a formal or informal wetland determination for the project site? If yes, provide the identifying number and/ or a copy of the jurisdictional map.

   Yes. An Approved Jurisdictional Determination was completed by USACE in July 2016 (See Attachment 6). An Informal Wetland Determination was completed by FDEP in May 2016 (See Attachment 7).

8. Provide a map(s) of the project area and vicinity delineating USDA/NRCS soil types.

   See Figure 3: NRCS Soils provided in Attachment 2: Permit Drawings.

9. Provide recent aerials, legible for photointerpretation (no photocopies) with a scale of 1" = 400 ft, or more detailed, with project boundaries and wetland boundaries delineated on the aerial.

   See Figure 6: Existing Conditions and Figure 8: Project Overview provided in Attachment 2: Permit Drawings.

10. Provide existing and proposed maps indicating vegetative community types based on Florida Land Use and Cover Classification System (FLUCCS) (FDOT 1999). For vegetated areas dominated by exotic vegetation, use the FLUCCS code representative of the native community type that was present prior to exotic infestation.

    See Figure 4: SJRWMD Existing FLUCCS Map provided in Attachment 2: Permit Drawings for existing communities. See Figure 1: Proposed FLUCCS Map provided in Attachment 8: Application Figures for proposed communities.

11. Provide existing and proposed maps indicating vegetative community types based on the Florida Natural Areas Inventory Guide to the Natural Communities of Florida.

12. Impact Summary Tables (located at the end of this section):

    a. For all projects, complete Table 1, 2 and 3 as applicable.

       See Table 1: Project Wetland and Other Surface Water and Impact Summary. Tables 2 & 3 are not applicable to the proposed project.

    b. For shoreline stabilization projects, provide the information requested in Table 4.

       Table 4 is not applicable to the proposed project.

13. Adjacent property owners. The following information is required only for projects proposed to occur in, on or over wetlands that need a federal dredge and fill permit and/or authorization to use state owned submerged lands and is not necessary when applying solely for an Environmental Resource Permit. If the activity is located on state owned submerged lands and requires a lease or easement, provide a list of names and addresses from the latest county tax assessment roll of all property owners located within a 500 ft. radius of the proposed lease or easement boundary in mailing label format, or you may elect to send notice to those persons by certified mail, with the return-receipt card addressed to the DEP or water management district, as applicable, in accordance with subsection 18-21.005(3), F.A.C., and Section 253.115, F.S. For projects that need a federal dredge and fill permit, please provide the names, addresses and zip codes of property owners whose property directly adjoins the project (excluding applicant). Attach additional sheets if necessary.

    See Attachment 9: Adjacent Landowner's Mailing List.

PART 2: ENVIRONMENTAL CONSIDERATIONS

Note: for many questions, a state rule/Applicant's Handbook Volume I (AH I) section is cited to assist the applicant in addressing these questions. However, additional Federal criteria may apply.

1. Elimination or Reduction of Impacts (Avoidance and Minimization). Describe measures taken to eliminate or reduce impacts to wetlands and other surface waters (*Refer to AH I Section 10.2.1*).

   The DMMA BV-24A site contains relatively high quality wetlands within a minimally-disturbed palmetto prairie / pine flatwoods ecosystem. To the extent practicable, the DMMA BV-24A design has avoided and minimized impacts to wetlands while striving to meet four predominant Florida Inland Navigation District DMMA design criteria:

   1. **Provide sufficient material storage capacity for the 50-year material storage requirement.**
   2. **Meet applicable state water quality standards.**
   3. **Avoid and minimize environmental impacts and comply with other state and federal permitting constraints associated with site development.**
   4. **Provide an adequate buffer from adjacent properties.**

   BV-24A DMMA containment basin provides an estimated capacity of 1,035,818-cy that meets 98% of the 1,053,044-cy estimated 50-year maintenance volume identified in the Dredged Material Management Plan for this facility (Attachment 1). Within this capacity requirement, the engineering design locates and minimizes the containment basin footprint to the extent

possible (with dike elevations and footprint location) considering Florida Scrub-Jay habitat, potential groundwater impacts, potential wetland impacts, and adjacent properties.

The site purchased for this project in the 1990s was found more recently to contain high-quality Scrub-Jay habitat. Brevard County had also purchased most of the properties to the west, north and east of the proposed project as part of the Brevard Environmentally Endangered Lands program, in part to protect Scrub-Jay habitat. To minimize the impact of the proposed project on Scrub-Jay habitat, FIND swapped a western portion of the property with high-quality habitat and nesting territories for land farther east with lower quality Scrub-Jay habitat. Outside the construction footprint, FIND plans to retain the native vegetation.

The proposed project includes an improved road around the DMMA that drains to a stormwater management system

The proposed project will decant saline water from the IRL and return it to that water body with appropriate water quality. Some of the water however, will unavoidably move into the groundwater. The design encompasses a saline control ditch to ensure that any water that does reach the surficial groundwater remains on site.

The proposed project includes an impact associated with the placement of riprap along the shoreline to dissipate energy of water discharging via the emergency overflow structure for storm water that exceeds the retention capacity. The area of the energy-dissipating riprap has been minimized in order to minimize the impact to the Indian River. In addition, the contractor will establish temporary erosion control measures upon mobilization to the site. The contractor will place the erosion control measures (e.g., silt fence) along the limits of construction as delineated on the final construction drawings. The contractor will monitor and maintain these erosion control devices according to FDEP protocol. See Attachment 2: Permit Drawings for more detailed information about the placement of the riprap.

Attachment 10: Environmental Site Documentation characterizes onsite natural communities including wetlands. Attachment 2: Permit Drawings provides the proposed project construction plans. FIND proposes to mitigate both unavoidable wetland impacts from dredging and filling in the construction of the DMMA and wetland impacts that result from potential surficial aquifer drawdown of 1-ft or greater (due to the stormwater management system and saline control ditch) with the purchase in-kind credits from a DEP- and USACE-approved mitigation bank. The proposed project is within the service area of the Mary A mitigation bank, which has sufficient freshwater wetland mitigation credits available to offset the unavoidable impacts.

The DMMA design meets applicable state water quality criteria, including the management of decant water resulting from dewatering dredged sediments and stormwater. Management of decant water discharge will take place entirely within the DMMA containment basin. Further described in Attachment 11: Geotechnical Reports (Preliminary, Final and Pipeline), the weir system, basin geometry, and anticipated dredged material characteristics will allow adequate settlement time entirely within the containment basin. Stormwater entering the DMMA (including the DMMA area bounded by the outside edge of the dike crest) will be captured and retained within the DMMA except for rainfall from extreme storm events. Runoff from the outside of the dike and the DMMA access road is captured and treated in a stormwater pond sized to provide required treatment for stormwater discharged to the Class II waters of the IRL (Attachment 2, Figure 8). Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A details the stormwater treatment design and volume calculations.

The remainder of the site (outside of the DMMA access road) will not be altered or managed other than mowing upland areas 1 - 2 times/year. Rainfall runoff from this area will flow into a perimeter ditch to a buried drainage pipe extending from the north side of the property to the IRL shoreline. The receiving waterbody, IRL WBID 2963A1, does not meet Class II marine water quality standards for bacteria or mercury, but was recently delisted for nutrients as a result of an approved TMDL for the Indian River above Sebastian Inlet waterbody. FDEP has an approved TMDL for this waterbody that includes specific nutrient reduction targets for nitrogen and phosphorus. Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A details site stormwater runoff loading reductions in excess of those required to meet the TMDL criteria.

The naturally vegetated buffer areas that surround the containment basin visually isolate the DMMA from adjacent properties, maintaining much of the viewshed of the site from adjacent properties and minimizing potential disturbance from facility activities. The outside edge of construction (i.e., perimeter ditch) lies a minimum of 130 feet from the property boundary, of which at least 50 feet will remain as undisturbed vegetation. In addition, the DMMA will be over 400 feet from the nearest adjacent privately-owned lands. Maintenance of the natural conditions in the buffer also results in maintenance of remaining wetlands in the buffer area. Following the final site grading, the contractor will establish permanent vegetation (e.g., grass, sod, etc.) at the project site. See Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for further details regarding the long-term site maintenance.

2. Fish, Wildlife, Listed Species and their Habitats. Provide results of any wildlife assessments that have been conducted on the project site and provide any comments pertaining to the project from the Florida Fish and Wildlife Conservation Commission and/or the U.S. Fish and Wildlife Service (*Refer to AH I Section 10.2.2*).

   The project site provides suitable habitat for several state- and federally-listed species. These include the Florida scrub-jay, the bald eagle, the Everglades snail kite, the eastern indigo snake, and the gopher tortoise. Please See Attachment 10: Environmental Site Documentation for more detailed information about the project impact on each of these species. In addition to these species, the proposed project is located in the consultation area for the red-cockaded woodpecker and the piping plover. Note: While there is habitat available for the Everglades snail kite on the project site, the proposed project is outside of the snail kite consultation area.

   To date, no consultation with the FWC or USFWS has occurred regarding any species other than the Florida scrub-jay.

   See the table below for more information regarding the federal and state status of each of the species mentioned above.

Listed Species that May Occur within the Study Area

Class	Common Name	Scientific Name	Federal Status [1]	State Status [2]
Birds	Florida scrub-jay	*Aphelocoma coerulescens*	Threatened	Threatened
	Everglades snail kite	*Rostrhamus sociabilis plumbus*	Endangered	Endangered
	Red-cockaded woodpecker	*Picoides borealis*	Endangered	Endangered
	Wood Stork	*Mycteria americana*	Threatened	Threatened
Reptiles	Eastern indigo snake	*Drymarchon corais couperi*	Threatened	Threatened
	Gopher tortoise*	*Gopherus polyphemus**	Candidate	Threatened

[1] Federally-listed and Candidate Species in Brevard County, FL; USFWS website (accessed September 2017)
[2] List of Imperiled Species, FWC (accessed September 2017) / FNAI Report for Matrix Unit 63265, 63266, 63530, 63531
NL – Not Listed

The Florida scrub-jay (*Aphelocoma coerulescens*) is listed as Threatened at both the Federal and State level. According to the Species Conservation Guidelines, South Florida: Florida scrub-jay, the scrub-jay typically utilizes oak scrub and coastal scrub, but it includes a wide range of habitat. In recent years, as part of its Environmentally Endangered Lands program, Brevard County has obtained land to the north, east, and west of the original FIND property (BV-24); in part to conserve habitat utilized by the Florida scrub-jay. Due to the abundance of high quality habitat on the original BV-24 property, FIND entered into a land-swap agreement with Brevard County (See Attachment 13: Exchange Agreement) in order to avoid and/or minimize effects to the Florida scrub-jay. Following survey guidelines, and as a precursor to the land-swap agreement, a survey was completed by Normandeau Associates in July 2015 and has been provided as Attachment 14. See also Attachment 10: Environmental Site Documentation, Section 4.2 for more information. While some scrub-jay habitat remains within the proposed project bounds, the amount has been greatly reduced and affects to the scrub-jay have been minimized to the extent possible. Due to the abundance of scrub-jay habitat that will be preserved through the land swap (i.e., >25 acres) there will still be sufficient habitat to support any scrub-jays disturbed via DMMA construction. Therefore, the project may affect, but is not likely to adversely affect the Florida scrub-jay.

Through a review of the FWC database for known bald eagle (*Haliaeetus leucocephalus*) nesting locations, the closest nest (BE041) was identified as approximately 0.51 mile southeast of BV-24A. During the field investigation, and as documented in Attachment 10: Environmental Site Documentation, an apparently abandoned bald eagle nest was observed on the eastern portion of the property. There is no known record of this nest. Although the FWC and USFWS have delisted the bald eagle due to recovery, the Bald and Golden Eagle Act and U.S. Migratory Bird Treaty Act continue to provide legal protections for the species. As the nest is located within the area proposed for the containment basin, coordination with USFWS regarding the potential nest will be required.

The Everglades snail kite (*Rostrhamus sociabilis plumbus*) is listed as Endangered at both the Federal and State level. According to the USFWS Quick Facts: Everglade Snail Kite and Everglade Snail Kite Conservation Measures, snail kite foraging habitat typically includes relatively shallow wetland vegetation. A survey is only necessary when the project site is both within the consultation area and suitable habitat is present. While the project site does contain suitable foraging habitat for the snail kite using the criteria to determine the suitability of the habitat as laid out by the USFWS, it is not within the Everglades Snail Kite Consultation Area. Therefore, this project is anticipated to have no effect on the Everglades Snail Kite.

The Red-cockaded woodpecker (*Picoides borealis*) is listed as Endangered at both the Federal and State level. According to the Species Conservation Guidelines, South Florida: Red-

cockaded woodpecker, the woodpecker typically utilizes mature pine trees, especially longleaf pines, to develop nest cavities. Optimum habitat for the red-cockaded woodpecker include pine stands with low or sparse understory and ample old-growth pines (>60 years old). A survey is only necessary when the project site is both within the consultation area and suitable habitat is present. The project site is located within the consultation area and there are mature pine trees >6" suitable for nesting cavities throughout the project site. A survey will be conducted in accordance with USFWS guidelines to determine the presence of red-cockaded woodpeckers on site prior to any construction on the site. Utilizing results of the survey, conservation measures as described in the Species Conservation Guidelines will be followed. It should be noted however, that according to the species conservation guidelines as laid out by USFWS, the lack of fire management on the site results in lowered habitat suitability for the red-cockaded woodpecker. Additionally, through Brevard County's Environmentally Endangered Lands program, there remains ample habitat (>494 acres) for supporting the red-cockaded woodpecker to the west and north of the project site.

The piping plover (*Charadrius melodus*) is listed as Threatened at both the Federal and State level. According to the Standard Local Operating Procedure for Endangered Species – South Florida: Piping Plover, the piping plover utilizes a variety of coastal habitats for wintering, especially intertidal beaches and flats and the associated dune systems. A survey is only necessary when the project site is both within the consultation area and suitable habitat is present. While the project site is located within the Piping Plover Consultation Area, no suitable habitat is located on site (using the criteria to determine the suitability of the habitat as laid out by the USFWS) and the project site does not contain any optimal habitat (described in the P3BO). Specifically, suitable habitat for the piping plover includes beach/dunes ecosystems, sand or mud flats (or both) with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers. Due to the fact that the shoreline is heavily vegetated, no suitable habitat occurs within the projects bounds. Additionally, the nearest federally-designated critical habitat is nearly 60 miles away. Therefore, it is anticipated the project will have no effect on the piping plover.

The wood stork (*Mycteria americana*) is listed as Threatened at both the Federal and State levels. The Horseshoe Island (BC39) wood stork rookery is located approximately 2.0 miles to the northeast (heading 2 degrees) from the center of the proposed project. The Grant Farm Island (BC46) wood stork rookery is located approximately 2.1 miles to the southeast (heading 52 degrees) from the center of the proposed project. The Grange Island (BC49) wood stork rookery is located approximately 3.9 miles to the southeast (heading 56 degrees) from the center of the proposed project. The Micco North (BC51) wood stork rookery is located approximately 4.7 miles to the southeast (heading 57 degrees) from the center of the proposed project. The Micco South (BC52) wood stork rookery is located approximately 5.1 miles to the southeast (heading 58 degrees) from the center of the proposed project. Each of these rookeries are within the 15-mile foraging buffer radius designated for counties within the North Florida Geographic Area of Responsibility (GAR). Additionally, located within the South Florida GAR, the Pelican Island wood stork rookery is located approximately 16.0 miles to the southeast (heading 63 degrees) from the center of the proposed project and the Wabasso wood stork rookery is located approximately 11.8 miles to the southeast (heading 58 degrees) from the center of the proposed project. Both of these rookeries are within the 18.6-mile foraging buffer radius designated for South Florida counties. According to the Wood Stork Recovery Plan (Florida Fish and Wildlife Conservation Commission website), suitable foraging areas include a wide variety of shallow wetlands including freshwater marshes, stock ponds, roadside or agricultural ditches, tidal creeks or pools, human-created impoundments and swamp sloughs. The site provides about 10.5 acres of suitable foraging habitat, of which about 9.5 are proposed for impact. However, there is abundant foraging habitat located outside the project footprint within the area obtained by Brevard County as part of its Environmentally Endangered Lands program, adjacent to the north and west borders of the project property and within each of the rookeries' foraging radius. Additionally, the mitigation bank proposed for use by FIND is also within the core foraging radius for each of the colonies. Utilizing the Effect Determination Key for the Wood Stork in Central and North Peninsular

Florida and the South Florida Programmatic Occurrence: Wood Stork (which have been provided as part of Attachment 15), this project may affect, but is not likely to adversely affect the Wood Stork. Both determination north and south Florida determination keys were utilized as colonies in both the North Florida GAR and South Florida GAR are potentially being impacted by the proposed project. See Attachment 15: Listed Species Determination Keys for more information about the determination. Additionally, according to the Programmatic Occurrence, with an outcome of "no effect" or "NLAA" as outlined in this key, and because the project has less than 20.2 hectares (50 acres) of wetland impacts (the project includes 9.14 acres of wetland impact), the requirements of section 7 of the Act are fulfilled for the wood stork and no further action is required. Additionally, with an outcome of NLAA, the Corps recommends following management zones and guidelines found in the Habitat Management Guidelines for the Wood Stork.

The project site includes numerous gopher tortoise burrows. Existing gopher tortoises will be mapped and relocated during prior to construction through coordination with the Florida Fish and Wildlife Commission after completion of a gopher tortoise survey. All burrows within the limits of construction will be excavated and relocated within 90 days of the construction start date. All work will be performed under the supervision of individuals authorized by FFWCC. Gopher tortoises found will be relocated to a permitted relocation site.

The eastern indigo snake (*Drymarchon carais couperi*) is listed as Threatened at both the Federal and State level. According to the North and South Florida Ecological Services Field Offices Programmatic Concurrence for use of Original Eastern Indigo Snake Key(s) Until Further Notice, the eastern indigo snake frequents several habitat types including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats. Wherever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise (*Gopherus polyphemus*), the burrows of which provide shelter from winter cold and summer desiccation. According to the Environmental Site Documentation (Attachment 10) there were numerous gopher tortoise burrows identified onsite, as well as abundant xeric habitat (>25 acres). However, the exact number of burrows will not be known until a survey is completed under the supervision of individuals authorized by FFWCC. Utilizing the programmatic key, the project may affect, but is not likely to adversely affect the indigo snake and consultation is requested. See Attachment 15: Listed Species Determination Keys for more details. Note: All Conservation Measures described by the Standard Protections for the Eastern Indigo Snake will be followed including the posting of signs throughout the construction site and providing the contractor with copies of the brochure.

Please see Attachment 10: Environmental Site Documentation, Attachment 14: Florida Scrub-Jay Survey, and Attachment 15: Listed Species Determination Keys for more detailed information regarding potential listed species and their habitats.

3. Water quantity impacts to wetlands and other surface waters (*Refer to AH I Section 10.2.2.4 and AH II*).

   a. Does the activity include a proposed stormwater water management system with a control elevation different than the wetland normal pool elevation(s) of existing or proposed created wetlands or other surface waters?

      Yes. The project proposes a storm water management system that will include a retention system and a perimeter ditch designed to intercept DMMA seepage with a discharge only for volumes in excess of the permitted system capacity.

b. If yes to (a), provide documentation (e.g. drawdown assessment or other methods) that shows the proposed surface water management system will not change the hydroperiod of the existing or created wetland or other surface water.

The proposed project is expected to result in changes (reductions) to the seasonal high-water table around the site, including some wetland areas. These changes can be minimized by management of the perimeter ditch outfall weir elevation. The Preliminary Geotechnical Engineering Report Phases I & II – BV-24A DMMA provided as part of Attachment 11: Geotechnical Reports indicates that the system may alter groundwater elevations up to 5 feet, falling rapidly with distance away from the perimeter ditch. Attachment 2, Figure 10 provides the 1-foot drawdown contour, which may affect two isolated freshwater marsh wetlands on the east side of the property as well as 2 similar jurisdictional wetlands along the northeast edge of the property. FIND will optimize the ditch weir elevation, but will also mitigate those portions of wetlands within the current one-foot drawdown contour. See also Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A and the Final Geotechnical Engineering Report Phase III – BV-24A DMMA provided as part of Attachment 11: Geotechnical Reports for more information regarding water quantity impacts to wetlands and other surface waters. See Attachment 4: Groundwater Model Calibration Figure for information regarding the groundwater elevations used as a basis for modeling groundwater drawdown.

4. Public Interest Test. Please describe how the proposed activity will ***not be contrary*** to the public interest, OR if such an activity significantly degrades or is located within an Outstanding Florida Water (OFW), that the regulated activity will be ***clearly in*** the public interest (*Refer to AH I Section 10.2.3*).

The primary objective of the proposed project is to construct a long-term storage and management facility for sediments dredged from the ICWW in order to maintain navigation within the federally authorized waterway for commercial and recreational purposes. As such, this project clearly meets the public interest criterion.

Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A provides a detailed analysis of the DMMA BV-24A containment basin design to demonstrate that the project will meet state water quality standards and will not result in water quality impacts to the Malabar to Vero Beach Aquatic Preserve. The Preliminary Geotechnical Engineering Report Phases I & II – BV-24A DMMA provided as part of Attachment 11: Geotechnical Reports provides a detailed analysis of the containment basin design to ensure that off-site groundwater impacts will not occur as a result of the site construction and operation. Attachment 1: Management Plan – DMMA BV-24A provides more information on the long-term management and use of the site.

a. Please describe how the project will be designed to avoid adverse affects to public health, safety, or the welfare or the property of others.

The contractor will establish temporary erosion control measures upon mobilization to the site. The contractor will place the erosion control measures (e.g., silt fence) along the limits of construction as delineated on the final construction drawings. The contractor will monitor and maintain these erosion control devices according to FDEP protocol. Within the limits of construction and following the final site grading, the contractor will establish permanent vegetation (e.g., grass, sod, etc.). See Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for further details regarding the long-term site maintenance.

The site design provides a ~300-ft buffer from the northern boundary, a 150-ft – 400-ft buffer from the southern boundary, a 350-ft – 400-ft buffer from the eastern boundary, and

a ~125-ft buffer from the western boundary. See Attachment 2: Permit Drawings for more detailed information. Grounds maintenance (i.e., mowing) of grassed areas will occur seasonally, the buffer will remain undisturbed. The DMMA will be used approximately once every 5-10 years, limiting the interruption to the local area community after initial construction.

b. Please describe how the project will be designed to avoid adverse affects to the conservation of fish and wildlife, including endangered or threatened species, or their habitats.

Using the listed species identified in Attachment 10: Environmental Site Documentation (Section 4.2), and based on review of available literature; the present environmental conditions within the proposed project area potentially provides habitat for the Florida scrub-jay, red-cockaded woodpecker, everglades snail kite, wood stork, eastern indigo snake, gopher tortoise and the de-listed bald eagle.

Please see Attachment 10: Environmental Site Documentation for a brief synopsis of the potential impacts to listed species associated with the construction of the proposed project, and the protection measures that will be implemented to limit the potential impacts to listed species. For more detailed information regarding these species, please see Section C, Part 2, Item 2.

c. Please describe how the project will be designed to avoid adverse affects to navigation or the flow of water or cause harmful erosion or shoaling.

The primary objective of the proposed project is to provide storage capacity for sediments dredged from Reach VI of the ICWW in Brevard County as part of a navigation safety maintenance program managed by the Florida Inland Navigation District (FIND). FIND is tasked with maintaining the ICWW at its design template, which includes the removal of shoals that would impede navigation.

d. Please describe how the project will be designed to avoid adverse affects to the fishing or recreational values or marine productivity in the vicinity of the activity.

All but a very small portion of project construction will occur above the safe upland line and will not adversely impact fishing, recreational values, or marine productivity in the vicinity of the project. While an emergency overflow will be constructed along the shoreline, it's overall footprint has been minimized to avoid adverse effects. See Attachment 2: Permit Drawings for more detailed information.

Construction of this DMMA will provide an upland containment area to dewater and store material dredged from the ICWW to maintain its federally-authorized depth of -12-ft Mean Lower Low Water (MLLW), with a 2-ft allowable overage for a max. bottom depth of -14-ft MLLW. Maintaining water depth within the ICWW benefits both commercial and recreational users of waterway.

e. Will the project be of a temporary or permanent nature?

The proposed project will be permanent in nature. With proper maintenance, this DMMA has a 50-yr design life. See Attachment 1: Management Plan – DMMA BV-24A and Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for further details regarding the long-term site maintenance.

f. Please describe how the project will be designed to avoid adverse impacts to significant historical and archaeological resources, under the provisions of section 267.061, F.S.

Per Attachment 16: Florida Master Site File Search for DMMA BV-24A, it was determined that the project site intersects with two linear resources (Florida East Coast Railroad and US Highway 1/Cocoa Boulevard). However, only US Highway 1/Cocoa Boulevard is eligible for further SHPO evaluation. A compliance and review request will be submitted to the Bureau of Historic Preservation, Division of Historical Resources, Florida Department of State; consultation is ongoing to determine effects of the project on this site.

g. Please describe how the project will be designed to avoid adverse affects to the current condition and relative value of functions being performed by areas affected by the proposed regulated activity.

Currently, the proposed project site is located within minimally-disturbed Palmetto Prairie / Pine Flatwoods ecosystem. Within the property, the project maintains that ecosystem structure outside the construction footprint. The intermittent use of the site (about once every five to ten years and seasonal site maintenance confined to the constructed portion of the property) will result in minimal disturbance to the functions and values provided by the surrounding ecosystem. Upon completion of DMMA construction, vegetation within the interior of the site will be sparse, providing the optimum habitat for nesting shorebirds and reducing cover for predatory birds. After construction, within the buffer zone and other areas such as the DMMA berm, burrowing opportunities for gopher tortoises should not be adversely impacted. Recolonization of the site by this species and others that use gopher tortoise burrows is anticipated. See Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for further details.

5. Water Quality. Provide a description of how water quality will be maintained in wetlands and other surface waters that will be preserved or will remain undisturbed, both on and offsite. Please address both short-term (such as during construction) and long-term water quality considerations (*Refer to AH I Section 10.2.4*).

Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A provides the analyses demonstrating that the retention system proposed for the project site, meets the SJRWMD design criteria for discharges to Outstanding Florida Waters. During construction, the FIND contractor will obtain and comply with erosion control methods as described in the NDPES stormwater construction permit as part of the construction contact.

Upon mobilization to the site, the contractor will establish temporary erosion control measures. The contractor will place the erosion control measures (e.g., silt fence) along the limits of construction as delineated on the final construction drawings. The contractor will monitor and maintain these erosion control devices according to FDEP protocol. Following the final site grading, the contractor will establish permanent vegetation (e.g., grass, sod, etc.) at the project site. See Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for further details regarding the long-term site maintenance.

During DMMA operation, the decant water from the DMMA will be piped back to federal waters of the ICWW. In the long-term, the retention system will capture and infiltrate most of the stormwater runoff from the site; with only stormwater runoff in excess of the permitted design discharged to the lagoon.

The Preliminary Geotechnical Engineering Report Phases I & II – BV-24A DMMA provided as part of Attachment 11: Geotechnical Reports provides a detailed analysis of the containment basin design to ensure that off-site groundwater impacts will not occur as a result of the site construction and operation. The Final Geotechnical Engineering Report Phase III – BV-24A

DMMA provided as part of Attachment 11: Geotechnical Reports provides further analysis of containment basin design, construction, operation considerations, and stormwater treatment analysis to demonstrate how DMMA BV-24A construction and operation will not adversely affect water quality.

6. Class II Waters; Waters approved for shellfish harvesting *(Refer to AH I Section 10.2.5)*.

   a. Will the project occur in Class II that are NOT approved for shellfish harvesting? If yes, please provide a plan or procedure detailing the measures to be taken to meet the requirements of *AH I Section 10.2.5(a)*.

      Yes. Part of the proposed project will occur in Class II waters along the shoreline of Body F (#74) via the installation and use of a single storm water discharge structure in an area that is "conditionally restricted" for shellfish harvesting. The stormwater management system is proposed to be a retention system designed according to SJRWMD standards in the Applicant's Handbook Volumes I & II, and will only be discharged during extreme events. All other stormwater will be managed onsite. See Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for further details regarding the proposed stormwater management system. See Figure 2 provided in Attachment 8: Application Figures for more information about shellfish harvesting areas in Body F (#74).

   b. Is the project located adjacent to or in close proximity to Class II waters? If yes, please provide a plan or procedure detailing the measures to be taken to meet the requirements of *AH I Section 10.2.5(b)*.

      Yes. The entire Indian River Lagoon from Cape Malabar to the Saint Sebastian River is considered Class II waters. See Section C, Part 2, Item 6 (a) above for more information.

   c. Is the project located in Class II or Class III waters that are classified as "approved", "restricted", "conditionally approved", or "conditionally restricted"? If yes, demonstrate that the project meets the requirements of *AH I Section 10.2.5(c)*.

      Yes. The project will occur in waters classified as "conditionally restricted". See Section C, Part 2, Item 6 (a) above for more information.

7. Vertical seawalls. Are vertical seawalls proposed in an estuary or lagoon as part of the project? If yes, please describe how the project meets the requirements of *AH I Section 10.2.6*.

   No. There are no vertical seawalls associated with the project.

8. Secondary Impacts (*AH I Section 10.2.7*).

   a. Will an upland buffer, with a minimum width of 15' and an average width of 25', be provided between the proposed activities and existing wetlands or wetlands to be preserved, enhanced, restored, or created? Provide the location and dimension of all buffers on the plans. If not, demonstrate that secondary impacts will not occur or how they will be offset.

      Every wetland on the project site is proposed to be impacted, at least temporarily, except for Wetland I (See Figure 10: Wetland Impacts provided in Attachment 2: Permit Drawings). This southernmost wetland is over 175-feet away from the clearing limits for DMMA construction and is not affected by groundwater drawdown. In addition to the wetlands

and ditches located on the BV-24A property, there is proposed to be a small surface water impact (108 square feet) to the Indian River Lagoon at the point of discharge for the emergency overflow structure, but this impact has been minimized to the extent possible. Furthermore, as there is a roughly 350-ft buffer between the DMMA containment basin and the easternmost property boundary most of the construction will occur away from the shoreline of the Indian River. See Attachment 2: Permit Drawings for further details regarding site plans.

In addition, the contractor will establish temporary erosion control measures upon mobilization to the site. The contractor will place the erosion control measures (e.g., silt fence) along the limits of construction as delineated on the final construction drawings. The contractor will monitor and maintain these erosion control devices according to FDEP protocol. Following the final site grading, the contractor will establish permanent vegetation (e.g., grass, sod, etc.) at the project site. See Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for further details regarding the long-term site maintenance.

b. If listed species are present or may be present then coordination with wildlife agencies is needed. Have you coordinated with the FFWCC and/or USFWS? If so, please provide correspondence from the wildlife agencies indicating concurrence with the species management plan(s).

Per Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A and Attachment 10: Environmental Site Documentation, coordination will occur with the Florida Fish and Wildlife commission to obtain a gopher tortoise relocation permit before construction begins.

Please see Attachment 10: Environmental Site Documentation and Attachment 14: Florida Scrub-Jay Survey for more detailed information regarding potential listed species and their habitats.

To date, no consultation with the FWC or USFWS has occurred outside of coordination regarding the Florida Scrub-Jay minimization efforts (i.e., land swap between Brevard County and FIND). However, see the table below for a summary of the listed species likely to occur on-site and their determination (as described in Section C, Part 2, Item 2). See Attachment 15: Listed Species Determination Keys for more information on the determination of effect.

Listed Species Likely to Occur On-site

Common Name	Scientific Name	Federal Status [1]	State Status [2]	Determination
Florida scrub-jay	*Aphelocoma coerulescens*	Threatened	Threatened	*May Affect, Not Likely to Adversely Affect*
Everglades snail kite	*Rostrhamus sociabilis plumbus*	Endangered	Endangered	*No Affect*
Red-cockaded Woodpecker	*Picoides borealis*	Endangered	Endangered	**STILL NEED TO CONDUCT SURVEY**
Wood Stork	*Mycteria americana*	Threatened	Threatened	*Not Likely to Adversely Affect*
Eastern indigo snake	*Drymarchon corais couperi*	Threatened	Threatened	*May Affect, Not Likely to Adversely Affect*

[1] Federally-listed and Candidate Species in Brevard County, FL; USFWS website (accessed September 2017)

[2] List of Imperiled Species, FWC (accessed September 2017) / FNAI Report for Matrix Unit 63265, 63266, 63530, 63531

c. What measures will be taken to avoid impacts to wetland-dependent wildlife and/or listed species that use uplands for nesting or denning?

While the site contains habitat that is potentially valuable to wetland-dependent wildlife and listed species that use uplands for nesting or denning, the project site itself is bordered by lands owned by Brevard County under the Environmentally Endangered Lands program. These lands are preserved specifically for use by endangered species and to protect endangered ecosystems. Additionally, through coordination with USFWS and Brevard County, efforts have been made to minimize effects to listed species, specifically the Florida scrub-jay. Please see Attachment 14: Florida Scrub-Jay Survey and Attachment 13: Exchange Agreement for more information regarding avoidance and minimization of Florida scrub-jay habitat. The shoreline adjacent to the property is eroded and dominated by Australian Pine, limiting use by wading birds. The uplands habitat covering the project site is somewhat dense, with pine communities consisting of taller trees lining the palmetto prairie habitat. These tall trees provide cover for predatory birds, therefore limiting use of the palmetto prairie and sand pine scrub habitats by smaller birds such as the Florida scrub-jay. See Attachment 10: Environmental Site Documentation for more information.

d. Describe whether there are any other relevant activities that are very closely linked and causally related to any proposed dredging or filling in wetlands or other surface waters that have the potential to cause impacts to significant historical and archaeological resources.

The primary objective of the proposed project is to provide storage capacity for sediments dredged from Reach VI of the ICWW as part of a navigation safety maintenance program managed by the Florida Inland Navigation District (FIND). FIND is federally authorized to maintain a maximum bottom depth of -14-ft Mean Lower Low Water (federally-authorized depth of -12-ft Mean Lower Low Water (MLLW) with a 2-ft allowable overage) within the ICWW channel. Per Attachment 16: Florida Master Site File Search for DMMA BV-24A, there is not likely to be any impact to historical or archaeological resources. However, there is a potential to impact the linear resources of the Florida East Coast Railroad and US Highway 1/Cocoa Boulevard through the installation of a permanent pipeline from the DMMA to the Indian River Shoreline. As the project proposes to lay the pipeline beneath the road the impact should only be temporary and should not substantially alter the overall linear resource. To that effect coordination with the Division of Historical Resources is ongoing for the linear resource eligible for SHPO review. See Section C, Part 2, F for more information.

e. Are there additional future phases or extensions of the proposed activities that are not shown? If yes, please describe.

No. There are no additional future phases or extensions of the proposed activities that are not shown.

9. Cumulative Impacts. Is the proposed mitigation located within the same drainage basin (*Refer to AH I Figures 10.2.8.1 – 10.2.8.5)* as the proposed wetland impacts? If not, please submit a Cumulative Impact Evaluation in accordance with *AH I Section 10.2.8*.

Yes. The project site and all associated wetlands that must be mitigated as well as the Mary A mitigation bank are located within the Central Indian River Lagoon drainage basin. FIND will obtain credits after the application has been evaluated.

10. Mitigation Plan (*Refer to AH I Section 10.3*).

a. If a mitigation bank is proposed to offset wetland/other surface water impacts, provide:

i. the name of the bank: **Mary A Mitigation Bank**. A letter of reservation from the banker will be required once the application has been evaluated.

ii. If the mitigation bank was assessed using UMAM, provide UMAM worksheets for impact area(s). If the bank was assessed using a method other than UMAM, then prepare the impact assessment using the same method.

See Attachment 17: UMAM Summary – FDEP for information regarding UMAM assessments for the impacted wetlands.

b. If mitigation is proposed to offset wetland/other surface water impacts, please provide a mitigation plan that includes, at a minimum, the following:

i. ☐ Proposed mitigation narrative:
   (1) ☐ Describe the current and proposed condition for each type of mitigation component (restoration, enhancement, creation, preservation), including:
      (a) ☐ Describe current and proposed vegetation
      (b) ☐ Describe current and proposed hydrologic conditions for the proposed mitigation.
      (c) ☐ Describe the soil types from NRCS maps and confirm if actual soil conditions appear to match.
   (2) ☐ Provide details of the proposed construction/mitigation activities including phasing and timing, as appropriate.
   (3) ☐ Identify measures that will be implemented during and after construction to avoid adverse impacts related to the proposed activities.
   (4) ☐ A mitigation implementation and monitoring schedule with dates.
   (5) ☐ Identify the success criteria.
   (6) ☐ Describe the anticipated site conditions in and around the mitigation area after the mitigation plan is successfully implemented.
   (7) ☐ Provide a comparison of current fish and wildlife habitat to expected habitat after the mitigation plan is successfully implemented.

ii. ☐ Provide a Management Plan that includes, as appropriate, aspects of operation and maintenance, including water management practices, vegetation establishment, exotic and nuisance species control, fire management, and control of access.

iii. ☐ Maps:
   (1) ☐ Soil map (include soil names/codes, hydrologic soil groups and hydric soil types).
   (2) ☐ Topographic map of the mitigation area and adjacent contributing and receiving areas.
   (3) ☐ Hydrologic features map of the mitigation area and adjacent contributing and receiving areas.
   (4) ☐ Vegetative communities map (using FLUCCS or other appropriate classification system).
   (5) ☐ For all maps, indentify source.

iv. Provide the necessary supporting information for the application of sections 62-345.400 - .600 (Uniform Mitigation Assessment Method (UMAM)). To meet this requirement, submittal of UMAM worksheets is acceptable for impact and mitigation areas.

v. If onsite and/or offsite applicant-responsible mitigation is proposed, submit a draft Conservation Easement document or other form of restrictive covenant that provides for protection of the mitigation area in perpetuity. Standard forms, as described in subsection 62-330.301(6), F.A.C., are available from the Agency or on its website.

vi. If onsite and/or offsite applicant-responsible mitigation is proposed, submit a cost estimate for completing the mitigation, including monitoring and maintenance.

vii. If onsite and/or offsite applicant-responsible mitigation is proposed and the proposed mitigation exceeds $25,000, please provide a draft financial assurance document.

viii. Identify the entity responsible for monitoring, maintenance and long-term stewardship of the mitigation area (i.e. the landowner or homeowner association, not the consultant or contractor that will do the work).

PART 3: PLANS

PLANS: The information listed in the checklist below represent the typical information required on the submitted project plans. The Plans checklists in each application section are cumulative unless otherwise noted. Separate plans for each application section are not required.

1. ☒ Include the following on the construction plans and cross sections:

   a. ☒ An Existing Conditions sheet showing the entire project and wetland/other surface water boundaries. Include the following: Acreage and type (herbaceous, forested or other surface water) of each wetland/other surface water.

      See Figure 4: SJRWMD Existing FLUCCS Map and Figure 6: Existing Conditions provided in Attachment 2: Permit Drawings.

   b. ☒ A Proposed Conditions sheet showing the entire project and wetland/other surface water boundaries with construction plan overlay.

      See Figure 1: Proposed FLUCCS Map provided in Attachment 8: Application Figures. See also the Figure 8: Project Overview provided in Attachment 2: Permit Drawings.

   c. ☒ A Proposed Wetland Impact sheet that include the following:

      See Figure 10: Wetlands Impacts provided in Attachment 2: Permit Drawings. Please see also Table 1: Project Wetland and other Surface Water Impact Summary provided as part of this application for more information regarding acreage and type of wetland to be impacted.

      i. ☒ Acreage and type (herbaceous, forested or other surface water) of each wetland/other surface water to be impacted.
      ii. ☐ Proposed upland buffers with dimensions.
      iii. ☐ Identify the seasonal high water and wetland normal pool elevations on the plans.
      iv. ☒ Separately identify WMD/FDEP and USACE wetland/other surface water impacts if different.

   d. ☒ Include wetland boundaries on all construction plan sheets.

      Wetland boundaries, as well as the established Safe Upland Line, have been included on all applicable sheets within Attachment 2: Permit Drawings.

2. ☐ If onsite and/or offsite applicant-responsible mitigation is proposed, submit mitigation permit plans and cross sections including, at a minimum:

   No applicant-responsible mitigation is proposed for this project. FIND will work with the Mary A mitigation bank to reserve the appropriate credits required to mitigate any applicable on-site impacts.

   a. ☐ existing conditions plan sheet identifying upland and wetland communities and acreage of each, topography, drainage patterns, and location of cross-section detail.

b. ☐ proposed conditions plan sheet identifying proposed improvements by type (restoration, enhancement, creation, preservation), acreage of each, topography, drainage patterns, and location of cross-section detail.
c. ☐ monitoring plan sheet including proposed improvements, monitoring transects, photostations, and mitigation signage (if applicable).
d. ☐ cross-section and/or profile detail(s) sheet(s) including representative section of each type of mitigation component. Include existing and proposed conditions and representative elevations.
e. ☐ planting schedule, plant species including common and scientific names divided into three sections (canopy, shrub, herbaceous) by mitigation component, quantity, spacing, size, and elevation range.

TABLE 1 - PROJECT WETLAND (WL) AND OTHER SURFACE WATER (SW) AND IMPACT SUMMARY

WL & SW ID	UMAM ASSESSMENT AREA NAME(S)	WL & SW TYPE	WL & SW SIZE (acres)	WL & SW NOT IMPACTED (acres)	TEMPORARY WL & SW IMPACTS		PERMANENT WL & SW IMPACTS	
					IMPACT SIZE (acres)	IMPACT TYPE	IMPACT SIZE (acres)	IMPACT TYPE
Wetland A	A, D, E, F, K (Fill) / A, G, J, N (GW Drawdown)	Freshwater Marsh	4.13	-	-	N/A	4.13	F / H
Wetland B	-	Freshwater Marsh	0.18	-	-	N/A	0.18	F
Wetland C	-	Freshwater Marsh	0.27	-	-	N/A	0.27	F
Wetland D	A, D, E, F, K (Fill) / D, F, G, J, M, N (Secondary)	Freshwater Marsh	1.79	0.17	0.18	C	1.44	F / O
Wetland E	A, D, E, F, K (Fill)	Freshwater Marsh	0.73	-	-	N/A	0.73	F
Wetland F	A, D, E, F, K (Fill) / D, F, G, J, M, N (Secondary)	Freshwater Marsh	0.53	0.16	-	N/A	0.37	F / O
Wetland G	A, G, J, N (GW Drawdown) / D, F, G, J, M, N (Secondary)	Freshwater Marsh	0.19	-	-	N/A	0.37	H / O
Wetland J	A, G, J, N (GW Drawdown) / D, F, G, J, M, N (Secondary)	Freshwater Marsh	0.54	0.40	-	N/A	0.14	H / O
Wetland K	A, D, E, F, K (Fill)	Freshwater Marsh	0.76	-	-	N/A	0.76	F
Wetland L	-	Freshwater Marsh	0.15	-	-	N/A	0.15	F
Wetland M	M (Fill) /D, F, G, J, M, N (Secondary)	Wetland Scrub	0.45	-	-	N/A	0.81	F / O
Wetland N	A, G, J, N (GW Drawdown) / D, F, G, J, M, N (Secondary)	Freshwater Marsh	0.56	0.524	-	N/A	0.036	H / O
Wetland O	-	Freshwater Marsh	0.05	-	-	N/A	0.08	F / O
Ditch 1	-	Ditch	0.01	-	0.01	F	-	N/A
Ditch 2	-	Ditch	0.13	-	0.13	F	-	N/A
Ditch 3	-	Ditch	0.03	-	0.03	F	-	N/A
Outfall	-	Streams & Waterways	-	-	-	N/A	0.002	F
PROJECT TOTALS:			**10.500**	**1.254**	**0.350**		**9.468**	

Comments: Project Totals for “WL/SW Size (acres)” and “WL/SW Not Impacted (acres)” only include the area within the BV-24A property and associated pipeline easement. Any offsite impacts are not included in these totals. However offsite impacts are included in the project totals for both the Temporary and Permanent “-Impact Size (acres)”.

Impact Type: D=dredge; F=fill; H=change hydrology; S=shading; C=clearing; O=other **(Please Note: For this project, impacts classified as “Other” are secondary impacts.)**

SECTION E: SUPPLEMENTAL INFORMATION REQUIRED FOR WORKS OR OTHER ACTIVITIES INVOLVING A STORMWATER MANAGEMENT SYSTEM
(OTHER THAN A SINGLE-FAMILY PROJECT)

Instructions: The information listed in the checklists below represents the level of information that is usually required to evaluate an application. Information can be provided within reports, plans and documents. The level of information required for a specific project will vary depending on the nature and location of the site and the activity proposed. Conceptual approvals generally do not require the same level of detail as a construction permit. However, providing a greater level of detail will reduce the need to submit additional information at a later date. If an item does not apply to your project, proceed to the next item. The supplemental information required by this section is in addition to the information required by Section A of the ERP application.

PART 1: STORMWATER MANAGEMENT SYSTEM SUMMARY

Provide drainage calculations, signed and sealed by an appropriate registered professional, and supporting documentation demonstrating that the proposed project meets the conditions for issuance under 62-330.301(1)(a),(b),(c),(e), F.A.C. The drainage calculations should include, but not necessarily be limited to, the following:

1. General Site Information:

   a. ☒ Provide pre-development and post-development drainage map(s), as appropriate, that include drainage patterns and basin boundaries with acreage served by each hydraulically separate system, showing the direction of flows, including any off-site runoff being routed through or around the system; topographic information; and connections between wetlands and other surface waters.

      Isolated ditches and wetlands occur on the site, as well as a ditch at the outer end of the easement that drains to the IRL which will not be significantly altered following pipeline construction. Therefore, no pre-development drainage maps have been provided. This project proposes the construction of a containment basin. Stormwater entering the DMMA (including the DMMA area bounded by the outside edge of the dike crest) will be captured and retained within the DMMA except for rainfall from extreme storm events. Runoff from the outside of the dike and the DMMA access road is captured and treated in a stormwater pond sized to provide required treatment for stormwater discharged to the Class II waters of the IRL (Attachment 2, Figures 8 and 22). Post-development drainage is depicted within the site plan in Attachment 2: Permit Drawings.

   b. ☒ Provide the results of any percolation tests, where appropriate, and soil borings that are representative of the actual site conditions. Identify the wet season high water table elevations, soil profiles, and hydraulic conductivity. Include dates, datum, and methods used to determine these soil parameters.

      See the Preliminary Geotechnical Engineering Report Phases I & II – BV24A DMMA, the Final Geotechnical Report Phase III – BV-24A DMMA, and the Geotechnical Report – Permanent Discharge Pipeline each provided as part of Attachment 11: Geotechnical Reports for applicable geotechnical data.

c. ☒ Identify the onsite hydrologic soil classification (e.g. Type A, B/D, D). Reference the source, such as the USDA/NRCS Soil Survey, used in estimating the onsite hydrologic soil classification. Provide maps, as appropriate, with the project limits delineated.

See Figure 3: NRCS Soils Map provided in Attachment 2: Permit Drawings and Attachment 18: USDA/NRCS Soil Resource Report for DMMA BV-24A.

d. ☒ Identify the seasonal high water or mean high tide elevation for receiving waters/wetlands into which runoff will be discharged. Include dates, datum, and methods used to determine these elevations.

The safe upland line has been provided on all applicable figures within Attachment 2: Permit Drawings. See Attachment 5 for more information regarding the safe upland line as designated by FDEP.

e. ☒ Identify the name of each receiving waterbody to which the proposed stormwater management system will discharge:

The proposed stormwater management system will discharge into the Malabar to Vero Beach Aquatic Preserve within the Indian River. This overflow structure will be designed for storm water volumes in excess of the dry retention capacity of the DMMA.

f. ☒ Indicate the existing land use and land cover.

See Figure 4: Existing FLUCCS Map provided in Attachment 2: Permit Drawings.

g. ☒ Provide the acreage, and percentages of the total project, of the following:

1. Impervious surfaces, excluding buildings, wetlands and other surface waters;
2. Buildings;
3. Pervious surfaces (green areas not including wetlands);
4. Lakes, canals, retention areas, other open water areas; and
5. Wetlands (Please refer to Section C to ensure consistency in wetland acreages).

The pre-development project site is 116.03 acres total; 10.66 acres (9.2%) wetlands and 105.37 acres (90.8%) green upland areas.

The project footprint includes 77.30 acres. The site design provides a 300-ft buffer from the northern boundary, a ~150-ft buffer from the southern boundary (400-ft at its largest), a 350-ft - 400-ft buffer from the eastern boundary and a ~125-ft boundary from the western boundary. The eastern and western boundaries will follow the fence-line of the site. Of the total project footprint, the dredged material management area (from outer toe of embankment) will cover 64.72 acres (83.7 % of the total footprint). Of this, 43.56 acres consist of the basin actually capable of holding dredged material and/or stormwater.

Stormwater ditches and a stormwater pond will cover 7.77 acres (10.1% of the total footprint).

Impervious and semi-impervious surfaces (crushed limerock road) will cover 4.35 acres (5.6% of the project footprint); of which 0.17 acres consist of the already existing Old Dixie Highway, F.E.C. Railroad and US Highway 1. The remaining 4.18 acres to be constructed consist of a stabilized access road and perimeter road, a stabilized ramp, 2 concrete spillways, 2 concrete mitered end structures and rip-rap stabilizing the

outfall structure. There will be a temporary access road to the laydown area and storage trailer, but it will be grassed over following construction of the DMMA.

A pad for dissipation of energy from water flowing through the emergency stormwater overflow pipe includes 0.002 acres (108.31 sf) of area below the safe upland line of the Indian River Lagoon. Additionally, 9.466 acres of currently existing wetlands will be permanently affected via the actual construction of the DMMA, groundwater drawdowns resulting from DMMA construction and perimeter ditch configuration, and any associated secondary impacts. For more information see Table 1: Project Wetland and Other Surface Water Impact Summary provided within Section C of this permit application package and Figure 10 provided in Attachment 2: Permit Drawings.

h. ☒ Provide the location and description of any nearby existing offsite features (such as wetland and other surface waters, stormwater management ponds, and building or other structures) which might be affected by or affect the proposed construction or development.

Residential development occurs east of Old Dixie Highway and an excavated pit and haul road occur in the property adjoining the central portion of the pipeline easement just west of the utility corridor. Private property and a residence lies on the southern boundary of the project area. To the southeast of the property lies more private property and multiple structures, most likely associated with an equestrian center. Much of the land to the east and north of the site encompass lands bought by Brevard County as part of its Environmentally Endangered Lands program. The 60-foot wide pipeline easement north and east of the site includes several privately-owned properties and portions of Old Dixie Highway, US Highway 1, and the Florida East Coast Railway. Additionally, there is a former facility and paved lot located to the north of the easement. For more information please see Attachment 3: Phase I Environmental Site Assessment.

2. Water Quality Analysis:

a. ☒ Provide a description of the proposed stormwater treatment methodology that addresses the type of treatment, pollution abatement volumes, and recovery analysis.

See Element 3: Stormwater and Appendices B, C, D, & E provided in Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for information and calculations regarding the proposed stormwater treatment methodology.

b. ☒ Is the receiving waterbody known to be impaired, and/or has an established Total Maximum Daily Load (TMDL) or Basin Management Action Plan (BMAP)? If so, please provide specific descriptions of all water quality parameters for which the waterbody is known to be impaired? For more information about water quality, impaired waters, and to determine whether a TMDL has been adopted in your project area, refer to: http://waterwebprod.dep.state.fl.us/basin411/downloads/Florida-Adopted-TMDLs.pdf. To determine whether a BMAP exists, or is being developed in your project area, refer to: *http://www.dep.state.fl.us/water/watersheds/bmap.htm#rad*.

☒ yes ☐ no ☐ don't know

A statewide TMDL for mercury applies to the water body. Additionally, a TMDL has been established for the receiving water associated with the project: Indian River above Sebastian Inlet, WBID 2963A, for nutrients (seagrass)

(https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwiE9sn2x8bXAhVF92MKHa3xAGwQFggwMAE&url=http%3A%2F%2Fciteseerx.ist.psu.edu%2Fviewdoc%2Fdownload%3Fdoi%3D10.1.1.629.358%26rep%3Drep1%26type%3Dpdf&usg=AOvVaw1MBBnNn7u8S_q2yvUAfGgc). **Total nitrogen (TN) and total phosphorus (TP) TMDL reduction targets have been identified. Additionally, the receiving waters have also been identified as being impaired due to bacteria levels, thus resulting in Class II waters that are "conditionally restricted" for shellfish harvest.**

If yes, provide calculations demonstrating that the proposed project will not contribute to violations of state water quality standards in accordance with the applicable Applicant's Handbook, Vol. II.

See Element 3: Stormwater and Appendices B, C, D, & E provided in Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for information and calculations regarding the proposed stormwater treatment methodology.

c. ☒ Does the project have a direct discharge to a Class I, Class II, Outstanding Florida Waters or Class III waters, which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting? *To determine whether your project is within, or will discharge to an OFW, or for more information about OFWs in general, refer to: http://www.dep.state.fl.us/water/wqssp/ofw.htm.*

☒ yes ☐ no ☐ don't know

Any stormwater discharge will go to the Malabar to Vero Beach Aquatic Preserve. This segment of the Indian River is also categorized as Class II waters that are "conditionally restricted" for shellfish harvest. See Figure 2 provided in Attachment 8: Application Figures for more information regarding shellfish harvesting boundaries.

If yes, additional treatment in accordance with the applicable Applicant's Handbook, Vol. II, may be required.

d. ☒ Provide construction plans and calculations that address the required treatment volume and recovery, as well as stage-storage and design elevations, which demonstrate compliance with the appropriate water quality treatment criteria in the applicable Applicant's Handbook, Vol. II.

See Attachment 2: Permit Drawings, as well as Element 3: Stormwater and Appendices B, C, D, & E provided in Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for construction plans and calculations.

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Provide a description of the engineering methodology, assumptions and references for the parameters listed above, and a copy of all such computations, engineering plans, and specifications used to analyze the system. If a computer program is used for the analysis, provide the name of the program, a description of the program, input and output data, and justification for model selection.

3. Water Quantity Analysis:

Provide calculations and documentations demonstrating that the project, as proposed, meets the applicable design criteria as indicated in the applicable Applicant's Handbook, Vol. II. Typically, the information would include, at a minimum, but is not necessarily be limited to, the following:

a. ☐ For projects requiring pre-development analysis, provide an analysis of the pre-development peak rate of discharge and / or volume of runoff, for all design storm events. Account for all onsite depressional storage and offsite contributing area. Please refer to the applicable Applicant's Handbook, Vol. II for the design storm event(s) that apply to your project.

b. ☒ Provide an analysis of the post-development peak rate of discharge and / or volume of runoff for all applicable design storm events. Account for all onsite storage and offsite contributing area. Please refer to the applicable Applicant's Handbook, Vol. II for the design storm event(s) and criteria that apply to your project.

See Element 3: Stormwater and Appendices B, C, D, & E provided in Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for post-development analysis of water quantities for applicable storm events. For more information please see the Preliminary Geotechnical Engineering Report Phases I & II – BV24A DMMA, the Final Geotechnical Report Phase III – BV-24A DMMA, and the Geotechnical Report – Permanent Discharge Pipeline provided as part of Attachment 11: Geotechnical Reports.

These analyses should include:

- ☐ Runoff characteristics, including area, runoff curve number or runoff coefficient, and time of concentration for each drainage basins in the pre-development and post-development condition;
- ☐ Design storms used including rainfall depth, duration, frequency, and distribution;
- ☐ Runoff hydrograph(s) for each drainage basin, for all required design storm event(s);
- ☐ Stage-storage computations for any area such as a reservoir, closed basin, detention area, or channel, used in storage routing;
- ☐ Stage-discharge computations for any storage areas at a selected control point, such as control structure or natural restriction;
- ☐ Flood routings through on-site conveyance and storage areas;
- ☐ Water surface profiles in the primary drainage system for each required design storm event(s);
- ☐ Runoff peak rates and volumes discharged from the site for each required design storm event(s);
- ☐ Design tailwater elevation(s) for each storm event at all points of discharge (include source or method of estimate); and

☐ Pump specifications and operating curves for range of possible operating conditions (if used in system).

Provide a description of the engineering methodology, assumptions and references for the parameters listed above, and a copy of all such computations, engineering plans, and specifications used to analyze the system. If a computer program is used for the analysis, provide the name of the program, input and output data, justification for model selection, and, if necessary, a description of the program.

4. Floodplain Analysis (where applicable).

a. ☒ If the project is in a known floodplain of a stream or other water course, identify the appropriate floodplain boundary and approximate flooding elevations of any lake, stream or other watercourse located on or adjacent to the site.

See Figure 5 provided in Attachment 2: Permit Drawings for floodplain boundaries on the project site. DMMA construction intersects with two Zone "A" floodplains that result from unnamed ponding. No elevations are readily available for Zone "A" flood zones.

b. ☐ For traversing works, in accordance with the applicable Applicant's Handbook, Vol. II, provide:

☐ Hydraulic calculations for all proposed traversing works; and

☐ Water surface profiles showing upstream impact of traversing works.

c. ☐ For impacts to regulated floodplains, in accordance with the applicable Applicant's Handbook, Vol. II, provide:

☐ Location and volume of encroachment within regulated floodplain(s); and

☐ Plans and calculations for compensating floodplain storage, if necessary, and calculations required for determining minimum building and road flood elevations.

PART 2: CONSTRUCTION PLANS

1. Provide clear, construction level detailed plans for the system. The plans must be signed and sealed by an appropriate registered professional as required by law. These plans should include cumulative information from all applicable sections; as well as the following:

a. ☒ Project area boundary and total area, including distances and orientation from roads or other landmark.

The project area boundary has been provided on all applicable sheets within Attachment 2: Permit Drawings.

b. ☒. Existing topography extending at least 100 feet off the project area. All topography shall include location and description of benchmarks, reference to NGVD 1929 or NAVD 1988 along with the conversion factor.

Existing Topography has been depicted on Figures 6 and 9 within Attachment 2:

Permit Drawings. Please Note: All information included in Attachment 2: Permit Drawings references to NAVD88.

c. ☒ Proposed site plan with acreage, including the following:

- ☒ plan view of proposed development, including impervious surfaces and water management areas;
- ☒ land cover and natural communities*;
- ☒ wetlands and other surface waters*;
- ☒ undisturbed uplands*;
- ☒ aquatic communities*;
- ☒ proposed buffers*;
- ☒ proposed impacts to wetlands and other surface waters, and any proposed connections/outfalls to other surface waters or wetlands, (if applicable); and
- ☒ onsite wetland mitigation areas*.

*Please refer to Section C.

- ☐ For phased projects, provide a master development plan clearing delineating the limits of each phase of construction.

See Attachment 2: Permit Drawings for requested site plan information. Please Note: this is not a phased project.

d. ☒ Paving, Grading, and Drainage Information, which includes, but not necessarily limited to, the following:

- ☒ Existing topography;
- ☒ Boundaries of wetlands and other surface waters and upland buffers (see Section C);
- ☒ Plan view of proposed development;
- ☒ Proposed elevations and/or profiles, including:
  - ☒ roadway, parking, and pavement grades;
  - ☐ floor slabs, walkways, and other paved surfaces;
  - ☒ earthwork grades for pervious landscaped areas; and
  - ☐ perimeter site grading, tying back into existing grades.
- ☒ Location of all water management areas, including elevations, dimensions, side slopes, and design water depths;
- ☒ Location, size, and invert elevations of existing and proposed stormwater conveyance systems;
- ☒ Vegetative cover plan for all on-site and off-site earth surfaces disturbed by construction; and
- ☒ Rights-of-way and easements for the system, including all on-site and off-site areas to be reserved for water management purposes (including access), and rights-of-way and easements for the existing drainage system, if any.

See Attachment 2: Permit Drawings for requested paving, grading, and drainage information.

e. ☒ Stormwater detail information, including but not necessarily limited to, the following:

- ☒ Cross section of all stormwater management areas, including elevations, dimensions, side slopes, and proposed stabilization measures (with location of the cross section(s) shown on the corresponding plan view);
- ☒ Detail of all proposed control structures, including elevations, dimensions, and skimmer, where applicable; and

☒ Details of proposed stormwater management systems, such as underdrains, exfiltration trenches, vaults, and other proposed Best Management Practices (BMPs).

See Attachment 2: Permit Drawings for requested stormwater detail information.

f. ☒ Location and description of any nearby existing offsite features (such as wetland and other surface waters, stormwater management ponds, and building or other structures) which might be affected by or affect the proposed construction or development.

See the Preliminary Geotechnical Engineering Report Phases I & II – BV-24A DMMA provided as part of Attachment 11: Geotechnical Reports for groundwater modeling. There are no other offsite features that the project would potentially affect.

PART 3: CONSTRUCTION SCHEDULE AND TECHNIQUES

Provide a construction schedule, and a description of construction techniques, sequencing and equipment. This information should include, as applicable, the following.

a. ☒ Access and staging of equipment;

See Attachment 19: Construction Methodology.

b. ☒ Location and details of the erosion, sediment and turbidity control measures to be implemented during each phase of construction and all permanent control measures to be implemented in post-development conditions.

See Figures 34 and 35 provided in Attachment 2: Permit Drawings.

c. ☐ The location of disposal site(s) for any excavated material, including temporary and permanent disposal sites.

Any excavated material will be used in DMMA berm construction. No temporary or permanent disposal sites will be necessary for this construction

d. ☐ A demolition plan for any existing structures to be removed.

There are no structures on the site that require demolition

e. ☒ Dewatering plan details. If dewatering is required, detail the dewatering proposal including the methods that are proposed to contain the discharge, methods of isolating dewatering areas, and indicate the period dewatering structures will be in place; Note: a Consumptive Use or Water Use permit may be required for dewatering.

Dewatering will likely be required as part of containment basin excavation, which is estimated to take about six months. However, dewatering effluent will not be permitted to leave the site. Specific dewatering methodology will be left up to the selected contractor.

One method might entail pumping dewatered effluent into temporary ditches excavated around the perimeter of the construction area where the water will be allowed to infiltrate into the soil. Another method might be to divide the basin excavation area into halves, dewatering one side at a time and pumping the dewatered effluent into the other half. Any method selected by the Contractor must

meet the requirement that no dewatered effluent is allowed to leave the site via overland flow, direct pumping, or other means.

f. ☒ Methods for transporting equipment and materials to and from the work site. If barges are required for access, provide the low water depths and draft of the fully loaded barge;

All materials will be transported to and from the worksite on uplands using trucks.

PART 4: OPERATION AND MAINTENANCE AND LEGAL DOCUMENTATION:

a. ☒ Describe the overall maintenance and operation schedule for the proposed system.

See Attachment 1: Management Plan – DMMA BV-24A and Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for information regarding maintenance and operation of the DMMA.

b. ☒ Identify the entity (or entities) that will be responsible for operating and maintaining the system (or parts of the system) to demonstrate that the entity (or entities) meet(s) the requirements of section 12.3 of the Applicant's Handbook, Vol. I.

Florida Inland Navigation District (FIND)

☐ If different from the permittee, provide a draft document enumerating the enforceable affirmative obligations on the entity to properly operate and maintain the system for its expected life, and documentation of the entity's financial responsibility for long-term maintenance.

☒ If the proposed operation and maintenance entity is not a property owner's association, provide proof of the existence of an entity, or the future acceptance of the system by an entity which will operate and maintain the system.

FIND is a special taxing District within the State of Florida. As the "local sponsor" of the Atlantic Intracoastal Waterway since its formation in 1927, the District taxes all counties through which the Intracoastal Waterway passes to provide funds for necessary operations. For further detailed information on the financial viability of the District, please refer to their 2013 Annual Financial Report found on the District's website: *<u>http://aicw.org/financials.jhtml?method=list</u>*

c. ☒ Provide drafts of all proposed conservation easements, stormwater management system easements, draft property owner's association documents, and plats for the property containing the proposed system.

The property where DMMA construction will occur is owned by FIND as a result of the land-swap agreement between FIND and Brevard County (See Attachment 13: Exchange Agreement). Pipeline and access road construction will occur on an easement. See Attachment 20: BV-24A Easement Order of Taking for more information regarding the easement. This easement is depicted on all applicable sheets within Attachment 2: Permit Drawings.

d. ☐ Provide legal reservations for access to the treatment system for maintenance and operation by future maintenance entities for subdivided projects.

NA (project not subdivided)

e. ☐ Provide indication of how water and wastewater service will be supplied.

NA (no services required)

f. ☒ Provide a copy of the boundary survey and/or legal description and acreage of the total land area of contiguous property owned/controlled the applicant.

See Attachment 21: Boundary Survey & Legal Description.

PART 5: WATER USE

a. ☒ Describe how irrigation will be provided to the project. Will the surface water system be used for water supply, including landscape irrigation, or recreation?

The construction contractor is responsible for establishing the native ground cover for the site during the 180-day grass establishment period. This is typically done using a mobile watering tuck. Surface water is not expected to be used for irrigation during or post-construction.

b. ☐ If a Consumptive Use or Water Use permit has been issued for the project, state the permit number: **NA**

c. ☐ If a Consumptive Use or Water Use permit has not been issued for the project, indicate if such a permit will be required. ☐ yes ☒ no ☐ don't know

If yes, please indicate when the application for a permit will be submitted: **NA**

d. ☒ Indicate how any existing wells located within the project site will be utilized or abandoned.

There are 11 shallow monitoring wells located on the BV-24A, with 3 potentially being abandoned while the rest will continue to be used.

PART 6: SPECIAL BASIN INFORMATION

Is your project within a special basin as described in the applicable Applicant's Handbook, Vol. II?

☐ yes ☒ no ☐ don't know

The proposed project is within the Indian River Lagoon Basin which is *NOT* designated by SJRWMD as a special basin.

If yes, please demonstrate that the project will meet the applicable special basin criteria.

SECTION F: APPLICATION FOR AUTHORIZATION TO USE STATE-OWNED SUBMERGED LANDS

Instructions: If you were referred to this section from Section A, please provide the following additional information. Please note that if your proposed project is on state-owned submerged lands and the below requested information is not provided, your application will be considered incomplete. All items required under this section are in addition to those required under other sections, as applicable.

PART 1: TYPE OF AUTHORIZATION REQUESTED

A. Exceptions: The following activities do not require authorization to use state-owned submerged lands. *If you are certain that your project (including all components/phases thereof) qualifies, please indicate accordingly, below, and no further action is required to complete this section.*

- ☐ Construction or maintenance of a county water or sewer system under Section 153.04 F.S.
- ☐ Removal of material from the area adjacent to an intake or discharge structure under 403.813(1)(f), F.S.
- ☐ Removal of organic detrital material under Section 403.813(1)(r) or (u), F.S.
- ☐ Construction of floating vessel platforms under Section 403.813(1)(s), F.S.
- ☐ Trimming or alteration of mangroves under Sections 403.9321 through 403.9334, F.S.

B. Consent by Rule: Except for activities authorized under Section 253.77(4), F.S., no application or written authorization for the use of state-owned submerged lands is required for an activity that complies with the criteria listed in subparagraphs 18-21.005(1)(b)1. through 5., F.A.C., and that is exempt from the requirements of obtaining a permit under the provisions of:

- Section 403.813(1), F.S., paragraphs (a); (b), provided that the structure is the only dock or pier on a parcel and it is not a private residential multi-family dock with three or more slips.
- Section 403.813(1), F.S., paragraphs (c); (d); (e); (f), provided that no severance fee is required under Rule 18-21.011, F.A.C., and the existing activity has a valid Board of Trustees authorization.
- Section 403.813(1), F.S., paragraphs (g); (h); (i), provided that no private residential multi-family dock or pier is constructed.
- Section 403.813(1), F.S., paragraph (k), provided that any channel markers delineate existing and authorized or permitted navigation channels.

Such activities must still comply with the General Conditions for Authorizations under subsection 18-21.004(7), F.A.C. Agency staff will determine whether the proposed project qualifies for Consent by Rule. Be advised that if your project does not qualify for an Exception or Consent by Rule for one of the reasons listed above, then it will require one of the forms of authorization listed below.

C. Letter of Consent: Written authorization is required for each of the following activities:

- ☐ One minimum-size private residential single-family dock (see definition in Rule 18-21.003, F.A.C.).
- ☐ Private residential single-family or multi-family docks, piers, boat ramps, and similar existing and proposed activities that cumulatively preempt no more than 10 square feet of sovereignty submerged land for each linear foot of the applicant’s riparian shoreline, along sovereignty submerged land on the affected waterbody within a single plan of development (see “preempted area” definition in Rule 18-21.003, F.A.C.).
- ☐ Private channels that provide access to an upland single-family or multi-family residential

parcel and that measures no more than 10 square feet of sovereignty submerged land for each linear foot of the applicant's riparian shoreline along sovereignty submerged land on the affected waterbody within a single plan of development.

- ☐ Seawalls, bulkheads, or other shoreline stabilization structures no more than three feet waterward of mean or ordinary high water.
- ☒ Placement, replacement, or repair of riprap, groins, breakwaters, or intake and discharge structures no more than ten feet waterward of the line of mean or ordinary high water.
- ☐ Restoration and nourishment of naturally occurring sandy beaches, including borrow areas to be used for five years or less.
- ☐ Artificial reefs or fish attractors that are constructed for public use.
- ☐ Public docks or piers that are exempt from permit requirements under Section 403.813(1), F.S., or that qualify as minimum-size docks or piers or are less than or equal to the 10:1 preempted area to shoreline ratio; public boat ramps; public channels; or public swimming areas, provided that all such structures or activities are owned and operated by governmental entities and any revenues collected are used solely for operation and maintenance of the structure or adjacent public recreational facilities.
- ☐ Ski course buoys and ski jumps not associated with revenue-generating water skiing activities.
- ☐ Removal of wrecked, abandoned or derelict vessels or structures.
- ☐ Habitat restoration.

D. Lease: A state-owned submerged land lease is required for the following activities.

- ☐ Private residential single-family or multi-family docks or piers, other docks or piers, boat ramps, or other similar activities that do not qualify for a letter of consent.
- ☐ Private residential multi-family docks designed or used to moor three or more vessels within aquatic preserves.
- ☐ Docks designed or used to moor ten or more vessels in Monroe County.
- ☐ Commercial/industrial docks, as defined in Rule 18-18.004, F.A.C., in Biscayne Bay Aquatic Preserve, as required by paragraph 18-18.006(3)(c), F.A.C.
- ☐ All revenue-generating activities.
- ☐ Oil and gas exploration and development.
- ☐ Open-water mooring fields.
- ☐ Mining.

E. Easement. A state-owned submerged land easement is required for the following public or private activities.

- ☐ Utility crossings and rights of way.
- ☐ Road and bridge crossings and rights of way, including such structures built prior to the need to obtain an easement when proposed for modification or repair.
- ☐ Groins, breakwaters, and shoreline protection structures, except when constructed as part of a docking facility that requires a lease.
- ☐ Public navigation projects other than public channels.
- ☐ Private residential channels that do not qualify for a letter of consent, and channels that provide access to revenue-generating facilities in uplands.
- ☐ Oil, gas and other pipelines.
- ☐ Intake and discharge structures more than 10 feet waterward of the mean or ordinary high water line.
- ☐ Spoil disposal sites.

☐ Borrow areas that will be used for longer than five years for beach nourishment.
☐ Public water management projects other than public channels.
☐ Treasure salvage (Cultural Resource Recovery).

PART 2: SUBMITTAL REQUIREMENTS

If state-owned submerged lands will be affected by your project, we will notify you in writing, and the items in this section will also be required. For expediency, if you acknowledge or believe that your project affects state-owned submerged lands you may submit the items in the appropriate section of Part 2 prior to receiving written confirmation of state ownership. This will not jeopardize any future claim of ownership.

Unless your proposed project qualifies for an Exception or Consent by Rule, as described in Part 1 A or B, then your application to use state-owned submerged lands must include the following items, as applicable to your project.

A. All applications for Letter of Consent, Lease or Easement must include the following:

☒ Satisfactory evidence of sufficient upland interest to the extent required by paragraph 18-21.004(3)(b), F.A.C.

The upland property adjacent to the sovereign submerged lands requesting a letter of consent is owned by the Florida Inland Navigation District, which is also the applicant for this project. See Attachment 20: BV-24A Easment Order of Taking and Attachment 21: Boundary Survey and Legal Description.

☒ Detailed statement of the proposed activity.

The proposed project involves the construction of a 64.72-acre dredged material management area (DMMA) located in southern Brevard County, just west of the Atlantic Intracoastal Waterway (ICWW). This long-term storage facility will provide the capacity for dewatering and storing up to 1,035,818 cubic yards of sediments dredged to maintain navigation within Reach VI of the ICWW. During dredging activities, the facility will receive dredged material from the Intracoastal Waterway (ICWW) through a pipe, dewater the sediments, and discharge the decanted water through a permanent pipeline to the Indian River. After construction and in between maintenance dredging operations, stormwater in excess of the permitted design capacity of the stormwater management system will discharge via an emergency overflow structure along the western shoreline of the Indian River. See Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for more information.

☒ If dredging is proposed, an estimate of the number of cubic yards of sovereignty materials to be removed showing how the amount was calculated.

No dredging of soveriegn submerged lands is proposed for the construction of DMMA BV-24A. However the primary objective of the proposed project is to construct a long-term storage and management facility for sediments dredged from the ICWW in order to maintain navigation within the waterway for commercial and recreational purposes. This containment basin has been designed to contain up to 1,035,818 cubic yards of sediments. See Attachment 1: Management Plan – DMMA BV-24A, Attachment 2: Permit Drawings, and Attachment 12: Supplemental Information for DMMA Construction Projects – DMMA BV-24A for more information.

B. Applications for a **Letter of Consent** shall also include the following:

☐ Multiple boat slip facilities may require an affidavit certifying that the facility will not be a revenue generating/income producing facility.

☒ Two copies of a dimensioned site plan drawing(s) with the following requirements:

a. Utilizing an appropriate scale on 8 1/2" × 11" size paper;
b. Showing the approximate location of the mean high/ordinary high/or safe upland line;
c. Showing the location of the shoreline vegetation, if existing;
d. Showing the location of the proposed structures and any existing structures;
e. Showing the applicant's upland parcel property lines;
f. Showing the riparian lines; and
g. Showing the primary navigation channels or direction to the center of the affected waterbody.

See Attachment 2: Permit Drawings and Attachment 5: Safe Upland Line Determination.

C. Applications for **Leases** shall also include the following:

☐ Lease processing fee as specified in subparagraph 18-21.008(1)(a)8, F.A.C.

☐ Location of the proposed activity including: county; section, township and range; affected waterbody; and a vicinity map, preferably a reproduction of the appropriate portion of United States Geological Survey quadrangle map.

☐ Two prints of a survey prepared, signed, and sealed by a person properly licensed by the Board of Professional Surveyors and Mappers.

a. Use an appropriate scale on 8 1/2"× 11" size paper;
b. Show the location of ordinary or mean high water;
c. Show the location of the shoreline vegetation, if existing;
d. Show the location of the proposed structures and any existing structures;
e. Show the applicant's upland parcel property lines;
f. Show the primary navigation channels or direction to the center of the affected waterbody
g. Show the riparian lines;
h. Include a legal description of the preempted area to be leased; and
i. For those lease applications in the Florida Keys, indicate the water depths referenced to mean low water within the lease area and out to the navigation channel.

☐ Noticing information as required by subsection 18-21.005(3), F.A.C.

☐ Billing Information Form, which provides billing information; sales tax information; and other data required in accordance with Section 24.115(4), F.S.

☐ Computation of the total square footage of preempted sovereignty land to be leased.

D. Applications for **Easements** shall also include the following:

☐ Easement processing fee as specified in either (for public easements) paragraph 18-21.009(1)(g), or (for private easements) paragraph 18-21.010(1)(i), F.A.C.

☐ Vicinity map.

☐ Detailed statement of proposed use and satisfactory evidence of need for installation of telecommunication lines and associated conduits that are subject to the provisions of paragraph 18-21.004(2)(l), F.A.C. If the applicant is a local governing body, the request shall be by official resolution or minutes.

☐ Two prints of a survey prepared by a Licensed Florida Surveyor and Mapper in accordance with Chapter 61G17, F.A.C., (see attachment X for survey checklist) and meeting the following requirements:

a. Utilizing an appropriate scale on 8 1/2" × 11" size paper;
b. Showing boundaries of the parcel sought;
c. Showing ownership lines of the riparian uplands;
d. Showing the line of ordinary or mean high water;
e. Showing the location of the shoreline vegetation, if existing;
f. Showing the location of any proposed or existing structures;
g. Showing the riparian lines; and
h. Legal description and acreage of the parcel sought.

☐ Noticing information as required by subsection 18-21.005(3), F.A.C.

ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 1
MANAGEMENT PLAN – DMMA BV-24A

TAYLOR ENGINEERING, INC.

Management Plan

Florida Inland Navigation District
Dredged Material Management Area BV-24A
Brevard County, Florida
October 2015

10151 Deerwood Park Blvd., Building 300, Suite 300
Jacksonville, Florida 32256
904-731-7040 | www.taylorengineering.com

Management Plan
BV-24A Dredged Material Management Area

Prepared for

Florida Inland Navigation District

By

Taylor Engineering, Inc.
10151 Deerwood Park Blvd., Bldg. 300, Suite 300
Jacksonville, FL 32256
(904) 731-7040

October 2015

C2015-014

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LIST OF FIGURES

1.0 INTRODUCTION

A key element in the long-term utilization of any dredged material management area is the development and implementation of a site-specific management plan. Such a plan for dredged material management area BV-24A is outlined in this report. The plan is intended to provide guidance for the development and operation of the material management area so that optimum efficiency is achieved in both effluent quality and containment facility area service life while minimizing the impact of the site on the environment and adjacent areas.

This plan document addresses those facets of site design and operation which directly influence site efficiency or reduce off-site conflicts. These include elements of site preparation prior to the initial dredging operation, techniques of decanting and dewatering the maintenance material during and immediately following a dredging event, and criteria for post-dredging site operation and maintenance. Throughout, the goal of each phase of site management is to ensure that the site not only achieves its minimum design 50-year service life, but that it also fulfills its potential as a permanent operating facility for the intermediate storage and re-handling of maintenance material dredged from the Intracoastal Waterway (ICWW).

FIND's long-range dredged material management plan for the ICWW in Brevard County identified BV-24 as one of eight permanent maintenance material management areas (Taylor et al., 1989). After Florida scrub jays (*Aphelocoma coerulescens*) were found on the western part of BV-24, FIND negotiated a property exchange with Brevard County through which FIND received property adjacent to and east of BV-24 and the county received a portion of the north and western areas of BV-24. The exchange allowed FIND to minimize impacts to scrub jay habitat while allowing the county to increase its scrub jay habitat preservation area. The redesignated BV-24A (Figure 1-1) comprises the southeastern part of the original BV-24 site and the adjacent property acquired from the county.

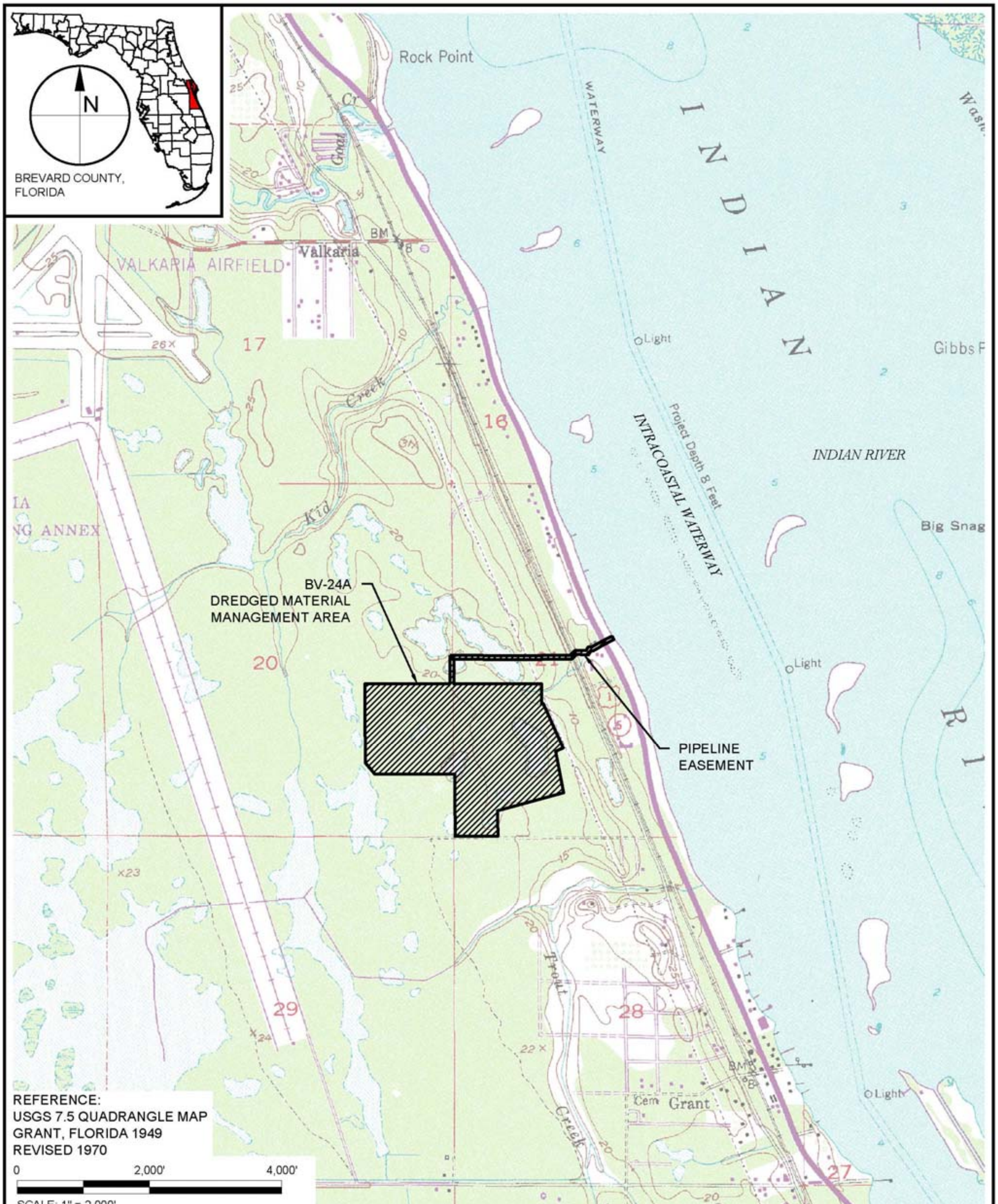
Specifically, BV-24A is intended to serve that portion of the ICWW defined by Taylor et al. (1989) as Reach VI. This reach extends 13.49 miles from the vicinity of Turkey Creek (ICWW mile 180.87) southward to the Brevard-Indian River County line at Sebastian Inlet (ICWW mile 194.36). Taylor et al. (1989) projected the 50-year dredged material storage requirement to be met by BV-24A at 1,053,044 cubic yards (cy). Anticipating dredging within this reach to occur once every five to ten years, the 1989 dredged material management plan estimated each maintenance dredging event would produce between 105,000 cy and 210,000 cy of material. The most recent bathymetric survey of the Brevard County portion of the ICWW, completed in September 2014, found shoals totaling 128,816 cy in Reach VI[1]. Considering the additional volume from a 2-foot combined advance maintenance and over dredging allowance and applying a 2.15 bulking factor gives a maximum current dredged material disposal requirement of about 1,391,000 cy. Including the full over dredging allowance results in a significantly more conservative estimate of storage requirements, and therefore, the estimate of 1,391,000 cy is an extreme upper limit for the 50-year storage requirement. Recognizing that the goal of BV-24A is to provide commensurate storage to the original BV-24 site, the preliminary design presented herein targets the original storage requirement projected by Taylor et al (1989) — 1,053,044 cy.

The total area of BV-24A is 112.52 acres. The required storage capacity for BV-24A will be provided by constructing a 63.12-acre (including perimeter road and stormwater ditches, etc.) containment basin within the central portion of the site. Thus, nearly 44% of the site will remain as a natural buffer area of undisturbed vegetation. The capacity of the BV-24A containment basin is 1,084,100 cy, slightly more than the target storage volume.

As stated, beyond providing dredged material storage capacity for Reach VI, the management objective for BV-24A is to process (i.e. decant and dewater) the dredged material efficiently and to operate the facility to extend its usefulness beyond the design service life. The potential long-term efficiency of the material management area is established by the design and construction of the facility, while the degree to which this potential is realized is largely determined by operating procedures. Specific elements of site design and operation during and following dredging operations will be discussed in turn as they relate to site efficiency and local impacts. However, design features and construction practices, beginning with site preparation, provide the physical and figurative foundation for the project. These features and practices, then, reflect the level of effort that has gone into the selection of BV-24A.

This site management plan begins in Section 2.0 with a discussion of site preparation and design. Site operational considerations during dredging are discussed in Section 3.0. Post-dredging site management is addressed in Section 4.0.

[1]Reported to FIND in June 3, 2015 memo to Mark Crosley from John Adams.



TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 1-1
LOCATION MAP
FIND BV-24A DREDGED MATERIAL MANAGEMENT PLAN
BREVARD COUNTY, FLORIDA

PROJECT C2015-014
DRAWN BY RLJ
DATE SEPT 2015

2.0 PRE-DREDGING SITE PREPARATION AND DESIGN FEATURES

2.1 Site Design

No attempt is made here to address, in detail, all elements of site design. These are described elsewhere in permit and design documentation. Rather, the present discussion is limited to those aspects of site design which directly influence site construction and operation.

2.1.1 Containment Basin Configuration

The configuration of the BV-24A containment basin must provide maximum capacity to serve Reach VI without unnecessarily impacting environmentally sensitive wetland and upland habitats on-site. As discussed in Section 1.0, the target storage requirement for Reach VI is 1,053,044 cy. The basin configuration presented in Figures 2-1 through 2-3, and discussed in the following paragraphs, provides a capacity of 1,084,100 cy.

The BV-24A containment basin also minimizes the impacts of site development on environmentally sensitive areas (wetlands and Florida scrub jay habitat). Wetlands (freshwater marsh) occur in several locations on the site (Figure 2-2). Florida scrub jay habitat, identified by Normandeau (2015) occurs on the western part of the site (Figure 2-2). As stated, the total acreage of BV-24A is 112.52 acres. Adequate storage capacity requires a containment basin area of 55.11 acres (to the outside toe of the dike). An additional 8.01 acres will be impacted by the excavation of a perimeter ditch and the construction of access roads surrounding the containment area. Thus, a total of 63.12 acres will be impacted by the development of the containment facility. This represents approximately 56% of the total site area. Therefore, approximately 44% (49.4 acres) of the existing natural vegetation within the site boundaries is preserved within the buffer area.

As shown in Figure 2-2, the resulting configuration of the containment facility provides various width buffers separating the containment basin and associated perimeter features from the BV-24A property boundaries. Along the east side of the site, buffer width ranges from about 425 to 700 feet. The largest wetland on site will remain preserved within this area. A 500–900 foot-width buffer separates the southeast part of BV-24A from adjacent properties. Another large wetland will remain preserved within this area. The northeast part of the site contains a 115-foot buffer while the northwest part contains a 50-foot buffer. The remaining west and southwest parts contain a 10-foot wide buffer.

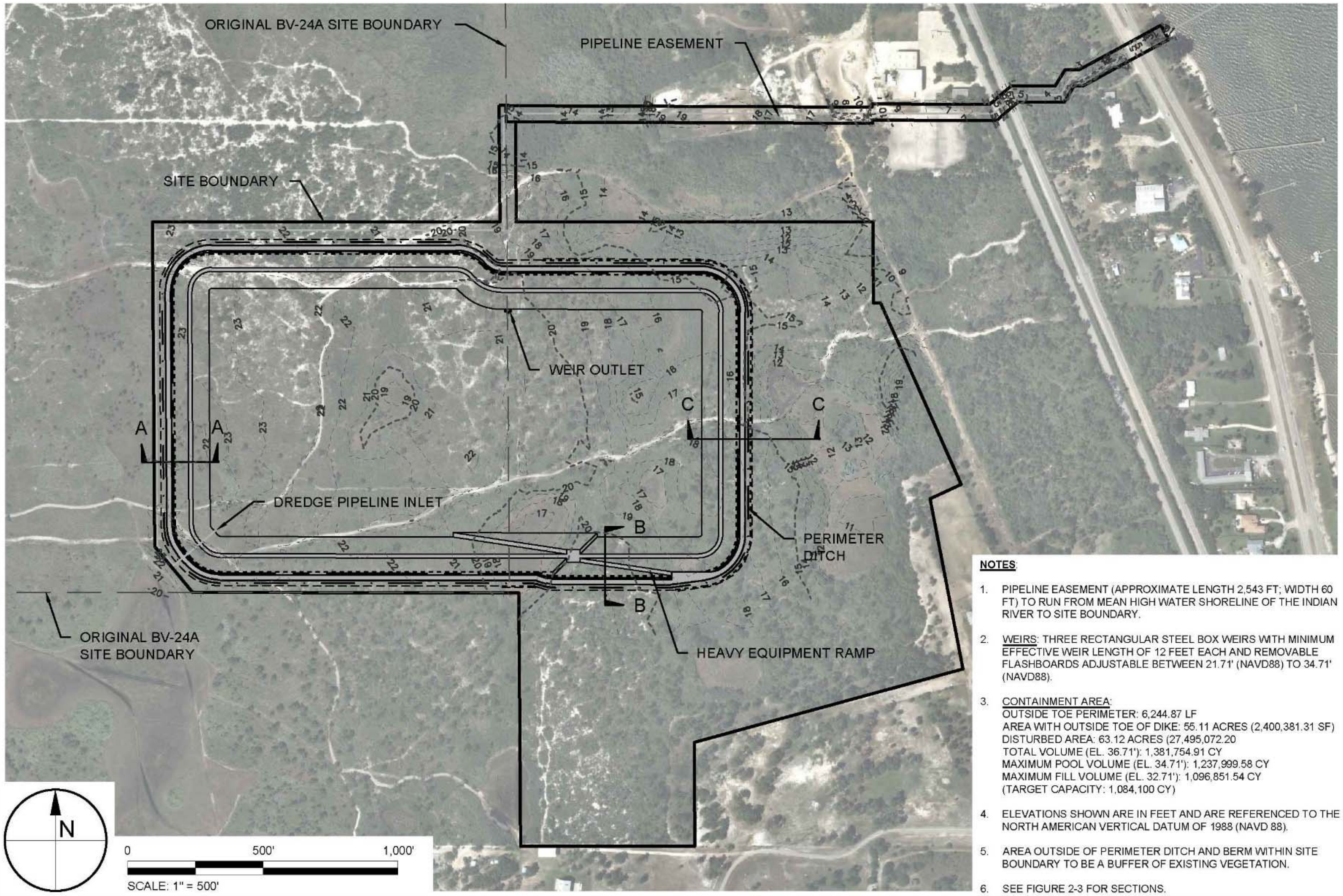
The management of the biological resources within the buffer area, including considerations related to the use of the area by scrub jays, is discussed in more detail in Section 4.5.

2.1.2 Site Capacity

The design capacity of BV-24A is 1,084,100 cy. To obtain this capacity within a containment area of 55.11 acres, construction of a containment dike to a crest elevation of approximately 16.5 feet (+36.71 feet NAVD) above the existing mean site elevation of +20.21 feet NAVD (Figure 2-3) will be necessary. Material used to construct the dike will be obtained by excavating the basin interior to an elevation of +15.71 feet NAVD (approximately 4.5 feet below the existing site grade). Based on a conservative dike cross-sectional design, including side slopes of 1V:3H and a dike crest width of 15 feet, 254,149 cy of material will be required to construct the dike. An additional 11,465 cy will be required for ramps to provide equipment access to the interior of the containment basin. When the containment basin is filled to capacity, the surface of the deposition layer will be a minimum of 4.0 feet below the dike crest, comprising a minimum 2.0 feet of freeboard and 2.0 feet of ponding depth above the maximum deposition surface. The resulting capacity of the containment basin is 1,084,100 cy.

2.2 Site Preparation

Site preparation required for BV-24A will consist of two phases. The first phase will include the clearing and grubbing of vegetation in the area of the containment basin and the fence line and the installation of the fence. The access road will also most likely be constructed at this time. As soon as practical, this phase will be completed following site acquisition. The second phase of site preparation will consist of the construction of the containment basin and related earthmoving operations and the installation of the outlet structures and other design features. This phase of site preparation is subject to the scheduling and budget priorities of FIND and the U.S. Army Corps of Engineers (USACE) Jacksonville District, and therefore, may not immediately follow the completion of the first phase. However, the site will be secured by a fence and security procedures will be in place regardless of whether excavation, grading, or dike construction commences. In the remainder of this section, each element of site preparation is discussed in more detail.



NOTES:

1. PIPELINE EASEMENT (APPROXIMATE LENGTH 2,543 FT; WIDTH 60 FT) TO RUN FROM MEAN HIGH WATER SHORELINE OF THE INDIAN RIVER TO SITE BOUNDARY.
2. WEIRS: THREE RECTANGULAR STEEL BOX WEIRS WITH MINIMUM EFFECTIVE WEIR LENGTH OF 12 FEET EACH AND REMOVABLE FLASHBOARDS ADJUSTABLE BETWEEN 21.71' (NAVD88) TO 34.71' (NAVD88).
3. CONTAINMENT AREA:
   OUTSIDE TOE PERIMETER: 6,244.87 LF
   AREA WITH OUTSIDE TOE OF DIKE: 55.11 ACRES (2,400,381.31 SF)
   DISTURBED AREA: 63.12 ACRES (27,495,072.20
   TOTAL VOLUME (EL. 36.71'): 1,381,754.91 CY
   MAXIMUM POOL VOLUME (EL. 34.71'): 1,237,999.58 CY
   MAXIMUM FILL VOLUME (EL. 32.71'): 1,096,851.54 CY
   (TARGET CAPACITY: 1,084,100 CY)
4. ELEVATIONS SHOWN ARE IN FEET AND ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
5. AREA OUTSIDE OF PERIMETER DITCH AND BERM WITHIN SITE BOUNDARY TO BE A BUFFER OF EXISTING VEGETATION.
6. SEE FIGURE 2-3 FOR SECTIONS.

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FIGURE 2-1
SITE PLAN
FIND BV-24A DREDGED MATERIAL MANAGEMENT PLAN
BREVARD COUNTY, FLORIDA

PROJECT	C2015-014
DRAWN BY	RLJ
DATE	SEPT 2015

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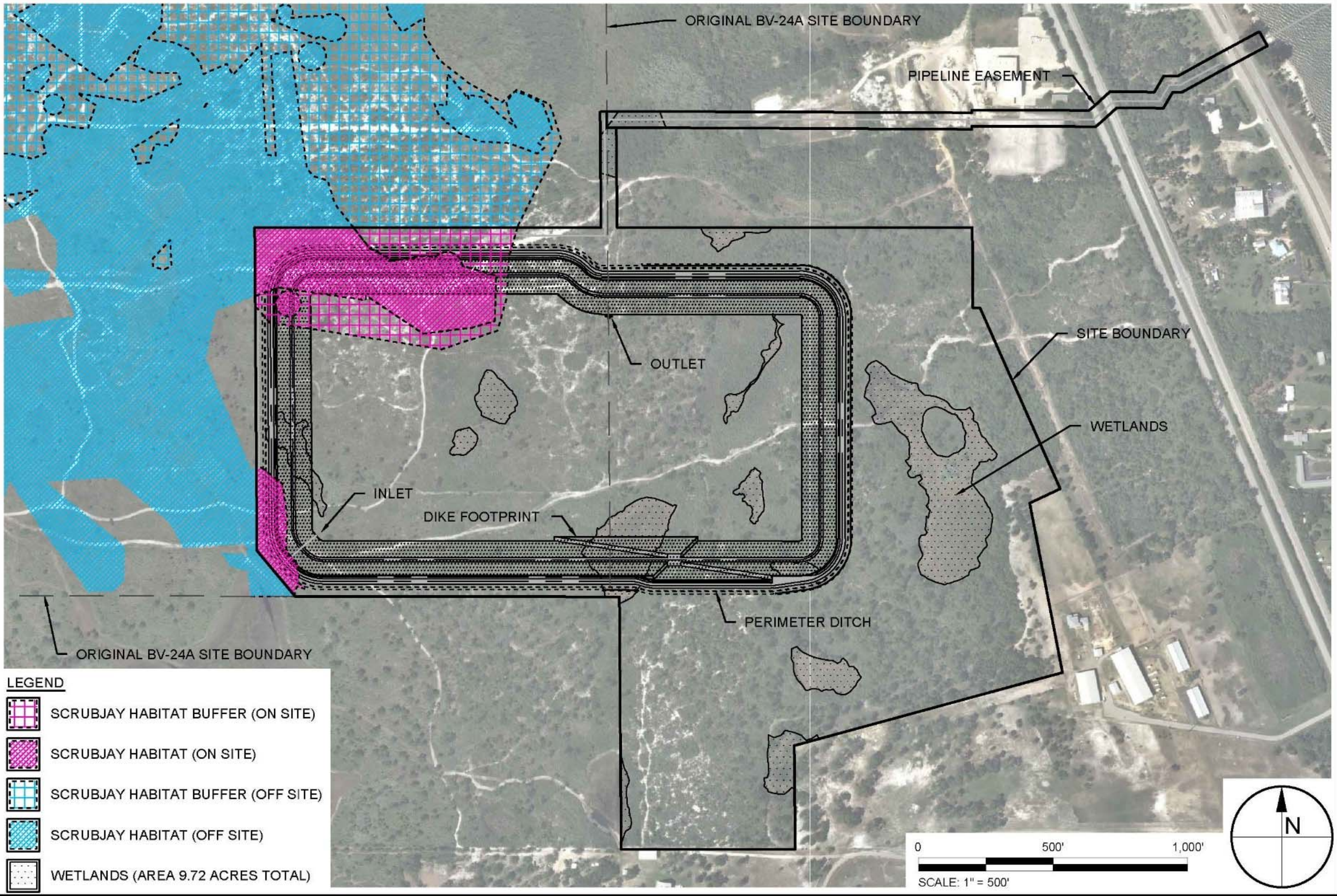

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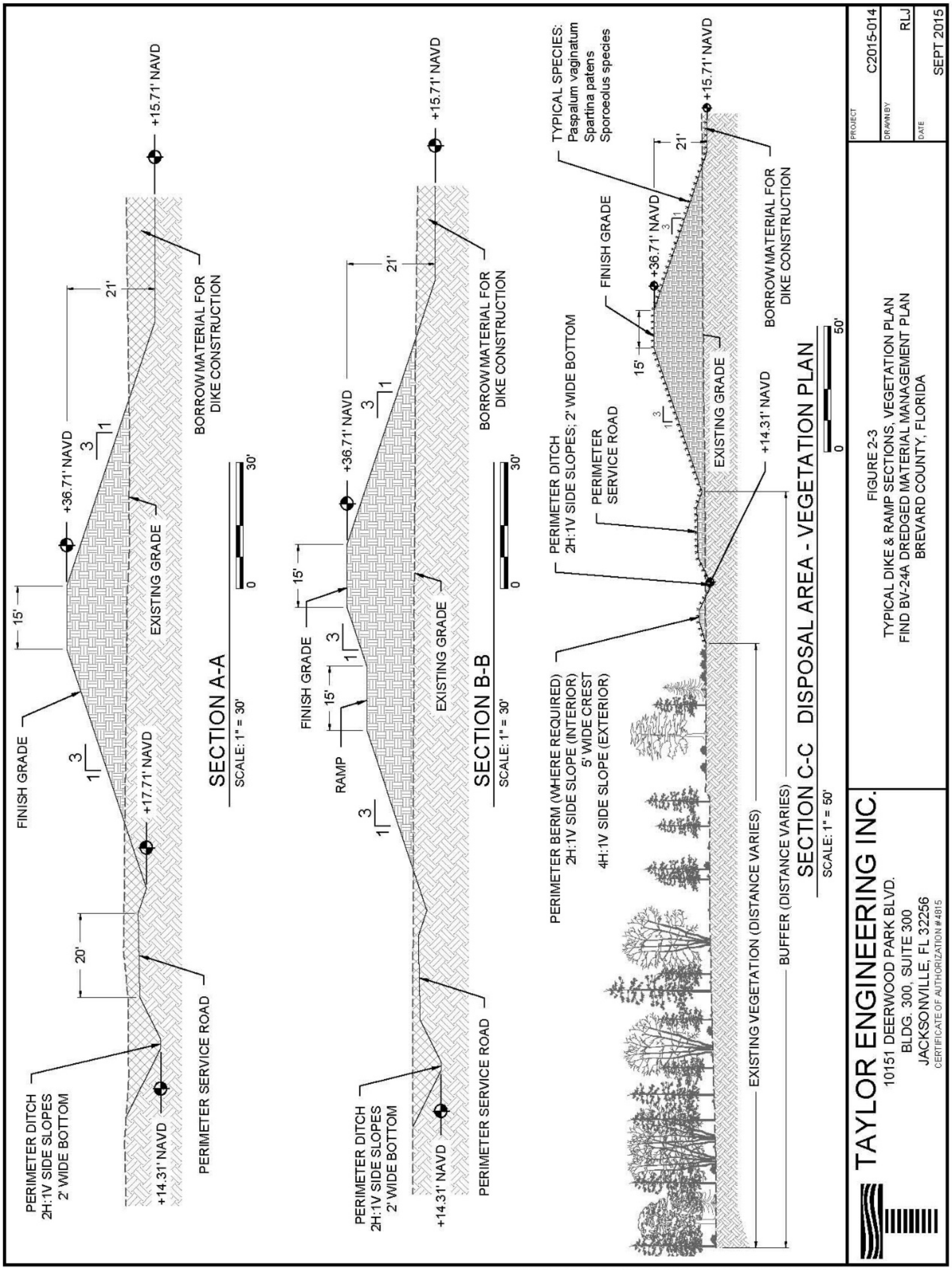
FIGURE 2-2
NATURAL RESOURCES
FIND BV-24A DREDGED MATERIAL MANAGEMENT PLAN
BREVARD COUNTY, FLORIDA

PROJECT C2015-014
DRAWN BY RLJ
DATE SEPT 2015



SECTION A-A
SCALE: 1" = 30'
PERIMETER DITCH
2H:1V SIDE SLOPES
2' WIDE BOTTOM
+14.31' NAVD
PERIMETER SERVICE ROAD
20'
+17.71' NAVD
FINISH GRADE
3
1
15'
+36.71' NAVD
EXISTING GRADE
21'
BORROW MATERIAL FOR
DIKE CONSTRUCTION
+15.71' NAVD
0
30'
SECTION B-B
SCALE: 1" = 30'
RAMP
FINISH GRADE
SECTION C-C DISPOSAL AREA - VEGETATION PLAN
SCALE: 1" = 50'
EXISTING VEGETATION (DISTANCE VARIES)
BUFFER (DISTANCE VARIES)
PERIMETER BERM (WHERE REQUIRED)
2H:1V SIDE SLOPE (INTERIOR)
5' WIDE CREST
4H:1V SIDE SLOPE (EXTERIOR)
PERIMETER DITCH
2H:1V SIDE SLOPES; 2' WIDE BOTTOM
PERIMETER
SERVICE ROAD
TYPICAL SPECIES:
Paspalum vaginatum
Spartina patens
Sporoeolus species
50'
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FIGURE 2-3
TYPICAL DIKE & RAMP SECTIONS, VEGETATION PLAN
FIND BV-24A DREDGED MATERIAL MANAGEMENT PLAN
BREVARD COUNTY, FLORIDA
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2.2.1 *Clearing and Grubbing*

The first phase of site preparation begins with the required clearing and grubbing of vegetation. Historically, containment area construction has often been accomplished without any interior site preparation. Moreover, clearing and grubbing vegetation and uniformly excavating and grading the site interior adds significantly to the initial construction cost of the containment area and should not be undertaken without the expectation of significant benefits. However, such measures are warranted in the present situation. Haliburton (1978) and Gallagher (1978) have established that a limited growth of herbaceous vegetation or native grasses can improve sedimentation by filtration. However, the woody vegetation (i.e. trees and shrubs) which characterizes much of the site, can constrict or channelize the flow through the containment basin, resulting in short-circuiting, reduced retention times, resuspension of sediment through increased flow velocities, and the deterioration of effluent quality. Additionally, a failure to clear existing vegetation will make the periodic removal of the dewatered dredged material much more difficult. Therefore, the containment area should be cleared and grubbed prior to construction.

2.2.2 *Excavation and Grading*

The second phase of site preparation includes all earthmoving operations required to construct the containment dike, basin, and perimeter ditch to the design geometry. Preliminary site design (Figures 2-1, 2-3) specifies that most of the material for the initial dike construction (total fill of 254,149 cy) will be obtained from the excavation of the interior of the containment area. Some of the fill (17,126 cy) will be produced from the excavation of the perimeter ditch (se Section 2.3.6). Preliminary review of existing data characterizing soil conditions on-site (Huckle et al., 1974) indicates that material obtained from either source is equally suitable for dike construction. To provide the required volume of material from the interior of the basin, excavating 4.5 feet below the existing grade to an average elevation of +15.71 feet NAVD will be necessary. Additional geotechnical data by which to define soil properties, foundation conditions, etc., will be obtained prior to the final design of the facility. The depth of the water table below the undisturbed soil surface will also be determined at that time. However, the use of a sump and/or pumping of groundwater seepage during construction is likely. The interior of the containment area must also be graded following the completion of excavation. Construction efficiency may dictate that the dike material be initially taken from a perimeter trench inside the containment dike. However, this trench must be eliminated and the site interior re-graded prior to the initiation of dredging operations to avoid flow channelization and unacceptable effluent water quality. Irregular basin topography will produce non-uniform flow patterns and deposition geometry which, in turn, will result in the ponding of surface water. Ponding will inhibit drying of the deposition layer and make initial attempts at surface trenching more difficult. For these reasons, a uniform grade must be provided from inlet to weir as part of the initial construction of the facility, with an adequate slope (about 0.2%). Differential settling of varying grain size fractions (i.e., rapid precipitation of the coarser fractions nearer the inlet with increasingly finer sediments deposited nearer the outlet) will quickly establish a deposition surface sloping downward from inlet to weir once dredging operations begin.

2.3 Additional Design Features

2.3.1 Inlet

The number and locations of the dredge slurry outfalls, or pipeline inlets, are the primary factors which govern the pattern of deposition within the containment basin. The disadvantage of a single, fixed inlet is a characteristic mounding of coarse material in the vicinity of the inlet, which if not mechanically re-distributed, will result in a reduced retention area. However, the anticipated infrequent requirement for maintenance dredging in this reach of the ICWW (one event every five to 10 years) cannot justify the cost of a fixed, multiple inlet manifold system for the BV-24A site. More appropriate is the use of a moveable single inlet with the flexibility to be repositioned between successive dredging operations or within a single dredging event. The single inlet should also be fitted with a device, such as a flow-splitter or a spoon, which breaks the momentum of the jet. This will aid in the distribution of the slurry. However, the ability to more evenly distribute the coarser fraction of dredged material within the containment area by repositioning the inlet pipe and breaking the discharge jet may not preclude the necessity of regrading the dewatered sediment prior to each succeeding dredging operation. Moreover, the efficient use of the containment area and maximum solids retention performance will also require that the initial uniform slope (about 0.2%) from inlet to weir be re-established between each dredging operation. Preliminary analysis of the dredged material settling behavior within BV-24A (see Section 2.3.3) indicates that the maximum available distance between inlet and weir is adequate to meet solids retention requirements. Nevertheless, movement of the inlet to achieve a more even distribution of sediment should not be allowed to result in a significant reduction in the separation distance between inlet and outlet without the implementation of additional precautions to ensure that water quality standards are met. These may include increasing the ponding depth or the use of floating baffles or turbidity screens surrounding the weirs.

2.3.2 Weirs

The outlet control structures within the containment basin consist of a system of weirs whose primary function is to control the release of the ponded water by maintaining the required ponding depth and thereby maintaining the retention time within the containment basin. However, several additional aspects of weir design control the flow of water inside the basin and thereby strongly influence the efficiency of solids retention and the quality of effluent released from the site. These include the type of weir employed, the length of the weir crest, and the location of the weirs within the containment area. Each of these design aspects and its effect on the efficiency by which the dredged material is retained in the basin is discussed in the following paragraphs.

The type of weir structure to be employed at BV-24A represents a compromise between considerations of performance, adjustability, maintenance, and economy. A sharp-crested, rectangular weir is specified to minimize the depth of withdrawal of the clarified water or supernatant. The term “sharp-crested” describes a weir in which the thickness of the weir crest (T) is less than the depth of flow over the weir (h); typically h/T > 1.5. A rectangular weir is straight and passes flow over its crest normal to the primary axis of the weir crest. The depth of withdrawal is the depth at which the gravity forces on a suspended sediment particle exceed the inertial forces associated with flow over the weir. It therefore represents the depth of the surface layer of ponded water which is drawn over the weir and released from the containment basin. Maintaining the depth of the withdrawal layer to less than the ponding depth reduces the possibility of resuspending sediment which has settled out of the water column. Moreover, since the concentration of suspended sediment increases with depth, minimizing the depth of the withdrawal layer maximizes the retention of suspended solids. Specific performance characteristics of the weir system to be employed at BV-24A are discussed later in this section. The height of the weir crest is adjustable by means of removable flashboards. The range of adjustment is from the grade at the weirs shelf (+21.71 ft NAVD) to a maximum elevation of +34.71 ft NAVD. The minimum elevation of the weirs allows for the removal of stormwater ponding above the average exterior grade prior to the initial use of the site, while the maximum elevation provides 2.0 feet of freeboard above the maximum deposition surface. The flashboards are to be 4 x 4 hollow composite boards, to provide rigidity against hydrostatic pressure and to minimize between-board seepage. This provides a minimum adjustment increment which is less than the projected depth of flow over the weir crest (5.6 inches) at the point the weir discharge approximately equals the liquid inflow to the containment area. This design provides the site operator with adequate adjustment resolution to maximize weir performance and effluent quality throughout the dredging operation and the subsequent release of the ponded water.

The minimum length of the weir crest for BV-24A is 36 feet. This specification is based on results obtained from the Selective Withdrawal Model developed by the USACE Waterways Experiment Station (WES) and represents the weir crest length required to maintain a depth of withdrawal less than the minimum ponding depth of 2.0 feet. It has been assumed that a 24-inch O.D. dredge (discharge velocity, 16 ft/sec; volumetric discharge, 6,430 cy/hr; 20/80 solids/liquid slurry mix) will be used for future dredging operations. However, the physical constraints of the channel will most likely dictate the use of a 16 to 18 inch O.D. dredge. Therefore, the assumption of a 24-inch dredge ensures a conservative containment facility design. The 36-foot minimum weir crest length will be provided by three rectangular structural steel box weirs, each providing a minimum of 12 feet of effective weir length. The three pipes will be connected by a common manifold so that the effluent will exit the containment area via a single pipe under the dike.

The final weir design parameter considered is the location of the weirs within the containment area so that their distance from the dredge pipe inlet is maximized and the return distance to the receiving waters is minimized (Figure 2-1). The latter requirement is to promote the most efficient transport of the effluent from the containment area using gravity flow. However, because of the length of pipeline required to return the clarified water to the Indian River (2,543 feet, see Section 3.1), it may be necessary to provide auxiliary pumping. Positioning the weirs as shown in Figure 2-1 provides approximately 1,362 feet of separation between the inlet and the weirs. Analysis of weir performance based on nomograms developed at the USACE WES under the Dredged Material Research Program (Walski and Schroeder, 1978) indicates that these design parameters may be expected to produce an effluent suspended sediment concentration of 0.63 g/L, assuming an average ponding depth of 2.0 feet. Translation of suspended solids concentration to a measure of turbidity on which Florida water quality standards are based is highly dependent on the suspended material characteristics. However, USACE WES guidelines (Palermo et al., 1978) indicate that this effluent quality should be adequate.

2.3.3 Ponding Depth, Sediment Characteristics, and Basin Performance

Ponding depth refers to the height of the water column (with its suspended sediment load) maintained above the depositional surface during dredging operations. It is regulated by the height of the weir crest and, to a lesser extent, by the dredge plant output. More of an operational criterion than a design feature, ponding depth nevertheless impacts the design of the containment area, the dikes, and the weirs.

Maintaining as great a ponding depth during dredging operations as possible is advantageous. Increased ponding depths produce increased retention times and decreased flow velocities through the containment basin and are therefore directly related to improved solids retention and effluent quality. The limiting consideration for increased ponding depth is the unbalanced head, or hydrostatic pressure, which the dikes can withstand without compromising their structural integrity.

An analysis of containment area efficiency was performed to determine the required minimum ponding depth and basin retention time needed for adequate solids retention performance and acceptable effluent quality. The required retention time is, in turn, dependent on the physical characteristics of the sediment to be dredged. Since the fine-grained component of the sediment requires the longest period of time to settle out of the water column, the fine fraction of the material to be dredged determines the required basin retention time and, in turn, the required ponding depth.

The characteristics of the sediment to be dredged within Reach VI were derived from the findings of a county-wide study of Indian River sediments conducted by Trefry et al. (1990). This study identified segments of the ICWW channel within Reach VI which have sediment deposits containing significant components of fine-grained materials overlaying the native bottom material of coarser sand and shell. These deposits range in thickness from less than 1 cm to more than 70 cm. In a previous study, Trefry and Stauble (1987) determined the deposited sediments contained on average 66.5% "fines," that is, sediments less than 0.074 mm grain size diameter. These fines are primarily composed of aluminosilicates derived from the erosion of upland soils with an additional small fraction of organic material. In contrast, the coarser native bottom material was determined to contain only 11.5% fines, again consisting primarily of aluminosilicates with an additional small fraction of organics.

These data were then analyzed with respect to the relatively contemporaneous 1987 ICWW channel survey data to estimate composition of the Reach IV shoal sediments. From this analysis it was determined that 32.9% of the in-place volume of shoal sediments within Reach VI is made up of fine material as previously defined. Organics, which represent a small component of the fines, make up only 5.0% of the total shoal volume.

However, the Trefry report also indicates that some areas of the ICWW channel within Reach VI contain deposits of fine-grained sediments in excess of 30 cm thick. Dredging these areas could result in short periods during which the sediments entering the containment basin contain up to 60% fines. Therefore, to ensure that the containment basin is able to meet or exceed all effluent discharge and water quality criteria, its design is based on the "worst-case" assumption that the dredged material contains 60% fines. This does not imply that all or even a majority of the material to be stored in BV-24A contains such a high fraction of fines. As discussed, available data indicate that fines represent less than one-third of the Reach VI shoal material.

Based on design criteria, an associated zone settling velocity was then determined from Taylor and McFetridge's (1989) empirical relationship between the percentage of fines and settling behavior: $y = 3.14 * x^{-0.57}$, where y = zone settling velocity and x = fines percentage (i.e., material passing through a No. 200 sieve). The resulting zone settling velocity for the sediment to be placed in BV-24A, based on the assumed 60% fines content, was determined to be 0.30 cm/min. This settling velocity was then used to determine the retention time needed to provide adequate sedimentation within the containment basin.

The preliminary design of the containment area and dike provides for a minimum 2.0 feet ponding depth. That is, at capacity, the containment dike will retain 2.0 feet of ponding plus 2.0 feet of freeboard above the maximum deposition surface. Analysis of the hydraulic characteristics of the proposed containment area indicates that a 2.0-foot ponding depth will provide a minimum retention time of 24.7 hours during the time the flow over the weir balances the liquid discharge of the dredge. In comparison, the time required for the suspended sediment to settle out of the withdrawal depth of 2.0 feet is 3.4 hours, based on the zone settling velocity derived above. However, research by USACE WES (Shields et al., 1987) indicates that the predicted settling time of the dredged material should be multiplied by a correction factor of 2.25 to account for field conditions. This yields an adjusted required settling time of 7.65 hours. Thus, the BV-24A containment basin provides a retention time which exceeds the adjusted settling time required to maintain adequate sedimentation and effluent quality by a factor of 3.23.

Nevertheless, ponding depths should be maintained above the 2.0 foot minimum whenever possible. Indeed, field conditions may require that the ponding depth be increased above the minimum if effluent turbidity standards cannot be met. The recommended operational ponding depth for BV-24A is 4.0 feet, with a maximum ponding depth limited to 5.0 feet. The use of a 4.0-foot operational ponding depth results in a basin retention time of 49.9 hours, thereby providing an additional margin of safety and a basin retention time adequate to maintain the required effluent quality. Care must be taken not to increase ponding depth above the minimum too quickly. This may lead to dike saturation, piping, slumping, and other conditions of dike instability. Operational experience has demonstrated that if ponding depth is increased at a sufficiently slow rate, the permeability of the dike is reduced as fine sediments are filtered and trapped by percolation, thereby limiting dike saturation and instability. Restricting initial ponding depth to 4.0 feet should minimize the occurrence of unstable dike conditions, while providing a sufficient safety factor to ensure efficient solids removal.

In addition to the recommendation of a ponding depth which exceeds that required for adequate basin performance, several additional considerations emphasize that the design of the containment basin for BV-24A is conservative. USACE WES research indicates that under field conditions, the depth of withdrawal may be significantly less than that predicted by the Selective Withdrawal Model. Therefore, the use of the Selective Withdrawal Model provides a conservative containment area design. Also, a withdrawal depth of 2.0 feet is not expected to result in the resuspension of sediment because of the negative slope of the deposition layer from inlet to weir, which produces ponding depths at the weir greater than the minimum 2.0 feet average over the entire containment area. Moreover, providing the recommended operational ponding depth of 4.0 feet should further eliminate the possibility of resuspension, as well as doubling the retention time provided by a 2.0-foot ponding depth. Such measures should ensure that the turbidity of the effluent released from BV-24A complies with state water quality standards.

Additionally, the design dredge discharge of 6,430 cy/hr is based on a minimum pumping distance from the dredge plant to the site. Increasing the distance over which the dredged material must be pumped results in increased line losses in the dredge pipe, thereby reducing output. This, in turn, produces an increase in the containment basin retention time. The maximum pumping distance for BV-24A to serve all of Reach VI is 8.4 miles. Thus, actual dredging operations may lead to significant increases in basin retention time and a further decrease in the turbidity of the effluent released from the site. However, because the design of BV-24A is based on the maximum dredge plant output and is therefore conservative, the site does not require reduced dredge output for compliance with state water quality standards.

2.3.4 Interior Earthworks

Secondary compartmentalization of the BV-24A containment area is neither required nor is it desirable. Analysis of historical dredging records indicates that the projected frequency of dredging (at intervals of five to 10 years) does not warrant the use of parallel containment areas. Neither is the use of spur dikes to improve retention times appropriate for the site. This results from several considerations. First, the increased retention times which may result from the use of spur dikes do not offset the loss of capacity within the containment area. Second, although they are intended to improve the efficiency of fine particle retention, spur dikes are often counter-productive because they constrict the flow, leading to increased velocities and the possibility of sediment resuspension. For this site, the increased irregularity of the containment area geometry would result in more dead zones, a reduced effective retention area, and less uniform deposition. Finally, a preliminary analysis of the efficiency of the BV-24A containment area indicates that retention times are adequate to allow precipitation of the finest category of sediment likely to be encountered are achievable without recourse to spur dikes.

2.3.5 Ramps

An important concept of the Long-Range Dredged Material Management Program for Florida's ICWW requires that each dredged material management area be managed as a permanent operating facility. Therefore, ramps to provide heavy equipment access to the containment basin interior have been integrated into the design of the containment dike (Figures 2-1 and 2-3). This was done to provide the capability of efficiently removing the dewatered dredged material as prevailing restrictions and market conditions dictate. Thus, the site is designed to function more as a material processing and rehandling station than as a permanent storage facility. Although the BV-24A containment basin is designed for the projected 50-year disposal requirement for the channel reach it is to serve, the capacity can be effectively expanded by removing suitable material off-site for use in construction or agriculture. In this manner, the useful service life of the site may be extended indefinitely.

Ramps obliquely traverse the containment dike, maintaining the same 1V:3H side slope as the dike. Recommended ascending/descending grade is 5%, with a road surface width of 15 feet. The ramps are positioned along the south side of the containment dike as shown in Figure 2-1. In addition to providing for material removal, the ramps also allow easy entry for equipment to be used in the dewatering process. This process is discussed in Section 4.1.

2.3.6 Perimeter Ditches

A system of ditches will be constructed around the outer perimeter of the dike to: 1) intercept the lateral flow of saline water from the basin, and 2) control stormwater runoff from the exterior of the dike. The perimeter ditches are to be constructed at a 20-foot setback from the outside toe of the containment dike. To effectively intercept lateral saltwater migration during the initial dredging operation, the ditch invert must be at or below the adjacent excavated interior grade of the containment basin. Because both the existing site topography and the excavated interior grade of the containment basin slope downward from west to east, a ditch of an average depth of approximately 6 feet below the average existing grade will provide the required depth and slope. The ditches are to have a 1V:2H sideslope and a bottom width of 2.0 feet. Preliminary analysis indicates that a minimum depth of 1.5 feet will provide adequate conveyance for the 25-yr storm runoff from the contributing drainage area, which consists of the exterior face of the containment dike, the perimeter road, and limited portions of the buffer area adjacent to the ditches. Control and conveyance of stormwater runoff from within the containment basin is discussed in Section 4.2.1.

2.3.7 Dike Erosion and Vegetation

The stability of the containment dike must also be ensured against erosion from rainfall runoff and wind. This will be accomplished by vegetating the dike slopes and crest immediately following dike construction (Figure 2-3). Native grasses will be used (including, but not limited to, *Paspalum vaginatum*) which quickly form soil binding mats while not rooting so deeply so as to structurally weaken the dike. An acceptable turf cover may be provided by approved techniques of sprigging, sodding, or seeding (broadcast or hydroseeding), or a combination of these methods, as determined by the contractor. Contract responsibilities shall include the maintenance of the vegetation until adequately established, as certified by USACE. An additional benefit of vegetating the dike in this manner is the site's aesthetic character.

2.3.8 Site Security

Security for the project area will be provided appropriate to the commitment of public funds. As stated previously (see Section 2.2), during the initial phase of construction, permanent security fencing will be erected around the site perimeter. Access to the site interior will be controlled by locked gates. Keys to these gates will be held by FIND and distributed on an as-needed basis to USACE, dredging contractors, and other authorized parties. In addition, on-site operators should be present at all times during active dredging operations and decanting procedures following a dredging event, as well as at any time when significant ponded water remains within the containment area. This is to ensure the proper operation, adjustment, and maintenance of the weirs, and to prevent the premature release of effluent through unauthorized weir operation. Active on-site operations are discussed in more detail in Section 3.0.

3.0 OPERATIONAL CONSIDERATIONS DURING DREDGING

The primary objectives of site management during dredging operations are to: (1) maintain acceptable effluent quality during the decanting process, (2) maximize the dewatering rate of the deposited material by controlling the pattern of deposition, and (3) minimize the impact of site operations on adjacent areas. To this end, four elements of site management are discussed. The first addresses the placement and handling of pipelines to and from the containment basin. The second examines the operation and monitoring of the dredged slurry inlets to the containment basin. Site operational guidelines and procedures included herein are intended to promote the efficient use of the containment basin and to help meet effluent water quality standards. The third site management consideration addressed, and the one most critical for determining the quality of effluent released from the disposal site, is weir operation. Last, a monitoring program is presented to ensure that the operation of the containment area does not degrade the shallow aquifer groundwater in the immediate vicinity of the site.

3.1 Placement of Pipelines

Each dredging operation over the design life of the BV-24A site will require the placement and retrieval of both supply and return pipelines. The route to be used for this purpose is shown in Figure 3-1. The pipelines will lie within a 60-foot wide easement, approximately 2,540 feet in length, which extends from the MHW shoreline of the Indian River to the central part of the north site boundary. The pipeline route was selected to allow the use of an existing box culvert to pass the pipelines under U.S. Highway 1 and follows an existing drainage feature and property boundaries westward from U.S. 1 to the FEC Railroad right-of-way. The pipelines will cross under the railroad right-of-way and the adjacent right-of-way of Old Dixie Highway by passing through culverts placed specifically for that purpose. The pipeline route then continues westward about 1,750 feet, paralleling an existing powerline easement and property boundaries, and then turning south to intersect the site boundary about midway along the north site boundary. Between the railroad and the site boundary, the pipeline route crosses highly disturbed uplands as well as patches of palmetto prairie and wetland scrub.

Within the site boundary, the dredge discharge pipeline route extends a short distance southwest, crosses the perimeter ditch, and then continues west and, finally, south along the outside toe of the dike to the inlet location at the southwest corner of the containment basin. The pipeline enters the containment basin by passing over the southwest corner of the dike crest. The return pipeline connects to the weir-manifold system near the central north part of the containment basin and then runs north to the point at

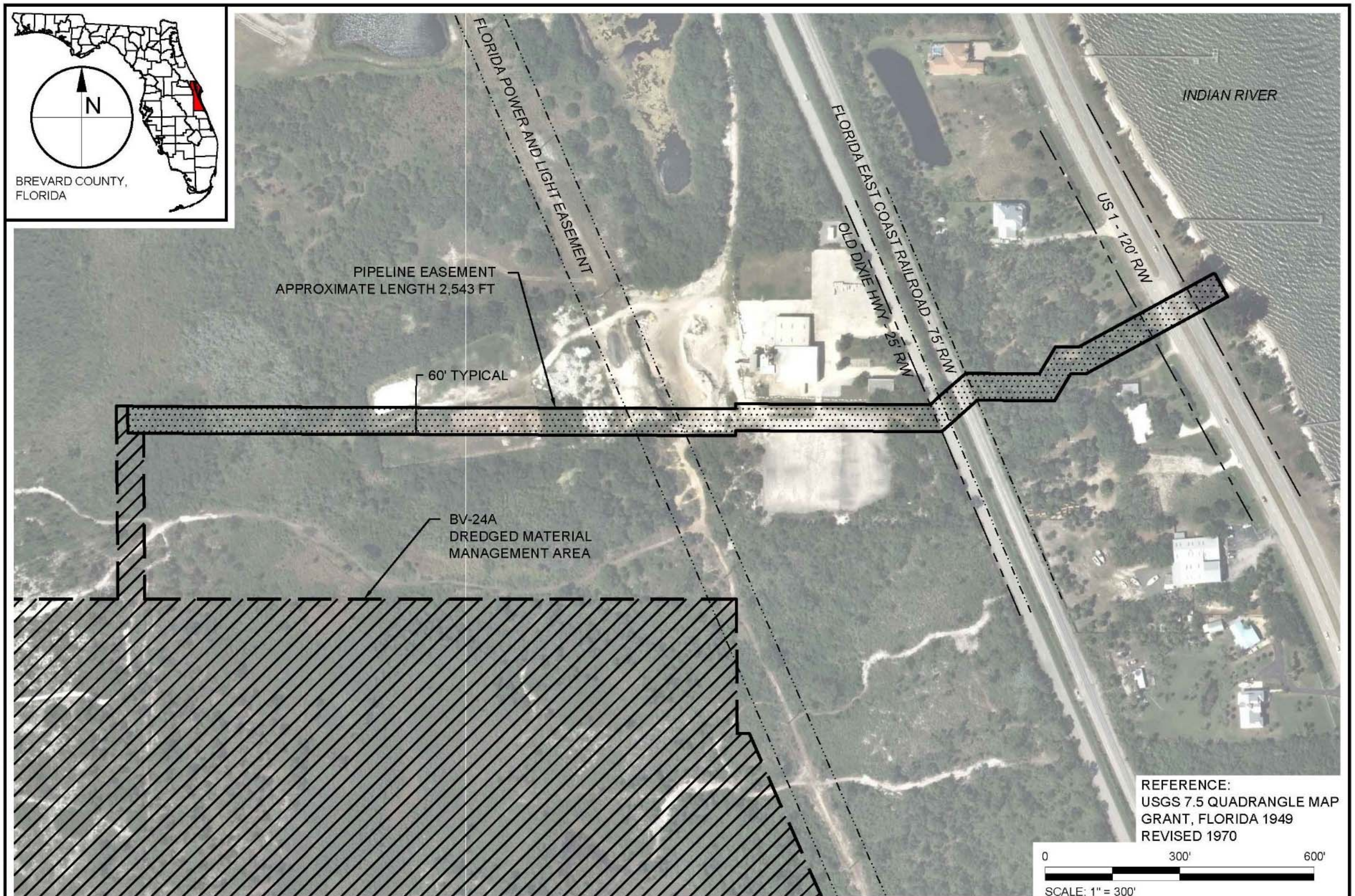

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FIGURE 3-1
PIPELINE EASEMENT
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which the pipeline easement intersects the site boundary. The pipeline then continues to the MHW shoreline of the Indian River within the easement by the same route described above. Within both the easement and the site, the pipelines will be placed so as to minimize their impact on wetlands and existing vegetation.

The pipelines will be placed immediately before dredging begins and will remain in place until dredging and dewatering operations are complete. The time required to complete the dredging phase of operations will depend on the quantity and distribution of the material to be dredged. The average bulked volume of material produced in a single maintenance dredging operation, based on a 10-year maintenance interval (approximately 210,000 cy), corresponds to an in-situ (unbulked) volume of approximately 105,000 cy (Taylor et al., 1989). Based on project planning guidelines used by USACE, an 18-inch dredge will most likely be used. However, this report conservatively assumes a maximum 24-inch dredge, with a discharge velocity of 16 ft/sec, a volumetric discharge rate of 3560 cy/hr, and a 20/80 solids/liquid slurry mix. Applying these values to the in-situ material volume of 105,000 cy yields an effective dredging period of approximately 37 hours of continuous operation. However, because of typical delays associated with dredging projects and to account for the likelihood of a smaller dredge conducting the work, a job duration of four to five weeks is a more realistic estimate.

Immediately upon completion, the dredge discharge pipeline will be removed. An additional four to five weeks will then be required to decant all ponded water over the weirs. This would also include the removal of any water released by initial trenching procedures, if required. At this point, the return water pipeline would also be removed. Ponded rainwater expected to collect in the containment area will subsequently be removed via the weir system so that any suspended sediment will be retained. However, unlike the clarified effluent removed during dredging operations, the rainwater will be routed to an appropriate discharge point via a pipe/ditch system. The removal of run-off is discussed further in Section 4.2.1.

3.2 Inlet Operation

The operation of the inlet pipe will be primarily determined by the physical characteristics of the sediment to be dredged. As discussed in Section 2.3.3, available data indicates that the shoal sediments to be dredged in Reach VI are predominantly a mix of fine to medium quartz sand and shell, with a smaller component (32.9%) of fine-grained material. However, more specific data characterizing the material will be obtained prior to future dredging operations. These data will include, at a minimum, core boring logs and a qualitative categorization of each strata of sediment; laboratory data, including sediment size distribution curves and/or Atterberg limits; and suspended sediment-settling time curves for the sample composite from each core boring location.

Subject to this event-specific information which characterizes the quality of the sediment to be dredged, the following strategy of inlet operation within the containment area is recommended. As discussed, it is based on available data that indicates the dredged material is predominantly sand and shell with a smaller component of fine-grained material. This strategy makes no attempt to segregate material grain size fractions by manipulation of the inlet. Some segregation will occur naturally as a result of differential settling behavior, with the coarsest fraction settling out of suspension very rapidly, forming a mound in the area of the inlet. Successively finer fractions, characterized by lower settling velocities, will then be deposited closer to the outlet weirs. The deposition of the finest fraction nearest the weirs is not expected to require intensive dewatering procedures because of the thin lift approach employed. The position of the inlet will be moved during dredging operations to minimize the mounding of the coarser fraction of sediment and to distribute the deposited material more uniformly. This will entail a progressive northerly extension of the supply pipeline from the point where it enters the containment basin, resting each extension on the mound formed by the previous inlet position. A minimum distance of 100 feet must be maintained between the inlet and the inside toe of the dike to preclude erosion or undercutting of the interior dike slope. The resulting pattern of deposition will maintain a consistent slope from inlet to weir, minimize dead zones and channelization, and reduce the requirement for grading the deposited material to reestablish the desired 0.2% slope between successive dredging operations.

An additional, although secondary, advantage to extending the inlet pipeline in this manner comes as a result of the dredge plant being necessarily shut-down to allow each extension section to be added. These operational intermissions, together with temporary shutdowns to move the dredge, effectively increase the retention time of the containment area, thereby increasing its solids retention efficiency. However, a preliminary analysis of containment area performance indicates that adequate effluent quality can be attained without requiring intermittent dredge operation.

3.2.1 Monitoring related to Inlet Operation

During active dredging operations, several monitoring procedures related to inlet operations will be required. Ponding depth, as mentioned, is a critical parameter for best containment area performance. Maintaining as great a ponding depth as possible, thereby increasing retention time, increases solids retention and effluent quality. However, unbalanced hydrostatic forces resulting from too great a ponding depth under saturated foundation conditions can lead to slope instability, slumping, and potential for dike failure. Obviously, the latter situation must be avoided at all costs. Therefore, ponding depth should be increased above the 2.0-foot minimum only under close monitoring by visual inspection of dike integrity. Indications of impending instability include evidence of seepage related to piping and foundation saturation at the outer dike toe and small-scale slumping. If no effluent is released at the weirs, the maximum design dredge output (i.e., 6430 cy/hr slurry at a 20/80 solids/liquid mix, or 5144 cy/hr liquid) will produce an average increase in water level of approximately 0.1 ft/hr at BV-24A. This rate is slow enough to allow close continual monitoring of the entire dike perimeter. Ponding depth should not be permitted to increase beyond a maximum of 5.0 feet. Dike stability should be monitored continuously when ponding depth is maintained above the 2.0-foot minimum.

Optimal containment area operating efficiency requires that flow through the basin approximate plug flow to the greatest degree possible, thereby minimizing the uneven distribution of flow velocities and sediment resuspension and maximizing retention time. Therefore, the pattern of sediment deposition should be monitored for indications of irregular distribution, channelization, and short-circuiting. If evidence of such anomalies is found, the inlet pipe should be repositioned until a more uniform depositional surface is formed.

Last, the dredge plant output should be periodically monitored at the slurry outfall within the containment area throughout dredging operations to confirm or refine dredge output specifications, including volumetric output and slurry solids content. These parameters, in combination with the duration of actual dredge operation, can be used as an independent measure of material volume to determine remaining site capacity. Additionally, the computed material storage volume can be used with pre- and post-dredging bathymetric surveys of the channel and topographic surveys within the containment area to refine the bulking factor used to translate in-situ dredging volume to required storage volume. Also, within the same monitoring program, the quality of the dredged sediment should be established by laboratory analysis of grain size distributions, settling velocities, specific gravity, and Atterberg limits.

3.3 Weir Operation

Once the containment area is constructed and dredging operations have begun, the most effective way to control effluent quality is by changing the ponding depth and rate of flow over the weir through adjustments in the weir crest elevation. Before dredging, the weir crest elevation should be set as high as possible to preclude the early release of effluent. The maximum initial elevation of the weir crest above the mean interior site grade should be equal to the maximum anticipated mean ponding depth of four feet, minus the operational static head (i.e., the height of the water surface above the weir crest) of 0.47 foot. As the deposited material grows, the weir crest elevation should be increased at approximately the same rate as the growth of the deposition layer. With the average depth of deposition per event projected to between 2.5 and 3.5 feet (depending on the maintenance interval), the weir crest elevation at the completion of each dredging event should increase by a commensurate amount .

Once dredging begins, the weir crest elevation should be maintained at its initial elevation until the ponded water surface approaches the weir crest. During this initial phase of operation when no effluent is released, the discharge of the dredge plant will increase the ponding depth at a rate of approximately 0.08 ft/hr and increase the ponded water surface elevation (ponding depth plus deposition layer) at a rate of approximately 0.10 ft/hr. This relatively slow rate of rise should allow for close continual monitoring of the entire dike perimeter for indications of slope instability, as discussed. Inspection is most critical during the initial phase of operations, and during subsequent periods when the ponded water surface is raised above its previous maximum elevation. Experience has shown that as the ponded water percolates into the interior dike slope, fine suspended sediment is filtered by the coarser dike material. This reduces the permeability of the dike and decreases the susceptibility of the dike to piping and saturation.

As ponding depth increases above the 2.0-foot minimum design depth (or approximately 4.0 feet at the weirs), release of the supernatant can begin. Note that the weirs are only flow control structures, and therefore, cannot improve effluent quality beyond that of the surface water immediately interior to the weir crests. Thus, the decision to release must be based on the results of turbidity testing or suspended sediment concentration analysis conducted on the surface waters inside the weirs. These tests must reflect conditions at the maximum depth of withdrawal. For BV-24A, this was determined from recommended USACE WES procedures to be 2.0 feet, based on a design weir loading of 1.1 cfs/ft. If adequate water quality is not achieved before the ponded water surface reaches the initial weir crest elevation, the dredge plant must be shut-down until the surface water turbidity reaches acceptable limits or until alternative measures such as the installation of turbidity screens or floating baffles are implemented. If the desired water quality is achieved at a ponding depth less than the initial weir crest elevation, the water surface should still be permitted to rise to the weir crest provided that dike integrity is not threatened.

Once flow over the weirs has begun and effluent of acceptable quality is being produced, as indicated by effluent sample analysis, the hydraulic head over the weir becomes the most readily used criterion for weir operation. For a design weir loading of 1.1 cfs/ft, the operational static head has been calculated to be 0.47 foot (5.6 inches), based on an empirical relationship developed for sharp-crested weirs. This represents the operating head of water upstream of the weir at a point where velocities are small (one to two percent of the weir loading rate).

Actual operating head over the weir can be measured on-site by two methods. First, the static head can be determined by using a staff gauge, located in the basin where velocities caused by the weir are small (at least 40 to 50 feet from the weir). The elevation of the water surface can be read directly from the gauge, with the difference between the gauge elevation and the elevation of the weir crest indicating the static head. Second, the static head can be determined indirectly by measuring the depth of flow over the weir. The ratio of depth of flow over the weir to static head has been shown to be 0.85 for sharp-crested weirs, yielding a design depth of flow for the BV-24A facility of 0.40 foot (4.8 inches). If the head over the weir, as measured by either method, falls below these design values as a result of unsteady dredge output or intermittent operation, effluent quality should increase. However, if the head exceeds these values, the ponding depth should be increased by adding a flash board or interrupting dredging to prevent a decrease in effluent quality, unless maximum ponding depth has been achieved.

At all times, each of the three weir sections must be maintained at the same elevation to prevent flow concentration and a decrease in effluent quality related to an increase in weir loading. Preventing floating debris from collecting in front of the weir sections is also important. This will result in an increase in the effective depth of withdrawal and a corresponding increase in effluent suspended solids concentration.

After dredging is completed, the ponded water must be slowly released, allowing the flow over the weir to drop essentially to zero before the next flash board is removed. Monitoring of effluent quality should continue during this process. If turbidity violates water quality standards, the effluent must be retained until analysis of the interior surface waters indicates the suspended solids concentration to be within acceptable limits. The decanting process should continue in this manner until all ponded water is released over the weirs. Trenching and other dewatering techniques are considered post-dredging site operating procedures. These procedures are discussed in Section 4.0.

3.4 Monitoring of Effluent

The monitoring of effluent released from BV-24A will be an integral part of the operation of the facility. The containment area has been designed to produce effluent which meets the water quality standards for Class II waters as set forth in Chapter 62-302, *Florida Administrative Code*. These rules require that site compliance be documented by results obtained from a comprehensive monitoring program. Therefore, the monitoring program should be in place at all times during active dredging operations. Effluent samples should be taken and analyzed as often as practical. The minimum recommended sampling frequency is two times per eight hour shift.

Although the turbidity of the effluent is but one of the parameters addressed in the state water quality standards, compliance with these standards has historically been based solely on turbidity for several reasons. First, turbidity is reliably measured in the field and is the only water quality parameter over which the containment area operator may exercise direct control. Second, turbidity is a strong indicator of general effluent quality since many contaminants, most notably metals, exhibit a strong affinity for fine particles. Thus, reducing turbidity should result in an overall improvement in effluent quality.

However, the disturbance of contaminated sediments may result in the release of other pollutants, predominantly nutrients and hydrocarbons, which do not necessarily associate with fine particles. Thus, if the in-situ sediments contain elevated levels of these contaminants, turbidity may be an inadequate indicator of effluent quality. Monitoring of effluent should therefore be based on the results of comprehensive elutriate and dry analysis of the sediment to be dredged before dredging begins. Testing required under the effluent monitoring program should then focus on those contaminants whose presence in the sediment has been established.

Because effluent turbidity is a primary water quality parameter for site operation, compliance with turbidity standards will control both the dredge plant output and the release of effluent. State turbidity standards are expressed in terms of nephelometric turbidity units (NTU), which measure the optical transparency of the effluent relative to the optical transparency of the receiving waters. By comparison, containment area design guidelines published by USACE WES relate containment area performance to the suspended solids concentration of the effluent. However, the translation of solids concentration - expressed as grams/liter, for example - to a measure of turbidity is highly dependent on the characteristics of the suspended material. For the operation of this site, as well as the design and operation of other similar sites, it would be advantageous to use the results of the effluent monitoring program, in combination with known sediment characteristics, to relate suspended solids concentration to the state performance criterion of turbidity or transparency. This should be a primary objective of the site monitoring program.

3.5 Groundwater Monitoring

The most appropriate approach to ensure that the operations of the BV-24A containment facility will keep saltwater from entering local groundwater must be based on results of detailed geotechnical investigations. This work will be performed as part of the final design phase prior to the initiation of construction. However, available qualitative information describing general soil and groundwater conditions indicate that the majority of BV-24A is poorly to moderately well drained. The predominant soils on-site are Immokalee sand (occupying 65 acres) and Pomello sand (40 acres) (NRCS, 2015). Immokalee sand is a poorly drained soil with the water table typically 6 to 18 inches below ground surface. Pomello sand is a moderately well drained soil with the water table typically 24 to 42 inches below the surface. Construction of the containment basin (see Section 2.1) will require the excavation of the basin interior to a depth of approximately 4.5 feet below the mean grade of the site. Therefore, the excavation will extend below the local water table in at least some locations during some periods of the year.

The BV-24A containment basin will temporarily impound saltwater pumped from the ICWW as part of the dredging operation. Because of general soil conditions, the possibility exists that saltwater may enter the local shallow aquifer if appropriate precautionary measures are not taken. The preliminary design and operational plan for the BV-24A containment basin considers two factors which limit this possibility. First, a system of perimeter ditches will be constructed surrounding the basin. As discussed in Section 2.3.6, these ditches will extend below the depth of excavation of the basin interior and will intercept lateral seepage from the containment basin, allowing it to drain back to the ICWW. Second, the BV-24A containment basin will impound brackish water pumped from the ICWW in connection with dredging operations for relatively short periods of time (about 8–10 weeks) no more than once every five to ten years. These design and operational features serve to minimize the amount of salt water that may enter groundwater from the containment basin. However, during final design, detailed geotechnical engineering and groundwater evaluation will dictate the need or lack for the design to incorporate additional saline control features.

More detailed information defining site soil conditions will be obtained from a comprehensive geotechnical survey prior to the final design of the containment facility. If the results of this survey indicate that additional precautions should be taken to prevent saltwater contaminating the local shallow aquifer, the selection of the most appropriate strategy will be addressed during the final design phase.

These precautions are expected to minimize the possibility of saltwater entering the local groundwater as a result of site operations. Nevertheless, a groundwater monitoring program should be initiated before construction begins. Such a program will require that shallow test wells be sunk within the planned on-site buffer region which separates the basin from adjacent properties. Baseline chloride concentrations should then be determined for preconstruction conditions and a regular monitoring program should be established to document any deviations from these conditions. Continuing significant demands placed by adjacent properties on local groundwater supplies could also result in the direct intrusion of saltwater from the Indian River. Therefore, it is important that an ongoing well monitoring program be maintained throughout the design life of the site to distinguish any changes in groundwater chloride concentrations which are attributable to site operations.

4.0 POST-DREDGING SITE MANAGEMENT

The post-dredging phase of site operations begins following the completion of dredging and the decanting of all ponded water over the weirs. It continues until the start of the next planned dredging event. During the post-dredging phase, the dredged material deposited within the containment area is actively managed to increase the rate at which its moisture content is reduced. In addition, the material is made suitable for handling and can be removed from the site should market conditions prove favorable. However, because the BV-24A site is intended to be a permanent facility, other management procedures between active dredging operations will also be required. These include a comprehensive monitoring and data collection effort to guide the efficient use and environmental compliance of the dredged material management area, handling of stormwater runoff, monitoring and maintenance of site habitat, taking measures to control mosquitoes, and providing permanent site security measures. These are discussed below.

4.1 Dewatering Operations

The techniques of dewatering to be used at BV-24A are highly dependent on the physical characteristics of the dredged material. The material to be placed in BV-24A is expected to be a mix of predominantly fine to medium quartz sand and shell and a component of finer grained sediments. As discussed in Section 2.3.3, available data indicate that 32.9% of the in-place volume of shoal sediments within Reach VI is made up of fine material, that is, material less than 0.074 mm in diameter. This fine-grained fraction material will be the most difficult to dewater through natural evaporative drying alone. In addition, the depth of the deposition layer may further retard evaporative drying because of limited surface area. Therefore, supplementary dewatering measures may be required to lower the moisture content of the finer grained fraction of the deposited material to allow its efficient removal. The most appropriate dewatering techniques for the projected quantities of fine-grained material and thickness of the deposition layer are surface water removal, progressive trenching to promote continued drainage and, if required, progressive reworking or removal of the dried surface layer. Each procedure and its specific application to the present situation is discussed below.

The decanting of all remaining surface water is necessary before significant evaporative drying of the fine-grained material can occur. Most of the ponded water is removed following the completion of dredging operations by simply continuing to lower the weir crest. However, it is likely that all ponded water can be drained off in this manner because of the topography of the surface of the deposition layer. As discussed, differential settling of the various size fractions of the sediment results in partial segregation of the dredged material within the containment basin. Coarser sand and gravel-sized particles are deposited nearer the inlet, while finer-grain sizes are deposited nearer the weirs. The thickness of the deposition layer, or lift, resulting from a single average dredging operation is projected to be 2.5 and 3.5 feet (depending on the maintenance interval). The fine-grained component of sediment is expected to concentrate near the weirs, which may result in the formation of a depression as it consolidates under its own weight. However, the sand-sized fraction, concentrated nearer to the inlet, should experience relatively little consolidation because of its lower initial water content. Therefore, to remove the ponded water which may remain in the area of fine material deposition, a trench connecting the depression to the weirs will have to be dug. Excavating a sump adjacent to the weirs to receive the remaining ponded water may also be necessary. During this phase of operations, the weir must be raised to prevent the premature release of the ponded water which, as a result of the excavation, will contain high suspended solids concentrations. Clarified water can then be released over the weirs as soon as effluent turbidity standards are met.

In addition, a system of drainage trenches will be needed to continue lowering the moisture content of the deposition layer. The area of predominantly sandy material is expected to be relatively free draining; therefore, trenching can be limited to the area of fine-grained material nearer the weirs. The deposition layer will require one or two trenching operations to adequately lower its water content throughout. Before crust forms on the surface of the drying material, an initial perimeter trench can be excavated by a dragline or clamshell operating from the crest of the containment dike. More intensive trenching should wait until a significant crust (greater than five to six inches) has developed on the deposition surface, allowing the formation of desiccation cracks and retarding additional evaporative drying. During this phase of trenching, conventional low ground pressure equipment can be used within the interior of the containment basin. A system of radial or parallel trenches should then be constructed throughout the area of fine sediment deposition. The depth of each trenching operation is dictated by the resistance to slumping of the semi-liquid layer beneath the crust; however, a reasonable depth would be from 1.0 to 1.5 feet. As the water table within the deposition layer is lowered by drainage and evaporation and the thickness of the crust increases, the trenches can be deepened. Alternatively, the dried surface material can be transferred to a more well-drained area within the containment basin. This would expose the wetter underlayers and restore a relatively high rate of evaporative drying.

The dewatering process will continue until the crust extends over the entire depth of the deposition layer. The time required to complete this phase of site operation will depend on the physical characteristics of the sediment, as well as climatic conditions (e.g., rainfall, relative humidity, season, etc.). During the entire dewatering phase of site operation, the weirs must be adjusted to control the release of residual water and impounded stormwater. The clarified effluent will then be routed by pipe or ditch from the terminus of the outlet manifold to the ICWW.

4.2 Grading the Deposition Material

Following the completion of dewatering, the deposition material must be graded to prepare for the next dredging operation. The grading should consist primarily of distributing the mounded coarser sediment (sand, shell, gravel, etc.) over the remainder of the containment area so as to reestablish the initial uniform 0.2% downward slope from inlet to weir. Additional benefits are gained by grading the mounded coarse material over the entire containment basin. Grading provides a free-draining substrate in the area of fine sediment deposition by separating successive depositions, thereby improving subsequent dewatering of this material. Distributing the mound of sand, shell, and gravel also reestablishes the effective plan area of the containment basin.

4.2.1 Control of Stormwater Runoff

Beyond simply preparing the site for the next dredging operation, grading the dewatered deposition layer will provide several additional benefits. One is the control and release of stormwater runoff. A shallow and uniform slope toward the weirs will ensure adequate drainage and eliminate the ponding of runoff in irregular depressions. It will also minimize flow velocities and the risk of channelization and erosion.

Following the completion of decanting and removal of all residual ponded water, the contractor must reinstall the weir boards to a sufficient height to control stormwater discharges over the weir crest. Operating procedures recommend the weir board elevations be set such that the site interior can retain stormwater quantities associated with the 25-year, 24-hour storm. At this location, this storm is predicted to produce approximately 8.4 inches of rain. In this case, the adjustable weir system comprises 4 x 4 composite lumber flashboards (oriented with the 6-inch dimension [actual dimension] perpendicular to the water surface) to provide an adjustment increment of 4 inches. As such, to retain the target storm, the final weir configuration should include three weir boards (12-inches of height) above the mean finished dredged material surface.

The site should retain no more than 12 inches of stormwater above the mean finished dredged material surface. After a storm event, this retained water should readily infiltrate and evaporate from the site. For severe storms that produce more than 12 inches of rain, excess water will flow over the weir to be discharge through the perimeter ditch. As necessary, a site operator may also be responsible for the gradual release of the ponded runoff at intervals determined by local weather conditions

As discussed in Section 3.1, the clarified run-off will be transported via a culvert/ditch system from the terminus of the outlet manifold to an appropriate point of release by the most direct on-site route. However, construction details (required slope, culvert size, etc.) will be deferred to the final design phase of site development.

4.3 Material Rehandling and Reuse

As discussed in Section 1.0, BV-24A is one of eight dredged material management areas being developed to serve the long-term maintenance requirements of the ICWW within Brevard County. Throughout this report as well as the accompanying permit documentation, it has been emphasized that although each site has been designed for a specific service life, each is intended to be operated as a permanent facility for the intermediate storage and rehandling of dredged material. However, to fulfill this intended use, at some point the dewatered material must be removed off-site. The ultimate use of this material is discussed below.

Based on a comprehensive analysis of dredging records, the bulked disposal volume projected over the 50-year design service life of the eight Brevard County facilities exceeds 7,000,000 cy of predominantly fine to medium quartz sand. Although relatively minor by the standards of some dredging operations, this volume still represents a significant quantity of potentially valuable construction material. Even if the possible return on the sale of this material were disregarded, the cost savings of permanent storage alone would justify a concentrated effort on the part of the state of Florida to determine through a formal market analysis the potential demand for dewatered dredged material.

If such an analysis determines that material resale and/or reuse is practical, it must then be demonstrated that the engineering properties of the dredged material will satisfy the requirements of commercial interests. It is anticipated that much of the material can be used "as is," having been partially segregated through differential settling. However, the feasibility of compartmentalized segregation of material during disposal or mechanical separation following dewatering should be explored if market conditions dictate. Portions of the material that may be unsuitable for fill or other construction purposes because of a high percentage of fines or organics might be used as capping material for landfills or as agricultural material.

If market analysis determines that resale or reuse is not feasible, locating and developing a centralized permanent storage facility will be necessary. The appropriate location for such a facility would appear to be inland, where lower real estate values and development potential makes permanent storage more economically feasible. The optimal distance from the initial containment area to the permanent storage site would represent a compromise between lower land and higher transportation costs.

4.4 Monitoring of Containment Area Performance

Several monitoring programs relevant to site management between successive dredging operations have already been discussed. These include the monitoring of shallow aquifer groundwater for evidence of elevated chloride concentrations and the analysis of the stormwater runoff effluent released over the weirs. These programs should continue throughout the service life of the site, although the sampling interval between active site operations may be extended to coincide with regular site inspections required to maintain security.

Additional site monitoring in the form of two topographic surveys of the containment area deposition surface is also recommended. First, a post-dredging survey should be performed as soon as possible following the completion of material dewatering operations and initial grading of the deposition surface. From this, a refined estimate of the quantity of material deposited can be obtained. Second, a pre-dredging survey should be performed during periods in which no material is removed between dredging events. This survey would be performed prior to the commencement of the next dredging operation. Used in combination with information obtained from the previous post-dredging survey, the pre-dredging survey will establish the amount of material consolidation which has occurred and the remaining site capacity.

In conjunction with the monitoring of material consolidation, a series of core borings taken after the completion of dewatering would further define the progress of consolidation. Core borings would also provide a means to determine the engineering properties of the dewatered material and its suitability for reuse. Samples should be analyzed for grain size distribution, Atterberg limits, moisture and organic content, and other factors which may affect the marketability of the material.

4.5 Monitoring of Habitat and Vegetation

A primary consideration in the design and operational guidelines for BV-24A is the desire to restrict significant adverse impacts related to habitat destruction to the containment area. Normandeau (2015) documented the presence of scrub jays, a state and federally-listed threatened species, within the scrubby pine flatwoods community on the western part of the site. FIND has addressed the impact of the containment basin on scrub jay habitat through a land exchange with Brevard County that preserves high quality scrub jay habitat on the original BV-24 site immediately west of BV-24A. All activities relating to the development and operation of BV-24A which impact scrub jay habitat will be subject to an agreement negotiated between FIND, USACE, U.S. Fish and Wildlife Service, and the Florida Fish and Wildlife Conservation Commission.

Notwithstanding the above, additional biological monitoring will be required within the buffer zone which lies outside of the containment area. A comprehensive environmental survey of these areas completed prior to any construction would be required to establish baseline habitat and vegetation conditions. Periodic resurveys should continue throughout the service life of the site. Degradation of habitat related to saltwater intrusion, the interruption of natural drainage patterns, or other aspects of site construction or operations should be noted, corrective actions taken, and guidelines developed to minimize further adverse impact. Similarly, any beneficial aspects of site management should be recognized and encouraged, and the lessons learned should be applied to the future operation of this and other comparable dredged material management areas.

4.6 Mosquito Control

The basic approach of the mosquito control program for BV-24A will emphasize physical rather than chemical control. The time during which standing water remains inside the containment area will be kept to a minimum, thereby reducing the potential for mosquito breeding. The phase of operation most favorable for breeding occurs during the dewatering of sediment when desiccation cracks form in the crust as the fine sediment deposits shrink through evaporative drying. Trenching procedures (see Section 4.1) will accelerate the dewatering process by allowing much of the moisture within the cracks to drain to the weirs. However, adverse climatological conditions could delay the dewatering phase long enough to result in successful breeding within the desiccation cracks. This would require a short-term spray program coordinated through Brevard County.

4.7 Site Security

A key element in the proper management of BV-24A is the provision of adequate site security. Disposal areas have typically been subject to a variety of unauthorized activities including illegal dumping, vandalism, hunting, and the destruction of dikes through the use of off-road vehicles. The occurrence of such activities on BV-24A will be controlled by the installation of security fencing around the entire site perimeter. Access to the site will at all times be limited to agents and representatives of FIND and USACE. Containment area access gates will remain locked at all times except during disposal and maintenance operations. The presence of an on-site operator during all phases of active disposal and dewatering operations should further discourage unauthorized entry to the site and the occurrence of non-sanctioned activities. Between disposal operations, the site operator will be responsible for carrying out regularly scheduled inspections. The primary purpose of these inspections will be to perform routine operational functions and to ensure that the security of the facility is maintained. Breaches in site security will be identified and appropriate actions will be taken as quickly as possible to restore the site to a fully operational standby condition. Other responsibilities of the operator during these visits will include weir operation and stormwater release, monitoring of stormwater effluent quality and groundwater monitoring wells, as well as the performance of routine inspections of dike integrity and buffer area conditions.

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ENVIRONMENTAL RESOURCE PERMIT APPLICATION

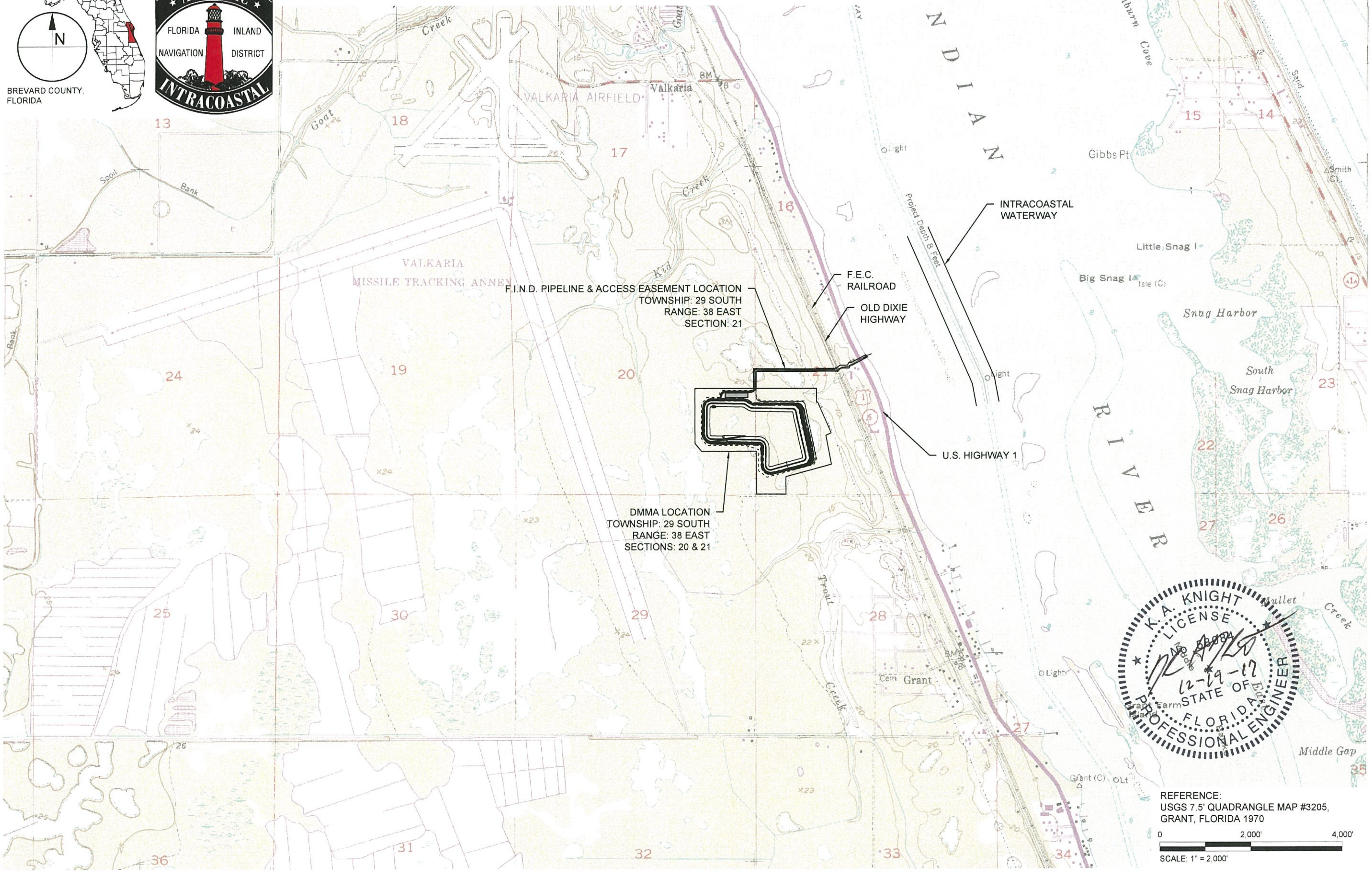
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 2

PERMIT DRAWINGS

BV-24A DREDGE MATERIAL MANAGEMENT AREA



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TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 1
LOCATION MAP
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

PROJECT	C2015-065
DRAWN BY	RLJ
SHEET	1 of 35
DATE	DECEMBER 2017

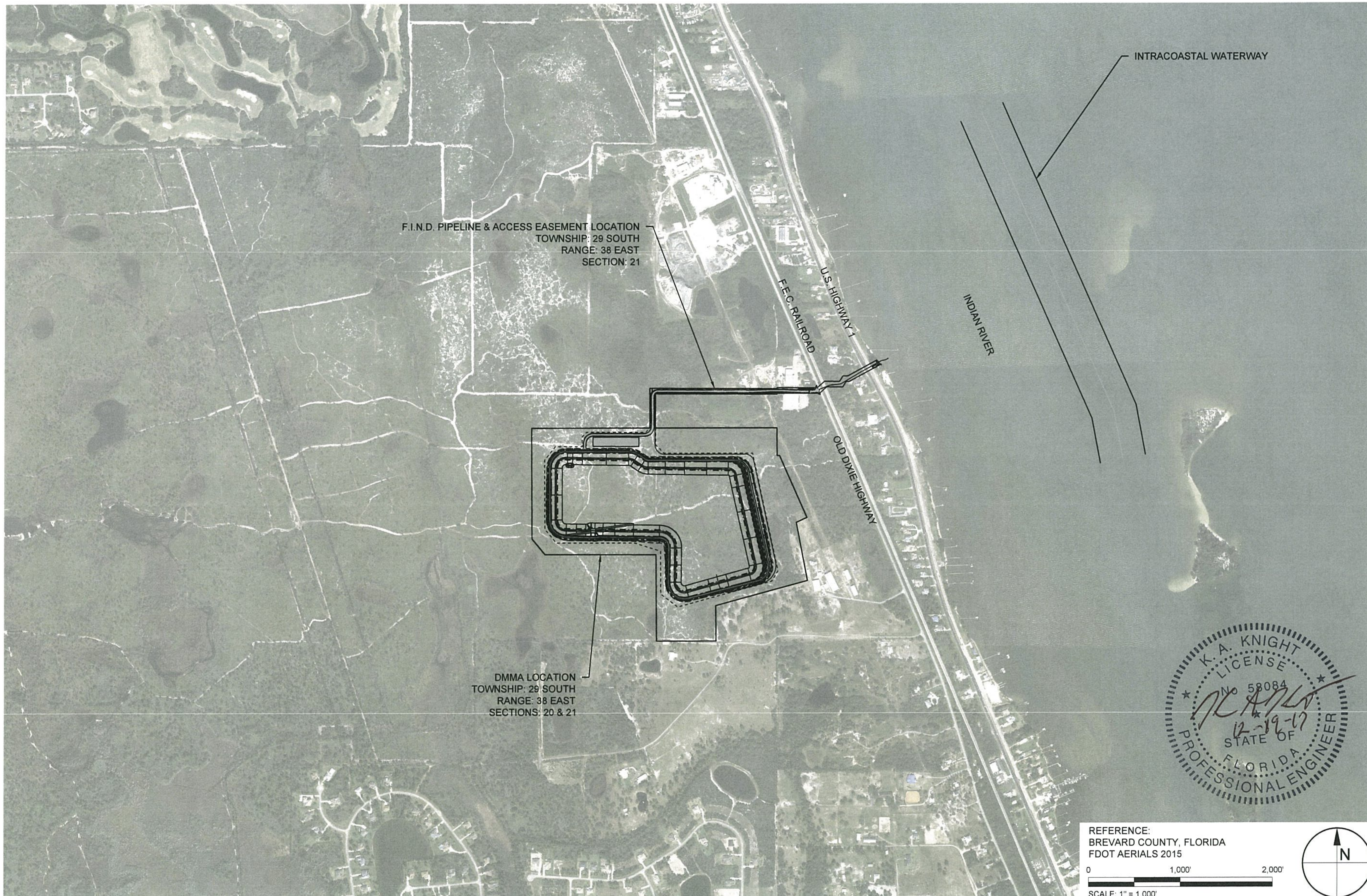
SEAL

DRAFT

KEITH A. KNIGHT P.E.# 58084

DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.



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10151 DEERWOOD PARK BLVD
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CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 2
VICINITY MAP
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

PROJECT C2015-065
DRAWN BY RLJ
SHEET 2 of 35
DATE DECEMBER 2017

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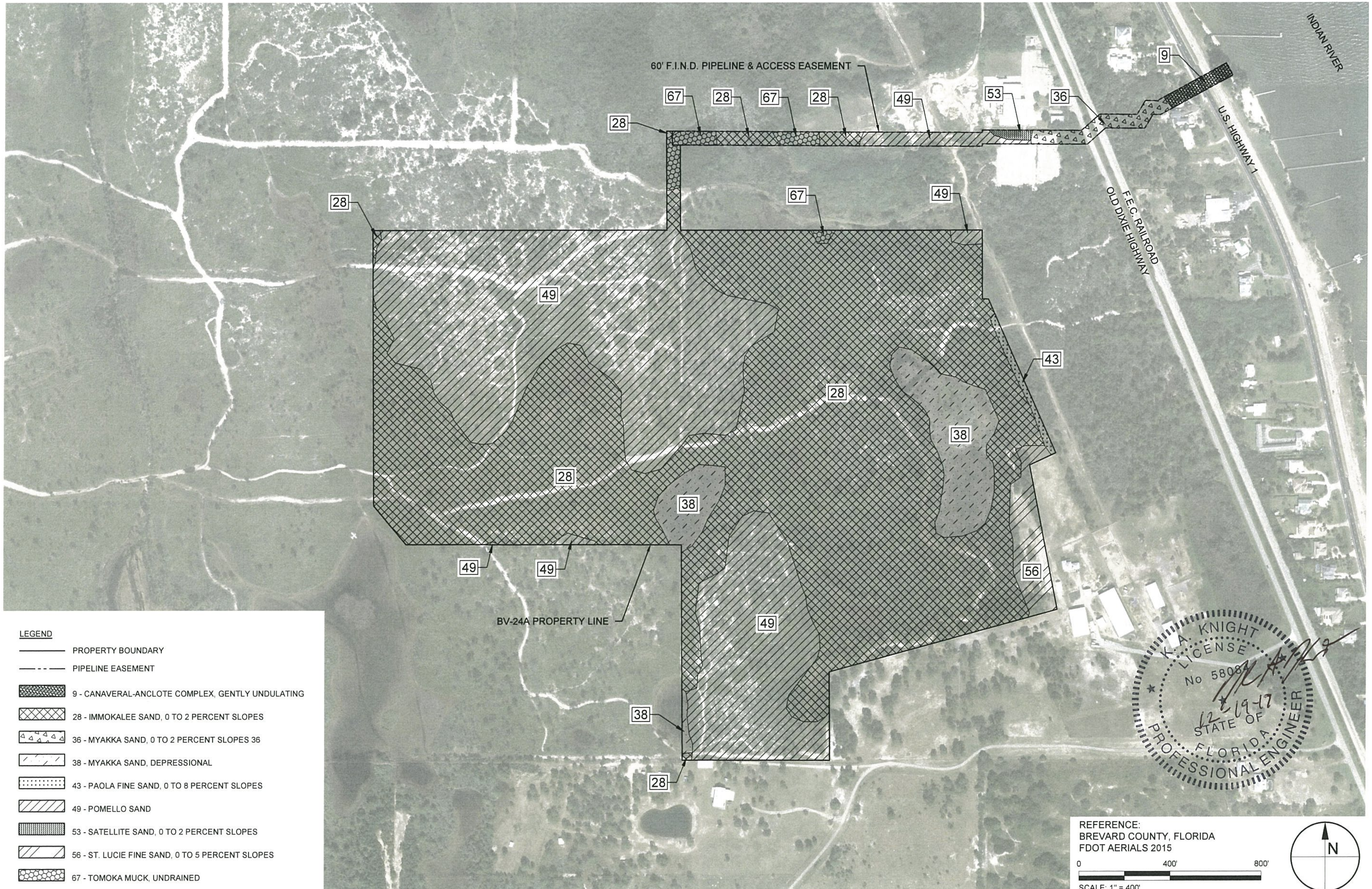

LEGEND

- PROPERTY BOUNDARY
- PIPELINE EASEMENT
- 9 - CANAVERAL-ANCLOTE COMPLEX, GENTLY UNDULATING
- 28 - IMMOKALEE SAND, 0 TO 2 PERCENT SLOPES
- 36 - MYAKKA SAND, 0 TO 2 PERCENT SLOPES 36
- 38 - MYAKKA SAND, DEPRESSIONAL
- 43 - PAOLA FINE SAND, 0 TO 8 PERCENT SLOPES
- 49 - POMELLO SAND
- 53 - SATELLITE SAND, 0 TO 2 PERCENT SLOPES
- 56 - ST. LUCIE FINE SAND, 0 TO 5 PERCENT SLOPES
- 67 - TOMOKA MUCK, UNDRAINED

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FIGURE 3
NRCS SOILS MAP
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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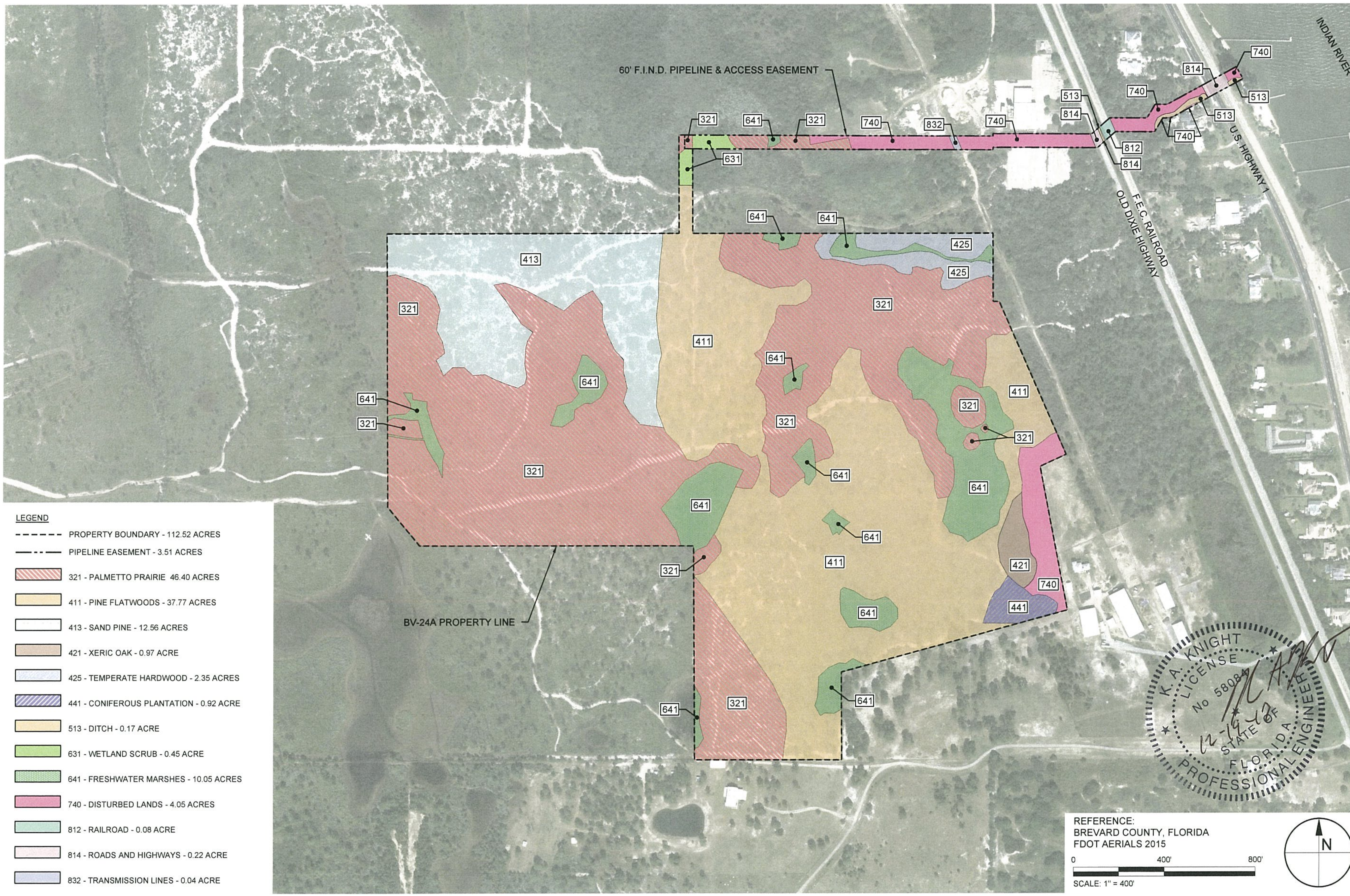

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FIGURE 4
SJRWMD EXISTING FLUCCS MAP
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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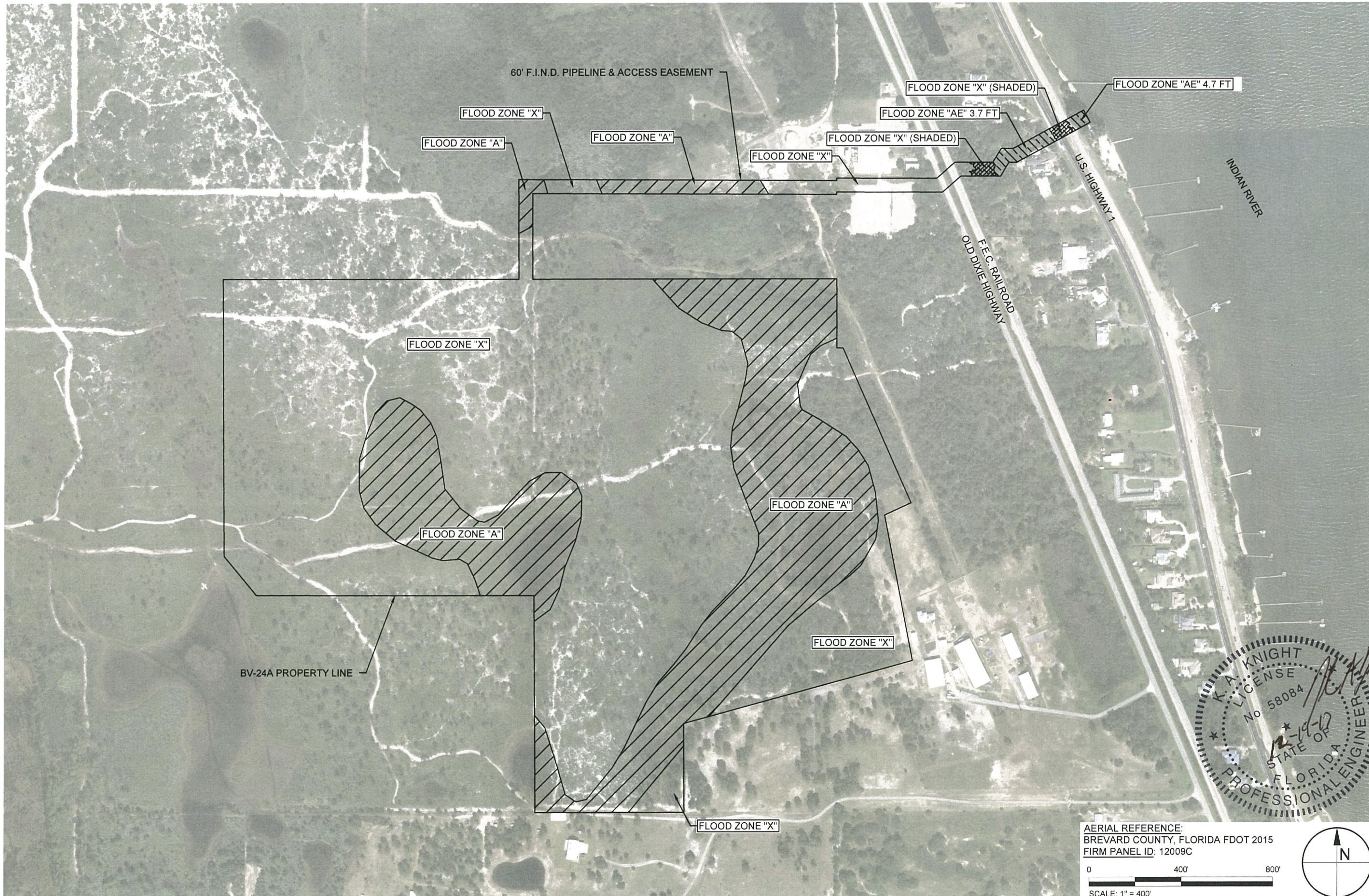

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FIGURE 5
FEMA FLOOD ZONE MAP
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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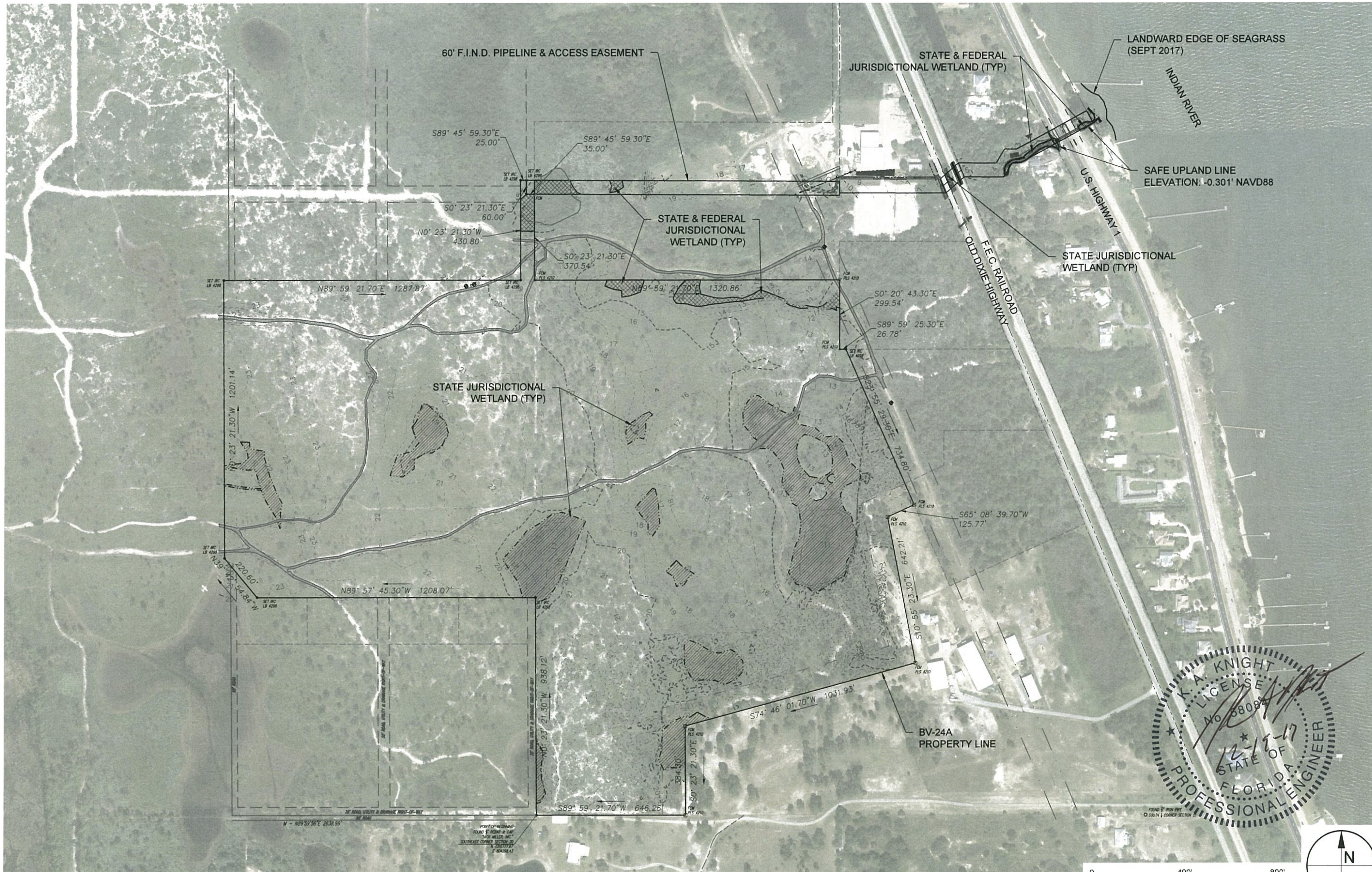

REFERENCES:
AERIAL: BREVARD COUNTY, FLORIDA - FDOT 2015
SURVEY: MORGAN & EKLUND, INC., DATED MAY 18, 2015.

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FIGURE 6
EXISTING CONDITIONS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
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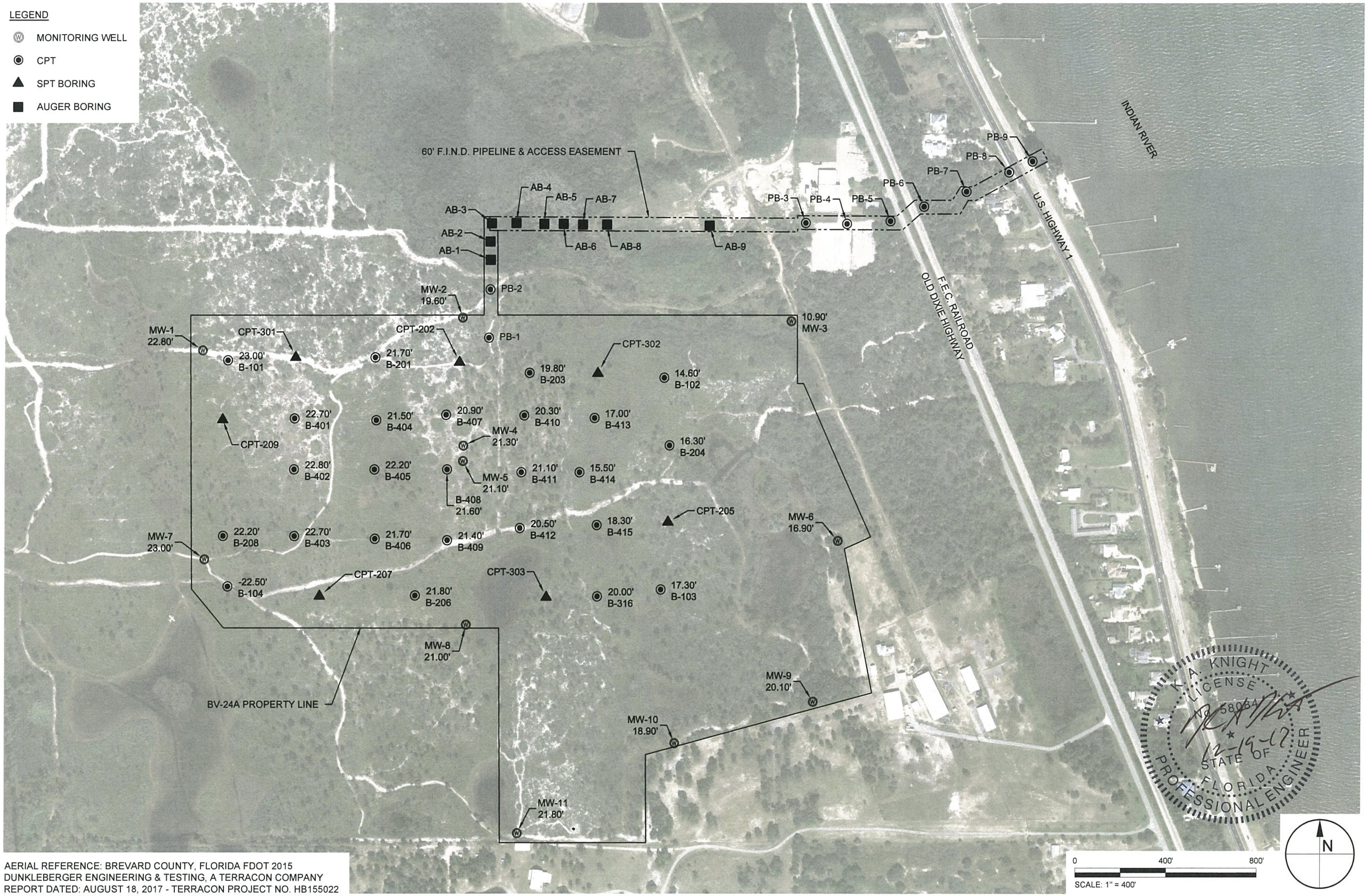

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FIGURE 7
GEOTECHNICAL LOCATIONS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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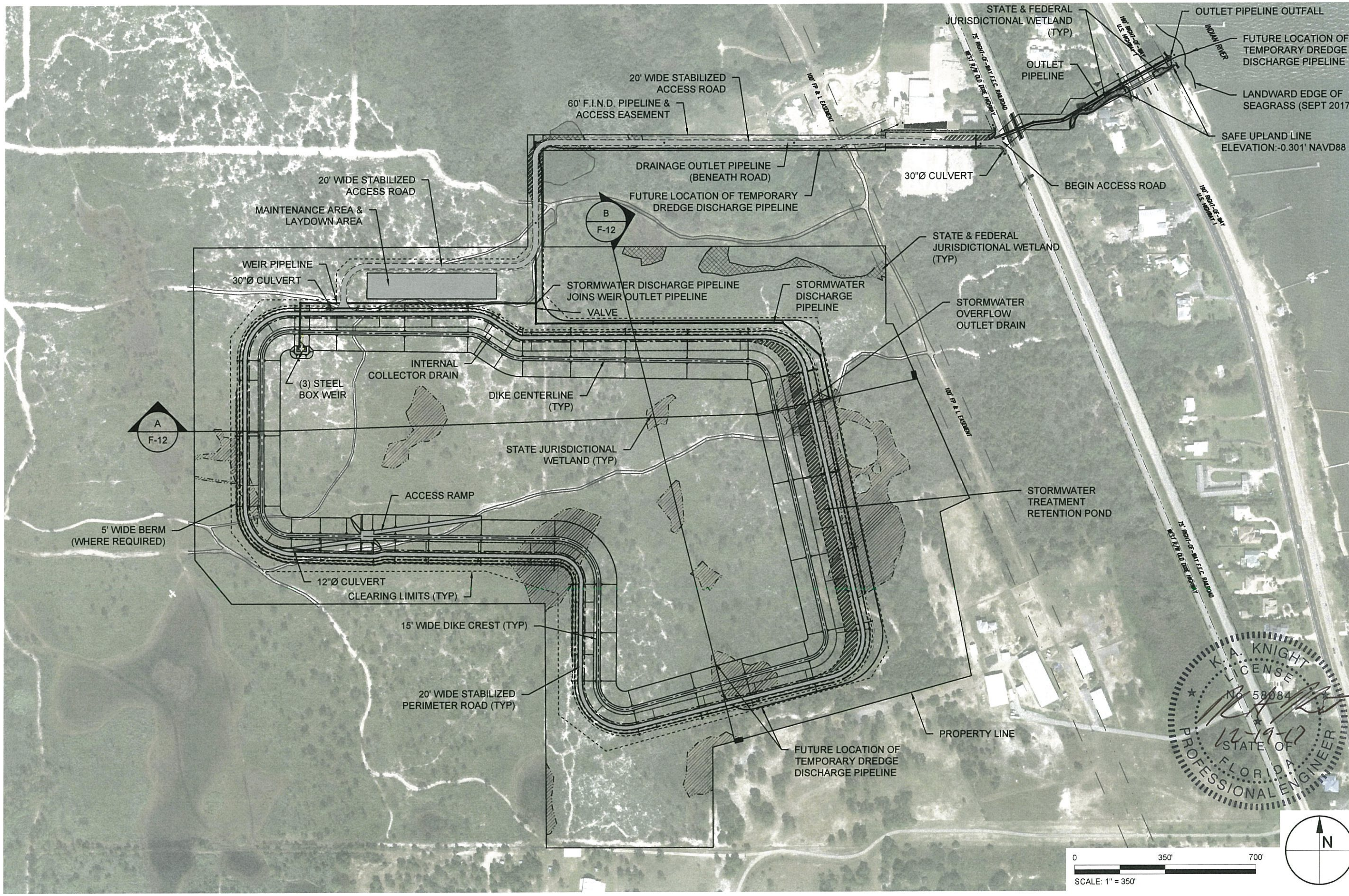

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FIGURE 8
PROJECT OVERVIEW
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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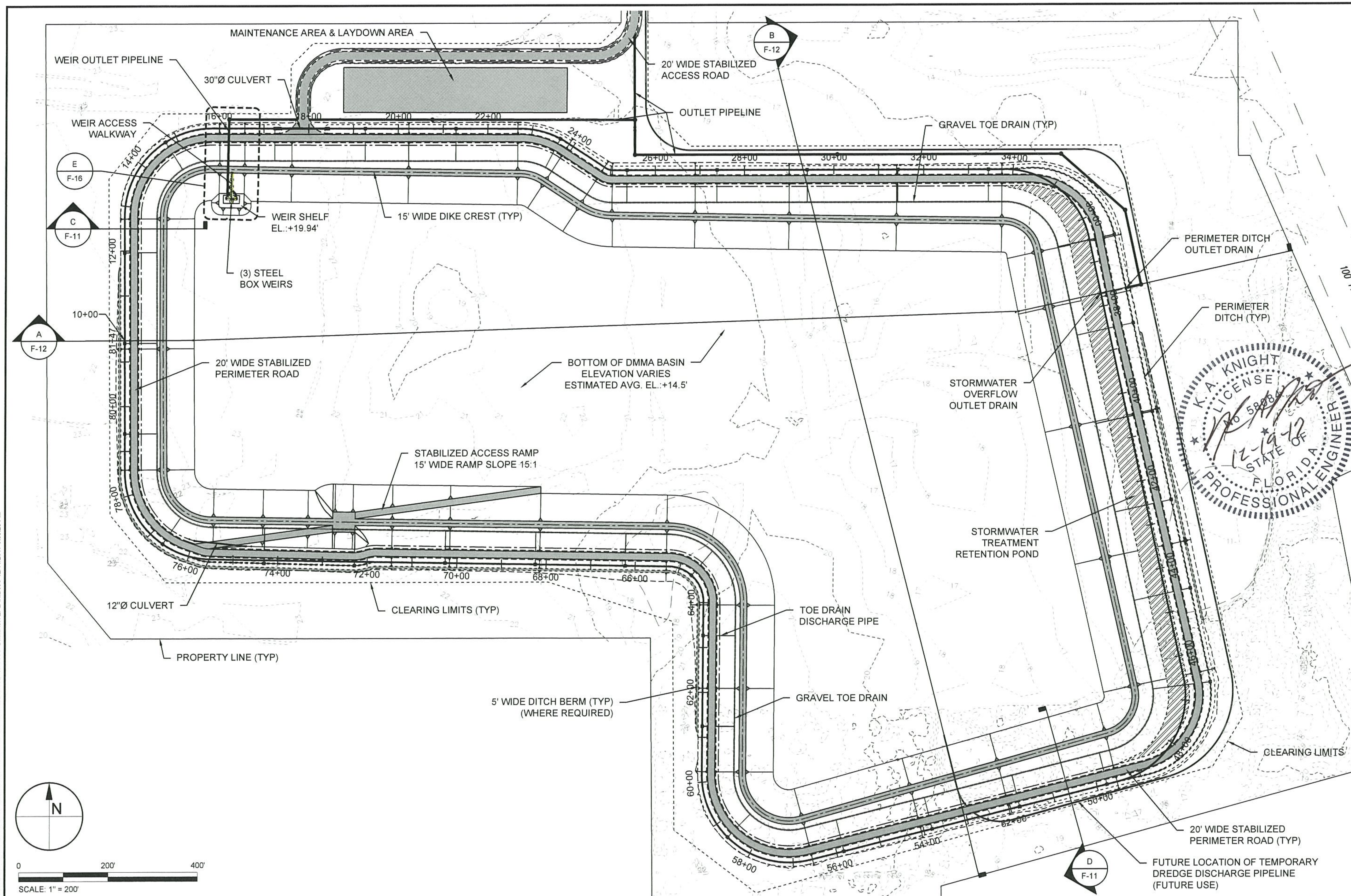

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FIGURE 9
DMMA SITE PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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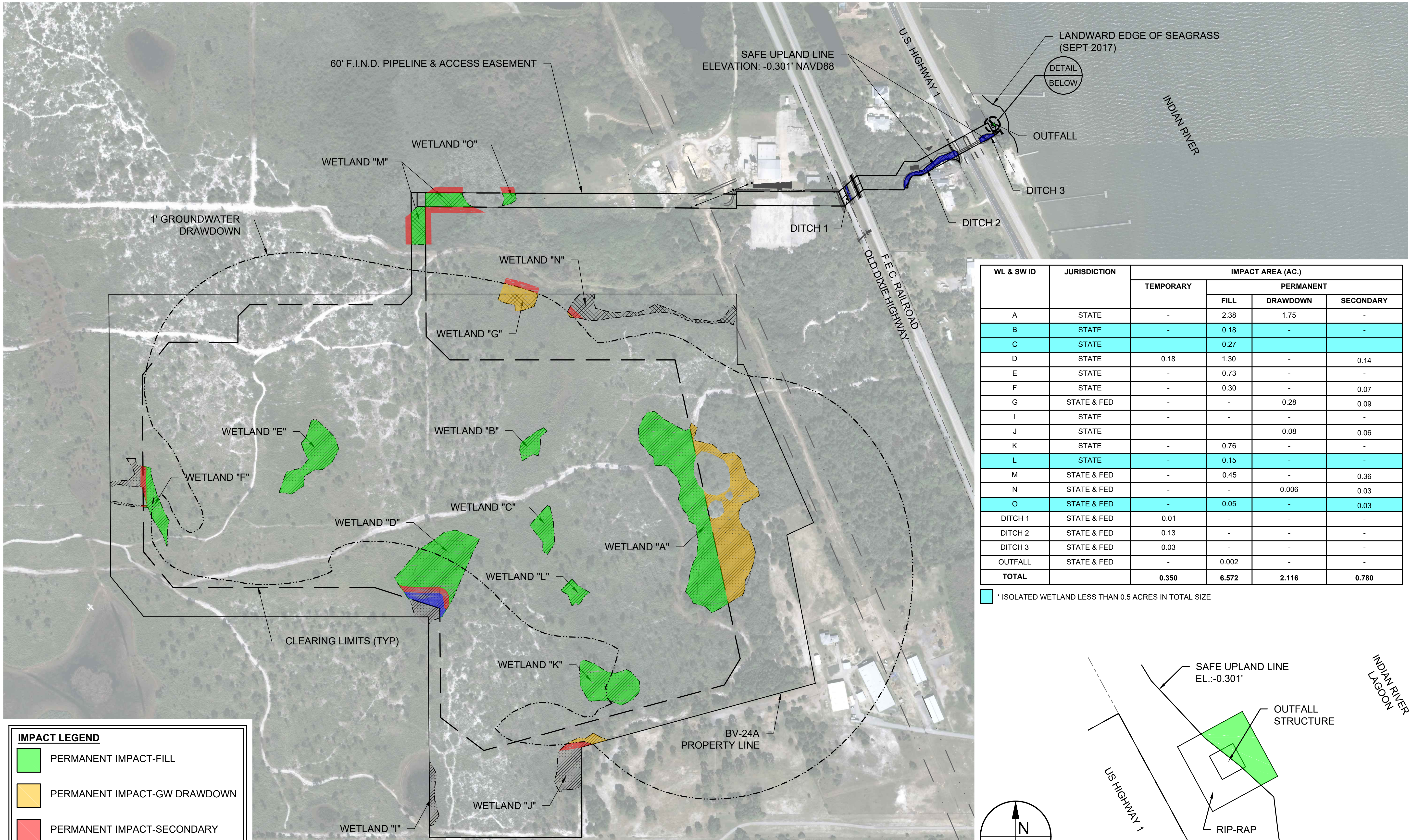

IMPACT LEGEND

- PERMANENT IMPACT-FILL
- PERMANENT IMPACT-GW DRAWDOWN
- PERMANENT IMPACT-SECONDARY
- TEMPORARY IMPACT

WL & SW ID	JURISDICTION	IMPACT AREA (AC.)			
		TEMPORARY	PERMANENT		
			FILL	DRAWDOWN	SECONDARY
A	STATE	-	2.38	1.75	-
B	STATE	-	0.18	-	-
C	STATE	-	0.27	-	-
D	STATE	0.18	1.30	-	0.14
E	STATE	-	0.73	-	-
F	STATE	-	0.30	-	0.07
G	STATE & FED	-	-	0.28	0.09
I	STATE	-	-	-	-
J	STATE	-	-	0.08	0.06
K	STATE	-	0.76	-	-
L	STATE	-	0.15	-	-
M	STATE & FED	-	0.45	-	0.36
N	STATE & FED	-	-	0.006	0.03
O	STATE & FED	-	0.05	-	0.03
DITCH 1	STATE & FED	0.01	-	-	-
DITCH 2	STATE & FED	0.13	-	-	-
DITCH 3	STATE & FED	0.03	-	-	-
OUTFALL	STATE & FED	-	0.002	-	-
TOTAL		**0.350**	**6.572**	**2.116**	**0.780**

* ISOLATED WETLAND LESS THAN 0.5 ACRES IN TOTAL SIZE

OUTFALL IMPACT

SCALE: 1" = 20'

0 20'

N

0 400' 800'

SCALE: 1" = 400'

NOTES:

1. PERMANENT IMPACTS (FILL AND GROUNDWATER DRAWDOWN) WITHIN THE BV-24A PROPERTY DETERMINED BY THE LIMITS OF THE PROPOSED DMMA OR THE 1 FT GROUNDWATER DRAWDOWN CONTOUR, WHICHEVER RESULTS IN THE GREATEST IMPACT.
2. SECONDARY IMPACTS DETERMINED BY 25 - FT OFFSET FROM FILL AND GROUNDWATER DRAWDOWN IMPACTS.

REFERENCES:

AERIAL: BREVARD COUNTY, FLORIDA - FDOT 2015

SURVEY: MORGAN & EKLUND, INC., DATED MAY 18, 2015.

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FIGURE 10
WETLAND IMPACTS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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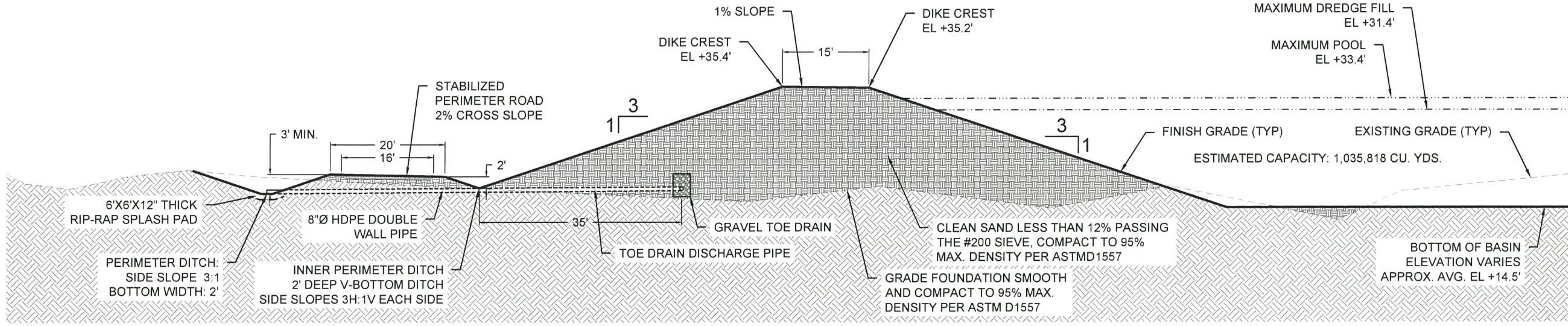
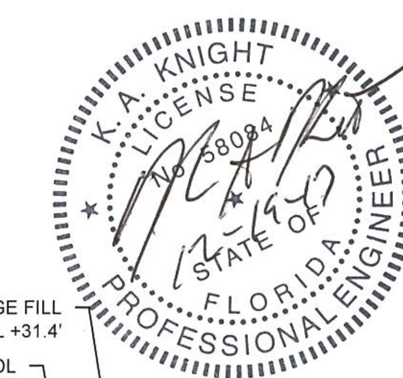


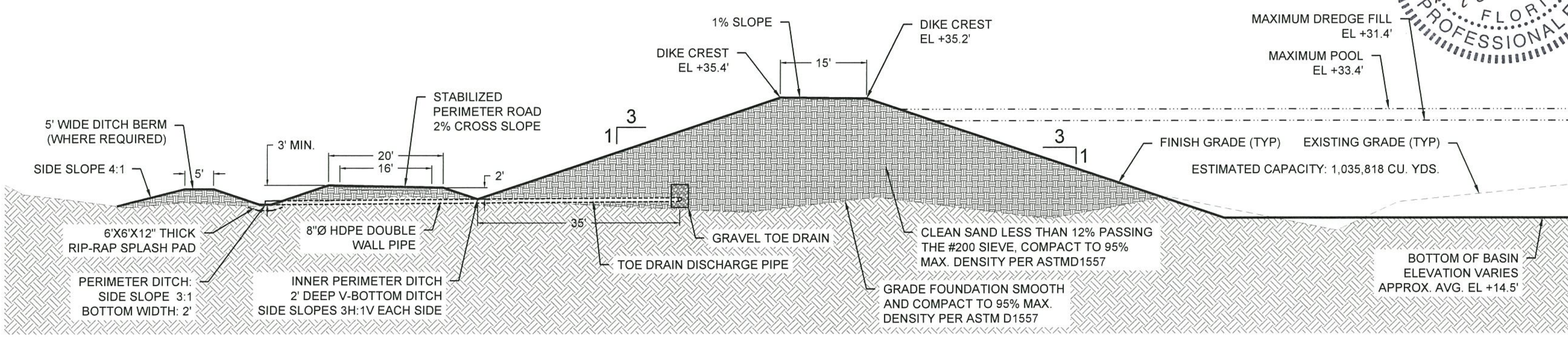
C
F-9

TYPICAL DIKE SECTION - NO DITCH BERM REQUIRED

SCALE: 1" = 20'

0 20'





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F-9

TYPICAL DIKE SECTION - DITCH BERM REQUIRED

SCALE: 1" = 20'

0 20'

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FIGURE 11
DMMA TYPICAL SECTIONS
F.I.N.D. BV-24A DREDGE MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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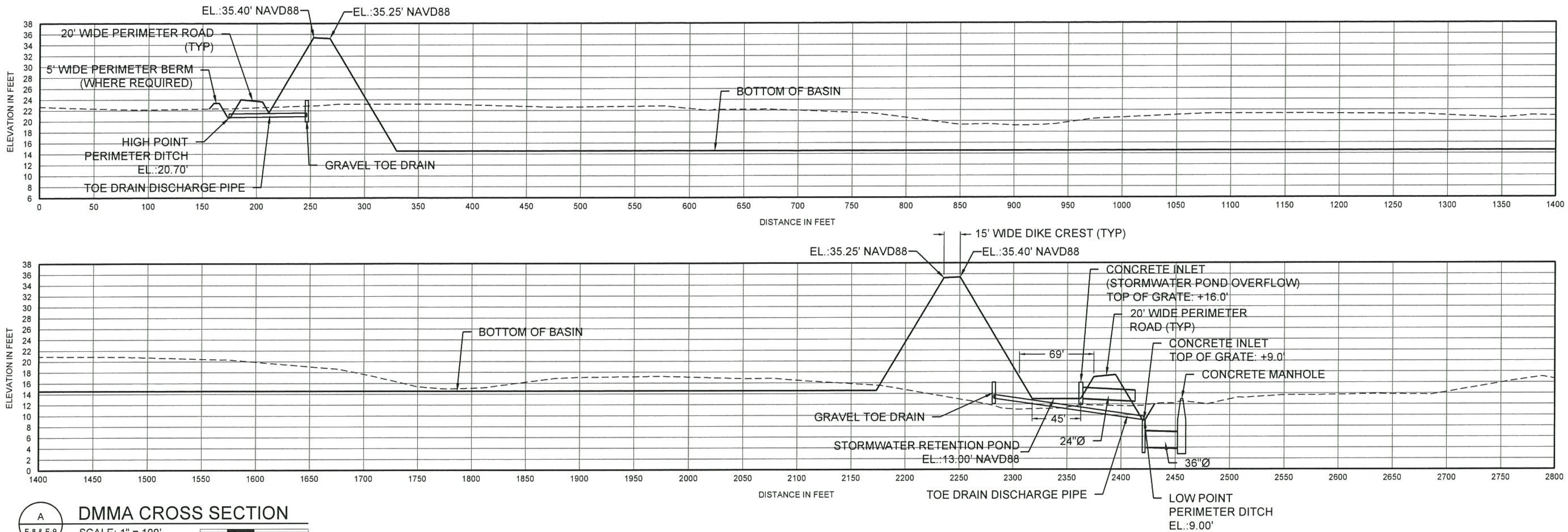
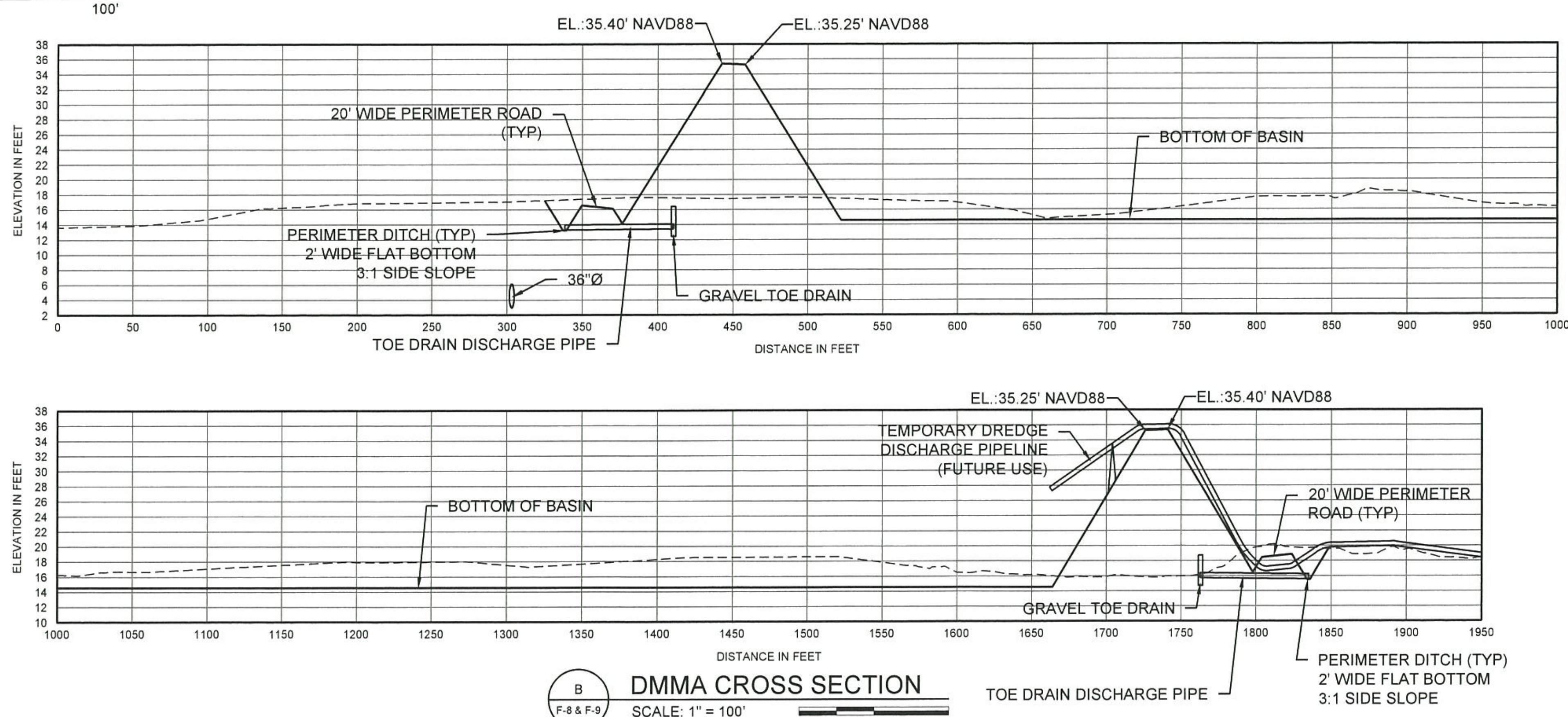


A DMMA CROSS SECTION F-8 & F-9

SCALE: 1" = 100'
V-SCALE: 1" = 20'

0 100'



B DMMA CROSS SECTION F-8 & F-9

SCALE: 1" = 100'
V-SCALE: 1" = 20'

0 100'

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FIGURE 12
DMMA CROSS SECTIONS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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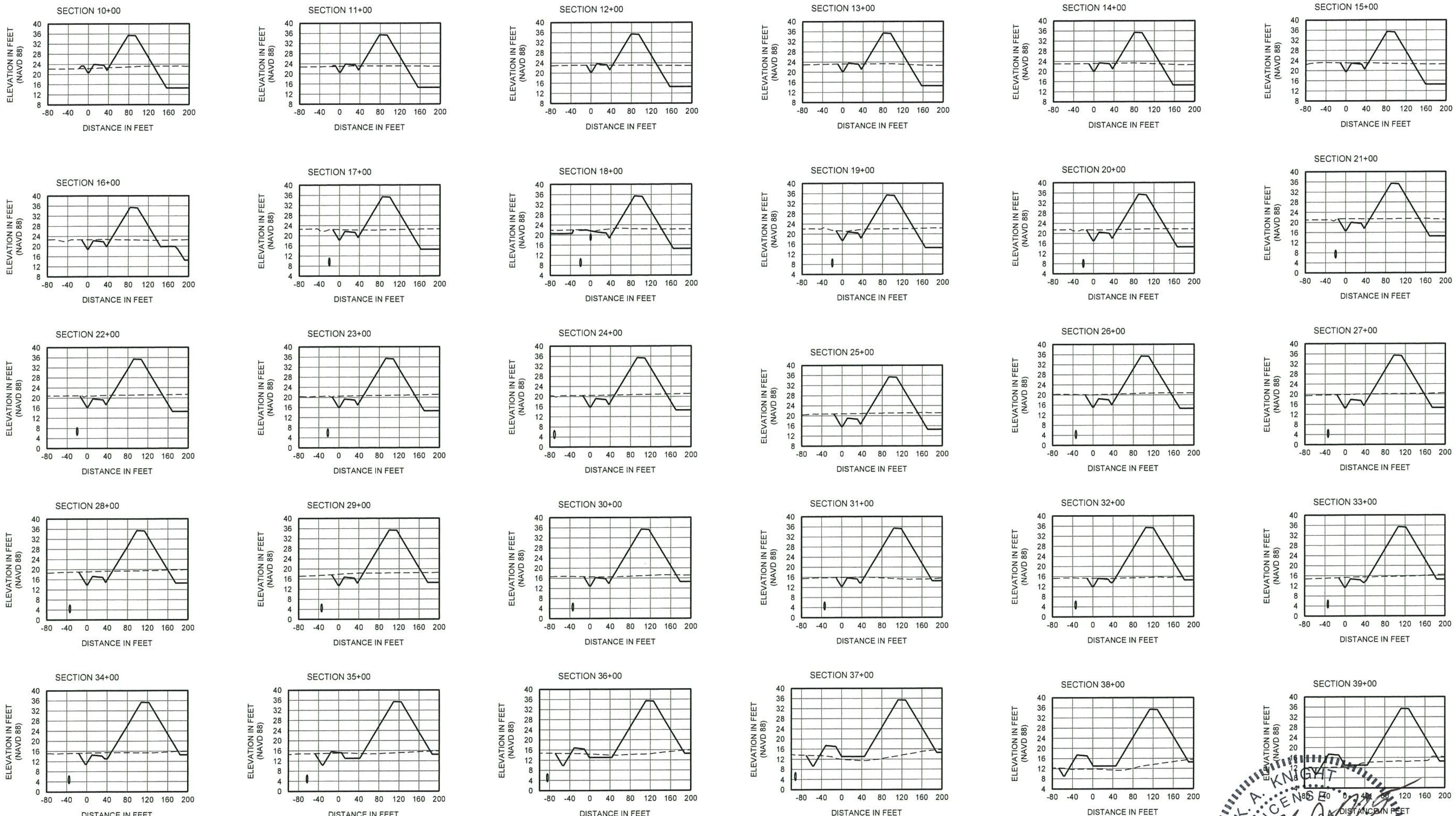

DMMA CROSS SECTION

SCALE: 1" = 200'
V-SCALE: 1" = 40'
0 200'

FIGURE 13
DMMA SAMPLE SECTIONS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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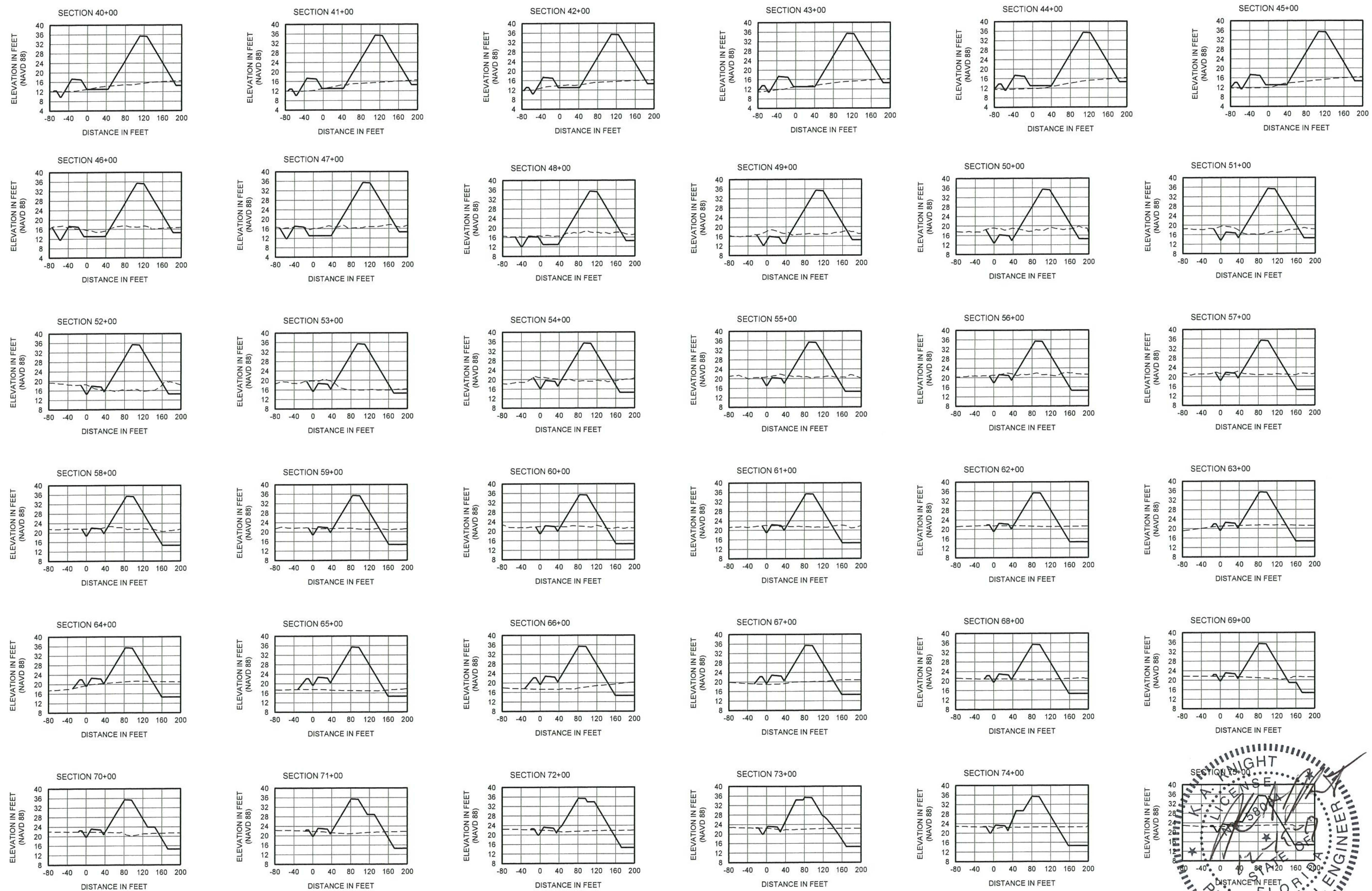

DMMA CROSS SECTION

SCALE: 1" = 200'
V-SCALE: 1" = 40'
0 200'

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FIGURE 14
DMMA SAMPLE SECTIONS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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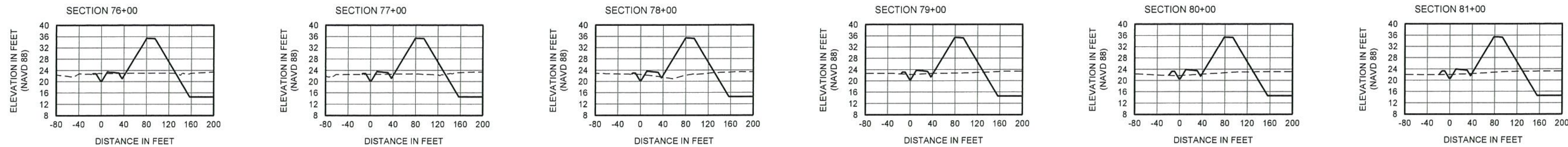

DMMA CROSS SECTION

SCALE: 1" = 200'
V-SCALE: 1" = 40'
0 200'

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FIGURE 15
DMMA SAMPLE SECTIONS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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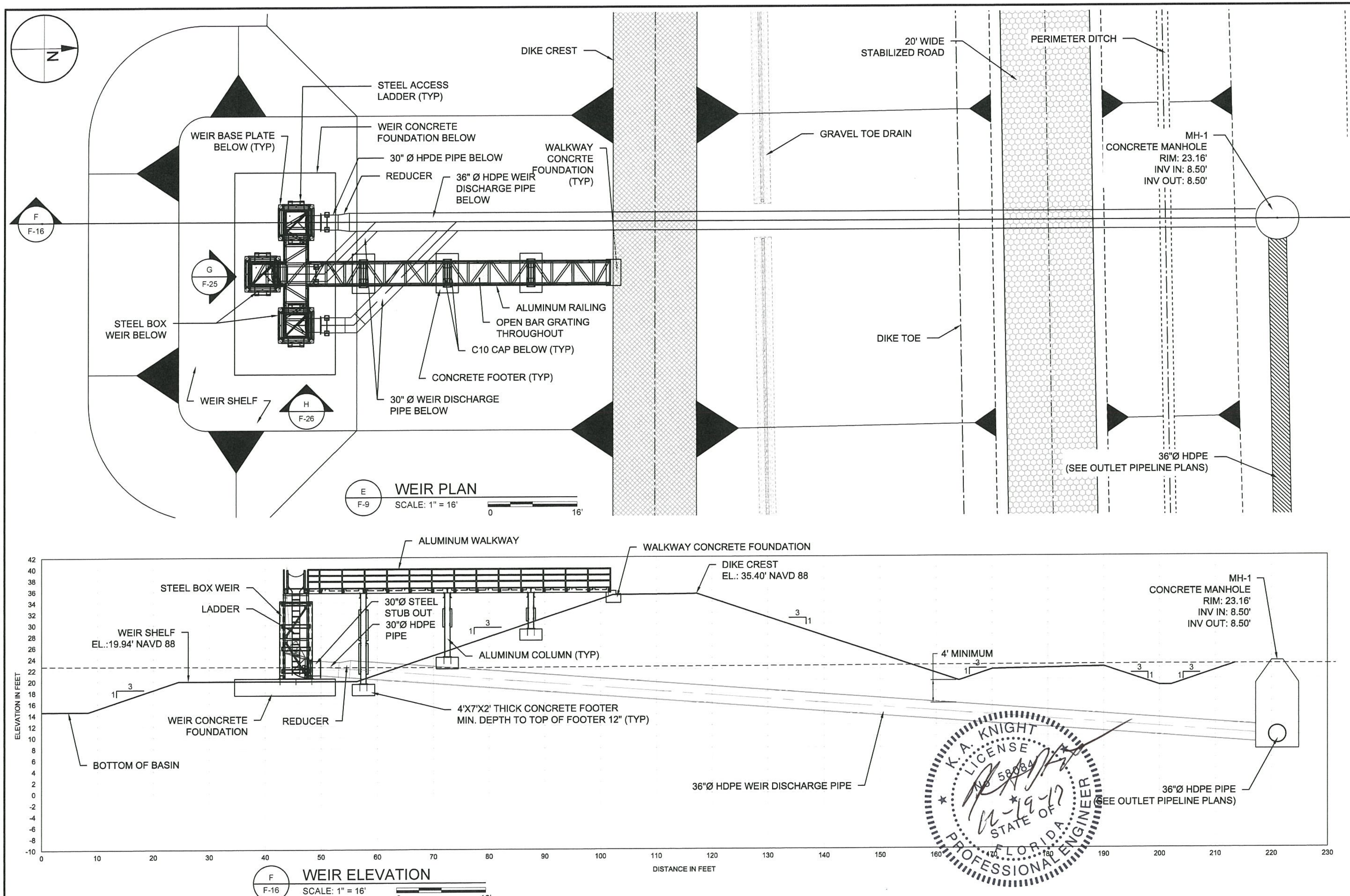

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FIGURE 16
ALUMINUM WALKWAY PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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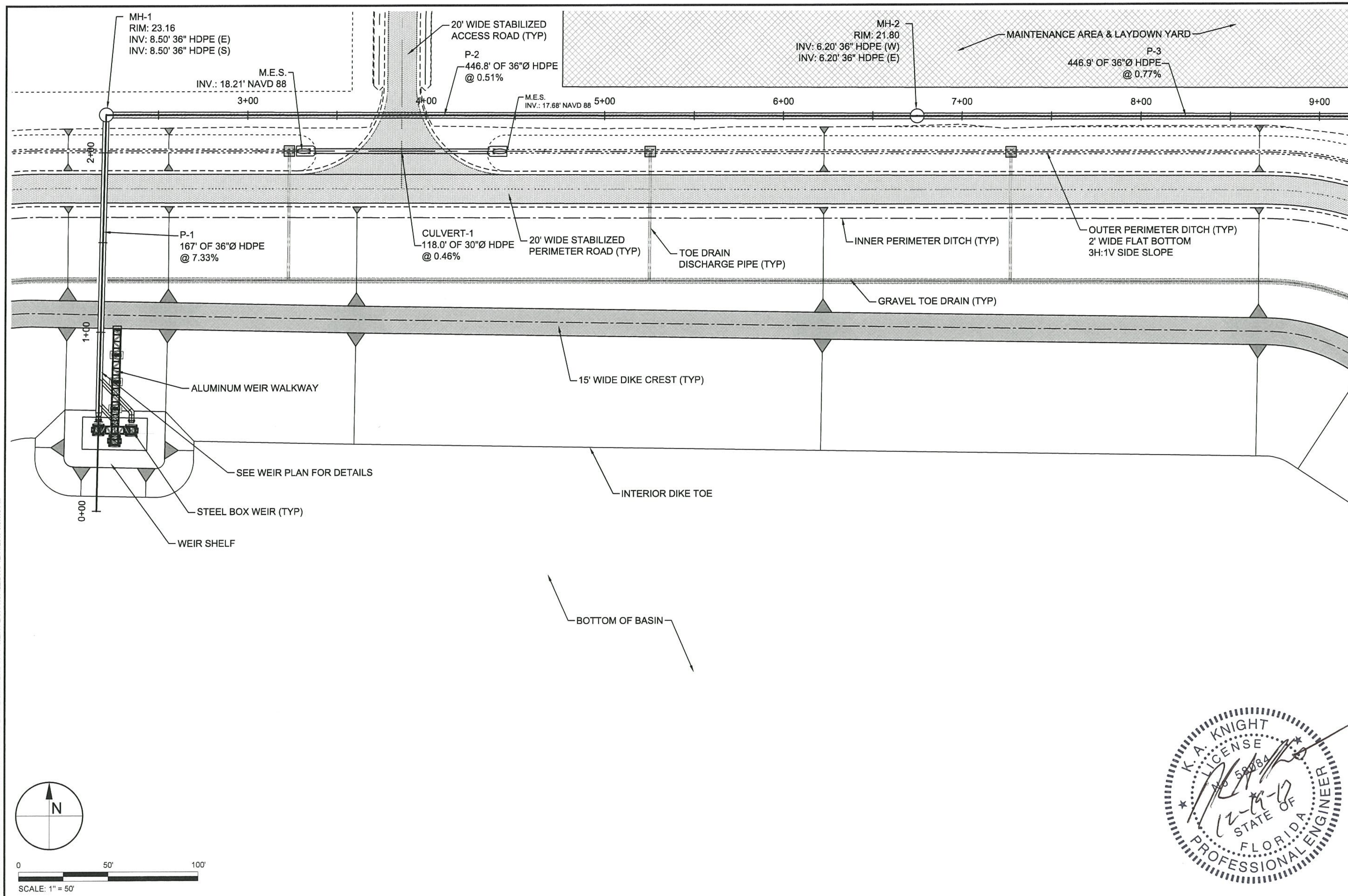

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FIGURE 17
WEIR PIPELINE PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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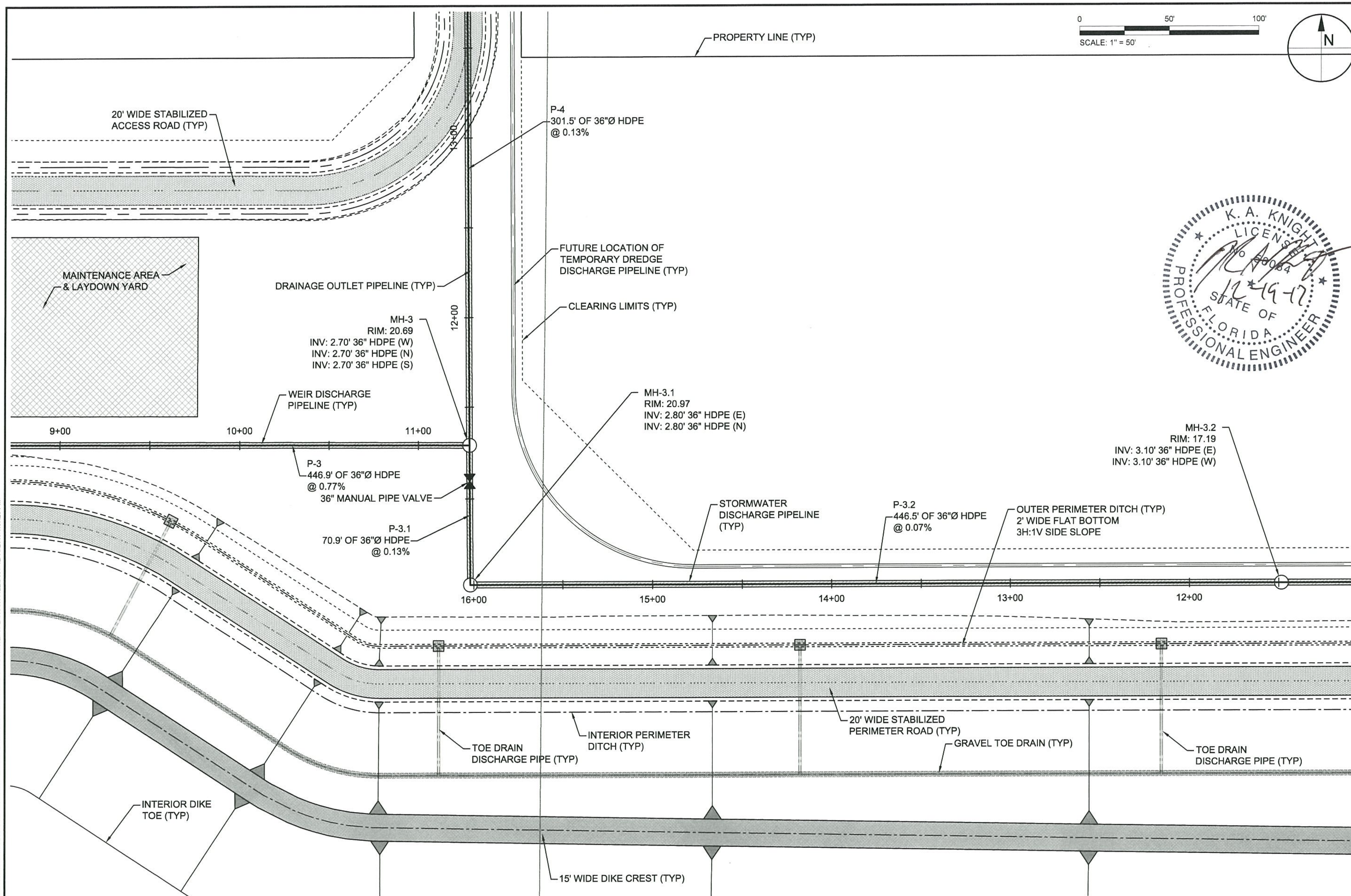

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FIGURE 18
WEIR PIPELINE PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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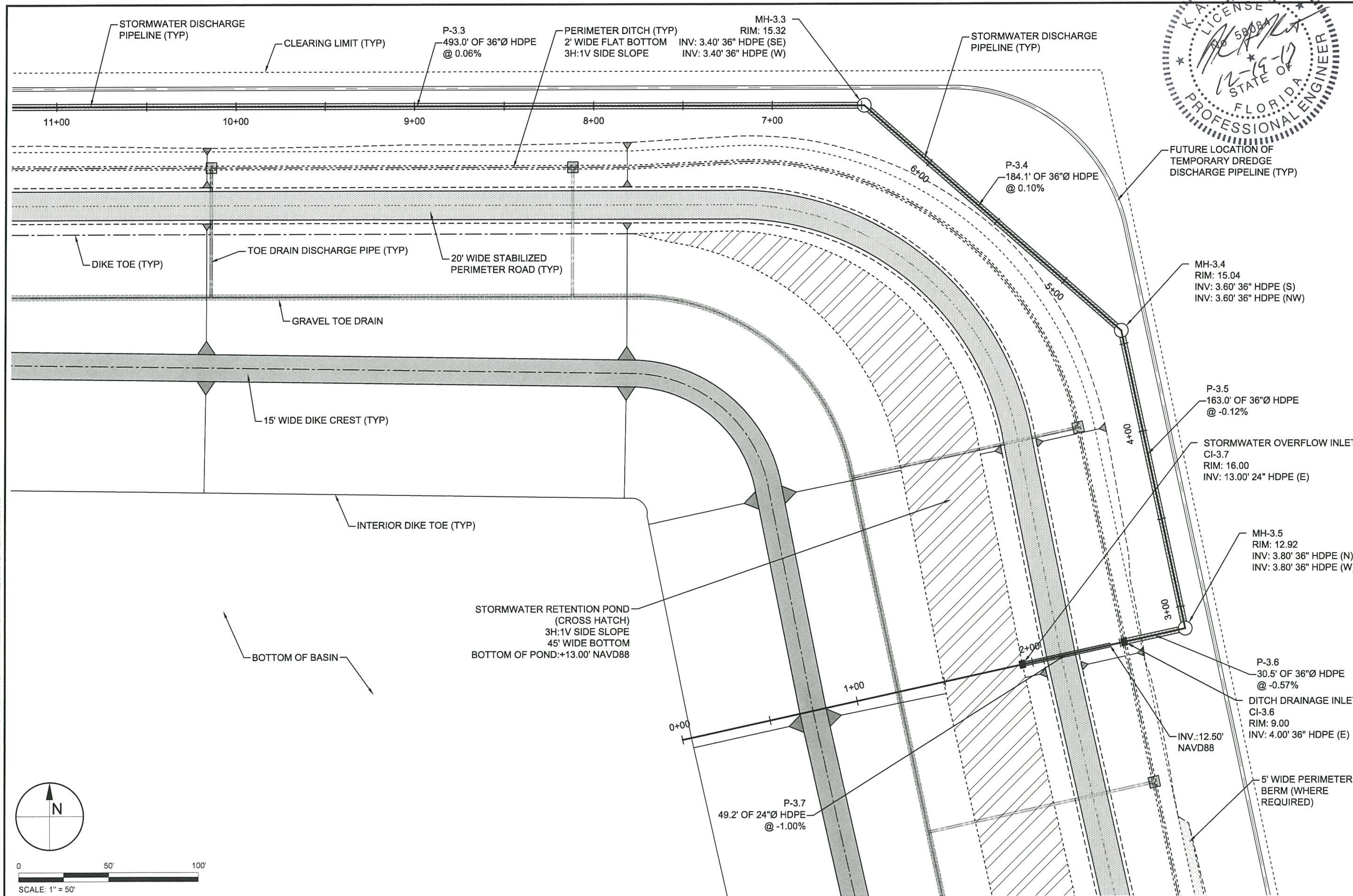

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FIGURE 19
WEIR PIPELINE PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
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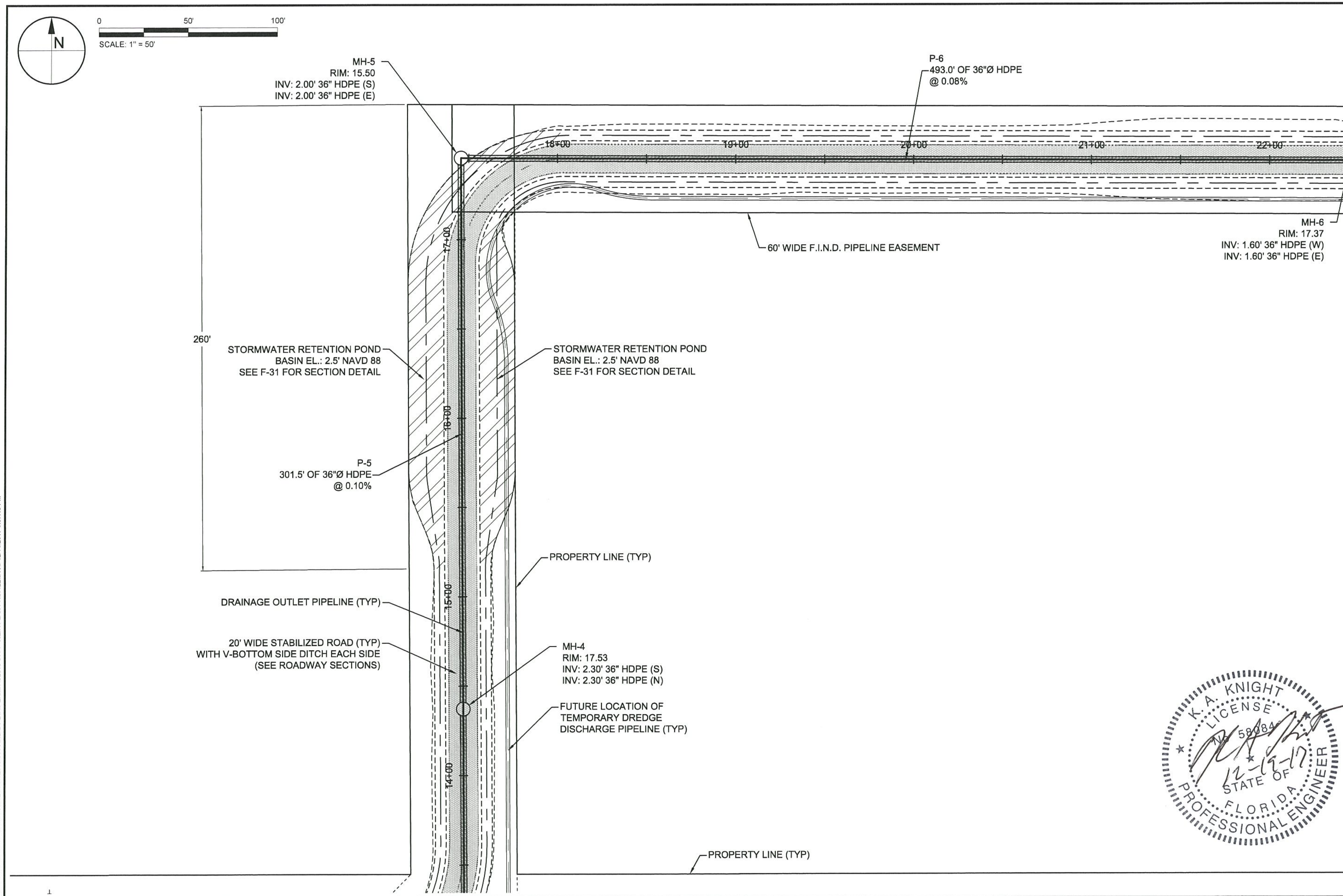

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FIGURE 20
WEIR PIPELINE PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

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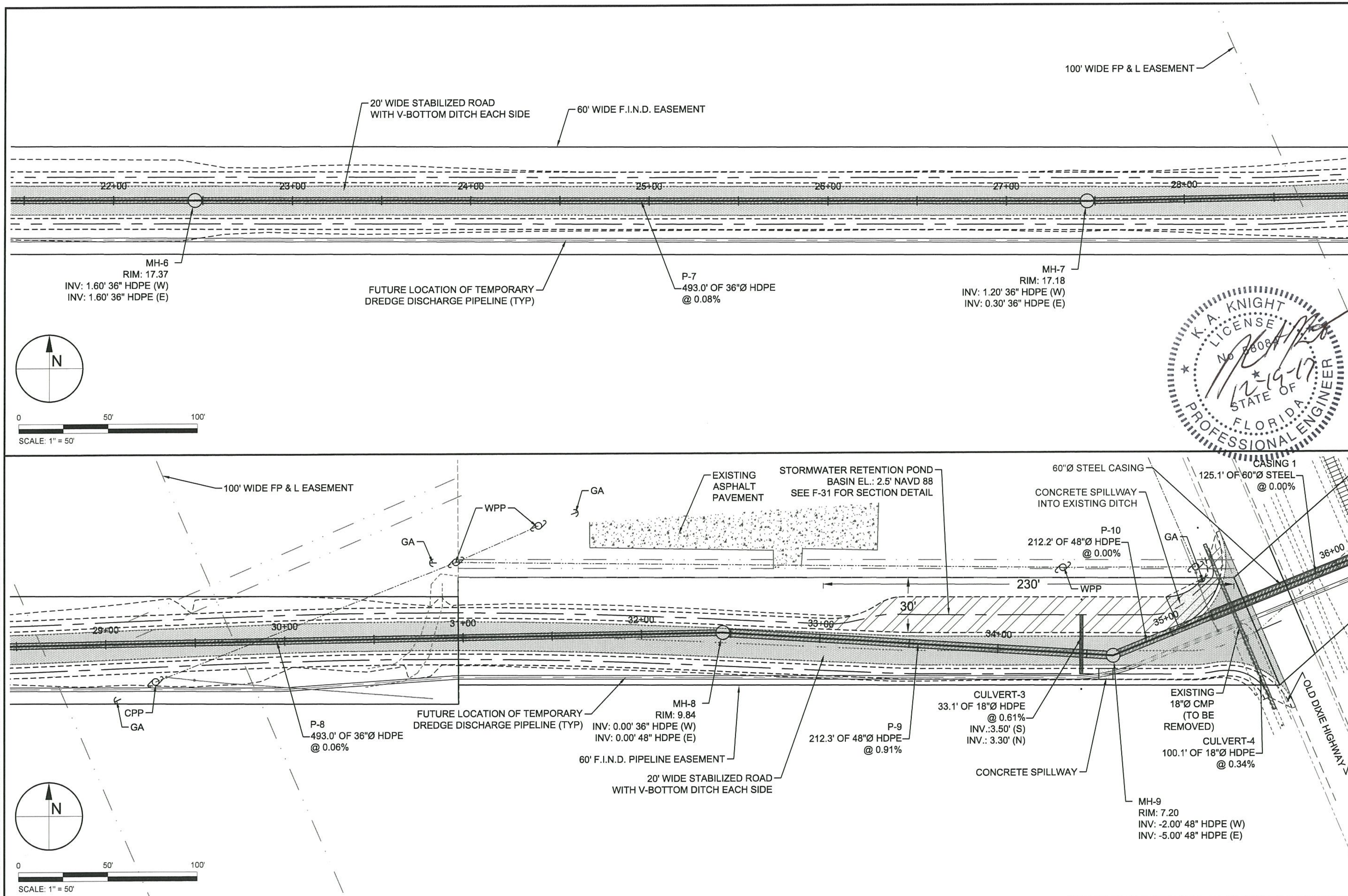

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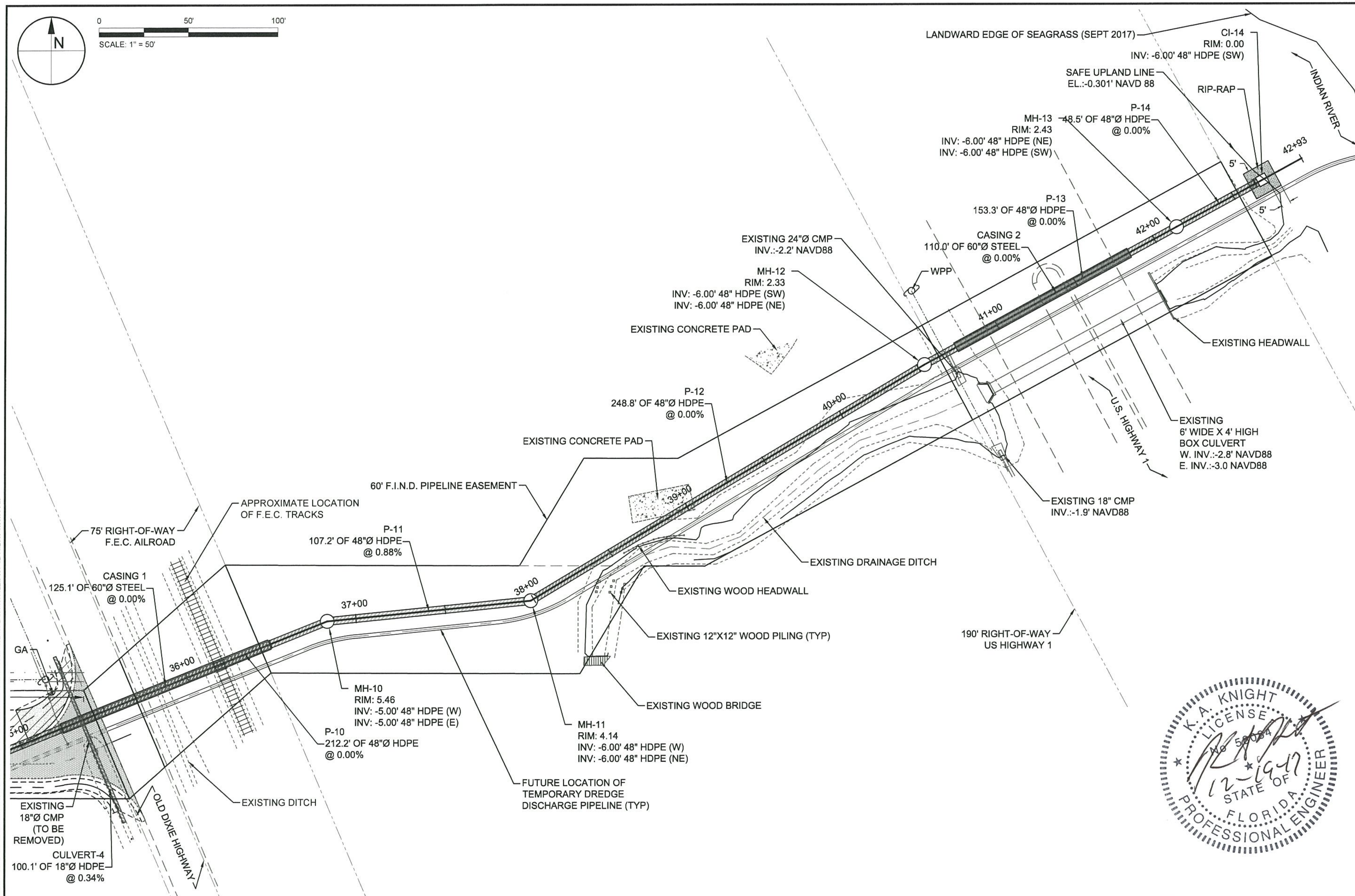
FIGURE 21
WEIR PIPELINE PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.



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TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 22
WEIR PIPELINE PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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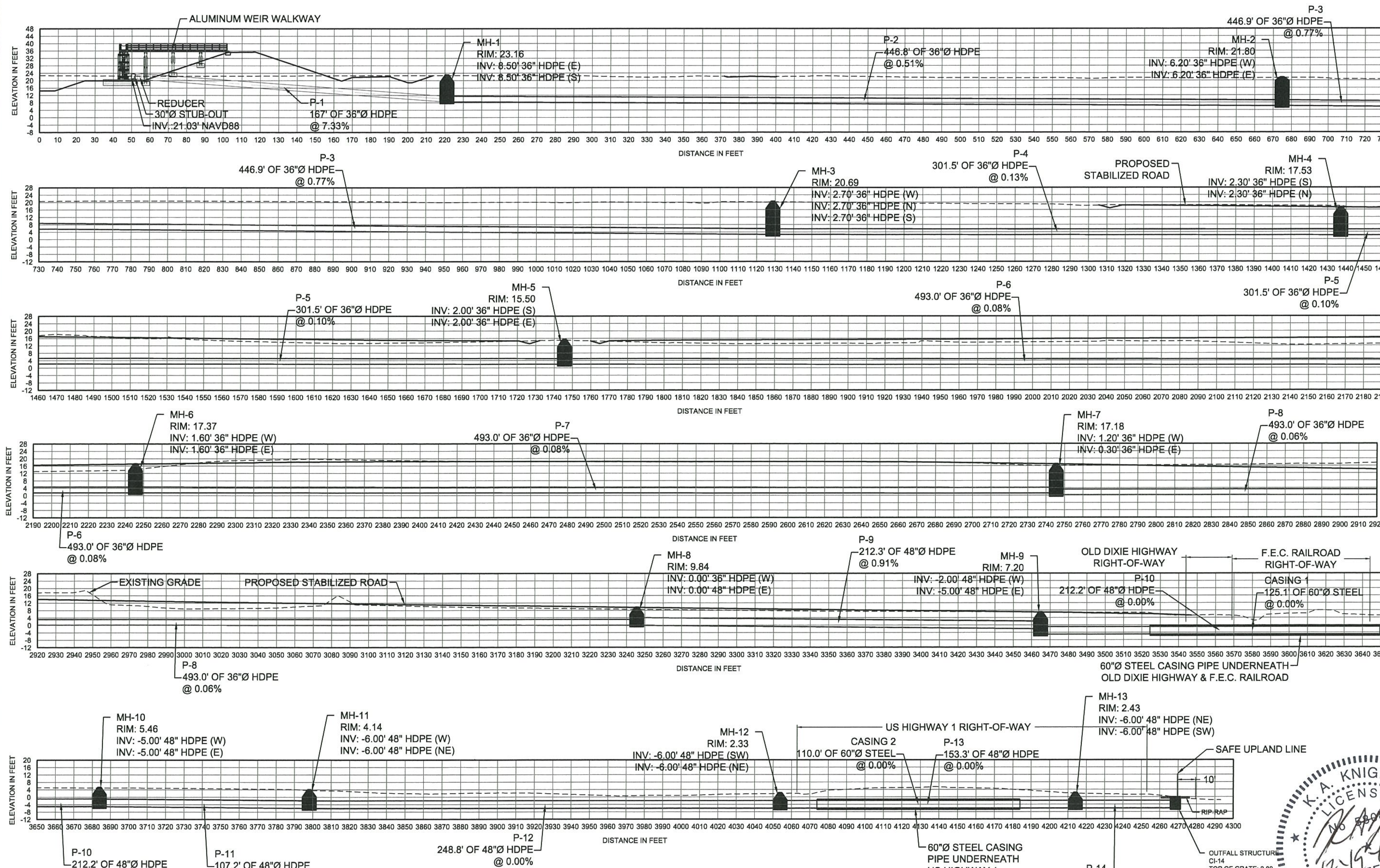

WEIR PIPELINE AND DRAINAGE OUTLET PROFILES

SCALE: 1" = 50'
V-SCALE: 1" = 50'

0 50'

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FIGURE 23
WEIR PIPELINE PROFILES
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
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K. A. KNIGHT
LICENSE
No 58084
STATE OF FLORIDA
PROFESSIONAL ENGINEER
12-15-17

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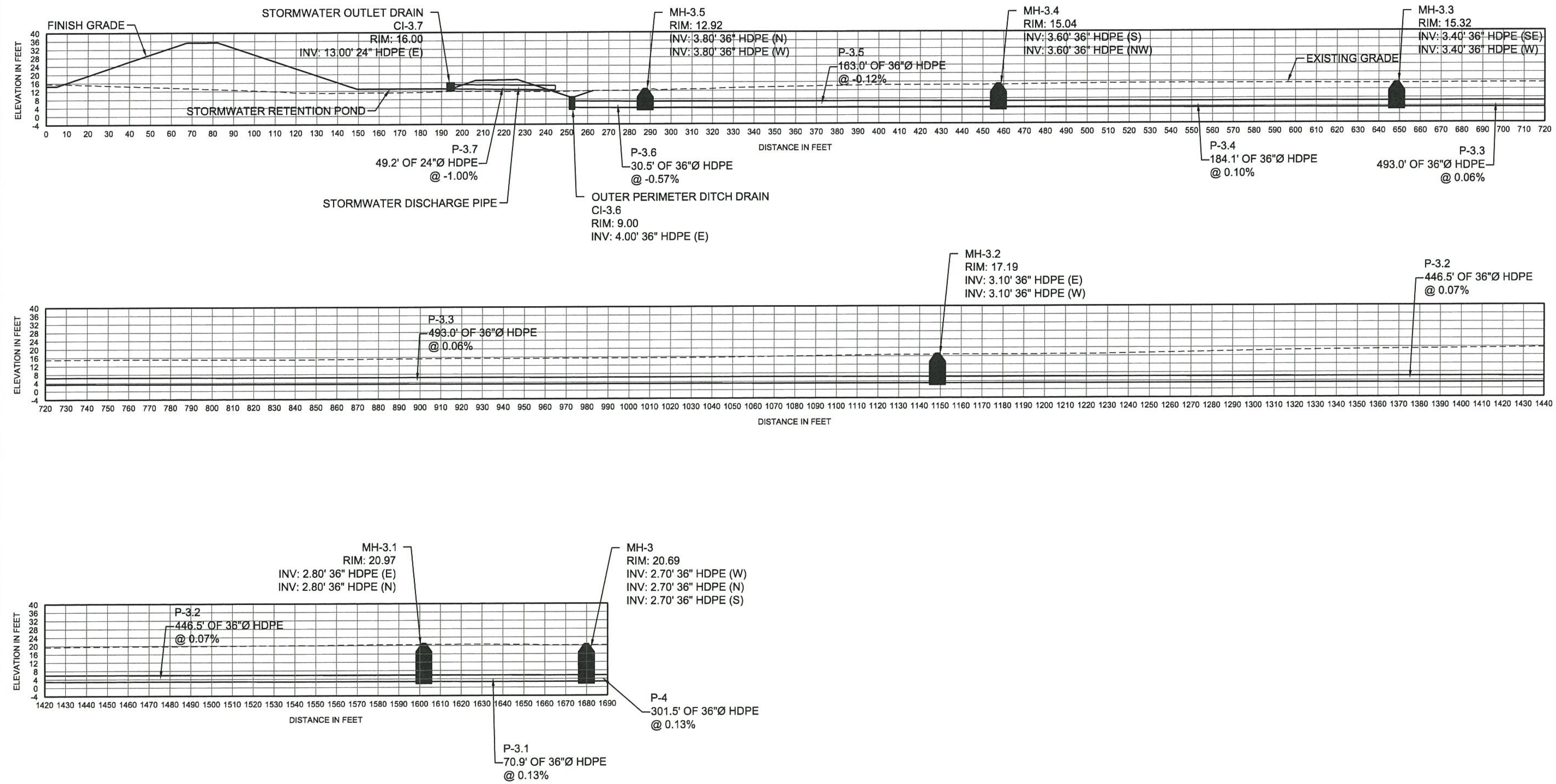

STORMWATER DISCHARGE PIPELINE PROFILE

SCALE: 1" = 50'
V-SCALE: 1" = 50'

0 50'

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CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 24
STORMWATER DISCHARGE PIPELINE PROFILE
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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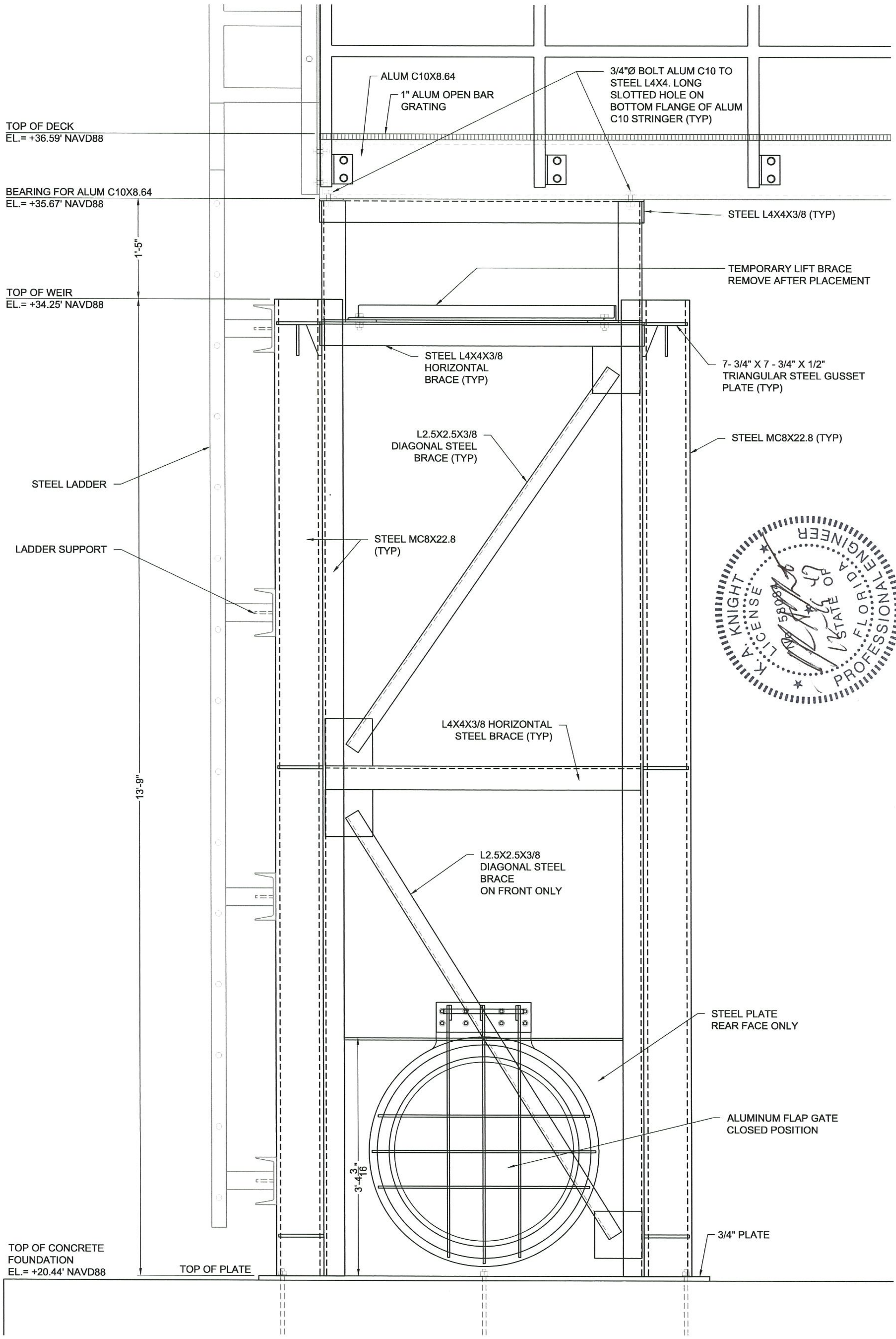

F
F-16

STEEL BOX WEIR FRONT TYPICAL ELEVATION

SCALE: 3/4" = 1'

0 1'

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FIGURE 25
STEEL WEIR FRONT TYPICAL ELEVATION
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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KEITH A. KNIGHT P.E.# 58084 DATE

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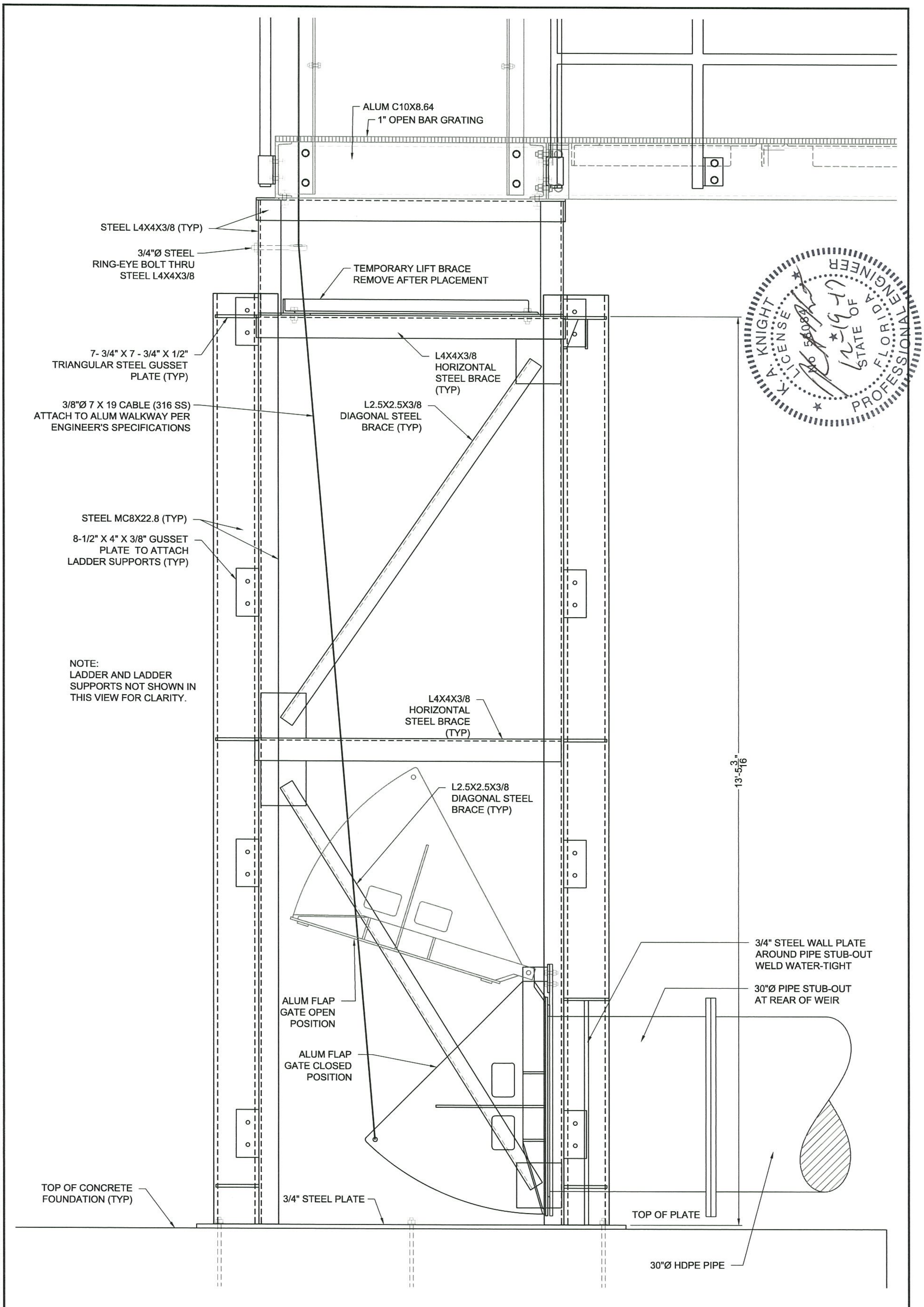

G
F-16

STEEL BOX WEIR SIDE TYPICAL ELEVATION

SCALE: 3/4" = 1'

0 1'

TAYLOR ENGINEERING INC. 10151 DEERWOOD PARK BLVD BLDG 300, SUITE 300 JACKSONVILLE, FLORIDA 32256 CERTIFICATE OF AUTHORIZATION # 4815	FIGURE 26 STEEL WEIR SIDE TYPICAL ELEVATION F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA BREVARD COUNTY, FLORIDA	PROJECT C2015-065 DRAWN BY RLJ SHEET 26 of 35 DATE DECEMBER 2017	SEAL DRAFT KEITH A. KNIGHT P.E.# 58084 DATE

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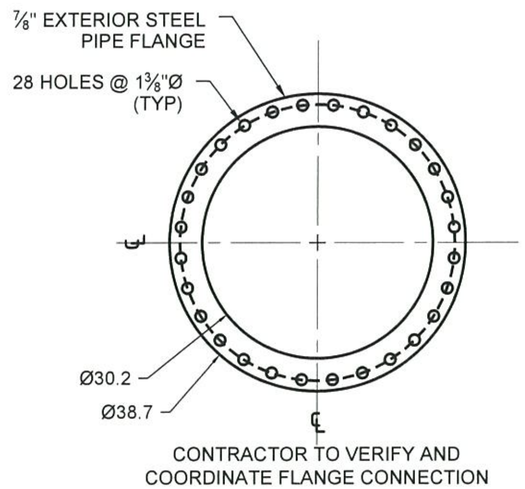
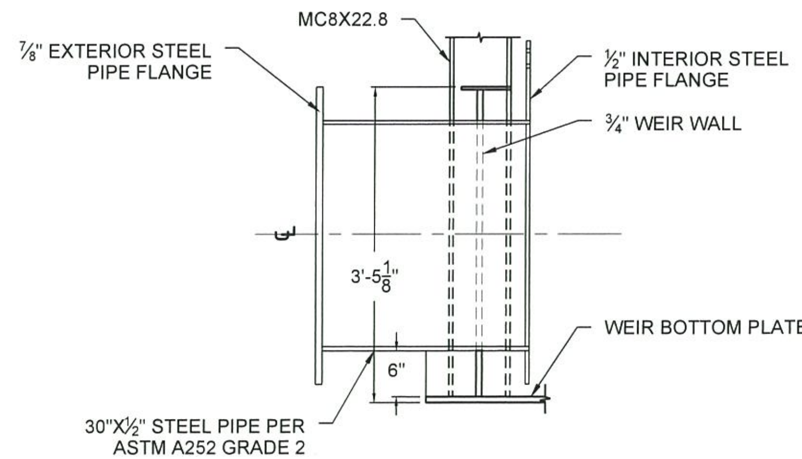
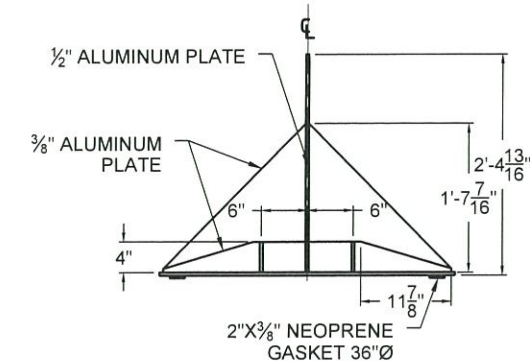


EXTERIOR STEEL PIPE FLANGE
SCALE: 1" = 2'



FLANGED STEEL PIPE STUB
SCALE: 1" = 2'



TOP VIEW

ALUMINUM FLAP GATE
SCALE: 1" = 2'

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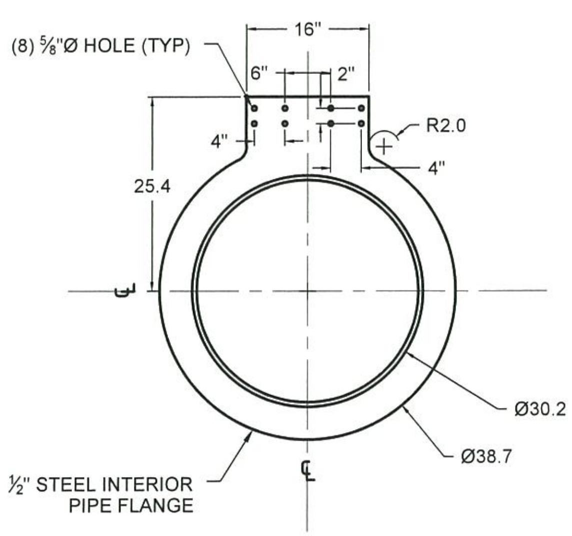
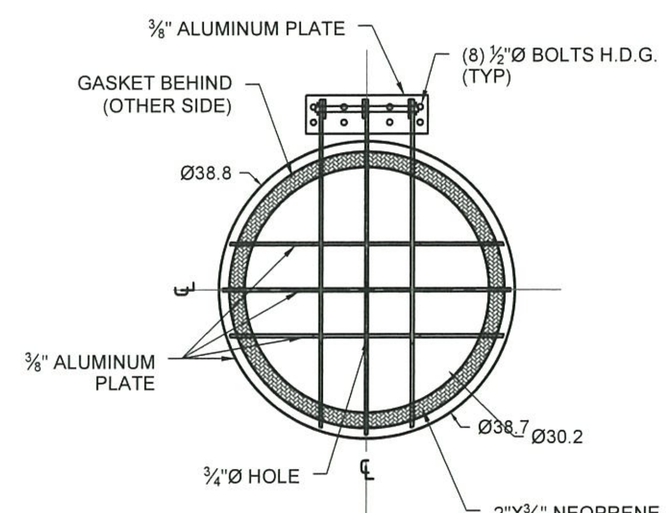
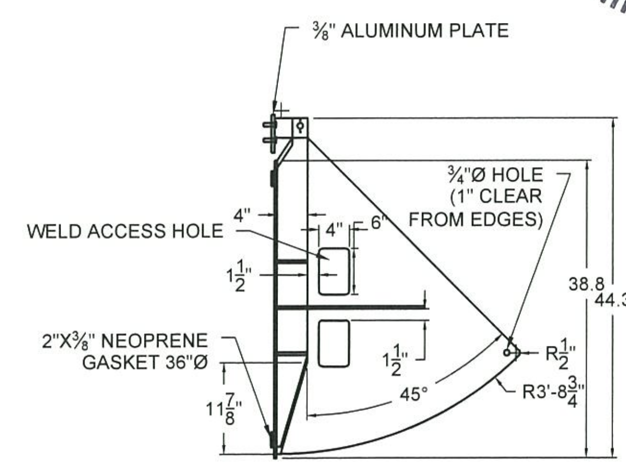


INTERIOR STEEL PIPE FLANGE
SCALE: 1" = 2'



FRONT VIEW

ALUMINUM FLAP GATE
SCALE: 1" = 2'



SIDE VIEW

ALUMINUM FLAP GATE
SCALE: 1" = 2'

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FIGURE 27
FLANGE & FLAP GATE DETAIL
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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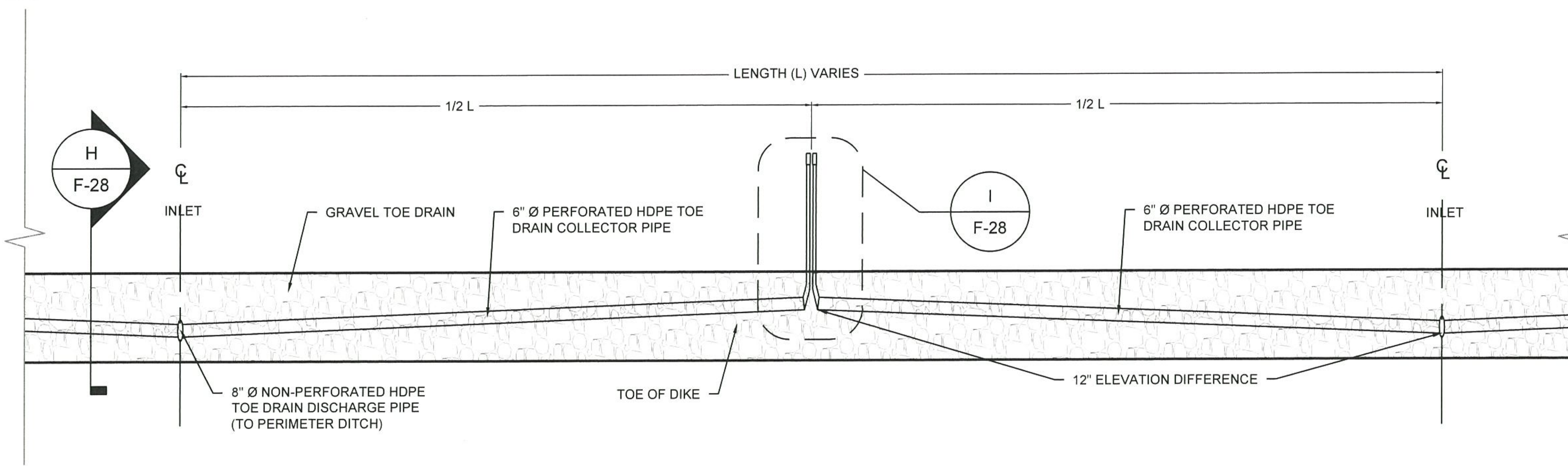
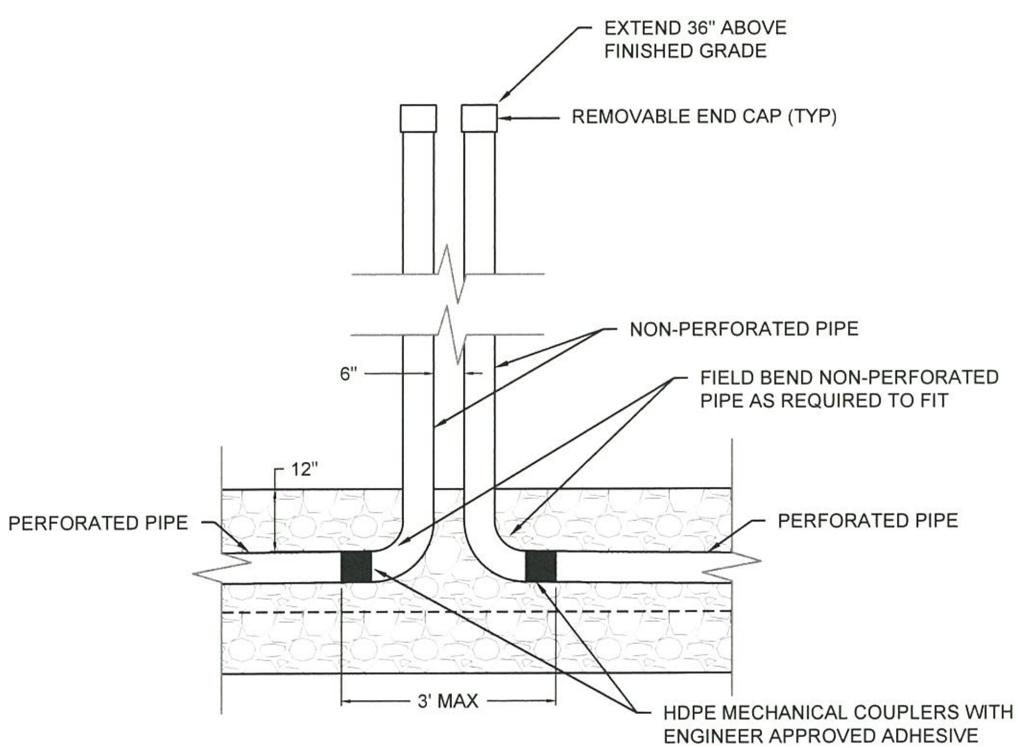
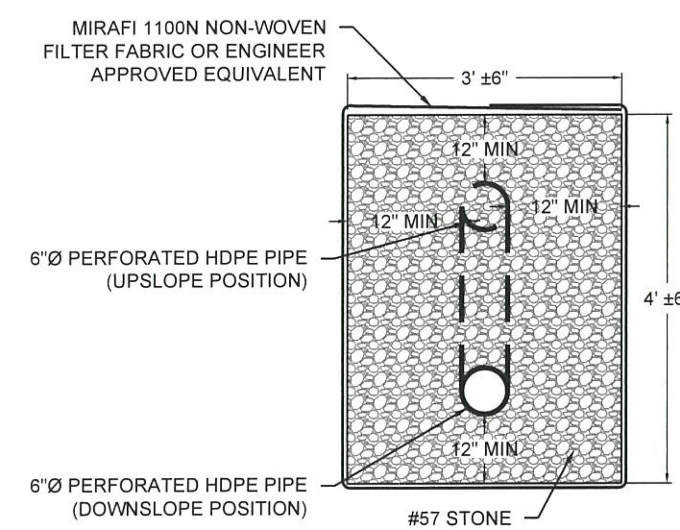


TOE DRAIN TYPICAL ELEVATION VIEW
NOT TO SCALE



I / F-28 **TOE DRAIN DETAIL**
SCALE: 1" = 3'
0 3'



H / F-28 **TYPICAL GRAVEL TOE DRAIN DETAIL**
SCALE: 1" = 2'
0 2'

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CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 28
INTERNAL GRAVEL TOE DRAIN DETAILS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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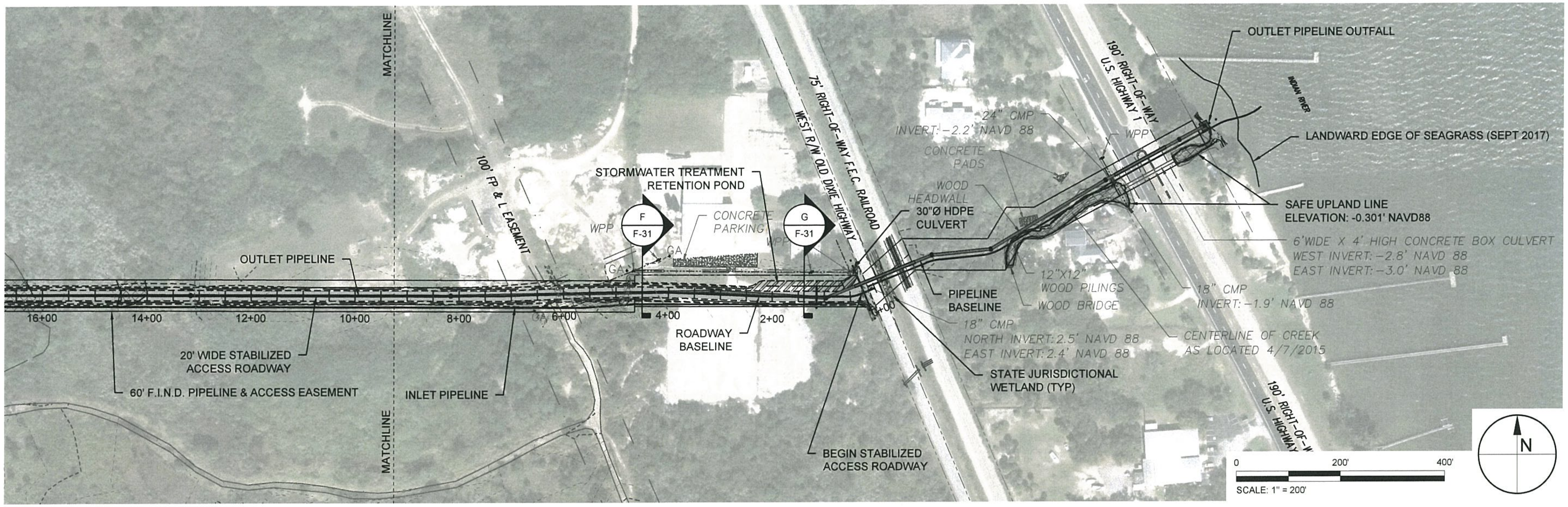

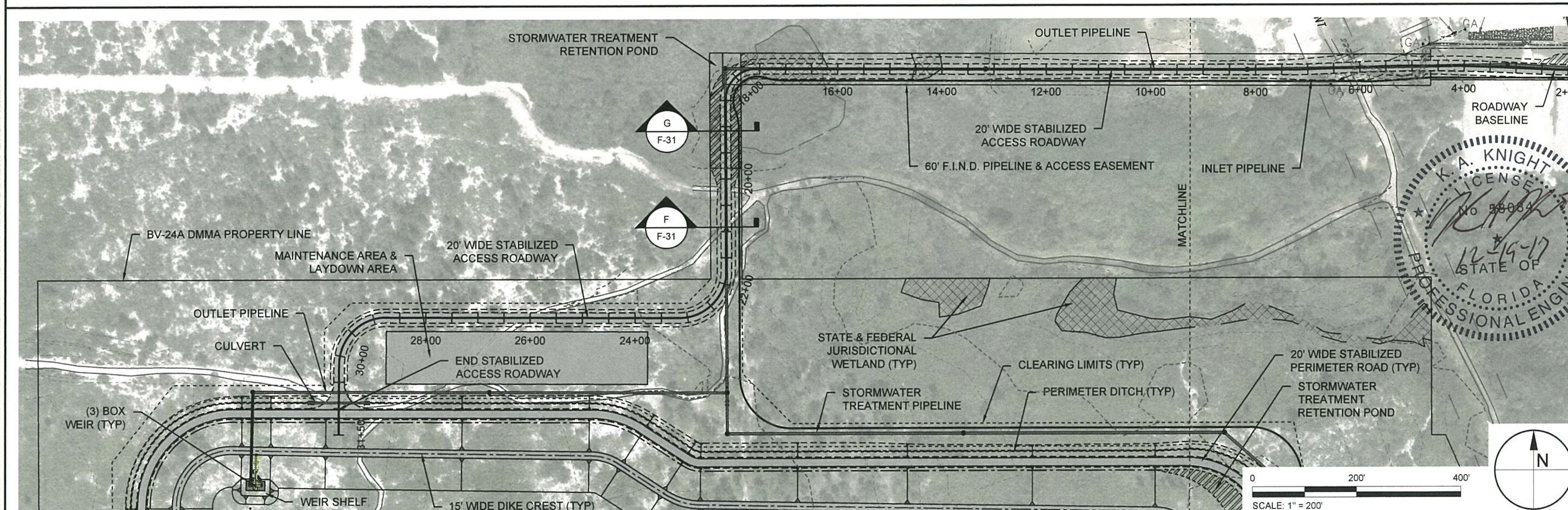

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LICENSE
No 58084
12-15-17
STATE OF FLORIDA
PROFESSIONAL ENGINEER

FIGURE 29
ACCESS ROADWAY PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

TAYLOR ENGINEERING, INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

PROJECT	C2015-065
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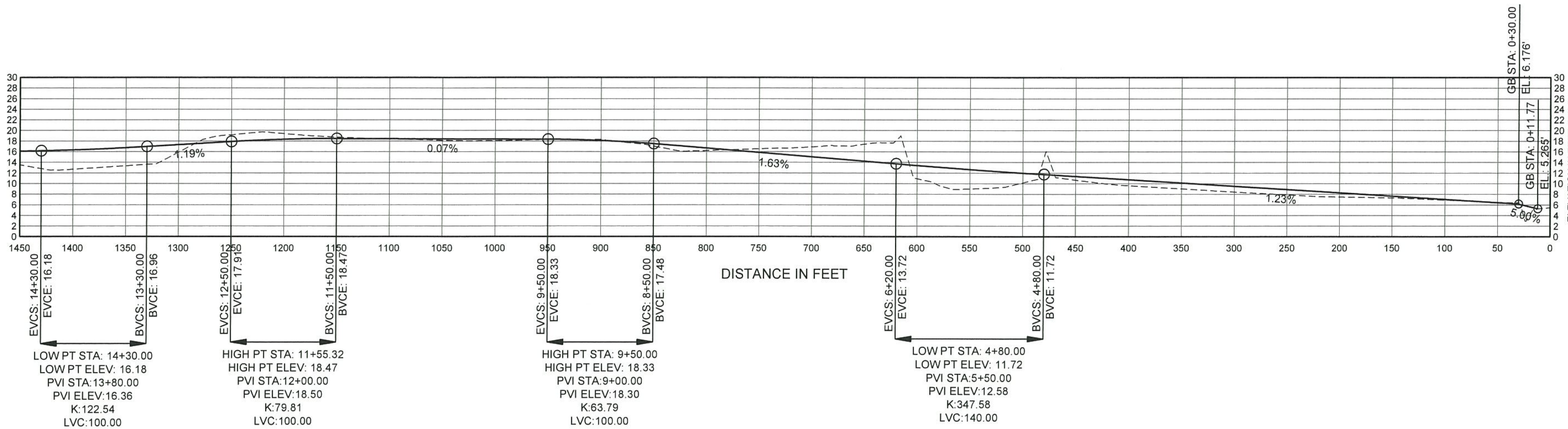
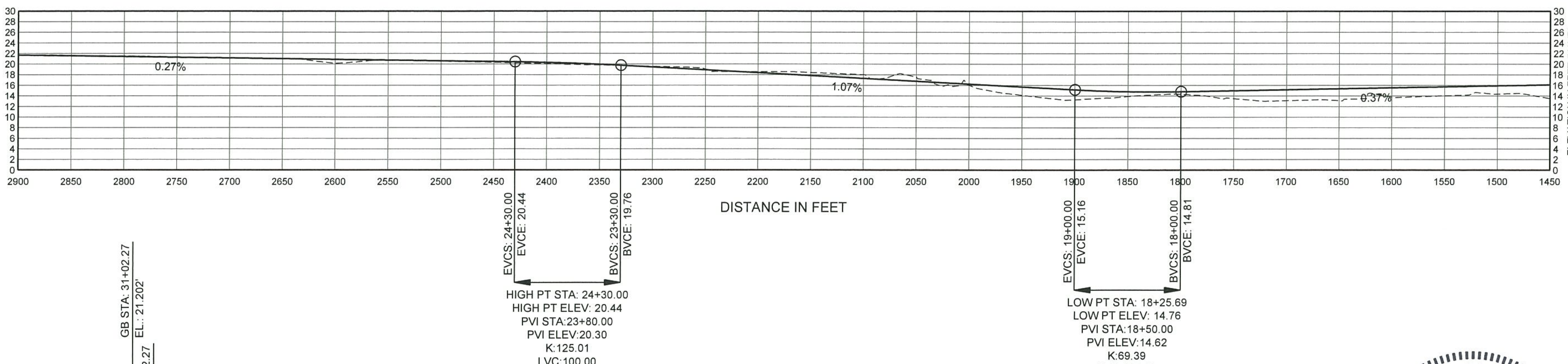
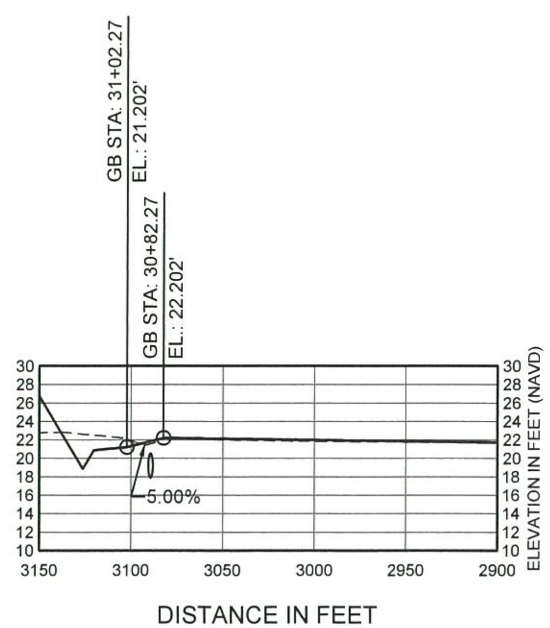


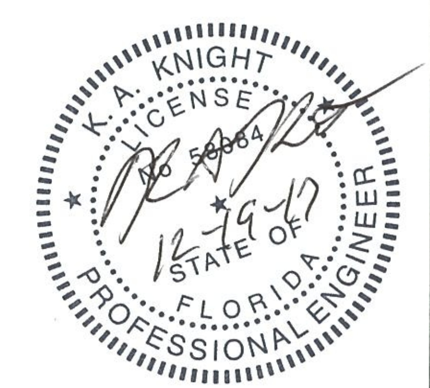




ACCESS ROADWAY DESIGN PROFILE

SCALE: 1" = 100'
V-SCALE: 1" = 20'

0 100'



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PROJECT C2015-065
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DATE DECEMBER 2017

FIGURE 30
ACCESS ROADWAY DESIGN PROFILE
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

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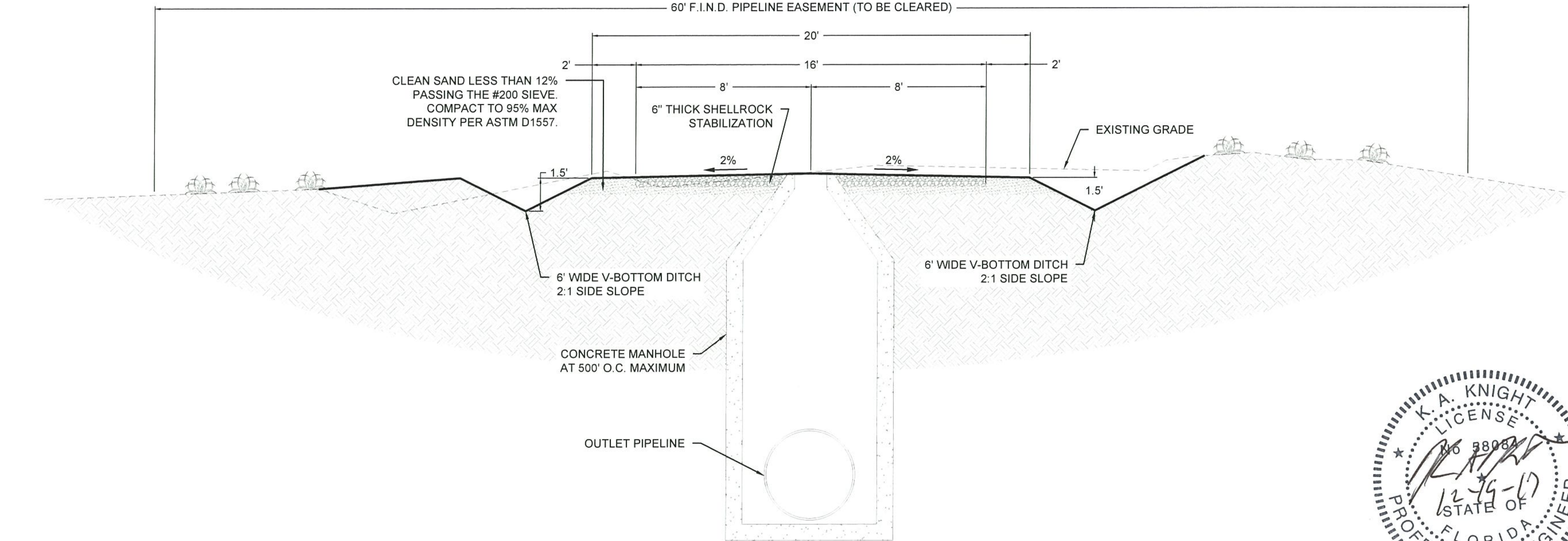
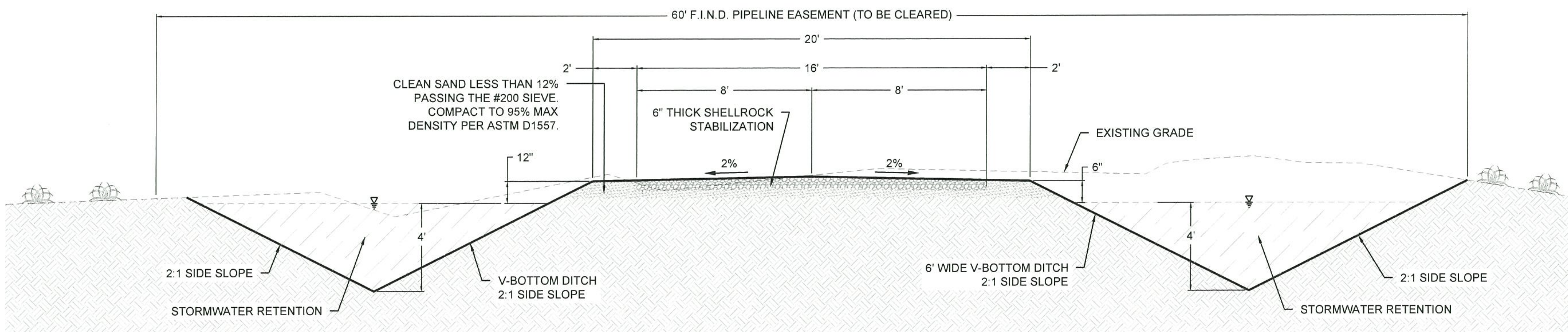


F / F-29 TYPICAL ACCESS ROADWAY SECTION

SCALE: 1" = 5'

0 5'



G / F-29 ACCESS ROADWAY WITH STORMWATER RETENTION SECTION

SCALE: 1" = 5'

0 5'

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TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 31
ACCESS ROADWAY TYPICAL SECTION
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

PROJECT	C2015-065
DRAWN BY	RLJ
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12-19-17

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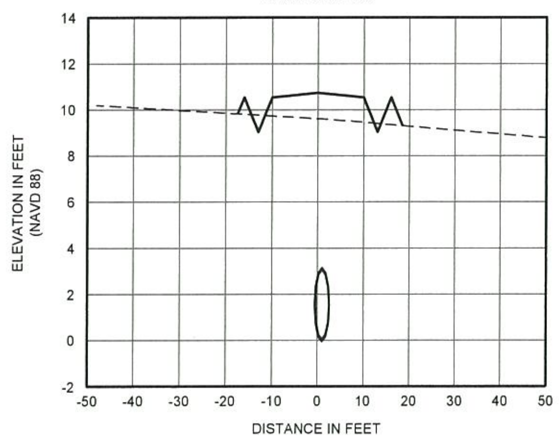
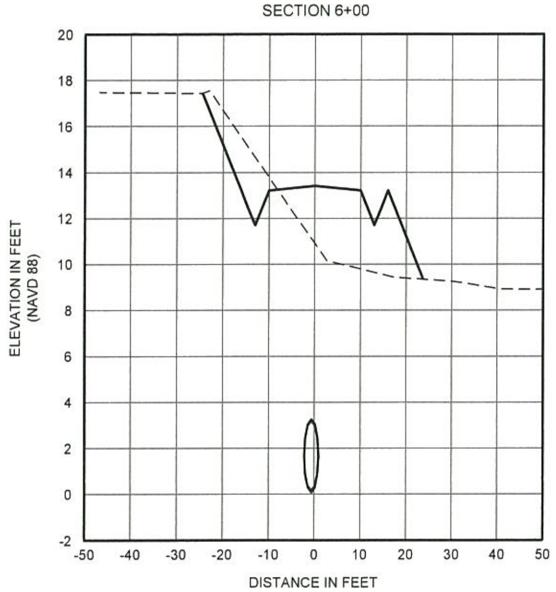
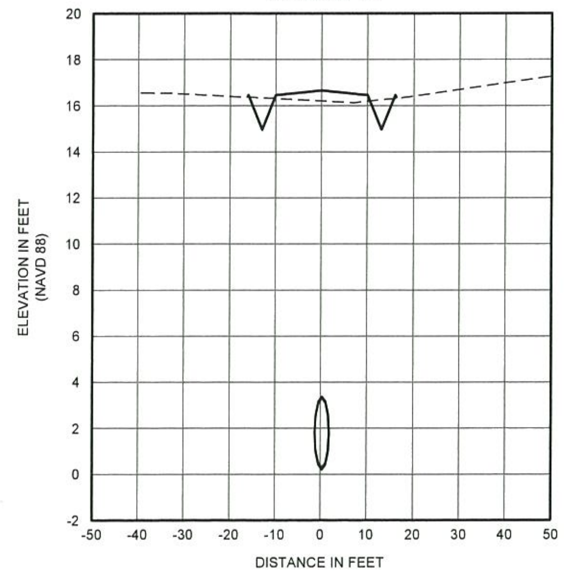
SECTION 4+00



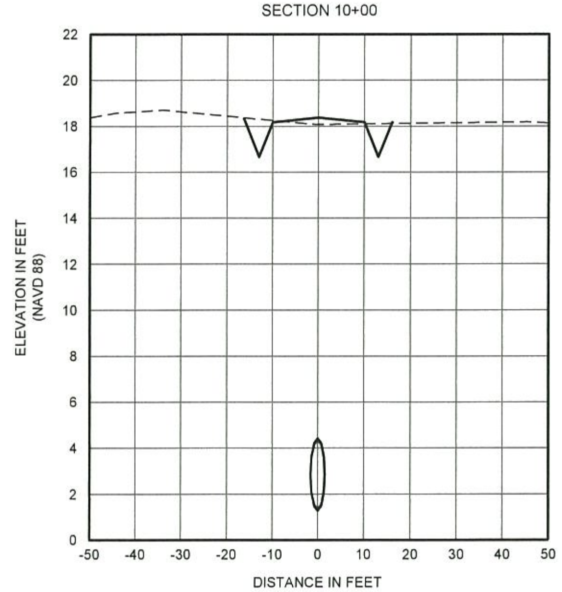
SECTION 6+00



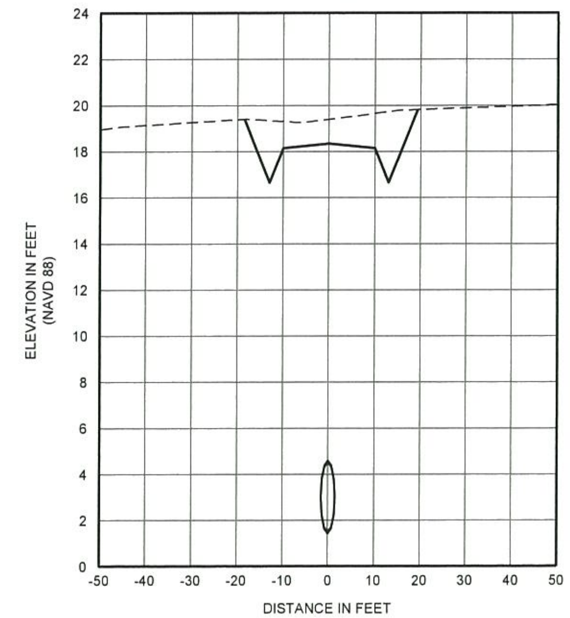
SECTION 8+00



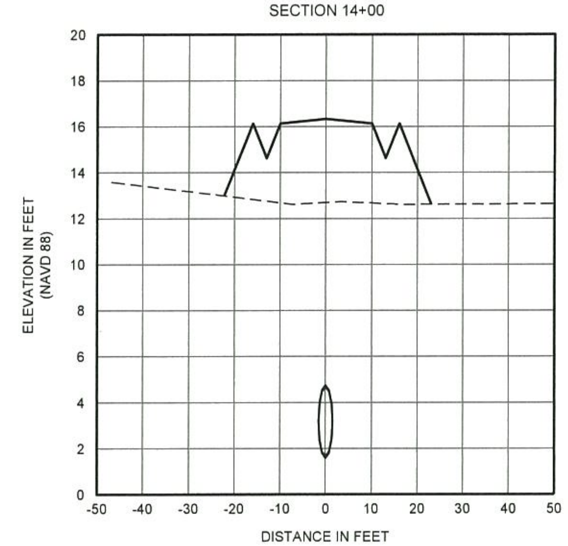
SECTION 10+00



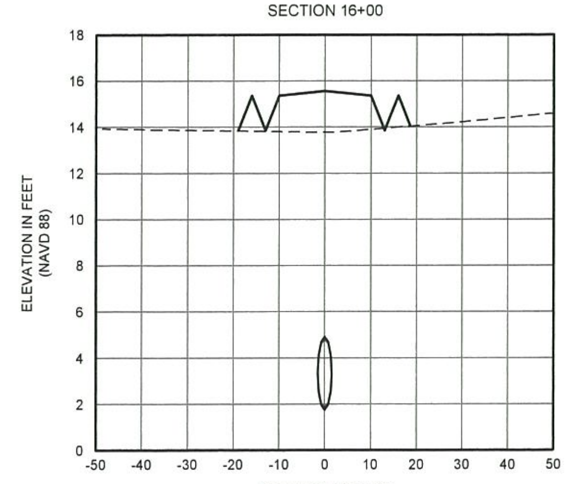
SECTION 12+00



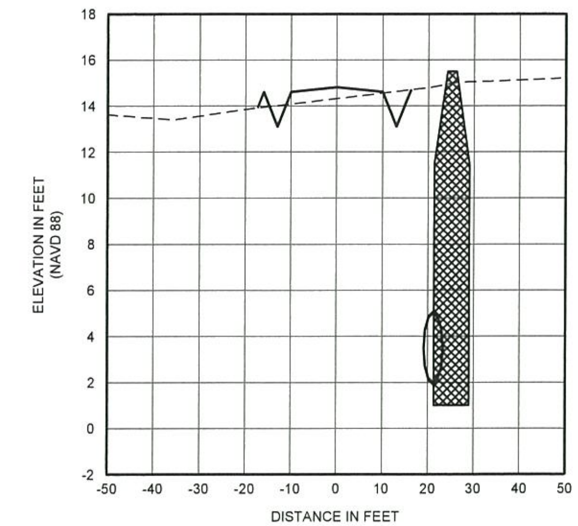
SECTION 14+00



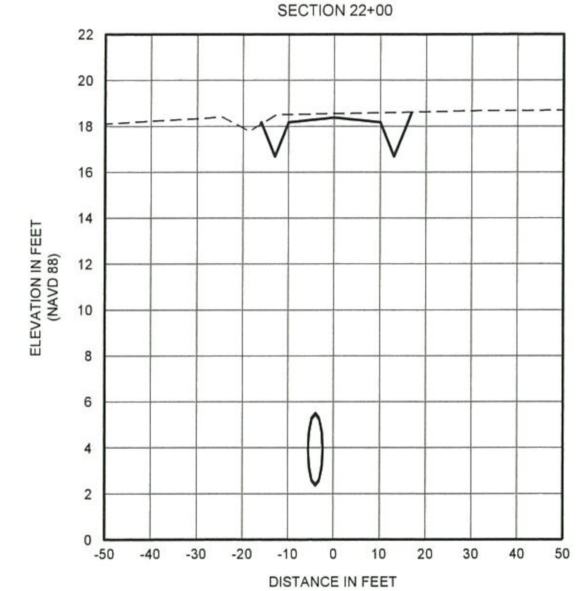
SECTION 16+00



SECTION 18+00



SECTION 22+00



ACCESS ROADWAY SECTIONS

SCALE: 1" = 40'
V-SCALE: 1" = 20'

0 40'

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FIGURE 32
ACCESS ROADWAY SECTIONS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

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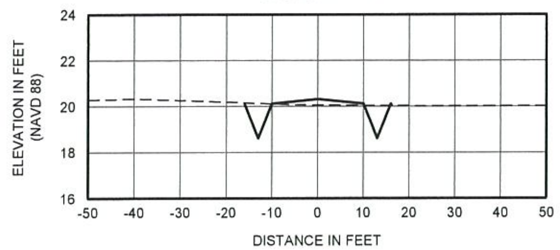
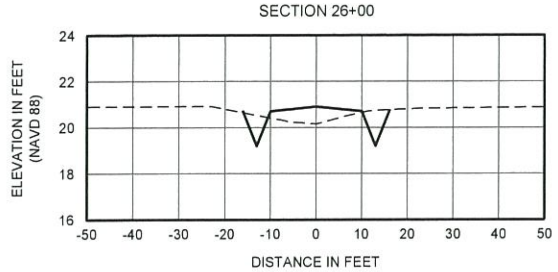
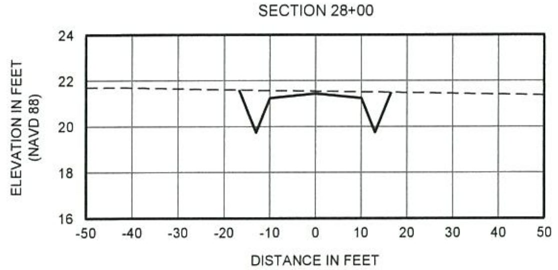
SECTION 24+00



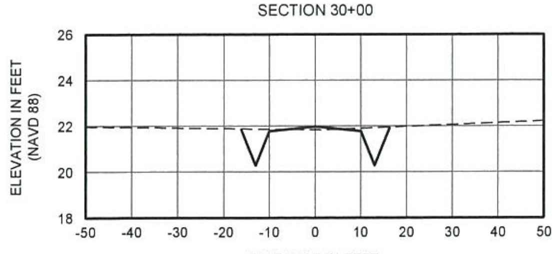
SECTION 26+00



SECTION 28+00



SECTION 30+00



ACCESS ROADWAY SECTIONS

SCALE: 1" = 40'
V-SCALE: 1" = 20'
0 40'

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FIGURE 33
ACCESS ROADWAY SECTION
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

PROJECT C2015-065
DRAWN BY RLJ
SHEET 33 of 35
DATE DECEMBER 2017

SEAL
DRAFT
KEITH A. KNIGHT P.E.# 58084
DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

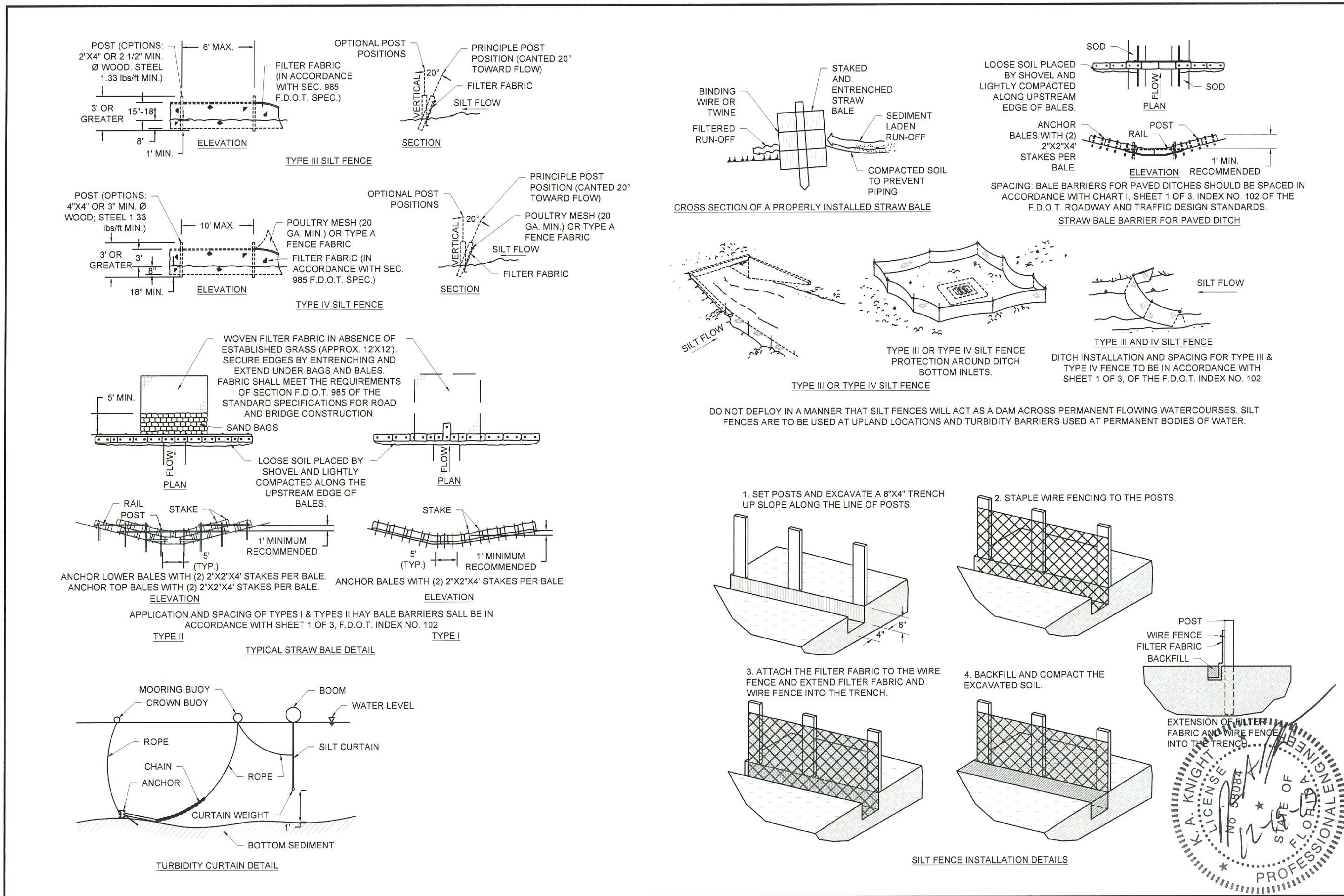

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FIGURE 34
EROSION CONTROL DETAILS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

PROJECT	C2015-065
DRAWN BY	RLJ
SHEET	34 of 35
DATE	DECEMBER 2017

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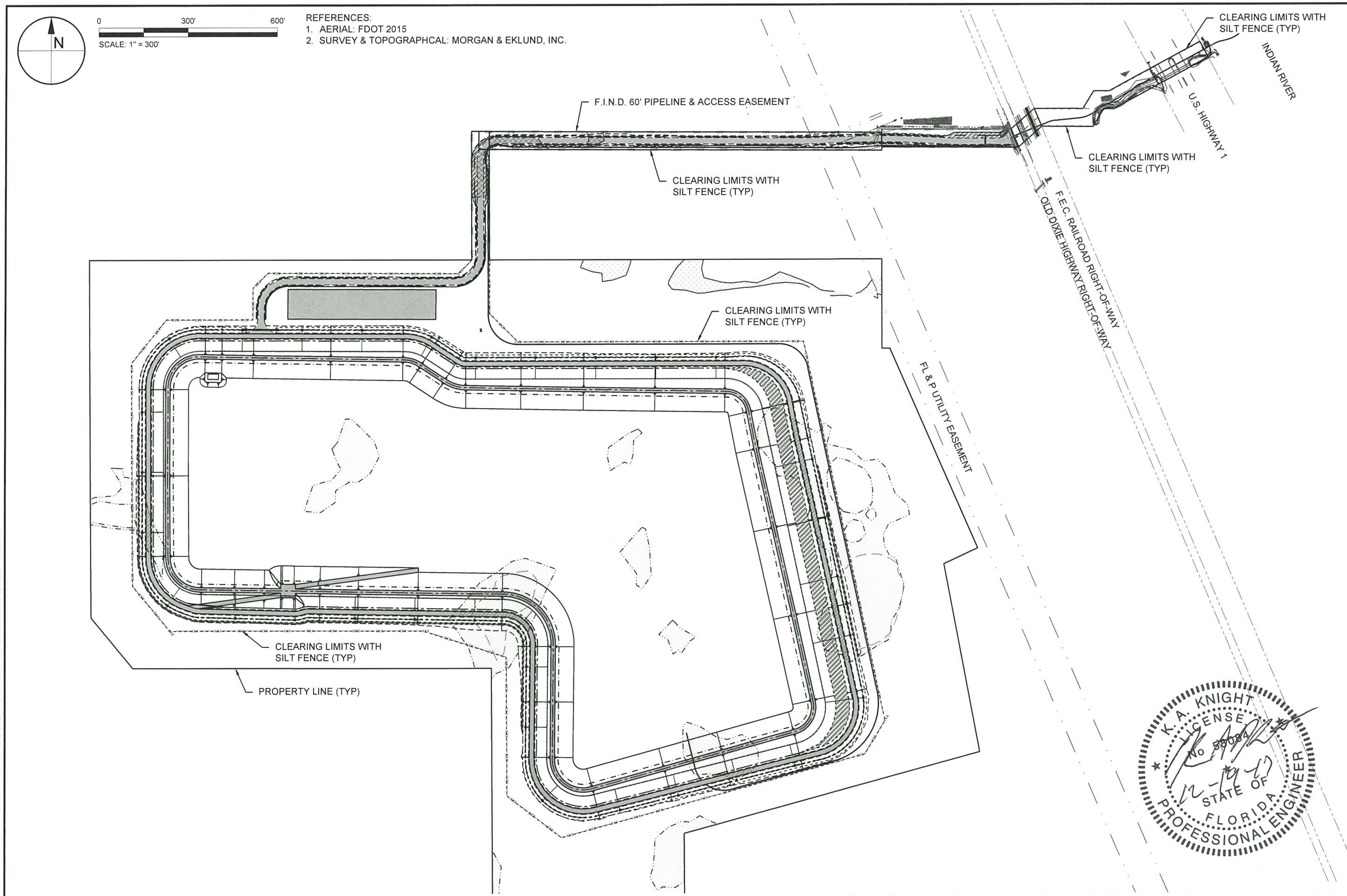

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FIGURE 35
EROSION CONTROL PLAN
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

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DATE	DECEMBER 2017

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ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 3
PHASE I ENVIRONMENTAL SITE ASSESSMENT

TAYLOR ENGINEERING, INC.

Phase I Environmental Site Assessment

Florida Inland Navigation District
Dredged Material Management Area BV-24A
Brevard County, Florida
June 2015

10151 Deerwood Park Blvd., Building 300, Suite 300
Jacksonville, Florida 32256
904-731-7040 | www.taylorengineering.com

PHASE I ENVIRONMENTAL SITE ASSESSMENT

Dredged Material Management Area BV-24A
Brevard County, Florida

Prepared for

Florida Inland Navigation District

by

Taylor Engineering, Inc.
10151 Deerwood Park Blvd
Building 300, Suite 300
Jacksonville, Florida 32256
(904) 731-7040

June 2015
C2015-014

EXECUTIVE SUMMARY

Taylor Engineering, Inc., under contract to the Florida Inland Navigation District (FIND), performed a Phase I Environmental Site Assessment for dredged material management area (DMMA) BV-24A and associated pipeline easement in Brevard County, Florida. The assessment documents the environmental condition of the site with respect to the likely presence or observed presence of hazardous substances or petroleum products. Tasks for the BV-24A assessment included an examination of topographic maps and aerial photographs; an environmental records search; interviews with the property owners and state/local environmental agency staff; and site reconnaissance.

The BV-24A assessment area comprises approximately 116 acres. The main BV-24A site includes property owned by FIND, Brevard County, and the Town of Grant-Valkaria. The 60-foot wide pipeline easement north and east of the site includes several privately-owned properties and portions of Old Dixie Highway, US Highway 1, and the Florida East Coast Railway.

A review of the historic aerials (dating back to 1943) and the site reconnaissance shows the BV-24A site as largely undeveloped and relatively isolated from surrounding land use changes. One inactive industrial site (Oldcastle Coastal facility), located partially within the pipeline easement, is visible in the photographs and noted during the site reconnaissance. Notable features within the assessment area (limited to the pipeline easement) include a previously excavated and filled borrow pit and areas containing dumped fill material. Notable off-site features include the two undocumented ASTs located on the Oldcastle Coastal facility and areas of dumped fill material.

A search of various federal and state agency environmental databases (EDR and Florida Department of Environmental Protection (FDEP) petroleum databases) identified 6 facilities near BV-24A. The Oldcastle Coastal facility (located adjacent) was listed in the Facility Index System (FINDS), Domestic and Industrial Wastewater Facilities (NPDES), Air Resources Management (AIRS), and Tier 2 databases. The Ranger Construction facility was listed as a Resource Conservation and Recovery Act (RCRA) Non Generator (NonGen) and appeared in the AIRS list. The Pence Septic System facility was listed as a RCRA/NonGen, appeared in the FINDS and AIRS lists, and was listed by the state and tribal storage tank list as having in service Above Ground Storage Tanks (AST). The Cemex – Valkaria Ready Mix facility was listed on the state and tribal storage tank list as having three closed in place Underground Storage Tanks (UST), two removed ASTs, and one in service AST. The Hudgins Fish Co., Inc. was listed by the state and tribal leaking storage tank list as having one removed UST with an associated Leaking Underground Storage Tank (LUST) incident with a discharge cleanup status of No Further Action (NFA). The USAF Valkaria MIS AX facility was listed as a Formerly Used Defense Sites (FUDS) property. With the exception of the Oldcastle facility, none of the listed facilities appear likely to affect BV-24A.

The results of this Phase I Environmental Site Assessment — the previously excavated and filled borrow area within the easement, the two undocumented ASTs located slightly upgradient from the pipeline easement, and the areas of dumped fill material within easement — suggest the possible occurrence of hazardous substances or petroleum products in the pipeline easement within the vicinity of the Oldcastle Coastal facility. The occurrence of these features may warrant a Phase II Environmental Site Assessment depending on the intended use of the pipeline easement. If future FIND project construction requires excavation of materials within the easement (e.g., associated with a permanent buried pipeline), Taylor Engineering recommends a limited Phase II Environmental Site Assessment to screen for soil or groundwater contamination in the easement.

A Phase II Environmental Site Assessment is typically an iterative and progressive process. The Phase II assessment process provides information to confirm the actual presence of hazardous substances or petroleum products or provides data to support an opinion that there is no reasonable possibility of site impacts from the observed environmental conditions.

As is typical, this Phase I Environmental Site Assessment was a modest preliminary investigation of existing site conditions. Notably, a Phase I Environmental Site Assessment can fail to uncover problems existing at a given location. This is especially true of underground conditions, which defy evaluation by surface observations. To the best of the authors' knowledge, the information contained in this report is factual. Taylor Engineering, however, makes no representations regarding the accuracy of information obtained from other sources. Taylor Engineering limits its liability to fraudulent statements or gross negligence.

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1.0 INTRODUCTION

1.1 Purpose

Taylor Engineering, Inc., under contract to the Florida Inland Navigation District (FIND), conducted a Phase I Environmental Site Assessment for the proposed dredged material management area (DMMA) BV-24A and associated pipeline easement in Brevard County, Florida. The assessment documents the environmental condition of the site with respect to the likely presence or observed presence of hazardous substances or petroleum products. Toward this end, Taylor Engineering assessed the condition of the BV-24A project area and adjacent properties and conducted an environmental records search for contaminated properties within one and one half miles of the site boundaries. This report documents the results of this Phase I Environmental Site Assessment, performed in general accordance with American Society for Testing and Materials (ASTM) Standard E1527-13.

1.2 Limitation and Exceptions of Assessment

A Phase I Environmental Site Assessment makes use of reasonably ascertainable information to identify recognized environmental conditions pertaining to hazardous substances or petroleum products at a given site. To the best of the authors' knowledge, this report contains factual information. Taylor Engineering, however, makes no representations regarding the accuracy of information obtained from other sources. Taylor Engineering limits its liability to fraudulent statements or gross negligence.

As is typical, this Phase I Environmental Site Assessment was a modest preliminary investigation of existing site conditions. Notably, a Phase I Environmental Site Assessment can fail to uncover problems existing at a given location. This is especially true of underground conditions, which defy evaluation by surface observations. The absence of visual signs of contamination does not prove that the site is free of contamination nor does the presence of visual signs of contamination indicate that the site is extensively contaminated.

1.3 Methodology

The following tasks comprised the BV-24A assessment:

- **Review general physical setting** — General topographic information for the site and adjacent areas came from the United States Geological Survey (USGS) Grant Quad, FL 7.5', 1:24,000 quadrangle map. General information about soils and subsurface conditions came from the United States Department of Agricultural (USDA) website http://websoilsurvey.sc.egov.usda.gov/app/WebSoilSurvey.aspx.

- **Review past land use** — Four black and white photographs, downloaded from the Florida Department of Transportation (FDOT) Office of Surveying and Mapping website https://fdotewp1.dot.state.fl.us/AerialPhotoLookUpSystem, two black and white photographs downloaded from the Google Earth website https://www.google.com/earth, and five color photographs downloaded from the Google Earth website were used to document the land use history of the BV-24A assessment area. The photographs document site conditions in 1943, 1958, 1983, 1994, 1999, 2004, 2007, 2010, 2013 and 2014 (Appendix A). In addition to the photographic review, Taylor Engineering sent questionnaires to the landowners and user to solicit information regarding land use and any known hazardous substances or petroleum product issues. Questionnaires were emailed to Jenny Ashbury (Brevard County, representing the landowner) and Mark Crosley (Executive Director, FIND; representing the landowner and user). Ms. Ashbury returned the questionnaire via email on June 6, 2015 and Mr. Crosley returned the questionnaire via email on June 2, 2015 (Appendix C).

- **Review regulatory agency environmental databases** — A search of federal and state environmental databases dealing with toxic and hazardous substances or petroleum products identified facilities with known environmental problems on or within one and one half miles of the BV-24A assessment area. Environmental Data Resources, Inc. (EDR) provided the environmental records information on April 30, 2015.

The EDR records search included the federal and state ASTM standard databases listed below. The agency release date for the database follows each listed database. Appendix B provides records from ASTM standard databases and other supplemental databases including Local Brownfield list, Local Lists of Landfill/Solid Waste Disposal Sites, Local Lists of Hazardous waste/Contaminated Sites, Local Land Records, Records of Emergency Release Reports, and other ascertainable records.

Federal Databases

- National Priorities List (NPL) site list - January 2014
- Federal Delisted NPL site list – January 2014
- Federal Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list – October 2013
- Federal CERCLIS No Further Remedial Action Planned (NFRAP) site list – October 2013
- Federal Resource Conservation and Recovery Act (RCRA) Corrective Action Report (CORRACTS) facilities list – December 2014
- Federal RCRA non-CORRACTS Treatment, Storage, and Disposal (TSD) facilities list – December 2014
- Federal RCRA generators list – December 2014
- Federal institutional controls/engineering controls registries – September/December 2014
- Federal Emergency Response Notification System (ERNS) list – September 2014

State Databases

- State and tribal – equivalent CERCLIS - January 2015
- State and tribal leaking storage tank lists – see Appendix B page 5
- State and tribal registered storage tanks – see Appendix B page 6
- State and tribal institutional control/engineering control registries – March 2015
- State and tribal voluntary cleanup sites – See Appendix B page 9
- State and tribal Brownfields sites – March/April 2015

In addition to the search of federal and state environmental databases dealing with toxic and hazardous substances or petroleum products, Taylor Engineering reviewed a previous Phase I Environmental Assessment conducted by Taylor Engineering (2002) for FIND-owned BV-24. Taylor Engineering also contacted the following agency staff to obtain information about other potential problems related to hazardous substances or petroleum products on or near the BV-24A assessment area (Appendix C).

- Mr. Bret LeRoux, P.G., Storage Tanks Manager, FDEP Central District
- Mr. Dave Maher, Brevard County Environmental Remediation and Compliance, Site Manager/RA Specialist
- Ms. Duan Festa, FDEP Central District
- Lieutenant Nelson, Brevard County Fire Department

- **Site reconnaissance** — On May 22 and June 5, 2015, Taylor Engineering staff (Chris Ellis and Noah Adams) conducted a site reconnaissance to observe existing conditions on and near the BV-24A assessment area. The reconnaissance entailed a systematic walk through the site to observe readily accessible areas. As is typical, a Phase I Environmental Site Assessment provides visual observations of on-site conditions to identify signs of contamination; it does not entail sampling or analysis. Appendix D contains the photograph key and photographs taken during the site reconnaissance.

2.0 SITE DESCRIPTION AND HISTORICAL USE

2.1 Location

As **Figure 2.1** shows, the DMMA BV-24A locates in southeast Brevard County approximately 1.30 miles south-southeast of the Valkaria Road and Old Dixie Highway intersection (Sections 20 and 21, Township 29 South, Range 38 East). The ±116-acre site lies north of Atlantic Ridge Lane and east of Old Dixie Highway. The 60-foot wide pipeline easement extends approximately 400 feet off the northern boundary of the site and then east approximately 2,450 feet until reaching the Indian River shoreline.

2.2 Ownership

The BV-24A assessment area (including the pipeline easement) includes a large number of parcels owned by FIND, Brevard County, the Florida East Coast Railway, the Town of Grant-Valkaria, and four private individual owners. Table 2.2 and Figure 2.2 below provide the location, acreage, ownership, parcel numbers and map identification for the parcels as recorded by the Brevard County Property Appraiser.

2.3 Site and Vicinity Characteristics

Knowledge of the physical setting provides a framework for identifying potential sources of contamination and the distribution of contaminants should they occur on or near the site. This section describes the general physical setting, topography, drainage features, soils, and subsurface conditions of the BV-24A assessment area. Unless otherwise noted, the information in this section came from sources cited in Section 1.3.

The Grant, FL USGS 7.5’ 1:24,000 quadrangle map (Figure 2.3) shows DMMA BV-24A as relatively flat with an elevation ranging between +10 and +20 ft NGVD (National Geodetic Vertical Datum).

The BV-24A assessment area is largely undeveloped with only the central and eastern sections of the 60-foot wide pipeline easement containing permanent structures. Based on the Florida Natural Area Inventory (FNAI) community type descriptions, the majority of the site consists of upland mesic flatwoods and scrubby flatwoods with isolated pockets of depression marsh interspersed throughout the

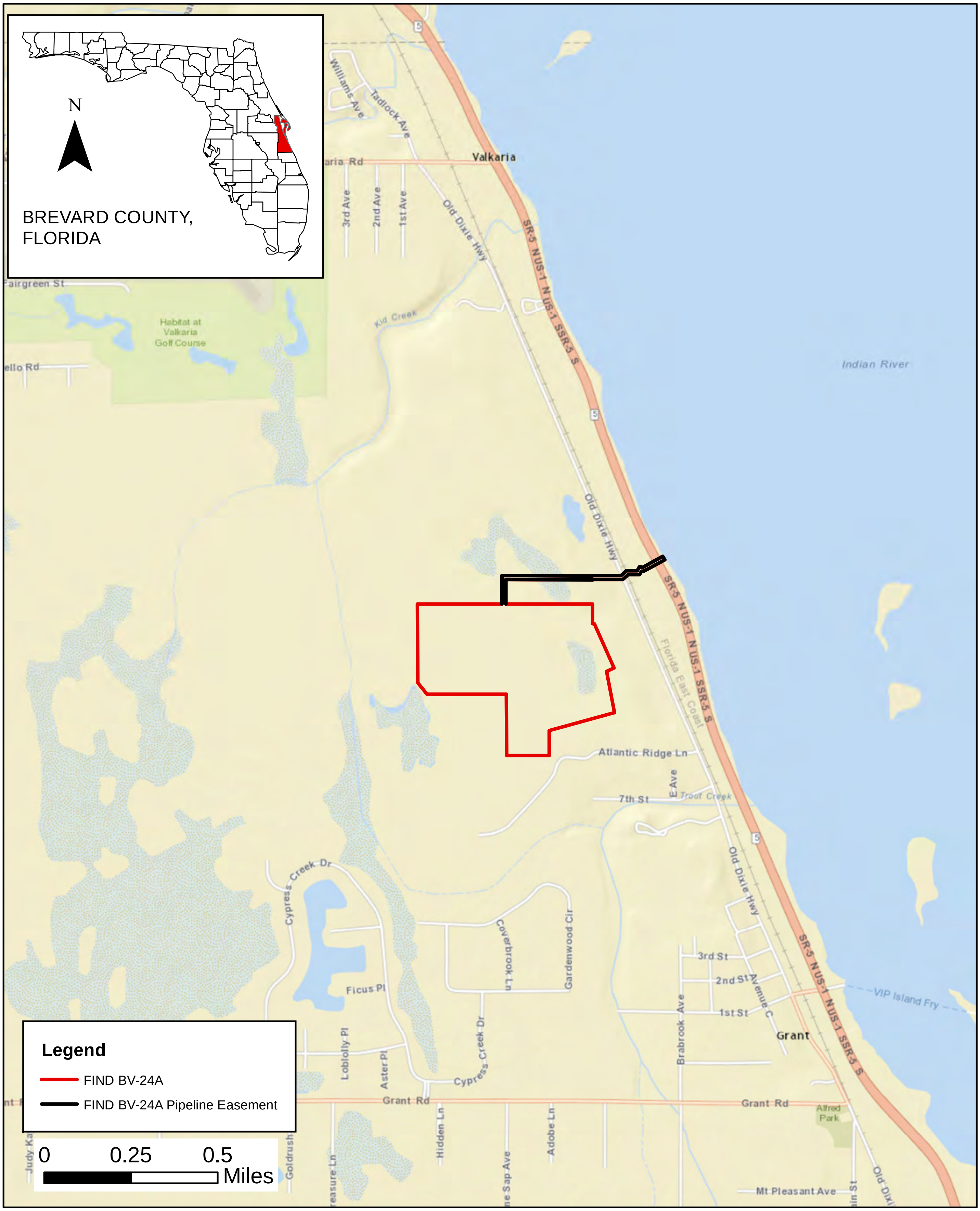

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FIGURE 2.1
LOCATION MAP
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

PROJECT	C2015-014
DRAWN BY	NA
SHEET	
DATE	JUNE 2015

Table 2.1 BV-24A Property Ownership

Property Owner	Parcel Map ID (see Figure 2.2)	Parcel Number	Area (Acres)
FIND	1	29-38-20-00-00061.0-0000-00	0.01
	2	29-38-20-00-00774.0-0000.00	0.16
	3	29-38-20-00-00760.0-0000.00	1.14
	4	29-38-20-00-00832.0-0000.00	1.14
	5	29-38-20-00-00819.0-0000.00	1.14
	6	29-38-20-00-00799.0-0000.00	1.13
	7	29-38-20-00-00763.0-0000.00	1.40
	8	29-38-20-00-00758.0-0000.00	1.40
	9	29-38-20-00-00820.0-0000.00	1.40
	10	29-38-20-00-00798.0-0000.00	1.35
	11	29-38-20-00-00762.0-0000.00	1.40
	12	29-38-20-00-00831.0-0000.00	1.40
	13	29-38-20-00-00800.0-0000.00	1.40
	14	29-38-20-00-00789.0-0000.00	1.35
	15	29-38-20-00-00833.0-0000.00	1.40
	16	29-38-20-00-00830.0-0000.00	1.40
	17	29-38-20-00-00775.0-0000.00	1.40
	18	29-38-20-00-00777.0-0000.00	1.35
	19	29-38-20-00-00802.0-0000.00	1.44
	20	29-38-20-00-00829.0-0000.00	1.44
	21	29-38-20-00-00785.0-0000.00	1.44
	22	29-38-20-00-00818.0-0000.00	1.40
	23	29-38-20-00-00803.0-0000.00	1.44
	24	29-38-20-00-00828.0-0000.00	1.44
	25	29-38-20-00-00821.0-0000.00	1.44
	26	29-38-20-00-00797.0-0000.00	1.40
	27	29-38-20-00-00850.0-0000.00	0.13
	28	29-38-20-00-00804.0-0000.00	1.26
	29	29-38-20-00-00827.0-0000.00	1.38
	30	29-38-20-00-00822.0-0000.00	1.38
	31	29-38-20-00-00766.0-0000.00	1.33
Florida East Coast Railway LLC	32	29-38-21-00-00289.0-0000.00	0.15
Town of Grant-Valkaria	33	29-38-20-00.00039.0-0000.00	4.31
Brevard County	34	29-38-21-00-00511.0-0000.00	69.81
Alfred R. Agarie	35	29-38-21-00-00274.0-0000.00	1.81
Bruce W. / Craig R. Graham	36	29-38-21-00-00269.0-0000.00	0.61
Glen Davies	37	29-38-21-00-00268.0-0000.00	0.32
David /Joan Moalem Trustees	38	29-38-21-00-00266.0-0000.00	0.24

Source: Brevard County Property Appraiser, May 2015

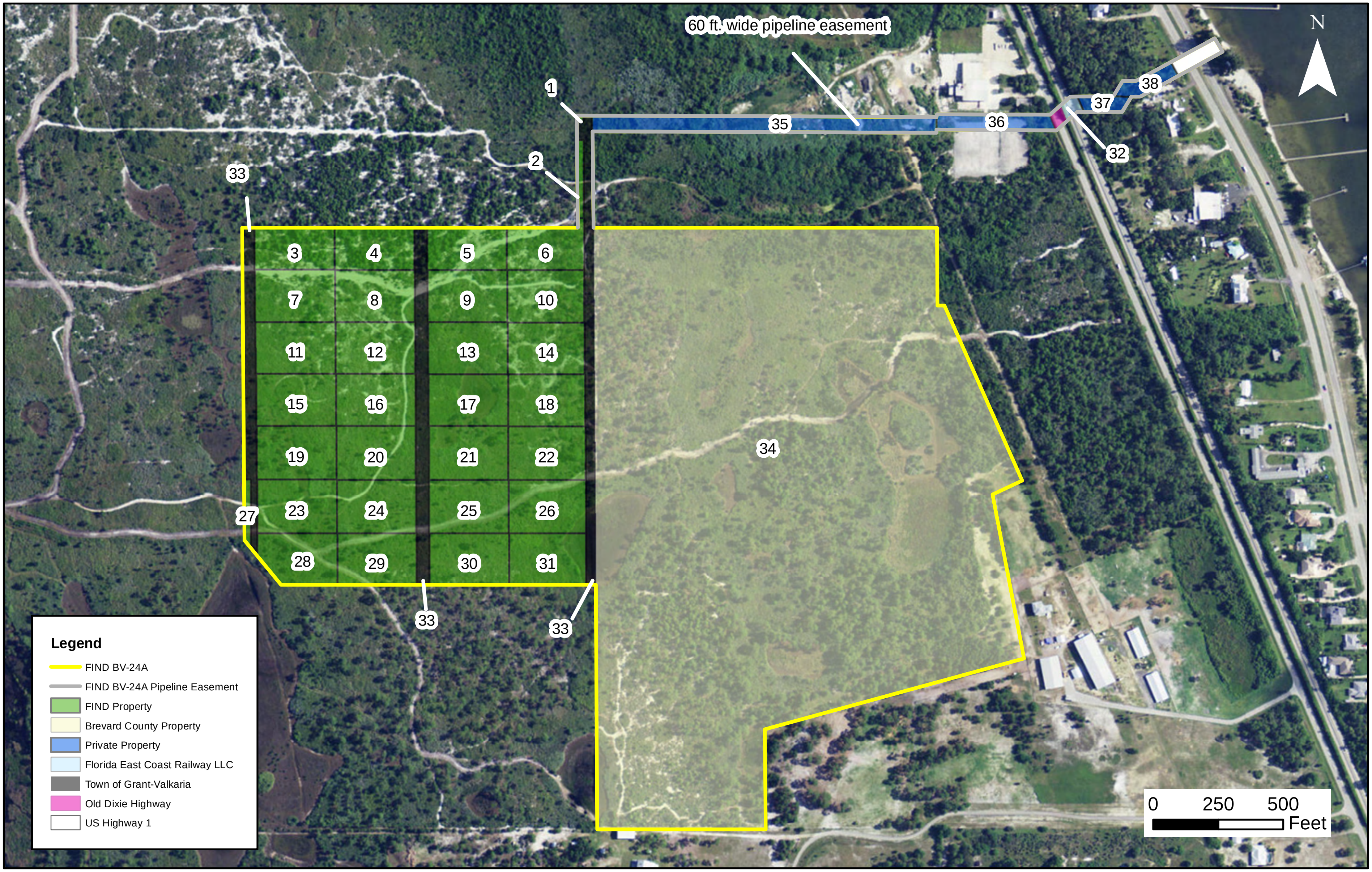

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FIGURE 2.2
PARCEL MAP
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

Notes:

1. Basemap Source: ESRI, Digital Globe, GeoEye
2. Horizontal Datum: NAD 1983

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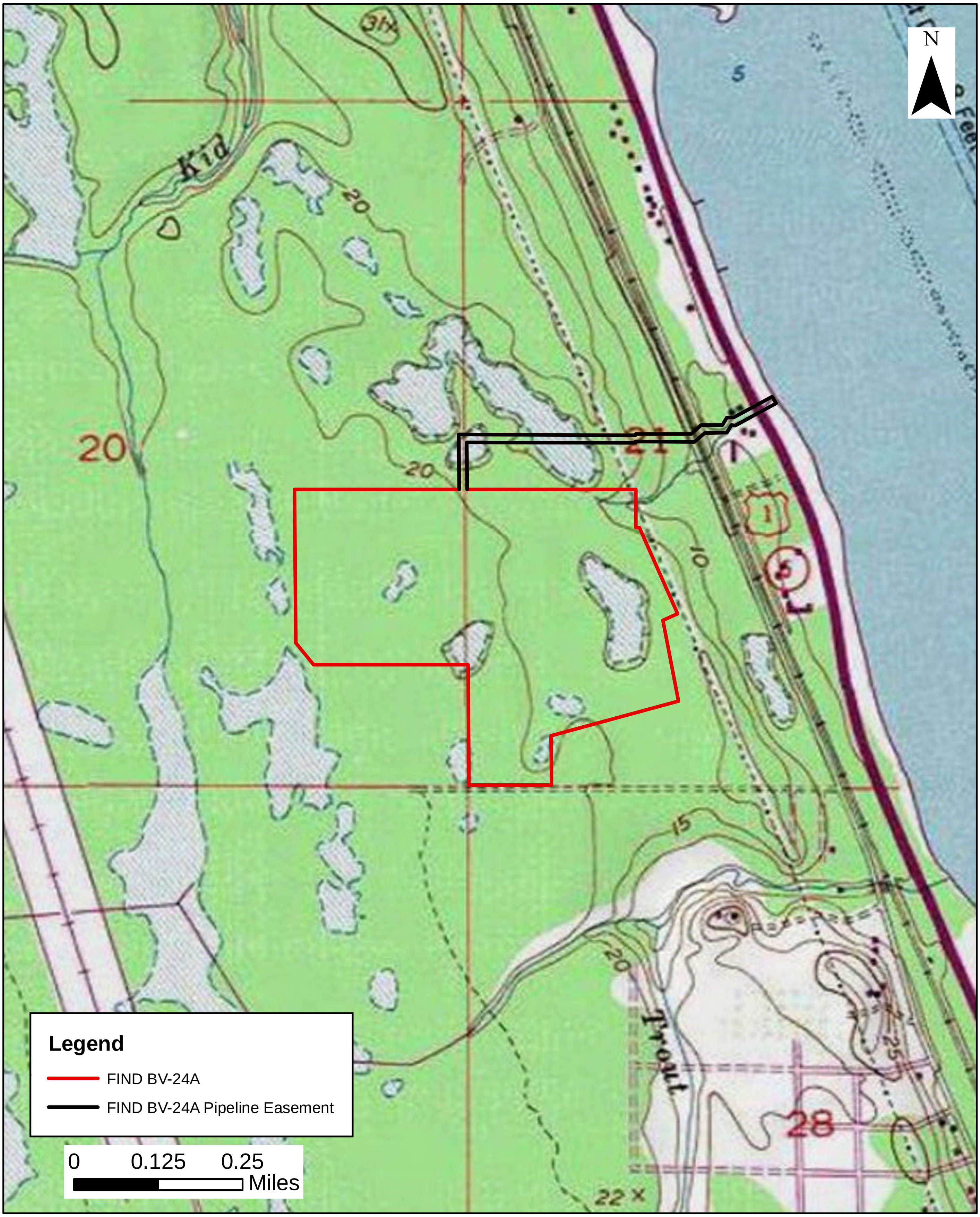

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FIGURE 2.3
USGS TOPOGRAPHIC MAP
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

PROJECT	C2015-014
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assessment area. Other community types located within the assessment area include scrub (northwestern corner) and mesic hammock (northeastern corner).

The US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) web soil survey shows that the predominant soils consist of Immokalee sand (Map Unit 28) and Pomello sand (Map Unit 49). Immokalee sand is found in association with flats on marine terraces. Within the assessment area, the FNAI community associated with this soil type is mesic flatwoods. Poorly drained, these soils typically have a depth to water table between 6 to 18 inches. Pomello sand is associated with flats/rises on marine terraces. Within the assessment area, the FNAI communities associated with this soil type are scrub and scrubby flatwoods. Moderately well drained, these soils generally have a depth to water table between 24 to 42 inches.

The NRCS web soil survey shows that the soils associated with the wetland areas onsite consist of Myakka sand (Map Unit 38) and Tomoka muck (Map Unit 67). Myakka sand is associated with depressions on marine terraces. Within the assessment area, the FNAI community associated with this soil type is depression marsh. These soils are very poorly drained and the water table is usually at the ground surface. Tomoka muck is generally associated with marshes on marine terraces. Within the assessment area, the FNAI community associated with this soil type is shrub bog. The water table usually occurs at the ground surface of these poorly drained soils.

Minor components of the soils identified by the NRCS web soil survey associated with the assessment area include Canaveral-Anclote complex (Map Unit 9), Myakka sand (Map Unit 36), and St. Lucie sand (Map Unit 56).

The BV-24A assessment area is located on the Atlantic Coastal Ridge. The ridge, ranges in east-west width from 1 ½ to 3 miles, and consists of a series of relic dunes that formed at a time of higher sea level (Steward and Van Armam, 1987). Locally, this ridge peaks at an elevation of +25 ft NGVD with many low lying depression or wetland areas scattered throughout. The Kid Creek (lying north and west of the site) and Trout Creek (lying south of the site) tributary systems appear to collect a portion of the surface water runoff from the assessment area and eventually drain into the Indian River. The surficial aquifer, located along the coastal island and 3-10 miles inland, consists of the Anastasia Formation of Pleistocene age overlying the Tamiami Formation of Pliocene age (Steward and Van Arman, 1987). Chloride concentrations within the surficial aquifer are relatively low (below 250 mg/L) due to the Atlantic Coastal Ridge and little development within the immediate area.

2.4 Description of Structures, Roads, and Other Improvements on the Site

The assessment area is largely undeveloped with only the central and eastern portions of the pipeline easement containing permanent structures. Primitive trail roads occur throughout the property and provide access to the site. The poor condition of the trail roads likely limits vehicular access to mostly recreational all-terrain vehicles. Trail roads connecting to Old Dixie Highway or a utility easement provide access to the northern and eastern site boundaries. Trail roads branching off Atlantic Ridge Lane and a private drive provide access to the southern site boundary. A large network of trail roads provide access to the western site boundary and likely serve as access points for vehicular traffic.

2.5 Current Use of Property

With the exception of portions of the pipeline easement, the assessment area consists of undeveloped land. Land use within BV-24A is generally limited to occasional unauthorized recreational use (e.g., ATV riding, hunting). Land use within the pipeline easement east of Old Dixie Highway consists of residential properties and a drainage ditch. The pipeline easement west of Old Dixie Highway contains portions of the Oldcastle Coastal facility (listed in the EDR report) which is closed and advertised for sale. The western side of the pipeline easement traverses a small goat farm.

2.6 Past Use of Property

Aerial photographs may indicate whether past activities on the site may have introduced sources of contamination that would otherwise avoid detection. Appendix A provides historical aerial photographs depicting the approximate boundaries of the BV-24A assessment area.

The earliest aerial photograph obtained, taken in 1943, shows BV-24A as undeveloped and sparsely vegetated. No primitive trails are visible within the assessment area boundaries. The upland and wetland features appear similar to present conditions. A power utility corridor, Old Dixie Highway, and US Highway one intersect the pipeline easement.

The 1958 aerial photograph shows that the conditions of BV-24A remained unchanged from the 1943 aerial photograph. The pipeline easement shows residential development occurring between Old Dixie Highway and US Highway 1 as well as some vegetative clearing between the utility easement and Old Dixie Highway.

A data gap exists between the 1958 and 1983 aerial photographs. High quality resolution aerial photographs were not readily available for review.

The 1983 aerial photograph shows BV-24A undeveloped with scrubby vegetation and a relatively open tree canopy. Primitive trail roads appear on the western portion of the BV-24A assessment area. Residential development occurs east of Old Dixie Highway and an excavated pit and haul road occur in the central portion of the pipeline easement just west of the utility corridor.

The 1994 aerial photograph shows that BV-24A remained largely undeveloped with scrubby vegetation and slightly denser forest canopy compared to the 1983 aerial photograph. The 1994 photograph shows more extensive primitive trail roads on the western portion of the assessment area. Some clearing is evident in the southeast corner of the assessment area. The 1994 photograph does not show the excavated pit and haul road visible in the 1983 aerial photograph.

The 1999 aerial photograph shows BV-24A similar to its 1994 appearance but with fewer trees on the western part of the assessment area. Primitive trail roads are more extensive on the western portion of the assessment area. The clearing identified in the southeast corner of the assessment area in the 1994 aerial photograph remains evident.

The 2004 aerial photographs show the condition of BV-24A appearing similar to the 1999 aerial photograph.

The 2007 aerial photograph shows BV-24A unchanged from the 2004 aerial photograph. The area of the pipeline easement west of Old Dixie Highway and east of the utility corridor is now in use as a storage area for the industrial facility north of the pipeline easement.

The 2010 aerial photograph shows BV-24A as largely undeveloped with few trees on the northern half of the assessment area. Primitive trail roads are more extensive and a large trail road now bisects the site and connects the trail roads. It appears that fill material has been added to the western portion of the pipeline easement, and the section west of Old Dixie Highway and east of the utility easement is still in use as a storage area for the Oldcastle Coastal facility.

The 2013 aerial photograph shows BV-24A as unchanged from the 2010 aerial photograph. It appears that additional fill material has been added to the western portion of the pipeline easement and the section west of Old Dixie Highway and east of the utility easement is no longer in use as a storage area for the Oldcastle Coastal facility.

The 2014 aerial photograph shows BV-24A as unchanged from the 2013 aerial photograph. Within the pipeline easement, it appears as though additional fill activities have occurred on western portion of the pipeline easement as well as the introduction of small scale farming activities.

2.7 Current and Past Use of Adjoining Properties

Aerial photographs may indicate whether past activities on properties adjoining the site may have introduced sources of contamination that would otherwise avoid detection. Appendix A provides historical aerial photographs showing the approximate boundaries of the DMMA BV-24A assessment area.

The 1943 aerial photograph shows the properties adjoining BV-24A as undeveloped and sparsely vegetated. A utility corridor, Old Dixie Highway, and US Highway 1 are evident in this photograph.

The 1958 aerial photograph shows that the conditions of the properties adjoining the majority of BV-24A remained unchanged from the 1943 aerial photograph. The properties adjoining the pipeline easement show residential development occurring between Old Dixie Highway and US Highway 1 as well as some vegetative clearing between the utility easement and Old Dixie Highway.

A data gap exists between the 1958 and 1983 aerial photographs. High quality resolution aerial photographs were not readily available for review.

The 1983 aerial photograph shows the properties adjoining BV-24A as undeveloped with a mix of vegetation of scrubby and forested habitats. Residential development occurs east of Old Dixie Highway and an excavated pit and haul road occur in the property adjoining the central portion of the pipeline easement just west of the utility corridor.

The 1994 aerial photograph shows the properties adjoining BV-24A remained largely undeveloped and vegetated with a relatively open tree canopy. This aerial photograph shows more extensive primitive trail roads on the adjoining properties west of the assessment area. Clearing is evident on the adjoining property to the southeast of the assessment area. The Oldcastle facility appears on the property adjoining to the north of the pipeline. The 1994 photograph does not show the excavated pit and haul road visible in the 1983 aerial photograph.

The 1999 aerial photograph shows the properties adjoining BV-24A similar to their 1994 appearance but with fewer trees west of the assessment area.

The 2004 aerial photograph shows permanent structures occurring on the property adjoining BV-24A to the southeast. An online review of the site address for this property revealed that the structures most likely associate with an equestrian center.

Three additional structures appear on the adjoining property to the southeast in the 2007 aerial photograph as well as what appears to be a hunt camp on the property adjoining BV-24A to the south. An additional paved lot appears south of the pipeline easement in the location associated with the Oldcastle Coastal Facility.

The 2010, 2013, and 2014 aerial photographs show the properties adjoining BV-24A similar to their 2007 appearance.

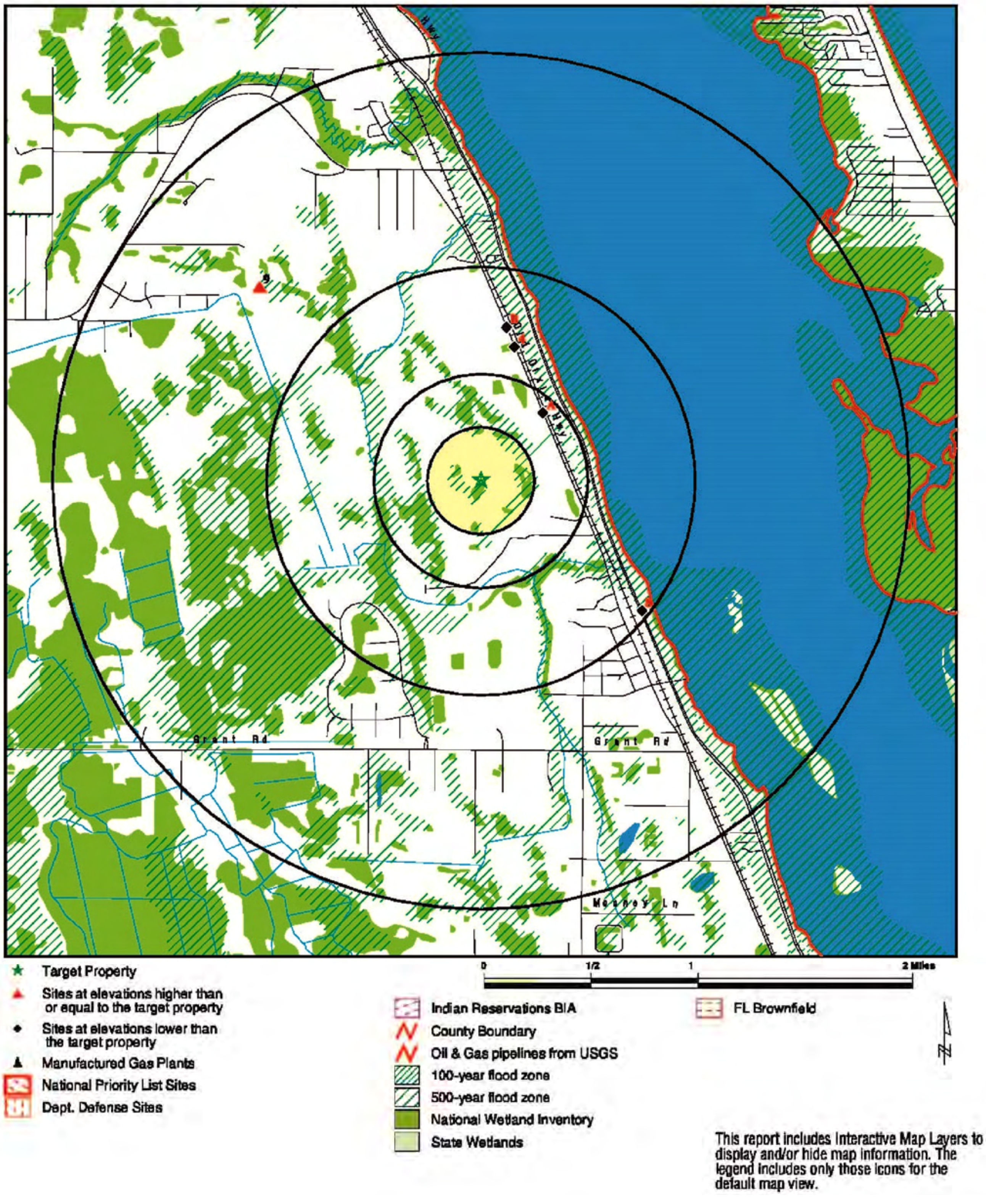
3.0 RECORDS REVIEW

Federal and state agencies maintain several databases with information about facilities with known or potential problems related to hazardous substances and petroleum products. EDR searched the databases identified in Section 1.3 to identify facilities present on or within one and one half miles of the BV-24A assessment area. This section describes the search results as well as a review of other records of interest.

The records search, approximately centered on BV-24A (Figure 3.1 and Appendix B), encompassed a maximum one and one half-mile radius, one half mile beyond the ASTM standard. EDR did not identify any records of facilities within the BV-24A property in any of the searched databases. The EDR report identified one facility (Hudgins Fish Co., Inc.) in the state LUST (Leaking Underground Storage Tank) database, two facilities (Hudgins Fish Co., Inc. and Cemex – Valkaria REA) in the state UST (Underground Storage Tank) database, three facilities (Pence Septic Systems, Pence Septic & Land, and Cemex – Valkaria REA) with state listed AST's (Aboveground Storage Tanks), two facilities (Ranger Construction and Pence Septic Systems) identified as RCRA Non-Generators, one Formerly Used Defense Site (FUDS) facility (USAF Valkaria MIS AX), one facility (Oldcastle Coastal) listed by both the Facility Index System and US AIRS databases. Table 3.1 summarizes all the facilities identified in the environmental database search. Based solely on the EDR report, none of the facilities identified are likely to affect the BV-24A assessment area. All of the UST's, ranging in size from 250 to 8,000 gallons, were removed or closed in place and are located down gradient from the assessment area. The remaining AST's that are in service reported no contamination or leaks and are located down gradient from the assessment area.

We reviewed the May 2002 Taylor Engineering Phase I Environmental Site Assessment completed for FIND DMMA BV-24 for potential recognized environmental conditions discovered during that assessment that may affect the BV-24A assessment area. The BV-24 assessment focused on areas outside of the current investigation of BV-24A but some assessment overlap occurs between the eastern boundary of BV-24 and the western boundary of BV-24A. Observations made during the 2002 site reconnaissance revealed no visible indications of hazardous substances or petroleum products within the BV-24A assessment area. However, the presence of shallow trenches and an oval shaped "race track" feature located in the southern interior portion of the BV-24 site led to a recommendation for a limited Phase II assessment of that area. Due to the distance from BV-24A boundary, these features do not constitute a recognized environmental condition for the BV-24A assessment area. A review of Taylor

Engineering and FIND records did not reveal any results of a Phase II investigation or whether a Phase II investigation was performed on the BV-24 property.



Source: Environmental Data Resources, Inc.; April 30, 2015

Taylor Engineering Inc. 10151 Deerwood Park Blvd. Bldg. 300, Suite 300 Jacksonville, FL 32256 CERTIFICATE OF AUTHORIZATION # 4815	FIGURE 3.1 LOCATION OF FACILITIES IDENTIFIED IN THE ENVIRONMENTAL RECORDS SEARCH BREVARD COUNTY, FLORIDA	PROJECT C2015-014 DRAWN BY NA SHEET DATE JUNE 2015

Table 3.1 Facilities Information from the EDR Environmental Records Search

Symbol No.	*Owner Address*	*Database*	*Number of Tanks / Capacity (gal)*	*Tank Contents*	*Contaminated Media*	*Comments / Status*
A1	OLDCASTLECOASTAL 4460 Old Dixie Hwy	FINDS				
A2	OLDCASTLECOASTAL 4460 Old Dixie Hwy	FINDS, US AIRS				
A3	OLDCASTLECOASTAL 4460 Old Dixie Hwy	NPDES, AIRS, Tier 2				
4	RANGER CONSTRUCTION 4210 Old Dixie Hwy	RCRA NonGen, AIRS				
B5	PENCE SEPTIC SYSTEMS 4150 Old Dixie Hwy	RCRA NonGen, FINDS, AST	1/10,000 1/1,000	Vehicular Diesel Unleaded Gas		In Service/Facility Open In Service/Facility Open
B6	PENCE SEPTIC SYSTEMS 4150 Old Dixie Hwy	AST	1/150 3/287 2/110	New/Lube Oil New/Lube Oil New/Lube Oil		Enclosed/Facility Closed Enclosed/Facility Closed Enclosed/Facility Closed
B7	CEMEX – VALKARIA READY MIX 4152 Old Dixie Hwy	UST	1/8000 1/550 1/250	Vehicular Diesel Unleaded Gas Waste Oil		Closed in place/Facility Open Closed in place/Facility Open Closed in place/Facility Open
B7	CEMEX – VALKARIA READY MIX 4152 Old Dixie Hwy	AST	1/10000 1/1000 1/10000	Vehicular Diesel Waste Oil Vehicular Diesel		Removed/Facility Open Removed/Facility Open In Service/Facility Open
8	HUDGINS FISH CO INC 5340 Soutel Dr	LUST, UST	1/2000 1/888	Unleaded Gas Unknown		Removed/Facility Closed Removed/Facility Closed
9	USAF VALKARIA MIS AX Valkaria, FL	FUDS				

Source: 4/30/15 Environmental Data Resources, Inc. Report 4280153.2s (Appendix B)

4.0 SITE RECONNAISSANCE AND INTERVIEWS

Taylor Engineering conducted a site reconnaissance to observe conditions within BV-24A and adjacent areas to look for visual evidence of hazardous substances or petroleum products. We conducted interviews with state and local government officials regarding recognized environmental conditions associated with the assessment area. This section documents the observations made during the reconnaissance and interview results. Appendix D contains photographs taken during the site reconnaissance and shows the approximate location of the photographs.

4.1 Site Reconnaissance

The narrative that follows documents the observations made during the site reconnaissance. Figures 4.1a and 4.1b provide the locations of the features observed during the site reconnaissance.

Site reconnaissance of BV-24A and pipeline easement confirmed that the areas consist of undeveloped land with numerous meandering trail roads traversing the property. No observations made during the site reconnaissance indicated the presence of recognized environmental conditions within the assessment area.

One industrial facility (Oldcastle Coastal) was located partially within and adjacent to the BV-24A pipeline easement. This facility was closed and advertised for sale (Appendix D, Photographs 1 - 5 and 8).

The parcel immediately north of the pipeline easement contains the structures associated with the Oldcastle Coastal facility. Taylor Engineering made exterior observations from the pipeline easement relating to recognized environmental conditions on the property. Taylor Engineering observed two ASTs (Appendix D, Photograph 16) with a concrete secondary containment structure located behind (west of) the main structure of the facility. The EDR records search did not identify these ASTs. Taylor Engineering was unable to investigate the contents of the ASTs because the view was restricted from the pipeline easement. Site observations suggest that the topography of the Oldcastle Coastal site falls towards the pipeline easement to the south.

The western portion of the pipeline easement was undeveloped. A goat farm (Photographs 14 and 15, Appendix D) was located in its central section and numerous piles of dumped fill material

(Photographs 9-13, and 20-21, Appendix D) were observed on its eastern section. The original origin of the fill material was not identified.

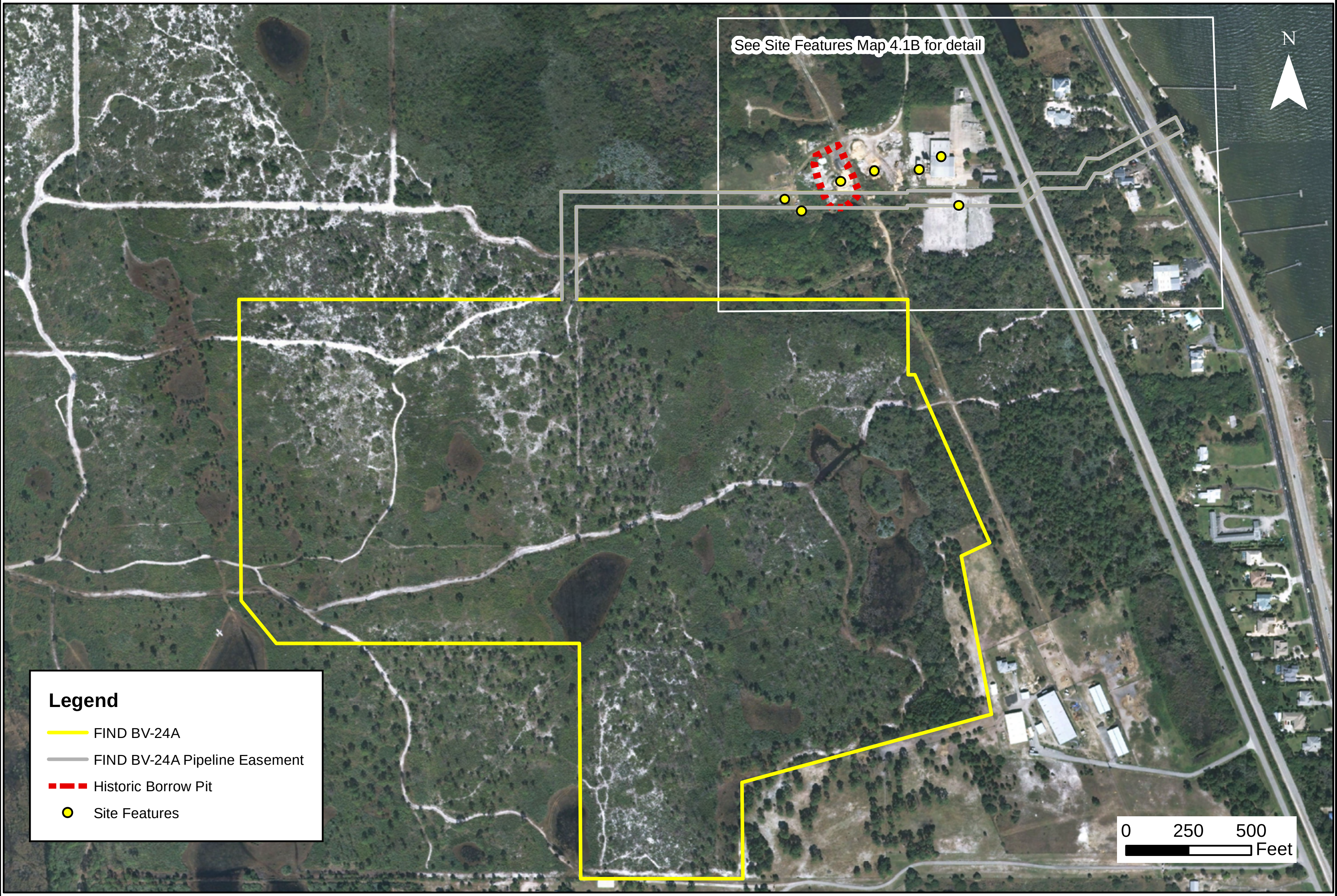
4.2 Regulatory Interviews and Questionnaire

On May 28, 2015, Taylor Engineering contacted (via telephone) Mr. Bret LeRoux, P.G. (Storage Tanks Manager, FDEP Central District) to obtain additional information regarding recognized environmental conditions associated with the BV-24A assessment area. Mr. LeRoux did not have any personal information on the assessment area and recommended a records request be submitted to the FDEP Central District. Taylor Engineering contacted (via telephone) Ms. Duan Festa (FDEP Central District) and submitted a records request. On May 29, 2015 Taylor Engineering received (via email) a response from the FDEP which indicated that there "were no Central District records located" for the parcels associated with the assessment area (Appendix C).

On May 28, 2015, Taylor Engineering contacted (via telephone) Mr. Dave Maher (Brevard County Environmental Remediation and Compliance, Site Manager/RA Specialist) to obtain additional information regarding recognized environmental conditions associated with or adjoining the assessment area. Mr. Dave Maher did not have any personal information on the assessment area. However, Mr. Maher provided Taylor Engineering with an e-mail on May 28, 2015 that stated that the county does not have "any files that could be searched directly by parcel number", but a check of sites managed by the NRMD (Natural Resources Management Department) for the Petroleum Cleanup Program returned no matches" for properties on or near the assessment area (Appendix C).

On May 28, 2015, Taylor Engineering contacted (via telephone) Lieutenant Nelson with the Brevard County Fire Department to obtain additional information regarding recognized environmental conditions on or adjoining the BV-24A assessment area. Lieutenant Nelson acknowledged that he was familiar with the properties associated with the assessment area, but was unaware of any recognized environmental conditions relevant to the area (Appendix C).

Questionnaires completed by Jenny Ashbury (Brevard County) and Mark Crosley (FIND) as representatives for the Brevard County and FIND-owned properties revealed no recognized environmental conditions associated with the properties (Appendix C).



TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 4.1A
SITE FEATURES MAP - OVERVIEW
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye
2. Horizontal Datum: NAD 1983

PROJECT	C2015-014
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SHEET	
DATE	JUNE 2015

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 4.1B
SITE FEATURES MAP - DETAIL
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye
2. Horizontal Datum: NAD 1983

PROJECT	C2015-014
DRAWN BY	NA
SHEET	
DATE	JUNE 2015

5.0 FINDINGS AND CONCLUSIONS

5.1 Findings

BV-24A appears relatively undisturbed with little on-site or surrounding land use change since 1943. No notable on-site features were identified as recognized environmental conditions within BV-24A.

Review of historical information, the site reconnaissance, and the EDR records search results indicate that the parcels associated with the pipeline easement which have been historically associated with the activities of the Oldcastle Coastal facility contain the identified features below.

The pipeline easement and the adjoining property contained an excavated pit in 1983 (Figures 4.1a and 4.1b). The pit was filled by 1994. Site reconnaissance provided no additional information on this area other than documentation that fill material was located in the area (Appendix D, Photograph 9).

Site reconnaissance revealed the presence of two ASTs (Appendix D, Photograph 16) located on Oldcastle Coastal property, which adjoins the northern boundary of the pipeline easement. The EDR report did not identify these ASTs. The general topography of the area appeared to drain south towards the pipeline easement.

Site reconnaissance revealed that a portion of the pipeline easement had been filled with various dumped materials including concrete, asphalt, fill dirt, treated timber, and by-products of the manufacturing of concrete block including slag, calcium carbonate, and quartz (Appendix D, Photographs 9-13, and 20-21). The origins of the dumped material could not be identified.

The EDR and FDEP petroleum databases identified the Oldcastle Coastal facility listed in the Facility Index System (FINDS), Domestic and Industrial Wastewater Facilities (NPDES), Air Resources Management (AIRS), and Tier 2 databases.

5.2 Conclusions

Taylor Engineering performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E1527-13 of the BV-24A property. Any exceptions to, or deletions from, this practice are described in Section 1.3 of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the assessment area except for the following:

- An excavated and filled borrow area associated the Oldcastle Coastal facility within the pipeline easement
- The presence of two undocumented ASTs located on the Oldcastle Coastal facility, just north of the pipeline easement. These ASTs were not identified in the EDR records search.
- Areas of dumped fill material within the pipeline easement. The piles of various dumped materials include concrete, asphalt, fill dirt, treated timber, and by-products of the manufacturing of concrete block such as slag, calcium carbonate, and quartz. The origins of the dumped material are unknown.

If future FIND project construction requires excavation of materials within the pipeline easement (e.g., associated with a permanent buried pipeline), Taylor Engineering recommends a limited Phase II Environmental Site Assessment within the filled borrow area and dumping areas described above. A Phase II Environmental Site Assessment is typically an iterative and progressive process. The Phase II assessment process provides information to confirm the actual presence of hazardous substances or petroleum products or provides data to support an opinion that there is no reasonable possibility of site impacts from the observed environmental conditions.

6.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

In accordance with ASTM E1527-13, this Phase I Environmental Site Assessment was a modest preliminary investigation of recognized environmental conditions within the BV-24A assessment area. Notably, a Phase I Environmental Site Assessment can fail to uncover problems existing at a given location. This is especially true of underground conditions, which defy evaluation by surface observations. To the best of the author's knowledge, the information contained in this report is factual. Taylor Engineering limits its obligation and liabilities to fraudulent statements or gross negligence.

We declare that, to the best of our professional knowledge and belief we meet the definition of Environmental professional as defined in 312.10 of 40 CFR 312 and we have the special qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. We have developed and performed all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Noah Adams, Environmental Scientist

Christopher B. Ellis, Group Leader, Environmental Services

REFERENCES

Steward, J.S. and Van Arman, J.A. 1987. *Indian River Lagoon Joint Reconnaissance Report.* St. Johns River Water Management District and South Florida Water Management District.

APPENDIX A

Historical Aerial Photographs

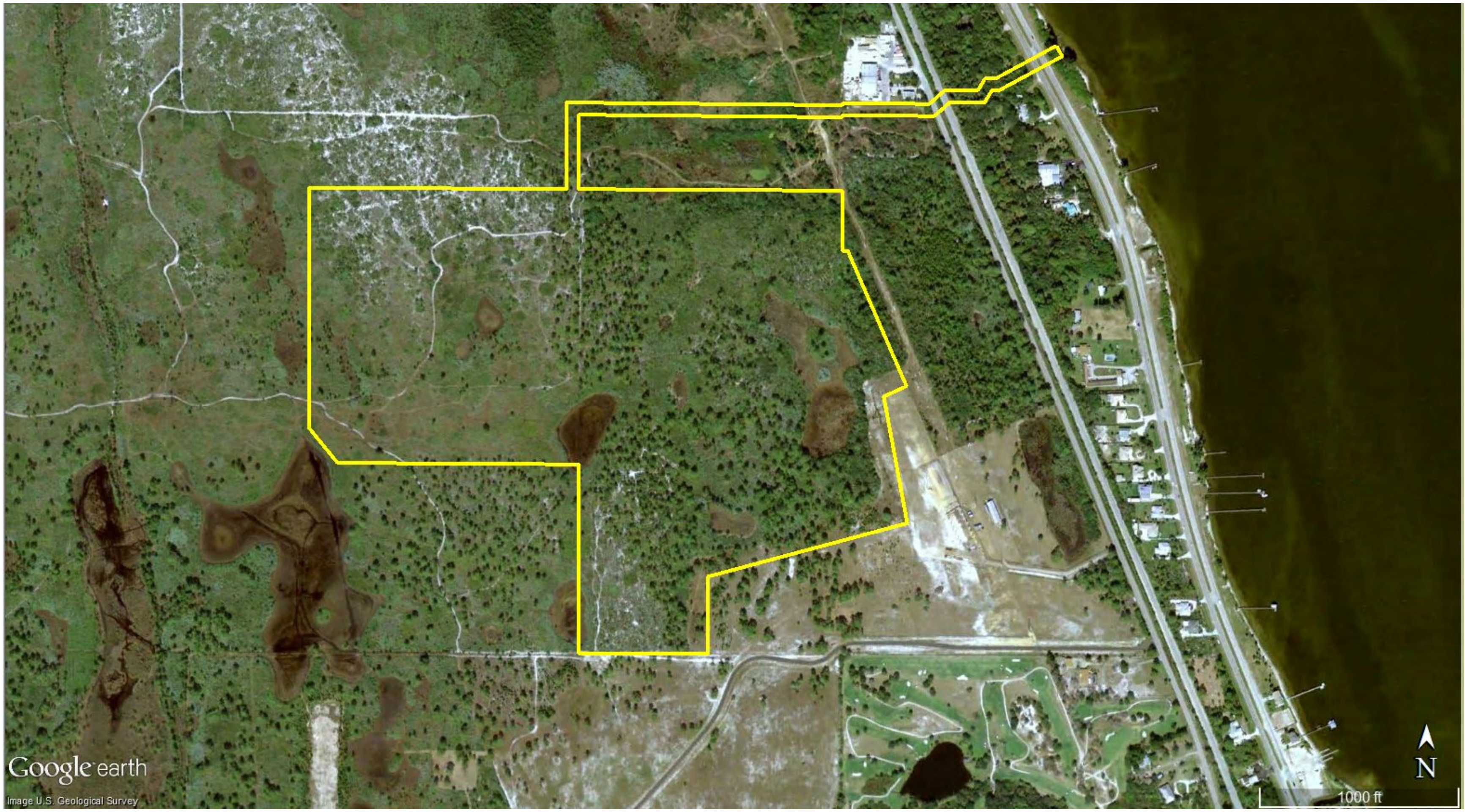
1943 aerial photograph showing the approximate boundaries of the assessment area

1958 aerial photograph showing the approximate boundaries of the assessment area

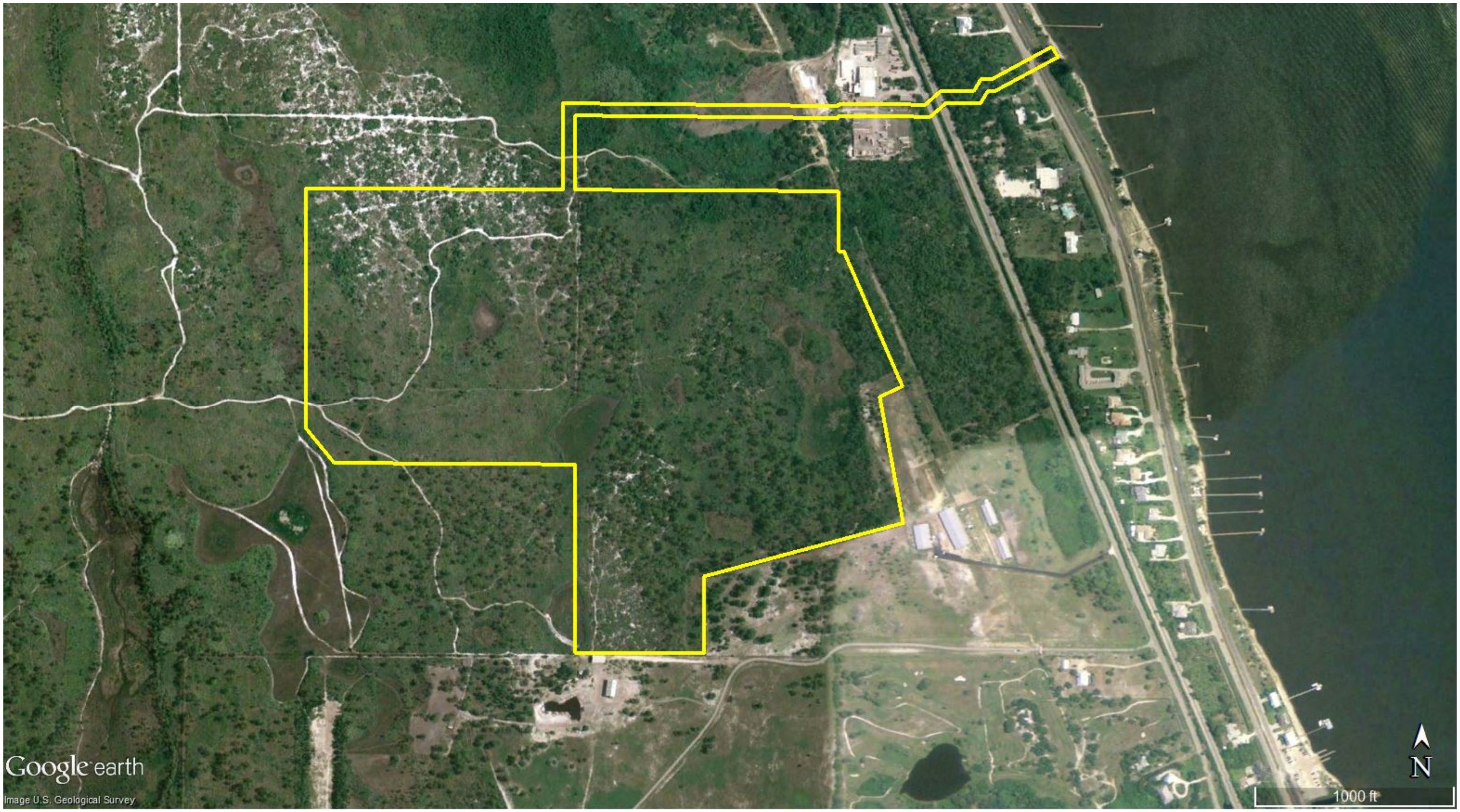
1983 aerial photograph showing the approximate boundaries of the assessment area

1994 aerial photograph showing approximate boundaries of the assessment area

1999 aerial photograph showing approximate boundaries of the assessment area



2004 aerial photograph showing approximate boundaries of the assessment area



2007 aerial photograph showing approximate boundaries of the assessment area

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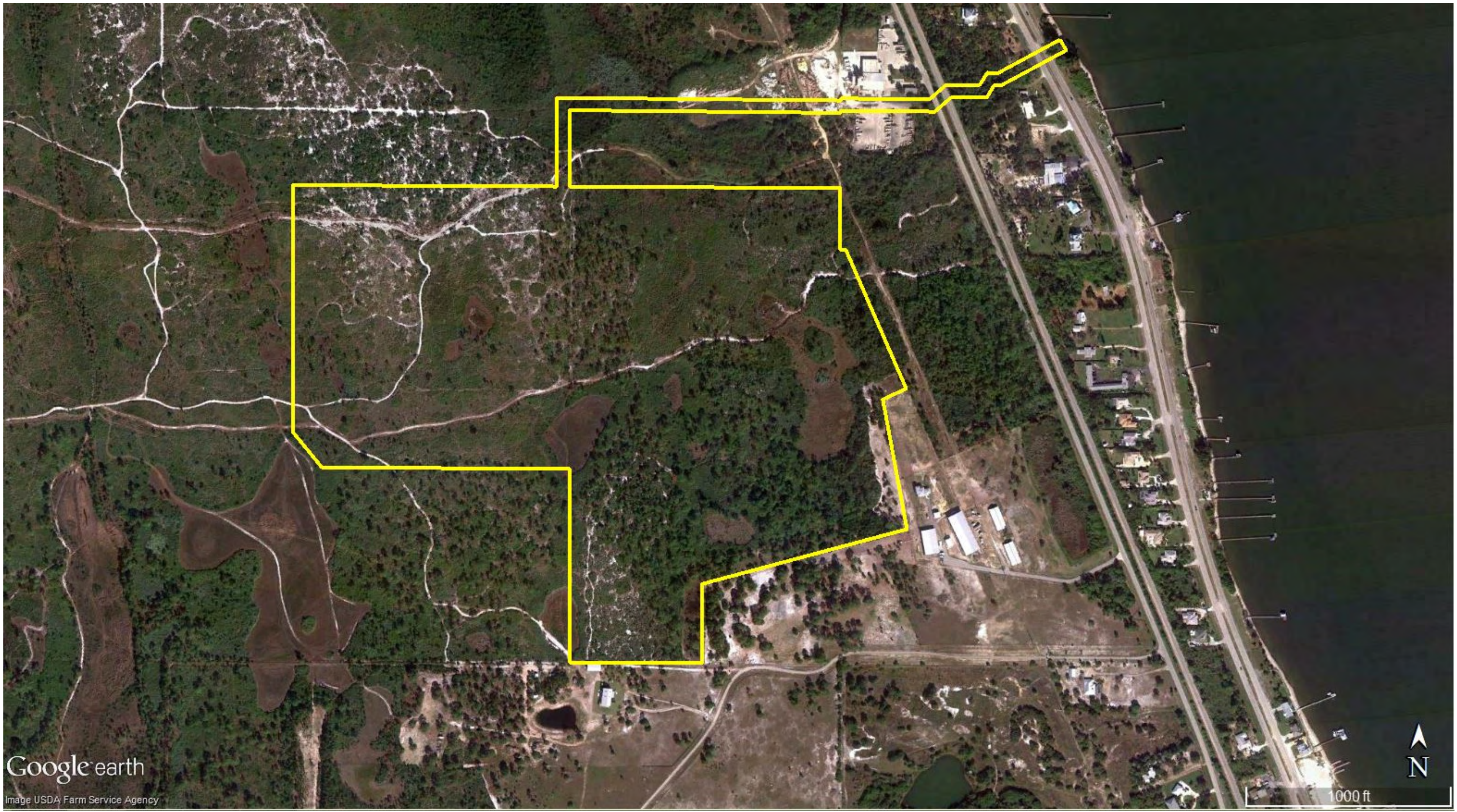
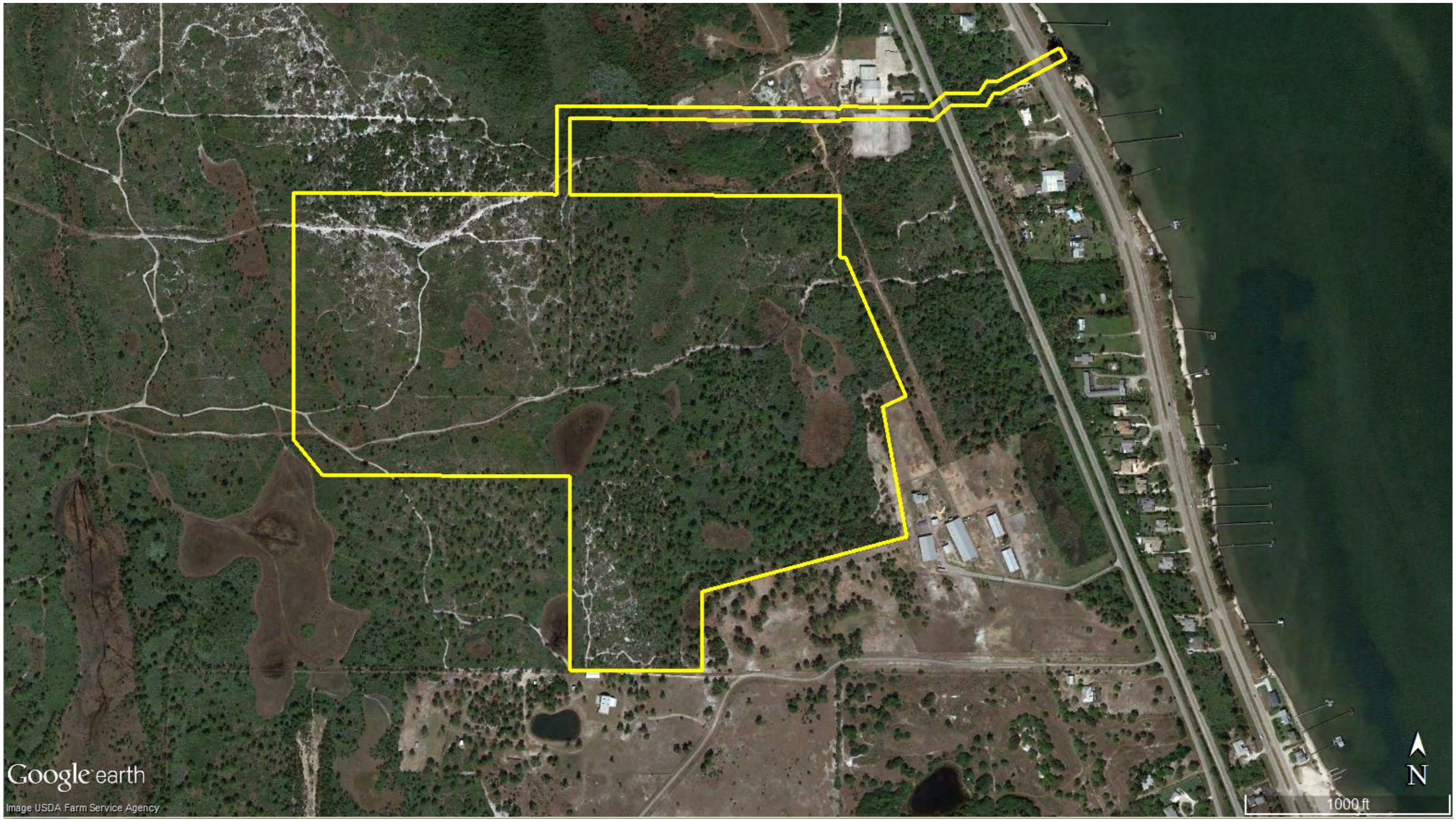
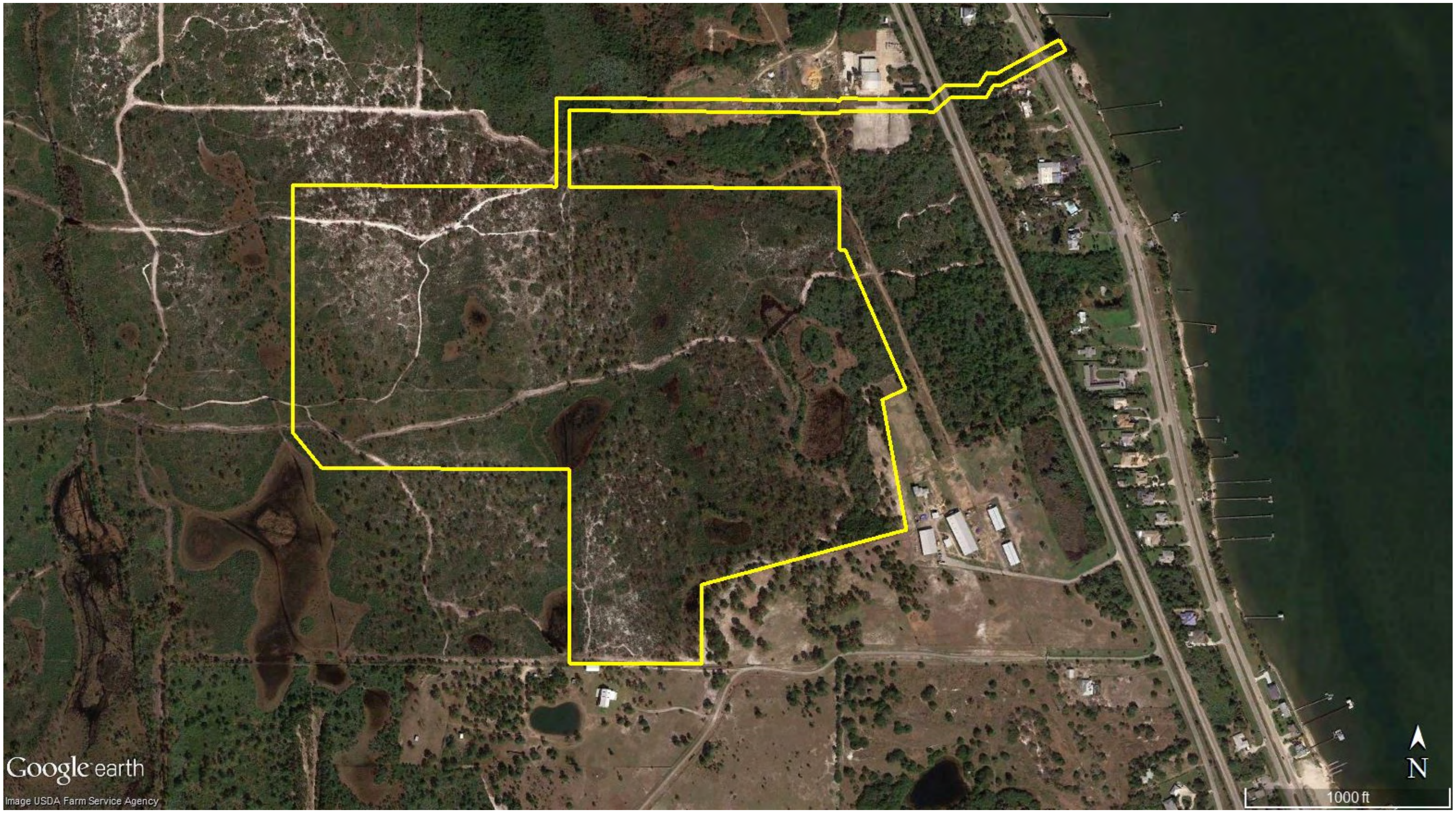


2010 aerial photograph showing approximate boundaries of the assessment area



2013 aerial photograph showing approximate boundaries of the assessment area



2014 aerial photograph showing approximate boundaries of the assessment area

APPENDIX B

Environmental Records Search Report

DMMA BV-24A
DMMA BV-24A
Malabar, FL 32950

Inquiry Number: 4280153.2s
April 30, 2015

The EDR Radius Map™ Report

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION **PAGE**

GEOCHECK ADDENDUM

GeoCheck - Not Requested

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

DMMA BV-24A
MALABAR, FL 32950

COORDINATES

Latitude (North):	27.9427000 - 27˚ 56' 33.72''
Longitude (West):	80.5409000 - 80˚ 32' 27.24''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	545164.9
UTM Y (Meters):	3090768.2
Elevation:	19 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	27080-H5 GRANT, FL
Most Recent Revision:	1970

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20100502
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
DMMA BV-24A
MALABAR, FL 32950

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
A1	OLDCASTLECOASTAL	4460 OLD DIXIE HWY	FINDS	Lower	2257, 0.427, NE
A2	OLDCASTLE COASTAL IN	4460 OLD DIXIE HWY	FINDS, US AIRS	Lower	2262, 0.428, NE
A3	OLDCASTLECOASTAL - V	4460 OLD DIXIE HIGHW	NPDES, AIRS, TIER 2	Lower	2262, 0.428, NE
4	RANGER CONSTRUCTION	4210 OLD DIXIE HIGHW	RCRA NonGen / NLR, FINDS, US AIRS	Lower	3409, 0.646, NNE
B5	PENCE SEPTIC SYSTEMS	4150 OLD DIXIE HIGHW	RCRA NonGen / NLR, FINDS, AST	Lower	3760, 0.712, North
B6	PENCE SEPTIC & LAND	4150 OLD DIXIE HWY	AST	Lower	3760, 0.712, North
B7	CEMEX - VALKARIA REA	4152 OLD DIXIE HWY	UST, AST, Financial Assurance	Lower	3836, 0.727, North
8	HUDGINS FISH CO INC	5185 US HWY 1	LUST, UST	Lower	5100, 0.966, SE
9	USAF VALKARIA MIS AX		FUDS	Higher	7247, 1.373, NW

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL - National Priority List
Proposed NPL - Proposed National Priority List Sites
NPL LIENS - Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL - National Priority List Deletions

Federal CERCLIS list

CERCLIS - Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY - Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP - CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS - Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF - RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG - RCRA - Large Quantity Generators
RCRA-SQG - RCRA - Small Quantity Generators
RCRA-CESQG - RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS - Engineering Controls Sites List
US INST CONTROL - Sites with Institutional Controls

LUCIS........................ Land Use Control Information System

Federal ERNS list

ERNS........................ Emergency Response Notification System

State- and tribal - equivalent CERCLIS

SHWS........................ Florida's State-Funded Action Sites

State and tribal landfill and/or solid waste disposal site lists

SWF/LF........................ Solid Waste Facility Database

State and tribal leaking storage tank lists

LAST........................ Leaking Aboveground Storage Tank Listing
INDIAN LUST........................ Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

INDIAN UST........................ Underground Storage Tanks on Indian Land
FEMA UST........................ Underground Storage Tank Listing
FF TANKS........................ Federal Facilities Listing

State and tribal institutional control / engineering control registries

ENG CONTROLS........................ Institutional Controls Registry
INST CONTROL........................ Institutional Controls Registry

State and tribal voluntary cleanup sites

VCP........................ Voluntary Cleanup Sites
INDIAN VCP........................ Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS........................ Brownfields Sites Database

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS........................ A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9........................ Torres Martinez Reservation Illegal Dump Site Locations
ODI........................ Open Dump Inventory
SWRCY........................ Recycling Centers
INDIAN ODI........................ Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL........................ Clandestine Drug Labs

Fl Sites - Sites List
PRIORITYCLEANERS - Priority Ranking List
US HIST CDL - National Clandestine Laboratory Register

Local Land Records

LIENS 2 - CERCLA Lien Information

Records of Emergency Release Reports

HMIRS - Hazardous Materials Information Reporting System
SPILLS - Oil and Hazardous Materials Incidents
SPILLS 90 - SPILLS 90 data from FirstSearch
SPILLS 80 - SPILLS 80 data from FirstSearch

Other Ascertainable Records

DOT OPS - Incident and Accident Data
DOD - Department of Defense Sites
CONSENT - Superfund (CERCLA) Consent Decrees
ROD - Records Of Decision
UMTRA - Uranium Mill Tailings Sites
US MINES - Mines Master Index File
TRIS - Toxic Chemical Release Inventory System
TSCA - Toxic Substances Control Act
FTTS - FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS - FIFRA/TSCA Tracking System Administrative Case Listing
SSTS - Section 7 Tracking Systems
ICIS - Integrated Compliance Information System
PADS - PCB Activity Database System
MLTS - Material Licensing Tracking System
RADINFO - Radiation Information Database
RAATS - RCRA Administrative Action Tracking System
RMP - Risk Management Plans
UIC - Underground Injection Wells Database Listing
DRYCLEANERS - Drycleaning Facilities
DEDB - Ethylene Dibromide Database Results
FL Cattle Dip. Vats - Cattle Dipping Vats
INDIAN RESERV - Indian Reservations
SCRD DRYCLEANERS - State Coalition for Remediation of Drycleaners Listing
DWM CONTAM - DWM CONTAMINATED SITES
COAL ASH EPA - Coal Combustion Residues Surface Impoundments List
CLEANUP SITES - DEP Cleanup Sites - Contamination Locator Map Listing
PCB TRANSFORMER - PCB Transformer Registration Database
Financial Assurance - Financial Assurance Information Listing
RESP PARTY - Responsible Party Sites Listing
COAL ASH DOE - Steam-Electric Plant Operation Data
2020 COR ACTION - 2020 Corrective Action Program List
PRP - Potentially Responsible Parties
US FIN ASSUR - Financial Assurance Information
EPA WATCH LIST - EPA WATCH LIST
SITE INV SITES - Site Investigation Section Sites Listing
LEAD SMELTERS - Lead Smelter Sites

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP - EDR Proprietary Manufactured Gas Plants

EDR US Hist Auto Stat - - - - - - - EDR Exclusive Historic Gas Stations
EDR US Hist Cleaners - - - - - - - EDR Exclusive Historic Dry Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LUST - - - - - - - - - - - - - - - - - - Recovered Government Archive Leaking Underground Storage Tank
RGA HWS - - - - - - - - - - - - - - - - - - - Recovered Government Archive State Hazardous Waste Facilities List
RGA LF - Recovered Government Archive Solid Waste Facilities List

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State and tribal leaking storage tank lists

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Department of Environmental Protection's PCTO1--Petroleum Contamination Detail Report.

A review of the LUST list, as provided by EDR, and dated 12/18/2014 has revealed that there is 1 LUST site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
HUDGINS FISH CO INC	***5185 US HWY 1***	***SE 1/2 - 1 (0.966 mi.)***	***8***	***30***

Facility Status: CLOSED
Facility-Site Id: 9200536
Discharge Cleanup Status: NFA - NFA COMPLETE

State and tribal registered storage tank lists

UST: The Underground Storage Tank database contains registered USTs. Shortly after the September 11 event, the DEP was instructed to remove the detail about some of the storage tank facilities in the state from their reports. Federal-owned facilities and bulk storage facilities are included in that set.

A review of the UST list, as provided by EDR, and dated 01/06/2015 has revealed that there is 1 UST site within approximately 0.75 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
CEMEX - VALKARIA REA Facility-Site Id: 8519327 Facility Status: OPEN Tank Status: A	***4152 OLD DIXIE HWY***	***N 1/2 - 1 (0.727 mi.)***	***B7***	***22***

AST: Shortly after the Sept 11 event, the DEP was instructed to remove the detail about some of the storage tank facilities in the state from their reports. Federal-owned facilities and bulk storage facilities are included in that set.

A review of the AST list, as provided by EDR, and dated 01/06/2015 has revealed that there are 3 AST sites within approximately 0.75 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
PENCE SEPTIC SYSTEMS Facility Status: OPEN Facility-Site Id: 8627757 Facility Status: OPEN	***4150 OLD DIXIE HIGHW***	***N 1/2 - 1 (0.712 mi.)***	***B5***	***18***
PENCE SEPTIC & LAND Facility Status: CLOSED Facility-Site Id: 8840437 Facility Status: CLOSED	4150 OLD DIXIE HWY	N 1/2 - 1 (0.712 mi.)	B6	21
CEMEX - VALKARIA REA Facility Status: OPEN Facility-Site Id: 8519327 Facility Status: OPEN	***4152 OLD DIXIE HWY***	***N 1/2 - 1 (0.727 mi.)***	***B7***	***22***

ADDITIONAL ENVIRONMENTAL RECORDS

Other Ascertainable Records

RCRA NonGen / NLR: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

A review of the RCRA NonGen / NLR list, as provided by EDR, and dated 12/09/2014 has revealed that there are 2 RCRA NonGen / NLR sites within approximately 0.75 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
RANGER CONSTRUCTION	***4210 OLD DIXIE HIGHW***	***NNE 1/2 - 1 (0.646 mi.)***	***4***	***15***
PENCE SEPTIC SYSTEMS	***4150 OLD DIXIE HIGHW***	***N 1/2 - 1 (0.712 mi.)***	***B5***	***18***

FUDS: The Listing includes locations of Formerly Used Defense Sites Properties where the US Army Corps Of Engineers is actively working or will take necessary cleanup actions.

A review of the FUDS list, as provided by EDR, and dated 06/06/2014 has revealed that there is 1 FUDS site within approximately 1.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
USAF VALKARIA MIS AX		NW 1 - 2 (1.373 mi.)	9	33

FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail. These include: RCRIS; Permit Compliance System (PCS); Aerometric Information Retrieval System (AIRS); FATES (FIFRA [Federal Insecticide Fungicide Rodenticide Act] and TSCA Enforcement System, FTTS [FIFRA/TSCA Tracking System]; CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control (FURS); Federal Reporting Data System (FRDS); Surface Impoundments (SIA); TSCA Chemicals in Commerce Information System (CICS); PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the U.S. EPA/NTIS.

A review of the FINDS list, as provided by EDR, and dated 01/18/2015 has revealed that there are 2 FINDS sites within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
OLDCASTLECOASTAL	4460 OLD DIXIE HWY	NE 1/4 - 1/2 (0.427 mi.)	A1	8
OLDCASTLE COASTAL IN	***4460 OLD DIXIE HWY***	***NE 1/4 - 1/2 (0.428 mi.)***	***A2***	***8***

NPDES: Domestic and Industrial Wastewater Facilities

A review of the NPDES list, as provided by EDR, and dated 02/02/2015 has revealed that there is 1 NPDES site within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
OLDCASTLECOASTAL - V Status: A Facility ID: FLR10IH04	***4460 OLD DIXIE HIGHW***	***NE 1/4 - 1/2 (0.428 mi.)***	***A3***	***11***

AIRS: A listing of Air Resources Management permits.

A review of the AIRS list, as provided by EDR, and dated 02/09/2015 has revealed that there is 1 AIRS site within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
OLDCASTLECOASTAL - V Facility Status: A Facility Id: 90121	***4460 OLD DIXIE HIGHW***	***NE 1/4 - 1/2 (0.428 mi.)***	***A3***	***11***

EXECUTIVE SUMMARY

TIER 2: A listing of facilities which store or manufacture hazardous materials that submit a chemical inventory report.

A review of the TIER 2 list, as provided by EDR, and dated 12/31/2013 has revealed that there is 1 TIER 2 site within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
OLDCASTLECOASTAL - V	*4460 OLD DIXIE HIGHW*	*NE 1/4 - 1/2 (0.428 mi.)*	*A3*	*11*

US AIRS: The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

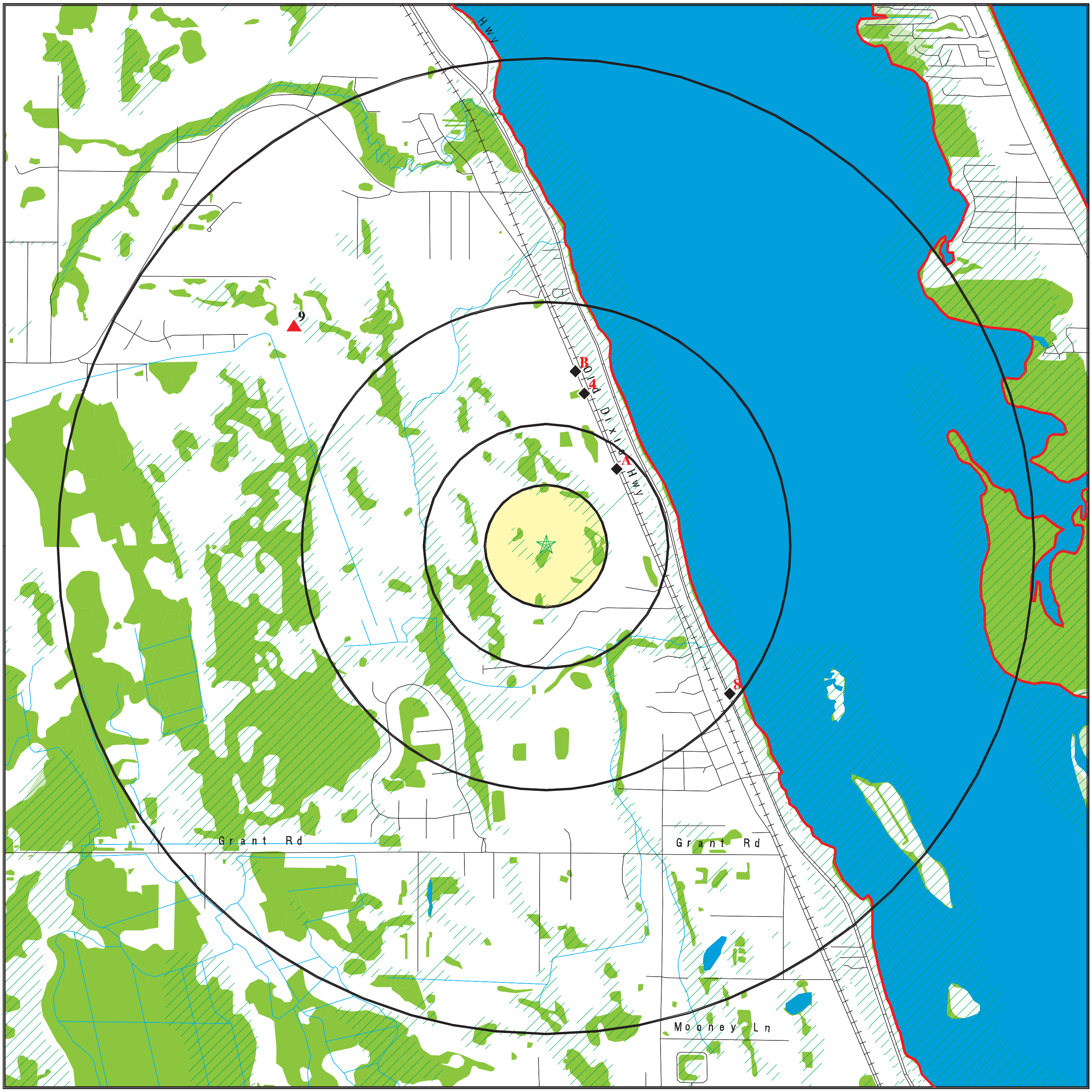
A review of the US AIRS list, as provided by EDR, and dated 10/16/2014 has revealed that there is 1 US AIRS site within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
OLDCASTLE COASTAL IN	*4460 OLD DIXIE HWY*	*NE 1/4 - 1/2 (0.428 mi.)*	*A2*	*8*

EXECUTIVE SUMMARY

There were no unmapped sites in this report.

OVERVIEW MAP - 4280153.2S

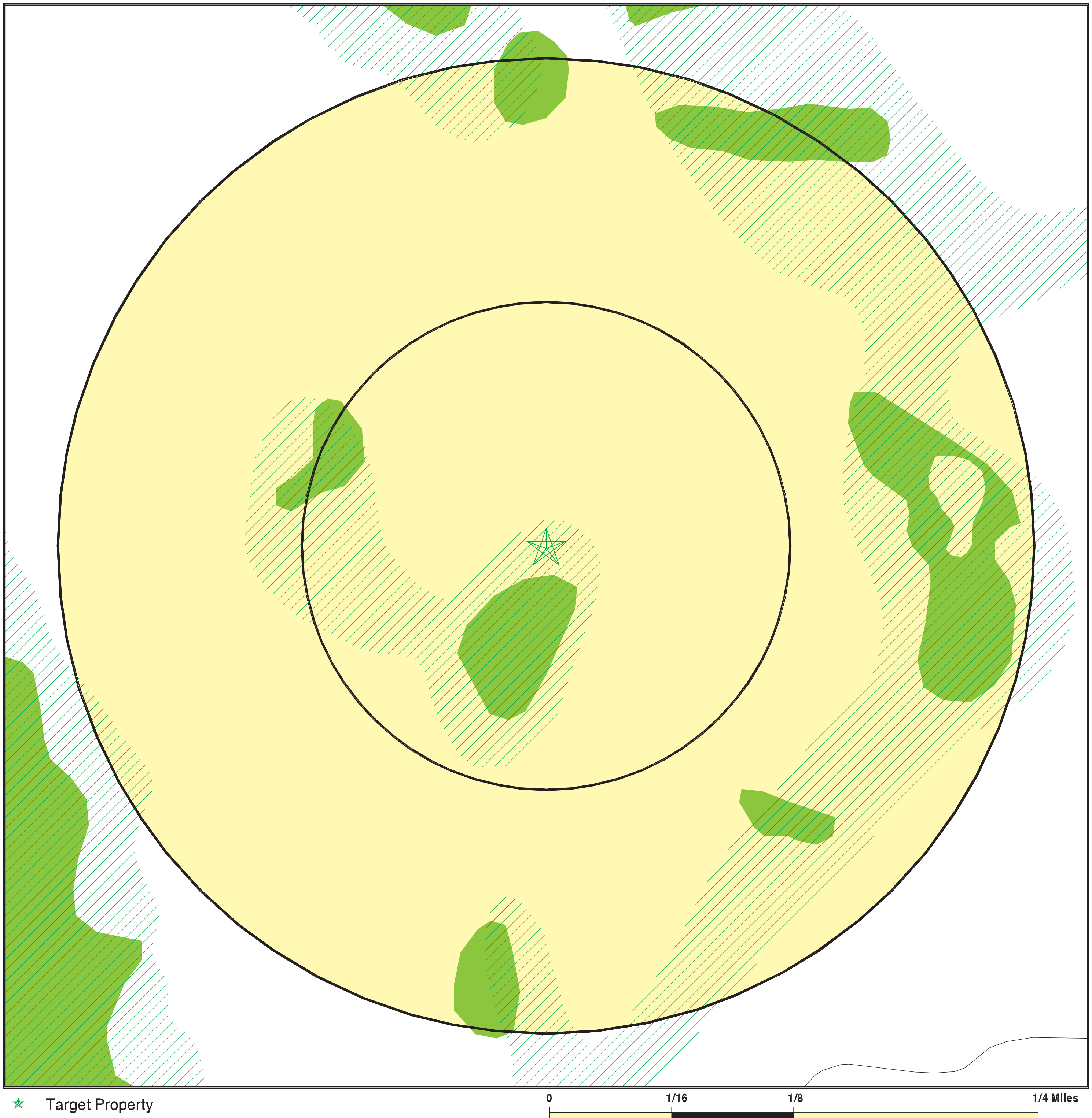


- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- FL Brownfield

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: DMMA BV-24A	CLIENT: Taylor Engineering
ADDRESS: DMMA BV-24A	CONTACT: Noah Adams
Malabar FL 32950	INQUIRY #: 4280153.2s
LAT/LONG: 27.9427 / 80.5409	DATE: April 30, 2015 10:50 am

DETAIL MAP - 4280153.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- FL Brownfield

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: DMMA BV-24A	CLIENT: Taylor Engineering
ADDRESS: DMMA BV-24A	CONTACT: Noah Adams
Malabar FL 32950	INQUIRY #: 4280153.2s
LAT/LONG: 27.9427 / 80.5409	DATE: April 30, 2015 10:51 am

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.500		0	0	0	0	0	0
Proposed NPL	1.500		0	0	0	0	0	0
NPL LIENS	0.500		0	0	0	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.500		0	0	0	0	0	0
Federal CERCLIS list								
CERCLIS	1.000		0	0	0	0	NR	0
FEDERAL FACILITY	1.000		0	0	0	0	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	1.000		0	0	0	0	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.500		0	0	0	0	0	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	1.000		0	0	0	0	NR	0
Federal RCRA generators list								
RCRA-LQG	0.750		0	0	0	0	NR	0
RCRA-SQG	0.750		0	0	0	0	NR	0
RCRA-CESQG	0.750		0	0	0	0	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	1.000		0	0	0	0	NR	0
US INST CONTROL	1.000		0	0	0	0	NR	0
LUCIS	1.000		0	0	0	0	NR	0
Federal ERNS list								
ERNS	0.500		0	0	0	NR	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.500		0	0	0	0	0	0
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	1.000		0	0	0	0	NR	0
State and tribal leaking storage tank lists								
LUST	1.000		0	0	0	1	NR	1
LAST	1.000		0	0	0	0	NR	0
INDIAN LUST	1.000		0	0	0	0	NR	0
State and tribal registered storage tank lists								
UST	0.750		0	0	0	1	NR	1

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
AST	0.750		0	0	0	3	NR	3
INDIAN UST	0.750		0	0	0	0	NR	0
FEMA UST	0.750		0	0	0	0	NR	0
FF TANKS	0.750		0	0	0	0	NR	0
State and tribal institutional control / engineering control registries								
ENG CONTROLS	1.000		0	0	0	0	NR	0
INST CONTROL	1.000		0	0	0	0	NR	0
State and tribal voluntary cleanup sites								
VCP	1.000		0	0	0	0	NR	0
INDIAN VCP	1.000		0	0	0	0	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	1.000		0	0	0	0	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	1.000		0	0	0	0	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	1.000		0	0	0	0	NR	0
ODI	1.000		0	0	0	0	NR	0
SWRCY	1.000		0	0	0	0	NR	0
INDIAN ODI	1.000		0	0	0	0	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	0.500		0	0	0	NR	NR	0
Fl Sites	1.500		0	0	0	0	0	0
PRIORITYCLEANERS	1.000		0	0	0	0	NR	0
US HIST CDL	0.500		0	0	0	NR	NR	0
Local Land Records								
LIENS 2	0.500		0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS	0.500		0	0	0	NR	NR	0
SPILLS	0.500		0	0	0	NR	NR	0
SPILLS 90	0.500		0	0	0	NR	NR	0
SPILLS 80	0.500		0	0	0	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.750		0	0	0	2	NR	2
DOT OPS	0.500		0	0	0	NR	NR	0
DOD	1.500		0	0	0	0	0	0
FUDS	1.500		0	0	0	0	1	1

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
CONSENT	1.500		0	0	0	0	0	0
ROD	1.500		0	0	0	0	0	0
UMTRA	1.000		0	0	0	0	NR	0
US MINES	0.750		0	0	0	0	NR	0
TRIS	0.500		0	0	0	NR	NR	0
TSCA	0.500		0	0	0	NR	NR	0
FTTS	0.500		0	0	0	NR	NR	0
HIST FTTS	0.500		0	0	0	NR	NR	0
SSTS	0.500		0	0	0	NR	NR	0
ICIS	0.500		0	0	0	NR	NR	0
PADS	0.500		0	0	0	NR	NR	0
MLTS	0.500		0	0	0	NR	NR	0
RADINFO	0.500		0	0	0	NR	NR	0
FINDS	0.500		0	0	2	NR	NR	2
RAATS	0.500		0	0	0	NR	NR	0
RMP	0.500		0	0	0	NR	NR	0
UIC	0.500		0	0	0	NR	NR	0
DRYCLEANERS	0.750		0	0	0	0	NR	0
DEDB	0.750		0	0	0	0	NR	0
NPDES	0.500		0	0	1	NR	NR	1
AIRS	0.500		0	0	1	NR	NR	1
TIER 2	0.500		0	0	1	NR	NR	1
FL Cattle Dip. Vats	0.750		0	0	0	0	NR	0
INDIAN RESERV	1.500		0	0	0	0	0	0
SCRD DRYCLEANERS	1.000		0	0	0	0	NR	0
DWM CONTAM	1.000		0	0	0	0	NR	0
US AIRS	0.500		0	0	1	NR	NR	1
COAL ASH EPA	1.000		0	0	0	0	NR	0
CLEANUP SITES	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	0.500		0	0	0	NR	NR	0
Financial Assurance	0.500		0	0	0	NR	NR	0
RESP PARTY	1.000		0	0	0	0	NR	0
COAL ASH DOE	0.500		0	0	0	NR	NR	0
2020 COR ACTION	0.750		0	0	0	0	NR	0
PRP	0.500		0	0	0	NR	NR	0
US FIN ASSUR	0.500		0	0	0	NR	NR	0
EPA WATCH LIST	0.500		0	0	0	NR	NR	0
SITE INV SITES	1.000		0	0	0	0	NR	0
LEAD SMELTERS	0.500		0	0	0	NR	NR	0

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP	1.500		0	0	0	0	0	0
EDR US Hist Auto Stat	0.750		0	0	0	0	NR	0
EDR US Hist Cleaners	0.750		0	0	0	0	NR	0

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
RGA HWS	0.500		0	0	0	NR	NR	0
RGA LF	0.500		0	0	0	NR	NR	0
- Totals --		0	0	0	6	7	1	14

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

A1 | **OLDCASTLECOASTAL** | **FINDS** | **1009604042**
NE | **4460 OLD DIXIE HWY** | | **N/A**
1/4-1/2 | **GRANT, FL 32949**
0.427 mi.
2257 ft. | **Site 1 of 3 in cluster A**

Relative:
Lower

Actual:
4 ft.

FINDS:

Registry ID: 110025331870

Environmental Interest/Information System
US EPA TRIS (Toxics Release Inventory System) contains information from facilities on the amounts of over 300 listed toxic chemicals that these facilities release directly to air, water, land, or that are transported off-site.

A2 | **OLDCASTLE COASTAL INC** | **FINDS** | **1012088687**
NE | **4460 OLD DIXIE HWY** | **US AIRS** | **N/A**
1/4-1/2 | **VALKARIA, FL 32950**
0.428 mi.
2262 ft. | **Site 2 of 3 in cluster A**

Relative:
Lower

Actual:
4 ft.

FINDS:

Registry ID: 110038521338

Environmental Interest/Information System
AFS (Aerometric Information Retrieval System (AIRS) Facility Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.

US National Pollutant Discharge Elimination System (NPDES) module of the Compliance Information System (ICIS) tracks surface water permits issued under the Clean Water Act. Under NPDES, all facilities that discharge pollutants from any point source into waters of the United States are required to obtain a permit. The permit will likely contain limits on what can be discharged, impose monitoring and reporting requirements, and include other provisions to ensure that the discharge does not adversely affect water quality.

AIR MINOR

AIRS (AFS):

Airs Minor Details:
EPA plant ID: 110038521338
Plant name: OLDCASTLE COASTAL INC
Plant address: 4460 OLD DIXIE HWY
VALKARIA, FL 32950

OLDCASTLE COASTAL INC (Continued) **1012088687**

County: BREVARD
Region code: 04
Dunn & Bradst #: Not reported
Air quality cntrl region: 048
Sic code: 3272
Sic code desc: CONCRETE PRODUCTS, NEC
North Am. industrial classf: 327390
NAIC code description: Other Concrete Product Manufacturing
Default compliance status: IN COMPLIANCE - SHUT DOWN
Default classification: POTENTIAL UNCONTROLLED EMISSIONS < 100 TONS/YEAR
Govt facility: ALL OTHER FACILITIES NOT OWNED OR OPERATED BY A FEDERAL, STATE, OR LOCAL GOVERNMENT
Current HPV: Not reported

Compliance and Enforcement Major Issues:
Air program: Not reported
National action type: Not reported
Date achieved: Not reported
Penalty amount: Not reported

Air program: Not reported
National action type: Not reported
Date achieved: Not reported
Penalty amount: Not reported

Historical Compliance Minor Sources:
State compliance status: IN COMPLIANCE - SHUT DOWN
Hist compliance date: 1402
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - SHUT DOWN
Hist compliance date: 1304
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - SHUT DOWN
Hist compliance date: 1303
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - CERTIFICATION
Hist compliance date: 1301
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - CERTIFICATION
Hist compliance date: 1203
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - CERTIFICATION
Hist compliance date: 1201
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - CERTIFICATION
Hist compliance date: 1104
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - SHUT DOWN

OLDCASTLE COASTAL INC (Continued) **1012088687**

Hist compliance date: 1403
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - SHUT DOWN
Hist compliance date: 1401
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - SHUT DOWN
Hist compliance date: 1302
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - CERTIFICATION
Hist compliance date: 1204
Air prog code hist file: SIP SOURCE

State compliance status: IN COMPLIANCE - CERTIFICATION
Hist compliance date: 1202
Air prog code hist file: SIP SOURCE

Compliance & Violation Data by Minor Sources:

Air program code: SIP SOURCE
Plant air program pollutant: Not reported
Default pollutant classification: POTENTIAL UNCONTROLLED EMISSIONS < 100 TONS/YEAR
Def. poll. compliance status: PRESENT, SEE OTHER PROGRAM(S)
Def. attainment/non attnmnt: Not reported
Repeat violator date: Not reported
Turnover compliance: Not reported

Air program code: SIP SOURCE
Plant air program pollutant: PARTICULATE MATTER
Default pollutant classification: POTENTIAL UNCONTROLLED EMISSIONS < 100 TONS/YEAR
Def. poll. compliance status: PRESENT, SEE OTHER PROGRAM(S)
Def. attainment/non attnmnt: ATTAINMENT AREA FOR GIVEN POLLUTANT
Repeat violator date: Not reported
Turnover compliance: Not reported

Air program code: SIP SOURCE
Plant air program pollutant: TOTAL PARTICULATE MATTER
Default pollutant classification: POTENTIAL UNCONTROLLED EMISSIONS < 100 TONS/YEAR
Def. poll. compliance status: PRESENT, SEE OTHER PROGRAM(S)
Def. attainment/non attnmnt: ATTAINMENT AREA FOR GIVEN POLLUTANT
Repeat violator date: Not reported
Turnover compliance: Not reported

Air program code: SIP SOURCE
Plant air program pollutant: VISIBLE EMISSIONS
Default pollutant classification: CLASS IS UNKNOWN
Def. poll. compliance status: IN COMPLIANCE - SHUT DOWN
Def. attainment/non attnmnt: ATTAINMENT AREA FOR GIVEN POLLUTANT
Repeat violator date: Not reported
Turnover compliance: Not reported

A3 **NE** **1/4-1/2** **0.428 mi.** **2262 ft.**	**OLDCASTLECOASTAL - VALKARIA** **4460 OLD DIXIE HIGHWAY** **VALKARIA, FL 32949** **Site 3 of 3 in cluster A**	**NPDES** **AIRS** **TIER 2**	**S107721601** **N/A**

Relative:
Lower

Actual:
4 ft.

WASTEWATER:

Facility ID:	FLR10IH04
Facility Type:	Construction Stormwater GP
Status:	Active - Existing, permitted facility/site for which effluent, reclaimed water or wastewater residual discharge into the environment and/or monitoring is taking place.
District Office:	TLST
NPDES Permitted Site:	Not reported
Environmental Interest:	Not reported
Owner Type:	Private
Permit Capacity:	Not reported
Party Name:	Curtis McKinney, PMTE
Company Name:	McKinney Commercial Construction Group Inc
RP Address:	2112 W New Haven Ave
RP Address 2:	Not reported
RP City,Stat,Zip:	West Melbourne FL 32904
Telephone:	3217270059
Email:	Not reported
Issue Date:	05/24/2009
Effective Date:	05/24/2009
Expiration Date:	05/23/2014
DOC Description:	Generic Permit
Latitude Degrees:	27
Latitude Minutes:	56
Latitude Seconds:	8.01
Longitude Degrees:	80
Longitude Minutes:	32
Longitude Seconds:	15.4
Treatment:	Not reported

AIRS:

Facility ID:	90121
Facility Status:	Active One or more emissions units in operation, on standby status, temporarily shut down (including any shutdown while undergoing modification), or on long-term reserve shutdown. This code indicates an existing facility which has not been permanently shut down, though it may not be operating at the time of, or immediately subsequent to, permit issuance.
Office:	CD
Category:	POINT
Owner Name:	Oldcastle Coastal Inc
SIC:	Stone, Clay, Glass And Concrete Products
Title V:	No
Permit Number:	0090121005AG
Issue Date:	03/12/2010
Expiration Date:	03/12/2015
Lat/Long (dms):	27 59 13.9704 / 80 34 35.9796
Contact Name:	Shawn Echoff
Contact Address1:	4460 Old Dixie Hwy
Contact Address2:	Not reported
Contact City:	Valkaria
Contact State:	FL
Contact Zip Code:	32950

OLDCASTLECOASTAL - VALKARIA (Continued) **S107721601**

Contact Zip4:	Not reported
Contact Phone:	321-727-3202
Contact EMail:	Not reported

TIER 2:

Year:	2010
Facility Id:	Not reported
Active Date:	Not reported
Inactive Date:	Not reported
Sale Pending:	Not reported
Original Date:	Not reported
PLOT Source:	Not reported
Latitude:	0
Longitude:	0
LEPC District:	Not reported
Counties:	Not reported
SERC:	Not reported
Program Level:	Not reported
PRIME:	Not reported
SIC Code:	Not reported
SIC Code 2:	Not reported
NAICS Code:	Not reported
Last Modified Date:	Not reported
First Submit Date:	Not reported
Data Submitted By:	Not reported
Company Name:	Not reported
Comments:	Not reported

Chemical Code:	SLAG
Chemical Name:	SLAG
Chemical State:	SOLID
Location Name:	SILOS LOCATED ON WEST SIDE OF PLANT BLDG
Container Code:	H
Pressure Code:	1
Temperature Code:	4
Average Quantity:	50000
Maximum Quantity:	50000
Days On Site:	365

Year:	2010
Facility Id:	Not reported
Active Date:	Not reported
Inactive Date:	Not reported
Sale Pending:	Not reported
Original Date:	Not reported
PLOT Source:	Not reported
Latitude:	0
Longitude:	0
LEPC District:	Not reported
Counties:	Not reported
SERC:	Not reported
Program Level:	Not reported
PRIME:	Not reported
SIC Code:	Not reported
SIC Code 2:	Not reported

OLDCASTLECOASTAL - VALKARIA (Continued) **S107721601**

NAICS Code:	Not reported
Last Modified Date:	Not reported
First Submit Date:	Not reported
Data Submitted By:	Not reported
Company Name:	Not reported
Comments:	Not reported

Chemical Code:	1317653
Chemical Name:	CALCIUM CARBONATE [LIMESTONE]
Chemical State:	SOLID
Location Name:	OUTSIDE DIVIDED BINS ON WEST SIDE OF PLANT BLDG
Container Code:	R
Pressure Code:	1
Temperature Code:	4
Average Quantity:	80000
Maximum Quantity:	144000
Days On Site:	365

Year:	2010
Facility Id:	Not reported
Active Date:	Not reported
Inactive Date:	Not reported
Sale Pending:	Not reported
Original Date:	Not reported
PLOT Source:	Not reported
Latitude:	0
Longitude:	0
LEPC District:	Not reported
Counties:	Not reported
SERC:	Not reported
Program Level:	Not reported
PRIME:	Not reported
SIC Code:	Not reported
SIC Code 2:	Not reported
NAICS Code:	Not reported
Last Modified Date:	Not reported
First Submit Date:	Not reported
Data Submitted By:	Not reported
Company Name:	Not reported
Comments:	Not reported

Chemical Code:	14808607
Chemical Name:	QUARTZ
Chemical State:	SOLID GRANULAR
Location Name:	OUTSIDE DIVIDED BINS ON WEST SIDE OF PLANT BLDG
Container Code:	R
Pressure Code:	1
Temperature Code:	4
Average Quantity:	140000
Maximum Quantity:	192000
Days On Site:	365

Year:	2010
Facility Id:	Not reported
Active Date:	Not reported

OLDCASTLECOASTAL - VALKARIA (Continued) **S107721601**

Inactive Date:	Not reported
Sale Pending:	Not reported
Original Date:	Not reported
PLOT Source:	Not reported
Latitude:	0
Longitude:	0
LEPC District:	Not reported
Counties:	Not reported
SERC:	Not reported
Program Level:	Not reported
PRIME:	Not reported
SIC Code:	Not reported
SIC Code 2:	Not reported
NAICS Code:	Not reported
Last Modified Date:	Not reported
First Submit Date:	Not reported
Data Submitted By:	Not reported
Company Name:	Not reported
Comments:	Not reported

Chemical Code:	65997151
Chemical Name:	PORTLAND CEMENT
Chemical State:	LIQUID
Location Name:	SILOS LOCATED ON WEST SIDE OF PLANT BLDG
Container Code:	H
Pressure Code:	1
Temperature Code:	4
Average Quantity:	40000
Maximum Quantity:	50000
Days On Site:	365

Year:	2010
Facility Id:	Not reported
Active Date:	Not reported
Inactive Date:	Not reported
Sale Pending:	Not reported
Original Date:	Not reported
PLOT Source:	Not reported
Latitude:	0
Longitude:	0
LEPC District:	Not reported
Counties:	Not reported
SERC:	Not reported
Program Level:	Not reported
PRIME:	Not reported
SIC Code:	Not reported
SIC Code 2:	Not reported
NAICS Code:	Not reported
Last Modified Date:	Not reported
First Submit Date:	Not reported
Data Submitted By:	Not reported
Company Name:	Not reported
Comments:	Not reported

Chemical Code:	65997151
Chemical Name:	PORTLAND CEMENT

OLDCASTLECOASTAL - VALKARIA (Continued) **S107721601**

Chemical State:	SOLID
Location Name:	SILOS LOCATED ON WEST SIDE OF PLANT BLDG
Container Code:	H
Pressure Code:	1
Temperature Code:	4
Average Quantity:	120000
Maximum Quantity:	150000
Days On Site:	365

Click this hyperlink while viewing on your computer to access
8 additional FL_TIER2: record(s) in the EDR Site Report.

4
NNE
1/2-1
0.646 mi.
3409 ft.

RANGER CONSTRUCTION IND INC
4210 OLD DIXIE HIGHWAY
MALABAR, FL 32950

RCRA NonGen / NLR
FINDS
US AIRS

1001218316
FLR000043752

Relative:
Lower

Actual:
4 ft.

RCRA NonGen / NLR:

Date form received by agency:	06/13/2013
Facility name:	RANGER CONSTRUCTION IND INC
Facility address:	4210 OLD DIXIE HIGHWAY GRANT, FL 33949
EPA ID:	FLR000043752
Mailing address:	OLD DIXIE HWY GRANT, FL 32949-0705
Contact:	JO MOORE
Contact address:	PO BOX 15065 WEST PALM BEACH, FL 33416-5065
Contact country:	US
Contact telephone:	5617939400
Telephone ext.:	513
Contact email:	JO.MOORE@RANGERCONSTRUCTION.COM
EPA Region:	04
Land type:	Private
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	LEO VECELLIO
Owner/operator address:	PO BOX 15065 WEST PALM BEACH, FL 33416
Owner/operator country:	US
Owner/operator telephone:	Not reported
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	04/10/1998
Owner/Op end date:	Not reported

Owner/operator name:	RANGER CONSTRUCTION IND INC
Owner/operator address:	4210 OLD DIXIE HWY GRANT, FL 32949
Owner/operator country:	US
Owner/operator telephone:	Not reported
Legal status:	Private
Owner/Operator Type:	Operator

RANGER CONSTRUCTION IND INC (Continued) **1001218316**

Owner/Op start date: 06/13/2013
Owner/Op end date: Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Historical Generators:

Date form received by agency: 07/07/2011
Site name: RANGER CONSTRUCTION IND INC
Classification: Not a generator, verified

. Waste code: D001
. Waste name: IGNITABLE WASTE

Date form received by agency: 03/23/1998
Site name: RANGER CONSTRUCTION IND INC
Classification: Conditionally Exempt Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

Facility Has Received Notices of Violations:

Regulation violated: GGR:262.34 (d) (5)
Area of violation: Generators - Pre-transport
Date violation determined: 03/23/1998
Date achieved compliance: 08/31/1998
Violation lead agency: State
Enforcement action: DEP NON-COMPLIANCE LETTER
Enforcement action date: 03/27/1998
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Evaluation Action Summary:

Evaluation date: 04/02/2004
Evaluation: COMPLIANCE ASSISTANCE VISIT
Area of violation: Not reported
Date achieved compliance: Not reported

RANGER CONSTRUCTION IND INC (Continued) **1001218316**

Evaluation lead agency: State

Evaluation date: 03/23/1998
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - Pre-transport
Date achieved compliance: 08/31/1998
Evaluation lead agency: State

FINDS:

Registry ID: 110005649307

Environmental Interest/Information System

AFS (Aerometric Information Retrieval System (AIRS) Facility Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.

AIR SYNTHETIC MINOR

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

US National Pollutant Discharge Elimination System (NPDES) module of the Compliance Information System (ICIS) tracks surface water permits issued under the Clean Water Act. Under NPDES, all facilities that discharge pollutants from any point source into waters of the United States are required to obtain a permit. The permit will likely contain limits on what can be discharged, impose monitoring and reporting requirements, and include other provisions to ensure that the discharge does not adversely affect water quality.

CRITERIA AND HAZARDOUS AIR POLLUTANT INVENTORY

Florida Environmental System Today Application (FIESTA) Data Maintenance (FDM) system maintains entity, environmental interest and affiliation data for the State of Florida.

AIRS (AFS):

Compliance and Violation Data Major Sources:
EPA plant ID: 110005649307
Plant name: RANGER CONSTRUCTION INDUSTRIES INC
Plant address: 4210 OLD DIXIE HIGHWAY
MALABAR, FL 32950
County: BREVARD

RANGER CONSTRUCTION IND INC (Continued) **1001218316**

Region code:	04
Dunn & Bradst #:	Not reported
Air quality cntrl region:	048
Sic code:	2951
Sic code desc:	ASPHALT PAVING MIXTURES AND BLOCKS
North Am. industrial classf:	324121
NAIC code description:	Asphalt Paving Mixture and Block Manufacturing
Default compliance status:	IN COMPLIANCE - CERTIFICATION
Default classification:	POTENTIAL EMISSIONS ARE BELOW ALL APPLICABLE MAJOR SOURCE THRESHOLDS IF AND ONLY IF THE SOURCE COMPLIES WITH FEDERALLY ENFORCEABLE REGULATIONS OR LIMITATIONS.
Govt facility:	ALL OTHER FACILITIES NOT OWNED OR OPERATED BY A FEDERAL, STATE, OR LOCAL GOVERNMENT
Current HPV:	Not reported

B5
North
1/2-1
0.712 mi.
3760 ft.

PENCE SEPTIC SYSTEMS
4150 OLD DIXIE HIGHWAY
VALKARIA, FL 32906

RCRA NonGen / NLR **1000700326**
FINDS **FLD982103814**
AST

Site 1 of 3 in cluster B

Relative:
Lower

Actual:
4 ft.

RCRA NonGen / NLR:

Date form received by agency:	07/07/2011
Facility name:	PENCE SEPTIC SYSTEMS
Facility address:	4150 OLD DIXIE HIGHWAY VALKARIA, FL 32906
EPA ID:	FLD982103814
Mailing address:	PO BOX 101 PALM BAY, FL 32906
Contact:	CHARLES MATHIS
Contact address:	PO BOX 101 PALM BAY, FL 32906
Contact country:	US
Contact telephone:	3057250363
Contact email:	Not reported
EPA Region:	04
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	CHARLES MATHIS
Owner/operator address:	PO BOX 101 PALM BAY, FL 32906
Owner/operator country:	US
Owner/operator telephone:	Not reported
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	10/18/1996
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No

PENCE SEPTIC SYSTEMS (Continued) **1000700326**

Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 05/28/1987
Site name: PENCE SEPTIC SYSTEMS
Classification: Small Quantity Generator

Violation Status: No violations found

FINDS:

Registry ID: 110006380647

Environmental Interest/Information System
RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

Florida Environmental System Today Application (FIESTA) Data Maintenance (FDM) system maintains entity, environmental interest and affiliation data for the State of Florida.

AST:
Facility ID: 8627757
Facility Status: OPEN
Type Description: Fuel user/Non-retail
Facility Phone: (321) 427-5623
DEP Contractor Own: No
Region: STATE
Positioning Method: GGPS
Lat/Long (dms): 27 57 12 / 80 32 23

Owner:
Owner Id: 16652
Owner Name: PENCE SEPTIC SYSTEMS
Owner Address: 3160 DIXIE HWY NE
Owner Address 2: Not reported
Owner City,St,Zip: PALM BAY, FL 32905
Owner Contact: SAM STAPLES
Owner Phone: (321) 427-5623

Tank Id: 1

PENCE SEPTIC SYSTEMS (Continued) **1000700326**

Status: In service
Status Date: In service
Install Date: 01-MAY-1986
Substance: Vehicular diesel
Content Description: Vehicular Diesel
Gallons: 10000
Tank Location: ABOVEGROUND

Construction:
Tank Id: 1
Construction Category: Overfill/Spill
Construction Description: Ball check valve

Tank Id: 1
Construction Category: Secondary Containment
Construction Description: AST containment

Monitoring:
Tank ID: 1
Monitoring Description: Visual inspection of ASTs

Piping:
Tank ID: 1
Piping Category: Miscellaneous Attributes
Piping Description: Abv, no soil contact

Tank ID: 1
Piping Category: Primary Construction
Piping Description: Fiberglass

Tank Id: 2
Status: In service
Status Date: In service
Install Date: 01-MAY-1986
Substance: Unleaded gas
Content Description: Unleaded Gas
Gallons: 2000
Tank Location: ABOVEGROUND

Construction:
Tank Id: 2
Construction Category: Overfill/Spill
Construction Description: Ball check valve

Tank Id: 2
Construction Category: Secondary Containment
Construction Description: AST containment

Monitoring:
Tank ID: 2
Monitoring Description: Visual inspection of ASTs

Piping:
Tank ID: 2

PENCE SEPTIC SYSTEMS (Continued) **1000700326**

Piping Category: Miscellaneous Attributes
Piping Description: Abv, no soil contact

Tank ID: 2
Piping Category: Primary Construction
Piping Description: Fiberglass

Click here for Florida Oculus:

B6
North
1/2-1
0.712 mi.
3760 ft.

PENCE SEPTIC & LAND MATERIALS-GLOVER **AST** **A100379253**
4150 OLD DIXIE HWY **N/A**
VALKARIA, FL 32950

Site 2 of 3 in cluster B

Relative:
Lower

Actual:
4 ft.

AST:
Facility ID: 8840437
Facility Status: CLOSED
Type Description: Fuel user/Non-retail
Facility Phone: Not reported
DEP Contractor Own: No
Region: STATE
Positioning Method: UNVR
Lat/Long (dms): 28 11 17 / 80 36 16

Owner:
Owner Id: 8514
Owner Name: GLOVER OIL CO INC
Owner Address: PO BOX 790
Owner Address 2: ATTN: KEN MARSHALL
Owner City,St,Zip: MELBOURNE, FL 32902
Owner Contact: JOSEPH H GLOVER III | KEN MARSHALL
Owner Phone: (321) 723-3953

Tank Id: 1
Status: Enclosed/modified
Status Date: Enclosed/modified
Install Date: Not reported
Substance: New/lube oil
Content Description: New/Lube Oil
Gallons: 150
Tank Location: ABOVEGROUND

Tank Id: 2
Status: Enclosed/modified
Status Date: Enclosed/modified
Install Date: Not reported
Substance: New/lube oil
Content Description: New/Lube Oil
Gallons: 287
Tank Location: ABOVEGROUND

Tank Id: 3
Status: Enclosed/modified
Status Date: Enclosed/modified
Install Date: Not reported

PENCE SEPTIC & LAND MATERIALS-GLOVER (Continued) **A100379253**

Substance: New/lube oil
Content Description: New/Lube Oil
Gallons: 287
Tank Location: ABOVEGROUND

Tank Id: 4
Status: Enclosed/modified
Status Date: Enclosed/modified
Install Date: Not reported
Substance: New/lube oil
Content Description: New/Lube Oil
Gallons: 110
Tank Location: ABOVEGROUND

Tank Id: 5
Status: Enclosed/modified
Status Date: Enclosed/modified
Install Date: Not reported
Substance: New/lube oil
Content Description: New/Lube Oil
Gallons: 110
Tank Location: ABOVEGROUND

Tank Id: 6
Status: Enclosed/modified
Status Date: Enclosed/modified
Install Date: Not reported
Substance: Waste oil
Content Description: Waste Oil
Gallons: 287
Tank Location: ABOVEGROUND

Tank Id: 7
Status: Enclosed/modified
Status Date: Enclosed/modified
Install Date: Not reported
Substance: New/lube oil
Content Description: New/Lube Oil
Gallons: 287
Tank Location: ABOVEGROUND

Click here for Florida Oculus:

B7 **CEMEX - VALKARIA READY-MIX PLANT** **UST** **U001341540**
North **4152 OLD DIXIE HWY** **AST** **N/A**
1/2-1 **VALKARIA, FL 32976** **Financial Assurance**
0.727 mi.
3836 ft. **Site 3 of 3 in cluster B**

Relative:
Lower

Actual:
4 ft.

UST:
Facility Id: 8519327
Facility Status: OPEN
Type Description: Fuel user/Non-retail
Facility Phone: (813) 968-3274
Region: STATE
Positioning Method: GGPS
Lat/Long (dms): 27 57 9 / 80 32 22

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Owner:

Owner Id:	63629
Owner Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address 2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Owner Contact:	DENISE CORRALES
Owner Phone:	(813) 968-3274

Tank Info:

Tank Id:	1
Status:	Closed in place
Status Date:	Not reported
Install Date:	01-MAY-1984
Substance:	Vehicular diesel
Content Description:	Vehicular Diesel
Gallons:	8000
Vessel Indicator:	TANK
Tank Location:	UNDERGROUND
DEP Contractor:	No

Tank Id:	2
Status:	Closed in place
Status Date:	31-OCT-1988
Install Date:	01-MAR-1984
Substance:	Unleaded gas
Content Description:	Unleaded Gas
Gallons:	550
Vessel Indicator:	TANK
Tank Location:	UNDERGROUND
DEP Contractor:	No

Tank Id:	3
Status:	Closed in place
Status Date:	30-JUN-1991
Install Date:	01-MAR-1984
Substance:	Waste oil
Content Description:	Waste Oil
Gallons:	250
Vessel Indicator:	TANK
Tank Location:	UNDERGROUND
DEP Contractor:	No

Click here for Florida Oculus:

AST:

Facility ID:	8519327
Facility Status:	OPEN
Type Description:	Fuel user/Non-retail
Facility Phone:	(813) 968-3274
DEP Contractor Own:	No
Region:	STATE
Positioning Method:	GGPS
Lat/Long (dms):	27 57 9 / 80 32 22

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Owner:
Owner Id: 63629
Owner Name: CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address: 3820 NORTHDALE BLVD #100B
Owner Address 2: ATTN: DENISE CORRALES
Owner City,St,Zip: TAMPA, FL 33624
Owner Contact: DENISE CORRALES
Owner Phone: (813) 968-3274

Tank Id: 4
Status: Removed
Status Date: Removed
Install Date: 01-OCT-1988
Substance: Vehicular diesel
Content Description: Vehicular Diesel
Gallons: 10000
Tank Location: ABOVEGROUND

Tank Id: 5
Status: Removed
Status Date: Removed
Install Date: 01-OCT-1988
Substance: Waste oil
Content Description: Waste Oil
Gallons: 1000
Tank Location: ABOVEGROUND

Tank Id: 6
Status: In service
Status Date: In service
Install Date: 01-DEC-2003
Substance: Vehicular diesel
Content Description: Vehicular Diesel
Gallons: 10000
Tank Location: ABOVEGROUND

Construction:
Tank Id: 6
Construction Category: Primary Construction
Construction Description: Steel

Tank Id: 6
Construction Category: Overfill/Spill
Construction Description: Ball check valve

Tank Id: 6
Construction Category: Overfill/Spill
Construction Description: Flow shut-Off

Tank Id: 6
Construction Category: Overfill/Spill
Construction Description: Level gauges/alarms

Tank Id: 6
Construction Category: Secondary Containment
Construction Description: Double wall

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Tank Id: 6
Construction Category: Overfill/Spill
Construction Description: Spill containment bucket

Tank Id: 6
Construction Category: Overfill/Spill
Construction Description: DEP approved protection

Monitoring:
Tank ID: 6
Monitoring Description: DEP approved monitoring

Tank ID: 6
Monitoring Description: Monitor dbl wall tank space

Piping:
Tank ID: 6
Piping Category: Secondary Containment
Piping Description: Double wall - pipe jacket

Tank ID: 6
Piping Category: Primary Construction
Piping Description: Steel/galvanized metal

Click here for Florida Oculus:

FL Financial Assurance 3:
Region: 3
Facility ID: 8519327
Facility Phone: (813) 968-3274
Facility Status: OPEN
Facility Type: C
Type Description: Fuel user/Non-retail
DEP CO: N
Finaincial Responsibility: SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company: Not reported
Effective Date: 16-APR-2009
Expire Date: 15-APR-2010
Owner ID: 63629
Onwer Name: CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address: 3820 NORTHDALE BLVD #100B
Owner Address2: ATTN: DENISE CORRALES
Owner City,St,Zip: TAMPA, FL 33624
Contact: DENISE CORRALES
Resp Party Phone: (813) 968-3274

Region: 3
Facility ID: 8519327
Facility Phone: (813) 968-3274
Facility Status: OPEN
Facility Type: C
Type Description: Fuel user/Non-retail
DEP CO: N
Finaincial Responsibility: SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company: Not reported

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Effective Date:	16-APR-2010
Expire Date:	15-APR-2011
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	16-APR-2012
Expire Date:	15-APR-2013
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	15-APR-2014
Expire Date:	14-APR-2015
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Effective Date:	14-APR-2011
Expire Date:	14-APR-2012
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

FL Financial Assurance 3:

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	16-APR-2009
Expire Date:	15-APR-2010
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	16-APR-2010
Expire Date:	15-APR-2011
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Insurance Company:	Not reported
Effective Date:	16-APR-2012
Expire Date:	15-APR-2013
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	15-APR-2014
Expire Date:	14-APR-2015
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	14-APR-2011
Expire Date:	14-APR-2012
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

FL Financial Assurance 3:

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	16-APR-2009
Expire Date:	15-APR-2010
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	16-APR-2010
Expire Date:	15-APR-2011
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	16-APR-2012
Expire Date:	15-APR-2013
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N

CEMEX - VALKARIA READY-MIX PLANT (Continued) **U001341540**

Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	15-APR-2014
Expire Date:	14-APR-2015
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

Region:	3
Facility ID:	8519327
Facility Phone:	(813) 968-3274
Facility Status:	OPEN
Facility Type:	C
Type Description:	Fuel user/Non-retail
DEP CO:	N
Finaincial Responsibility:	SELF-INSURANCE - LETTER FROM CHIEF FINANCIAL OFFIC
Insurance Company:	Not reported
Effective Date:	14-APR-2011
Expire Date:	14-APR-2012
Owner ID:	63629
Onwer Name:	CEMEX CONSTRUCTION MATERIALS FL LLC
Owner Address:	3820 NORTHDALE BLVD #100B
Owner Address2:	ATTN: DENISE CORRALES
Owner City,St,Zip:	TAMPA, FL 33624
Contact:	DENISE CORRALES
Resp Party Phone:	(813) 968-3274

8
SE
1/2-1
0.966 mi.
5100 ft.

HUDGINS FISH CO INC
5185 US HWY 1
GRANT, FL 32949

LUST **U001342194**
UST **N/A**

Relative:
Lower

Actual:
1 ft.

LUST:

Region:	STATE
Facility Id:	9200536
Facility Status:	CLOSED
Facility Type:	C - Fuel user/Non-retail
Facility Phone:	(407)723-8199
Facility Cleanup Rank:	Not reported
District:	Central District
Lat/Long (dms):	27 56 3.47800000 / 80 31 40.4626000
Section:	Not reported
Township:	Not reported
Range:	Not reported
Feature:	Not reported
Method:	UNVR
Datum:	0
Score:	Not reported
Score Effective Date:	Not reported
Score When Ranked:	Not reported
Operator:	HILL, ROLAND
Name Update:	Not reported
Address Update:	Not reported

HUDGINS FISH CO INC (Continued) **U001342194**

Discharge Cleanup Summary:

Discharge Date:	05/14/1993
PCT Discharge Combined:	Not reported
Cleanup Required:	R - CLEANUP REQUIRED
Discharge Cleanup Status:	NFA - NFA COMPLETE
Disch Cleanup Status Date:	06/30/1994
Cleanup Work Status:	COMPLETED
Information Source:	D - DISCHARGE NOTIFICATION
Other Source Description:	Not reported
Eligibility Indicator:	I - INELIGIBLE
Site Manager:	Not reported
Site Mgr End Date:	Not reported
Tank Office:	-

Task Information:

District:	CD
Facility ID:	9200536
Facility Status:	CLOSED
Facility Type:	C - Fuel user/Non-retail -
County:	BREVARD
County ID:	5
Cleanup Eligibility Status:	I
Source Effective Date:	06-30-1994
Discharge Date:	05-14-1993
Cleanup Required:	R - CLEANUP REQUIRED
Discharge Cleanup Status:	NFA - NFA COMPLETE
Disch Cleanup Status Date:	06-30-1994
SRC Action Type:	NFA - NO FURTHER ACTION
SRC Submit Date:	04-08-1994
SRC Review Date:	06-08-1994
SRC Completion Status:	A - APPROVED
SRC Issue Date:	06-30-1994
SRC Comment:	Not reported
Cleanup Work Status:	COMPLETED
Site Mgr:	Not reported
Site Mgr End Date:	Not reported
Tank Office:	-
SR Task ID:	Not reported
SR Cleanup Responsible:	-
SR Funding Eligibility Type:	-
SR Actual Cost:	Not reported
SR Completion Date:	Not reported
SR Payment Date:	Not reported
SR Oral Date:	Not reported
SR Written Date:	Not reported
SR Soil Removal:	Not reported
SR Free Product Removal:	Not reported
SR Soil Tonnage Removed:	Not reported
SR Soil Treatment:	Not reported
SR Other Treatment:	Not reported
SR Alternate Proc Received Date:	Not reported
SR Alternate Procedure Status:	Not reported
SR Alternate Procedure Status Date:	Not reported
SR Alternate Procedure Comments:	Not reported
SA Task ID:	15485
SA Cleanup Responsible:	-
SA Funding Eligibility Type:	-

HUDGINS FISH CO INC (Continued) **U001342194**

SA Actual Cost:	Not reported
SA Completion Date:	06-08-1994
SA Payment Date:	Not reported
RAP Task ID:	Not reported
RAP Cleanup Responsible ID:	-
RAP Funding Eligibility Type:	-
RAP Actual Cost:	Not reported
RAP Completion Date:	Not reported
RAP Payment Date:	Not reported
RAP Last Order Approved:	Not reported
RA Task ID:	15486
RA Cleanup Responsible:	RP - RESPONSIBLE PARTY
RA Funding Eligibility Type:	-
RA Years to Complete:	Not reported
RA Actual Cost:	Not reported

Click here for Florida Oculus:

UST:

Facility Id:	9200536
Facility Status:	CLOSED
Type Description:	Fuel user/Non-retail
Facility Phone:	(407) 723-8199
Region:	STATE
Positioning Method:	UNVR
Lat/Long (dms):	27 56 0 / 80 31 42

Owner:

Owner Id:	10477
Owner Name:	HUDGINS FISH CO INC
Owner Address:	PO BOX 10681
Owner Address 2:	Not reported
Owner City,St,Zip:	RIVIERA BEACH, FL 33419
Owner Contact:	LEWIS E. HUDGINS
Owner Phone:	(305) 845-2881

Tank Info:

Tank Id:	1
Status:	Removed
Status Date:	31-MAY-1993
Install Date:	01-JUL-1973
Substance:	Unleaded gas
Content Description:	Unleaded Gas
Gallons:	2000
Vessel Indicator:	TANK
Tank Location:	UNDERGROUND
DEP Contractor:	No

Tank Id:	2
Status:	Removed
Status Date:	31-MAY-1993
Install Date:	01-JUL-1973
Substance:	Unknown/Not reported
Content Description:	Unknown/Not Reported
Gallons:	888
Vessel Indicator:	TANK
Tank Location:	UNDERGROUND

HUDGINS FISH CO INC (Continued) **U001342194**

DEP Contractor: No

Click here for Florida Oculus:

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9 **USAF VALKARIA MIS AX** **FUDS** **1009484698**
NW **N/A**
> 1 **VALKARIA, FL**
1.373 mi.
7247 ft.

Relative:
Higher

Actual:
22 ft.

FUDS:

Federal Facility ID:	FL9799F4467
FUDS #:	I04FL0247
INST ID:	55762
Facility Name:	USAF VALKARIA MIS AX
City:	VALKARIA
State:	FL
EPA Region:	04
County:	BREVARD
Congressional District:	15
US Army District:	Jacksonville District (SAJ)
Fiscal Year:	2012
Telephone:	904-232-2235
NPL Status:	Not Listed
RAB:	Not reported
CTC:	38.20000
Current Owner:	Private Sector
Current Prog:	Not reported
Future Prog:	Not reported
Acreage:	Not reported
Description:	The site consists of 494.42 acres located in Brevard County, FL., adjacent to the south side of the county - owned Valkaria Airport.
History:	In 1960 and 1965 the U.S. acquired three separate sites for an Air Force missile tracking facility. The site became excess and all properties had reverted back to private owners by 1976.
Latitude:	27.95583333000
Longitude:	-80.55777777999

Count: 0 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
		NO SITES FOUND			

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 12/16/2014
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 12/16/2014
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal Delisted NPL site list

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 12/16/2014
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 04/02/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 07/21/2014
Date Data Arrived at EDR: 10/07/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 13

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 04/02/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List
A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 09/18/2014
Date Data Arrived at EDR: 09/19/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls
A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 09/18/2014
Date Data Arrived at EDR: 09/19/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/26/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Varies

LUCIS: Land Use Control Information System
LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/03/2014
Date Data Arrived at EDR: 12/12/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 48

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System
Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 09/29/2014
Date Data Arrived at EDR: 09/30/2014
Date Made Active in Reports: 11/06/2014
Number of Days to Update: 37

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

State- and tribal - equivalent CERCLIS

SHWS: Florida’s State-Funded Action Sites
State Hazardous Waste Sites. State hazardous waste site records are the states’ equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 03/05/2015
Number of Days to Update: 9

Source: Department of Environmental Protection
Telephone: 850-488-0190
Last EDR Contact: 02/24/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Semi-Annually

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: Solid Waste Facility Database

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 01/19/2015
Date Data Arrived at EDR: 01/20/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 850-922-7121
Last EDR Contact: 04/20/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Semi-Annually

State and tribal leaking storage tank lists

LUST: Petroleum Contamination Detail Report

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 12/18/2014
Date Data Arrived at EDR: 02/03/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 9

Source: Department of Environmental Protection
Telephone: 850-245-8839
Last EDR Contact: 02/03/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

LAST: Leaking Aboveground Storage Tank Listing

The file for Leaking Aboveground Storage Tanks. Please remember STCM does not track the source of the discharge so the agency provides a list of facilities with an aboveground tank and an open discharge split by facilities with aboveground tanks only and facilities with aboveground and underground tanks.

Date of Government Version: 02/04/2015
Date Data Arrived at EDR: 02/06/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 6

Source: Department of Environmental Protection
Telephone: 850-245-8799
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 02/12/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 29

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 01/28/2015
Date Data Arrived at EDR: 01/30/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 42

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land

Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 01/30/2015
Date Data Arrived at EDR: 02/05/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 32

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 01/08/2015
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 01/08/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 05/01/2013
Date Made Active in Reports: 11/01/2013
Number of Days to Update: 184

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 09/30/2014
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 10

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/10/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 31

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 09/23/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 65

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

State and tribal registered storage tank lists

UST: Storage Tank Facility Information
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 01/06/2015
Date Data Arrived at EDR: 02/03/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 9

Source: Department of Environmental Protection
Telephone: 850-245-8839
Last EDR Contact: 02/03/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

AST: Storage Tank Facility Information
Registered Aboveground Storage Tanks.

Date of Government Version: 01/06/2015
Date Data Arrived at EDR: 02/03/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 9

Source: Department of Environmental Protection
Telephone: 850-245-8839
Last EDR Contact: 02/03/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 05/01/2013
Date Made Active in Reports: 01/27/2014
Number of Days to Update: 271

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 09/30/2014
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 10

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 01/30/2015
Date Data Arrived at EDR: 02/05/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 36

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 28

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/23/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 65

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 01/29/2015
Date Data Arrived at EDR: 01/30/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 42

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 02/12/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 29

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 12/14/2014
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 28

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

FF TANKS: Federal Facilities Listing
A listing of federal facilities with storage tanks.

Date of Government Version: 04/01/2015
Date Data Arrived at EDR: 04/02/2015
Date Made Active in Reports: 04/15/2015
Number of Days to Update: 13

Source: Department of Environmental Protection
Telephone: 850-245-8250
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Quarterly

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 04/13/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

ENG CONTROLS: Institutional Controls Registry
The registry is a database of all contaminated sites in the state of Florida which are subject to engineering controls. Engineering Controls encompass a variety of engineered remedies to contain and/or reduce contamination, and/or physical barriers intended to limit access to property. ECs include fences, signs, guards, landfill caps, provision of potable water, slurry walls, sheet pile (vertical caps), pumping and treatment of groundwater, monitoring wells, and vapor extraction systems.

Date of Government Version: 03/01/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 04/16/2015
Number of Days to Update: 8

Source: Department of Environmental Protection
Telephone: 850-245-8927
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Semi-Annually

Inst Control: Institutional Controls Registry

The registry is a database of all contaminated sites in the state of Florida which are subject to institutional and engineering controls.

Date of Government Version: 03/01/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 04/16/2015
Number of Days to Update: 8

Source: Department of Environmental Protection
Telephone: 850-245-8927
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Semi-Annually

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 09/29/2014
Date Data Arrived at EDR: 10/01/2014
Date Made Active in Reports: 11/06/2014
Number of Days to Update: 36

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 04/02/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

VCP: Voluntary Cleanup Sites

Listing of closed and active voluntary cleanup sites.

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/25/2015
Date Made Active in Reports: 03/05/2015
Number of Days to Update: 8

Source: Department of Environmental Protection
Telephone: 850-245-8705
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

State and tribal Brownfields sites

BSRA: Brownfield Site Rehabilitation Agreements Listing

The BSRA provides DEP and the public assurance that site rehabilitation will be conducted in accordance with Florida Statutes and DEP's Contaminated Site Cleanup Criteria rule. In addition, the BSRA provides limited liability protection for the voluntary responsible party. The BSRA contains various commitments by the voluntary responsible party, including milestones for completion of site rehabilitation tasks and submittal of technical reports and plans. It also contains a commitment by DEP to review technical reports according to an agreed upon schedule. Only those brownfield sites with an executed BSRA are eligible to apply for a voluntary cleanup tax credit incentive pursuant to Section 376.30781, Florida Statutes.

Date of Government Version: 03/06/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 04/20/2015
Number of Days to Update: 12

Source: Department of Environmental Protection
Telephone: 850-245-8934
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Varies

BROWNFIELDS AREAS: Brownfields Areas Database

A "brownfield area" means a contiguous area of one or more brownfield sites, some of which may not be contaminated, that has been designated as such by a local government resolution. Such areas may include all or portions of community redevelopment areas, enterprise zones, empowerment zones, other such designated economically deprived communities and areas, and Environmental Protection Agency (EPA) designated brownfield pilot projects. This layer provides a polygon representation of the boundaries of these designated Brownfield Areas in Florida.

Date of Government Version: 04/06/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 04/20/2015
Number of Days to Update: 12

Source: Department of Environmental Protection
Telephone: 850-245-8934
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

BROWNFIELDS: Brownfields Sites Database

Brownfields are defined by the Florida Department of Environmental Protection (FDEP) as abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.

Date of Government Version: 04/06/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 04/20/2015
Number of Days to Update: 12

Source: Department of Environmental Protection
Telephone: 850-245-8927
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Semi-Annually

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 12/22/2014
Date Data Arrived at EDR: 12/22/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 38

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 03/24/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 04/23/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

SWRCY: Recycling Centers
A listing of recycling centers located in the state of Florida.

Date of Government Version: 07/24/2014
Date Data Arrived at EDR: 10/22/2014
Date Made Active in Reports: 01/12/2015
Number of Days to Update: 82

Source: Department of Environmental Protection
Telephone: 850-245-8718
Last EDR Contact: 04/23/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/25/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/03/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Quarterly

FL SITES: Sites List
This summary status report was developed from a number of lists including the Eckhardt list, the Moffit list, the EPA Hazardous Waste Sites list, EPA's Emergency & Remedial Response information System list (RCRA Section 3012) & existing department lists such as the obsolete uncontrolled Hazardous Waste Sites list. This list is no longer updated.

Date of Government Version: 12/31/1989
Date Data Arrived at EDR: 05/09/1994
Date Made Active in Reports: 08/04/1994
Number of Days to Update: 87

Source: Department of Environmental Protection
Telephone: 850-245-8705
Last EDR Contact: 03/24/1994
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

PRIORITYCLEANERS: Priority Ranking List
The Florida Legislature has established a state-funded program to cleanup properties that are contaminated as a result of the operations of a drycleaning facility.

Date of Government Version: 12/29/2014
Date Data Arrived at EDR: 02/17/2015
Date Made Active in Reports: 03/05/2015
Number of Days to Update: 16

Source: Department of Environmental Protection
Telephone: 850-245-8927
Last EDR Contact: 02/17/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Varies

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/25/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/03/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: No Update Planned

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/18/2014
Date Data Arrived at EDR: 03/18/2014
Date Made Active in Reports: 04/24/2014
Number of Days to Update: 37

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/29/2014
Date Data Arrived at EDR: 12/30/2014
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 69

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

SPILLS: Oil and Hazardous Materials Incidents

Statewide oil and hazardous materials inland incidents.

Date of Government Version: 01/12/2015
Date Data Arrived at EDR: 01/13/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 21

Source: Department of Environmental Protection
Telephone: 850-245-2010
Last EDR Contact: 04/13/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Semi-Annually

SPILLS 80: SPILLS80 data from FirstSearch

Spills 80 includes those spill and release records available from FirstSearch databases prior to 1990. Typically, they may include chemical, oil and/or hazardous substance spills recorded before 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 80.

Date of Government Version: 09/01/2001
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 03/06/2013
Number of Days to Update: 62

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 12/10/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 03/04/2013
Number of Days to Update: 60

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 12/09/2014
Date Data Arrived at EDR: 12/29/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 02/03/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 04/14/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 06/06/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 09/18/2014
Number of Days to Update: 8

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 24

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 11/25/2013
Date Data Arrived at EDR: 12/12/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 74

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 03/10/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010	Source: Department of Energy
Date Data Arrived at EDR: 10/07/2011	Telephone: 505-845-0011
Date Made Active in Reports: 03/01/2012	Last EDR Contact: 02/27/2015
Number of Days to Update: 146	Next Scheduled EDR Contact: 06/08/2015
	Data Release Frequency: Varies

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 12/30/2014	Source: Department of Labor, Mine Safety and Health Administration
Date Data Arrived at EDR: 12/31/2014	Telephone: 303-231-5959
Date Made Active in Reports: 01/29/2015	Last EDR Contact: 03/06/2015
Number of Days to Update: 29	Next Scheduled EDR Contact: 06/15/2015
	Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2011	Source: EPA
Date Data Arrived at EDR: 07/31/2013	Telephone: 202-566-0250
Date Made Active in Reports: 09/13/2013	Last EDR Contact: 01/29/2015
Number of Days to Update: 44	Next Scheduled EDR Contact: 06/08/2015
	Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2012	Source: EPA
Date Data Arrived at EDR: 01/15/2015	Telephone: 202-260-5521
Date Made Active in Reports: 01/29/2015	Last EDR Contact: 03/27/2015
Number of Days to Update: 14	Next Scheduled EDR Contact: 07/06/2015
	Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009	Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Date Data Arrived at EDR: 04/16/2009	Telephone: 202-566-1667
Date Made Active in Reports: 05/11/2009	Last EDR Contact: 02/23/2015
Number of Days to Update: 25	Next Scheduled EDR Contact: 06/08/2015
	Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009	Source: EPA
Date Data Arrived at EDR: 04/16/2009	Telephone: 202-566-1667
Date Made Active in Reports: 05/11/2009	Last EDR Contact: 02/23/2015
Number of Days to Update: 25	Next Scheduled EDR Contact: 06/08/2015
	Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 04/10/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/06/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 04/09/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 10/15/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 33

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/17/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 12/29/2014
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 21

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 02/27/2015
Date Data Arrived at EDR: 02/27/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 26

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 04/09/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 01/18/2015
Date Data Arrived at EDR: 02/27/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 26

Source: EPA
Telephone: (404) 562-9900
Last EDR Contact: 03/09/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 02/01/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

BRS: Biennial Reporting System
The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 02/26/2013
Date Made Active in Reports: 04/19/2013
Number of Days to Update: 52

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 02/24/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Biennially

UIC: Underground Injection Wells Database Listing
A listing of Class I wells. Class I wells are used to inject hazardous waste, nonhazardous waste, or municipal waste below the lowermost USDW.

Date of Government Version: 01/27/2015
Date Data Arrived at EDR: 01/28/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 15

Source: Department of Environmental Protection
Telephone: 850-245-8655
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

DRYCLEANERS: Drycleaning Facilities
The Drycleaners database, maintained by the Department of Environmental Protection, provides information about permitted dry cleaner facilities.

Date of Government Version: 01/08/2015
Date Data Arrived at EDR: 01/28/2015
Date Made Active in Reports: 02/10/2015
Number of Days to Update: 13

Source: Department of Environmental Protection
Telephone: 850-245-8927
Last EDR Contact: 01/28/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

DEDB: Ethylene Dibromide Database Results
Ethylene dibromide (EDB), a soil fumigant, that has been detected in drinking water wells. The amount found exceeds the maximum contaminant level as stated in Chapter 62-550 or 520. It is a potential threat to public health when present in drinking water.

Date of Government Version: 01/06/2015
Date Data Arrived at EDR: 01/20/2015
Date Made Active in Reports: 02/03/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 850-245-8335
Last EDR Contact: 03/23/2015
Next Scheduled EDR Contact: 07/06/2015
Data Release Frequency: Varies

WASTEWATER: Wastewater Facility Regulation Database
Domestic and industrial wastewater facilities.

Date of Government Version: 02/02/2015
Date Data Arrived at EDR: 02/10/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 2

Source: Department of Environmental Protection
Telephone: 850-245-8600
Last EDR Contact: 02/10/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

AIRS: Permitted Facilities Listing
A listing of Air Resources Management permits.

Date of Government Version: 02/09/2015
Date Data Arrived at EDR: 02/10/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 2

Source: Department of Environmental Protection
Telephone: 850-921-9558
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

TIER 2: Tier 2 Facility Listing
A listing of facilities which store or manufacture hazardous materials that submit a chemical inventory report.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 06/20/2014
Date Made Active in Reports: 07/14/2014
Number of Days to Update: 24

Source: Department of Environmental Protection
Telephone: 850-413-9970
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Varies

FL Cattle Dip. Vats: Cattle Dipping Vats
From the 1910's through the 1950's, these vats were filled with an arsenic solution for the control and eradication of the cattle fever tick. Other pesticides, such as DDT, were also widely used. By State law, all cattle, horses, mules, goats, and other susceptible animals were required to be dipped every 14 days. Under certain circumstances, the arsenic and other pesticides remaining at the site may present an environmental or public health hazard.

Date of Government Version: 02/04/2005
Date Data Arrived at EDR: 06/29/2007
Date Made Active in Reports: 07/11/2007
Number of Days to Update: 12

Source: Department of Environmental Protection
Telephone: 850-488-3601
Last EDR Contact: 04/10/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: No Update Planned

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 04/14/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 02/18/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 01/30/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/22/2015
Data Release Frequency: Varies

Financial Assurance 3: Financial Assurance Information Listing
A listing of financial assurance information for storage tanks sites.

Date of Government Version: 01/06/2015
Date Data Arrived at EDR: 02/03/2015
Date Made Active in Reports: 02/12/2015
Number of Days to Update: 9

Source: Department of Environmental Protection
Telephone: 850-245-8853
Last EDR Contact: 02/03/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Quarterly

Financial Assurance 2: Financial Assurance Information Listing
A listing of financial assurance information for solid waste facilities.

Date of Government Version: 02/02/2015
Date Data Arrived at EDR: 02/03/2015
Date Made Active in Reports: 02/10/2015
Number of Days to Update: 7

Source: Department of Environmental Protection
Telephone: 850-245-8743
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information
All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 03/09/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 02/16/2015
Next Scheduled EDR Contact: 06/01/2015
Data Release Frequency: Quarterly

Financial Assurance 1: Financial Assurance Information Listing
A list of hazardous waste facilities required to provide financial assurance under RCRA.

Date of Government Version: 02/02/2015
Date Data Arrived at EDR: 02/03/2015
Date Made Active in Reports: 02/10/2015
Number of Days to Update: 7

Source: Department of Environmental Protection
Telephone: 850-245-8793
Last EDR Contact: 02/02/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Varies

US AIRS MINOR: Air Facility System Data
A listing of minor source facilities.

Date of Government Version: 10/16/2014
Date Data Arrived at EDR: 10/31/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 17

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/16/2014
Date Data Arrived at EDR: 10/31/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 17

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 07/13/2015
Data Release Frequency: Annually

COAL ASH DOE: Steam-Electric Plant Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 04/15/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Varies

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 02/09/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 04/14/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: N/A

PRP: Potentially Responsible Parties

A listing of verified Potentially Responsible Parties

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 10/17/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 3

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 02/13/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Quarterly

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 11/25/2014
Date Data Arrived at EDR: 11/26/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 64

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 04/10/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Varies

DWM CONTAM: DWM CONTAMINATED SITES

A listing of active or known sites. The listing includes sites that need cleanup but are not actively being working on because the agency currently does not have funding (primarily petroleum and drycleaning).

Date of Government Version: 10/15/2014
Date Data Arrived at EDR: 10/16/2014
Date Made Active in Reports: 12/08/2014
Number of Days to Update: 53

Source: Department of Environmental Protection
Telephone: 850-245-7503
Last EDR Contact: 04/13/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Varies

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 04/22/2013
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 6

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 02/13/2015
Next Scheduled EDR Contact: 05/25/2015
Data Release Frequency: Varies

RESP PARTY: Responsible Party Sites Listing

Open, inactive and closed responsible party sites

Date of Government Version: 04/06/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 04/16/2015
Number of Days to Update: 8

Source: Department of Environmental Protection
Telephone: 850-245-8758
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

CLEANUP SITES: DEP Cleanup Sites - Contamination Locator Map Listing

This listing includes the locations of waste cleanup sites from various programs. The source of the cleanup site data includes Hazardous Waste programs, Site Investigation Section, Compliance and Enforcement Tracking, Drycleaning State Funded Cleanup Program (possibly other state funded cleanup), Storage Tank Contamination Monitoring.

Date of Government Version: 03/02/2015
Date Data Arrived at EDR: 03/04/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 9

Source: Department of Environmental Protection
Telephone: 866-282-0787
Last EDR Contact: 03/04/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Quarterly

SITE INV SITES: Site Investigation Section Sites Listing

Statewide coverage of Site Investigation Section (SIS) sites. Site Investigation is a Section within the Bureau of Waste Cleanup, Division of Waste Management. SIS provides technical support to FDEP District Waste Cleanup Programs and conducts contamination assessments throughout the state.

Date of Government Version: 02/23/2015
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 03/05/2015
Number of Days to Update: 9

Source: Department of Environmental Protection
Telephone: 850-245-8953
Last EDR Contact: 02/24/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Quarterly

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR US Hist Auto Stat: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Environmental Protection in Floridia.

Date of Government Version: N/A	Source: Department of Environmental Protection
Date Data Arrived at EDR: 07/01/2013	Telephone: N/A
Date Made Active in Reports: 01/10/2014	Last EDR Contact: 06/01/2012
Number of Days to Update: 193	Next Scheduled EDR Contact: N/A
	Data Release Frequency: Varies

RGA HWS: Recovered Government Archive State Hazardous Waste Facilities List

The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Environmental Protection in Floridia.

Date of Government Version: N/A	Source: Department of Environmental Protection
Date Data Arrived at EDR: 07/01/2013	Telephone: N/A
Date Made Active in Reports: 12/30/2013	Last EDR Contact: 06/01/2012
Number of Days to Update: 182	Next Scheduled EDR Contact: N/A
	Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Environmental Protection in Floridia.

Date of Government Version: N/A	Source: Department of Environmental Protection
Date Data Arrived at EDR: 07/01/2013	Telephone: N/A
Date Made Active in Reports: 12/30/2013	Last EDR Contact: 06/01/2012
Number of Days to Update: 182	Next Scheduled EDR Contact: N/A
	Data Release Frequency: Varies

COUNTY RECORDS

ALACHUA COUNTY:

Facility List

List of all regulated facilities in Alachua County.

Date of Government Version: 04/01/2015	Source: Alachua County Environmental Protection Department
Date Data Arrived at EDR: 04/07/2015	Telephone: 352-264-6800
Date Made Active in Reports: 04/10/2015	Last EDR Contact: 03/30/2015
Number of Days to Update: 3	Next Scheduled EDR Contact: 07/13/2015
	Data Release Frequency: Annually

BROWARD COUNTY:

Aboveground Storage Tanks

Aboveground storage tank locations in Broward County.

Date of Government Version: 12/04/2014	Source: Broward County Environmental Protection Department
Date Data Arrived at EDR: 03/05/2015	Telephone: 954-818-7509
Date Made Active in Reports: 03/13/2015	Last EDR Contact: 03/03/2015
Number of Days to Update: 8	Next Scheduled EDR Contact: 06/15/2015
	Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Semi-Annual Inventory Report on Contaminated Locations

Early Detection Incentive/Environmental Assessment Remediation. This report monitors the status and remediation progress of known contaminated locations within Broward County. Sites listed by the US EPA, the Florida Department of Environmental Protection, and sites licensed for contamination assessment and cleanup by the Division of Pollution Prevention and Remediation Programs of the Department.

Date of Government Version: 03/30/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 04/10/2015
Number of Days to Update: 10

Source: Broward County Environmental Protection Department
Telephone: 954-818-7509
Last EDR Contact: 03/31/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Underground Storage Tanks

All known regulated storage tanks within Broward County, including those tanks that have been closed

Date of Government Version: 12/04/2014
Date Data Arrived at EDR: 03/05/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 8

Source: Broward County Environmental Protection Department
Telephone: 954-818-7509
Last EDR Contact: 03/03/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Annually

HILLSBOROUGH COUNTY:

Hillsborough County LF

Hillsborough county landfill sites.

Date of Government Version: 10/15/2014
Date Data Arrived at EDR: 10/16/2014
Date Made Active in Reports: 12/02/2014
Number of Days to Update: 47

Source: Hillsborough County Environmental Protection Commission
Telephone: 813-627-2600
Last EDR Contact: 04/13/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Varies

MIAMI-DADE COUNTY:

Air Permit Sites

Facilities that release or have a potential to release pollutants.

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Department of Environmental Resources Management
Telephone: 305-372-6755
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Marine Facilities Operating Permit

What is this permit used for? Miami-Dade County Ordinance 89-104 and Section 24-18 of the Code of Miami-Dade County require the following types of marine facilities to obtain annual operating permits from DERM: All recreational boat docking facilities with ten (10) or more boat slips, moorings, davit spaces, and vessel tie-up spaces. All boat storage facilities contiguous to tidal waters in Miami-Dade County with ten (10) or more dry storage spaces including boatyards and boat manufacturing facilities.

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: DERM
Telephone: 305-372-3576
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Quarterly

Maimi River Enforcement

The Miami River Enforcement database files were created for facilities and in some instances vessels that were inspected by a workgroup within the Department that was identified as the Miami River Enforcement Group. The files do not all necessarily reflect enforcement cases and some were created for locations that were permitted by other Sections within the Department.

Date of Government Version: 06/05/2013
Date Data Arrived at EDR: 06/06/2013
Date Made Active in Reports: 08/06/2013
Number of Days to Update: 61

Source: DERM
Telephone: 305-372-3576
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Quarterly

Hazardous Waste Sites
Sites with the potential to generate waste

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Dade County Department of Environmental Resources Management
Telephone: 305-372-6755
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Industrial Waste Type 2-4 Sites
IW2s are facilities having reclaim or recycling systems with no discharges, aboveground holding tanks or spill prevention and countermeasure plans. IW4s are facilities that discharge an effluent to the ground.

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Department of Environmental Resources Management
Telephone: 305-372-6700
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Industrial Waste Type 5 Sites
Generally these facilities fall under the category of "conditionally exempt small quantity generator" or "small quantity generator".

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Department of Environmental Resources Management
Telephone: 305-372-6700
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Industrial Waste Type 6
Permits issued to those non-residential land uses located within the major drinking water wellfield protection areas that are not served by sanitary sewers. These facilities do not handle hazardous materials but are regulated because of the env. sensitivity of the areas where they are located.

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Department of Environmental Resources Management
Telephone: 305-372-6700
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Industrial Waste Permit Sites
Facilities that either generate more than 25,000 of wastewater per day to sanitary sewers or are pre-defined by EPA.

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Department of Environmental Resources Management
Telephone: 305-372-6700
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Enforcement Case Tracking System Sites
Enforcement cases monitored by the Dade County Department of Environmental Resources Management.

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Department of Environmental Resources Management
Telephone: 305-372-6755
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Fuel Spills Cases

DERM documents fuel spills of sites that are not in a state program.

Date of Government Version: 01/08/2009
Date Data Arrived at EDR: 01/13/2009
Date Made Active in Reports: 02/05/2009
Number of Days to Update: 23

Source: Department of Environmental Resources Management
Telephone: 305-372-6755
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

Storage Tanks

A listing of aboveground and underground storage tank site locations.

Date of Government Version: 03/03/2015
Date Data Arrived at EDR: 03/06/2015
Date Made Active in Reports: 03/16/2015
Number of Days to Update: 10

Source: Department of Environmental Resource Management
Telephone: 305-372-6700
Last EDR Contact: 03/06/2015
Next Scheduled EDR Contact: 06/15/2015
Data Release Frequency: Semi-Annually

PALM BEACH COUNTY:

Palm Beach County LF

Palm Beach County Inventory of Solid Waste Sites.

Date of Government Version: 09/01/2011
Date Data Arrived at EDR: 09/20/2011
Date Made Active in Reports: 10/10/2011
Number of Days to Update: 20

Source: Palm Beach County Solid Waste Authority
Telephone: 561-640-4000
Last EDR Contact: 03/30/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 07/30/2013
Date Data Arrived at EDR: 08/19/2013
Date Made Active in Reports: 10/03/2013
Number of Days to Update: 45

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 11/17/2014
Next Scheduled EDR Contact: 03/02/2015
Data Release Frequency: No Update Planned

NJ MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/19/2012
Date Made Active in Reports: 08/28/2012
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 04/14/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 01/01/2015
Date Data Arrived at EDR: 02/04/2015
Date Made Active in Reports: 02/27/2015
Number of Days to Update: 23

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 02/04/2015
Next Scheduled EDR Contact: 05/18/2015
Data Release Frequency: Annually

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 07/21/2014
Date Made Active in Reports: 08/25/2014
Number of Days to Update: 35

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 07/15/2014
Date Made Active in Reports: 08/13/2014
Number of Days to Update: 29

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 02/23/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 03/19/2015
Date Made Active in Reports: 04/07/2015
Number of Days to Update: 19

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 03/13/2015
Next Scheduled EDR Contact: 06/29/2015
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.
Daycare Centers: Department of Children & Families
Source: Provider Information
Telephone: 850-488-4900

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory
Source: Department of Environmental Protection
Telephone: 850-245-8238

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

STREET AND ADDRESS INFORMATION

APPENDIX C

Interview Questionnaires

ASTM E1527-13 USER QUESTIONNAIRE
SITE BV-24A
BREVARD COUNTY, FLORIDA

1. Are you aware of any environmental cleanup liens against the property that are filed or recorded under federal, tribal, state, or local law? Have the title records or judicial records (where appropriate) been searched for this information?

No.

2. Are you aware of any Activity and Use Limitations (AULs), such as engineering controls, land use restrictions or institutional controls that are in place at the site and/or have been filed or recorded in a registry under federal, tribal, state, or local law?

No.

3. As the user of this Environmental Site Assessment (ESA), do you have any specialized knowledge or experience related to the property or nearby properties? For example, are you involved in the same line of business as the current or former occupants of the property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by the type of business?

No.

4. Does the purchase price/loan amount for this property reasonably reflect the fair market value of the property? If you conclude that there is a difference, have you considered whether the lower purchase price is because contamination is known or believed to be present at the property?

Yes, purchase price reflects fair market value.

5. Are you aware of commonly known or reasonably ascertainable information about the property that would help the environmental professional to identify conditions indicative of releases or threatened releases? For example, as user, (a) Do you know the past uses of the property? (b) Do you know of specific chemicals that are present or once were present at the property? (c) Do you know of spills or other chemical releases that have taken place at the property? (d) Do you know of any environmental cleanups that have taken place at the property?

None.

6. As the user of this ESA, based on your knowledge and experience related to the property, are there any obvious indicators that point to the presence or likely presence of contamination at the property?

None.

Completed by:	**Mark Crosley**
Title:	**Executive Director**
Company:	**Florida Inland Navigation District**
Relationship to site:	**Pending Owner**
Signature:	
Date:	**06-02-15**

ASTM E1527-13 OWNER INTERVIEW/QUESTIONNAIRE
SITE BV-24A
BREVARD COUNTY, FLORIDA

Please describe the current use of the property:

Vacant land

Please circle the appropriate answer and provide additional details if necessary:

YES / NO 1. Is the property or any adjoining property used for an industrial use? **If yes please describe:**

YES / NO 2. To the best of your knowledge, has the property or any adjoining property been used for an industrial use in the past? **If yes please describe:**

YES / NO 3. Is the property or any adjoining property presently used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility? **If yes please describe:**

YES / NO 4. To the best of your knowledge, has the property or any adjoining property been used in the past as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility? **If yes please describe:**

YES / NO 5. Are there currently, or to the best of your knowledge, have there been previously, any damaged or discarded automotive or industrial batteries, or pesticides, paints, or other chemicals in individual containers of greater than five gallons in volume or fifty gallons in the aggregate, stored on or used at the property or at the facility? **If yes please describe:**

YES / NO 6. Are there currently, or to the best of your knowledge has there been previously, any industrial drums (typically 55 gallon) or sacks of chemicals located on the property or at the facility? **If yes please describe:**

YES / NO 7. Has Fill Dirt been brought onto the property which originated from a contaminated site or which is of an unknown origin? **If yes please describe:**

YES / NO 8. Are there currently, or to the best of your knowledge have there been previously, any pits, ponds, or lagoons? **If yes please describe:**

YES / NO 9. Is there currently, or to the best of your knowledge has there been previously, any stained soil on the property? **If yes please describe:**

YES / NO 10. Are there currently, or to the best of your knowledge have there been previously, any registered or unregistered storage tanks (above or underground) located on the property? **If yes please describe:**

YES / NO 11. Are there currently, or to the best of your knowledge, have there been previously any vent pipes, fill pipes or access ways indicating a fill pipe protruding from the ground on the property or adjacent to any structure located on the property? **If yes please describe:**

YES / NO 12. Are there currently, or to the best of your knowledge, have there been previously any flooring, drains, or walls located within the facility that are stained by substances other than water or are emitting foul odors? **If yes please describe:**

YES / NO 13. If the property is served by a private well or non-public water system, have contaminates been identified in the well or system that exceed guidelines applicable to the water system or has the well been designated as contaminated by any government environmental/health agency? **If yes please describe:**

YES / NO 14. Does the owner or occupant of the property have any knowledge of environmental liens or governmental notification relating to past or current violations of environmental laws with respect to the property or any facility located on the property? **If yes please describe:**

YES / NO 15. Has the owner or occupant of the property been informed of the past or current existence of hazardous substances or petroleum products or environmental violations with respect to the property or any facility located on the property? **If yes please describe:**

YES / NO 16. Does the owner or occupant of the property have any knowledge of any environmental site assessment of the property or facility that indicated the presence of hazardous substances or petroleum products on, or contamination of, the property or recommended further assessment of the property? **If yes please describe:**

YES / NO 17. Does the owner or occupant of the property know of any past, threatened or pending lawsuits or administrative proceedings concerning a release of any hazardous substances or petroleum products involving the property by any owner or occupant of the property? **If yes please describe:**

YES / NO 18. Does the property discharge waste water on or adjacent to the property other than storm water or into a sanitary sewer system? **If yes please describe:**

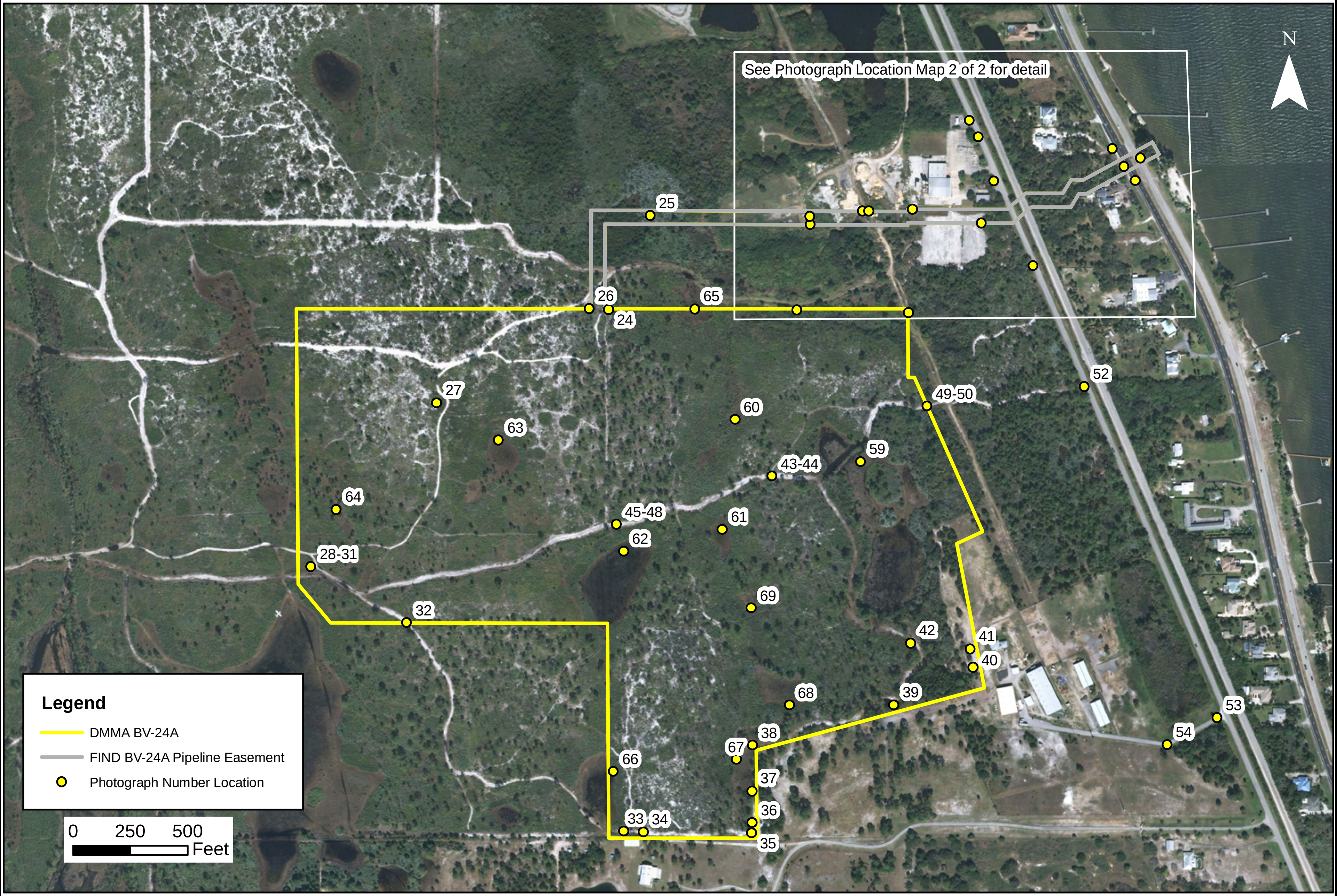
YES / NO 19. To the best of your knowledge, have any hazardous substances or petroleum products, unidentified waste materials, tires, automotive or industrial batteries, or other waste materials been dumped above ground, buried and/or burned on the property? **If yes please describe:**

YES / NO 20. Is there a transformer, capacitor or any hydraulic equipment for which there are any records indicating the presence of PCB's? **If yes please describe:**

Completed by:	**Jenny Ashbury**
Title:	**Support Services Specialist**
Company:	**Brevard County Environmentally Endangered Lands (EEL) Program**
Relationship to site:	**County owned property**
Signature:	**Jenny Ashbury**
Date:	**June 10, 2015**

APPENDIX D

Site Reconnaissance Photographs

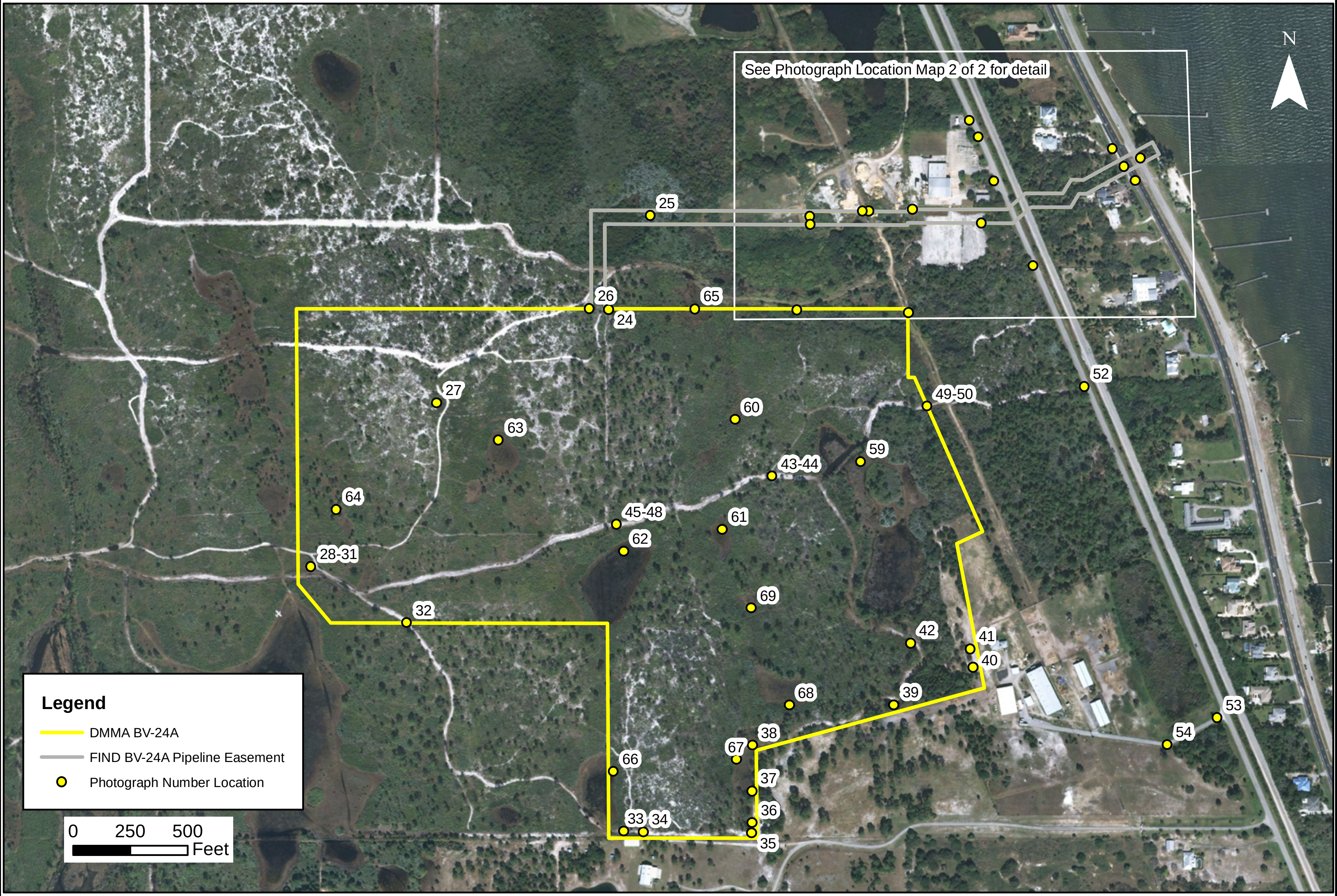


TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

PHOTOGRAPH LOCATION MAP (1 OF 2)
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye
2. Horizontal Datum: NAD 1983

PROJECT	C2015-014
DRAWN BY	NA
SHEET	
DATE	JUNE 2015



TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

PHOTOGRAPH LOCATION MAP (1 OF 2)
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye
2. Horizontal Datum: NAD 1983

PROJECT	C2015-014
DRAWN BY	NA
SHEET	
DATE	JUNE 2015

Photograph 1 See Photograph Location Map. Closed Oldcastle Coastal facility (4460 Old Dixie Highway).

Photograph 2 See Photograph Location Map. Photograph of stored concrete block on north portion of Oldcastle Coastal facility taken facing northwest.

Photograph 3 See Photograph Location Map. Photograph taken facing east of the front lot of the Oldcastle Coastal facility.

Photograph 4 See Photograph Location Map. Photograph taken facing east of the eastern portion of the front lot of the Oldcastle Coastal facility.

Photograph 5 See Photograph Location Map. Photograph taken facing west the of remaining conveyor belt and air compressor at the Oldcastle Coastal facility.

Photograph 6 See Photograph Location Map. Electrical transformer located north of the Oldcastle Coastal facility.

Photograph 7 See Photograph Location Map. Propane powered pump station located north of the Oldcastle Coastal facility.

Photograph 8 See Photograph Location Map. Photograph taken facing southwest from the northeastern property boundary of the Oldcastle Coastal facility.

Photograph 9 See Photograph Location Map. Photograph taken facing west of dumped material located along the northern border of the pipeline easement behind the Oldcastle Coastal facility.

Photograph 10 See Photograph Location Map. Photograph taken facing north of dumped material located along the pipeline easement behind the Oldcastle Coastal facility.

Photograph 11 See Photograph Location Map. Photograph taken facing north of dumped material located along the northern border of the pipeline easement behind the Oldcastle Coastal facility.

Photograph 12 See Photograph Location Map. Photograph taken facing east of dumped material located along the pipeline easement behind the Oldcastle Coastal facility.

Photograph 13 See Photograph Location Map. Photograph taken facing east of dumped material located along the northern border of the pipeline easement behind the Oldcastle Coastal facility.

Photograph 14 See Photograph Location Map. Photograph taken facing west of the goat farm located along the northern border of the pipeline easement.

Photograph 15 See Photograph Location Map. Photograph taken facing southwest of the goat farm located along the northern border of the pipeline easement.

Photograph 16 See Photograph Location Map. Photograph taken from the pipeline easement facing north northeast of undocumented AST containers located at Oldcastle Coastal facility.

Photograph 17 See Photograph Location Map. Photograph taken facing east along the northern boundary of the pipeline easement.

Photograph 18 See Photograph Location Map. Photograph taken facing east along the northern boundary of the pipeline easement.

Photograph 19 See Photograph Location Map. Photograph taken facing southwest.

Photograph 20 See Photograph Location Map. Photograph taken facing west of dumped fill material behind the Oldcastle Coastal facility.

Photograph 21 See Photograph Location Map. Photograph taken facing south of recently dumped material including dirt and concrete.

Photograph 22 See Photograph Location Map. Photograph taken facing southeast of the utility corridor.

Photograph 23 See Photograph Location Map. Photograph taken facing west.

Photograph 24 See Photograph Location Map. Photograph taken facing east.

Photograph 25 See Photograph Location Map. Photograph taken facing west.

Photograph 26 See Photograph Location Map. Photograph taken facing north.

Photograph 27 See Photograph Location Map. Photograph taken facing south.

Photograph 28 See Photograph Location Map. Photograph taken facing west.

Photograph 29 See Photograph Location Map. Photograph taken facing east.

Photograph 30 See Photograph Location Map. Photograph taken facing north.

Photograph 31 See Photograph Location Map. Photograph taken facing south.

Photograph 32 See Photograph Location Map. Photograph taken facing southeast.

Photograph 33 See Photograph Location Map. Photograph taken facing south of the equipment shed of the adjoining hunt camp.

Photograph 34 See Photograph Location Map. Photograph taken facing south of the enclosed structure located on the adjoining hunt camp.

Photograph 35 See Photograph Location Map. Photograph taken facing west along the assessment area boundary.

Photograph 36 See Photograph Location Map. Photograph taken facing north along the assessment area boundary.

Photograph 37 See Photograph Location Map. Photograph taken facing east of the adjoining Brevard Equestrian Center.

Photograph 38 See Photograph Location Map. Photograph taken facing east northeast along the assessment area boundary.

Photograph 39 See Photograph Location Map. Photograph taken facing south along of the adjoining Brevard Equestrian Center.

Photograph 40 See Photograph Location Map. Photograph taken facing south southeast along the assessment area boundary.

Photograph 41 See Photograph Location Map. Photograph taken facing north along the assessment area boundary.

Photograph 42 See Photograph Location Map. Photograph taken facing east of a xeric hammock.

Photograph 43 See Photograph Location Map. Photograph taken facing east along the main primitive trail road bisecting the assessment area.

Photograph 44 See Photograph Location Map. Photograph taken facing west along the main primitive trail road bisecting the assessment area.

Photograph 45 See Photograph Location Map. Photograph taken facing north along the main primitive trail road bisecting the assessment area.

Photograph 46 See Photograph Location Map. Photograph taken facing west along the main primitive trail road bisecting the assessment area.

Photograph 47 See Photograph Location Map. Photograph taken facing south along the main primitive trail road bisecting the assessment area.

Photograph 48 See Photograph Location Map. Photograph taken facing east along the main primitive trail road bisecting the assessment area.

Photograph 49 See Photograph Location Map. Photograph taken facing west along the main primitive trail road bisecting the assessment area.

Photograph 50 See Photograph Location Map. Photograph taken facing east along the main primitive trail road bisecting the assessment area.

Photograph 51 See Photograph Location Map. Photograph taken facing west showing a for sale sign on Parcel No. 29-38-21-00-00507.0-0000.00.

Photograph 52 See Photograph Location Map. Photograph taken facing west of the ingress/egress for the assessment area located along Old Dixie Highway.

Photograph 53 See Photograph Location Map. Photograph taken facing west of the entrance to the Brevard Equestrian Center adjoining the assessment area to the southwest.

Photograph 54 See Photograph Location Map. Photograph taken facing west northwest of the Brevard Equestrian Center adjoining the assessment area to the southwest.

Photograph 55 See Photograph Location Map. Photograph taken facing west of the pipeline easement west of US 1.

Photograph 56 See Photograph Location Map. Photograph taken facing east of the pipeline easement east of US 1.

Photograph 57 See Photograph Location Map. Photograph taken facing west of the adjoining parcel to the north of the pipeline easement due west of US 1.

Photograph 58 See Photograph Location Map. Photograph taken facing west of the adjoining parcel to the south of the pipeline easement due west of US 1.

Photograph 59 See Photograph Location Map. Photograph taken facing south of a depression marsh located within the assessment area.

Photograph 60 See Photograph Location Map. Photograph taken facing south of a depression marsh located within the assessment area.

Photograph 61 See Photograph Location Map. Photograph taken facing south of a depression marsh located within the assessment area.

Photograph 62 See Photograph Location Map. Photograph taken facing south of a depression marsh located within the assessment area.

Photograph 63 See Photograph Location Map. Photograph taken facing south of a depression marsh located within the assessment area.

Photograph 64 See Photograph Location Map. Photograph taken facing north of a depression marsh located within the assessment area.

Photograph 65 See Photograph Location Map. Photograph taken facing south of a shrub bog located within the assessment area.

Photograph 66 See Photograph Location Map. Photograph taken facing southwest of a depression marsh located within the assessment area.

Photograph 67 See Photograph Location Map. Photograph taken facing south of a depression marsh located within the assessment area.

Photograph 68 See Photograph Location Map. Photograph taken facing east of a depression marsh located within the assessment area.

Photograph 69 See Photograph Location Map. Photograph taken facing north of a depression marsh located within the assessment area.

ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 4

GROUNDWATER MODEL CALIBRATION FIGURE

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) Normal Wet Season

Pond Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.		GROUNDWATER MODELING **BV-24A** BREVARD COUNTY, FL
APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16 PN:GPGW-16-013	ENGINEER:NA DRAWN BY: DLS
		GROUNDWATER MODEL CALIBRATION EXHIBIT D-10

ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 5
SAFE UPLAND LINE DETERMINATION

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Noah Valenstein
Secretary

DATE: August 29, 2017

TO: David Stites, Ph.D.
Taylor Engineering, Inc.
Telephone: 904.256.1373
Email: David Stites dstites@taylorengineering.com

FROM: Steve Kellogg, PLSM
Bureau of Survey and Mapping
Division of State Lands
Email: Steve.Kellogg@dep.state.fl.us

SUBJECT: Safe Upland Line (SUL)
Indian River
Section 27, Township 23 South, Range 36 East
Section 21, Township 29 South, Range 38 East
Brevard County

Dear David:

An ordinary high water line has not been determined at this site. Based on available records, as of this date, an elevation of **1.1 feet National Geodetic Vertical Datum 1929 (NGVD29)** along the natural shoreline is sufficient for a safe upland line. The safe upland line is at or above the ordinary high water line. The ordinary high water line is an ambulatory boundary that will shift in response to long term natural changes in the shoreline (ie., accretion, erosion, reliction and submergence. Please contact me at the letterhead address, mail station 105, or by phone at (850) 245.2640.

ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 6
USACE APPROVED JURISDICTIONAL DETERMINATION

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
400 HIGH POINT DRIVE, SUITE 600
COCOA, FLORIDA 32926

REPLY TO
ATTENTION OF

July 21, 2016

Regulatory Division
North Permits Branch
Cocoa Permits Section
SAJ-2016-00684(JD-AWP)
JURISDICTIONAL VERIFICATION

Florida Inland Navigation District
Attn: Mark Crosley
1314 Marcinski Road
Jupiter, Florida 33477

Dear Mr. Crosley:

Reference is made to information submitted to the U.S. Army Corps of Engineers (Corps) regarding the potential extent of Federal jurisdiction at Dredge Material Management Area BV-24A, located Latitude 27.94198 North, Longitude 80.5406 West, in Section 20, Township 29 South, Range 38 East, Grant, Brevard County, Florida. The evaluation of this jurisdictional determination involved many factors and may have included a field visit, review of aerial photographs, geological quad sheets, county soils maps, and site specific information provided by you. A copy of the approved jurisdictional determination form and depiction of the geographic extent of Federal jurisdiction are enclosed. A Department of the Army permit may be required for work in areas identified as waters of the United States.

This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the South Atlantic Division Office at the following address: If you object to this determination, you may request an administrative appeal under Corps' regulations at 33 CFR Part 331. If you request to appeal this determination, you must submit a completed RFA form to the South Atlantic Division Office at the following address:

Mr. Jason Steele
South Atlantic Division
U.S. Army Corps of Engineers
CESAD-CM-CO-R, Room 9M15
60 Forsyth St., SW.
Atlanta, Georgia 30303-8801.

Mr. Steele can be reached by telephone number at 404-562-5137, or by facsimile at 404-562-5138.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division office within 60 days of the date of the RFA. Should you decide to submit an RFA form, it must be received at the above address by **September 19, 2016**. It is not necessary to submit a RFA form to the Division Office if you do not object to the determination in this letter.

The determination shown on the enclosed information represents the upland/wetland boundary for purposes of determining the Corps jurisdictional line. As depicted on the enclosed drawings, the property encompasses waters of the United States, which are subject to regulation by the Corps; and, which are not subject to regulation by the Corps. Please be advised that the jurisdictional determination shown is based on the Corps of Engineers Wetlands Delineation Manual (1987) or current regional supplement, and is valid for a period no longer than 5 years from the date of this letter unless new information warrants a revision of the determination before the expiration date. If, after the 5-year period, the Corps has not specifically revalidated this jurisdictional determination, it shall automatically expire. Any reliance upon this jurisdictional determination beyond the expiration date may lead to possible violation of current Federal laws and/or regulations. You may request revalidation of the jurisdictional determination prior to the expiration date. Any revalidation or updating will be considered under the method of jurisdictional determination and other applicable regulations in use at the time of the request. Additionally, this determination has been based on information provided by you or your agent; should we determine that the information was incomplete or erroneous this delineation would be invalid.

This determination has been conducted to identify the limits of the Corps Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985, as amended. If you or your tenant are U.S. Department of Agriculture (USDA) program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

You are cautioned that work performed below the mean high water line or ordinary high water line in waters of the United States; and/or, the discharge of dredged or fill material into any areas identified on the enclosed information as within Federal jurisdiction, without a Department of the Army permit could subject you to enforcement action. Receipt of a permit from the Department of Environmental Protection or the

Water Management District does not obviate the requirement for obtaining a Department of the Army permit.

The Corps' Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to visit http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey and complete our automated Customer Service Survey. Your input is appreciated – favorable or otherwise. Please be aware this Internet address is case sensitive and should be entered as it appears above.

Thank you for your cooperation with our permit program. If you have any questions concerning this matter please contact Andrew Phillips by mail at the letterhead address, by electronic mail at andrew.w.phillips@ usace.army.mil, or by telephone at 321-504-3771 extension 14.

Sincerely,

for Donald W. Kinard
Chief, Regulatory Division

Enclosures

Copy Furnished: (electronically)

Taylor Engineering; Noah Adams (nadams@taylorengineering.com)

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Florida Inland Navigation District		File Number: SAJ-2016-00684	Date: July 21, 2016
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
X	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/CECW/Pages/reg_materials.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- *ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.*
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- *ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.*
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- *ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.*
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT		
REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)		
ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.		
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:		
If you have questions regarding this decision you may contact: **Project Manager as noted in letter**	If you have questions regarding the appeal process you may contact: Jason W. Steele Administrative Appeals Review Officer USACE – South Atlantic Division 60 Forsyth Street SW, Room 10M15 Atlanta, Georgia 30303-8801 (404) 562-5137	
RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.		
Signature of appellant or agent.	Date:	Telephone number:

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Cocoa Permits Section, FIND Dredge Material Mgt Area BV- 24A, SAJ-2016-00684

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: Florida County/parish/borough: Brevard City: Grant-Valkaria
Center coordinates of site (lat/long in degree decimal format): Lat. 27.942881° **N**, Long. 80.54.0328/° **W**.
Universal Transverse Mercator: UTM 17
Name of nearest waterbody: Indian River
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Indian River
Name of watershed or Hydrologic Unit Code (HUC): Portion of Kid Creek HUC 12: 030802020105

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): March 23, 2016

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: N/A.

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **are and are not** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**

a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]

☐ TNWs, including territorial seas
☐ Wetlands adjacent to TNWs
☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
☒ Non-RPWs that flow directly or indirectly into TNWs
☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
☐ Impoundments of jurisdictional waters
☐ Isolated (interstate or intrastate) waters, including isolated wetlands

b. **Identify (estimate) size of waters of the U.S. in the review area:**

Non-wetland waters: 8.72 acres linear feet: width (ft) and/or acres.
Wetlands: 1.46 acres.

c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**

Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]

☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **Isolated wetlands with no significant nexus were identified within the project area and determined to be not jurisdictional. Wetland A, Wetland B, Wetland C, Wetland D, Wetland E1/E2, Wetland I, Wetland J, Wetland K, Wetland L, Wetland F, and Ditch 1 are isolated wetlands within the review area. The subject wetlands are surrounded by upland vegetation and do not have any physical, chemical, or biological connection to waters of the United States.**

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

Sandy soils surrounding the wetlands allow the perculation of surface water collected in these depressions into the surficial aquifer. Geomorphic conditions appear to reduce the opportunity for lateral movement by subsurface flow to any nearby intermittent tributaries (i.e. swales, ditches). The nearest RPW is located less than 0.5 mile south of the subject wetland discussed above. Give the absence of a factual determination of subsurface flow, or a substantial nexus to commerce, these wetlands were determined to be isolated consistent with SWANCC and the "Migratory Bird Rule".

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW:.

Summarize rationale supporting determination:

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent".

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 9,166 **acres**
Drainage area: 9,166 **acres**
Average annual rainfall: 49 inches
Average annual snowfall: N/A inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☒ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **1 (or less)** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **1 (or less)** aerial (straight) miles from TNW.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: N/A.

Identify flow route to TNW[5]: Tributary 1 flows northwest for 0.27 miles before it terminates into the Indian River.
Tributary stream order, if known: Unknown.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
- ☐ Natural
- ☐ Artificial (man-made). Explain: .
- ☒ Manipulated (man-altered). Explain: Tributary has been channelized.

Tributary properties with respect to top of bank (estimate):
Average width: 10 feet
Average depth: unknown feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):
- ☒ Silts
- ☒ Sands
- ☐ Concrete
- ☐ Cobbles
- ☐ Gravel
- ☒ Muck
- ☐ Bedrock
- ☐ Vegetation. Type/% cover:
- ☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Generally stable. Bank highly vegetated.
Presence of run/riffle/pool complexes. Explain: No run/riffle/pool complexes observed.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **6-10**
Describe flow regime: Flow results from water staging up in wetlands within the review area and outflowing into the channelized non-rpw.
Other information on duration and volume: Unknown.

Surface flow is: **Confined.** Characteristics: Confined within side banks.

Subsurface flow: **Unknown**. Explain findings: N/A.
- ☐ Dye (or other) test performed: .

Tributary has (check all that apply):
- ☒ Bed and banks
- ☒ OHWM[6] (check all indicators that apply):
  - ☒ clear, natural line impressed on the bank
  - ☐ changes in the character of soil
  - ☐ shelving
  - ☐ vegetation matted down, bent, or absent
  - ☐ leaf litter disturbed or washed away
  - ☐ sediment deposition
  - ☐ water staining
  - ☐ other (list):
  - ☐ the presence of litter and debris
  - ☐ destruction of terrestrial vegetation
  - ☐ the presence of wrack line
  - ☐ sediment sorting
  - ☐ scour
  - ☐ multiple observed or predicted flow events
  - ☒ abrupt change in plant community
- ☐ Discontinuous OHWM.[7] Explain:N/A.

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
- ☐ High Tide Line indicated by:
  - ☐ oil or scum line along shore objects
  - ☐ fine shell or debris deposits (foreshore)
  - ☐ physical markings/characteristics
  - ☐ tidal gauges
  - ☐ other (list):
- ☐ Mean High Water Mark indicated by:
  - ☐ survey to available datum;
  - ☐ physical markings;
  - ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.
[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: Water color is tanic.
Identify specific pollutants, if known: N/A.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☒ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☒ Aquatic/wildlife diversity. Explain findings: provides habitat for and life cycle support to various amphibians and reptiles.

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: N/A.

Subsurface flow: **Pick List**. Explain findings: N/A.
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
☐ Discrete wetland hydrologic connection. Explain: .
☐ Ecological connection. Explain: .
☐ Separated by berm/barrier. Explain:.

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain:.
Identify specific pollutants, if known:.

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: Freshwater marsh (641) and wetland shrub (631).
☐ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **12**
Approximately 288 acres in total are being considered in the cumulative analysis.

For each wetland, specify the following: See attached Table 1 and Figure 4

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: The review area includes a total of 288 acres of that 22.62 are identified as wetlands according to the National Wetland Inventory. This includes palustrine emergent (1.72 acres), palustrine scrub-shrub (15.28 acres), and palustrine unconsolidated bottom (1.98 acres) wetlands. These wetland systems provide habitat for wildlife, perform flood storage and drainage for the surrounding areas, water quality treatment and base flow to the Indian River, and food web support for the Sebastian River and Indian River Lagoon.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: See Section IV(B).

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial:.
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☒ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☒ Tributary waters: **1,300** linear feet **4** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **Intermittent surface water.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☒ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: Ditch (0.029 acre), Wetland G (0.19 acre), Wetland M (0.48 acre), Wetland N (0.56 acre), and Wetland O (0.05 acre) acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.

---

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☒ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☒ Other non-wetland waters: Ditch 1 (0.012 acres). List type of aquatic resource: .
☒ Wetlands: Wetland A (4.13 acres), Wetland B (0.18 acre), Wetland C (0.27 acre), Wetland D (1.79 acres), Wetland E1/E2 (0.73 acre), Wetland I (0.16 acre), Wetland J (0.54 acre), Wetland K (0.76 acre), Wetland L (0.15 acre), and Wetland F (0.5 acre).

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands:

SECTION IV: DATA SOURCES.

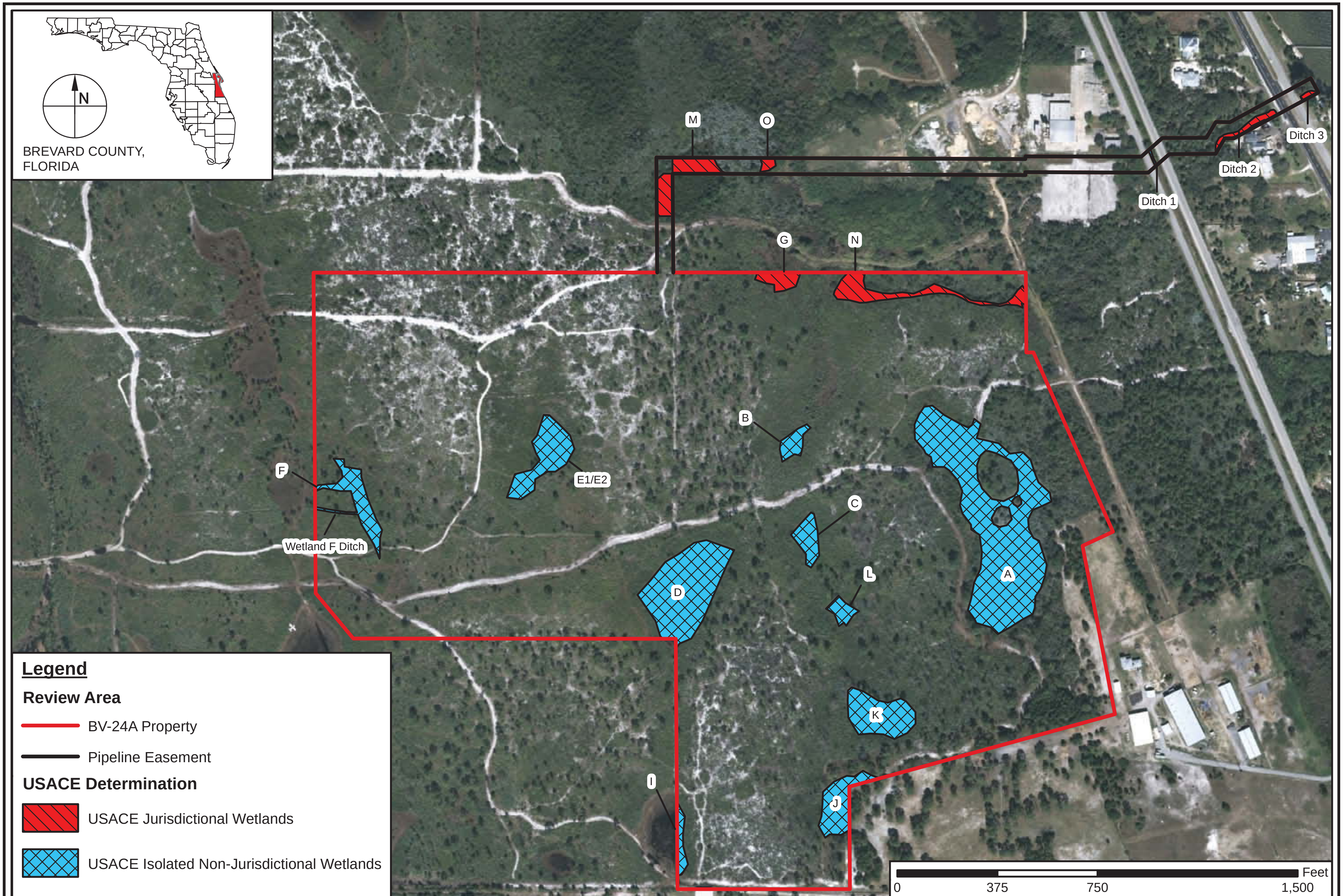
A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☒ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:1:24,000, Grant Quad.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USDA, NRCS 2014.
☒ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☒ 100-year Floodplain Elevation is: 5.7 NAVD888 (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): FDOT, 2015.
or ☐ Other (Name & Date): .
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: This document determines the jurisdictional status of waters of the United States, including wetlands, found within the review area of the BV-24A Dredge Material Management Area. Waters of the United States and wetlands outside of the review area are not considered as part of this evaluation.

There are 1.46 acres of jurisdictional wetlands and tributaries are located within the Review Area. These wetlands are hydrologically connected to the Indian River through adjacent connections. Wetlands M,O,G, and N are hydrologically connected to an non-RPW which intermittently discharges directly into the Indian River. Water was observed overtopping an existing maintenance road along the northern property line connecting wetlands G and N to wetlands M and O during the Corps field visit. Wetland N also has a manmade hydrologic connection to ditches 2 and 3.

The on-site non-RPW and its adjacent hydrologically connected wetlands: Wetland G (0.19 acre), Wetland M (0.48 acre), Wetland N (0.56 acre), and Wetland O (0.05 acre)) provide flood water storage and pollutant treatment prior to waters reaching the TNW. These wetlands have the ability to provide habitat and lifecycle support to various amphibians and reptiles as well as foraging and nesting habitat for various avian species,all of which provides for higher level organisms in the food web including species downstream in the Indian River. The subject wetlands have the capacity to transfer nutrients and detritis downstream into the Indian River further supporting the food web. There are water stains and signs of inundation that indicate that hydrological patterns between the subject wetlands and the non-RPW. Therefore, the subject wetlands and non-RPW tributary significantly contribute to the Indian River.

There are 9.22 acres of non-jurisdictional isolated wetlands within the review area. These wetlands are surrounded by uplands and wetlands but do not have any hydrologic connections to waters of the United States. The Corps completed a field investigation on March 23, 2016 and did not observe hydrologic connections between the isolated wetlands. Ditch 1 (0.012 acre), Wetland A (4.13 acres), Wetland B (0.18 acre), Wetland C (0.27 acre), Wetland D (1.79 acres), Wetland E1/E2 (0.73 acre), Wetland I (0.16 acre), Wetland J (0.54 acre), Wetland K (0.76 acre), Wetland F (0.5 acre), and Wetland L (0.15 acre) are physically, chemically, any hydrologically isolated from other wetlands or surface watersand do not convey water to any RPW, non- RPW, TNW or waters of the United States.

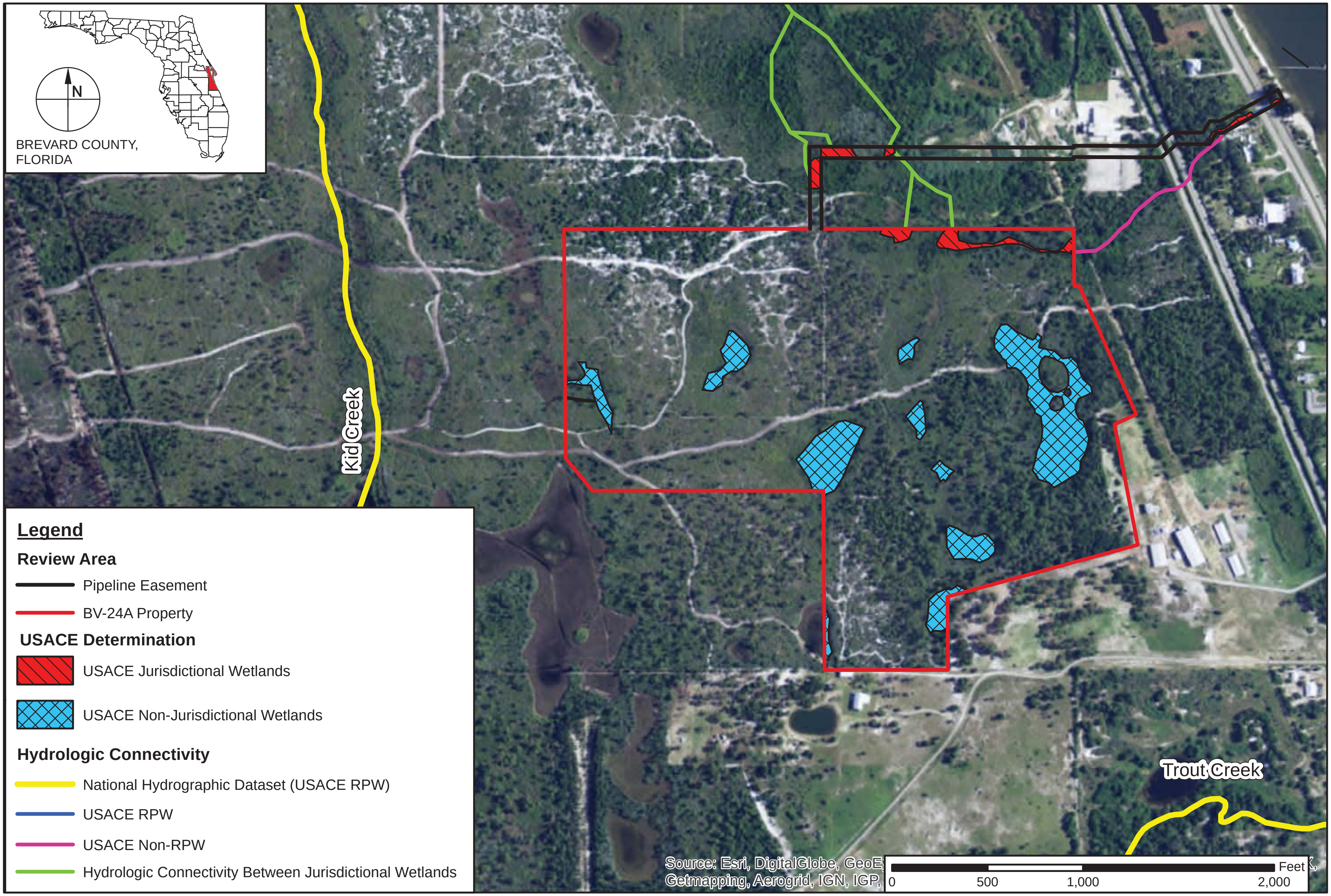


TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 1
2015 AERIAL PHOTOGRAPH
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: Florida Department of Transportation, 2015
2. Field review conducted with Andrew Phillips (USACE) and Jeff Collins (USACE) on March 23, 2013.

PROJECT	C2015-065
DRAWN BY	NA
SHEET	
DATE	JUNE 2016



TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 2a
HYDROLOGIC CONNECTIVITY
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye
2. National Hydrograph Dataset Source: USGS
3. Field review conducted with Andrew Phillips (USACE) and Jeff Collins (USACE) on March 23, 2013.

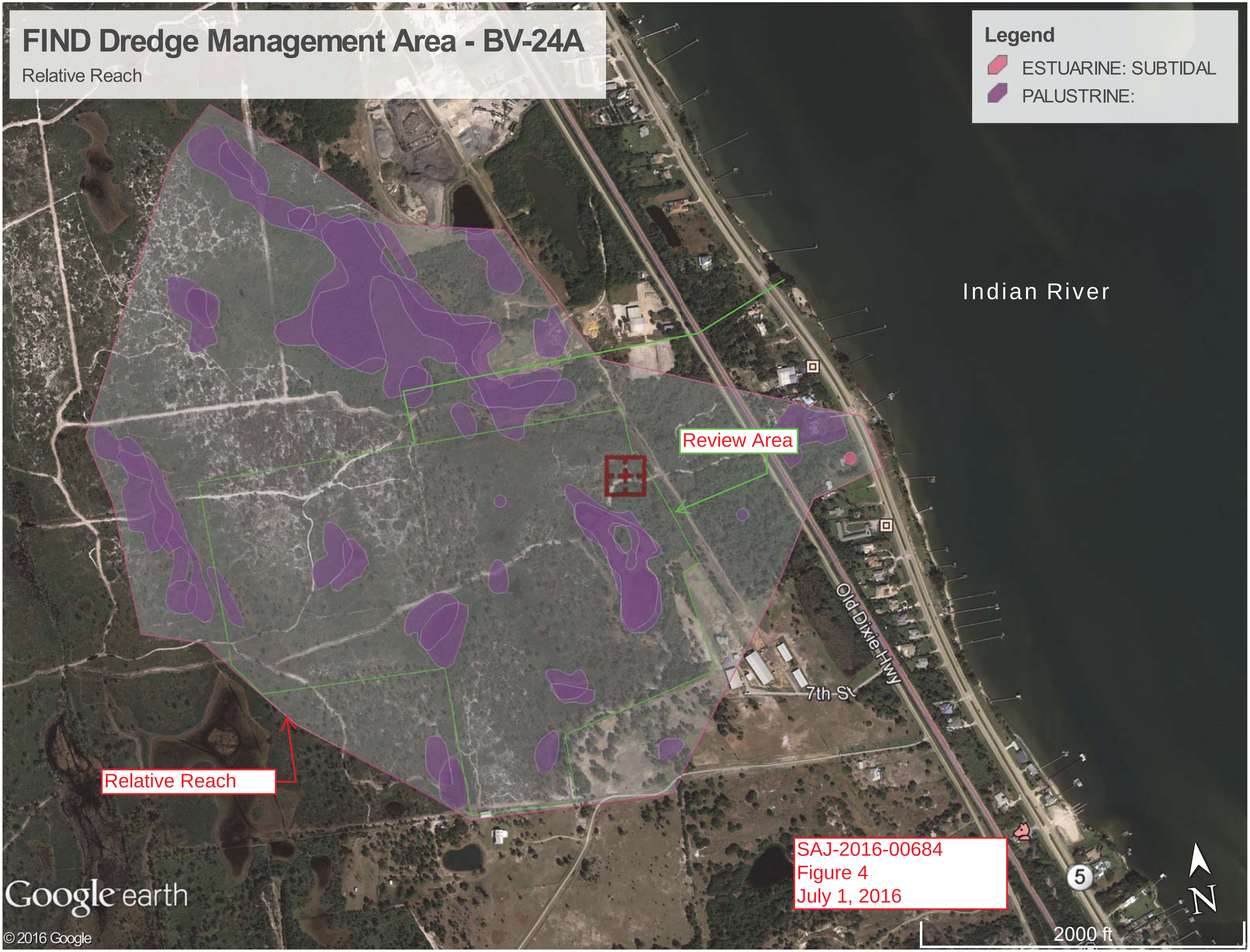
PROJECT	C2015-065
DRAWN BY	NA
SHEET	
DATE	JUNE 2016

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 2b
HYDROLOGIC CONNECTIVITY
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye
2. National Hydrograph Dataset Source: USGS
3. Field review conducted with Andrew Phillips (USACE) and Jeff Collins (USACE) on March 23, 2013.

PROJECT	C2015-065
DRAWN BY	NA
SHEET	
DATE	JUNE 2016



FIND Dredge Management Area - BV-24A
Relative Reach
Legend
ESTUARINE: SUBTIDAL
PALUSTRINE:
Indian River
Review Area
Relative Reach
Old Dixie Hwy
7th St
5
SAJ-2016-00684
Figure 4
July 1, 2016
N
2000 ft
Google earth
© 2016 Google

SAJ-2016-00684

Query Name	DCMA		
Analysis Type	04 NWI	**Date**	30 Jun 2016 14:34
Geometry Type	POLYGON	**Record Id**	13647
Input File	DCMA RR.kmz		
Buffer Radius	0 Miles	**Area**	288.47 Acres

LAYER: Florida NWI 2013 **(POLYGON)**

attribute	system_name	class_name	acres
PEM1Fd	PALUSTRINE:	EMERGENT: PERSISTENT	0.99
PEM1Fd	PALUSTRINE:	EMERGENT: PERSISTENT	0.54
PEM1Fd	PALUSTRINE:	EMERGENT: PERSISTENT	0.85
PUBHx	PALUSTRINE:	UNCONSOLIDATED BOTTOM:	1.84
PEM1Fd	PALUSTRINE:	EMERGENT: PERSISTENT	3.99
PEM1Fd	PALUSTRINE:	EMERGENT: PERSISTENT	3.16
PEM1Fd	PALUSTRINE:	EMERGENT: PERSISTENT	0.83
PUBHx	PALUSTRINE:	UNCONSOLIDATED BOTTOM:	0.14
PSS1Fd	PALUSTRINE:	SCRUB-SHRUB: BROAD-LEAVED DECIDUOUS	0.93
PSS1Fd	PALUSTRINE:	SCRUB-SHRUB: BROAD-LEAVED DECIDUOUS	12.65
PSS1Fd	PALUSTRINE:	SCRUB-SHRUB: BROAD-LEAVED DECIDUOUS	0.47
PSS1Fd	PALUSTRINE:	SCRUB-SHRUB: BROAD-LEAVED DECIDUOUS	1.23

LAYER: National Wetlands **(POLYGON)**

poly_count	attribute	system_name	class_name	acres
1	E1UBLx	ESTUARINE: SUBTIDAL	UNCONSOLIDATED BOTTOM:	0.10
1	PSS3/EM1C	PALUSTRINE:	SCRUB-SHRUB: BROAD-LEAVED EVERGREEN	18.29
1	PEM1/FO3A	PALUSTRINE:	EMERGENT: PERSISTENT	2.37
4	PEM1A	PALUSTRINE:	EMERGENT: PERSISTENT	1.95
15	PEM1F	PALUSTRINE:	EMERGENT: PERSISTENT	20.36
1	PEM1/SS3C	PALUSTRINE:	EMERGENT: PERSISTENT	3.35

ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 7
INFORMAL WETLAND DETERMINATION

Florida Department of Environmental Protection

Central District
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

May 23, 2016

Florida Inland Navigation District
Attn: Mark T. Crosley, Executive Director
1314 Marcinski Rd.
Jupiter, FL 33477
mcrosley@aicw.org

RE: Informal Wetlands Jurisdictional Determination
Brevard County, Sections 20 & 21, Township 29 South, Range 38 East
Old Dixie Hwy
Grant-Valkaria, FL 32949
File Nos. 05-0169652-003 FD

Dear Mr. Crosley:

DEP staff inspected the site listed above on March 23, 2016 to review the wetland line previously flagged for this property by M. Noah Adams of Taylor Engineering, Inc. and found:

> The wetland lines reviewed in the field and depicted on the attached survey appear to be an accurate representation of the landward extent of the wetlands and surface waters on the property pursuant to Section 62-340, Florida Administrative Code. Before any development of these wetlands, **you would need a permit from DEP.**

Please contact Kim Eisele at Kim.Eisele@dep.state.fl.us or 407-897-2950 with any questions regarding a permit. Permit applications can be obtained from Ms. Eisele or from the Department's web site at www.dep.state.fl.us/water/wetlands/erp.

Also, prior to any construction activity of one or more acres of upland, you will need a National Pollution Discharge Elimination System (NPDES) Permit. Construction can include soil disturbance, clearing, grading and excavation. Please contact the NPDES Stormwater Section at 850-245-7522 for assistance.

Important notes:

1) Other federal, state, or local land development restrictions may apply to your property. You may need authorizations from agencies like U.S Army Corps of Engineers (321-504-3771), Brevard County (321-633-2016), or Florida Fish and Wildlife Conservation Commission (352-732-1225).

2) This wetland determination review is informal and is for pre-application planning purposes only.
3) If you desire a binding jurisdictional determination, then you should petition the Department for a jurisdictional declaratory statement under 62-343.040, Florida Administrative Code, or you should apply to DEP for an Environmental Resource Permit.
4) DEP will consider this informal determination review to be valid for pre-application planning purposes for no longer than 5 years from the date of the site inspection March 23, 2021.

If you have any questions, please feel free to contact Courtney Knickerbocker by phone at 407-897-4184 by email at Courtney.knickerbocker@dep.state.fl.us or the letterhead address.

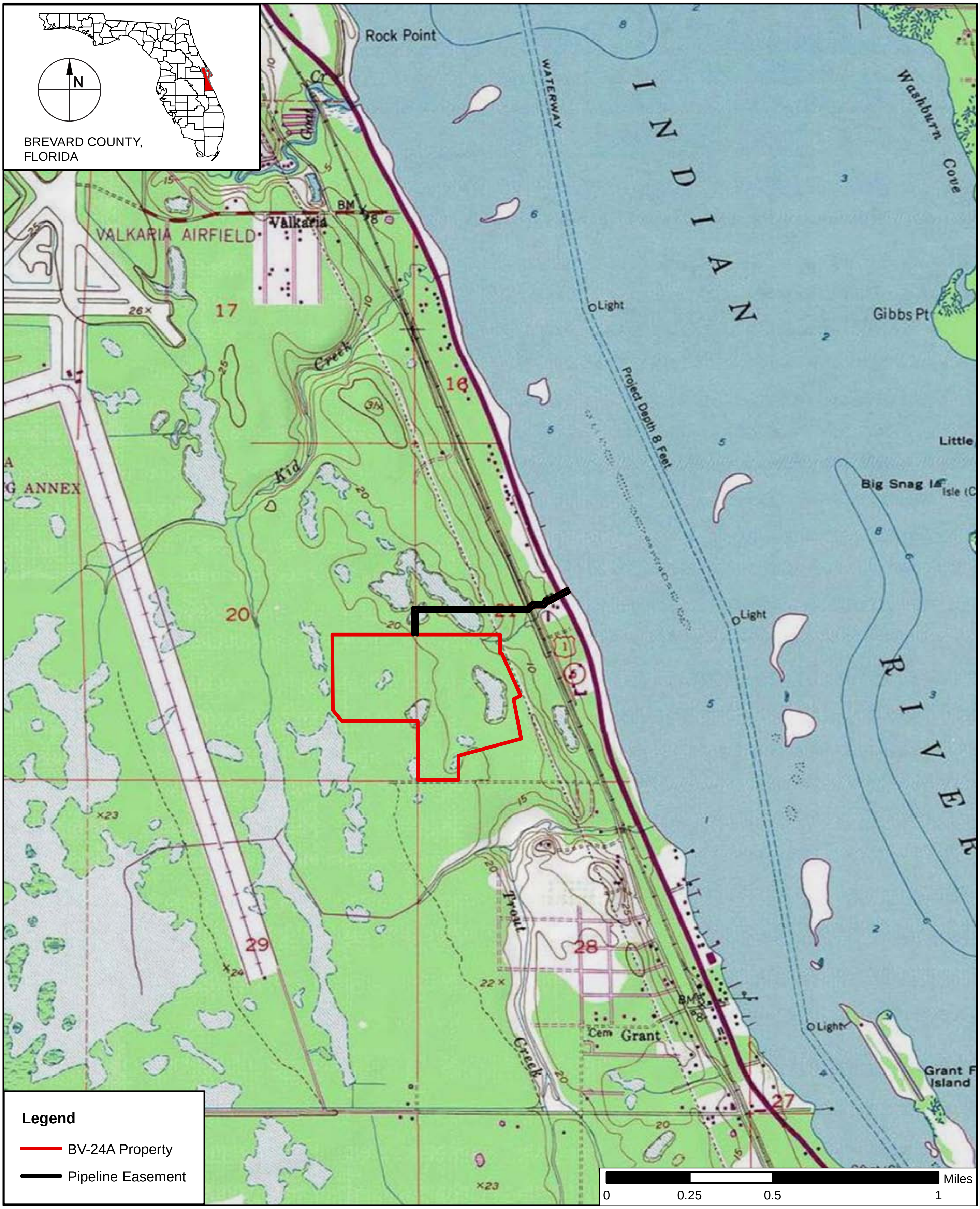
Sincerely,

Caroline Shine

Caroline Shine, Environmental Administrator
Drinking Water/Environmental Resource Permitting
Permitting and WCU Program

Enclosure: Survey with approximate wetland area

cc:
Lori Brownell, P.E., Taylor Engineering - lbrownell@taylorengineering.com
M Noah Adams, Taylor Engineering - nadams@taylorengineering.com
Brevard County Natural Resources-LeeAnn McCullough-Wham
LeeAnn.McCullough-Wham@brevardcounty.us
Kimberly Eisele-FDEP- kim.eisele@dep.state.fl.us



Taylor Engineering Inc.
10151 Deerwood Park Blvd.
Bldg. 300, Suite 300
Jacksonville, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

LOCATION MAP
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

PROJECT	C2015-065
DRAWN BY	NA
SHEET	
DATE	FEBRUARY 2016

0 200' 400'
HORIZONTAL SCALE 1" = 200'
INTENDED DISPLAY SCALE

* ACCESS, INGRESS AND EGRESS EASEMENTS ARE DEDICATED TO THE TOWN OF GRANT–VALKARIA (GRANT DRAINAGE DISTRICT) PER THE OFFICIAL RECORDS OF BREVARD COUNTY, FLORIDA BOOK 1087 PAGE 373 AND MAY NEED TO BE VACATED FOR THIS PROJECT.

SEE SHEET 1 FOR SURVEY NOTES

JOHN R. MORGAN II, PSM
FLORIDA CERTIFICATION #3520

MORGAN & EKLUND, INC.
PROFESSIONAL SURVEY CONSULTANTS

8745 US HIGHWAY #1
P.O. BOX 701420
WABASSO, FL 32970
PHONE: (772) 388–5364
FAX: (772) 388–3165

1159 SW 1ST WAY
DEERFIELD BEACH, FL 33441
PHONE: (954) 421–6882
FAX: (954) 421–0425

LB #4298

CERTIFICATE OF SURVEYOR – I HEREBY CERTIFY THAT THE INFORMATION SHOWN HEREON IS IN ACCORDANCE WITH A RECENT FIELD SURVEY MADE UNDER MY DIRECTION, AND THAT IT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND MEETS THE STANDARDS OF PRACTICE AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL LAND SURVEYORS IN CHAPTER 5J–17, FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

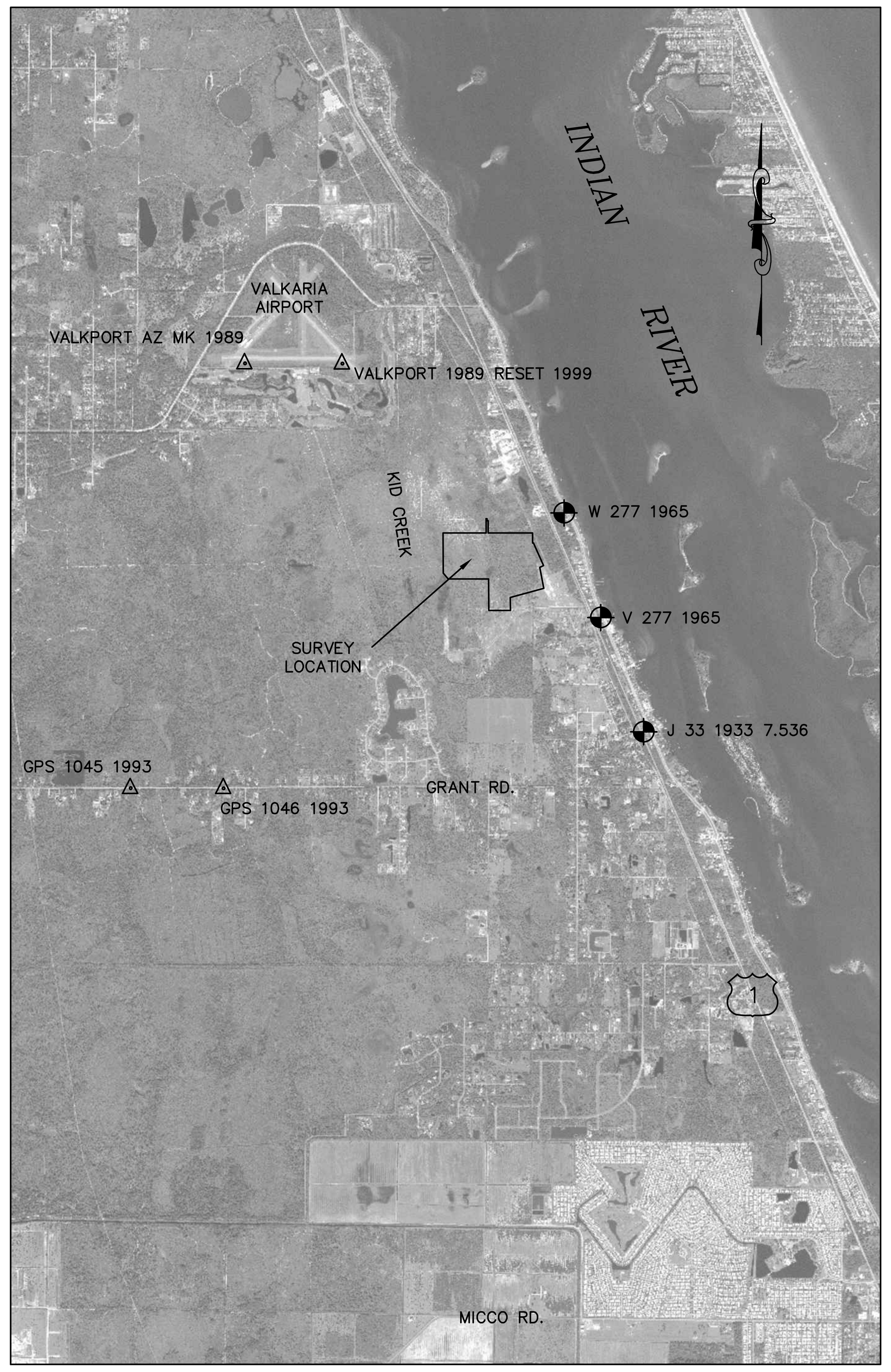
MAP OF BOUNDARY SURVEY

BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED PARCEL 102; A PORTION OF F.I.N.D. SITE BV–24A
SECTIONS 20 & 21, TOWNSHIP 29 SOUTH, RANGE 38 EAST
BREVARD COUNTY, FLORIDA
FOR TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK / PAGE NO.	DATE OF SURVEY
CAG	JRM	SEE COVER	7/2/15

COMMISSION NO.	5558.00
SCALE	1" = 200'
DATE	5/18/15

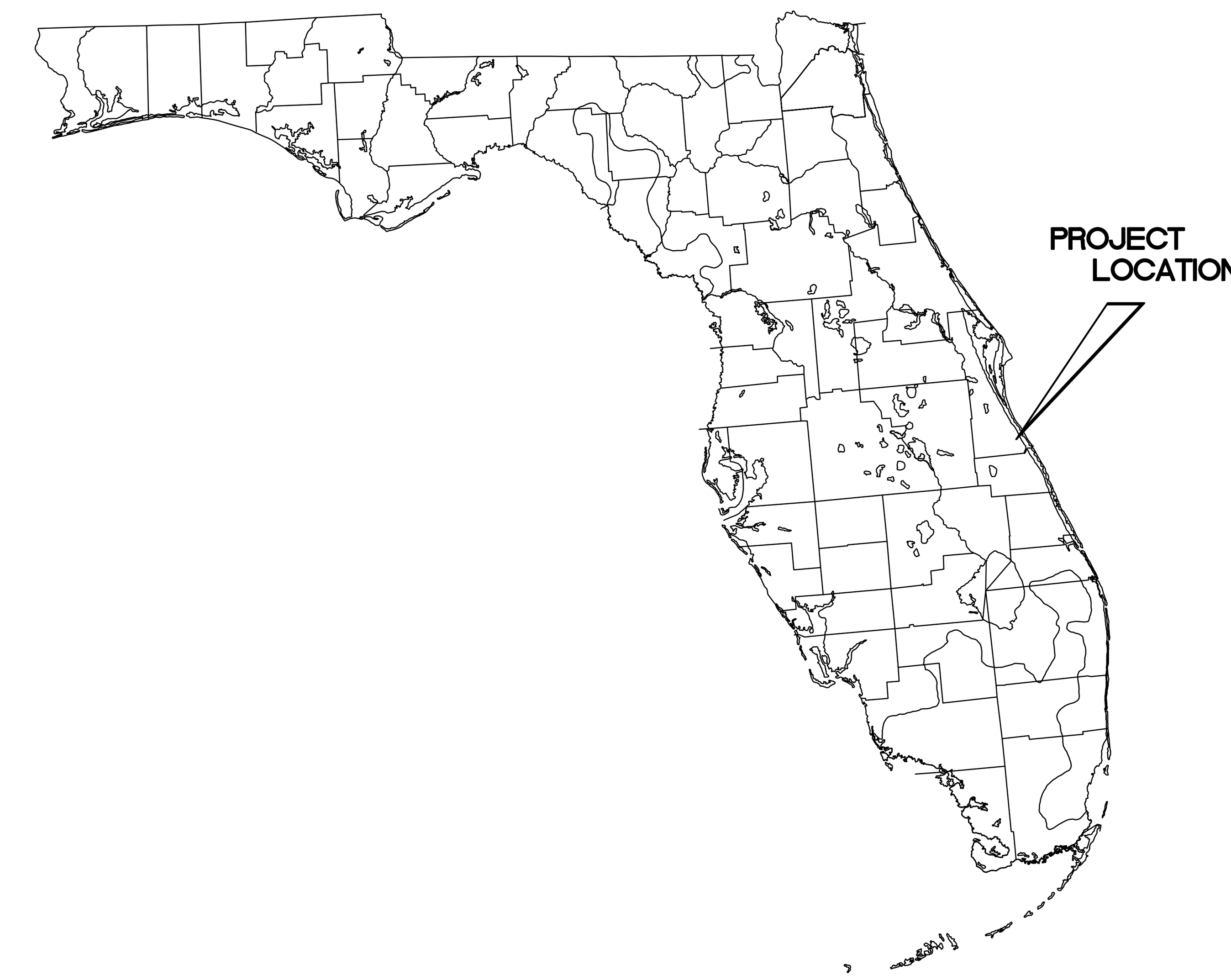
H:\Sdskpro\5558-00\dwg\5558-00.dwg Chris Mon, 04 Jan 2016 – 12:10pm



LOCATION MAP
1" INCH = 4,000 FEET

SPECIFIC PURPOSE SURVEY
(WETLANDS LOCATION)
FLORIDA INLAND NAVIGATION DISTRICT SITE BV-24A
BREVARD COUNTY, FLORIDA
FOR TAYLOR ENGINEERING, INC.

DATE: APRIL 5, 2016
COMMISSION NO.: 5558.01



SURVEY NOTES:

1. GRID COORDINATES SHOWN ARE IN FEET, AND ARE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983, NGS ADJUSTMENT OF 2007 (NAD 83/07).
2. GRID COORDINATES ARE BASED ON MONUMENTS AS SHOWN IN THE CONTROL TABLE.
3. ELEVATIONS SHOWN ARE IN FEET AND ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. ELEVATIONS ARE BASED ON MONUMENTS AS SHOWN IN THE CONTROL TABLE.
5. WETLAND BOUNDARIES LOCATED BY TAYLOR ENGINEERING, INC. AND REVIEWED BY ANDREW PHILLIPS (USACOE), JEFF COLLINS (USACOE). COURTNEY KNICKERBOCKER (FDEP), AND KIMBERLY EISELE (FDEP) ON MARCH 23, 2016.
6. AERIAL IMAGERY WAS TAKEN IN 2012 AND WAS PROVIDED BY THE FLORIDA DEPARTMENT OF TRANSPORTATION.
7. AERIAL IMAGERY IS DISPLAYED HEREON FOR INFORMATION PURPOSES ONLY, NO PHOTOGRAPHIC ACCURACY IS IMPLIED BY THIS MAP.
8. NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.
9. UNDERGROUND UTILITIES AND IMPROVEMENTS NOT LOCATED.
10. THIS SURVEY WAS PERFORMED FOR THE SPECIFIC PURPOSE OF LOCATING JURISDICTIONAL WETLANDS.

PREPARED BY:

MORGAN & EKLUND, INC.
PROFESSIONAL SURVEY CONSULTANTS

8745 US HIGHWAY #1
P.O. BOX 701420
WABASSO, FL 32970
PHONE: (772) 388-5364
FAX: (772) 388-3165

1159 SW 1ST WAY
DEERFIELD BEACH, FL 33441
PHONE: (954) 421-6882
FAX: (954) 421-0451

WETLAND ACREAGE

WETLAND	AREA (IN ACRES)
A	4.13
B	0.18
C	0.27
D	1.79
E1/E2	0.73
F	0.50
G	0.19
I	0.16
J	0.54
K	0.76
L	0.15
M	0.48
N	0.56
O	0.05
TOTAL	10.49

DITCH ACREAGE

DITCH	AREA (IN ACRES)
1	0.012
2	0.125
3	0.027
F	0.029
TOTAL	0.193

CONTROL TABULATION

	NAD 83/07 SPCS 0901		NAVD 88			
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION	AGENCY	STAMPING
101	1305460.19	793607.70	-----	DEEP ROD MONUMENT	BREV CO	GPS 1045 1993
102	1305458.24	796383.93	-----	DEEP ROD MONUMENT	BREV CO	GPS 1046 1993
104			6.13	CONCRETE MONUMENT	CGS	J 33 1933 7.536
105			2.40	DISK IN HEADWALL	CGS	V 227 1965
106	1313686.00	806544.67	3.22	DISK IN HEADWALL	CGS	W 277 1965
108	1318142.36	799924.12	-----	DEEP ROD MONUMENT	NGS	VALKPORT 1989 RESET 1999
109	1318148.91	797017.43	-----	DEEP ROD MONUMENT	NGS	VALKPORT AZ MK 1989
202	1311850.37	806145.54	17.08	5/8" REBAR & CAP	M&E	202
203	1312556.69	805829.02	15.54	5/8" REBAR & CAP	M&E	203
204	1313229.69	805536.34	15.25	5/8" REBAR & CAP	M&E	204
205	1313069.50	804020.09	19.62	5/8" REBAR & CAP	M&E	205
206	1313061.41	803985.95	19.80	5/8" REBAR & CAP	M&E	206

SHEET INDEX

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	KEY MAP
3-8	WETLAND DELINEATION

FIELD BOOKS: BREVARD 169 PAGES 44-54

KEY MAP

0 200' 400'
HORIZONTAL SCALE 1" = 200'
INTENDED DISPLAY SCALE

SEE SHEET 1 FOR SURVEY NOTES

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JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

WETLANDS SURVEY OF FLORIDA INLAND NAVIGATION DISTRICT SITE BV-24A
BREVARD COUNTY, FLORIDA
FOR TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK / PAGE NO.	DATE OF SURVEY
LFP	JRM	SEE COVER	4/5/16

COMMISSION NO. 5558.01
SCALE 1" = 200'
DATE 4/8/16
SHEET 2 OF 8

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WD–1	1312084.88	804406.97
WD–2	1312074.96	804360.80
WD–3	1312034.92	804306.11
WD–4	1312003.14	804252.71
WD–5	1311934.33	804197.14
WD–6	1311880.21	804148.42
WD–7	1311782.44	804216.24
WD–8	1311693.76	804243.76
WD–9	1311673.97	804287.62
WD–10	1311697.65	804306.69
WD–11	1311715.85	804350.16
WD–12	1311783.87	804392.96
WD–13	1311892.24	804439.42
WE–1–1	1312341.40	803841.02
WE–1–2	1312369.52	803881.61
WE–1–3	1312426.75	803912.72
WE–1–4	1312477.46	803896.34
WE–1–5	1312520.14	803854.22
WE–1–6	1312553.25	803818.42
WE–1–7	1312553.89	803797.38
WE–1–8	1312476.71	803771.95
WE–1–9	1312453.45	803752.78
WE–1–10	1312409.03	803769.25
WE–1–11	1312385.20	803783.13
WE–1–12	1312341.68	803810.92
WE–2–1	1312272.49	803763.19

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WE–2–2	1312313.23	803765.56
WE–2–4	1312331.91	803689.39
WE–2–5	1312244.65	803659.30
WE–2–6	1312238.04	803712.49
WE2–3	1312348.02	803751.77
WF–1	1312015.43	803182.55
WF–2	1312094.29	803184.64
WF–3	1312123.11	803191.89
WF–4	1312164.79	803169.52
WF–5	1312240.01	803138.33
WF–6	1312322.03	803113.85
WF–7	1312349.79	803113.74
WF–8	1312360.30	803051.54
WF–9	1312388.45	803048.88
WF–10	1312389.88	803009.83
WF–11	1312344.30	803040.06
WF–12	1312320.23	803043.52
WF–13.2	1312297.40	803021.55
WF–13.3	1312291.69	802954.75
WF–13.4	1312279.97	802971.08
WF–13.5	1312268.51	803035.41
WF–14	1312269.10	803075.15
WF–15	1312203.98	803092.84
WF–16	1312143.31	803115.00
WF–17	1312068.24	803161.64

0 50' 100'
HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

SEE SHEET 1 FOR SURVEY NOTES

JOHN R. MORGAN II, PSM
FLORIDA CERTIFICATION #3520

MORGAN & EKLUND, INC.
PROFESSIONAL SURVEY CONSULTANTS

8745 US HIGHWAY #1
P.O. BOX 701420
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PHONE: (772) 388–5364
FAX: (772) 388–3165

1159 SW 1ST WAY
DEERFIELD BEACH, FL 33441
PHONE: (954) 421–6882
FAX: (954) 421–0425

LB #4298

CERTIFICATE OF SURVEYOR – I HEREBY CERTIFY THAT THE INFORMATION SHOWN HEREON IS IN ACCORDANCE WITH A RECENT FIELD SURVEY MADE UNDER MY DIRECTION, AND THAT IT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND MEETS THE STANDARDS OF PRACTICE AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL LAND SURVEYORS IN CHAPTER 5J–17, FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

WETLANDS SURVEY OF FLORIDA INLAND NAVIGATION DISTRICT SITE BV–24A BREVARD COUNTY, FLORIDA FOR TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK / PAGE NO.	DATE OF SURVEY
LFP	JRM	SEE COVER	4/5/16

COMMISSION NO. 5558.01
SCALE 1" = 50'
DATE 4/8/16
SHEET 3 OF 8

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WE-1-6	1312553.25	803818.42
WE-1-7	1312553.89	803797.38
WM-1	1313298.51	804308.09
WM-2	1313298.61	804193.25
WMA-0.4	1313360.81	804169.06
WMA-0.5	1313366.18	804183.04
WMA-0.6	1313381.75	804194.65
WMA-0.7	1313386.38	804206.92
WMA-0.8	1313406.55	804211.33
WMA-0.9	1313432.76	804217.35
WMA-1	1313457.19	804245.22
WMA-2	1313474.50	804243.02
WMA-3	1313505.21	804263.25
WMA-4	1313510.35	804275.98
WMA-5	1313523.46	804294.62
WMA-11	1313512.65	804436.44
WMA-12	1313490.19	804447.30

0 50' 100'
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INTENDED DISPLAY SCALE

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JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

WETLANDS SURVEY OF FLORIDA INLAND NAVIGATION
DISTRICT SITE BV-24A
BREVARD COUNTY, FLORIDA
FOR TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK / PAGE NO.	DATE OF SURVEY
LFP	JRM	SEE COVER	4/5/16

COMMISSION NO. 5558.01
SCALE 1" = 50'
DATE 4/8/16
SHEET 4 OF 8

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WI–1	1311155.63	804262.92
WI–2	1311143.09	804291.74
WI–3	1311103.32	804297.42
WI–4	1311050.62	804326.53
WI–5	1310981.70	804319.19
WI–6	1310937.33	804320.23
WI–7	1310870.80	804338.29
WI–8	1310832.79	804314.00
WI–10	1310810.71	804242.91
WJ–1	1311000.02	804944.33
WJ–2	1310981.02	804912.17
WJ–3	1310982.88	804869.49
WJ–4	1310970.53	804852.05
WJ–5	1311015.08	804826.85
WJ–6	1311051.21	804838.26
WJ–7	1311096.28	804841.55
WJ–8	1311142.30	804843.56
WJ–9	1311180.12	804884.45
WJ–10	1311202.32	804932.56
WJ–11	1311199.46	804961.58
WJ–12	1311221.05	804993.75
WJ–13	1311204.45	805024.62
WJ–14	1311192.53	805056.77
WK–1	1311356.78	804977.27
WK–2	1311360.34	805021.69
WK–3	1311357.73	805070.10
WK–4	1311340.23	805111.20
WK–5	1311362.02	805159.15
WK–6	1311397.15	805190.82
WK–7	1311441.27	805190.04
WK–8	1311481.04	805155.28
WK–9	1311491.91	805134.98
WK–10	1311475.85	805086.62
WK–11	1311484.48	805048.93
WK–12	1311518.79	804995.14
WK–13	1311533.58	804951.86
WK–14	1311522.01	804937.84
WK–15	1311483.51	804935.90
WK–16	1311420.43	804938.81
WK–17	1311380.31	804962.20

0 50' 100'
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INTENDED DISPLAY SCALE

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JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

WETLANDS SURVEY OF FLORIDA INLAND NAVIGATION DISTRICT SITE BV–24A
BREVARD COUNTY, FLORIDA
FOR TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK / PAGE NO.	DATE OF SURVEY
LFP	JRM	SEE COVER	4/5/16

COMMISSION NO. 5558.01
SCALE 1" = 50'
DATE 4/8/16
SHEET 5 OF 8

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
UA1–1	1312420.08	805453.10
UA1–2	1312401.84	805433.19
UA1–3	1312365.90	805420.83
UA1–4	1312316.85	805423.70
UA1–5	1312278.79	805439.65
UA1–6	1312238.99	805476.72
UA1–7	1312230.92	805519.96
UA1–8	1312252.27	805561.75
UA1–9	1312269.92	805573.75
UA1–10	1312308.83	805575.80
UA1–11	1312348.52	805570.04
UA1–12	1312383.06	805548.02
UA1–13	1312410.08	805493.13
UA1–14	1312418.02	805467.05
UA2–1	1312202.91	805494.54
UA2–2	1312167.15	805475.29
UA2–3	1312144.94	805482.66
UA2–4	1312134.51	805504.52
UA2–5	1312140.80	805531.95
UA2–6	1312163.14	805551.27
UA2–7	1312205.78	805540.56
UA2–8	1312212.48	805512.28
UA3–1	1312250.95	805578.50
UA3–2	1312244.88	805562.88
UA3–3	1312231.45	805552.29
UA3–4	1312220.22	805557.44
UA3–5	1312209.72	805573.24
UA3–6	1312221.30	805586.54
UA3–7	1312232.86	805587.12
WA–10	1312462.99	805187.89
WA–11	1312423.73	805221.76
WA–12	1312410.03	805228.24
WA–13	1312396.72	805248.00
WA–14	1312359.38	805254.48
WA–15	1312359.19	805298.44
WA–16	1312345.64	805317.41
WA–17	1312307.90	805349.15
WA–18	1312268.82	805365.55
WA–19	1312216.17	805356.42
WA–20	1312184.23	805366.82
WA–21	1312143.19	805398.09
WA–22	1312124.56	805399.09
WA–23	1312104.86	805430.30
WA–24	1312039.25	805438.90
WA–25	1311978.04	805434.10
WA–26	1311926.46	805410.28
WA–27	1311867.18	805399.28
WA–28	1311823.00	805386.39
WA–29	1311789.81	805411.87
WA–30	1311774.53	805418.32

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WA–31	1311758.48	805472.18
WA–32	1311733.04	805498.54
WA–33	1311758.94	805545.53
WA–34	1311787.17	805589.64
WA–35	1311808.29	805628.90
WA–36	1311831.17	805637.19
WA–37	1311872.94	805639.34
WA–40	1311903.96	805659.50
WA–41	1311947.68	805674.79
WA–42	1311991.90	805682.24
WA–43	1312059.11	805660.60
WA–44	1312082.67	805653.36
WA–45	1312093.54	805631.39
WA–46	1312127.30	805614.90
WA–47	1312162.43	805611.89
WA–48	1312199.03	805630.19
WA–49	1312209.14	805656.07
WA–50	1312229.69	805699.81
WA–51	1312262.77	805693.69
WA–52	1312301.55	805651.05
WA–53	1312328.52	805640.00
WA–54	1312386.44	805620.90
WA–55	1312415.17	805591.69
WA–56	1312409.00	805544.46
WA–57	1312448.02	805501.79
WA–58	1312462.04	805440.32
WA–59	1312466.96	805419.70
WB–1	1312402.75	804686.51
WB–2	1312378.53	804691.20
WB–3	1312407.12	804736.89
WB–4	1312401.53	804759.79
WB–5	1312436.41	804767.96
WB–6	1312479.94	804768.96
WB–10	1312474.65	804711.47
WB–11	1312457.11	804685.65
WB–12	1312425.40	804681.49
WC–1	1312188.39	804798.53
WC–2	1312147.54	804760.54
WC–3	1312104.87	804723.75
WC–4	1312032.85	804780.02
WC–5	1311994.23	804779.57
WC–6	1311982.19	804798.73
WC–7	1312026.98	804829.52
WC–8	1312120.07	804823.57
WC–9	1312183.23	804810.24
WD–1	1312084.88	804406.97
WD–2	1312074.96	804360.80
WD–3	1312034.92	804306.11
WD–4	1312003.14	804252.71
WD–5	1311934.33	804197.14

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WD–7	1311782.44	804216.24
WD–8	1311693.76	804243.76
WD–9	1311673.97	804287.62
WD–10	1311697.65	804306.69
WD–11	1311715.85	804350.16
WD–12	1311783.87	804392.96
WD–13	1311892.24	804439.42
WD–14	1311989.66	804482.11
WD–15	1312048.20	804511.03
WK–9	1311491.91	805134.98
WK–10	1311475.85	805086.62
WK–12	1311518.79	804995.14
WK–13	1311533.58	804951.86
WK–14	1311522.01	804937.84
WL–1	1311762.53	804903.58
WL–2	1311776.21	804921.78
WL–3	1311764.37	804930.84
WL–4	1311804.53	804958.13
WL–5	1311818.94	804978.65
WL–6	1311850.57	804926.91
WL–7	1311876.49	804902.05
WL–8	1311828.10	804855.05
WL–9	1311809.63	804886.04

0 50' 100'
HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

SEE SHEET 1 FOR SURVEY NOTES

JOHN R. MORGAN II, PSM
FLORIDA CERTIFICATION #3520

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JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

WETLANDS SURVEY OF FLORIDA INLAND NAVIGATION DISTRICT SITE BV–24A
BREVARD COUNTY, FLORIDA
FOR TAYLOR ENGINEERING, INC.

COMMISSION NO.	SCALE	DATE
5558.01	1" = 50'	4/8/16

DRAWN BY	CHECKED BY	FIELD BOOK / PAGE NO.	DATE OF SURVEY	SHEET
LFP	JRM	SEE COVER	4/5/16	6 OF 8

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
UA1–1	1312420.08	805453.10
UA1–2	1312401.84	805433.19
UA1–3	1312365.90	805420.83
UA1–11	1312348.52	805570.04
UA1–12	1312383.06	805548.02
UA1–13	1312410.08	805493.13
UA1–14	1312418.02	805467.05
WA–1	1312539.09	805410.78
WA–2	1312516.40	805402.58
WA–3	1312506.75	805387.95
WA–4	1312518.60	805361.31
WA–5	1312554.12	805297.46
WA–6	1312589.03	805253.78
WA–7	1312584.52	805222.49
WA–8	1312555.74	805203.20
WA–9	1312518.40	805186.69
WA–10	1312462.99	805187.89
WA–11	1312423.73	805221.76
WA–12	1312410.03	805228.24
WA–13	1312396.72	805248.00
WA–14	1312359.38	805254.48
WA–15	1312359.19	805298.44
WA–16	1312345.64	805317.41
WA–54	1312386.44	805620.90
WA–55	1312415.17	805591.69
WA–56	1312409.00	805544.46
WA–57	1312448.02	805501.79
WA–58	1312462.04	805440.32
WA–59	1312466.96	805419.70
WA–60	1312520.27	805434.79
WB–1	1312402.75	804686.51
WB–2	1312378.53	804691.20
WB–3	1312407.12	804736.89
WB–4	1312401.53	804759.79
WB–5	1312436.41	804767.96
WB–6	1312479.94	804768.96

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WB–7	1312505.99	804797.35
WB–8	1312518.93	804783.28
WB–9	1312503.07	804750.20
WB–10	1312474.65	804711.47
WB–11	1312457.11	804685.65
WB–12	1312425.40	804681.49
WG–1	1313119.77	804609.68
WG–2	1313091.43	804599.23
WG–3	1313061.48	804588.47
WG–4	1313047.43	804627.57
WG–5	1313041.86	804661.15
WG–6	1313014.26	804662.18
WG–7	1313019.32	804697.20
WG–8	1313035.22	804742.18
WG–9	1313073.32	804755.65
WG–10	1313098.69	804761.06
WM–1	1313298.51	804308.09
WM–2	1313298.61	804193.25
WN–1	1313105.28	804977.23
WN–2	1313095.09	805002.59
WN–2	1313095.10	805002.58
WN–3	1313056.46	804995.74
WN–4	1313026.70	805003.33
WN–5	1313018.32	805036.35
WN–6	1313010.54	805066.71
WN–7	1313008.53	805096.99
WN–8	1313013.42	805141.01
WN–9	1313008.62	805182.92
WN–10	1313024.93	805223.36
WN–11	1313045.41	805260.03
WN–12	1313031.80	805298.12
WN–13	1313016.06	805337.73
WN–14	1313003.14	805368.17
WN–15	1312985.15	805396.38
WN–16	1312982.26	805409.06
WN–16.1	1312964.78	805434.04

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WN–16.2	1312966.20	805483.64
WN–16.3	1312960.95	805505.85
WN–16.4	1312967.85	805531.64
WN–16.5	1312964.51	805571.26
WN–16.6	1312955.56	805591.55
WN–16.7	1312971.40	805588.23
WN–16.9	1312955.49	805648.85
WN–16.10	1313038.31	805590.69
WN–16.11	1313021.60	805572.49
WN–16.12	1312994.45	805553.44
WN–16.13	1312976.57	805530.88
WN–16.14	1312969.73	805506.76
WN–16.15	1312972.33	805483.70
WN–16.16	1312978.52	805453.18
WN–16.17	1312980.60	805426.70
WN–17	1312977.52	805388.72
WN–18	1312990.85	805365.46
WN–19	1313004.14	805335.99
WN–20	1313006.95	805316.96
WN–21	1313009.86	805279.74
WN–22	1313006.86	805242.82
WN–23	1313000.95	805210.54
WN–24	1312994.37	805167.96
WN–25	1312993.26	805140.83
WN–26	1312989.88	805112.53
WN–27	1312986.15	805083.95
WN–28	1312983.17	805053.52
WN–29	1312974.92	805006.17
WN–30	1312974.25	804981.39
WN–31	1312984.36	804942.32
WN–32	1312987.57	804897.03
WN–33	1313005.45	804883.73
WN–34	1313018.37	804887.03
WN–35	1313061.23	804912.08
WN–36	1313088.09	804937.62

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HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

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JOHN R. MORGAN II, PSM
FLORIDA CERTIFICATION #3520

MORGAN & EKLUND, INC.

PROFESSIONAL SURVEY CONSULTANTS

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PHONE: (954) 421-6882
FAX: (954) 421-0425

LB #4298

CERTIFICATE OF SURVEYOR – I HEREBY CERTIFY THAT THE INFORMATION SHOWN HEREON IS IN ACCORDANCE WITH A RECENT FIELD SURVEY MADE UNDER MY DIRECTION, AND THAT IT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND MEETS THE STANDARDS OF PRACTICE AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL LAND SURVEYORS IN CHAPTER 5J-17, FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

WETLANDS SURVEY OF FLORIDA INLAND NAVIGATION DISTRICT SITE BV-24A BREVARD COUNTY, FLORIDA FOR TAYLOR ENGINEERING, INC.

COMMISSION NO.	SCALE	DATE
5558.01	1" = 50'	4/8/16

DRAWN BY	CHECKED BY	FIELD BOOK / PAGE NO.	DATE OF SURVEY	SHEET
LFP	JRM	SEE COVER	4/5/16	7 OF 8

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WMA–0.4	1313360.81	804169.06
WMA–0.5	1313366.18	804183.04
WMA–0.6	1313381.75	804194.65
WMA–0.7	1313386.38	804206.92
WMA–0.8	1313406.55	804211.33
WMA–0.9	1313432.76	804217.35
WMA–1	1313457.19	804245.22
WMA–2	1313474.50	804243.02
WMA–3	1313505.21	804263.25
WMA–4	1313510.35	804275.98

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WMA–5	1313523.46	804294.62
WMA–6	1313547.94	804320.57
WMA–7	1313587.07	804367.34
WMA–8	1313609.84	804418.12
WMA–9	1313576.55	804447.13
WMA–10	1313539.42	804441.32
WMA–11	1313512.65	804436.44
WMA–12	1313490.19	804447.30
WMA–13	1313465.96	804466.24
WMA–14	1313460.14	804478.91

POINT COORDINATES NAD83/07		
DESIGNATION	NORTHING	EASTING
WO–1	1313554.65	804643.13
WO–2	1313543.33	804624.62
WO–3	1313519.67	804605.98
WO–4	1313494.67	804615.43
WO–5	1313463.91	804608.26
WO–6	1313469.78	804640.11
WO–7	1313487.71	804666.99
WO–8	1313531.05	804659.67
WO–9	1313547.45	804661.66

0 50' 100'
HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

SEE SHEET 1 FOR SURVEY NOTES

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JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

WETLANDS SURVEY OF FLORIDA INLAND NAVIGATION DISTRICT SITE BV–24A
BREVARD COUNTY, FLORIDA
FOR TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK SEE	DATE OF SURVEY
LFP	JRM	PAGE NO. COVER	4/5/16

COMMISSION NO. 5558.01
SCALE 1" = 50'
DATE 4/8/16
SHEET 8 OF 8

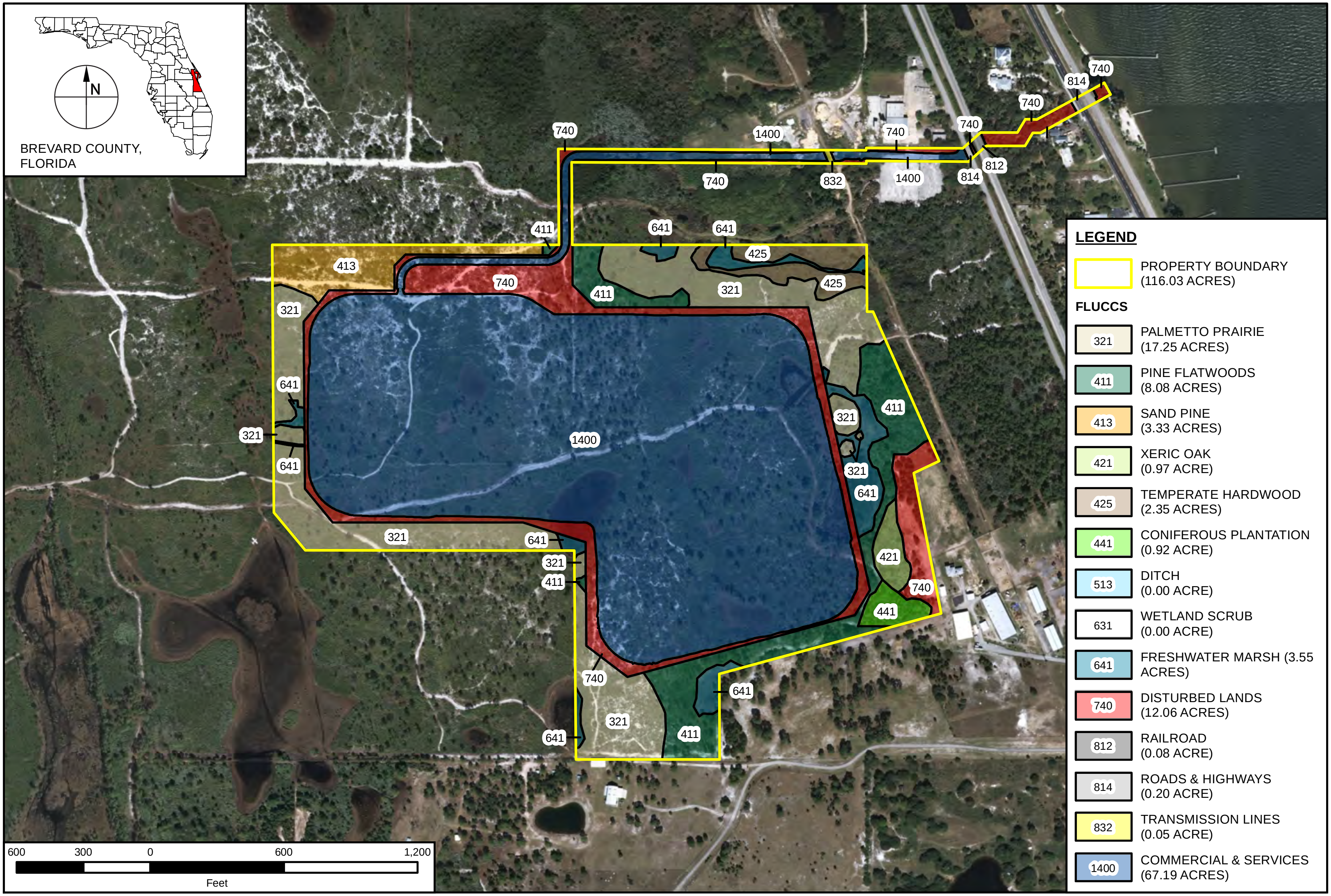
ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 8

APPLICATION FIGURES



TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300 SUITE 300
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 1
PROPOSED FLUCCS MAP
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

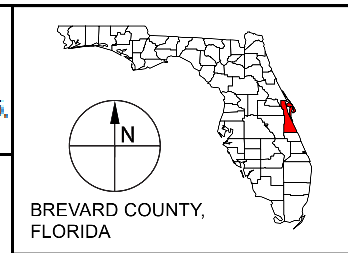
Notes:
1. AERIAL REFERENCE: FDOT 2015

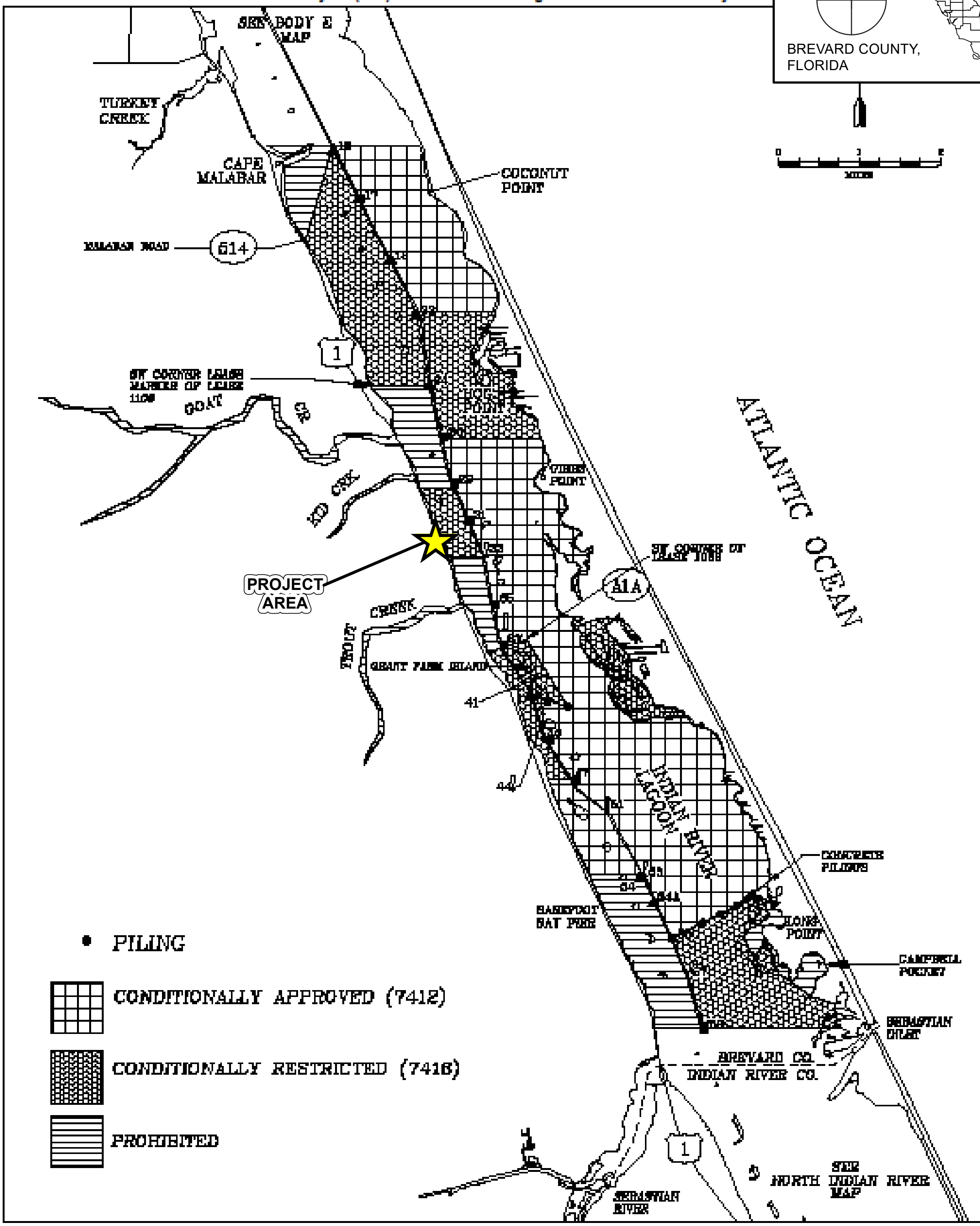
PROJECT	C2015-065
DRAWN BY	KM
SHEET	
DATE	OCTOBER 2017

Current status of this area

SHELLFISH HARVESTING AREA CLASSIFICATION MAP #74 (Effective: April 5,

Body F (#74) Shellfish Harvesting Area in Brevard County





Taylor Engineering Inc. 10151 Deerwood Park Blvd. Bldg. 300, Suite 300 Jacksonville, FL 32256 CERTIFICATE OF AUTHORIZATION # 4815	FIGURE 2 SHELLFISH HARVESTING MAP DREDGED MATERIAL MANAGEMENT AREA BV-24A BREVARD COUNTY, FLORIDA	PROJECT C2015-065 DRAWN BY KM SHEET DATE OCTOBER 2017

ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 9
ADJACENT LANDOWNERS MAILING LIST

ADJACENT LANDOWNER MAILING LIST

Alfred A. Agarie 281 Emerson Drive NW Palm Bay, FL 32907	Brevard County C/O Asset Management 700 Park Avenue S Titusville, FL 32780
Cheri A. Cameron & Gary A. Cameron PO Box 29 Grant, FL 32949-0029	Glen Davies 4480 US Highway 1 Grant, FL 32949
Florida East Coast Railway 7411 Fullerton Street Suite 300 Jacksonville, FL 32256	State of Florida – Division of State Lands C/O FL Department of Environmental Protection 3900 Commonwealth Boulevard, MS 115 Tallahassee, FL 32399-3000
Bruce W. Graham & Craig R. Graham 1800 South Babcock Street Melbourne, FL 32901	Town of Grant-Valkaria 1449 Valkaria Road Grant-Valkaria, FL 32950-4222
Leonard D. Hearndon 4472 S US Highway 1 Grant-Valkaria, FL 32949	Elizabeth E. McDonald Estate C/O William H Carter 1000 Westmoreland Ave Huntsville AL 35801
Larry J. Messer & Teresa R. Messer 7000 Mango Avenue St. Petersburg, FL 33707	David Moallem & Joan P. Moallem Trustees 1663 Georgia Street NE, Suite 200 Palm Bay, FL 32907
Oldcastle Coastal Inc. 900 Ashwood Parkway, Suite 700 Atlanta, GA 30338-4780	Alene Pence 3160 NE Dixie Highway Palm Bay, FL 32905-2512
James Raczek & Mary Jane Raczek 4444 S US Highway 1 Grant-Valkaria, FL 32949-4907	Lisa J. Smit 4850 Old Dixie Highway Grant-Valkaria, FL 32949
US Sprint Communications Company Attn: Property Tax Department PO Box 12913 Shawnee Mission, KS 66218	

ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 10

ENVIRONMENTAL SITE DOCUMENTATION

TAYLOR ENGINEERING, INC.

Environmental Site Documentation

Florida Inland Navigation District
Dredged Material Management Area BV-24A
Brevard County, Florida
September 2015

10151 Deerwood Park Blvd., Building 300, Suite 300
Jacksonville, Florida 32256
904-731-7040 | www.taylorengineering.com

ENVIRONMENTAL SITE DOCUMENTATION
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

Prepared for

FLORIDA INLAND NAVIGATION DISTRICT

by

Taylor Engineering, Inc.
10151 Deerwood Park Blvd
Bldg 300, Suite 300
Jacksonville, Florida 32256
(904) 731-7040

September 2015
C2015-014

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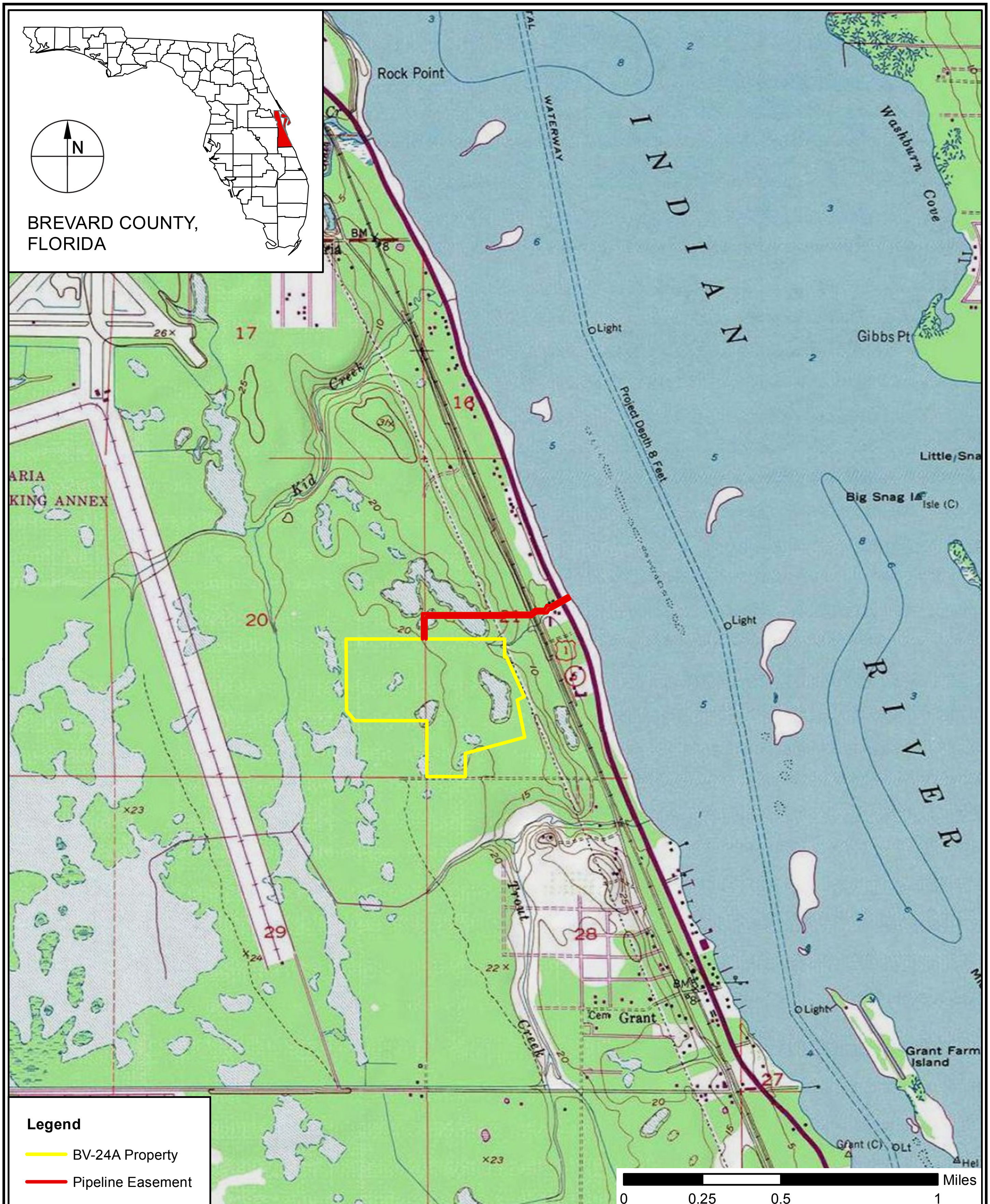
1.0 INTRODUCTION

Owned by the Florida Inland Navigation District (FIND), BV-24A is a site in Brevard County, Florida, selected for development and operation as a permanent dredged material management area (DMMA) to serve the maintenance requirements of the Intracoastal Waterway (ICWW). Specifically, BV-24A will receive dredged material from ICWW Reach VI as defined by Taylor et al. (1989). This reach extends 13.49 miles from the vicinity of Turkey Creek (ICWW mile 180.87) southward to the Brevard-Indian River County line at Sebastian Inlet (ICWW mile 194.36).

The 112.4-acre BV-24A property is located in southeast Brevard County (Sections 20 and 21, Township 29 South, Range 38 East) approximately 1.30 miles south-southeast of the Valkaria Road and Old Dixie Highway intersection (Figure 1.1). Associated with BV-24A, a 60-foot wide, 3.8-acre pipeline easement extends off the northern property boundary and then east to the Indian River Lagoon. BV-24A is undeveloped and contains an interior network of primitive trails generally used for unauthorized recreation (e.g., ATV riding, hunting) throughout the property. The central and eastern sections of the 60-foot wide pipeline easement contain permanent structures.

FIND's development of BV-24A for dredged material management requires environmental site documentation to describe vegetation and wildlife communities including listed species that may occur within the property. This report provides the environmental documentation for BV-24A.



Taylor Engineering Inc.
10151 Deerwood Park Blvd.
Bldg. 300, Suite 300
Jacksonville, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 1.1
LOCATION MAP
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

PROJECT	C2015-014
DRAWN BY	NA
SHEET	
DATE	SEPTEMBER 2015

2.0 METHODOLOGY

Before visiting BV-24A, Taylor Engineering environmental staff reviewed 2015 aerials of the site obtained from the Florida Department of Transportation (FDOT). These aerials show habitat signatures that indicate potential community types and boundaries. A 2015 topographic survey by Morgan & Eklund, Inc. provided additional information to help identify natural community boundaries within the site. A review of the Florida Natural Areas Inventory database (FNAI, 2015), which includes detailed information on the occurrence and location of threatened, endangered, and species of special concern within Florida, identified state- and federally-listed species that may occur within the proposed project area.

On May 22 and June 5, 2015, Taylor Engineering environmental scientists visited the site to assess and document vegetative and wildlife communities. The assessment included verification of habitat signatures identified on the aerial photographs, characterization of the vegetative community, and documentation of incidental wildlife sightings. Wildlife sightings included observed tracks, calls, scat, nests, and direct observation. The survey occurred during daylight hours.

3.0 NATURAL COMMUNITIES

This section describes the natural communities identified during the May 22 and June 5, 2015, field investigation. Taylor Engineering environmental staff classified the communities according to the Florida Land Use, Cover, and Forms Classification System (FLUCCS) (FDOT, 1999). Figure 3.1 depicts the BV-24A habitats according to FLUCCS. Table 3.1 lists the observed vegetative species by community type.

3.1 Palmetto Prairie (321)

Palmetto prairie comprises approximately 46.10 acres of the BV-24A property and 0.69 acre of the pipeline easement. A large majority of the western portion of the BV-24A property consists of this community type. Saw palmetto (*Serenoa repens*) dominates this community. Rusty staggerbush (*Lyonia ferruginea*), tarflower (*Befaria racemose*), and wiregrass (*Aristida stricta*) are common associates found within this community type. Palmetto prairies are seldom flooded and locate in in dry sandy areas.

3.2 Pine Flatwoods (411)

The pine flatwoods community comprises approximately 37.73 acres of BV-24A property and 0.26 acre of the pipeline easement. This community comprises an open, mixed canopy of longleaf pine (*Pinus palustris*) and slash pine (*Pinus elliottii*) and locates in the central and eastern portions of the BV-24A property. Common in the northern and central regions of Florida, this community type is often associated with agricultural practices, but Taylor Engineering staff did not encounter any evidence suggesting recent pine-harvesting activities. Saw palmetto dominates the shrub layer, which also includes gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), and rusty staggerbush. Species such as broomsedge (*Andropogon virginicus*), wiregrass, panicgrass (*Dicanthelium* sp.), and dwarf huckleberry (*Gaylussacia dumosa*) are common groundcover species.

3.3 Sand Pine (413)

An area of sand pine totaling 12.56 acres locates in the northwestern corner of the BV-24A property. Found on areas of deep, infertile deposits of marine sand, this sparsely vegetated community has an open appearance. Typical plant species associated with this community include sand pine (*Pinus clausa*), sand live oak (*Quercus geminata*), saw palmetto, and ground lichens (*Cladonia* sp.).

3.4 Xeric Oak (421)

An isolated pocket of the xeric oak community (0.97 acre) locates in the southeastern corner of the BV-24A property adjacent to the Brevard County Equestrian Center. Found on well-drained sandy soils, this community consists of canopy species associated with evergreen forests and shrubs that dominate the understory. Fire exclusion is imperative for the succession of this community type. Live oak (*Quercus virginiana*) and sand live oak form the closed canopy, while saw palmetto controls the shrub layer and shades out other species. The groundcover was sparse and species identified include bracken fern (*Pteridium aquilinum*), wiregrass, and sweet goldenrod (*Solidago odora*).

3.5 Temperate Hardwood (425)

A 2.91-acre temperate hardwood community locates in the extreme northeastern corner of BV-24A. Often associated with upland areas of lower topography, the temperate hardwood community consists of a canopy dominated by live oak, but also includes cabbage palm (*Sabal palmetto*), southern magnolia (*Magnolia grandiflora*), and bay trees. Saw palmetto and gallberry are common species in the shrub layer while the groundcover is generally sparse.

3.6 Coniferous Plantation (441)

An artificially created, 0.92-acre coniferous plantation community locates in the southeastern corner of the BV-24A property. The creation of coniferous plantations occurs by planting seedling stock or seeds and this community identifies by its characteristic uniform rowed appearance. The dense slash pine dominated canopy leads to sparse shrub and groundcover strata due to limited sunlight penetration and pine needle accumulation.

3.7 Ditch (513)

A 0.01-acre upland terminating drainage ditch is located within the pipeline easement. The ditch appears associated with the historic commercial/industrial activities on the adjacent property. The ditch discharges into swales along the western side of Old Dixie Highway. Taylor Engineering staff identified invasive exotic species such as Brazilian pepper (*Schinus terebinthifolius*) and torpedo grass (*Panicum repens*) within this altered community.

3.8 Wetland Scrub (631)

Located in the northwestern corner of the pipeline easement is a small (0.49 acre) area of wetland scrub. This wetland is contiguous with a larger wetland system northwest of the easement. The area consists of an open canopy with sparse loblolly bay (*Gordonia lasianthus*) and a thick impenetrable shrub layer woven tightly by wax myrtle, fetterbush, and greenbrier (*Smilax* sp.). Patchy areas of groundcover include swamp fern (*Blechnum serrulatum*), royal fern (*Osmunda regalis*), soft rush (*Juncus effusus*), and redroot (*Lachnanthes caroliniana*).

3.9 Freshwater Marsh (641)

Interspersed throughout the uplands are topographically isolated pockets of wetlands categorized as freshwater marsh (totaling 9.23 acres). These shallow depressions locate in highly permeable sandy soils within fire-maintained upland communities. The canopy stratum is noticeably absent within these wetland areas, and very few to no shrub species occurring. The groundcover species include blue maidencane (*Amphicarpum muhlenbergianum*), bushy bluestem, broomsedge, swamp fern, royal fern, maidencane (*Panicum hemitomon*), spikerush (*Eleocharis* sp.), yellow milkwort (*Polygala rugelii*), meadow beauties (*Rhexia* sp.), redroot, pipewort (*Eriocaulon* sp.), bogbutton (*Lachnocaulon* sp.), and sand cordgrass (*Spartina bakeri*). These species provide near complete coverage in this stratum.

3.10 Disturbed Lands (740) / Ditch (513)

A 0.72-acre area characterized as disturbed lands/ditch is located within the eastern portion of the pipeline easement. Altered from its natural community type to provide drainage for the surrounding uplands, invasive exotic species including Australian pine (*Casuarina equisetifolia),* torpedo grass, and Brazilian pepper occupy this area. Other species identified include bushy bluestem, wax myrtle, and beakrush.

3.11 Disturbed Lands (740)

A majority (1.42 acres) of the pipeline easement and a 1.96-acre area in the southeast corner of the BV-24A property classify as disturbed lands. Active and historic alterations caused by a variety of anthropogenic activities has allowed invasive exotic species such as cogongrass (*Imperata cylindrical*), torpedo grass, and castor bean (*Rincincus communis*) to colonize the area. Other species identified include broomsedge, dog fennel (*Eupatorium capillifolium*), bahiagrass (*Paspalum notatum*), and smutgrass (*Sporobolus indicus*).

3.12 Railroad (812)

A 0.08-acre area associated with an active rail line was located in the central portion of the 60-foot wide pipeline easement. Taylor Engineering staff identified no actively growing plant species within the rail line and observed evidence of herbicidal treatment.

3.13 Roads and Highways (814)

Portions (0.09 acre) of Old Dixie Highway and U.S. 1 cross through the eastern portions of the pipeline easement. The vegetated shoulders of these paved areas are mechanically maintained and dominated by bahiagrass.

3.14 Transmission Lines (832)

A transmission line crosses a 0.04 acre-section of the pipeline easement. Herbicidal and mechanical treatment within the transmission line area keep the plant biodiversity low in this section of the easement. Observed vegetation include groundcover species such as dogfennel, broomsedge, cogongrass, bahiagrass and smutgrass.

3.15 Endangered and Threatened Plants

Taylor Engineering environmental staff did not observe any threatened or endangered plant species within the BV-24A property or the pipeline easement. Table 3.2 lists species that may occur within the natural habitat of BV-24A, as indicated by FNAI (2015). An explanation of the status of listed species follows the table.

Table 3.1 Vegetation Observed on BV-24A

Scientific Name	Common Name	Frequency of Occurrence*
<u>Palmetto Prairie (321)</u>		
Trees and Shrubs		
Hypericum faciculatum	Sandweed	O
Ilex glabra	Gallberry	O
Lyonia ferruginea	Rusty staggerbush	C
Lyonia lucida	Fetterbush	O
Pinus elliottii	Slash pine	R
Pinus palustris	Longleaf pine	R
Quercus geminata	Sand live oak	R
Quercus myrtifolia	Myrtle oak	R
Serenoa repens	Saw palmetto	A
Herbs, grasses, and vines		
Andropogon virginicus	Broomsedge	O
Aristida stricta	Wiregrass	C
Befaria racemose	Tarflower	C
Galactia elliottii	Elliot’s milkpea	O
Gaylussacia dumosa	Dwarf huckleberry	R
Heterotheca gramnfolia	Silversword	R
Licania michauxii	Gopher apple	R
Opuntia humifusa	Eastern pricklypear	R
Pteridium aquilinum	Bracken fern	O
Pterocaulon virgatum	Blackroot	O
Vaccinium myrsinites	Shiny blueberry	O
<u>Pine Flatwoods (411)</u>		
Trees and Shrubs		
Ilex glabra	Gallberry	A
Lyonia ferruginea	Rusty staggerbush	C
Lyonia lucida	Fetterbush	C
Pinus elliotti	Slash pine	C
Pinus palustris	Longleaf pine	C
Herbs, grasses, and vines		
Andropogon virginicus	Broomsedge	C
Aristida stricta	Wiregrass	C
Dicanthelium sp.	Panicgrass	C
Gaylussacia dumosa	Dwarf huckleberry	C
Quercus elliottii	Runner oak	O
Vaccinium myrsinites	Shiny blueberry	O

Table 3.1 Vegetation Observed on BV-24A (cont.)

Scientific Name	Common Name	Frequency of Occurrence*
<u>Sand Pine (413)</u>		
Trees and Shrubs		
Lyonia ferruginea	Rusty staggerbush	O
Pinus clausa	Sand pine	O
Quercus geminata	Sand live oak	O
Quercus myrtifolia	Myrtle oak	O
Serenoa repens	Saw Palmetto	R
Herbs, grasses, and vines		
Aristida stricta	Wiregrass	O
Ceratiola ericoides	Florida rosemary	R
Rhynchospora sp.	Beakrush	R
<u>Xeric Oak (421)</u>		
Trees and Shrubs		
Lyonia ferruginea	Rusty staggerbush	O
Gaylussacia dumosa	Dwarf huckleberry	O
Quercus geminata	Sand live oak	C
Quercus virginiana	Live oak	C
Serenoa repens	Saw palmetto	A
Herbs, grasses, and vines		
Aristida stricta	Wiregrass	O
Dicanthelium sp.	Panicgrass	O
Pteridium aquilinum	Braken fern	R
Rhynchospora sp.	Beakrush	O
Solidago odora	Sweet goldenrod	R
<u>Temperate Hardwood (425)</u>		
Trees and Shrubs		
Ilex glabra	Gallberry	C
Lyonia ferruginea	Rusty Staggerbush	O
Myrica cerifera	Wax myrtle	O
Magnolia grandiflora	Southern magnolia	R
Quercus virginiana	Live oak	A
Sabal palmetto	Cabbage palm	C
Serenoa repens	Saw palmetto	C

Table 3.1 Vegetation Observed on BV-24A (cont.)

Scientific Name	Common Name	Frequency of Occurrence*
Herbs, grasses, and vines		
Aristida stricta	Wiregrass	O
Dicanthelium sp.	Panicgrass	O
Pteridium aquilinum	Bracken fern	R
Vitus sp.	Wild grape	R
<u>Coniferous Plantation (441)</u>		
Trees and Shrubs		
Myrica cerifera	Wax myrtle	O
Pinus elliottii	Slash pine	A
Herbs, grasses, and vines		
Aristida stricta	Wiregrass	O
Pteridium aquilinum	Bracken fern	O
Rhynchospora sp.	Beakrush	O
Vitus sp.	Wild grape	R
<u>Ditch (513)</u>		
Herbs, grasses, and vines		
Andropogon glomeratus	Bushy bluestem	C
Eleocharis sp.	Spikerush	C
Myrica cerifera	Wax myrtle	C
*Panicum repens**	Torpedo grass*	O
*Schinus trebinthifolius**	Brazilian pepper*	O
Xyris sp.	Yellow-eyed grass	C
<u>Wetland Scrub (631)</u>		
Trees and Shrubs		
Gordonia lasianthus	Loblolly bay	R
Lyonia lucida	Fetterbush	C
Myrica cerifera	Wax myrtle	C
Herbs, grasses, and vines		
Andropogon glomeratus	Bushy broomsedge	O
Baccharis halimifolia	Saltbush	O
Blechnum serrulatum	Swamp fern	R
Juncus effusus	Soft rush	R
Lachnanthes caroliniana	Redroot	O
Osmunda regalis	Royal fern	O
Smilax sp.	Greenbrier	C
Vitus sp.	Wild grape	C

Table 3.1 Vegetation Observed on BV-24A (cont.)

Scientific Name	Common Name	Frequency of Occurrence*
<u>Freshwater Marsh (641)</u>		
Herbs, grasses, and vines		
Amphicarpum muhlenbergianum	Blue maidencane	C
Andropogon glomeratus	Bushy bluestem	O
Andropogon virginicus	Broomsedge	C
Baccharis halimifolia	Saltbush	R
Blechnum serrulatum	Swamp fern	R
Cephalanthus occidentalis	Buttonbush	O
Eleocharis sp.	Spikerush	O
Eriocaulon sp.	Pipewort	O
Hypericum faciculatum	Sandweed	A
Juncus effusus	Soft rush	O
Lachnanthes caroliniana	Redroot	O
Lachnocaulon sp.	Bogbutton	O
Myrica cerifera	Wax myrtle	R
Osmunda regalis	Royal fern	R
Panicum hemitomon	Maidencane	C
Polygala rugelii	Yelow Yellow milkwort	C
Rhexia sp.	Meadow beauties	O
Rhynchospora sp.	Beakrush	C
Sabatia grandiflora	Large-flowered marshpink	O
Smilax sp.	Greenbrier	R
Spartina bakeri	Sand cordgrass	C
Vitus sp.	Wild grape	R
Woodwardia virginica	Virginia chain fern	C
Xyris sp.	Yellow-eyed grass	A
<u>Disturbed Land (740)/Ditch (513)</u>		
Herbs, grasses, and vines		
Andropogon glomeratus	Bushy bluestem	O
*Cauarina Casuarina spequisetifolia.**	Australian pine*	R
Myrica cerifera	Wax myrtle	O
*Panicum repens**	Torpedo grass*	O
Rhynchospora sp.	Beakrush	O
*Schinus terebinthifolius**	Brazilian pepper*	O

Table 3.1 Vegetation Observed on BV-24A (cont.)

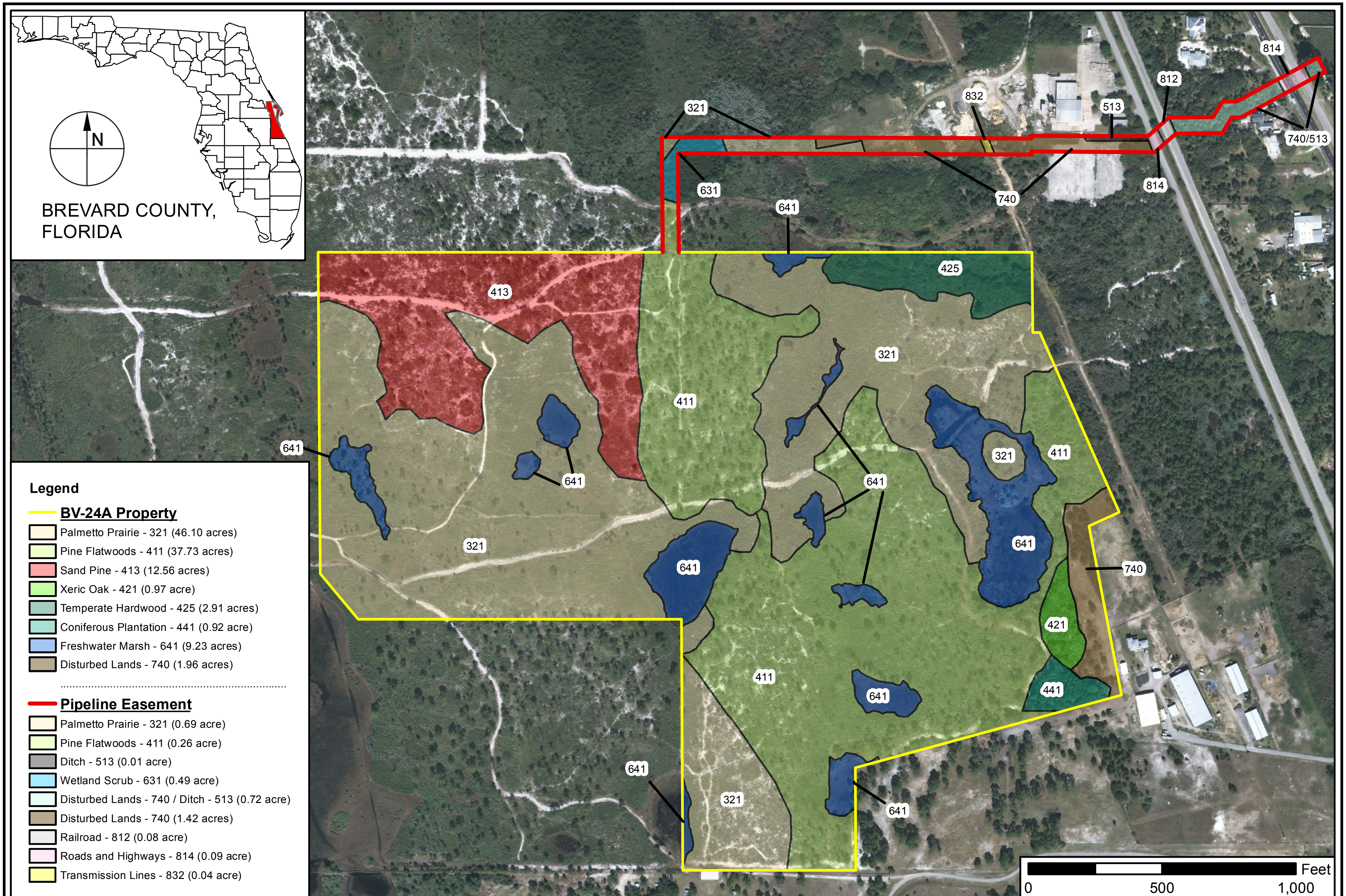
Scientific Name	Common Name	Frequency of Occurrence*
Disturbed Lands (740)		
Herbs, grasses, and vines		
Andropogon glomeratus	Bushy broomsedge	O
Andropogon virginicus	Broomsedge	O
Eupatorium capillifolium	Dogfennel	O
*Imperata cylindrical**	Cogongrass*	O
Myrica cerifera	Wax myrtle	C
*Panicum repens**	Torpedo grass*	C
Parthenocissus quinquefolia	Virginia creeper	R
Paspalum notatum	Bahia grass	C
*Rincincus communis***	Castor bean**	O
Sporobolus indicus	Smutgrass	C
Roads and Highways (814)		
Herbs, grasses, and vines		
Paspalum notatum	Bahia grass	A
Transmission Line (832)		
Trees and shrubs		
Pinus elliottii	Slash pine	R
Herbs, grasses, vines		
Andropogon virginicus	Broomsedge	C
Eupatorium capillifolium	Dogfennel	O
*Imperata cylindrica**	Cogongrass*	O
Paspalum notatum	Bahia grass	A
Sporobolus indicus	Smutgrass	A

Frequency of Occurrence Codes:

A = Abundant	O = Occasional
C = Common	R = Rare

* Category I species as identified by the Florida Exotic Pest Plant Council Invasive Plant List (FLEPPC, 2015)

** Category II species as identified by the FLEPPC Invasive Plant List



TAYLOR ENGINEERING INC.
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JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 3.1
FLUCCS MAP
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye

PROJECT	C2015-014
DRAWN BY	NA
SHEET	
DATE	SEPTEMBER 2015

Table 3.2 Endangered and Threatened Plants that may occur within BV-24A

Scientific Name	Common Name	Status of Listed Species		
		Federal	State	FNAI
Conradina grandiflora	Large-flowered rosemary	N	LT	S3
Centrosema arenicola	Sand butterfly pea	N	LE	S2
Chamaesyce cumlicola	Sand-dune spurge	N	LE	S2
Cladonia perforata	Perforate-reindeer lichen	LE	LE	S1
Dicerandra immaculata	Lakela's mint	LE	LE	S1
Glandularia maritima	Coastal vervain	N	LE	S3
Harrisia simpsonii	Simpsons prickly apple	N	LE	S2
Lechea divaricata	Pine pinweed	N	LE	S2
Lechea cernua	Nodding pinweed	N	LE	S3
Nemastylis floridana	Celestial lily	N	LE	S2
Nolina atopocarpa	Florida beargrass	N	LT	S3
Panicum abscissum	Cutthroat grass	N	LE	S3
Pteroglossaspis ecristata	Giant orchid	N	LT	S2
Schizachyrium niveum	Scrub bluestem	N	LE	S1S2
Warea carteri	Carter's warea	LE	LE	S3

Source: Florida Natural Areas Inventory (www.fnai.org, accessed August 2015)

Federal Legal Status
LE = Endangered: an animal or plant species in danger of extinction throughout all or a significant portion of its range
LT = Threatened: an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
SC = Species of Concern: is an informal term that refers to those species which might be in need of concentrated conservation actions.
C = Candidate Species: plants or animals species for which FWS or NOAA Fisheries has on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened.
N = Not currently listed, nor currently being considered for listing as Endangered or Threatened.

State Legal Status
LE = Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.
LT = Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.
SSC = Listed as a Species of Special Concern by the Florida Fish and Wildlife Conservation Commission. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration,

human disturbance, or substantial human exploitation which in the foreseeable future, may result in its becoming a threatened species.
N = Not currently listed, nor currently being considered for listing.

Florida Natural Areas Inventory State Rank Definitions
S1 = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
S2 = Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
S3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

4.0 WILDLIFE COMMUNITIES

This section describes the wildlife communities and listed species likely to use the BV-24A habitats. Tables 4.1 and 4.2 list wildlife observed during the site investigation and potential listed species that may occur onsite.

4.1 Wildlife Habitat

The natural upland ecosystems within the BV-24A property, including the palmetto prairie, pine flatwoods, sand pine, xeric oak, and temperate hardwoods, provide habitat for a variety of birds, mammals, reptiles, and amphibians. According to Myers and Ewel (1990), common birds associated with these upland habitats include brown-headed nuthatch (*Sitta pusilla*), red-cockaded woodpecker (*Picoides borealis*), Bachman's sparrow (*Aimophila aestivalis*), pine warbler (*Dendroica pinus*), great horned owl (*Bubo virginianus*), bobwhite (*Colinus virginianus*), ground dove (*Columbigallina passerine*), Florida scrub jay (*Aphelocoma coerulescens*), rufous-sided towhee (*Pipilo erthrophthalmus*), yellow-breasted chat (*Icteria virens*), loggerhead shrike (*Lanius ludovicianus*), eastern kingbird (*Tyrannus tyrannus*), southeastern kestrel (*Falco sparverius paulus*), eastern bluebird (*Sialia sialis*), downey woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), Carolina wren (*Thryothorus ludovicianus*), Cooper's hawk (*Accipiter cooperii*), and hairy woodpecker *(Picoides villosus*). Mammals found in association with these ecosystems include the gray squirrel (*Sciurus carolinensis*), southeastern pocket gopher (*Geomys pinetis*), Florida mouse (*Podomys flordanus*), black bear (*Ursus americanus floridanus*), white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), spotted skunk (*Spilogale* sp.), and raccoon (*Procyon lotor*. Potential reptiles in these habitats include box turtle (*Terrapene carolina*), pine woods snake (*Rhadinaea flavilata*), eastern diamondback rattlesnake (*Crotalus adamanteus*), black racer (*Coluber constrictor*), six-lined race runner (*Cnemidophorus sexlineatus*), gopher tortoise (*Gopherus polyphemus*), Florida scrub lizard (*Sceloporus woodi*), blue-tailed mole skink (*Eumeces egregious lividus*), and the eastern indigo snake (*Drymarchon corais couperi*). The amphibian species associated with these upland habitats include oak toad (*Anaxyrus quercicus*), pine woods tree frog (*Hyla femoralis*), and gopher frog (*Rana areolate*),

The natural wetland habitats of BV-24A include freshwater marsh and wetland scrub that have the potential to support the life cycles of a variety of a species. Myers and Ewel (1990) provide a list of the fish, bird, mammal, reptile, and amphibian species likely utilizing these habitats. A fish commonly found in association with these wetland habitats is the mosquito fish (*Gambusia affinis*). Bird species include the least bittern (*Ixobrychus exilis*), American bittern (*Botaurus lentiginosus*), glossy ibis (*Plegadis falcinellus*), green-backed heron (*Butrorides striatus*), white ibis (*Eudocimus albus*), limpkin (*Aramus guarauna*), marsh wren (*Cistothorus palustris*), common yellowthroat (*Geothlypis trichas*), red-winged blackbird (*Agelaius phoeniceus*), sandhill crane (*Grus canadensis*), and boat-tailed grackle (*Quiscalus major*). Mammals utilizing freshwater marshes and wetland scrub include the Florida water rat (*Neofiber alleni*) and the white-tailed deer. Potential reptiles in the wetlands include the green water snake (*Nerodia cyclopion*), swamp snake (*Seminatrix pygaea*), cottonmouth (*Agkistrodon piscivorus*), mud snake (*Farancia abacura*), mud turtle (*Kinosternon bauri*), musk turtle (*Sternotherus odoratus*), red-bellied cooter (*Chrysemys nelson*), and occasionally the American alligator (*Alligator mississippiensis*). The pig frog (*Rana grylio*), leopard frog (*Rana sphenocehala*), bullfrog (*Rana catesbeiana*) green tree frog (*Hyla cinerea*), fire-bellied newt (*Notophthalamus viridescens*), and the dwarf newt (*Pseudobranchus striatus*) are common amphibian species found in these habitat types.

The anthropogenically altered communities (ditches, disturbed lands, railroads, roads and highways, and transmission lines) found in association with the pipeline easement provide a limited amount of habitat value for wildlife. The habitat associated with these man-made community types supports a less diversified list of species due to repeated disturbances from maintenance activities. Nonetheless, ditches provide cover and foraging habitat for a variety amphibians, reptiles, and small fish. The altered communities provide loafing opportunities for some bird species. Birds of prey may hunt these birds as well as insects and small rodents caught traversing the road. Mammals may also use the roads for travel. However, human activity along the road likely prevents any other significant wildlife uses of the road.

Table 4.1 Wildlife Observed at BV-24A

Scientific Name	Common Name	Community Type (FLUCCS)
REPTILES		
Cnemidophorus sexlineatus	Six-lined racerunner	321, 411
Gopherus polyphemus	Gopher tortoise	321, 411, 413
BIRDS		
Accipiter cooperii	Cooper's hawk	411
Cardinalis cardinalis	Cardinal	421
Coragyps atratus	Black vulture	411, 421
Melanerpes erythrocephalus	Red-headed woodpecker	411
Pandion haliaetus	Osprey	411
Zenaida macroura	Mourning dove	411

Source: Florida Natural Areas Inventory (www.fnai.org, accessed August 2015)

4.2 Listed Wildlife Species

Taylor Engineering environmental staff directly observed multiple gopher tortoise (state-listed threatened) and areas of Florida scrub jay (state-and federally-listed threatened) habitat within the BV-24A site boundaries. Table 4.2 lists the other listed species that may occur within the natural habitat of BV-24A, as indicated by FNAI (2015). An explanation of the status of listed species follows the table.

Sand pine, palmetto prairie, and pine flatwoods represent the largest land cover types on BV-24A. These community types include habitat essential to the support of gopher tortoise and the eastern indigo snake. During the two-day field investigation, Taylor Engineering staff observed several gopher tortoises within these communities.

To avoid impacts to gopher tortoises during site development, FIND should implement the following activities. Prior to any construction activities within BV-24A, FIND should enlist a Florida Fish and Wildlife Conservation Commission (FWC)-authorized gopher tortoise agent to conduct a survey for potential gopher tortoise habitat and burrows. The results of these surveys are valid for 90 days from the date of the completion of the fieldwork. Identification of gopher tortoise burrows within the construction footprint provides evidence that gopher tortoises may inhabit portions of the construction area, and a FWC gopher tortoise permit is required to capture and relocate the tortoises out of the construction area. A FWC-authorized gopher tortoise agent will secure the permit and provide the services to capture and relocate the gopher tortoises. Gopher tortoise burrows located outside of the construction footprint require a 25-foot buffer in all directions from construction activities or will need to be included in the capture and relocation activities.

In order to avoid impacts to the state- and federally-listed threatened eastern indigo snake, the project will need to adhere to the guidance provided by the U.S. Fish and Wildlife Service "Standard Protection Measures For The Eastern Indigo Snake, August 12, 2013" (USFWS, 2013).

Taylor Engineering staff did not observe Florida scrub jay on BV-24A. However, the sand pine community identified in the northwestern portions of the assessment area may provide habitat for this species. A separate scrub jay survey performed by Normandeau Associates, Inc. (2015) under contract to Taylor Engineering identified Florida scrub jays along and within the western boundary of BV-24A. Over the course of the survey, Normandeau Associates recorded the location of Florida scrub jay sightings. By combining the sightings from all of the observations, Normandeau Associates developed a polygon to show the areas in which Florida scrub jays have been observed (Figure 4.1). Normandeau staff recognize that it is possible that Florida scrub jays utilize a larger area of BV-24A than is shown within the direct observation polygon shown on Figure 4.1,In order to show a more accurate estimate of areas potentially occupied by Florida scrub jays, Normandeau Associates placed a high quality habitat buffer around the northern area of direct observance. Normandeau Associates did not observe any Florida scrub jays in the central or eastern portions of BV-24A. BV-24A development will require coordination with state and federal wildlife agencies regarding scrub jay protection and preservation of scrub jay habitat.

Taylor Engineering reviewed the FWC database for known bald eagle (*Haliaeetus leucocephalus*) nesting locations in the project vicinity. The FWC database identified the closest nest (BE041) approximately 0.51 mile southeast of BV-24A. During the field investigation, Taylor Engineering staff observed an apparent abandoned bald eagle nest on the eastern portion of the property (27° 56' 32.197"N / 80° 32' 16.631"W). Taylor Engineering could not locate a record of this nest. Although the FWC and USFWS have delisted the bald eagle due to recovery, the Bald and Golden Eagle Act and U.S. Migratory Bird Treaty Act continue to provide legal protections for the species. Site developmet activities will require coordination with USFWS regarding the potential nest. USFWS may require monitoring to confirm the activity status of the nest and need for further coordination.

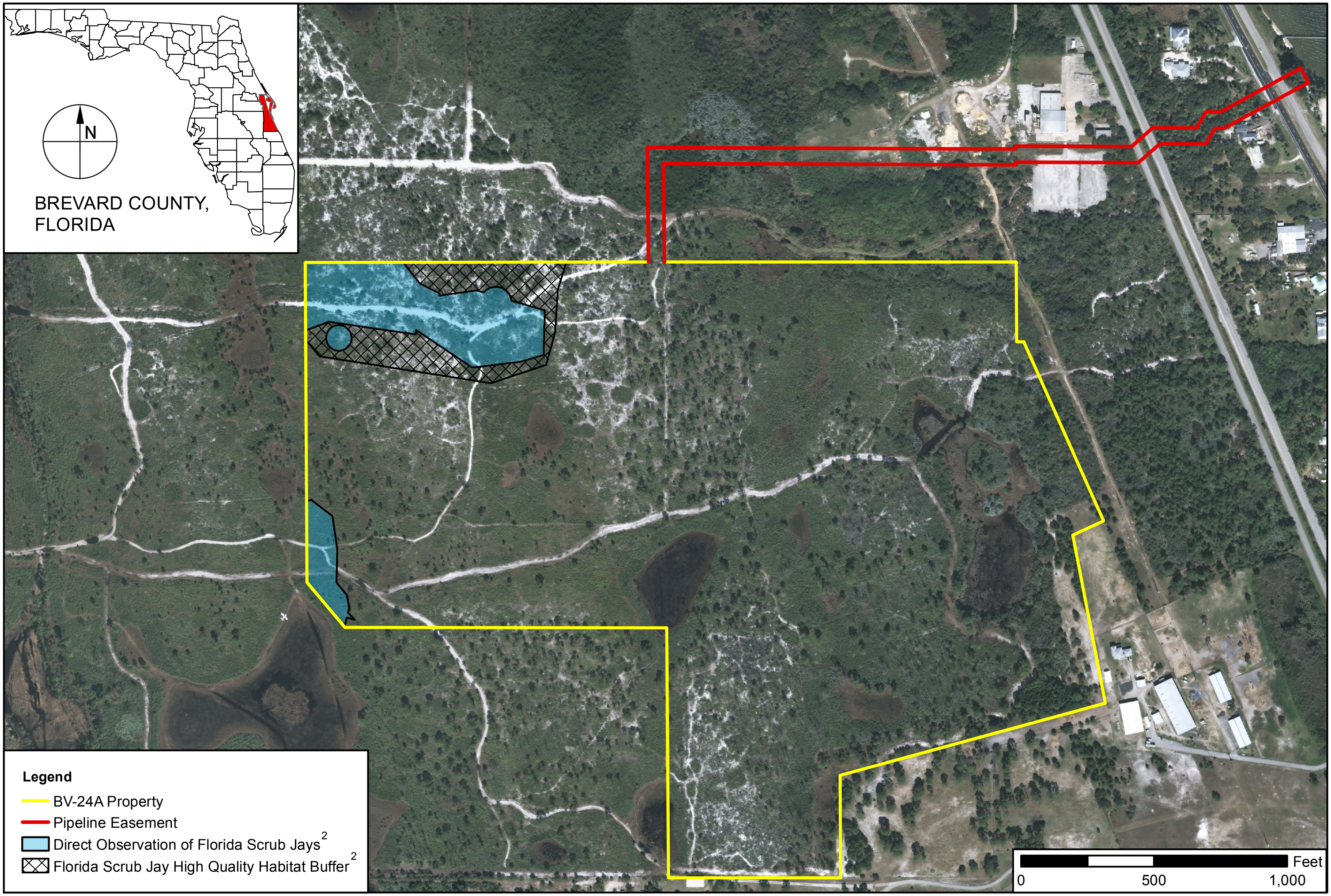

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FIGURE 4.1
SCRUB JAY HABITAT MAP
FIND DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FL

Notes:
1. Basemap Source: ESRI, Digital Globe, GeoEye
2. Normandeau Associates, Inc. 2015 Florida Scrub Jay Survey

PROJECT	C2015-014
DRAWN BY	NA
SHEET	
DATE	SEPTEMBER 2015

Table 4.2 State and Federally-Listed Vertebrates that may occur within BV-24A

Scientific Name	Common Name	Status of Listed Species		
		Federal	State	FNAI
REPTILES				
Drymarchon couperi	Eastern indigo snake	LT	FT	S3
*Gopherus polyphemus**	Gopher tortoise*	C	ST	S3
BIRDS				
Aphelocoma coerulescens	Florida scrub-jay	LT	FT	S2
Mycteria americana	Wood stork	LT	FE	S2
Picoides borealis	Red-cockaded woodpecker	LE	FE	S2
Rostrhamus s. plumbeus	Snail kite	LE	FE	S2

Source: Florida Natural Areas Inventory (www.fnai.org, accessed August 2015)

*Observed on-site during field investigation

Federal Legal Status

LE = Endangered: an animal or plant species in danger of extinction throughout all or a significant portion of its range

LT = Threatened: an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

SC = Species of Concern: is an informal term that refers to those species, which might be in need of concentrated conservation actions.

C = Candidate Species: plants or animals species for which USFWS or NOAA Fisheries has on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened.

N = Not currently listed, nor currently being considered for listing as endangered or threatened.

State Legal Status

FE = Endangered: listed as endangered species at the federal level by USFWS.

FT = Threatened: listed as threatened species at the federal level by USFWS.

ST = State population listed as threatened by FWC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species in the foreseeable future.

SSC = Listed as a species of special concern by FWC. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which in the foreseeable future, may result in its becoming a threatened species.

N = Not currently listed, nor currently being considered for listing.

Florida Natural Areas Inventory State Rank Definitions

S1 = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1,000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.

S2 = Imperiled in Florida because of rarity (6–20 occurrences or less than 3,000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local throughout its range (21–100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

S4 = Apparently secure in Florida (may be rare in parts of range)

5.0 WETLAND JURISDICTION

Some or all of the freshwater marshes (641), wetland scrub (631), and ditches (513) will fall within the jurisdiction of both the Florida Department of Environmental Protection (FDEP) and the U.S. Army Corps of Engineers (USACE). Areas of isolated freshwater marsh under one-half acre may be exempt from state-mandated mitigation criteria. However, these same areas may meet the significant nexus criteria of USACE and may require mitigation for impacts. Site development will require an environmental resource permit from FDEP and a dredge and fill permit from the U.S. Department of the Army. The permitting processes will require a wetlands delineation of the entire BV-24A property and pipeline easement. Completing the approved jurisdictional determination process with USACE will determine which wetlands fall under federal jurisdiction.

REFERENCES

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ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 11

GEOTECHNICAL REPORTS

Preliminary Geotechnical Engineering Report

Phases I and II
BV-24A Dredged Material Management Area (DMMA)
Brevard County, Florida

November 13, 2017
Terracon Project No. HB155022

Prepared for:
Taylor Engineering, Inc.
Jacksonville, Florida

Prepared by:
Dunkelberger Engineering & Testing,
A Terracon Company
Port St. Lucie, Florida

November 13, 2017

Taylor Engineering, Inc.
10151 Deerwood Park Blvd.
Jacksonville, Florida 32256

Attn: Jonathan Armbruster, P.E. … via e-mail (jarmbruster@taylorengineering.com)
Vice President

Re: Preliminary Geotechnical Engineering Report – Phases I and II
BV-24A Dredged Material Management Area (DMMA)
Brevard County, Florida
Dunkelberger Project Number: HB155022

Dear Mr. Armbruster:

Dunkelberger Engineering and Testing, A Terracon Company (DUNKELBERGER) has completed the initial phases of geotechnical engineering services for the above referenced project. This study was carried out in general accordance with our subcontract agreement (Taylor Engineering Contract No. C2015-065) dated January 4, 2015.

This preliminary report presents the findings of both the *Geotechnical Field Investigation and Laboratory Analysis* phase and the *Groundwater Modeling* phase of the contract work scope.

The geotechnical findings for the permanent pipeline alignment of the project have been presented separately in an addendum to this report.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please contact us.

Sincerely,
Dunkelberger Engineering and Testing, Inc. a Terracon Company

DOUGLAS S. DUNKELBERGER
LICENSE
No 33317
STATE OF FLORIDA
PROFESSIONAL ENGINEER

11/17/

Brent M. Langlois, P.E.
Project Engineer
FL Registration No. 81336

Douglas S. Dunkelberger, P.E.
Principal
FL Registration No. 33317

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PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
PHASES I AND II
BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA)
BREVARD COUNTY, FLORIDA

Terracon Project No. HB155022
November 13, 2017

1.0 PROJECT & SITE DESCRIPTION

The proposed BV-24A Dredged Material Management Area (DMMA) is located east of Grant-Valkaria, Florida in Brevard County. The BV-24A DMMA is one of eight sites selected to provide long-term dredged material containment capacity for the Intracoastal Waterway (ICWW) in Brevard County. It is intended to serve Reach VI located between Turkey Creek and the Brevard County - Indian River County line at Sebastian Inlet. The site is situated about ¼ mile west of the ICWW. A *Site Vicinity Map* is provided as *Sheet 1*. The overall site boundaries surround approximately 112.5 acres of vegetated land. Wetlands are located throughout the site. Several paths traverse through the site which are consistently used as equestrian or all-terrain vehicle trails. Two horse farms lie to the south and southeast of the site and an abandoned Oldcastle Coastal plant lies to the northeast.

2.0 PROPOSED CONSTRUCTION

The purpose of this study phase was to obtain and summarize data characterizing the subsurface conditions within the site to be used for subsequent detailed engineering analyses pertaining to both the design and construction of the DMMA. The data collection included field and laboratory parameters necessary for the set up and calibration of groundwater flow models that will be used in the next phase of study to evaluate potential saline impacts on the aquifer from the DMMA operation.

Background information concerning the design, construction and operation of the DMMA was provided by Taylor Engineering within the following five documents:

1) *BV-24A DMMA Management Plan (October 2015)*- summary of preliminary design, site preparation, and site management features
2) *BV-24A DMMA Engineering Narrative (October 2015)*- abbreviated summary of the site's key proposed engineering parameters
3) *BV-24A DMMA Environmental Site Documentation (September 2015)*- summary of documented on-site and nearby adjacent vegetation habitats and wildlife habitats
4) *Morgan & Eklund Topographic and Boundary Survey (July 2015)- survey of the topography and boundaries of the site including pipeline easement.*

5) *Morgan & Eklund Core Boring and Monitoring Well Stake Out (January 2016)- survey of boring and monitoring well locations including ground elevations.*

From the document review, we understand that the proposed DMMA footprint is expected to cover 63.1 acres of the site (includes perimeter roads and ditches) with a design capacity of approximately 1,084,100 cubic yards of dredged materials. To provide that storage capacity, perimeter earthen dikes will be constructed to a final crest elevation of +36.7 feet (approximately 16 feet above the existing mean site grade of +20.2 feet NAVD) with respect to the North American Vertical Datum of 1988 (NAVD). Preliminary design of the dikes indicates 3:1 (horizontal: vertical) side slopes with a 15-foot wide crest. The interior area of the containment embankment will be excavated to an elevation of +15.7 feet NAVD (about 4 ½ feet below the existing mean site grade) as a borrow source. The borrow fill, with an estimated quantity of 265,614 cubic yards, will be used to construct the dike and access ramps.

Native vegetation covers the majority of the site consisting of palmetto prairies, pine flatwoods, and sand pines. Multiple freshwater marshes (wetlands) were also found throughout the site. Wildlife habitat of significance includes gopher tortoises and scrub jays.

3.0 SCOPE OF WORK

The overall geotechnical work scope consists of: (1) geotechnical field investigation and laboratory analysis; (2) engineering analyses, recommendations, and design; (3) summary report and recommendations; and (4) assistance with construction drawings and specifications. That scope will be completed in four separate phases (Phases I through IV). This study, being the initial phase, involved collection of field and laboratory data to support the detailed engineering analyses of subsequent phases. The specific tasks of the Phase I work scope are listed below:

- Review of existing data (geotechnical, hydrological and hydrogeological)
- Compilation of nearby well, septic tank and pond inventory information
- Sampling and laboratory testing of ICWW sediments to be dredged
- Geotechnical field work (subsurface exploration) and laboratory testing for DMMA design and groundwater modelling.
- Preliminary groundwater modeling (set up , calibration and initial operational runs)
- Preparation of this preliminary (progress) geotechnical engineering report.

4.0 REVIEW OF AVAILABLE DATA

4.1 USGS Topographic Map

A copy of the USGS Topographic Map is provided as *Sheet 2* of this report. Reference to the map shows the site area with a west to east downward slope ranging in elevation from approximately

+25 feet to +15 feet with respect to the National Geodetic Vertical Datum of 1929 (NGVD '29). The elevation at the central area of the site is about +20 (ft.-NGVD). The average elevation of the site based on the ground surface elevations obtained at the boring and monitoring well locations (provided by Morgan and Eklund, Inc.) is about +20 feet as referenced to the North American Vertical Datum of 1988 (NAVD88).

The map also depicts the site surface as vegetated land with green shading and containing multiple wetlands.

4.2 Brevard County Soil Conservation Survey

The Soil Survey of Brevard County, Florida as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS; later renamed the Natural Resource Conservation Service – NRCS) identifies the majority of soil types in the proposed DMMA footprint area of the site as Immokalee Sand (Map Unit 28) and Pomello Sand (Map Unit 49) with a localized area of Myakka Sand, Depressional (Map Unit 38).

The Immokalee Sand and Pomello Sand soil types which cover about 95% of the proposed DMMA footprint are generally sandy and devoid of organic (muck) soils, clay/silt soils, and rock at shallow depths. As an exception, the Myakka Sand, Depressional soil type occurs in a circular-shaped, wetland feature on the south side of the proposed dike alignment. This area is of importance due to surficial layers of muck (unsuitable soil) commonly found in wetland areas. More detailed descriptions of the primary soil classifications are provided below.

28 – Immokalee Sand. This soil type has 0 to 2 percent slopes and is poorly drained. Under natural conditions, this soil type has a depth to water table of 6 to 18 inches. This soil type consists of relatively clean sands to a depth of 35 inches. A layer of black weakly cemented fine sand with organic coating, locally known as hardpan, is indicated from 35 to 54 inches. Thereafter, to the maximum defined depth of 80 inches, the soil profile consists of loamy sands.

49 – Pomello Sand. This soil type has 0 to 2 percent slopes and is moderately well drained. Under natural conditions, this soil type has a depth to water table of 24 to 42 inches. This soil type consists of relatively clean sands to a depth of 42 inches. A layer of black weakly cemented sand with organic coating, locally known as hardpan, is indicated from 42 to 54 inches. Thereafter, to the maximum defined depth of 80 inches, the soil profile consists of additional clean sands.

38 – Myakka Sand, depressional. This soil type has 0 to 2 percent slopes and is very poorly drained. Under natural conditions, this soil type has a water table at the ground surface. This soil type consists of relatively clean sands to a depth of 20 inches. A layer of black weakly cemented sand with organic coating, locally known as hardpan, is indicated from 20 to 36 inches. Thereafter, to the maximum defined depth of 85 inches, the soil profile consists of additional clean sands.

The Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be found. Boundaries between adjacent soils types on the Soil Survey maps are approximate. The Soil Survey is included as *Sheet 3*.

4.3 Regional Geology

The geology at the site (Reference Florida Geologic Survey: Geologic Map of Florida, dated 2002, revised in 2006) is mapped with the Anastasia Formation. The Anastasia Formation generally is recognized near the coast, generally composed of sands and coquinoid limestones. The most recognized materials found within the Anastasia Formation are coquina of whole or fragmented shells in a matrix of sand which is often cemented. The Anastasia Formation forms part of the surficial aquifer system. Below the surficial aquifer lies the Hawthorn Formation which is considered an intermediate confining unit. The Hawthorn Formation begins at approximately Elevation -85 feet NAVD and separates the surficial aquifer from the Upper Floridan Aquifer at about -300 feet NAVD. The Upper Floridan Aquifer is made up of a Limestone Formation referred to as Basal Hawthorne/ Suwanee and Ocala Limestone.

4.4 Historical Aerial Review

Historical aerial photographs from Years 1943, 1951, 1958, 1994, 1999, 2004, 2005, 2007, 2009, 2013, and 2014 were reviewed for features of geotechnical significance. The noted items are listed below in chronological order.

- 1943: the site is vacant, wooded (vegetated) land
- 1994: the site has ATV/equestrian paths traversing areas of the site, otherwise unchanged
- 1999: the western half of the site appears to have been cleared of tall trees; possibly a controlled burning operation
- 2014: the site appears similar to its current condition

According to available historic aerial photographs and with the exception of a potential clearing or controlled burn operation on the western half of the site, the site appears to have been relatively undisturbed from 1943 to date.

4.5 Nearby Well, Septic Tank and Pond Information

Given the planned disposal of dredged material within the relatively large DMMA footprint and the proximity of surrounding properties, we compiled an inventory of wells, septic tanks, and ponds within an approximately ½ mile radius of the site. Records for wells less than 6 inches in diameter were obtained from St. Johns River Water Management District (SJRWMD) data bases. Larger well (greater than 6 inches in diameter) and septic tank records were obtained from Brevard

County Florida Department of Health data bases. Pond locations were primarily identified using Google Earth aerial images. The compiled data is mapped on *Sheet 4* and summarized in the table below.

Table 4.1 - Nearby Well, Septic Tank, and Pond Information

Item	No. of Items	Type
Wells	66	Potable / Irrigation
Septic Tanks	23	Sewage Disposal
Ponds	10	Retention/Borrow

4.6 Hydrological and Hydrogeological Data

Existing hydrological data was collected from the National Oceanic and Atmospheric Administration (NOAA) and SJRWMD data sources. Historical rainfall amounts and evapotranspiration (ET) rates were researched as water balance parameters necessary for groundwater model calibration. Other SJRWMD sources (East Central Florida Regional Groundwater Flow Model and Floridan Aquifer potentiometric maps) were reviewed to establish the groundwater flow model hydrogeological cross-section (i.e. model layers) as discussed further in **Section 10.0.**

Historical (Years 2004-2014) rainfall and ET data was collected from the SJRWMD and Lake Alfred NOAA weather stations, respectively. The data set for the period of record was used for average yearly and monthly values. Also, a site specific rainfall data set was obtained from the SJRWMD's rainfall radar data base for the period of May 2015 through April 2016 corresponding to the collection period of on-site monitoring well readings.

Eleven (11) existing monitoring wells were constructed on the site. A layout of the monitoring well locations is presented as *Sheet 5*. The ground elevations at the well locations were determined by the project surveyor, Morgan and Eklund, Inc. The depths of the wells were 15 feet with the exception of a single deep well, MW-4, constructed to 40 feet bls.

Initial background groundwater quality data for the wells was collected by Pace Analytical Services Inc. following well construction. The data includes chloride concentration, total dissolved solids, pH, and turbidity. A summary of the data is shown in the following table.

Table 4.2 - Background Groundwater Quality Data (Collected on 4-12-16)

Well ID	Depth (feet)	Chloride Content (mg/L)	Total Dissolved Solids (mg/L)	pH	(1)Turbidity (NTU)
MW-1	15	13.2	61	4.6	5.5 / 3.2
MW-2	15	9.8	51	4.7	22.1 / 22.9
MW-3	15	62.0	186	5.0	28.2 / 17.4
MW-4	40	51.9	143	5.0	11.6 / 8.4
MW-5	15	65.8	186	4.7	271.0 / 11.7
MW-6	15	66.0	286	3.8	5.3 / 3.2
MW-7	15	50.3	173	4.8	141.0 / 12.4
MW-8	15	29.5	72	4.8	6.8 / 5.0
MW-9	15	46.9	119	4.6	90.4 / 8.2
MW-10	15	46.6	96	4.4	32.8 / 6.0
MW-11	15	180.0	409	4.1	4.3 / 1.6

(1) Numbers represent initial turbidity and final turbidity after purging.

With respect to the chloride concentrations in the groundwater, the levels were all less than the Florida Department of Environmental Protection's (FDEP) Groundwater Cleanup Target Level (GCTL) of 250 mg/L. The mean (average) and median values for the chloride data are 56.5 mg/L and 50.3 mg/L, respectively.

5.0 DETAILED SITE DESCRIPTION

Over the course of our field exploration, we obtained knowledge regarding the site terrain, vegetation, soil conditions and drainage patterns. A detailed site description with photos is provided herein.

The terrain was mostly flat with overall gradual topographic relief sloping downward from west to east. Several all-terrain and equestrian paths traversed throughout the site and exposed loose, white "sugar" sands.

Figure 5.1 - "Sugar" sand all-terrain/equestrian paths

The remaining areas consisted of natural vegetation and multiple wetlands found throughout the site. The vegetation primarily consisted of short saw palmettos and scattered tall pine trees.

Figure 5.2 - Typical vegetation

The wetlands found at the site were low lying, topographically-closed areas with tall grasses. Wetland bottom conditions ranged from saturated (soggy) to holding several feet of standing water.

Figure 5.3 - Typical wetland

The surficial soils found at the site were light gray clean sands and white "sugar sands" found along the paths described above. Consistent with the topographic relief across the site, surface drainage flow was from west to east. The site experienced significant rainfall during our field exploration causing many of the paths, wetlands, and other low lying areas to contain standing water.

Figure 5.4 - Standing water after heavy rains

Figure 5.5 - Standing water in wetland after heavy rains

Wildlife found during our site visits was minimal. Although tracks were found consistently for deer and raccoons, gopher tortoises were the only species found in addition to their burrows. The presence of gopher tortoises is significant with respect to an earthen dike project given their propensity to burrow through soil.

Figure 5.6 - Gopher tortoise burrow

6.0 FIELD EXPLORATION PROGRAM AND METHODS

The layout of the field exploration program (i.e. test hole locations and monitoring well locations) is shown in *Sheet 5*. Prior to our field exploration, Morgan and Eklund field staked and provided ground elevations for the test hole and monitoring well locations. Ground elevations at each field test location are included on *Sheet 5*. Descriptions of the exploratory program are provided in the following report sections.

6.1 Standard Penetration Test (SPT) Borings

Subsurface conditions within the DMMA footprint were explored with twenty five (25) Standard Penetration Test (SPT) borings. The borings were drilled 15 feet deep in the proposed interior borrow area and 45 to 100 feet in depth along the proposed perimeter dike alignment. The SPT borings were drilled with an ATV-mounted drill rig employing mud-rotary procedures. The drilling involved use of a standard split-barrel driven with a 140-pound automatic hammer (slide hammer) freely falling 30 inches (the Standard Penetration Test per ASTM D 1586). Samples of the in-place materials were recovered continuously to a depth of 10 feet, and then taken at 5-foot vertical intervals to the termination depth of the borehole. SPT “N-values” were recorded at 2-foot vertical intervals within the first 10 feet of the boring and at 5-foot vertical intervals thereafter. Samples recovered from the borings were placed in moisture-proof containers, labeled, and returned to our laboratory for visual-manual classification by a geotechnical engineer. The deep boreholes were subsequently sealed with neat cement grout and the shallow boreholes were sealed with bentonite chips. Subsurface profiles are presented as *Sheets 6 through 12*.

6.2 Cone Penetration Test (CPT) Soundings

Cone Penetrometer Test (CPT) soundings were advanced at seven (7) locations in lieu of SPT borings as a cost effective means to complete the field exploration. The CPT soundings were completed to depths of 35 to 75 feet along the proposed perimeter dike alignment. The CPT method provides continuous readings of soil resistance by use of a track-mounted, mechanical cone penetrometer equipped with a friction mantle (ASTM D 3441). CPT cone bearing resistances and friction sleeve readings were recorded as the penetrometer was pushed into the ground with a hydraulic ram. Detailed graphical logs and correlative parameters are presented in *Appendix A* as *Exhibits A-1* through *A-14*.

6.3 Bulk Samples

Bulk samples were obtained at fifteen (15) locations from the interior borrow area. The samples were obtained from auger borings drilled to depths up to about seven feet using a continuous flight auger (CFA). During the drilling, soil cuttings were raised and expelled at the surface where they were recovered, placed in large bags, labeled, and transported to our laboratory for testing.

6.4 Groundwater Monitoring Wells

Eleven (11) locations were selected for the installation of wells to measure groundwater quality and levels. Nine wells were constructed along the perimeter of the site and two were installed at the center of the site. The two wells installed at the center of the site, MW-4 and MW-5, were installed close to one another and at depths of 40 feet and 15 feet, respectively. The objective of these wells was to assess any influence of potential confining (clay and/or silt) layers by placing the screened intervals of wells both above and below the potential confining layer. A difference in hydrostatic head between the companion shallow and deep wells would suggest the presence of a confining layer which could impact deep foundation, groundwater flow (seepage), and construction dewatering aspects of the project. The perimeter wells were installed to a depth of 15 feet.

The wells consisted of a 5-foot length by 2-inch diameter machine slotted PVC pipe (0.010-inch slot width) screen that was coupled to solid riser pipe of similar composition which rose to about 3 feet above the ground. The deep (40 foot well), MW-4, consisted of the same dimensions with the exception of a 10-foot screen length. The sand pack surrounding the well screen consisted of clean 6/20 silica sand. Bentonite chips were placed above the piezometer screen up to the ground surface. Finally, an aluminum casing with pad lock was placed over the pipe stick-up and a concrete pad was constructed on the ground surface for protection.

6.5 Field Permeability Tests

Two (2) constant head field permeability tests were performed in monitoring wells MW-4 and MW-5. The tests generally consisted of pumping water at a fixed volumetric flow to maintain a constant head near the top of the well pipe. The time was measured for multiple test runs.

Additionally, a shallow temporary piezometer was installed near MW-4 and MW-5 to a depth of 5 feet bls and a third permeability test was performed using procedures described in the South Florida Water Management District (SFWMD) Usual Open Hole test method. The test method consists of installing a 2-inch diameter, full-length, perforated PVC pipe with a clean 6/20 sand pack. Similarly, the test was performed with a constant head maintained at the ground surface.

6.6 Intracoastal Waterway (ICWW) Vibracores

Dredged sediment samples were recovered by our subcontractor, Athena Technologies, Inc., from Reach VI of the Intracoastal Waterway (ICWW) using the Vibracore method. In general, this method consisted of vibrating a thin walled 6-inch diameter steel casing down to the target elevation of -17 feet with respect to Mean Lower Low Water which corresponds to 5 feet below the Federally authorized depth of 12 feet. The casing was then extracted and the sample emptied into containers. The process was repeated until approximately 5 gallons of sediment was recovered at each test location. Dredged sediment sampling was obtained at eleven (11) locations from the proposed dredge areas. The bulk samples, placed in large containers, were labeled by location with State-Plane coordinates and transported back to our laboratory where they were laid out for visual-manual classification by a geotechnical engineer. A layout of the Vibracore locations is shown on *Sheet 13*.

7.0 GENERAL SUBSURFACE CONDITIONS

7.1 Subsoil Conditions

The soil samples collected from the SPT and auger borings were visually-manually classified in accordance with the Unified Soil Classification System (USCS). Subsurface profiles are presented graphically in Sheets 6 through 12. The generalized soil stratification is discussed below.

Table 7.1 - Generalized Soil Stratification

Stratum	Material Description	Unified Soil Classification System (USCS)
1	Gray or brown medium to fine SAND	SP
2	Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan)	SP-SM, SM
3	Light brown slightly silty medium to fine SAND	SP-SM
4	Dark gray to green sandy SILT	ML
5	Gray shelly SAND with varying amounts of silt	SP, SP-SM, SM
6	Green or light gray CLAY, traces of shell	CL, CH
7	Gray to green slightly silty to silty fine SAND	SP-SM, SM

In general, the borings/soundings found about 40 feet of relatively clean, medium to fine sands (SP, SP-SM; Strata 1, 2, and 3) with some test areas indicating isolated 5 +/- foot thick layers of silt between Elevations 0 and -15 feet NAVD. Underlying the sands were typically clays and silts (Strata 4 and 6) with highly variable thicknesses ranging from 5 to 40 feet. Below the silts and clays were typically shelly sands with varying amounts of silt (Stratum 5) extending to the respective boring termination depths.

The SPT N-values, and CPT cone tip readings, indicate that the predominately sandy subsoils beneath the DMMA footprint range from very loose to medium dense in terms of relative density. The deeper shelly sands are typically dense to very dense. With respect to the fine grained layers (i.e. silts/clays, Strata 4 and 6), the isolated upper layers of silt are very soft to soft, while the deeper clay and silt layers are medium stiff to stiff in terms of relative consistency.

Hydraulic conductivity of the sands measured by field permeability tests were 43.5 feet per day in the upper 5 feet, 7.0 feet per day from 10 to 15 feet bls, and 9.4 feet per day from 35 to 40 feet bls.

7.2 Groundwater Conditions

At the time of our field exploration, groundwater was found in each drilled test hole. At these locations, the groundwater level was measured during drilling at elevations between about +22.5 and +14.6 (feet-NAVD). The groundwater depth ranged from at the ground surface to 3.0 feet bls. Additionally, groundwater level readings were taken periodically in the monitoring wells. Those groundwater measurements are shown in the following table.

Table 7.2 - Groundwater Elevations

Date	Groundwater Elevations (Feet - NAVD)										
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11
2/24/16	-	-	+8.3	-	-	+13.3	-	-	+16.8	+17.6	+20.2
2/26/16	+22.5	+17.1	+8.9	+18.2	+19.6	-	+21.7	+19.9	-	-	+20.8
4/12/16	+20.1	+15.9	+7.9	+17.0	+17.0	+12.7	+20.2	+18.8	+15.4	+16.2	+18.7

Similar to the trend of topographic relief across the site, the groundwater flow gradient is from west to east dropping in elevation from about +22 to +12 (feet- NAVD). Comparison of the MW-4 (shallow) and MW-5 (deep) data indicates no significant head differential that may be caused by a confining soil layer.

8.0 LABORATORY TESTING PROGRAM: ON-SITE SOILS

Samples from the borings were reviewed by a geotechnical engineer and classified in accordance with the Unified Soil Classification System (ASTM D 2487) and appropriate geologic nomenclature. Representative samples of the subsurface strata were tested for soil properties as follows.

- Moisture Content (102 Tests)
- Organic Content (3)
- Fines Content (97)
- Gradation (37)
- Modified Proctor Compaction (5)
- Limerock Bearing Ratio (LBR) (3)
- Hydraulic Conductivity (8)
- Triaxial Shear Strength (3)
- Consolidation (4)

The laboratory test results are discussed below and summarized in Tables A through G following Sheet 13.

8.1 Index Properties

Representative samples of the soils recovered from the borings were tested for index properties including moisture content (ASTM D2216), organic content (ASTM D2974), Atterberg Limits (ASTM D4318), fines content (ASTM D1140), and grain size distribution (ASTM D422). A complete summary of the index properties and grain size distribution results are presented in Tables A and B. Grain size distribution curves are provided in *Appendix B* as *Exhibits B-1* through *B-5*. Average values of the test results are summarized in the following table.

Table 8.1 - Index Property Laboratory Test Results (On-Site Soils)

Stratum No.	Soil Type	MC (%)	Atterberg Limits		OC (%)	Amount of Material Passing Sieve Size (%)					
			LL	PI		#4	#10	#40	#60	#100	#200
1	SP	24.6	-	-	-	100	100	94.3	70.2	29.4	3.0
2	SP-SM	21.5	-	-	7.4	100	99.1	91.3	61.8	29.0	10.2
3	SP-SM	23.9	-	-	-	100	100	99.4	97.2	82.1	6.9
4	ML	51.5	45.0	17.3	-	-	-	-	-	-	69.2
5	SP, SP-SM, SM	20.0	-	-	-	97.2	93.1	78.9	60.1	34.2	9.3
6	CL, CH	42.4	35.2	14.3	-	-	-	-	-	-	82.9
7	SP-SM, SM	26.8	NP	NP	-	100	100	90.5	84.8	61.0	9.9

Notes: 1. Soil Type refers to the Unified Soil Classification System Group Symbol (ASTM D2487).
2. MC, LL, PI, and OC indicates moisture content, Liquid Limit, Plasticity Index and organic content, respectively.
3. NP - Not plastic

8.2 Modified Proctor Compaction

Bulk soil samples obtained from the proposed interior borrow area at five (5) locations, from depths of 0 to 7 feet bls, were tested for their compacted moisture/dry density relationship in accordance with the Modified Proctor Compaction Test (ASTM D 1557). The optimum moisture content of the compacted soils ranged between 10.4 and 14.3 percent, and the maximum dry density ranged from 101.9 to 103.1 pounds per cubic foot (pcf). A summary of the test data are provided in Table C.

8.3 Limerock Bearing Ratio (LBR)

Bulk soil samples at three (3) selected locations within the interior borrow area were tested for Limerock Bearing Ratio (LBR). The optimum moisture content of the compacted soils ranged between 12.8 and 13.6 percent, and the maximum dry density ranged from 103.3 to 104.9 pounds per cubic foot (pcf). The LBR values ranged from 41.9 to 59.6. A summary of the test data are provided in Table D.

8.4 Hydraulic Conductivity

Two (2) undisturbed (Shelby tube) samples of the clay (Stratum 6) were extruded and tested for hydraulic conductivity in a triaxial flexible wall permeameter (ASTM D 5084). The hydraulic conductivity of the clays were 4.87×10^{-8} cm/sec and 5.57×10^{-8} cm/sec.

Additionally, three (3) bulk samples of near-surface soils in the proposed interior borrow area were remolded to specific moisture-dry density conditions and tested in the laboratory for hydraulic conductivity. Each sample was remolded to two moisture-density conditions: one near the approximate dry density of the in-situ conditions; and one at approximately 95 percent of its maximum dry density as determined by the Modified Proctor Compaction Test. The hydraulic conductivity of the samples was determined in a rigid-walled permeameter using the constant head method (ASTM D 2434). The hydraulic conductivity of the material obtained from the proposed interior borrow area at in-situ density ranged from 1.70×10^{-2} cm/sec to 2.61×10^{-2} cm/sec (48.1 to 74.0 feet per day) and the hydraulic conductivity at 95 percent of its maximum dry density ranged from 1.21×10^{-2} cm/sec to 2.02×10^{-2} cm/sec (34.3 to 57.3 feet per day).

Results of the hydraulic conductivity testing are summarized in Tables E.1, E.2, and E.3. Detailed test reports are provided in *Appendix B* as *Exhibits B-6 to B-13*.

8.5 Triaxial Shear Strength

Consolidated Drained (CD) triaxial shear strength tests with pore pressure measurements were completed on two (2) remolded bulk samples of near-surface sandy soils (depths of 0 to 7 feet bls) representative of those that will be a source of borrow for the dike embankment fill and foundation soils. The soil specimens were prepared at approximately 95 percent of their maximum dry density and ±2 percent of their optimum moisture content as determined by the Modified Proctor Compaction Test. A Consolidated Undrained (CU) test was completed on an undisturbed clay sample obtained from a depth of about 33 feet bls. The specimens were run at consolidation pressures varying for each test. The effective angle of internal soil friction (ϕ') for the sandy soils representative of the embankment and shallow foundation soils were 31.0 and 33.1 degrees. The total strength and effective strength values for cohesion (c) from the triaxial shear strength tests for the clay sample were 562 and 605 pounds per square foot (psf), respectively.

A summary of the triaxial shear strength test results and test parameters are summarized in Table F. Detailed reports of the test results are provided in *Appendix B* as *Exhibits B-14 to B-17*.

8.6 Consolidation

Four (4) undisturbed (Shelby tube) samples of silt (Stratum 4) and clay (Stratum 6) were extruded and tested for one-dimensional consolidation. The tests were conducted at multiple load increments to a maximum load of 16 tons per square foot (tsf). Sample compression was measured using a ½ inch stroke dial gage. Compression index (C_c) values for the four tests ranged from 0.29 to 0.70 on a strain basis. Recompression index (C_r) values for the same four tests ranged from 0.03 to 0.09 on a strain basis. The pre-consolidation pressures ranged from 4.0 ksf to 6.2 ksf. This data, as well as the correlative CPT data, suggests that the silts and clays are slightly to moderately over-consolidated with OCRs ranging from 1.6 to 3.3.

A summary of the consolidation test results are summarized in Table G. Detailed reports of the test results are provided in *Appendix B* as *Exhibits B-18 to B-21*.

9.0 LABORATORY TESTING PROGRAM: DREDGED MATERIALS

Dredged sediment samples from the eleven (11) vibracores were reviewed by a geotechnical engineer and classified in accordance with the Unified Soil Classification System (ASTM D2487) and appropriate geologic nomenclature. Each Vibracore sample was tested for the following properties:

- Gradation
- Leachability

9.1 Index Properties

Representative samples of the soils recovered from the vibracores were tested for grain size distribution (ASTM D422). The Vibracore samples were visually inspected to estimate the amount of muck compared to the total sample volume. A summary of the index properties are presented in the following table. Grain size distribution curves are provided in *Appendix C* as *Exhibit C-1*. The test results are summarized in the following table.

Table 9.1 - Index Property Laboratory Test Results (Dredged Materials)

Vibracore Number	Soil Type	Muck %	Amount of Material Passing Sieve Size (%)									
			1”	¾”	½ “	#4	#10	#20	#40	#60	#100	#200
V-1	SC	20	100	93.2	92.9	85.9	78.1	70.5	63.9	55.0	38.8	18.1
V-2	SC	75	100	100	99.0	92.6	79.8	66.4	54.5	44.6	37.2	28.8
V-3	SC	30	100	100	99.0	91.7	79.0	64.3	56.0	46.1	33.7	15.7
V-4	SP-SC	15	100	100	98.4	85.8	64.2	46.8	36.2	27.4	21.5	10.4
V-5	SP-SC	10	100	100	99.9	95.9	86.3	78.3	69.3	57.5	39.1	10.9
V-6	SP	0	100	100	99.5	95.8	86.2	70.7	58.6	39.7	25.1	3.4
V-7	SP	0	100	100	100	96.8	87.9	80.5	70.5	53.7	42.4	3.2
V-8	SP	10	100	100	100	94.3	82.8	67.9	56.6	45.3	34.3	2.9
V-9	SP-SC	50	100	100	100	90.1	77.8	65.8	55.9	25.4	13.3	7.1
V-10	SP	5	100	100	100	90.8	76.9	58.3	50.7	37.9	23.2	2.7
V-11	SP-SC	80	100	100	100	97.2	93.0	87.2	77.6	50.4	27.5	6.7
AVG	**SP-SC**	**30**	**100**	**99.4**	**99.0**	**97.8**	**92.5**	**81.1**	**68.8**	**59.1**	**43.9**	**10.0**

Notes: 1. Soil Type refers to the Unified Soil Classification System Group Symbol (ASTM D2487).
2. Muck % indicates approximate percentage of muck mixed with the Vibracore sample based on visual observation

9.2 Chloride Leachability Testing

Representative soil samples from each of the eleven (11) vibracore locations were used for our in-house chloride leachability tests. The purpose of the laboratory testing was to simulate an operational condition of the DMMA to evaluate the leaching potential of a 2-foot thick layer (column) of dredged material when subjected to 52 inches of influent. The procedure generally consisted of a PVC pipe setup including two 3-inch diameter pipes, one at 2 feet in length to hold the soil specimen, and the second at 5 feet to hold 52 inches of water. A PVC pipe reducer and ball valve were fastened to the bottom of the pipes to allow pausing of the test. A filter stone was placed in the bottom of each pipe. Containers were placed under each ball valve to capture the leached extract. Two feet of sample was loaded into the tubes and water was subsequently added to saturate the sample. Once the samples were saturated, 52 inches of water (modeling annual rainfall) was loaded onto each sample and the ball valves were opened to begin the test. Chloride and pH tests were run on the liquid extract on an incremental basis after 9 inches of water had passed through the sample. After the complete 52 inches of water had fully passed through, a final set of chloride and pH tests were run.

In addition to our in-house testing, other portions of the eleven (11) vibracore samples were sent to Pace Analytical Services Inc. to test for pH, total chloride of soil, and Synthetic Precipitation Leaching Procedure (SPLP, EPA SW-846 Method 1312) testing. For a previous DMMA project, Toxicity Characteristic Leaching Procedure (TCLP, EPA SW-846, Method 1311) was used to test the vibracore samples. The TCLP generally applies to material sitting in a landfill whereas the SPLP was designed to simulate material sitting in-situ and therefore adopted for this study as the better of the two methods to assess chemical mobility in the open environment.

Results of the in-house soil column leaching tests showed relatively high concentrations of chlorides in the extracted liquid. For 11 column tests, the maximum and average chloride contents of the first 9 inches of percolated liquid extract were 18,750 mg/L and 13,000 mg/L, respectively. Four of the eleven tests were not fully completed due to the low permeability of the vibracore material. The incomplete data was not considered in our analyses. The average final chloride content based on the seven completed tests for the entire 52 inches of liquid extract was 2,800 mg/L. The commercial laboratory SPLP test results, for all 11 samples, averaged 234 mg/L. It is noted as a point of reference that seawater has a chloride concentration of 19,400 mg/L.

The reason for the order-of-magnitude difference between the SPLP and the column leaching is likely attributed to the latter test being larger scale and it is more representative physically of actual field conditions. Therefore, the column leaching data was adopted for use in the groundwater (transient solute transport) model. More specifically, the test data for Sample V-11 represented the highest leaching potential and was used as a conservative basis for both analysis and design which we believe is appropriate given the inherent variability of dredged material consistency.

Referencing the State's Secondary Drinking Water Standard at 250 mg/L, the column leaching test results indicate significant potential for leaching of chlorides particularly during first flushing of newly placed dredged materials.

Detailed results of the leachability testing are presented in *Appendix C* as *Exhibits C-2* through *C-7*.

10.0 GEOTECHNICAL MODEL

Based on the subsurface data collected in the field and the laboratory test results, the following model of representative soil properties was developed for use in subsequent geotechnical analysis of the DMMA.

Elevation (Ft - NAVD)					
+37 to +20	Embankment	$\phi = 31°$	$\phi' = 31°$	k = 40 ft/day γ_{dry} = 103 pcf	
+20 to +10	Sand	$\phi = 31°$	$\phi' = 30°$	k = 60 ft/day	E = 325,000 psf
+10 to -5	Sand	$\phi = 30°$	$\phi' = 30°$	k = 7 ft/day	E = 375,000 psf
-5 to -10	Silt	$\phi = 8°$ c = 560 psf	$\phi' = 20°$ c' = 0 psf	k = 0.00015 ft/day OCR = 3.3	$C_C = 0.47$ $C_R = 0.08$
-10 to -20	Sand	$\phi = 31°$	$\phi' = 31°$	k = 10 ft/day	E = 475,000 psf
-20 to -40	Clay/Silt	$\phi = 8°$ c = 560 psf	$\phi' = 20°$ c' = 0 psf	k = 0.00015 ft/day OCR = 2.0	$C_C = 0.43$ $C_R = 0.05$
-40 to -70	Shelly Sand	$\phi = 33°$	$\phi' = 33°$	k = 10 ft/day	E = 650,000 psf

ϕ - total friction angle	k - permeability
c - total cohesion	E - elastic modulus
ϕ' - effective friction angle	C_C - compressibility coefficient
c' - effective cohesion	C_R - recompression coefficient
γ_{dry} - dry density	OCR - Overconsolidation Ratio

Figure 10.1 - Geotechnical Model

In regard to the model and as it pertains to the proposed dike, the high permeability values of the embankment and shallow foundation soils are of importance as they will cause high seepage rates through the earthen dike which potentially may exit the downstream embankment face and/or toe. The intermediate and deep silt and clay layers indicate high virgin compressibility parameters which would generally result in significant settlement. However, these materials are sufficiently over-consolidated and deep enough below the base of the dike that embankment settlements should be modest. The friction angles of the embankment fill and upper foundation sands are typical values associated with these materials and should not cause issues from a stability standpoint. Additionally, the intermediate layer of silt is of a strength and at a depth to not cause deep-seated stability issues beneath the embankment.

11.0 GROUNDWATER MODELING

11.1 Model Set Up

Two models were set up and calibrated for numerical analysis of transient groundwater flow (MODFLOW) in the site area and transient solute transport (MT3D) under the conditions of dredged material disposal. The groundwater modeling efforts were carried out by Andreyev Engineering, Inc. (AEI) working as a professional sub-consultant to DUNKELBERGER.

The initial set up involved developing a MODFLOW2000 model in a GW-Vistas MODFLOW framework. A grid of 250 cells by 250 cells was used with a constant cell size of 50 feet by 50 feet.

For the initial model set up, the thicknesses of individual aquifer layers were selected based on published geologic data (SJRWMD sources) as well as the site-specific geotechnical data collected as part of this study. Some minor adjustments to individual layer thicknesses were made as part of the model calibration process. The adopted geologic cross-section for the modeling is shown in the following.

+10 to +25 feet-NAVD Ground Surface Elevations

-1	Surficial Aquifer (sand & silty sand)	LAYER 1
-17	Surficial Aquifer (sand & silty sand)	LAYER 2
-85	Surficial Aquifer (sand, clay, shell)	LAYER 3
-300	Aquitard (dense shell & hard clay)	LAYER 4
-600	Upper Floridan Aquifer (limestone)	LAYER 5

Figure 11.1 - Model Geologic Cross Section

Boundary conditions were applied in Layer 1 as illustrated in Figure 9.2 shown below. The Floridian Aquifer (Layer 5) was defined as a constant head boundary at +33 feet NAVD based on published potentiometric pressure maps (SJRWMD).

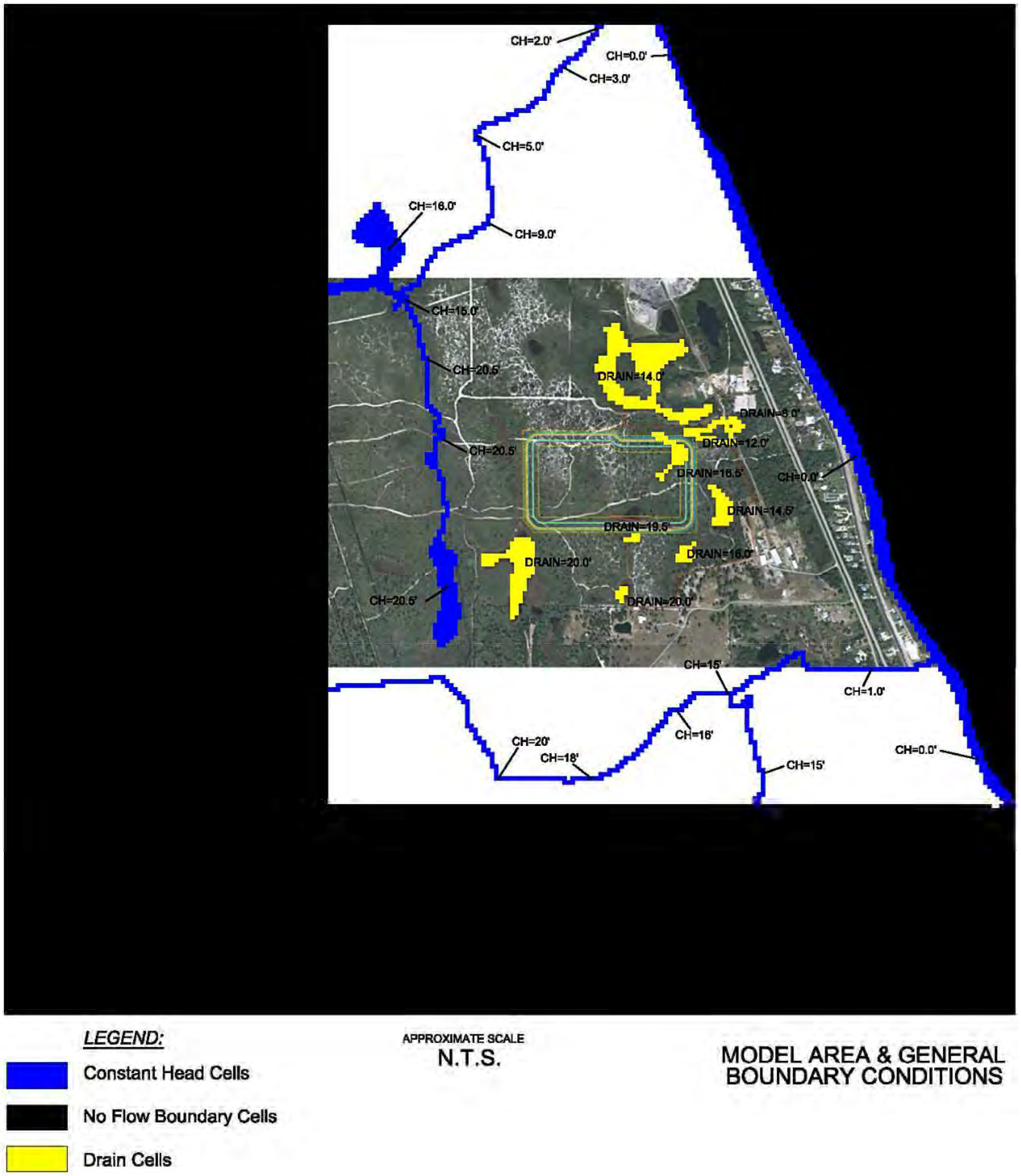


Figure 11.2 - Groundwater Model Area and General Boundary Conditions

The MT3D model setup was consistent with the aforementioned MODFLOW structure and conditions.

11.2 Calibration

11.2.1 MODFLOW

The hydrological data, both historical and site specific, were arranged in a water balance spreadsheet for calculation of net recharge to the shallow aquifer to allow for calibration of the model. The calibration was carried out using a stepped process with five successive stress periods: a long-term (10 years), average background condition (Stress Period 1); and transient site-specific conditions that corresponded to average dry and wet seasons (Stress Periods 2 and 3, respectively) followed by two on-site groundwater measurement events that occurred on February 26, 2016 (Stress Period 4) and April 12, 2016 (Stress Period 5). The steady-state model was executed concurrently with the transient model to achieve the same aquifer parameters during the calibration process.

The rainfall and evaporation/evapotranspiration data used to calculate net recharge for each Stress Period (e.g. SP 1) are summarized in the following tables:

Table 11.1 - SJRWMD Radar Rainfall Data

Month of Year	Year		SP 1	SP 2	SP 3	SP 4	SP 5
	2015	2016	Average	Average Dry	Average Wet	2/26/16	4/12/16
Jan	0.898	7.064	2.48	2.48		7.064	
Feb	2.464	2.450	2.49	2.49		2.450	
Mar	0.608	1.845	2.92	2.92			1.85
Apr	2.861	0.028*	2.08	2.08			0.03
May	1.124		3.94	3.94			
Jun	5.492		5.83		5.83		
Jul	7.213		5.38		5.38		
Aug	5.179		5.78		5.78		
Sep	7.659		7.20		7.2		
Oct	1.894		4.76	4.76		1.894	
Nov	3.055		3.12	3.12		3.055	
Dec	3.233		2.31	2.31		3.233	
Total	**41.68**		**48.29**	**24.10**	**24.19**	**17.70**	**1.87**

* through April 12
SJRWMD – St. John's Regional Water Management District

Table 11.2 - ET Values (Lake Alfred NOAA Station)

	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pan Evap. Rates	60.57	2.88	3.64	4.73	6.36	7.01	7.02	6.76	6.20	5.61	4.40	3.36	2.60
Average ET	40.28	1.92	2.42	3.15	4.23	4.66	4.67	4.50	4.12	3.73	2.93	2.23	1.73

Table 11.3- Lake Alfred Evapotranspiration Data

Month	SP 1	SP 2	SP 3	SP 4	SP 5
	Average	Avg. Dry	Avg. Wet	2/26/2016	4/12/2016
Jan	1.92	1.92		1.92	
Feb	2.42	2.42		2.17	0.25
Mar	3.15	3.15			3.15
Apr	4.23	4.23			1.69
May	4.66	4.66			
Jun	4.67		4.67		
Jul	4.50		4.50		
Aug	4.12		4.12		
Sep	3.73		3.73		
Oct	2.93	2.93		2.93	
Nov	2.23	2.23		2.23	
Dec	1.73	1.73		1.73	
Total	**40.28**	**23.26**	**17.02**	**10.97**	**5.09**

The calculated net recharge for each stress period that was used as part of the calibration process is summarized in the tables below:

Table 11.4 - Model Recharge Calculations (throughout project area)

Date	Time (days)	Rainfall (in)	Calculated ET (in)	Net Recharge (ft/day)	Stress Periods for Model Calibration
10/2/2004					
9/30/2014	3650	482.90	402.79	0.00183	1
5/31/2015	243	24.10	23.26	0.00029	2
9/30/2015	122	24.19	17.02	0.00490	3
2/26/2016	149	17.70	10.97	0.00376	4
4/12/2016	46	1.87	5.09	-0.00583	5

Table 11.5 - Model Recharge Calculations (areas of deeper groundwater)

Date	Time (days)	Rainfall (in)	Calculated ET (in)	Net Recharge (ft/day)	Stress Periods for Model Calibration
10/2/2004					
9/30/2014	3650	482.90	382.79	0.00229	1
5/31/2015	243	24.10	21.93	0.00074	2
9/30/2015	122	24.19	16.35	0.00536	3
2/26/2016	149	17.70	10.16	0.00422	4
4/12/2016	46	1.87	4.84	-0.00537	5

The areas of deeper groundwater are outlined on Figure 9.3 below and were assigned ET values slightly (5%) less than the remainder of modelled area.

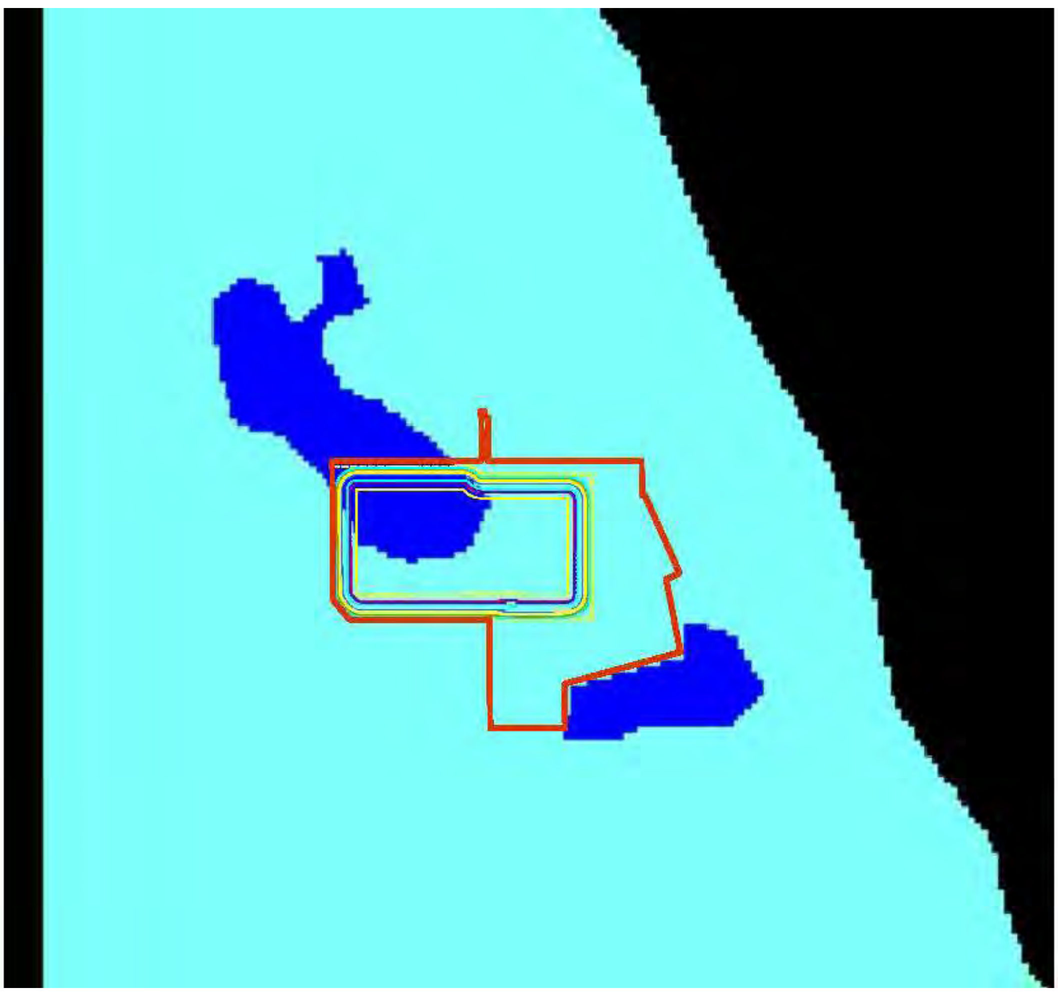


Figure 11.3 - Deep Groundwater Areas

The calibration target points were the on-site monitoring wells with two groundwater level measurement events. The well locations and groundwater elevation data were imported into the model for comparison with the output data. The locations of the target points are shown on the following figure.

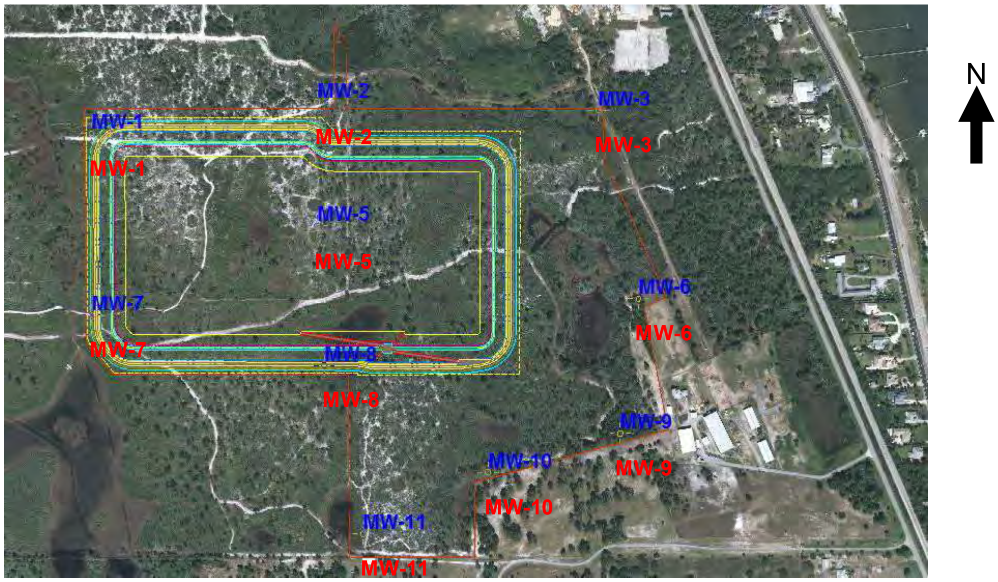


Figure 11.4 - Shallow Monitoring Wells in Layer 1 (Target Calibration Points)

The following series of plots compare modeled and measured (two events) groundwater elevations for each of the eleven target points.

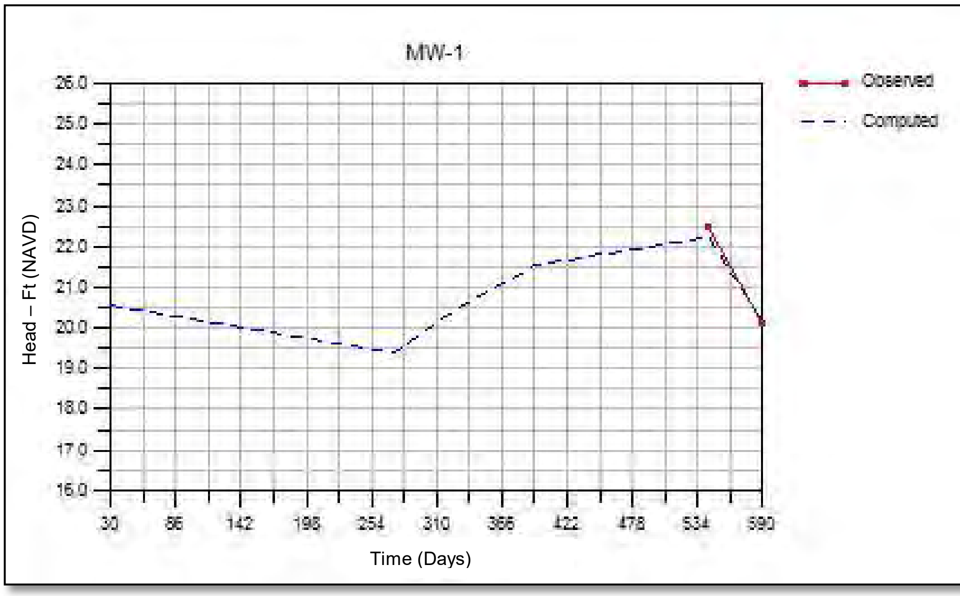


Figure 11.5 - Modeled vs Measured Groundwater Elevations (MW-1)

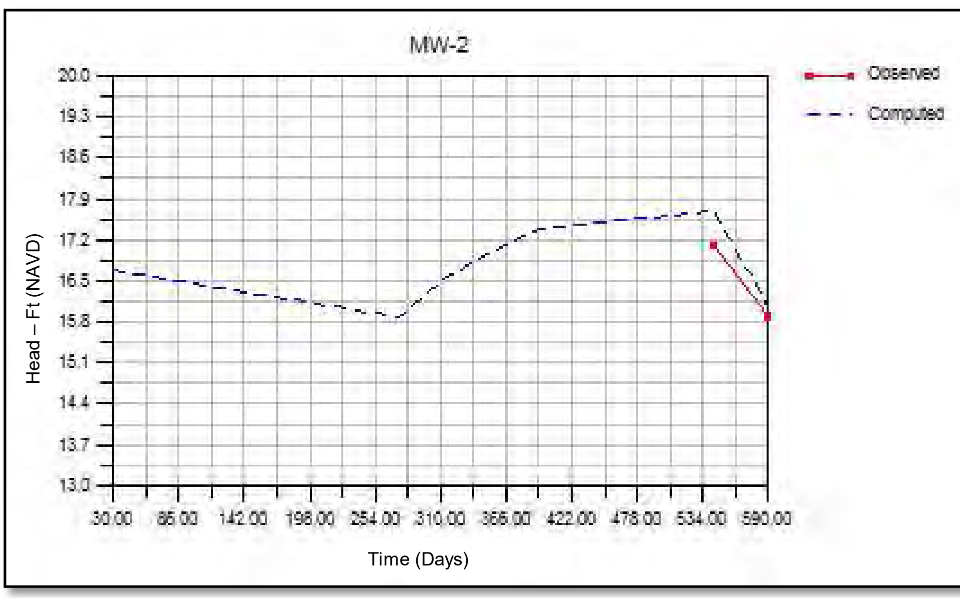


Figure 11.6 - Modeled vs Measured Groundwater Elevations (MW-2)

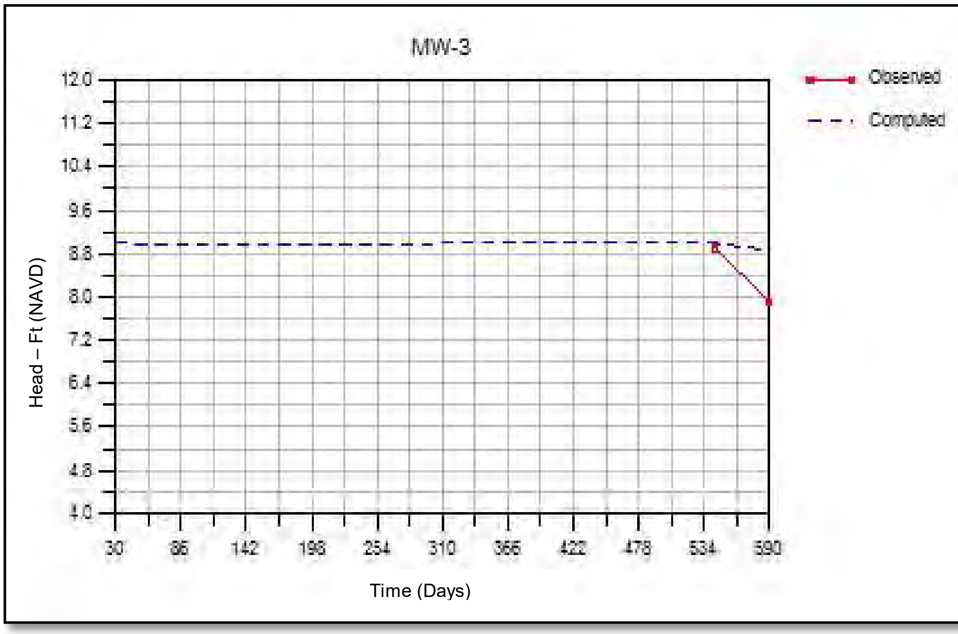


Figure 11.7 - Modeled vs Measured Groundwater Elevations (MW-3)

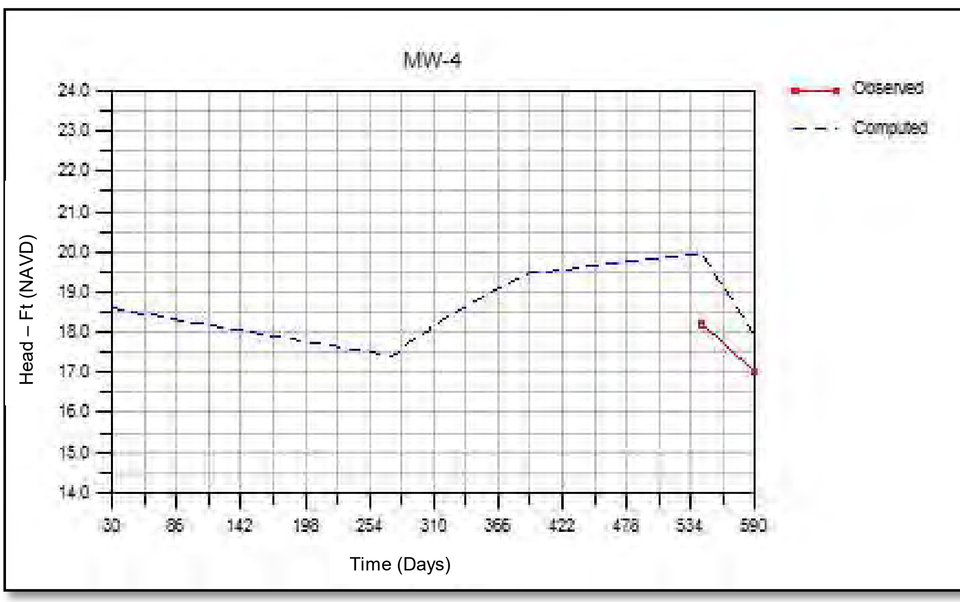


Figure 11.8 - Modeled vs Measured Groundwater Elevations (MW-4)

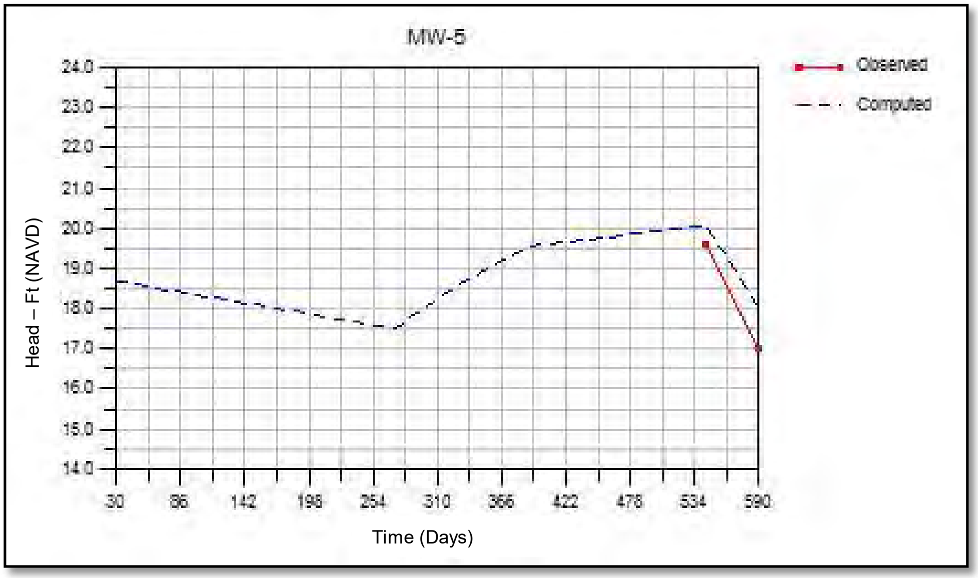


Figure 11.9 - Modeled vs Measured Groundwater Elevations (MW-5)

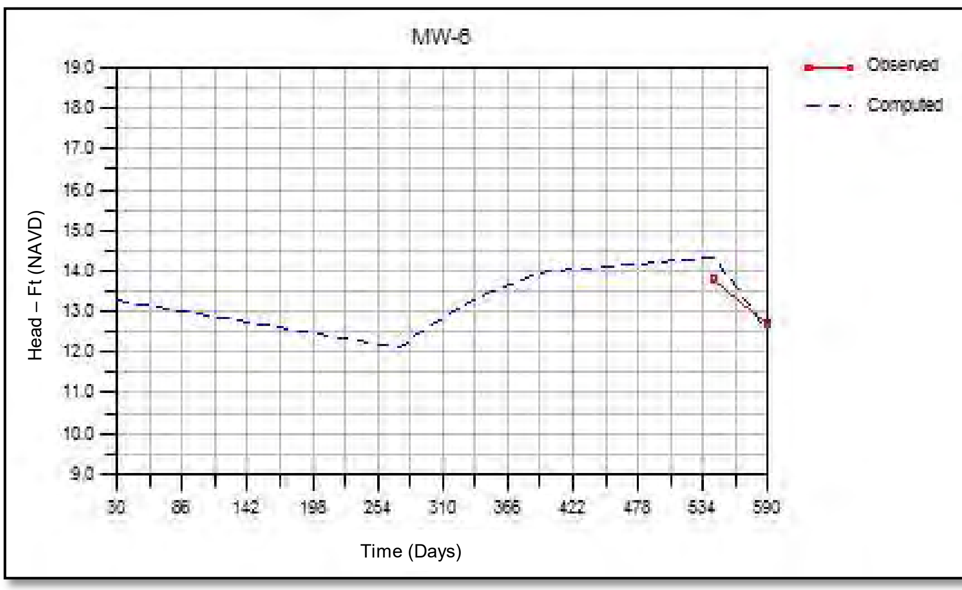


Figure 11.10 - Modeled vs Measured Groundwater Elevations (MW-6)

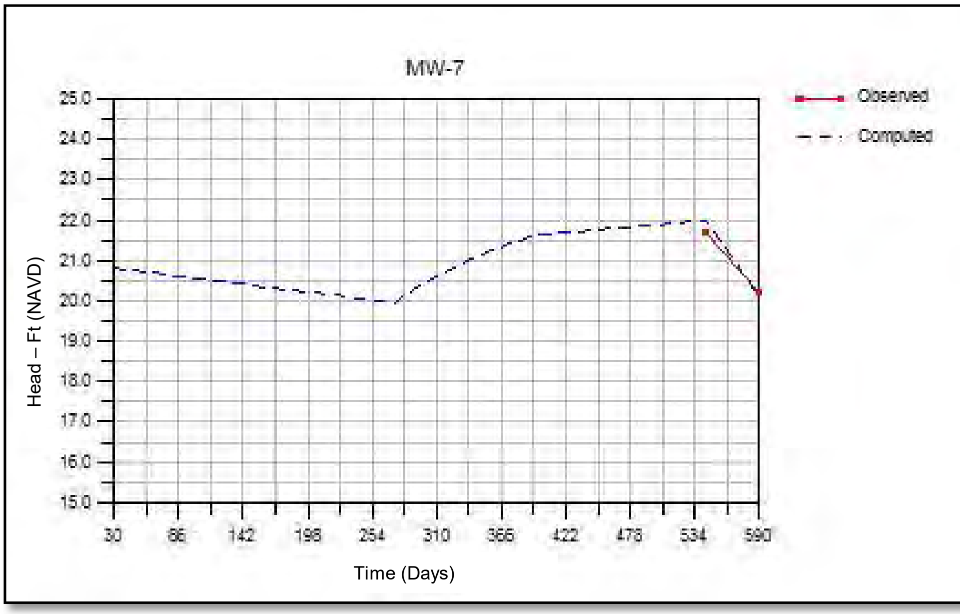


Figure 11.11 - Modeled vs Measured Groundwater Elevations (MW-7)

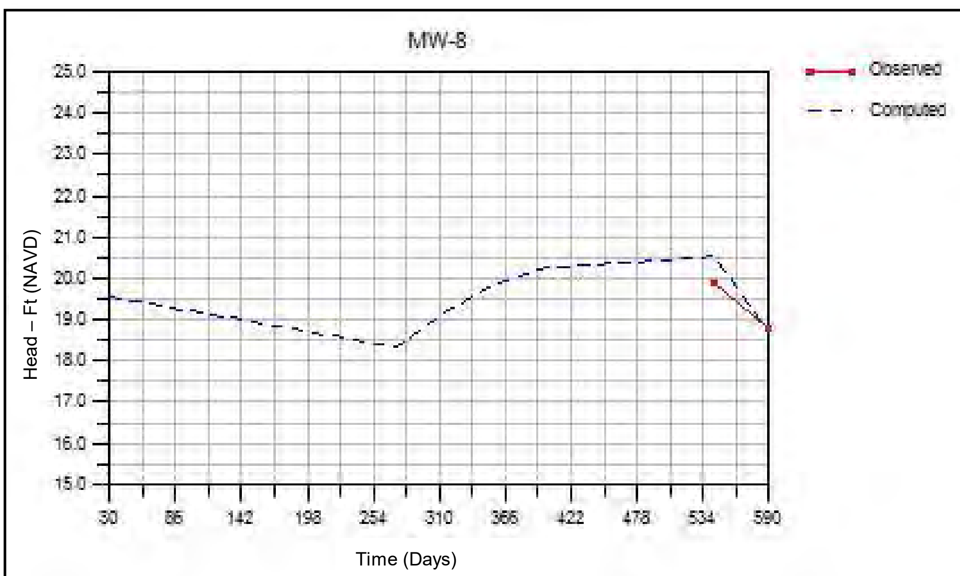


Figure 11.12 - Modeled vs Measured Groundwater Elevations (MW-8)

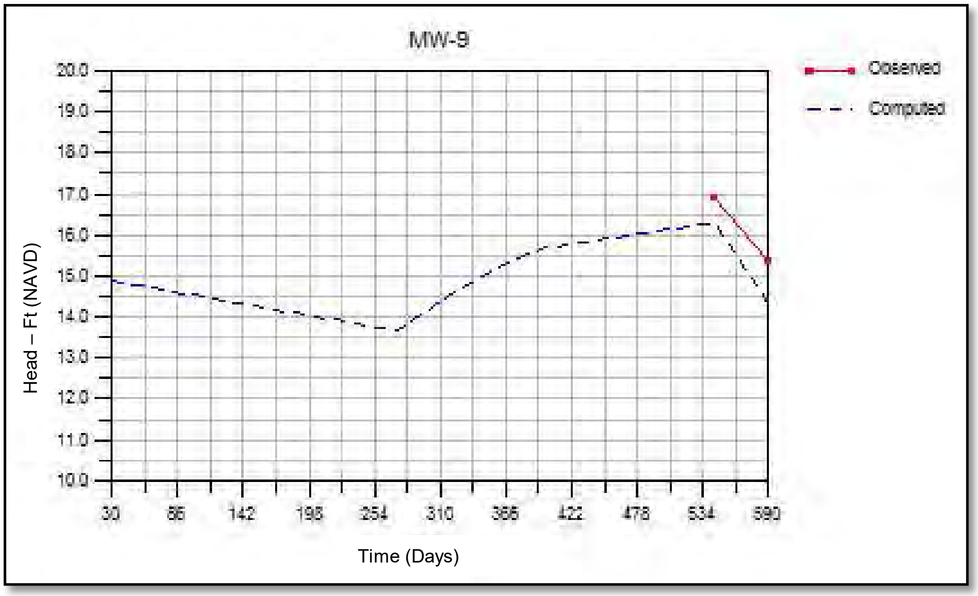


Figure 11.13 - Modeled vs Measured Groundwater Elevations (MW-9)

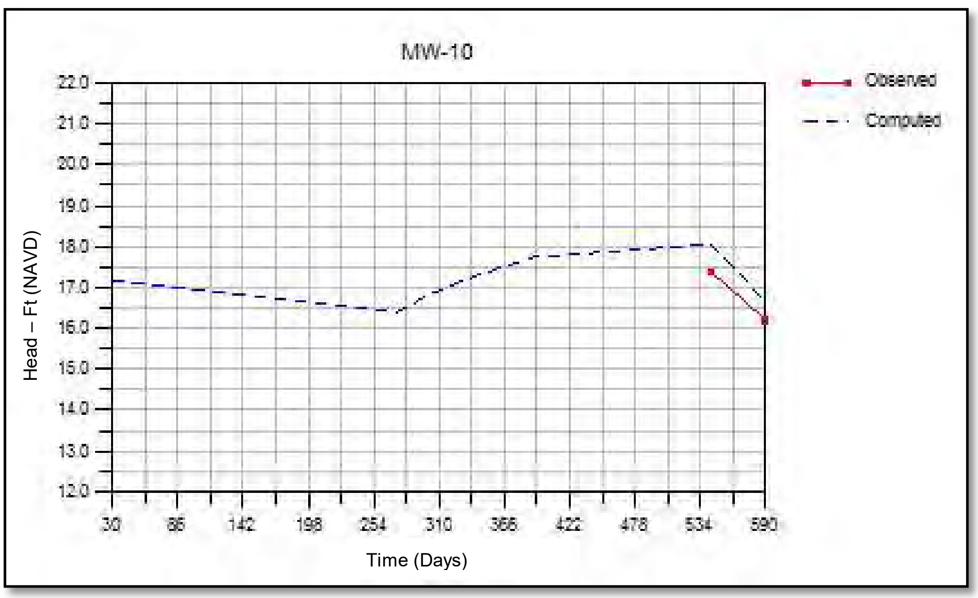


Figure 11.14 - Modeled vs Measured Groundwater Elevations (MW-10)

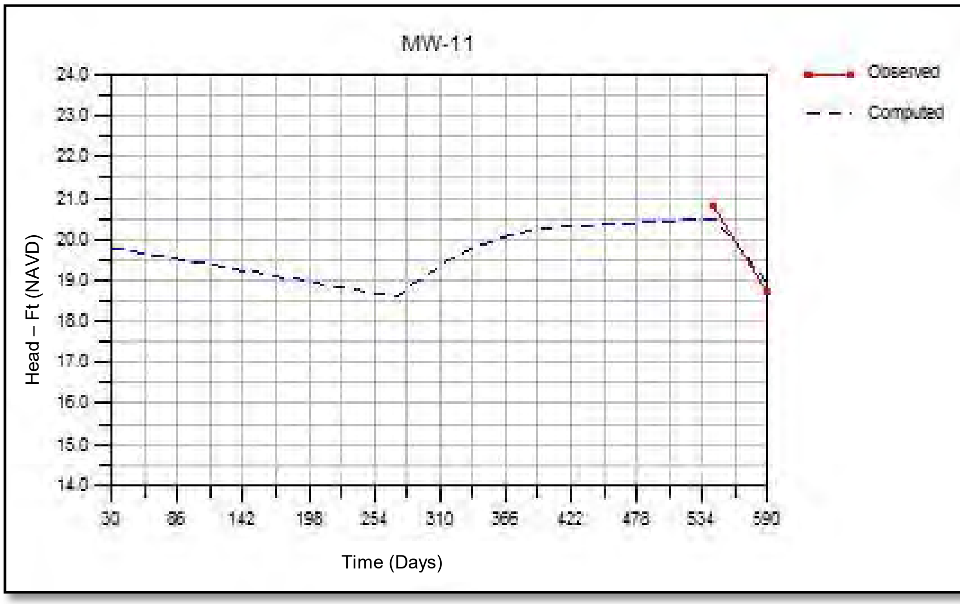


Figure 11.15 - Modeled vs Measured Groundwater Elevations (MW-11)

The graphs indicate that the model is relatively well calibrated based on visual comparison of measured and simulated groundwater levels. More qualitative measures of reasonable calibration performance were provided by goodness-of-fit statistics. The Root-Mean-Square-Error (RMSE) was less than 2 feet for thirteen of the fifteen monitoring well locations. The Nash Sutcliffe (E) was positive for twelve of the locations and greater than 0.5 for ten out of the fifteen monitoring well locations. The calibrated model groundwater elevation contours within the upper four model layers, for both monitoring well measurement events, are presented on *Exhibits D-1 through D-8* in *Appendix D*.

The calibrated aquifer properties for the five-layer geologic profile are listed below:

Table 11.6 - Calibrated Aquifer Properties

Layer No.	Layer Description	Horizontal Hydraulic Conductivity, K_h (ft/day)	Vertical Hydraulic Conductivity, K_v (ft/day)	Storage
1	Surficial Aquifer: fine sand and silty sand	6.5 to 10	3.0 to 5.0	0.17
2	Surficial Aquifer: fine sand and silty sand	3.0 to 8.5	1.5 to 4.0	0.0001
3	Surficial Aquifer: sand, silt and clay	2.5	1.0	0.0001
4	Aquitard: sandy clay and clay with shell	0.01	0.00001	0.0001
5	Floridan Aquifer: Limestone	300	1.0	0.00001

11.2.2 MT3D

The MT3D model adopted the adjustments established in the calibration of the site-specific transient MODFLOW model. Also, the solute transport parameters were based on the laboratory soil column leaching tests completed for this study. Referring to the graph presented below (chloride concentration in mg/L versus time in days), an equivalent MT3D model was developed to represent a laboratory leaching test (Vibracore Soil Sample V11).

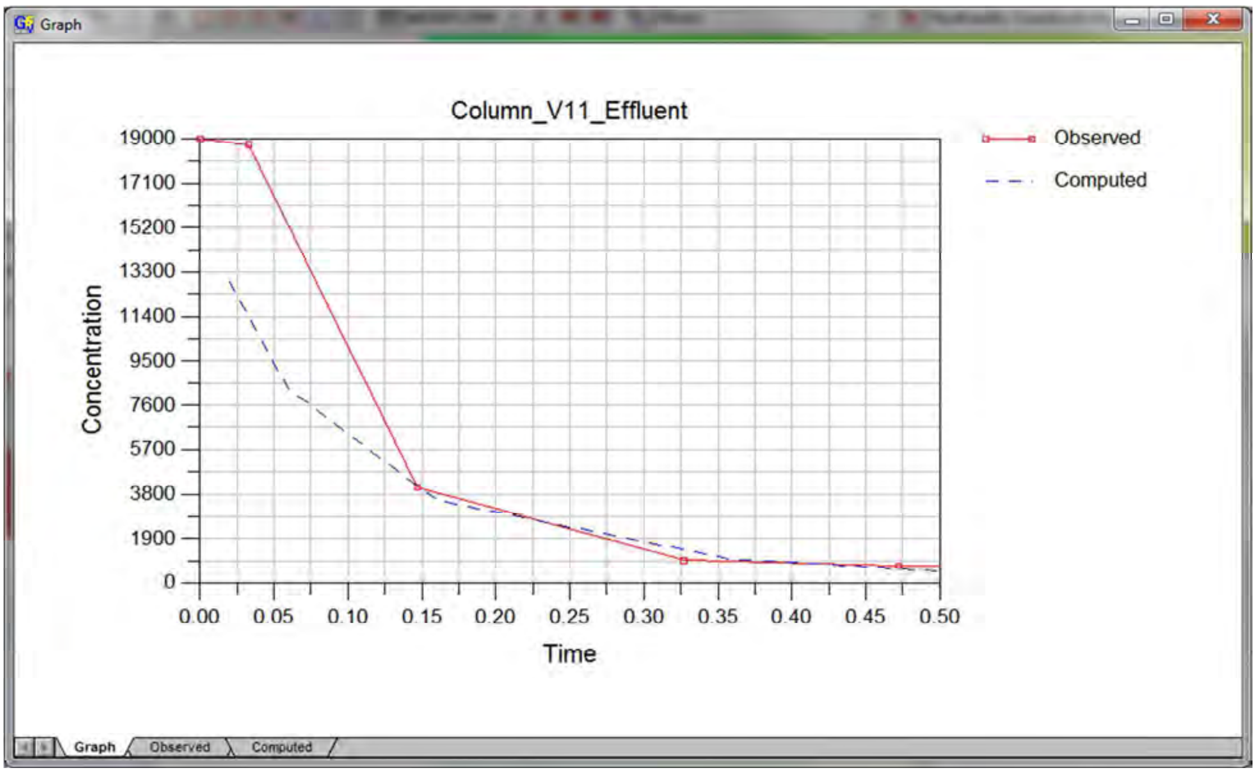


Figure 11.16 - Calibration Representative Column - MT3D Model

Calibration of the model to the laboratory results resulted in a retardation coefficient, k_d, of 0.001 feet and a longitudinal dispersion coefficient of 10 feet. These calibrated parameters were used for the site-specific MT3D modeling discussed in **Section 11.3** below. The sensitivity of varying the retardation coefficient was analyzed as part of the MT3D modeling for the first dredging event.

11.3 MT3D Model Simulation without Site Controls

Based on the Taylor Engineering, Inc. *Management Plan (October 2015)*, the MT3D model simulation considered a 50-year span of operation with dredging events at 10-year intervals to predict the extent of saline water migration from the DMMA into the local surficial aquifer. The dredge material was assumed to be saturated with brackish water at a chloride concentration of

19,000 mg/L as the maximum value from the laboratory leaching tests. A median background groundwater chloride concentration of 50 mg/L (Section 4.6), being the average measured value from the eleven monitoring wells, was assigned to all layers and boundaries in the model.

The top elevation of the dredged material was progressively increased for each of the five loading events as illustrated below in **Table 11.7**.

Table 11.7 - DMMA Basin Dredge Material Top and Bottom Elevations for each Loading Event

Simulation Period	Description	Top of Dredge Material Elevation (feet-NAVD)	Bottom of Dredge Material Elevation (feet-NAVD)
0 - 10 years	Saturated dredge material having a chloride concentration of 19,000 mg/L is added to the site for a period of 28-days, followed by 9 years and 11 months of recovery	+19.11	+15.71
10 - 20 years		+22.51	+19.11
20 - 30 years		+25.91	+22.51
30 - 40 years		+29.31	+25.91
40 - 50 years		+32.71	+29.31

To simulate the dredge loading and resting cycles, a total of five separate MT3D models were set up for 28 days of loading followed by 9 years and 11 months of resting. The resulting chloride concentration from the end of a resting period was imported into the next MT3D model as a starting condition and the same sequence of dredge material loading for 28 days followed by 9 years and 11 months of resting was repeated in the model. A more detailed description of the model set up and execution is presented below.

Dredged Material Event No. 1 (10 Year Simulation)
The first simulated dredging event included results from Stress Period #1 (a 28-day period) and Stress Period #2 (a 9-year and 11-month period). The initial groundwater condition for this simulation (chloride concentration across the model domain) was set at a background concentration of 50 mg/L. The General Head Boundary (GHB) condition was initially applied at Elevation +20.00 feet (NAVD) over the basin bottom area. After the first 28-day stress period, the basin boundary condition was removed to allow water elevations to rise and fall with time over a 9-year and 11-month stress period until the next dredging event. The chloride concentration of the water coming out of the dredge material was set at 19,000 mg/L.

Saline water migration begins immediately as the water from the dredged material pumped to the containment basin moves downward into the surficial aquifer through the basin bottom and then moves laterally following the groundwater flow gradient.

Exhibits E-1 through E-3 and Exhibits E-4 through E-6, in *Appendix E*, show the model results for the first dredge loading and resting cycle, respectively, within Model Layers 1 through 3 (top 100

+/- feet of the surficial aquifer above the Aquitard). The figures show contours of chloride concentration in the groundwater super-imposed on the DMMA footprint and the property boundaries. The minimum chloride concentration plotted is the 60 mg/L contour. The 250 mg/L contour is highlighted and represents the FDEP GCTL.

As shown, the 250 mg/L contour has moved by the end of the first 10-year resting period as much as 400 feet beyond the north property boundary, and just past the northeast and southwest corners, in all three layers. The 250 mg/L contour intercepts the north property boundary at 148 days after the start of dredged material placement. The chloride plume movement is significantly less to the west and south. The greater plume movement to the northeast is the result of the groundwater flow gradient in that same direction.

Within the basin area, saline water has infiltrated to a depth of approximately 100 feet reaching to the top of the Aquitard (Model Layer 4). Groundwater chloride concentrations range from about 5,000 mg/L, between 5 feet and 9 feet below the basin bottom, to less than 60 mg/L below the 100-foot depth. The chloride concentrations are greatest near the surface of the water table and lessen with depth due to mixing with the ambient groundwater and the restriction of confining soil layers. Likewise, the horizontal spread of the chloride plume shows decreasing concentrations due to mixing with ambient groundwater.

For the 10-Year Simulation, the retardation coefficient, $k_{d,}$ was both increased and decreased up to 20% while plotting the position of the 250 mg/L contour for each percentage of change in the retardation coefficient. The results are shown on Figures 11.17 and 11.18 below.

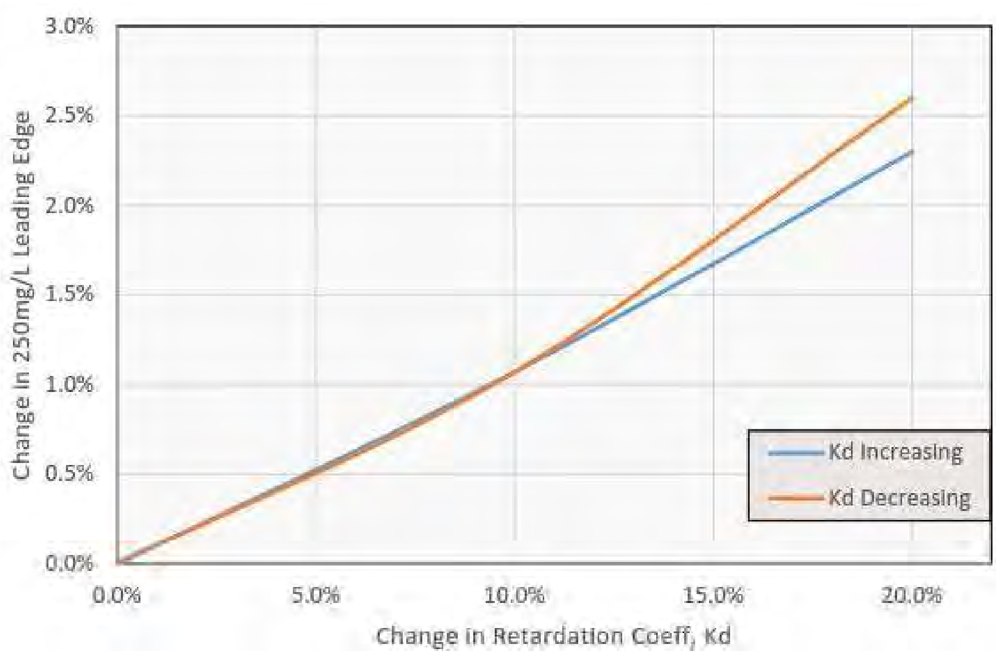


Figure 11.17 - Sensitivity Results for Northerly Moving Edge

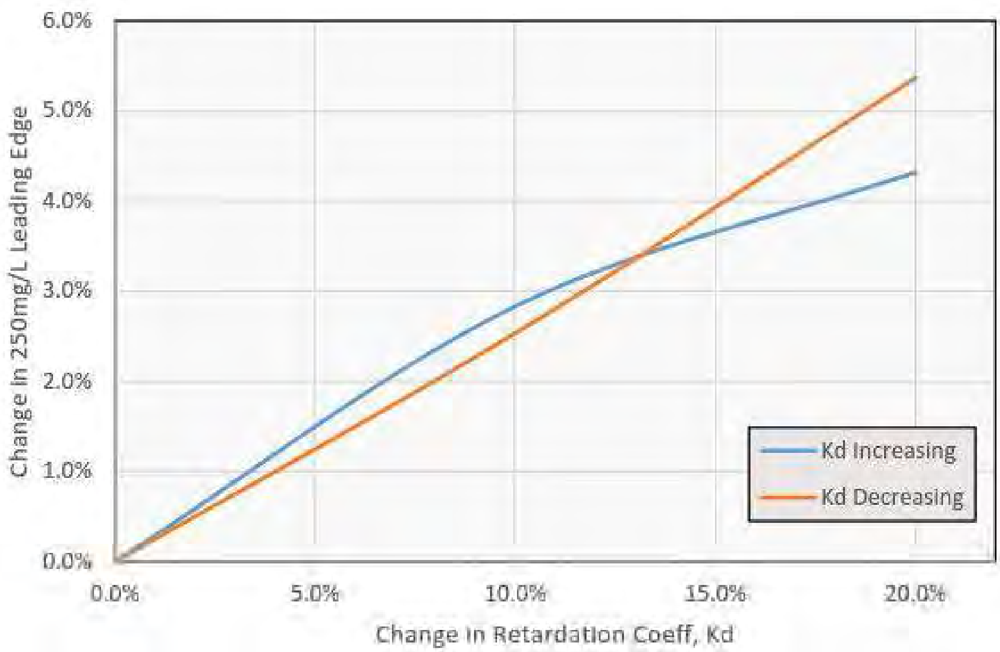


Figure 11.18 - Sensitivity Results for Easterly Moving Edge

The graphs indicate sensitivity relationships of 4:1 (retardation coefficient change, %: distance change, %) and 8:1 for the easterly and northerly movement, respectively, of the 250 mg/L contour leading edge. An order of magnitude change, both up and down, in the retardation coefficient indicated sensitivity ratios ranging from 89:1 to 16:1 representing distance changes of 10 to 55%, respectively, for the leading edge of the 250 mg/L contour. The analysis reflects fairly low sensitivity for the retardation coefficient which provides for relatively high confidence in the MT3D model results.

Dredged Material Event No. 2 (20 Year Simulation)

The second simulated event included results from Stress Period #3 (a 28-day period) and Stress Period #4 (a 9-year and 11-month period). The initial model conditions for this simulation were imported from the end of Stress Period #2. However, the GHB was raised to Elevation +22.51 feet for a period of 28 days (Stress Period #3) as presented in **Table 9.6**. The chloride concentration coming out of the dredge material was again set at 19,000 mg/L. The saline water migration from the containment basin was assumed to start leaking immediately. The chloride plume from the second dredging event joined with the plume remnants from the first dredging event. This co-joining of plumes created some irregularities in the plume shape and contours (see *Exhibits E-7 through E-12*).

At the end of Stress Period #4 (i.e. the second 10-year resting period), the 250 mg/L contour in the top three layers has extended as much as 600 feet beyond the north and east property boundaries. The 1,000 mg/L contour has also moved past those same boundaries. In addition, the 250 mg/L contour has migrated to a maximum distance of about 200 feet past the southwest property corner. The mounding effect of impounded water within the containment basin accounts for the increased spreading of the plume.

Dredged Material Events Nos. 3 through 5 (30, 40 and 50 Year Simulations)
The remaining three dredging events (Years 30, 40 and 50 simulations) were modeled in the same manner as described above for the first two events. These simulations are represented by Stress Periods #5 through #10 consisting of three consecutive cycles with 28 days of dredge material loading followed by 9-year and 11-month periods of resting. The resulting chloride concentration contour maps in Layers 1 through 3 for each event are presented in *Exhibits E-13 through E-30*.

The modeling results for the last three simulations show a progressive increase in the lateral movement of the plume. The 250 mg/L contour has extended eastward to just short of U.S. 1 and 500 to 1,000 feet beyond the north, west, and south property boundaries. The 5,000 mg/L contour has also moved past portions of the north and east property lines within Layers 1, 2 and 3.

11.4 MT3D Model Simulation with Site Controls

The groundwater model runs, without any special engineering controls as presented in the above **Section 11.3**, indicated the following:

- The chloride plume (i.e. 250 mg/L chloride concentration contour line) intercepts the north property boundary at about 148 days after the start of the first dredging event.
- By Year 30, the 250 mg/L contour line has moved in the shallow aquifer beyond most of the perimeter property boundaries.
- At the end of the final year (Year 50), the same contour has extended as much as 350 feet beyond the north and east property boundaries.

The model was then adjusted with a variety of engineering controls to evaluate methods to restrict the spread of the chloride plume. The performance criteria for the engineering controls were to: (1) restrict the horizontal movement of the chloride plume (250 mg/L contour) to within the property boundaries during the 50-year operational life of the DMMA and (2) limit drawdown to ½ foot in off-site wetlands.

The engineering controls that were initially considered included:

- Perimeter ditches
- Underdrains
- Pumped wells
- Vertical barrier (seepage cut-off wall)

The early model runs indicated significant flaws with both the underdrains (constructability issues) and the pumped wells (wetland drawdown impacts) and they were not considered further.

The subsequent model runs were an interactive process to evaluate the effectiveness of ditch control in combination with a vertical barrier and adjustment of the DMMA footprint (i.e. increased separation from the property boundary).

Ditch Control (original DMMA footprint)

The model was set-up with the original DMMA geometry, per the *Management Plan* (October 2015), and with a ditch control (i.e. invert elevation) at ½ to 1 foot below the Seasonal High Groundwater Level (SHGWL). The results indicated, as illustrated in the screen capture below, that the chloride plume moved past the north boundary by the end of the first (Year 10) dredging and resting event.

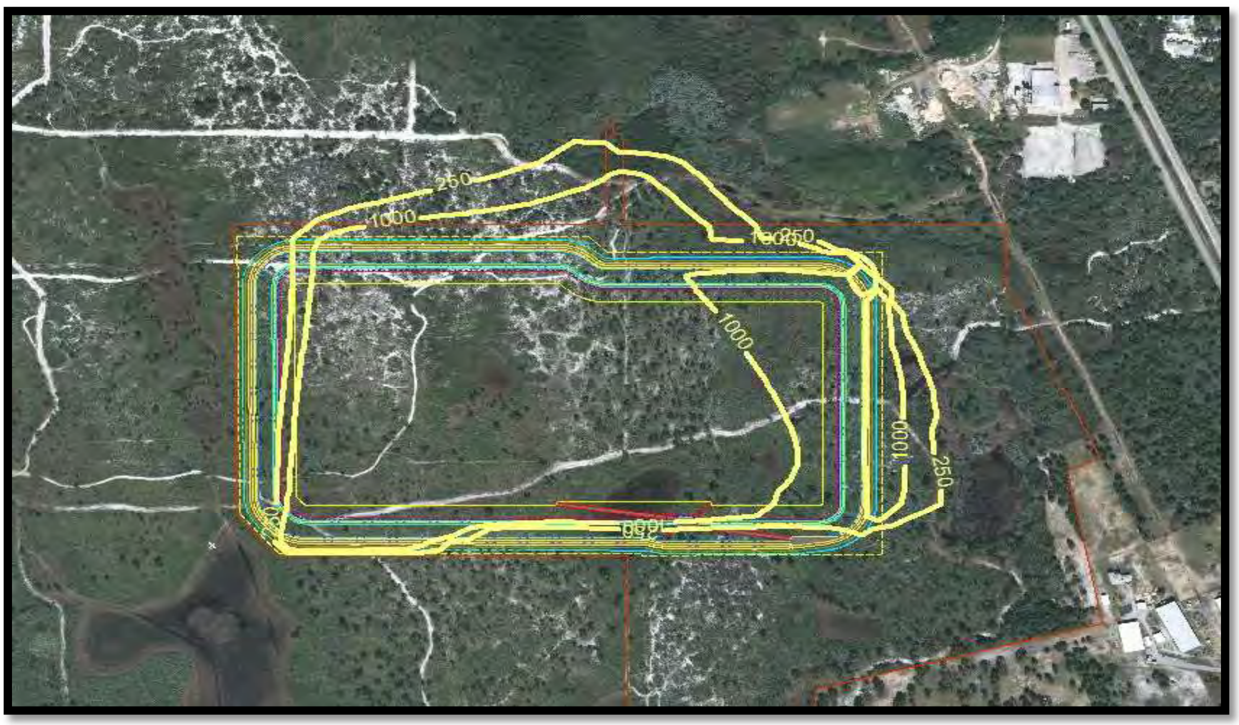


Figure 11.19 - Original Footprint with Ditch Control: Chloride Plume Movement Year 10 / Layer 1

Further lowering of the ditch control elevation provided better control of the chloride plume but resulted in excessive drawdown in the off-site wetlands. Thus, it was decided jointly by DUNKELBERGER and Taylor Engineering, Inc. to model a revised DMMA footprint by adjusting its perimeter at greater distance from the property boundaries to allow use of lower ditch controls.

<u>Ditch Control (initially revised DMMA footprint)</u>

The footprint was modified by moving the perimeter ditch line inward to a minimum distance of about 175 from the property boundaries. It was also stretched to the south to off-set the area reduced by the greater set-back distance. The revised shape of the footprint is illustrated below:

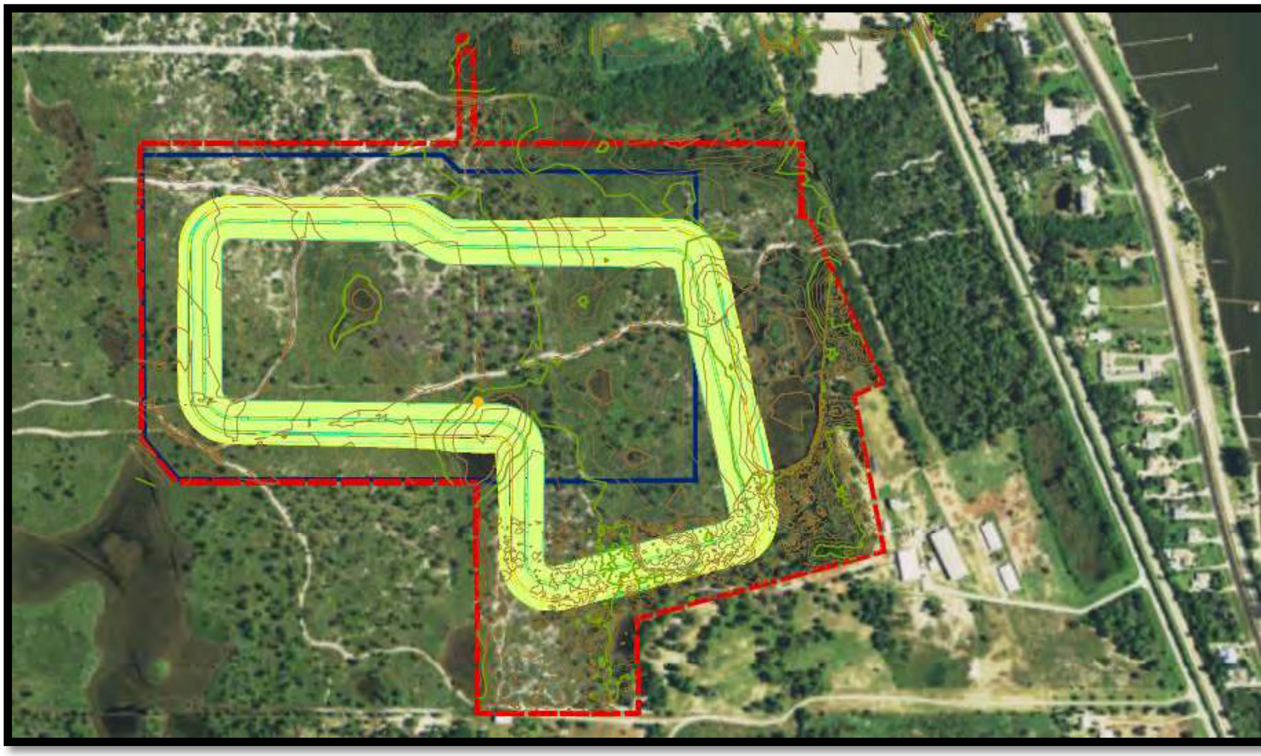


Figure 11.20 - Revised (Set Back) Footprint

The greater set-back distance allowed for a lowered ditch control at 1 foot (west side) to 2 feet (east side) below the SHGWL without creating excessive drawdown in the off-site wetlands. Chloride plume movement was also further restricted although the 250 mg/L contour reached the north and east property boundaries by the end of the second (Year 20) dredging event.

The results suggested that the required restriction on plume movement could be achieved by further adjustment of the footprint geometry and ditch controls with the possible addition of a vertical barrier (seepage cut-off wall) along the north and east sides of the perimeter ditch.

Accordingly, the set-back distance was increased slightly while dropping the ditch control to 3 feet on its east side and wrapping a vertical barrier around the east, northeast, and southeast parts of the DMMA perimeter. The results were that wetland impacts (drawdown) were acceptable while the chloride plume was maintained within the property boundaries through the last (Year 50) dredging event as shown below:

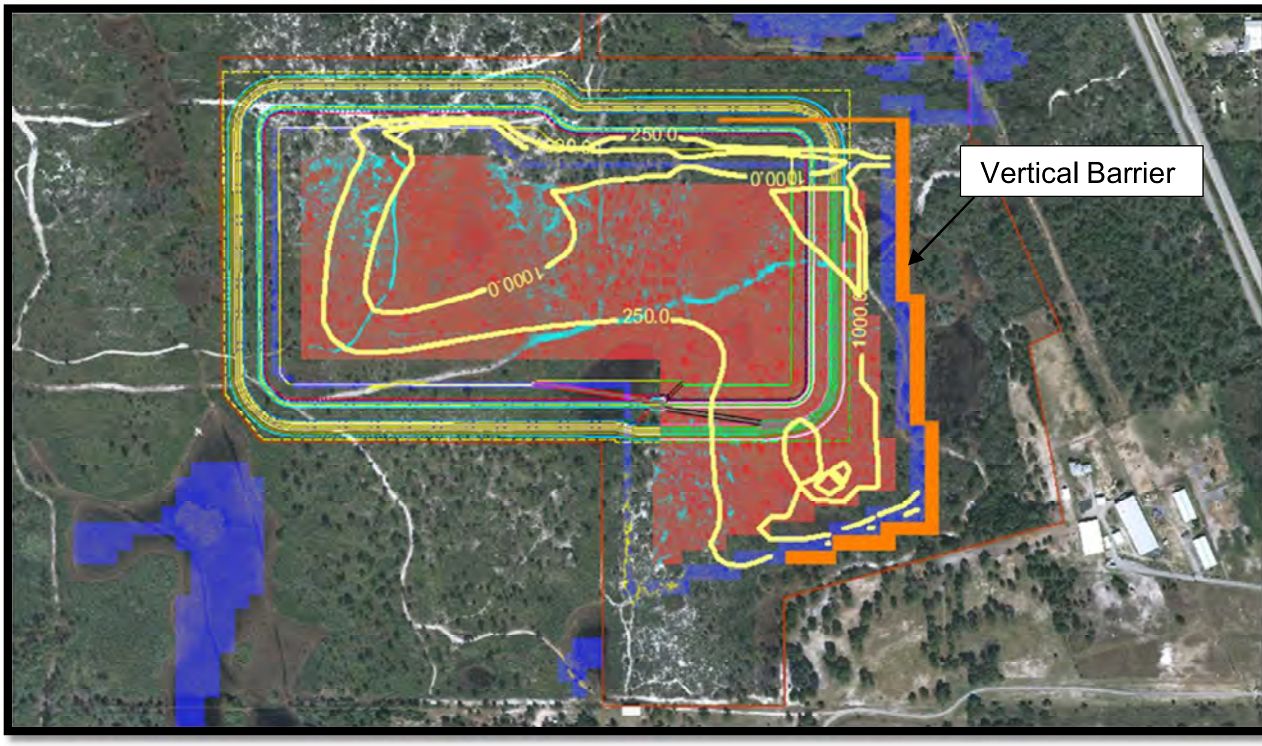


Figure 11.21 - Revised Footprint With Ditch and Vertical Barrier Controls: Chloride Plume Movement Year 50 / Layer 1

Since the vertical barrier, most likely a soil-bentonite cut-off wall, would be an expensive feature it was decided to evaluate further adjustment of the ditch controls using a more accurate (digitized) layout of the revised DMMA geometry.

Ditch Control (finally revised DMMA footprint)

The next model runs incorporated the digitized DMMA geometry, eliminated the vertical barrier, and interactively adjusted the ditch control with further lowering on the east side to meet the performance criteria with respect to plume movement and wetland drawdown. The criteria were achieved with a ditch control varying from ½ foot to 4 feet below the SHGWL. The highest point of the ditch is on the west side and the bottom slopes downward to a low point near the northeast corner of the DMMA. The model results, reflecting acceptable chloride plume movement and wetland drawdown, are presented on Exhibits F-1 through F-30 and Exhibits F-31 and F-32, respectively.

The modelled ditch controls (i.e. inverts) are presented as elevations in feet (per NAVD-88) on Exhibit F33.

12.0 ADDITIONAL STUDY

The revised DMMA footprint, required for groundwater (i.e. chloride plume movement) control, represents an approximately 500-foot shift of the southeasterly stretch of the perimeter dike as compared to the original position. The exploratory borings completed during an earlier phase (Phase I) of study were aligned with the original footprint. Thus, a significant gap of exploratory data now exits along the southeasterly segment of the revised DMMA footprint. We recommend the drilling of supplemental borings in this area to confirm consistency with the earlier borings and current assumptions being used for Phase III design-level geotechnical analyses.

13.0 SUMMARY AND RECOMMENDATIONS

With the topographic relief across the site, the planned dike construction will involve fill heights ranging from 14 to 20 feet on the west and east sides, respectively, of the site.

The proposed DMMA footprint area is underlain by a thick (100 feet +/-) deposit of mostly granular soils consisting of relatively clean to slightly silty sands containing broken shell with variable layers of fine grained soils (silts and clays). The sands are generally loose to medium dense in terms of relative density. The fine-grained materials are generally medium stiff to stiff.

A large wetland lies along the southern dike centerline. Surficial muck (unsuitable foundation materials) is commonly found in these wetlands. If found, the muck would require full removal and replacement. The area of this wetland is 76,500 square feet. With an assumed typical depth of 12 inches, the required excavation volume would be 3,000 to 4,000 cubic yards.

For preliminary design purposes, the shallow to moderate depth sand deposits are relatively strong, minimally compressible, and therefore will provide suitable foundation support for embankment fill heights up to 20 feet. Borrow excavations, as presently planned to depths up to 7 feet (4 ½ feet on average), should produce a blend of relatively clean sands that would be suitable for general embankment fill at a side slope inclination of 3:1 (horizontal: vertical) as presently planned. In a compacted condition, these sands show high permeability values in the range of 34 to 57 feet per day. High permeability values for embankment materials are of importance as they will cause high seepage rates through the earthen dike which potentially may exit the downstream embankment face and/or toe. These materials may require mixing or zoning of less permeable soils, and/or installation of seepage collection features such as toe or blanket drains, in the dike embankment.

The silts and clays are slightly to moderately over-consolidated, moderately compressible, and will result in maximum settlements of approximately 4 inches beneath the easterly perimeter dike.

The groundwater flow gradient mimics the topographic decline from west to east across the site.

Depths to groundwater measured in on-site monitoring wells during the study period (i.e. dry season, however abnormally wet) ranged from 3 to 8 feet below the existing ground surface. Groundwater control (dewatering) will likely be needed to accomplish fill placement at lower elevations, excavation of borrow, and removal of wetland areas within the DMMA footprint in the dry. The dewatering required for mass earthwork should involve the usual methods of rim ditches, pumped sumps, and on-site impoundment of pump discharge waters. However, dewatering means and methods are the responsibility of the contractor.

Initial groundwater quality data collected by Pace Analytical for on-site monitoring wells shows background chloride concentrations ranging from 10 to 180 mg/L.

Sample of sediments from the target dredge area indicated relatively high leaching potential of chlorides based on laboratory test results. A MT3D contaminate transport model was set up, based on site specific parameters, and calibrated using the laboratory soil column leaching test results.

The calibrated MT3D model was run to simulate a series of operational events during a 50-year service life. The simulations were of dredging events occurring at 10-year intervals and consisting of 28-day loading periods followed by 9 years and 11 months of resting. At the end of the final (Year 50), the model results indicated that the chloride plume carried a concentration of 10,000 mg/L to a depth of about 100 feet beneath the DMMA footprint. The presence of an Aquitard at that depth restricted further vertical movement of the plume. The horizontal spread of the plume was predominately northeasterly following the hydraulic down-gradient in that same direction. At Year 50, the 5,000 mg/L contour of the chloride plume in the upper part of the aquifer extended 350 feet beyond the east and north property boundaries.

By Year 30, the 250 mg/L contour of the chloride plume had moved in the shallow aquifer to beyond most of the perimeter property line.

For the next step (Phase II) of the study, the same operational events were modelled but with the addition of engineering controls to evaluate measures to mitigate chloride plume movement, both vertically and horizontally, in the shallow aquifer. The performance criteria for the engineering controls were to: (1) restrict the horizontal movement of the chloride plume (250 mg/L contour) to within the property boundaries during the 50-year operational life of the DMMA and (2) limit drawdown to ½ foot in off-site wetlands. The following engineering controls were considered:

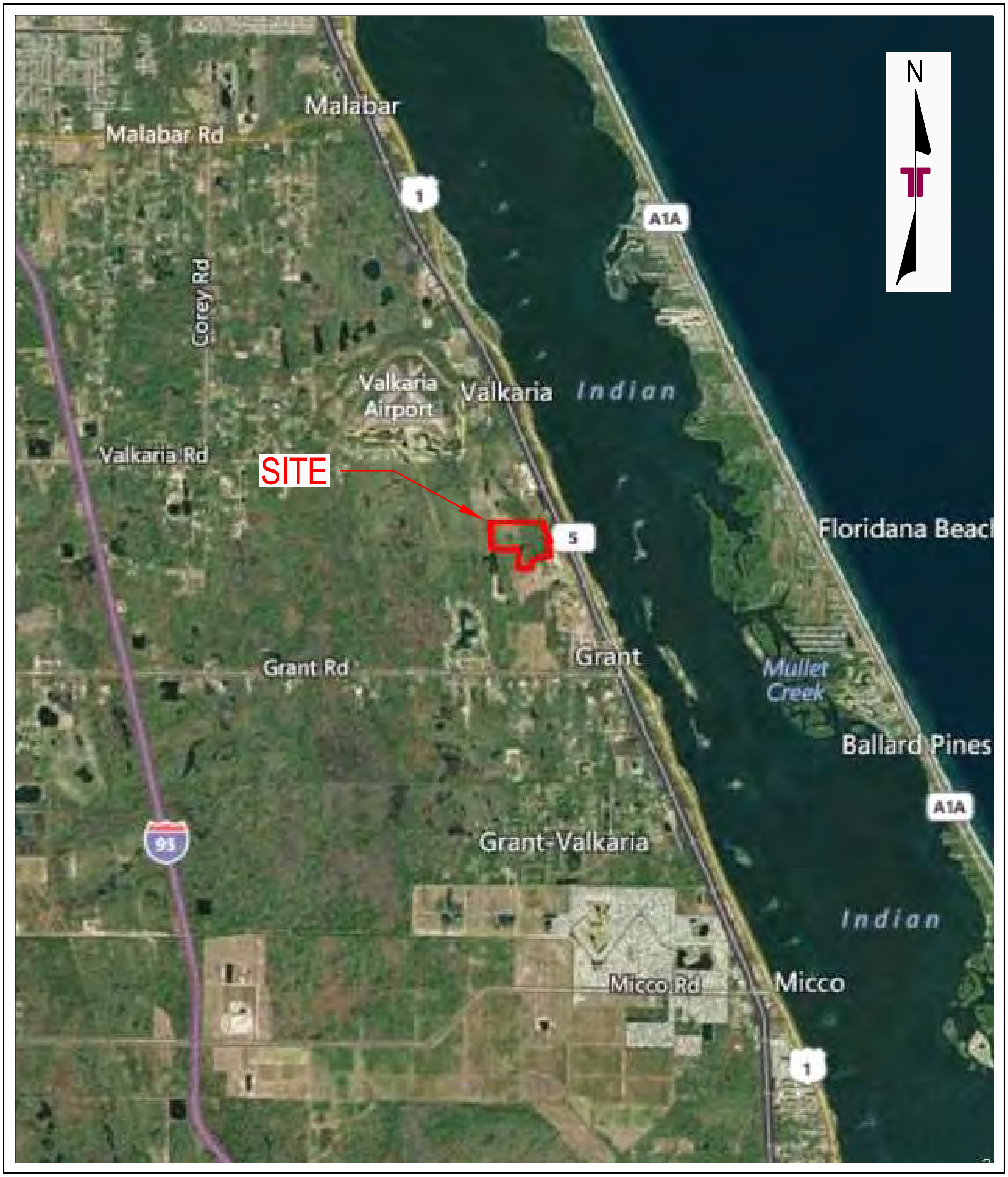
1) Perimeter ditch system with piped discharge (outfall) to the ICWW
2) Underdrain system with outfall
3) Pumped wells with outfall
4) Vertical barrier (seepage cut-off wall)
5) Combination of the above

The results of the Phase II modelling effort indicate that a revised DMMA footprint, with greater set-back distance from the property boundaries as compared to the original geometry, with a relatively deep, sloping ditch control can meet the required performance criteria with respect to chloride plume movement and wetland drawdown. We believe that this option represents the most practical (i.e. cost effective) option to do so. The low point of the ditch system will, however, need to outfall to the ICWW via a permanent, closed discharge pipeline.

14.0 GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.



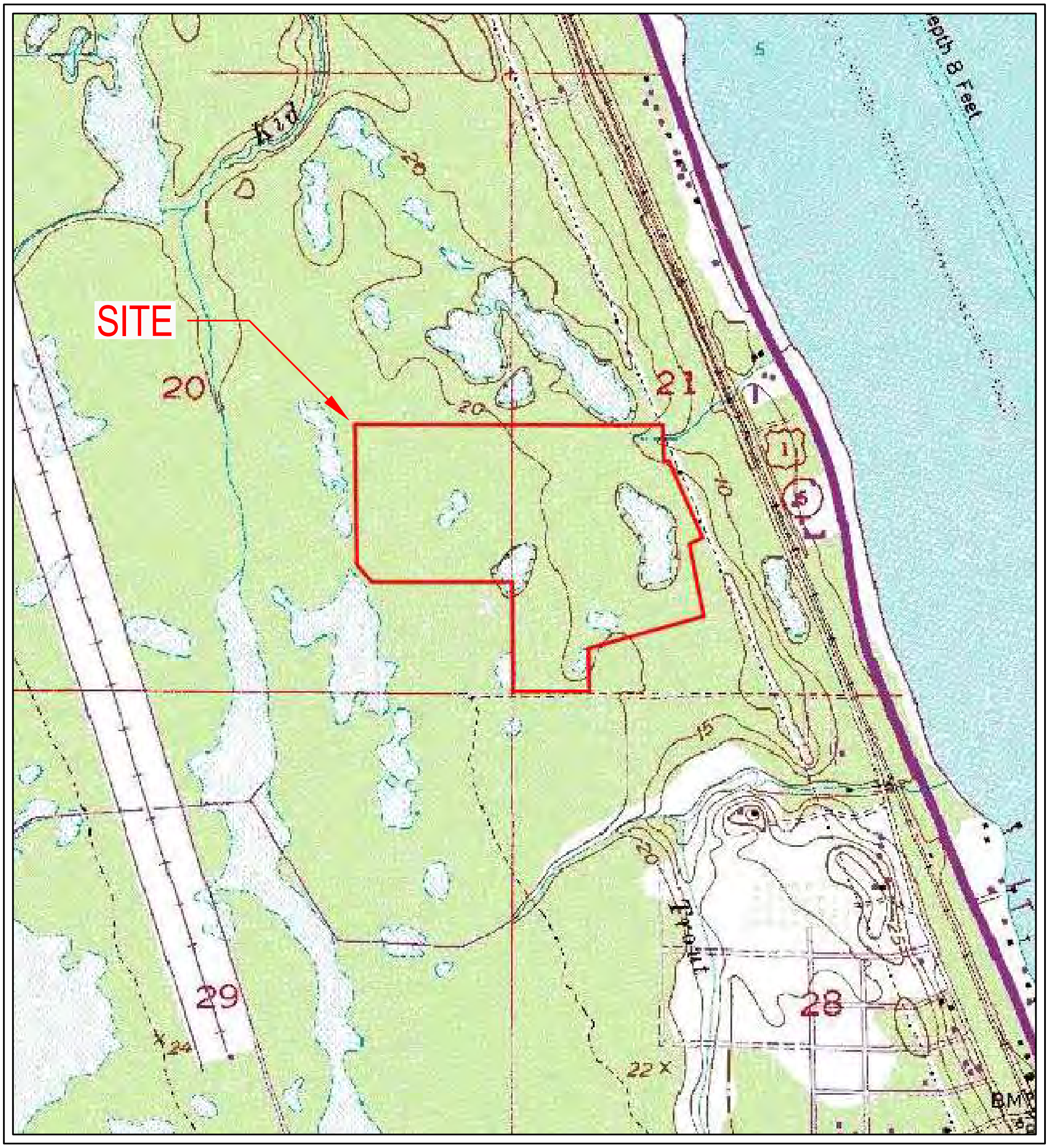
SCALE 1 : 90000

1 0 1 2 3 4 5

MILES

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SITE VICINITY MAP	SHEET
Drawn By: BL	Scale: AS SHOWN		GEOTECHNICAL SITE EXPLORATION TAYLOR ENGINEERING, INC.	1
Checked By: DD	File No. -	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
Approved By: KA	Date: 5/26/16	PH. (772) 343-9787 FAX. (772) 343-9404	Brevard County Florida	

UNITED STATES — DEPARTMENT OF THE INTERIOR — GEOLOGICAL SURVEY



SCALE 1 : 18000

1000 0 1000 2000 3000 4000 5000

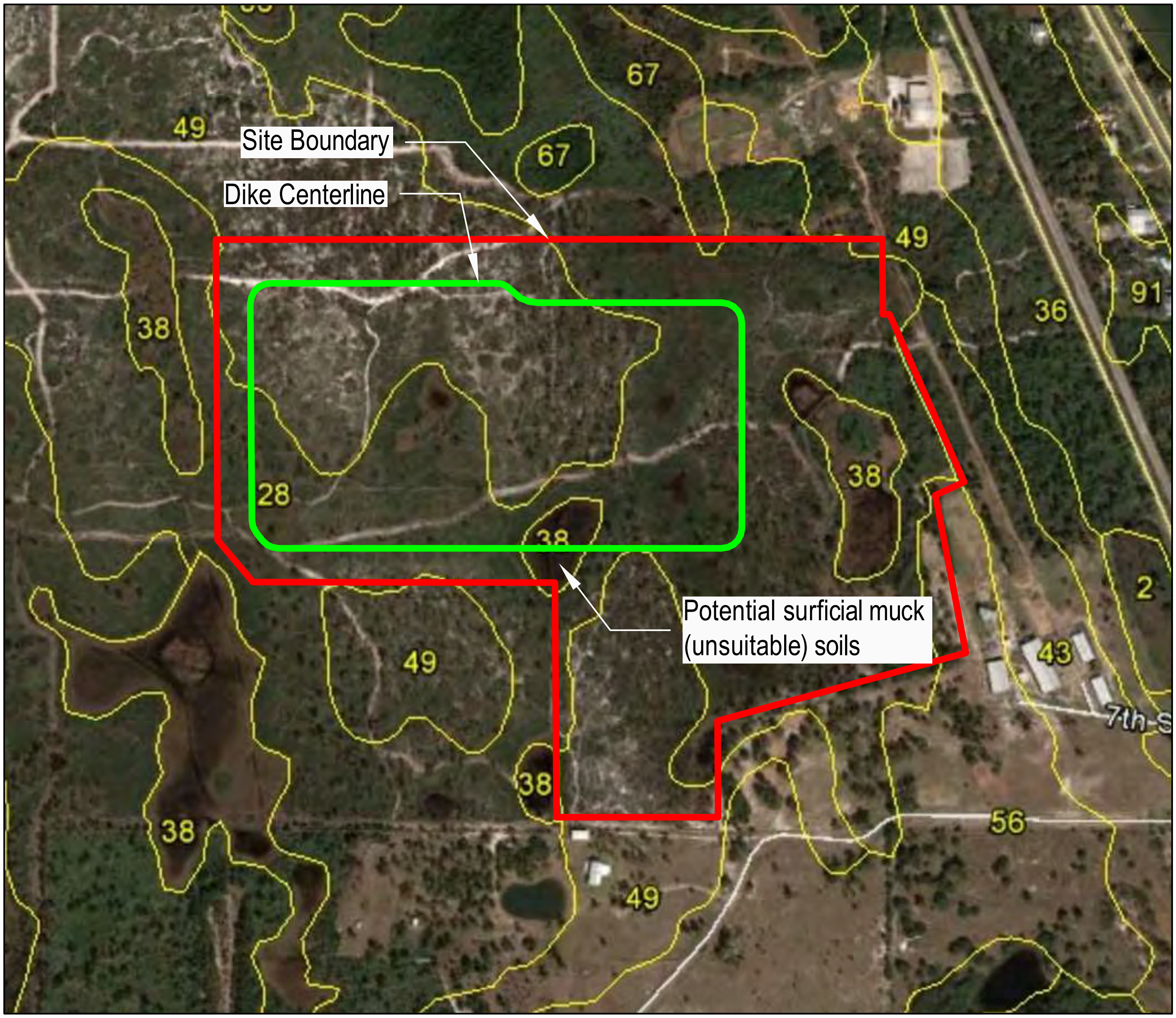
FEET

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GRANT, FLORIDA
1949; PHOTO REVISED 1970
7.5 MINUTE SERIES (TOPOGRAPHIC)

N

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	TOPOGRAPHIC VICINITY MAP	SHEET
Drawn By: BL	Scale: AS SHOWN		GEOTECHNICAL SITE EXPLORATION	2
Checked By: DD	File No. -	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16	PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
			Brevard County Florida	



SCALE 1 : 2600

400 0 400 800 1200 1600 2000

FEET

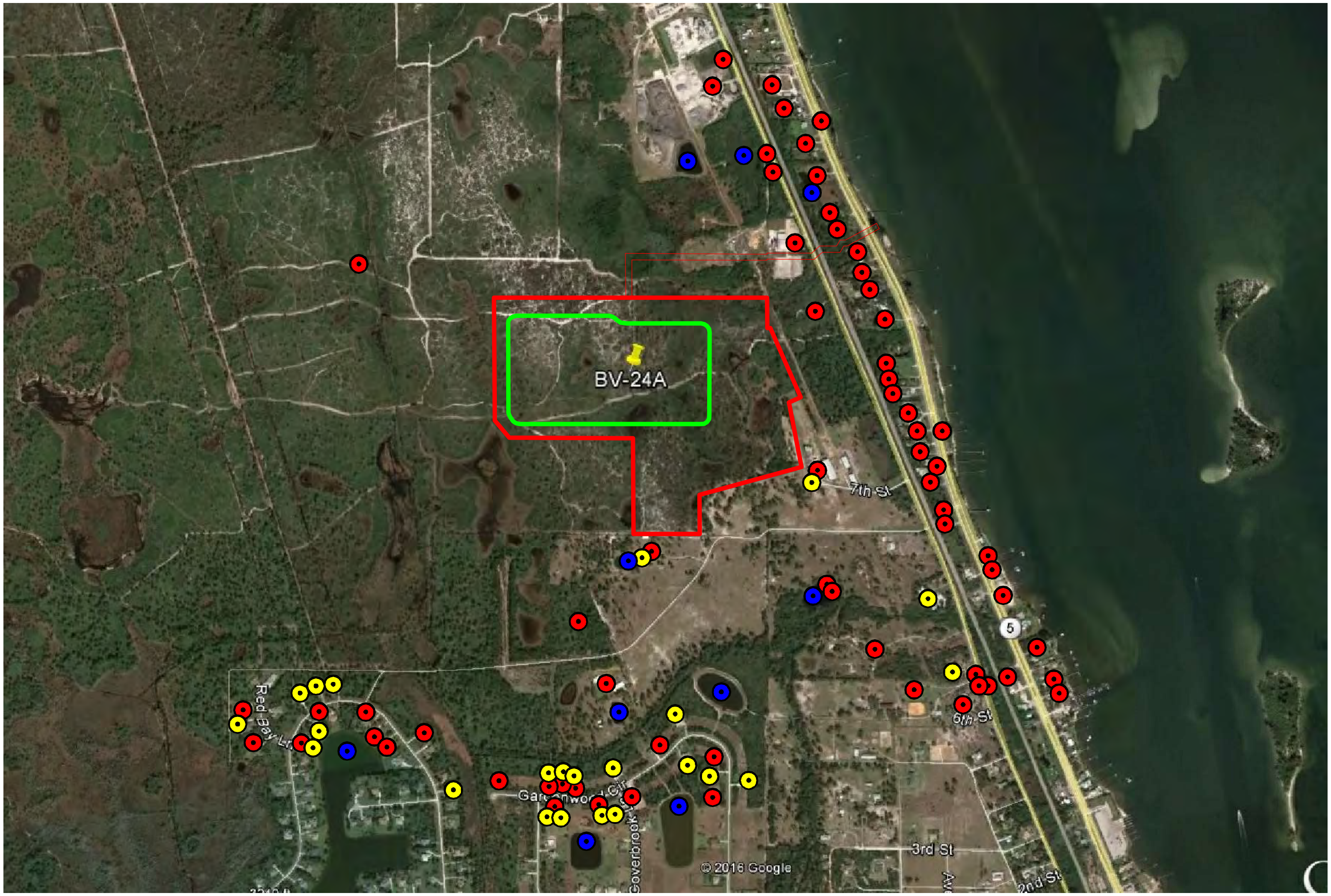
SOIL LEGEND

28	IMMOKALEE SAND
38	MYAKKA SAND, DEPRESSIONAL
49	POMELLO SAND
56	ST. LUCIE FINE SANDS, 0 TO 5 PERCENT SLOPES
67	TOMOKA MUCK, UNDRAINED

N

U.S.D.A. SOIL SURVEY FOR BREVARD COUNTY, FLORIDA
ISSUED: JANUARY 1987

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SOIL SURVEY MAP	SHEET
Drawn By: BL	Scale: AS SHOWN		GEOTECHNICAL SITE EXPLORATION	
Checked By: DD	File No. -	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	TAYLOR ENGINEERING, INC.	3
Approved By: KA	Date: 5/26/16	PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	



SOURCE: GOOGLE EARTH PRO

LEGEND

- WELL
- SEPTIC TANK
- POND

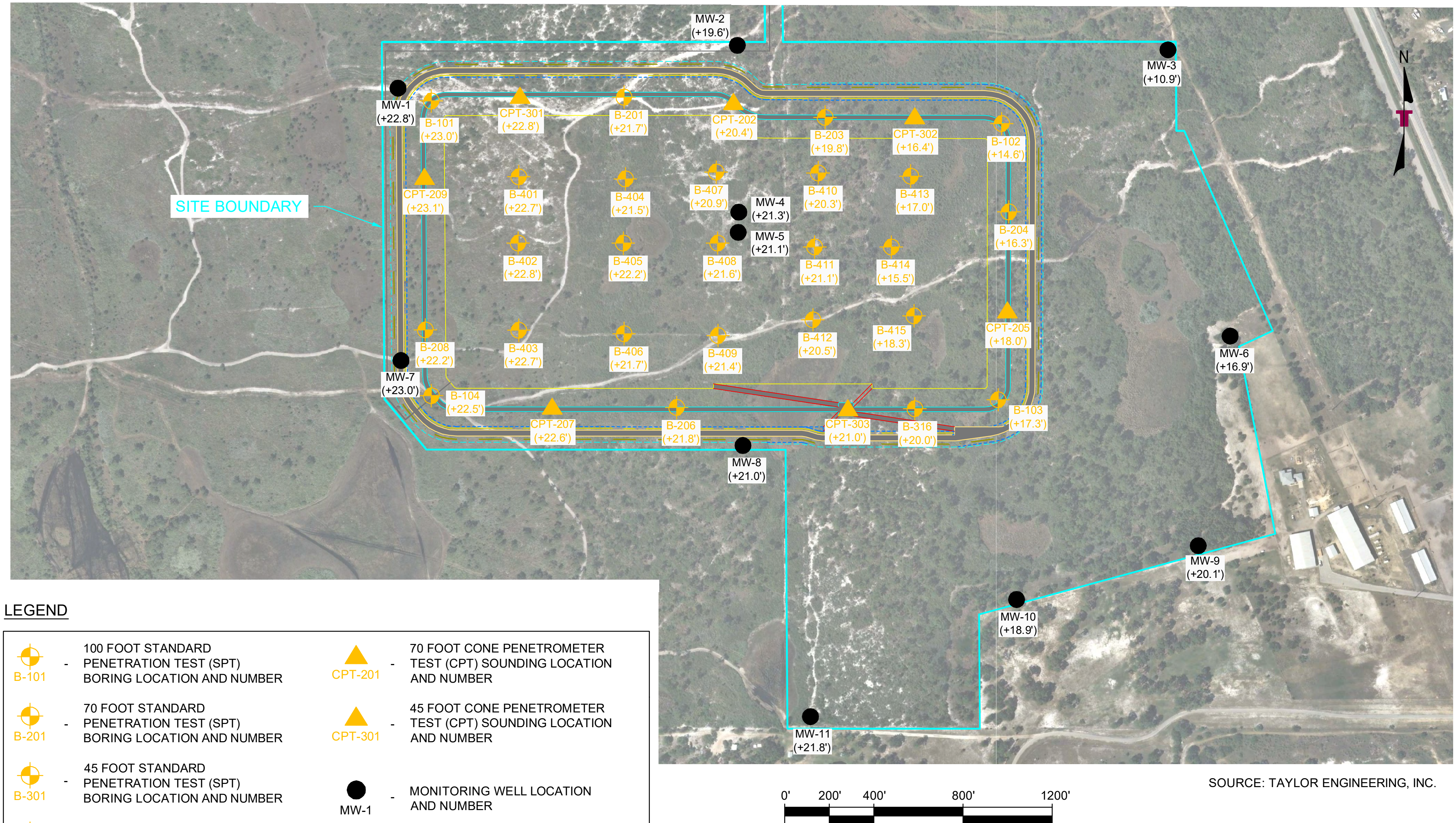
Locations are approximate

N

0 ¼ ½

MILES

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	HYDROLOGICAL DATA INVENTORY MAP	SHEET
Drawn By: BL	Scale: AS SHOWN	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION TAYLOR ENGINEERING, INC.	4
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
Approved By: KA	Date: 5/26/16		Brevard County Florida	



LEGEND

B-101	-	100 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER	CPT-201	-	70 FOOT CONE PENETROMETER TEST (CPT) SOUNDING LOCATION AND NUMBER
B-201	-	70 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER	CPT-301	-	45 FOOT CONE PENETROMETER TEST (CPT) SOUNDING LOCATION AND NUMBER
B-301	-	45 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER	MW-1	-	MONITORING WELL LOCATION AND NUMBER
B-401	-	15 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER	(+22.8')	-	INDICATED THE GROUND SURFACE ELEVATION WITH RESPECT TO NAVD88)

Locations are approximate

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	TEST LOCATION PLAN	SHEET
Drawn By: BL	Scale: AS SHOWN	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	5
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
			Brevard County Florida	

LEGEND

	1	Gray or brown medium to fine SAND. (SP)
	2	Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)
	3	Light brown slightly silty medium to fine SAND. (SP-SM)
	4	Dark gray to green sandy SILT. (ML)
	5	Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)
	6	Green or light gray CLAY, traces of shell. (CL, CH)
	7	Gray to green slightly silty to silty fine SAND. (SP-SM, SM)

SP - Unified Soil Classification System Group Symbol (ASTM D 2487)

N - Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586

B-101 - Standard Penetration Test (SPT) boring and number

MC - Moisture Content (%)

OC - Organic Content (%)

-200 - Amount finer than the U.S. No. 200 Sieve (%)

+22.9' 2-17-16 - Elevation of groundwater (feet-NAVD) and date measured

WOH - Indicates sampler advanced due to weight of hammer

50/1 - Indicates fifty blows required to drive sampler 1 inch

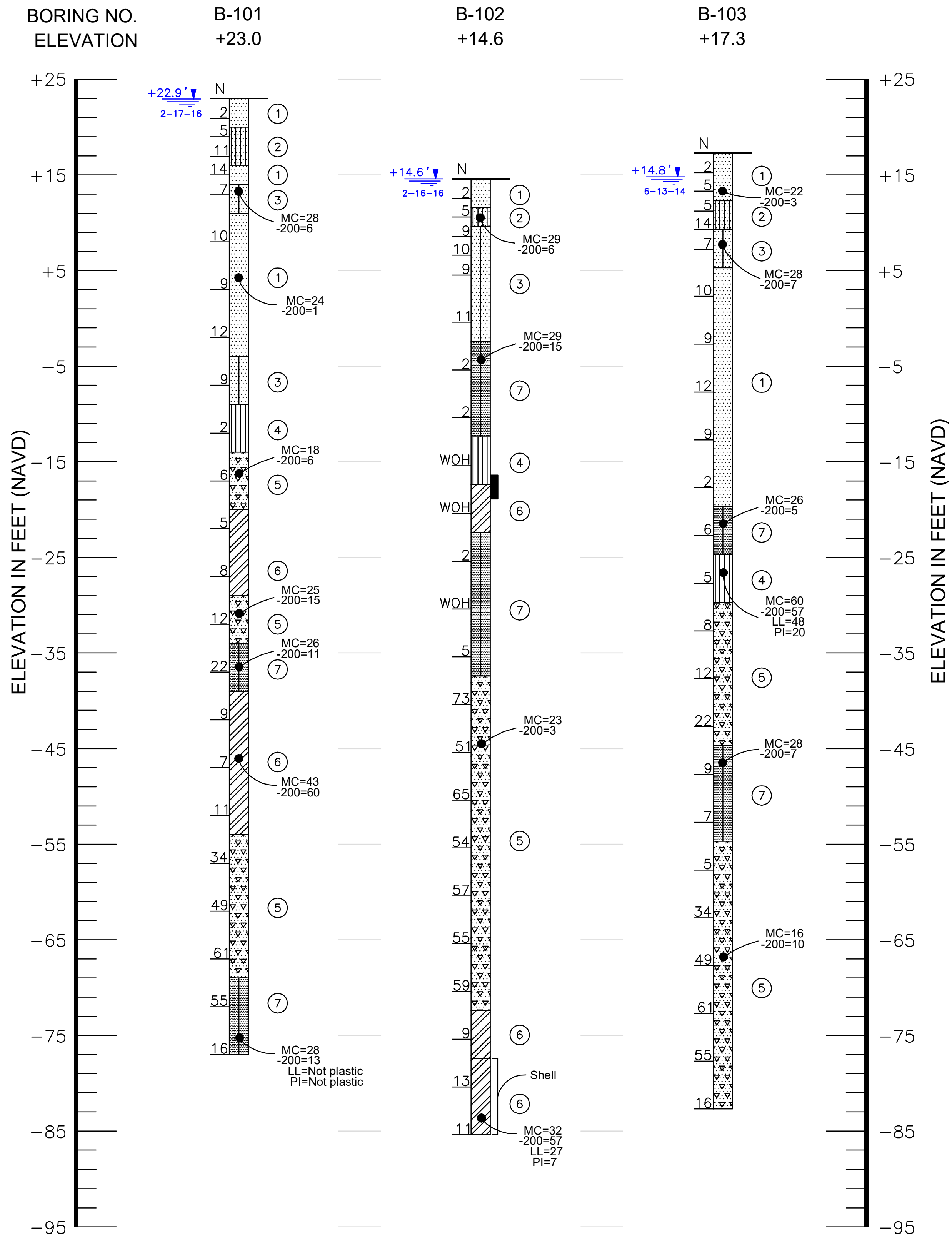
LL - Liquid Limit (%)

PI - Plasticity Index (%)

- Indicated location of undisturbed (Shelby tube) sample collection

NOTES

1. Borings were drilled February 15, 2016 through February 26, 2016 using an ATV mounted Deidrich 50 (D-50) drill rig.
2. Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.
3. Groundwater elevations shown on the subsurface profiles represent groundwater surfaces on the dates shown. Groundwater level fluctuations should be anticipated throughout the year.



LEGEND

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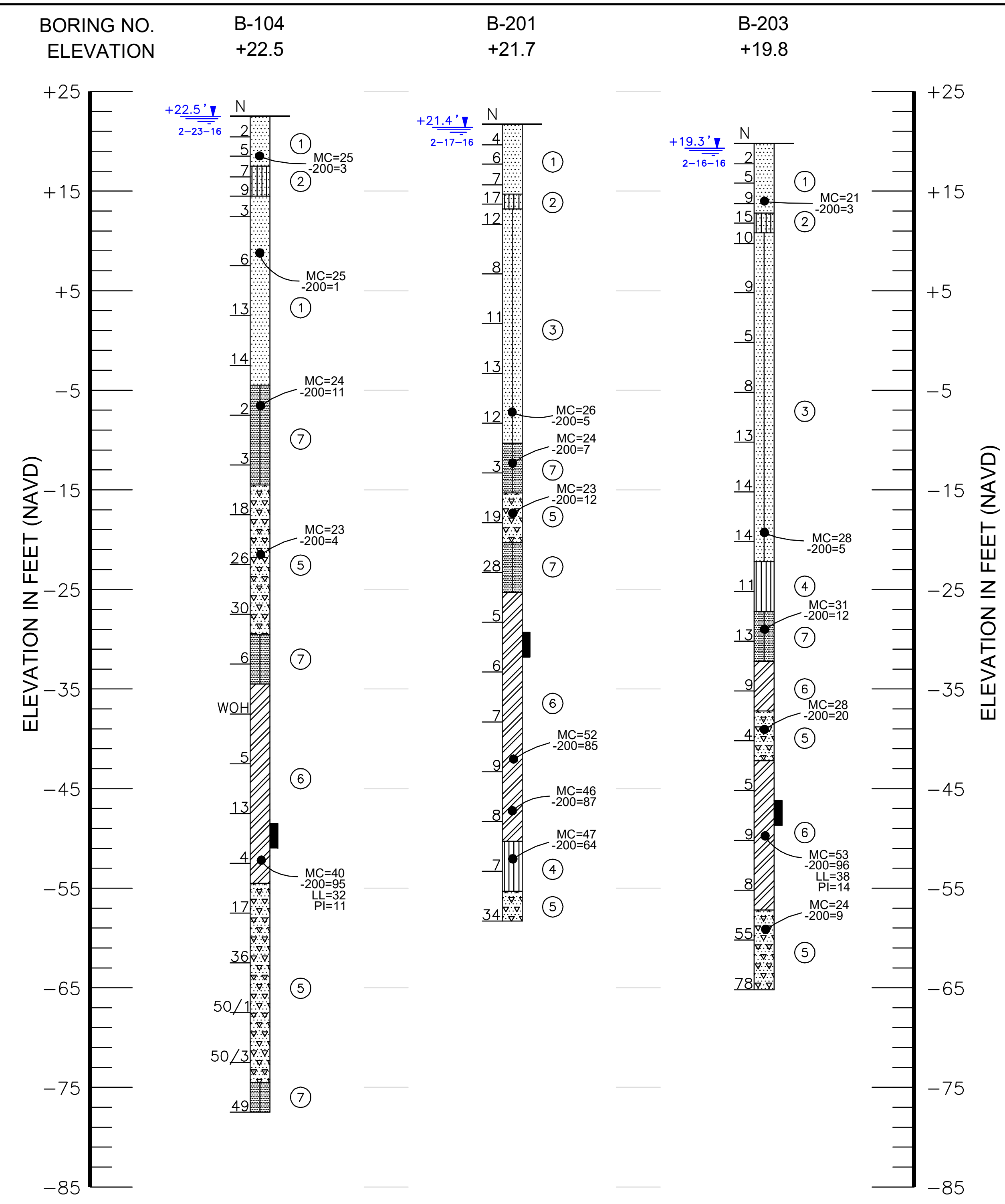
Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION TAYLOR ENGINEERING, INC.
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A
Approved By: KA	Date: 3/26/16		Brevard County Florida

SHEET 7



LEGEND

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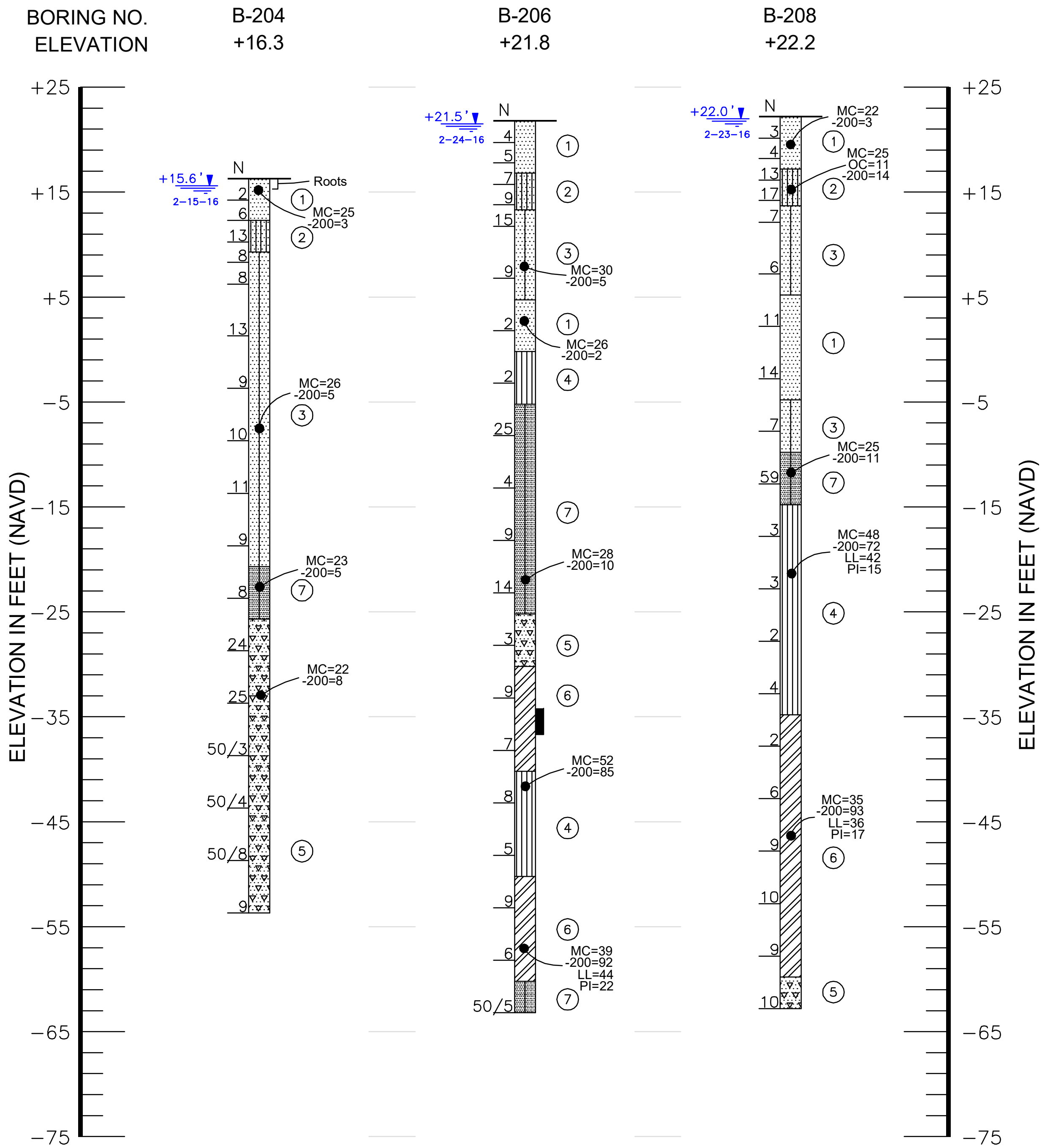
Project Mngr: DD	Project No. HB155022
Drawn By: BL	Scale: 1" = 10'
Checked By: DD	File No. -
Approved By: KA	Date: 3/26/16

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY
607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986
PH. (772) 343-9787 FAX (772) 343-9404

SUBSURFACE PROFILES
GEOTECHNICAL SITE EXPLORATION
TAYLOR ENGINEERING, INC.
DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A
Brevard County Florida

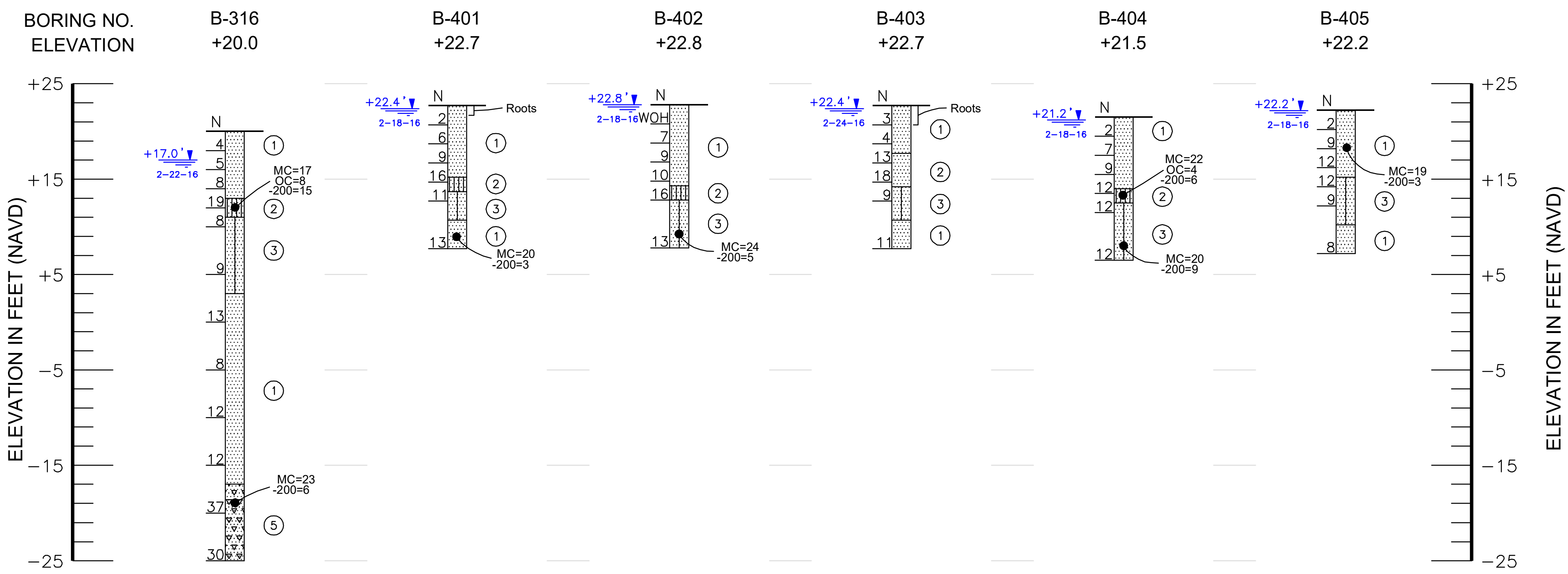
SHEET 8



LEGEND

① Gray or brown medium to fine SAND. (SP)	⑤ Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)
② Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)	⑥ Green or light gray CLAY, traces of shell. (CL, CH)
③ Light brown slightly silty medium to fine SAND. (SP-SM)	⑦ Gray to green slightly silty fine to silty SAND. (SP-SM, SM)
④ Dark gray to green sandy SILT. (ML)	

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES	SHEET
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	9
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
			Brevard County Florida	



LEGEND

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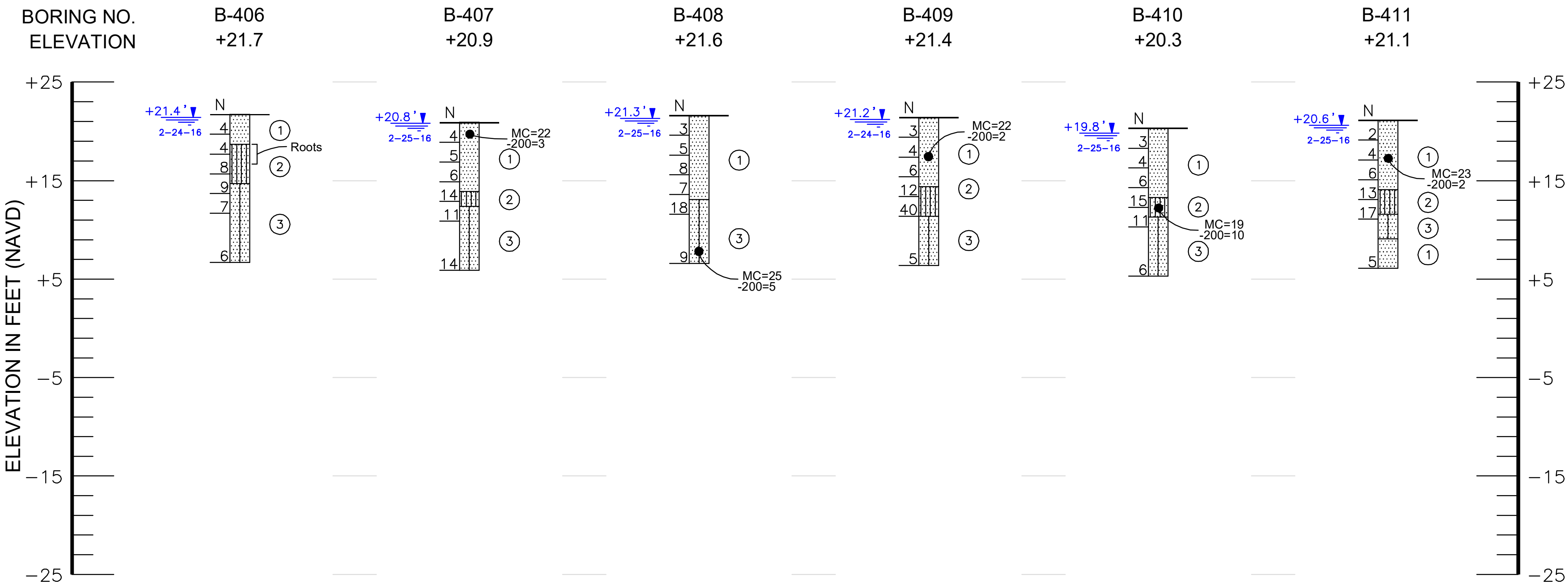
Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION TAYLOR ENGINEERING, INC.
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A
Approved By: KA	Date: 3/26/16		Brevard County Florida

SHEET 10



LEGEND

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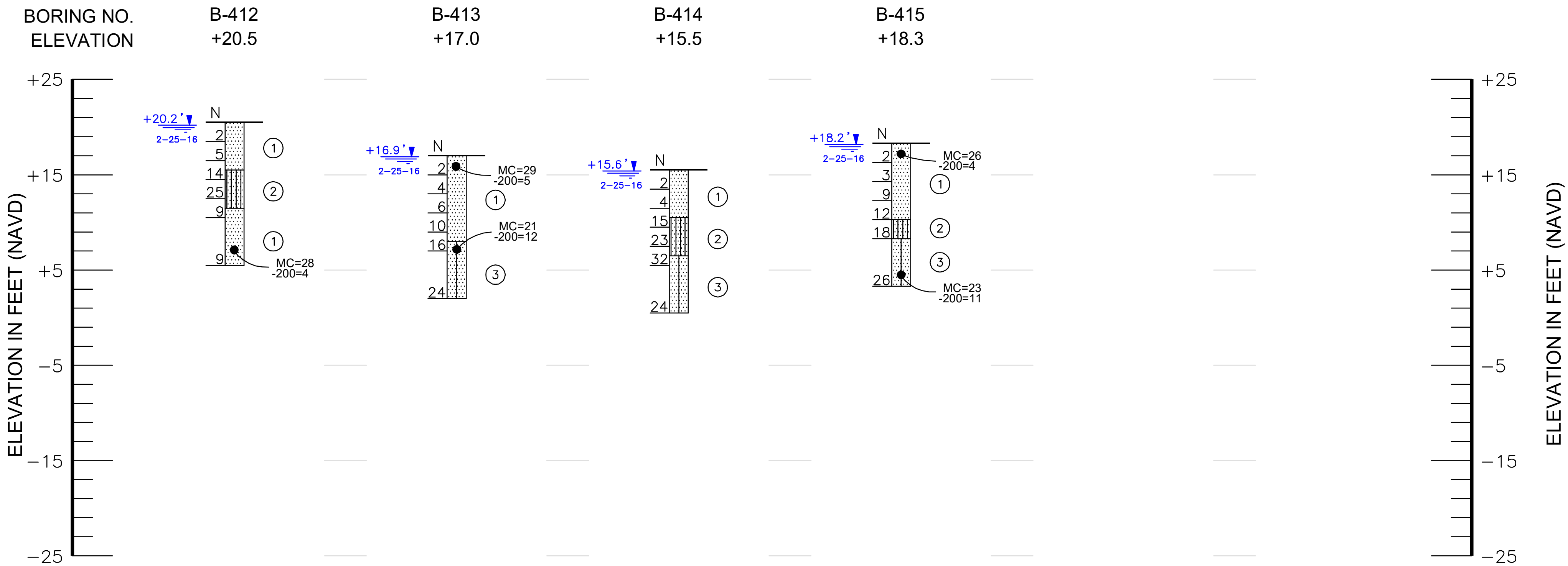
Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida

SHEET 11



LEGEND

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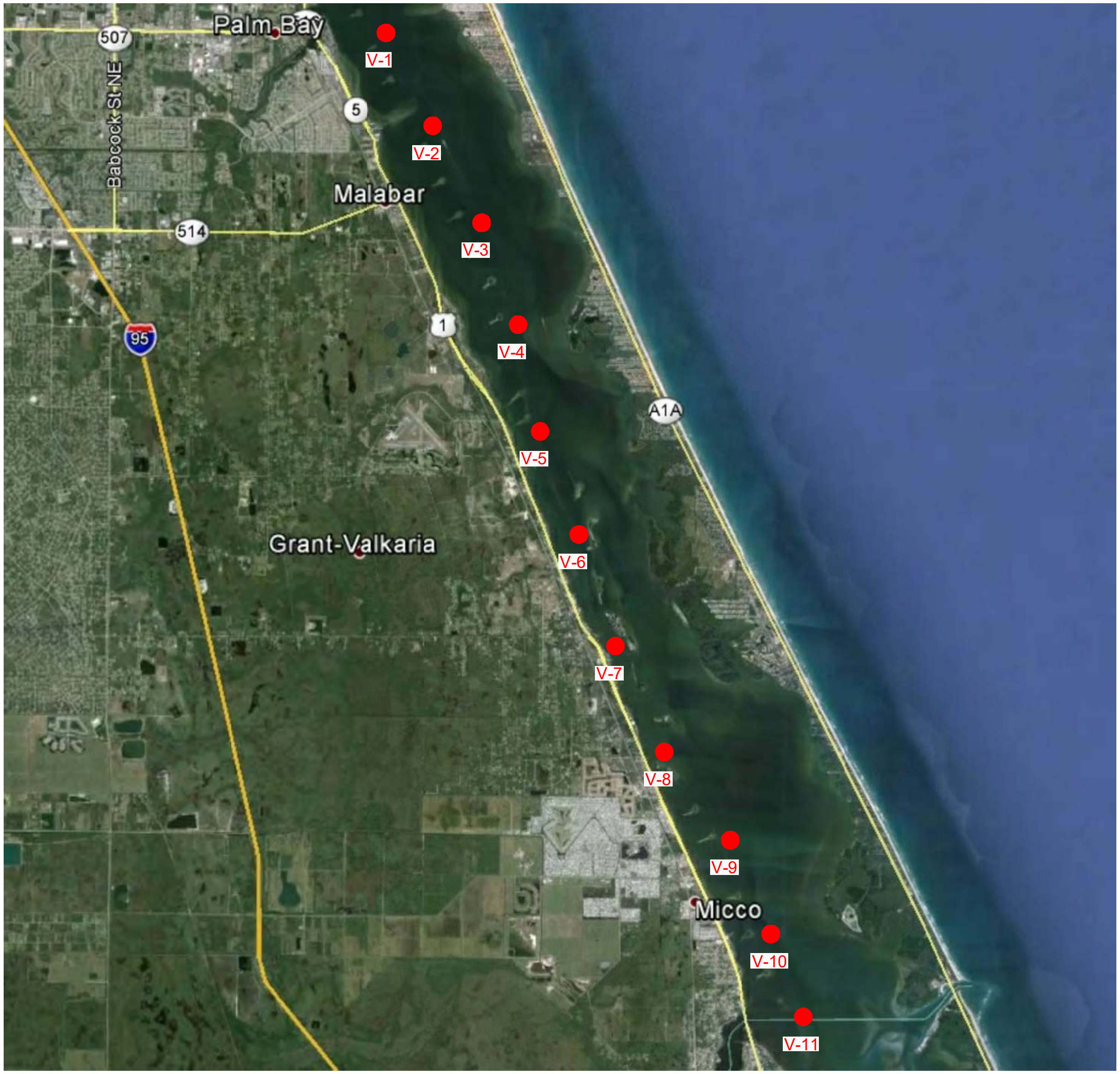
Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A — Brevard County, Florida

SHEET 12



SOURCE: GOOGLE EARTH PRO

STATE-PLANE COORDINATES

VIBRACORE NO.	NORTHING	EASTING
V-1	796408.32	1345623.44
V-2	799587.99	1339442.26
V-3	802904.71	1332943.36
V-4	805319.46	1326244.75
V-5	806869.92	1319150.80
V-6	809477.04	1312317.33
V-7	811849.13	1304957.15
V-8	815128.46	1297939.66
V-9	819627.28	1292100.20
V-10	822348.58	1285885.45
V-11	824503.59	1280396.94

Coordinates recorded in NAD83 State Plane, Florida East (Zone 0901), U.S. Survey Feet by Athena Technologies, Inc.

LEGEND

V-1 - VIBRACORE LOCATION AND NUMBER

Locations are approximate

N

0 0.5 1.0 2.0 4.0

MILES

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	VIBRACORE LOCATION PLAN	SHEET
Drawn By: BL	Scale: AS SHOWN	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	13
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
			Brevard County Florida	

Table A
Summary of Site Soil Index Properties
BV-24A DMMA, Brevard County, Florida

Stratum Number	Sample Location	Sample Depth (ft)	Moisture Content (%)	Amount Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Organic Content (%)
1	B-103	3 - 5	27.5	4.9	-	-	-
1	B-104	3 - 5	25.3	2.8	-	-	-
1	B-204	0 - 2	25.2	3.0	-	-	-
1	B-208	2 - 4	22.0	2.7	-	-	-
1	B-401	13 - 15	20.2	3.3	-	-	-
1	B-407	0 - 2	22.1	3.2	-	-	-
1	B-409	3 - 5	21.6	2.0	-	-	-
1	B-412	13 - 15	27.9	3.7	-	-	-
1	B-413	0 - 2	28.5	4.8	-	-	-
1	B-415	0 - 2	25.9	3.8	-	-	-
1	MIN		20.2	2.0	-	-	-
1	MAX		28.5	4.9	-	-	-
1	AVERAGE		24.6	3.4	-	-	-
2	B-208	6 - 8	25.1	13.5	-	-	11.0
2	B-316	7 - 9	17.4	14.8	-	-	7.7
2	B-404	7 - 9	22.1	6.1	-	-	3.6
2	MIN		17.4	6.1	-	-	3.6
2	MAX		25.1	14.8	-	-	11.0
2	AVERAGE		21.5	11.5	-	-	7.4
3	B-103	9 - 11	27.5	7.0	-	-	-
3	B-201	28 - 30	26.4	5.1	-	-	-
3	B-204	23 - 25	25.6	5.2	-	-	-
3	B-402	13 - 15	23.5	5.2	-	-	-
3	B-404	13 - 15	20.2	8.6	-	-	-
3	B-413	9 - 11	20.7	12.4	-	-	-
3	B-415	13 - 15	23.4	10.9	-	-	-
3	MIN		20.2	5.1	-	-	-
3	MAX		27.5	12.4	-	-	-
3	AVERAGE		23.9	7.8	-	-	-
4	B-103	43 - 45	59.5	56.5	47.8	19.8	-
4	B-201	73 - 75	46.7	63.5	-	-	-
4	B-206	63 - 65	51.9	84.6	-	-	-
4	B-208	43 - 45	47.8	72.2	42.1	14.8	-
4	MIN		46.7	56.5	42.1	14.8	-
4	MAX		59.5	84.6	47.8	19.8	-
4	AVERAGE		51.5	69.2	45.0	17.3	-

Table A (continued)
Summary of Site Soil Index Properties
BV-24A DMMA, Brevard County, Florida

Stratum Number	Sample Location	Sample Depth (ft)	Moisture Content (%)	Amount Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Organic Content (%)
5	B-101	38 - 40	18.3	6.4	-	-	-
5	B-103	83 - 85	16.0	9.9	-	-	-
5	B-201	38 - 40	23.4	12.4	-	-	-
5	B-204	48 - 50	22.2	7.8	-	-	-
5	MIN		16.0	6.4	-	-	-
5	MAX		23.4	12.4	-	-	-
5	AVERAGE		20.0	9.1	-	-	-
6	B-101	68 - 70	43.1	59.6	-	-	-
6	B-102	98 - 100	31.9	56.5	26.8	6.7	-
6	B-104	73 - 75	39.8	94.8	31.8	11.3	-
6	B-201	63 - 65	51.9	84.6	-	-	-
6	B-201	68 - 70	45.8	87.4	-	-	-
6	B-203	68 - 70	53.3	96.4	37.5	14.4	-
6	B-206	78 - 80	38.7	91.5	44.0	22.0	-
6	B-208	68 - 70	34.7	92.6	36.0	16.9	-
6	MIN		31.9	56.5	26.8	6.7	-
6	MAX		53.3	96.4	44.0	22.0	-
6	AVERAGE		42.4	82.9	35.2	14.3	-
7	B-101	58 - 60	25.8	11.1	-	-	-
7	B-101	98 - 100	28.4	13.3	Non-plastic	Non-plastic	-
7	B-102	18 - 20	28.8	14.7	-	-	-
7	B-103	63 - 65	27.5	7.0	-	-	-
7	B-104	28 - 30	23.7	11.4	-	-	-
7	B-201	33 - 35	23.8	7.3	-	-	-
7	B-203	48 - 50	30.6	12.3	-	-	-
7	B-206	43 - 45	27.9	10.0	-	-	-
7	B-208	33 - 35	24.9	11.3	-	-	-
7	MIN		23.7	7.0	-	-	-
7	MAX		30.6	14.7	-	-	-
7	AVERAGE		26.8	10.9	-	-	-

Table B
Summary of Sieve Analysis
BV-24A DMMA, Brevard County, Florida

Stratum Number	Sample Location	Sample Depth (ft)	USCS	Amount Passing Sieve Size (%)							
				3/8"	#4	#10	#20	#40	#60	#100	#200
1	B-101	18 - 20	SP	100.0	100.0	100.0	99.7	96.0	78.7	24.5	0.8
1	B-103	3 - 5	SP	100.0	100.0	100.0	99.7	92.3	63.2	29.8	2.7
1	B-104	13 - 15	SP	100.0	100.0	100.0	100.0	96.9	75.1	21.9	1.4
1	B-203	5 - 7	SP	100.0	100.0	100.0	99.8	93.0	64.6	31.1	3.2
1	B-206	18 - 20	SP	100.0	100.0	100.0	99.9	94.6	83.7	39.5	1.9
1	B-405	3 - 5	SP	100.0	100.0	100.0	99.7	93.9	65.7	33.3	3.0
1	B-411	3 - 5	SP	100.0	100.0	100.0	99.8	93.4	60.5	25.7	2.2
2	B-102	3 - 5	SP-SM	100.0	100.0	98.4	98.1	90.9	60.3	26.2	6.4
2	B-410	7 - 9	SP-SM	100.0	100.0	99.8	99.2	91.7	63.2	31.8	10.1
3	B-101	9 - 11	SP-SM	100.0	100.0	100.0	99.9	99.5	96.7	84.7	6.3
3	B-203	38 - 40	SP-SM	100.0	100.0	100.0	99.9	98.7	97.6	89.4	5.2
3	B-206	13 - 15	SP	100.0	100.0	100.0	100.0	99.9	99.5	88.9	4.9
3	B-408	13 - 15	SP-SM	100.0	100.0	100.0	100.0	99.3	94.9	65.4	5.1
5	B-101	53 - 55	SM	100.0	100.0	99.0	96.3	90.4	78.6	50.3	15.4
5	B-102	58 - 60	SP	100.0	100.0	100.0	100.0	98.7	49.5	10.1	3.0
5	B-104	43 - 45	SP	100.0	98.9	95.9	89.7	83.8	66.4	18.1	3.7
5	B-203	58 - 60	SM	100.0	91.1	84.5	77.3	73.0	70.2	66.6	20.4
5	B-203	78 - 80	SP-SM	100.0	95.8	88.6	76.6	60.7	41.3	21.5	8.5
5	B-316	38 - 40	SP-SM	100.0	97.7	90.5	76.4	66.6	54.7	38.4	5.5
7	B-103	38 - 40	SP-SM	100.0	100.0	100.0	99.5	98.0	94.9	62.7	5.4
7	B-204	38 - 40	SP-SM	100.0	100.0	100.0	94.9	83.0	74.8	59.3	5.2
1	Borrow[1]	0 - 7	SP	100.0	100.0	100.0	99.8	94.3	62.3	26.8	2.8
1	Borrow[1]	0 - 7	SP	100.0	100.0	100.0	99.8	94.5	64.6	30.0	4.9
1	Borrow[1]	0 - 7	SP	100.0	100.0	100.0	99.8	92.1	59.4	26.6	3.0
1	Borrow[1]	0 - 7	SP	100.0	100.0	99.9	99.7	93.7	62.3	28.4	3.3
1	Borrow[1]	0 - 7	SP	100.0	100.0	99.5	99.0	90.7	52.7	20.7	2.5

(1) Samples collected in bulk using a continuous flight auger from proposed interior borrow area

Table C
Modified Proctor (ASTM D1557) Compaction Results
BV-24A DMMA, Brevard County, Florida

Sample Location	Sample Depth (ft)	USCS	Fines Content (%)	Optimum Moisture Content (%)	Maximum Dry Unit Weight (pcf)
B-401 / B-402	0 - 7	SP	2.8	14.3	101.9
B-405 / B-406	0 - 7	SP	4.9	11.9	101.9
B-407 / B-408	0 - 7	SP	3.0	13.1	103.1
B-411 / B-412	0 - 7	SP	3.3	10.8	102.7
B-413 / B-414	0 - 7	SP	2.5	10.4	102.7

Samples collected in bulk using a continuous flight auger from proposed interior borrow area
Fines content refers to amount passing No. 200 Sieve

Table D
Limerock Bearing Ratio (LBR) Results
BV-24A DMMA, Brevard County, Florida

Sample Location	Sample Depth (ft)	USCS	Fines Content (%)	Optimum Moisture Content (%)	Maximum Dry Unit Weight (pcf)	LBR
B-403 / B-404	0 - 7	SP	4.1	13.3	103.3	41.9
B-409 / B-410	0 - 7	SP	2.4	12.8	104.9	54.5
B-413 / B-414	0 - 7	SP	2.2	13.6	103.4	59.6

Samples collected in bulk using a continuous flight auger from proposed interior borrow area
Fines content refers to amount passing No. 200 Sieve
Optimum moisture content and maximum dry unit weight determined in accordance with Modified Proctor test

Table E.1
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Sand Samples

Sample Location	Sample Depth (ft)	USCS	Sample Type	Fines Content (%)	Initial Conditions			Confining Stress (psi)	Hydraulic Conductivity	
					Moisture Content (%)	Dry Unit Weight (pcf)	Estimated Relative Compaction (%)		cm/sec	ft/day
B-401	0 - 7	SP	Remolded	< 5	12.8	103.3	101.4	-	1.24E-02	35.2
B-401	0 - 7	SP	Remolded	< 5	12.3	94.9	93.1	-	2.48E-02	70.3
B-408	0 - 7	SP	Remolded	< 5	13.3	101.3	98.3	-	1.21E-02	34.3
B-408	0 - 7	SP	Remolded	< 5	13.2	94.7	91.9	-	1.70E-02	48.1
B-415	0 - 7	SP	Remolded	< 5	13.1	102.6	99.9	-	2.02E-02	57.3
B-415	0 - 7	SP	Remolded	< 5	13.1	94.7	92.2	-	2.38E-02	67.6

Samples collected in bulk using a continuous flight auger from proposed interior borrow area
Fines content refers to amount passing No. 200 Sieve

Table E.2
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Fine Grained Samples

Sample Location	Sample Depth (ft)	USCS	Sample Type	Fines Content (%)	Initial Conditions		Confining Stress (psi)	Hydraulic Conductivity	
					Moisture Content (%)	Dry Unit Weight (pcf)		cm/sec	ft/day
B-102	31 - 33	CL	Undisturbed	85.0	51.6	68.7	3.0	4.87E-08	1.38E-04
B-203	66 - 68	CH	Undisturbed	98.7	53.6	67.4	3.0	5.57E-08	1.58E-04

Fines content refers to amount passing No. 200 Sieve

Table E.3
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Field Tests

Sample Location	Screen Interval (ft)	USCS	Sample Type	Hydraulic Conductivity	
				cm/sec	ft/day
PZ-1	0 - 5	SP	Insitu	1.53E-02	43.5
MW-4	10 - 15	SP-SM	Insitu	2.47E-03	7.0
MW-5	35 - 40	SP-SM	Insitu	3.32E-03	9.4

PZ-1 located near MW-4 and MW-5

Table F

Summary of Triaxial Shear Test Results

BV-24A DMMA, Brevard County, Florida

Sample Location	Test Method	Representative Area	Sample Type	Sample Depth (ft)	USCS	Total Strength Parameters		Effective Strength Parameters	
						Cohesion (C, psf)	Internal Friction Angle (φ, deg)	Cohesion (C', psf)	Internal Friction Angle (φ', deg)
Borrow[1]	Consolidated Drained	Embankment Soils	Remolded[2]	0 - 7	SP	-	-	274	31.0
Borrow[1]	Consolidated Drained	Foundation Soils	Remolded[2]	0 - 7	SP	-	-	389	33.1
B-102	Consolidated Undrained	Foundation Soils	Undisturbed	31 - 33	CL	562	8.2	605	15.0

(1) Samples collected in bulk using a continuous flight auger from proposed interior borrow area

(2) Samples remolded to 95% of their Modified Proctor determined maximum dry density

Table G
Summary Consolidation Test Results
BV-24A DMMA, Brevard County, Florida

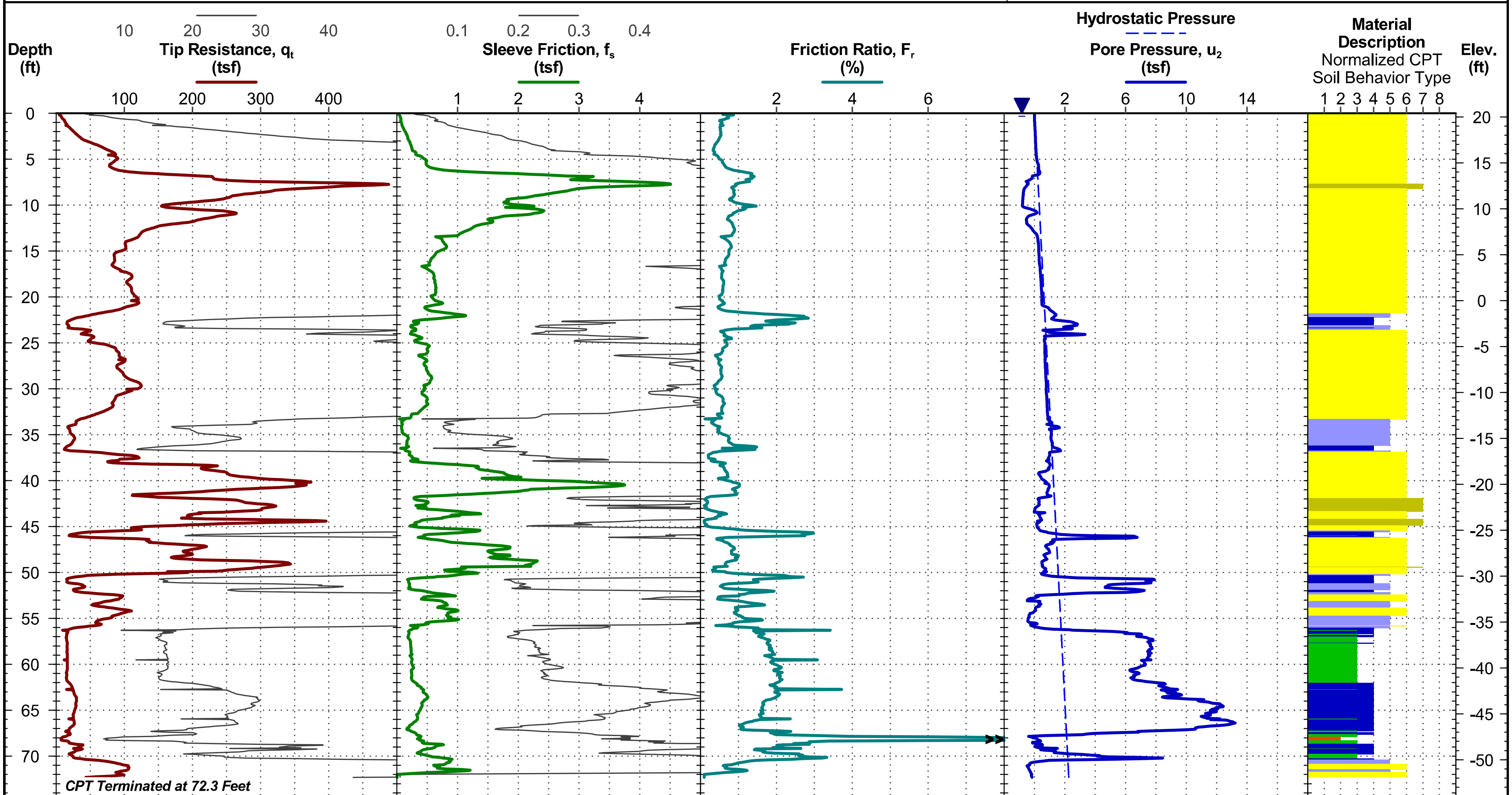
Sample Location	Sample Depth (ft)	USCS	Moisture Content (%)	Dry Unit Weight (pcf)	Fines Content (%)	Liquid Limit	Plasticity Index	Coefficient of Compression	Coefficient of Recompression	Void Ratio	Pre-Consolidation Pressure (ksf)	Over-Consolidation Ratio
B-102	31 - 33	CL	48.0	74.2	85.0	34.0	16.7	0.47	0.08	1.27	4.0	3.3
B-104	71 - 73	ML	39.5	80.9	87.2	38.0	11.0	0.29	0.03	1.10	4.2	1.6
B-203	66 - 68	CH	61.6	63.5	98.7	67.8	43.0	0.70	0.09	1.65	6.2	2.5
B-206	56 - 58	CL	27.7	86.5	82.4	43.0	23.0	0.31	0.04	0.96	4.4	2.0

Fines content refers to amount passing No. 200 Sieve

APPENDIX A
CONE PENETROMETER TEST (CPT) LOGS

CPT LOG NO. CPT-202

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 20.4 ft
SITE: Brevard County, FL		



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION	Probe no. DPG1228 with net area ratio of 0.8 U2 pore pressure transducer location Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in	**DUNKELBERGER** engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/18/2016	CPT Completed: 2/18/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)			Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-1

CPT LOG NO. CPT-205

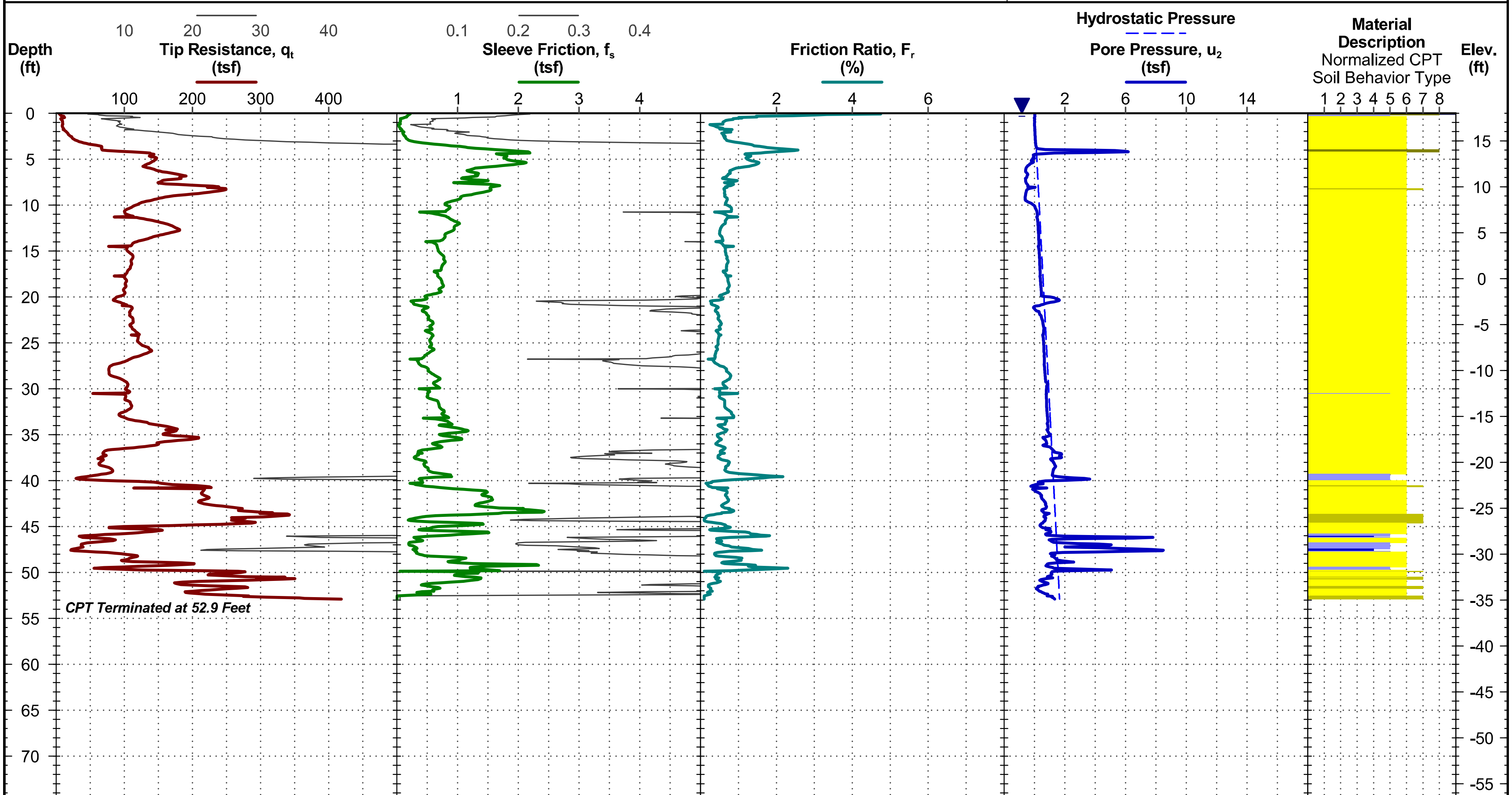
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 18.0 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/19/2016	CPT Completed: 2/19/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-2

CPT LOG NO. CPT-207

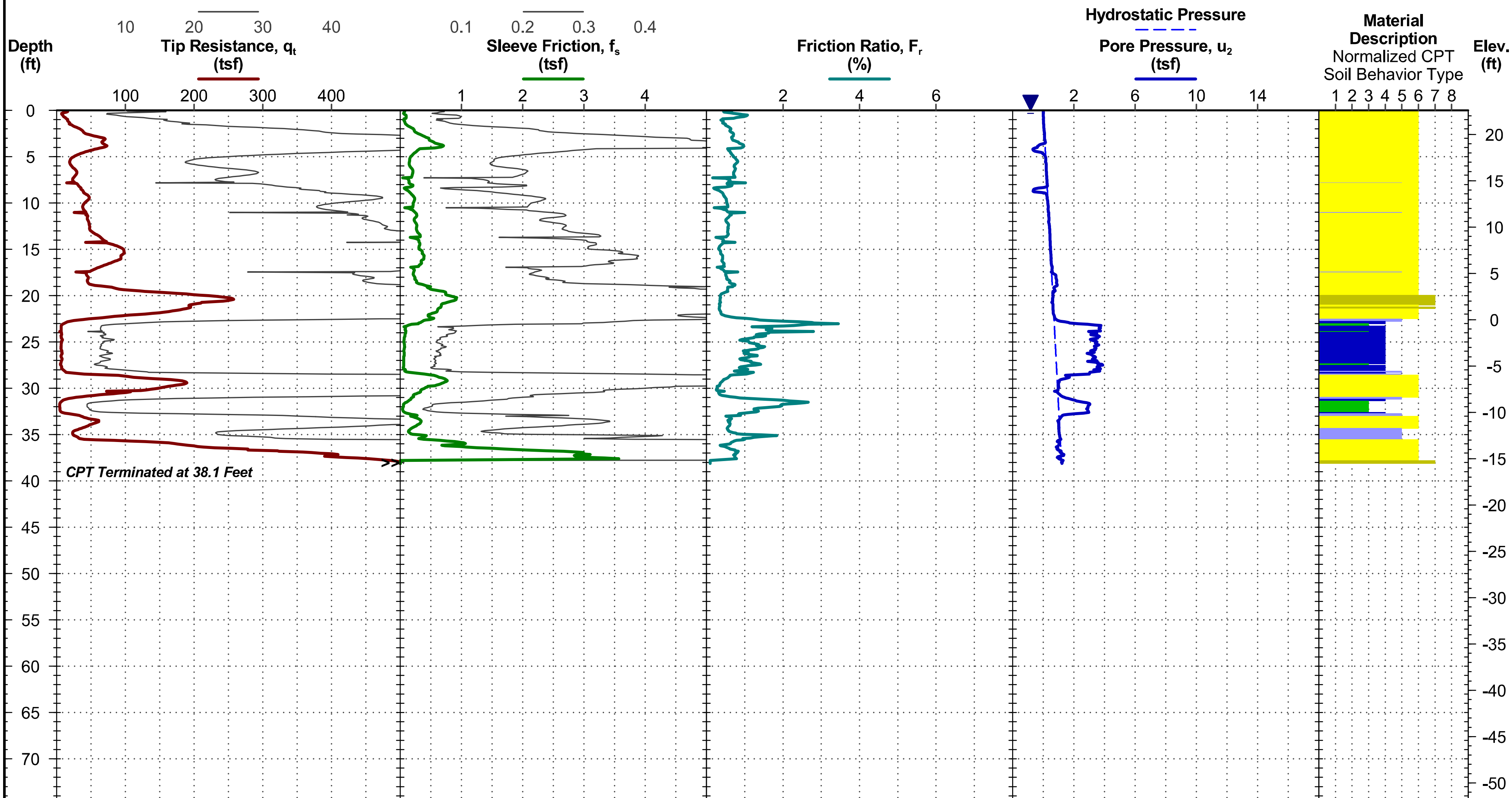
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.6 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

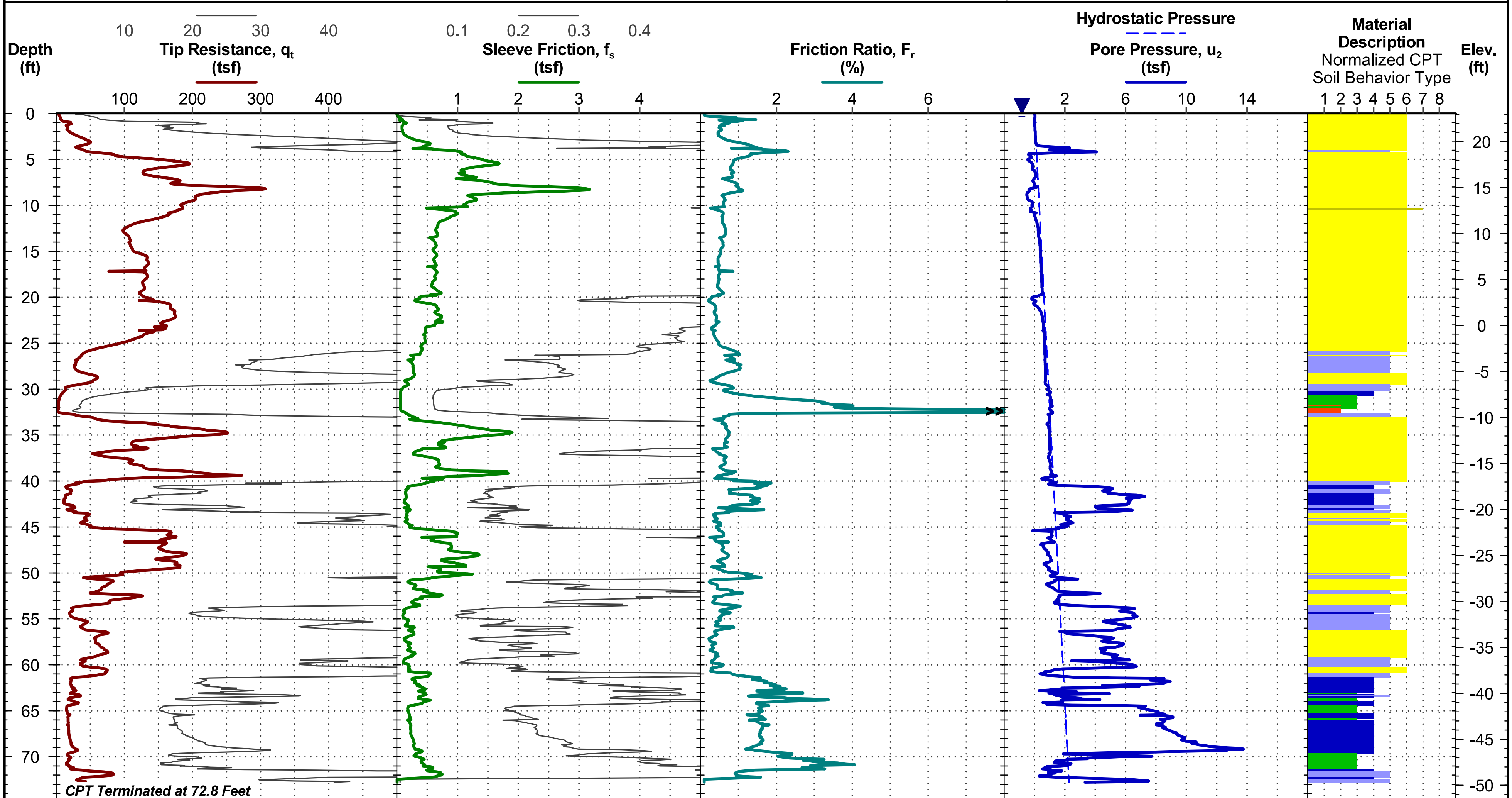
Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-3

CPT LOG NO. CPT-209

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 23.1 ft
SITE: Brevard County, FL		



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION 0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 U2 pore pressure transducer location Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/18/2016 Rig: 735 Project No.: HB155022	CPT Completed: 2/18/2016 Operator: Tony Antonatos Exhibit: A-4

CPT LOG NO. CPT-301

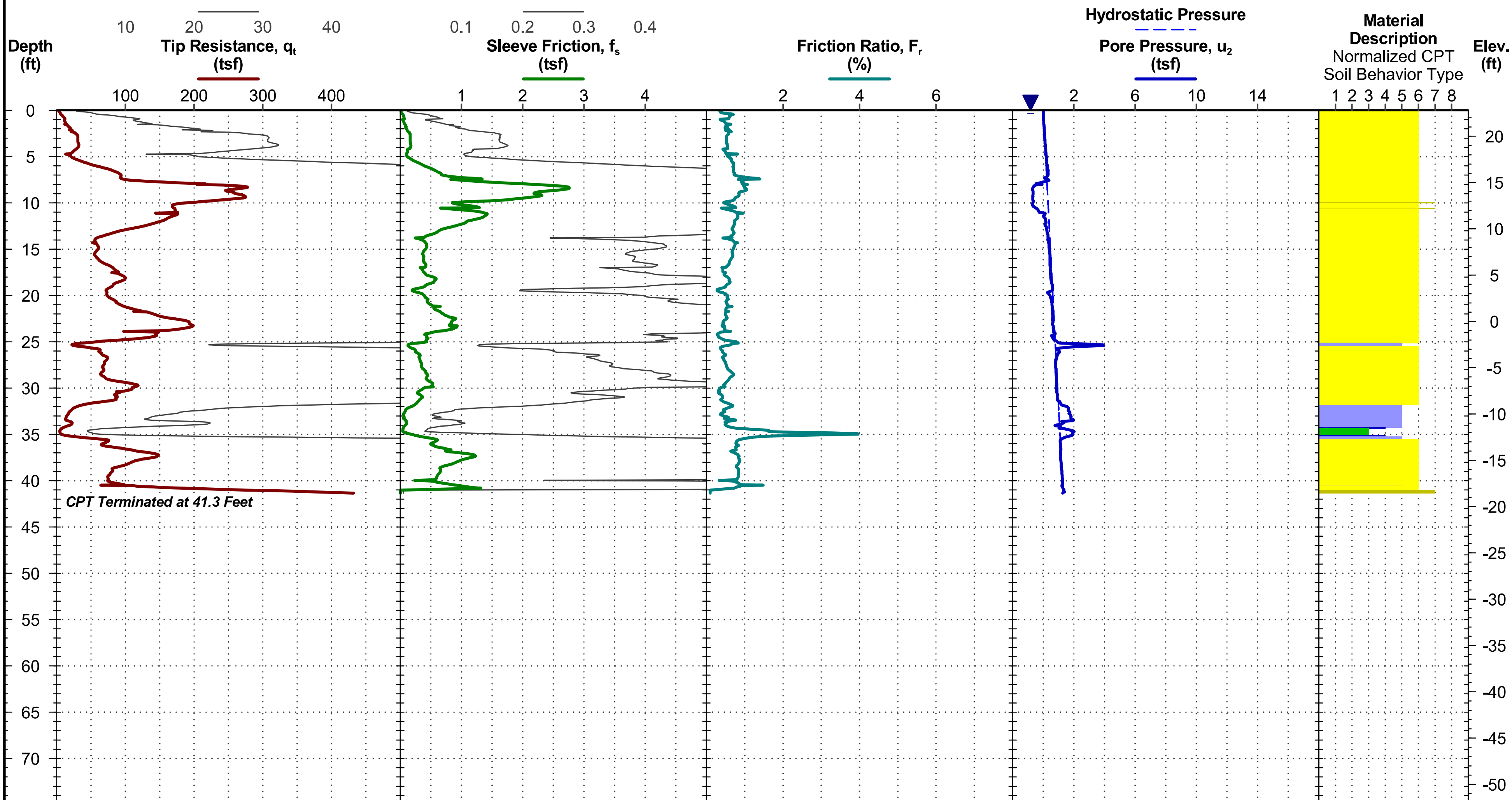
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.8 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)

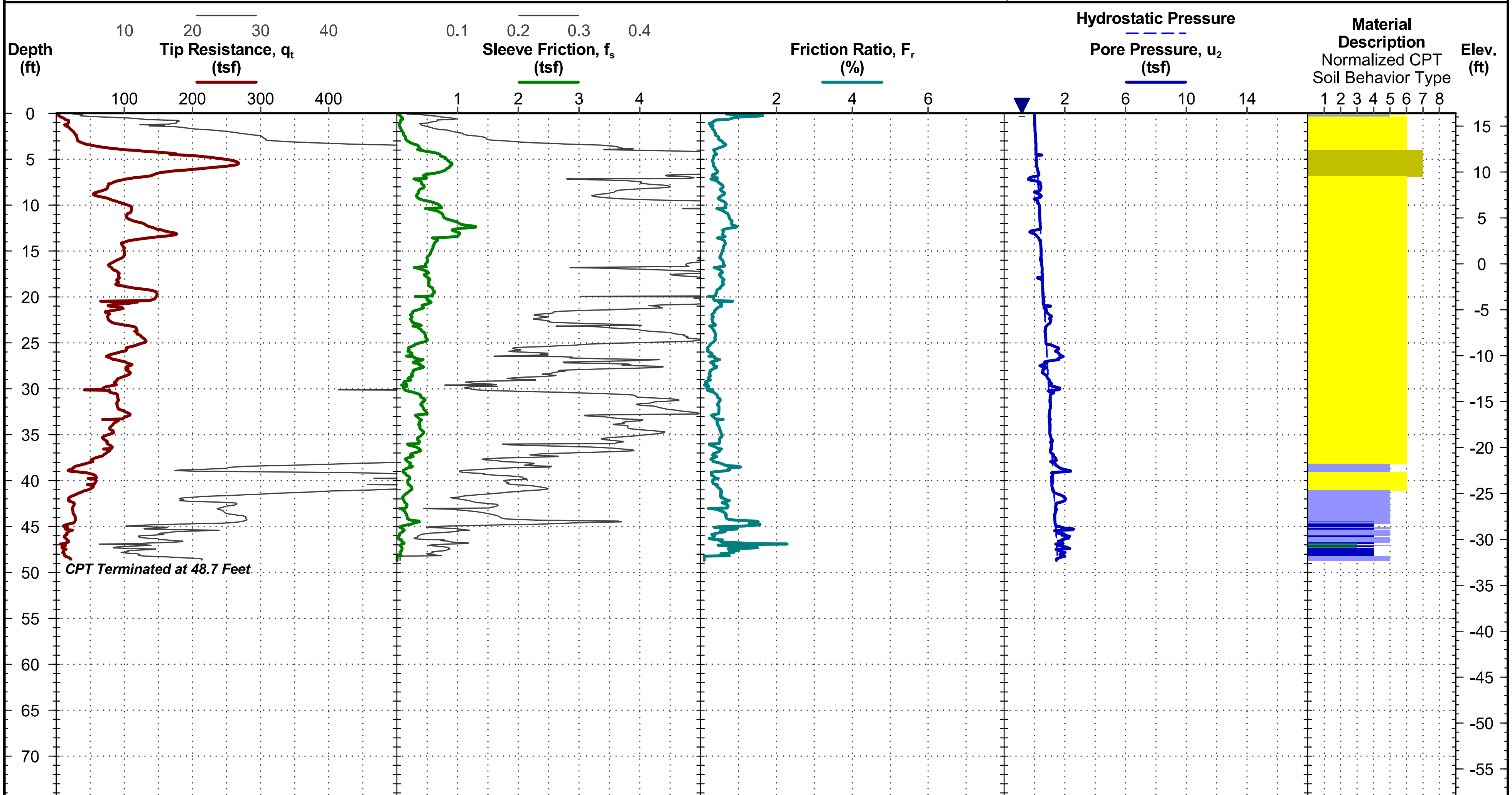
Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc. A Terracon COMPANY

CPT Started: 2/17/2016	CPT Completed: 2/17/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-5

CPT LOG NO. CPT-302

PROJECT: BV-24A DMMA	CLIENT: Taylor Engineering, Inc.	TEST LOCATION: See Sheet 5
SITE: Brevard County, FL		Surface Elev.: 16.4 ft



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

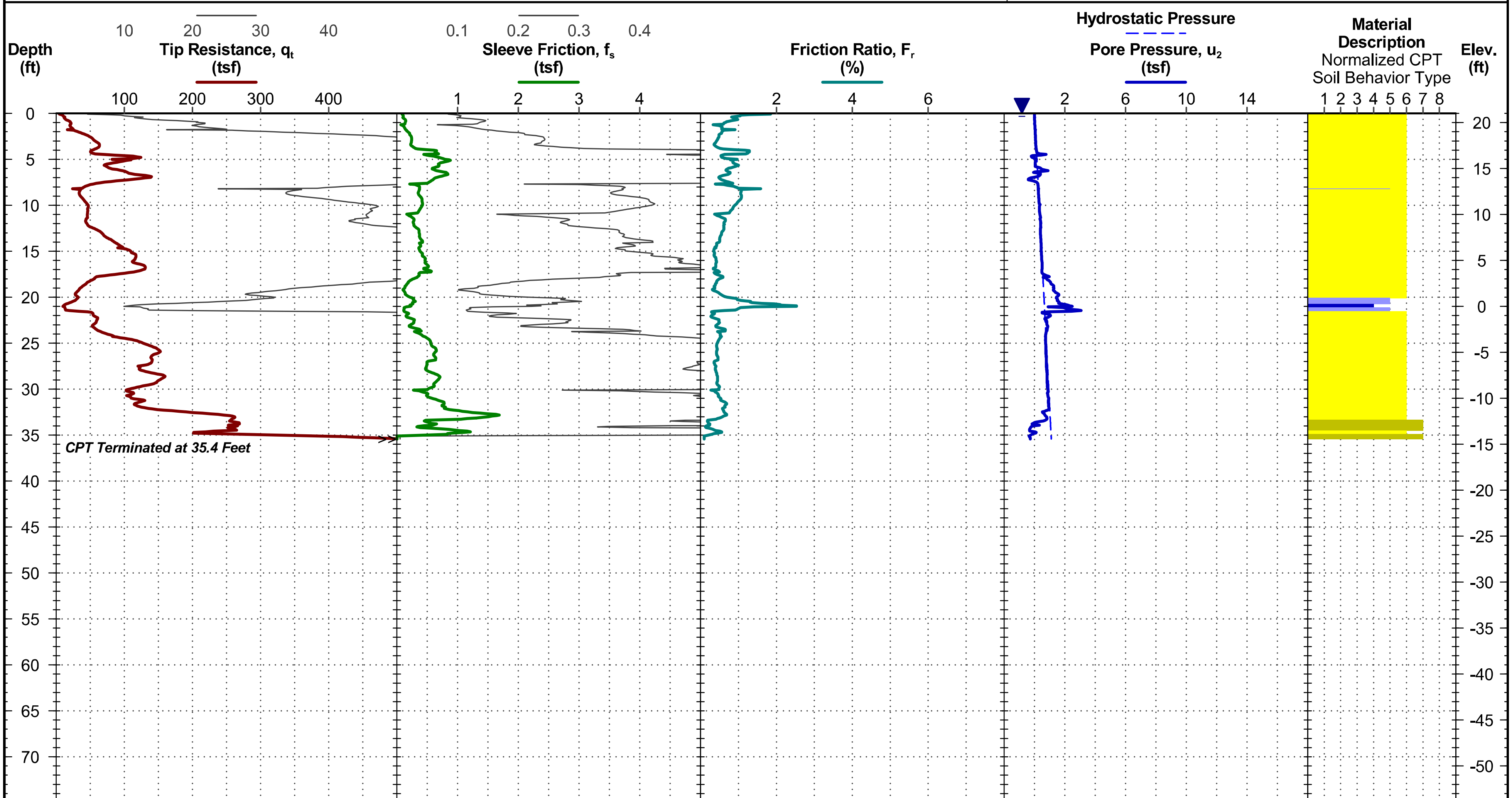
Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-6

CPT LOG NO. CPT-303

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 21.0 ft
SITE: Brevard County, FL		



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION	Probe no. DPG1228 with net area ratio of 0.8 U2 pore pressure transducer location Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in	**DUNKELBERGER** engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/19/2016	CPT Completed: 2/19/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)			Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-7

CPT CORRELATIVE PARAMETER LOG NO. CPT-202

SEE CPT LOG NO. CPT-202 FOR DETAILED TEST RESULTS

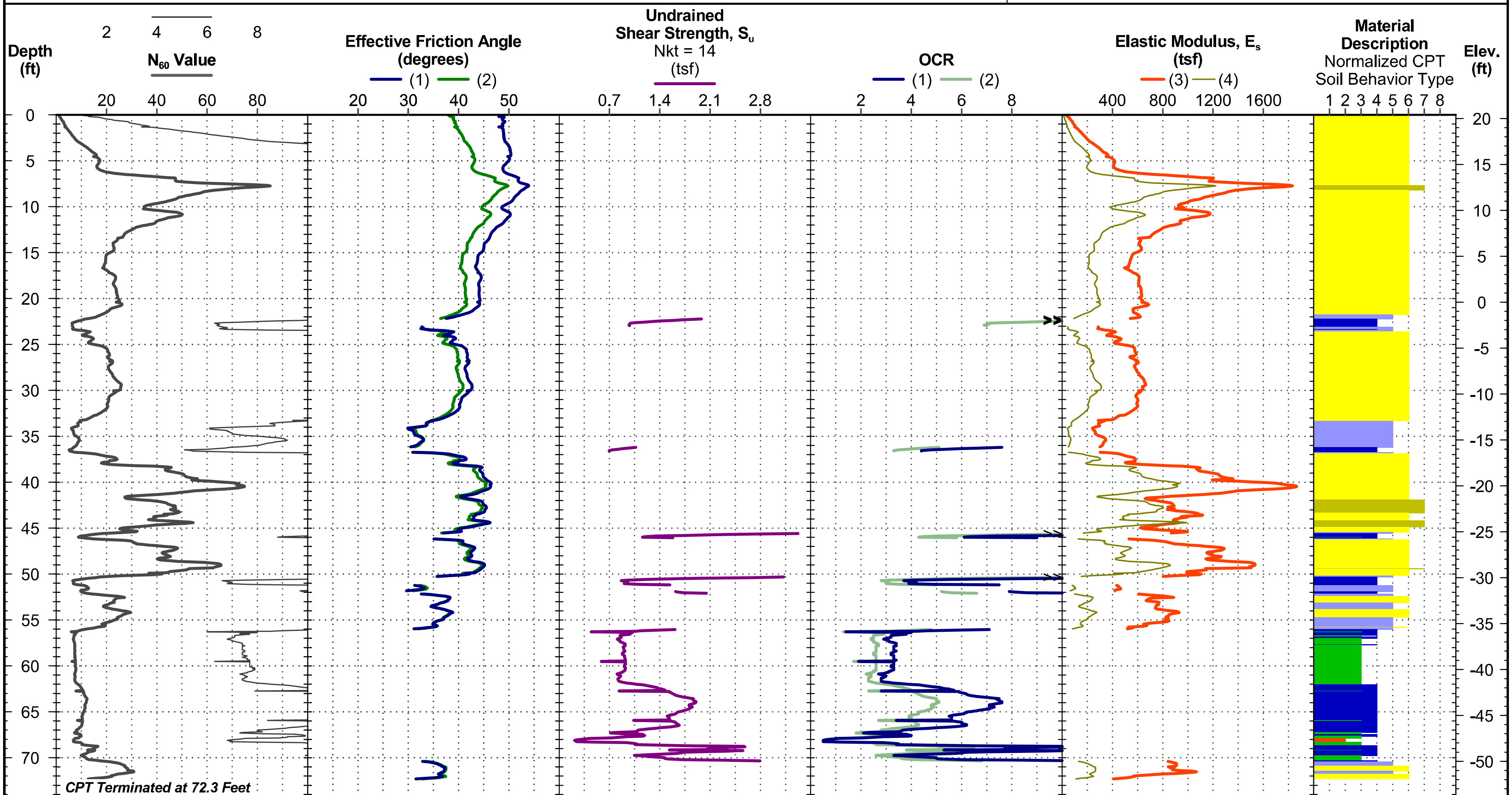
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 20.4 ft

SITE: Brevard County, FL



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION

0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)

Notes:
Probe no. DPG1228 with net area ratio of 0.8
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-8

CPT CORRELATIVE PARAMETER LOG NO. CPT-205

SEE CPT LOG NO. CPT-205 FOR DETAILED TEST RESULTS

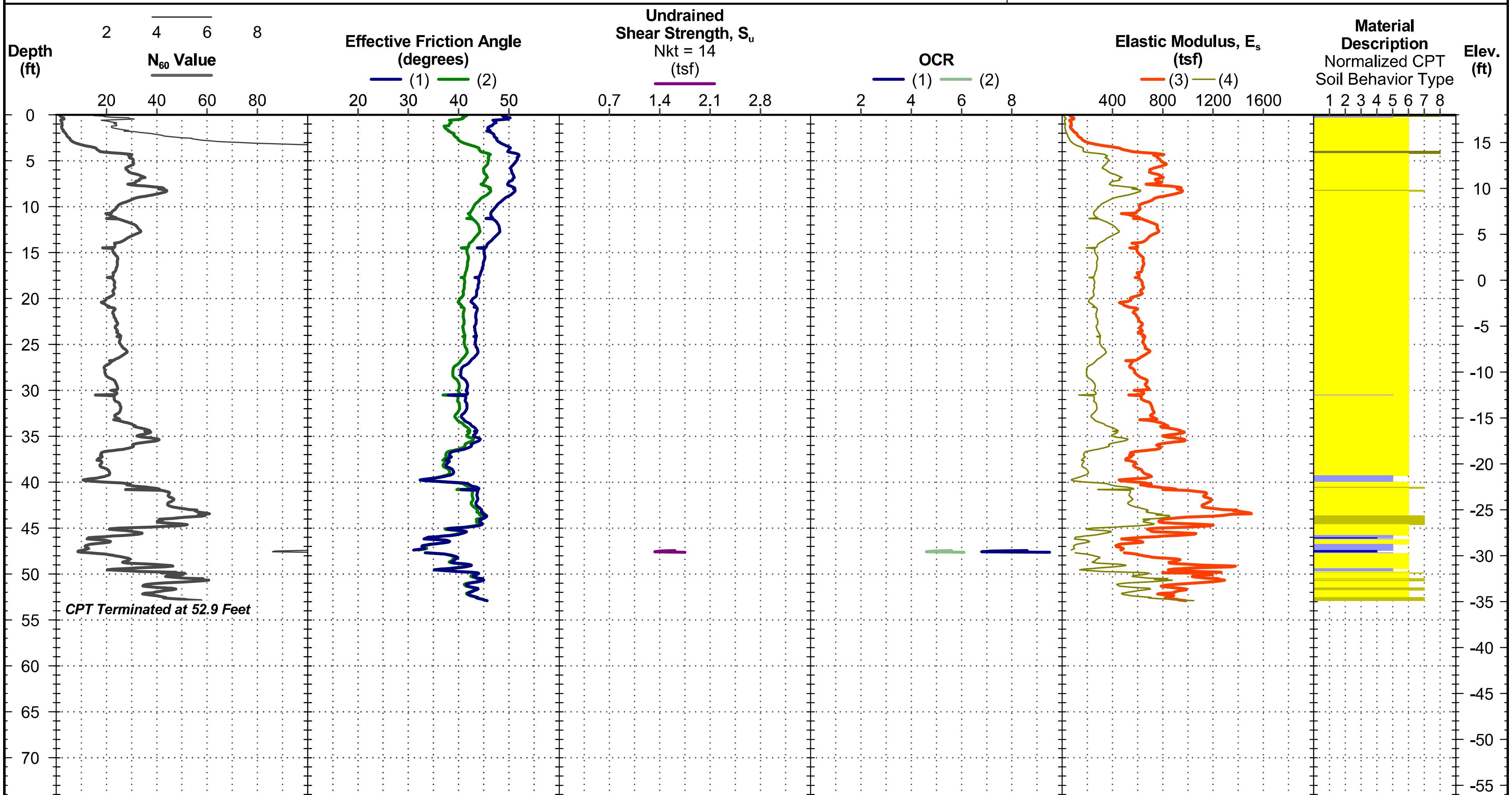
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 18.0 ft

SITE: Brevard County, FL



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION	Notes:	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/19/2016	CPT Completed: 2/19/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm² and 225 cm² Ring friction reducer with O.D. of 2 in		Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-9

CPT CORRELATIVE PARAMETER LOG NO. CPT-207

SEE CPT LOG NO. CPT-207 FOR DETAILED TEST RESULTS

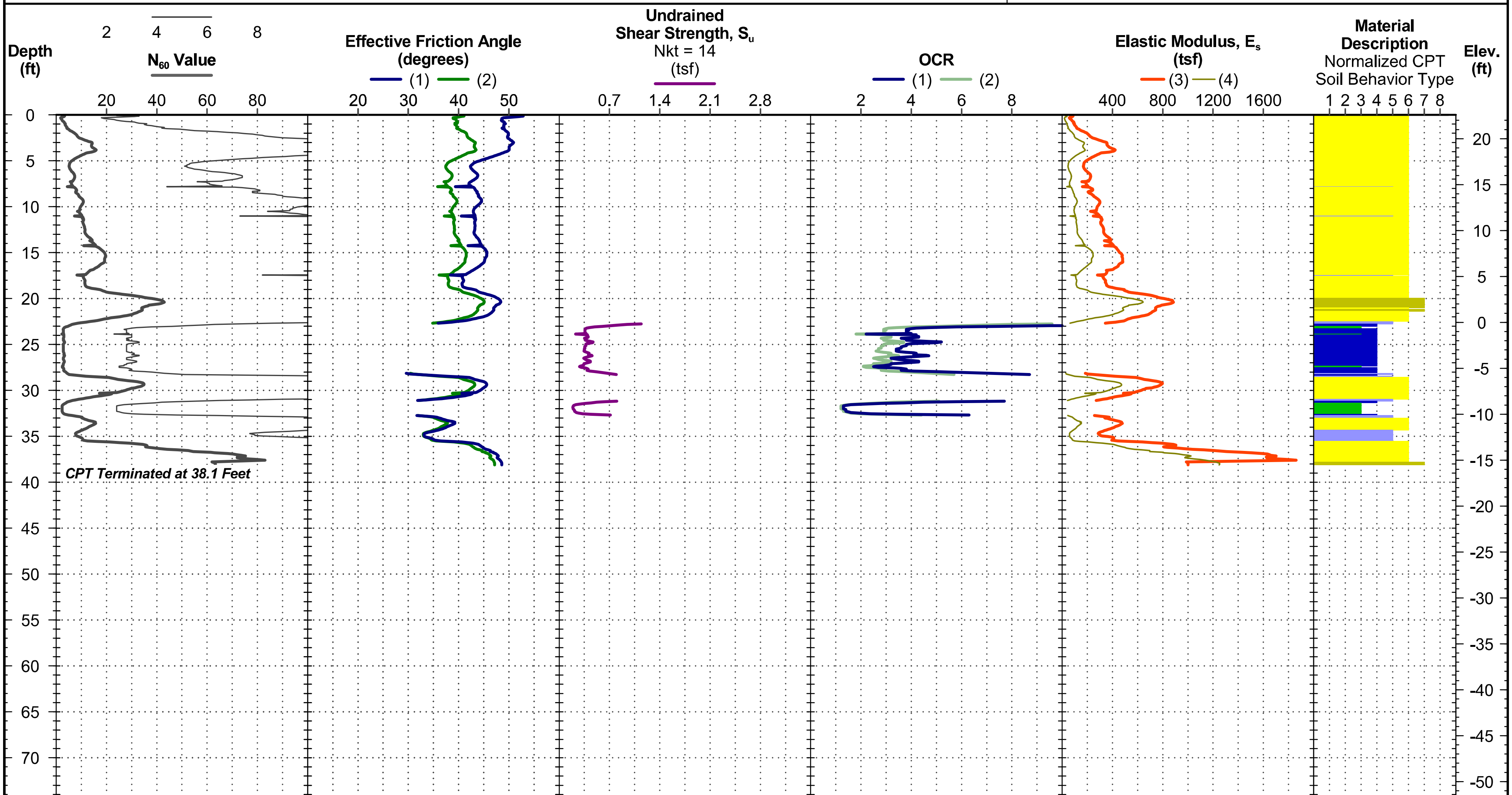
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.6 ft

SITE: Brevard County, FL



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Notes:
Probe no. DPG1228 with net area ratio of 0.8
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

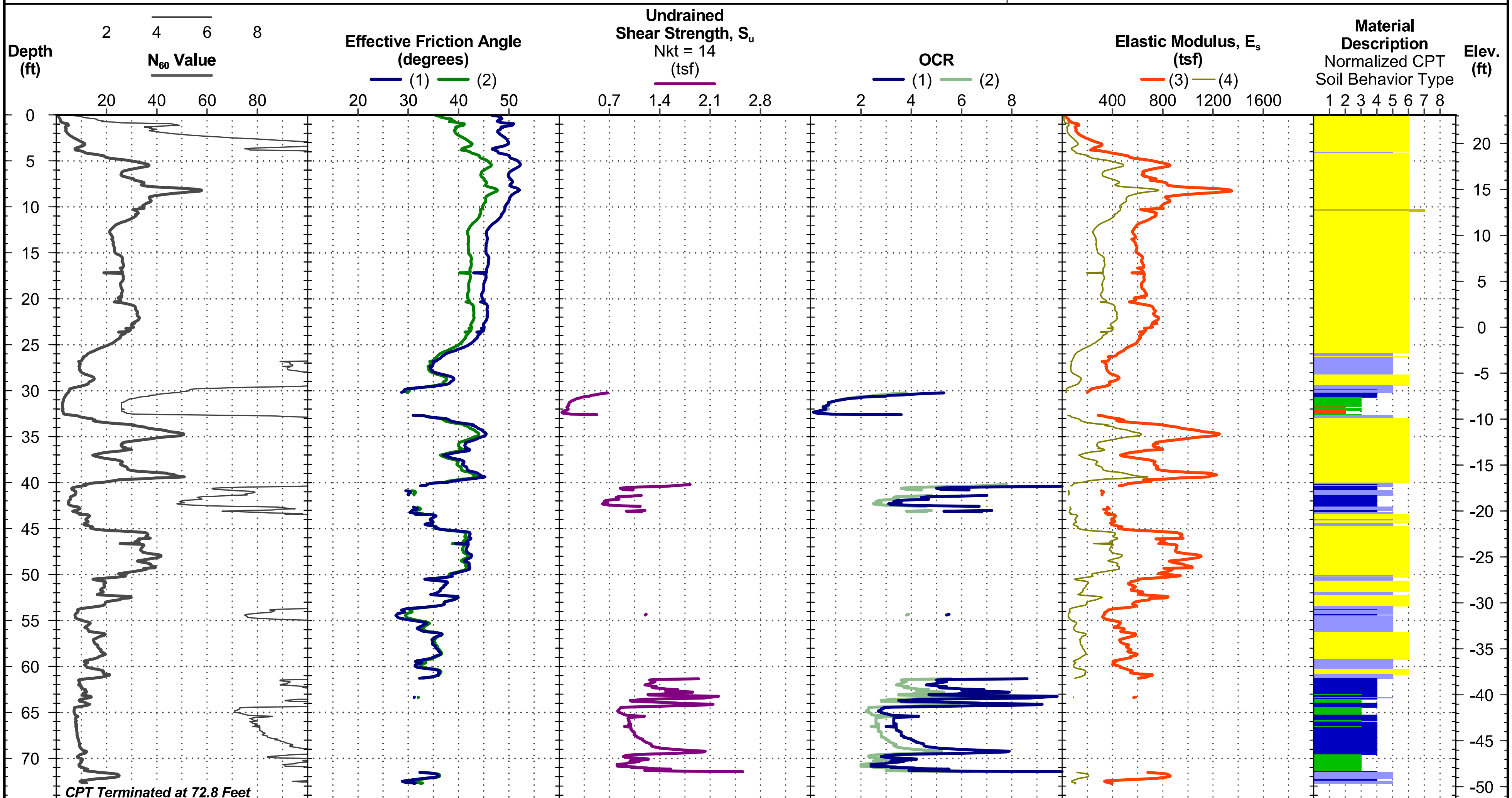
DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-10

CPT CORRELATIVE PARAMETER LOG NO. CPT-209

SEE CPT LOG NO. CPT-209 FOR DETAILED TEST RESULTS

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 23.1 ft
SITE: Brevard County, FL		



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Notes:
Probe no. DPG1228 with net area ratio of 0.8
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-11

CPT CORRELATIVE PARAMETER LOG NO. CPT-301

SEE CPT LOG NO. CPT-301 FOR DETAILED TEST RESULTS

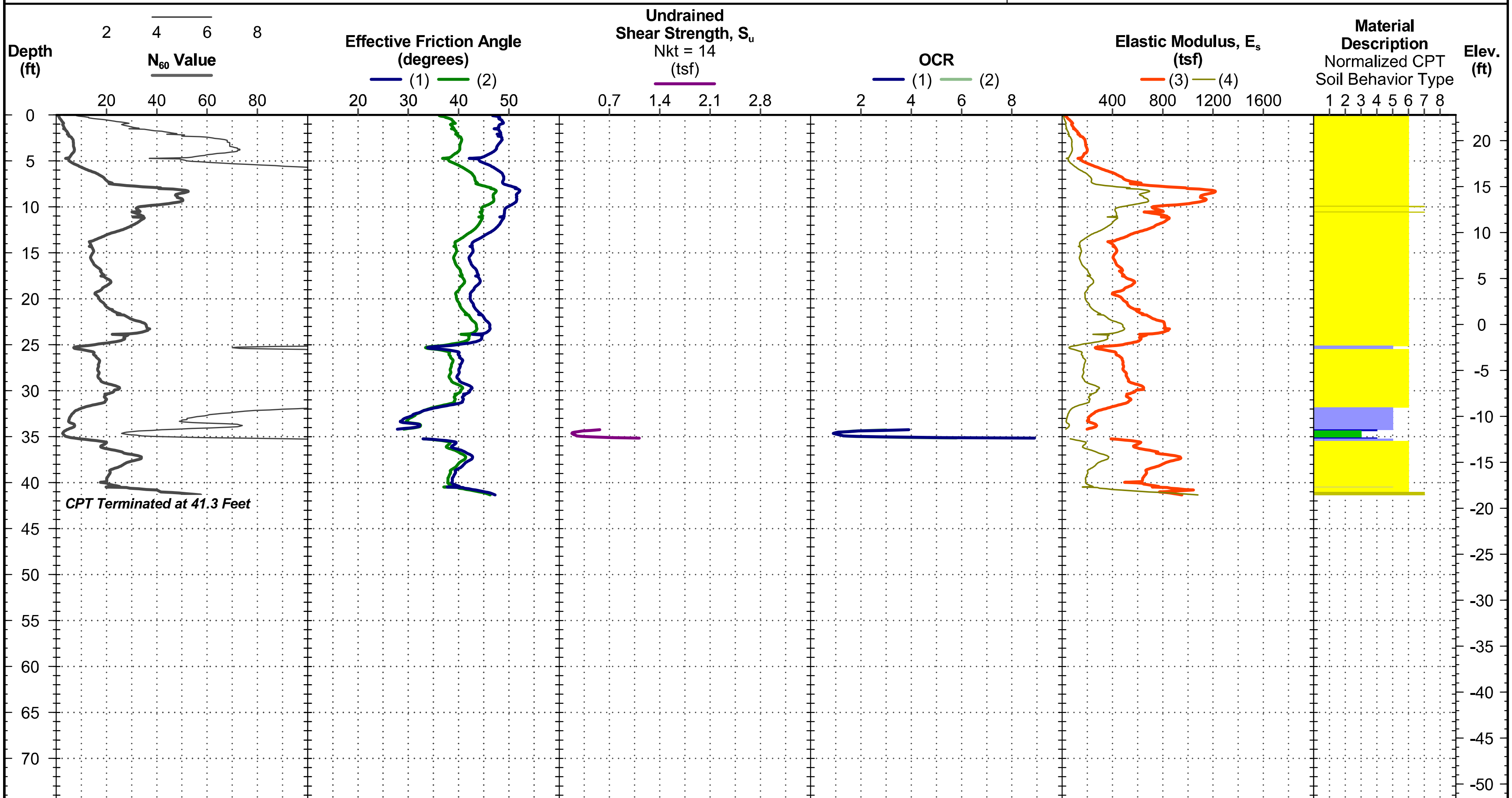
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.8 ft

SITE: Brevard County, FL



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Notes:
Probe no. DPG1228 with net area ratio of 0.8
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

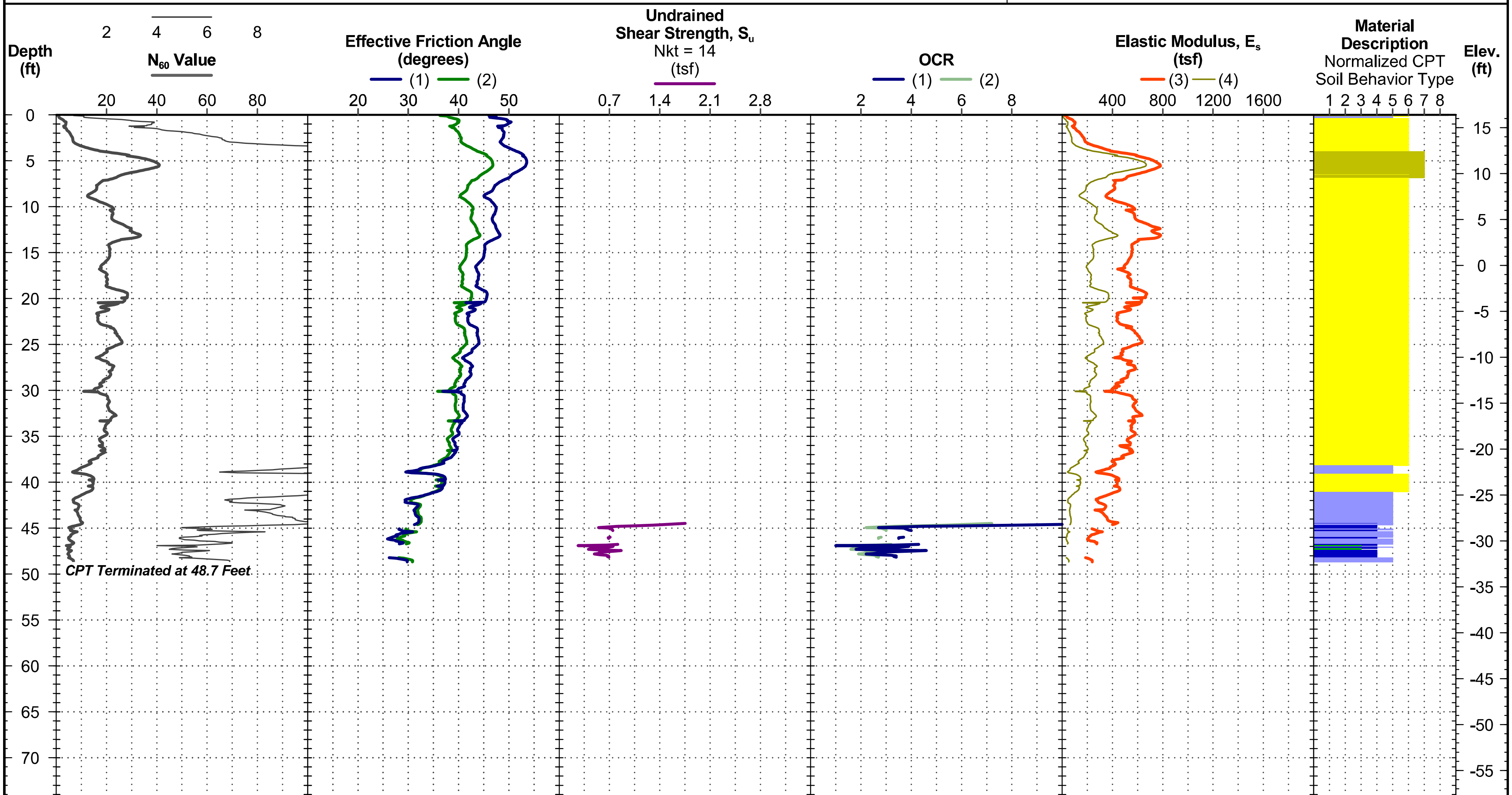
DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/17/2016	CPT Completed: 2/17/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-12

CPT CORRELATIVE PARAMETER LOG NO. CPT-302

SEE CPT LOG NO. CPT-302 FOR DETAILED TEST RESULTS

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 16.4 ft
SITE: Brevard County, FL		



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION	Notes:	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY		
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in		CPT Started: 2/18/2016 Rig: 735 Project No.: HB155022	CPT Completed: 2/18/2016 Operator: Tony Antonatos Exhibit: A-13

CPT CORRELATIVE PARAMETER LOG NO. CPT-303

SEE CPT LOG NO. CPT-303 FOR DETAILED TEST RESULTS

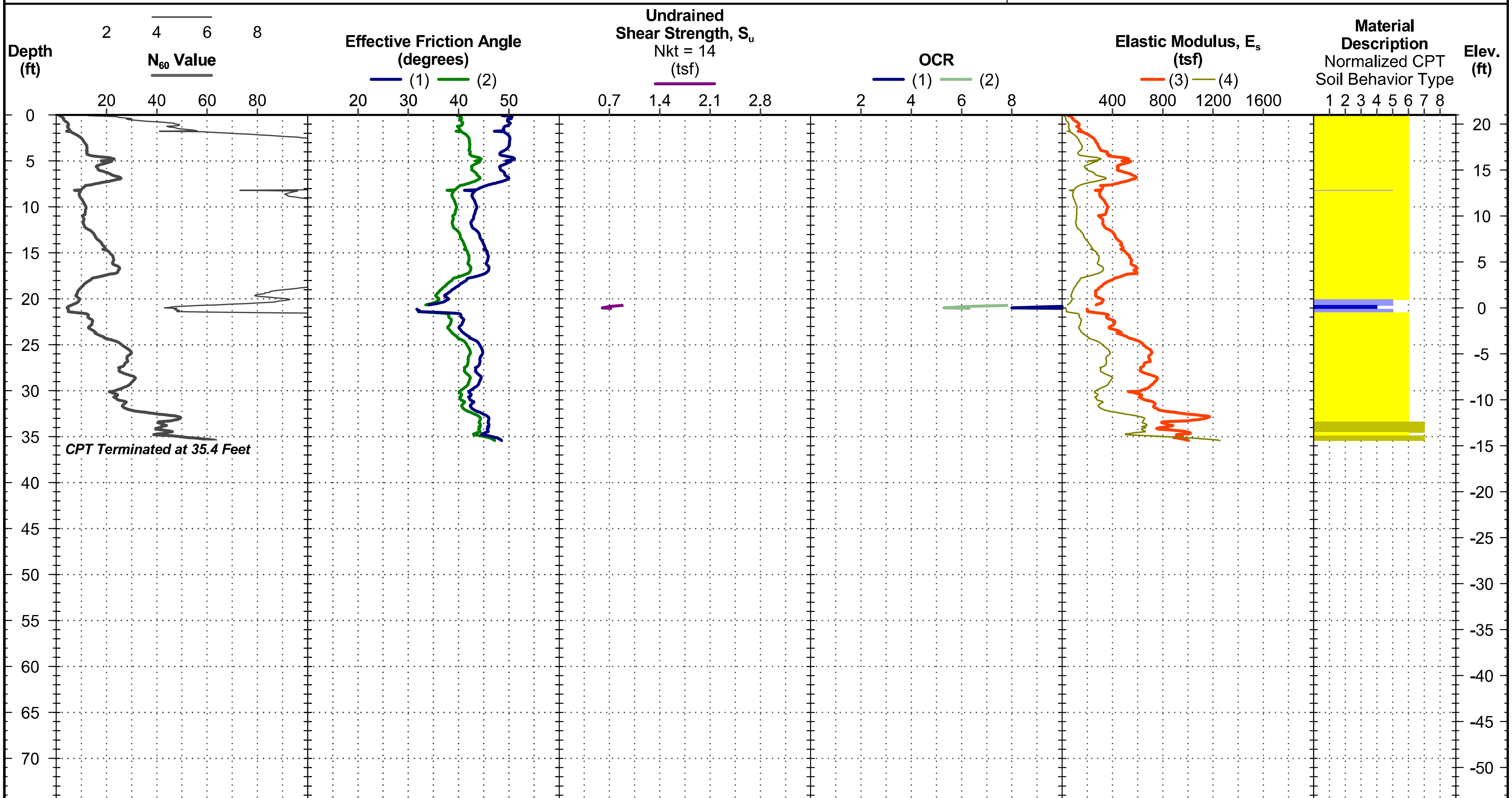
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 21.0 ft

SITE: Brevard County, FL



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Notes:
Probe no. DPG1228 with net area ratio of 0.8
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/19/2016	CPT Completed: 2/19/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-14

APPENDIX B
LABORATORY TESTING REPORTS

DUNKELBERGER
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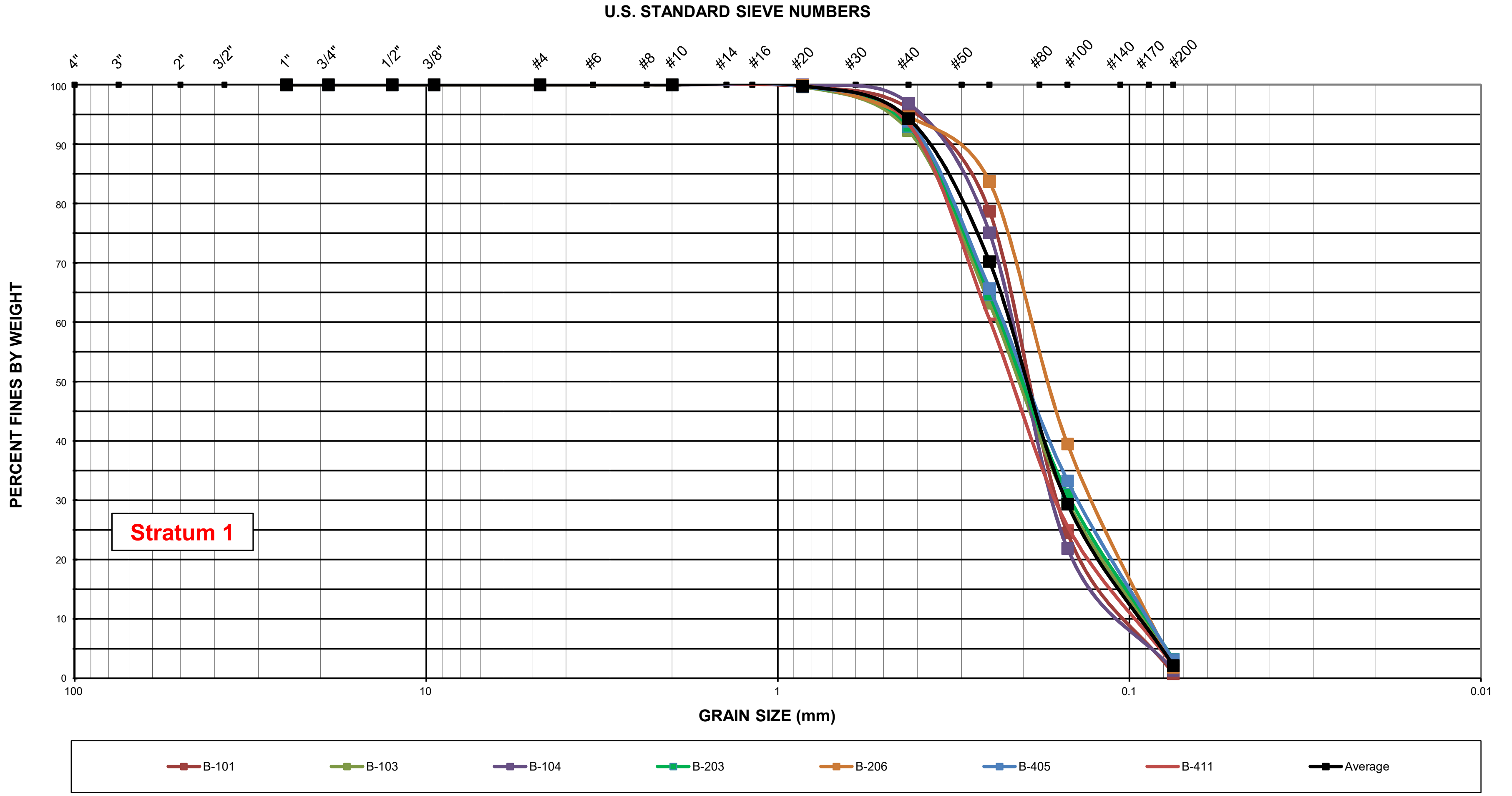
Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-101	18 - 20	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.7	96.0	78.7	24.5	0.8
B-103	3 - 5	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.7	92.3	63.2	29.8	2.7
B-104	13 - 15	SP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.9	75.1	21.9	1.4
B-203	5 - 7	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.8	93.0	64.6	31.1	3.2
B-206	18 - 20	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.9	94.6	83.7	39.5	1.9
B-405	3 - 5	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.7	93.9	65.7	33.3	3.0
B-411	3 - 5	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.8	93.4	60.5	25.7	2.2
			-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	100.0	100.0	99.8	94.3	70.2	29.4	2.2

Exhibit B-1

DUNKELBERGER
engineering & testing, inc.
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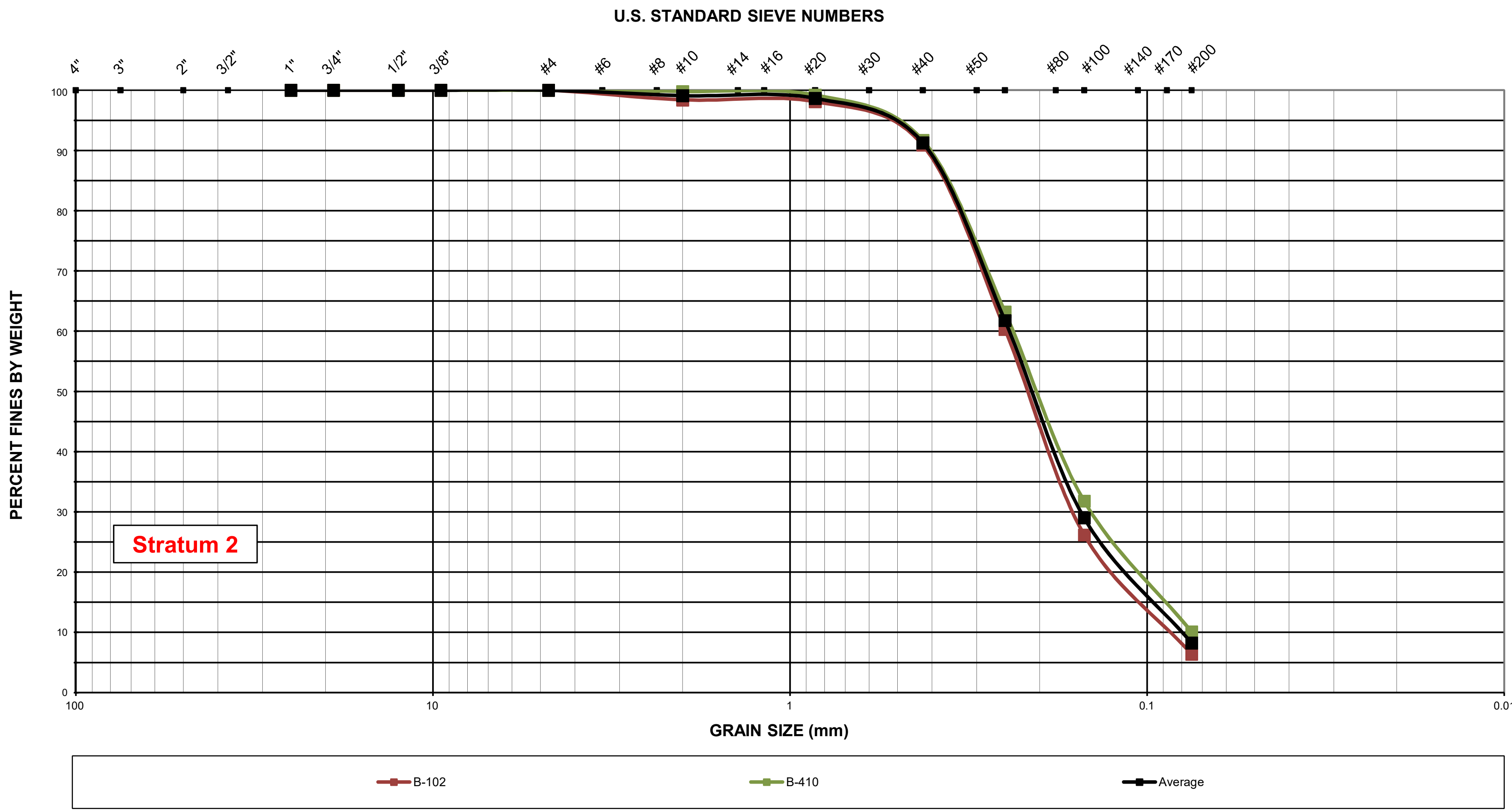
Particle Size Analysis of Soil

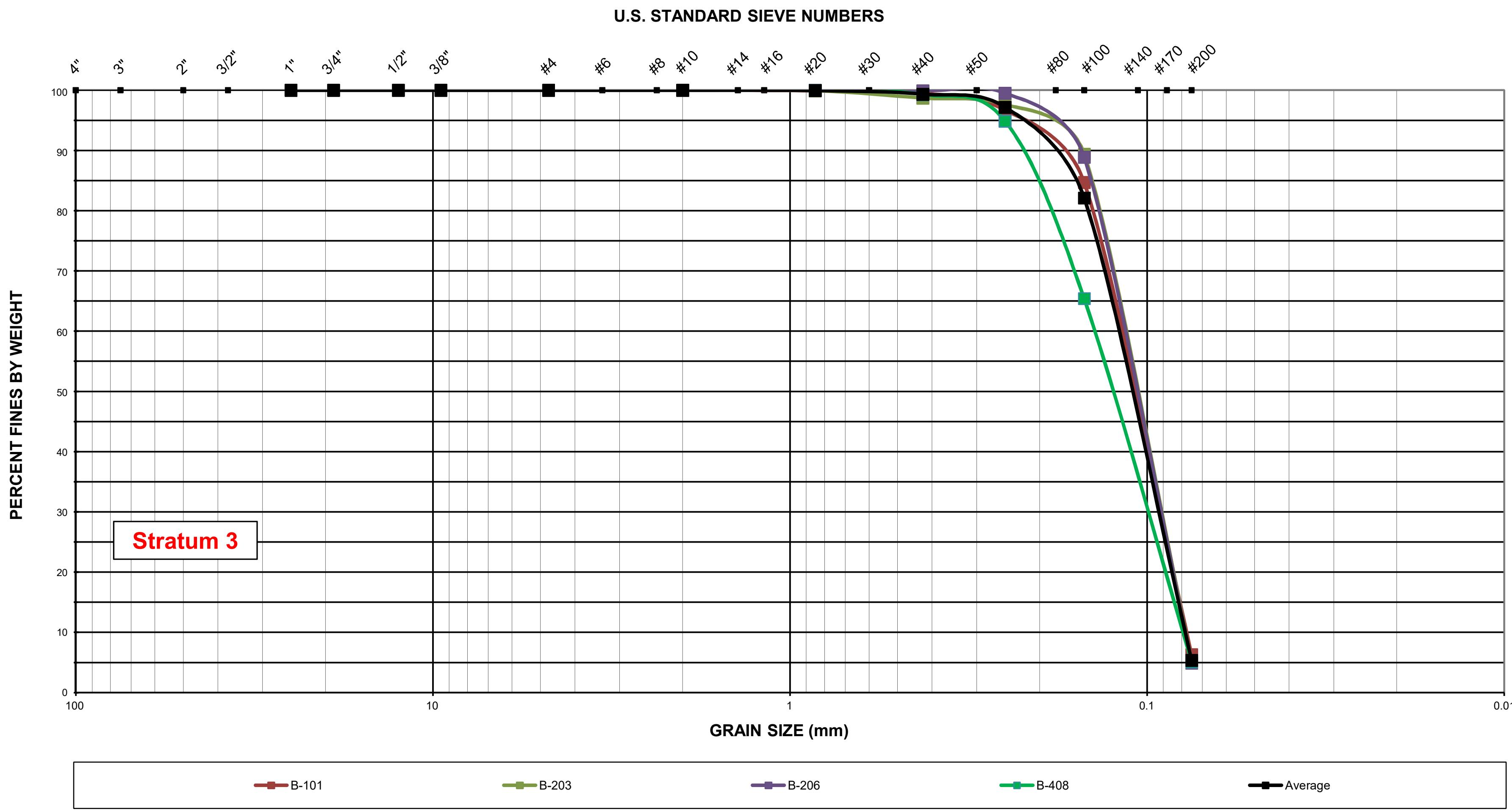


Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-102	3 - 5	SP-SM	100.0	100.0	100.0	100.0	100.0	98.4	98.1	90.9	60.3	26.2	6.4
B-410	7 - 9	SP-SM	100.0	100.0	100.0	100.0	100.0	99.8	99.2	91.7	63.2	31.8	10.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	-	SP-SM	100.0	100.0	100.0	100.0	100.0	99.1	98.7	91.3	61.8	29.0	8.3

Exhibit B-2

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Particle Size Analysis of Soil

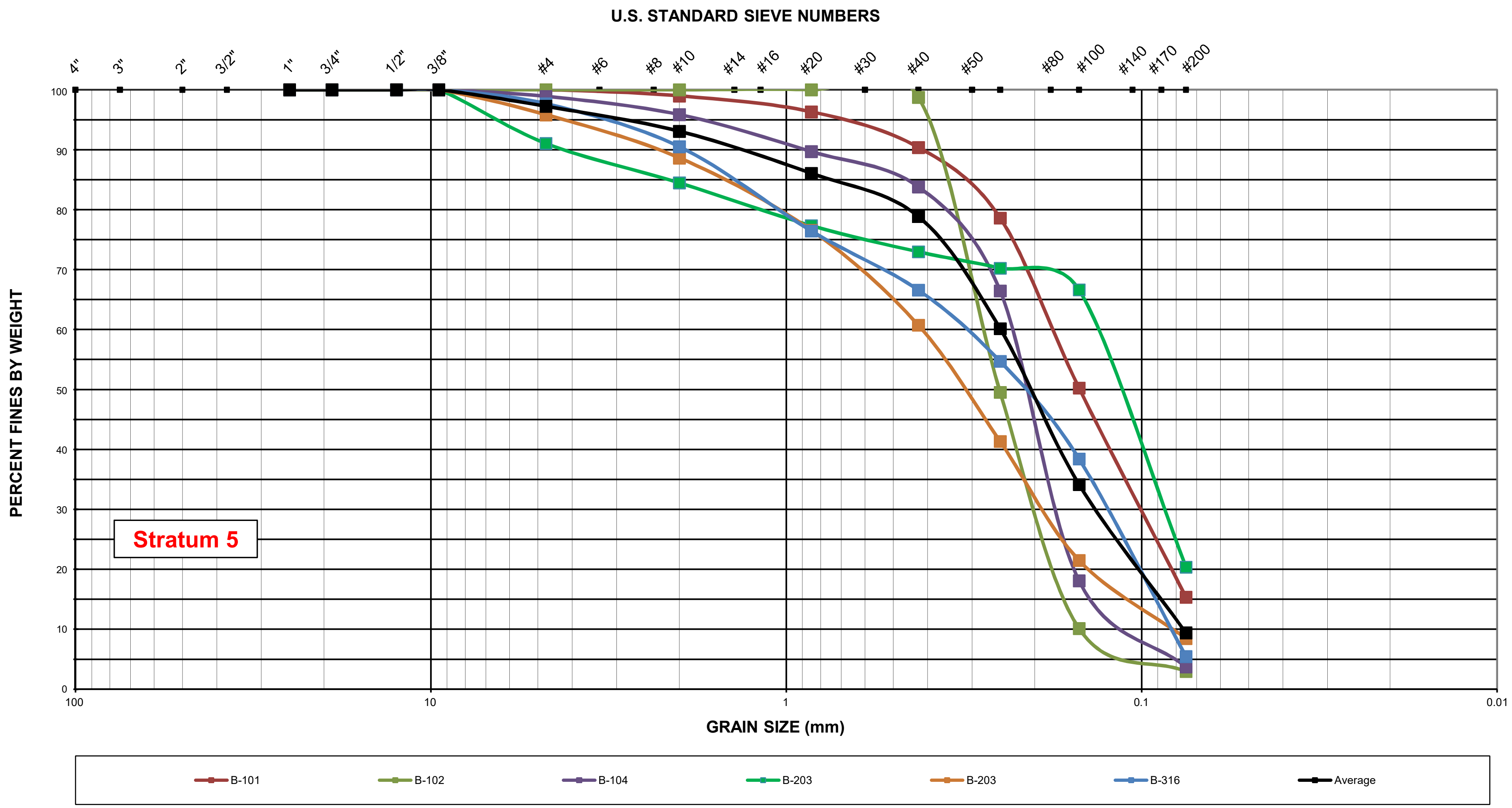


Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-101	9 - 11	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	96.7	84.7	6.3
B-203	38 - 40	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.7	97.6	89.4	5.2
B-206	13 - 15	SP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	88.9	4.9
B-408	13 - 15	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.3	94.9	65.4	5.1
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	97.2	82.1	5.4

Exhibit B-3

DUNKELBERGER engineering & testing, inc. A Terracon COMPANY

Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-101	53 - 55	SM	100.0	100.0	100.0	100.0	100.0	99.0	96.3	90.4	78.6	50.3	15.4
B-102	58 - 60	SP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7	49.5	10.1	3.0
B-104	43 - 45	SP	100.0	100.0	100.0	100.0	98.9	95.9	89.7	83.8	66.4	18.1	3.7
B-203	58 - 60	SM	100.0	100.0	100.0	100.0	91.1	84.5	77.3	73.0	70.2	66.6	20.4
B-203	78 - 80	SP-SM	100.0	100.0	100.0	100.0	95.8	88.6	76.6	60.7	41.3	21.5	8.5
B-316	38 - 40	SP-SM	100.0	100.0	100.0	100.0	97.7	90.5	76.4	66.6	54.7	38.4	5.5
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	97.2	93.1	86.1	78.9	60.1	34.2	9.4

Exhibit B-4

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Particle Size Analysis of Soil

Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-103	38 - 40	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	99.5	98.0	94.9	62.7	5.4
B-204	38 - 40	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	94.9	83.0	74.8	59.3	5.2
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	100.0	100.0	97.2	90.5	84.8	61.0	5.3

Exhibit B-5

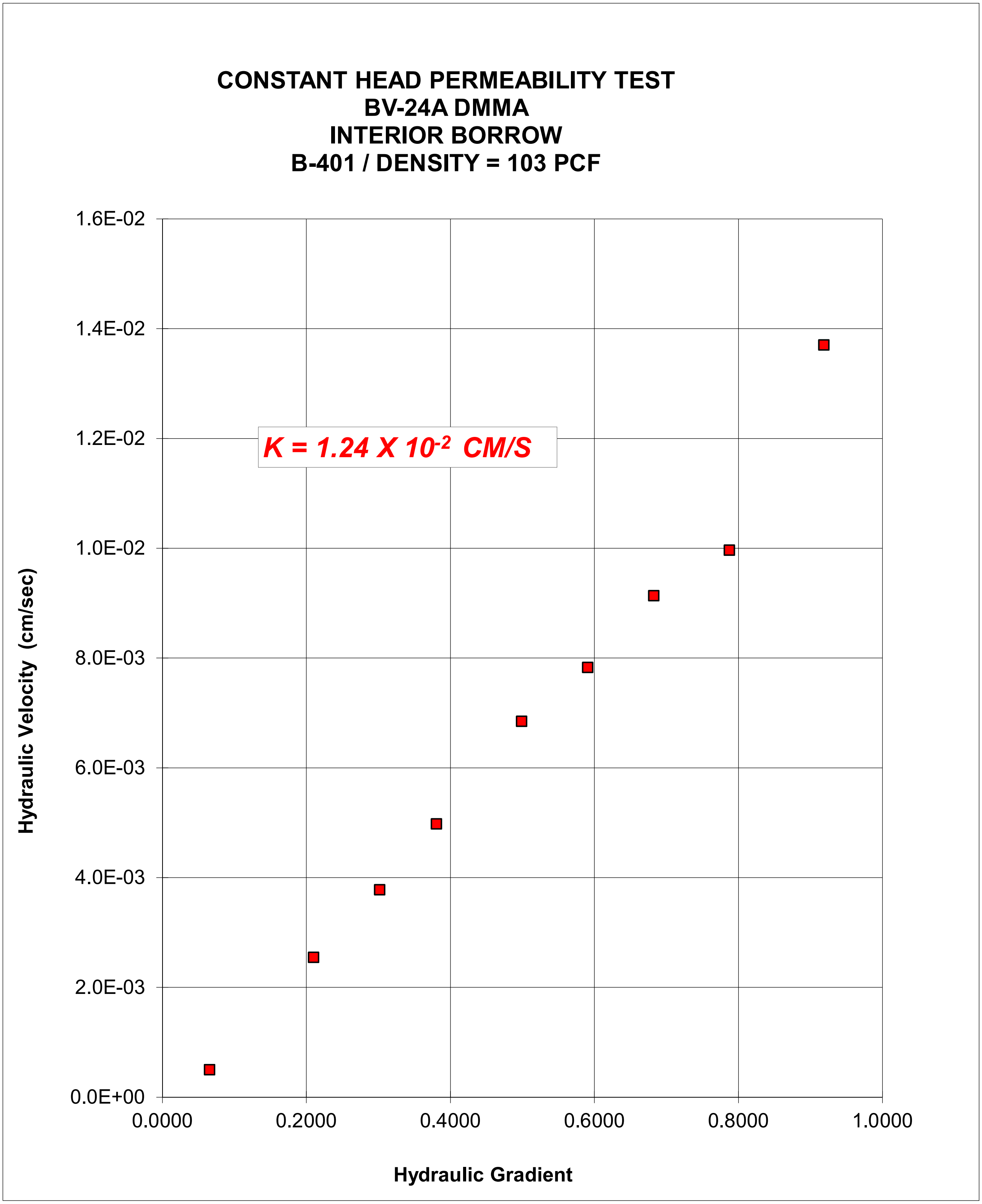
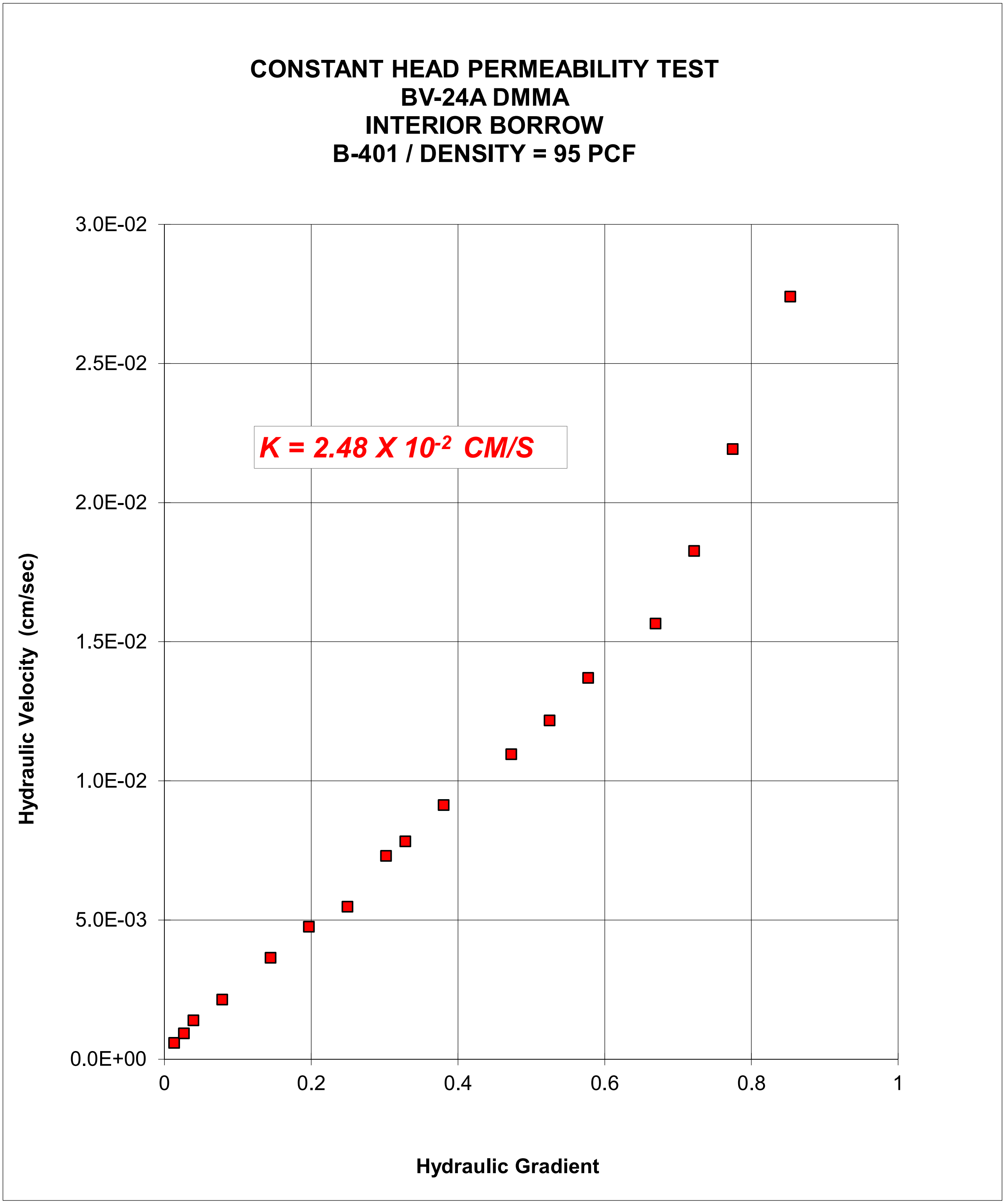
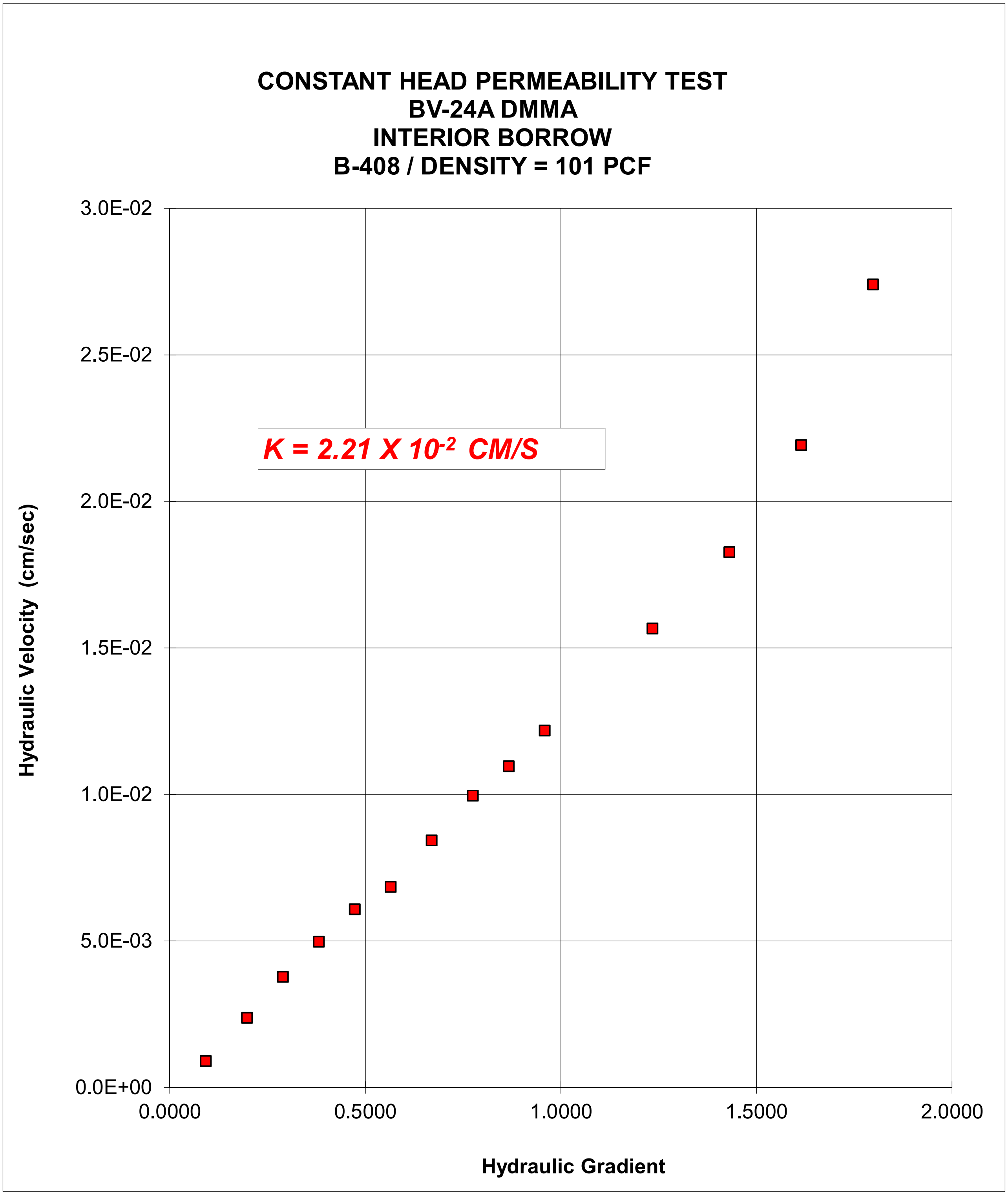
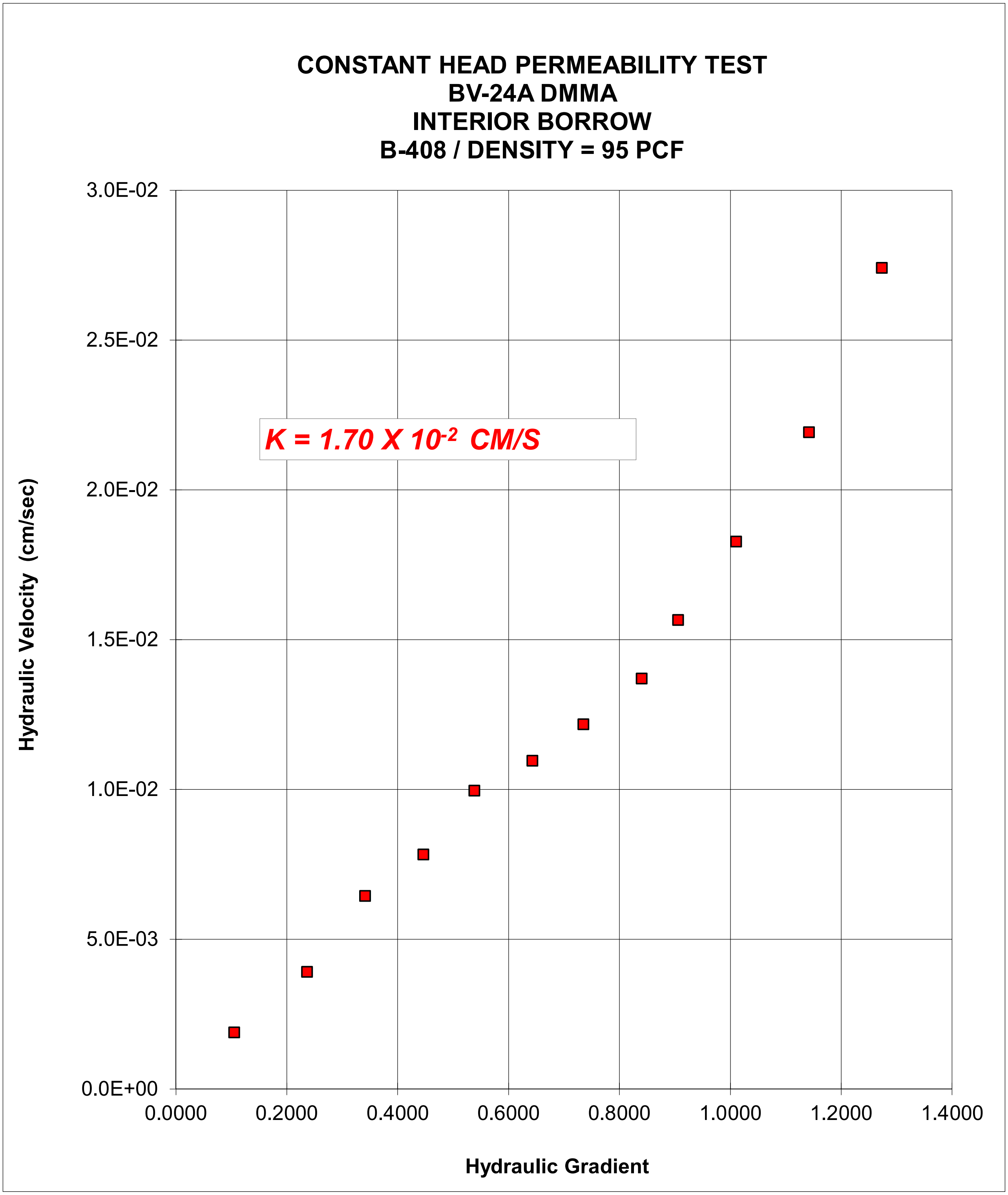

CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-401 / DENSITY = 103 PCF
K = 1.24 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
1.6E-02
1.4E-02
1.2E-02
1.0E-02
8.0E-03
6.0E-03
4.0E-03
2.0E-03
0.0E+00
0.0000
0.2000
0.4000
0.6000
0.8000
1.0000
Hydraulic Gradient

Exhibit B-6

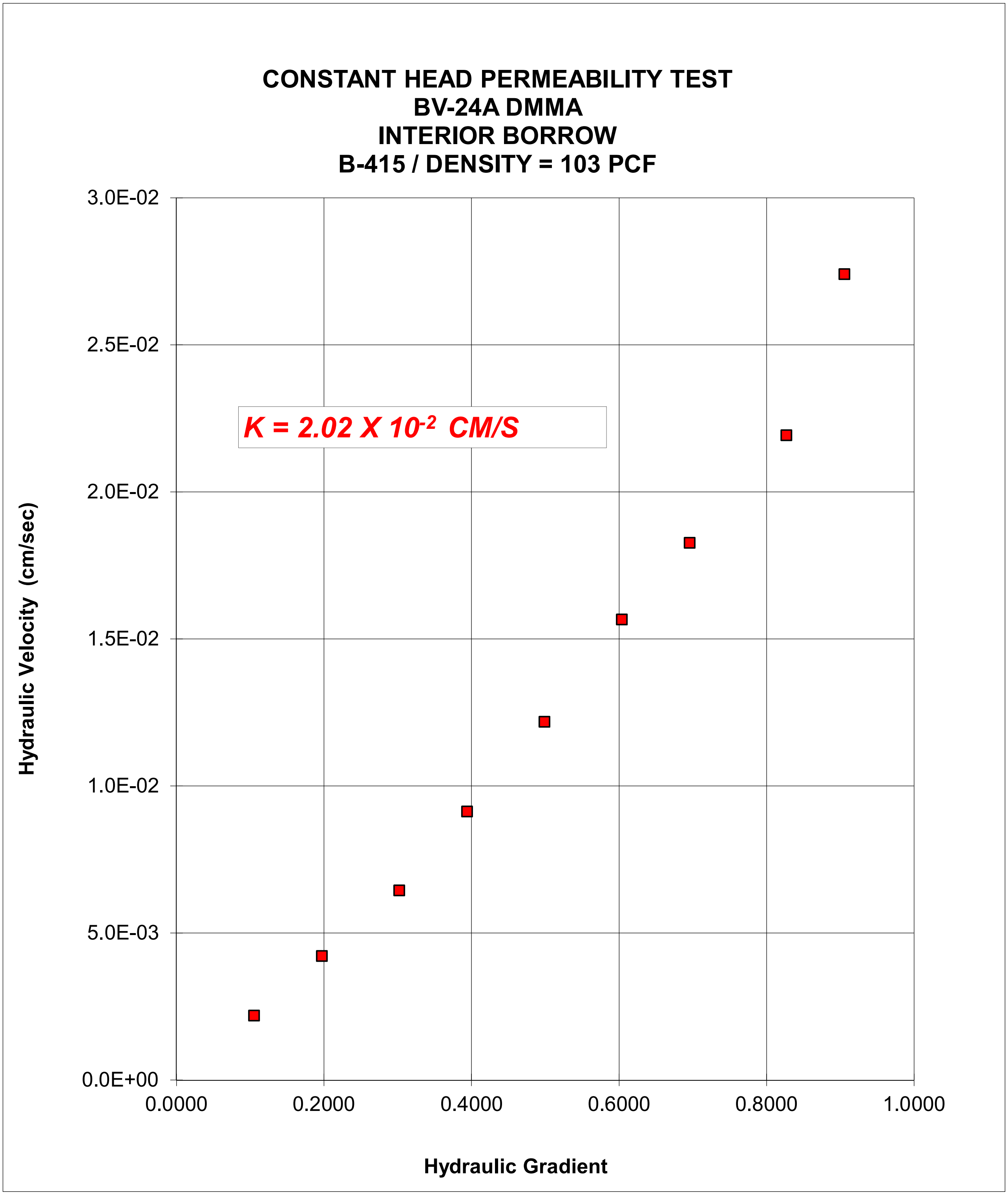

CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-401 / DENSITY = 95 PCF
K = 2.48 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
Hydraulic Gradient
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0
0.2
0.4
0.6
0.8
1

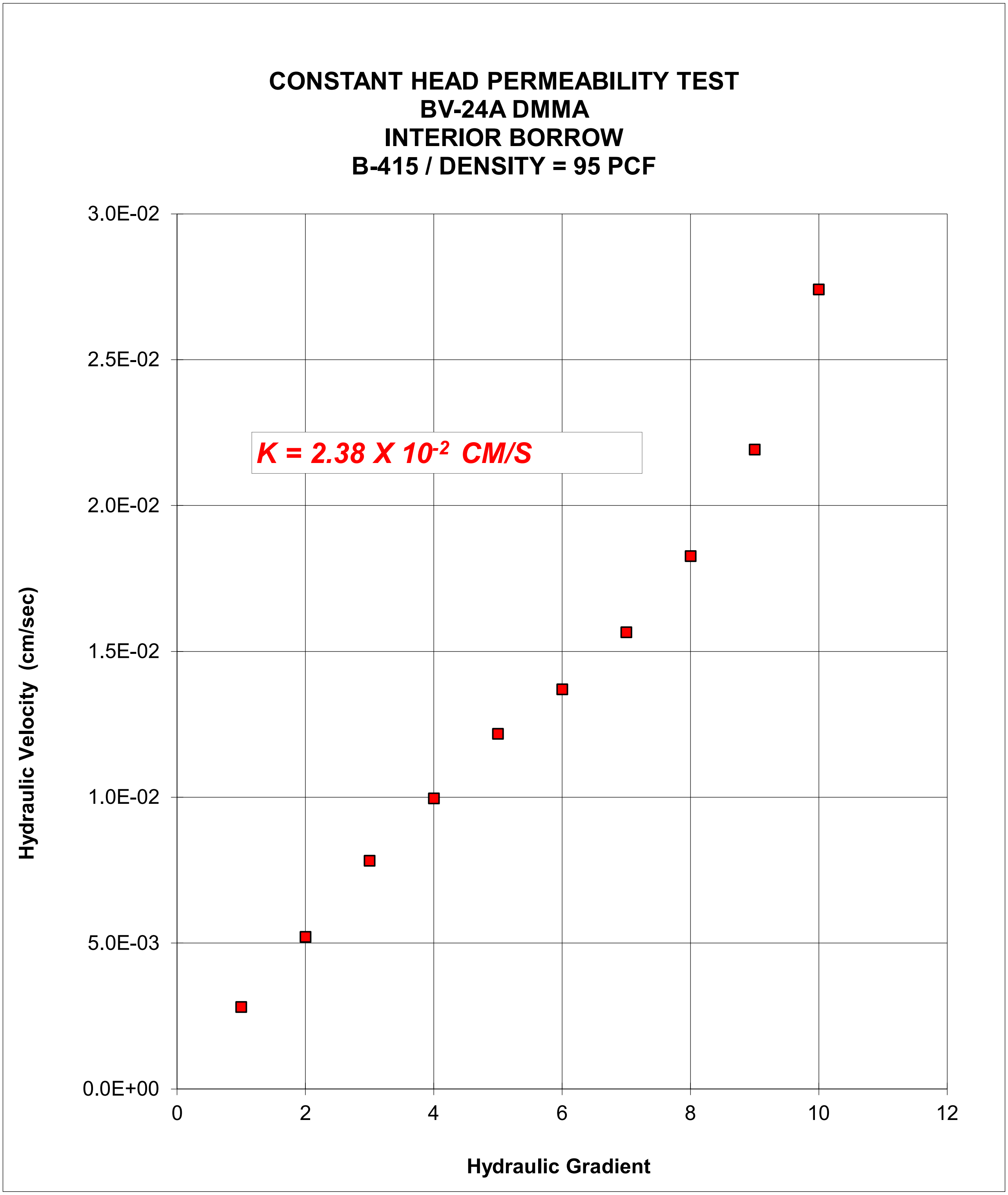


CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-408 / DENSITY = 101 PCF
K = 2.21 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
Hydraulic Gradient
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0.0000
0.5000
1.0000
1.5000
2.0000



CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-408 / DENSITY = 95 PCF
K = 1.70 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0.0000
0.2000
0.4000
0.6000
0.8000
1.0000
1.2000
1.4000
Hydraulic Gradient

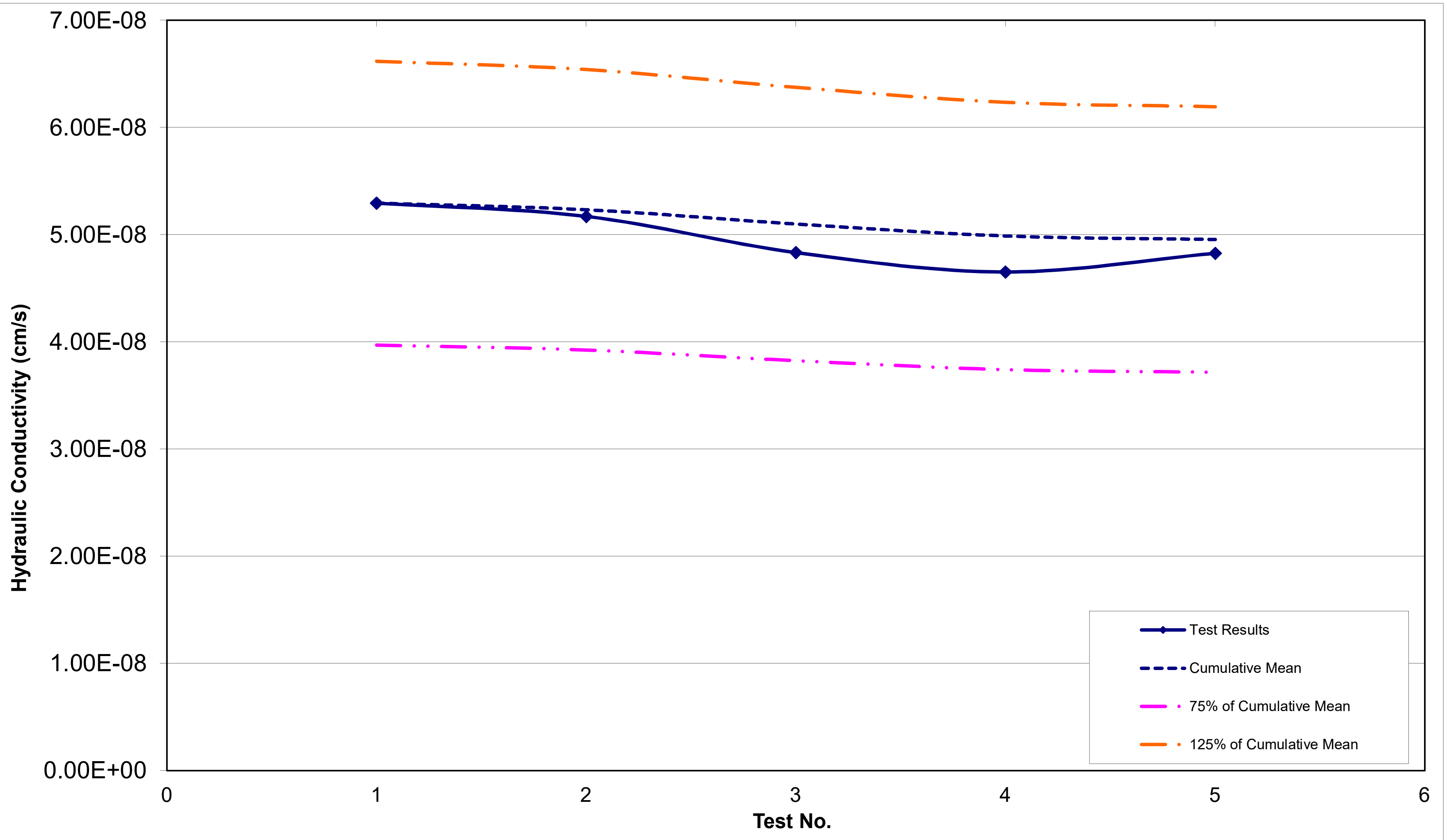

CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-415 / DENSITY = 103 PCF
K = 2.02 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0.0000
0.2000
0.4000
0.6000
0.8000
1.0000
Hydraulic Gradient


CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-415 / DENSITY = 95 PCF
K = 2.38 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0
2
4
6
8
10
12
Hydraulic Gradient

HYDRAULIC CONDUCTIVITY TEST RESULTS
(ASTM D 5084 - Method C)

PROJECT NAME: BV-24A
SAMPLE ID: B-102 (31 - 33 ft)

Hydraulic Conductivity = 4.87E-08 cm/sec



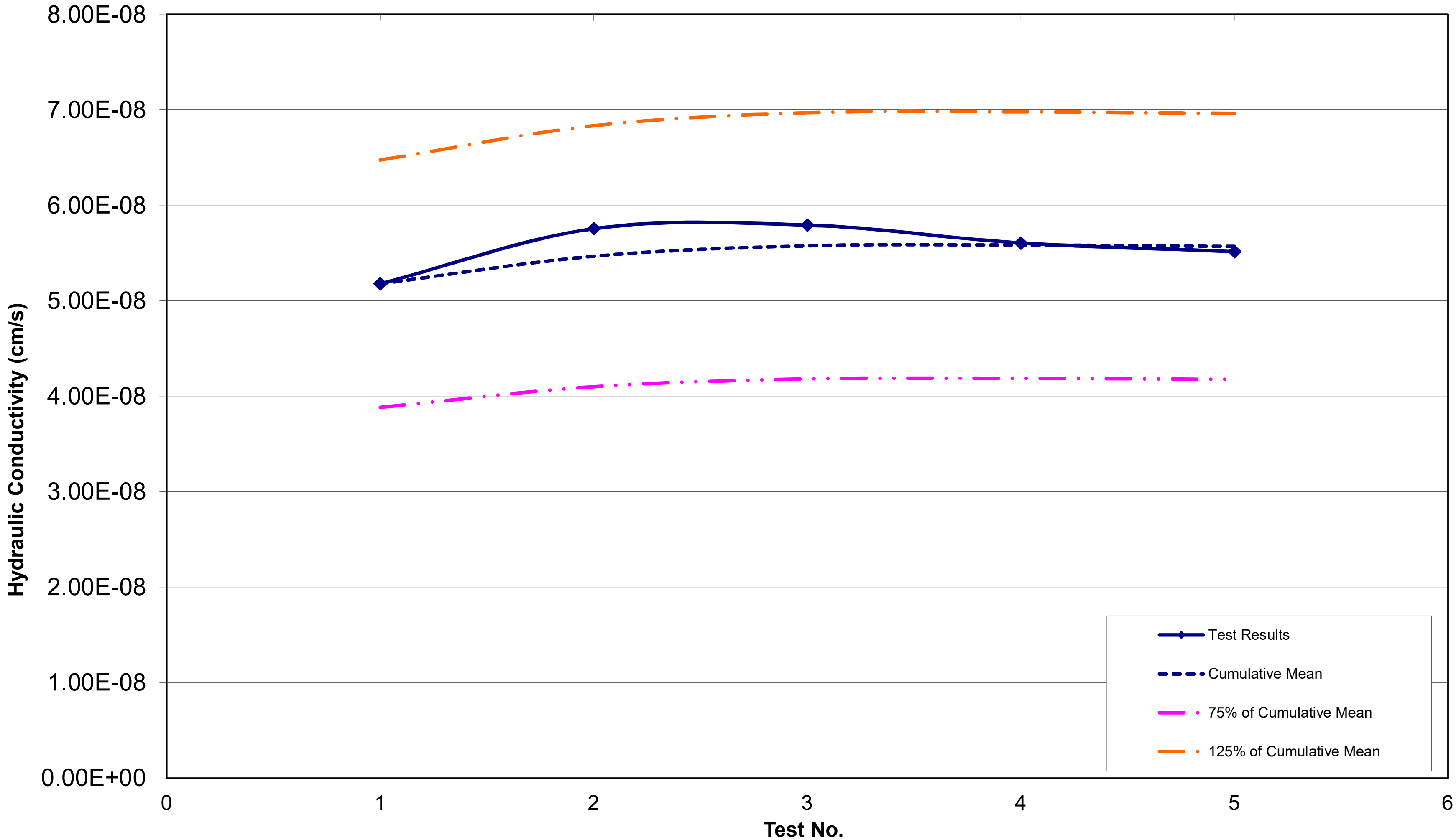
DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

Exhibit B-12

HYDRAULIC CONDUCTIVITY TEST RESULTS
(ASTM D 5084 - Method C)

PROJECT NAME: BV-24A
SAMPLE ID: B-203 (66 - 68 ft)

Hydraulic Conductivity = 5.57E-08 cm/sec

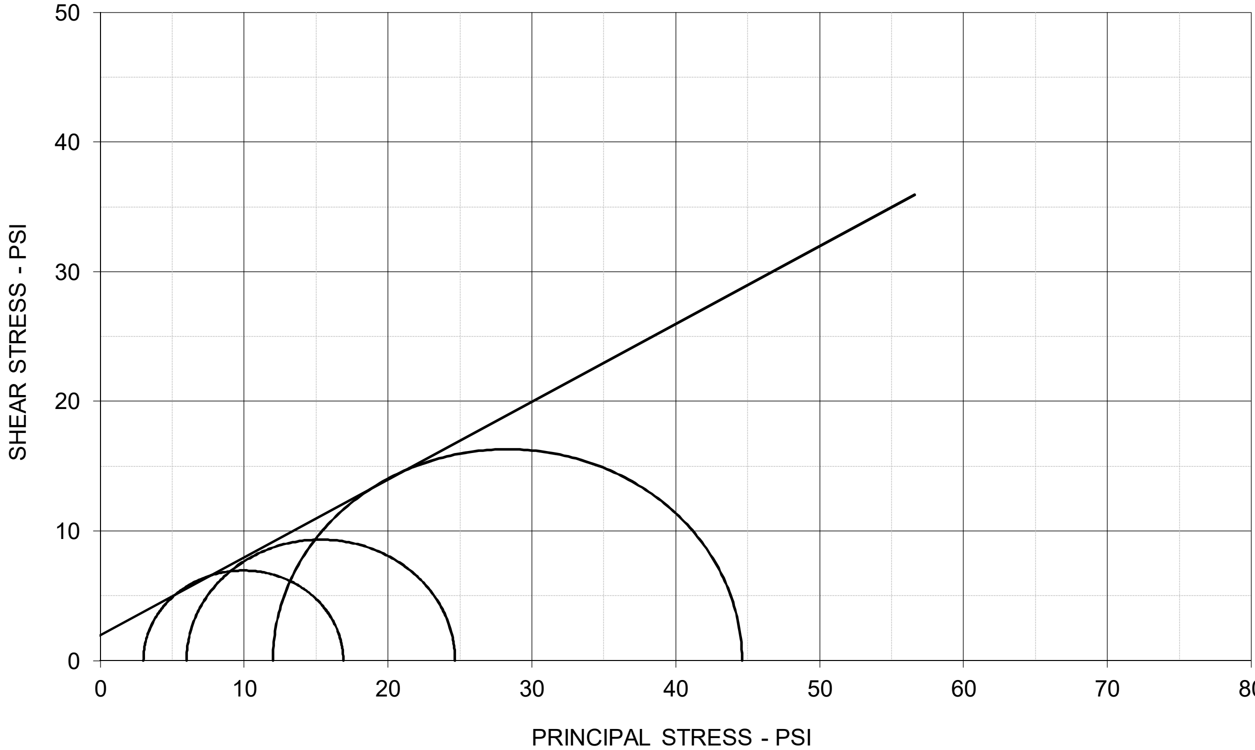


DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

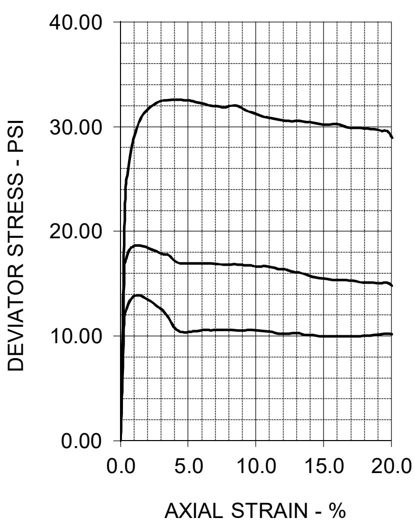
Exhibit B-13

TRIAXIAL SHEAR TEST REPORT

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY



EFFECTIVE STRESS PARAMETERS	φ ' = 31.0 deg	c' = 1.9 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	15.0	15.0	15.0	
Dry Density - pcf	96.9	96.9	96.9	
Diameter - inches	2.80	2.80	2.80	
Height - inches	5.60	5.60	5.60	
AT TEST				
Final Moisture - %	27.0	27.1	26.7	
Dry Density - pcf	96.9	97.0	97.3	
Calculated Diameter (in.)	2.79	2.80	2.76	
Height - inches	5.58	5.59	5.49	
Effect. Cell Pressure - psi	3.0	6.0	12.0	
Failure Stress - psi	13.89	18.66	32.61	
Total Pore Pressure - psi	50.0	50.0	50.0	
Strain Rate - inches/min.	0.05600	0.05600	0.05600	
Failure Strain - %	1.4	1.4	4.3	
σ_1' Failure - psi	16.89	24.66	44.61	
σ_3' Failure - psi	3.00	6.00	12.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CD Triaxial
SAMPLE TYPE: Remolded
DESCRIPTION: Gray Fine-Medium Sand
SAMPLE LOCATION: 401-402
ASSUMED SPECIFIC GRAVITY: 2.70
LL: NP PL: NP PI: NP Percent -200: 2.8
REMARKS: Specimens remolded to 95% at opt.

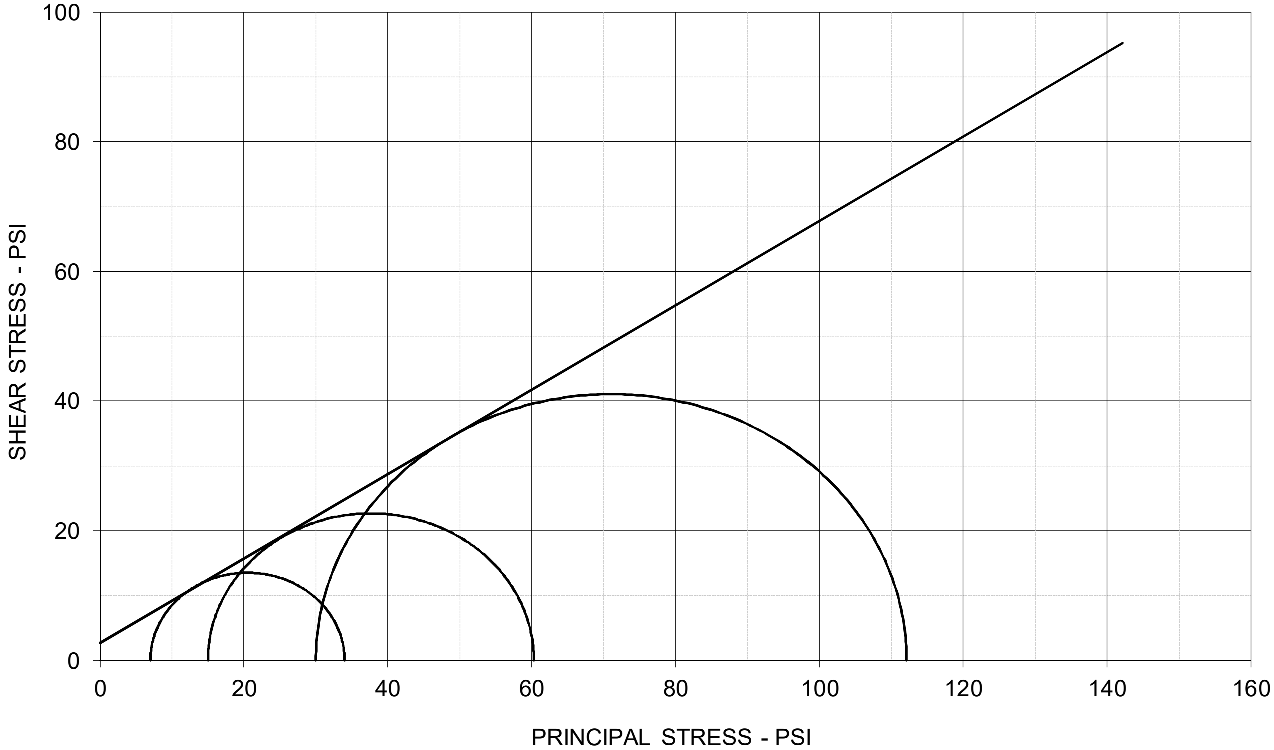
PROJECT INFORMATION

PROJECT: BV-24A DMMA
LOCATION: Grant-Valkaria, FL
PROJECT NO: HB155022
CLIENT: Taylor Engineering, Inc
DATE: 5/24/16

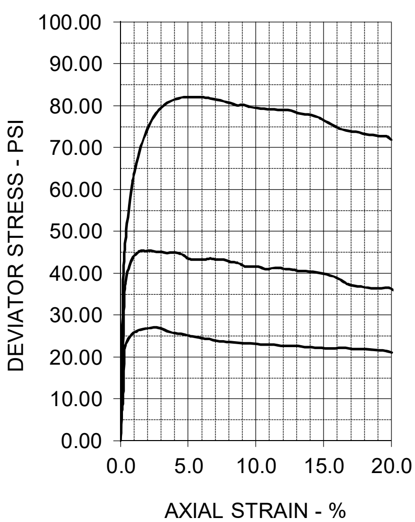
TERRACON Exhibit B-14

TRIAXIAL SHEAR TEST REPORT

DUNKELBERGER engineering & testing, inc. A Terracon COMPANY



EFFECTIVE STRESS PARAMETERS	ϕ ' = 33.1 deg	c' = 2.7 psi

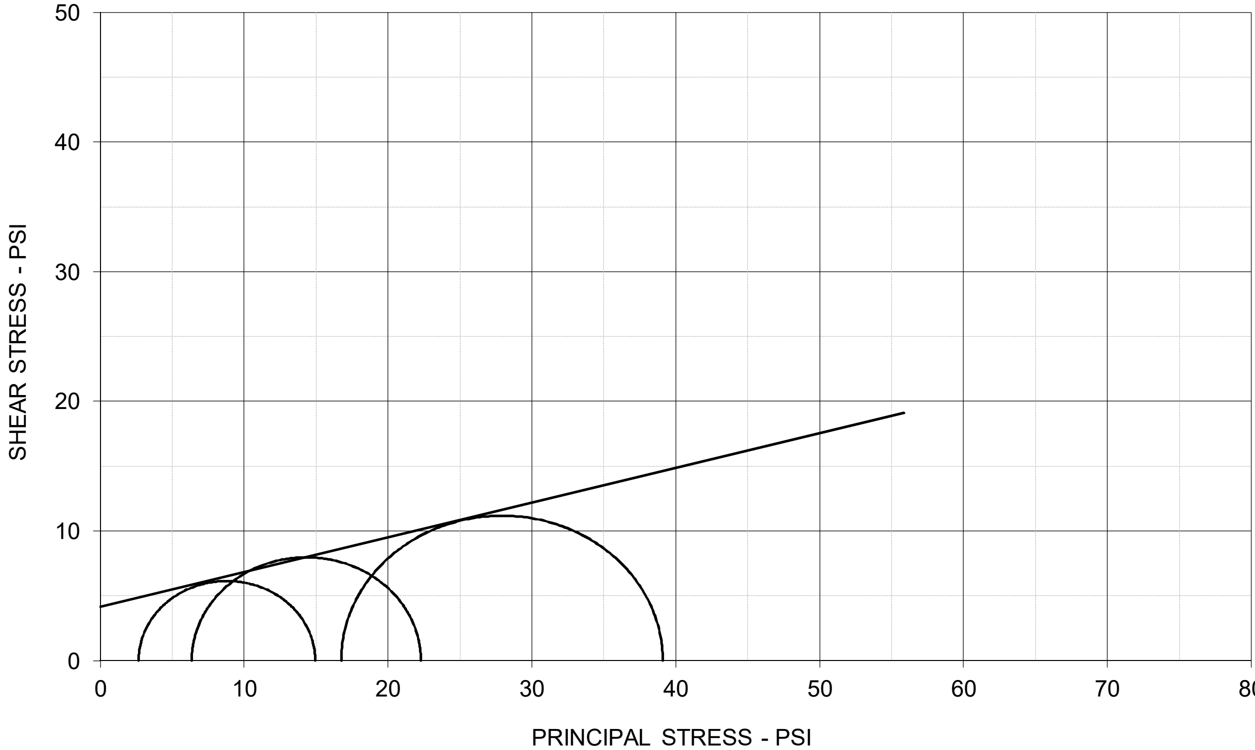


SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	10.0	10.0	10.0	
Dry Density - pcf	97.9	97.9	97.9	
Diameter - inches	2.80	2.80	2.80	
Height - inches	5.60	5.60	5.60	
AT TEST				
Final Moisture - %	26.2	26.0	26.0	
Dry Density - pcf	98.0	98.2	98.4	
Calculated Diameter (in.)	2.76	2.75	2.77	
Height - inches	5.47	5.46	5.51	
Effect. Cell Pressure - psi	7.0	15.0	30.0	
Failure Stress - psi	27.01	45.32	82.12	
Total Pore Pressure - psi	50.0	50.0	50.0	
Strain Rate - inches/min.	0.05600	0.05600	0.05600	
Failure Strain - %	2.7	2.3	5.1	
σ_1' Failure - psi	34.01	60.32	112.12	
σ_3' Failure - psi	7.00	15.00	30.00	

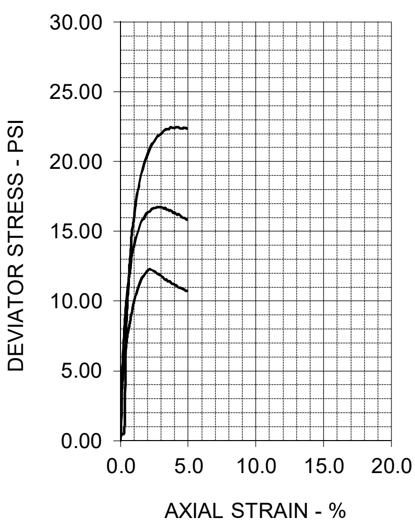
TEST DESCRIPTION	PROJECT INFORMATION
TYPE OF TEST & NO: CD Triaxial	PROJECT: BV-24A DMMA
SAMPLE TYPE: Remolded	LOCATION: Grant-Valkaria, FL
DESCRIPTION: Gray Fine-Medium Sand	PROJECT NO: HB155022
SAMPLE LOCATION: 413-414	CLIENT: Taylor Engineering, Inc
ASSUMED SPECIFIC GRAVITY: 2.70	DATE: 5/24/16
LL: NP PL: NP PI: NP Percent -200: 2.5	**TERRACON** Exhibit B-15
REMARKS: Specimens remolded to 95% at opt.	

TRIAXIAL SHEAR TEST REPORT

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY



EFFECTIVE STRESS PARAMETERS	φ ' = 15.0 deg	c' = 4.2 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	54.0	54.0	54.0	
Dry Density - pcf	68.6	68.6	68.6	
Diameter - inches	2.86	2.86	2.86	
Height - inches	5.69	5.69	5.69	
AT TEST				
Final Moisture - %			42.9	
Dry Density - pcf	69.6	72.3	77.6	
Calculated Diameter (in.)	2.83	2.85	2.83	
Height - inches	5.60	5.66	5.61	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	12.27	15.93	22.35	
Total Pore Pressure - psi	57.3	63.6	73.3	
Strain Rate - inches/min.	0.00060	0.00060	0.00060	
Failure Strain - %	2.1	4.8	4.9	
σ_1' Failure - psi	14.94	22.29	39.10	
σ_3' Failure - psi	2.67	6.36	16.75	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with Pore Pressure
SAMPLE TYPE: Tube
DESCRIPTION: Grayish Brown Clay
SAMPLE LOCATION: B102 31.0-33.5 ft
ASSUMED SPECIFIC GRAVITY: 2.70
LL: X PL: X PI: X Percent -200: X
REMARKS: Multistage Triaxial

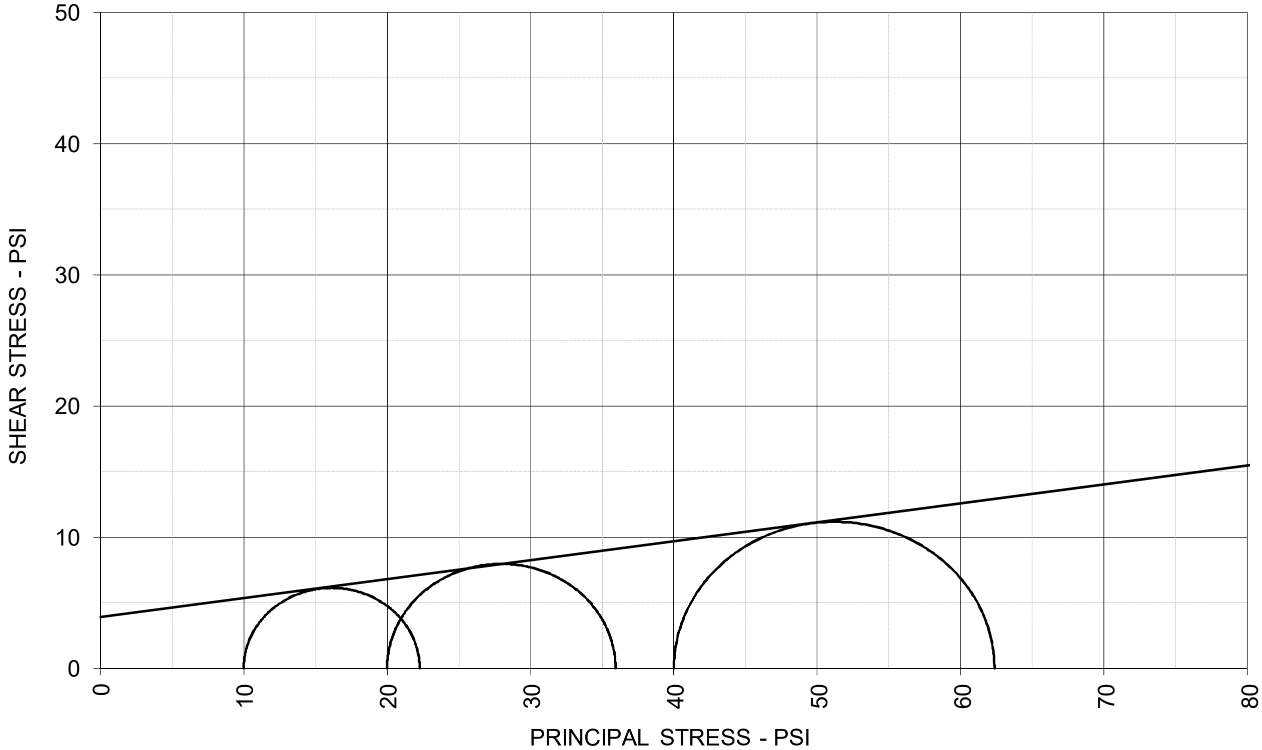
PROJECT INFORMATION

PROJECT: BV-24A DMMA
LOCATION: Grant-Valkaria, FL
PROJECT NO: HB155022
CLIENT: Taylor Engineering, Inc
DATE: 5/26/16

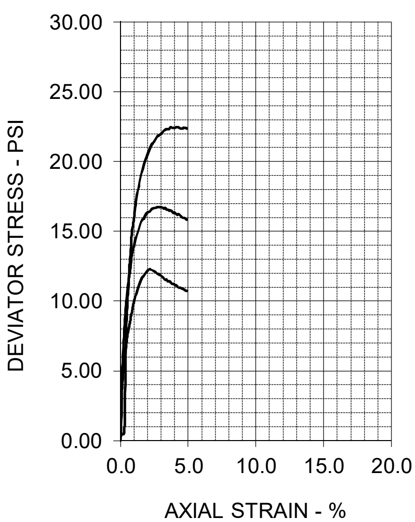
TERRACON Exhibit B-16

TRIAXIAL SHEAR TEST REPORT

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY



TOTAL STRESS PARAMETERS	ϕ = 8.2 deg	c = 3.9 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	54.0	54.0	54.0	
Dry Density - pcf	68.6	68.6	68.6	
Diameter - inches	2.86	2.86	2.86	
Height - inches	5.69	5.69	5.69	
AT TEST				
Final Moisture - %			42.9	
Dry Density - pcf	69.6	72.3	77.6	
Calculated Diameter (in.)	2.83	2.85	2.83	
Height - inches	5.60	5.66	5.61	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	12.27	15.93	22.35	
Total Pore Pressure - psi	57.3	63.6	73.3	
Strain Rate - inches/min.	0.00060	0.00060	0.00060	
Failure Strain - %	2.1	4.8	4.9	
σ_1 Failure - psi	22.27	35.93	62.35	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION

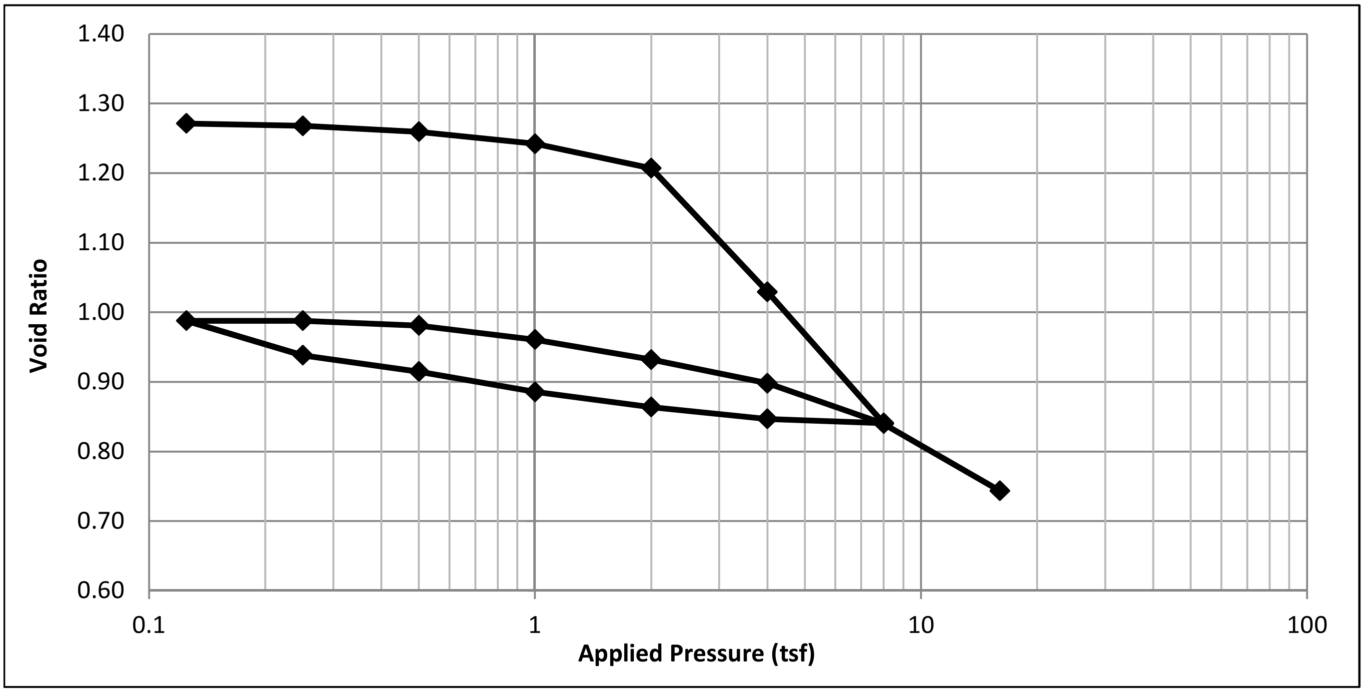
TYPE OF TEST & NO: CU with Pore Pressure
SAMPLE TYPE: Tube
DESCRIPTION: Grayish Brown Clay
SAMPLE LOCATION: B102 31.0-33.5 ft
ASSUMED SPECIFIC GRAVITY: 2.70
LL: X PL: X PI: X Percent -200: X
REMARKS: Multistage Triaxial

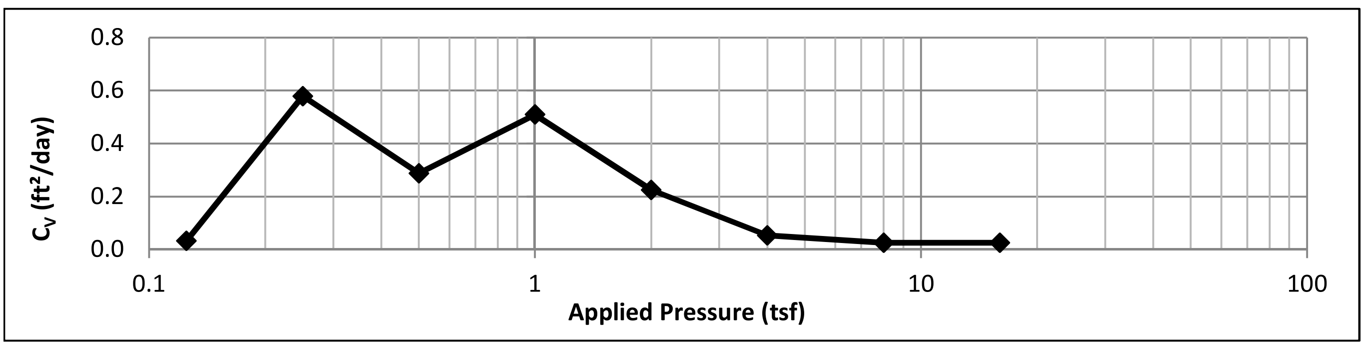
PROJECT INFORMATION

PROJECT: BV-24A DMMA
LOCATION: Grant-Valkaria, FL
PROJECT NO: HB155022
CLIENT: Taylor Engineering, Inc
DATE: 5/26/16

TERRACON	Exhibit B-17

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-102	31 to 33.5	Dark gray clay	CL

LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
34.0	16.7	2.7	74.2	96.6	48.0	27.6	1.27	0.74	4.0	0.47	0.08	85.0

Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

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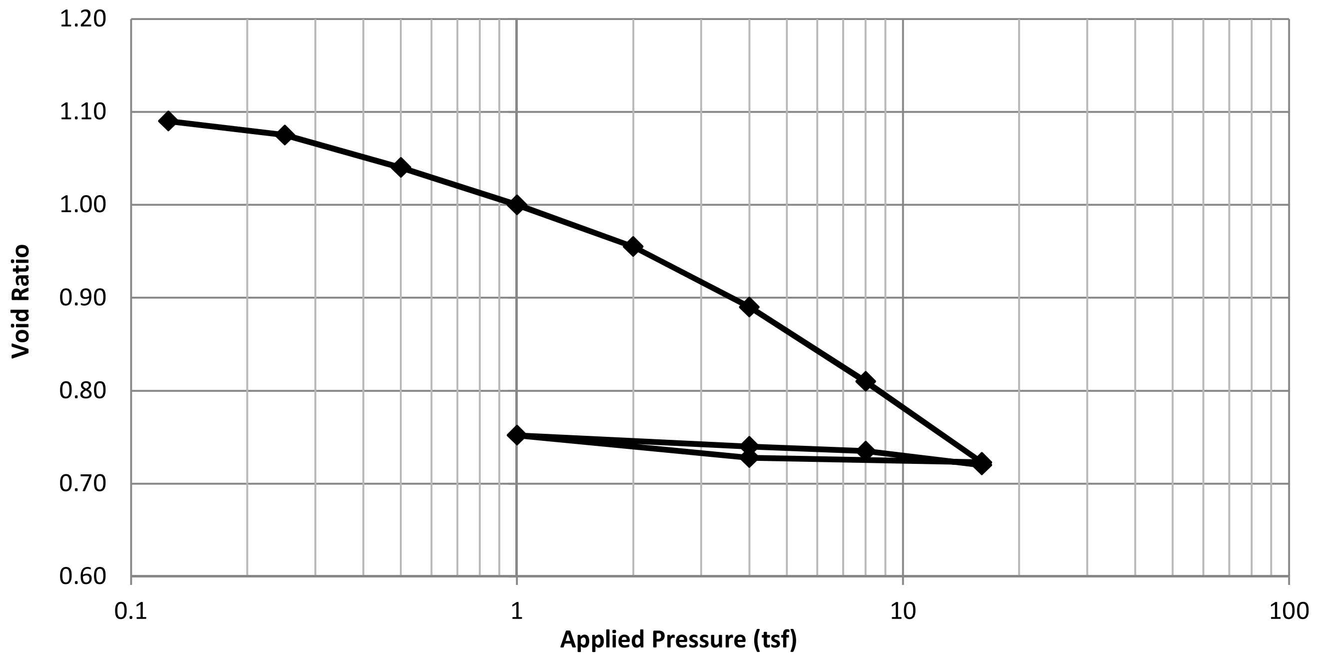
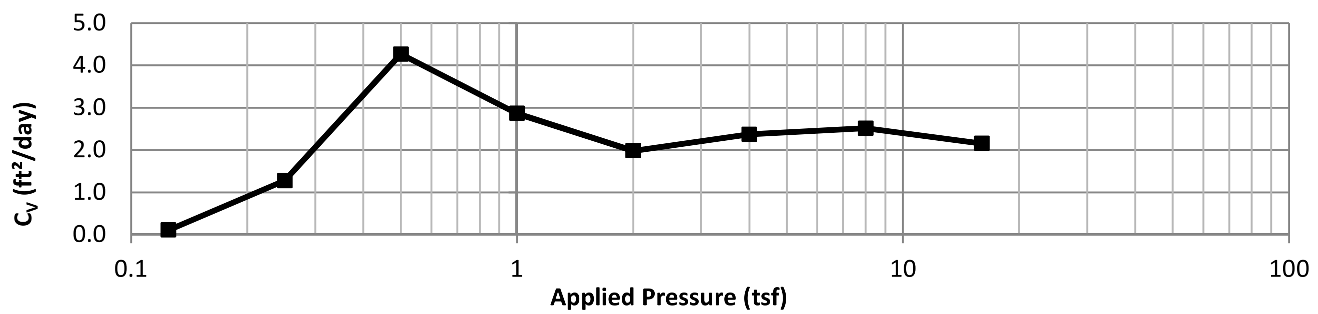
Exhibit B-18

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-104	71 to 73.5	Light gray silt with traces of shell	ML

LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
38.0	11.0	2.7	80.9	98.0	39.5	29.9	1.10	0.72	3.0	0.29	0.03	87.2

Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

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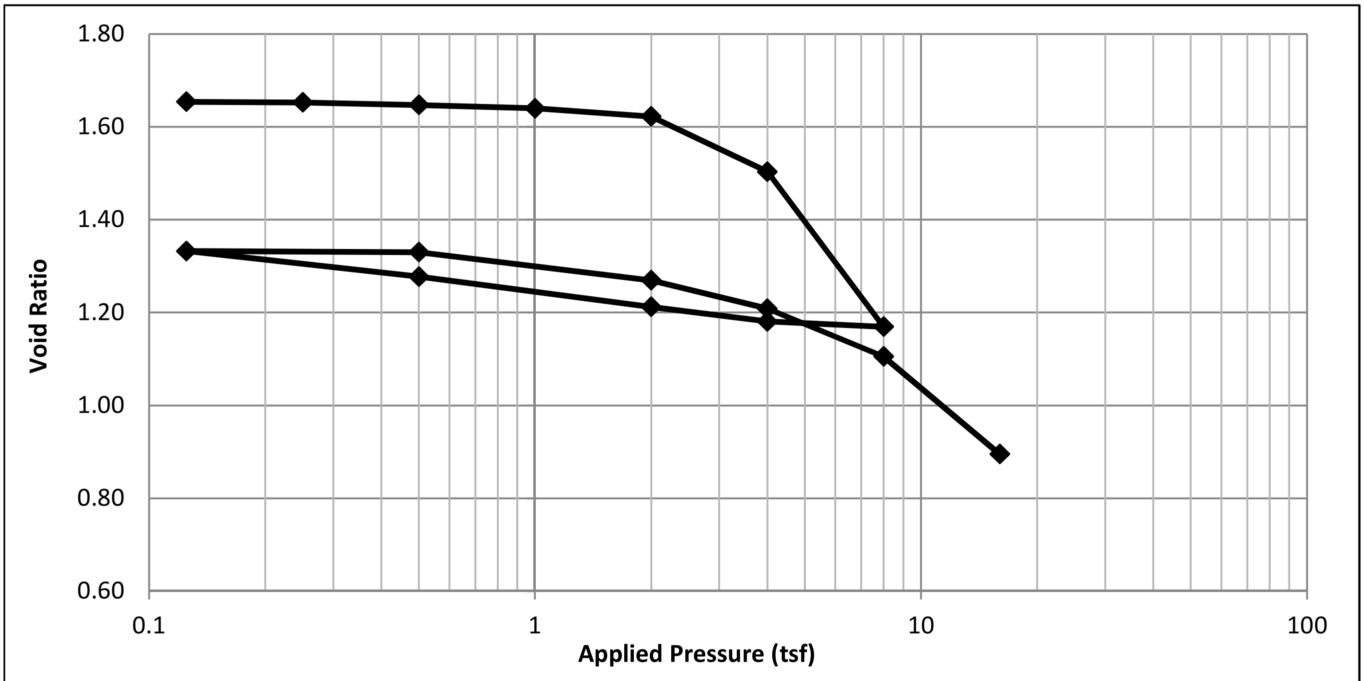
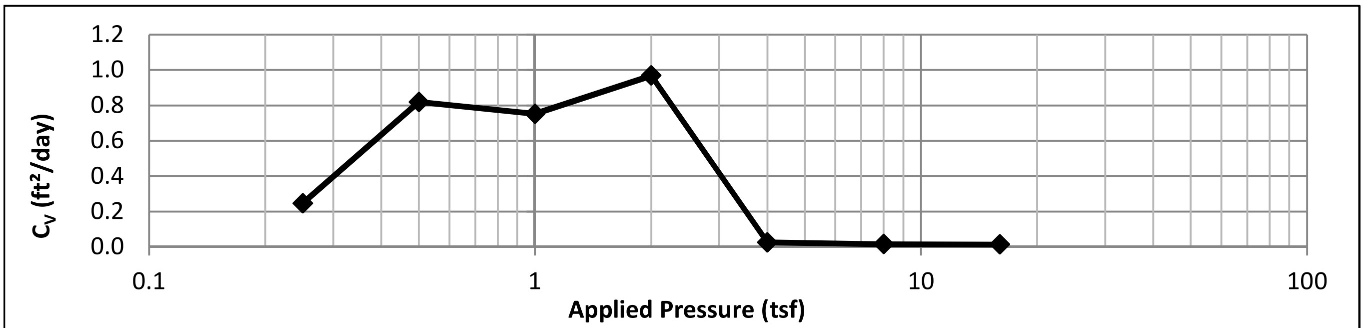
Exhibit B-19

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-203	66 to 68.5	Dark gray clay	CH

LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
6.0	43.0	2.7	63.5	88.9	61.6	35.3	1.65	0.90	6.2	0.70	0.09	98.7

Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

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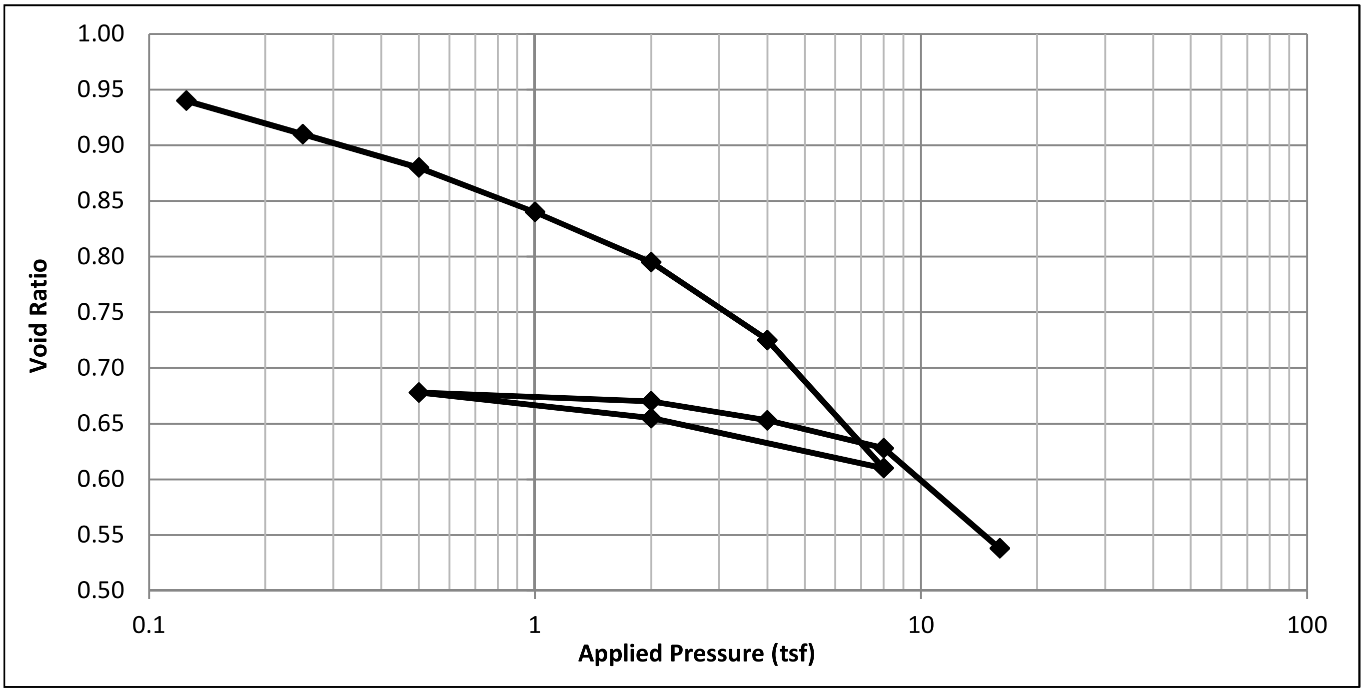
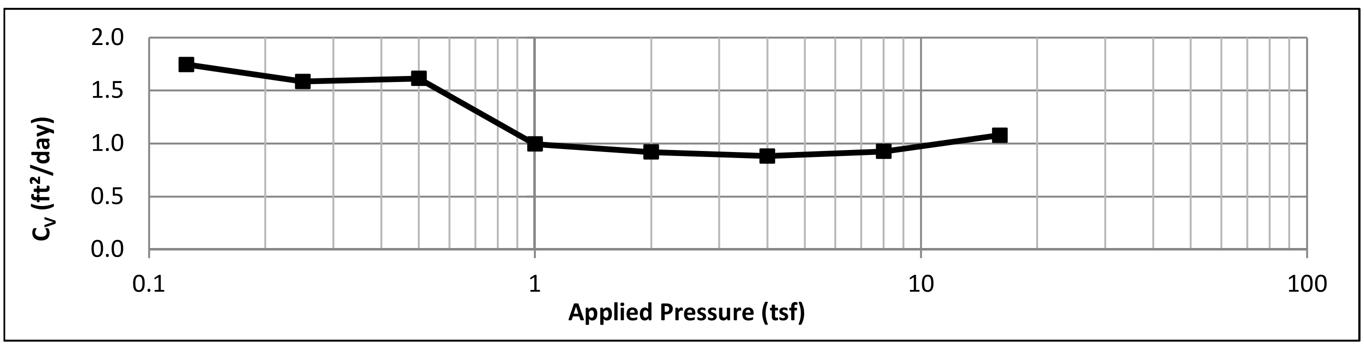
A Terracon COMPANY

Exhibit B-20

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-206	56 - 58.5	Dark gray CLAY	CL

LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
43.0	23.0	2.7	86.5	109.4	27.7	26.1	0.96	0.54	4.2	0.31	0.04	82.4

Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

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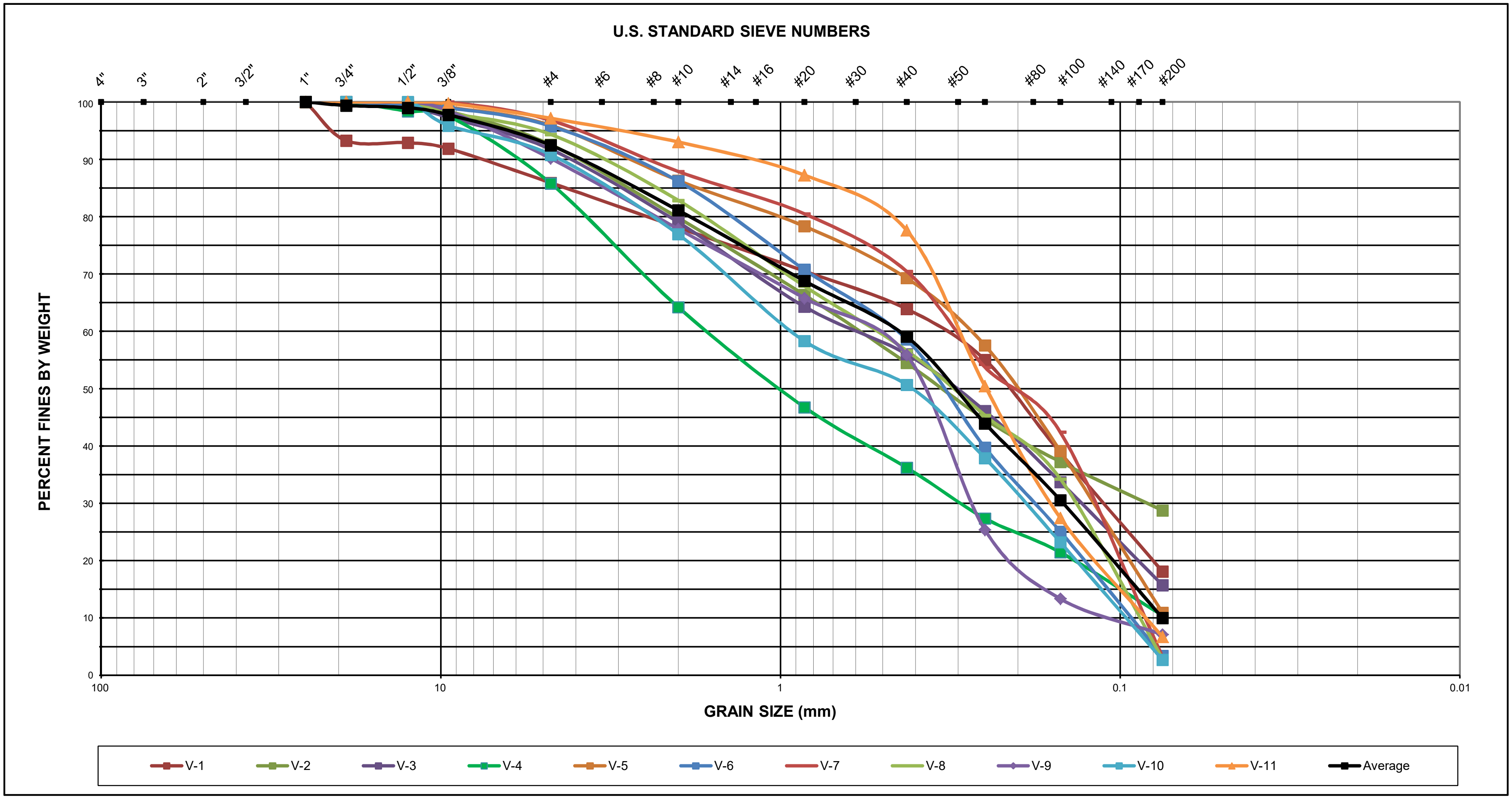
Exhibit B-21

APPENDIX C
DREDGED MATERIAL LABORATORY RESULTS

Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
V-1		SC	100.0	93.2	92.9	91.9	85.9	78.1	70.5	63.9	55.0	38.8	18.1
V-2		SC	100.0	100.0	99.0	98.4	92.6	79.8	66.4	54.5	44.6	37.2	28.8
V-3		SC	100.0	100.0	99.0	97.3	91.7	79.0	64.3	56.0	46.1	33.7	15.7
V-4		SP-SC	100.0	100.0	98.4	97.6	85.8	64.2	46.8	36.2	27.4	21.5	10.4
V-5		SP-SC	100.0	100.0	99.9	99.1	95.9	86.3	78.3	69.3	57.5	39.1	10.9
V-6		SP	100.0	100.0	99.5	99.0	95.8	86.2	70.7	58.6	39.7	25.1	3.4
V-7		SP	100.0	100.0	100.0	100.0	96.8	87.9	80.5	70.5	53.7	42.4	3.2
V-8		SP	100.0	100.0	100.0	98.1	94.3	82.8	67.9	56.6	45.3	34.3	2.9
V-9		SP-SC	100.0	100.0	100.0	98.5	90.1	77.8	65.8	55.9	25.4	13.3	7.1
V-10		SP	100.0	100.0	100.0	95.9	90.8	76.9	58.3	50.7	37.9	23.2	2.7
V-11		SP-SC	100.0	100.0	100.0	99.8	97.2	93.0	87.2	77.6	50.4	27.5	6.7
-			-	-	-	-	-	-	-	-	-	-	-
Average		SP-SC	100.0	99.4	99.0	97.8	92.5	81.1	68.8	59.1	43.9	30.6	10.0

Exhibit C-1

Influent Parameters:	Chloride Content:	94
	pH:	9.2

Sample ID V1

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
43055	4.8	33.9	1	13200	8.3
			2		
			3		
			4		
			5		
			6		
			Sum/Avg		
			Comp		

Pace Results:

SPLP Total Chl = 295 mg/L

Sample ID V2

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
8792	7.7	54.3	1	13200	6.3
43089	11.6	82.3	2	4320	9.0
			3		
			4		
			5		
			6		
			Sum/Avg		
			Comp		

Pace Results:

SPLP Total Chl = 183 mg/L

Sample ID V3

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
188	9.0	63.6	1	12000	7.7
2390	17.6	124.7	2	1440	9.4
13865	27.0	190.9	3	1440	9.7
36744	37.2	263.0	4	1200	10.0
			5	1440	10.4
			6		
			Sum/Avg	3504	9.4
			Comp		

Pace Results:

SPLP Total Chl = 311 mg/L

Sample ID V4

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
85	9.0	63.6	1	9600	8.7
269	18.0	127.2	2	1680	9.3
847	27.2	192.6	3	1200	9.7
1438	31.8	224.8	4	960	9.7
4634	45.0	318.1	5	1200	8.7
6061	48.6	343.5	6	960	9.5
			Sum/Avg	2600	9.3
			Comp	2400	9.4

Pace Results:

SPLP Total Chl = 162 mg/L

Sample ID V5

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
870	8.9	62.8	1	14400	8.9
11724	18.0	127.2	2	1440	7.8
35702	25.2	178.1	3	1440	9.8
			4	1680	9.3
			5	1920	8.8
			6	2160	9.4
			Sum/Avg	3840	9.0
			Comp	4320	9.4

Pace Results:

SPLP Total Chl = 175 mg/L

Sample ID V6

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
25	15.0	106.0	1	9600	8.9
29	18.6	131.5	2	1920	9.2
44	26.5	187.5	3	1680	9.1
66	35.6	251.9	4	2160	9.3
95	45.4	320.6	5	1680	9.2
130	51.8	366.4	6	1920	9.1
			Sum/Avg	3160	9.1
			Comp	3120	9.0

Pace Results:

SPLP Total Chl = 136 mg/L

"Comp" indicated a composite sample of all liquid exract passed through soil column.

Exhibit C-2

Influent Parameters:	Chloride Content:	94
	pH:	9.2

Sample ID V7

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
30	9.0	63.6	1	10800	8.1
59	17.9	126.4	2	2160	9.3
100	27.3	192.6	3	1920	9.1
144	36.0	254.5	4	1920	9.0
201	45.2	319.8	5	1920	9.0
269	53.6	379.2	6	1920	8.9
			Sum/Avg	3440	8.9
			Comp	3120	9.0

Pace Results:

SPLP Total Chl = 252 mg/L

Sample ID V8

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
16	9.0	63.6	1	14400	8.1
39	17.9	126.4	2	1920	8.7
70	26.8	189.2	3	1200	8.7
111	35.9	253.6	4	1200	8.7
157	45.3	319.8	5	1200	8.5
205	53.6	379.2	6	1200	8.8
			Sum/Avg	3520	8.6
			Comp	2880	8.7

Pace Results:

SPLP Total Chl = 253 mg/L

Sample ID V9

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
35	9.0	63.6	1	18000	8.2
100	17.9	126.4	2	3600	8.8
347	25.1	177.3	3	1200	9.2
1660	34.3	242.6	4	1200	9.4
10366	44.8	316.4	5	1200	9.3
21744	52.1	368.1	6	960	9.8
			Sum/Avg	4360	9.1
			Comp	2640	9.4

Pace Results:

SPLP Total Chl = 252 mg/L

Sample ID V10

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
21	9.0	63.6	1	8880	7.9
37	17.5	123.8	2	1440	8.4
66	27.0	190.9	3	960	9.2
97	36.0	254.5	4	960	9.3
135	45.4	320.6	5	960	8.8
182	52.1	368.1	6	1200	9.0
			Sum/Avg	2400	8.8
			Comp	3120	7.3

Pace Results:

SPLP Total Chl = 250 mg/L

Sample ID V11

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
48	9.0	63.6	1	18750	7.1
211	18.0	127.2	2	4080	7.5
471	24.2	171.3	3	960	8.5
680	27.6	195.1	4	720	8.7
7239	41.4	292.6	5	864	9.2
10071	44.6	315.5	6	1200	8.8
22764	51.2	362.2	7	1200	8.8
			Sum/Avg	3968	8.4
			Comp	2400	9.3

Pace Results:

SPLP Total Chl = 305 mg/L

"Comp" indicated a composite sample of all liquid exract passed through soil column.

Exhibit C-3

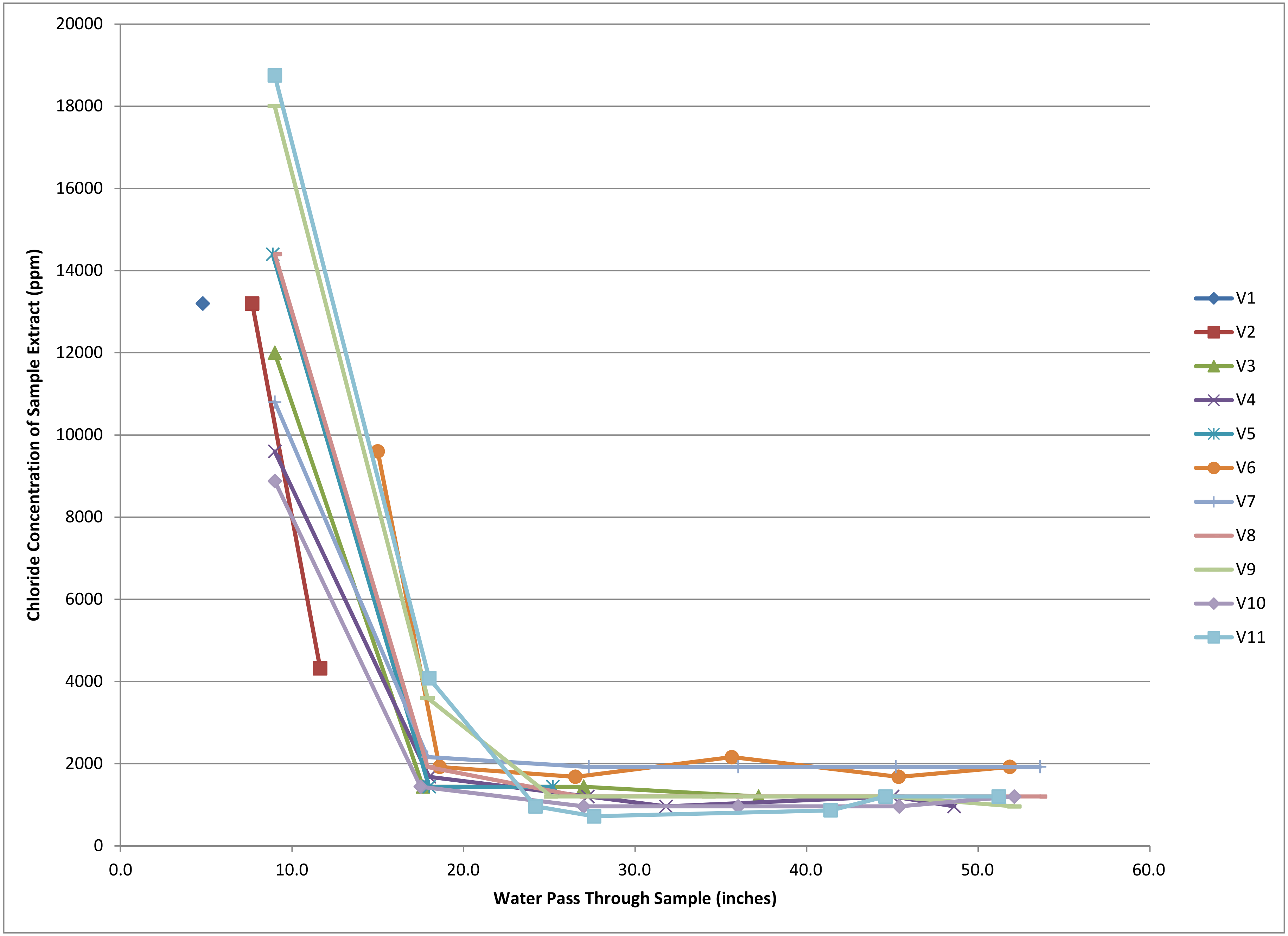


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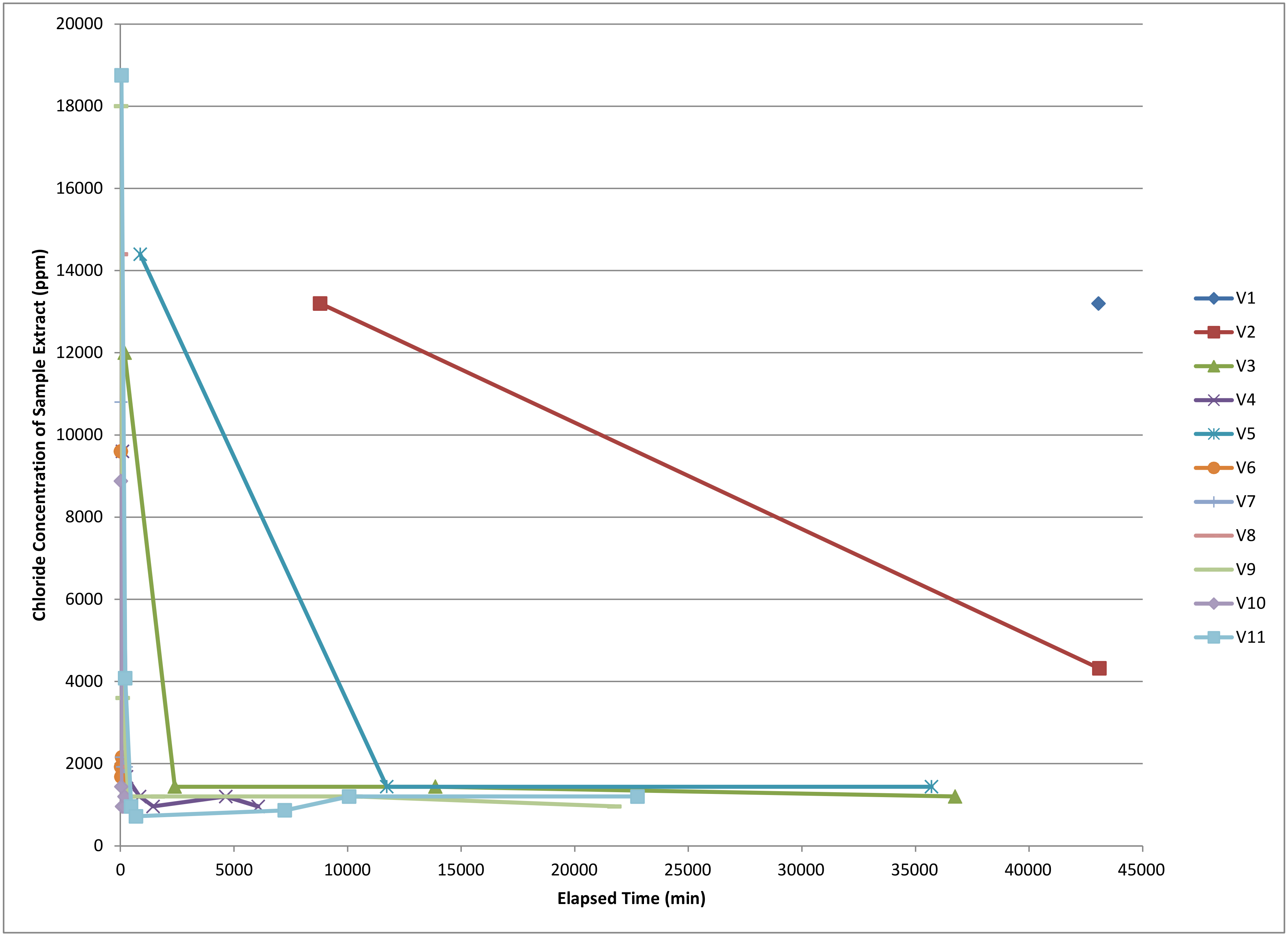
Exhibit C-4



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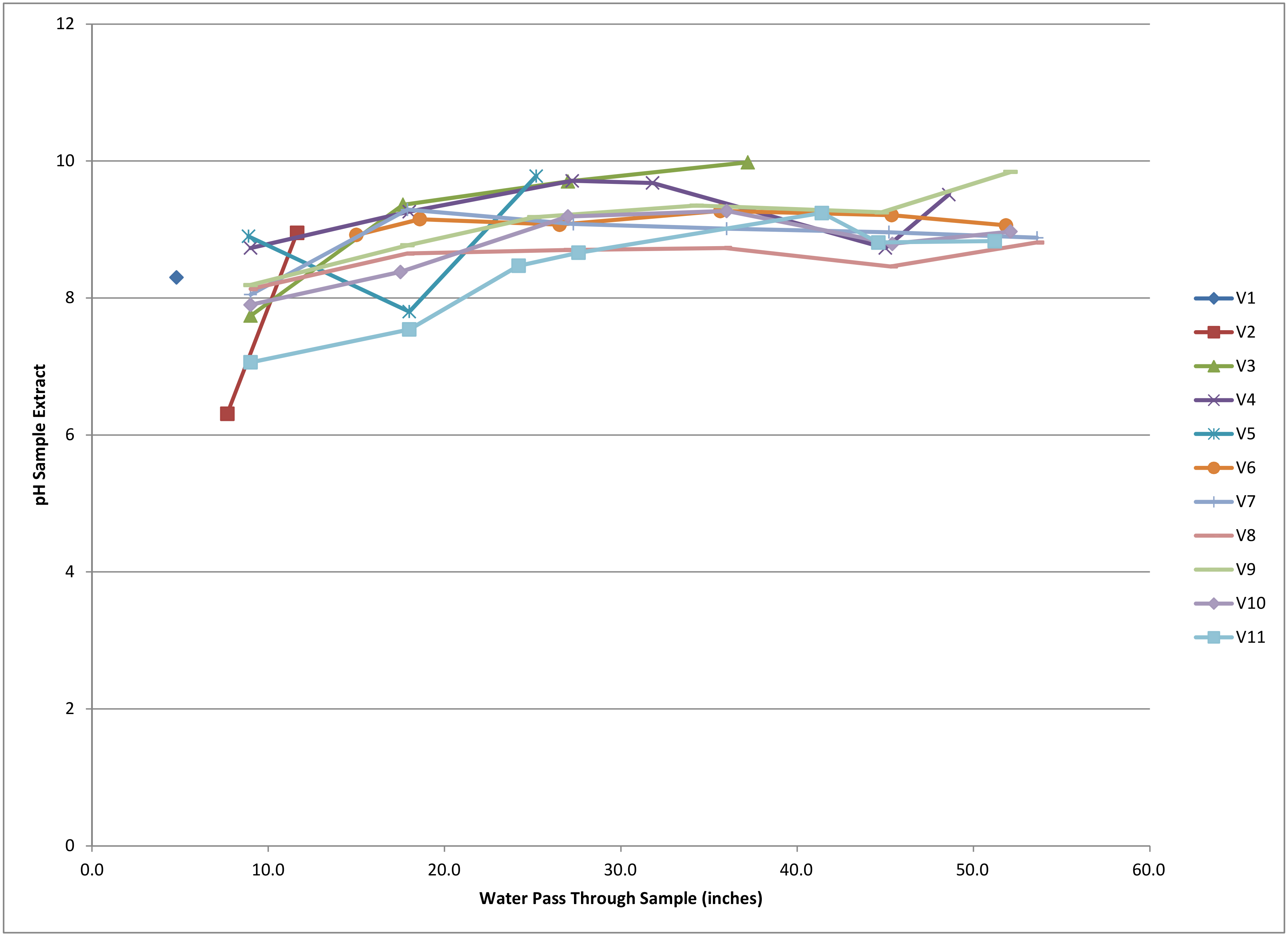
A Terracon COMPANY

Exhibit C-5



12
10
8
6
4
2
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30.0
40.0
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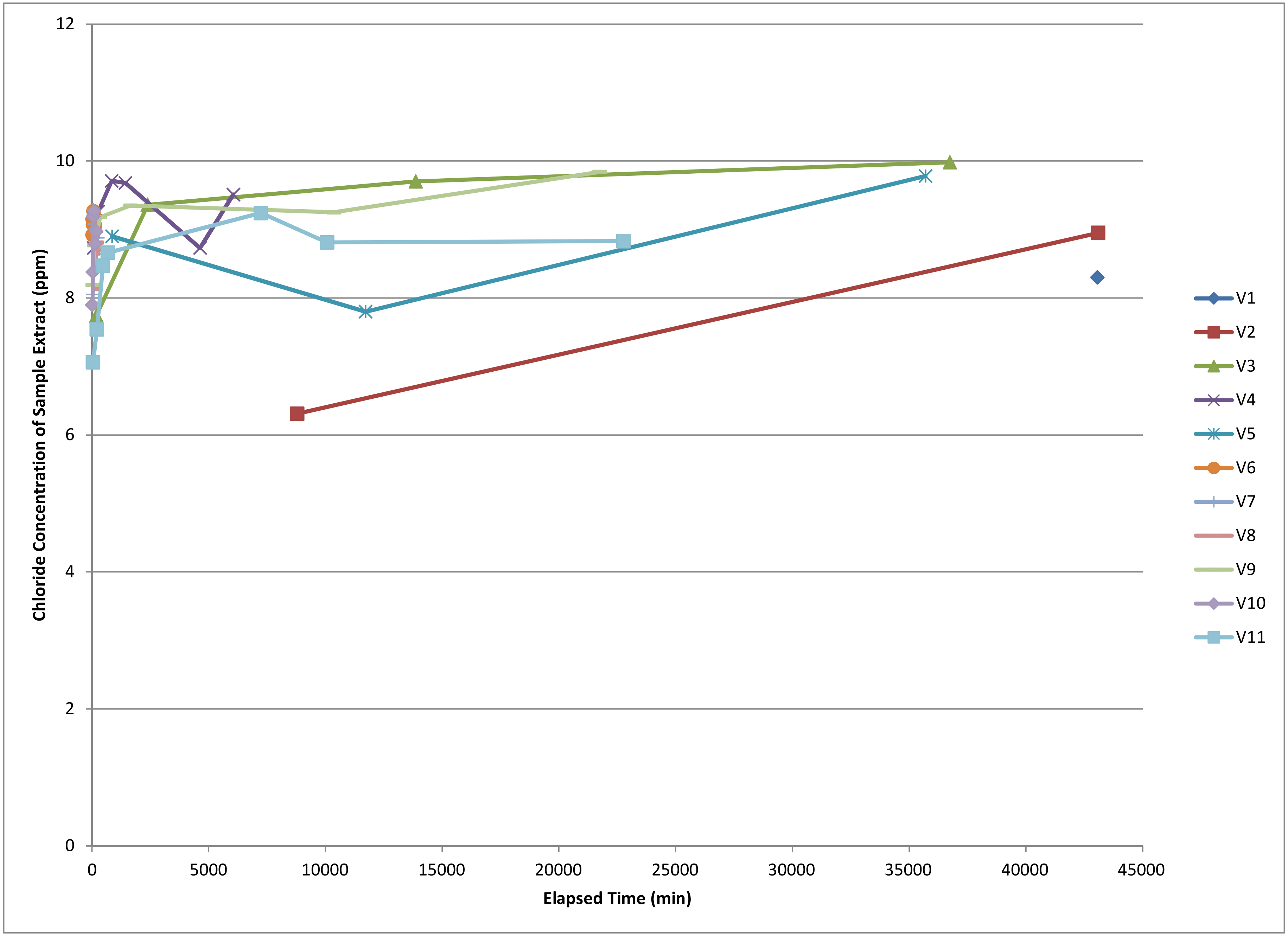
V1
V2
V3
V4
V5
V6
V7
V8
V9
V10
V11



DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Exhibit C-7

APPENDIX D
GROUNDWATER MODELING – CALIBRATION RUNS

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 2/26/2016 - Layer 1

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA	GROUNDWATER MODEL CALIBRATION
	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT D-1

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 2/26/2016 - Layer 2

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.			GROUNDWATER MODELING **BV-24A** BREVARD COUNTY, FL
APPROXIMATE SCALE:	DATE: 05/05/16	ENGINEER:NA	GROUNDWATER MODEL CALIBRATION
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT D-2

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 2/26/2016 - Layer 3

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.			GROUNDWATER MODELING BV-24A BREVARD COUNTY, FL
APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA	GROUNDWATER MODEL CALIBRATION
	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT D-3

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 2/26/2016 - Layer 4

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA
	PN:GPGW-16-013	DRAWN BY: DLS

GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

GROUNDWATER MODEL CALIBRATION

EXHIBIT D-4

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 4/12/2016 - Layer 1

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA	
	PN:GPGW-16-013	DRAWN BY: DLS	

GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

GROUNDWATER MODEL CALIBRATION

EXHIBIT D-5

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 4/12/2016 - Layer 2

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

GROUNDWATER MODEL CALIBRATION

APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA	
	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT D-6

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 4/12/2016 - Layer 3

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA	GROUNDWATER MODELING BV-24A BREVARD COUNTY, FL
	PN:GPGW-16-013	DRAWN BY: DLS	GROUNDWATER MODEL CALIBRATION EXHIBIT D-7

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 4/12/2016 - Layer 4

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.

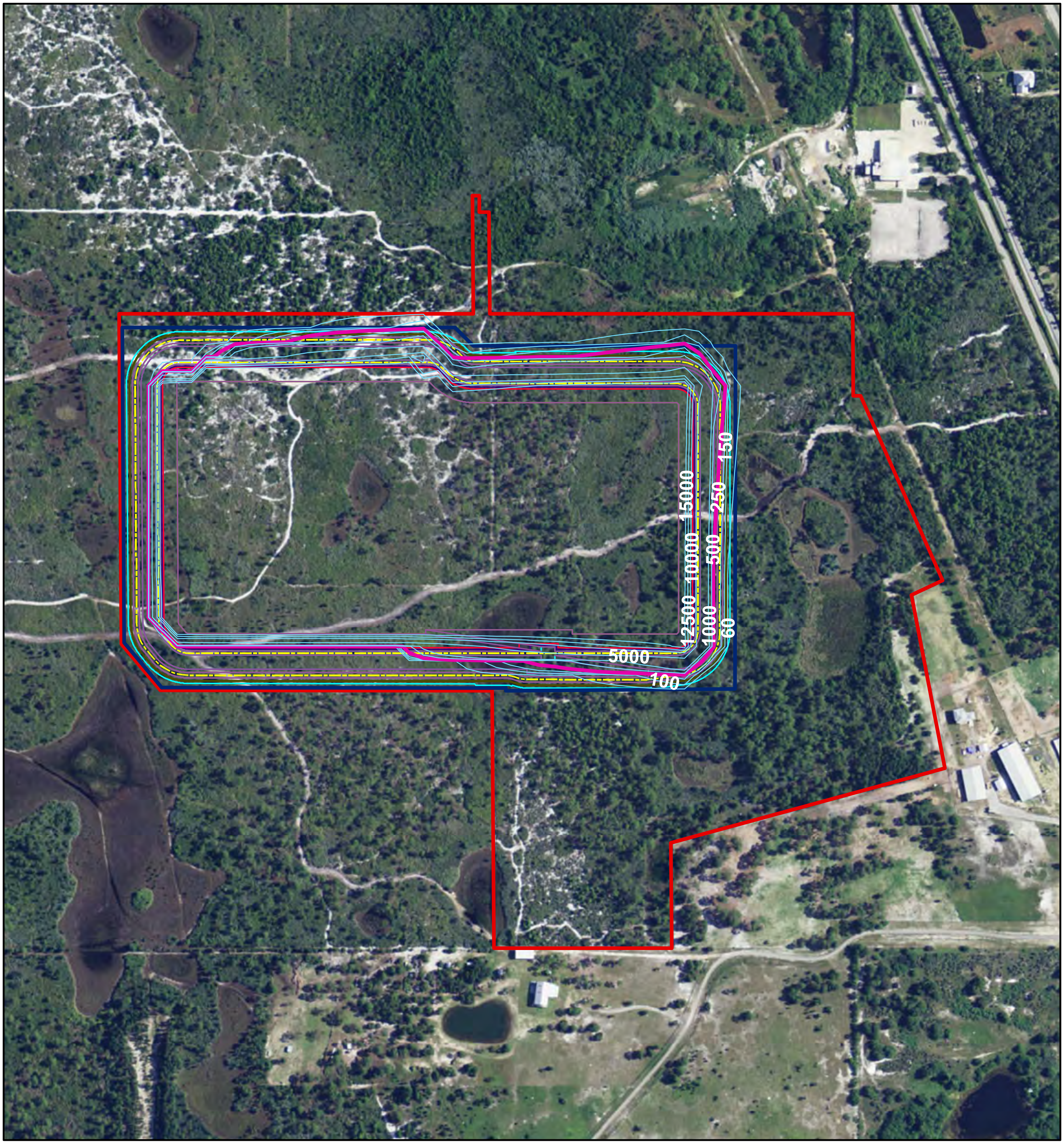
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA	GROUNDWATER MODEL CALIBRATION
	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT D-8

APPENDIX E
GROUNDWATER MODELING – WITHOUT CONTROLS



N

0 500 1,000 Feet

1 inch = 500 feet

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 1

DMMA Boundary

Property Boundary

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

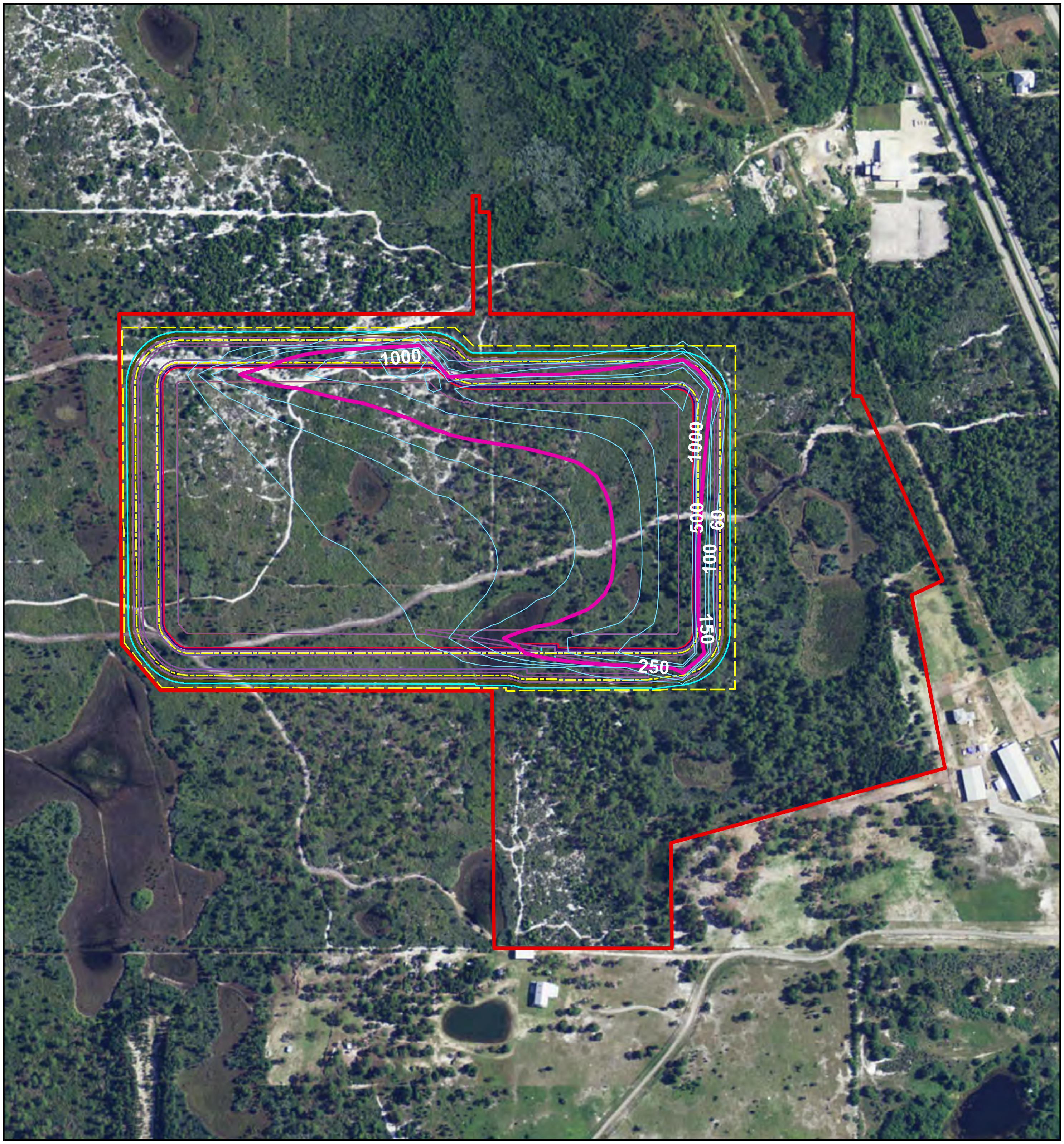
BV-24A

BREVARD COUNTY, FL

FIRST DREDGE LOADING & RESTING (0-10 YRS)

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

EXHIBIT E-1



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 2

DMMA Boundary

Property Boundary

0 500 1,000 Feet

1 inch = 500 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

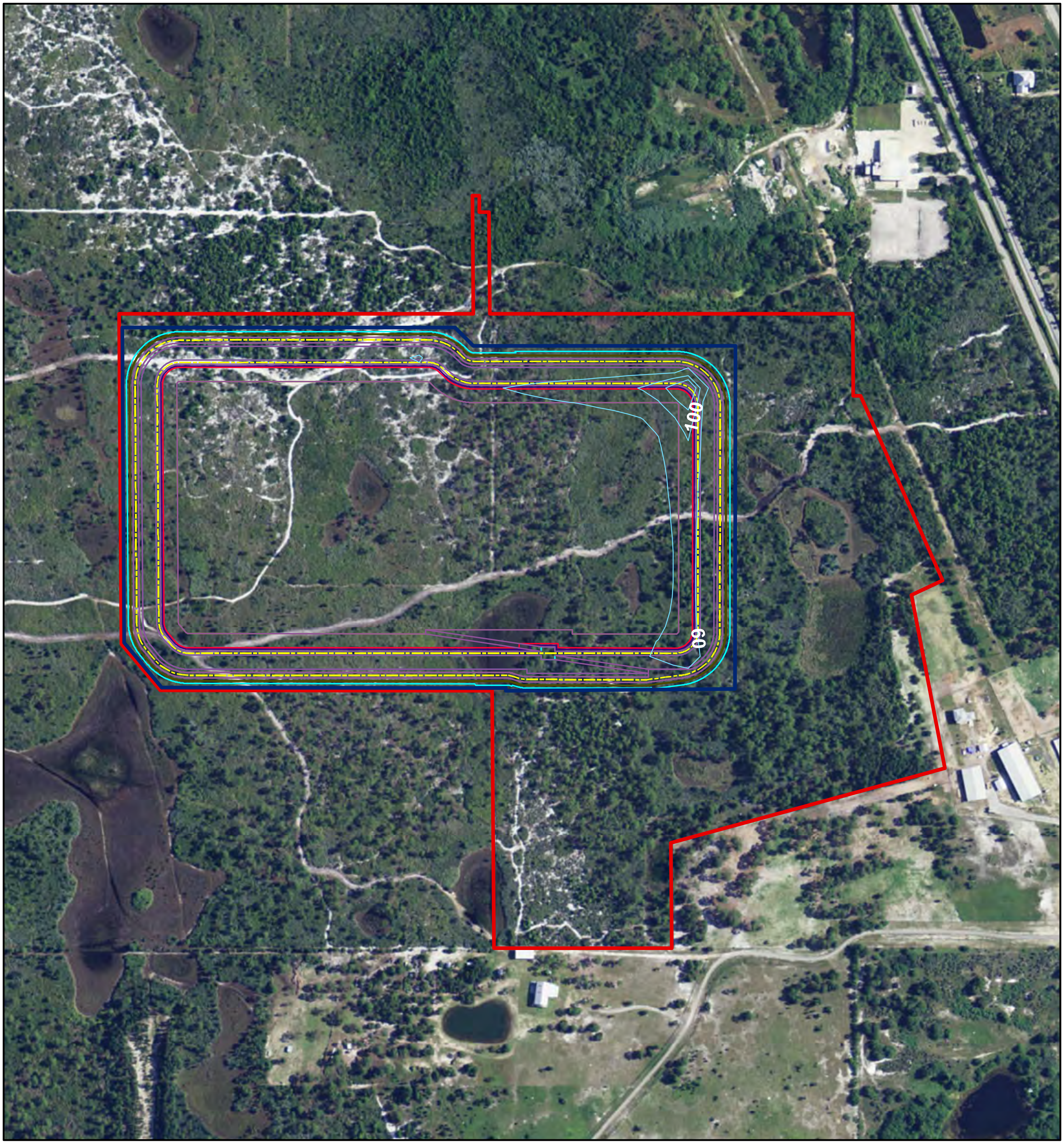
BV-24A

BREVARD COUNTY, FL

FIRST DREDGE LOADING & RESTING (0-10 YRS)

EXHIBIT E-2

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 3

DMMA Boundary

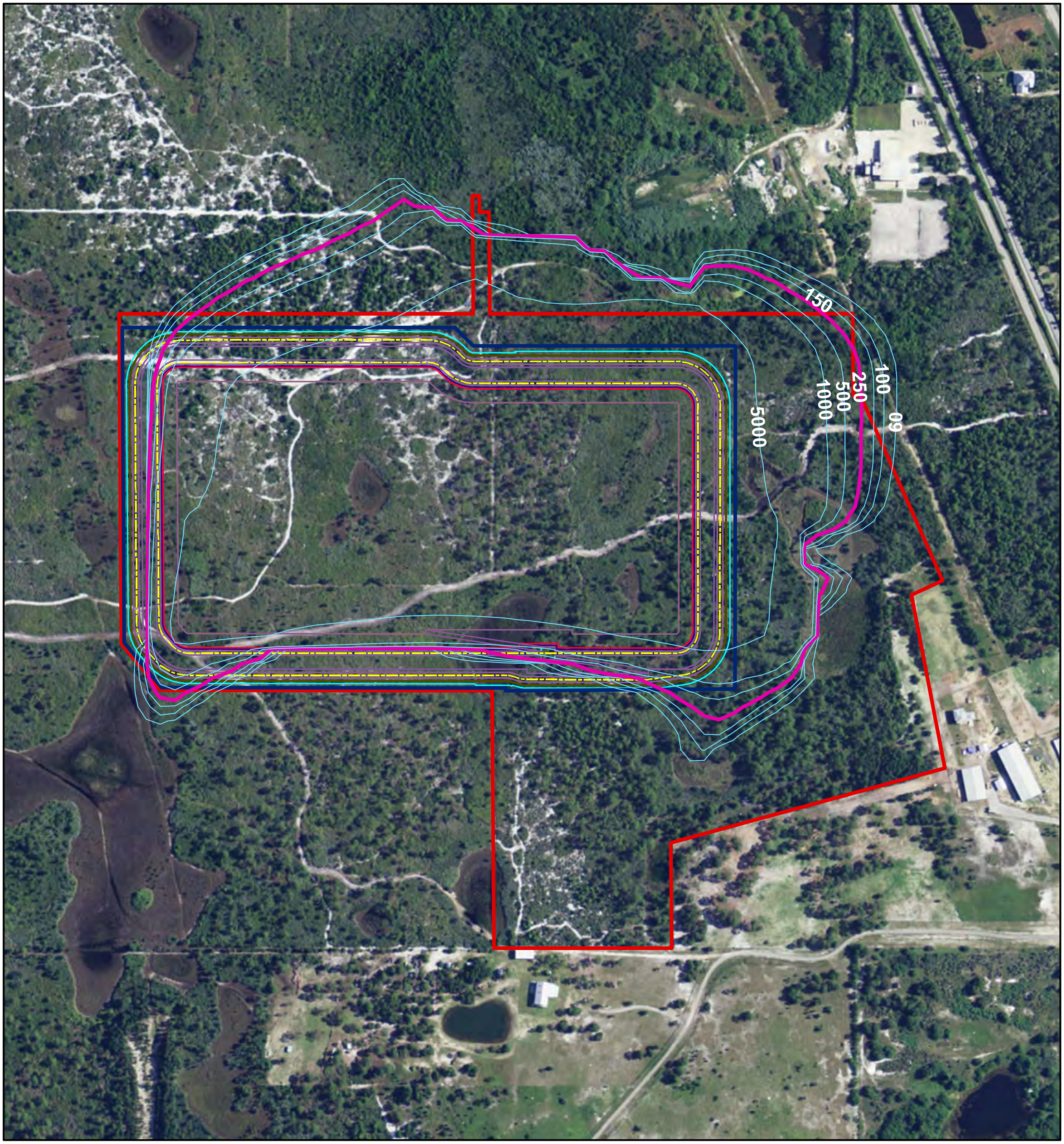
Property Boundary

0 500 1,000 Feet

1 inch = 500 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA	GROUNDWATER MODELING **BV-24A** BREVARD COUNTY, FL FIRST DREDGE LOADING & RESTING (0-10 YRS)
	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT E-3



N

0 500 1,000
Feet
1 inch = 500 feet

Legend:

Concentrations at the end of 10-year resting - Layer 1

DMMA Boundary

Property Boundary

ANDREYEV ENGINEERING, INC.

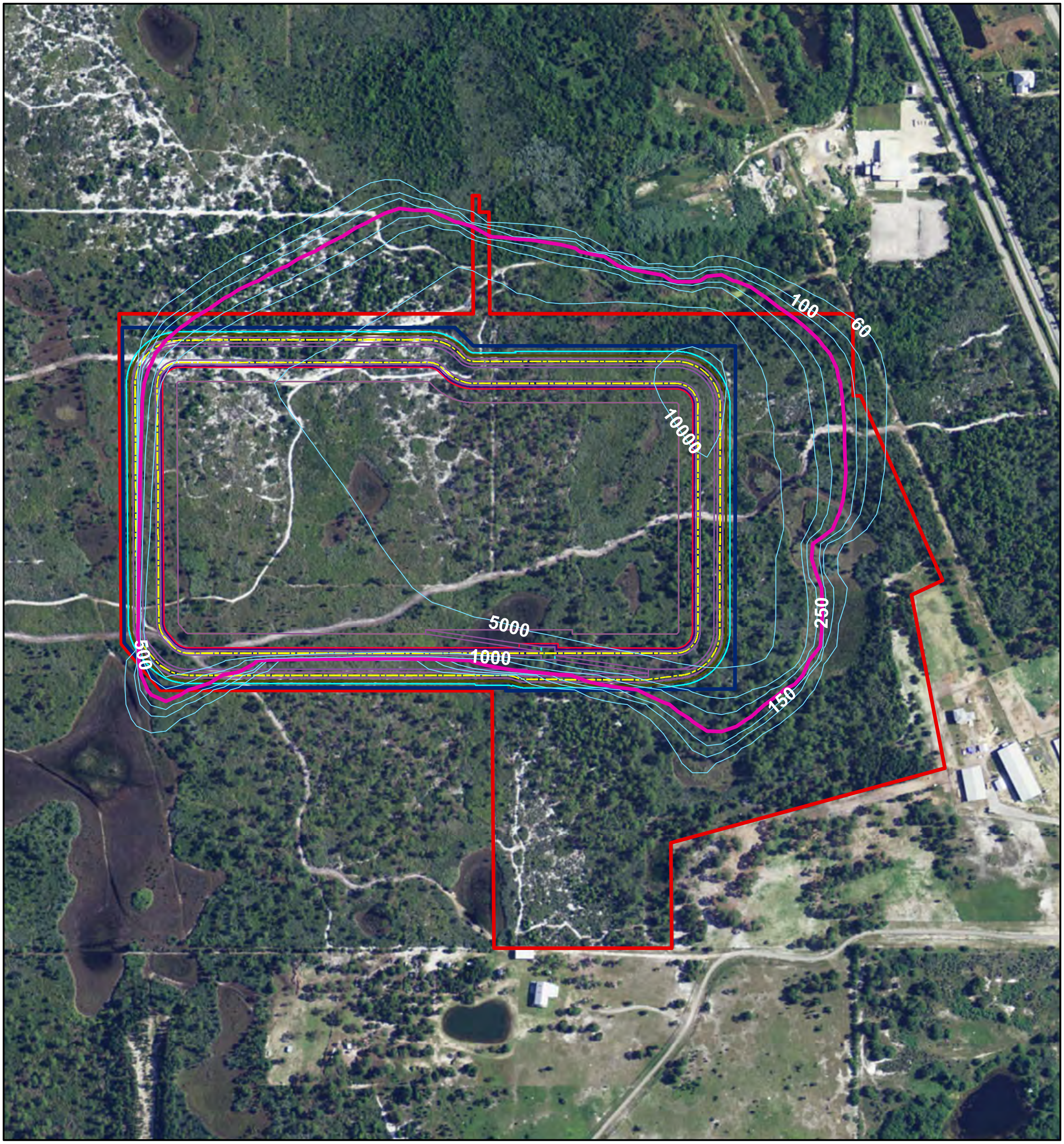
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

FIRST DREDGE LOADING & RESTING (0-10 YRS)

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA	EXHIBIT E-4
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS	



N

Legend:

Concentrations at the end of 10-year resting - Layer 2

DMMA Boundary

Property Boundary

0 500 1,000 Feet

1 inch = 500 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA
	PN:GPGW-16-013	DRAWN BY: DLS

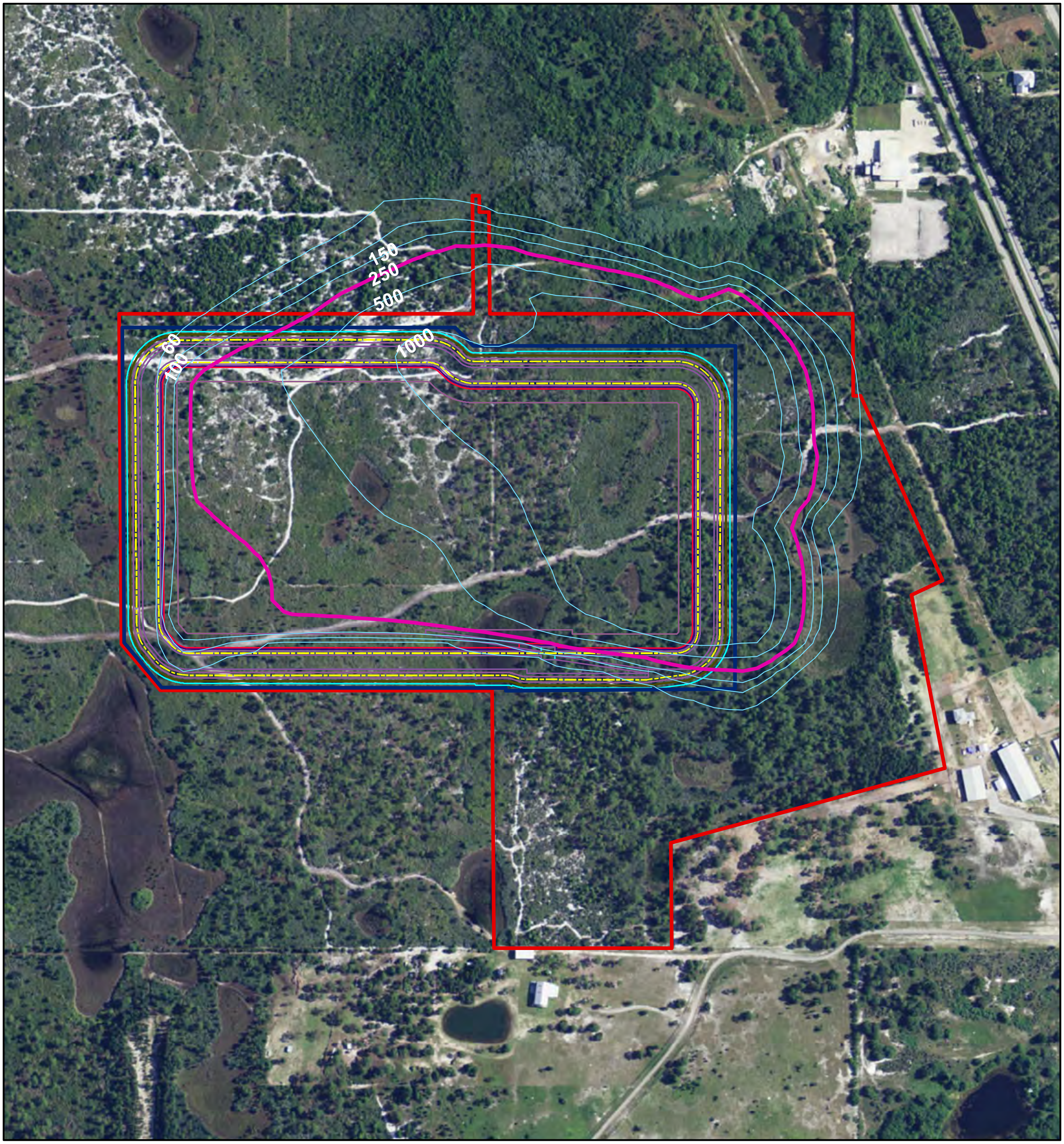
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

FIRST DREDGE LOADING & RESTING (0-10 YRS)

EXHIBIT E-5



N

Legend:

Concentrations at the end of 10-year resting - Layer 3

DMMA Boundary

Property Boundary

0 500 1,000 Feet

1 inch = 500 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

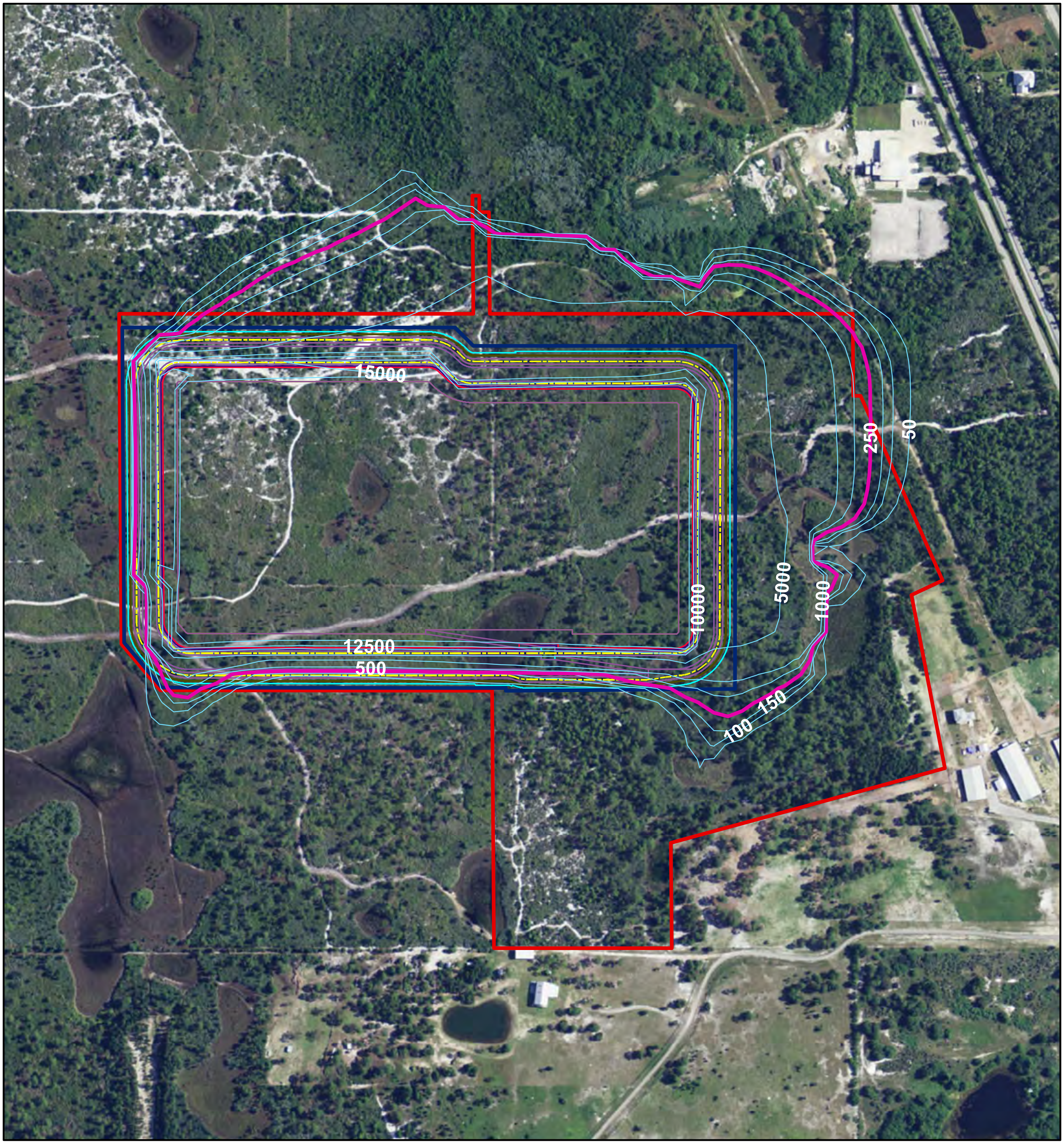
BV-24A

BREVARD COUNTY, FL

FIRST DREDGE LOADING & RESTING (0-10 YRS)

EXHIBIT E-6

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS



Legend:

Concentrations at the end of 28-days of dredge loading - Layer 1

DMMA Boundary

Property Boundary

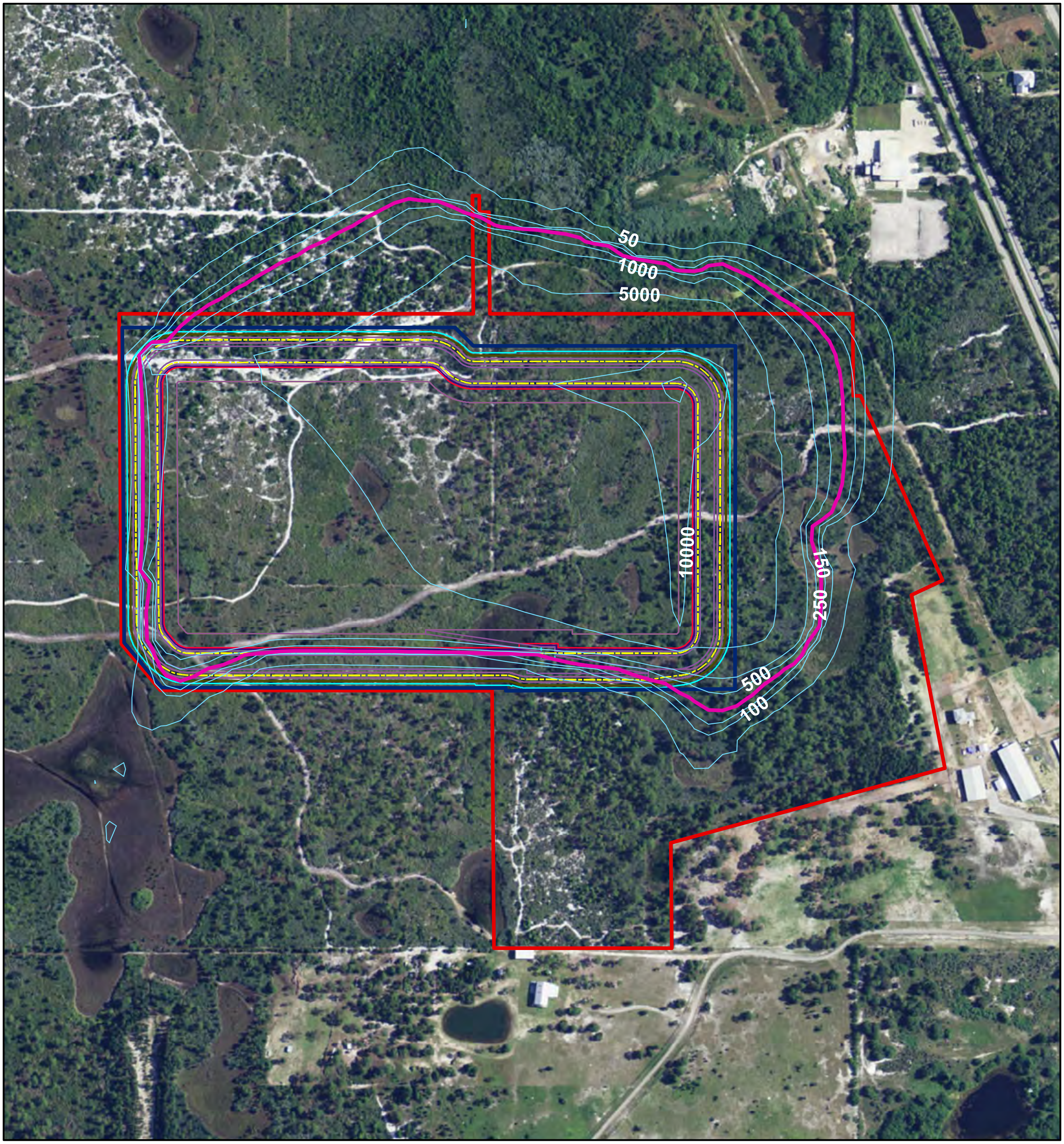
ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA	SECOND DREDGE LOADING & RESTING (10-20 YRS)
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT E-7



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 2

DMMA Boundary

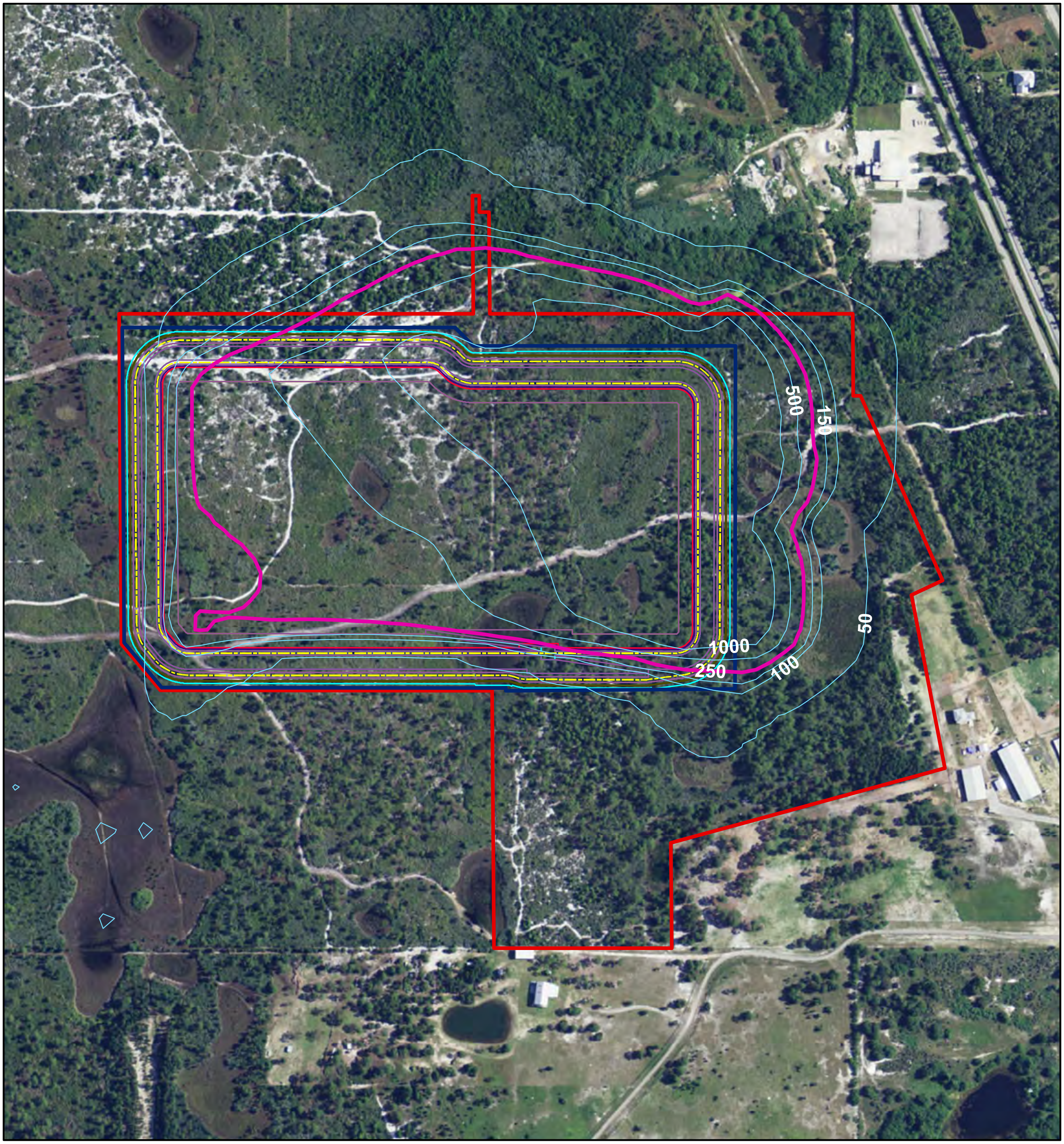
Property Boundary

0 500 1,000 Feet

1 inch = 500 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA	GROUNDWATER MODELING BV-24A BREVARD COUNTY, FL
	PN:GPGW-16-013	DRAWN BY: DLS	SECOND DREDGE LOADING & RESTING (10-20 YRS) EXHIBIT E-8



N

0 500 1,000
Feet
1 inch = 500 feet

Legend:

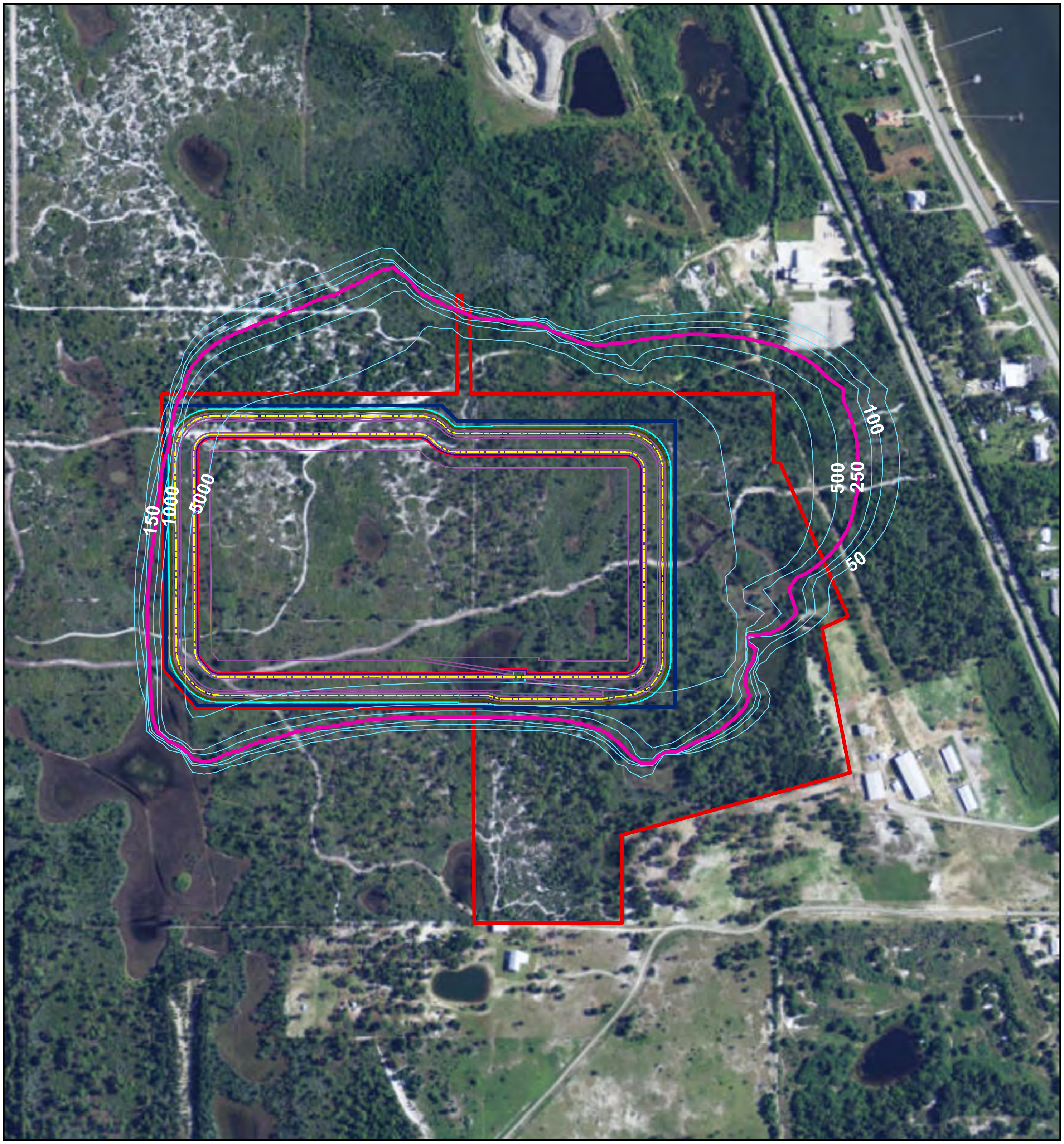
Concentrations at the end of 28-days of dredge loading - Layer 3

DMMA Boundary

Property Boundary

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA	GROUNDWATER MODELING BV-24A BREVARD COUNTY, FL
	PN:GPGW-16-013	DRAWN BY: DLS	SECOND DREDGE LOADING & RESTING (10-20 YRS) EXHIBIT E-9



N

Legend:

Concentrations at the end of 10-year resting - Layer 1

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

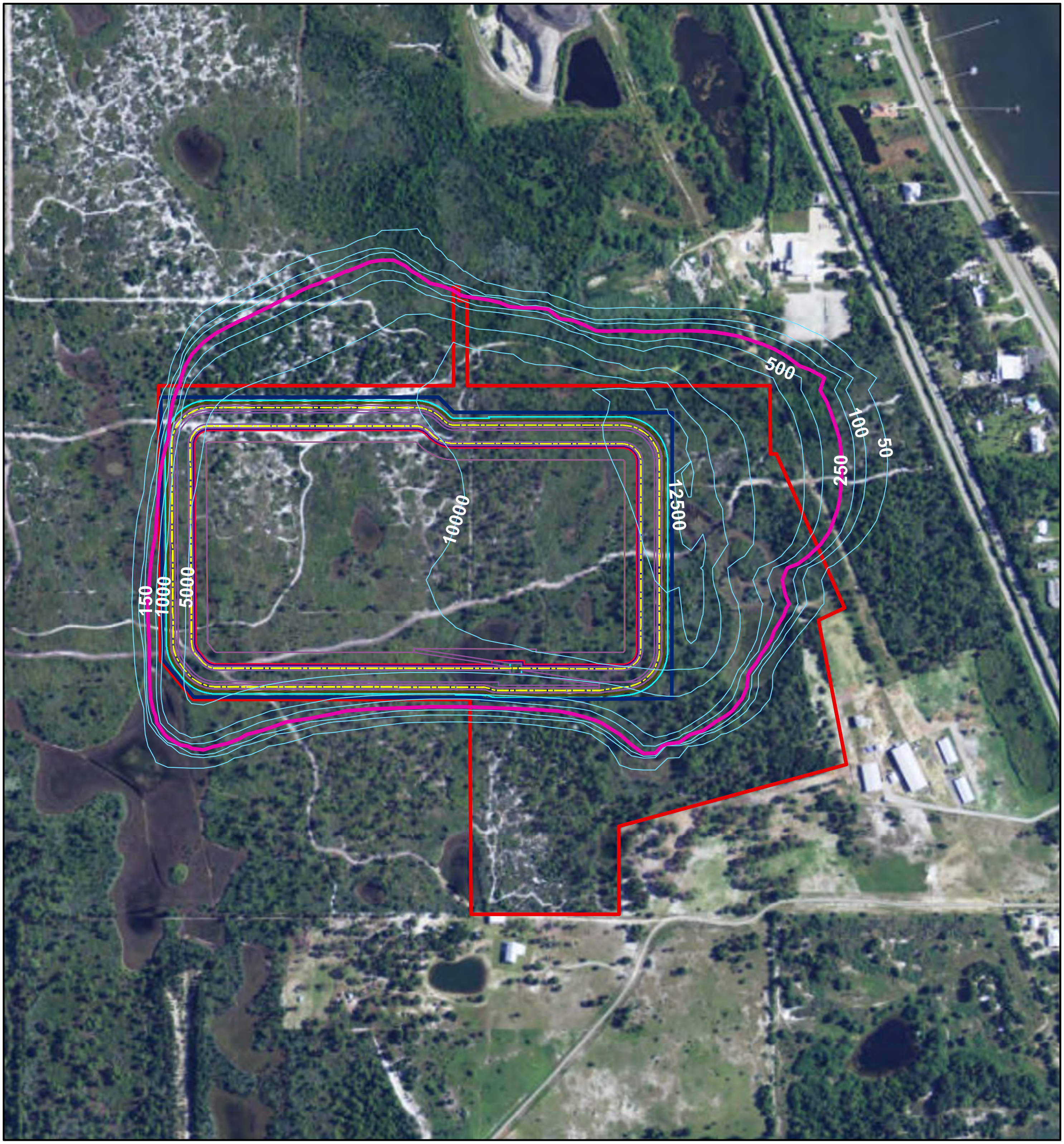
ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA	SECOND DREDGE LOADING & RESTING (10-20 YRS)
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS	EXHIBIT E-10



N

Legend:

Concentrations at the end of 10-year resting - Layer 2

DMMA Boundary

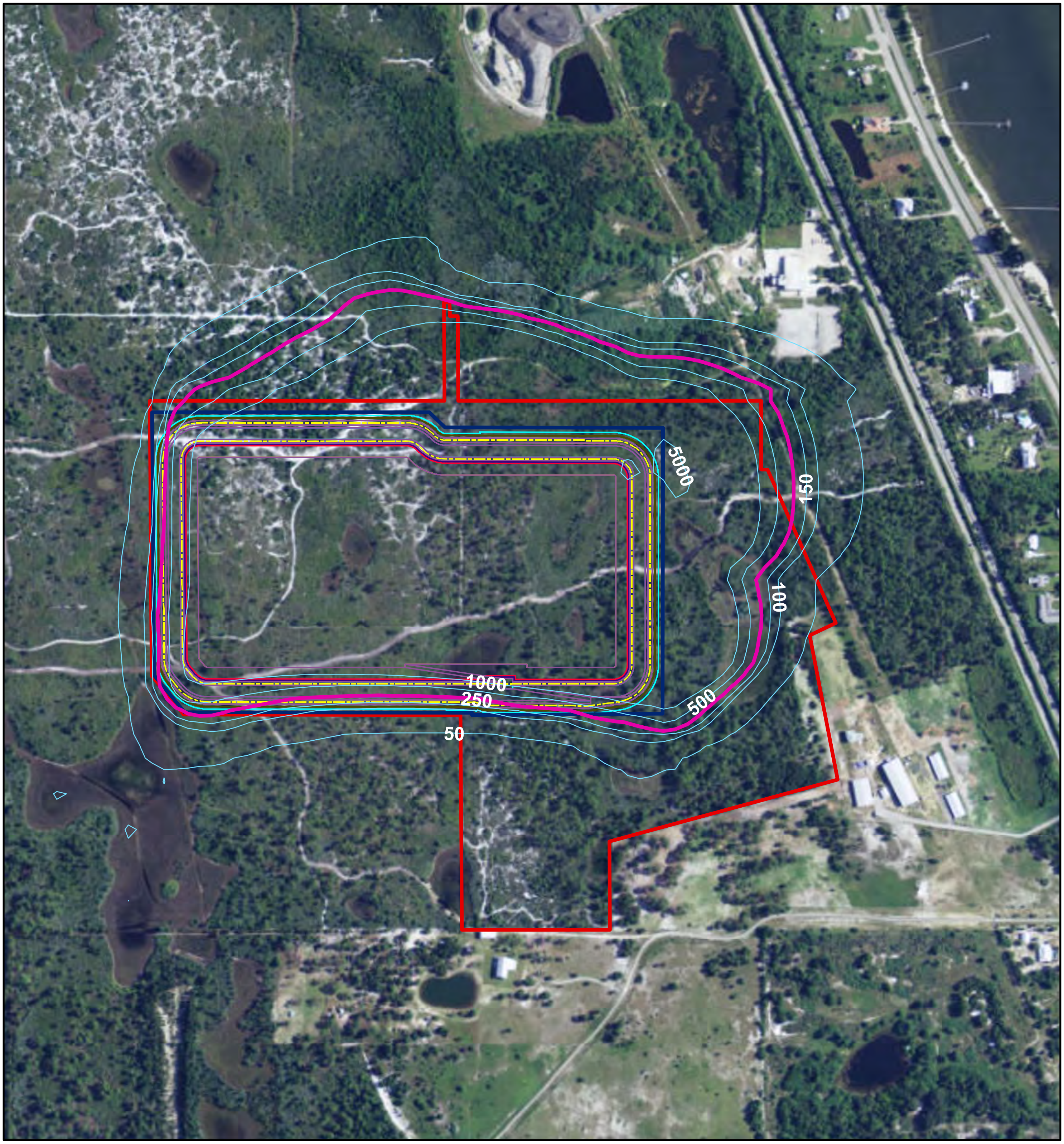
Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA	GROUNDWATER MODELING **BV-24A** BREVARD COUNTY, FL
	PN:GPGW-16-013	DRAWN BY: DLS	SECOND DREDGE LOADING & RESTING (10-20 YRS) EXHIBIT E-11



N

Legend:

Concentrations at the end of 10-year resting - Layer 3

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

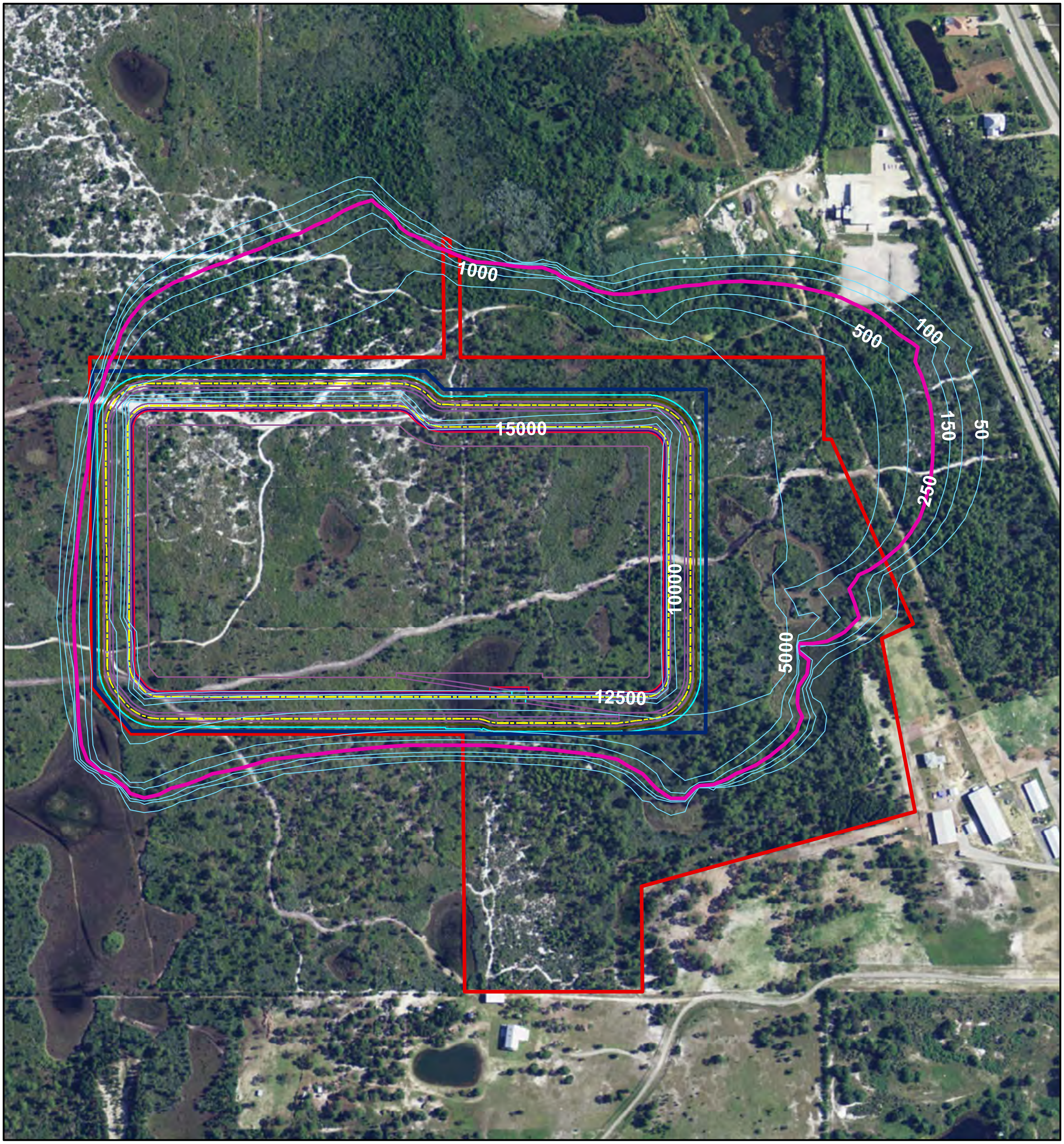
BV-24A

BREVARD COUNTY, FL

SECOND DREDGE LOADING & RESTING (10-20 YRS)

EXHIBIT E-12

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 1

DMMA Boundary

Property Boundary

0 500 1,000 Feet

1 inch = 500 feet

ANDREYEV ENGINEERING, INC.

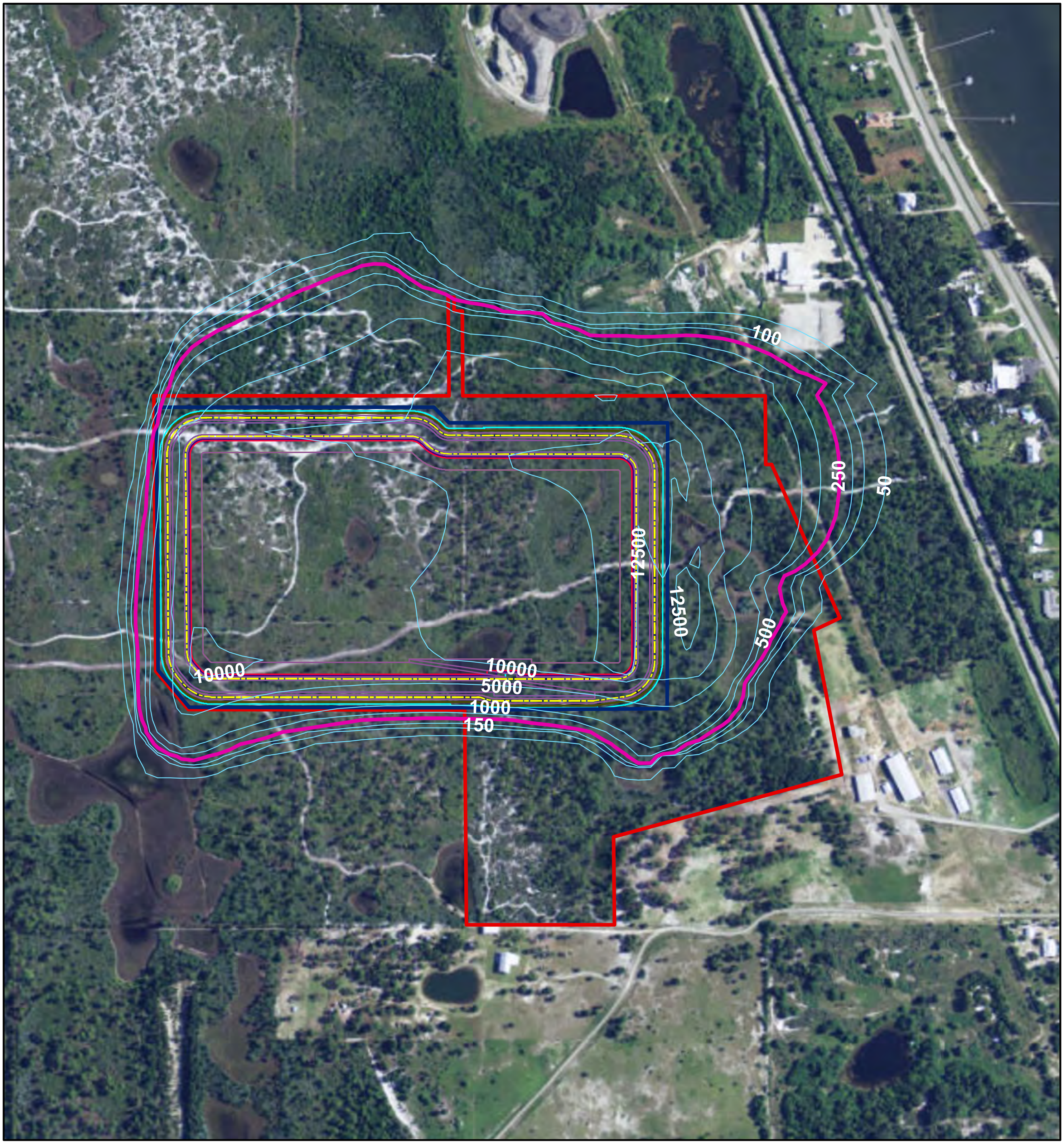
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

THIRD DREDGE LOADING & RESTING (20-30 YRS)

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA	EXHIBIT E-13
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS	



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 2

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA
	PN:GPGW-16-013	DRAWN BY: DLS

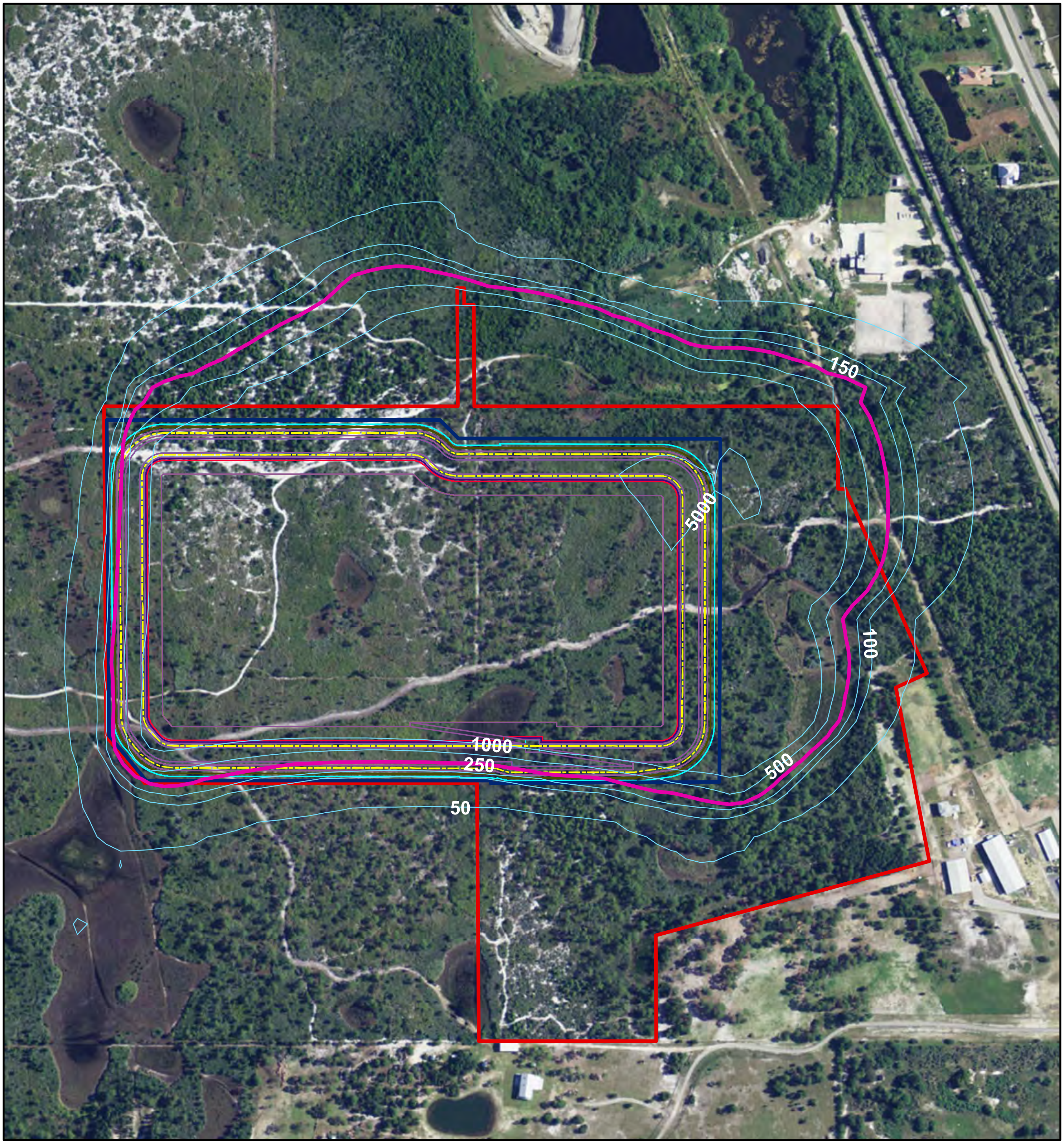
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

THIRD DREDGE LOADING & RESTING (20-30 YRS)

EXHIBIT E-14



Legend:

Concentrations at the end of 28-days of dredge loading - Layer 3

DMMA Boundary

Property Boundary

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

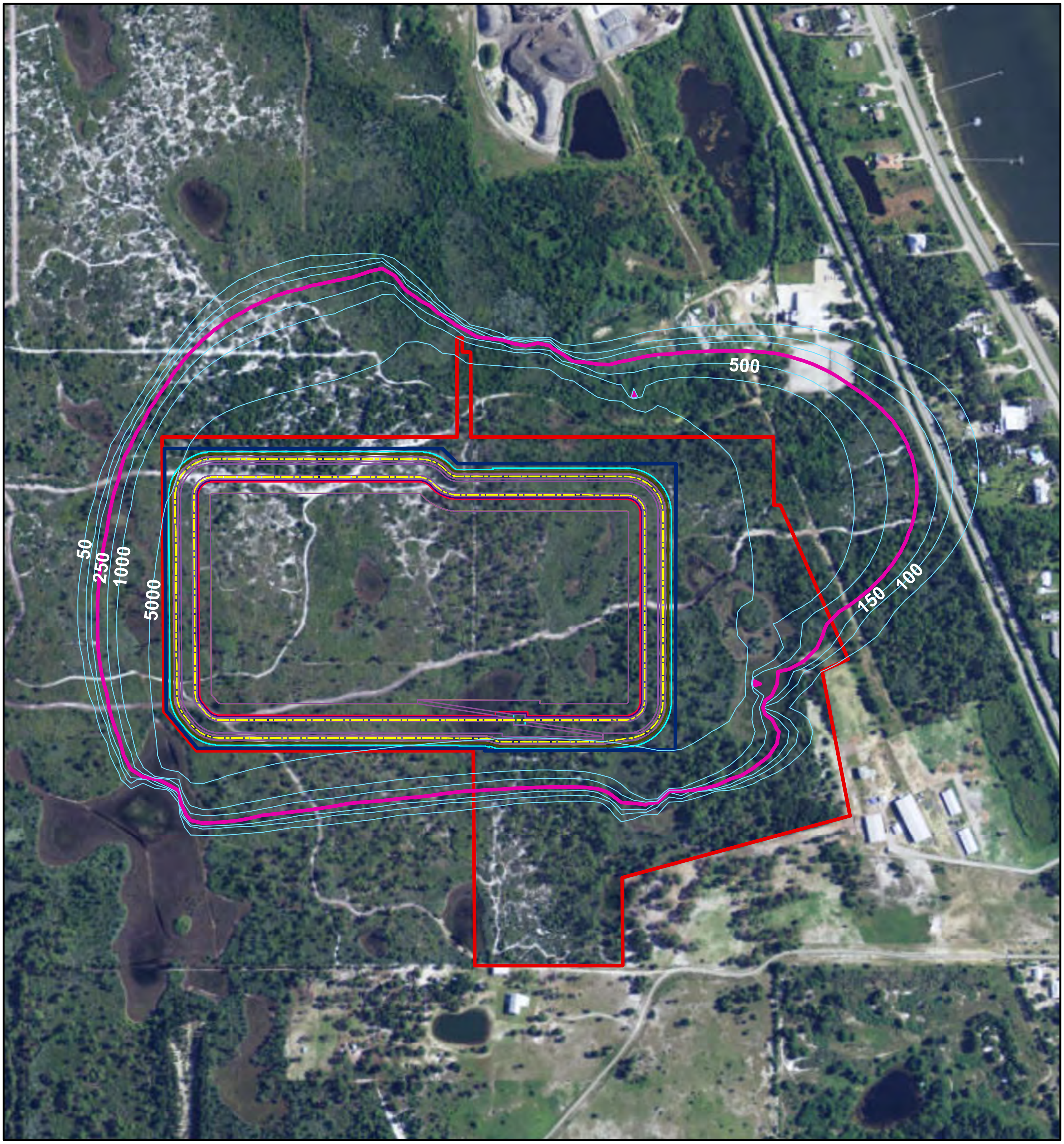
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

THIRD DREDGE LOADING & RESTING (20-30 YRS)

EXHIBIT E-15



N

Legend:

Concentrations at the end of 10-year resting - Layer 1

DMMA Boundary

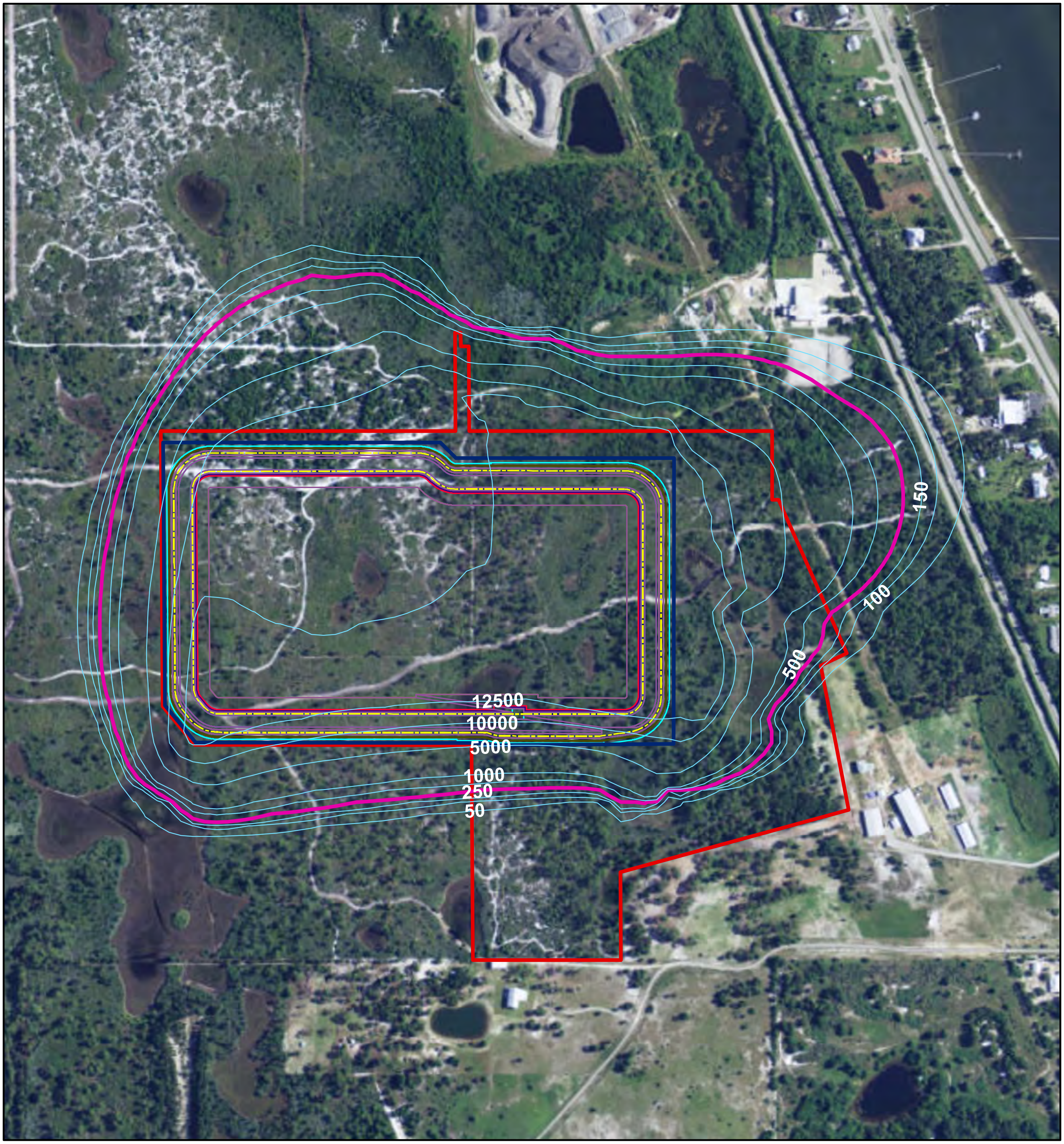
Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA	GROUNDWATER MODELING **BV-24A** BREVARD COUNTY, FL
	PN:GPGW-16-013	DRAWN BY: DLS	THIRD DREDGE LOADING & RESTING (20-30 YRS) EXHIBIT E-16



N

Legend:

Concentrations at the end of 10-year resting - Layer 2

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

THIRD DREDGE LOADING & RESTING (20-30 YRS)

APPROXIMATE SCALE: AS SHOWN

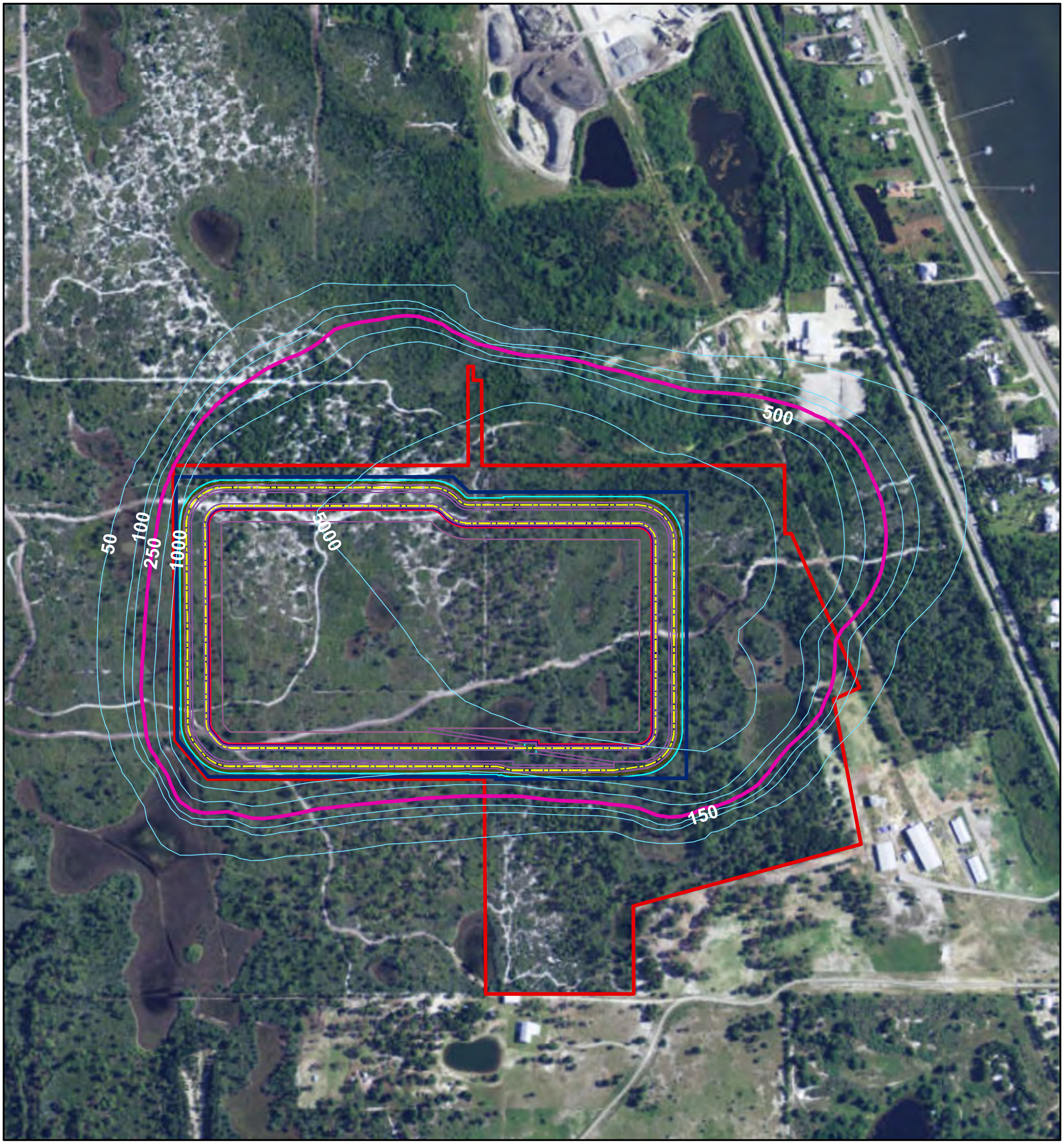
DATE: 05/25/16

ENGINEER:NA

PN:GPGW-16-013

DRAWN BY: DLS

EXHIBIT E-17



N

Legend:

Concentrations at the end of 10-year resting - Layer 3

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN

DATE: 05/25/16

ENGINEER:NA

PN:GPGW-16-013

DRAWN BY: DLS

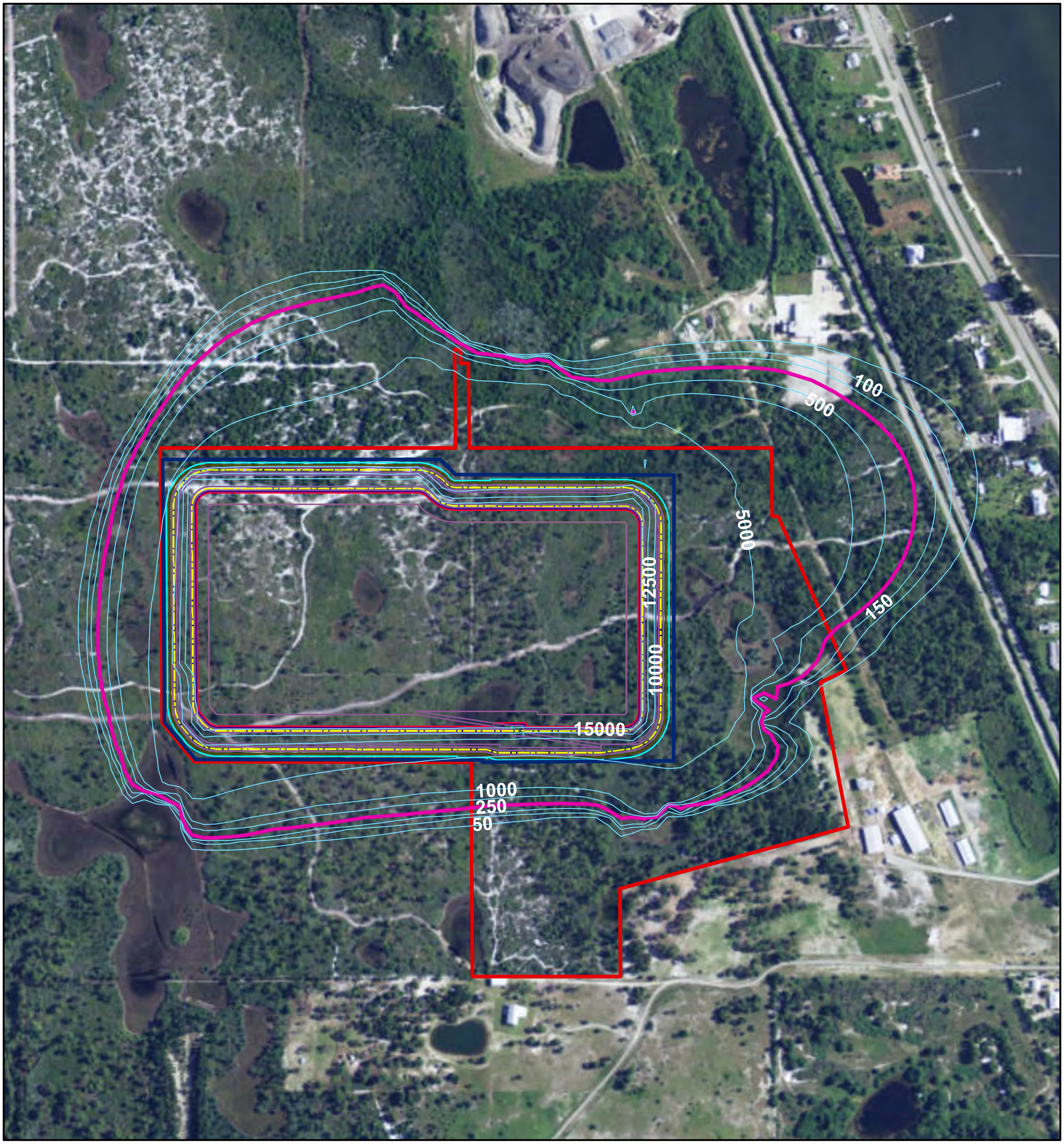
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

THIRD DREDGE LOADING & RESTING (20-30 YRS)

EXHIBIT E-18



Legend:

Concentrations at the end of 28-days of dredge loading - Layer 1

DMMA Boundary

Property Boundary

N

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

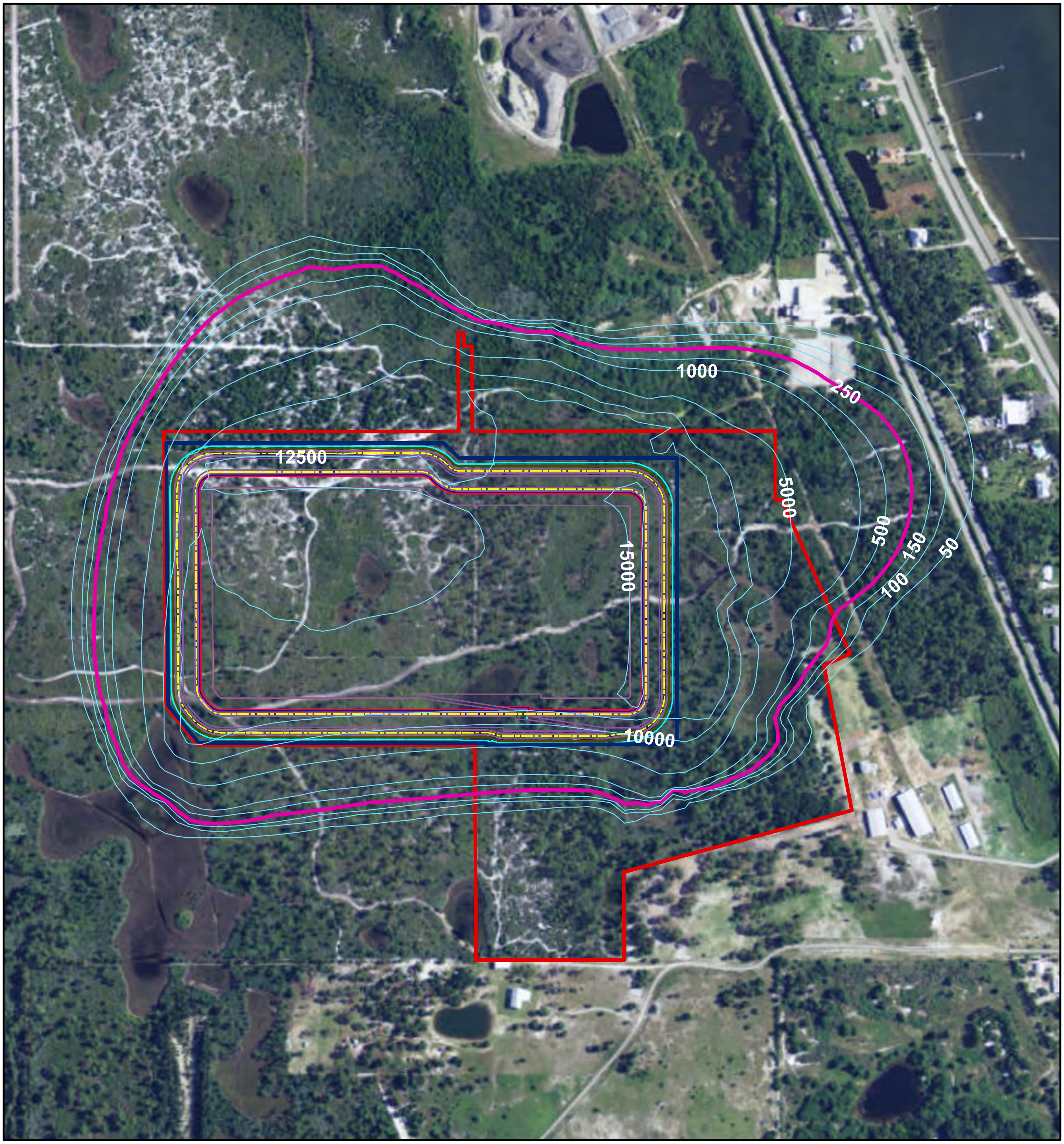
BV-24A

BREVARD COUNTY, FL

FOURTH DREDGE LOADING & RESTING (30-40 YRS)

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

EXHIBIT E-19



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 2

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

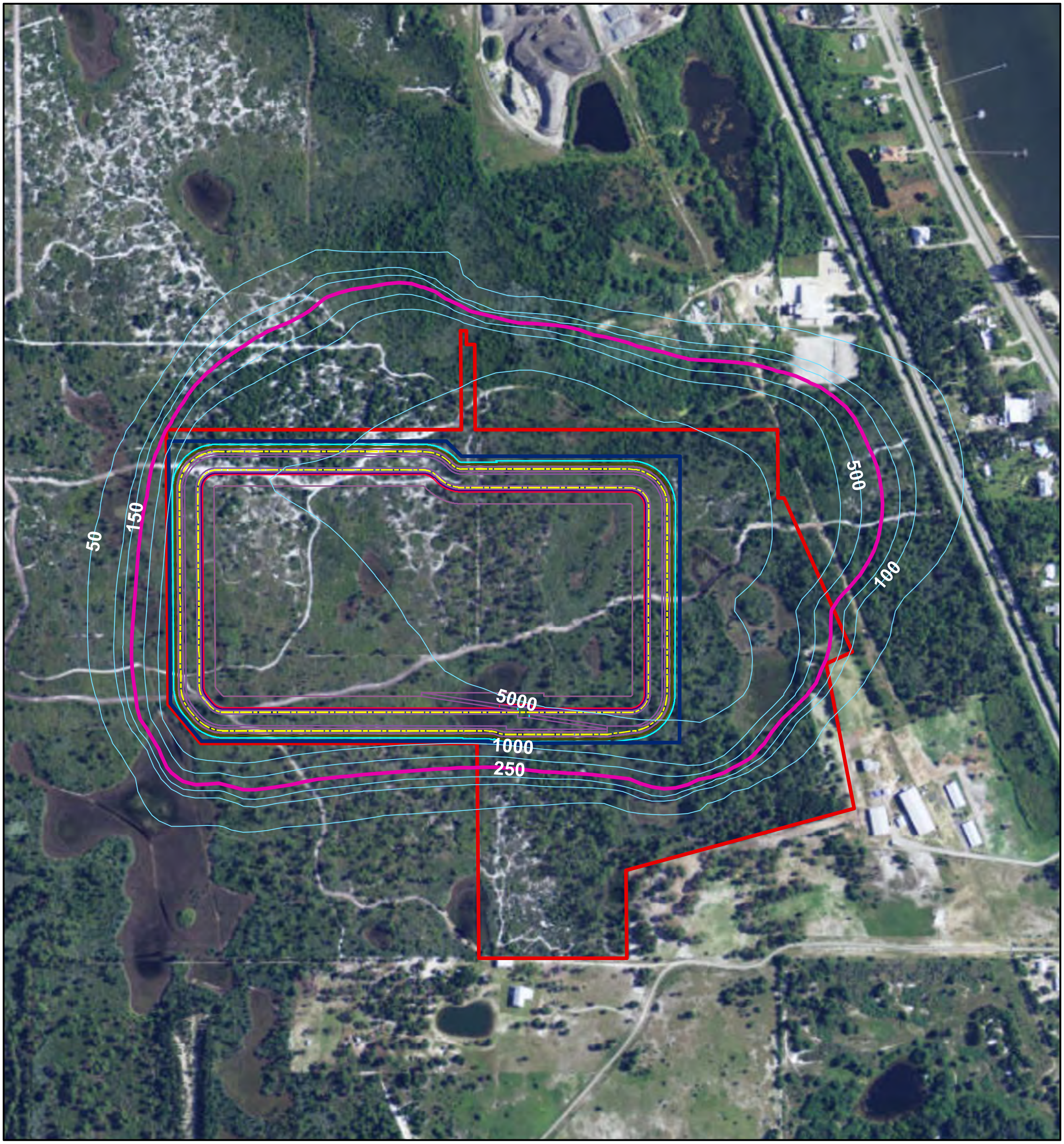
BV-24A

BREVARD COUNTY, FL

FOURTH DREDGE LOADING & RESTING (30-40 YRS)

EXHIBIT E-20

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 3

DMMA Boundary

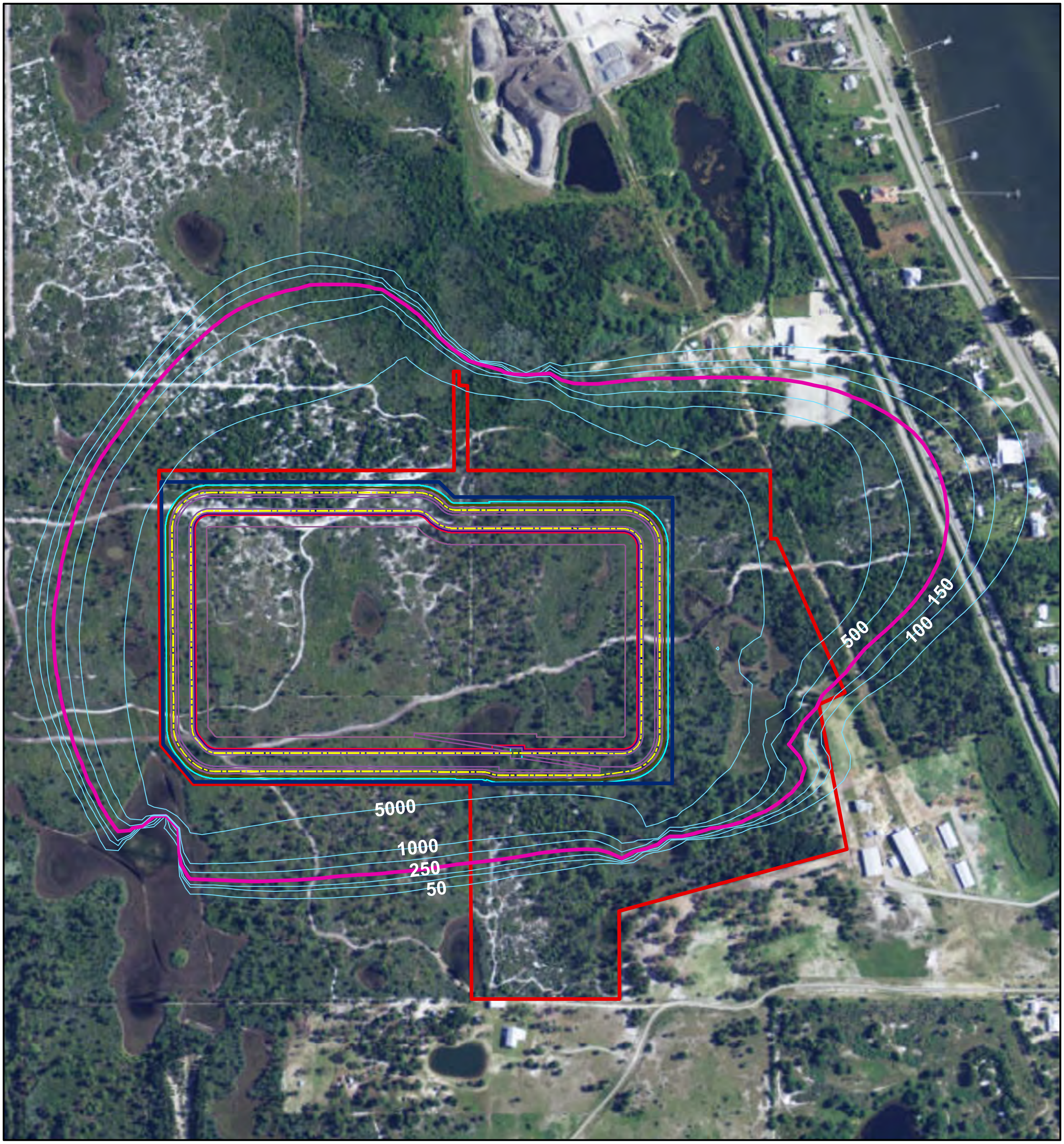
Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA	GROUNDWATER MODELING **BV-24A** BREVARD COUNTY, FL
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS	FOURTH DREDGE LOADING & RESTING (30-40 YRS) EXHIBIT E-21



N

Legend:

Concentrations at the end of 10-year resting - Layer 1

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

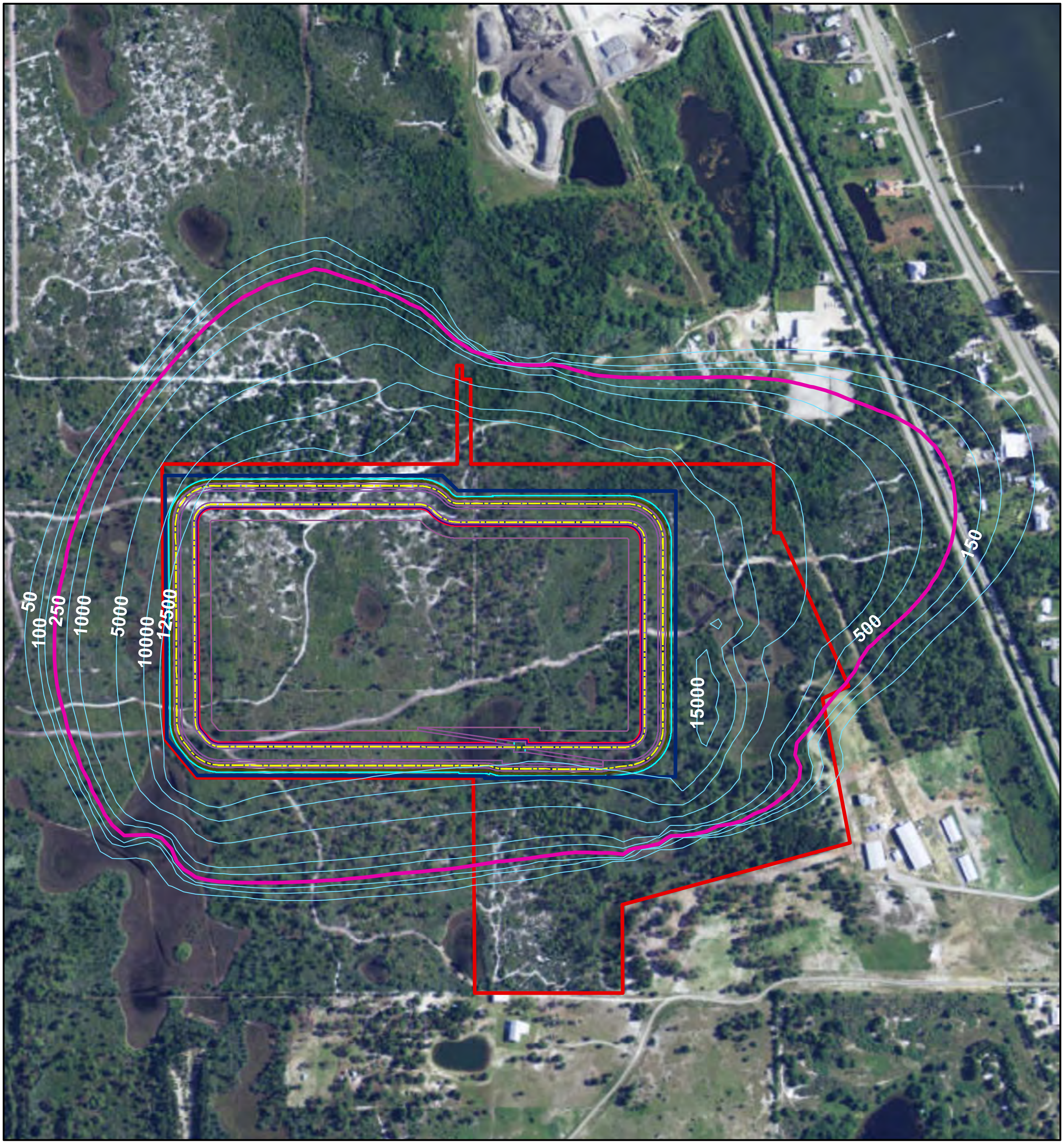
BV-24A

BREVARD COUNTY, FL

FOURTH DREDGE LOADING & RESTING (30-40 YRS)

EXHIBIT E-22

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS



N

Legend:

Concentrations at the end of 10-year resting - Layer 2

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

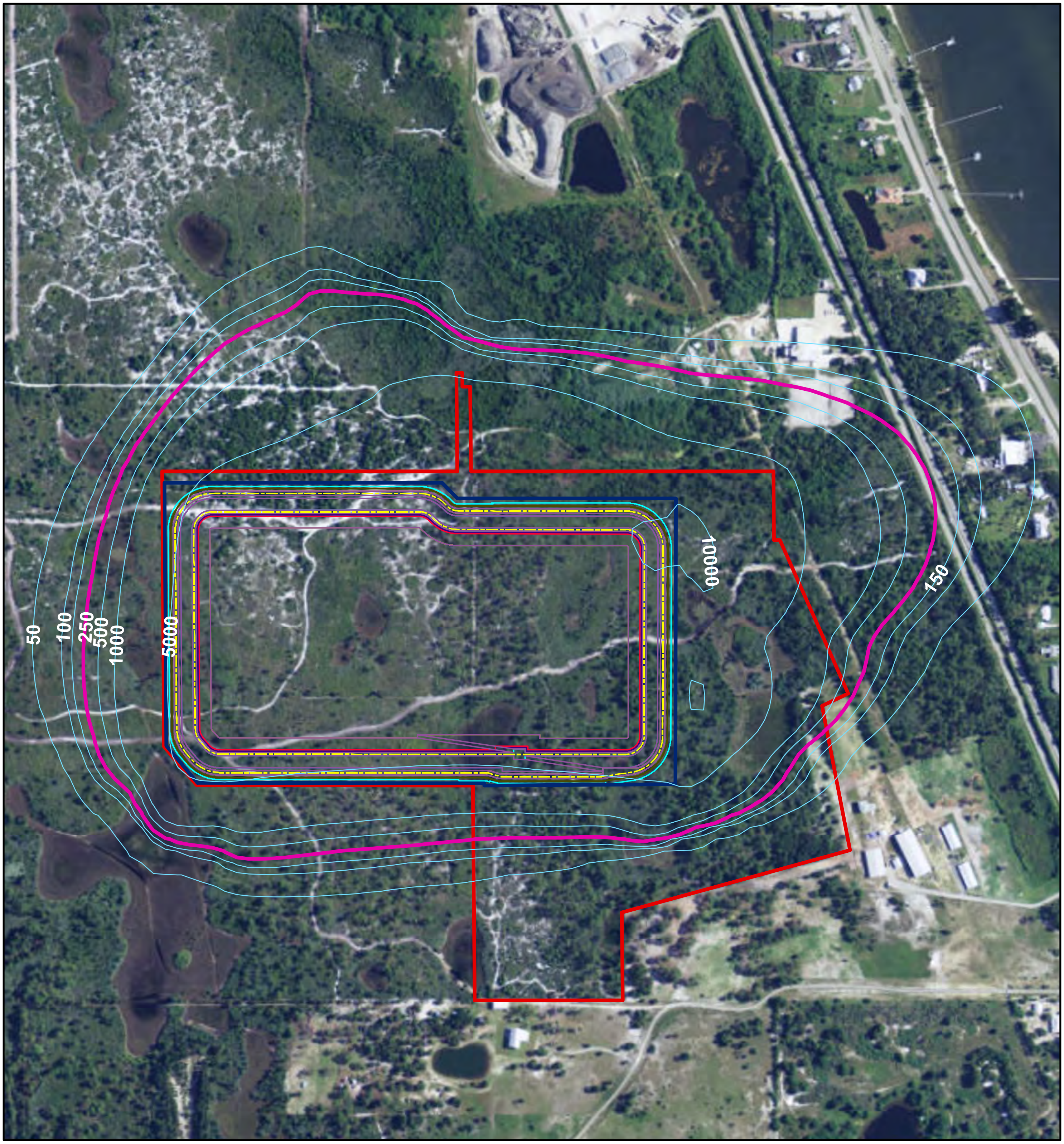
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

FOURTH DREDGE LOADING & RESTING (30-40 YRS)

EXHIBIT E-23



N

Legend:

Concentrations at the end of 10-year resting - Layer 3

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

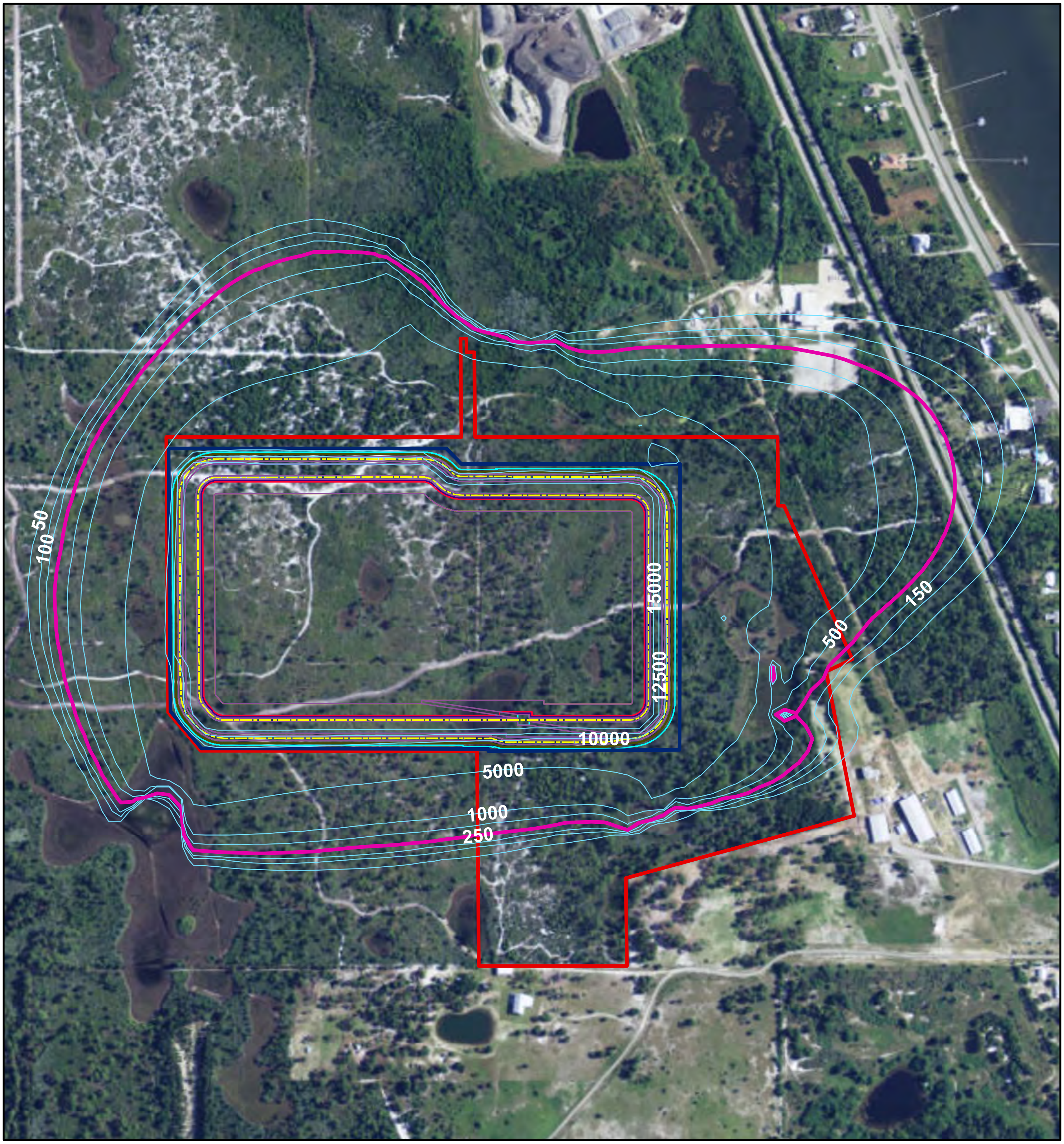
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

FOURTH DREDGE LOADING & RESTING (30-40 YRS)

EXHIBIT E-24



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 1

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING

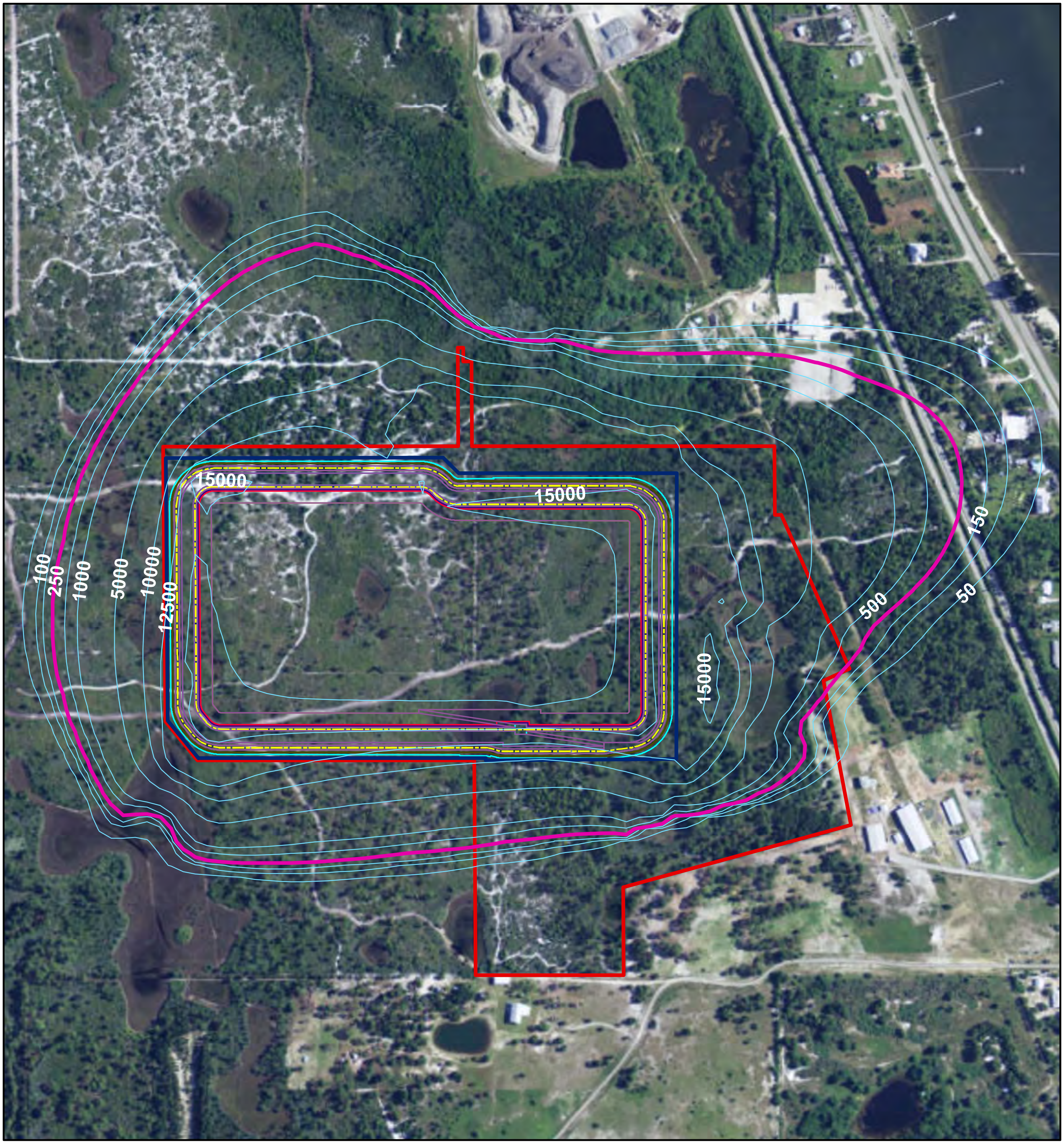
BV-24A

BREVARD COUNTY, FL

FIFTH DREDGE LOADING & RESTING (40-50 YRS)

EXHIBIT E-25

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 2

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

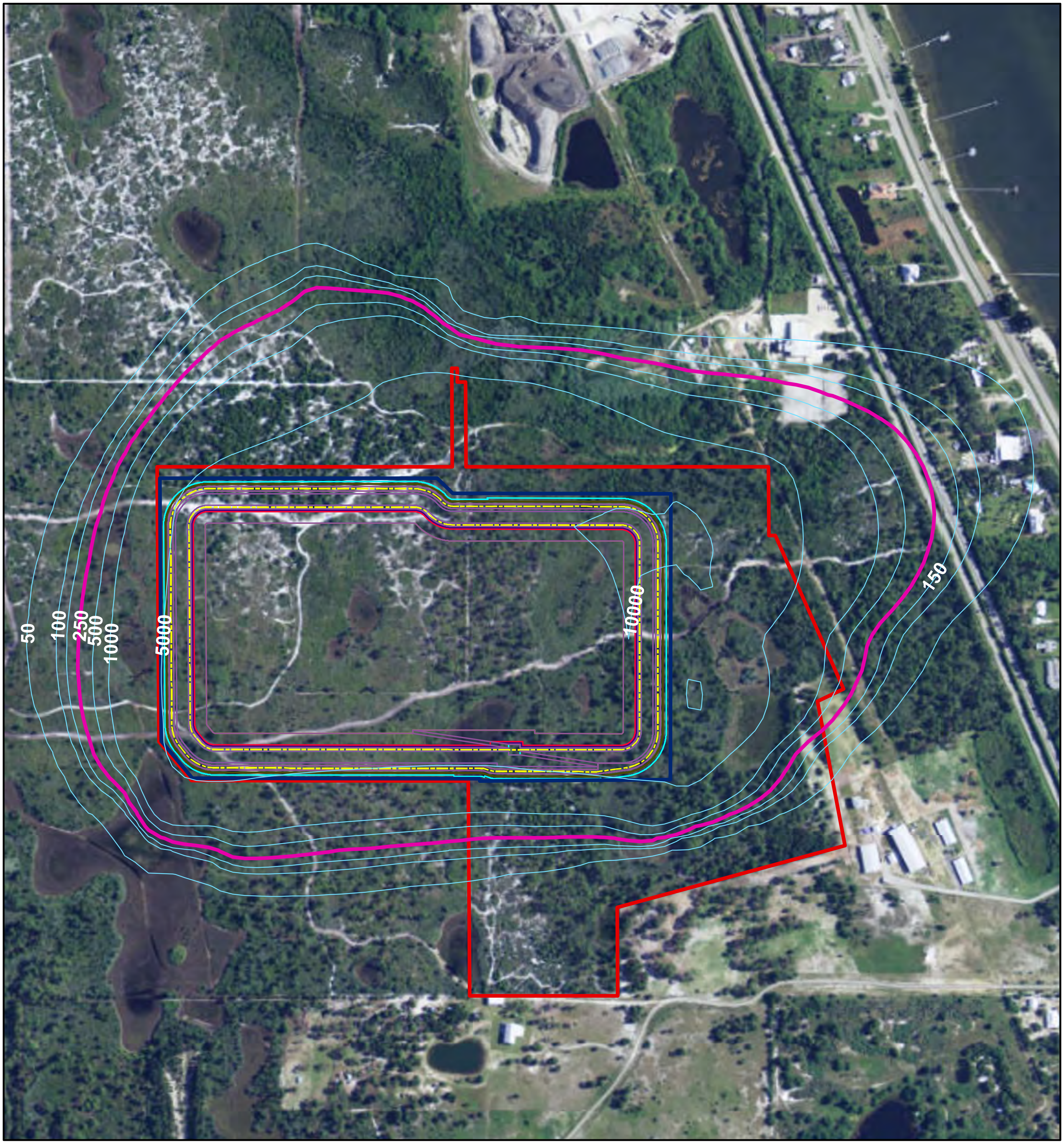
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

FIFTH DREDGE LOADING & RESTING (40-50 YRS)

EXHIBIT E-26



N

Legend:

Concentrations at the end of 28-days of dredge loading - Layer 3

DMMA Boundary

Property Boundary

0 600 1,200 Feet

1 inch = 600 feet

ANDREYEV ENGINEERING, INC.

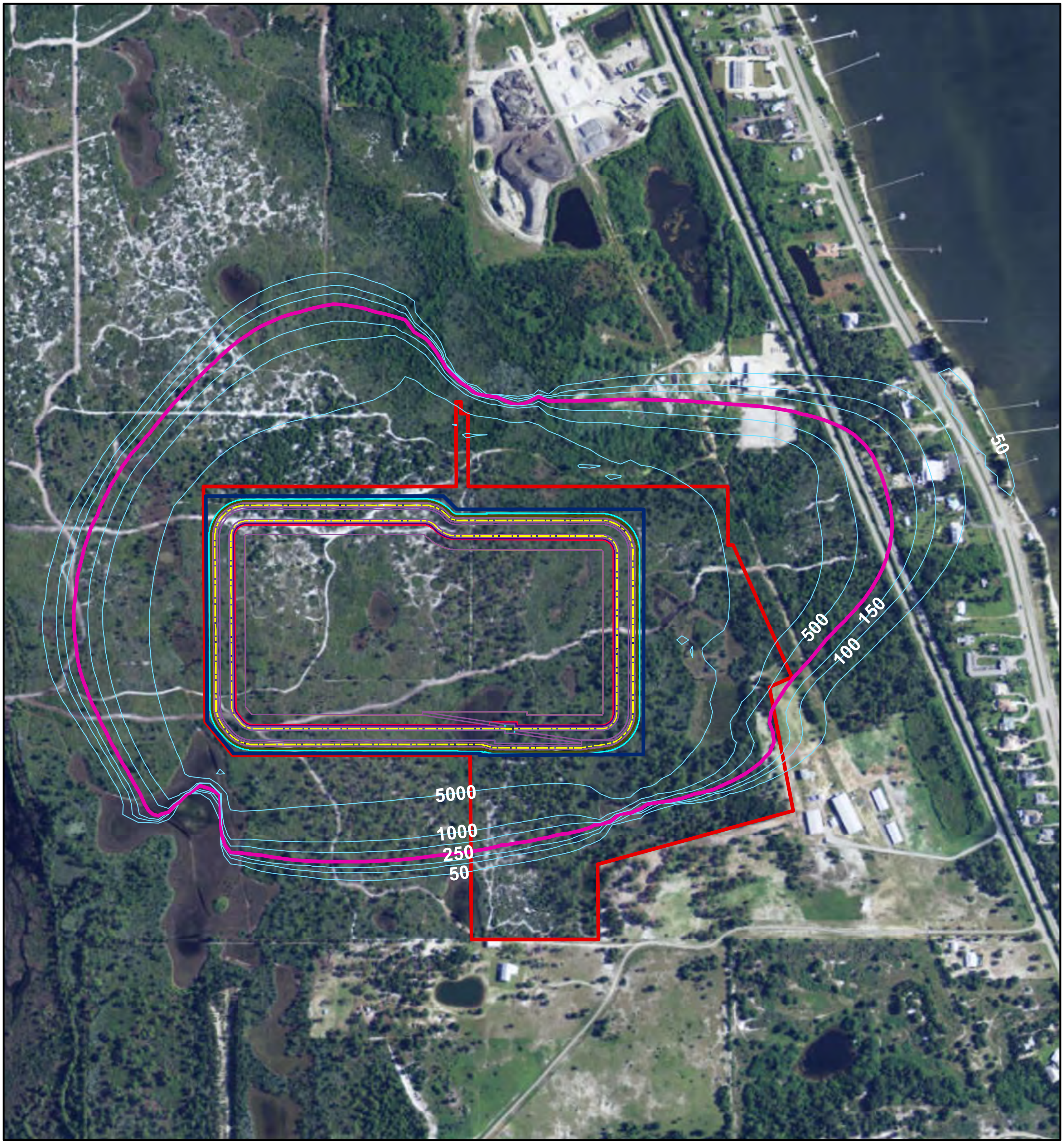
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

FIFTH DREDGE LOADING & RESTING (40-50 YRS)

APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA	EXHIBIT E-27
	PN:GPGW-16-013	DRAWN BY: DLS	



N

Legend:

Concentrations at the end of 10-year resting - Layer 1

DMMA Boundary

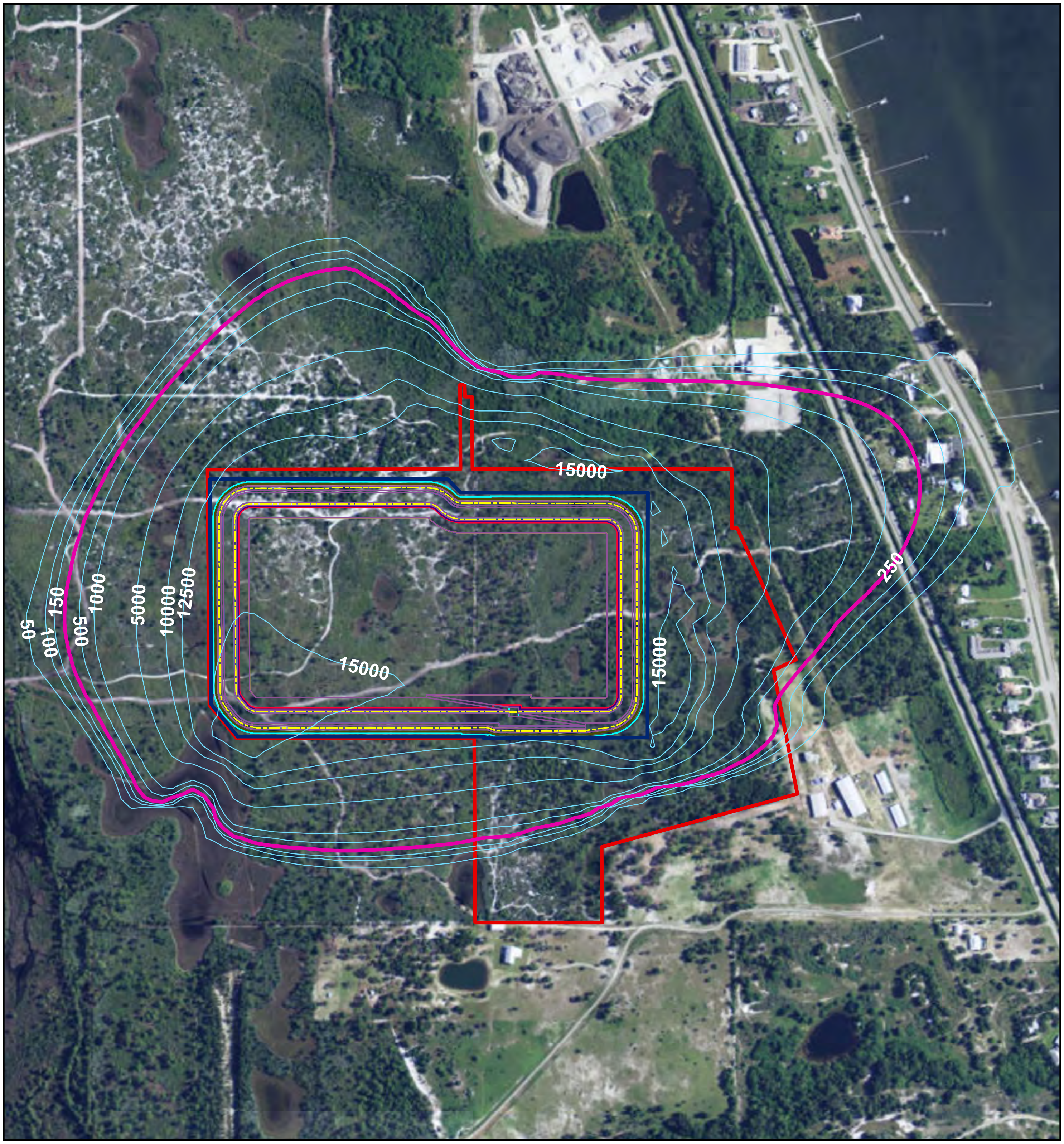
Property Boundary

0 700 1,400 Feet

1 inch = 700 feet

ANDREYEV ENGINEERING, INC.

GROUNDWATER MODELING		
BV-24A		
BREVARD COUNTY, FL		
FIFTH DREDGE LOADING & RESTING (40-50 YRS)		
APPROXIMATE SCALE: AS SHOWN	DATE: 05/25/16	ENGINEER:NA
	PN:GPGW-16-013	DRAWN BY: DLS
EXHIBIT E-28		



N

Legend:

Concentrations at the end of 10-year resting - Layer 2

DMMA Boundary

Property Boundary

0 700 1,400 Feet

1 inch = 700 feet

ANDREYEV ENGINEERING, INC.

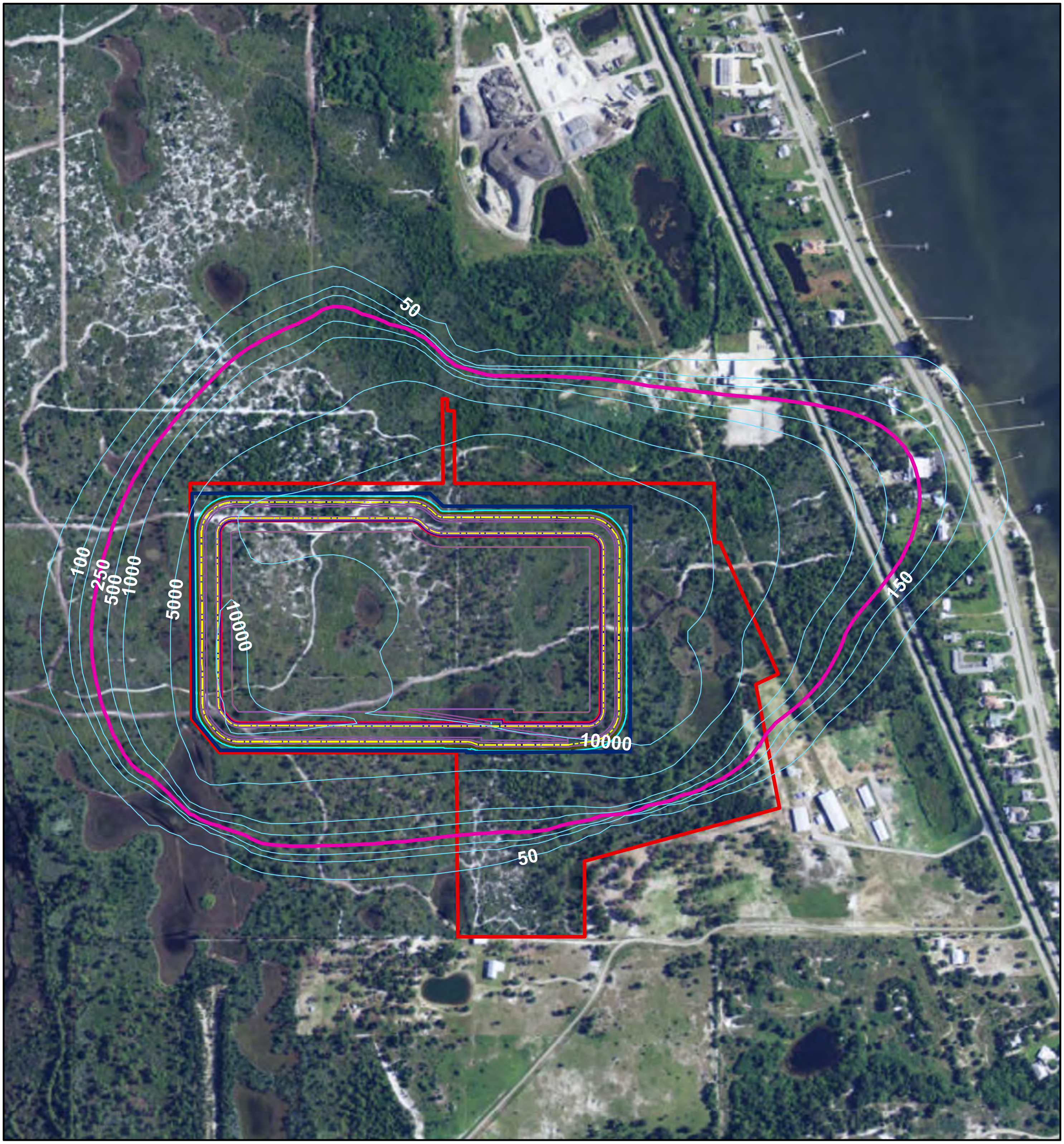
GROUNDWATER MODELING

BV-24A

BREVARD COUNTY, FL

FIFTH DREDGE LOADING & RESTING (40-50 YRS)

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA	EXHIBIT E-29
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS	



Legend:

Concentrations at the end of 10-year resting - Layer 3

DMMA Boundary

Property Boundary

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 05/25/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

GROUNDWATER MODELING

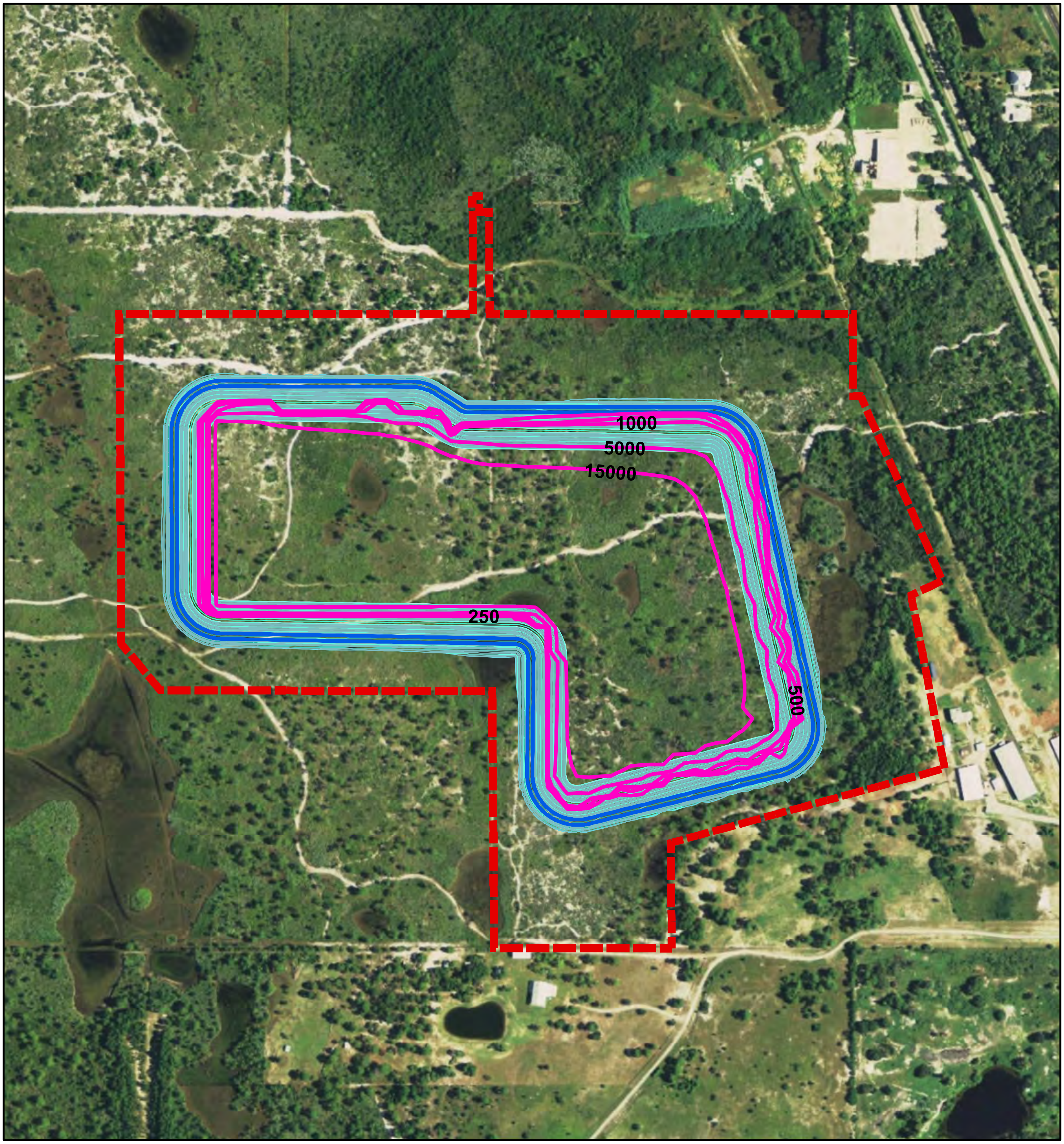
BV-24A

BREVARD COUNTY, FL

FIFTH DREDGE LOADING & RESTING (40-50 YRS)

EXHIBIT E-30

APPENDIX F
GROUNDWATER MODELING – WITH CONTROLS



0 500 1,000
Feet
1 " = 500 '

N

Legend:

Property Boundary
Perimeter Ditch
Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

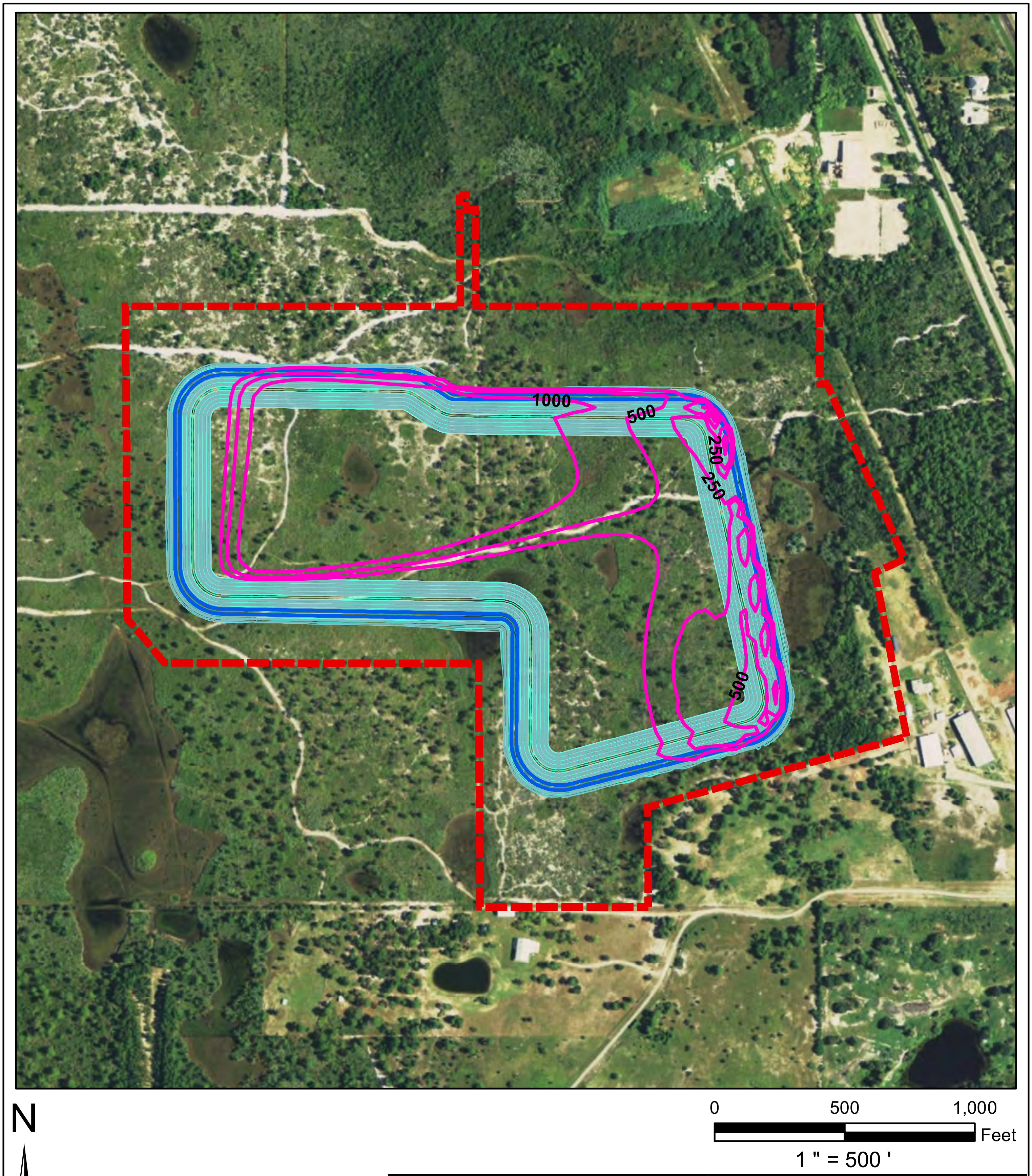
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 0-10 YEAR CYCLE

Exhibit F-1



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

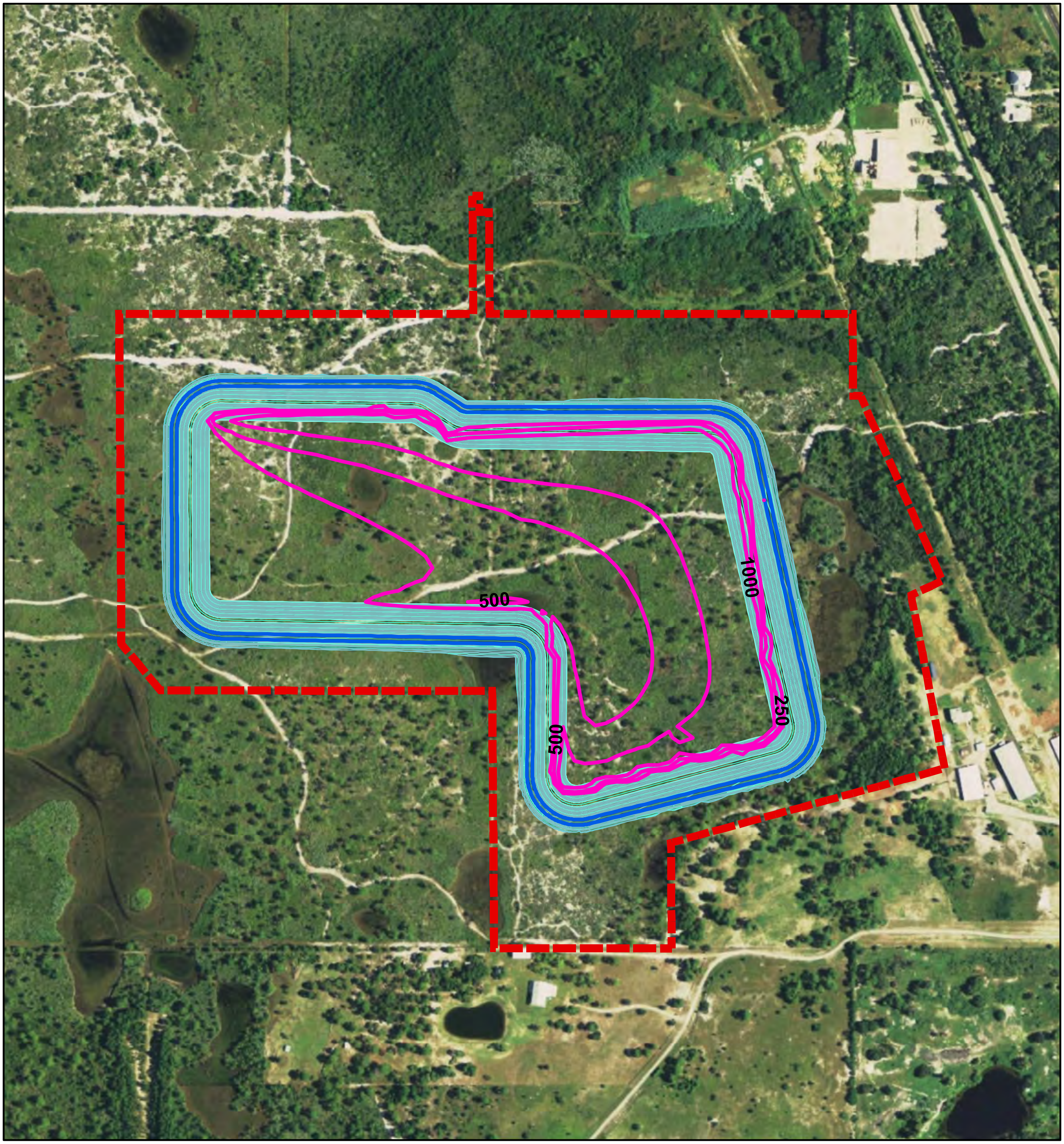
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 0-10 YEAR CYCLE

Exhibit F-2



N

0 500 1,000
Feet
1 " = 500 '

Legend:
Property Boundary
Perimeter Ditch
Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

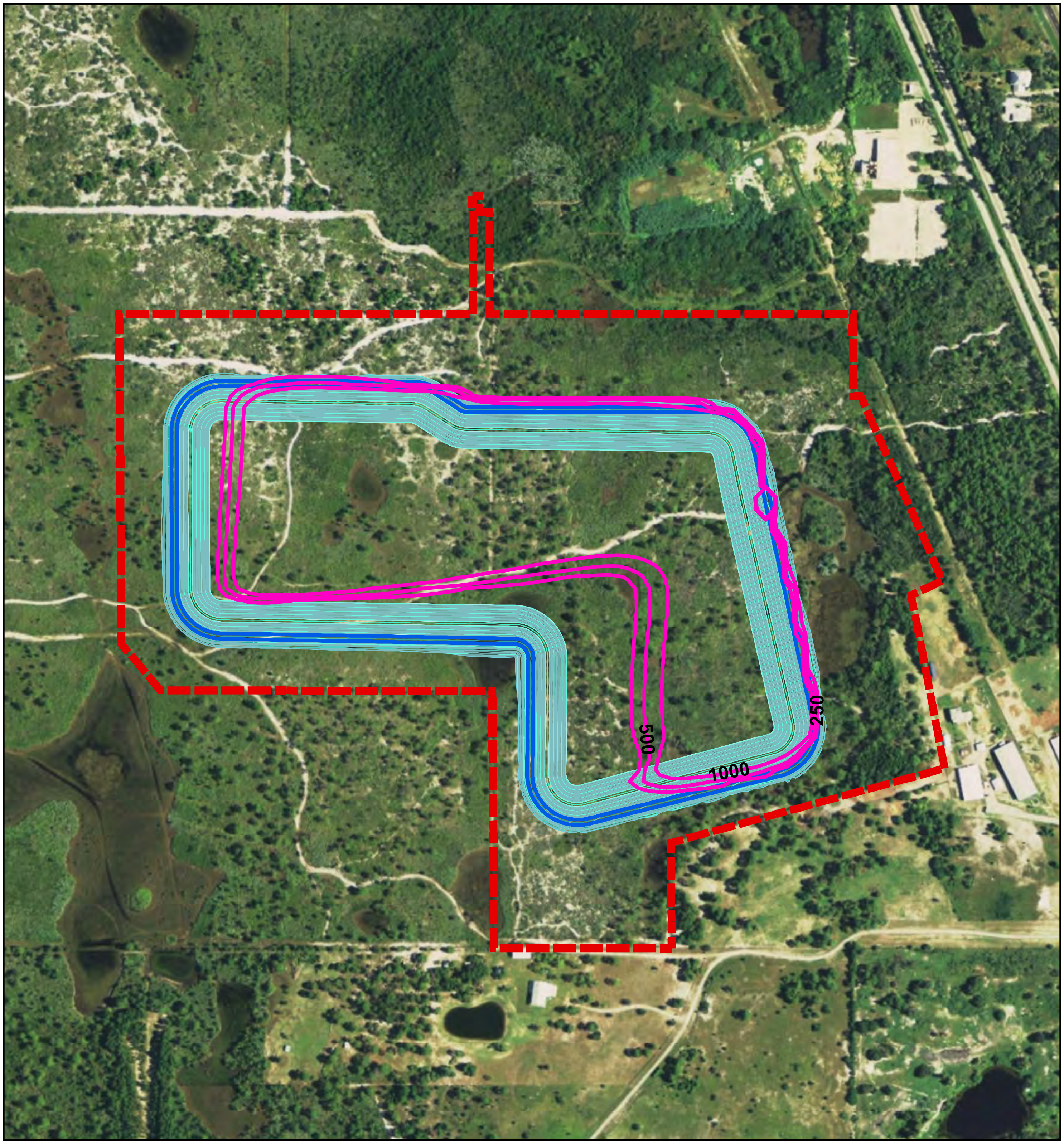
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 0-10 YEAR CYCLE

Exhibit F-3



N

0 500 1,000
Feet
1 " = 500 '

Legend:

Property Boundary
Perimeter Ditch
Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

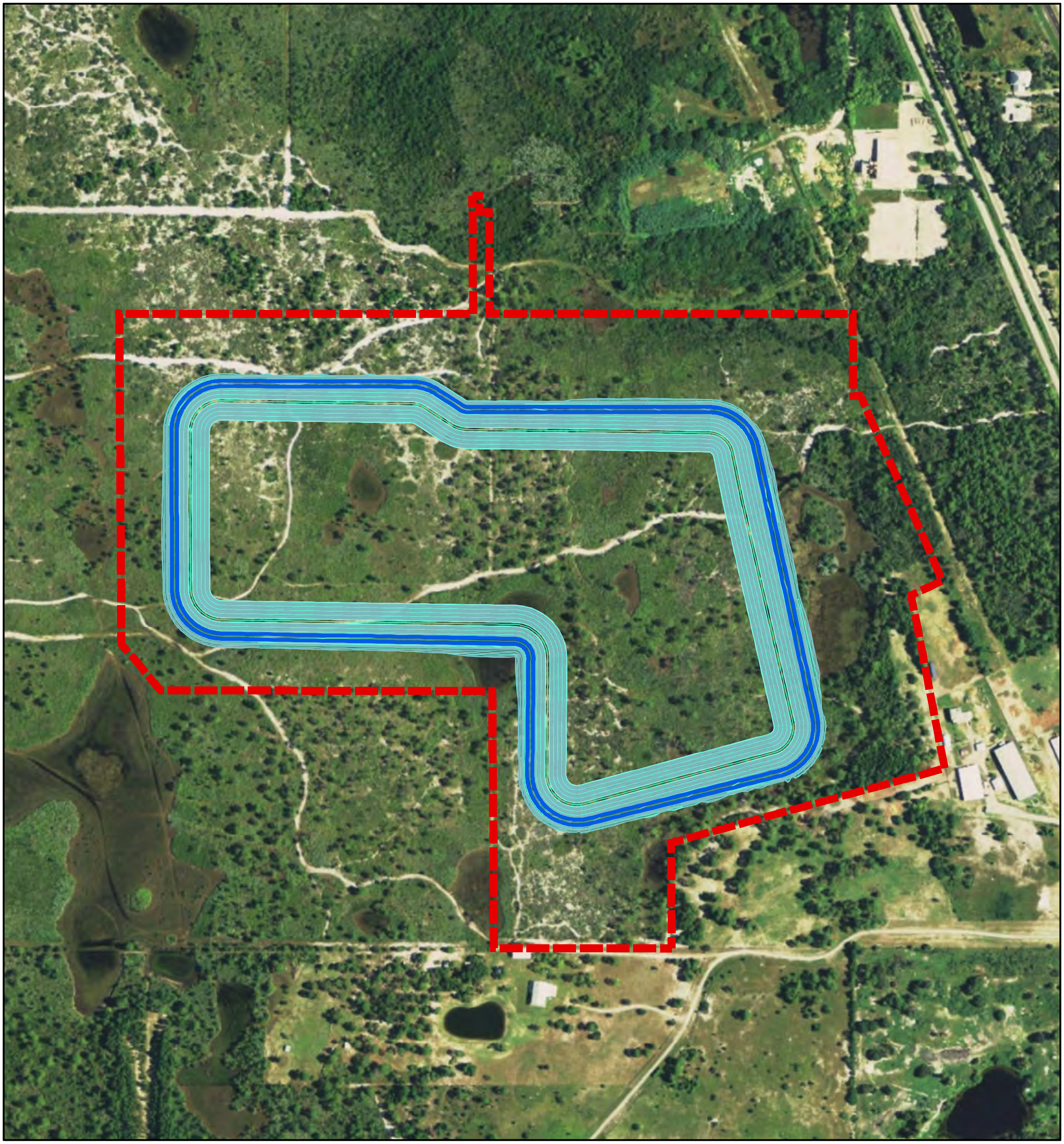
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 0-10 YEAR CYCLE

Exhibit F-4



N

1 " = 500 '

0 500 1,000 Feet

Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

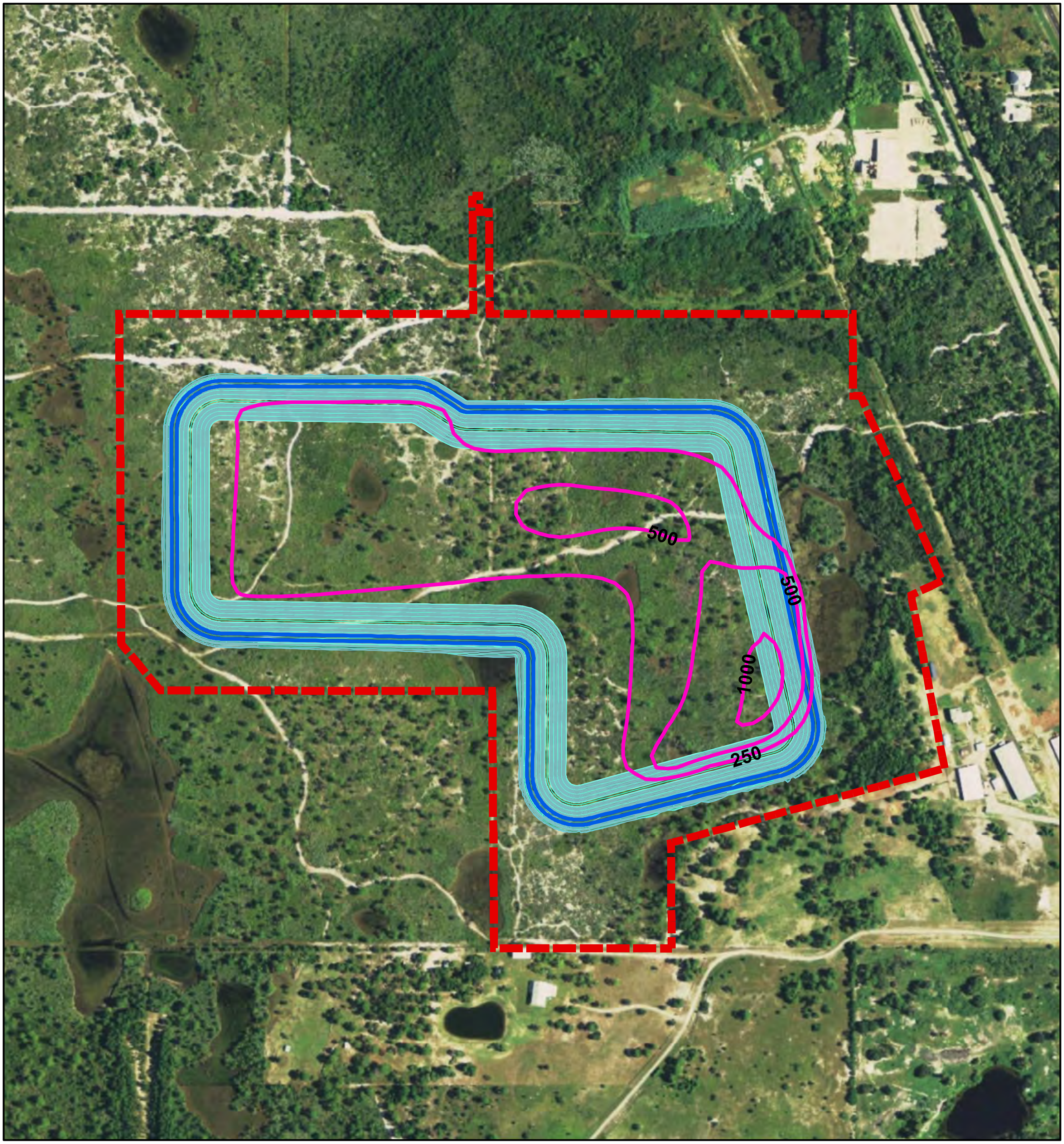
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 0-10 YEAR CYCLE

Exhibit F-5



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

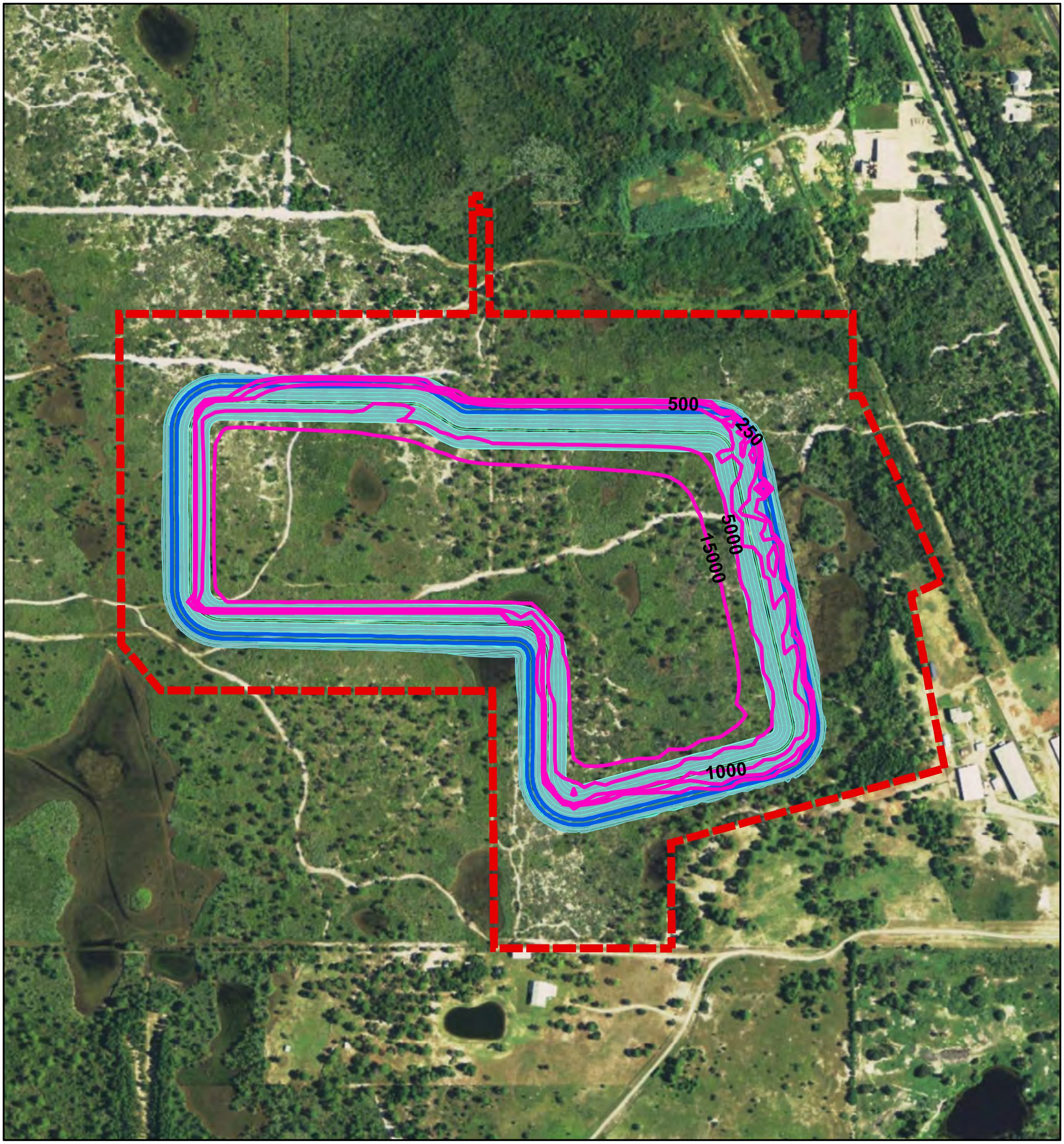
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 0-10 YEAR CYCLE

Exhibit F-6



N

0 500 1,000
Feet
1 " = 500 '

Legend:

Property Boundary
Perimeter Ditch
Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

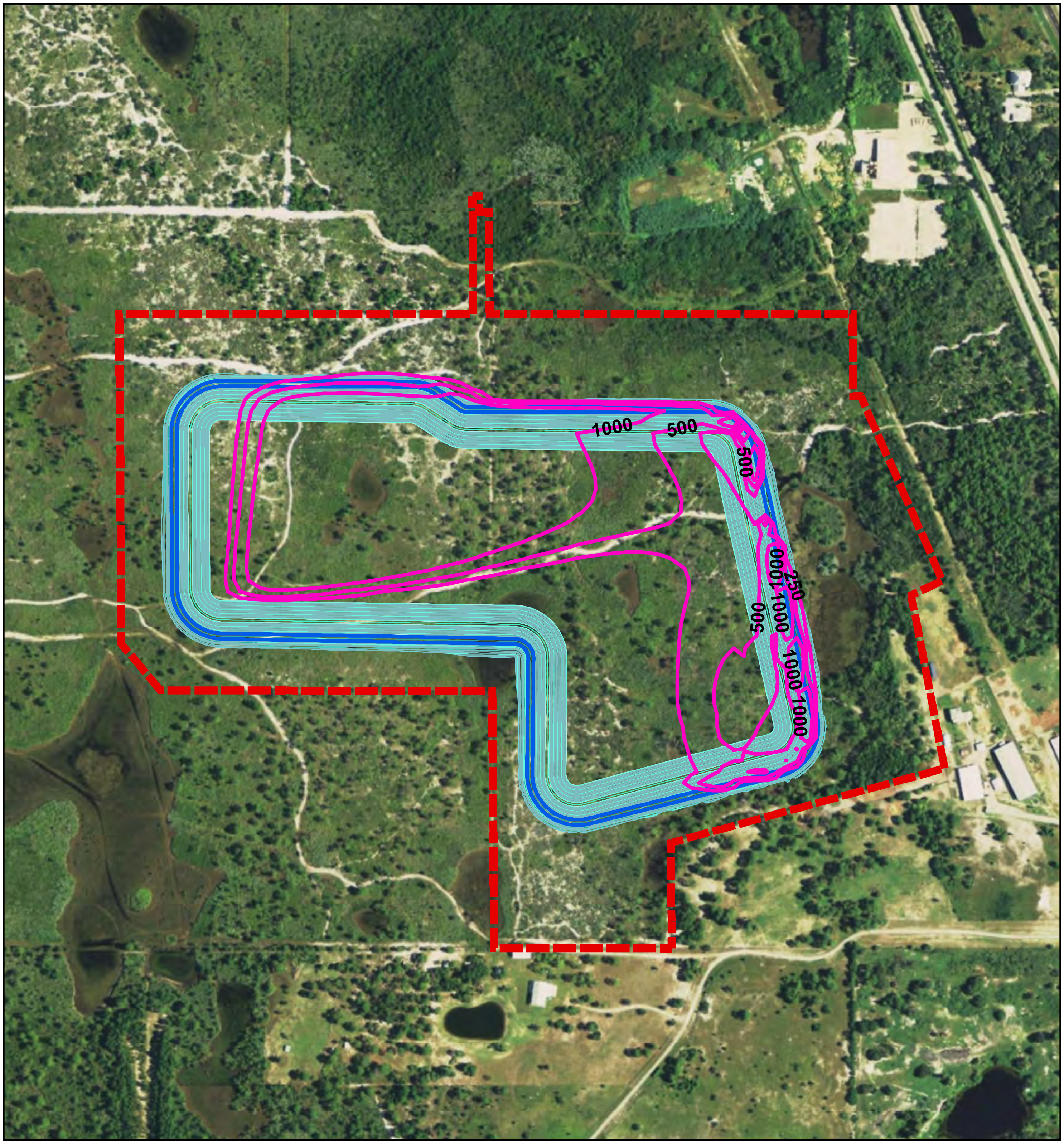
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 10-20 YEAR CYCLE

Exhibit F-7



N

0 500 1,000 Feet

1 " = 500 '

Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

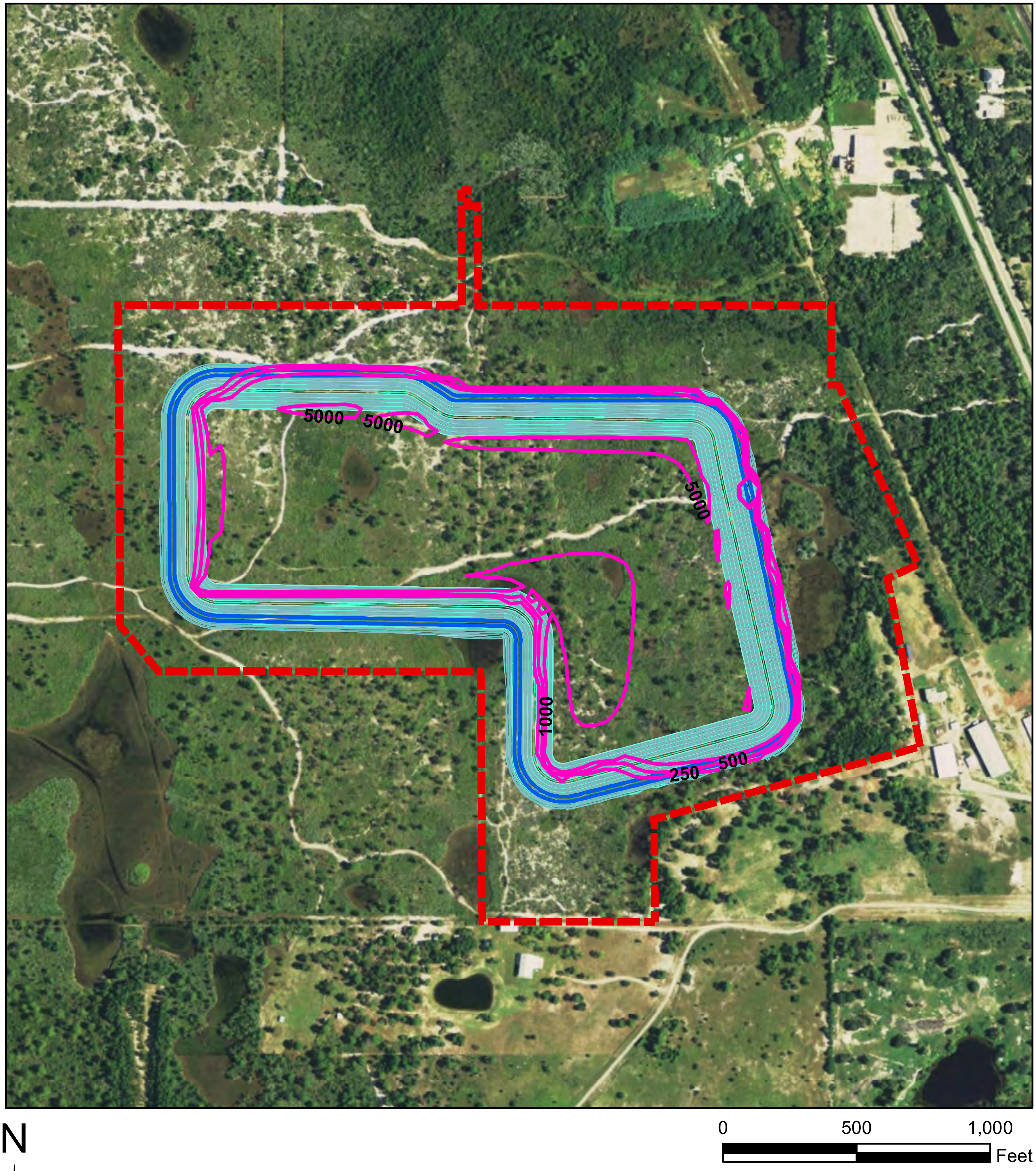
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 10-20 YEAR CYCLE

Exhibit F-8



Legend:

- Property Boundary
- Perimeter Ditch
- Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

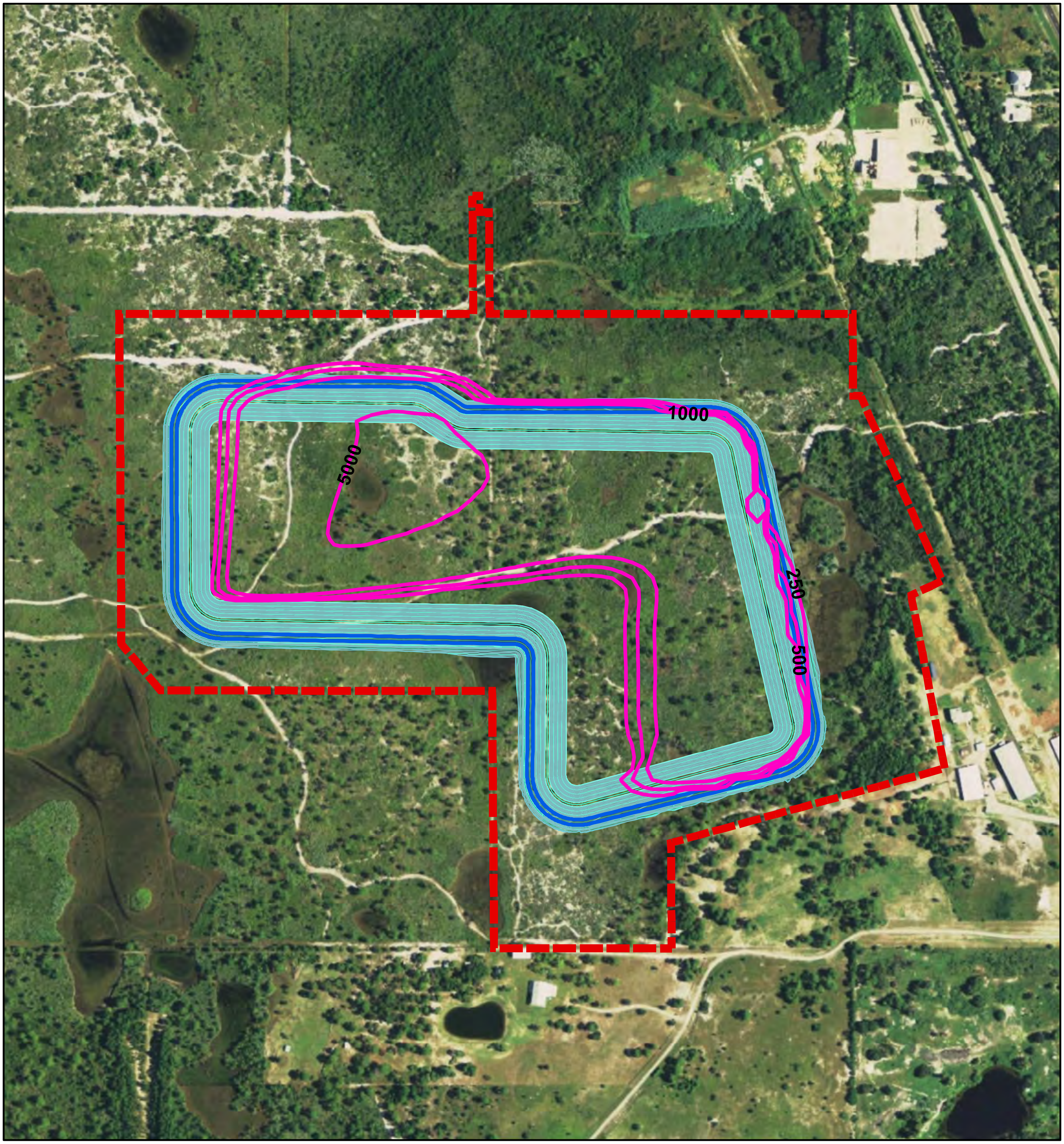
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 10-20 YEAR CYCLE

Exhibit F-9



N

0 500 1,000
Feet
1 " = 500 '

Legend:

Property Boundary
Perimeter Ditch
Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

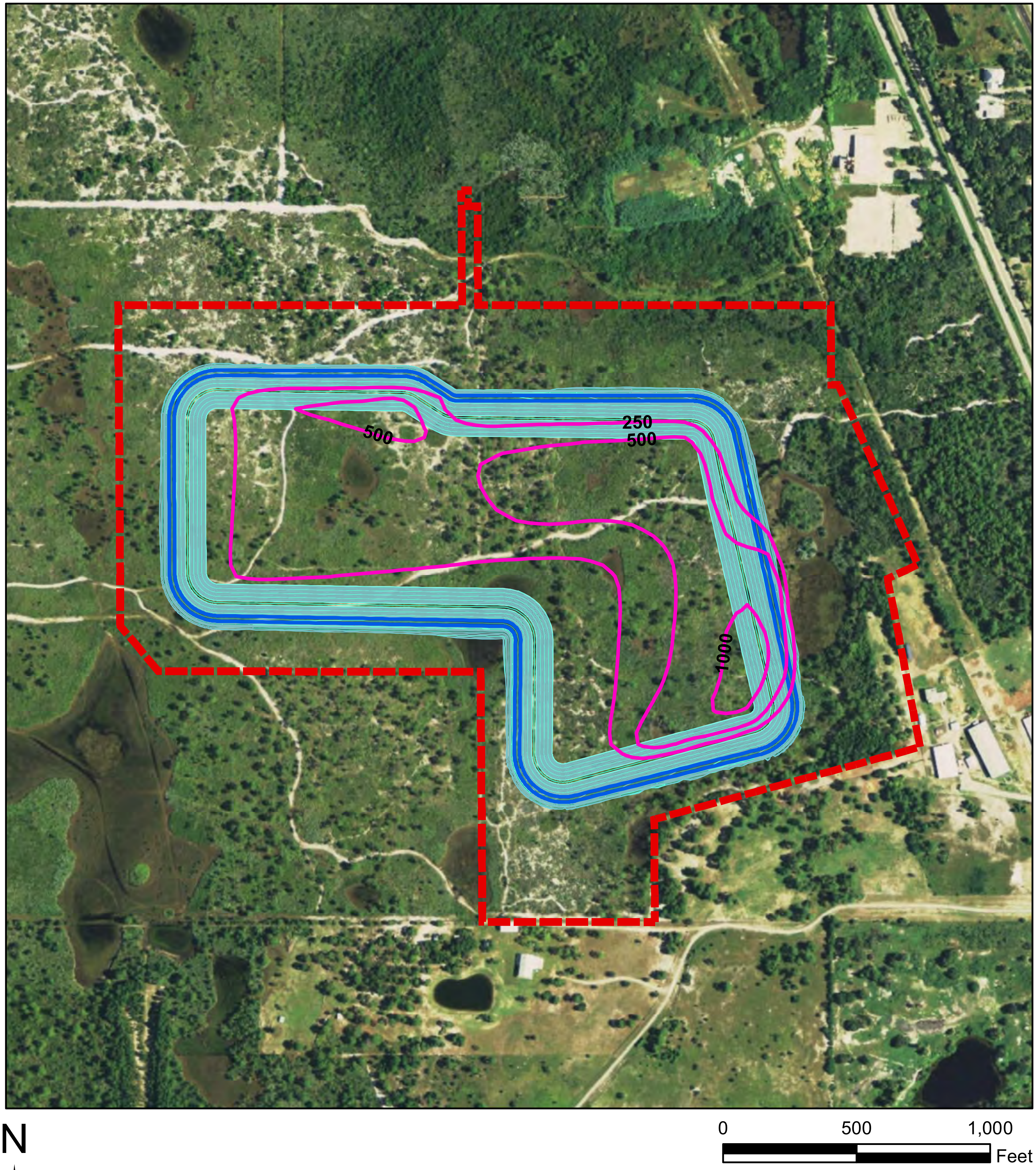
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 10-20 YEAR CYCLE

Exhibit F-10



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

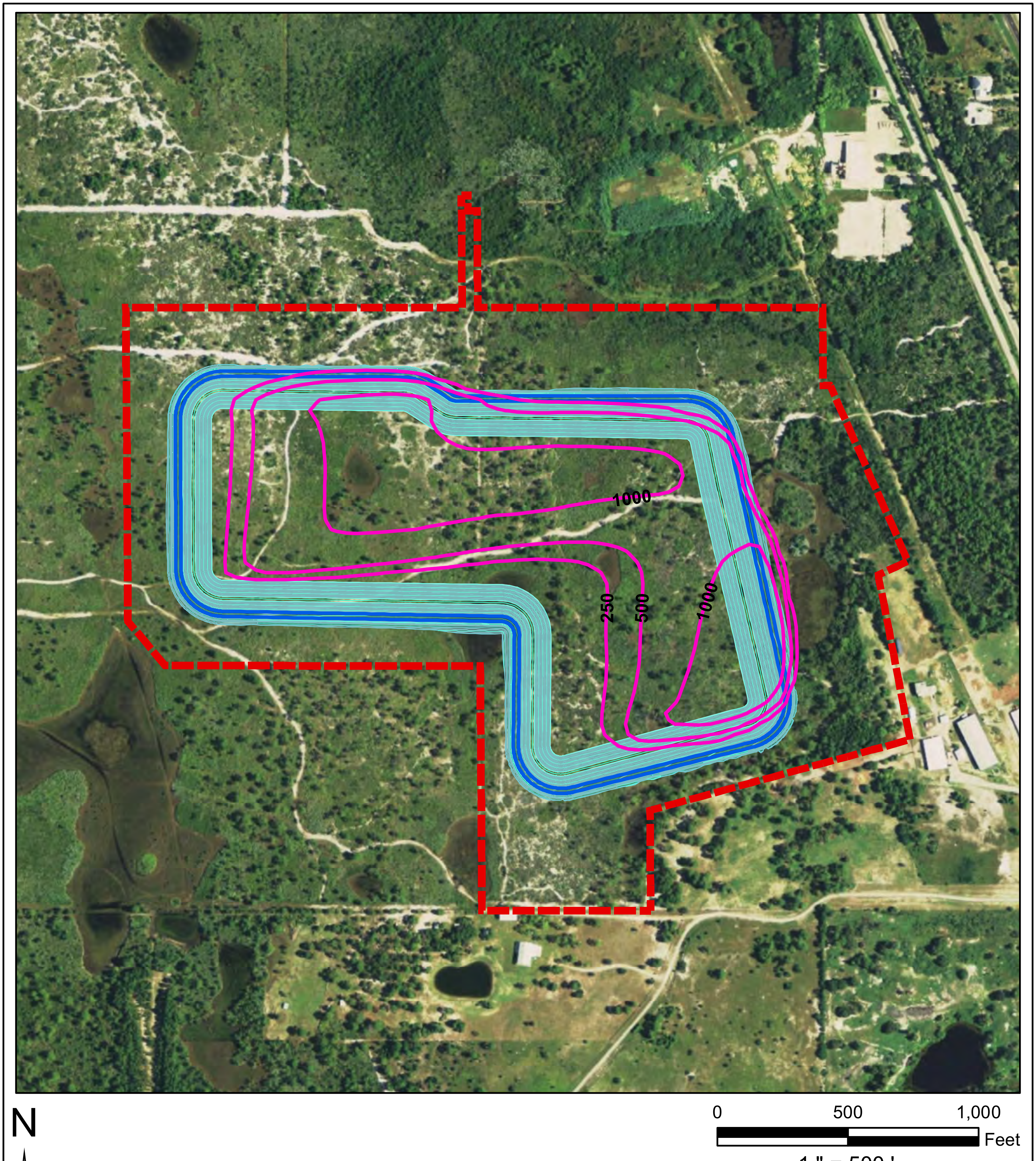
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 10-20 YEAR CYCLE

Exhibit F-11



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

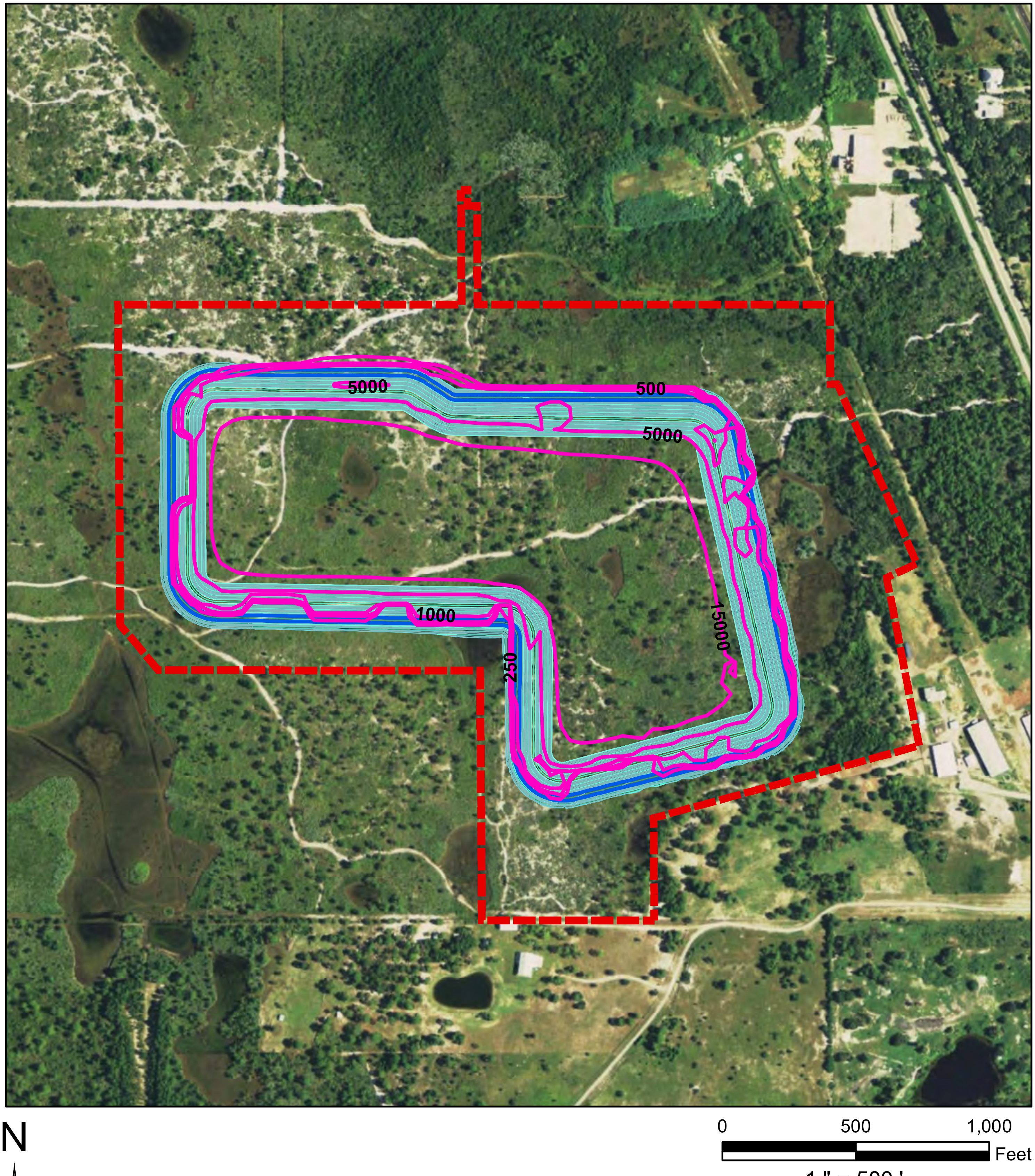
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 10-20 YEAR CYCLE

Exhibit F-12



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

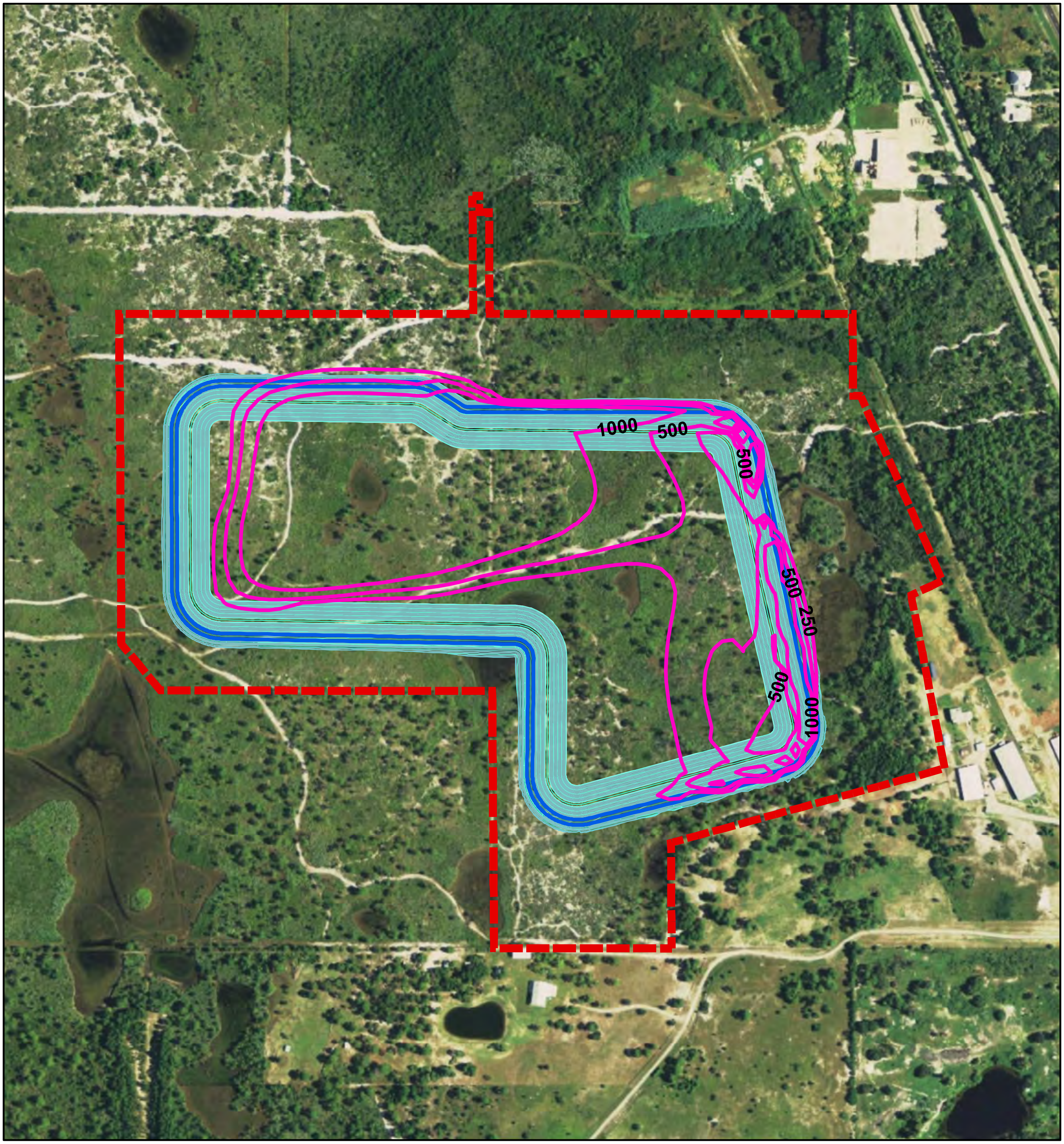
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 20-30 YEAR CYCLE

Exhibit F-13



0 500 1,000 Feet

1 " = 500 '

N

Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

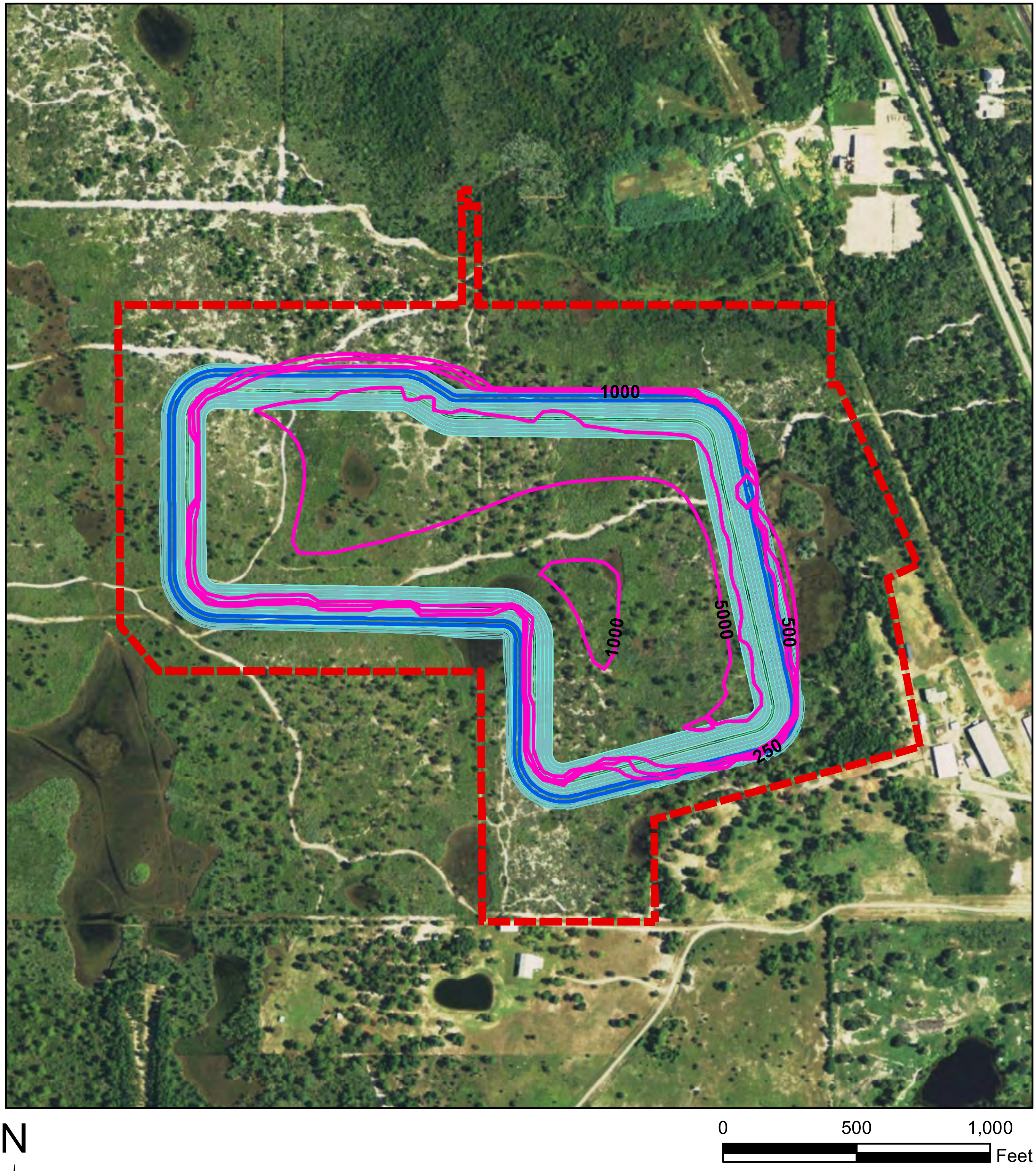
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 20-30 YEAR CYCLE

Exhibit F-14



Legend:

Property Boundary
Perimeter Ditch
Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

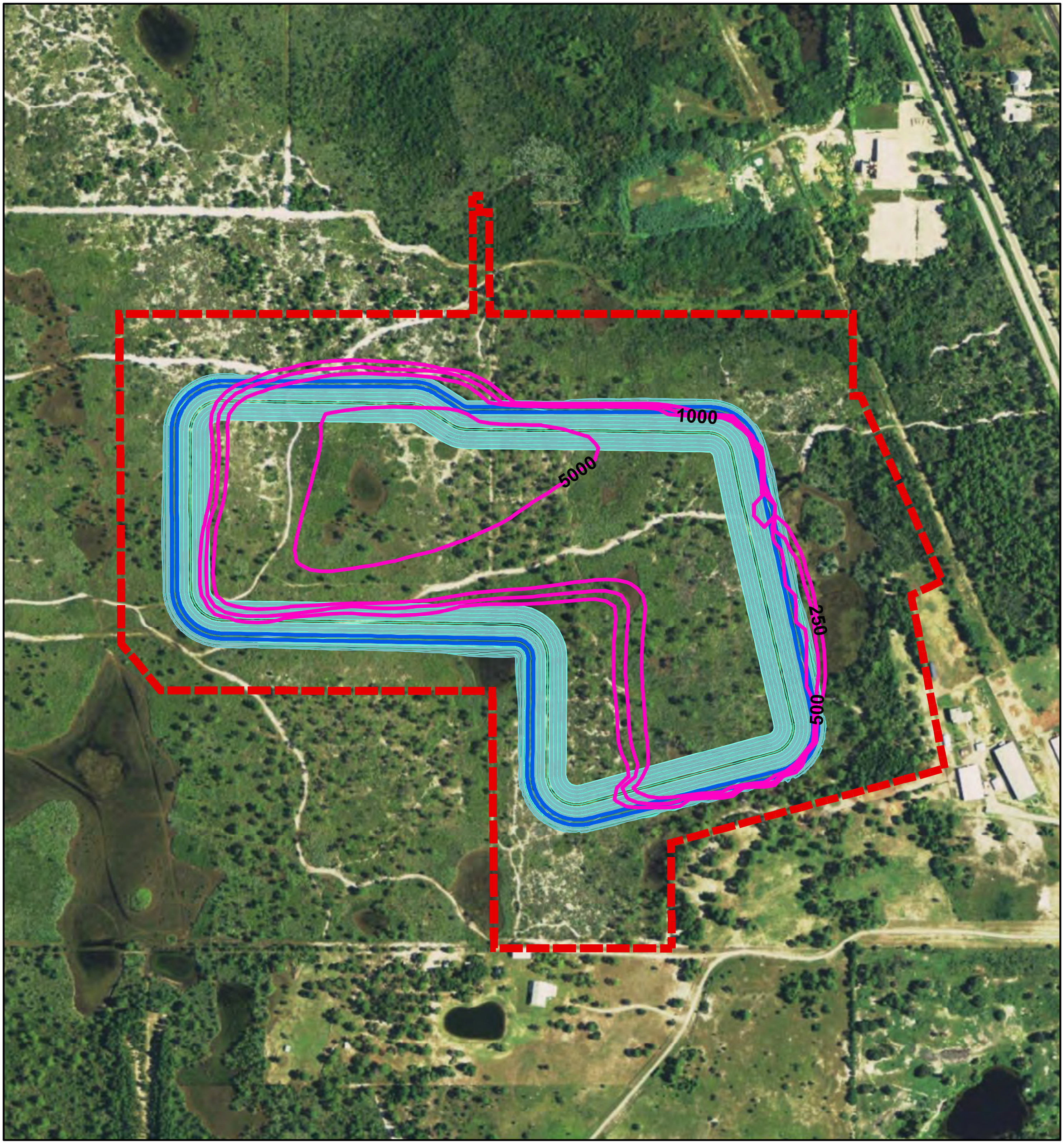
APPROXIMATE SCALE: AS SHOWN	DATE: 11/15/16	ENGINEER:NA
	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 20-30 YEAR CYCLE

Exhibit F-15



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

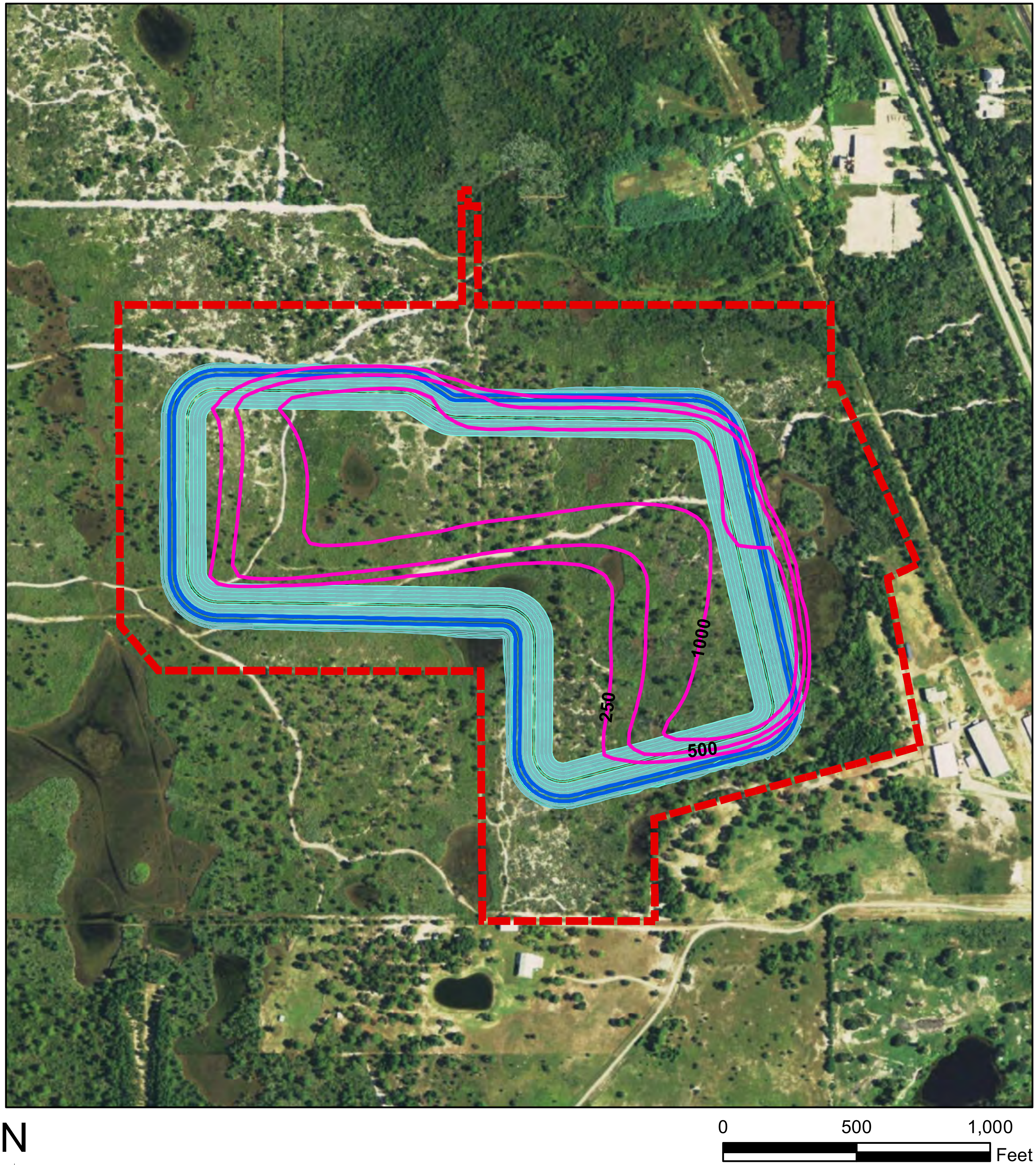
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 20-30 YEAR CYCLE

Exhibit F-16



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

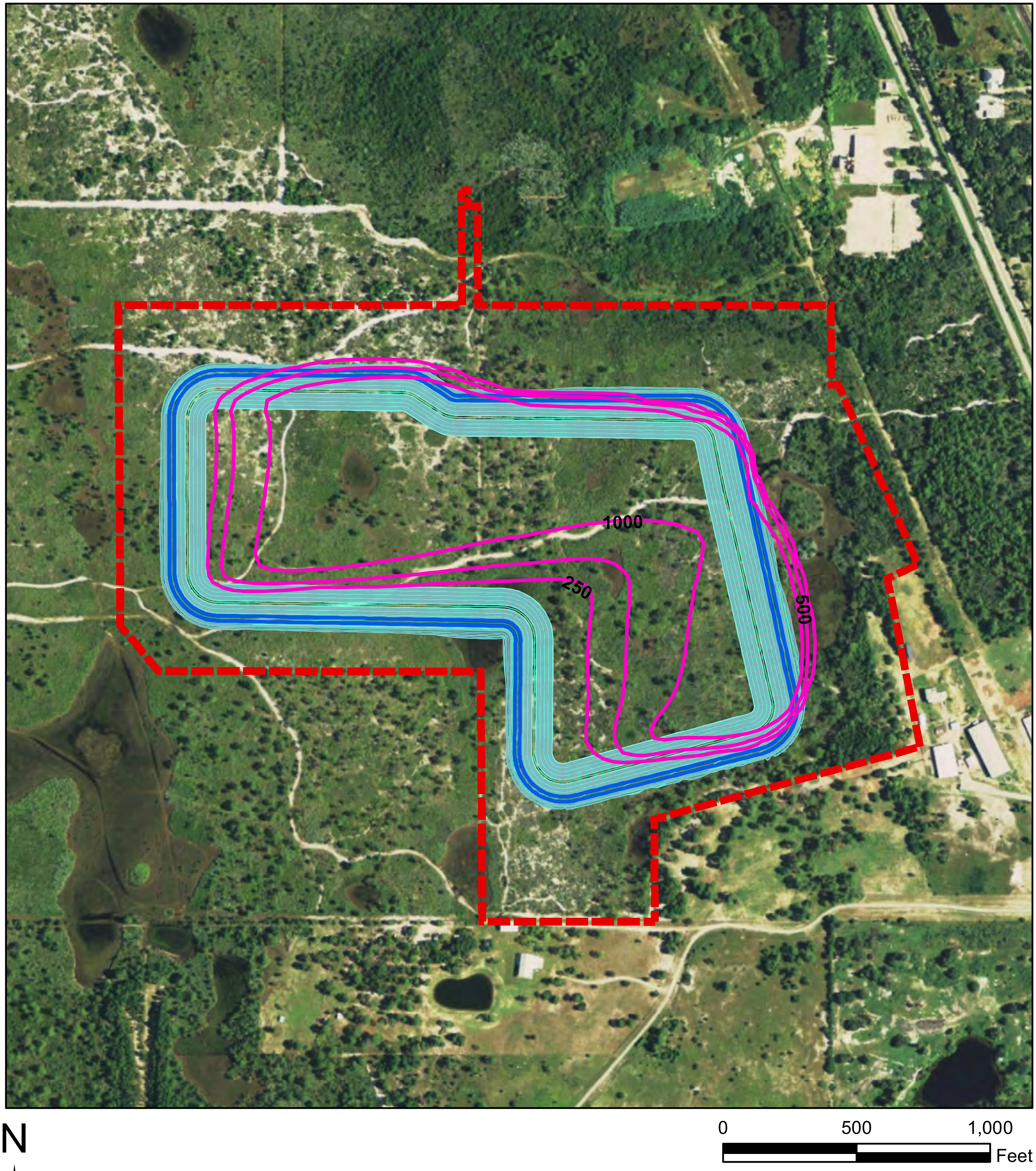
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 20-30 YEAR CYCLE

Exhibit F-17



Legend:

- Property Boundary
- Perimeter Ditch
- Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

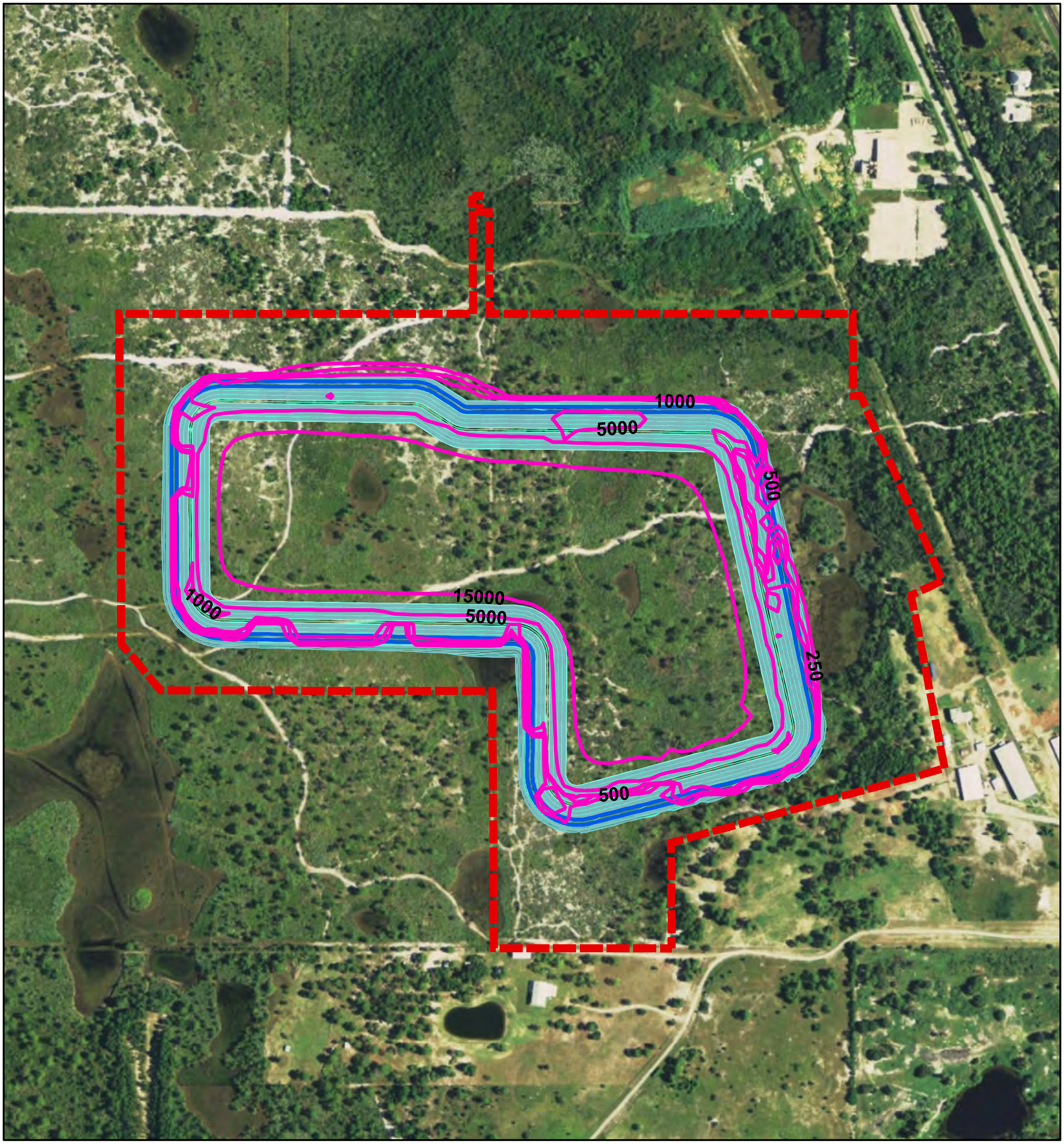
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 20-30 YEAR CYCLE

Exhibit F-18



N

0 500 1,000
Feet
1 " = 500 '

Legend:
Property Boundary
Perimeter Ditch
Chloride Contour (mg/L) - Layer 1

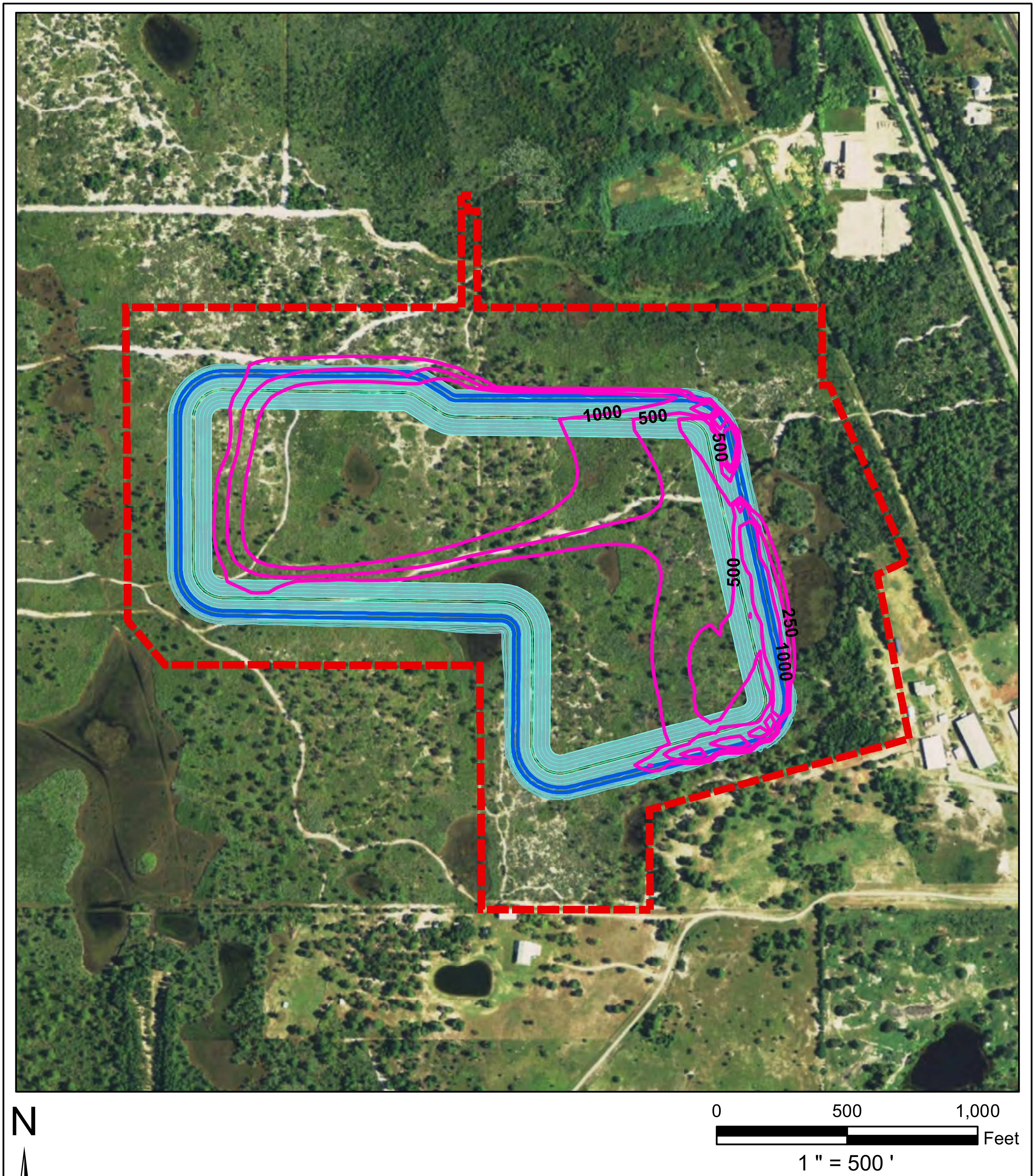
ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A
BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 30-40 YEAR CYCLE

Exhibit F-19



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

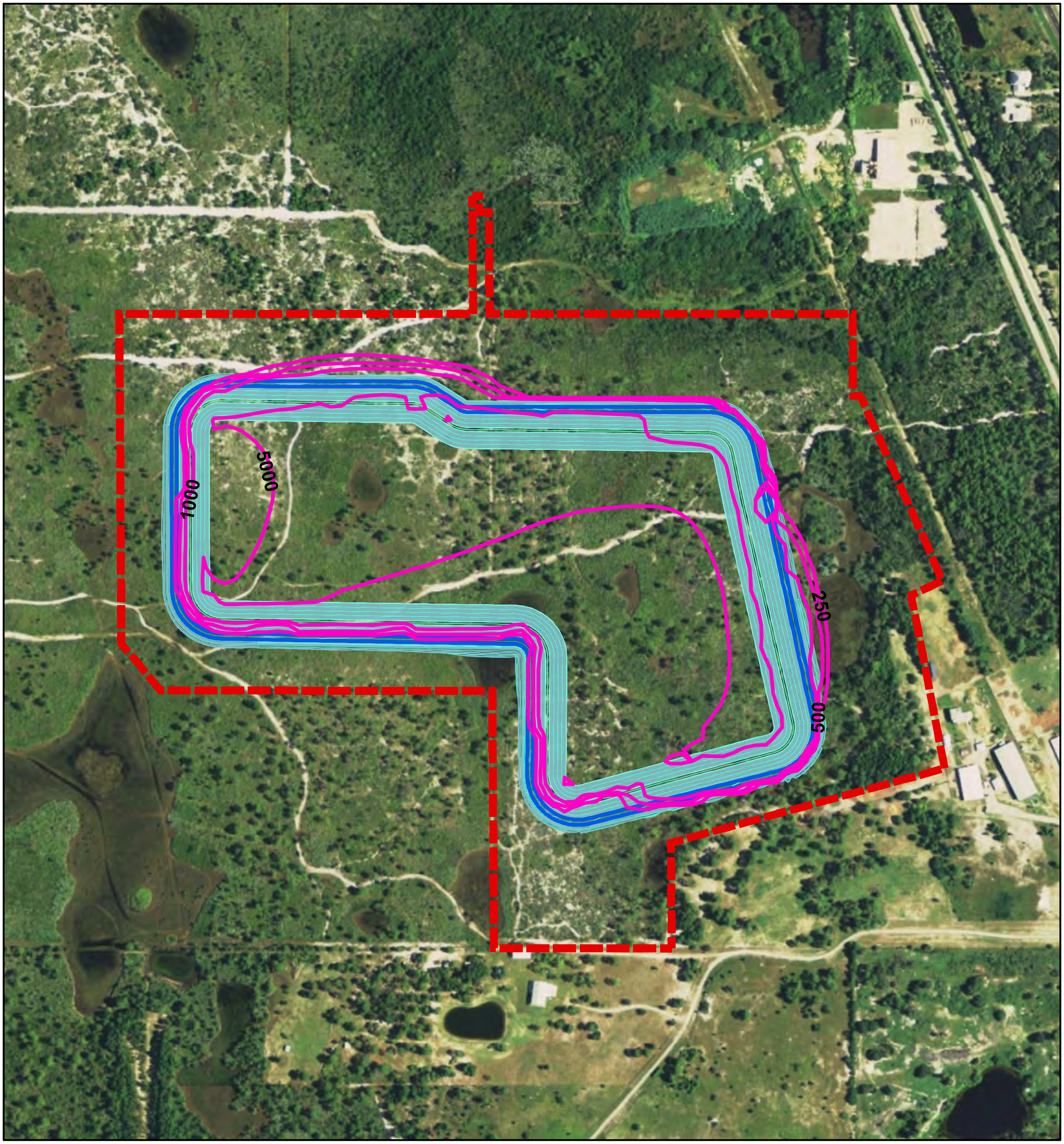
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 30-40 YEAR CYCLE

Exhibit F-20



N

0 500 1,000

Feet

1 " = 500 '

Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

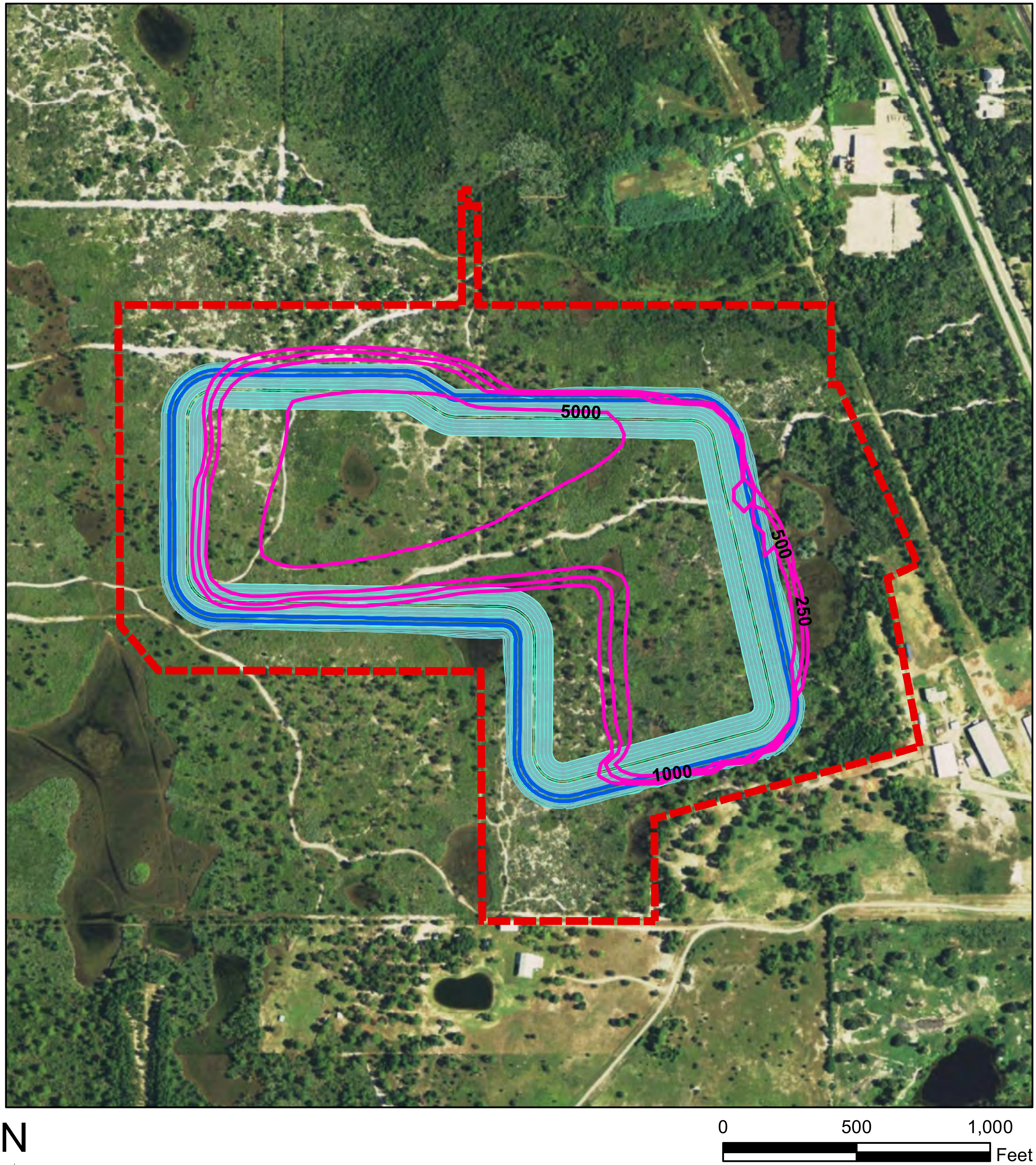
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 30-40 YEAR CYCLE

Exhibit F-21



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

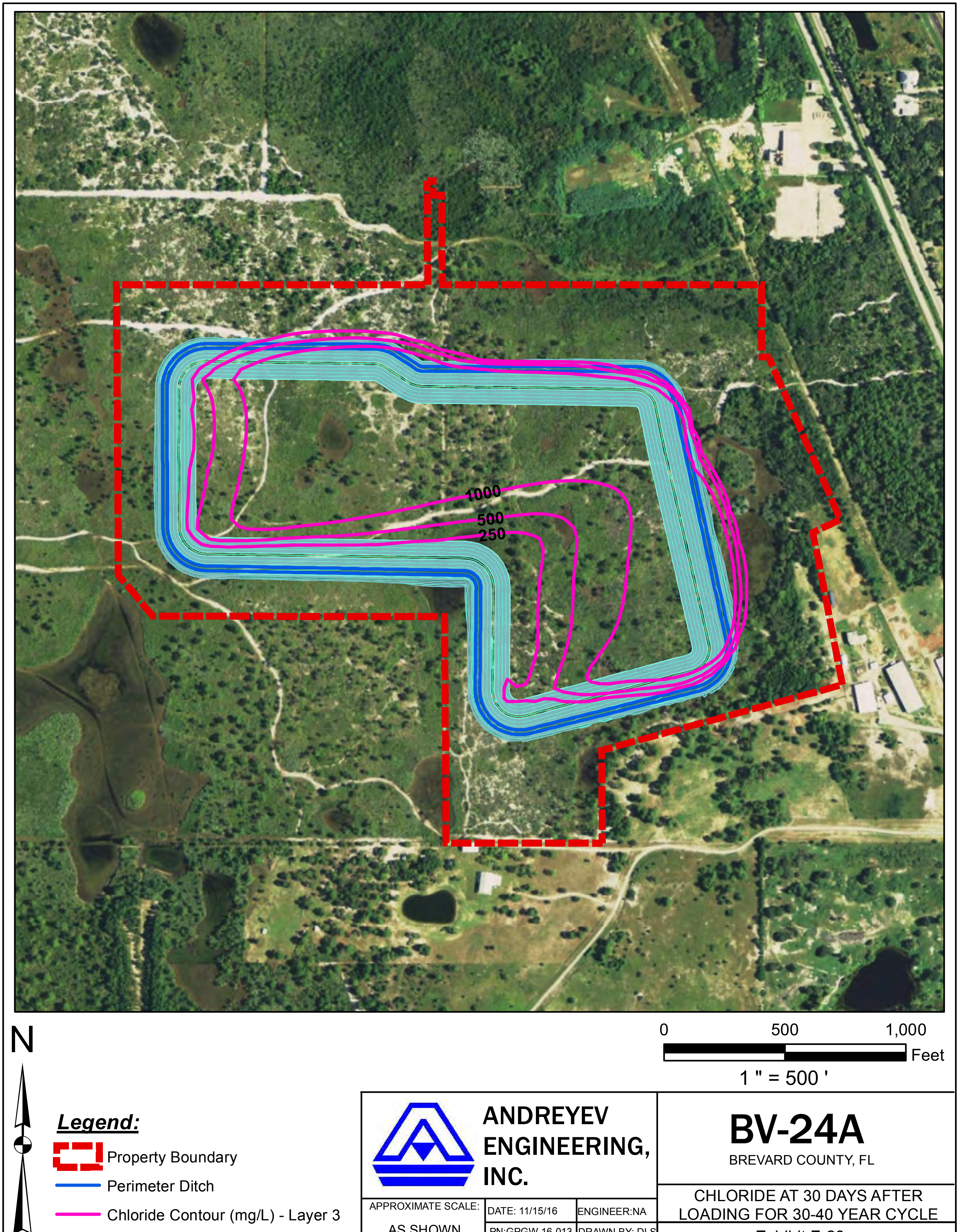
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 30-40 YEAR CYCLE

Exhibit F-22



ANDREYEV ENGINEERING, INC.

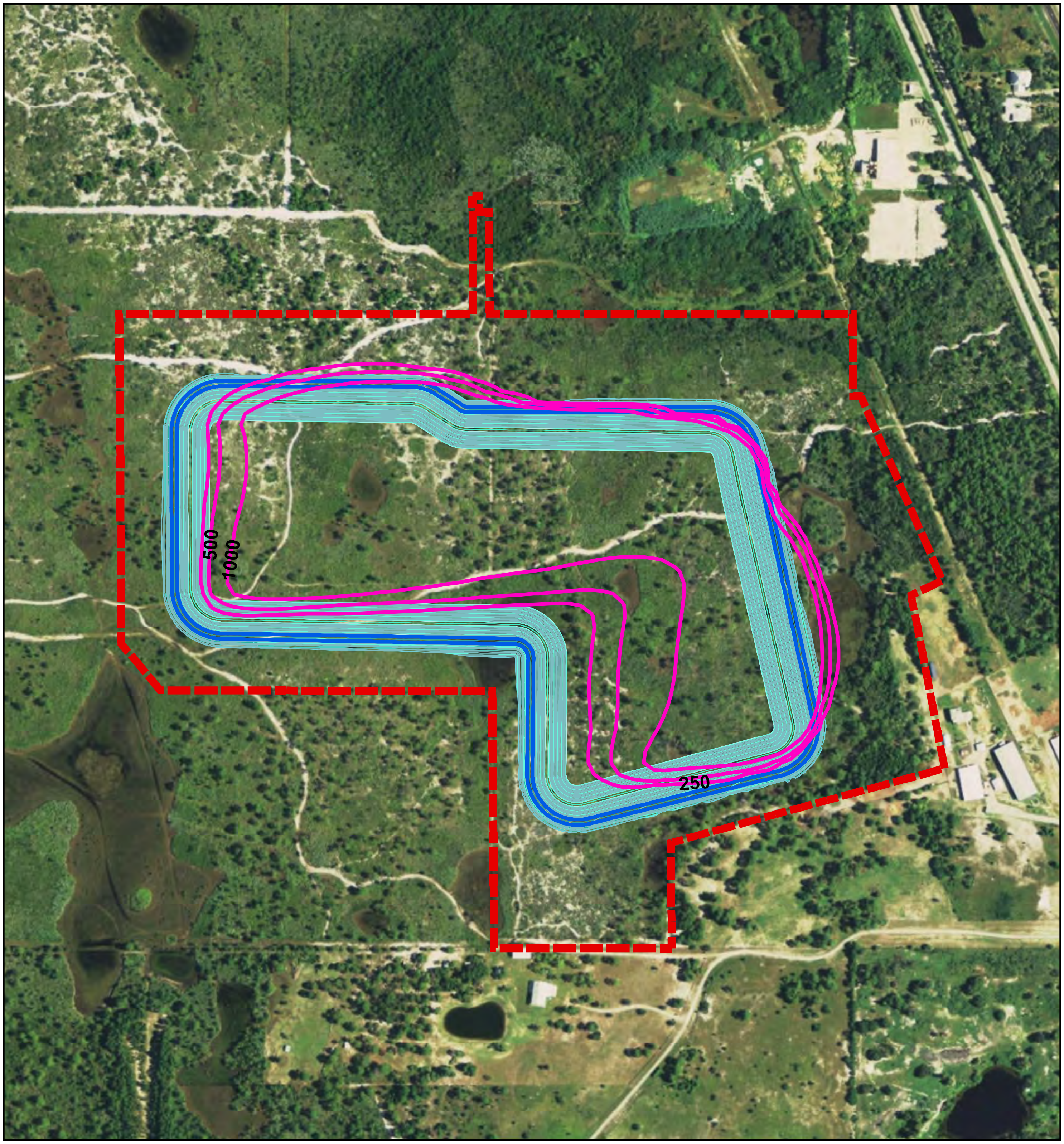
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 30-40 YEAR CYCLE

Exhibit F-23



N

0 500 1,000 Feet

1 " = 500 '

Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

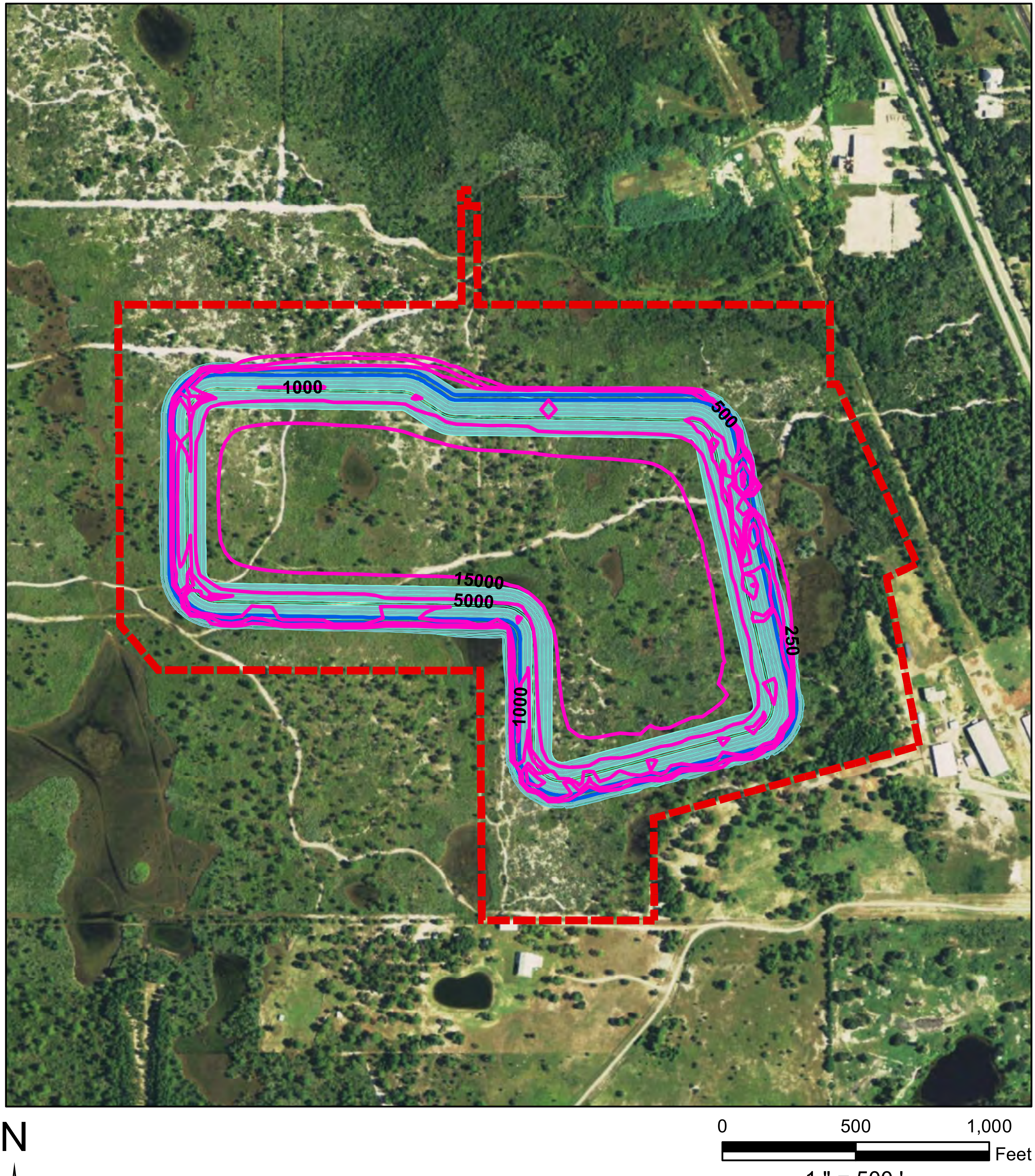
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 30-40 YEAR CYCLE

Exhibit F-24



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

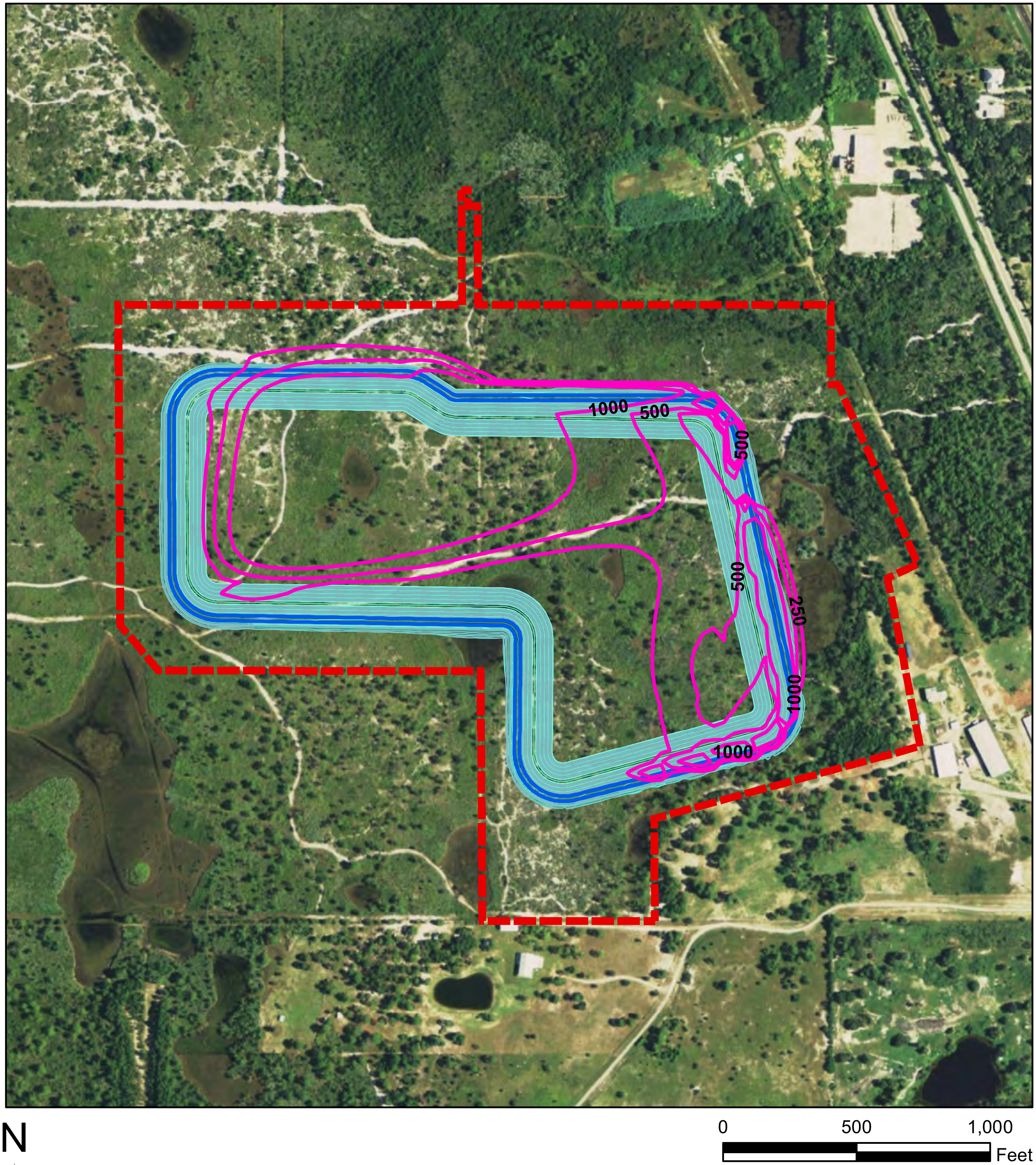
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 40-50 YEAR CYCLE

Exhibit F-25



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 1

ANDREYEV ENGINEERING, INC.

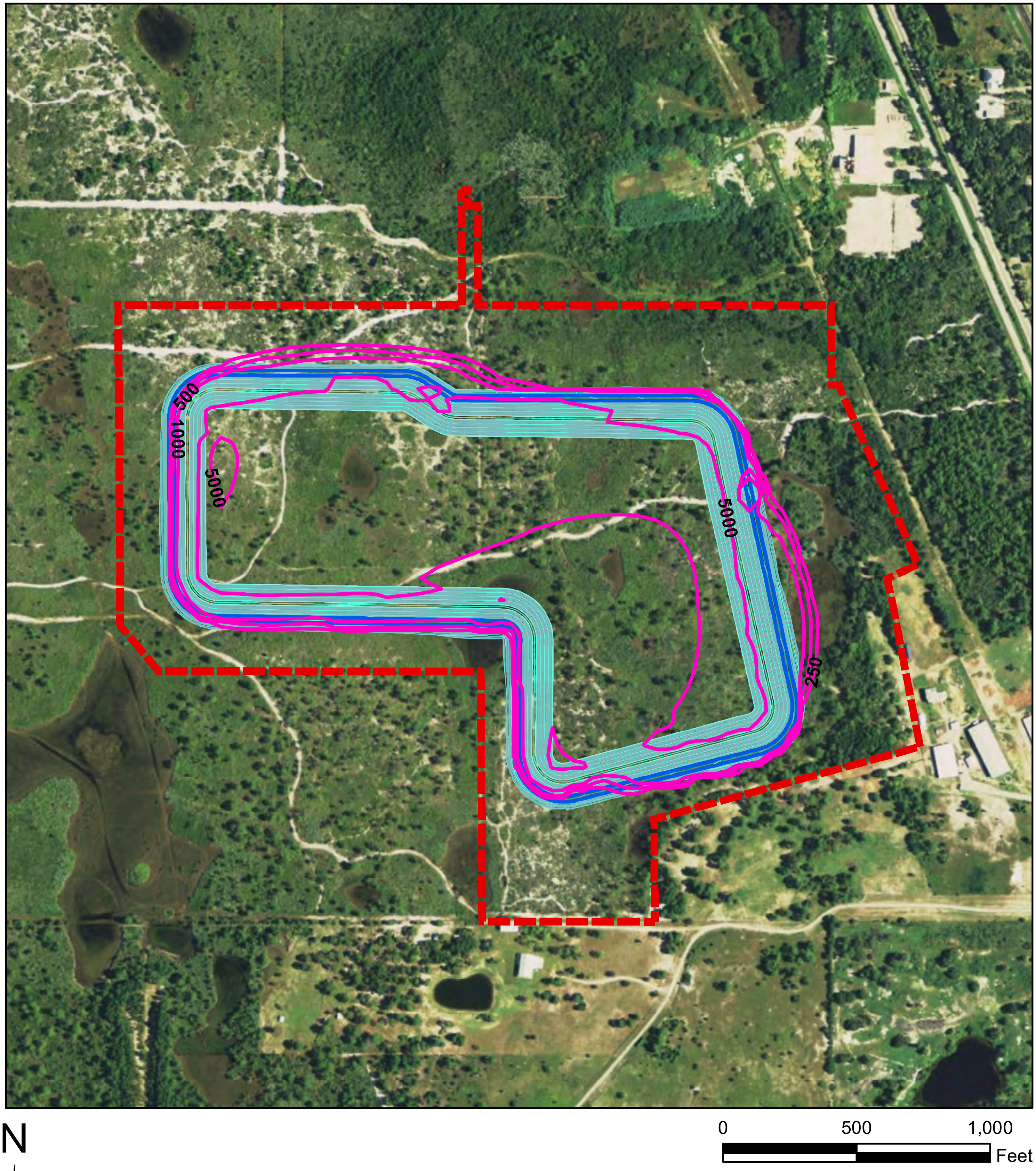
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 40-50 YEAR CYCLE

Exhibit F-26



N

Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN

DATE: 11/15/16

ENGINEER:NA

PN:GPGW-16-013

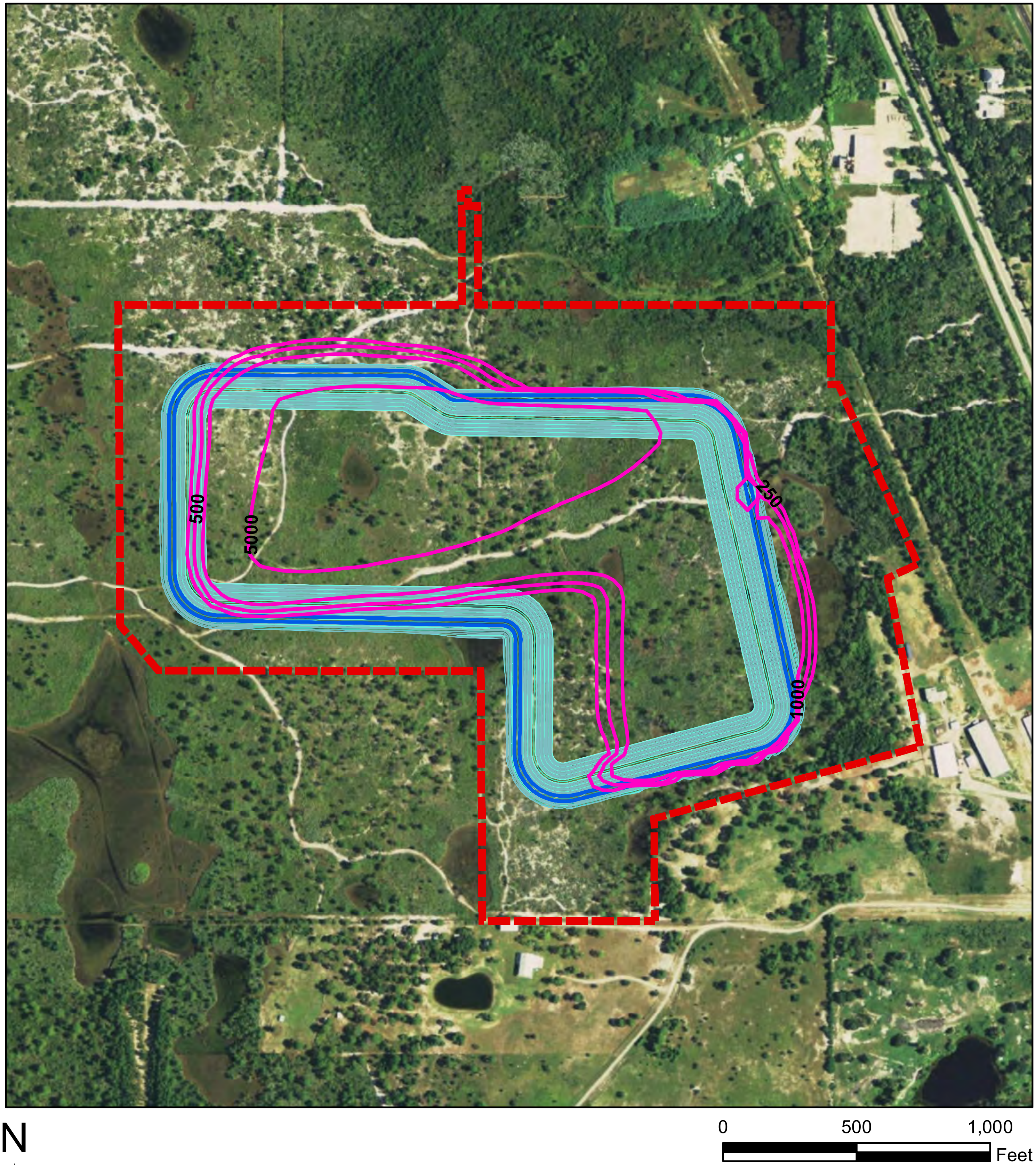
DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 40-50 YEAR CYCLE

Exhibit F-27



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 2

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN

DATE: 11/17/16

ENGINEER:NA

PN:GPGW-16-013

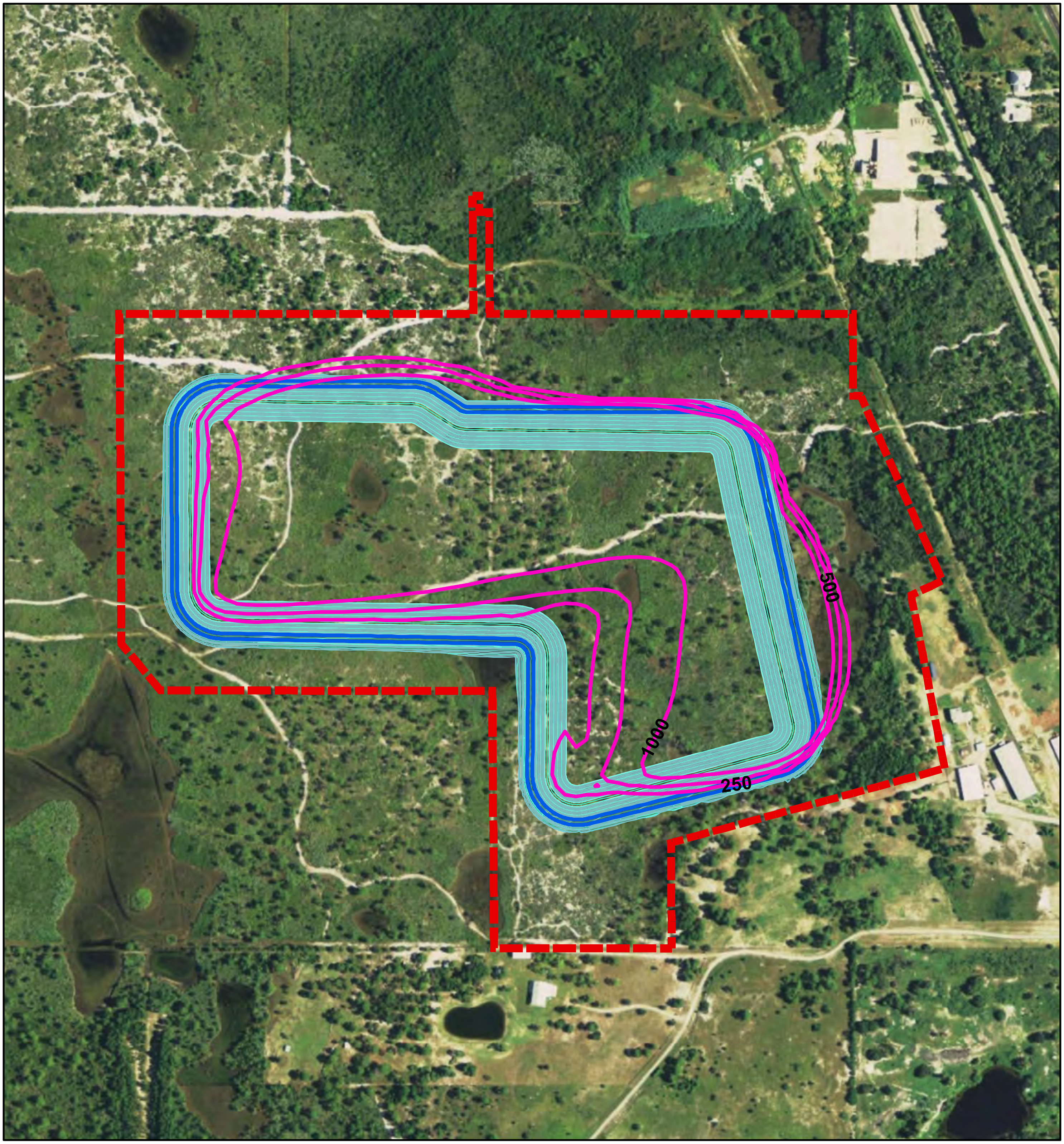
DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 40-50 YEAR CYCLE

Exhibit F-28



0 500 1,000 Feet

1 " = 500 '

N

Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

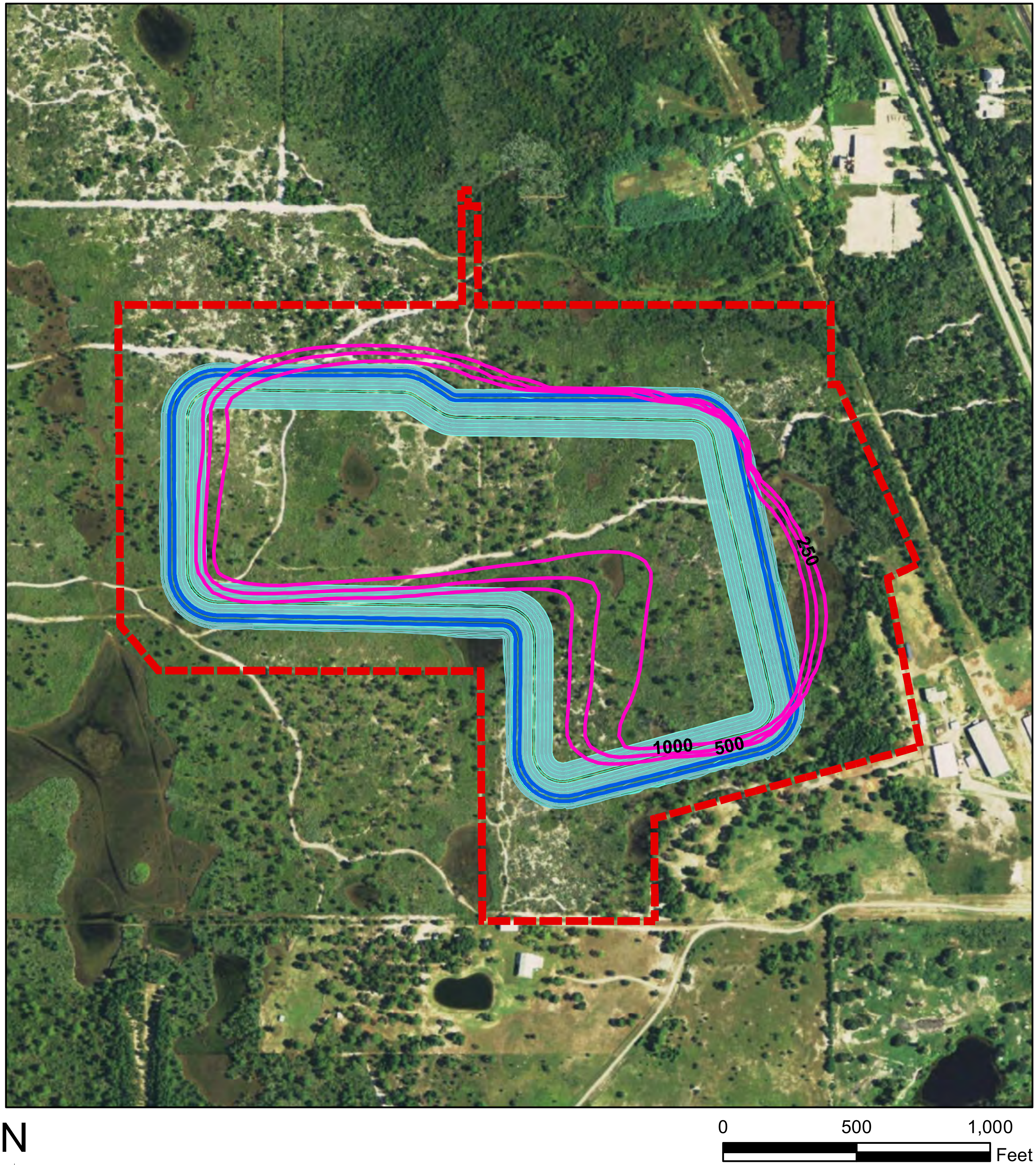
APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT 30 DAYS AFTER LOADING FOR 40-50 YEAR CYCLE

Exhibit F-29



Legend:

Property Boundary

Perimeter Ditch

Chloride Contour (mg/L) - Layer 3

ANDREYEV ENGINEERING, INC.

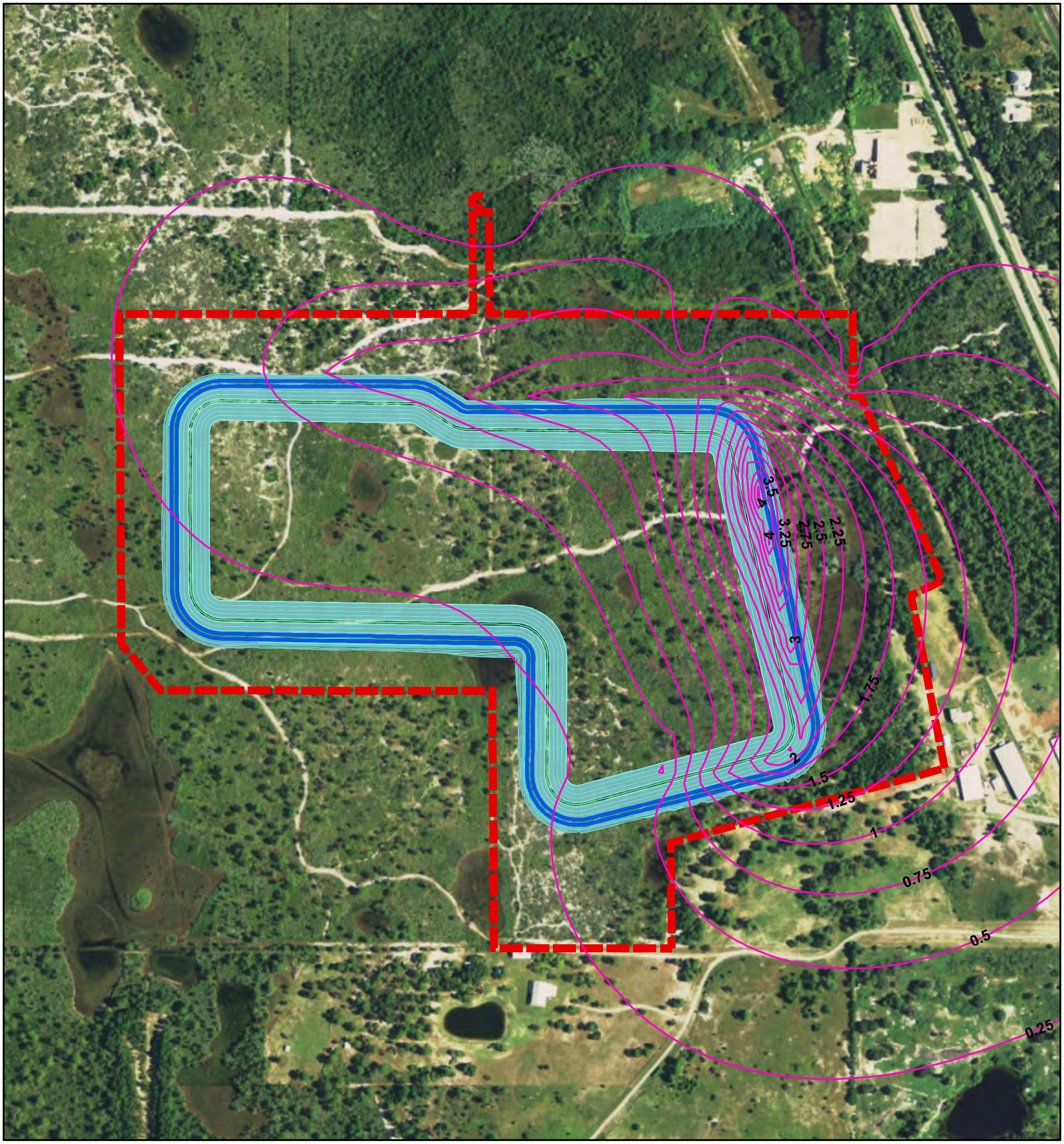
APPROXIMATE SCALE:	DATE: 11/17/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

CHLORIDE AT END OF 40-50 YEAR CYCLE

Exhibit F-30



Legend:

- Drawdown Contour (ft) End of 1st 10-year Load/ Rest Cycle - Normal Dry Season
- Property Boundary
- Perimeter Ditch

ANDREYEV ENGINEERING, INC.

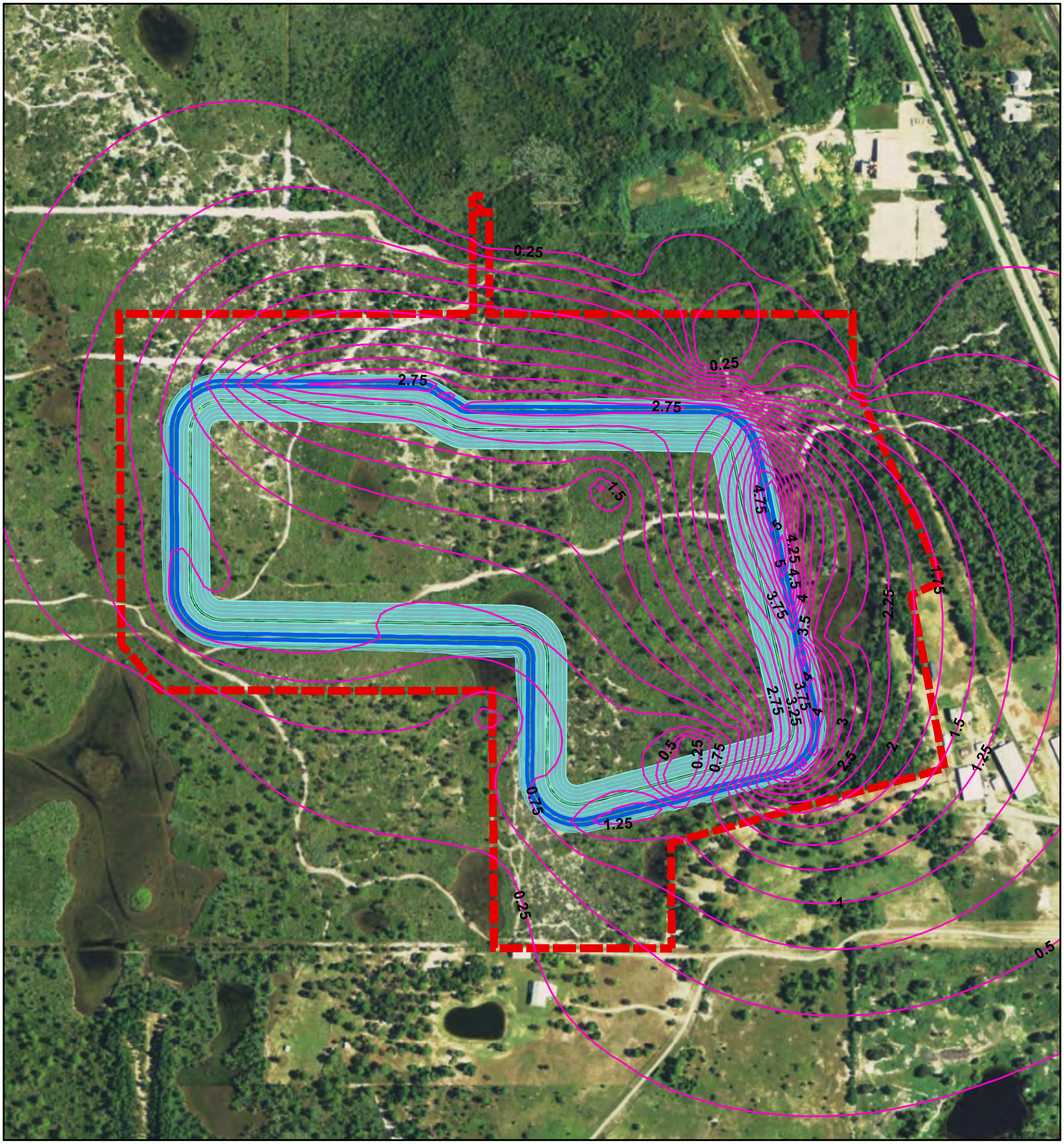
APPROXIMATE SCALE:	DATE: 12/01/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

BV-24A

BREVARD COUNTY, FL

OFF-SITE WETLAND IMPACT
LAYER 1

Exhibit F-31



N

0 500 1,000

Feet

1 " = 500 '

Legend:

Drawdown Contour (ft)
End of 1st 10-year Load/
Rest Cycle - Normal
Wet Season

Property Boundary

Perimeter Ditch

ANDREYEV ENGINEERING, INC.

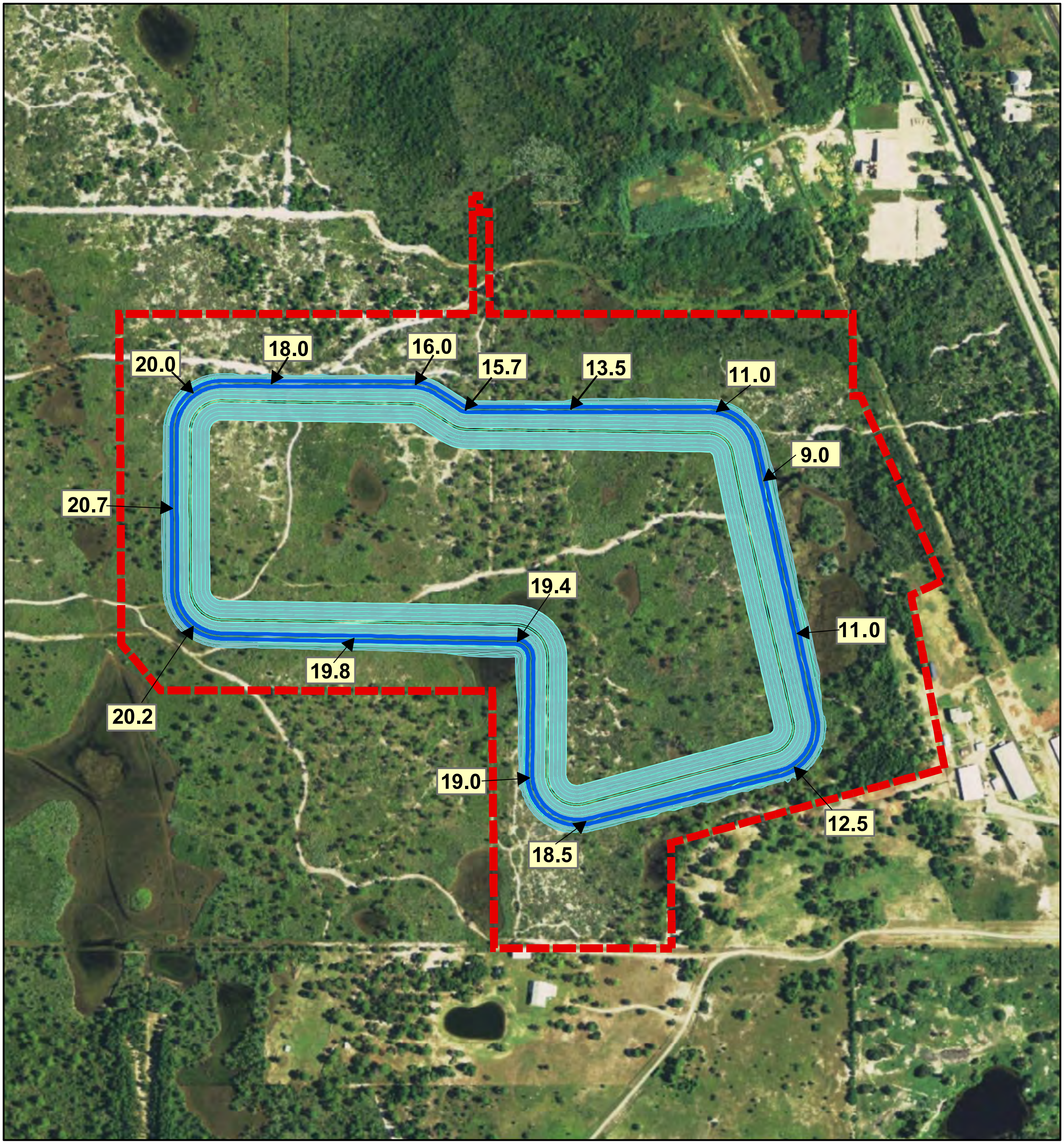
BV-24A

BREVARD COUNTY, FL

OFF-SITE WETLAND IMPACT
LAYER 1

APPROXIMATE SCALE:	DATE: 12/01/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

Exhibit F-32



0 500 1,000
Feet
1 " = 500 '

N

Legend:

Property Boundary

Perimeter Ditch

20.0 Ditch Invert Elevation (ft-NAVD88)

ANDREYEV ENGINEERING, INC.

BV-24A

BREVARD COUNTY, FL

APPROXIMATE SCALE:	DATE: 11/15/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

DITCH INVERT ELEVATION MAP

Exhibit F-33

Geotechnical Engineering Report

Phase III
BV-24A Dredged Material Management Area (DMMA)
Brevard County, Florida
December 19, 2017
Terracon Project No. HB155022

Prepared for:
Taylor Engineering, Inc.
Jacksonville, Florida

Prepared by:
Dunkelberger Engineering & Testing,
A Terracon Company
Port St. Lucie, Florida

December 19, 2017
Revised

Taylor Engineering, Inc.
10151 Deerwood Park Blvd.
Jacksonville, Florida 32256

Attn: Jonathan Armbruster, P.E. … via e-mail (jarmbruster@taylorengineering.com)
Vice President

Re: Geotechnical Engineering Report – Phase III
BV-24A Dredged Material Management Area (DMMA)
Brevard County, Florida
Dunkelberger Project Number: HB155022

Dear Mr. Armbruster:

Dunkelberger Engineering and Testing, A Terracon Company (DUNKELBERGER) has substantially completed the Geotechnical Analysis (Phase III services) for the above referenced project. This study was carried out in general accordance with our subcontract agreement (Taylor Engineering Contract No. C2015-065) dated January 4, 2015.

The findings from the geotechnical analysis are presented in the following report.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please contact us.

Sincerely,
Dunkelberger Engineering and Testing, Inc. a Terracon Company

BRENT M. LANGLOIS
LICENSE
No. 81336
STATE OF FLORIDA
PROFESSIONAL ENGINEER
12/21/17

Brent M. Langlois, P.E.
Project Engineer
FL Registration No. 81336

Douglas S. Dunkelberger, P.E.
Principal
FL Registration No. 33317

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PHASES III
BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA)
BREVARD COUNTY, FLORIDA
Terracon Project No. HB155022
December 19, 2017

1.0 PROJECT & SITE DESCRIPTION

The proposed BV-24A Dredged Material Management Area (DMMA) is located east of Grant-Valkaria, Florida in Brevard County. The BV-24A DMMA is one of eight sites selected to provide long-term dredged material containment capacity for the Intracoastal Waterway (ICWW) in Brevard County. It is intended to serve Reach VI located between Turkey Creek and the Brevard County - Indian River County line at Sebastian Inlet. The site is situated about ¼ mile west of the ICWW. A *Site Vicinity Map* is provided as *Sheet 1*. The overall site boundaries surround approximately 112.5 acres of vegetated land. Wetlands are located throughout the site. Several paths traverse through the site which are consistently used as equestrian and all-terrain vehicle trails. Two horse farms lie to the south and southeast of the site and an abandoned Oldcastle Coastal (stone and masonry block) plant lies to the northeast.

2.0 PROPOSED CONSTRUCTION

The purpose of this study phase was to obtain and summarize data characterizing the subsurface conditions within the site to be used for subsequent detailed engineering analyses pertaining to both the design and construction of the DMMA.

Background information concerning the design, construction and operation of the DMMA was provided by Taylor Engineering within the following five documents:

1) *BV-24A DMMA Management Plan (October 2015)*- summary of preliminary design, site preparation, and site management features
2) *BV-24A DMMA Engineering Narrative (October 2015)*- abbreviated summary of the site's key proposed engineering parameters
3) *BV-24A DMMA Environmental Site Documentation (September 2015)*- summary of documented on-site and nearby adjacent vegetation habitats and wildlife habitats
4) *Morgan & Eklund Topographic and Boundary Survey (July 2015)- survey of the topography and boundaries of the site including pipeline easement.*
5) *Morgan & Eklund Core Boring and Monitoring Well Stake Out (January 2016)- survey of boring and monitoring well locations including ground elevations.*

From the document review, initially the proposed DMMA footprint is expected to cover 63.1 acres of the site (including perimeter roads and ditches) with a design capacity of approximately 1,084,100 cubic yards of dredged materials. However, during Phase II of the project, the DMMA footprint was revised, based on groundwater modeling results, to control saline water migration off site. The revised DMMA footprint will cover 64.6 acres and provide a design capacity of approximately 1,035,818 cubic yards of dredged materials. To provide that storage capacity, perimeter earthen dikes will be constructed to a final crest elevation of +35.4 feet (approximately 15 feet above the existing mean site grade of +20.2 feet NAVD) with respect to the North American Vertical Datum of 1988 (NAVD). Preliminary design of the dikes indicates 3:1 (horizontal: vertical) side slopes with a 15-foot wide crest. The interior area of the containment embankment will be excavated to an elevation of +14.6 feet NAVD (about 5 ½ feet below the existing mean site grade) as a borrow source. The borrow fill, with an estimated quantity of 324,816 cubic yards, will be used to construct the dike and access ramps.

Native vegetation covers the majority of the site consisting of palmetto prairies, pine flatwoods, and sand pines. Multiple freshwater marshes (wetlands) were also found throughout the site. Wildlife habitat of significance includes gopher tortoises and scrub jays.

3.0 SCOPE OF WORK

The overall geotechnical work scope consists of: (1) geotechnical field investigation and laboratory analysis; (2) engineering analyses, recommendations, and design; (3) summary report and recommendations; and (4) assistance with construction drawings and specifications. That scope was divided into four separate phases (Phases I through IV). This study, being the third phase, involved design-level geotechnical engineering analyses supported by field and laboratory data collected in preceding phases.

A preliminary geotechnical engineering report was issued on February 27, 2017 encompassing the results of services under Phases I and II. The initial phase involved collection of field and laboratory data as required input to detailed geotechnical engineering analyses and groundwater models. The groundwater modeling, representing the Phase II services, evaluated groundwater impacts (i.e. elevated chloride concentrations) from operation of the DMMA both with and without saline control features (ditches, under drains, and wells). The first five report sections below (**Sections 4.0 through 9.0**) are a re-cap of the Phase I/II data relevant to the Phase III services. The latter sections of this report (**Sections 10.0 and 11.0**) present the results of the detailed geotechnical engineering analyses pertaining to the design and the construction of the DMMA dike and its associated features.

Additionally, a draft geotechnical engineering report was issued on August 19, 2016 which provided the results of our geotechnical exploration along the originally planned permanent discharge pipeline easement. This report summarizes the subsurface conditions found in the easement as well as provides recommendations concerning design and construction aspects of the pipeline including unsuitable soil removal and replacement, excavations, bedding support, and backfill.

4.0 REVIEW OF AVAILABLE DATA

4.1 USGS Topographic Map

A copy of the USGS Topographic Map is provided as *Sheet 2* of this report. Reference to the map shows the site area with a west to east downward slope ranging in elevation from approximately +25 feet to +15 feet with respect to the National Geodetic Vertical Datum of 1929 (NGVD '29). The elevation at the central area of the site is about +20 (ft.-NGVD). The median elevation of the site based on the ground surface elevations obtained at the boring and monitoring well locations (provided by Morgan and Eklund, Inc.) is about +20 feet as referenced to the North American Vertical Datum of 1988 (NAVD88).

The map also depicts the site surface as vegetated land with green shading and containing multiple wetlands.

4.2 Brevard County Soil Conservation Survey

The Soil Survey of Brevard County, Florida as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS; later renamed the Natural Resource Conservation Service – NRCS) identifies the majority of soil types in the proposed DMMA footprint area of the site as Immokalee Sand (Map Unit 28) and Pomello Sand (Map Unit 49) with a localized area of Myakka Sand, Depressional (Map Unit 38).

The Immokalee Sand and Pomello Sand soil types which cover about 95% of the proposed DMMA footprint are generally sandy and devoid of organic (muck) soils, clay/silt soils, and rock at shallow depths. As an exception, the Myakka Sand, Depressional soil type occurs in a circular-shaped, wetland feature on the south side of the proposed dike alignment. This area is of importance due to surficial layers of muck (unsuitable soil) commonly found in wetland areas. More detailed descriptions of the primary soil classifications are provided below.

28 – Immokalee Sand. This soil type has 0 to 2 percent slopes and is poorly drained. Under natural conditions, this soil type has a depth to water table of 6 to 18 inches. This soil type consists of relatively clean sands to a depth of 35 inches. A layer of black weakly cemented fine sand with organic coating, locally known as hardpan, is indicated from 35 to 54 inches. Thereafter, to the maximum defined depth of 80 inches, the soil profile consists of loamy sands.

49 – Pomello Sand. This soil type has 0 to 2 percent slopes and is moderately well drained. Under natural conditions, this soil type has a depth to water table of 24 to 42 inches. This soil type consists of relatively clean sands to a depth of 42 inches. A layer of black weakly cemented sand with organic coating, locally known as hardpan, is indicated from 42 to 54 inches. Thereafter, to the maximum defined depth of 80 inches, the soil profile consists of additional clean sands.

38 – Myakka Sand, depressional. This soil type has 0 to 2 percent slopes and is very poorly drained. Under natural conditions, this soil type has a water table at the ground surface. This soil type consists of relatively clean sands to a depth of 20 inches. A layer of black, weakly-cemented sand with organic coating, locally known as hardpan, is indicated from 20 to 36 inches. Thereafter, to the maximum defined depth of 85 inches, the soil profile consists of additional clean sands.

The Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be found. Boundaries between adjacent soils types on the Soil Survey maps are approximate. The Soil Survey is included as *Sheet 3*.

4.3 Regional Geology

The geology at the site (Reference Florida Geologic Survey: Geologic Map of Florida, dated 2002, revised in 2006) is mapped with the Anastasia Formation. The Anastasia Formation generally is recognized near the coast, generally composed of sands and coquinoid limestones. The most recognized materials found within the Anastasia Formation are coquina of whole or fragmented shells in a matrix of sand which is often cemented. The Anastasia Formation forms part of the surficial aquifer system. Below the surficial aquifer lies the Hawthorn Formation which is considered an intermediate confining unit. The Hawthorn Formation begins at approximately Elevation -85 feet NAVD and separates the surficial aquifer from the Upper Floridan Aquifer at about -300 feet NAVD. The Upper Floridan Aquifer is made up of a Limestone Formation referred to as Basal Hawthorne/ Suwanee and Ocala Limestone.

4.4 Historical Aerial Review

Historical aerial photographs from Years 1943, 1951, 1958, 1994, 1999, 2004, 2005, 2007, 2009, 2013, and 2014 were reviewed for features of geotechnical significance. The noted items are listed below in chronological order.

- 1943: the site is vacant, wooded (vegetated) land
- 1994: the site has meandering ATV/equestrian paths; otherwise unchanged
- 1999: the western half of the site appears to have been cleared of tall trees; possibly a controlled burning operation
- 2014: the site appears similar to its current condition

According to available historic aerial photographs and with the exceptions noted above, the site appears to have been relatively undisturbed from 1943 to date.

4.5 Nearby Well, Septic Tank and Pond Information

Given the planned disposal of dredged material within the relatively large DMMA footprint and the proximity of surrounding properties, we compiled an inventory of wells, septic tanks, and ponds within an approximately ½ mile radius of the site. Records for wells less than 6 inches in diameter were obtained from St. Johns River Water Management District (SJRWMD) data bases. Larger well (greater than 6 inches in diameter) and septic tank records were obtained from Brevard County Florida Department of Health data bases. Pond locations were primarily identified using Google Earth aerial images. The compiled data is mapped on *Sheet 4* and summarized in the table below.

Table 4.1 - Nearby Well, Septic Tank, and Pond Information

Item	No. of Items	Type
Wells	66	Potable / Irrigation
Septic Tanks	23	Sewage Disposal
Ponds	10	Retention/Borrow

5.0 DETAILED SITE DESCRIPTION

Over the course of our field exploration, we made observations pertaining to the site terrain, vegetation, soil conditions and drainage patterns. A detailed site description with photos is provided herein.

The terrain was mostly flat with overall gradual topographic relief sloping downward from west to east. Several all-terrain vehicle and equestrian paths traversed throughout the site and exposed loose, white “sugar” sands.

Figure 5.1 – Photo of "Sugar" sand covered all-terrain vehicle / equestrian paths

The remaining areas consisted of natural vegetation including wetland features. The vegetation primarily consisted of short saw palmettos and scattered tall pine trees.

Figure 5.2 – Photo of Typical vegetation

The wetlands found at the site were low lying, topographically-closed areas with tall grasses. Wetland bottom conditions ranged from saturated (soggy) to holding several feet of standing water.

Figure 5.3 – Photo of Typical wetland

The surficial soils found at the site were light gray clean sands and white "sugar sands" found along the paths described above. Consistent with the topographic relief across the site, surface drainage flow was from west to east. The site experienced significant rainfall during our field exploration causing many of the paths, wetlands, and other low lying areas to contain standing water.

Figure 5.4 – Photo of Standing water after heavy rains

Figure 5.5 – Photo of Standing water in wetland after heavy rains

Wildlife found during our site visits was minimal. Although tracks were found consistently for deer and raccoons, gopher tortoises were the only species found in addition to their burrows. The presence of gopher tortoises is significant with respect to an earthen dike project given their propensity to burrow through soil.

Figure 5.6 – Photo of Gopher tortoise burrow

6.0 FIELD EXPLORATION PROGRAM AND METHODS

The layout of the field exploration program (i.e. test hole locations and monitoring well locations) is shown in *Sheet 5*. Prior to our field exploration, Morgan and Eklund field staked and provided ground elevations for the test hole and monitoring well locations. Ground elevations at each field test location are included on *Sheet 5*. Descriptions of the exploratory program are provided in the following report sections.

6.1 Standard Penetration Test (SPT) Borings

Subsurface conditions within the DMMA footprint were explored with twenty-five (25) Standard Penetration Test (SPT) borings. The borings were drilled 15 feet deep in the proposed interior borrow area and 45 to 100 feet in depth along the proposed perimeter dike alignment. The SPT borings were drilled with an ATV-mounted drill rig employing mud-rotary procedures. The drilling involved use of a standard split-barrel driven with a 140-pound automatic hammer (slide hammer) freely falling 30 inches (the Standard Penetration Test per ASTM D 1586). Samples of the in-place materials were recovered continuously to a depth of 10 feet, and then taken at 5-foot vertical intervals to the termination depth of the borehole. SPT “N-values” were recorded at 2-foot vertical intervals within the first 10 feet of the boring and at 5-foot vertical intervals thereafter. Samples recovered from the borings were placed in moisture-proof containers, labeled, and returned to our laboratory for visual-manual classification by a geotechnical engineer. The deep boreholes were subsequently sealed with neat cement grout and the shallow boreholes were sealed with bentonite chips. Subsurface profiles are presented as *Sheets 6 through 12*.

6.2 Cone Penetration Test (CPT) Soundings

Cone Penetrometer Test (CPT) soundings were advanced at seven (7) locations in lieu of SPT borings as a cost effective means to complete the field exploration. The CPT soundings were completed to depths of 35 to 75 feet along the proposed perimeter dike alignment. The CPT method provides continuous readings of soil resistance by use of a track-mounted, mechanical cone penetrometer equipped with a friction mantle (ASTM D 3441). CPT cone bearing resistances and friction sleeve readings were recorded as the penetrometer was pushed into the ground with a hydraulic ram. Detailed graphical logs and correlative parameters are presented in *Appendix A* as *Exhibits A-1* through *A-14*.

6.3 Bulk Samples

Bulk samples were obtained at fifteen (15) locations from the interior borrow area. The samples were obtained from auger borings drilled to depths up to about seven feet using a continuous flight auger (CFA). During the drilling, soil cuttings were raised and expelled at the surface where they were recovered, placed in large bags, labeled, and transported to our laboratory for testing.

6.4 Groundwater Monitoring Wells

Eleven (11) locations were selected for the installation of wells to measure groundwater quality and levels. Nine wells were constructed along the perimeter of the site and two were installed at the center of the site. The two wells at the center of the site, MW-4 and MW-5, were installed close to one another and at depths of 40 feet and 15 feet, respectively. The objective of these wells was to assess any influence of potential confining (clay and/or silt) layers. A difference in hydrostatic head between the companion shallow and deep wells would suggest the presence of a confining layer which could impact deep foundation, groundwater flow (seepage), and construction dewatering aspects of the project. The perimeter wells were installed to a depth of 15 feet.

The wells consisted of a 5-foot length by 2-inch diameter machine slotted PVC pipe (0.010-inch slot width) screen that was coupled to solid riser pipe of similar composition which rose to about 3 feet above the ground. The deep (40 foot) well, MW-4, consisted of the same dimensions with the exception of a 10-foot screen length. The sand pack surrounding the well screen consisted of clean 6/20 silica sand. Bentonite chips were placed above the piezometer screen up to the ground surface. Finally, an aluminum casing with pad lock was placed over the pipe stick-up and a concrete pad was constructed on the ground surface for protection.

6.5 Field Permeability Tests

Two (2) constant head field permeability tests were run in monitoring wells MW-4 and MW-5. The tests generally consisted of pumping water at a fixed volumetric flow to maintain a constant head near the top of the well pipe. The time was measured for multiple test runs.

Additionally, a shallow temporary piezometer was installed near MW-4 and MW-5 to a depth of 5 feet bls and a third permeability test was performed using procedures described in the South Florida Water Management District (SFWMD) Usual Open Hole test method. The test method consists of installing a 2-inch diameter, full-length, perforated PVC pipe with a clean 6/20 sand pack. Similarly, the test was run with a constant head maintained at the ground surface.

6.6 Intracoastal Waterway (ICWW) Vibracores

Dredged sediment samples were recovered by our subcontractor, Athena Technologies, Inc., from Reach VI of the Intracoastal Waterway (ICWW) using the Vibracore method. In general, this method consisted of vibrating a thin walled 6-inch diameter steel casing down to the target elevation of -17 feet with respect to Mean Lower Low Water which corresponds to 5 feet below the Federally authorized depth of 12 feet. The casing was then extracted and the sample emptied into containers. The process was repeated until approximately 5 gallons of sediment was recovered at each test location. Dredged sediment sampling was obtained at eleven (11) locations from the proposed dredge areas. The bulk samples, placed in large containers, were labeled by location with State-Plane coordinates and transported back to our laboratory where they were laid out for visual-manual classification by a geotechnical engineer. A layout of the Vibracore locations is shown on *Sheet 13*.

7.0 GENERAL SUBSURFACE CONDITIONS

7.1 Subsoil Conditions

The soil samples collected from the SPT and auger borings were visually-manually classified in accordance with the Unified Soil Classification System (USCS). Subsurface profiles are presented graphically in Sheets 6 through 12. The generalized soil stratification is shown in the following table.

Table 7.1 - Generalized Soil Stratification

Stratum	Material Description	Unified Soil Classification System (USCS)
1	Gray or brown medium to fine SAND	SP
2	Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan)	SP-SM, SM
3	Light brown slightly silty medium to fine SAND	SP-SM
4	Dark gray to green sandy SILT	ML
5	Gray shelly SAND with varying amounts of silt	SP, SP-SM, SM
6	Green or light gray CLAY, traces of shell	CL, CH
7	Gray to green slightly silty to silty fine SAND	SP-SM, SM

In general, the borings/soundings found about 40 feet of relatively clean to silty, medium to fine sands (SP, SP-SM, SM; Strata 1, 2, 3, and 7) with some test areas indicating isolated 5 +/- foot thick layers of silt between Elevations 0 and -15 feet NAVD. Underlying the sands were typically clays and silts (Strata 4 and 6) with highly variable thicknesses ranging from 5 to 40 feet. Below the silts and clays were typically shelly sands with varying amounts of silt (Stratum 5) extending to the respective boring termination depths.

The SPT N-values, and CPT cone tip readings, indicate that the predominately sandy subsoils beneath the DMMA footprint range from very loose to medium dense in terms of relative density. The deeper shelly sands are typically dense to very dense. With respect to the fine-grained layers (i.e. silts/clays, Strata 4 and 6), the isolated upper layers of silt are very soft to soft, while the deeper clay and silt layers are medium stiff to stiff in terms of relative consistency.

Hydraulic conductivity of the sands measured by field permeability tests were 43.5 feet per day in the upper 5 feet, 7.0 feet per day from 10 to 15 feet bls, and 9.4 feet per day from 35 to 40 feet bls.

7.2 Groundwater Conditions

At the time of our field exploration, groundwater was found in each drilled test hole. At these locations, the groundwater level was measured during drilling at elevations between about +22.5 and +14.6 (feet-NAVD). The groundwater depth ranged from at the ground surface to 3.0 feet bls. Additionally, groundwater level readings were taken periodically in the monitoring wells. Those groundwater measurements are shown in the following table.

Table 7.2 - Groundwater Elevations

Date	Groundwater Elevations (Feet - NAVD)										
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11
2/24/16	-	-	+8.3	-	-	+13.3	-	-	+16.8	+17.6	+20.2
2/26/16	+22.5	+17.1	+8.9	+18.2	+19.6	-	+21.7	+19.9	-	-	+20.8
4/12/16	+20.1	+15.9	+7.9	+17.0	+17.0	+12.7	+20.2	+18.8	+15.4	+16.2	+18.7
4/22/16	+20.0	+16.5	+8.7	+17.0	+17.3	+12.6	+20.1	+18.6	+14.9	+16.1	+18.6
6/10/16	+22.6	+18.2	+10.0	+18.9	+19.3	+14.6	+22.1	+20.5	+17.6	+18.1	+20.7
7/11/16	-	-	+8.6	+17.6	+18.0	+12.9	-	-	-	-	-
8/1/16	+19.6	+15.5	+7.3	+16.6	+16.9	+12.3	+19.6	+18	+14.7	+15.5	+18.1
9/28/16	+20.9	+16.9	+9.0	+17.9	+18.4	+13.4	+21.0	+19.8	+16.6	+17.3	+19.7

Similar to the trend of topographic relief across the site, the groundwater flow gradient is from west to east dropping in elevation from about +22 to +12 (feet- NAVD). Comparison of the MW-4 (shallow) and MW-5 (deep) data indicates no significant head differential that may be caused by a confining soil layer.

8.0 LABORATORY TESTING PROGRAM: ON-SITE SOILS

Samples from the borings were reviewed by a geotechnical engineer and classified in accordance with the Unified Soil Classification System (ASTM D 2487) and appropriate geologic nomenclature. Representative samples of the subsurface strata were tested for soil properties as follows.

- Moisture Content (102 Tests)
- Organic Content (3)
- Fines Content (97)
- Gradation (37)
- Atterberg Limits (8)
- Modified Proctor Compaction (5)
- Limerock Bearing Ratio (LBR) (3)
- Hydraulic Conductivity (8)
- Triaxial Shear Strength (3)
- Consolidation (4)

The laboratory test results are discussed below and summarized in Tables A through G following *Sheet 13*.

8.1 Index Properties

Representative samples of the soils recovered from the borings were tested for index properties including moisture content (ASTM D2216), organic content (ASTM D2974), Atterberg Limits (ASTM D4318), fines content (ASTM D1140), and grain size distribution (ASTM D422). A complete summary of the index properties and grain size distribution results are presented in Tables A and B. Grain size distribution curves are provided in *Appendix B* as *Exhibits B-1* through *B-5*. Average values of the test results are summarized in the following table.

Table 8.1 - Index Property Laboratory Test Results (On-Site Soils)

Stratum No.	Soil Type	MC (%)	Atterberg Limits		OC (%)	Amount of Material Passing Sieve Size (%)					
			LL	PI		#4	#10	#40	#60	#100	#200
1	SP	24.6	-	-	-	100	100	94.3	70.2	29.4	3.0
2	SP-SM	21.5	-	-	7.4	100	99.1	91.3	61.8	29.0	10.2
3	SP-SM	23.9	-	-	-	100	100	99.4	97.2	82.1	6.9
4	ML	51.5	45.0	17.3	-	-	-	-	-	-	69.2
5	SP, SP-SM, SM	20.0	-	-	-	97.2	93.1	78.9	60.1	34.2	9.3
6	CL, CH	42.4	35.2	14.3	-	-	-	-	-	-	82.9
7	SP-SM, SM	26.8	NP	NP	-	100	100	90.5	84.8	61.0	9.9

Notes: 1. Soil Type refers to the Unified Soil Classification System Group Symbol (ASTM D2487).
2. MC, LL, PI, and OC indicates moisture content, Liquid Limit, Plasticity Index and organic content, respectively.
3. NP - Not plastic

8.2 Modified Proctor Compaction

Bulk soil samples obtained from the proposed interior borrow area at five (5) locations, from depths of 0 to 7 feet bls, were tested for their compacted moisture/dry density relationship in accordance with the Modified Proctor Compaction Test (ASTM D 1557). The optimum moisture content of the compacted soils ranged between 10.4 and 14.3 percent, and the maximum dry density ranged from 101.9 to 103.1 pounds per cubic foot (pcf). A summary of the test data is provided in Table C.

8.3 Limerock Bearing Ratio (LBR)

Bulk soil samples at three (3) selected locations within the interior borrow area were tested for Limerock Bearing Ratio (LBR). The optimum moisture content of the compacted soils ranged between 12.8 and 13.6 percent, and the maximum dry density ranged from 103.3 to 104.9 pounds per cubic foot (pcf). The LBR values ranged from 41.9 to 59.6. A summary of the test data is provided in Table D.

8.4 Hydraulic Conductivity

Two (2) undisturbed (Shelby tube) samples of the clay (Stratum 6) were extruded and tested for hydraulic conductivity in a triaxial flexible wall permeameter (ASTM D 5084). The hydraulic conductivity of the clay was measured at 4.87 x 10^{-8} cm/sec and 5.57 x 10^{-8} cm/sec.

Additionally, three (3) bulk samples of near-surface soils in the proposed interior borrow area were remolded to specific moisture-dry density conditions and tested in the laboratory for hydraulic conductivity. Each sample was remolded to two moisture-density conditions: one near the approximate dry density of the in-situ conditions; and one at approximately 95 percent of its maximum dry density as determined by the Modified Proctor Compaction Test. The hydraulic conductivity of the samples was determined in a rigid-walled permeameter using the constant head method (ASTM D 2434). The hydraulic conductivity of the material at in-situ density ranged from 1.70 x 10^{-2} cm/sec to 2.61 x 10^{-2} cm/sec (48.1 to 74.0 feet per day). At 95 percent of its maximum dry density, the hydraulic conductivity ranged from 1.21 x 10^{-2} cm/sec to 2.02 x 10^{-2} cm/sec (34.3 to 57.3 feet per day).

Results of the hydraulic conductivity testing are summarized in Tables E.1, E.2, and E.3. Detailed test reports are provided in *Appendix B* as *Exhibits B-6 to B-13*.

8.5 Triaxial Shear Strength

Consolidated Drained (CD) triaxial shear strength tests were completed on two (2) remolded bulk samples of near-surface sandy soils (depths of 0 to 7 feet bls) representative of those that will be foundation soils or a source of borrow for the dike embankment fill. The soil specimens were prepared at approximately 95 percent of their maximum dry density and ±2 percent of their optimum moisture content as determined by the Modified Proctor Compaction Test. A Consolidated Undrained (CU) test with pore pressure measurements was completed on an undisturbed clay sample obtained from a depth of about 33 feet bls. The specimens were run at consolidation pressures varying for each point.

The effective angle of internal friction (ϕ') for the sand borrow soils was measured at 31.0 and 33.1 degrees. Sandy soils such as these have zero cohesion, although some apparent cohesion was measured which is normal. The total strength values for angle of internal friction (ϕ) and cohesion (c) from the triaxial shear strength tests for the clay sample were 8.2 degrees and 562 pounds per square foot (psf), respectively. The effective strength values for angle of internal friction (ϕ) and cohesion (c) for the same sample was 15 degrees and 605 psf. The effective strength value above for cohesion is referred to as apparent cohesion.

A summary of the triaxial shear strength test results and test parameters are summarized in Table F. Detailed reports of the test results are provided in *Appendix B* as *Exhibits B-14 to B-17*.

8.6 Consolidation

Four (4) undisturbed (Shelby tube) samples of silt (Stratum 4) and clay (Stratum 6) were extruded and tested for one-dimensional consolidation. The tests were conducted at multiple load increments to a maximum load of 16 tons per square foot (tsf). Sample compression was measured using a ½ inch stroke dial gage. Compression index (C_c) values for the four tests ranged from 0.29 to 0.70 on a strain basis. Recompression index (C_r) values for the same four tests ranged from 0.03 to 0.09 on a strain basis. The pre-consolidation pressures ranged from 4.0 ksf to 6.2 ksf. This data, as well as the correlative CPT data, suggests that the silts and clays are slightly to moderately over-consolidated with OCRs ranging from 1.6 to 3.3.

A summary of the consolidation test results is summarized in Table G. Detailed reports of the test results are provided in *Appendix B* as *Exhibits B-18 to B-21*.

9.0 LABORATORY TESTING PROGRAM: DREDGED MATERIALS

Dredged sediment samples from the eleven (11) vibracores were reviewed by a geotechnical engineer and classified in accordance with the Unified Soil Classification System (ASTM D2487) and appropriate geologic nomenclature. Each Vibracore sample was tested for the following properties:

- Gradation
- Leachability

9.1 Index Properties

Representative samples of the soils recovered from the vibracores were tested for grain size distribution (ASTM D422). The Vibracore samples were visually inspected to estimate the amount of muck (organic matter) compared to the total sample volume. A summary of the index properties is presented in the following table. Grain size distribution curves are provided in *Appendix C* as *Exhibit C-1*. The test results are summarized in the following table.

Table 9.1 - Index Property Laboratory Test Results (Dredged Materials)

Vibracore Number	Soil Type	Muck %	Amount of Material Passing Sieve Size (%)									
			1”	¾”	½ “	#4	#10	#20	#40	#60	#100	#200
V-1	SC	20	100	93.2	92.9	85.9	78.1	70.5	63.9	55.0	38.8	18.1
V-2	SC	75	100	100	99.0	92.6	79.8	66.4	54.5	44.6	37.2	28.8
V-3	SC	30	100	100	99.0	91.7	79.0	64.3	56.0	46.1	33.7	15.7
V-4	SP-SC	15	100	100	98.4	85.8	64.2	46.8	36.2	27.4	21.5	10.4
V-5	SP-SC	10	100	100	99.9	95.9	86.3	78.3	69.3	57.5	39.1	10.9
V-6	SP	0	100	100	99.5	95.8	86.2	70.7	58.6	39.7	25.1	3.4
V-7	SP	0	100	100	100	96.8	87.9	80.5	70.5	53.7	42.4	3.2
V-8	SP	10	100	100	100	94.3	82.8	67.9	56.6	45.3	34.3	2.9
V-9	SP-SC	50	100	100	100	90.1	77.8	65.8	55.9	25.4	13.3	7.1
V-10	SP	5	100	100	100	90.8	76.9	58.3	50.7	37.9	23.2	2.7
V-11	SP-SC	80	100	100	100	97.2	93.0	87.2	77.6	50.4	27.5	6.7
AVG	**SP-SC**	**30**	**100**	**99.4**	**99.0**	**97.8**	**92.5**	**81.1**	**68.8**	**59.1**	**43.9**	**10.0**

Notes: 1. Soil Type refers to the Unified Soil Classification System Group Symbol (ASTM D2487).
2. Muck % indicates approximate percentage of muck mixed with the Vibracore sample based on visual observation

9.2 Chloride Leachability Testing

Representative soil samples from each of the eleven (11) vibracore locations were used for our in-house chloride leachability tests. The purpose of the laboratory testing was to simulate an operational condition of the DMMA to evaluate the leaching potential of a 2-foot thick layer (column) of dredged material when subjected to 52 inches of influent. The procedure generally consisted of a PVC pipe setup including two 3-inch diameter pipes, one at 2 feet in length to hold the soil specimen, and the second at 5 feet to hold 52 inches of water. A PVC pipe reducer and ball valve were fastened to the bottom of the pipes to allow pausing of the test. A filter stone was placed in the bottom of each pipe. Containers were placed under each ball valve to capture the leached extract. Two feet of sample was loaded into the tubes and water was subsequently added to saturate the sample. Once the samples were saturated, 52 inches of water (modeling annual rainfall) was loaded onto each sample and the ball valves were opened to begin the test. Chloride and pH tests were run on the liquid extract on an incremental basis after 9 inches of water had passed through the sample. After the complete 52 inches of water had fully passed through, a final set of chloride and pH tests were run.

In addition to our in-house testing, other portions of the eleven (11) vibracore samples were sent to Pace Analytical Services Inc. to test for pH, total chloride of soil, and Synthetic Precipitation Leaching Procedure (SPLP, EPA SW-846 Method 1312) testing. For a previous DMMA project, Toxicity Characteristic Leaching Procedure (TCLP, EPA SW-846, Method 1311) was used to test the vibracore samples. The TCLP generally applies to material sitting in a landfill whereas the SPLP was designed to simulate material sitting in-situ and therefore adopted for this study as the better of the two methods to assess chemical mobility in the open environment.

Results of the in-house soil column leaching tests showed relatively high concentrations of chlorides in the extracted liquid. For 11 column tests, the maximum and average chloride contents of the first 9 inches of percolated liquid extract were 18,750 mg/L and 13,000 mg/L, respectively. Four of the eleven tests were not fully completed due to the low permeability of the vibracore material. The incomplete data was not considered in our analyses. The average final chloride content based on the seven completed tests for the entire 52 inches of liquid extract was 2,800 mg/L. The commercial laboratory SPLP test results, for all 11 samples, averaged 234 mg/L. It is noted as a point of reference that seawater has a chloride concentration of 19,400 mg/L.

The reason for the order-of-magnitude difference between the SPLP and the column leaching is likely attributed to the latter test being larger scale and it is more representative physically of actual field conditions. Therefore, the column leaching data was adopted for use in the groundwater (transient solute transport) model. More specifically, the test data for Sample V-11 represented the highest leaching potential and was used as a conservative basis for both analysis and design which we believe is appropriate given the inherent variability of dredged material consistency.

Referencing the State's Secondary Drinking Water Standard at 250 mg/L, the column leaching test results indicate significant potential for leaching of chlorides particularly during first flushing of newly placed dredged materials.

Detailed results of the leachability testing are presented in *Appendix C* as *Exhibits C-2* through *C-7*.

10.0 ENGINEERING ANALYSIS

10.1 Design Sections

Four (4) typical dike sections were each analyzed for stability, settlement, and seepage. The following text provides details regarding the existing topography, foundation soil stratigraphy, and typical dike features followed by discussion of the results of the analyses.

10.1.1 Common Features

We have assumed that the following design features, typical of previous DMMA projects, will be incorporated into the dike and are included on the design cross-sections used in our analyses.

Crest
The final design elevation of the dike crest is to be at +35.4 feet NAVD. The dike will have a 15-foot wide crest for ease of construction and to provide suitable access for post-construction vehicle traffic.

Dike Slopes
The dike cross sections will have inside (upstream) slopes and outside (downstream) slopes of 3 horizontal to 1 vertical (3H:1V).

Dike Toe Swale
The dike cross sections will have a shallow swale located at the toe of the embankment to collect storm water runoff. The invert elevations will range from +10.7 to +22.4 feet NAVD. The side slopes will be consistent with the dike embankment (3H:1V).

Perimeter Ditch
The dike cross sections each have a downstream perimeter ditch for the collection of storm water runoff and seepage from the impoundment. The ditch bottom width is 2 feet and at elevations ranging from about +9 feet NAVD to +21 feet NAVD. The ditch bottom drops in elevation from west to east. The side slopes of the perimeter ditch are 3H:1V.

Toe Drain
Each design cross-section includes a toe drain feature beneath the downstream embankment slope. The drain will outfall to the perimeter ditch.

Weir Structure
The outlet structure will be located near the northeast corner of the dike and will consist of three weir-controlled drop inlets with a 36-inch diameter minimum high density polyethylene (HDPE) discharge pipes penetrating through the dike to outfall in the perimeter ditch. The steel weir box structure will be supported by a concrete slab foundation system and a timber walkway will span from the top of the structure to the dike crest. The elevated walkway will be supported by shallow foundation footings.

10.1.2 East Section

The design “Cross-Section: East” represents a high embankment fill reaching about 22 ½ feet above the topographical low area of the site.

The stratigraphy beneath the east section is represented by the conditions found in SPT Boring B-102 as well as CPT sounding CPT-205. In general, the subsurface profile consists of very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) that extend to an elevation of about -12 feet NAVD. These sands are followed by about 5 feet of very soft silt (ML) and 5 feet of very soft clay (CL). The clay layer is underlain by very loose to dense fine sands, sand with silt, silty sands intermixed with shell and shell fragments extending to an elevation of about -72 feet NAVD. Below these sands was a stiff clay layer (CL) which extended to the B-102 boring termination depth of about -85 feet NAVD.

The typical section adopted for analysis of the east section is presented below.

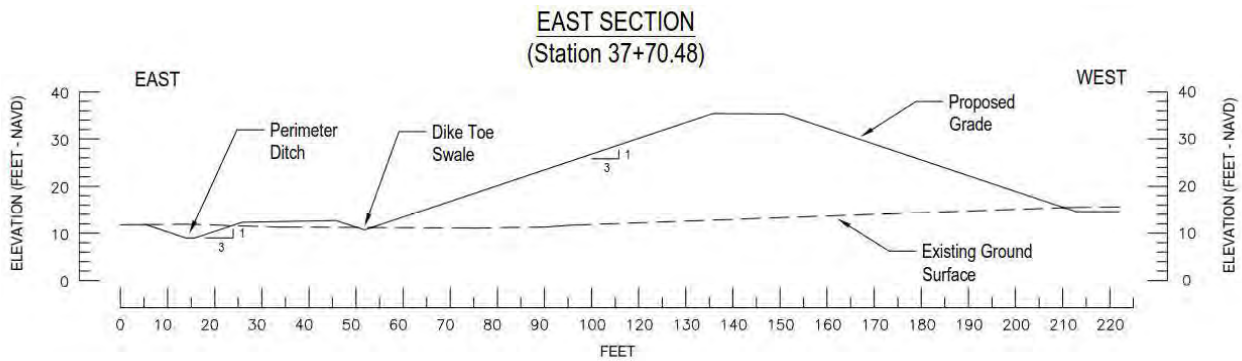


Figure 10.1.2 – Design Section: East

10.1.3 North Section

The design "Cross-Section: North" represents a medium embankment fill height of about 18 ½ feet for the north side of the dike.

The stratigraphy beneath the north section is represented by the conditions found in SPT Borings B-102 and B-203 as well as CPT soundings CPT-202 and CPT-302. In general, the subsurface profile consists of very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) that extend to an elevation of about -1.5 feet NAVD. A thin 2-foot layer of very soft silt (ML) was disclosed followed by additional very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) to an elevation of -25 feet NAVD. These sands are followed by very soft clay (CL) extending to an elevation of about -55 feet NAVD. The clay layer is underlain by dense fine sands, sand with silt, silty sands intermixed with shell and shell fragments extending to an elevation of about -72 feet NAVD. Below these sands was a stiff clay layer (CL) which extended to the B-102 boring termination depth of about -85 feet NAVD.

The typical section with foundation soil profile adopted for analysis of the north section is presented below.

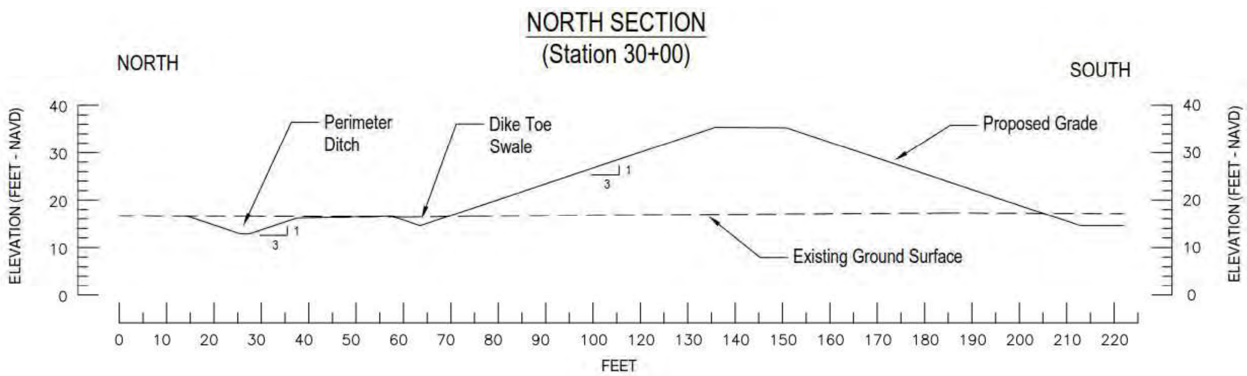


Figure 10.1.3 – Design Section: North

10.1.4 South Section

The southern dike alignment was divided into two design sections. The design “Cross-Section: Southeast” and “Cross Section: Southwest” represent medium embankment fill heights of about 15 and 19 ½ feet for the south side of the dike.

The stratigraphy beneath the southeast section is represented by the conditions found in SPT Borings B-102 and B-103 as well as CPT sounding CPT-303. In general, the subsurface profile consists of very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) that extend to an elevation of about +1 feet NAVD. A thin 2-foot layer of very soft silt (ML) was disclosed followed by additional very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) to an elevation of about -25 feet NAVD. These sands are followed by very soft silt (ML) extending to an elevation of about -30 feet NAVD. The clay layer is underlain by dense fine sands, sand with silt, silty sands intermixed with shell and shell fragments extending to the B-103 boring termination depth of about -83 feet NAVD.

The typical section with foundation soil profile adopted for analysis of the southeast section is presented below.

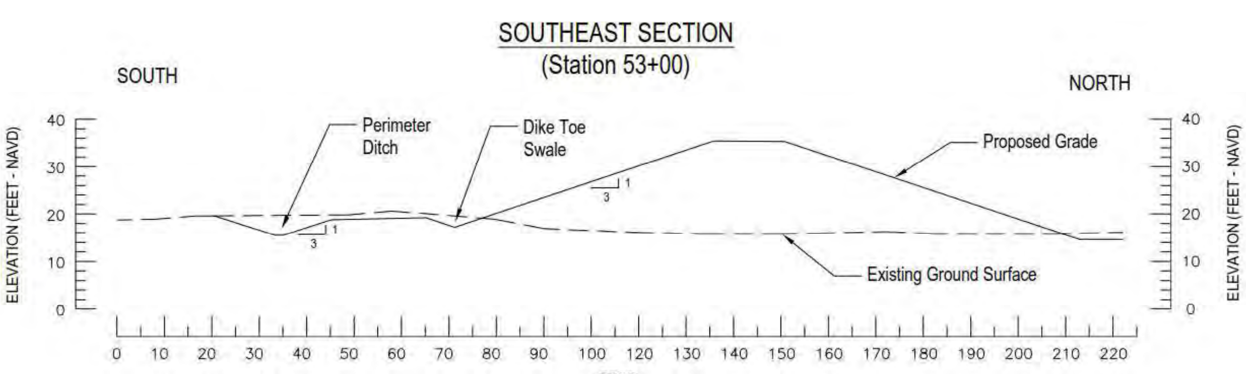


Figure 10.1.4-1 – Design Section: Southeast

The stratigraphy beneath the southwest section is represented by the conditions found in SPT Borings B-104 and B-206 as well as CPT sounding CPT-207. In general, the subsurface profile consists of very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) that extend to an elevation of about 0 feet NAVD. A 6-foot layer of very soft silt (ML) was disclosed followed by a thin 2 ½ foot layer of medium dense fine sands (SP) and then a 2-foot layer of very soft clay to an elevation of about -10.5 feet NAVD. The clay layer is underlain by medium dense fine sands, sand with silt, and silty sands to an elevation of -30 feet NAVD. The boring found very soft to stiff clay and silt to an elevation of -60 feet NAVD. The clay/silt layer is underlain by dense fine sands, sand with silt, silty sands intermixed with shell and shell fragments extending to the B-104 boring termination depth of about -77 feet NAVD.

The typical section with foundation soil profile adopted for analysis of the southwest section is presented below.

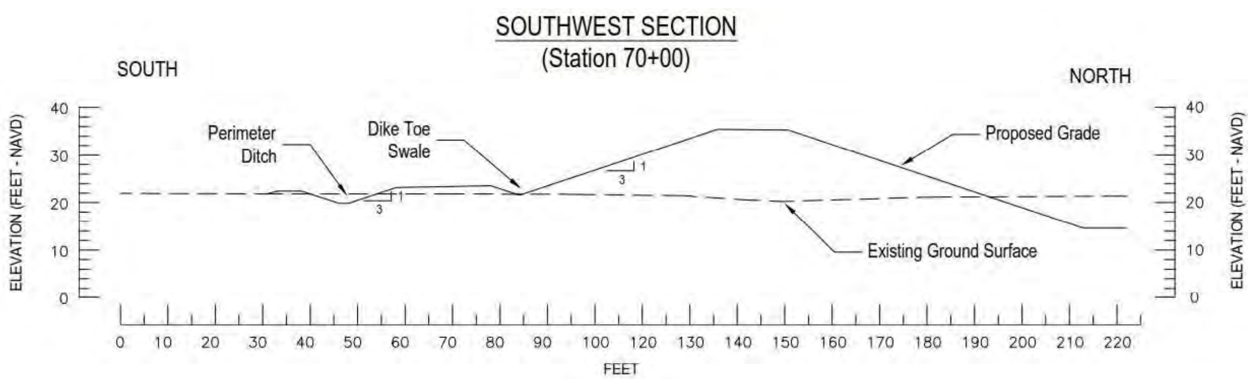


Figure 10.1.4-2 – Design Section: Southwest

10.1.5 West Section

The design "Cross-Section: West" represents a relatively low embankment fill height of about 12 ½ feet for the west side of the dike.

The stratigraphy beneath the west section is represented by the conditions found in SPT Borings B-101 and B-208 as well as CPT soundings CPT-208 and CPT-209. In general, the subsurface profile consists of very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) that extend to an elevation of about -7 feet NAVD. A thin 3-foot layer of very soft silt (ML) was disclosed followed by additional very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) to an elevation of about -17 feet NAVD. These sands are followed by 3 ½ feet of very soft silt (ML) to an elevation of about -20.5 feet NAVD. The profile then shows additional very loose to medium dense fine sands, sand with silt, and silty sands (SP, SP-SM, SM) extending to an elevation of about -27 feet NAVD. A layer combined with silt and clay was found under the sands to an elevation of -57 feet NAVD followed by dense fine sands, sand with silt, silty sands intermixed with shell and shell fragments extending to the B-101 boring termination depth of about -77 feet NAVD.

The typical section with foundation soil profile, including engineering properties, adopted for analysis of the west section is presented below.

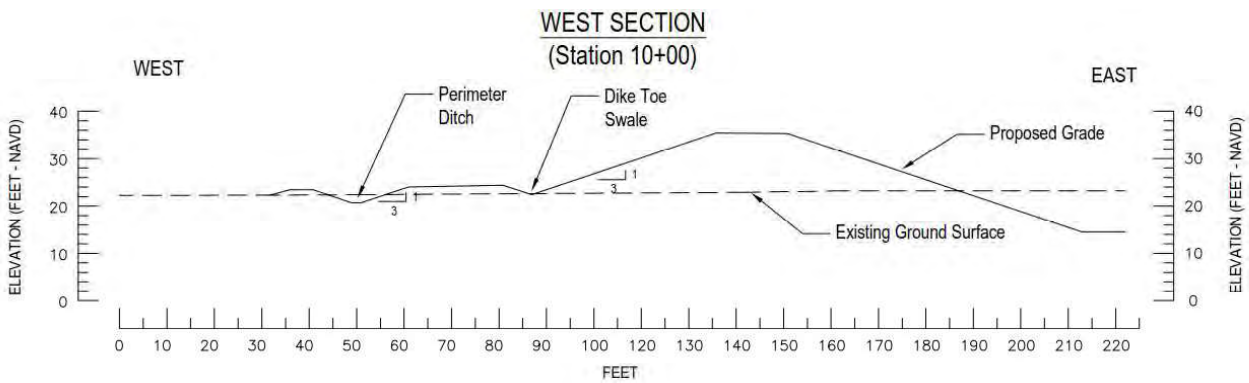


Figure 10.1.5 – Design Section: West

10.2 Dike Settlement Analysis

10.2.1 Settlement Analysis Design Assumptions

The immediate (elastic) and long-term (consolidation) settlement was evaluated at the five design dike sections. Each design section was represented by a trapezoidal stress diagram with a top (crest) width of 15 feet and a base width equal to that of each typical section. Each diagram was tapered from the crest to the base on a 3H:1V slope. Embankment load was calculated based on unit weight of the embankment fill soils and the height above the existing ground surface. Stress distribution to each stratified layer was based on equations by Boussinesq for a trapezoidal load. The soil compressibility parameters, used for both elastic and consolidation settlement analyses, are shown for each design section in Appendix. D

10.2.2 Initial Settlement

Settlement within the sand layers (identified as Strata Numbers 1, 2, 3, 5, and 7 on the subsurface profiles (provided in Sheets 6 through 12) is expected to occur almost immediately as the weight of the embankment fill is applied (i.e. during construction). The elastic settlement of these soils under dike loading was estimated using elastic compression theory based on an estimated elastic modulus. The elastic modulus was calculated from empirical equations based on SPT blow counts (N-values) and CPT cone tip resistance values. Settlement within soils at depths greater than about 100 feet below the base of the embankment was assumed to be negligible.

A summary of the estimated immediate settlement, beneath the dike crest, for each design section is summarized in the table below.

Table 10.2.1 Estimated Immediate Settlement

Design Section	Estimated Sand Settlement (inches)
East	2.1
North	2.4
Southeast	3.7
Southwest	2.2
West	1.4

These settlements are expected to occur during placement of the dike fill and post-construction settlement of the dike crest, associated with the sand layers, should be minimal.

10.2.3 Consolidation Settlement

The consolidation settlement within the fine-grained (clay and silt) soils (identified as Strata Numbers 4 and 6 on the *Subsurface Profiles* provided on Sheets 6 through 12) was calculated based upon the following design parameters:

Table 10.2.3-1 Silt/Clay Soil Index Properties

USCS Classification	Void Ratio	C_C	C_R	OCR
CL	1.27	0.47	0.08	3.3
ML	1.10	0.29	0.03	1.6
CH	1.65	0.70	0.09	2.5
CL	0.96	0.31	0.04	2.0

The compressibility parameters for the fine-grained soils were derived from laboratory consolidation tests (refer to **Section 8.6** of this report). The fine-grained soils were over consolidated within the range of anticipated embankment loads based on those test results.

We calculated the approximate increase in vertical effective stress ($\Delta\sigma'_v$) below the center of the embankment section based equations by Boussinesq for a trapezoidal load.

A summary of consolidation settlement estimates of the dike crest for each of the five sections is provided in the table below.

Table 10.2.3-2 Estimated Consolidation Settlement

Design Section	Estimated Consolidation Settlement (inches)
East	2.3
North	2.9
Southeast	1.5
Southwest	2.1
West	1.1

The values reflect settlements beneath the dike crest due to consolidation of the silt and clay layers. Consolidation settlement generally occurs over the long-term, in contrast to the immediate settlement of the sand layers, and therefore will continue after dike construction. It's important to note that the clay and silt layers located at the site are over-consolidated and the consolidation anticipated will occur as recompression. The rate of recompression occurs significantly faster than virgin consolidation. The time rate of the consolidation is discussed in the following section. If it is critical to maintain the design crest elevation of the dike, it should be over-built with a camber to account for the estimated magnitude of consolidation settlement.

10.2.4 Time Rate of Settlement

The time rate of consolidation settlement will vary across the site due to differences in both fine-grained soil layer and embankment fill thicknesses. The estimated time to reach various percentages of consolidation are summarized in the following table. The coefficient of compressibility (C_v) was based on the laboratory consolidation tests and calculated increases in vertical effective stress in the fine-grained layers due to embankment fill loads.

Table 10.2.4 Estimated Time Rate of Consolidation

Cross Section	Coefficient of Compressibility (C_v) (ft^2/day)	Consolidation (%)	Time
East	0.50 to 1.50	30	4 days
		50	10 days
		90	2 months
North	0.44 to 1.60	30	7 days
		50	1 month
		90	3 months
Southeast	0.39 to 0.50	30	0 days
		50	1 day
		90	4 days

Cross Section	Coefficient of Compressibility (C_v) (ft^2/day)	Consolidation (%)	Time
Southwest	0.32 to 1.60	30	3 days
		50	8 days
		90	2 months
West	0.32 to 1.90	30	2 days
		50	6 days
		90	1 month

The time required for 90% consolidation is estimated to be approximately 3 months or less across each section.

The actual magnitude and time rate of settlement of the dike should be monitored during construction through the use of settlement plates as discussed in **Section 11** of this report. If actual settlements vary significantly from our estimated settlements, then the dike overbuild should be adjusted accordingly.

10.2.5 Settlement at Dike Toe

In addition to the estimated settlement beneath the dike crest, there will be some post-construction settlement experienced beneath the toe of the dike embankment. The following table provides an estimate of the total consolidation settlement beneath the dike toe at each of the analyzed sections.

Table 10.2.5 Estimated Dike Toe Consolidation Settlement

Design Section	Estimated Dike Toe Consolidation Settlement (inches)
East	0.6
North	1.2
Southeast	0.3
Southwest	0.9
West	0.5

Based on the above estimated settlement under the toe and centerline of the dike, the anticipated differential settlement between these two areas can be expected to range from about 1 to 2 inches.

10.2.6 Operational Settlement (Dredge Material Load)

In addition to the settlement imposed by the newly constructed dike embankment, we anticipate "operational settlement" which will occur during loading of the dike's upstream slope with dredged materials. The dredged material load will cause additional total and differential settlement at the upstream toe of the dike, in addition to that indicated in **Section 10.2.5.** The operational settlement will also impact the weir structure and walkway. The following table provides an estimate of the total settlement (elastic and consolidation) beneath the dike's upstream toe at each of the analyzed sections based on fill heights representing the DMMA at full capacity.

Table 10.2.6 Estimated Operational Settlement

Design Section	Estimated Operational Settlement (inches)
East	3.1
North	4.3
Southeast	3.9
Southwest	4.7
West	3.5

Typical operational plans of the DMMA are to load dredge materials incrementally every 10 years for 50 years resulting in five loading events. The settlement will therefore occur incrementally.

10.3 Dike Seepage and Stability Analysis

10.3.1 Analysis Methodology

Field and laboratory test data were utilized to assign engineering properties for each of the subsoil layers in the east, north, southeast, and west typical sections. The southeast section was analyzed for the dike seepage and stability analysis. Both southern sections represent similar foundation materials, therefore only one was analyzed. Geotechnical computer software was then used to determine the slope stability factors of safety at each cross-section location under each operational scenario: End-of-Construction and Steady State Seepage.

The pore water pressure in the soil layers must be defined within the computer software for each slope stability analysis. A steady-state seepage analysis was used to determine the pore water pressure for the end-of-construction and steady state scenarios. The phreatic surface was manually defined for the rapid draw down scenario. The transient seepage analysis uses initial pore pressures calculated from a steady state seepage analysis or user defined phreatic surface, and incorporates the time required for the pool (impounded water) to recede in calculating the transient phreatic surface and pore water pressures.

The seepage and stability analyses were run using the computer programs SEEP/W and SLOPE/W, respectively. These programs are part of the GeoStudio two-dimensional finite element software suite developed by GEO-SLOPE International Ltd. SEEP/W uses a hydrogeologic model to determine seepage paths, seepage flow rates, phreatic surfaces, pore water pressures and exit gradients for steady state and transient seepage problems. SLOPE/W runs limit-equilibrium slope stability analyses using a method-of-slices search routine to determine a safety factor for multiple potential failure surfaces. SLOPE/W can use pore water pressures calculated from a phreatic surface that is manually defined by the user or it can use pore water pressures generated by SEEP/W.

The seepage exit gradients obtained from SEEP/W were compared with the exit gradients considered to be safe for major impoundments. For sandy soils, the factor of safety against piping (i.e. seepage induced soil erosion) is simply expressed as the reciprocal of the exit gradient.

For the stability analyses, the circular failure surface search routine using Morgenstern-Price's Method of Slices was used to find the minimum factor of safety failure surface. The Engineering Manual for Slope Stability published by the USACE, EM 1110-2-1902, Table 3-1 indicates that the required minimum factor of safety is 1.5 for downstream slopes under long-term conditions with steady-state seepage, 1.3 for upstream and downstream slopes at the end of construction, and 1.3 for upstream slopes during rapid drawdown from the Maximum Storage Pool. However, for DMMA dikes, rapid drawdown at the upstream slope is not an expected scenario since dredged materials will occupy the impoundment. The embankment stability analysis results were compared to these minimum factors of safety.

10.4 Slope Stability Analysis

10.4.1 Geotechnical Design Parameters

The slope stability geotechnical design parameters utilized in our evaluation included moist and saturated unit weights, angles of internal friction and cohesion. The soil unit weight and strength parameters were based on standard correlations with SPT N-values and laboratory triaxial shear test data. The raw data received from the triaxial shear tests was adjusted to reflect post-peak residual strength values which will account for any strain softening. Additionally, due to the curved nature of the shear failure envelope for drained clay/silt layers, the drained stability analysis considered a fitted bi-linear strength envelope. The model, using the bi-linear strength envelope, selected soil strength parameters based on the normal stress for each slice. The ranges of the soil parameters used for the four design sections are provided in the following table and shown the exhibits in Appendix D for each design section.

Table 10.4.1 Geotechnical Design Parameters

Material Description	Saturated Unit Weight (pcf)	Drained Parameters		Undrained Parameters		Permeability (K_X) (feet/day)	K_Y/ K_X
		Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)		
Dredged Material	90	20	0	-	-	5	1
Embankment	103	31	0	-	-	40	0.5
Sand (Upper)	100	30	0	-	-	60	0.5
Sand (Lower)	100	30	0	-	-	7	0.5
Shelly Sand	110	32	0	-	-	10	0.5
Silt/Clay	90	14 to 24	250	8	400	0.00015	1

The following sections of the report summarize the results of the long-term seepage and slope stability analyses for the four design cross-sections (east, north, south and west). The results are also shown graphically on the attached Exhibits E-1 through E-28 and F-1 through F-8 in Appendices E and F. Each cross-section includes figures to show each of the seepage and stability scenarios: end-of-construction and steady-state seepage.

The rapid drawdown scenario was not considered for the dike embankment due to the dredged materials occupying the impoundment. It was not considered in the ditches due to the high permeability of the embankment and foundation soils which would quickly relieve pore water pressures. The transient seepage scenario was also not considered for the same reason.

The failure planes and corresponding factors of safety for the stability analyses presented herein represent the worst case scenario for each condition and section. Deeper failure planes from the dike crest to the ditch toe were also analyzed but are not shown because they do not represent the worst case scenario (i.e. lowest factor of safety).

10.4.2 Dike Stability Analysis Results

The results of the slope stability analyses of the four dike design cross-sections are summarized in the following table.

Table 10.4.2 Dike Slope Stability Analysis Results

Cross Section	Analysis Condition	Minimum Factor of Safety, F.S. (USACE)	Calculated Factor of Safety, F.S.	
			Upstream Slope	Downstream Slope
East	End-of-Construction	1.3	1.71	1.80
	Steady State	1.5	-	1.60
North	End-of-Construction	1.3	1.66	1.79
	Steady State	1.5	-	1.66
South	End-of-Construction	1.3	1.64	1.80
	Steady State	1.5	-	1.57
West	End-of-Construction	1.3	1.55	1.80
	Steady State	1.5	-	1.70

The calculated safety factors are all above the USACE minimum values.

10.4.3 Ditch Stability Analysis

The results of the slope stability analyses for the four perimeter ditch cross-sections are summarized in the table below.

Table 10.4.3 Ditch Slope Stability Analysis Results

Cross Section	Analysis Condition	Minimum Factor of Safety, F.S. (USACE)	Calculated Factor of Safety, F.S.			
			Inside (Sand)	Outside (Sand)	Inside (Gravel Bed)	Outside (Gravel Bed)
East	End-of-Construction	1.3	1.47	1.48	-	-
	Steady State	1.5	1.37	1.43	1.76	1.74
North	End-of-Construction	1.3	1.39	1.39	-	-
	Steady State	1.5	1.24	1.31	1.75	1.75
South	End-of-Construction	1.3	1.44	1.44	-	-
	Steady State	1.5	0.92	1.08	1.75	1.78
West	End-of-Construction	1.3	1.76	1.72	-	-
	Steady State	1.5	1.42	1.46	1.77	1.73

The calculated factors of safety fell slightly below the USACE minimum values in all four design cross-sections under the steady-state seepage (Year 50 maximum impoundment operating level) as indicated above.

Ditch slope stability is significantly less critical than dike stability and may warrant a risk-based approach by dealing with ditch slope issues, should they occur, through routine post-construction inspection and maintenance. However, the inside slopes are of greater importance since they support the outfall piping from the weir and toe drain.

The ditch stability analyses under steady state conditions were re-run with a 1-foot gravel bed placed on the slopes and bottom of the ditch. The gravel bed improves the stability factor of safety by providing a filtered seepage exit which will reduce seepage gradients moving into the ditch as well as provide an increased friction angle. The gravel may be Number 57 stone or similar which we anticipate will be used for construction of the dike toe drain. As indicated in **Table 10.4.3** the gravel bed increased the factors of safety above the minimum required values.

10.5 Dike Seepage Analysis

10.5.1 Seepage Analysis Soil Properties

The principal soil property required for seepage analysis is hydraulic conductivity. Hydraulic conductivity values for the various soil layers were estimated using the laboratory permeability test results and our experience with similar soil types.

The hydraulic conductivity values used in the seepage analyses are provided in Table 10.4.1 in **Section 10.4.1**.

10.5.2 Boundary Conditions

All seepage analyses used constant head boundary conditions to represent the inside pool (impounded water) and outside water features (i.e. perimeter ditch). Exit-face boundary conditions were used on all outside slopes to allow the SEEP/W model to identify locations where the phreatic surface would exit the slope.

Constant head and no-flow boundary conditions were utilized on the vertical faces at the inside and outside limits of the model. The horizontal distance for each model was 340 feet from the left and right extents. This results in horizontal distances to the model extent of about 110 feet from the ditch and 30 feet from the upstream toe. The constant head boundary conditions for the water features in each design section are summarized in the following tables:

Table 10.5.2-1 East Cross-Section Boundary Conditions

Analyses	Pool Elevation (feet-NAVD)	Toe Drain Invert Elevation (feet-NAVD)	Ditch Water Elevation (feet-NAVD)	Groundwater Elevation (feet-NAVD)
End-of-Construction	+16.6	+11.2	-	+11
Steady State	+33.3	+11.2	-	+11

Table 10.5.2-2 North Cross-Section Boundary Conditions

Analyses	Pool Elevation (feet-NAVD)	Toe Drain Elevation (feet-NAVD)	Ditch Water Elevation (feet-NAVD)	Groundwater Elevation (feet-NAVD)
End-of-Construction	+16.6	+15.1	-	+16
Steady State	+33.3	+15.1	-	+16

Table 10.5.2-3 South Cross-Section Boundary Conditions

Analyses	Pool Elevation (feet-NAVD)	Toe Drain Elevation (feet-NAVD)	Ditch Water Elevation (feet-NAVD)	Groundwater Elevation (feet-NAVD)
End-of-Construction	+16.6	+17.7	-	+18
Steady State	+33.3	+17.7	-	+18

Table 10.5.2-4 West Cross-Section Boundary Conditions

Analyses	Pool Elevation (feet-NAVD)	Toe Drain Elevation (feet-NAVD)	Ditch Water Elevation (feet-NAVD)	Groundwater Elevation (feet-NAVD)
End-of-Construction	+16.6	+22.7	-	+22
Steady State	+33.3	+22.7	-	+22

10.5.3 Seepage Flow Rates

The seepage analysis indicated that the dike's downstream slope will be wet at its toe under steady-state seepage conditions. To avoid a wet toe, we recommend that a toe drain be installed beneath the entire length of the dike's downstream slope. The toe drain was modeled by inserting a circular region with a potential seepage face boundary condition along the perimeter. The toe drain was offset about 35 feet from the dike toe swale invert into the downstream embankment. This offset adequately controlled the phreatic surface at each analyzed section. The following table presents the seepage flow rates into the drain under steady-state seepage conditions for the three cross-sections.

Table 10.5.3 Seepage Flow Rate into Toe-Drain

Cross Section	Seepage Flow Rates per foot of dike (ft^3/day)	Seepage Flow Rates per foot of dike (gpm)
East	238.2	1.2
North	179.5	0.9
South	236.9	1.2
West	187.1	1.0

The water flowing to the drain will need to be routed to the perimeter ditch via an outfall pipe with positive gravity flow. The total maximum (i.e. Year 50) seepage flow rate into the perimeter ditch under steady-state seepage conditions is estimated to be 1,785,000 cubic feet per day or about 9,300 gallons per minute. This rate is a combination of piped outfall from the toe drain as well as seepage that passes below the drain and flows directly into the ditch. The rate is based on 7,147 lineal feet of dike.

10.5.4 Seepage Exit Gradients

The quantitative results of the seepage analyses for the end-of-construction and steady-state seepage scenarios are provided on Exhibits F-1 through F-8 in Appendix F. The seepage results indicate that most seepage lost from the DMMA will flow through the dike and within the upper sands above the clay and/or silt strata. The SEEP/W results also show that the phreatic surface does not exit on the face of the downstream slope, but instead passes through the toe drain.

The exit gradients into the perimeter ditch and dike toe swale under steady-state seepage conditions were determined for each design section. The phreatic surface exit gradient into the perimeter ditch for each dike section is presented in the following table.

Table 10.5.4-1 Perimeter Ditch Seepage Exit Gradients

Cross Section	Perimeter Ditch Surface Exit Gradient	Corresponding Piping Safety Factor
East	0.24	4.17
North	0.35	2.86
South	0.53	1.89
West	0.26	3.85

Table 10.5.4-2 Dike Toe Swale Seepage Exit Gradients

Cross Section	Dike Toe Swale Surface Exit Gradient	Corresponding Piping Safety Factor
East	0.18	5.56
North	0.24	4.17
South	0.42	2.38
West	0.10	10.00

The U.S. Army Corps of Engineers (USACE) Engineering Manual EM 1110-2-5027 – Confined Disposal of Dredged Material does not provide specific guidance for minimum factor of safety against a seepage piping failure. The USACE Engineering Manual EM 1110-2-1901 – Seepage Analysis and Control for Dams indicates a minimum factor of safety against piping between 2.5 and 3. DUNKELBERGER considers the factor of safety against piping at the dike toe swale (minimum of 2.38) adequate for the design provided that project specifications require routine visual observations along the southern dike toe while in use during dredging. If the observations indicate the presence of seepage along the dike toe, Taylor Engineering should be contacted immediately for recommendations. The factor of safety against piping at the perimeter ditch (minimum of 1.86) is lower than that at the toe swale and significantly lower than the USACE range above at locations along the southern perimeter ditch. The factor of safety could be increased by placing a filter along the southern ditch. However, we understand that Taylor Engineering considers a piping failure to be less critical as the distance from the dike increases. If the southern ditch is not filtered, project specifications should require the same routine visual observations along the southern perimeter ditch as for the dike toe stated above.

The exit gradients shown in the above tables may be decreased by adding a filter at the seepage exit points. The filter should provide sufficient permeability to reduce the pressure (gradient) at the exit point as well as meet gradation requirements to prevent particle migration (piping).

10.6 Weir Structure Foundations

Substantial settlements caused by the weight of the dredged spoils (i.e. operational settlement) as well as the structure itself are anticipated at the location of the weir structure when employing a shallow foundation system. The operational settlement alone at this location is estimated up to about 4.3 inches. The settlement of the weir slab under the weight of the structure is estimated at about 0.8 inches with the consolidation component being 0.5 inches and the other 0.3 inches as immediate (elastic) movement. Consolidation settlement of the weir structure could influence differential settlement of the elevated walkway depending on construction timing as explained further below.

The weir slab and elevated walkway may be supported by shallow foundations bearing on native soil or structural embankment soils (i.e. dike fill). Foundations based in these densified materials may be proportioned for a net allowable bearing pressure of 500 pounds per square foot (psf). To provide an adequate factor of safety against a bearing capacity failure: 1) all foundation components should be based at least 18 inches below the lowest adjacent grade; and 2) footings should be at least 48 inches wide. The footing concrete should be cast upon granular materials compacted to a firm and stable condition, and at least 95% of the ASTM D1557 maximum dry density.

The amount of settlement that the weir structure walkway experiences will be partially dependent on the construction schedule. If the walkway is constructed immediately after the dike is constructed, then the walkway will experience consolidation settlement in addition to operational settlement. If walkway construction is delayed approximately 3 months to allow consolidation underneath the dike to complete, then the walkway will experience only operational settlement.

Consolidation settlement of the walkway near the crest is estimated at about 2.9 inches over a period of 3 months while the walkway at the upstream toe of the dike may experience about 1.2 inches of consolidation. The walkway at its connection to the weir structure will experience 0.5 inches of consolidation settlement plus additional settlement of about 4.3 inches caused by operational loads from the dredge spoils. The following figures illustrate the estimated settlement of the walkway for each scenario described above.

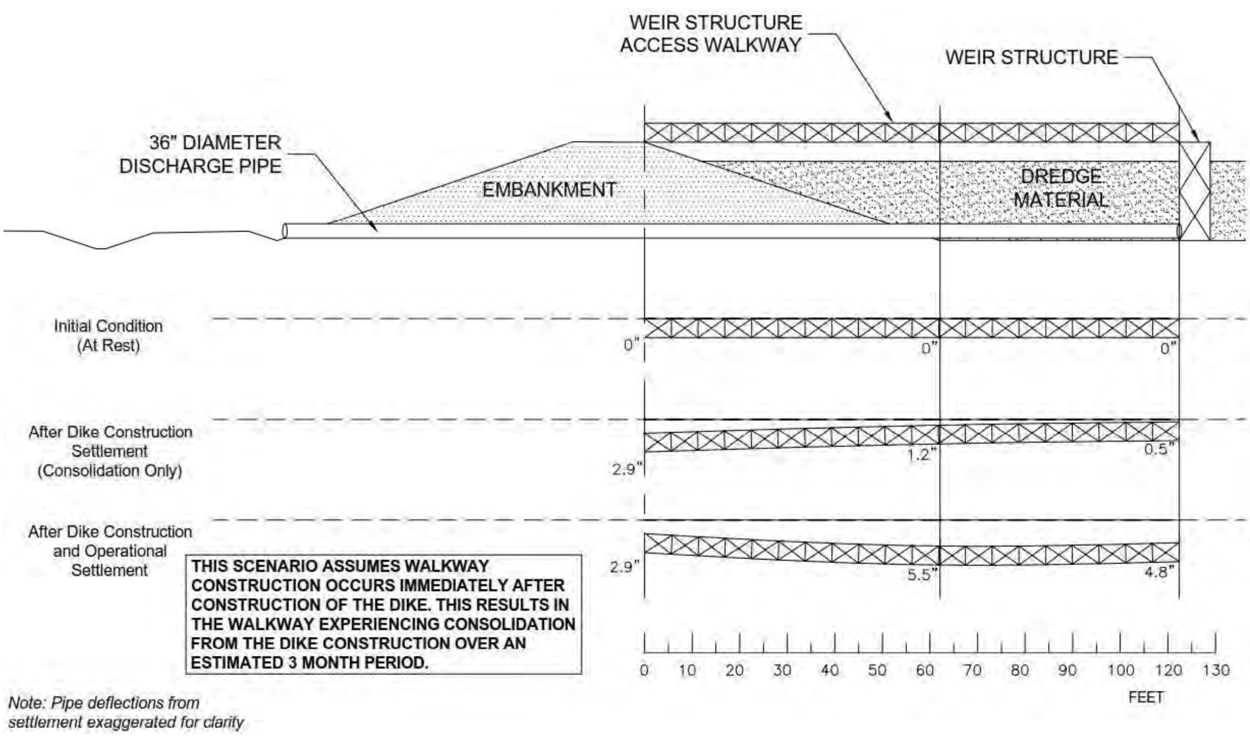


Figure 10.6.1 – Walkway Settlement (Scenario 1)

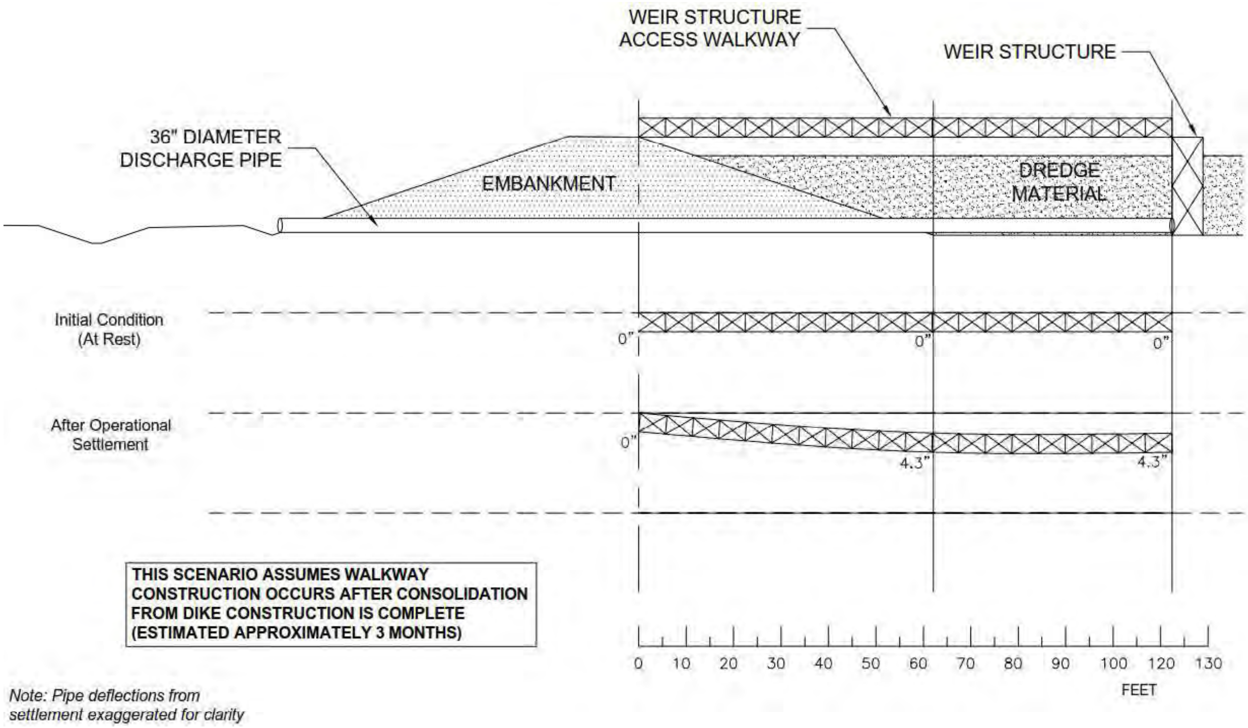


Figure 10.6.2 – Walkway Settlement (Scenario 2)

The walkway structure should be designed to accommodate the total settlement and also the differential settlement between the footings as well as the weir structure.

If these settlements cannot be tolerated by the weir structure or walkway, the Engineer should refer to **Section 11.4** as an alternative to limit post-construction settlement to the weir system.

10.7 Weir Discharge Pipe

Similar total and differential settlements are anticipated for the weir discharge pipe. The pipe will first undergo settlement impacts from construction of the dike embankment. The total settlement (elastic and consolidation) at the centerline and toe of the embankment is estimated at 5.3 inches and 1.5 inches, respectively. Operational settlement from the dredged spoils will also add settlement to both the upstream toe and the location of the pipe connection to the weir structure. The following figure illustrates the estimated settlement of the discharge pipe. Consolidation settlement of the weir structure could influence differential settlement of the discharge pipe depending on construction timing as explained further below.

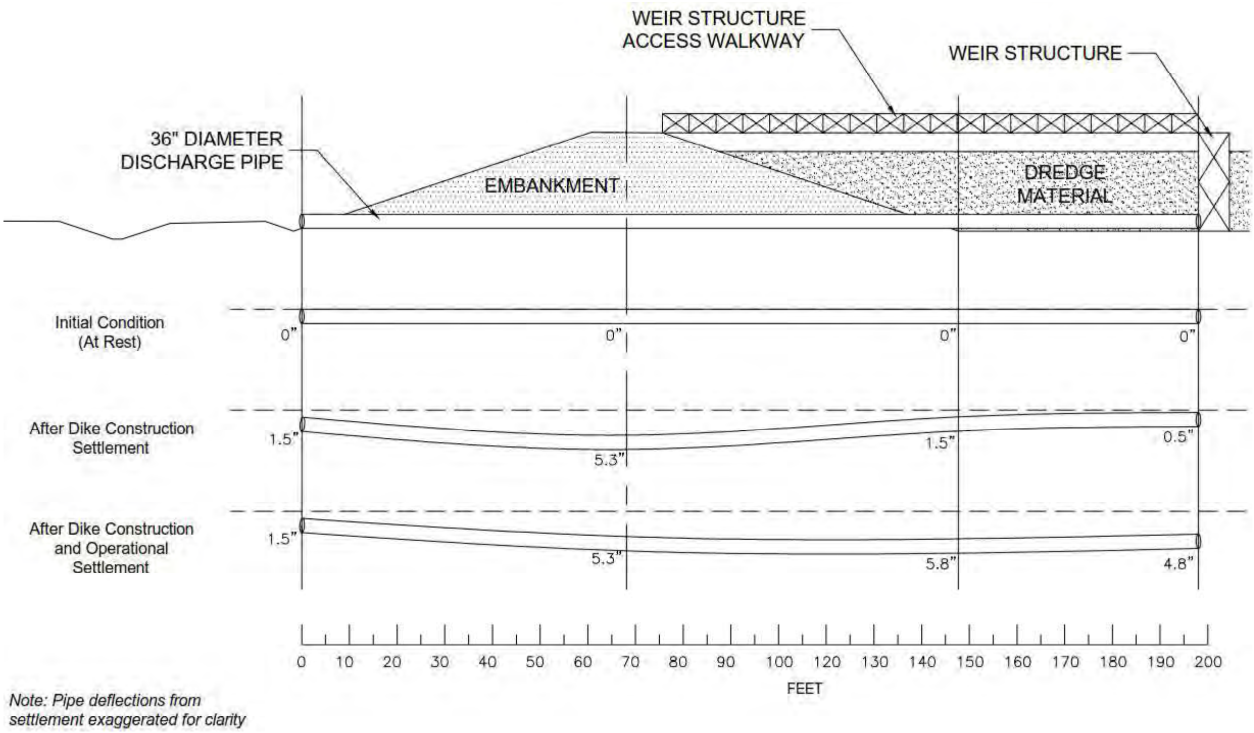


Figure 10.7 – Discharge Pipe Settlement

If these settlements cannot be tolerated by the weir discharge pipe, the Engineer should refer to **Section 11.4** as an alternative to limit post-construction settlement to the pipe.

11.0 CONSTRUCTION RECOMMENDATIONS

11.1 Dikes

11.1.1 Foundation Preparation

Earthwork operations should begin with the stripping of any surficial organic soil (topsoil) from the planned limits of the DMMA. The stripped topsoil should be removed from the construction areas. Wet or dry material should either be removed or moisture conditioned and re-compacted. After stripping, the exposed surface should be proof-rolled to aid in locating loose or soft areas. Proof-rolling should be performed with a vibratory roller with a minimum static weight of 20,000 pounds. The roller should make a minimum of eight overlapping passes over all areas of the site, the latter four passes at right angles to previous passes. The soils should be compacted sufficiently to obtain a minimum compaction of 95 percent of the maximum density at moisture content within 2 percent of the optimum moisture content as determined by ASTM D1557 to a minimum depth of 12 inches prior to fill placement.

11.1.2 Settlement Monitoring

Settlement platforms should be installed prior to fill placement. We recommend placing settlement platforms along the dike centerline at a minimum of one platform per analyzed section (5 total). The settlement platforms should be installed at the ground surface after it has been cleared, grubbed, and proof-rolled prior to dike fill placement.

11.1.3 Fill Placement

The fill borrow soil is anticipated to be near-surface clean sand and sand with silt (SP and SP-SM). Silty or clayey sand (SM, SC) with fines contents up to 25 percent may be used on the inside portion (not within 5 feet measured normal to the slope face) of the dike section. The fill should be free of roots, vegetation, and other deleterious materials. It should have an organic content no greater than 2 percent by weight.

Fill should be placed parallel to centerline of the dikes. Each lift of fill should extend across the entire dike section. If silty or clayey sands (SM, SC) are used as fill, the compacted surface of each lift should be scarified by light disking, or by any other approved method, before the succeeding layer is placed. After dumping the succeeding lift, materials should be spread by bulldozers or other approved means in approximately horizontal layers over the entire fill area. The fill should be placed in maximum 12-inch thick loose lifts.

The gradation and distribution of materials throughout the compacted earth fill section of the dike shall be such that the dike will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material. The fill should be disked or harrowed to blend.

The materials in each layer of the fill should be within ±2 percent of the soil's optimum moisture content, as determined by ASTM D1557, during placement. The moisture content after compaction should be as uniform as practical throughout any one layer. Harrowing, disking, or other approved methods will be required to work the moisture into the material until a uniform distribution of moisture is obtained.

The materials in each layer of the fill should be compacted as required to obtain a minimum of 95 percent of the soil's maximum dry density determined by ASTM D1557.

11.1.4 Seepage Toe Drains

The seepage toe drain should consist of a perforated, corrugated high density polyethylene (HDPE) pipe embedded in inert fine gravel which is also encased with C33 concrete sand to facilitate filter compatibility. The drain should outfall to the perimeter ditch via gravity flow through an outlet pipe with a minimum positive slope of 1%.

The predicted maximum, post-construction settlements along both the crest and upstream toe are less than 6 inches. Accordingly, we believe that there is relatively low risk of significant embankment cracking due to differential movement. An option, however, to further lessen that risk is extension of the toe drain upward on a 2H:1V incline as a blanket drain.

11.2 Groundwater Control

Where groundwater is expected to be encountered during excavation, a dewatering system should be installed to prevent softening and disturbance of subgrade below foundations and fill material, to allow foundations and fill material to be placed in the dry, and to maintain stable excavation side slopes. Groundwater should be maintained at least 3 feet below the bottom of any excavation.

Dewatering systems for structures should be kept in operation until the dead load of the structure exceeds possible buoyant uplift force on the structure. Dewatering systems should be shut off at such a rate as to prevent a quick upsurge of water that might weaken the subgrade, or cause instability in excavation side slopes.

11.3 Structures

Subgrade to receive fill or backfill should be free of organic material, roots, stumps or other undesirable material. It should be scarified to a depth of 6 inches and compacted to a minimum of 95 percent of the soil's maximum dry density as determined by ASTM D1557.

Fill and backfill adjacent to structures should be placed in 12-inch maximum loose lifts and compacted as necessary to obtain a minimum of 95 percent of the soil's maximum dry density determined by ASTM D1557. Fill material should be compacted with equipment of proper type and size to obtain the density specified. Hand-operated equipment should be used for filling and backfilling within 3 feet of walls and retaining walls. When hand-held equipment is used, fill should be placed in 6-inch maximum loose lifts. Fill or backfill material should not be placed when the air temperature is less than 40 degrees Fahrenheit and when the subgrade to receive the material is wet, loose, or soft.

Backfill should not be placed around any part of concrete structures until each part has reached its specified 28-day compressive strength. Backfilling should not commence until stripping of concrete forms, trash removal from excavations, concrete finishing, damp-proofing and waterproofing have been completed.

Fill should not be placed against walls until slabs at the top, bottom and intermediate levels of walls are in place and have reached 28-day required compressive strength to prevent wall movement.

Fill and backfill should be brought up uniformly around the structures and individual walls, piers, or columns.

11.4 Weir Structure and Discharge Pipe

If the settlements discussed in **Sections 10.6 and 10.7** cannot be tolerated by the weir structure, walkway, or discharge pipe, we recommend placing the full dike section in this area early in the construction schedule to limit the settlement impacts. When consolidation settlement is nearly complete, a portion of the dike would then be removed to expose a minimum 15-foot wide work area along the pipe alignment. After the pipe is installed, the dike fill should be replaced. The excavation slopes should be no steeper than 4H:1V, and each lift of the new fill should be bench-cut into the existing fill a minimum horizontal distance of 2 feet. The pipe alignment between the upstream embankment toe and the weir structure should also be pre-loaded with a temporary fill. The pre-load, if compacted, should be the same height as the dike embankment. If the preload is constructed “loose”, then the height should be increased by 5 feet.

Seepage control should be placed along the pipe where it penetrates the dike to avoid the potential for piping of soils along the outside of the pipe. The seepage control should utilize a filter diaphragm or collar placed around the pipe at the location of the toe drain. The filter diaphragm should tie directly into the toe drain for controlled routing of the seepage. If the filter diaphragm cannot be tied into the toe drain system, then the filter should extend across the entire downstream third of the pipe and be routed into the perimeter ditch by controlled outfall. Concrete seepage collars should not be used due to the difficulty associated with compaction around them creating potential for internal erosion. Concrete collars should not be confused with filter diaphragms (or filter collars).

12.0 SUMMARY AND RECOMMENDATIONS

The proposed DMMA footprint area is underlain by a thick (100 feet +/-) deposit of mostly granular soils consisting of relatively clean to silty sands containing broken shell. The profile also includes generally three layers of fine-grained (silt or clay) layers, referred to as upper, middle, and deep layers. The sands are generally loose in the upper part of the profile transitioning to dense at deeper depths in terms of relative density. The upper silt/clay layer is soft while the middle and deep layers are medium stiff to stiff.

A large wetland lies along the southern dike centerline. Surficial muck (unsuitable foundation materials) is commonly found in these wetlands. If found, the muck would require full removal and replacement. The area of this wetland is 76,500 square feet. With an assumed typical depth of 12 inches, the required excavation volume would be roughly 3,000 to 4,000 cubic yards.

The presence of the fine-grained layers is beneficial with respect to management of seepage from the impoundment. Seepage of impounded waters will predominately move laterally in the shallow sand layers above the clay/silt and allow for effective capture in a perimeter ditch system. Conversely, these materials are soft in areas and also locally thick which will cause significant dike and weir structure settlement.

Five design dike sections (east, north, southeast, southwest, and west) were used for engineering analysis to account for the variability in both topography and subsoil conditions from east to west across the site. Maximum dike (embankment fill) heights ranged from of 12 ½ feet on the west to 22 ½ feet on the east.

Slope stability analyses indicated sufficient stability in the dike sections, based on USACE criteria, for end-of-construction, steady-state seepage, and transient seepage conditions. Placement of a toe drain beneath the dike's downstream slope is required to maintain sufficient stability under steady-state seepage conditions. The perimeter ditch stability fell below UASCE required minimum factors of safety for steady-state seepage conditions. Placement of a gravel lining on the ditch slopes would maintain sufficient stability throughout the 50-year life span of the DMMA.

Estimated dike crest settlements from elastic compression of the sand strata added to consolidation of the fine-grained layers are summarized in the following table.

Table 12 Summary of Crest Settlement Estimates

Design Section	Estimated Sand Settlement (inches)	Estimated Consolidation Settlement (inches)	Total Estimated Settlement (inches)
East	2.1	2.3	4.4
North	2.4	2.9	5.3
Southeast	3.7	1.5	5.2
Southwest	2.2	2.1	4.3
West	1.4	1.1	2.5

The estimated combined settlement values should be considered for earthwork volume estimates and to establish crest over-build elevations. Operational settlements, resulting from the weight of dredge materials, near the upstream toe should also be considered.

The sand settlement will be immediate occurring simultaneously with placement of the dike fill. Fine-grained material consolidation is estimated to take about 3 months following the end of dike construction.

The magnitude and duration of fine-grained material consolidation will impact both design and construction of the weir structure and its components. The Engineer should review the estimated total and differential settlements associated with the weir structure, elevated walkway, and discharge pipe to determine if they are tolerable. If any component of the weir system cannot tolerate these settlements, then preloading will be required. Following preloading of the weir system, or in the case that the total and differential settlements are deemed acceptable by the Engineer, the weir structure and elevated walkway may be supported on shallow foundations consisting of concrete footings for the walkway and a heavily-reinforced concrete slab for the weir structure.

The groundwater flow gradient mimics the topographic decline from west to east across the site. Depths to groundwater measured in on-site monitoring wells during the study period (i.e. dry season although significant rain was experienced) ranged from 1 ½ to 3 ½ feet below the existing ground surface or elevations from +8.3 to +22.5 feet NAVD. Groundwater control (dewatering) will likely be needed to accomplish fill placement at lower elevations and borrow excavation in the dry.

Borrow excavations up to 5 ½ feet bls, as presently planned, should produce relatively clean fine sands that would meet the engineering properties adopted for analysis and therefore be suitable for general embankment fill. These clean, uniformly fine sands are, however, very high in permeability, even when compacted, and therefore will result in significant flow rates in the dike toe drain system.

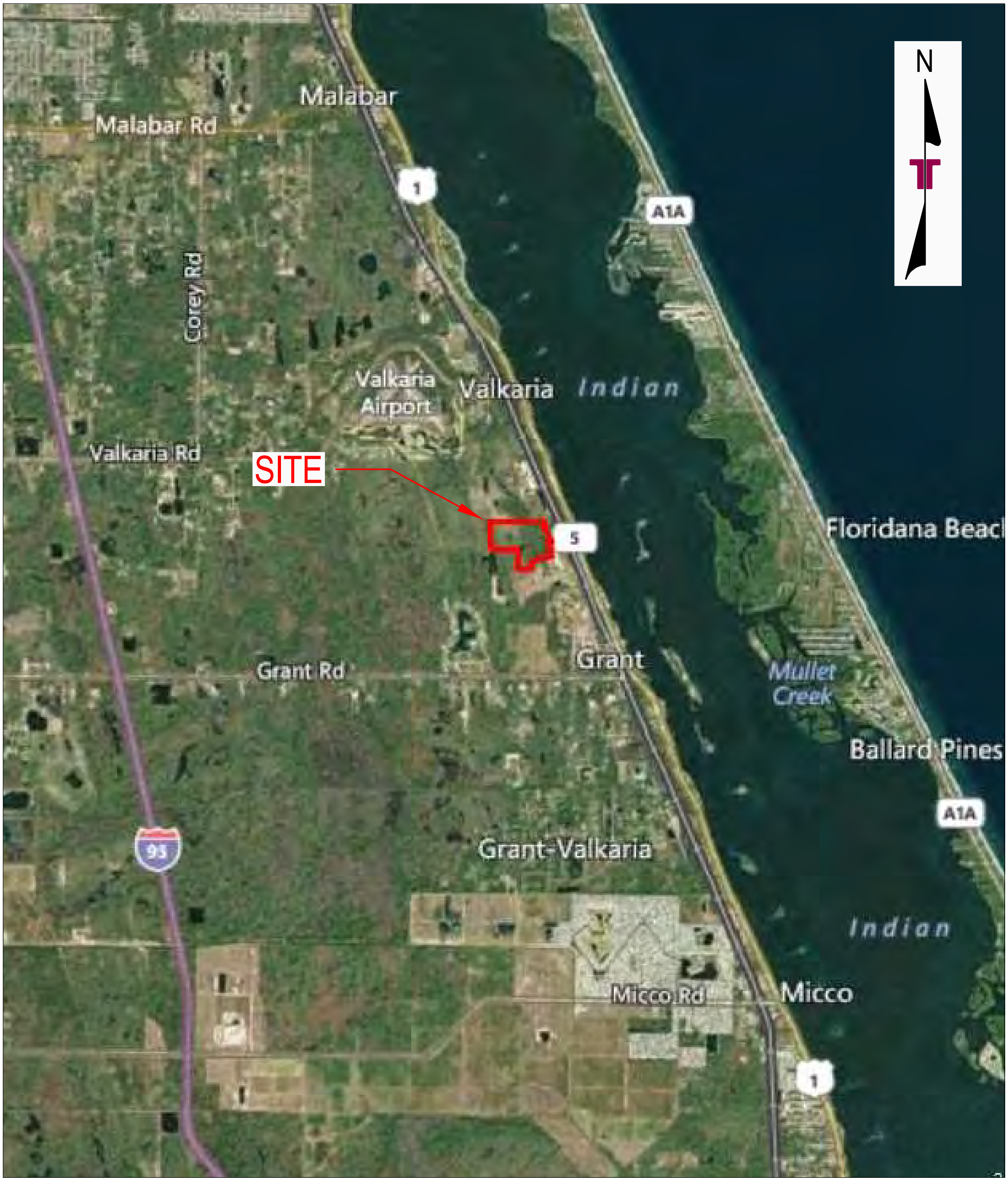
13.0 ADDITIONAL STUDY

The revised DMMA footprint, required for groundwater (i.e. chloride plume movement) control, represents an approximately 500-foot shift of the southeasterly stretch of the perimeter dike as compared to the original position. The exploratory borings completed during an earlier phase (Phase I) of study were aligned with the original footprint. Thus, a significant gap of exploratory data now exits along the southeasterly segment of the revised DMMA footprint. We recommend the drilling of supplemental borings in this area to confirm consistency with the earlier borings and current assumptions being used for Phase III design-level geotechnical analyses.

14.0 GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.



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MILES

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Checked By: DD	File No. -		TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986 PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	

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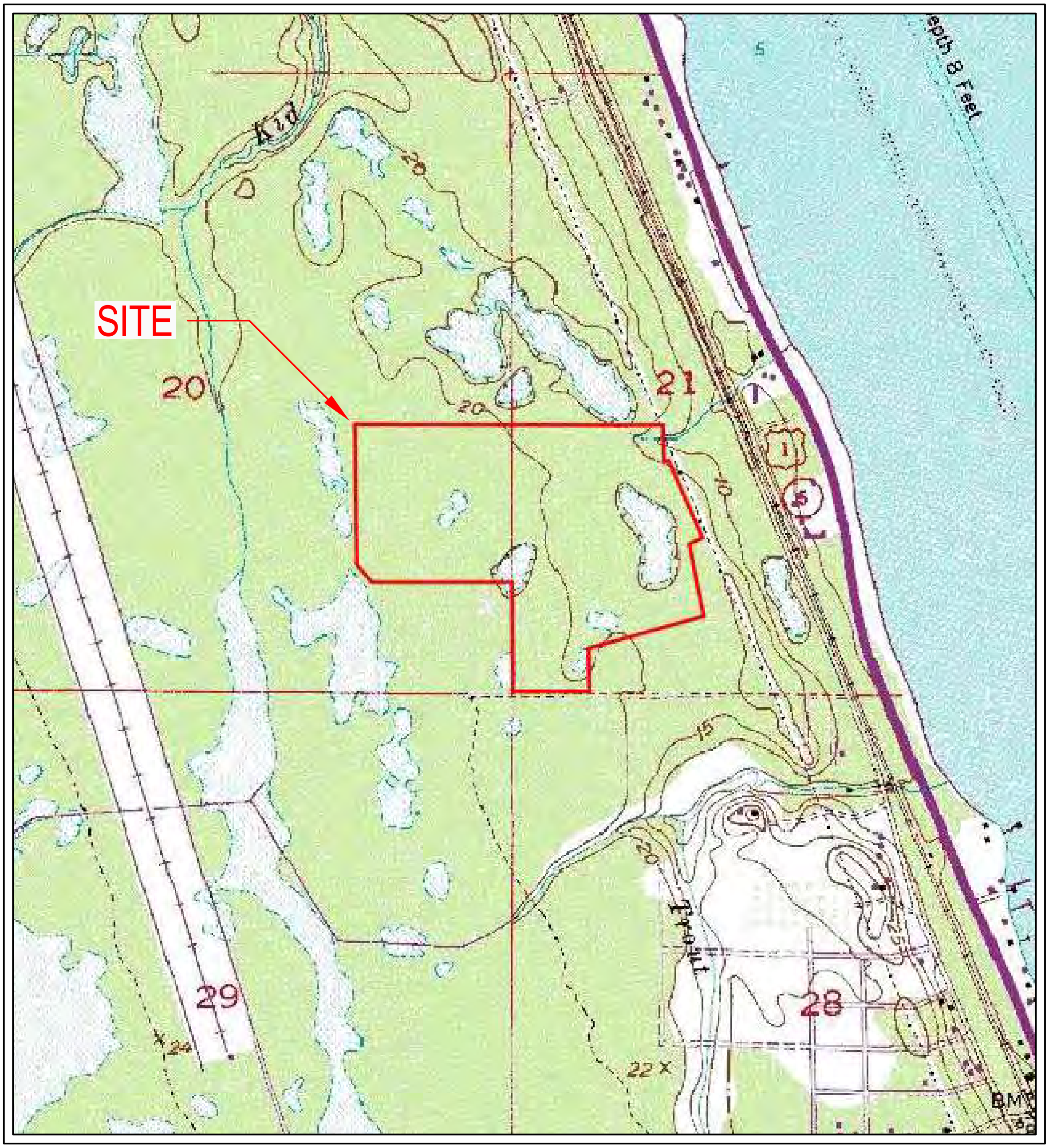

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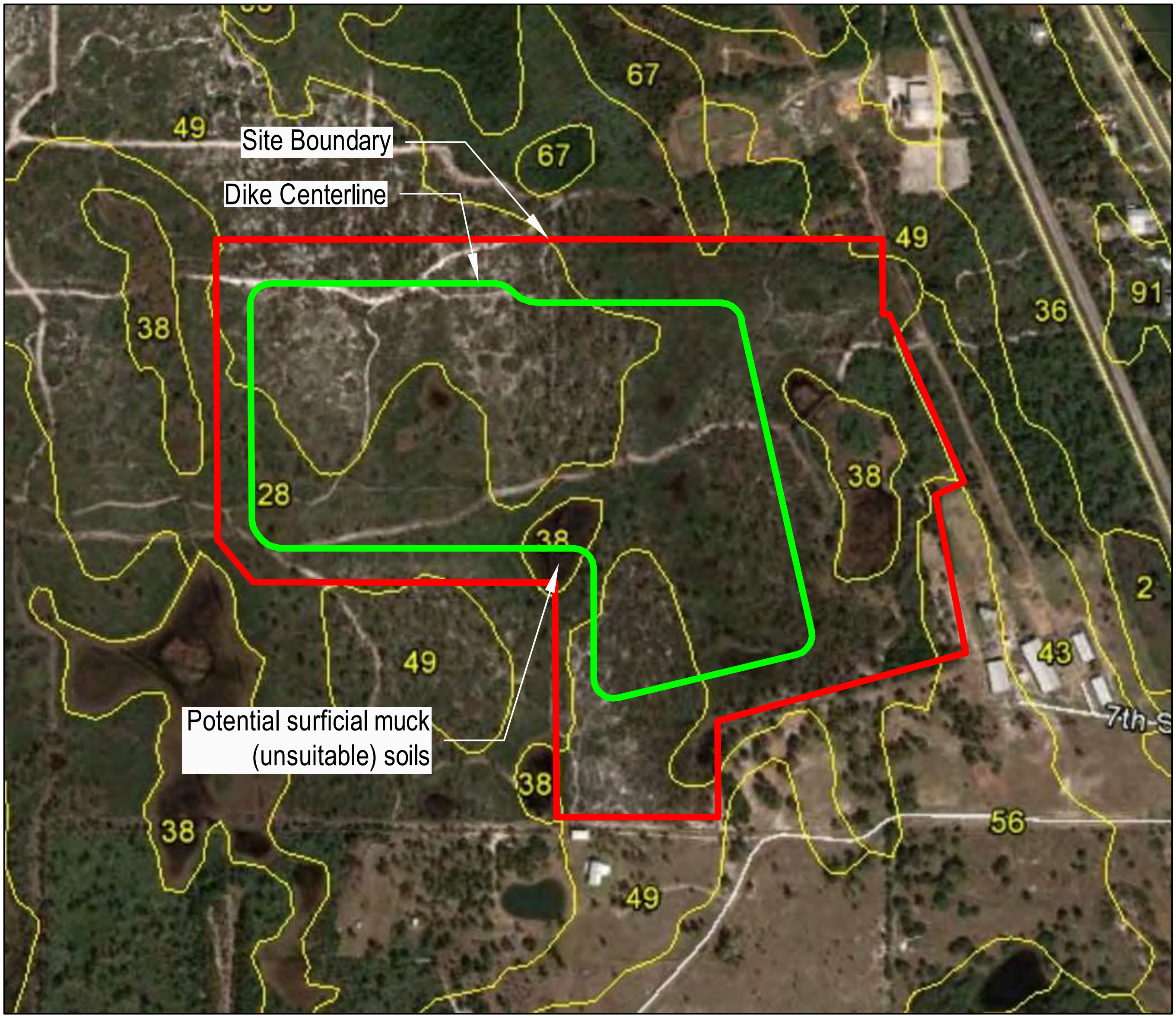
Checked By: DD	File No. -		TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986 PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	



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SOIL LEGEND	
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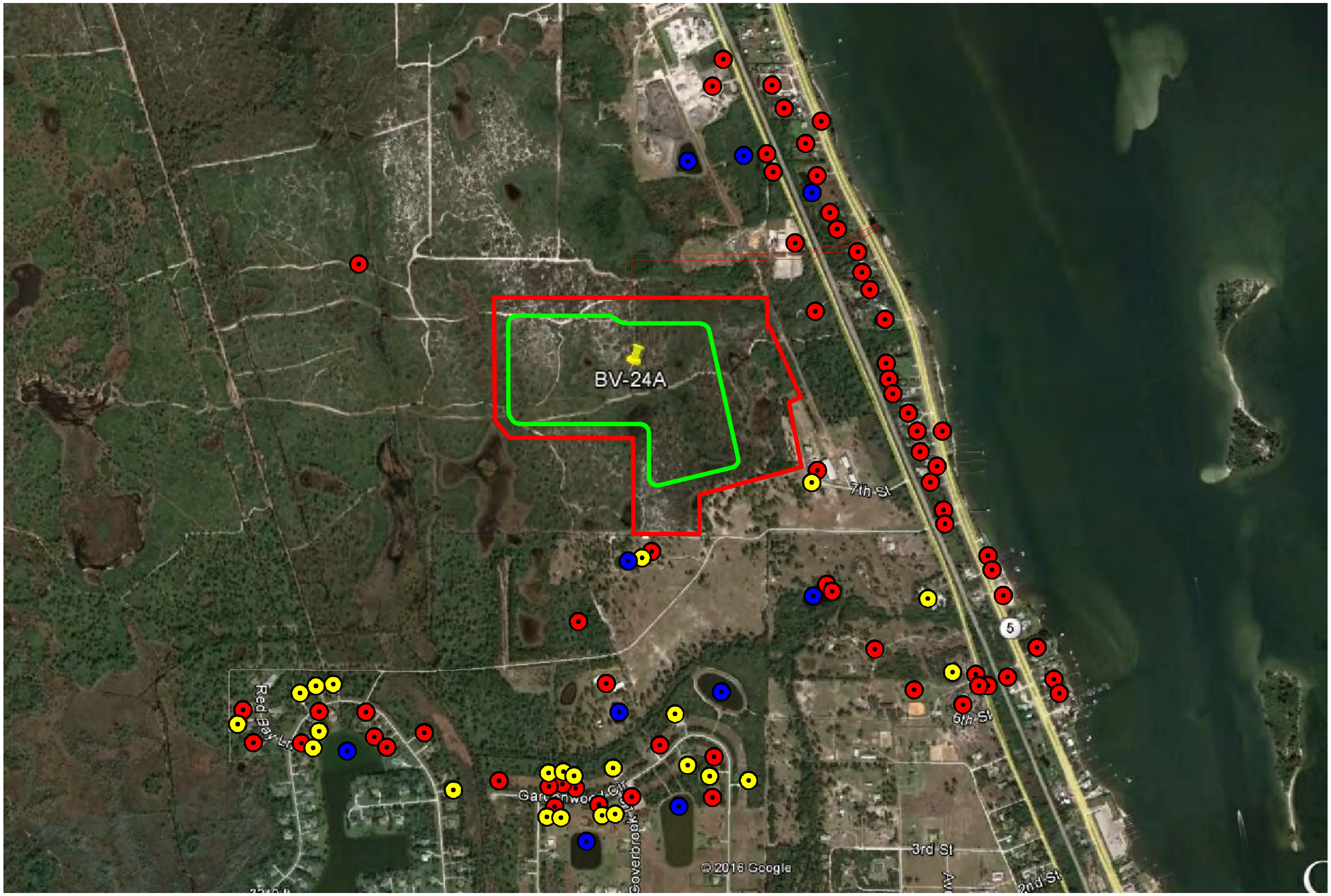
38	MYAKKA SAND, DEPRESSIONAL
49	POMELLO SAND
56	ST. LUCIE FINE SANDS, 0 TO 5 PERCENT SLOPES
67	TOMOKA MUCK, UNDRAINED

N

U.S.D.A. SOIL SURVEY FOR BREVARD COUNTY, FLORIDA
ISSUED: JANUARY 1987

Project Mngr: DD	Project No. HB155022	**DUNKELBERGER** engineering & testing, inc. A Terracon COMPANY	SOIL SURVEY MAP	SHEET
Drawn By: BL	Scale: AS SHOWN		GEOTECHNICAL SITE EXPLORATION	3
Checked By: DD	File No. -		TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986 PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	

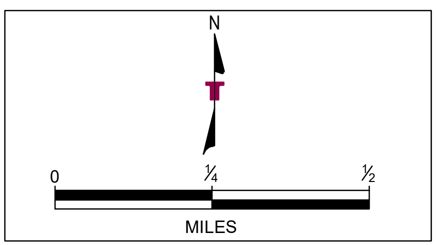


SOURCE: GOOGLE EARTH PRO

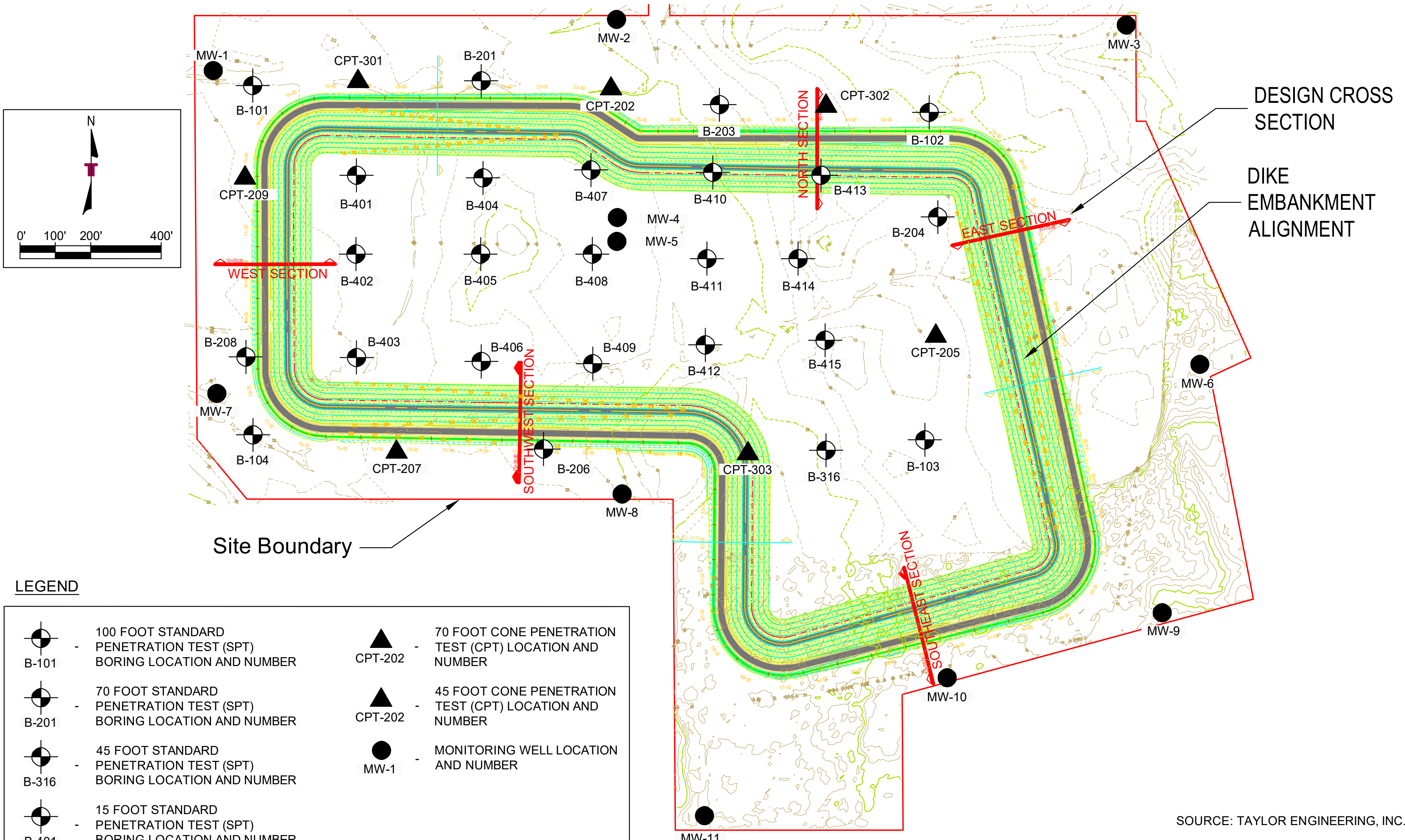
LEGEND

- WELL
- SEPTIC TANK
- POND

Locations are approximate



Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	HYDROLOGICAL DATA INVENTORY MAP	SHEET
Drawn By: BL	Scale: AS SHOWN	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	4
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
			Brevard County Florida	



LEGEND

B-101	-	100 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
B-201	-	70 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
B-316	-	45 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
B-401	-	15 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
CPT-202	-	70 FOOT CONE PENETRATION TEST (CPT) LOCATION AND NUMBER
CPT-202	-	45 FOOT CONE PENETRATION TEST (CPT) LOCATION AND NUMBER
MW-1	-	MONITORING WELL LOCATION AND NUMBER

Locations are approximate

SOURCE: TAYLOR ENGINEERING, INC.

Project Mngr: DD	Project No. HB155022	**DUNKELBERGER** engineering & testing, inc. A Terracon COMPANY	TEST LOCATION PLAN
Drawn By: BL	Scale: AS SHOWN	645 NW ENTERPRISE DR., STE 107 PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By: KA	Date: 8/16/17		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A
			Brevard County Florida

SHEET 5

LEGEND

1. Gray or brown medium to fine SAND. (SP)
2. Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)
3. Light brown slightly silty medium to fine SAND. (SP-SM)
4. Dark gray to green sandy SILT. (ML)
5. Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)
6. Green or light gray CLAY, traces of shell. (CL, CH)
7. Gray to green slightly silty to silty fine SAND. (SP-SM, SM)

SP - Unified Soil Classification System Group Symbol (ASTM D 2487)

N - Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586

B-101 - Standard Penetration Test (SPT) boring and number

MC - Moisture Content (%)

OC - Organic Content (%)

-200 - Amount finer than the U.S. No. 200 Sieve (%)

+22.9' 2-17-16 - Elevation of groundwater (feet-NAVD) and date measured

WOH - Indicates sampler advanced due to weight of hammer

50/1 - Indicates fifty blows required to drive sampler 1 inch

LL - Liquid Limit (%)

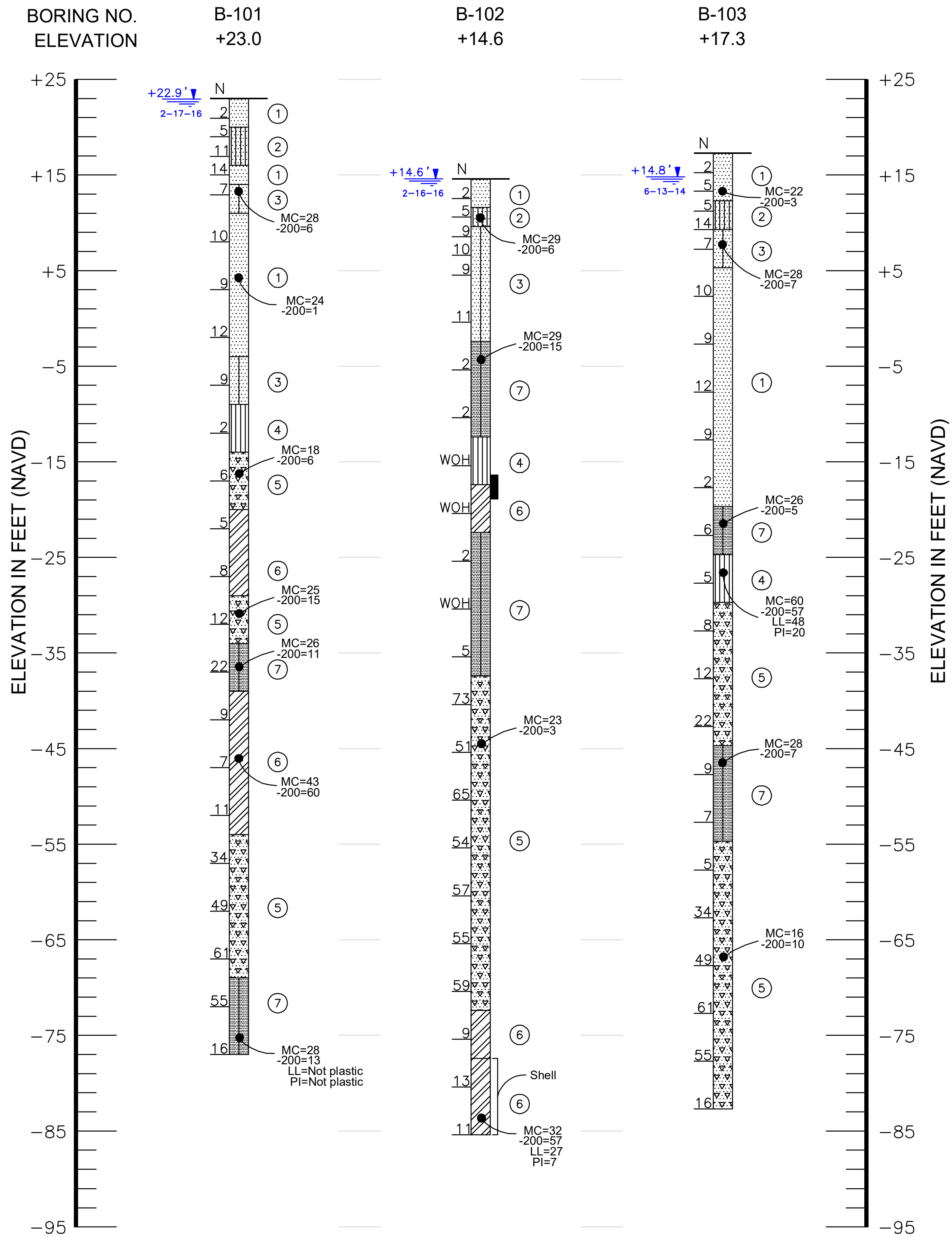
PI - Plasticity Index (%)

- Indicated location of undisturbed (Shelby tube) sample collection

NOTES

1. Borings were drilled February 15, 2016 through February 26, 2016 using an ATV mounted Deidrich 50 (D-50) drill rig.
2. Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.
3. Groundwater elevations shown on the subsurface profiles represent groundwater surfaces on the dates shown. Groundwater level fluctuations should be anticipated throughout the year.

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	LEGEND	SHEET
Drawn By: BL	Scale: AS-SHOWN		GEOTECHNICAL SITE EXPLORATION	6
Checked By: BL	File No. -	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16	PH. (772) 343-9787 FAX. (772) 343-9404	DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	



LEGEND

1. Gray or brown medium to fine SAND. (SP)
2. Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)
3. Light brown slightly silty medium to fine SAND. (SP-SM)
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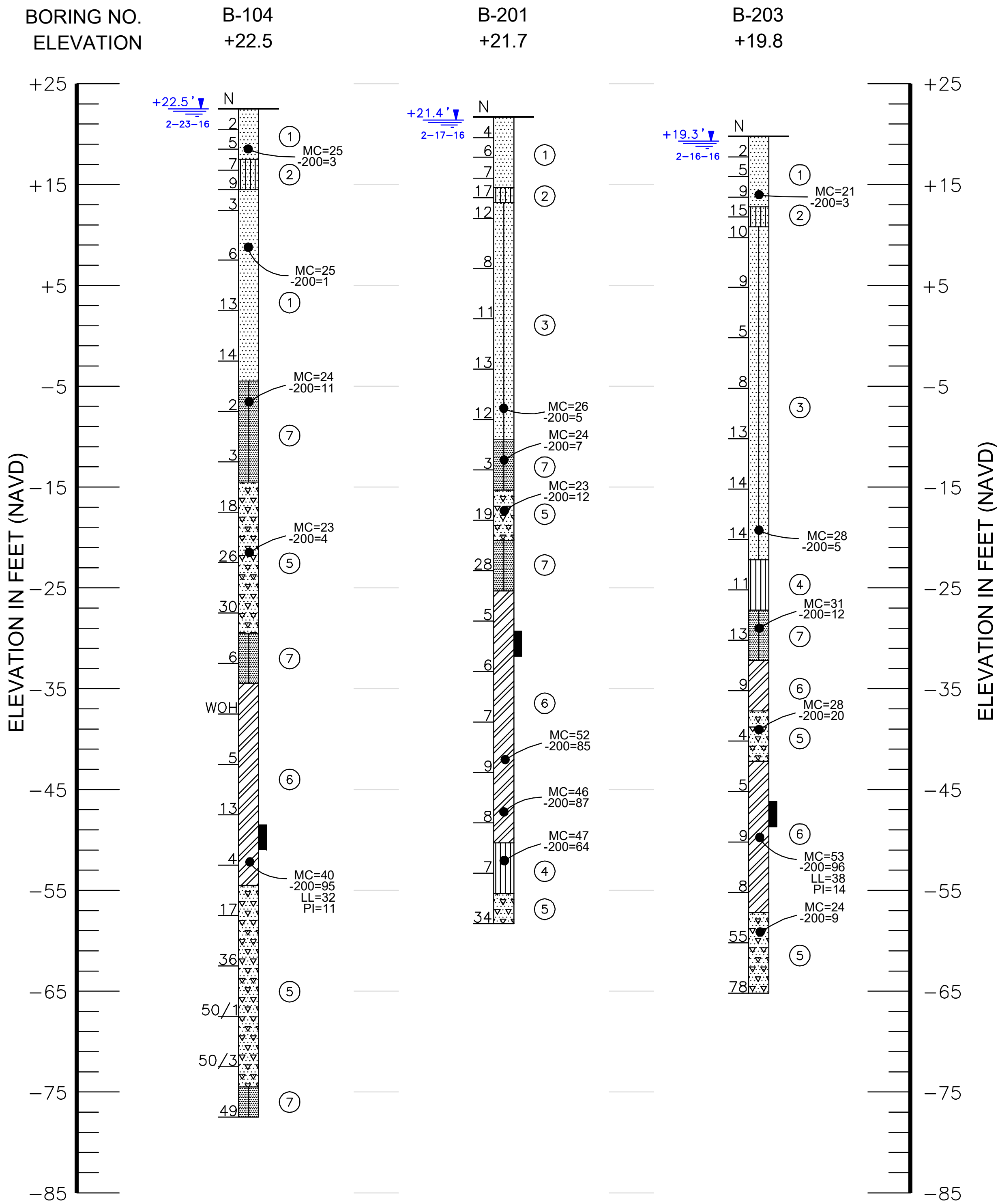
5. Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)
6. Green or light gray CLAY, traces of shell. (CL, CH)
7. Gray to green slightly silty fine to silty SAND. (SP-SM, SM)

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE, PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787, FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A, Brevard County, Florida

SHEET 7



LEGEND

1 Gray or brown medium to fine SAND. (SP)

2 Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)

3 Light brown slightly silty medium to fine SAND. (SP-SM)

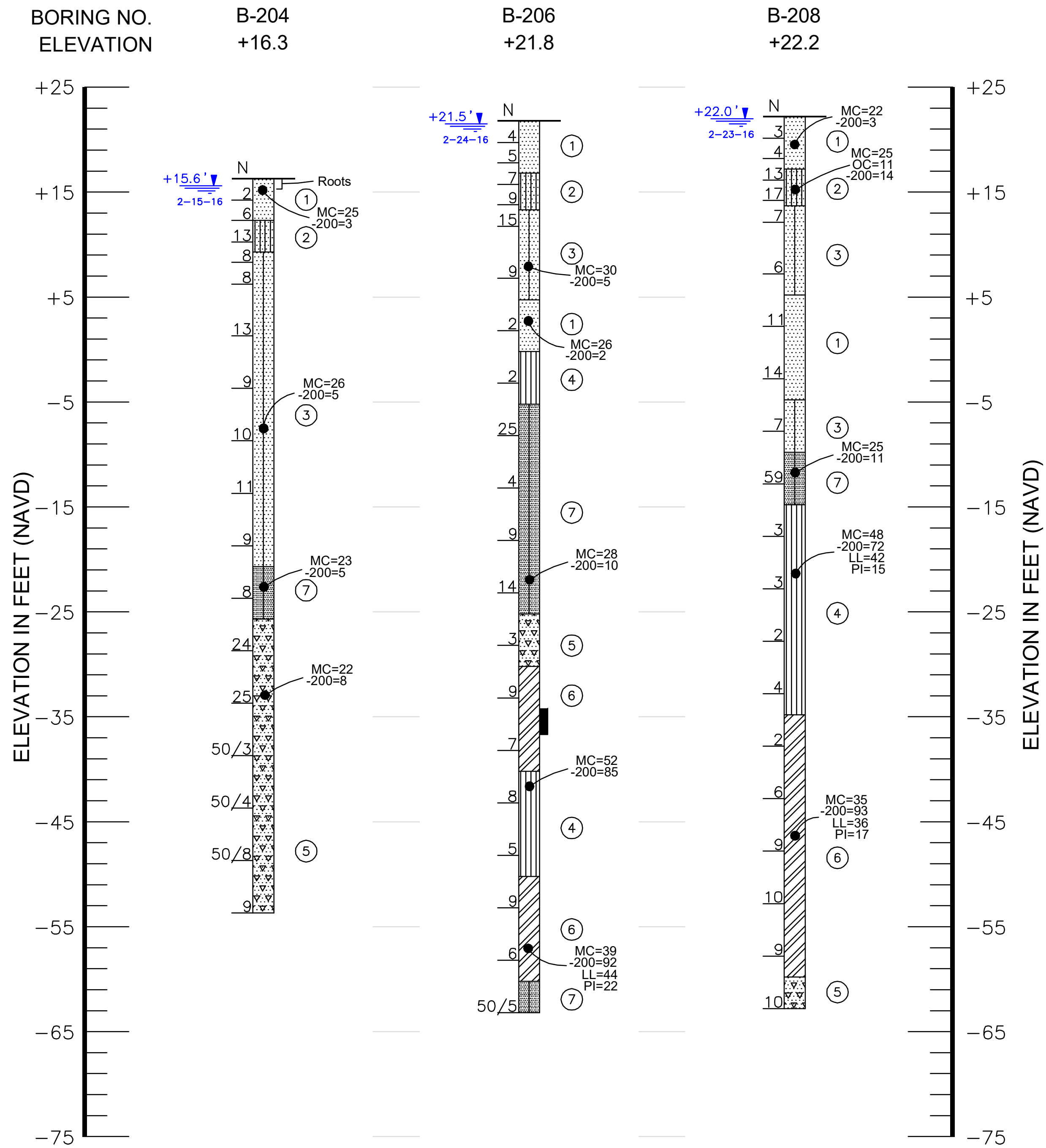
4 Dark gray to green sandy SILT. (ML)

5 Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)

6 Green or light gray CLAY, traces of shell. (CL, CH)

7 Gray to green slightly silty fine to silty SAND. (SP-SM, SM)

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES	SHEET
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	8
Checked By: DD	File No. -	PH. (772) 343-9787 FAX (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	



LEGEND

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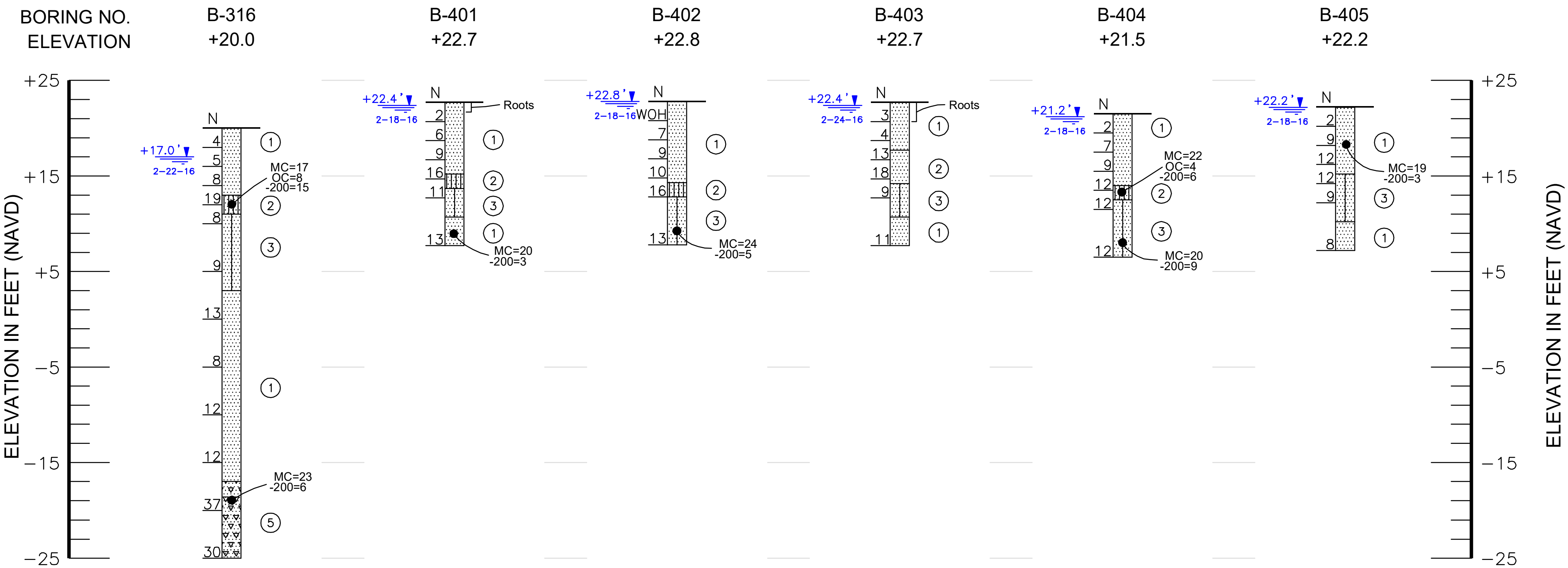
Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES	SHEET
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	9
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	



LEGEND

① Gray or brown medium to fine SAND. (SP)

② Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)

③ Light brown slightly silty medium to fine SAND. (SP-SM)

④ Dark gray to green sandy SILT. (ML)

⑤ Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)

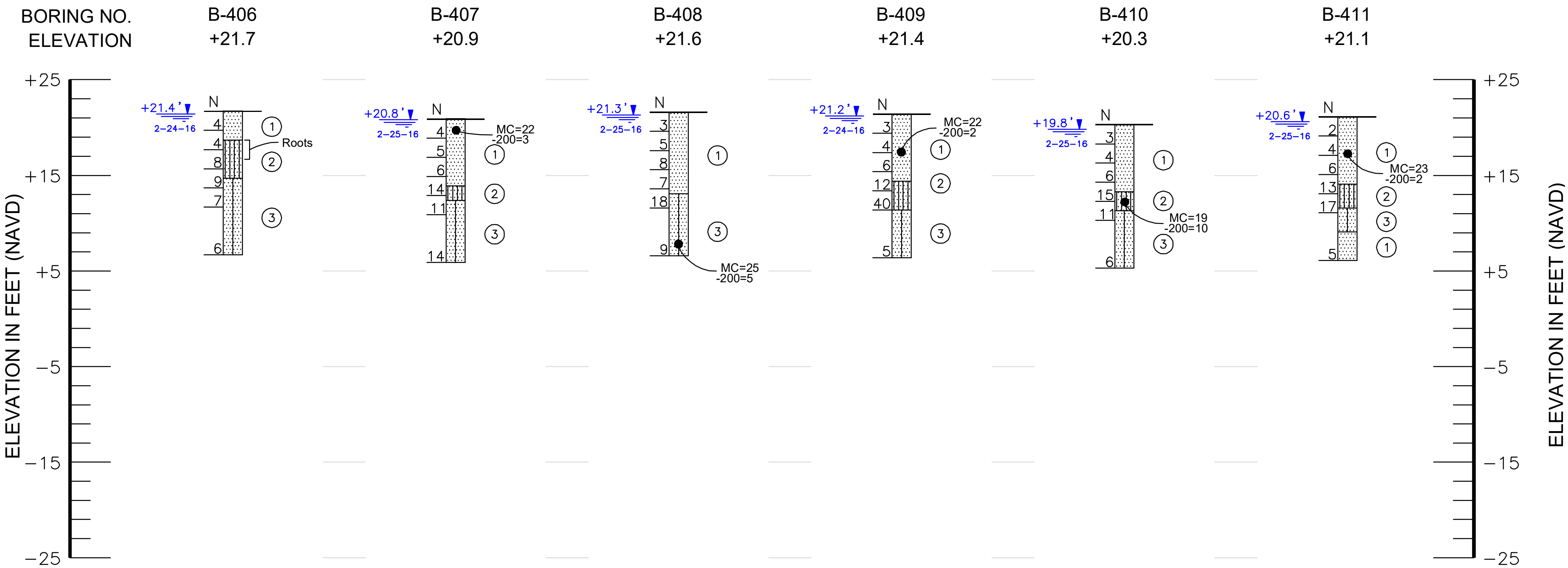
⑥ Green or light gray CLAY, traces of shell. (CL, CH)

⑦ Gray to green slightly silty fine to silty SAND. (SP-SM, SM)

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A
			Brevard County Florida

SHEET

10



LEGEND

- ① Gray or brown medium to fine SAND. (SP)
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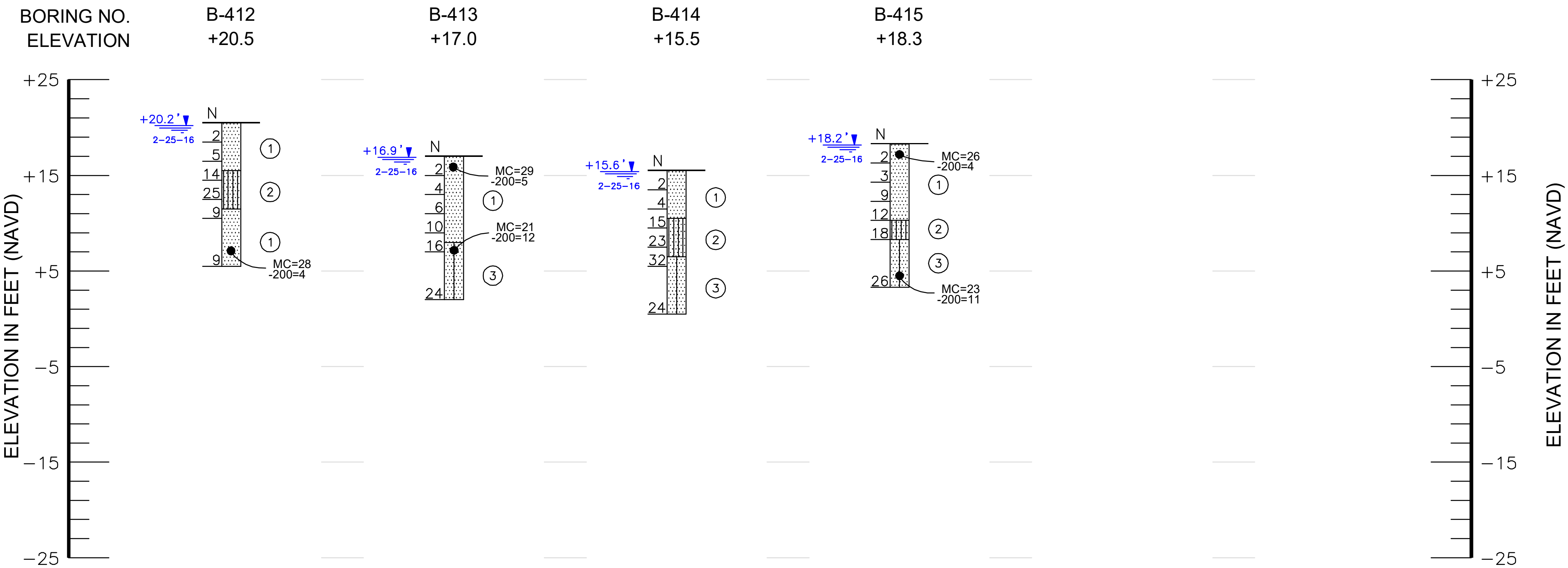
- ⑥ Green or light gray CLAY, traces of shell. (CL, CH)
- ⑦ Gray to green slightly silty fine to silty SAND. (SP-SM, SM)

Project Mngr:	DD	Project No.	HB155022
Drawn By:	BL	Scale:	1" = 10'
Checked By:	DD	File No.	-
Approved By:	KA	Date:	3/26/16

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY
607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986
PH. (772) 343-9787 FAX. (772) 343-9404

SUBSURFACE PROFILES
GEOTECHNICAL SITE EXPLORATION
TAYLOR ENGINEERING, INC.
DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A
Brevard County Florida

SHEET
11



LEGEND

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5 Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)

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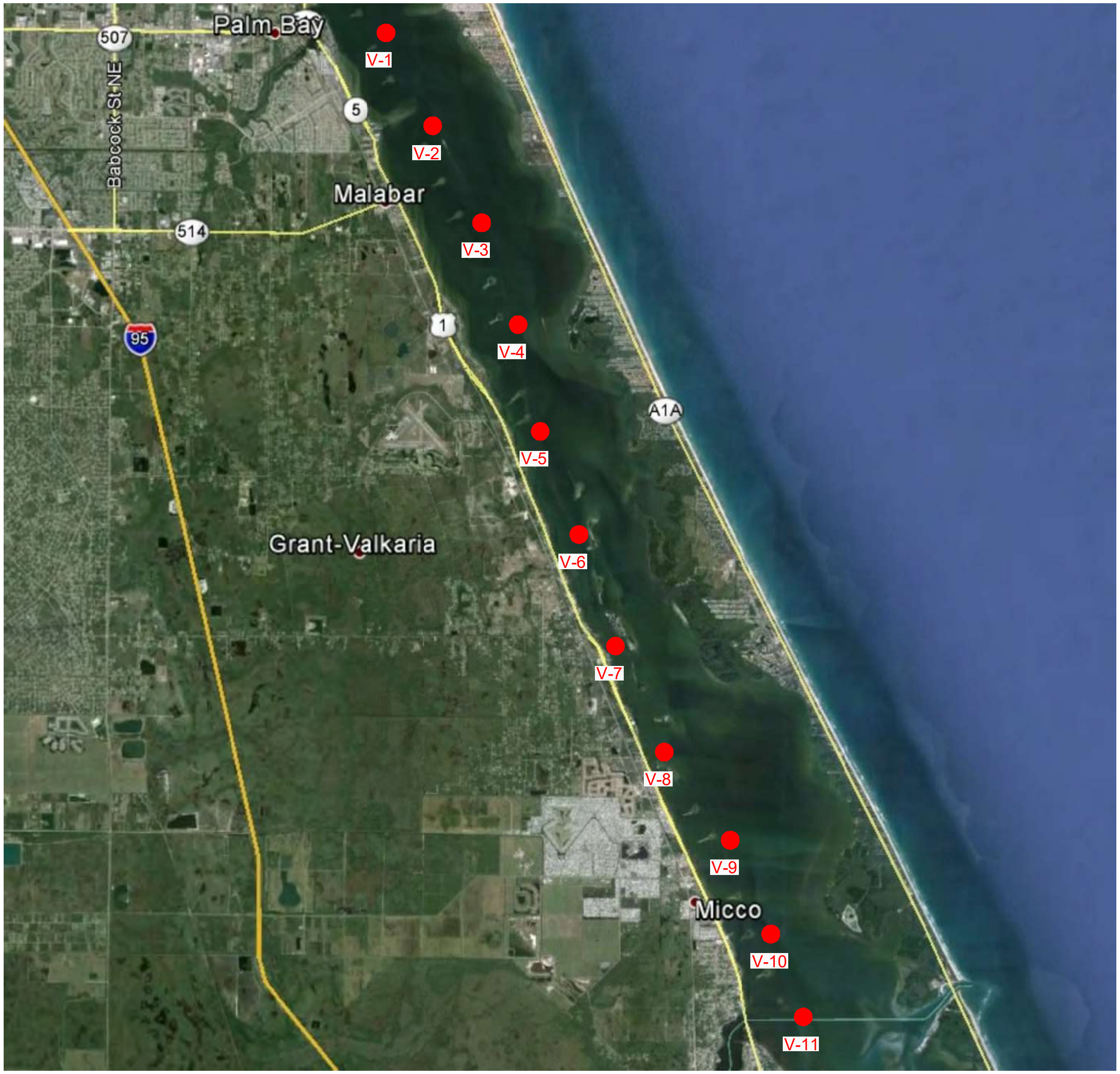
Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A
			Brevard County Florida

SHEET 12



SOURCE: GOOGLE EARTH PRO

STATE-PLANE COORDINATES

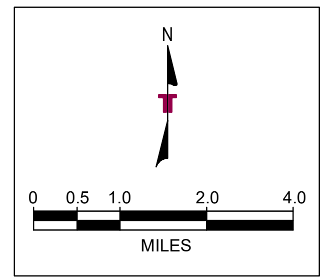
VIBRACORE NO.	NORTHING	EASTING
V-1	796408.32	1345623.44
V-2	799587.99	1339442.26
V-3	802904.71	1332943.36
V-4	805319.46	1326244.75
V-5	806869.92	1319150.80
V-6	809477.04	1312317.33
V-7	811849.13	1304957.15
V-8	815128.46	1297939.66
V-9	819627.28	1292100.20
V-10	822348.58	1285885.45
V-11	824503.59	1280396.94

Coordinates recorded in NAD83 State Plane, Florida East (Zone 0901), U.S. Survey Feet by Athena Technologies, Inc.

LEGEND

V-1 - VIBRACORE LOCATION AND NUMBER

Locations are approximate



Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	VIBRACORE LOCATION PLAN	SHEET
Drawn By: BL	Scale: AS SHOWN	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	13
Checked By: DD	File No. -	PH. (772) 343-9787 FAX (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 5/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
			Brevard County Florida	

Table A
Summary of Site Soil Index Properties
BV-24A DMMA, Brevard County, Florida

Stratum Number	Sample Location	Sample Depth (ft)	Moisture Content (%)	Amount Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Organic Content (%)
1	B-103	3 - 5	27.5	4.9	-	-	-
1	B-104	3 - 5	25.3	2.8	-	-	-
1	B-204	0 - 2	25.2	3.0	-	-	-
1	B-208	2 - 4	22.0	2.7	-	-	-
1	B-401	13 - 15	20.2	3.3	-	-	-
1	B-407	0 - 2	22.1	3.2	-	-	-
1	B-409	3 - 5	21.6	2.0	-	-	-
1	B-412	13 - 15	27.9	3.7	-	-	-
1	B-413	0 - 2	28.5	4.8	-	-	-
1	B-415	0 - 2	25.9	3.8	-	-	-
1	MIN		20.2	2.0	-	-	-
1	MAX		28.5	4.9	-	-	-
1	AVERAGE		24.6	3.4	-	-	-

2	B-208	6 - 8	25.1	13.5	-	-	11.0
2	B-316	7 - 9	17.4	14.8	-	-	7.7
2	B-404	7 - 9	22.1	6.1	-	-	3.6
2	MIN		17.4	6.1	-	-	3.6
2	MAX		25.1	14.8	-	-	11.0
2	AVERAGE		21.5	11.5	-	-	7.4

3	B-103	9 - 11	27.5	7.0	-	-	-
3	B-201	28 - 30	26.4	5.1	-	-	-
3	B-204	23 - 25	25.6	5.2	-	-	-
3	B-402	13 - 15	23.5	5.2	-	-	-
3	B-404	13 - 15	20.2	8.6	-	-	-
3	B-413	9 - 11	20.7	12.4	-	-	-
3	B-415	13 - 15	23.4	10.9	-	-	-
3	MIN		20.2	5.1	-	-	-
3	MAX		27.5	12.4	-	-	-
3	AVERAGE		23.9	7.8	-	-	-

4	B-103	43 - 45	59.5	56.5	47.8	19.8	-
4	B-201	73 - 75	46.7	63.5	-	-	-
4	B-206	63 - 65	51.9	84.6	-	-	-
4	B-208	43 - 45	47.8	72.2	42.1	14.8	-
4	MIN		46.7	56.5	42.1	14.8	-
4	MAX		59.5	84.6	47.8	19.8	-
4	AVERAGE		51.5	69.2	45.0	17.3	-

Table A (continued)
Summary of Site Soil Index Properties
BV-24A DMMA, Brevard County, Florida

Stratum Number	Sample Location	Sample Depth (ft)	Moisture Content (%)	Amount Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Organic Content (%)
5	B-101	38 - 40	18.3	6.4	-	-	-
5	B-103	83 - 85	16.0	9.9	-	-	-
5	B-201	38 - 40	23.4	12.4	-	-	-
5	B-204	48 - 50	22.2	7.8	-	-	-
5	MIN		16.0	6.4	-	-	-
5	MAX		23.4	12.4	-	-	-
5	AVERAGE		20.0	9.1	-	-	-
6	B-101	68 - 70	43.1	59.6	-	-	-
6	B-102	98 - 100	31.9	56.5	26.8	6.7	-
6	B-104	73 - 75	39.8	94.8	31.8	11.3	-
6	B-201	63 - 65	51.9	84.6	-	-	-
6	B-201	68 - 70	45.8	87.4	-	-	-
6	B-203	68 - 70	53.3	96.4	37.5	14.4	-
6	B-206	78 - 80	38.7	91.5	44.0	22.0	-
6	B-208	68 - 70	34.7	92.6	36.0	16.9	-
6	MIN		31.9	56.5	26.8	6.7	-
6	MAX		53.3	96.4	44.0	22.0	-
6	AVERAGE		42.4	82.9	35.2	14.3	-
7	B-101	58 - 60	25.8	11.1	-	-	-
7	B-101	98 - 100	28.4	13.3	Non-plastic	Non-plastic	-
7	B-102	18 - 20	28.8	14.7	-	-	-
7	B-103	63 - 65	27.5	7.0	-	-	-
7	B-104	28 - 30	23.7	11.4	-	-	-
7	B-201	33 - 35	23.8	7.3	-	-	-
7	B-203	48 - 50	30.6	12.3	-	-	-
7	B-206	43 - 45	27.9	10.0	-	-	-
7	B-208	33 - 35	24.9	11.3	-	-	-
7	MIN		23.7	7.0	-	-	-
7	MAX		30.6	14.7	-	-	-
7	AVERAGE		26.8	10.9	-	-	-

Table B
Summary of Sieve Analysis
BV-24A DMMA, Brevard County, Florida

Stratum Number	Sample Location	Sample Depth (ft)	USCS	Amount Passing Sieve Size (%)							
				3/8"	#4	#10	#20	#40	#60	#100	#200
1	B-101	18 - 20	SP	100.0	100.0	100.0	99.7	96.0	78.7	24.5	0.8
1	B-103	3 - 5	SP	100.0	100.0	100.0	99.7	92.3	63.2	29.8	2.7
1	B-104	13 - 15	SP	100.0	100.0	100.0	100.0	96.9	75.1	21.9	1.4
1	B-203	5 - 7	SP	100.0	100.0	100.0	99.8	93.0	64.6	31.1	3.2
1	B-206	18 - 20	SP	100.0	100.0	100.0	99.9	94.6	83.7	39.5	1.9
1	B-405	3 - 5	SP	100.0	100.0	100.0	99.7	93.9	65.7	33.3	3.0
1	B-411	3 - 5	SP	100.0	100.0	100.0	99.8	93.4	60.5	25.7	2.2
2	B-102	3 - 5	SP-SM	100.0	100.0	98.4	98.1	90.9	60.3	26.2	6.4
2	B-410	7 - 9	SP-SM	100.0	100.0	99.8	99.2	91.7	63.2	31.8	10.1
3	B-101	9 - 11	SP-SM	100.0	100.0	100.0	99.9	99.5	96.7	84.7	6.3
3	B-203	38 - 40	SP-SM	100.0	100.0	100.0	99.9	98.7	97.6	89.4	5.2
3	B-206	13 - 15	SP	100.0	100.0	100.0	100.0	99.9	99.5	88.9	4.9
3	B-408	13 - 15	SP-SM	100.0	100.0	100.0	100.0	99.3	94.9	65.4	5.1
5	B-101	53 - 55	SM	100.0	100.0	99.0	96.3	90.4	78.6	50.3	15.4
5	B-102	58 - 60	SP	100.0	100.0	100.0	100.0	98.7	49.5	10.1	3.0
5	B-104	43 - 45	SP	100.0	98.9	95.9	89.7	83.8	66.4	18.1	3.7
5	B-203	58 - 60	SM	100.0	91.1	84.5	77.3	73.0	70.2	66.6	20.4
5	B-203	78 - 80	SP-SM	100.0	95.8	88.6	76.6	60.7	41.3	21.5	8.5
5	B-316	38 - 40	SP-SM	100.0	97.7	90.5	76.4	66.6	54.7	38.4	5.5
7	B-103	38 - 40	SP-SM	100.0	100.0	100.0	99.5	98.0	94.9	62.7	5.4
7	B-204	38 - 40	SP-SM	100.0	100.0	100.0	94.9	83.0	74.8	59.3	5.2
1	Borrow[1]	0 - 7	SP	100.0	100.0	100.0	99.8	94.3	62.3	26.8	2.8
1	Borrow[1]	0 - 7	SP	100.0	100.0	100.0	99.8	94.5	64.6	30.0	4.9
1	Borrow[1]	0 - 7	SP	100.0	100.0	100.0	99.8	92.1	59.4	26.6	3.0
1	Borrow[1]	0 - 7	SP	100.0	100.0	99.9	99.7	93.7	62.3	28.4	3.3
1	Borrow[1]	0 - 7	SP	100.0	100.0	99.5	99.0	90.7	52.7	20.7	2.5

(1) Samples collected in bulk using a continuous flight auger from proposed interior borrow area

Table C
Modified Proctor (ASTM D1557) Compaction Results
BV-24A DMMA, Brevard County, Florida

Sample Location	Sample Depth (ft)	USCS	Fines Content (%)	Optimum Moisture Content (%)	Maximum Dry Unit Weight (pcf)
B-401 / B-402	0 - 7	SP	2.8	14.3	101.9
B-405 / B-406	0 - 7	SP	4.9	11.9	101.9
B-407 / B-408	0 - 7	SP	3.0	13.1	103.1
B-411 / B-412	0 - 7	SP	3.3	10.8	102.7
B-413 / B-414	0 - 7	SP	2.5	10.4	102.7

Samples collected in bulk using a continuous flight auger from proposed interior borrow area
Fines content refers to amount passing No. 200 Sieve

Table D
Limerock Bearing Ratio (LBR) Results
BV-24A DMMA, Brevard County, Florida

Sample Location	Sample Depth (ft)	USCS	Fines Content (%)	Optimum Moisture Content (%)	Maximum Dry Unit Weight (pcf)	LBR
B-403 / B-404	0 - 7	SP	4.1	13.3	103.3	41.9
B-409 / B-410	0 - 7	SP	2.4	12.8	104.9	54.5
B-413 / B-414	0 - 7	SP	2.2	13.6	103.4	59.6

Samples collected in bulk using a continuous flight auger from proposed interior borrow area
Fines content refers to amount passing No. 200 Sieve
Optimum moisture content and maximum dry unit weight determined in accordance with Modified Proctor test

Table E.1
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Sand Samples

Sample Location	Sample Depth (ft)	USCS	Sample Type	Fines Content (%)	Initial Conditions			Confining Stress (psi)	Hydraulic Conductivity	
					Moisture Content (%)	Dry Unit Weight (pcf)	Estimated Relative Compaction (%)		cm/sec	ft/day
B-401	0 - 7	SP	Remolded	< 5	12.8	103.3	101.4	-	1.24E-02	35.2
B-401	0 - 7	SP	Remolded	< 5	12.3	94.9	93.1	-	2.48E-02	70.3
B-408	0 - 7	SP	Remolded	< 5	13.3	101.3	98.3	-	1.21E-02	34.3
B-408	0 - 7	SP	Remolded	< 5	13.2	94.7	91.9	-	1.70E-02	48.1
B-415	0 - 7	SP	Remolded	< 5	13.1	102.6	99.9	-	2.02E-02	57.3
B-415	0 - 7	SP	Remolded	< 5	13.1	94.7	92.2	-	2.38E-02	67.6

Samples collected in bulk using a continuous flight auger from proposed interior borrow area
Fines content refers to amount passing No. 200 Sieve

Table E.2
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Fine Grained Samples

Sample Location	Sample Depth (ft)	USCS	Sample Type	Fines Content (%)	Initial Conditions		Confining Stress (psi)	Hydraulic Conductivity	
					Moisture Content (%)	Dry Unit Weight (pcf)		cm/sec	ft/day
B-102	31 - 33	CL	Undisturbed	85.0	51.6	68.7	3.0	4.87E-08	1.38E-04
B-203	66 - 68	CH	Undisturbed	98.7	53.6	67.4	3.0	5.57E-08	1.58E-04

Fines content refers to amount passing No. 200 Sieve

Table E.3
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Field Tests

Sample Location	Screen Interval (ft)	USCS	Sample Type	Hydraulic Conductivity	
				cm/sec	ft/day
PZ-1	0 - 5	SP	Insitu	1.53E-02	43.5
MW-4	10 - 15	SP-SM	Insitu	2.47E-03	7.0
MW-5	35 - 40	SP-SM	Insitu	3.32E-03	9.4

PZ-1 located near MW-4 and MW-5

Table F

Summary of Triaxial Shear Test Results

BV-24A DMMA, Brevard County, Florida

Sample Location	Test Method	Representative Area	Sample Type	Sample Depth (ft)	USCS	Total Strength Parameters		Effective Strength Parameters	
						Cohesion (C, psf)	Internal Friction Angle (φ, deg)	Cohesion (C', psf)	Internal Friction Angle (φ', deg)
Borrow[1]	Consolidated Drained	Embankment Soils	Remolded[2]	0 - 7	SP	-	-	274	31.0
Borrow[1]	Consolidated Drained	Foundation Soils	Remolded[2]	0 - 7	SP	-	-	389	33.1
B-102	Consolidated Undrained	Foundation Soils	Undisturbed	31 - 33	CL	562	8.2	605	15.0

(1) Samples collected in bulk using a continuous flight auger from proposed interior borrow area

(2) Samples remolded to 95% of their Modified Proctor determined maximum dry density

Table G
Summary Consolidation Test Results
BV-24A DMMA, Brevard County, Florida

Sample Location	Sample Depth (ft)	USCS	Moisture Content (%)	Dry Unit Weight (pcf)	Fines Content (%)	Liquid Limit	Plasticity Index	Coefficient of Compression	Coefficient of Recompression	Void Ratio	Pre-Consolidation Pressure (ksf)	Over-Consolidation Ratio
B-102	31 - 33	CL	48.0	74.2	85.0	34.0	16.7	0.47	0.08	1.27	4.0	3.3
B-104	71 - 73	ML	39.5	80.9	87.2	38.0	11.0	0.29	0.03	1.10	4.2	1.6
B-203	66 - 68	CH	61.6	63.5	98.7	67.8	43.0	0.70	0.09	1.65	6.2	2.5
B-206	56 - 58	CL	27.7	86.5	82.4	43.0	23.0	0.31	0.04	0.96	4.4	2.0

Fines content refers to amount passing No. 200 Sieve

APPENDIX A
CONE PENETROMETER TEST (CPT) LOGS

CPT LOG NO. CPT-202

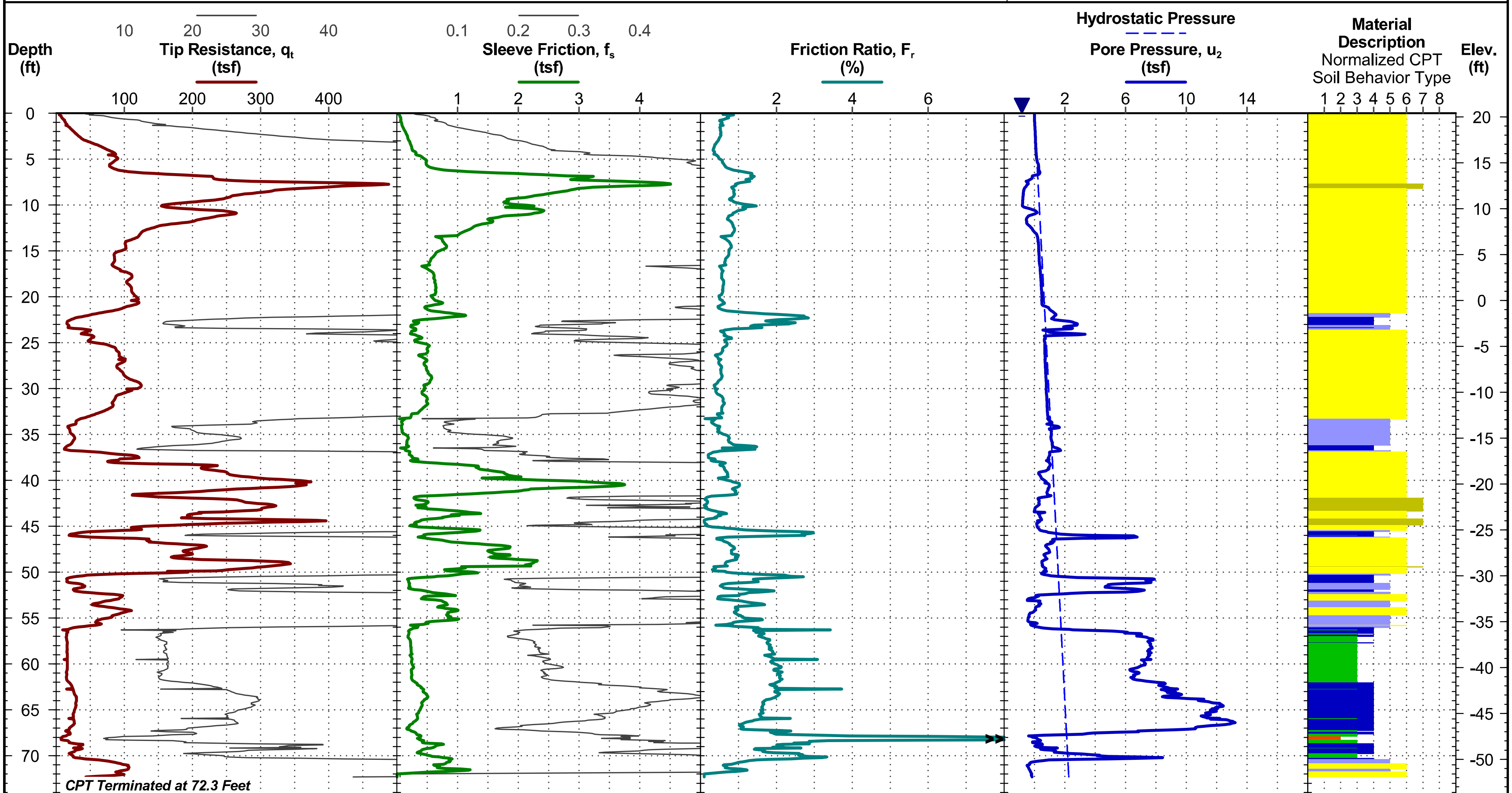
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 20.4 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc. A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-1

CPT LOG NO. CPT-205

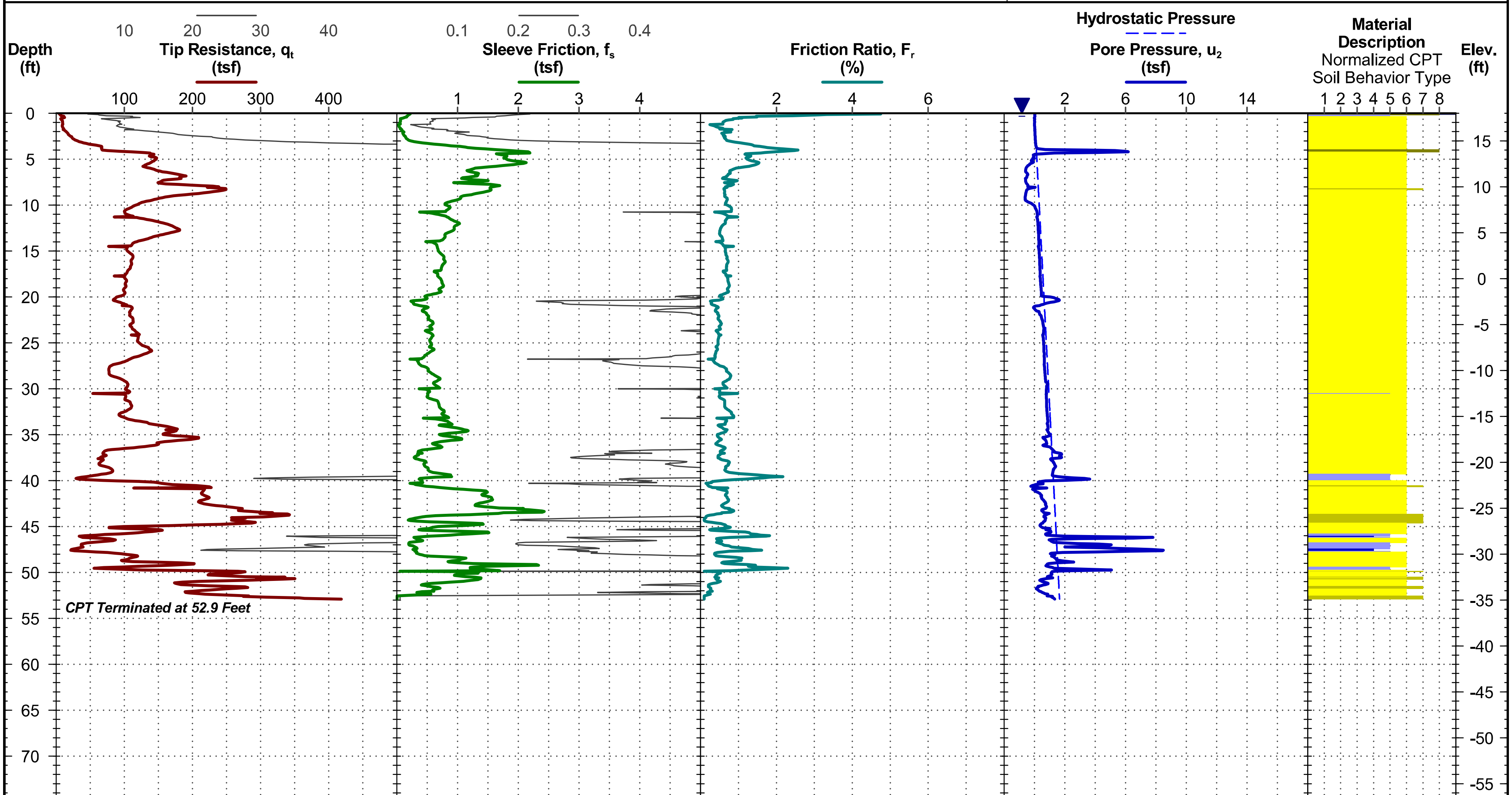
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 18.0 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION 0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 U2 pore pressure transducer location Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/19/2016 Rig: 735 Project No.: HB155022	CPT Completed: 2/19/2016 Operator: Tony Antonatos Exhibit: A-2

CPT LOG NO. CPT-207

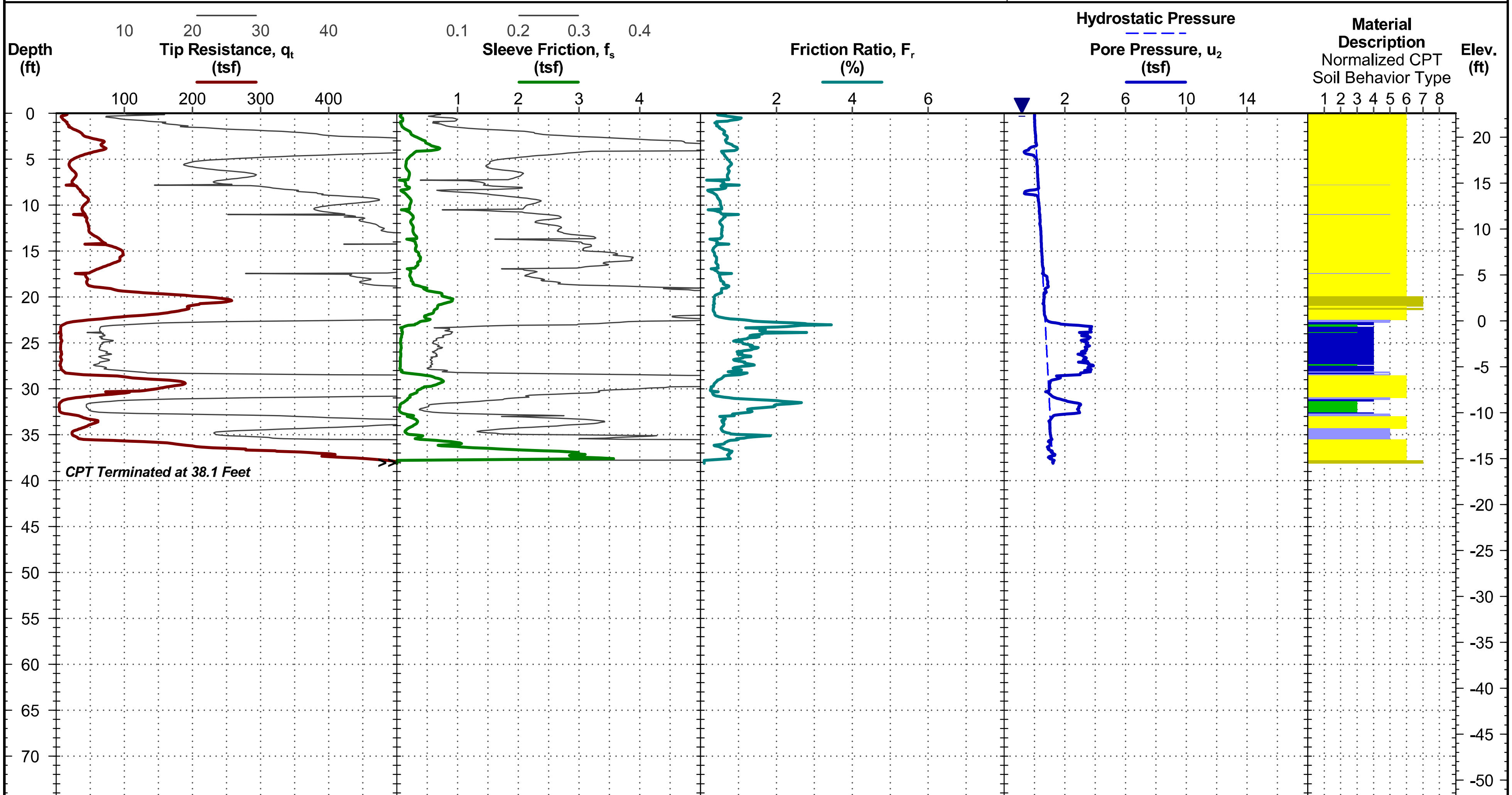
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.6 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-3

CPT LOG NO. CPT-209

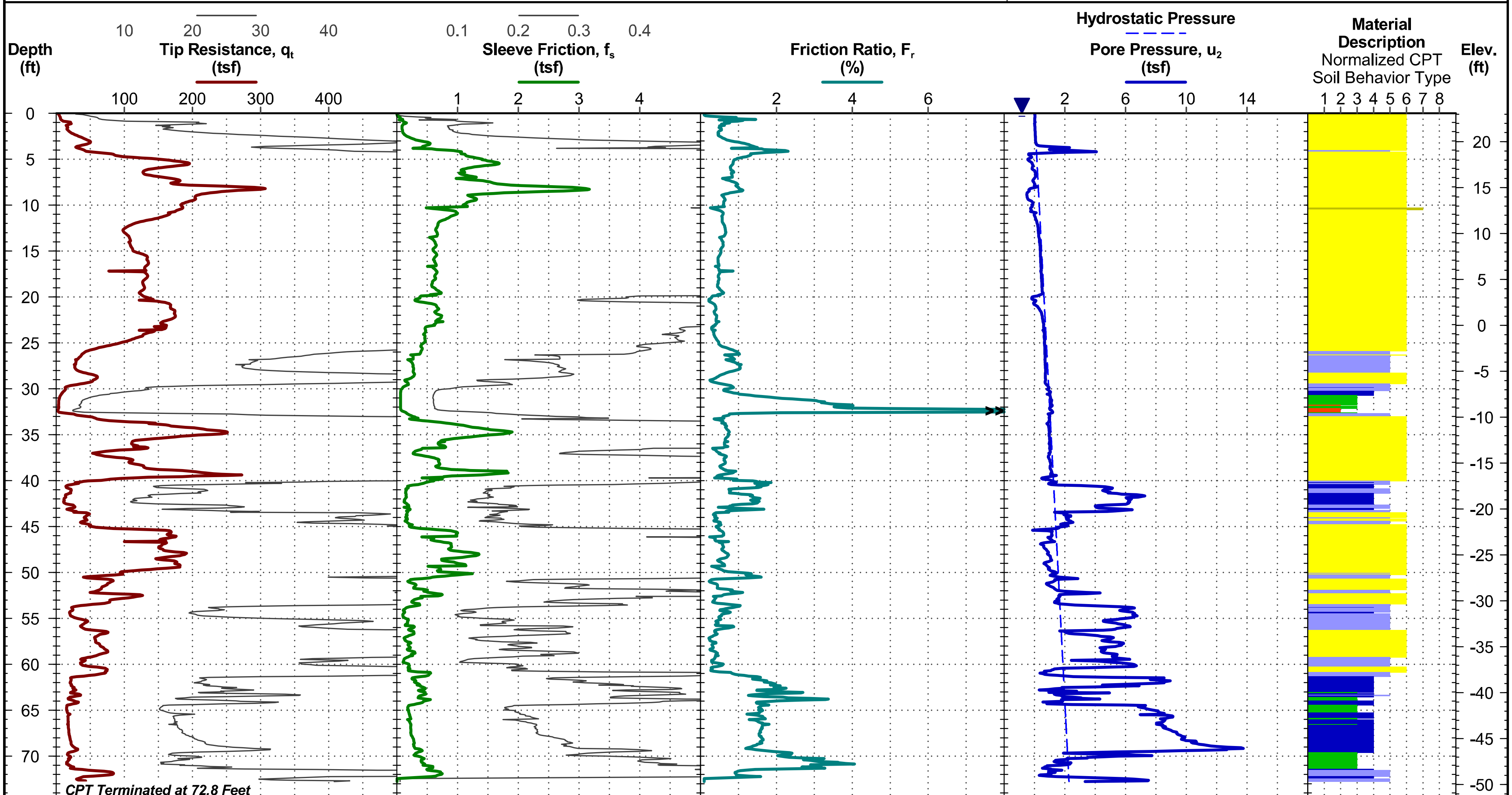
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 23.1 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-4

CPT LOG NO. CPT-301

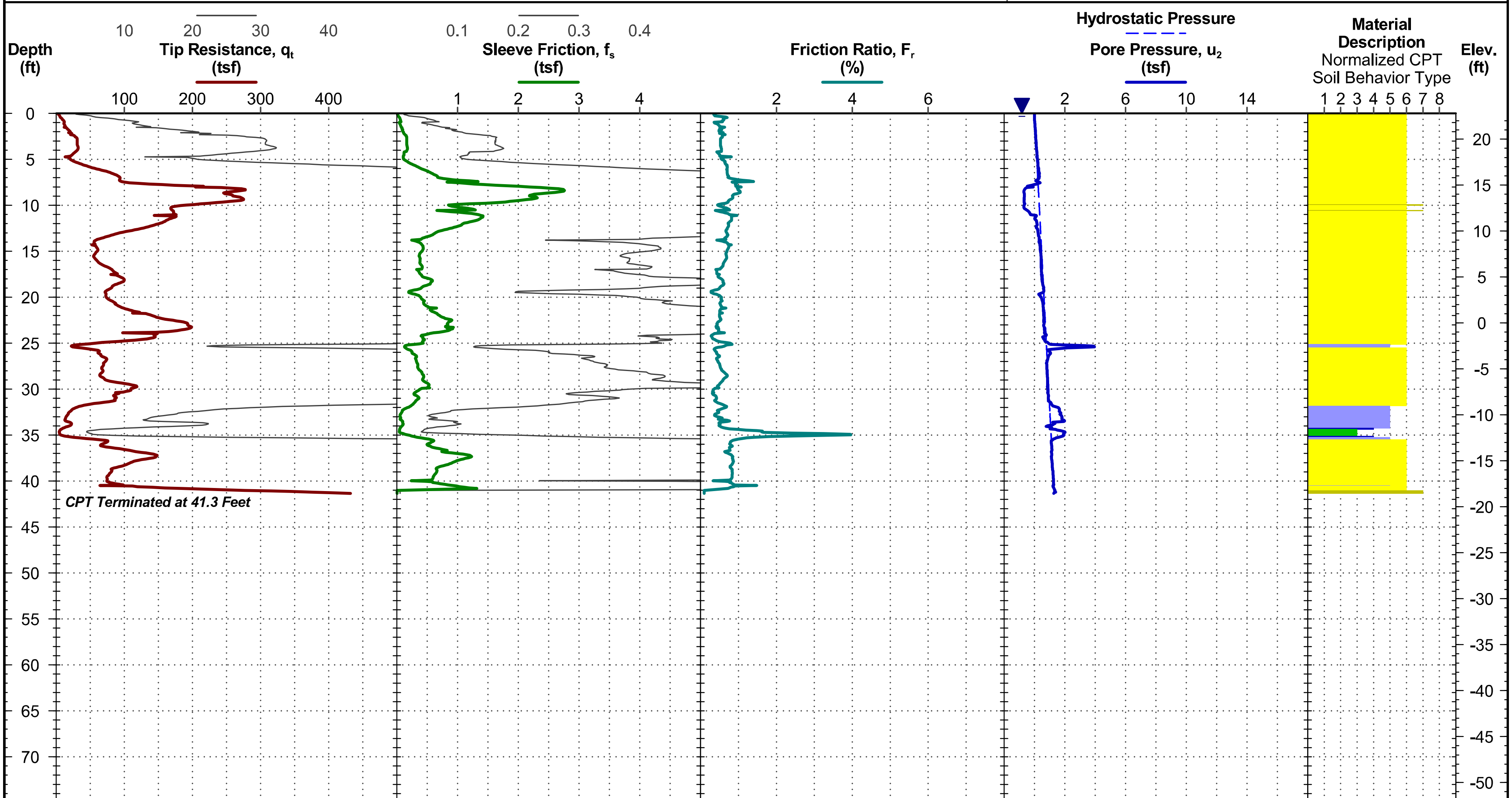
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.8 ft

SITE: Brevard County, FL



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

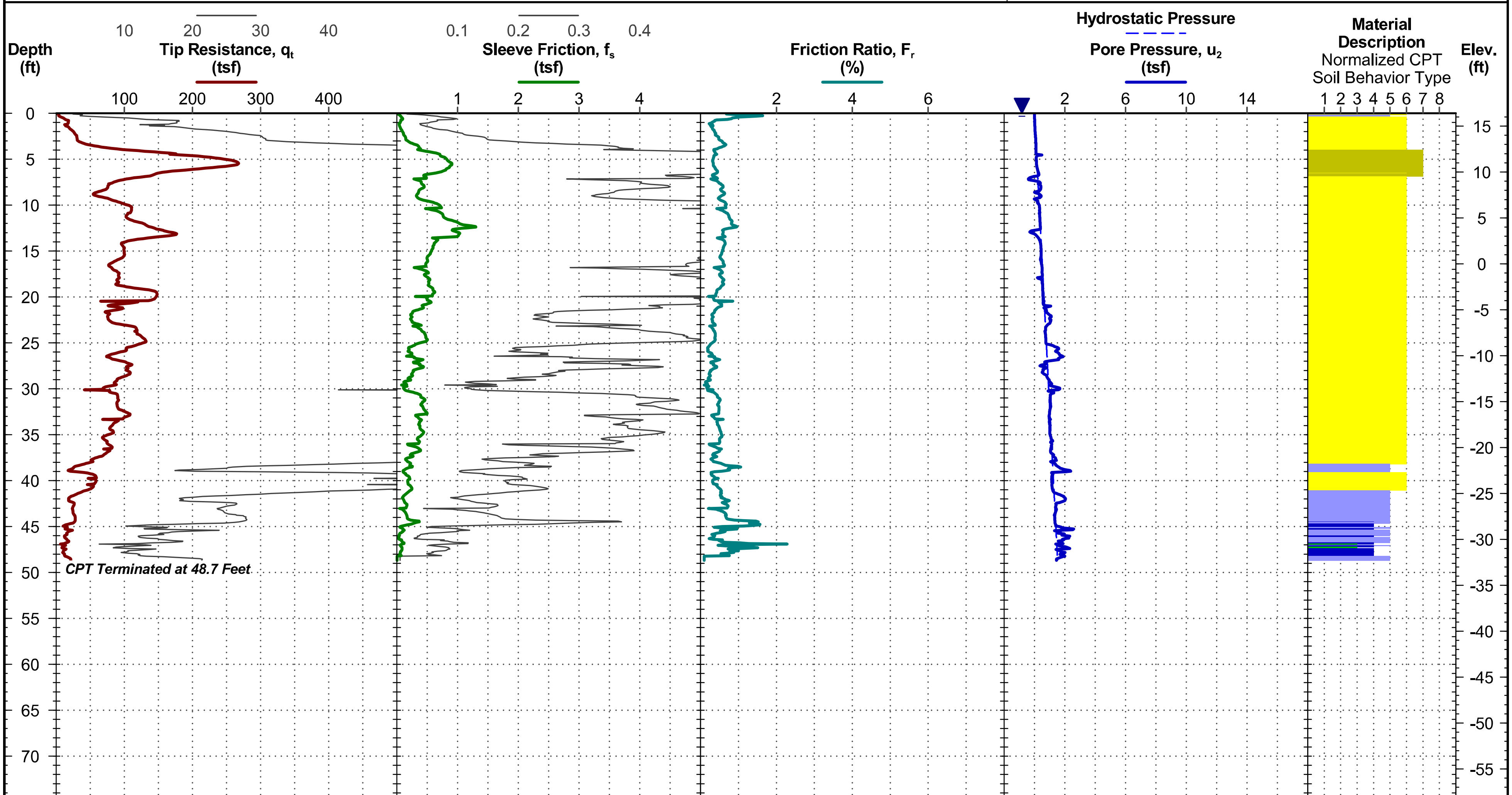
Probe no. DPG1228 with net area ratio of 0.8
U2 pore pressure transducer location
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/17/2016	CPT Completed: 2/17/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-5

CPT LOG NO. CPT-302

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 16.4 ft
SITE: Brevard County, FL		



See CPT General Notes for explanation of symbols and abbreviations.

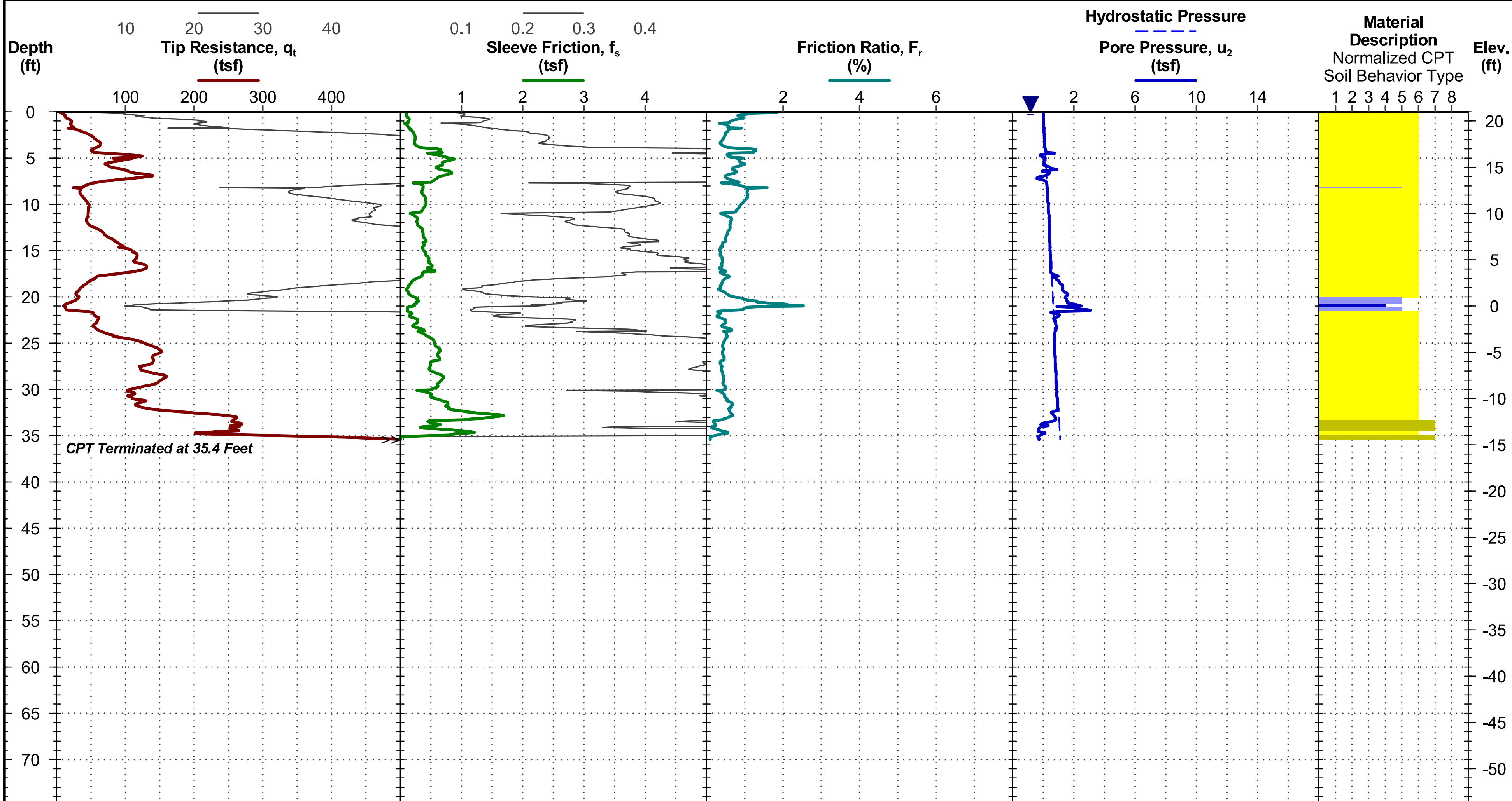
Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION	Probe no. DPG1228 with net area ratio of 0.8 U2 pore pressure transducer location Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in	**DUNKELBERGER** engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/18/2016	CPT Completed: 2/18/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)			Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-6

CPT LOG NO. CPT-303

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 21.0 ft
SITE: Brevard County, FL		



See CPT General Notes for explanation of symbols and abbreviations.

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

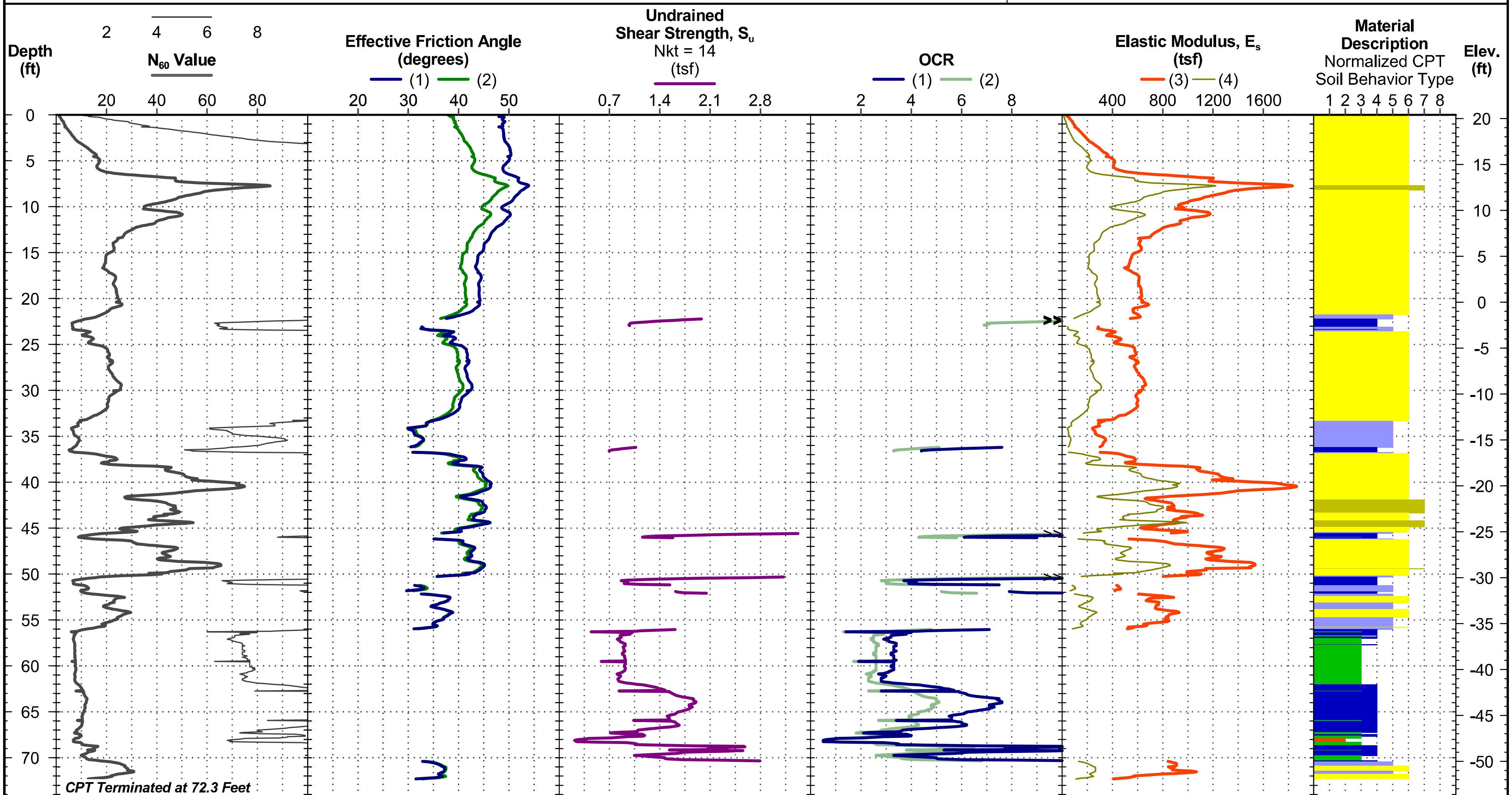
1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION	Probe no. DPG1228 with net area ratio of 0.8 U2 pore pressure transducer location Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in	**DUNKELBERGER** engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/19/2016	CPT Completed: 2/19/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)			Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-7

CPT CORRELATIVE PARAMETER LOG NO. CPT-202

SEE CPT LOG NO. CPT-202 FOR DETAILED TEST RESULTS

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 20.4 ft
SITE: Brevard County, FL		



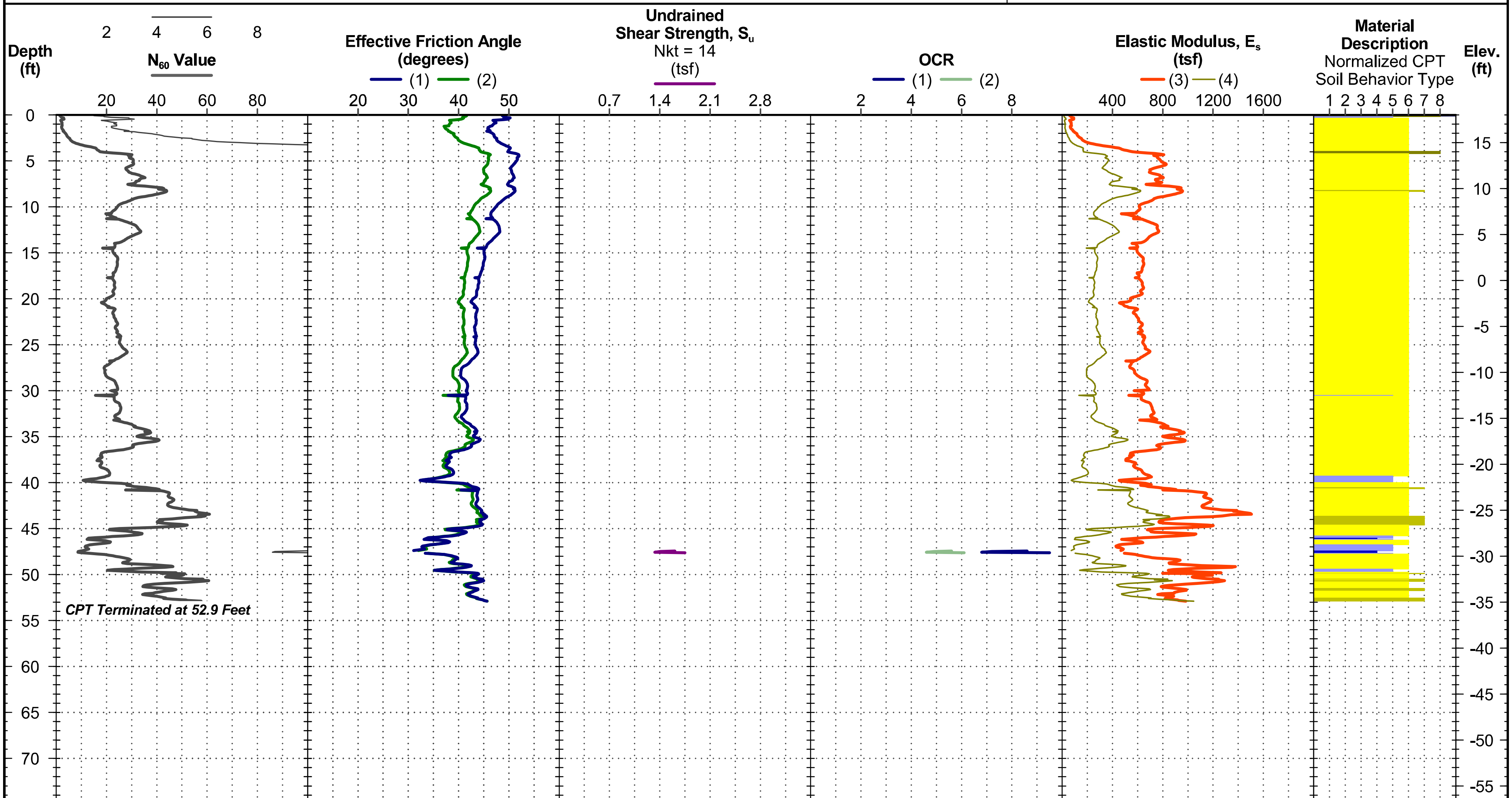
Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION	Notes:	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/18/2016	CPT Completed: 2/18/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in		Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-8

CPT CORRELATIVE PARAMETER LOG NO. CPT-205

SEE CPT LOG NO. CPT-205 FOR DETAILED TEST RESULTS

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 18.0 ft
SITE: Brevard County, FL		



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION	Notes:	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/19/2016	CPT Completed: 2/19/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in		Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-9

CPT CORRELATIVE PARAMETER LOG NO. CPT-207

SEE CPT LOG NO. CPT-207 FOR DETAILED TEST RESULTS

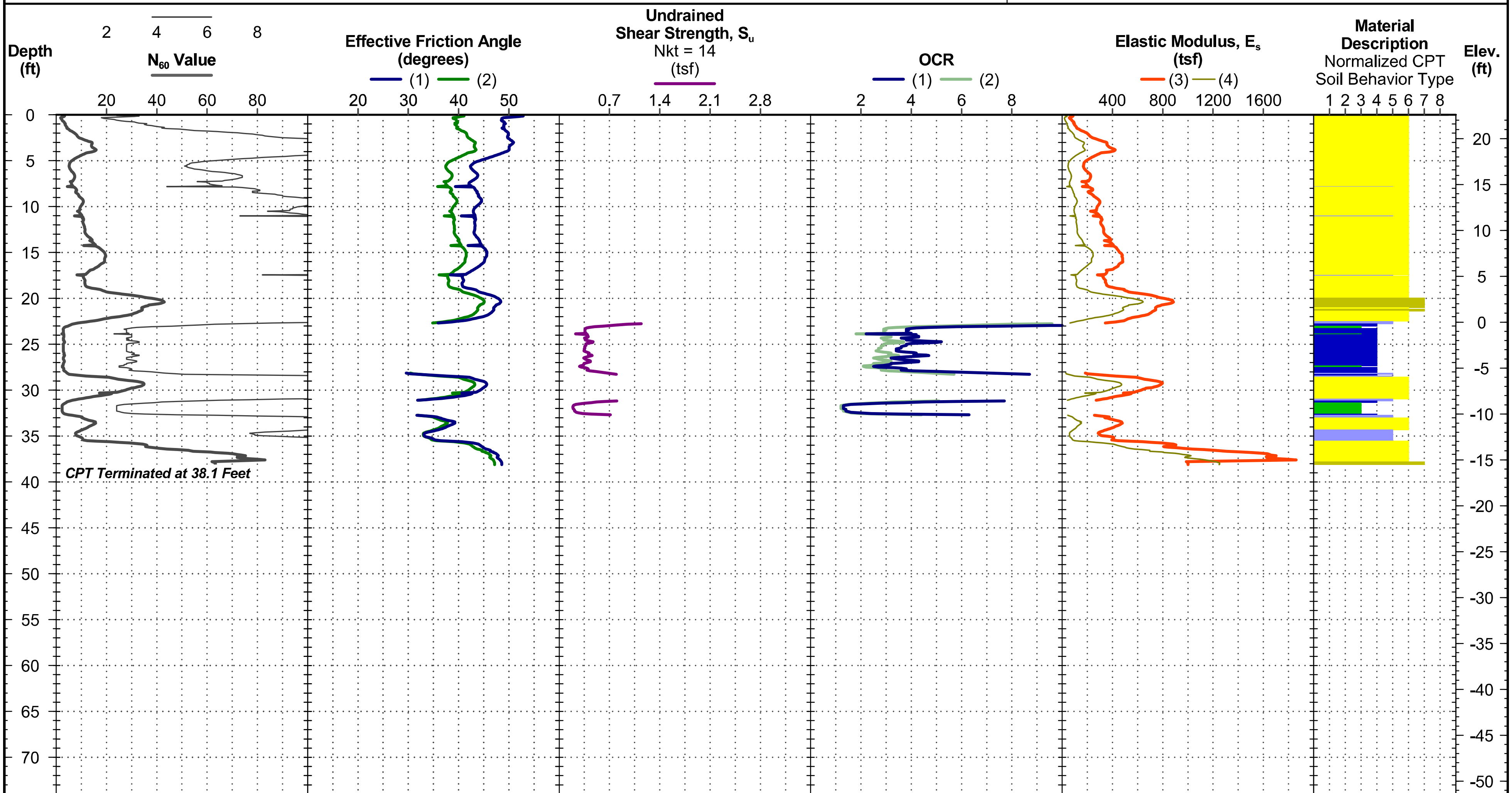
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.6 ft

SITE: Brevard County, FL



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Notes:
Probe no. DPG1228 with net area ratio of 0.8
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

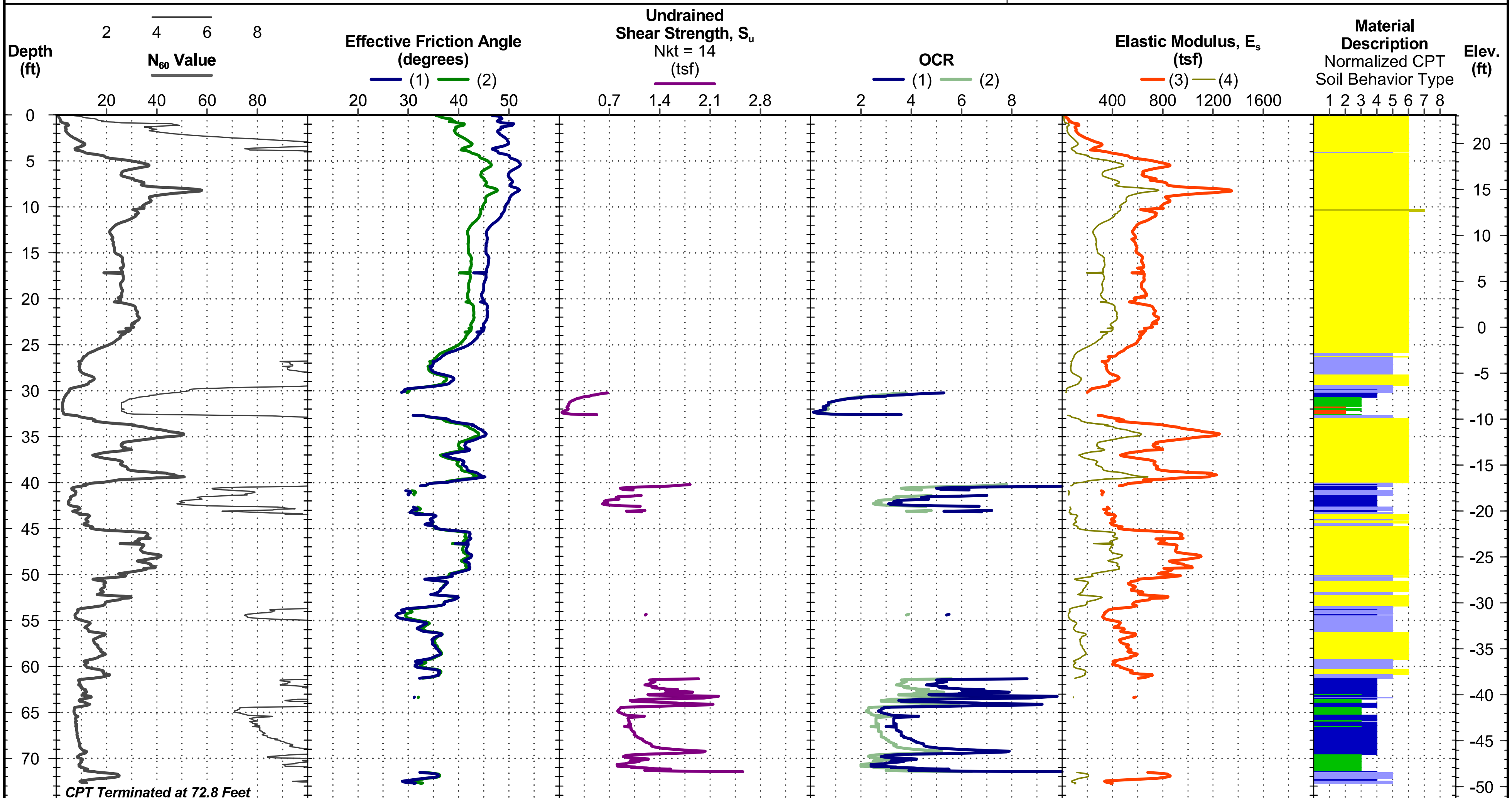
DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/18/2016	CPT Completed: 2/18/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-10

CPT CORRELATIVE PARAMETER LOG NO. CPT-209

SEE CPT LOG NO. CPT-209 FOR DETAILED TEST RESULTS

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 23.1 ft
SITE: Brevard County, FL		



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION	Notes:	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/18/2016	CPT Completed: 2/18/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in		Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-11

CPT CORRELATIVE PARAMETER LOG NO. CPT-301

SEE CPT LOG NO. CPT-301 FOR DETAILED TEST RESULTS

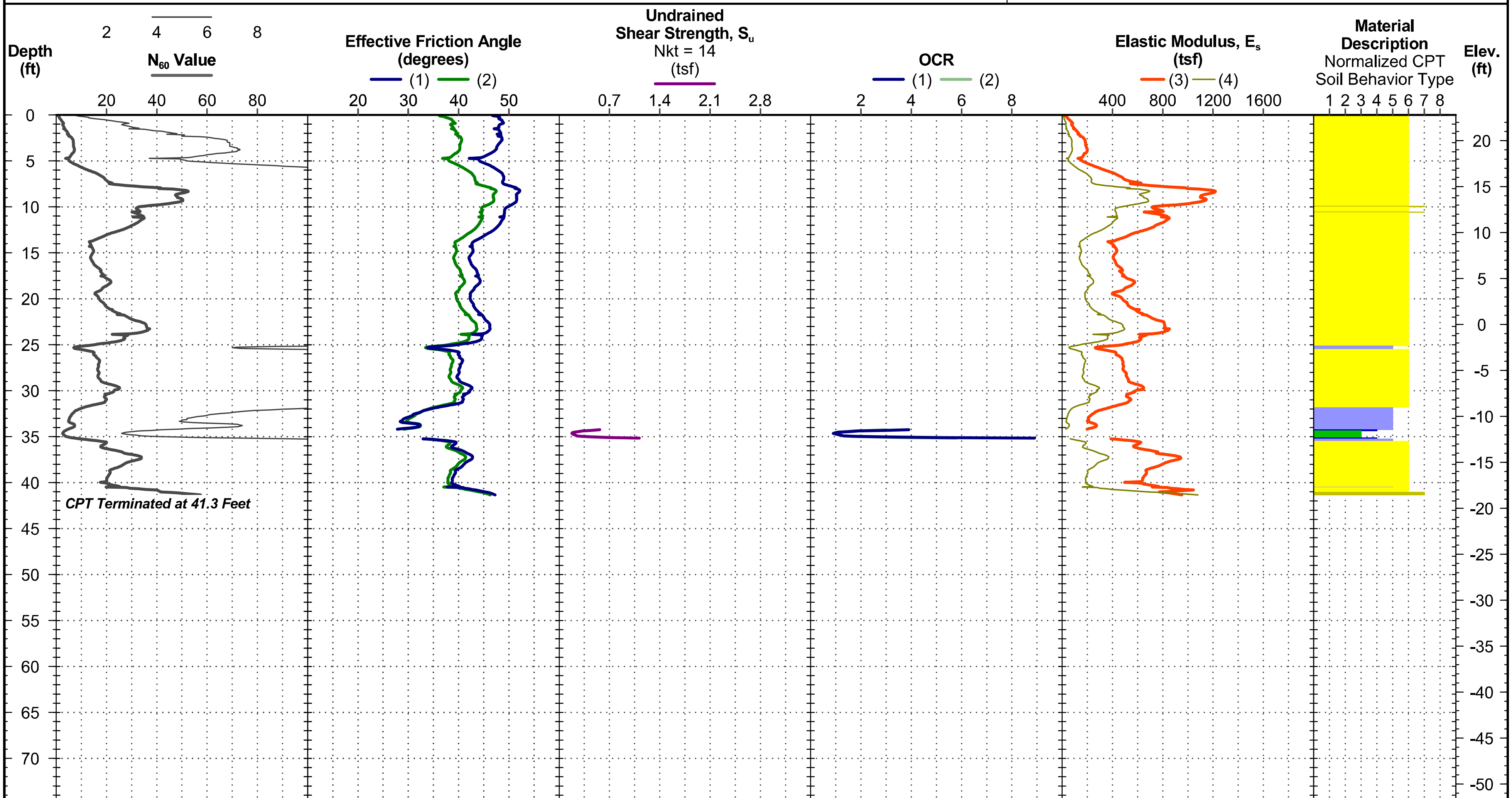
PROJECT: BV-24A DMMA

CLIENT: Taylor Engineering, Inc.

TEST LOCATION: See Sheet 5

Surface Elev.: 22.8 ft

SITE: Brevard County, FL



Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION

0 ft estimated water depth
(used in normalizations and correlations; see CPT General Notes)

Notes:
Probe no. DPG1228 with net area ratio of 0.8
Manufactured by Vertek; calibrated 12/27/2014
Tip and sleeve areas of 15 cm^2 and 225 cm^2
Ring friction reducer with O.D. of 2 in

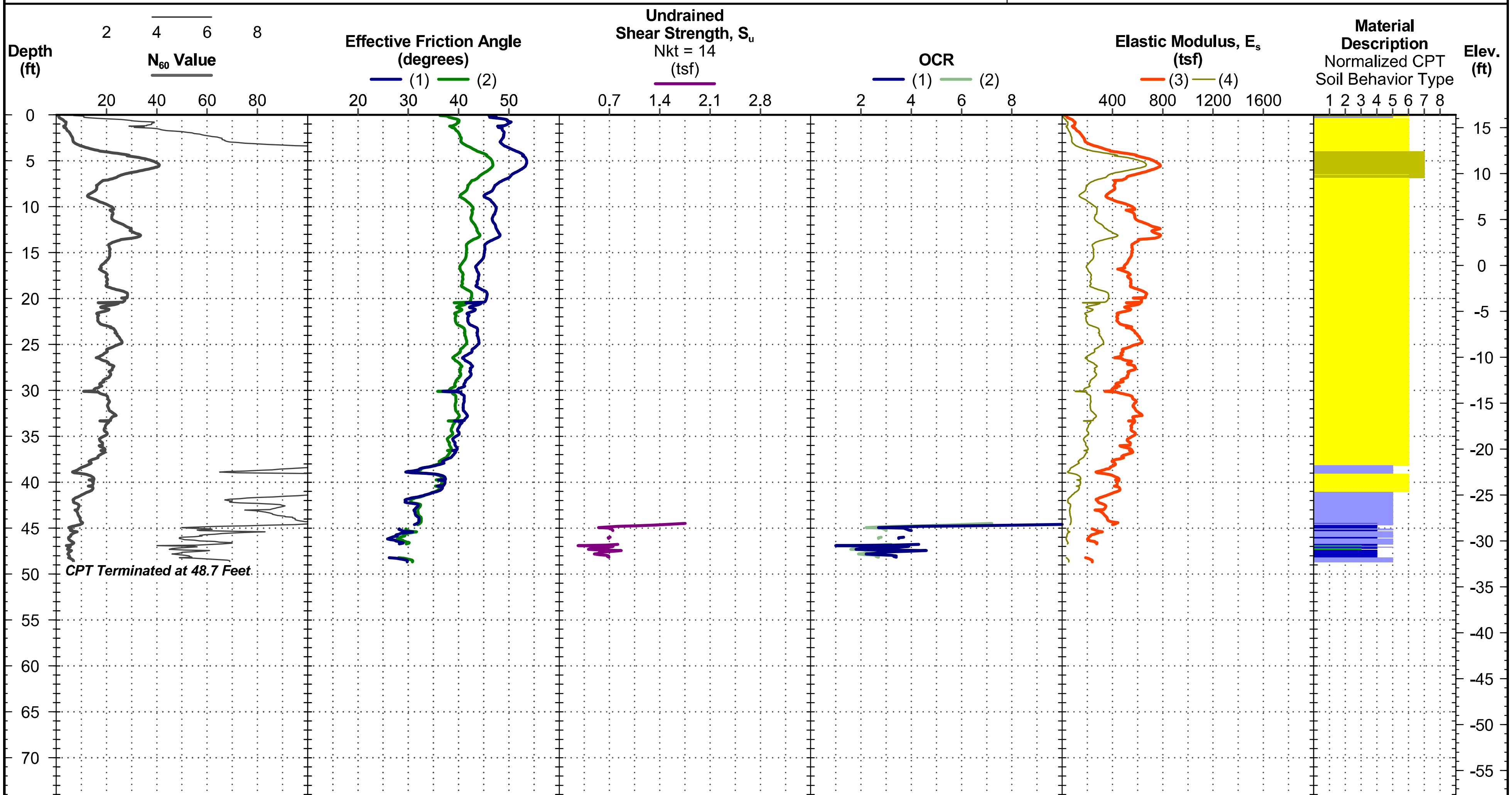
DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

CPT Started: 2/17/2016	CPT Completed: 2/17/2016
Rig: 735	Operator: Tony Antonatos
Project No.: HB155022	Exhibit: A-12

CPT CORRELATIVE PARAMETER LOG NO. CPT-302

SEE CPT LOG NO. CPT-302 FOR DETAILED TEST RESULTS

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 16.4 ft
SITE: Brevard County, FL		



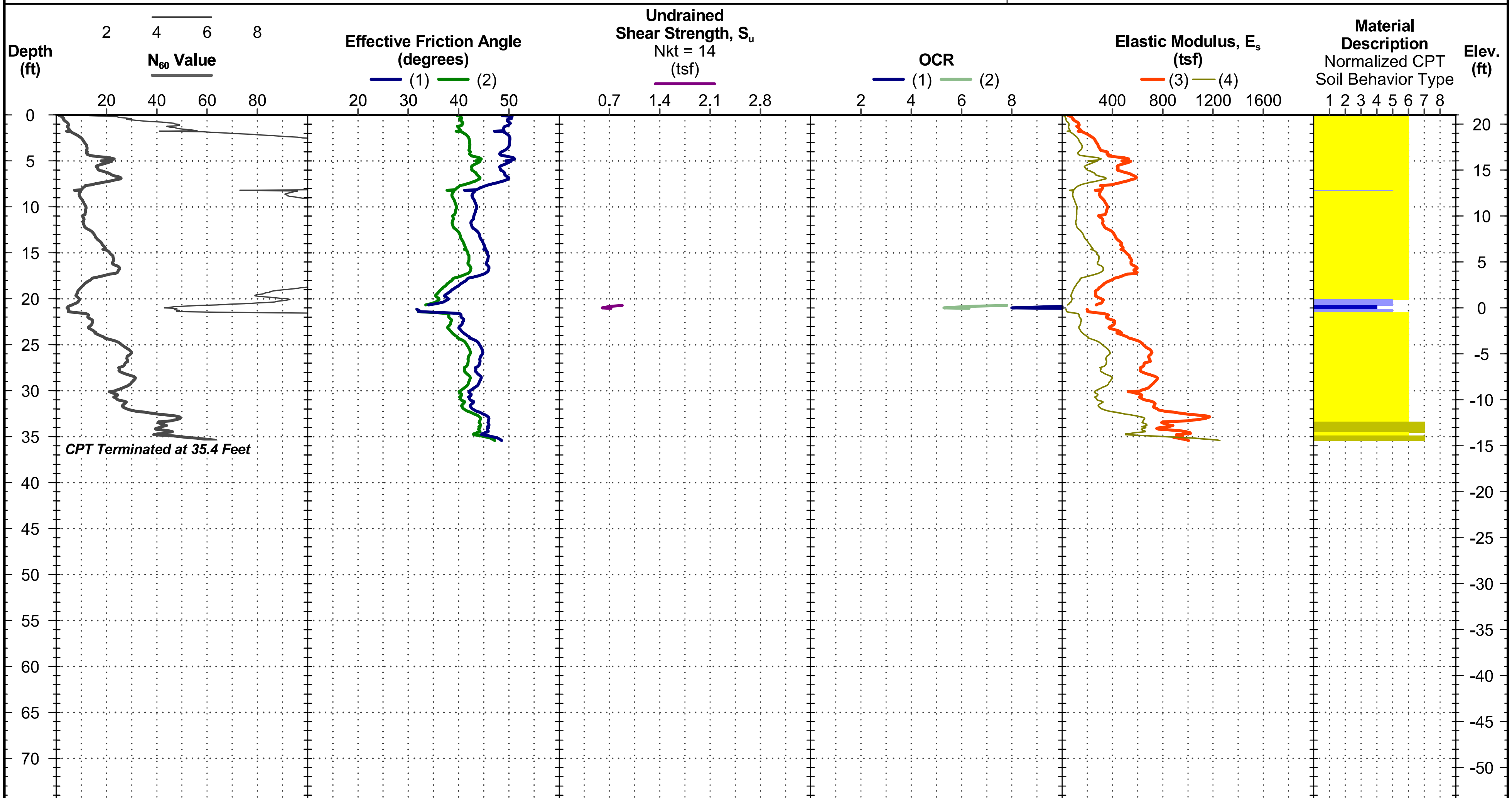
Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION	Notes:	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/18/2016	CPT Completed: 2/18/2016
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in		Rig: 735	Operator: Tony Antonatos
			Project No.: HB155022	Exhibit: A-13

CPT CORRELATIVE PARAMETER LOG NO. CPT-303

SEE CPT LOG NO. CPT-303 FOR DETAILED TEST RESULTS

PROJECT: BV-24A DMMA	**CLIENT:** Taylor Engineering, Inc.	**TEST LOCATION:** See Sheet 5 Surface Elev.: 21.0 ft
SITE: Brevard County, FL		



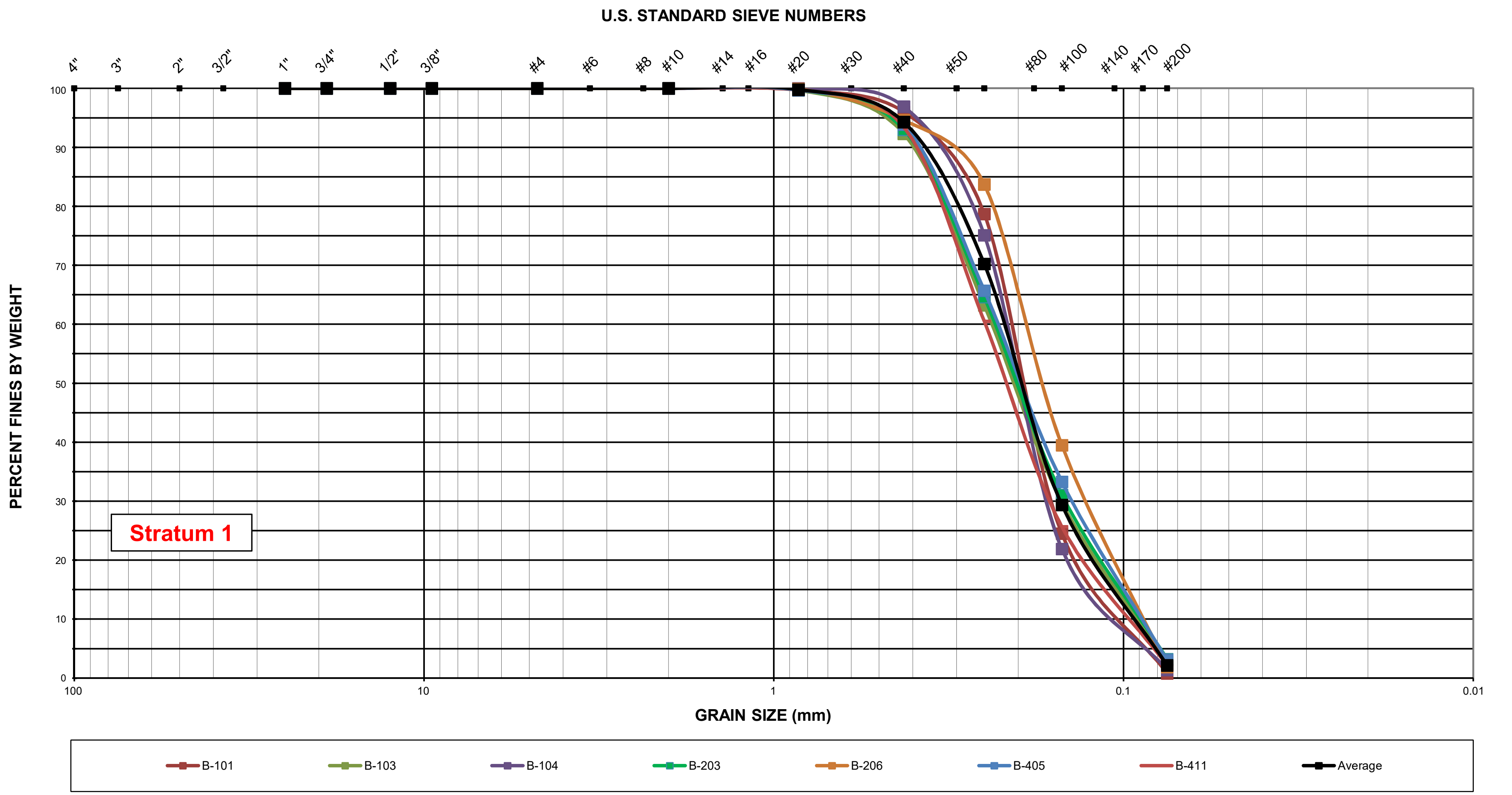
Tip resistance, sleeve resistance, porewater pressure, and tilt angle are measured. Other parameters presented are derived from interpretations of the measured data, based upon published correlations, but do not necessarily represent actual values that would be derived from direct testing. Appendix CPT General Notes provides the formulas used for these correlations and presents estimates of the relative reliability associated with the correlated parameters.

WATER LEVEL OBSERVATION	Notes:			
0 ft estimated water depth (used in normalizations and correlations; see CPT General Notes)	Probe no. DPG1228 with net area ratio of 0.8 Manufactured by Vertek; calibrated 12/27/2014 Tip and sleeve areas of 15 cm^2 and 225 cm^2 Ring friction reducer with O.D. of 2 in	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	CPT Started: 2/19/2016 Rig: 735 Project No.: HB155022	CPT Completed: 2/19/2016 Operator: Tony Antonatos Exhibit: A-14

APPENDIX B
LABORATORY TESTING REPORTS

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-101	18 - 20	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.7	96.0	78.7	24.5	0.8
B-103	3 - 5	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.7	92.3	63.2	29.8	2.7
B-104	13 - 15	SP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.9	75.1	21.9	1.4
B-203	5 - 7	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.8	93.0	64.6	31.1	3.2
B-206	18 - 20	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.9	94.6	83.7	39.5	1.9
B-405	3 - 5	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.7	93.9	65.7	33.3	3.0
B-411	3 - 5	SP	100.0	100.0	100.0	100.0	100.0	100.0	99.8	93.4	60.5	25.7	2.2
			-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	100.0	100.0	99.8	94.3	70.2	29.4	2.2

Exhibit B-1

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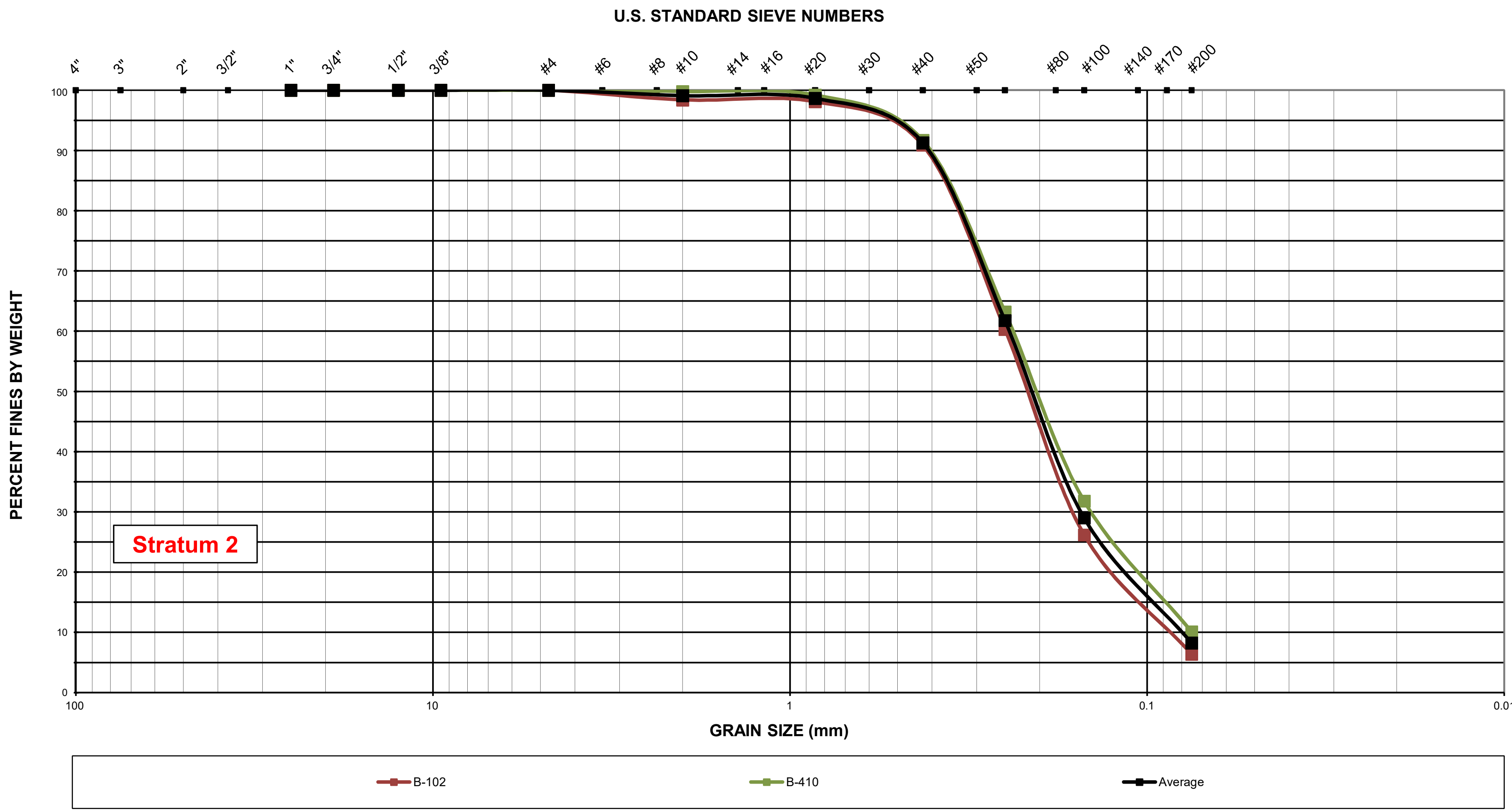
Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-102	3 - 5	SP-SM	100.0	100.0	100.0	100.0	100.0	98.4	98.1	90.9	60.3	26.2	6.4
B-410	7 - 9	SP-SM	100.0	100.0	100.0	100.0	100.0	99.8	99.2	91.7	63.2	31.8	10.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	-	SP-SM	100.0	100.0	100.0	100.0	100.0	99.1	98.7	91.3	61.8	29.0	8.3

Exhibit B-2

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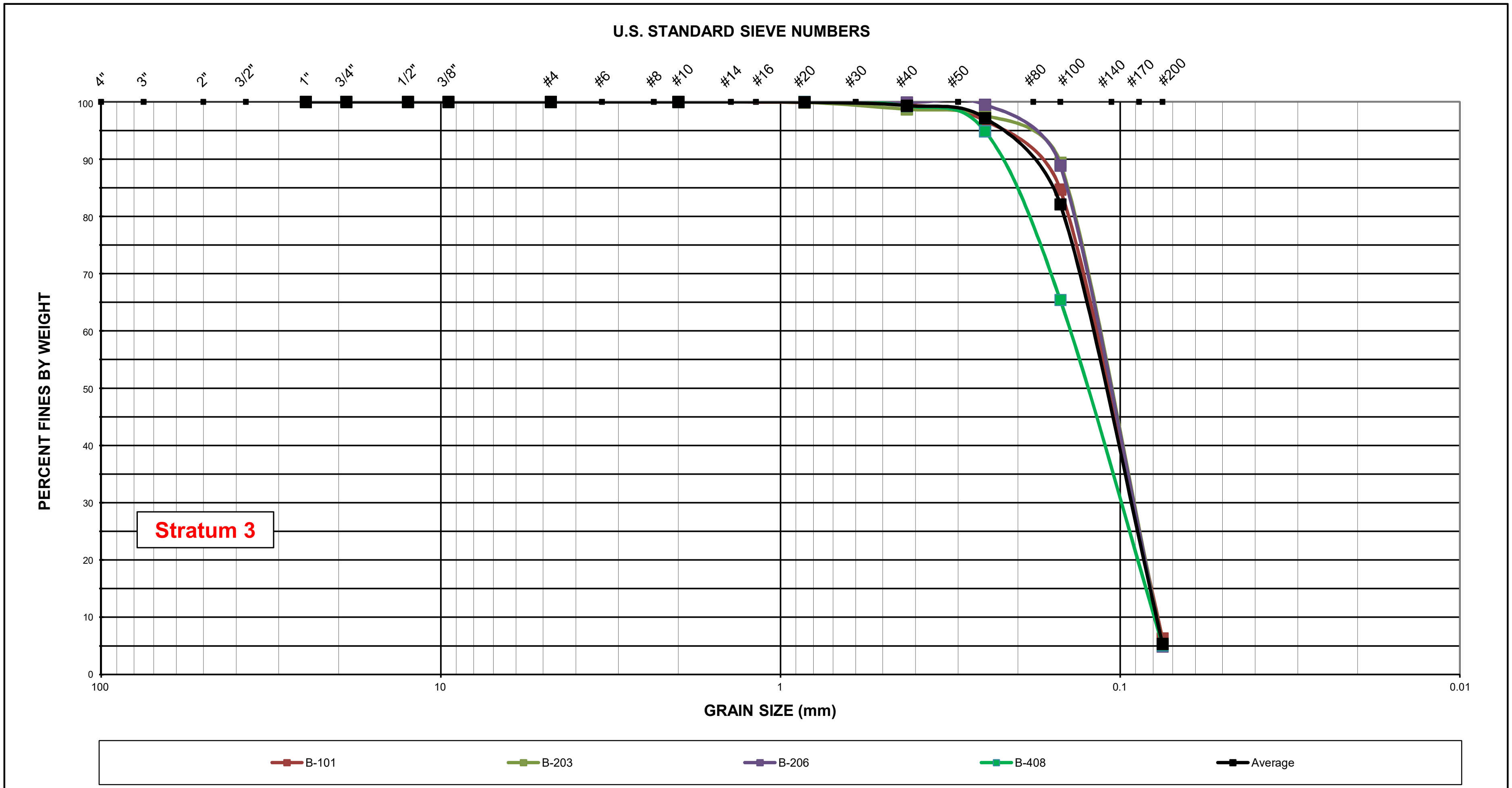
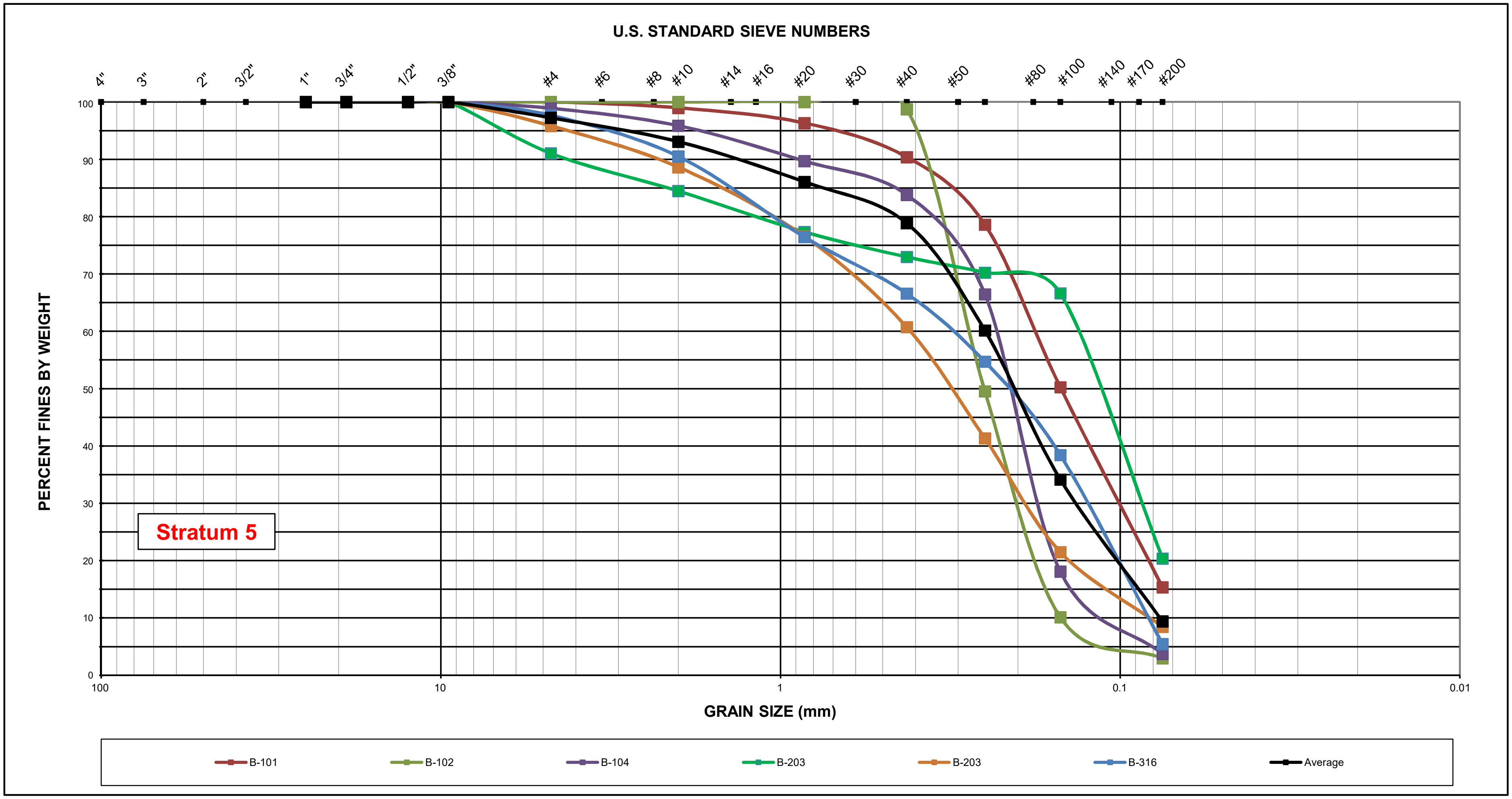
Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-101	9 - 11	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	96.7	84.7	6.3
B-203	38 - 40	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.7	97.6	89.4	5.2
B-206	13 - 15	SP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	88.9	4.9
B-408	13 - 15	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.3	94.9	65.4	5.1
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	97.2	82.1	5.4

Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-101	53 - 55	SM	100.0	100.0	100.0	100.0	100.0	99.0	96.3	90.4	78.6	50.3	15.4
B-102	58 - 60	SP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7	49.5	10.1	3.0
B-104	43 - 45	SP	100.0	100.0	100.0	100.0	98.9	95.9	89.7	83.8	66.4	18.1	3.7
B-203	58 - 60	SM	100.0	100.0	100.0	100.0	91.1	84.5	77.3	73.0	70.2	66.6	20.4
B-203	78 - 80	SP-SM	100.0	100.0	100.0	100.0	95.8	88.6	76.6	60.7	41.3	21.5	8.5
B-316	38 - 40	SP-SM	100.0	100.0	100.0	100.0	97.7	90.5	76.4	66.6	54.7	38.4	5.5
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	97.2	93.1	86.1	78.9	60.1	34.2	9.4

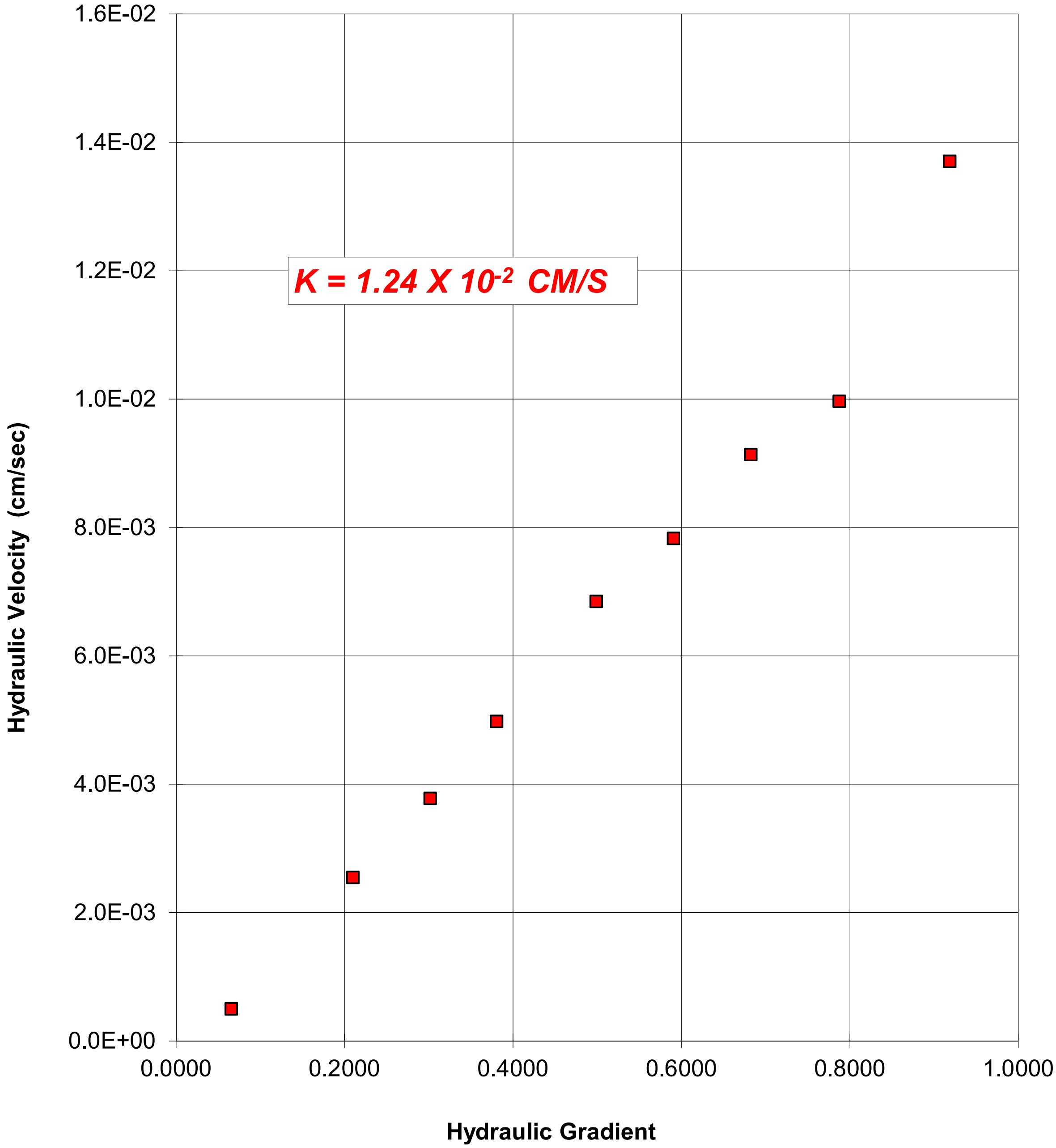
Exhibit B-4

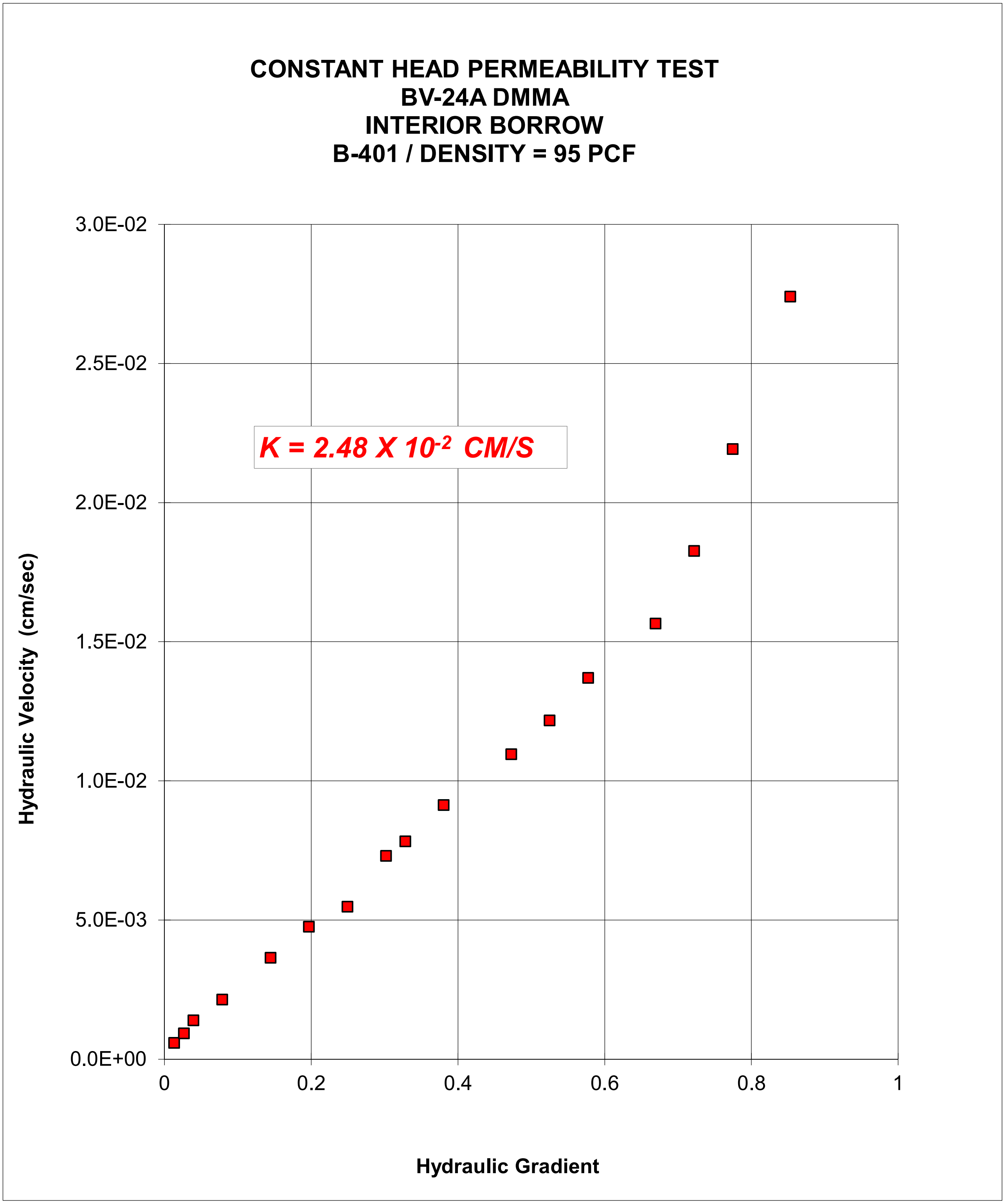
Particle Size Analysis of Soil

Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
B-103	38 - 40	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	99.5	98.0	94.9	62.7	5.4
B-204	38 - 40	SP-SM	100.0	100.0	100.0	100.0	100.0	100.0	94.9	83.0	74.8	59.3	5.2
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Average			100.0	100.0	100.0	100.0	100.0	100.0	97.2	90.5	84.8	61.0	5.3

Exhibit B-5

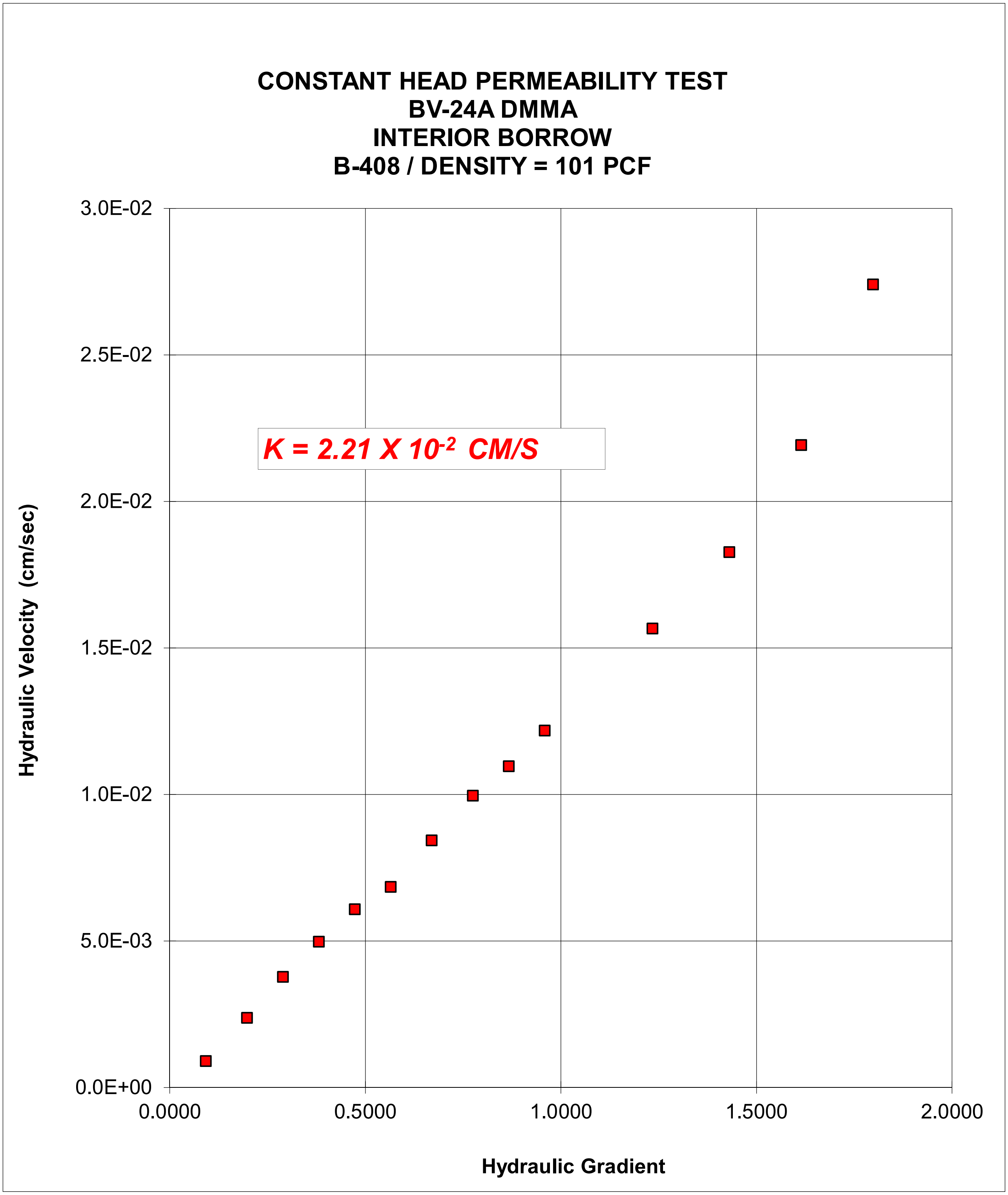
CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-401 / DENSITY = 103 PCF





CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-401 / DENSITY = 95 PCF
K = 2.48 X 10-2 CM/S
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
Hydraulic Velocity (cm/sec)
0
0.2
0.4
0.6
0.8
1
Hydraulic Gradient

Exhibit B-7


CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-408 / DENSITY = 101 PCF
K = 2.21 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
Hydraulic Gradient
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0.0000
0.5000
1.0000
1.5000
2.0000

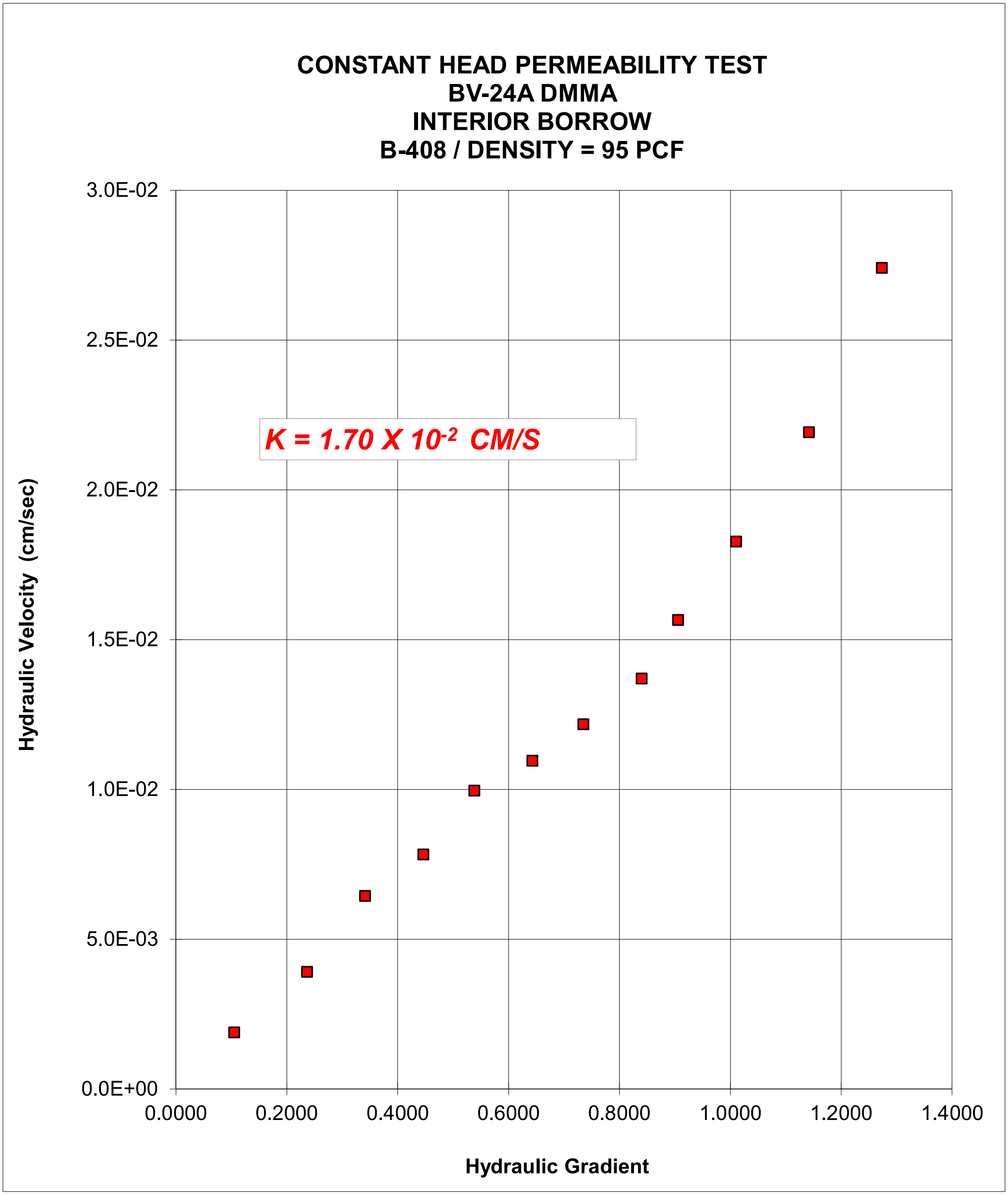
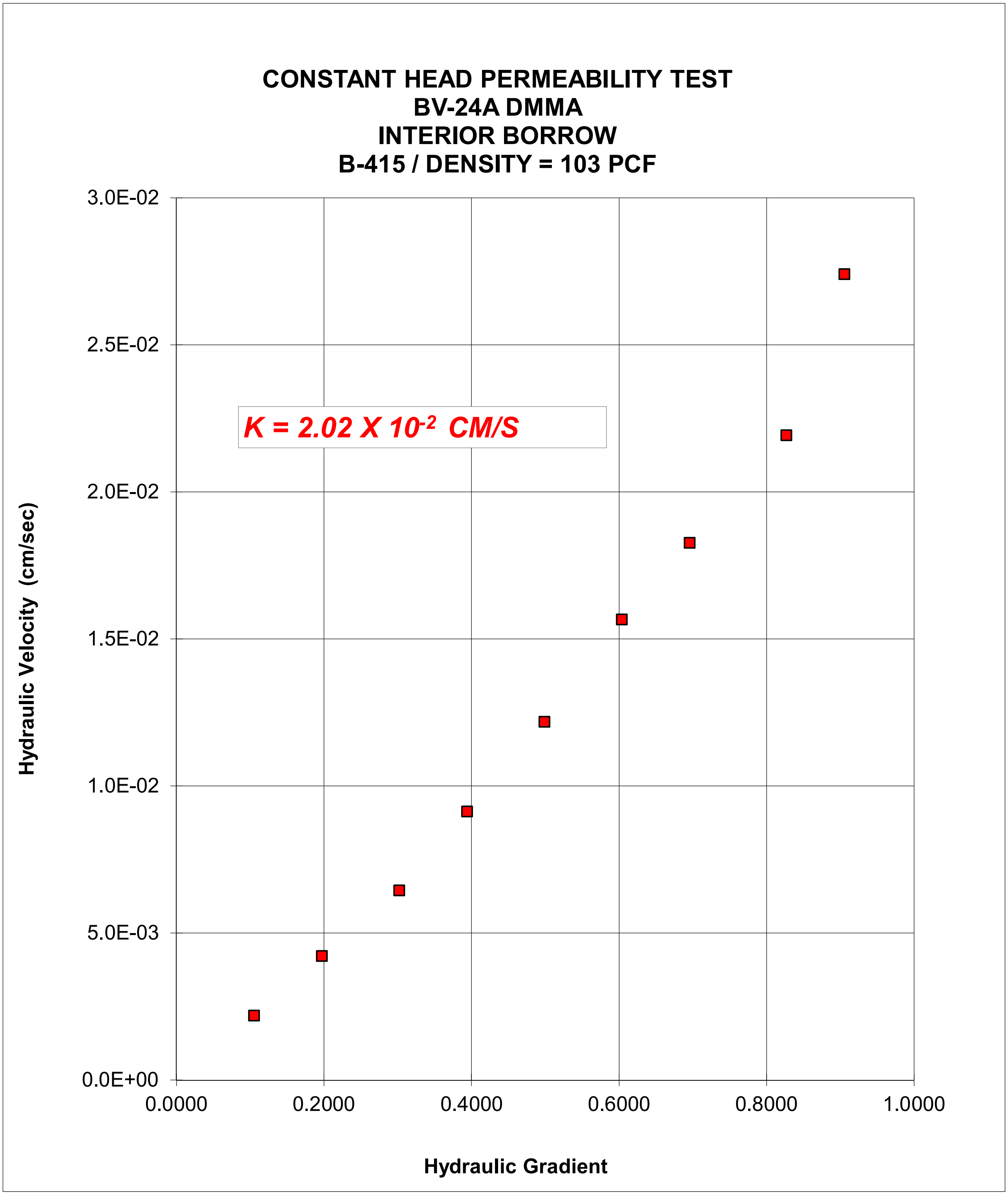
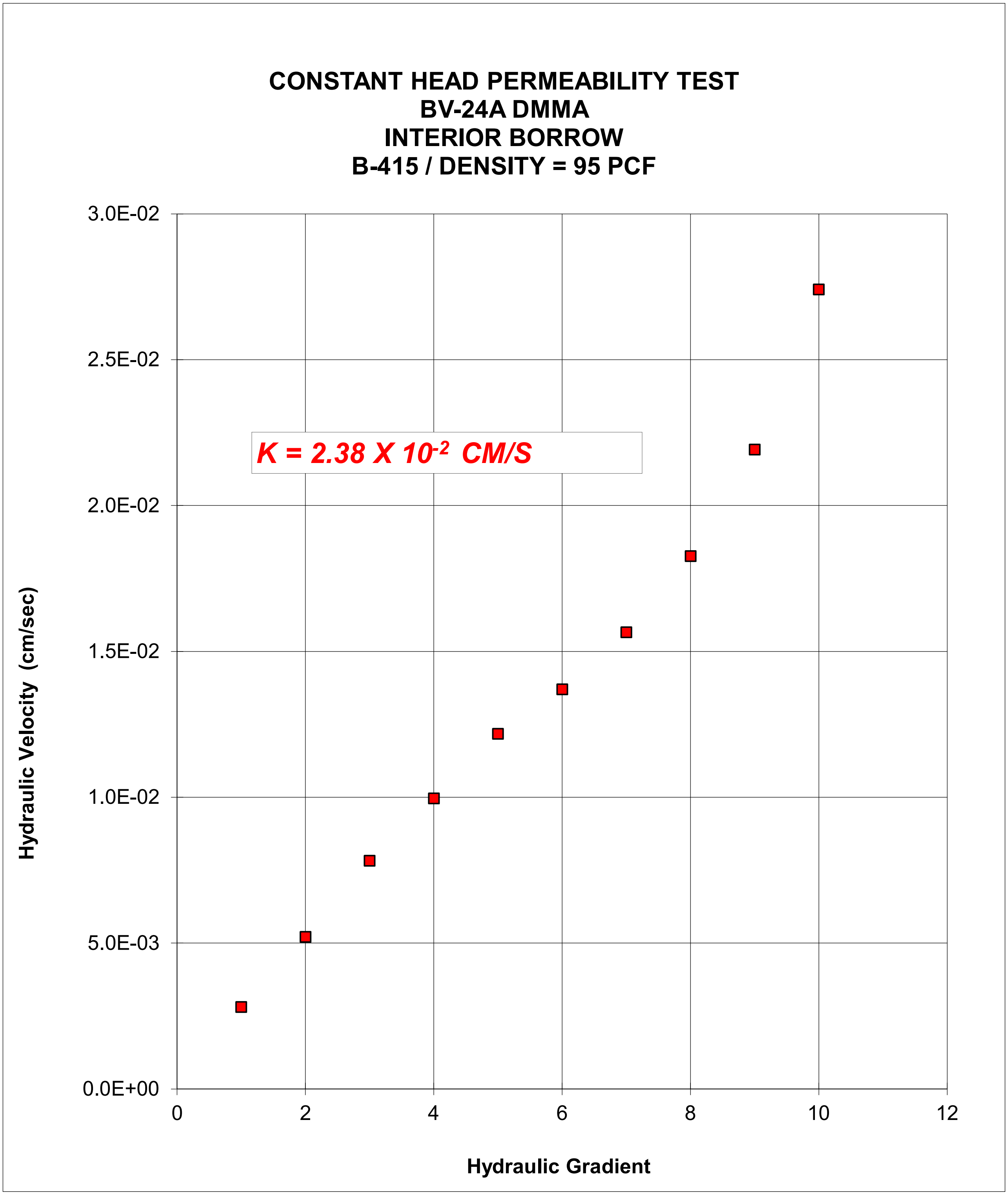

CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-408 / DENSITY = 95 PCF
K = 1.70 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0.0000
0.2000
0.4000
0.6000
0.8000
1.0000
1.2000
1.4000
Hydraulic Gradient

Exhibit B-9



CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-415 / DENSITY = 103 PCF
K = 2.02 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0.0000
0.2000
0.4000
0.6000
0.8000
1.0000
Hydraulic Gradient


CONSTANT HEAD PERMEABILITY TEST
BV-24A DMMA
INTERIOR BORROW
B-415 / DENSITY = 95 PCF
K = 2.38 X 10-2 CM/S
Hydraulic Velocity (cm/sec)
3.0E-02
2.5E-02
2.0E-02
1.5E-02
1.0E-02
5.0E-03
0.0E+00
0
2
4
6
8
10
12
Hydraulic Gradient

HYDRAULIC CONDUCTIVITY TEST RESULTS
(ASTM D 5084 - Method C)

PROJECT NAME: BV-24A
SAMPLE ID: B-102 (31 - 33 ft)

Hydraulic Conductivity = 4.87E-08 cm/sec

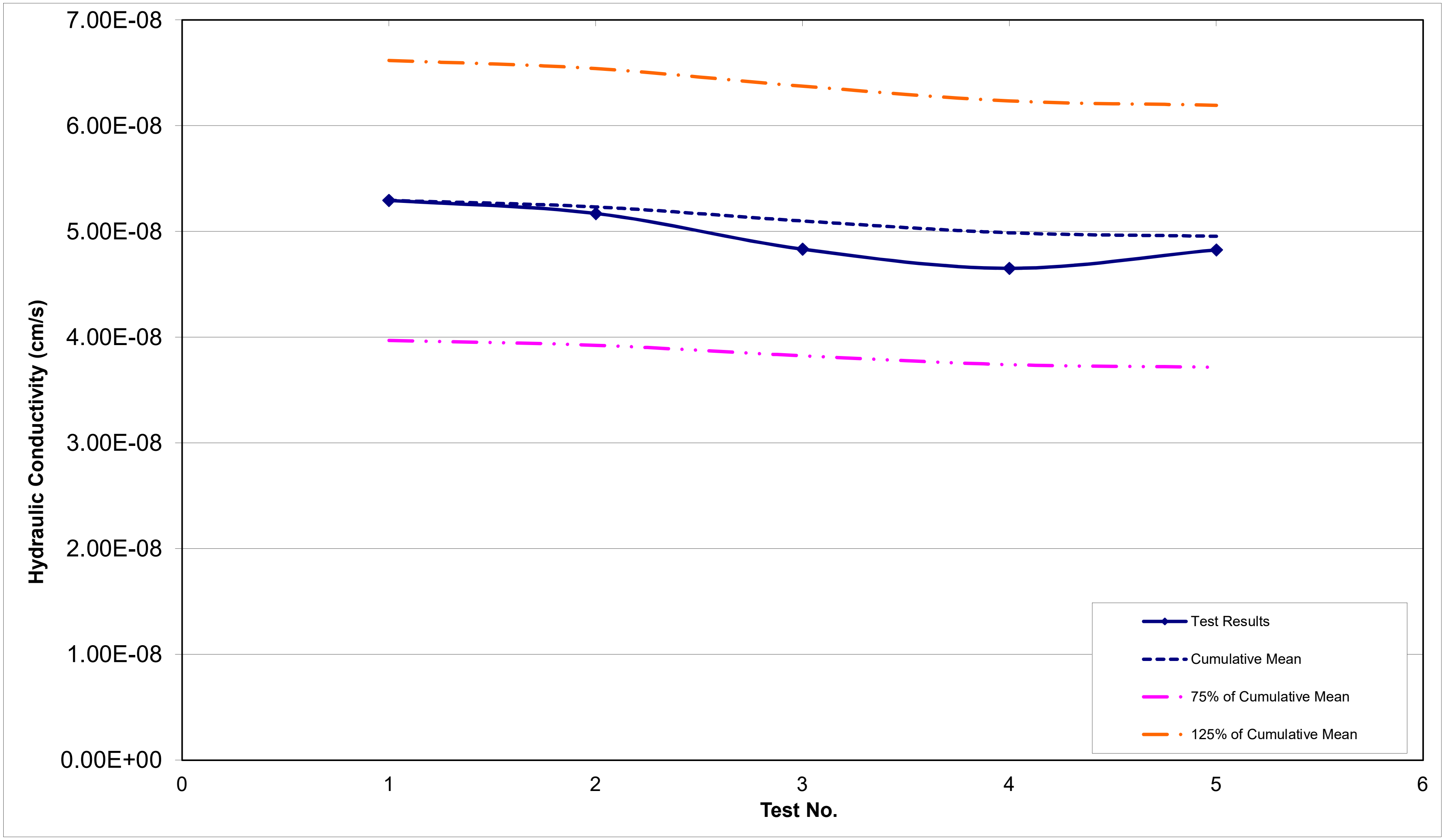


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Exhibit B-12

HYDRAULIC CONDUCTIVITY TEST RESULTS
(ASTM D 5084 - Method C)

PROJECT NAME: BV-24A
SAMPLE ID: B-203 (66 - 68 ft)

Hydraulic Conductivity = 5.57E-08 cm/sec

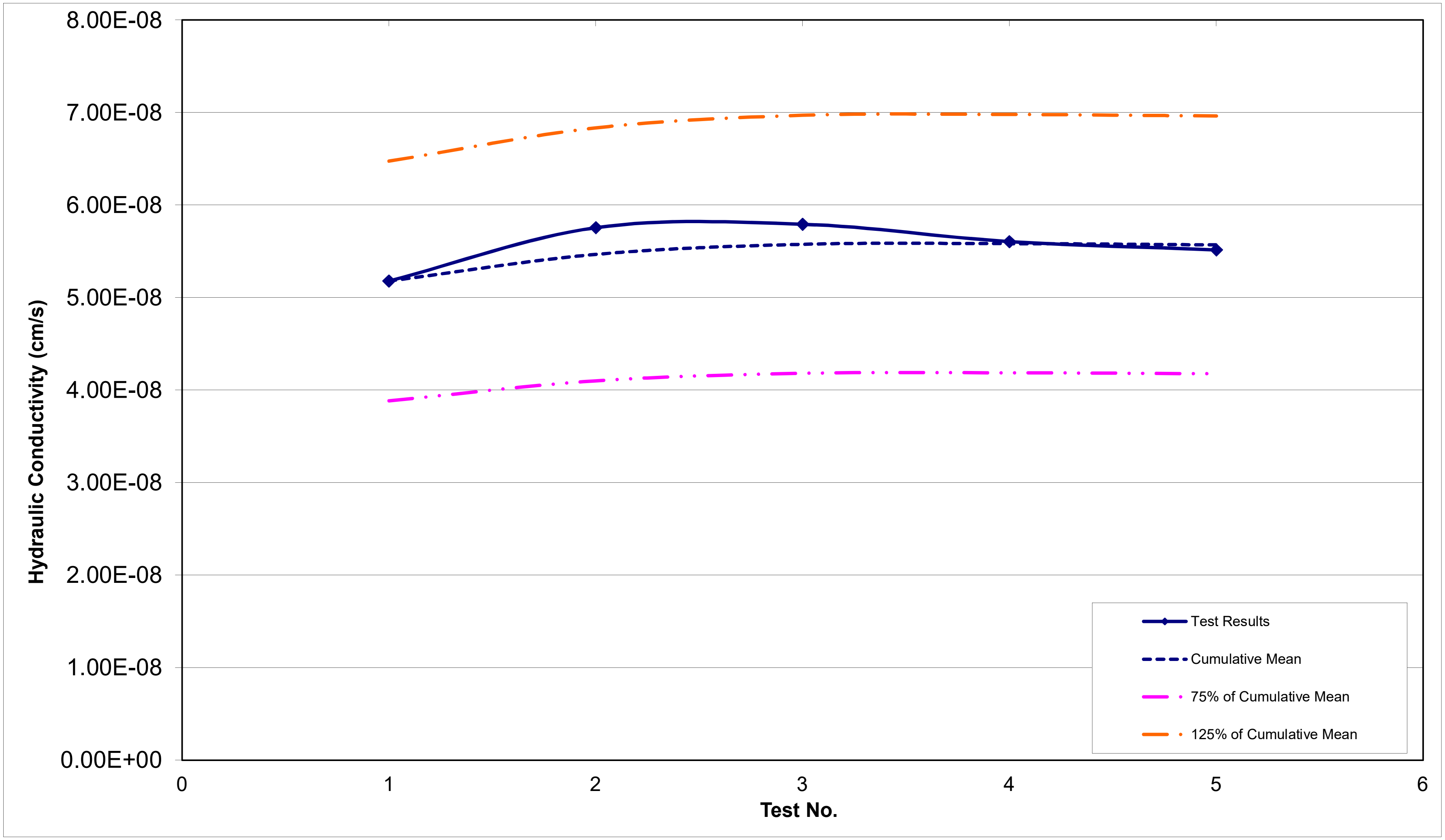

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Exhibit B-13

TRIAXIAL SHEAR TEST REPORT

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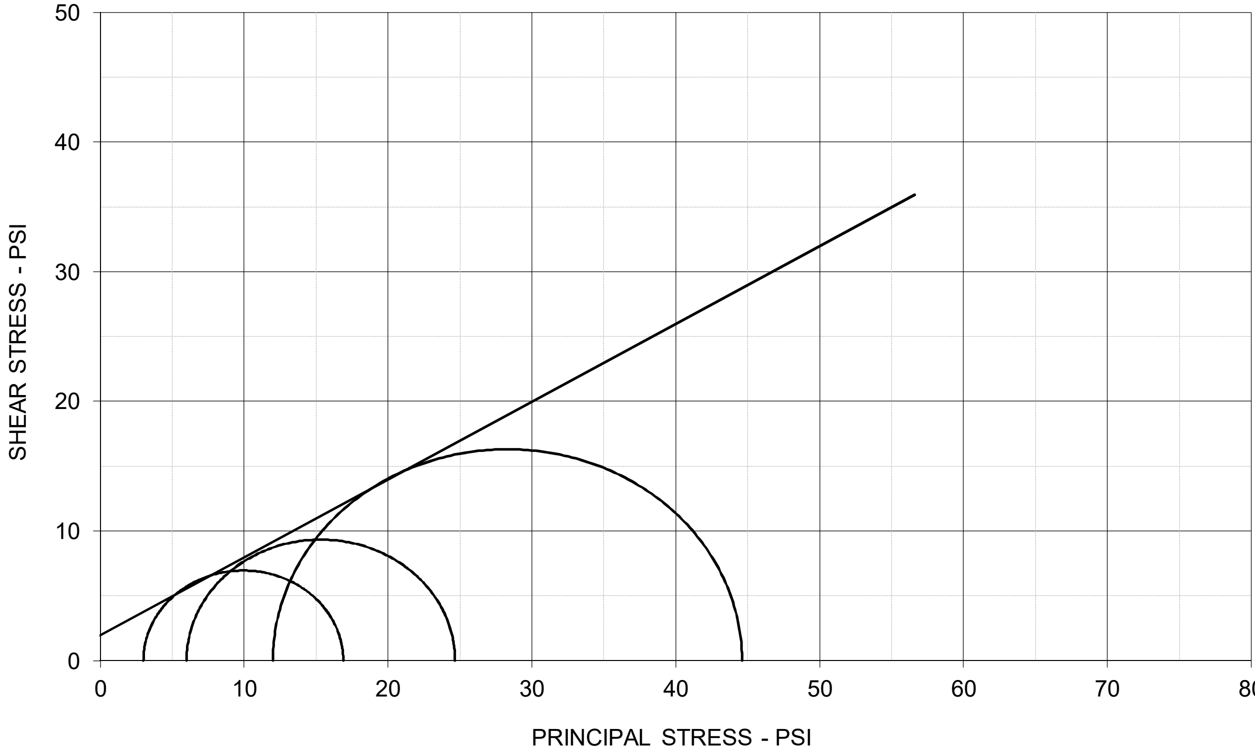
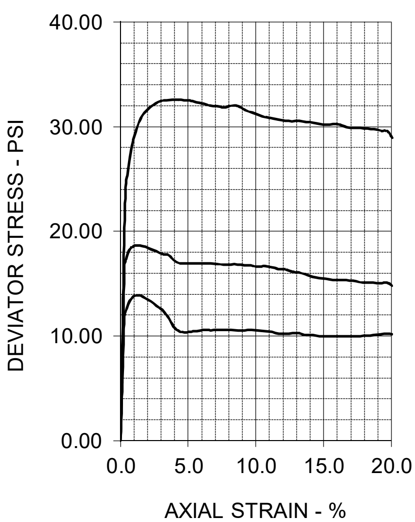


EFFECTIVE STRESS PARAMETERS	ϕ ' = 31.0 deg	c' = 1.9 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	15.0	15.0	15.0	
Dry Density - pcf	96.9	96.9	96.9	
Diameter - inches	2.80	2.80	2.80	
Height - inches	5.60	5.60	5.60	
AT TEST				
Final Moisture - %	27.0	27.1	26.7	
Dry Density - pcf	96.9	97.0	97.3	
Calculated Diameter (in.)	2.79	2.80	2.76	
Height - inches	5.58	5.59	5.49	
Effect. Cell Pressure - psi	3.0	6.0	12.0	
Failure Stress - psi	13.89	18.66	32.61	
Total Pore Pressure - psi	50.0	50.0	50.0	
Strain Rate - inches/min.	0.05600	0.05600	0.05600	
Failure Strain - %	1.4	1.4	4.3	
σ_1' Failure - psi	16.89	24.66	44.61	
σ_3' Failure - psi	3.00	6.00	12.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CD Triaxial
SAMPLE TYPE: Remolded
DESCRIPTION: Gray Fine-Medium Sand
SAMPLE LOCATION: 401-402
ASSUMED SPECIFIC GRAVITY: 2.70
LL: NP PL: NP PI: NP Percent -200: 2.8
REMARKS: Specimens remolded to 95% at opt.

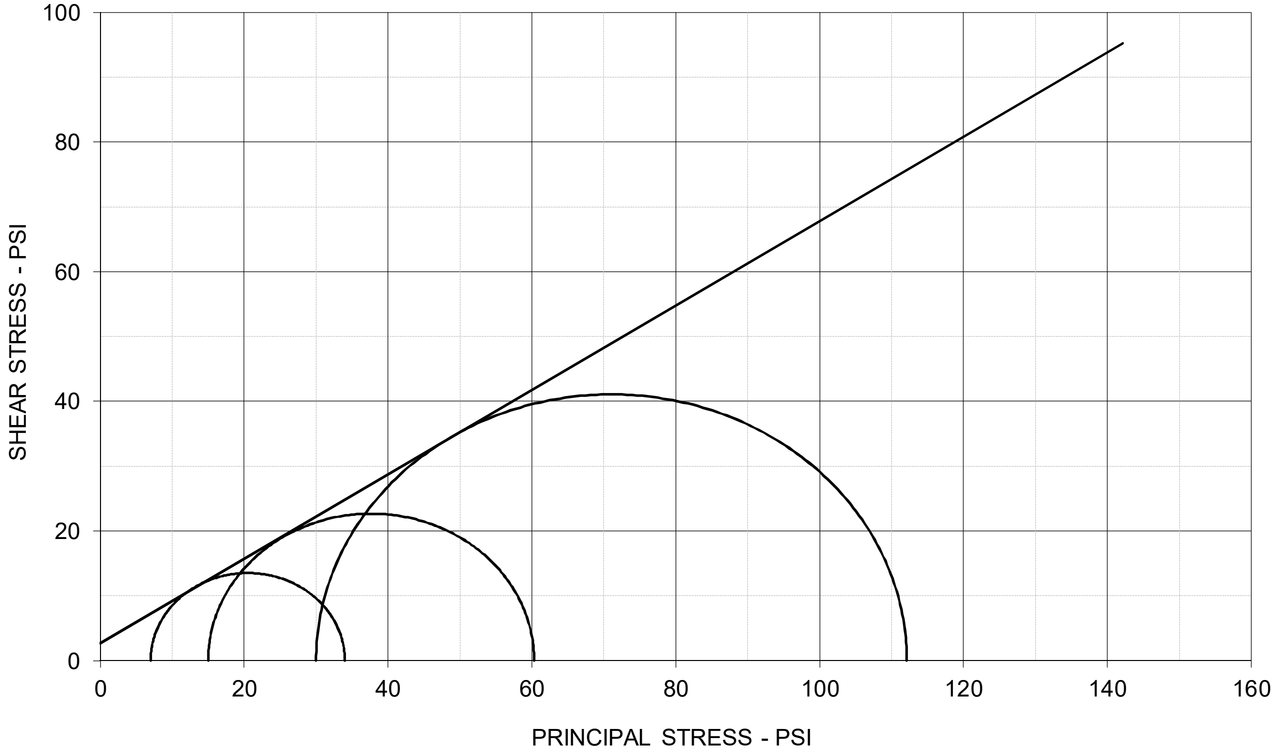
PROJECT INFORMATION

PROJECT: BV-24A DMMA
LOCATION: Grant-Valkaria, FL
PROJECT NO: HB155022
CLIENT: Taylor Engineering, Inc
DATE: 5/24/16

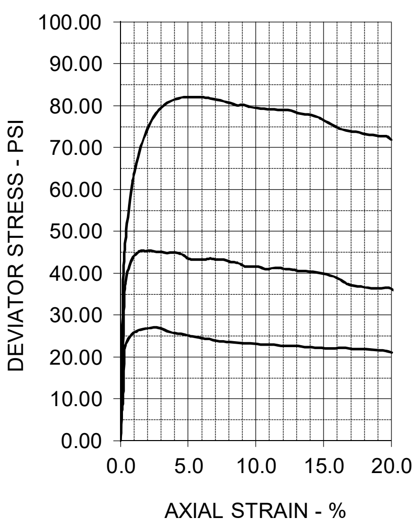
TERRACON	Exhibit B-14

TRIAXIAL SHEAR TEST REPORT

DUNKELBERGER engineering & testing, inc. A Terracon COMPANY



EFFECTIVE STRESS PARAMETERS	ϕ ' = 33.1 deg	c' = 2.7 psi

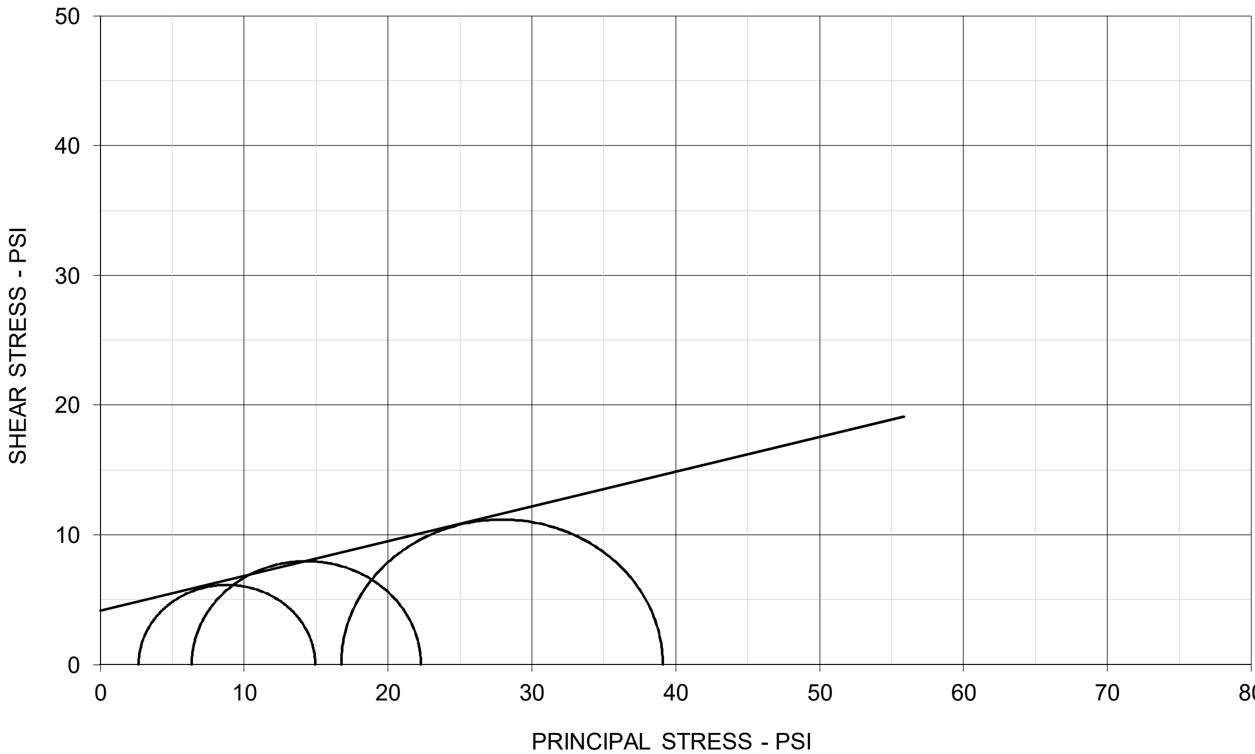


SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	10.0	10.0	10.0	
Dry Density - pcf	97.9	97.9	97.9	
Diameter - inches	2.80	2.80	2.80	
Height - inches	5.60	5.60	5.60	
AT TEST				
Final Moisture - %	26.2	26.0	26.0	
Dry Density - pcf	98.0	98.2	98.4	
Calculated Diameter (in.)	2.76	2.75	2.77	
Height - inches	5.47	5.46	5.51	
Effect. Cell Pressure - psi	7.0	15.0	30.0	
Failure Stress - psi	27.01	45.32	82.12	
Total Pore Pressure - psi	50.0	50.0	50.0	
Strain Rate - inches/min.	0.05600	0.05600	0.05600	
Failure Strain - %	2.7	2.3	5.1	
σ_1' Failure - psi	34.01	60.32	112.12	
σ_3' Failure - psi	7.00	15.00	30.00	

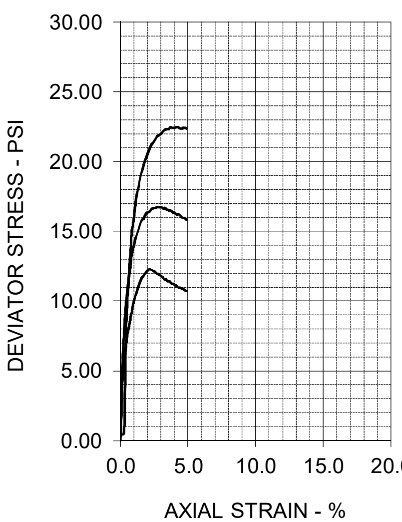
TEST DESCRIPTION	PROJECT INFORMATION
TYPE OF TEST & NO: CD Triaxial	PROJECT: BV-24A DMMA
SAMPLE TYPE: Remolded	LOCATION: Grant-Valkaria, FL
DESCRIPTION: Gray Fine-Medium Sand	PROJECT NO: HB155022
SAMPLE LOCATION: 413-414	CLIENT: Taylor Engineering, Inc
ASSUMED SPECIFIC GRAVITY: 2.70	DATE: 5/24/16
LL: NP PL: NP PI: NP Percent -200: 2.5	**TERRACON** Exhibit B-15
REMARKS: Specimens remolded to 95% at opt.	

TRIAXIAL SHEAR TEST REPORT

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY



EFFECTIVE STRESS PARAMETERS	φ ' = 15.0 deg	c' = 4.2 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	54.0	54.0	54.0	
Dry Density - pcf	68.6	68.6	68.6	
Diameter - inches	2.86	2.86	2.86	
Height - inches	5.69	5.69	5.69	
AT TEST				
Final Moisture - %			42.9	
Dry Density - pcf	69.6	72.3	77.6	
Calculated Diameter (in.)	2.83	2.85	2.83	
Height - inches	5.60	5.66	5.61	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	12.27	15.93	22.35	
Total Pore Pressure - psi	57.3	63.6	73.3	
Strain Rate - inches/min.	0.00060	0.00060	0.00060	
Failure Strain - %	2.1	4.8	4.9	
σ_1' Failure - psi	14.94	22.29	39.10	
σ_3' Failure - psi	2.67	6.36	16.75	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with Pore Pressure
SAMPLE TYPE: Tube
DESCRIPTION: Grayish Brown Clay
SAMPLE LOCATION: B102 31.0-33.5 ft
ASSUMED SPECIFIC GRAVITY: 2.70
LL: X PL: X PI: X Percent -200: X
REMARKS: Multistage Triaxial

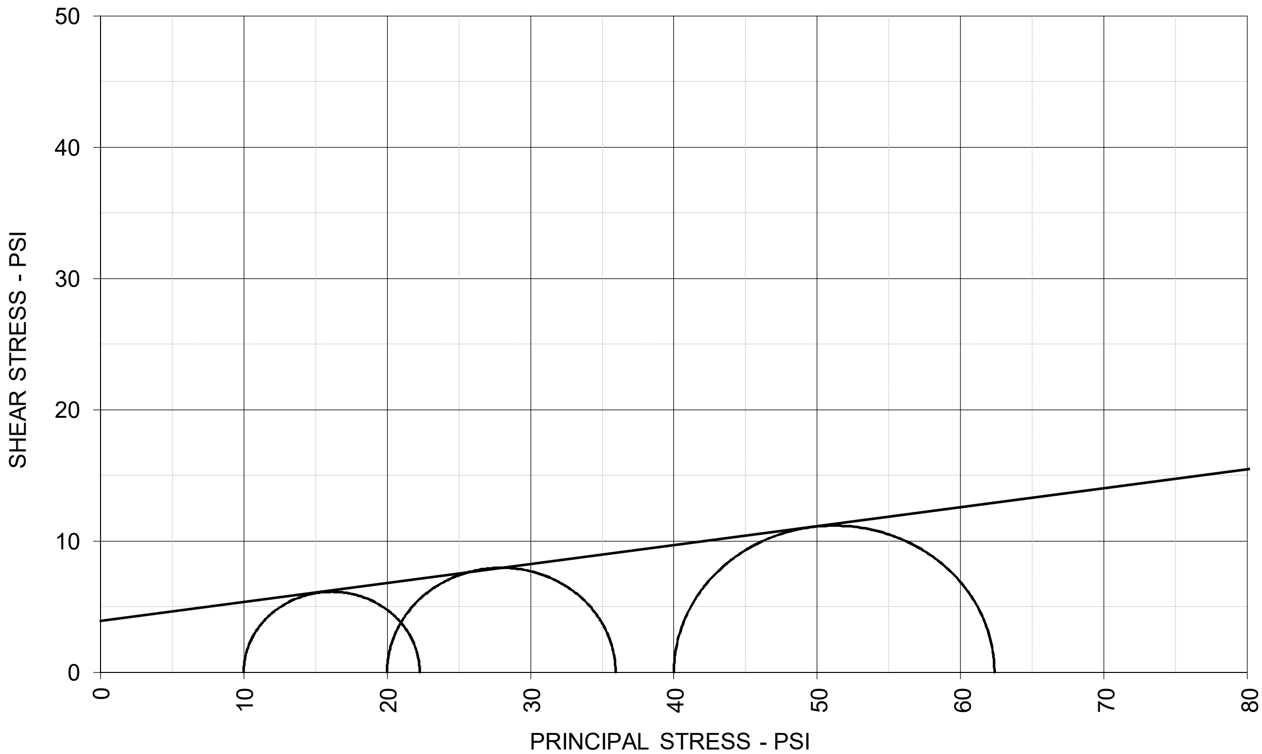
PROJECT INFORMATION

PROJECT: BV-24A DMMA
LOCATION: Grant-Valkaria, FL
PROJECT NO: HB155022
CLIENT: Taylor Engineering, Inc
DATE: 5/26/16

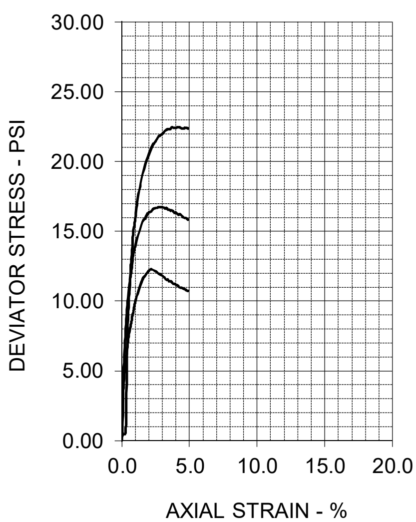
TERRACON | Exhibit B-16

TRIAXIAL SHEAR TEST REPORT

DUNKELBERGER engineering & testing, inc. A Terracon COMPANY



TOTAL STRESS PARAMETERS	ϕ = 8.2 deg	c = 3.9 psi

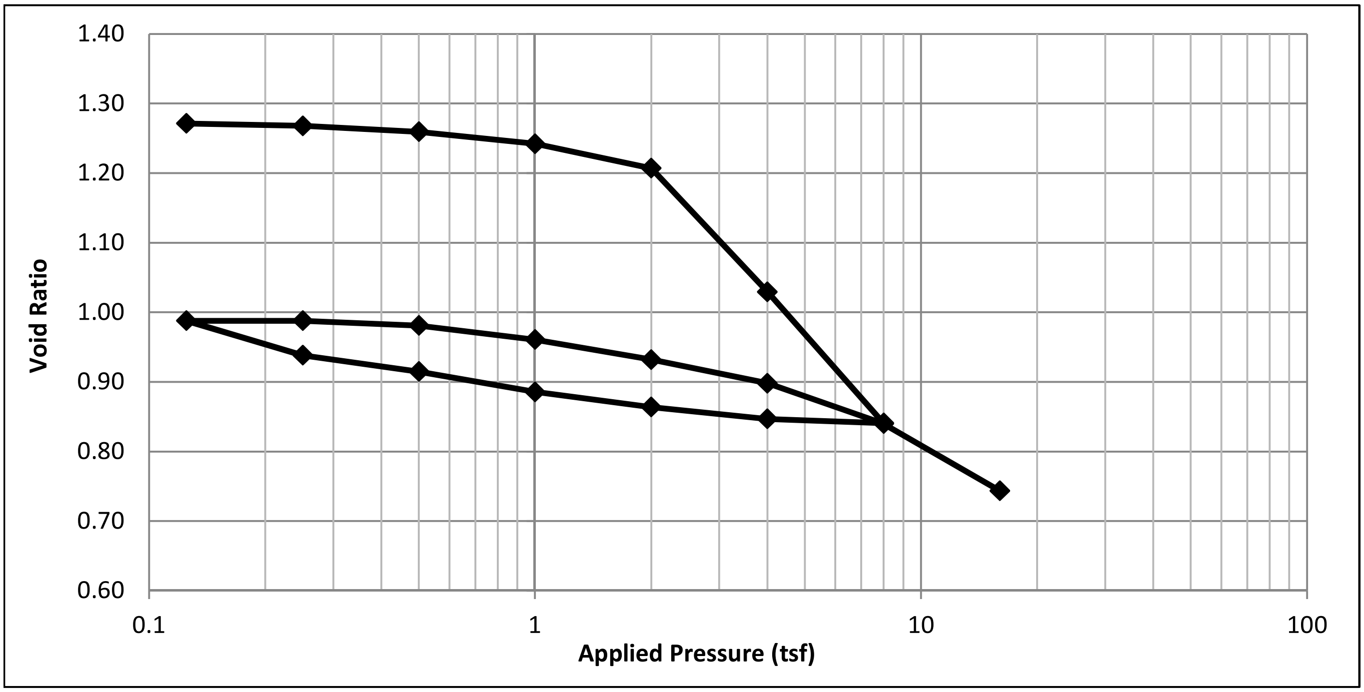


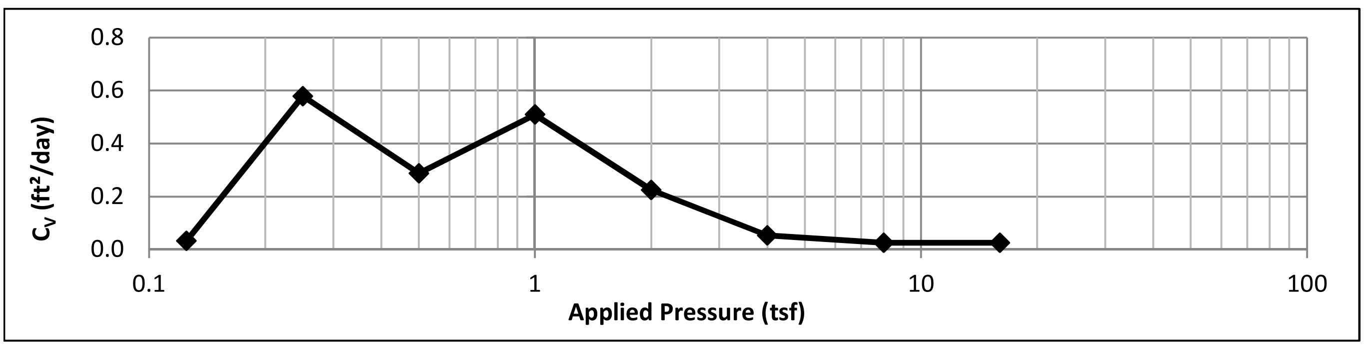
SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	54.0	54.0	54.0	
Dry Density - pcf	68.6	68.6	68.6	
Diameter - inches	2.86	2.86	2.86	
Height - inches	5.69	5.69	5.69	
AT TEST				
Final Moisture - %			42.9	
Dry Density - pcf	69.6	72.3	77.6	
Calculated Diameter (in.)	2.83	2.85	2.83	
Height - inches	5.60	5.66	5.61	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	12.27	15.93	22.35	
Total Pore Pressure - psi	57.3	63.6	73.3	
Strain Rate - inches/min.	0.00060	0.00060	0.00060	
Failure Strain - %	2.1	4.8	4.9	
σ_1 Failure - psi	22.27	35.93	62.35	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION	PROJECT INFORMATION
TYPE OF TEST & NO: CU with Pore Pressure	PROJECT: BV-24A DMMA
SAMPLE TYPE: Tube	LOCATION: Grant-Valkaria, FL
DESCRIPTION: Grayish Brown Clay	PROJECT NO: HB155022
SAMPLE LOCATION: B102 31.0-33.5 ft	CLIENT: Taylor Engineering, Inc
ASSUMED SPECIFIC GRAVITY: 2.70	DATE: 5/26/16
LL: X PL: X PI: X Percent -200: X	TERRACON
REMARKS: Multistage Triaxial	Exhibit B-17

TRIAX B102@33.5.xls

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-102	31 to 33.5	Dark gray clay	CL

LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
34.0	16.7	2.7	74.2	96.6	48.0	27.6	1.27	0.74	4.0	0.47	0.08	85.0

Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

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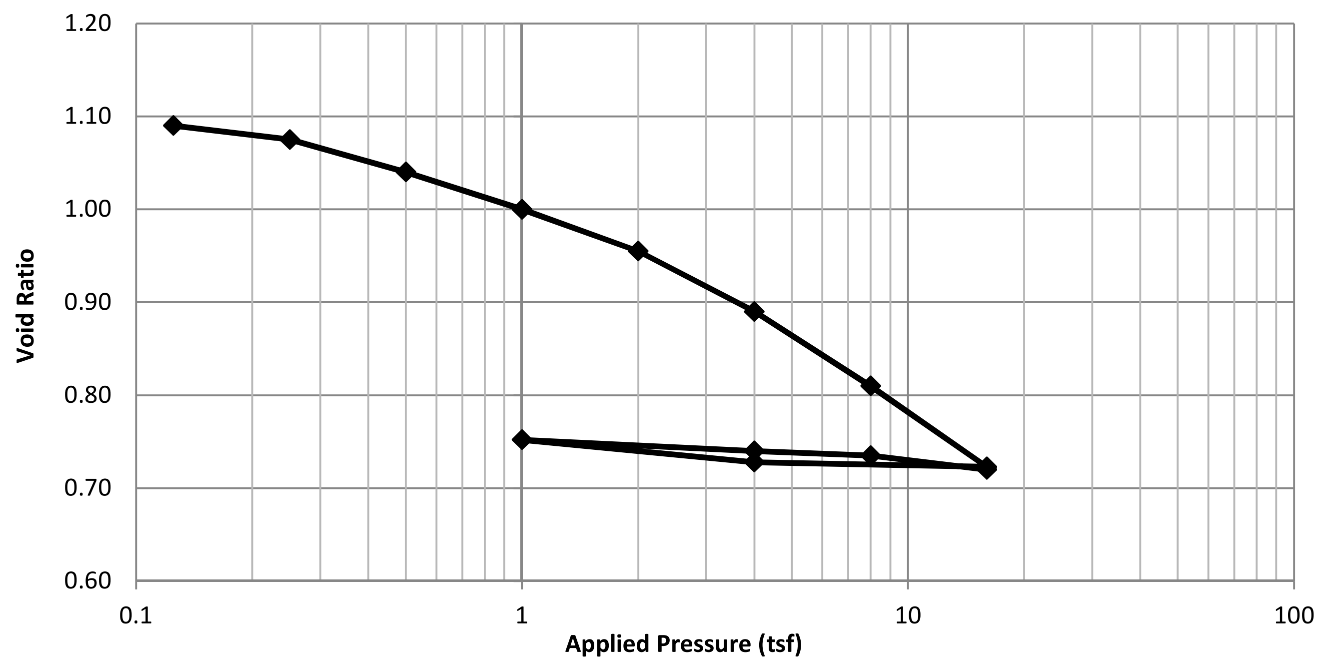
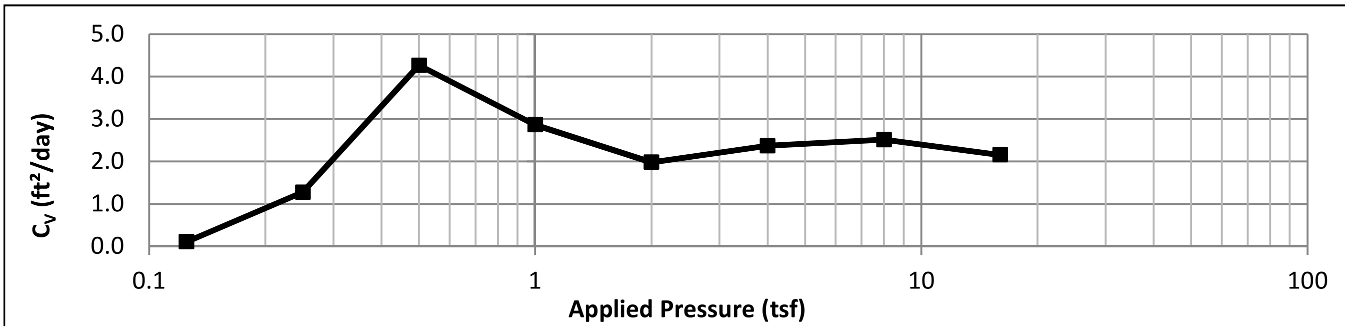
engineering & testing, inc.
A Terracon COMPANY

Exhibit B-18

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-104	71 to 73.5	Light gray silt with traces of shell	ML

LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
38.0	11.0	2.7	80.9	98.0	39.5	29.9	1.10	0.72	3.0	0.29	0.03	87.2

Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

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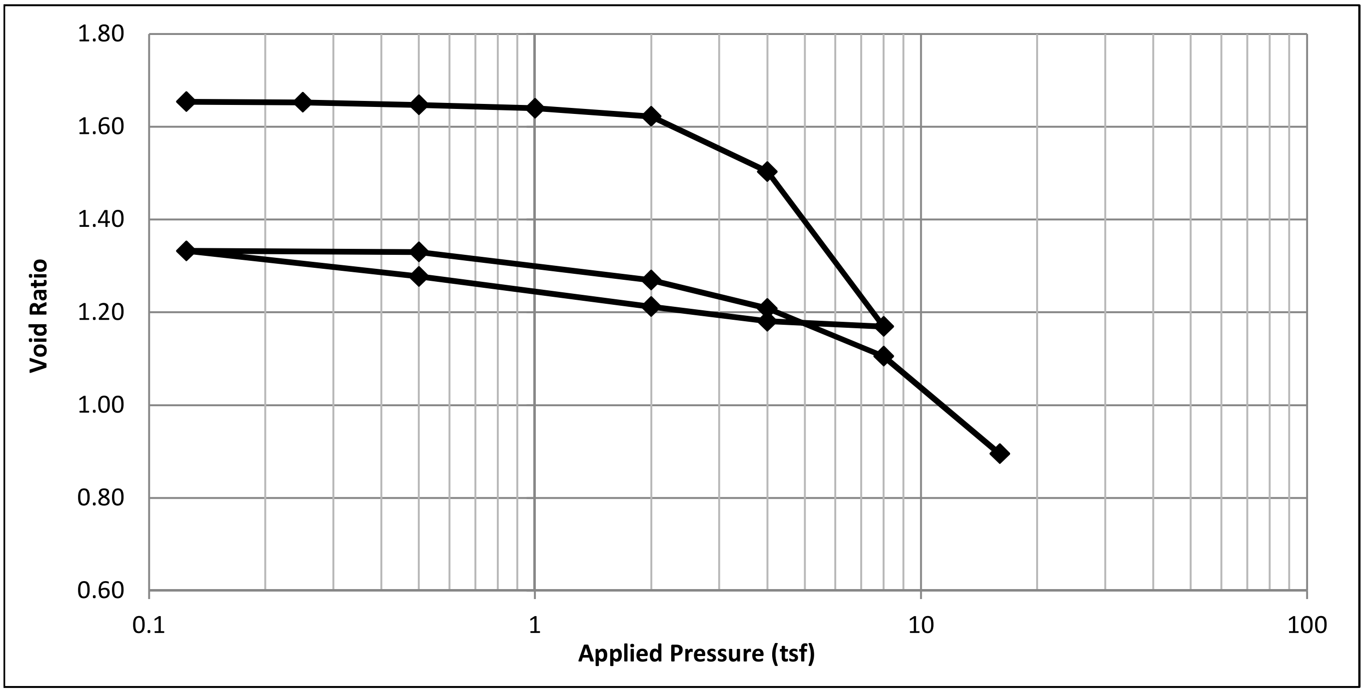
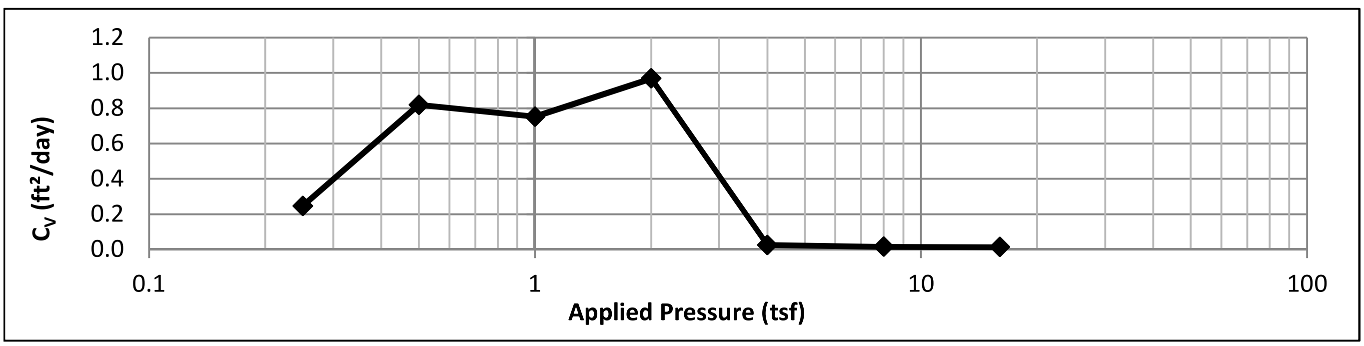
A Terracon COMPANY

Exhibit B-19

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-203	66 to 68.5	Dark gray clay	CH

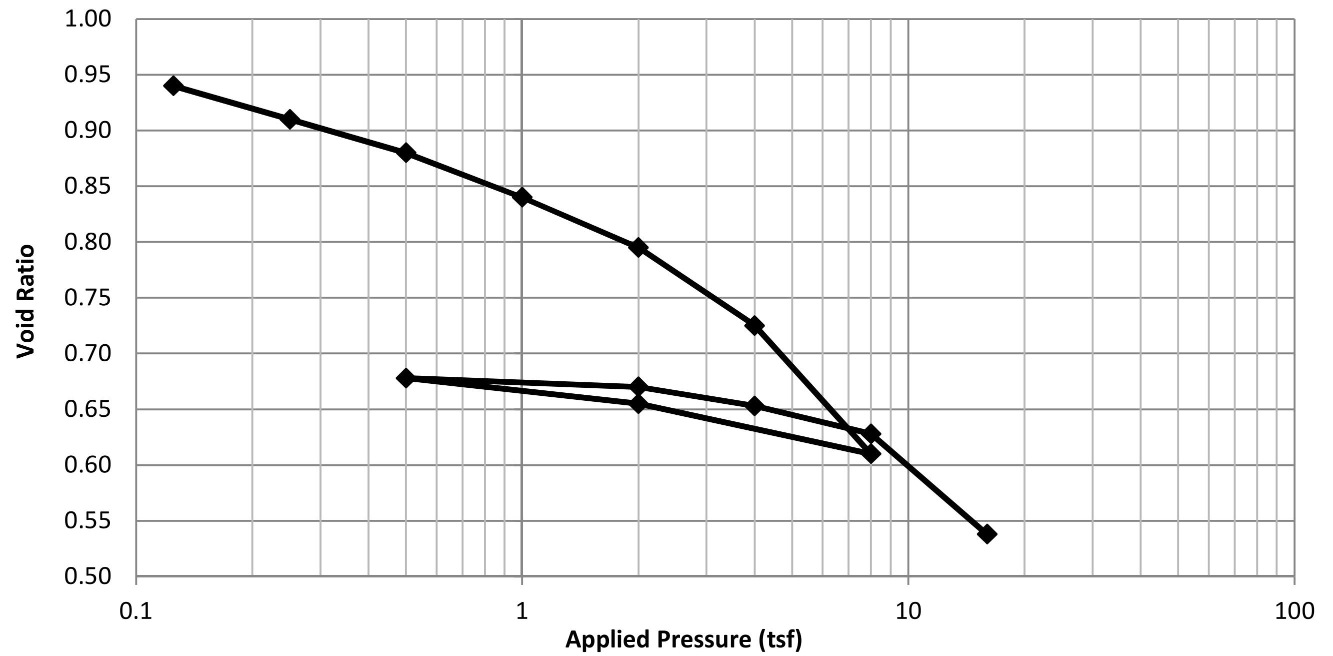
LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
6.0	43.0	2.7	63.5	88.9	61.6	35.3	1.65	0.90	6.2	0.70	0.09	98.7

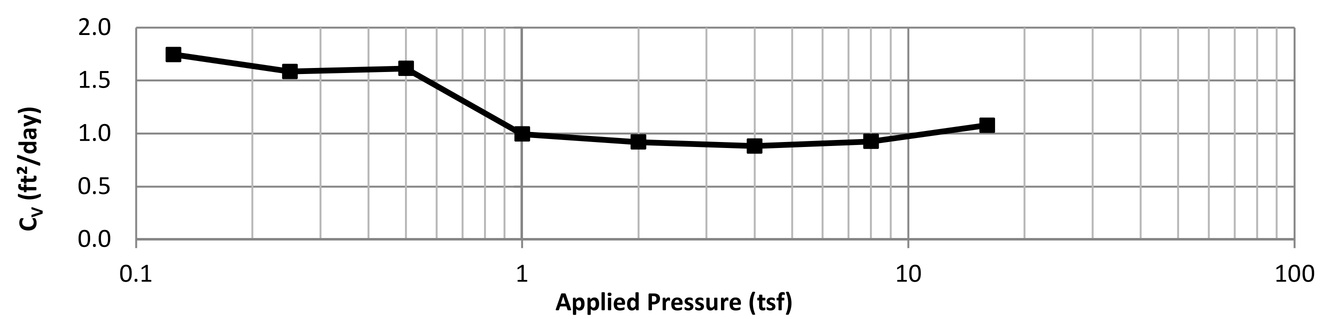
Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Exhibit B-20

CONSOLIDATION TEST REPORT





Boring	Sample Depth (feet)	Material Description	USCS
B-206	56 - 58.5	Dark gray CLAY	CL

LL	PI	SG (Assume)	Dry Density (pcf)		Moisture Content (%)		Void Ratio		P_C (ksf)	C_C	C_R	-200 (%)
			Initial	Final	Initial	Final	Initial	Final				
43.0	23.0	2.7	86.5	109.4	27.7	26.1	0.96	0.54	4.2	0.31	0.04	82.4

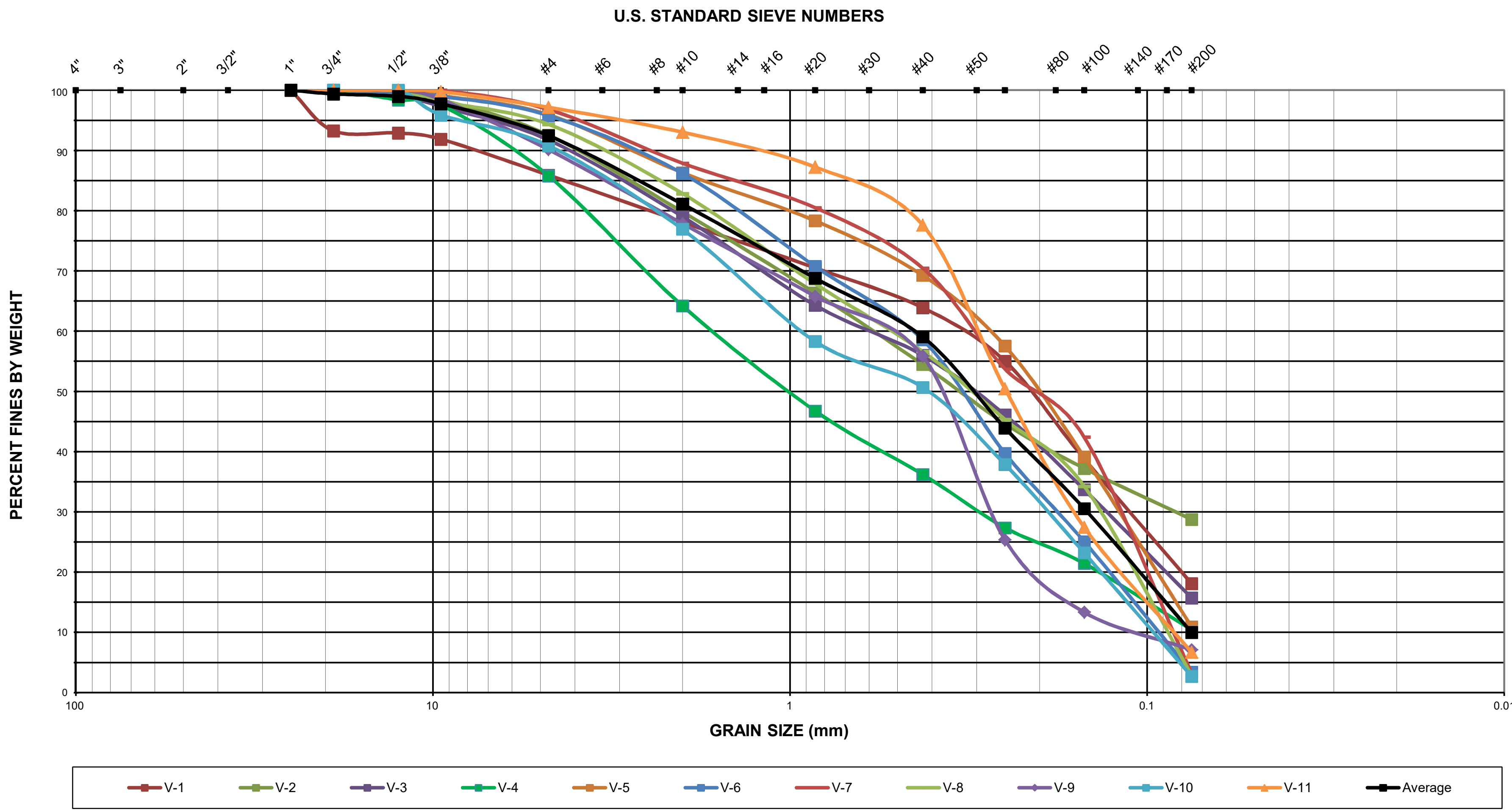
Project	Project Number	Client
BV-24A DMMA Brevard County, Florida	HB155022	Taylor Engineering

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Exhibit B-21

APPENDIX C
DREDGED MATERIAL LABORATORY RESULTS

Particle Size Analysis of Soil



Boring Location	Depth (feet)	USCS Classification	Percent Passing Sieve										
			1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
V-1		SC	100.0	93.2	92.9	91.9	85.9	78.1	70.5	63.9	55.0	38.8	18.1
V-2		SC	100.0	100.0	99.0	98.4	92.6	79.8	66.4	54.5	44.6	37.2	28.8
V-3		SC	100.0	100.0	99.0	97.3	91.7	79.0	64.3	56.0	46.1	33.7	15.7
V-4		SP-SC	100.0	100.0	98.4	97.6	85.8	64.2	46.8	36.2	27.4	21.5	10.4
V-5		SP-SC	100.0	100.0	99.9	99.1	95.9	86.3	78.3	69.3	57.5	39.1	10.9
V-6		SP	100.0	100.0	99.5	99.0	95.8	86.2	70.7	58.6	39.7	25.1	3.4
V-7		SP	100.0	100.0	100.0	100.0	96.8	87.9	80.5	70.5	53.7	42.4	3.2
V-8		SP	100.0	100.0	100.0	98.1	94.3	82.8	67.9	56.6	45.3	34.3	2.9
V-9		SP-SC	100.0	100.0	100.0	98.5	90.1	77.8	65.8	55.9	25.4	13.3	7.1
V-10		SP	100.0	100.0	100.0	95.9	90.8	76.9	58.3	50.7	37.9	23.2	2.7
V-11		SP-SC	100.0	100.0	100.0	99.8	97.2	93.0	87.2	77.6	50.4	27.5	6.7
-			-	-	-	-	-	-	-	-	-	-	-
Average		SP-SC	100.0	99.4	99.0	97.8	92.5	81.1	68.8	59.1	43.9	30.6	10.0

Exhibit C-1

Influent Parameters:	Chloride Content:	94
	pH:	9.2

Sample ID V1

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
43055	4.8	33.9	1	13200	8.3
			2		
			3		
			4		
			5		
			6		
			Sum/Avg		
			Comp		

Pace Results:

SPLP Total Chl = 295 mg/L

Sample ID V2

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
8792	7.7	54.3	1	13200	6.3
43089	11.6	82.3	2	4320	9.0
			3		
			4		
			5		
			6		
			Sum/Avg		
			Comp		

Pace Results:

SPLP Total Chl = 183 mg/L

Sample ID V3

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
188	9.0	63.6	1	12000	7.7
2390	17.6	124.7	2	1440	9.4
13865	27.0	190.9	3	1440	9.7
36744	37.2	263.0	4	1200	10.0
			5	1440	10.4
			6		
			Sum/Avg	3504	9.4
			Comp		

Pace Results:

SPLP Total Chl = 311 mg/L

Sample ID V4

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
85	9.0	63.6	1	9600	8.7
269	18.0	127.2	2	1680	9.3
847	27.2	192.6	3	1200	9.7
1438	31.8	224.8	4	960	9.7
4634	45.0	318.1	5	1200	8.7
6061	48.6	343.5	6	960	9.5
			Sum/Avg	2600	9.3
			Comp	2400	9.4

Pace Results:

SPLP Total Chl = 162 mg/L

Sample ID V5

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
870	8.9	62.8	1	14400	8.9
11724	18.0	127.2	2	1440	7.8
35702	25.2	178.1	3	1440	9.8
			4	1680	9.3
			5	1920	8.8
			6	2160	9.4
			Sum/Avg	3840	9.0
			Comp	4320	9.4

Pace Results:

SPLP Total Chl = 175 mg/L

Sample ID V6

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
25	15.0	106.0	1	9600	8.9
29	18.6	131.5	2	1920	9.2
44	26.5	187.5	3	1680	9.1
66	35.6	251.9	4	2160	9.3
95	45.4	320.6	5	1680	9.2
130	51.8	366.4	6	1920	9.1
			Sum/Avg	3160	9.1
			Comp	3120	9.0

Pace Results:

SPLP Total Chl = 136 mg/L

"Comp" indicated a composite sample of all liquid exract passed through soil column.

Exhibit C-2

Influent Parameters:	Chloride Content:	94
	pH:	9.2

Sample ID V7

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
30	9.0	63.6	1	10800	8.1
59	17.9	126.4	2	2160	9.3
100	27.3	192.6	3	1920	9.1
144	36.0	254.5	4	1920	9.0
201	45.2	319.8	5	1920	9.0
269	53.6	379.2	6	1920	8.9
			Sum/Avg	3440	8.9
			Comp	3120	9.0

Pace Results:

SPLP Total Chl = 252 mg/L

Sample ID V8

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
16	9.0	63.6	1	14400	8.1
39	17.9	126.4	2	1920	8.7
70	26.8	189.2	3	1200	8.7
111	35.9	253.6	4	1200	8.7
157	45.3	319.8	5	1200	8.5
205	53.6	379.2	6	1200	8.8
			Sum/Avg	3520	8.6
			Comp	2880	8.7

Pace Results:

SPLP Total Chl = 253 mg/L

Sample ID V9

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
35	9.0	63.6	1	18000	8.2
100	17.9	126.4	2	3600	8.8
347	25.1	177.3	3	1200	9.2
1660	34.3	242.6	4	1200	9.4
10366	44.8	316.4	5	1200	9.3
21744	52.1	368.1	6	960	9.8
			Sum/Avg	4360	9.1
			Comp	2640	9.4

Pace Results:

SPLP Total Chl = 252 mg/L

Sample ID V10

Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
21	9.0	63.6	1	8880	7.9
37	17.5	123.8	2	1440	8.4
66	27.0	190.9	3	960	9.2
97	36.0	254.5	4	960	9.3
135	45.4	320.6	5	960	8.8
182	52.1	368.1	6	1200	9.0
			Sum/Avg	2400	8.8
			Comp	3120	7.3

Pace Results:

SPLP Total Chl = 250 mg/L

Sample ID V11

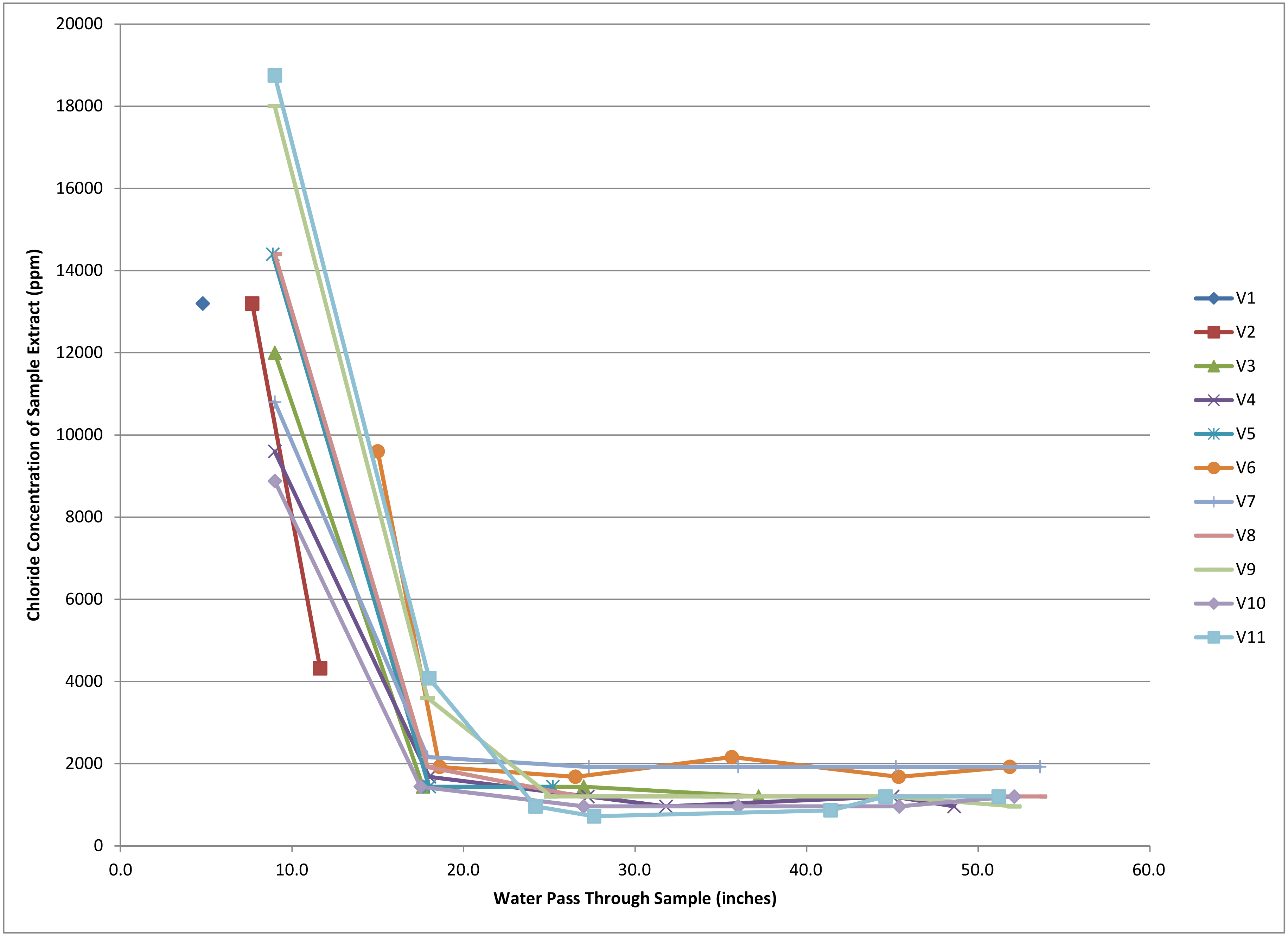
Elapsed (min)	Disp (in)	Vol (in^3)	Sample #	Chloride (ppm)	pH
0	0.0	0.0			
48	9.0	63.6	1	18750	7.1
211	18.0	127.2	2	4080	7.5
471	24.2	171.3	3	960	8.5
680	27.6	195.1	4	720	8.7
7239	41.4	292.6	5	864	9.2
10071	44.6	315.5	6	1200	8.8
22764	51.2	362.2	7	1200	8.8
			Sum/Avg	3968	8.4
			Comp	2400	9.3

Pace Results:

SPLP Total Chl = 305 mg/L

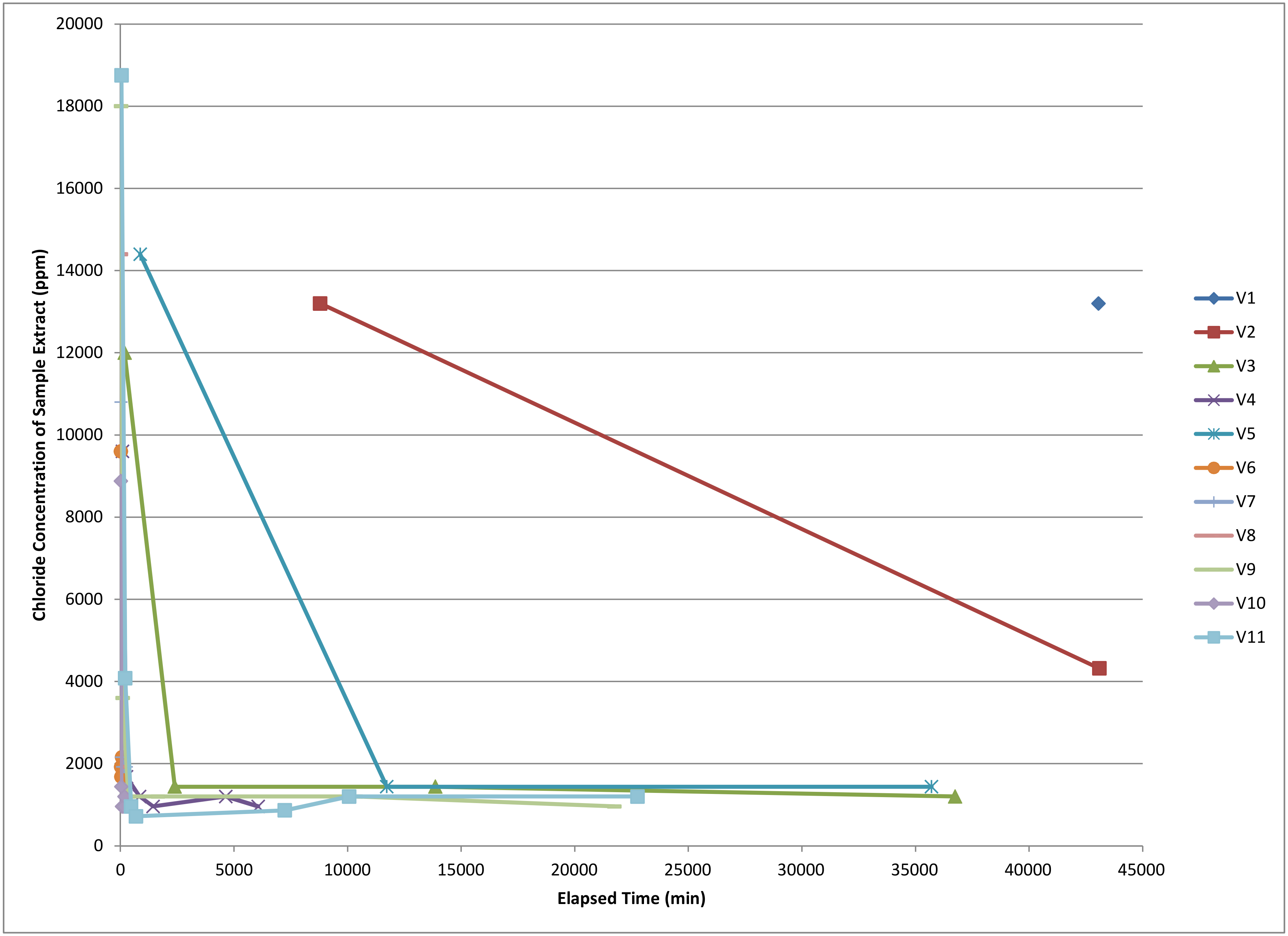
"Comp" indicated a composite sample of all liquid exract passed through soil column.

Exhibit C-3



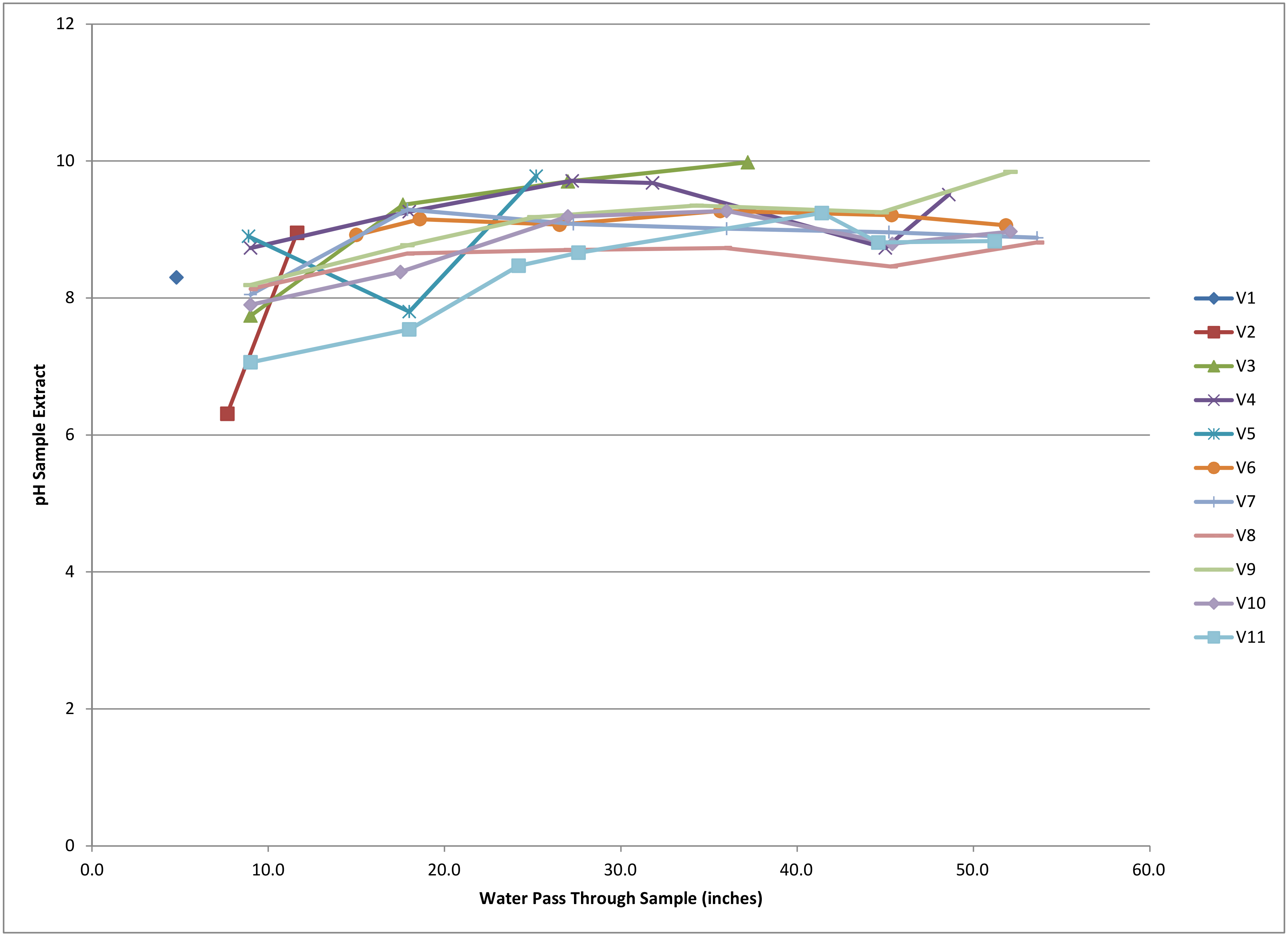
DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Exhibit C-4



DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Exhibit C-5



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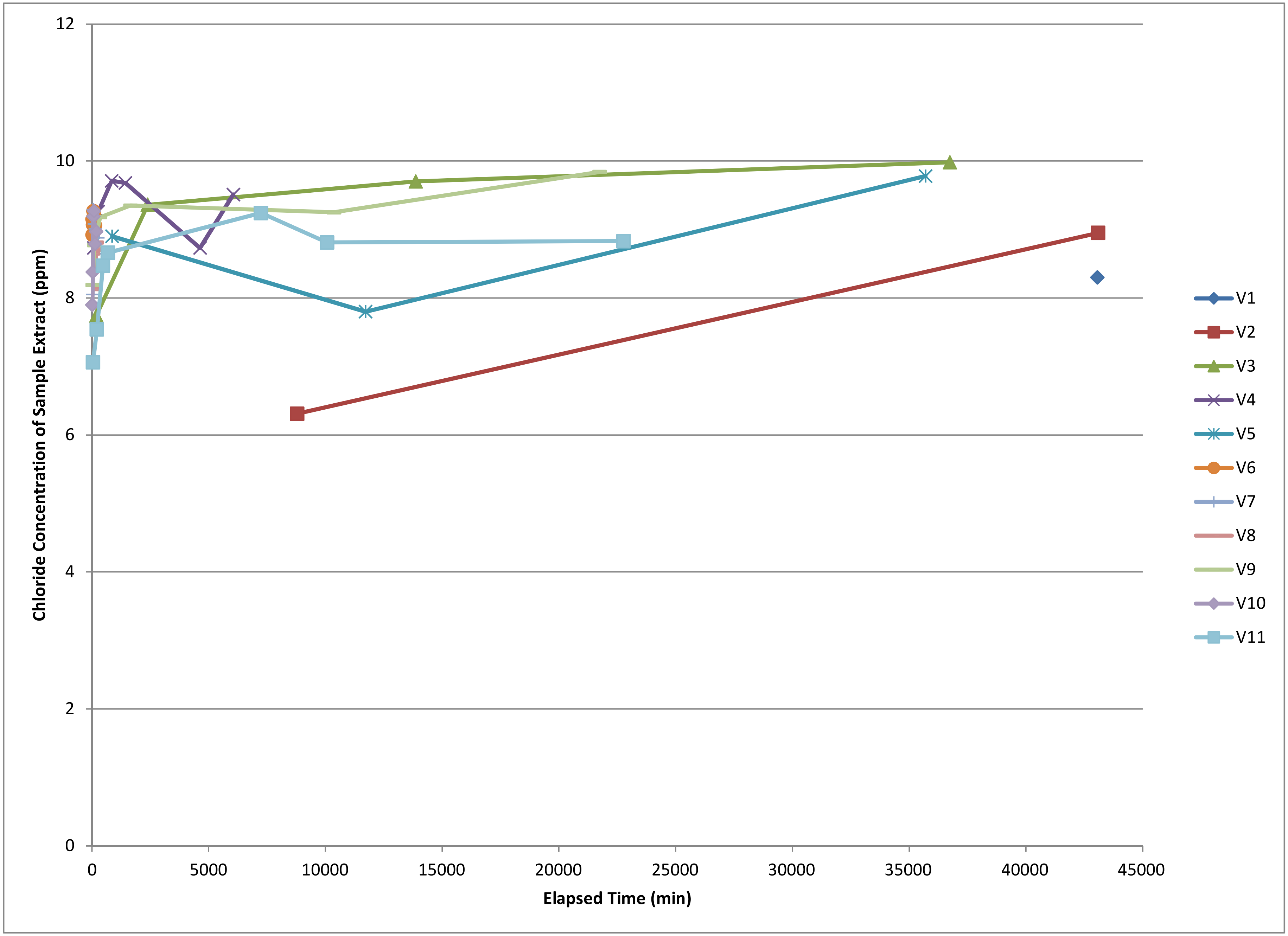
engineering & testing, inc.
A Terracon COMPANY

Exhibit C-6



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A Terracon COMPANY

Exhibit C-7

APPENDIX D
CROSS SECTIONS

EAST SECTION
(Station 37+70.48)

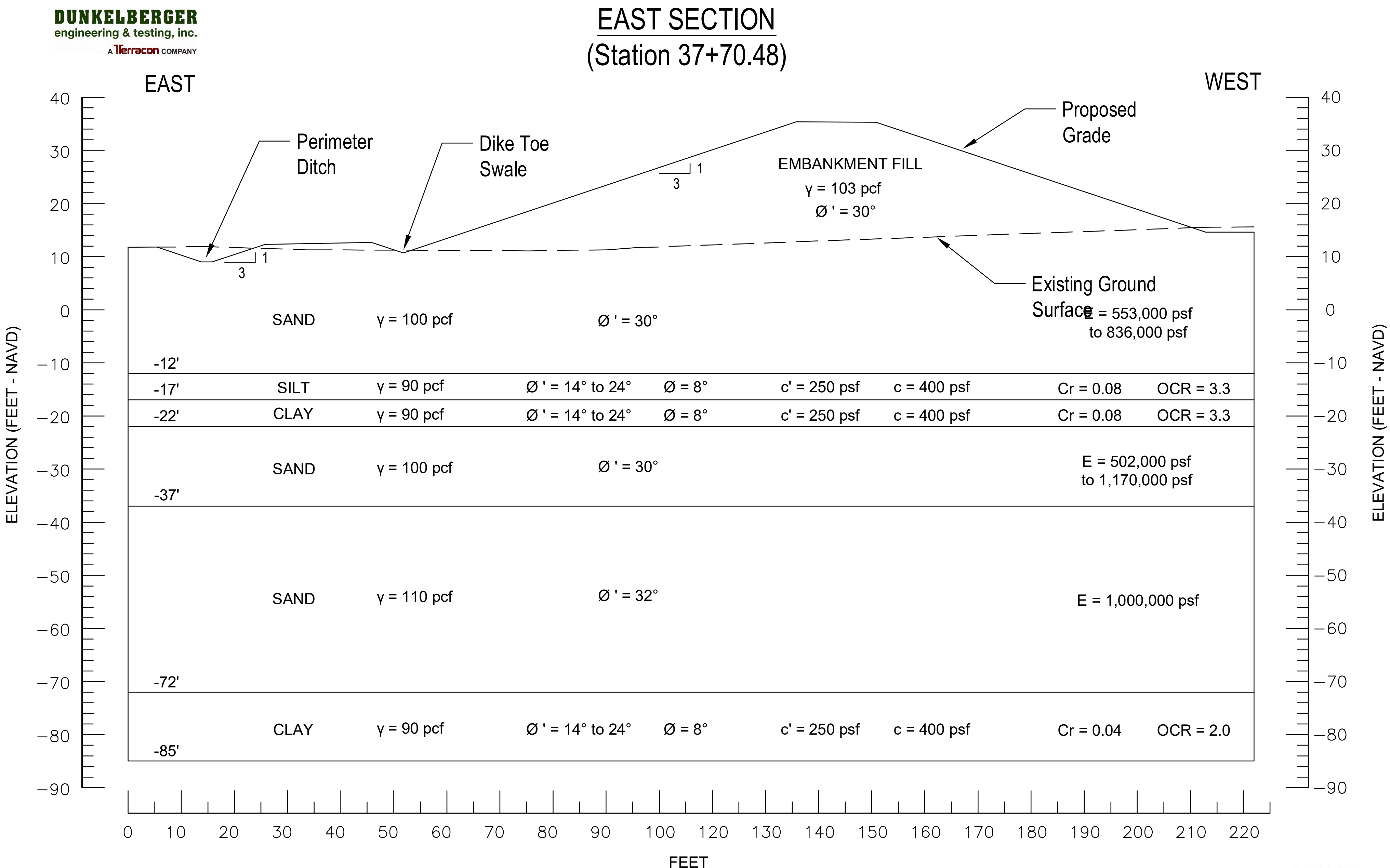


Exhibit D-1

DUNKELBERGER engineering & testing, inc.
A Terracon COMPANY

NORTH SECTION
(Station 30+00)

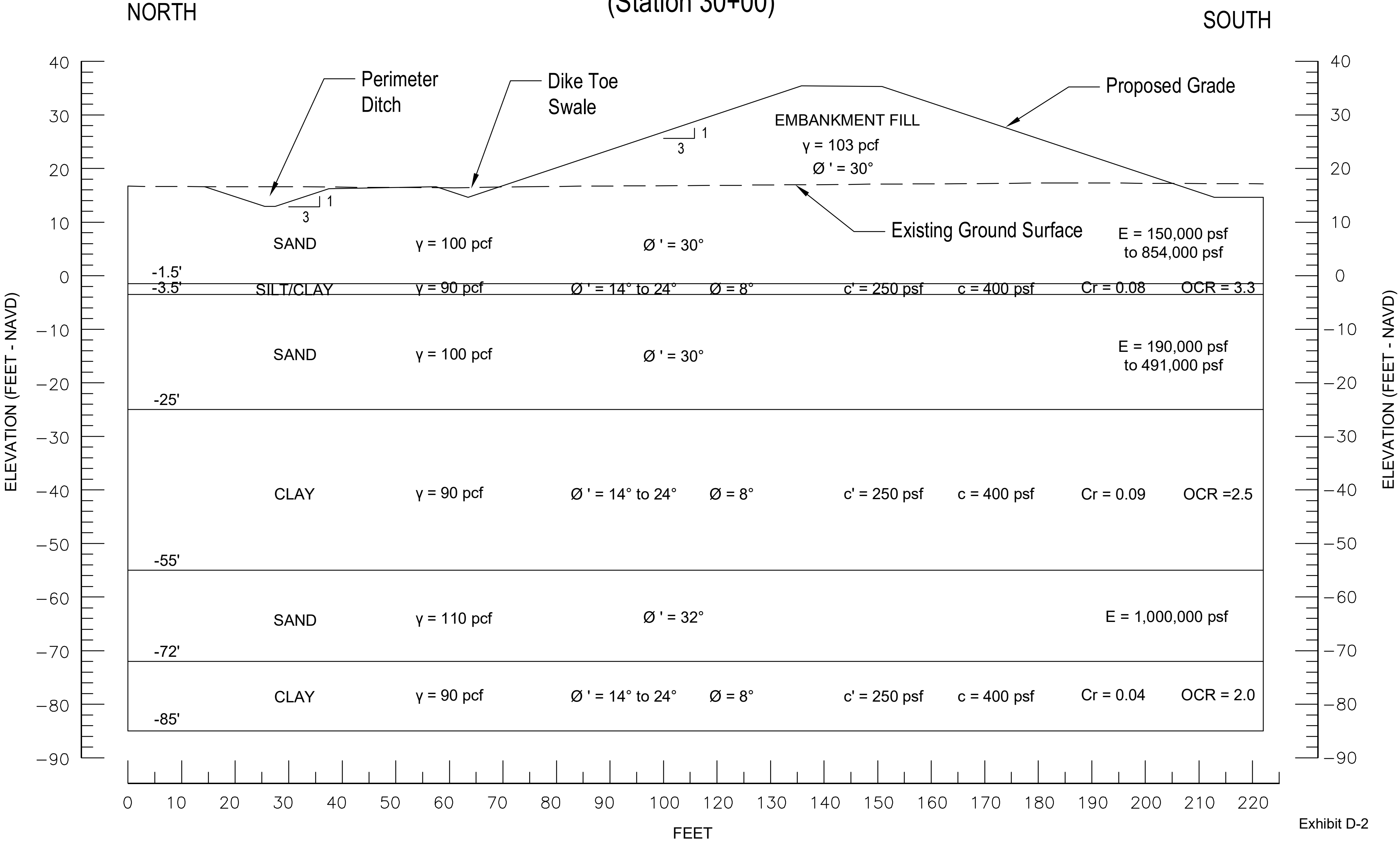


Exhibit D-2

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

SOUTHEAST SECTION
(Station 53+00)

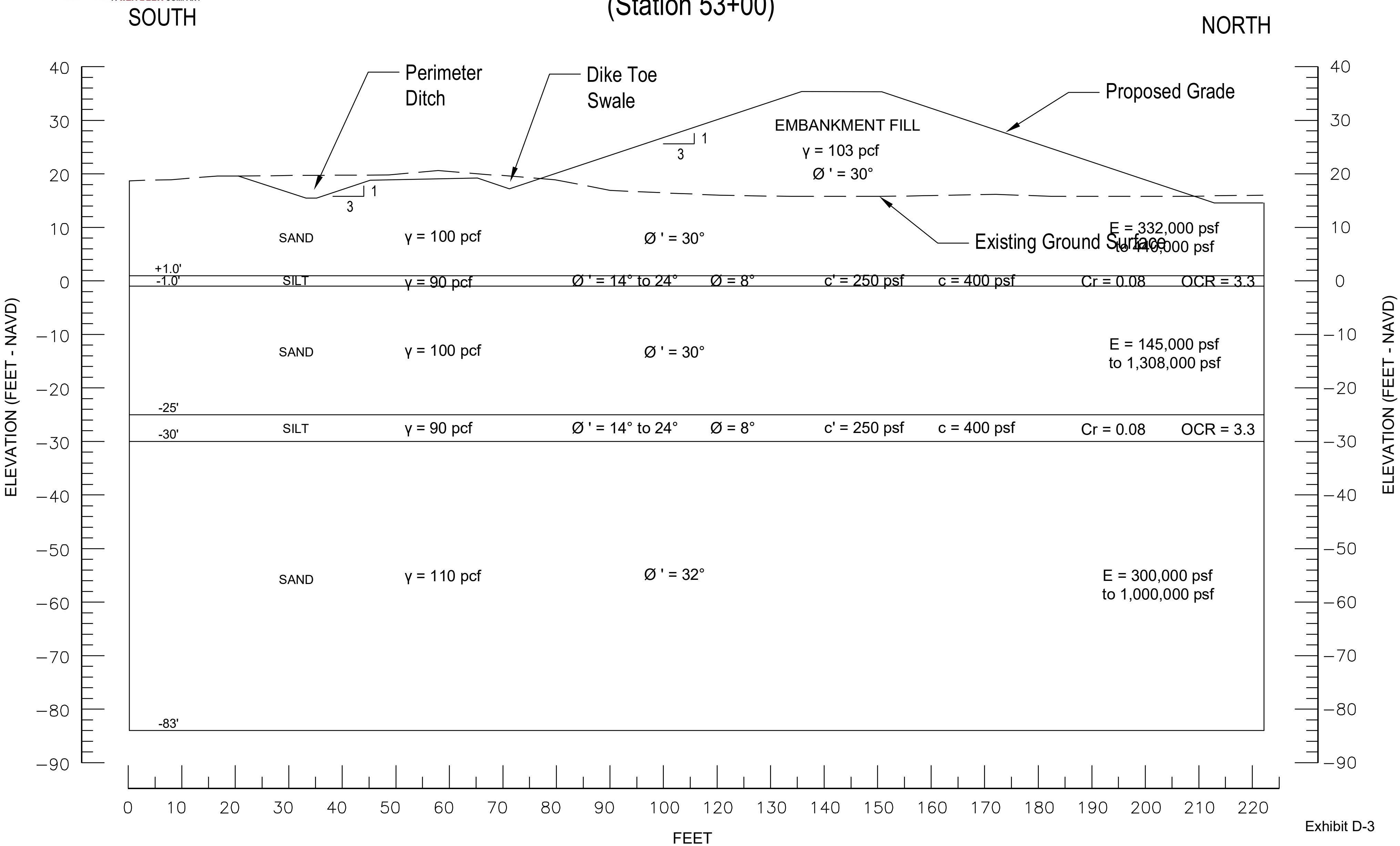
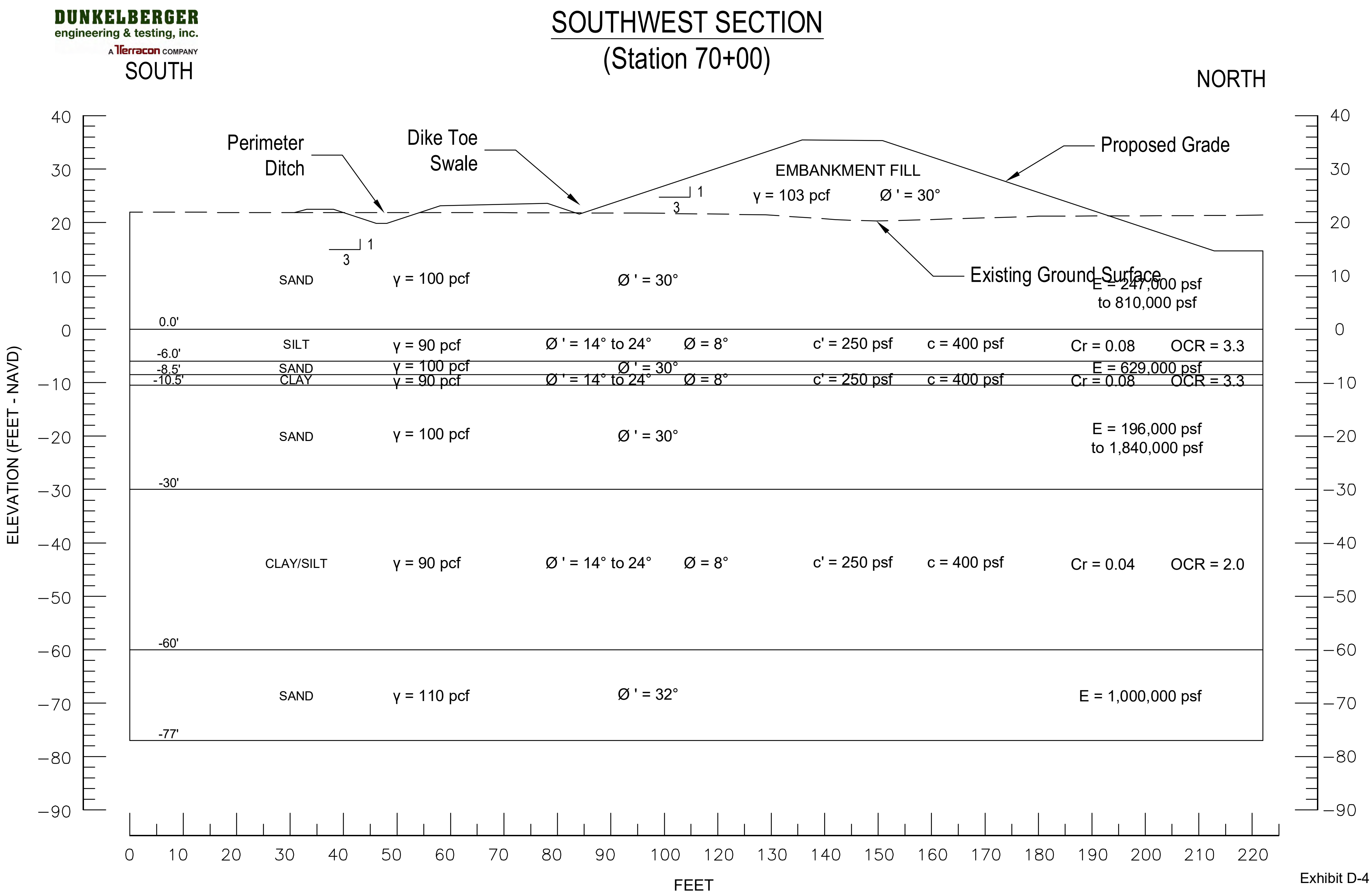


Exhibit D-3


DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY
SOUTHWEST SECTION
(Station 70+00)
SOUTH
NORTH
Perimeter Ditch
Dike Toe Swale
Proposed Grade
EMBANKMENT FILL
γ = 103 pcf
Ø ' = 30°
Existing Ground Surface
SAND γ = 100 pcf Ø ' = 30° E = 247,000 psf to 810,000 psf
0.0'
SILT γ = 90 pcf Ø ' = 14° to 24° Ø = 8° c' = 250 psf c = 400 psf Cr = 0.08 OCR = 3.3
-6.0'
SAND γ = 100 pcf Ø ' = 30° E = 629,000 psf
-8.5'
CLAY γ = 90 pcf Ø ' = 14° to 24° Ø = 8° c' = 250 psf c = 400 psf Cr = 0.08 OCR = 3.3
-10.5'
SAND γ = 100 pcf Ø ' = 30° E = 196,000 psf to 1,840,000 psf
-30'
CLAY/SILT γ = 90 pcf Ø ' = 14° to 24° Ø = 8° c' = 250 psf c = 400 psf Cr = 0.04 OCR = 2.0
-60'
SAND γ = 110 pcf Ø ' = 32° E = 1,000,000 psf
-77'
ELEVATION (FEET - NAVD)
FEET
Exhibit D-4

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

WEST SECTION
(Station 10+00)

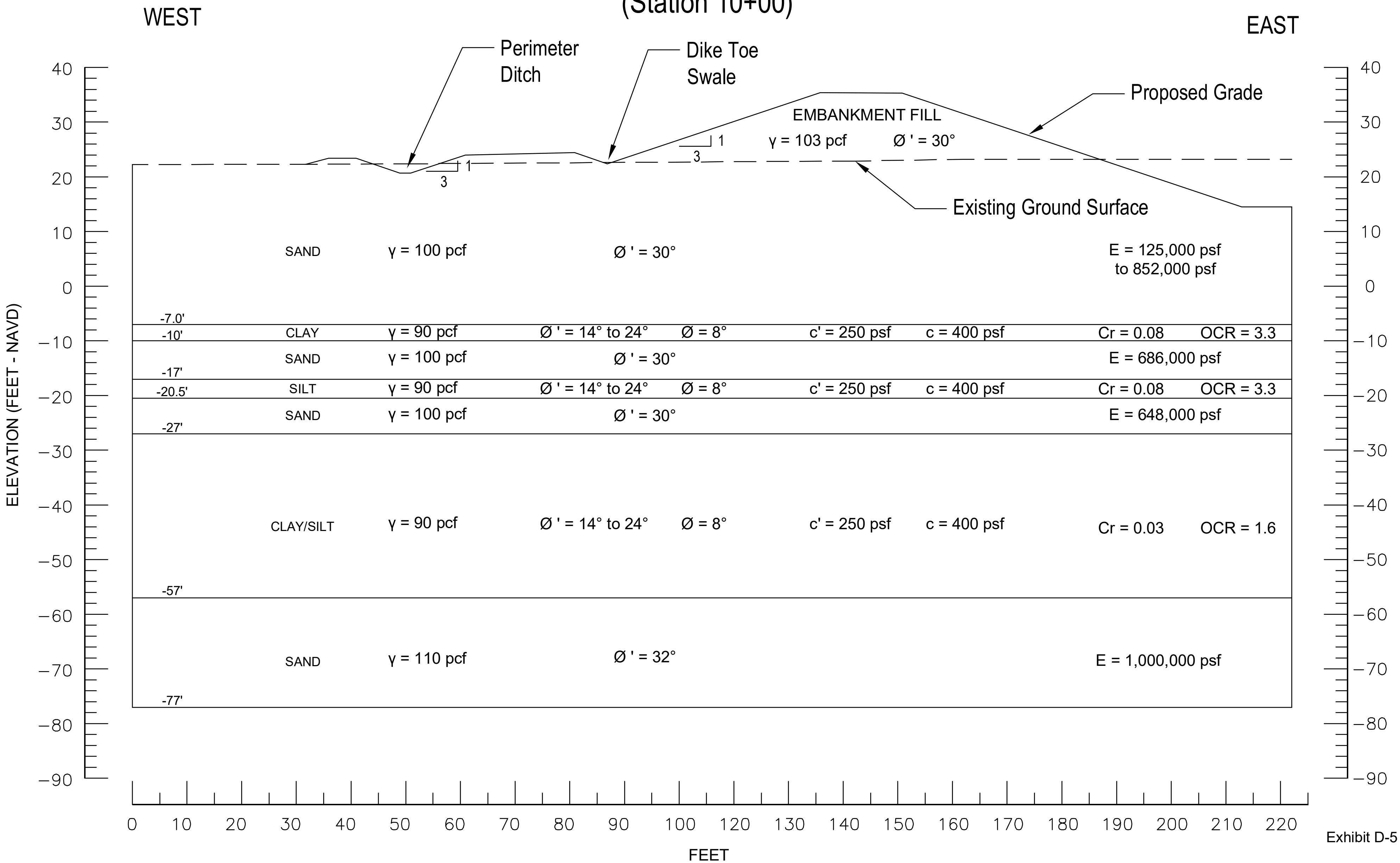
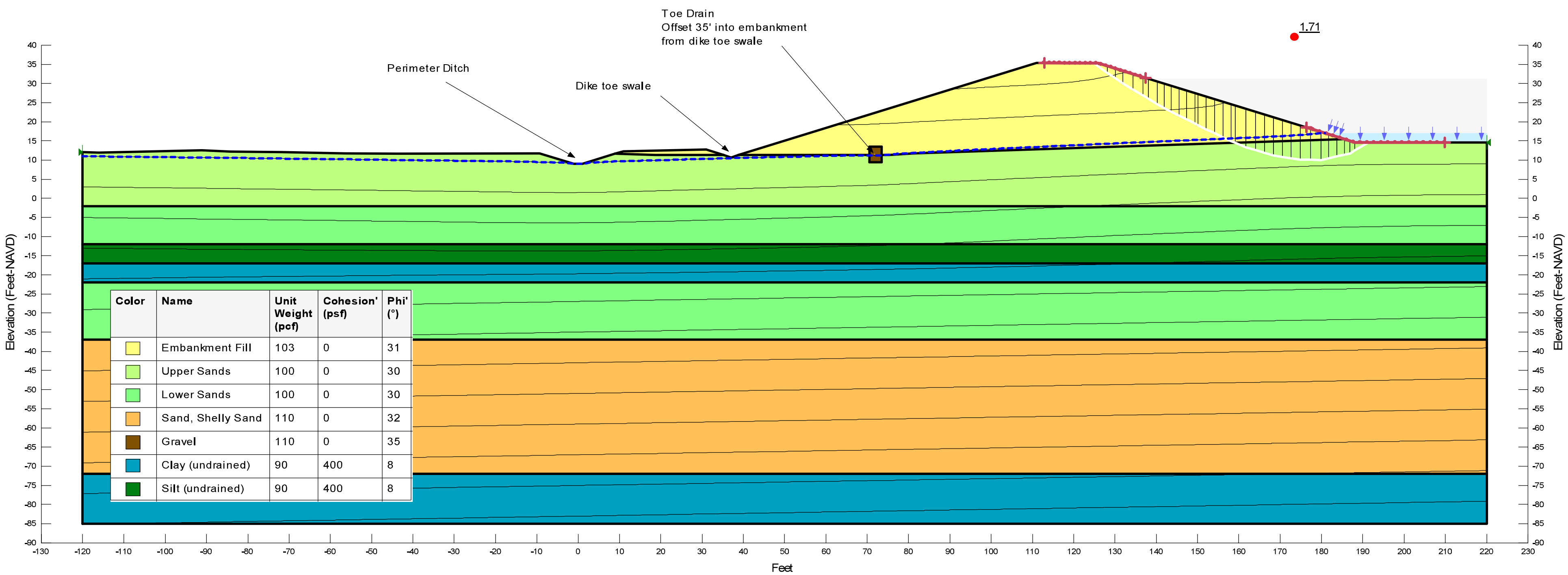


Exhibit D-5

APPENDIX E
SLOPE STABILITY ANALYSIS RESULTS

Stabilty Analysis

East Section
Station 37+70
Boring B-102
Pool = +17
Groundwater = +11

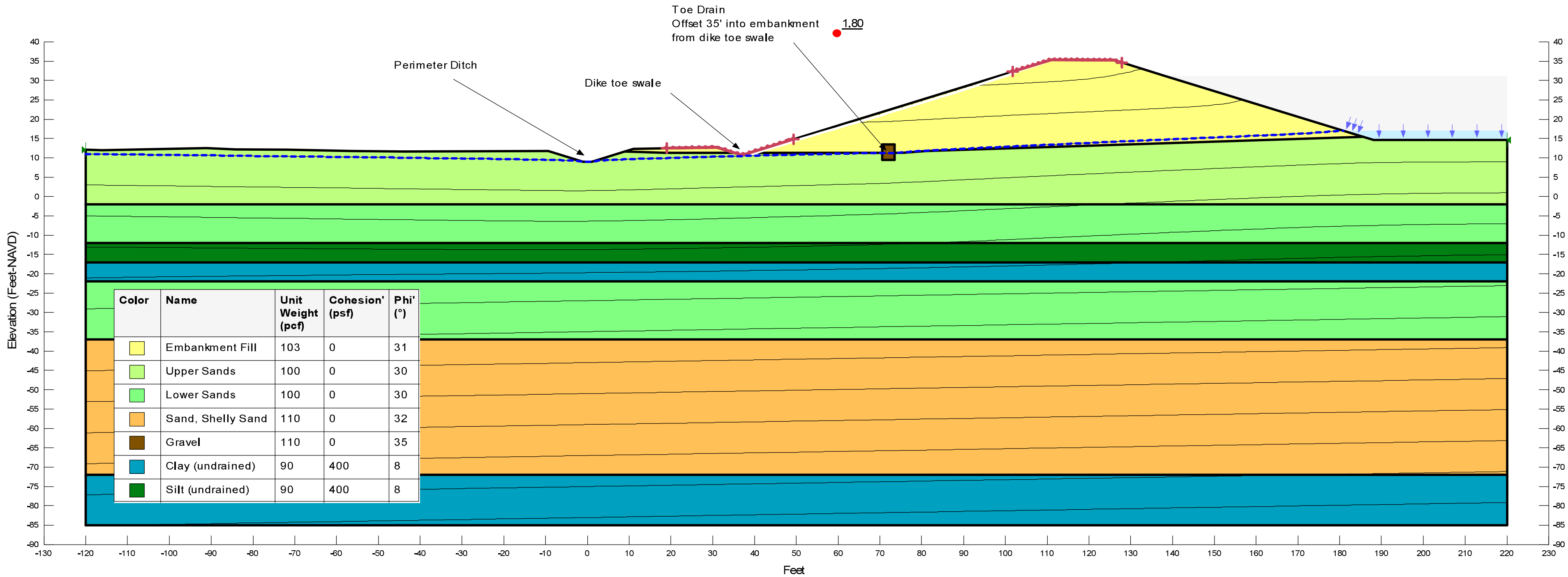


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8

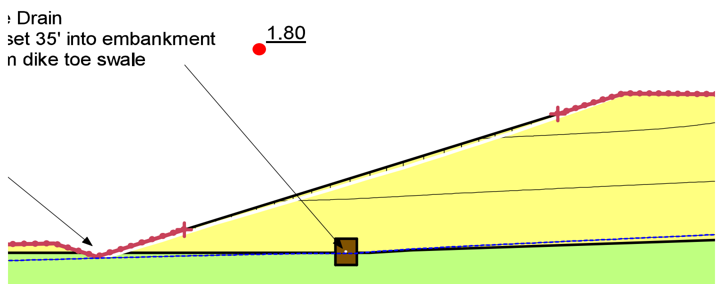
Drawn by: BL	Exhibit E-1
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stabilty Analysis

East Section
Station 37+70
Boring B-102
Pool = +17
Groundwater = +11



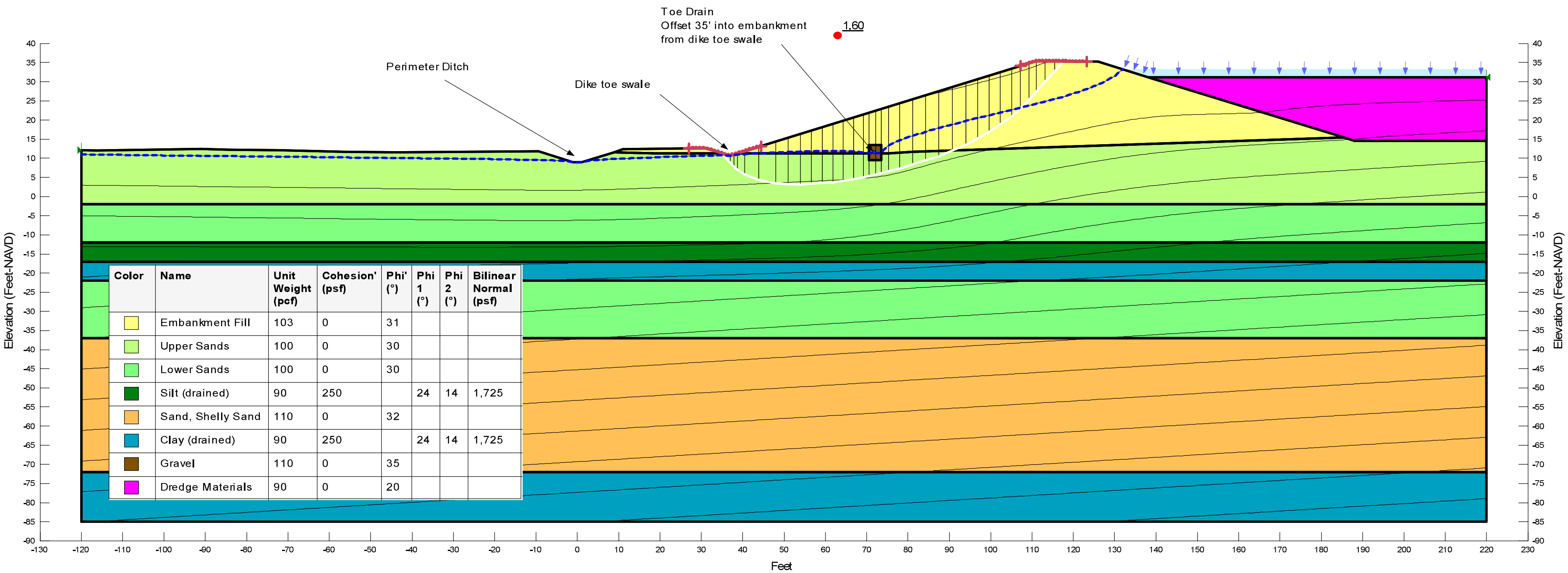
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8



Drawn by:	Exhibit E-2
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Stabilty Analysis

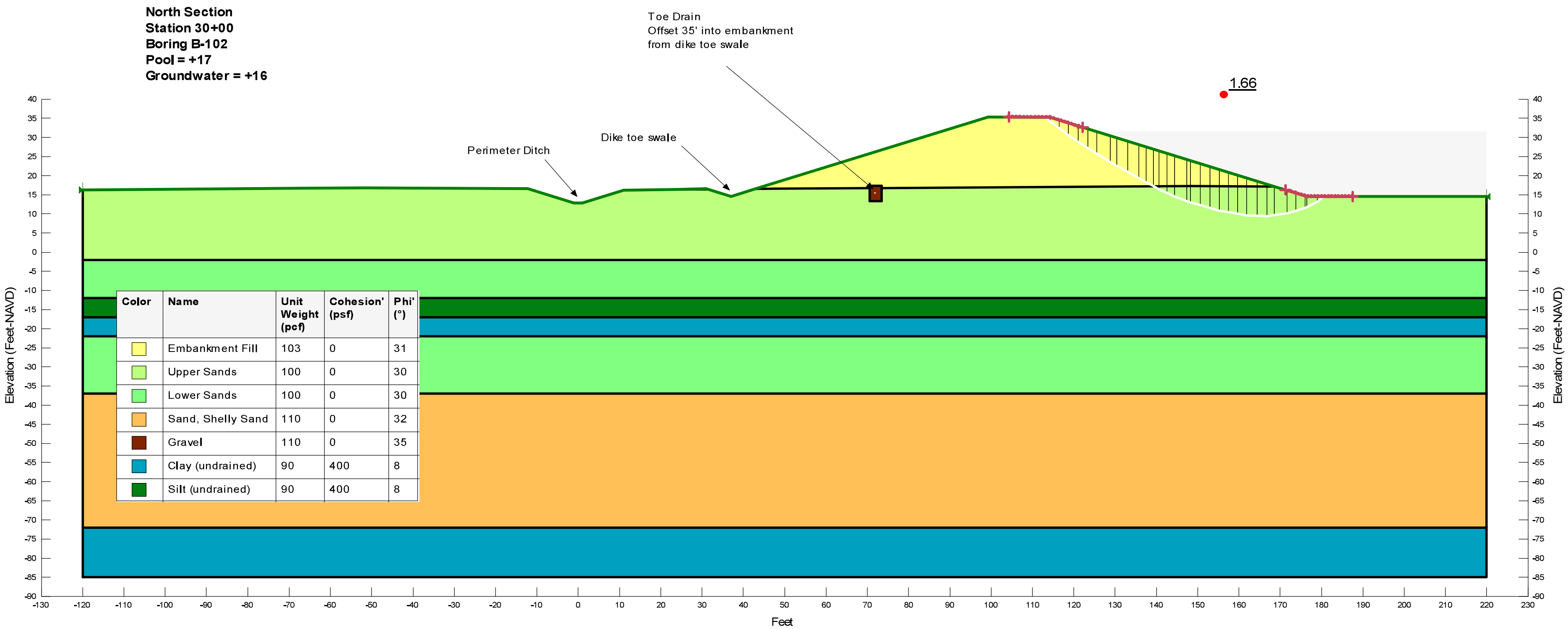
East Section
Station 37+70
Boring B-102
Pool = +33.25
Groundwater = +11



Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Materials	90	0	20			

Drawn by:	Exhibit E-3
BL	
Reviewed by:	Seepage/Stability Models - Steady State Seepage (SSS)
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

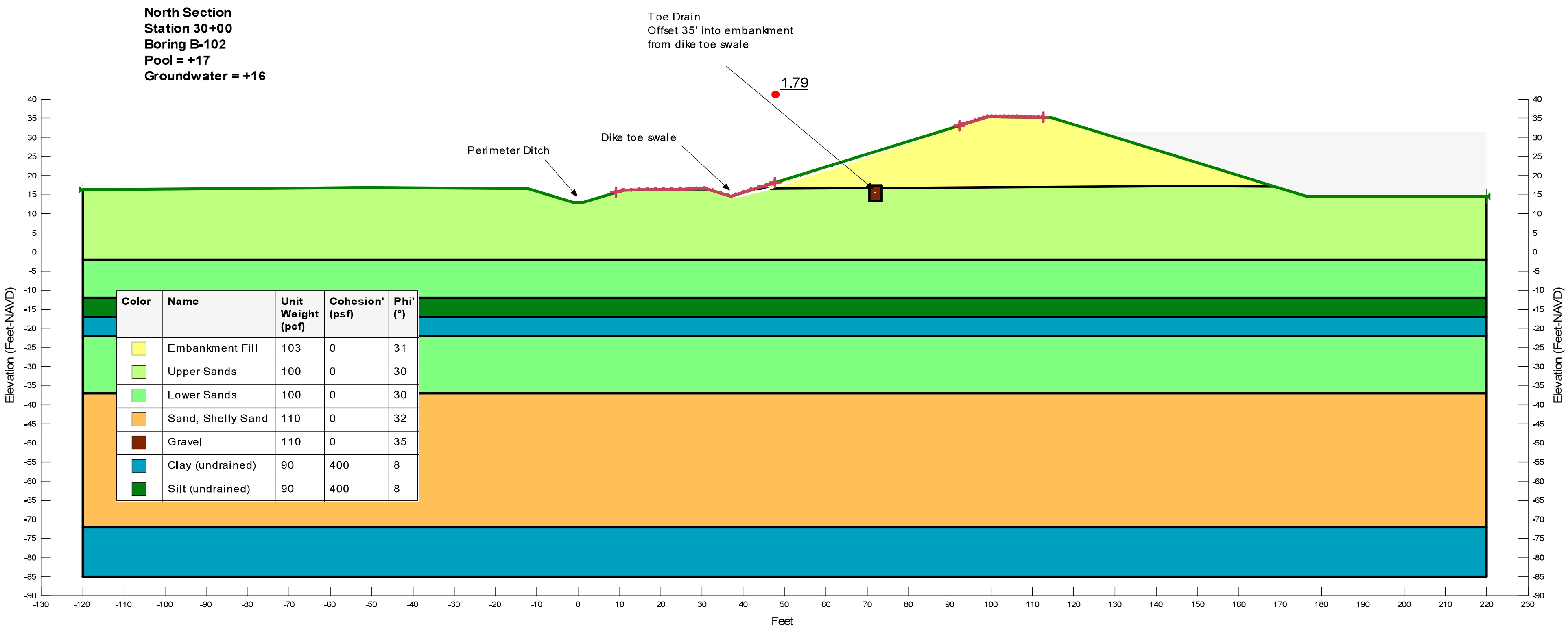
Stability Analysis



Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8

Drawn by: BL	Exhibit E-4
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

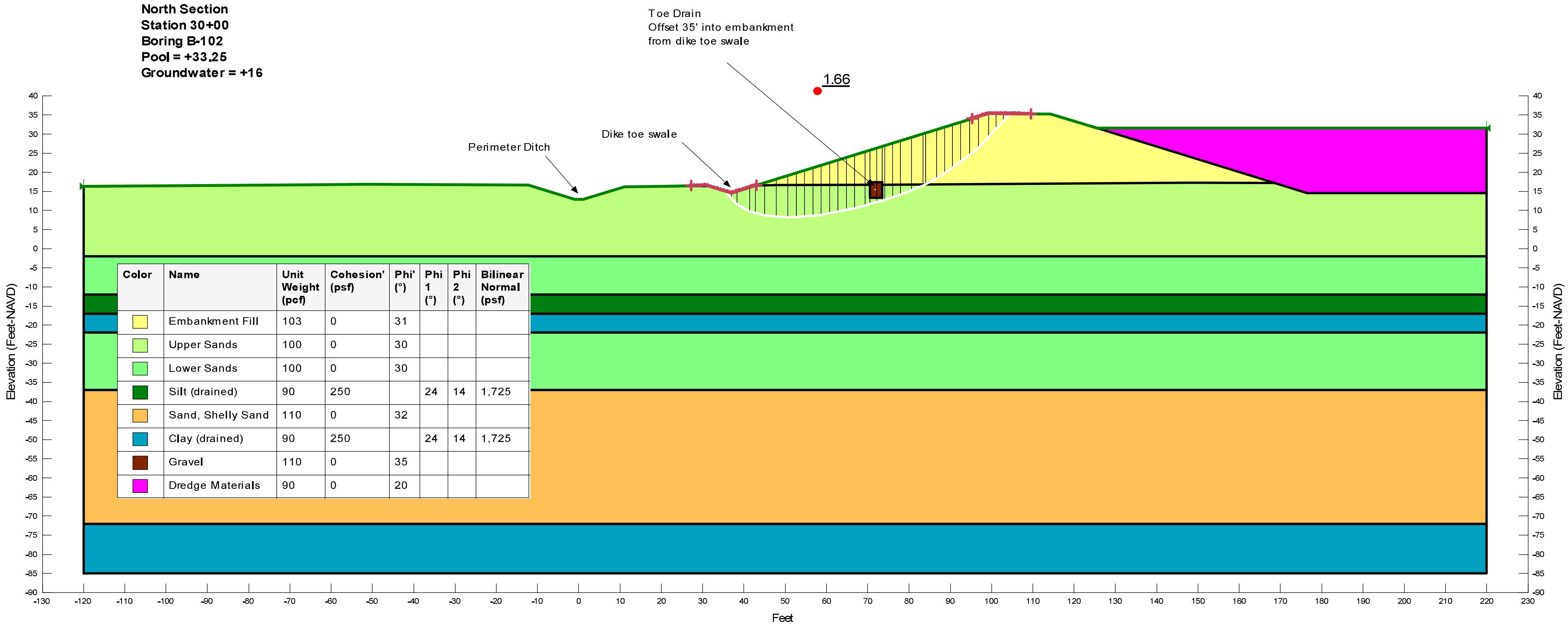
Stability Analysis



Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8

Drawn by:	Exhibit E-5
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Stability Analysis

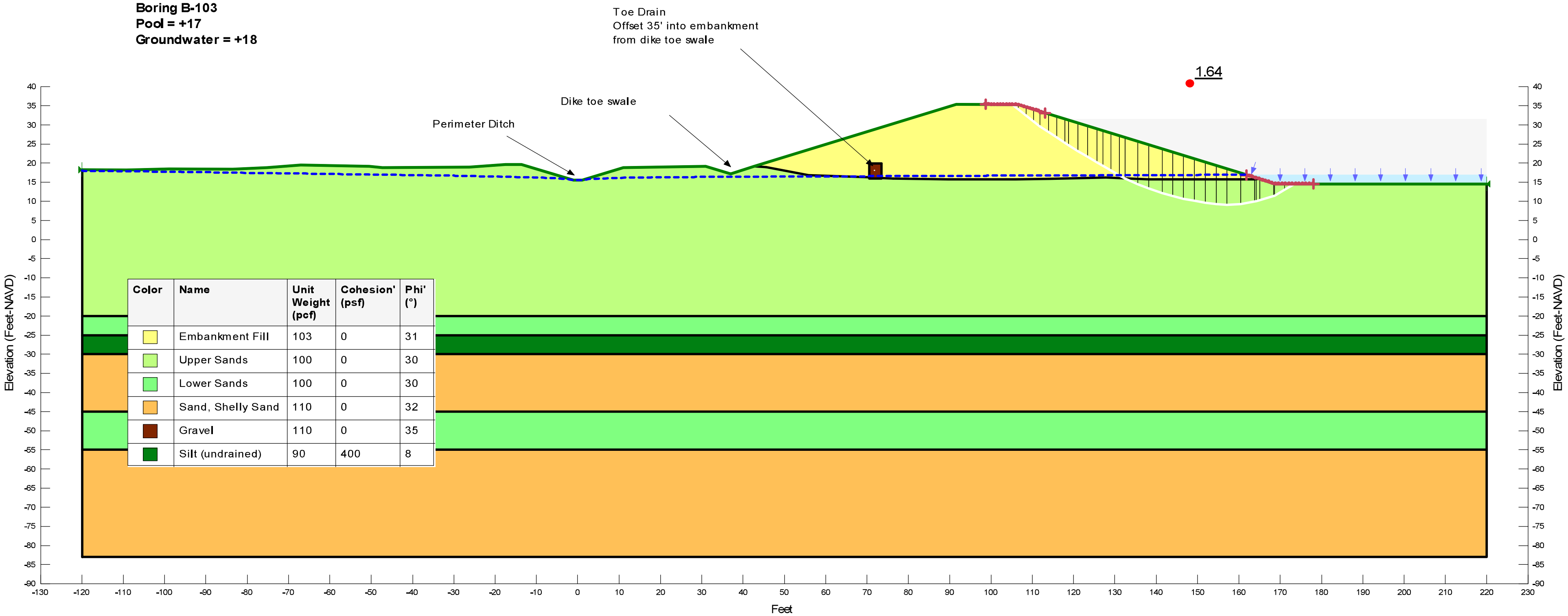


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Materials	90	0	20			

Drawn by: BL	Exhibit E-6
Reviewed by: DD	Seepage/Stability Models - Steady State Seepage (SSS)
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis

South Section
Station 53+00
Boring B-103
Pool = +17
Groundwater = +18

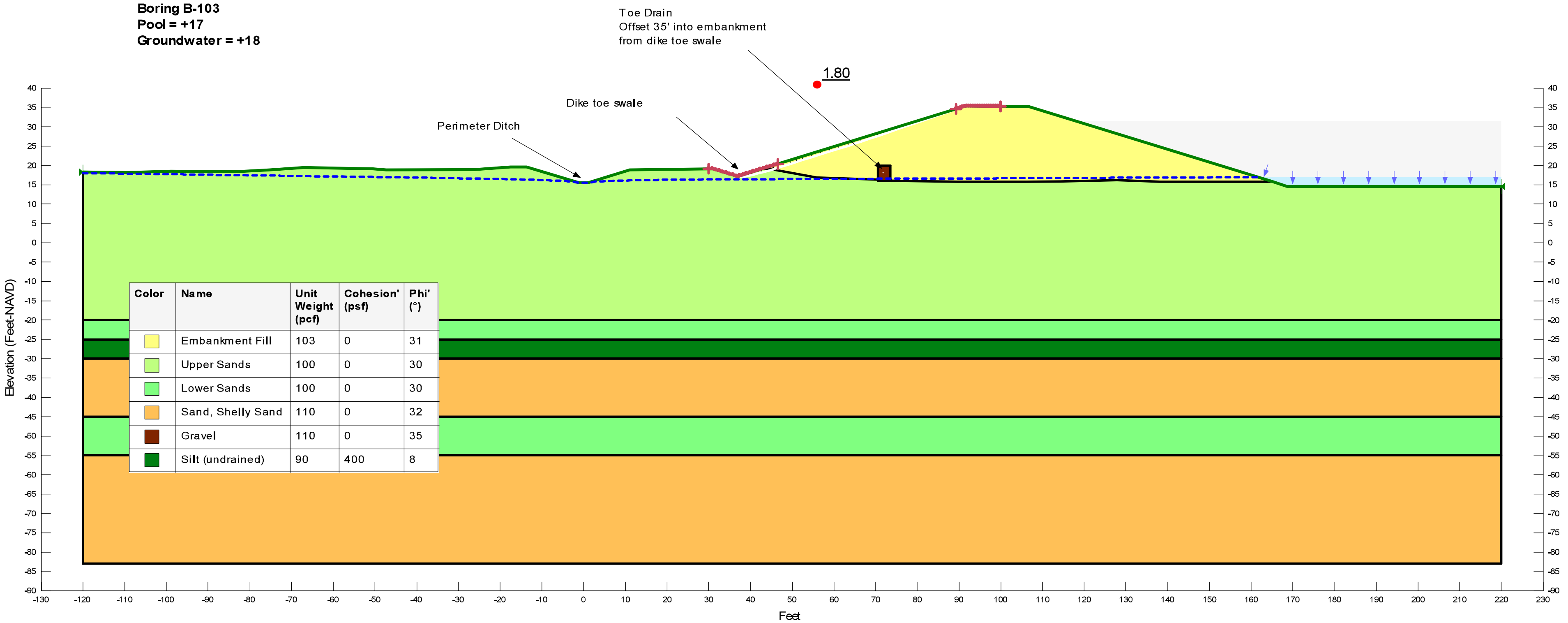


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Silt (undrained)	90	400	8

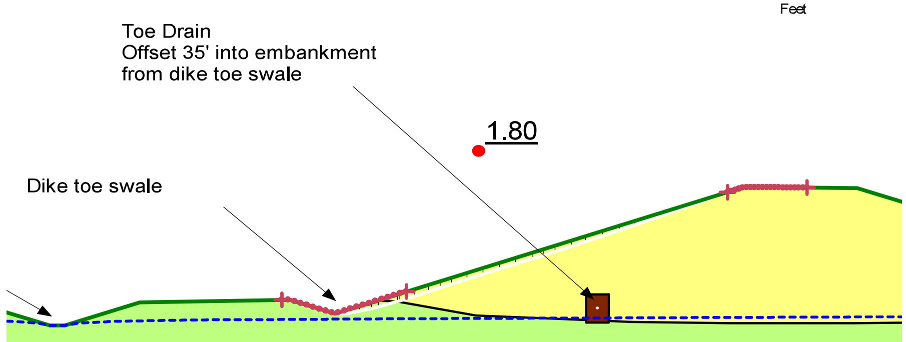
Drawn by: BL	Exhibit E-7
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis

South Section
Station 53+00
Boring B-103
Pool = +17
Groundwater = +18



Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Silt (undrained)	90	400	8

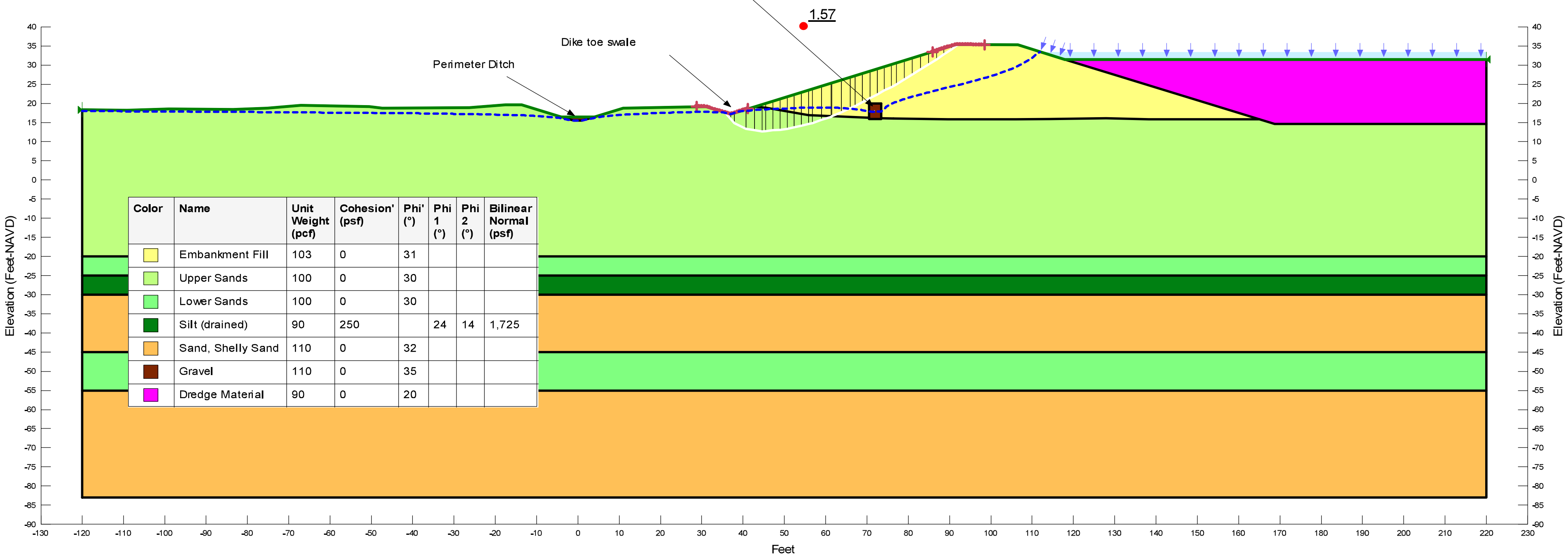


Drawn by:	Exhibit E-8
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	
Terracon Project No.	
HB155022	

Terracon

Stability Analysis

South Section
Station 53+00
Boring B-103
Pool = +33.25
Groundwater = +18

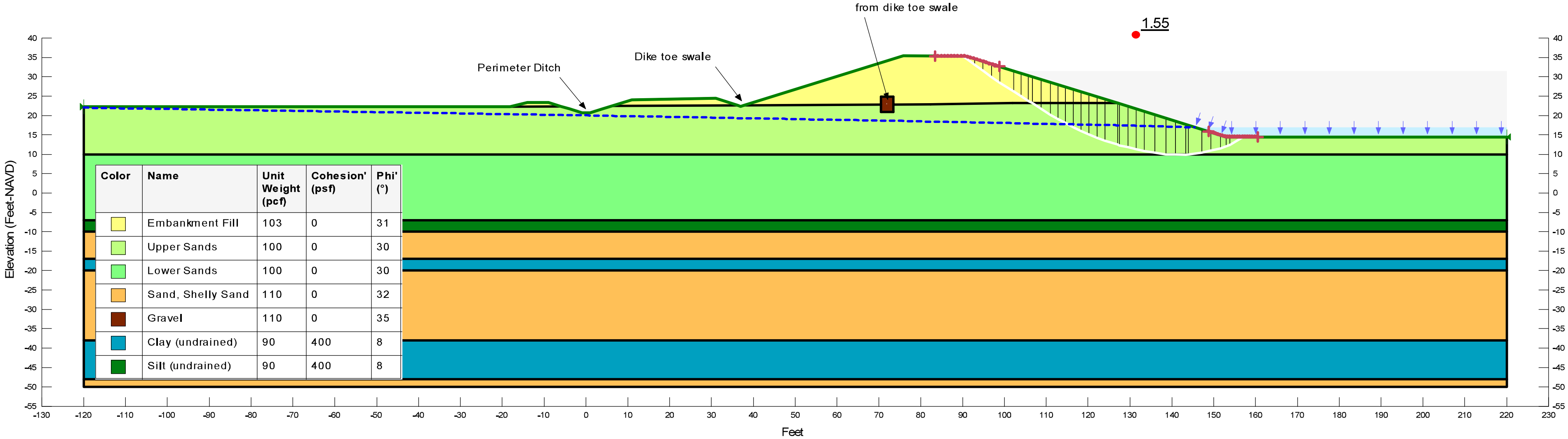


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Gravel	110	0	35			
	Dredge Material	90	0	20			

Drawn by: BL	Exhibit E-9
Reviewed by: DD	Seepage/Stability Models - Steady State Seepage (SSS)
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis

West Section
Station 10+00
Boring B-101
Pool = +17
Groundwater = +22

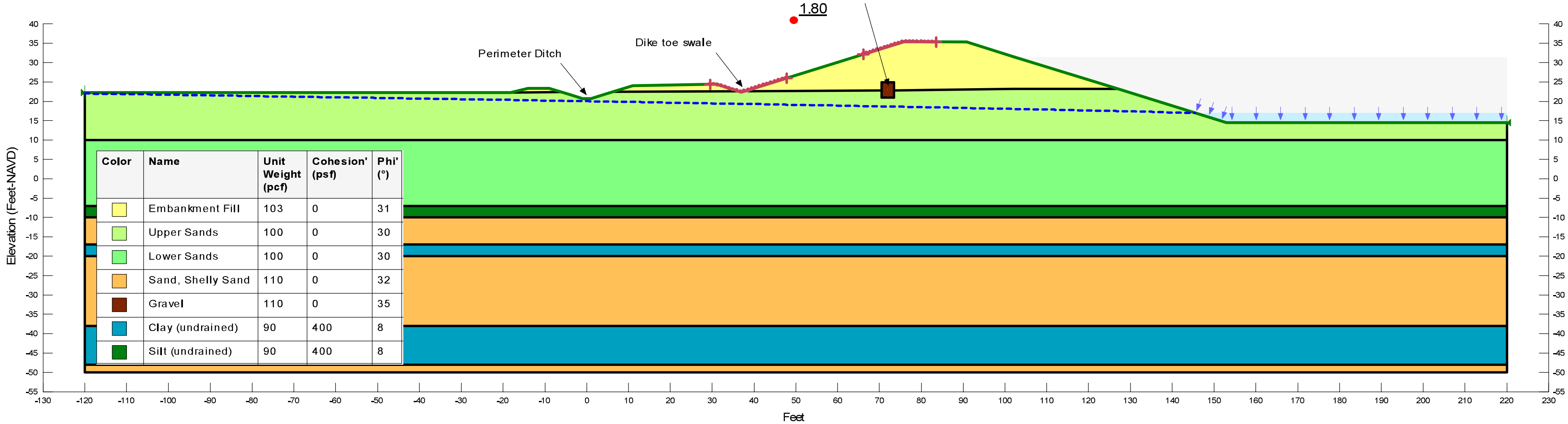


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8

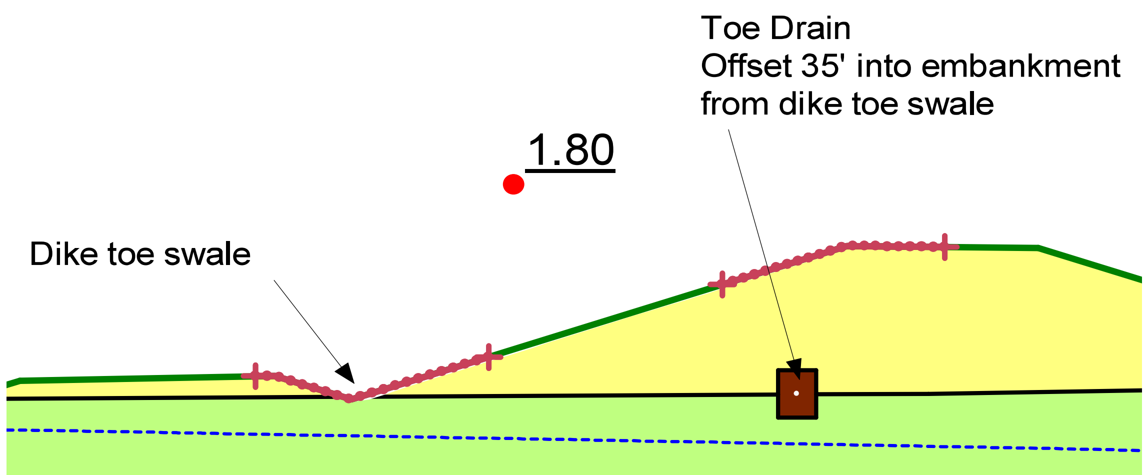
Drawn by:	Exhibit E-10
BL	Seepage/Stability Models - End of Construction
Reviewed by:	BV-24A DMMA
DD	Brevard County, Florida
Scale:	
As Shown	Terracon
Terracon Project No.	
HB155022	

Stability Analysis

West Section
Station 10+00
Boring B-101
Pool = +17
Groundwater = +22



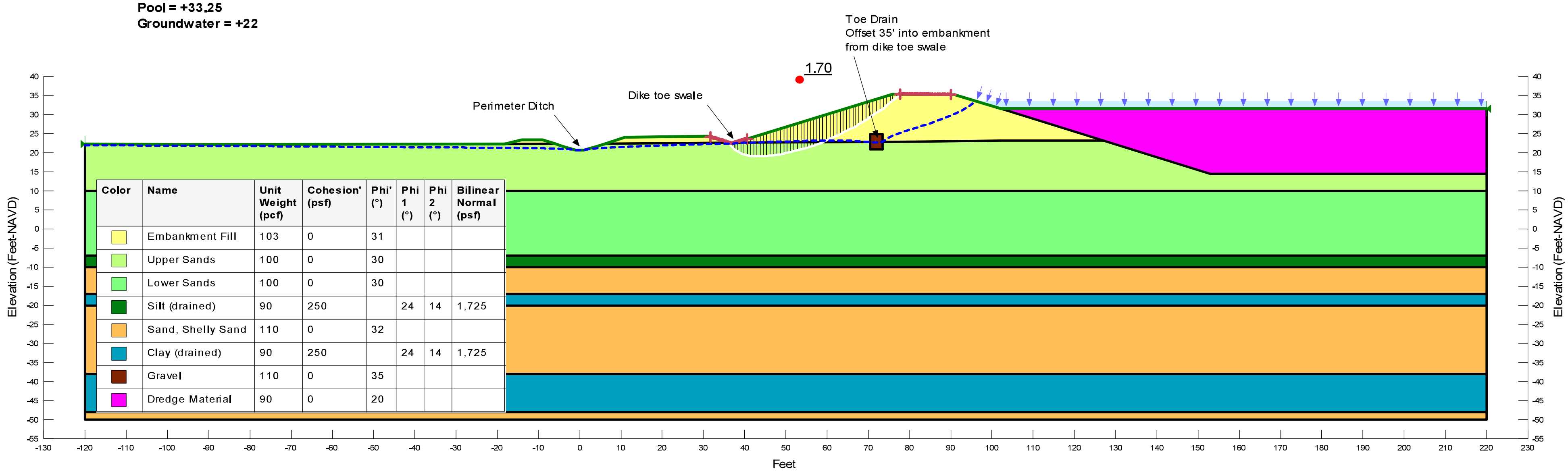
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8



Drawn by:	Exhibit E-11
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

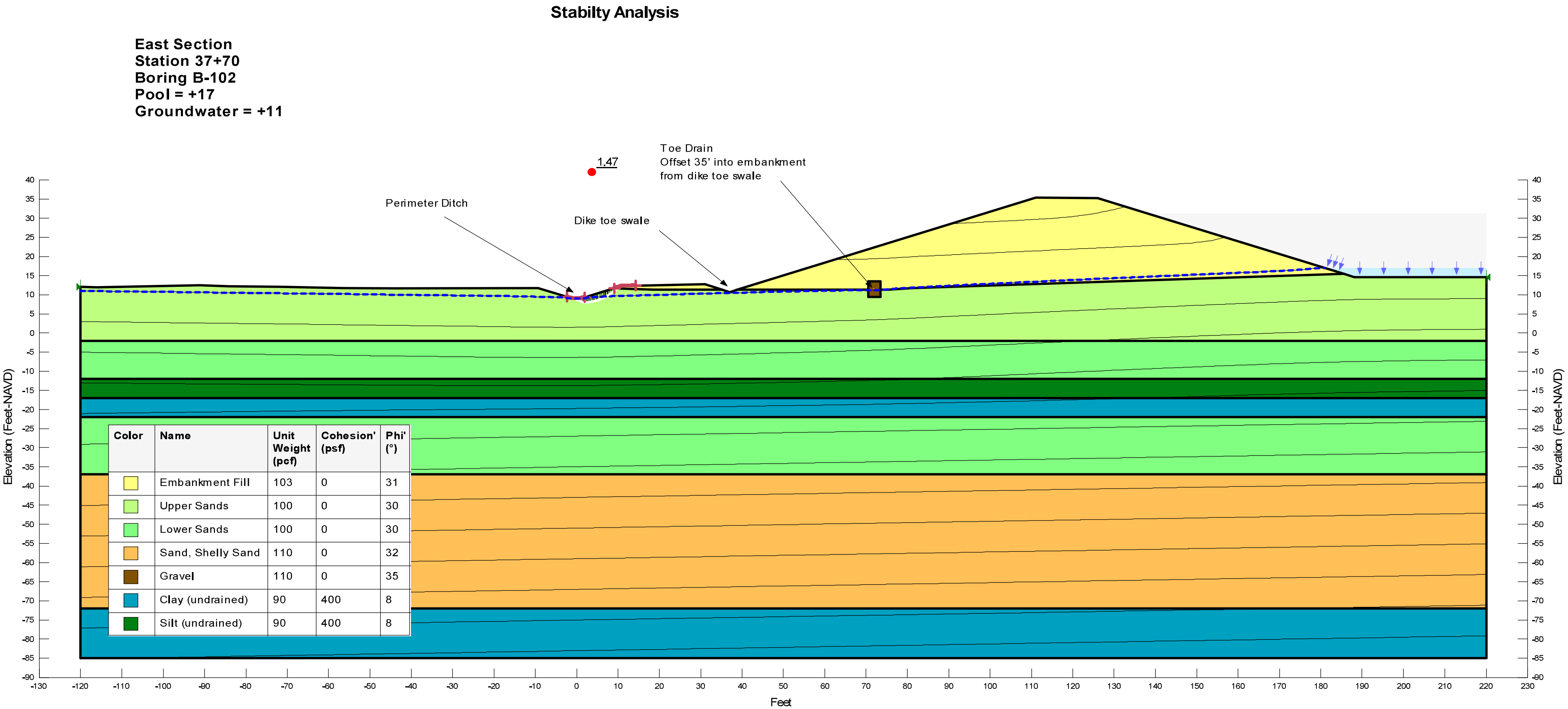
Stability Analysis

West Section
Station 10+00
Boring B-101
Pool = +33.25
Groundwater = +22

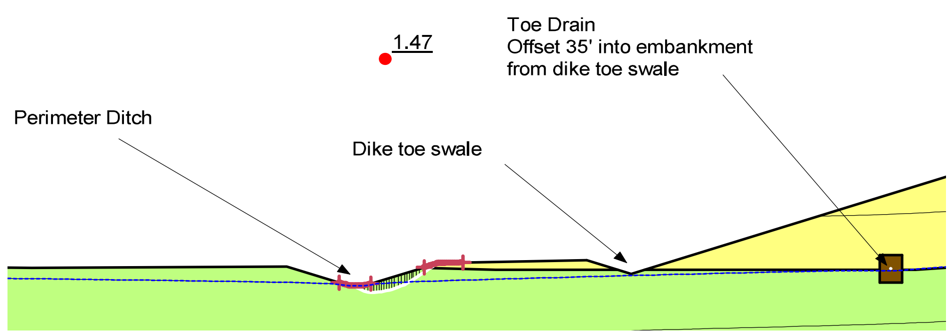


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Material	90	0	20			

Drawn by: BL	Exhibit E-12
Reviewed by: DD	Seepage/Stability Models - Steady State Seepage (SSS)
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon



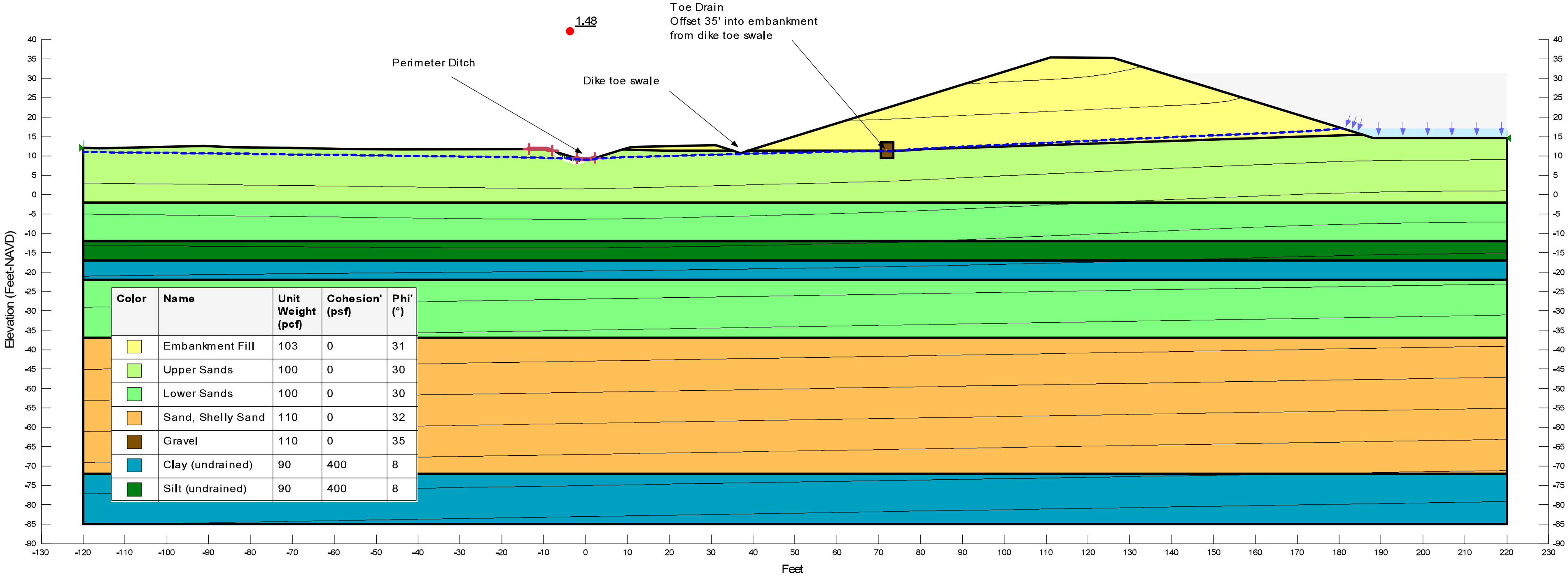
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8



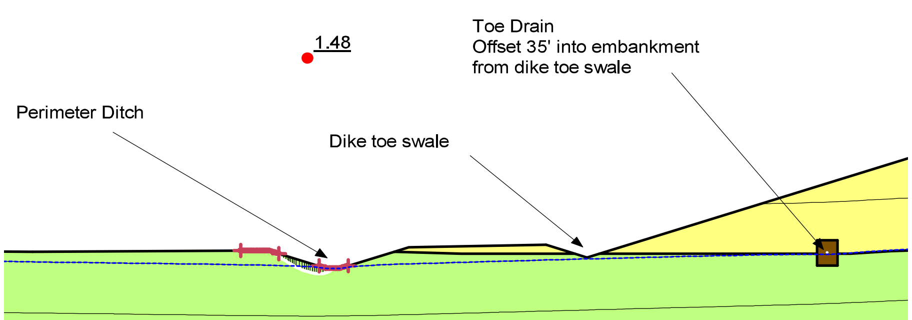
Drawn by:	Exhibit E-13
BL	Seepage/Stability Models - End of Construction
Reviewed by:	BV-24A DMMA
DD	Brevard County, Florida
Scale:	
As Shown	
Terracon Project No.	
HB155022	

Stabilty Analysis

East Section
Station 37+70
Boring B-102
Pool = +17
Groundwater = +11



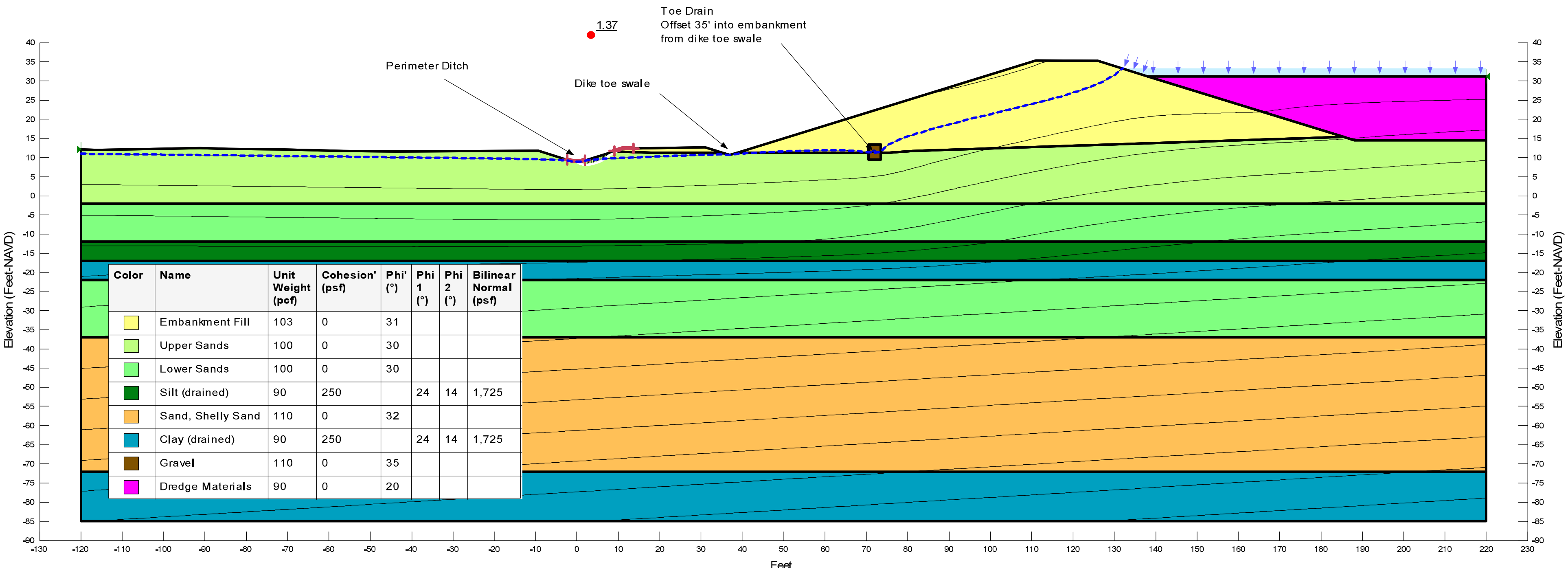
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8



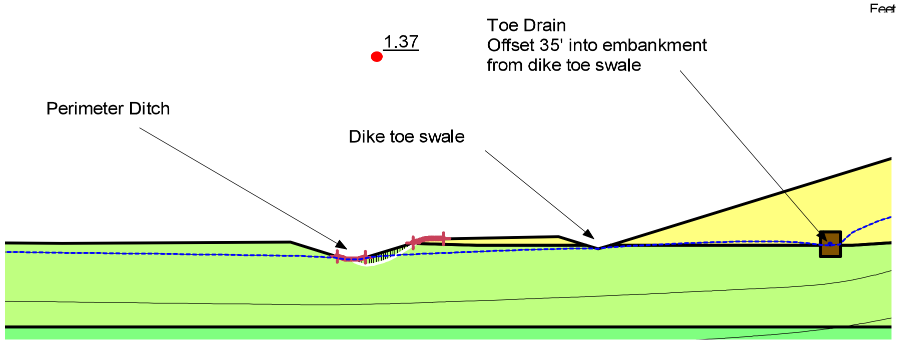
Drawn by: BL	Exhibit E-14
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stabilty Analysis

East Section
Station 37+70
Boring B-102
Pool = +33.25
Groundwater = +11



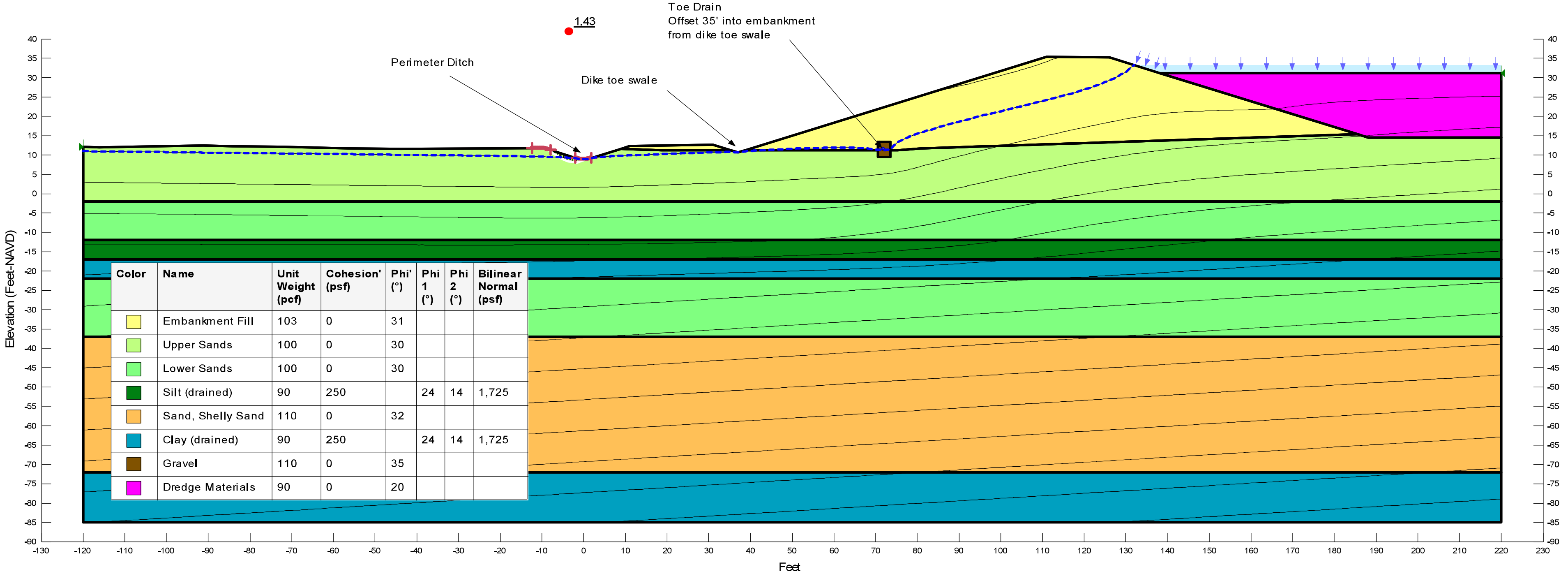
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Materials	90	0	20			



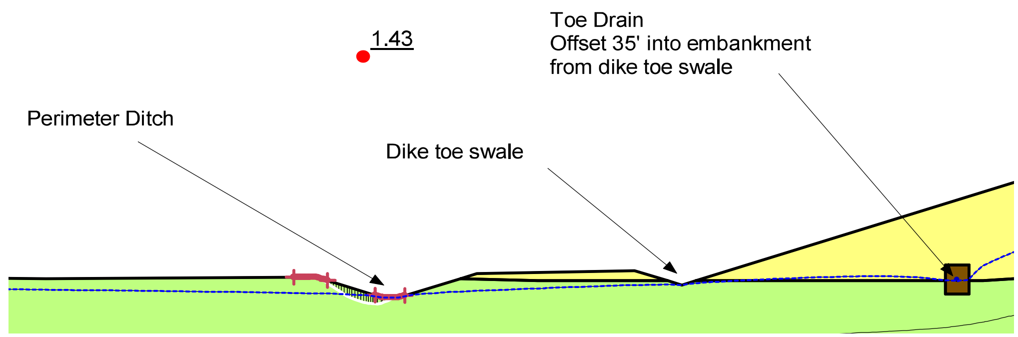
Drawn by:	Exhibit E-15
BL	
Reviewed by:	Seepage/Stability Models - Steady State Seepage (SSS)
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	
Terracon Project No.	
HB155022	

Stabilty Analysis

East Section
Station 37+70
Boring B-102
Pool = +33.25
Groundwater = +11



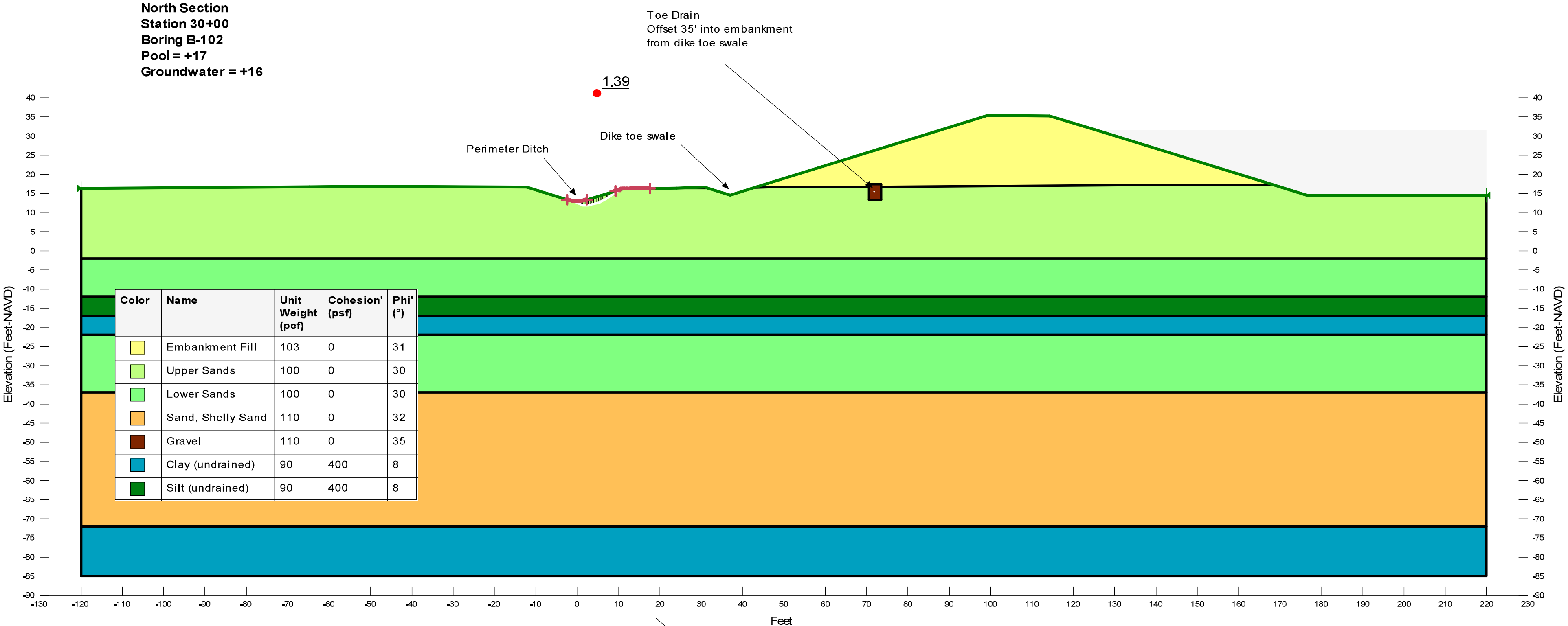
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Materials	90	0	20			



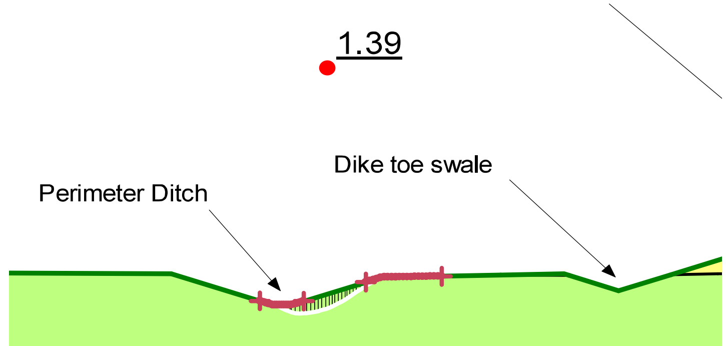
Drawn by:	Exhibit E-16
BL	
Reviewed by:	Seepage/Stability Models - Steady State Seepage (SSS)
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Stability Analysis

North Section
Station 30+00
Boring B-102
Pool = +17
Groundwater = +16

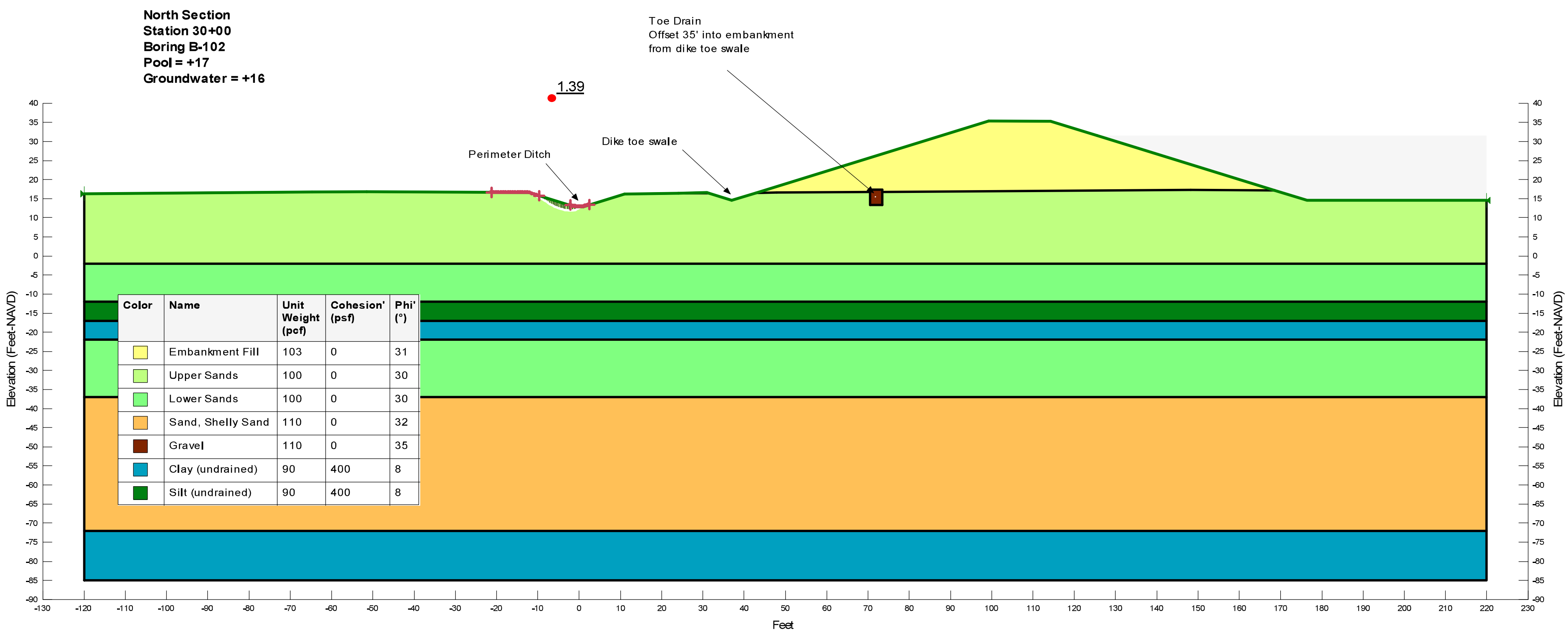


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8

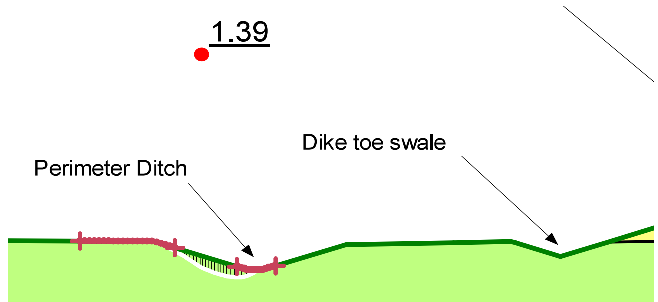


Drawn by: BL	Exhibit E-17
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis



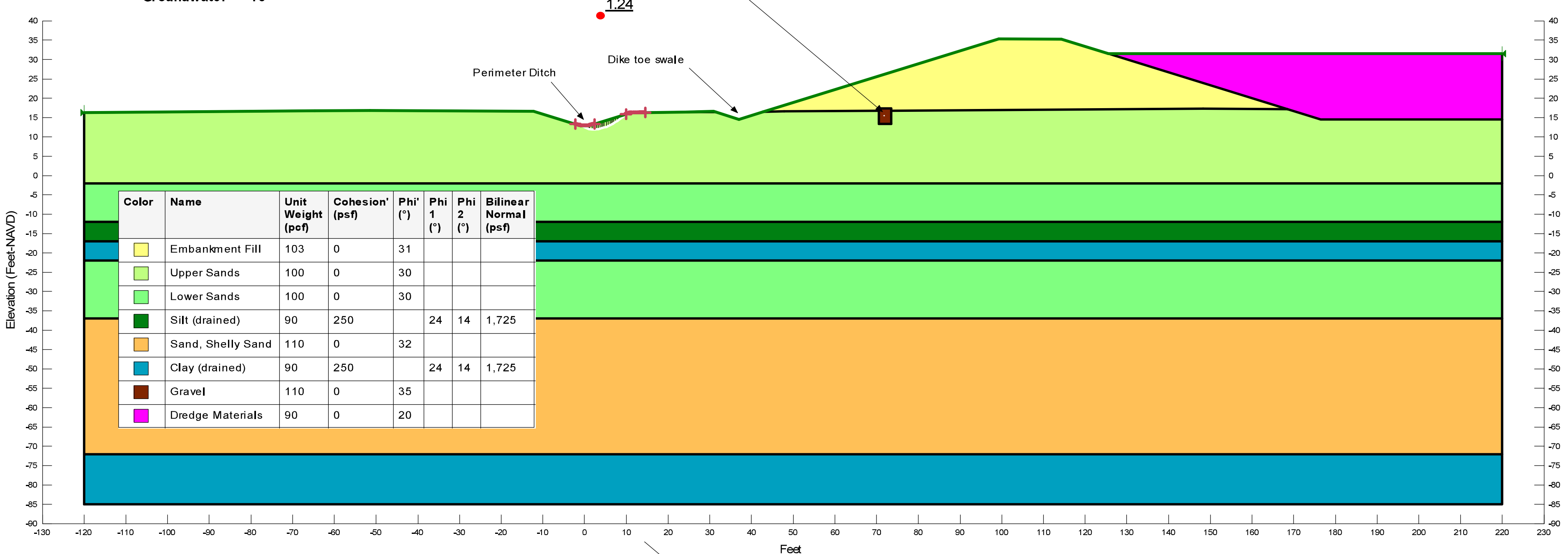
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8



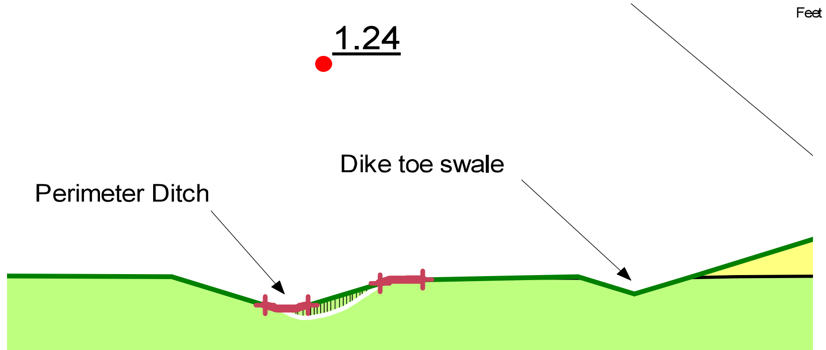
Drawn by:	Exhibit E-18
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Stability Analysis

North Section
Station 30+00
Boring B-102
Pool = +33.25
Groundwater = +16

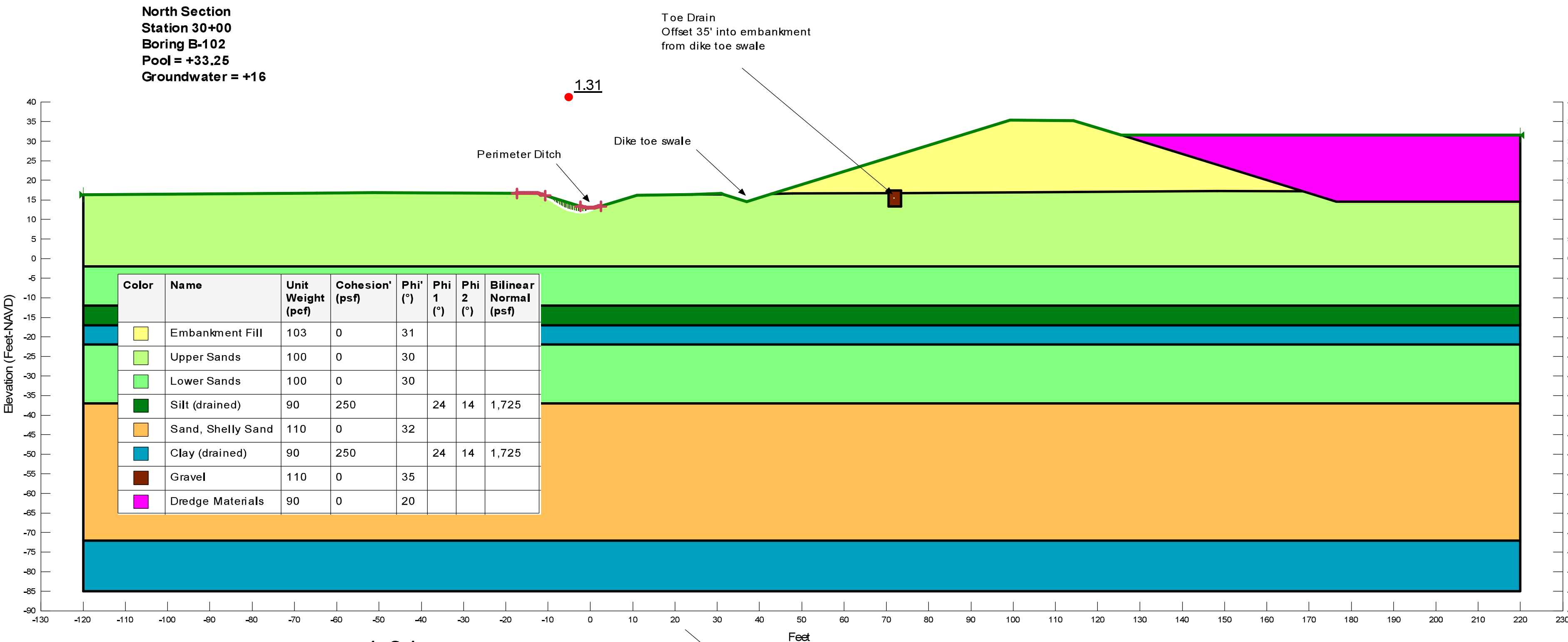


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Materials	90	0	20			

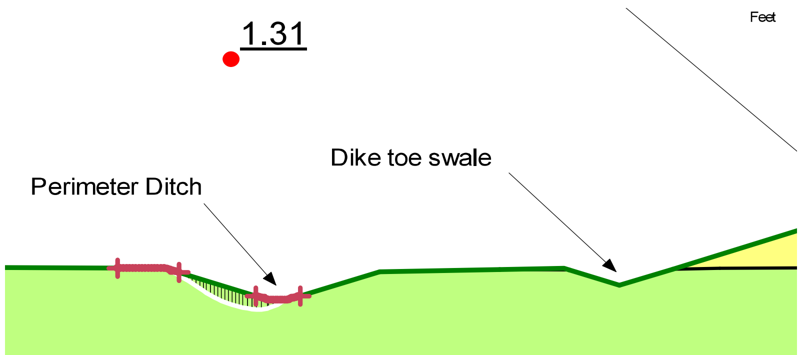


Drawn by:	Exhibit E-19
BL	
Reviewed by:	Seepage/Stability Models - Steady State Seepage (SSS)
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Stability Analysis



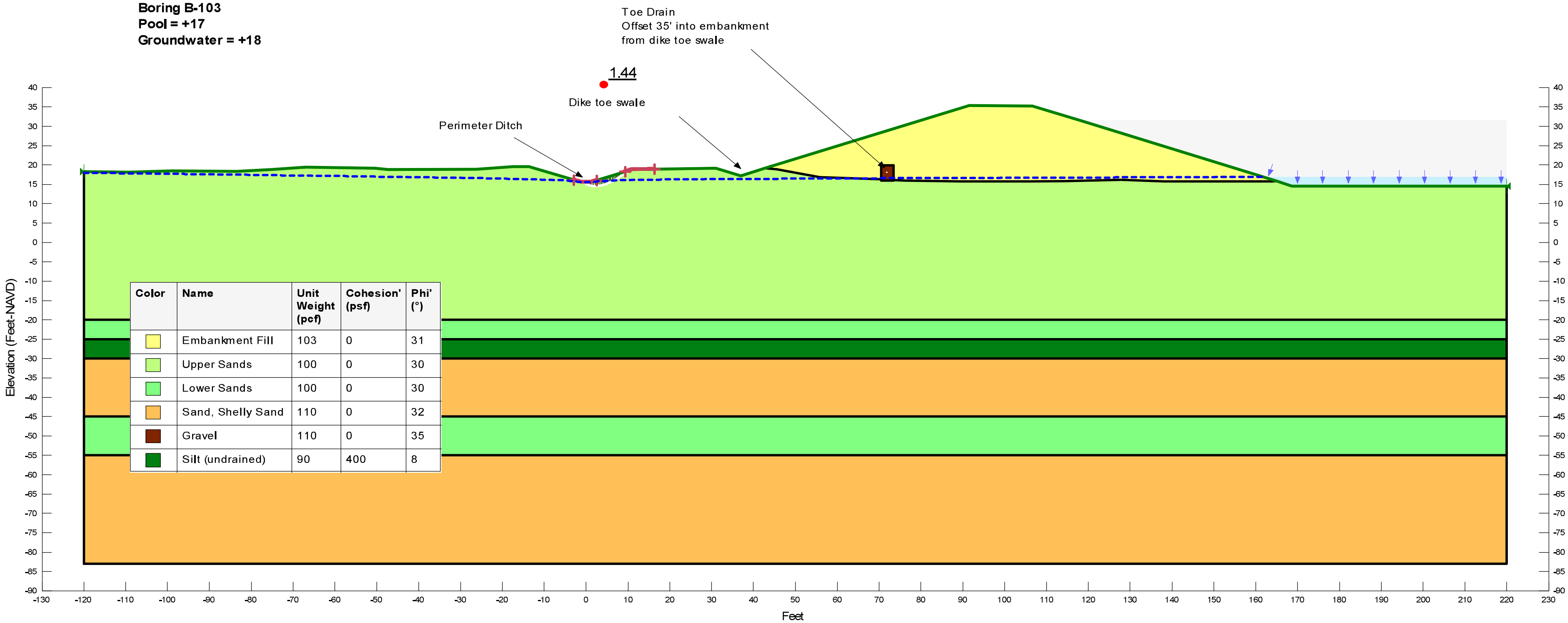
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Materials	90	0	20			



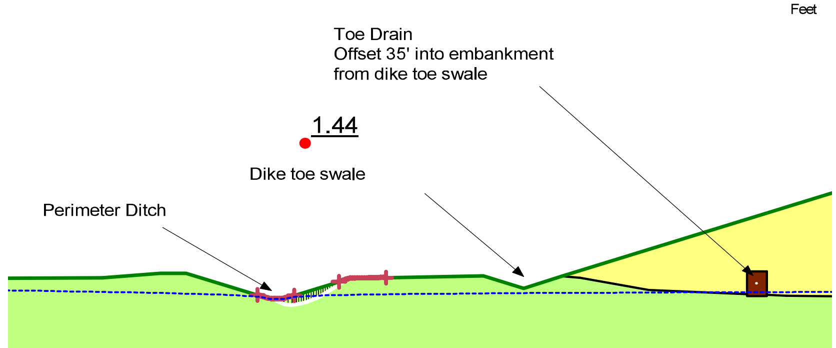
Drawn by: BL	**Exhibit E-20**
Reviewed by: DD	Seepage/Stability Models - Steady State Seepage (SSS)
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis

South Section
Station 53+00
Boring B-103
Pool = +17
Groundwater = +18



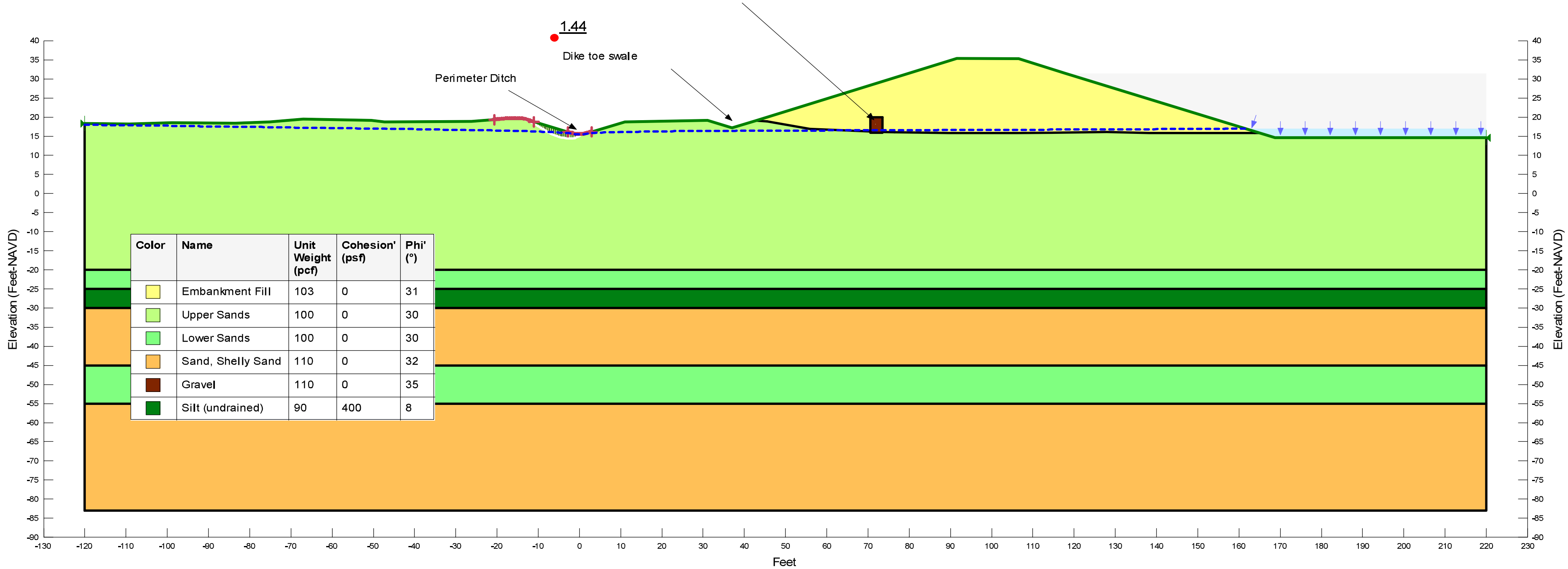
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Silt (undrained)	90	400	8



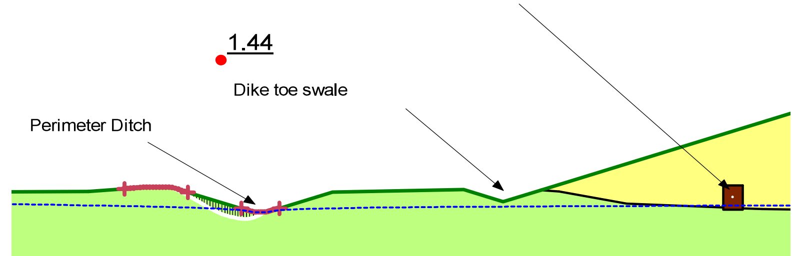
Drawn by:	Exhibit E-21
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Stability Analysis

South Section
Station 53+00
Boring B-103
Pool = +17
Groundwater = +18



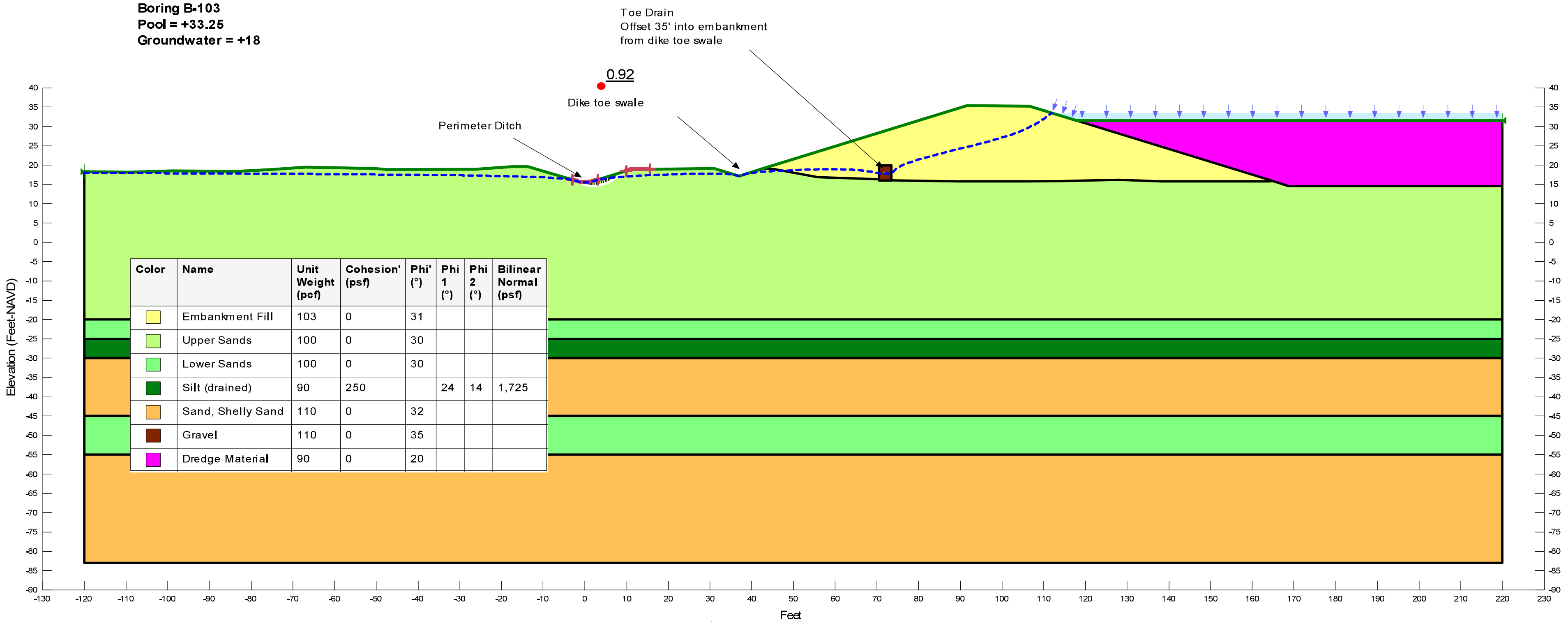
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Silt (undrained)	90	400	8



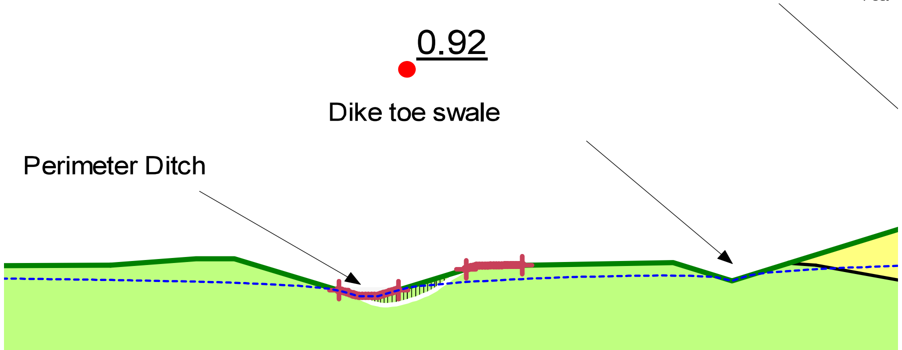
Drawn by:	Exhibit E-22
BL	Seepage/Stability Models - End of Construction
Reviewed by:	BV-24A DMMA
DD	Brevard County, Florida
Scale:	Terracon
As Shown	
Terracon Project No.	
HB155022	

Stability Analysis

South Section
Station 53+00
Boring B-103
Pool = +33.25
Groundwater = +18



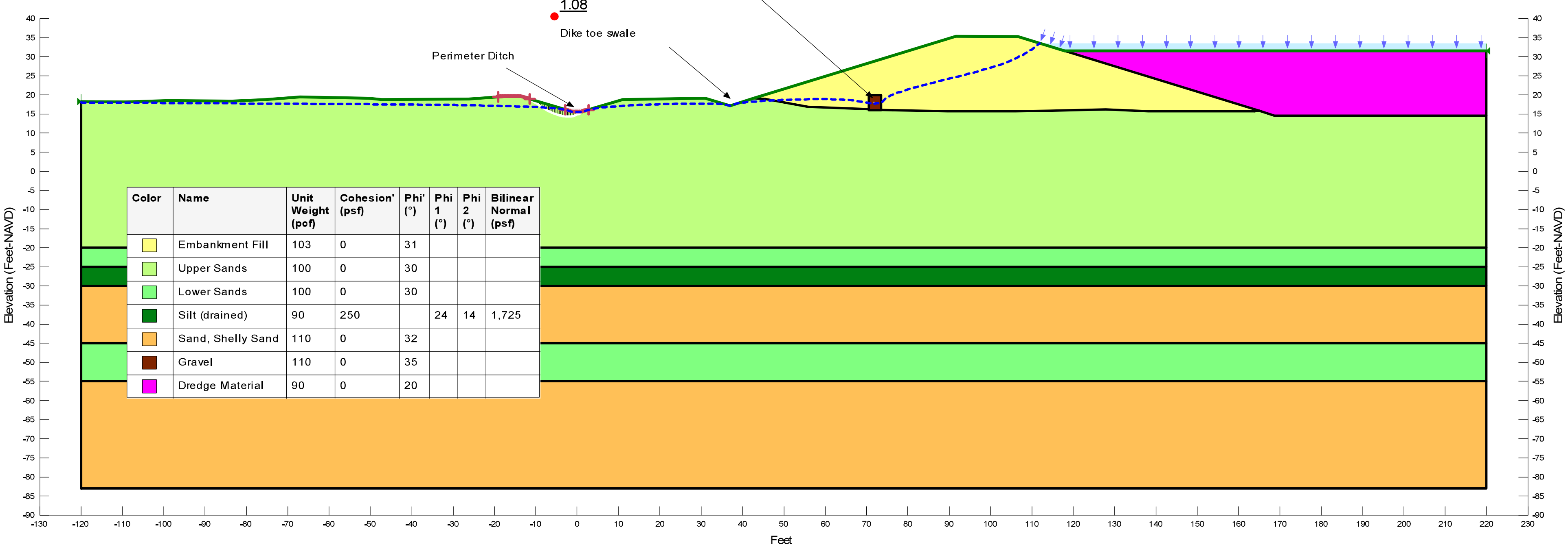
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Gravel	110	0	35			
	Dredge Material	90	0	20			



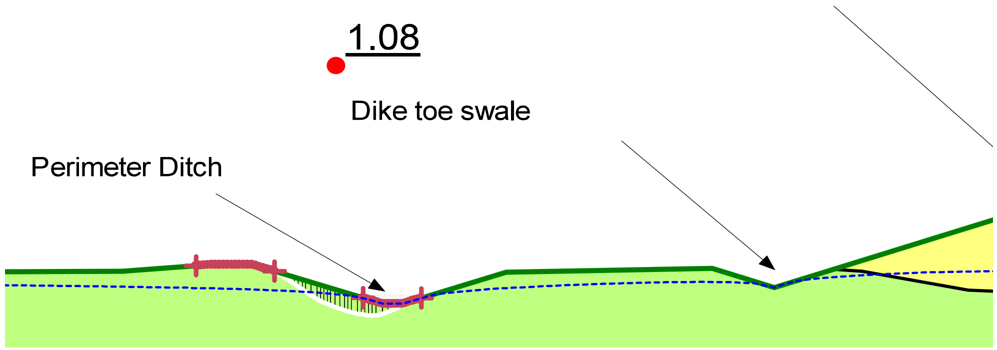
Drawn by:	Exhibit E-23
BL	Seepage/Stability Models - Steady State Seepage (SSS)
Reviewed by:	BV-24A DMMA
DD	Brevard County, Florida
Scale:	
As Shown	Terracon
Terracon Project No.	
HB155022	

Stability Analysis

South Section
Station 53+00
Boring B-103
Pool = +33.25
Groundwater = +18

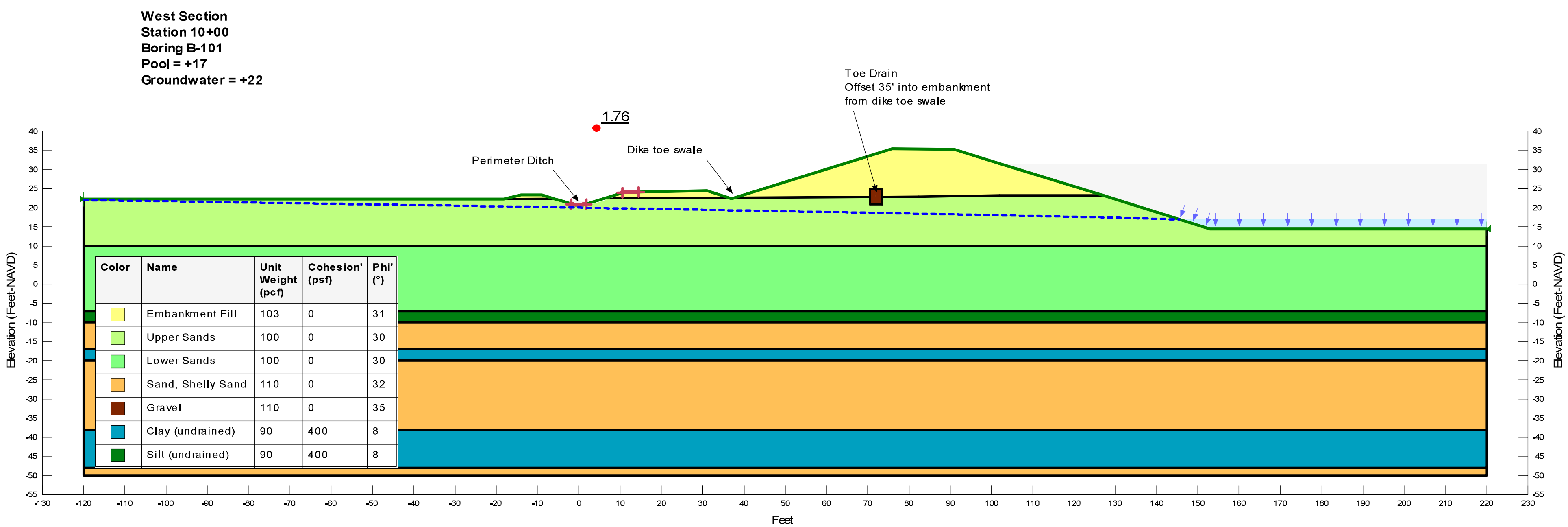


Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Gravel	110	0	35			
	Dredge Material	90	0	20			

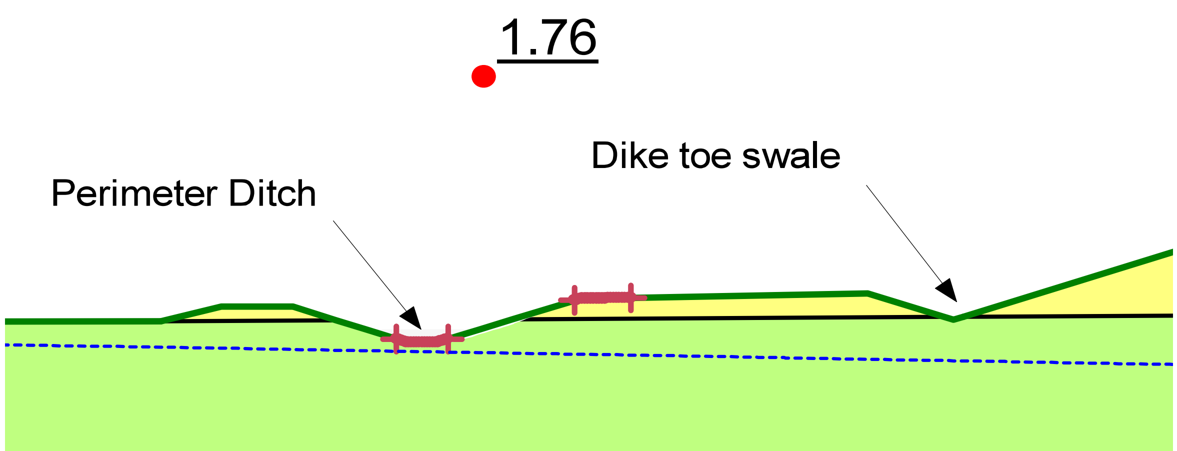


Drawn by:	**Exhibit E-24**
BL	Seepage/Stability Models - Steady State Seepage (SSS)
Reviewed by:	BV-24A DMMA
DD	Brevard County, Florida
Scale:	Terracon
As Shown	
Terracon Project No.	
HB155022	

Stability Analysis



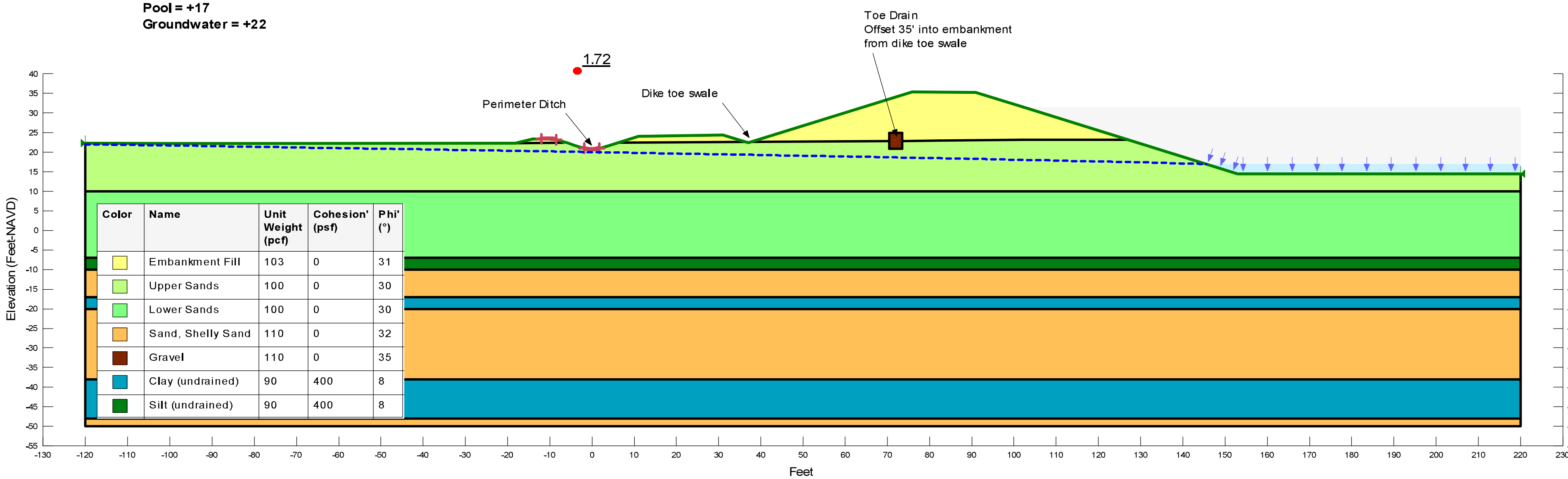
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8



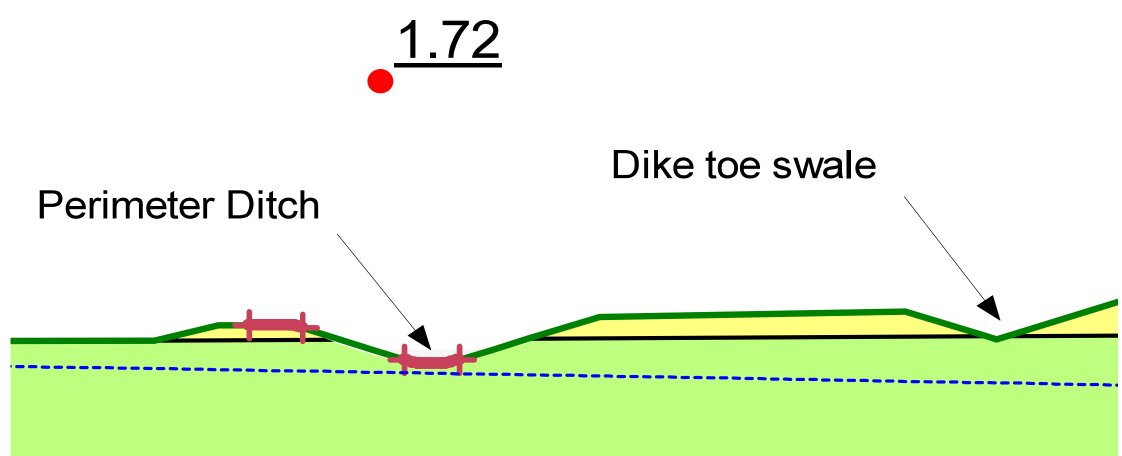
Drawn by: BL	Exhibit E-25
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis

West Section
Station 10+00
Boring B-101
Pool = +17
Groundwater = +22



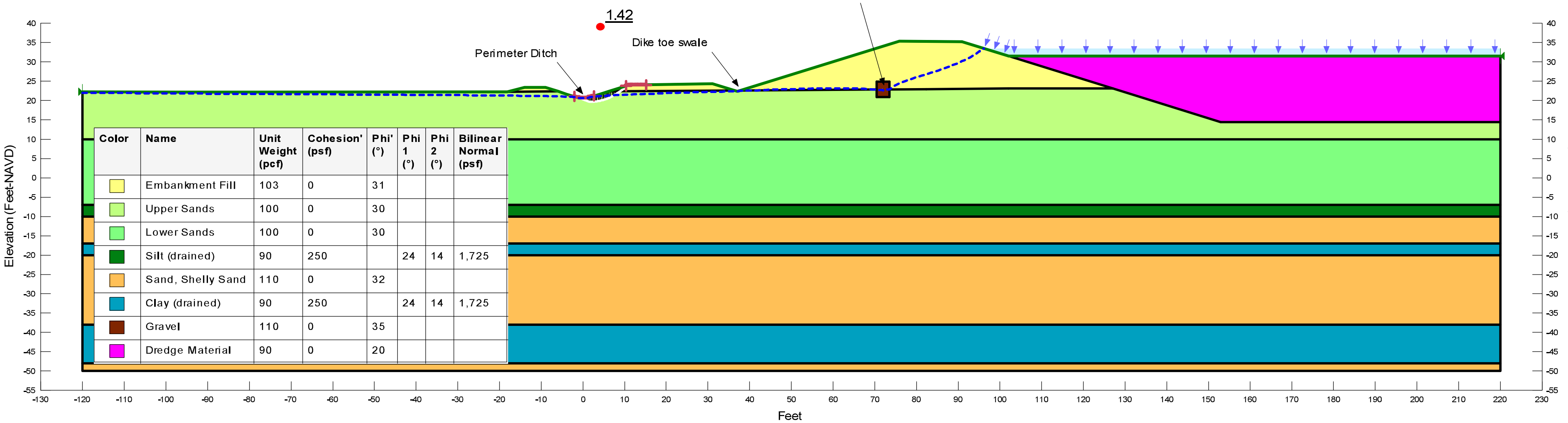
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill	103	0	31
	Upper Sands	100	0	30
	Lower Sands	100	0	30
	Sand, Shelly Sand	110	0	32
	Gravel	110	0	35
	Clay (undrained)	90	400	8
	Silt (undrained)	90	400	8



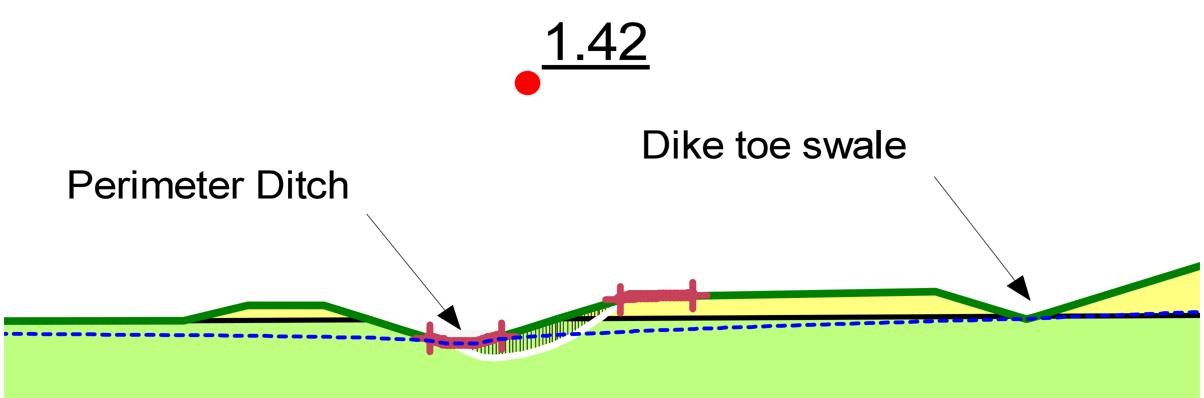
Drawn by: BL	Exhibit E-26
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis

West Section
Station 10+00
Boring B-101
Pool = +33.25
Groundwater = +22



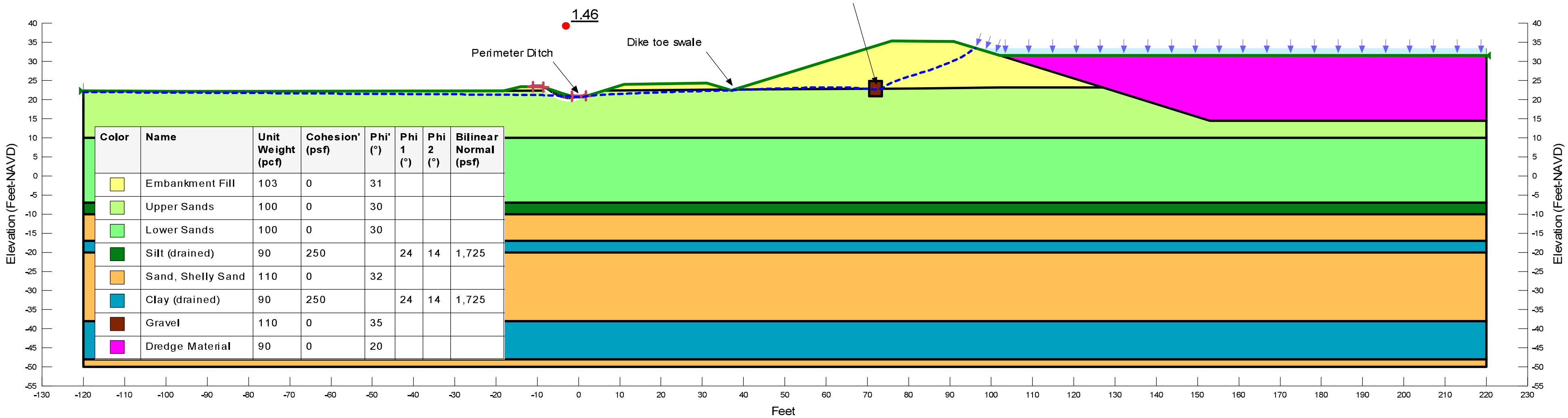
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Material	90	0	20			



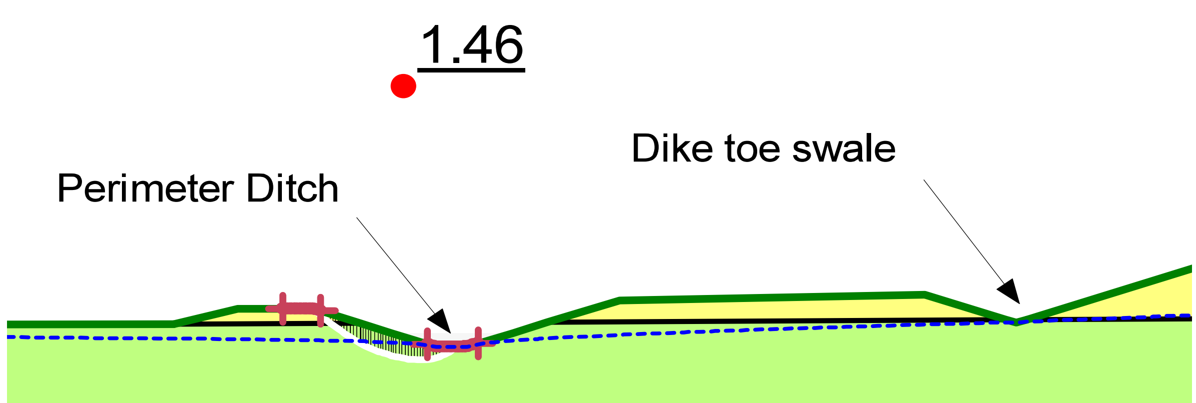
Drawn by: BL	Exhibit E-27
Reviewed by: DD	Seepage/Stability Models - Steady State Seepage (SSS)
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Stability Analysis

West Section
Station 10+00
Boring B-101
Pool = +33.25
Groundwater = +22



Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)
	Embankment Fill	103	0	31			
	Upper Sands	100	0	30			
	Lower Sands	100	0	30			
	Silt (drained)	90	250		24	14	1,725
	Sand, Shelly Sand	110	0	32			
	Clay (drained)	90	250		24	14	1,725
	Gravel	110	0	35			
	Dredge Material	90	0	20			

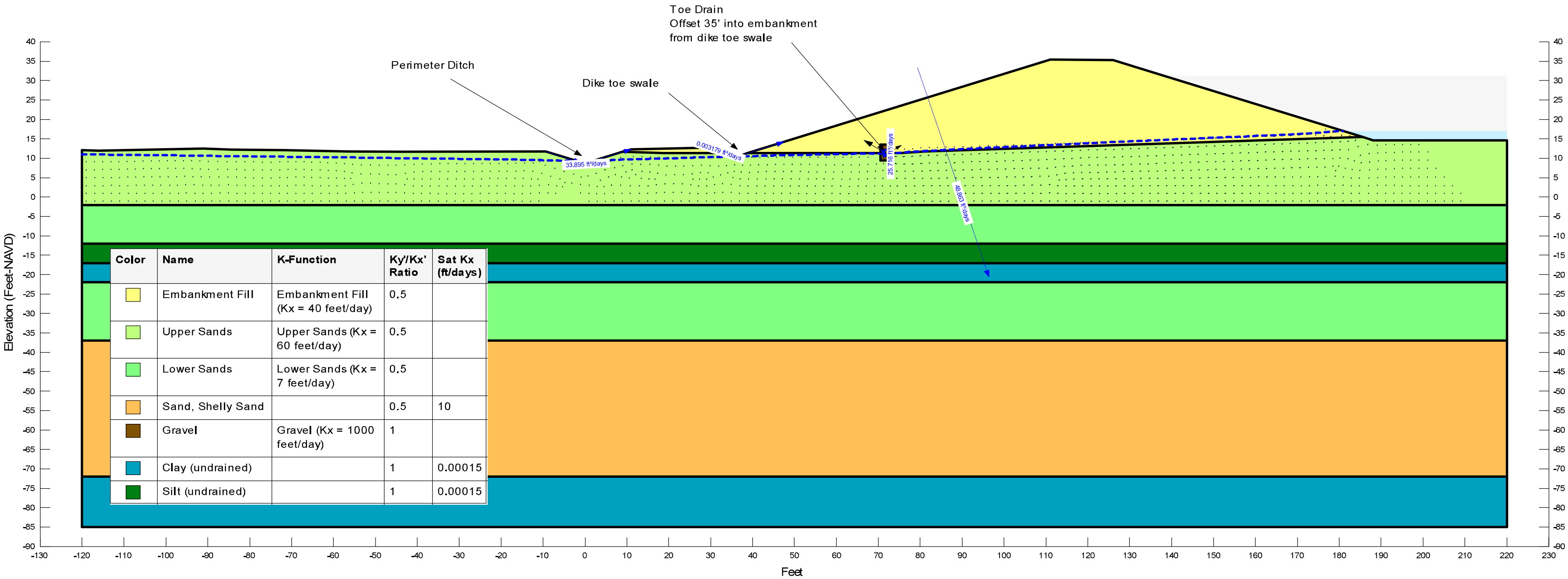


Drawn by: BL	Exhibit E-28
Reviewed by: DD	Seepage/Stability Models - Steady State Seepage (SSS)
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

APPENDIX F
SEEPAGE ANALYSIS RESULTS

Seepage Analysis

East Section
Station 37+70
Boring B-102
Pool = +17
Groundwater = +11

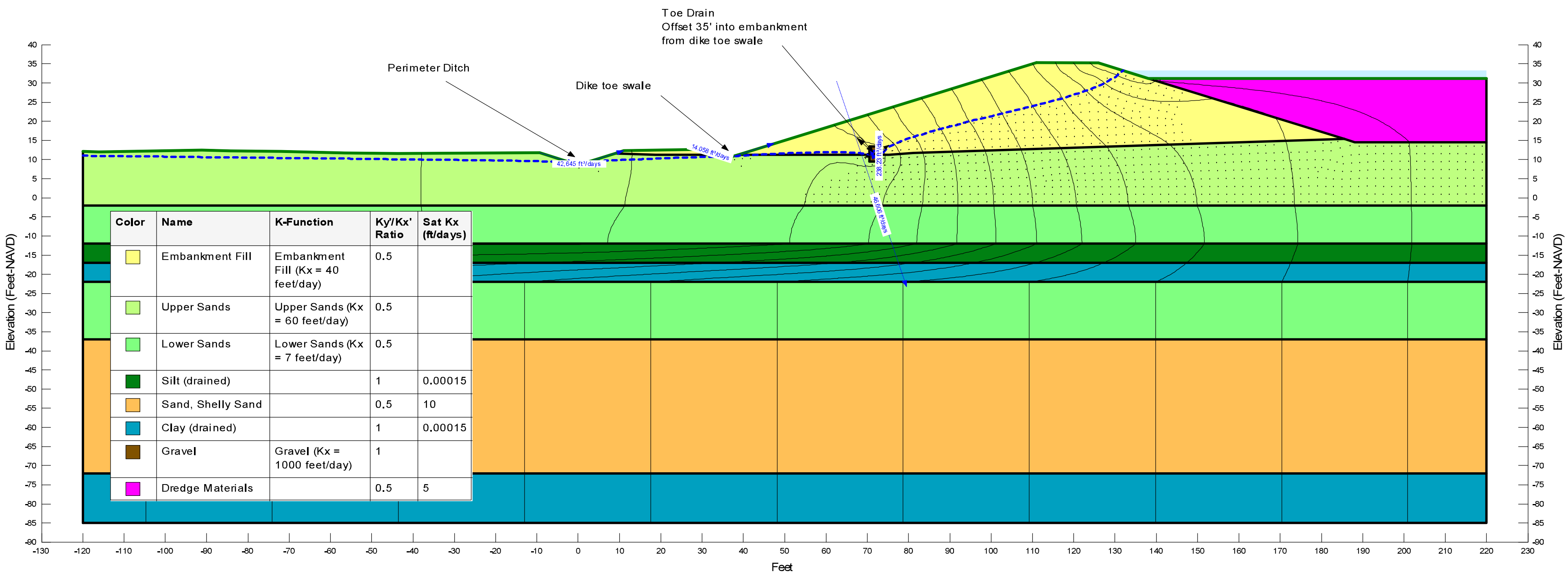


Color	Name	K-Function	Ky'/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 feet/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 feet/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 feet/day)	0.5	
	Sand, Shelly Sand		0.5	10
	Gravel	Gravel (Kx = 1000 feet/day)	1	
	Clay (undrained)		1	0.00015
	Silt (undrained)		1	0.00015

Drawn by:	Exhibit F-1
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Seepage Analysis

East Section
Station 37+70
Boring B-102
Pool = +33.25
Groundwater = +11



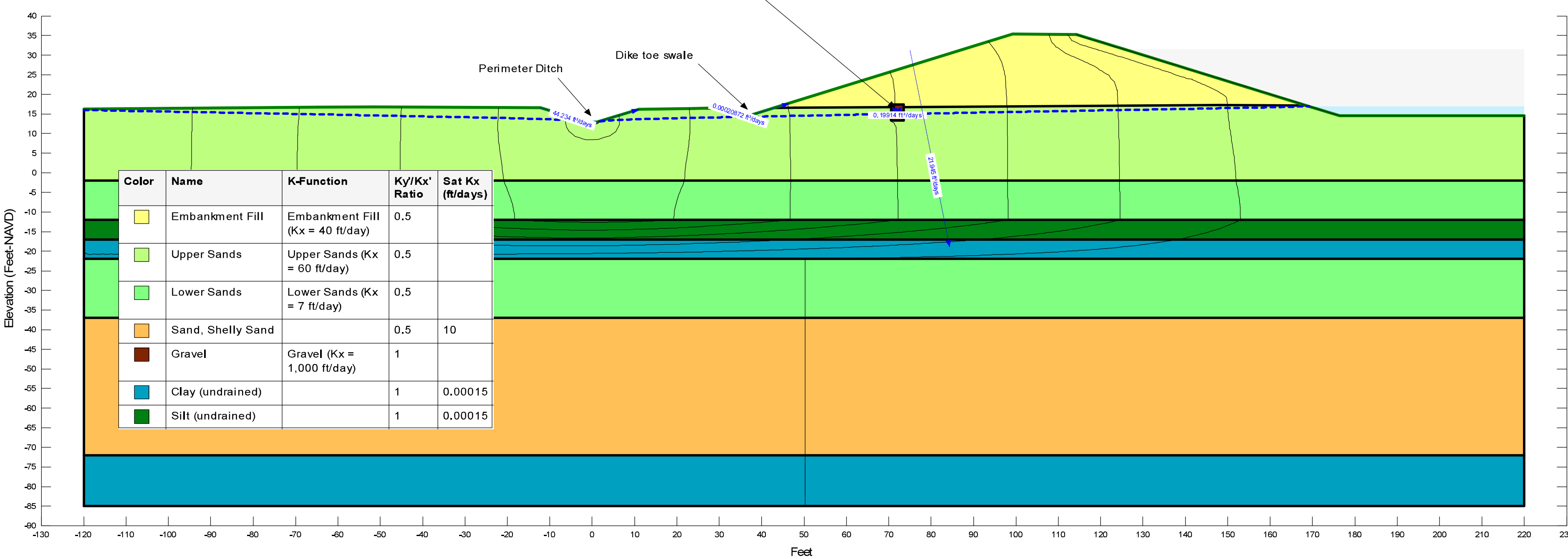
Color	Name	K-Function	Ky'/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 feet/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 feet/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 feet/day)	0.5	
	Silt (drained)		1	0.00015
	Sand, Shelly Sand		0.5	10
	Clay (drained)		1	0.00015
	Gravel	Gravel (Kx = 1000 feet/day)	1	
	Dredge Materials		0.5	5

Drawn by:	Exhibit F-2
BL	
Reviewed by:	Seepage/Stability Models - Steady State Seepage (SSS)
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Seepage Analysis

North Section
Station 30+00
Boring B-102
Pool = +17
Groundwater = +16

Toe Drain
Offset 35' into embankment
from dike toe swale

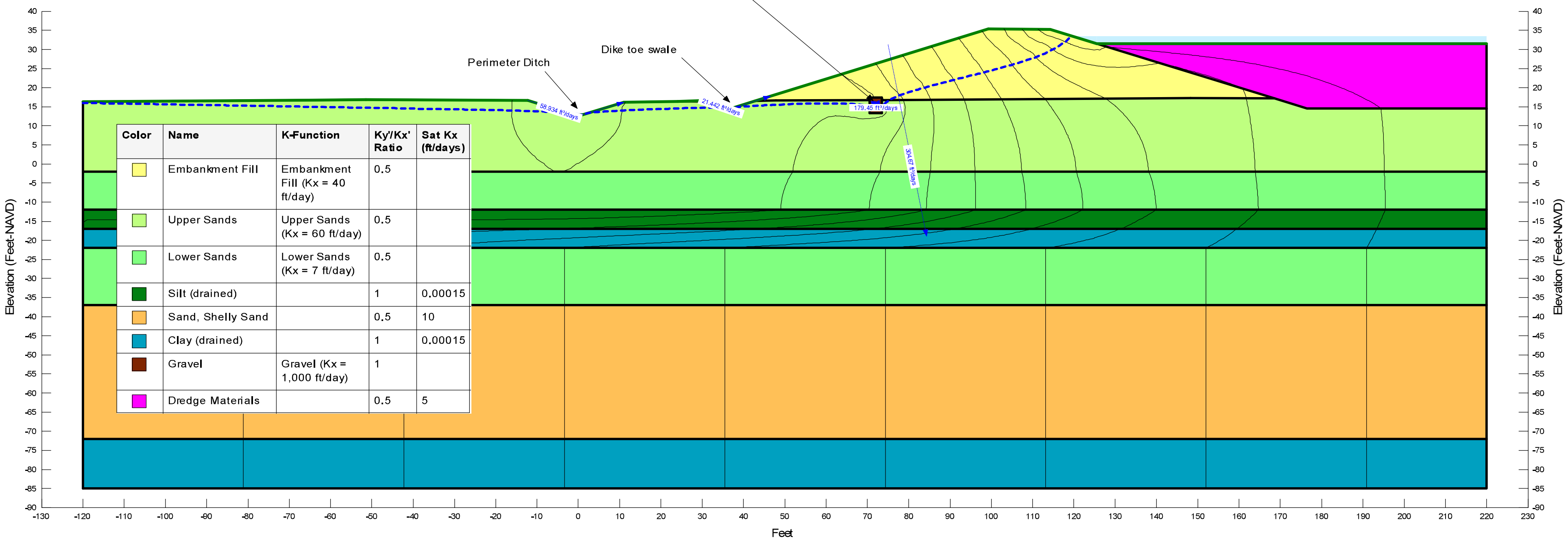


Color	Name	K-Function	Ky/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 ft/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 ft/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 ft/day)	0.5	
	Sand, Shelly Sand		0.5	10
	Gravel	Gravel (Kx = 1,000 ft/day)	1	
	Clay (undrained)		1	0.00015
	Silt (undrained)		1	0.00015

Drawn by:	Exhibit F-3
BL	
Reviewed by:	Seepage/Stability Models - End of Construction
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Seepage Analysis

North Section
Station 30+00
Boring B-102
Pool = +33.25
Groundwater = +16

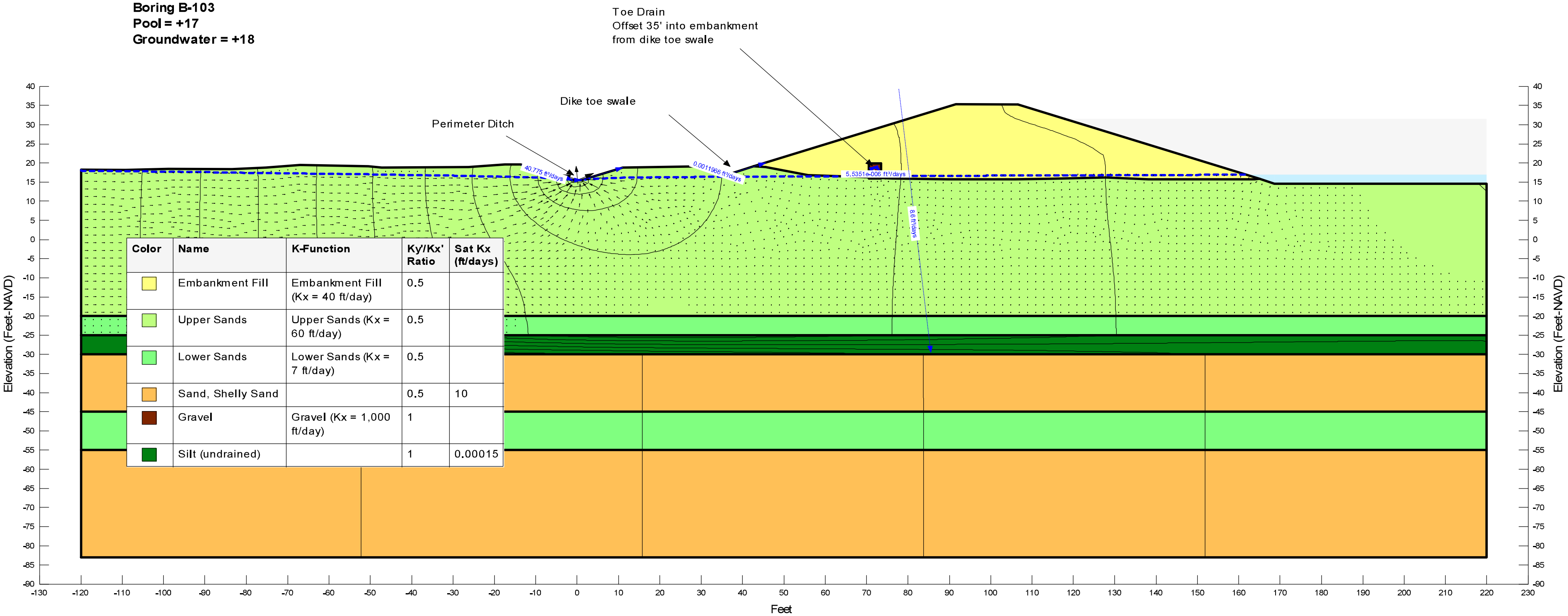


Color	Name	K-Function	Ky'/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 ft/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 ft/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 ft/day)	0.5	
	Silt (drained)		1	0.00015
	Sand, Shelly Sand		0.5	10
	Clay (drained)		1	0.00015
	Gravel	Gravel (Kx = 1,000 ft/day)	1	
	Dredge Materials		0.5	5

Drawn by:	Exhibit F-4
BL	
Reviewed by:	Seepage/Stability Models - Steady State Seepage (SSS)
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Seepage Analysis

South Section
Station 53+00
Boring B-103
Pool = +17
Groundwater = +18

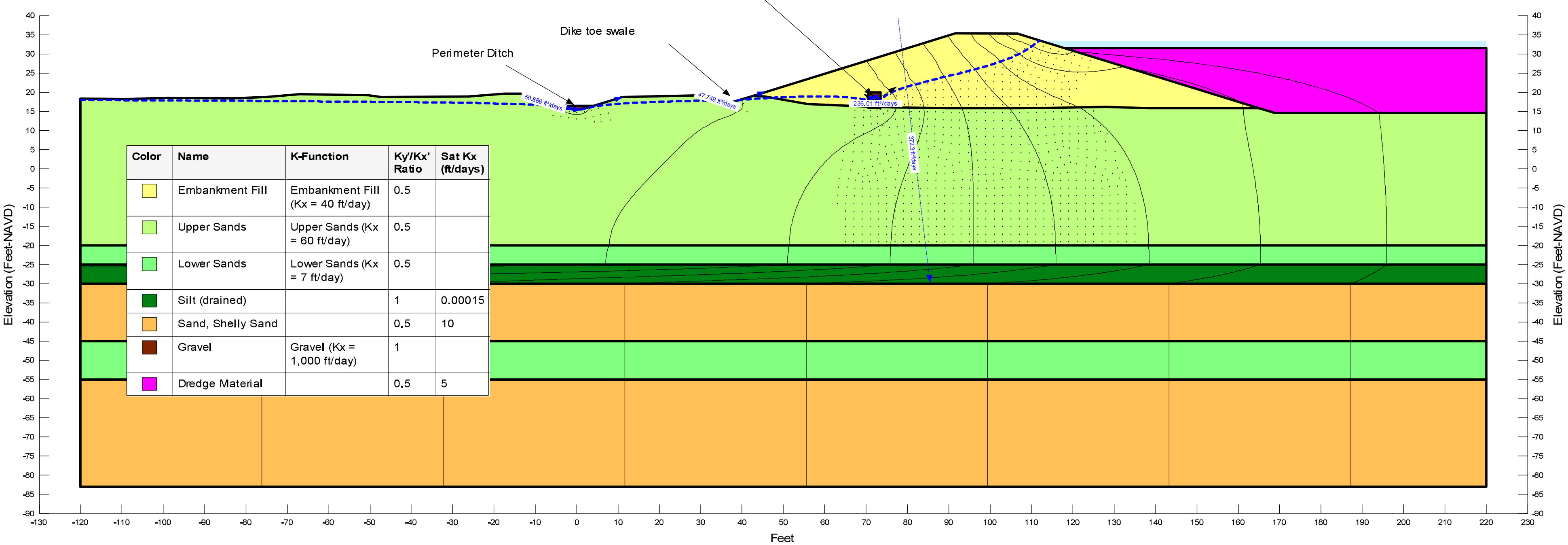


Color	Name	K-Function	Ky/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 ft/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 ft/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 ft/day)	0.5	
	Sand, Shelly Sand		0.5	10
	Gravel	Gravel (Kx = 1,000 ft/day)	1	
	Silt (undrained)		1	0.00015

Drawn by: BL	Exhibit F-5
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	

Seepage Analysis

South Section
Station 53+00
Boring B-103
Pool = +33.25
Groundwater = +18

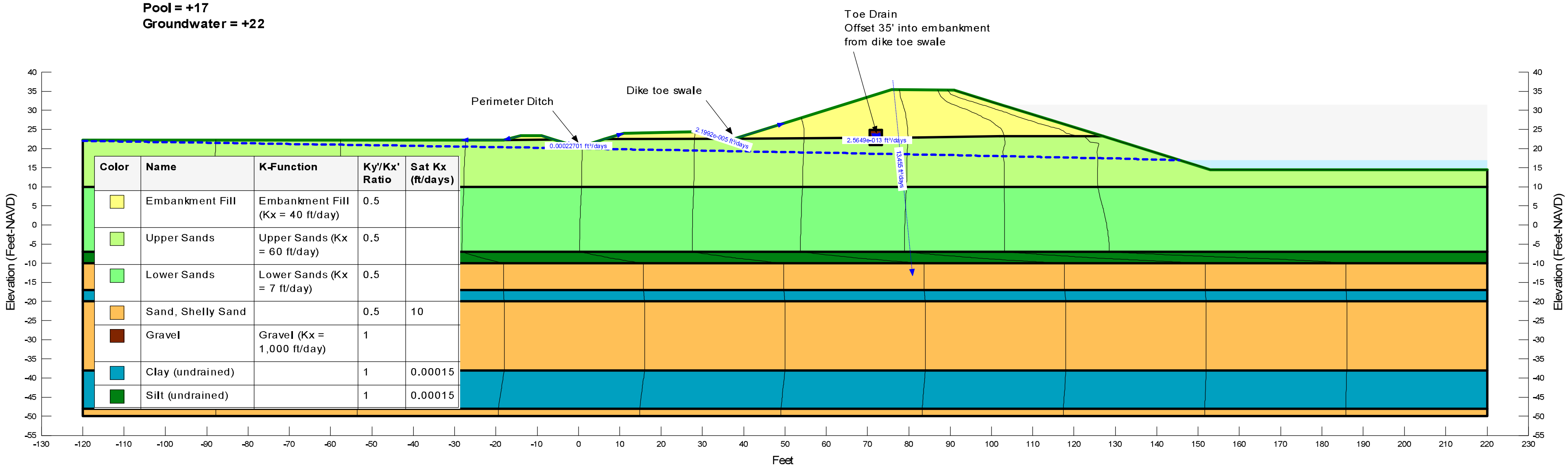


Color	Name	K-Function	Ky'/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 ft/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 ft/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 ft/day)	0.5	
	Silt (drained)		1	0.00015
	Sand, Shelly Sand		0.5	10
	Gravel	Gravel (Kx = 1,000 ft/day)	1	
	Dredge Material		0.5	5

Drawn by: BL	Exhibit F-6
Reviewed by: DD	Seepage/Stability Models - Steady State Seepage (SSS)
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Seepage Analysis

West Section
Station 10+00
Boring B-101
Pool = +17
Groundwater = +22

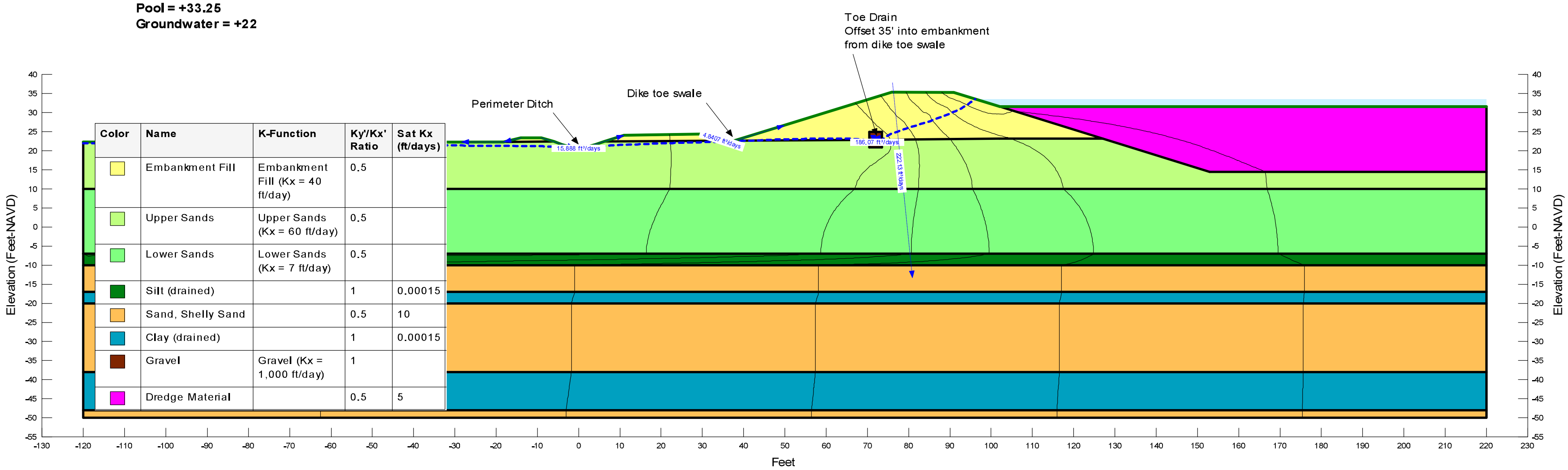


Color	Name	K-Function	Ky'/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 ft/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 ft/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 ft/day)	0.5	
	Sand, Shelly Sand		0.5	10
	Gravel	Gravel (Kx = 1,000 ft/day)	1	
	Clay (undrained)		1	0.00015
	Silt (undrained)		1	0.00015

Drawn by: BL	Exhibit F-7
Reviewed by: DD	Seepage/Stability Models - End of Construction
Scale: As Shown	BV-24A DMMA Brevard County, Florida
Terracon Project No. HB155022	Terracon

Seepage Analysis

West Section
Station 10+00
Boring B-101
Pool = +33.25
Groundwater = +22



Color	Name	K-Function	Ky'/Kx' Ratio	Sat Kx (ft/days)
	Embankment Fill	Embankment Fill (Kx = 40 ft/day)	0.5	
	Upper Sands	Upper Sands (Kx = 60 ft/day)	0.5	
	Lower Sands	Lower Sands (Kx = 7 ft/day)	0.5	
	Silt (drained)		1	0.00015
	Sand, Shelly Sand		0.5	10
	Clay (drained)		1	0.00015
	Gravel	Gravel (Kx = 1,000 ft/day)	1	
	Dredge Material		0.5	5

Drawn by:	Exhibit F-8
BL	
Reviewed by:	Seepage/Stability Models - Steady State Seepage (SSS)
DD	BV-24A DMMA
Scale:	Brevard County, Florida
As Shown	Terracon
Terracon Project No.	
HB155022	

Geotechnical Engineering Report

BV-24A Dredged Material Management Area (DMMA)
Permanent Discharge Pipeline
Brevard County, Florida

November 13, 2017
Terracon Project No. HB155022

Prepared for:

Taylor Engineering, Inc.
Jacksonville, Florida

Prepared by:

Dunkelberger Engineering & Testing,
A Terracon Company
Port St. Lucie, Florida

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

November 13, 2017

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

Taylor Engineering, Inc.
10151 Deerwood Park Blvd.
Jacksonville, Florida 32256

Attn: Lori Brownell, P.E. … via e-mail (lbrownell@taylorengineering.com)

Re: **Geotechnical Engineering Report - Permanent Discharge Pipeline Addendum**
BV-24A Dredged Material Management Area (DMMA)
Brevard County, Florida
Dunkelberger Project Number: HB155022

Dear Ms. Brownell:

Dunkelberger Engineering and Testing, A Terracon Company (DUNKELBERGER) has completed geotechnical engineering services for the above referenced project. This study was carried out in general accordance with our subcontract agreement (Taylor Engineering Contract No. C2015-065) dated January 4, 2015. This reports serves as an addendum to our Phase I Preliminary Geotechnical Report dated August 19, 2016.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations for the BV-24A DMMA permanent discharge pipeline.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please contact us.

Sincerely,
Dunkelberger Engineering and Testing, Inc.
A Terracon Company

BRENT M. LANGLOIS
LICENSE
No. 81336
11/17/17
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Brent M. Langlois, P.E.
Project Geotechnical Engineer
FL Registration No. 81336

Douglas S. Dunkelberger, P.E.
Principal
FL Registration No. 33317

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GEOTECHNICAL ENGINEERING REPORT
BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA)
PERMANENT DISCHRAGE PIPELINE
BREVARD COUNTY, FLORIDA

DUNKELBERGER Project No. HB155022

November 13, 2017

1.0 INTRODUCTION

This geotechnical engineering report has been prepared for the proposed permanent discharge pipeline associated with the BV-24A Dredged Material Management Area (DMMA) located in Brevard County, Florida. Nine (9) soil borings were performed to depths of between 20 and 40 feet below the existing ground surface (bgs) within the pipeline easement. Additionally, where drill rig access was unattainable, a combination of seven muck probes and two shallow hand auger borings were performed. Profiles of the borings and probes along with the test locations are included in *Appendix A* of this report.

The purpose of this study was to obtain data characterizing the subsurface conditions along the pipeline alignment and to provide geotechnical recommendations concerning design and construction aspects of the pipeline.

2.0 PROJECT & SITE DESCRIPTION

A permanent discharge pipeline will be installed as part of construction of the DMMA. The pipeline will be approximately 2,653 feet in length, positioned within a 60-foot wide easement, to transport saline discharge water from a weir structure at the north side of the DMMA to the Intracoastal Waterway (ICWW). A *Topographic Vicinity Map* of the pipeline easement is provided in *Appendix A* as *Exhibit A-1*.

We have assumed that the pipeline will be HDPE in composition, up to 48 inches in diameter, and placed with cut-and-cover methods at relatively shallow burial depths. The pipeline will require sufficient soil cover to resist buoyant forces from a high groundwater level. We expect the soil cover to range from 3 to 5 feet in thickness. Also, the pipeline will require a jack-and-bore installation beneath Old Dixie Highway and the Florida East Coast railroad tracks. At U.S. Highway 1, the pipeline will run through existing culverts.

We understand that the system will be designed for gravity flow but could experience hydrostatic pressure of about 10 psi from high volume flow during dredging events.

Manhole structures will be spaced intermittently along the pipeline alignment.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning placing, bedding, and backfilling of the pipeline.

3.0 REVIEW OF AVAILABLE DATA

3.1 Regional Geology

The geology along the discharge pipeline alignment (Reference Florida Geologic Survey: Geologic Map of Florida, dated 2002, revised in 2006) is mapped as the Anastasia Formation. The Anastasia Formation generally is recognized near the coast, generally composed of sands and coquinoid limestones. The most recognized materials found within the Anastasia Formation are coquina of whole or fragmented shells in a matrix of sand which is often cemented. The Anastasia Formation forms part of the surficial aquifer system. Below the surficial aquifer lies the Hawthorn Formation which is considered an intermediate confining unit. The Hawthorn Formation begins at approximately Elevation -85 feet NAVD and separates the surficial aquifer from the Upper Floridan Aquifer at about -300 feet NAVD. The Upper Floridan Aquifer is made up of a Limestone Formation referred to as Basal Hawthorne/ Suwanee and Ocala Limestone.

3.2 USGS Topographic Map

A copy of the USGS Topographic Map is provided as *Exhibit A-1* of this report. Reference to the map shows significant topographic relief from the west at an elevation of +20 feet with respect to the National Geodetic Vertical Datum of 1929 (NGVD '29) to the east at an elevation of +5 feet NGVD along the pipeline easement. Other features identified on the Topographic Map include wetlands on the western portion of the alignment, a power line easement, the Florida East Coast (FEC) Railroad, and U.S. Highway 1. The remaining areas are generally vegetated land indicated by green shading.

The topographic map was reviewed to gather useful data regarding the site; however, elevations referred to herein, including the ground surface elevation at the field test locations, were approximated based on the *Topographic & Boundary Survey* dated July 2, 2015 and *Core Boring Locates* survey dated June 8, 2016 provided by Morgan & Eklund. The elevations provided in the survey reference the North American Vertical Datum of 1988 (NAVD).

3.3 Brevard County Soil Survey

The Soil Survey of Brevard County, Florida as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS; later renamed the Natural Resource Conservation Service – NRCS) identifies the multiple soil types in the proposed pipeline alignment. In general soil types are sandy with the exception of the Tomoka Muck map unit which is associated with the wetland areas. These areas indicated muck in the upper 27 inches of the profile which is unsuitable for support and as use for backfill of the discharge pipe. More detailed descriptions of the primary soil classifications are provided below.

9 – Canaveral-Anclote Complex, Gently Undulating. This soil type has 0 to 5 percent slopes and is somewhat poorly drained. Under natural conditions, this soil type has a depth to water table of 12 to 36 inches. This soil type consists of relatively clean sands to the maximum defined depth of 80 inches.

28 – Immokalee Sand. This soil type has 0 to 2 percent slopes and is poorly drained. Under natural conditions, this soil type has a depth to water table of 6 to 18 inches. This soil type consists of relatively clean sands to a depth of 35 inches. A layer of black weakly cemented fine sand with organic coating, locally known as hardpan, is indicated from 35 to 54 inches. Thereafter, to the maximum defined depth of 80 inches, the soil profile consists of loamy sands.

36 – Myakka Sand. This soil type has 0 to 2 percent slopes and is poorly drained. Under natural conditions, this soil type has a depth to water table of 6 to 18. This soil type consists of relatively clean sands to a depth of 85 inches. A layer of black weakly cemented sand with organic coating, locally known as hardpan, is indicated from 20 to 36 inches.

49 – Pomello Sand. This soil type has 0 to 2 percent slopes and is moderately well drained. Under natural conditions, this soil type has a depth to water table of 24 to 42 inches. This soil type consists of relatively clean sands to a depth of 42 inches. A layer of black weakly cemented sand with organic coating, locally known as hardpan, is indicated from 42 to 54 inches. Thereafter, to the maximum defined depth of 80 inches, the soil profile consists of more relatively clean sands.

53 – Satellite Sand, 0 to 2 percent slopes. This soil type has 0 to 2 percent slopes and is somewhat poorly drained. Under natural conditions, this soil type has a depth to water table of 12 to 42 inches. This soil type consists of relatively clean sands to the maximum defined depth of 80 inches.

67 – Tomoka Muck, Undrained. This soil type has 0 to 1 percent slopes and is very poorly drained. Under natural conditions, this soil type indicated the water table is at the ground surface. This soil type consists of muck from to a depth of 27 inches. Below the muck are relatively clean sands to a depth of 35 inches. Thereafter, to the maximum defined depth of 55 inches, this soil type exists as sandy clay loam to sandy loam.

The Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be encountered. Boundaries between adjacent soils types on the Soil Survey maps are approximate. The Soil Survey is included as *Exhibit A-2*.

3.4 Historical Aerial Review

Historical aerial photographs from Years 1943, 1951, 1979, 1994, 1999, 2002, 2004, 2005, 2006, 2007, 2009, 2010, 2012, and 2014 were reviewed for features of geotechnical significance. The noted items are listed below in chronological order.

- 1943: the pipeline alignment consists of vacant, wooded (vegetated) land.
- 1951: residential structures constructed near the eastern portion of the pipeline alignment between U.S. Highway 1 and Old Dixie Highway.
- 1994: Old Castle Plant located off Old Dixie Highway constructed just north of the pipeline alignment.
- 2005: An area west of the Old Castle Plant is cleared of vegetation. The area shows significant ground disturbance.
- 2006: Asphalt lot constructed to the south of Old Castle Plant which intercepts the pipeline alignment. Lot used for materials storage.
- 2013: Goat pens installed on portion of cleared land described in 2005 aerial above.
- 2014: the pipeline alignment appears similar to its current condition

It is noted that the ground disturbance described in the 2005 aerial above continued up through 2016. Below is a 2014 aerial showing the disturbed area:

4.0 FIELD EXPLORATION

The layout of the field exploration program (i.e. test hole locations) is shown in *Exhibit A-3*. Descriptions of the exploratory program are provided in the following report sections. Detailed graphical boring profiles are presented as *Exhibits A-4 through A-6*.

4.1 Clearing

Some clearing of vegetation was required to provide access for our drilling equipment. A path was cleared beginning at U.S. Highway 1 extending west to the Florida East Coast (FEC) Railroad Tracks. The paths were cleared using a Bobcat equipped with a mower attachment.

4.2 Standard Penetration Test (SPT) Borings

The SPT soil borings were drilled along the pipeline alignment to depths of 20 to 40 feet below the existing land surface (bls) with a rubber track-mounted, rotary drilling rig equipped with an automatic hammer. The boreholes were advanced with a cutting head and stabilized by use of bentonite (drillers' mud). Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure. In the split spoon sampling procedure, the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch penetration, or the middle 12 inches of a 24-inch penetration, by means of a 140-pound hammer with a free fall of 30 inches is the standard penetration resistance value (N). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the *Subsurface Profiles (Exhibits A-4 through A-6).*

4.3 Shallow Subsurface Exploration

Two (2) hand auger borings, labeled AB-8 and AB-9, were drilled to a depth of six feet along the western portion of the pipeline easement. This area was un-accessible by drill rig due to the vegetation located within wetlands which we were not permitted to clear. The borings were drilled using hand turned auguring equipment. Samples of the soils were collected from the auger bucket, placed in plastic bags, labeled, and transported to our laboratory for visual-manual classification by a geotechnical engineer.

Seven muck probes, labeled AB-1 through AB-7, were pushed at locations (i.e. wetland areas) where the vegetation was very dense and unsuitable soils (muck) were expected to be present. The probe rod was pressed into the ground until firm tip resistance was achieved.

5.0 GENERAL SUBSURFACE CONDITIONS

The following sections describe the results of our field exploration along the pipeline easement.

Laboratory index testing was performed on selected samples to test for their physical properties and to aid in soil classification. Test results are included on the subsurface profiles provided as *Exhibits 4 through 6*. Laboratory test methods are described in *Appendix B*.

Appendix C contains general notes describing the exploratory drilling methods and explaining soil relative density as well as classification determinations.

5.1 Deep Subsurface Exploration

Deep subsoils were investigated in drill rig accessible areas using the SPT method. Seven (7) borings drilled on the eastern portion of the pipeline alignment and two (2) on the western end where the pipeline alignment exits the DMMA and enters the easement. The soil samples collected from the SPT borings were visually-manually classified in accordance with the Unified Soil Classification System (USCS). The generalized soil stratification is presented in the following table.

Stratum Number	Material Description	Unified Soil Classification System (USCS)
1	Gray or brown medium to fine SAND.	SP
2	Black slightly silty to silty fine SAND, weakly cemented, with an organic stain (Hardpan).	SP-SM
3	Brown to tan trace to slightly silty medium to fine SAND.	SP / SP-SM
4	Dark gray to green sandy SILT.	ML
5	Gray to tan shelly SAND with varying amounts of silt	SP, SP-SM, SM
6	Brown slightly clayey medium to fine SAND.	SP-SC
7	Gray to green silty fine SAND	SM

In general, the borings found about 15 to 20 feet of relatively clean fine sands (SP, SP-SM, SP-SC; Strata 1, 2, 3, and 6). Below depths of 20 feet, the borings typically disclosed about 10 feet of sandy silt. Below the silt, the deepest borings (PB-5 and PB-6) found more relatively clean sands before reaching shelly sands at their termination depth of 40 feet.

It is noted that fill was found in borings PB-5, PB-8, and PB-9 in the upper 2, 6, and 1 foot, respectively. The fill soils generally consisted of sand with some areas mixed with shell and rock.

The SPT N-values indicate that the predominately sandy subsoils within the pipeline alignment are loose to medium dense in terms of relative density. As exceptions to that characterization, the silt layers range from very soft to stiff in terms of relative consistency and a layer of cemented (rock-like) shelly sand was found between Elevations -8 and -13 feet NAVD in Boring PB-9.

5.2 Surficial and Shallow Subsurface Exploration

Two auger borings were drilled on the western portion of the pipeline easement just west of the power line easement. These borings were within the disturbed area shown in historic aerial photographs (see **Section 3.4**). The borings disclosed fill materials in the upper 5 ½ feet consisting of generally clean fine sands. Below the fill, the borings encountered buried debris consisting of wood chunks, bark, PVC pipe, roots, and broken concrete. Both borings terminated by refusal to further advance at a depth of 6 feet. The following table summarizes the finding of the auger borings.

Boring Location	Depth Below Existing Ground Surface (feet)	Material Description	Notes
AB-8	0 - 1	Light brown fine SAND with rock and shell fragments (SP) (Fill)	Hard drilling (Dense)
	1 - 5 ½	Brown to dark brown medium to fine SAND (SP) (Fill)	-
	5 ½ - 6 ½	Dark brown fine sand with wood chunks, bark, roots, PVC pipe.	Buried debris.
AB-9	0 - 4	Light brown fine SAND (SP) (Fill)	-
	4 - 6	Dark brown medium to fine SAND (SP) (Fill)	Roots from 4 to 5 feet
	6+	Concrete	Auger refusal on large piece of concrete

Seven muck probes were pushed along the western section of the pipeline easement. The probes indicated surficial muck ranging from 3 to 4+ feet in thickness within the wetlands. The probes performed in the areas outside or near the edge of the wetlands indicated a muck thickness of about 1 foot. The following table summarizes the findings of the muck probes.

Probe Location	Thickness (feet)(1)	Description	Notes
AB-1	Greater than 4	Muck	-
AB -2	3	Muck	-
AB -3	1	Muck	Near edge of wetland
AB -4	4	Muck	-
AB -5	1	Muck mixed with sand	Outside of wetland
AB -6	1	Muck mixed with sand	Outside of wetland
AB -7	3	Muck	-
AB -7A	1	Muck mixed with sand	Outside of wetland

(1) Extending from the surface

5.3 Groundwater Conditions

At the time of our field exploration, groundwater was found in each drilled test hole. The groundwater level was measured during drilling at elevations between about +18.8 feet NAVD at the western-most boring to +1.5 feet at the eastern-most boring. The groundwater depth ranged from 0 to 5.2 feet bls. The groundwater in the wetlands where muck probes were pushed was generally near the ground surface as indicated by saturated, near-surface soils.

According to our measurements, the groundwater elevation drops from west to east as it approaches the ICWW.

For design and construction purposes, the groundwater level should be expected to lie close to, and possibly above (i.e. standing water), the existing ground surface.

6.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

6.1 Geotechnical Considerations

The results of the subsurface exploration generally revealed fine-grained, but reasonably firm native sands. These materials, excluding surficial organics and buried debris found west of the power line easement, are generally suitable for support of the proposed pipeline.

Surficial muck found in wetlands and buried debris found in a section of highly disturbed land located between the wetlands and the power line easement are unsuitable for support of the permanent pipeline. These materials should be removed in their entirety and replaced with clean granular fill materials.

Further, the shallow water table will necessitate construction dewatering and impact trafficability of heavy construction equipment.

6.2 Unsuitable Material Removal and Replacement

Muck deposits found within the pipeline alignment are unsuitable for the proposed construction and should be removed in their entirety. Muck was found at each probe location (AB 1 through AB-7A) in thicknesses ranging from 1 to about 4 feet. Additionally, buried debris was found at about 6 feet bls in a highly disturbed area located just west of the power line easement. This area is shown in *Exhibit A-3.* The bottom of the debris could not be found using our hand augering tools. Muck and debris removal should be planned for the wetlands and ground disturbance areas. The excavation depths for removal of unsuitable materials should extend until clean granular materials (i.e. natural sands) are found. Laterally, the excavation should extend at least 5 feet beyond the planned outside edge of the pipe.

The excavations described above should be replaced with clean, granular materials meeting the fill requirements laid out in **Section 6.5.** Strata 1, 2, 3, and 7 soils should meet these criteria and may be stockpiled and re-used as backfill provided they are not intermixed with organic material. The newly placed fill materials should be compacted according to **Section 6.5.**

The material removal and subsequent replacement filling should be accomplished in a dry condition in conjunction with an appropriately designed and implemented dewatering operation. The dewatering system should be one that lowers the phreatic surface to not less than 2 feet below the excavation bottom. The purpose of the dewatering is to allow compaction of the granular backfill. As an alternative to dewatering, unsuitable material replacement may be performed in the wet provided that the excavations are backfilled with FDOT No. 57 coarse aggregate that is completely enveloped within a filter fabric.

6.3 Pipeline and Structure Excavations

Below grade excavations should be made in accordance with all applicable State and Federal requirements. Per the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1926, Sub-part P- “Excavations,” the granular subsoils throughout the project area fall within the Type C criteria. As such, temporary excavation slopes should be stable when adequately dewatered and constructed no steeper than 1.5:1 (horizontal: vertical). In areas of space limitation where open cut is not practical, the excavations may require sheeting or shoring. Sections where the pipeline will pass through existing wetlands where muck is found will also require sheeting or shoring. Further, we recommend that the contractor exercise extreme caution in any decision to place men or women and equipment in unbraced excavations.

During construction, groundwater levels should be maintained below the working excavation bottom. The dewatering effort should be sufficient to allow inspection of the trench bottom and to establish a firm, stable bedding condition. If persistent wetness causes a soft or otherwise unstable bedding condition, then the trench bottom should be deepened by 12 inches and backfilled with clean, coarse gravel (FDOT No. 57 Stone) with a filter fabric wrap. Dewatering may require a combination of methods including pumping from sumps, wells or well points. The method chosen for dewatering should be the responsibility of the contractor.

The results of the borings indicate that the excavations could be made using heavy track-mounted backhoe equipment. Soft ground (i.e. trafficability) may require use of a smaller excavator. Excavated materials consisting of sands and gravels with particle sizes of less than 1 inch in diameter and no more than 12 percent fines (particles passing through the U.S. Number 200 Sieve) may be stockpiled and re-used for backfill. Oversized materials and fine-grained soils that do not meet these requirements are unsuitable for use as backfill and should be removed if found.

6.4 Pipeline and Structure Bedding

Prior to excavation for the pipeline, site preparation should include the removal of vegetation, topsoil, major root systems, muck, peat, debris, and any otherwise unsuitable material.

Pipeline bedding shall provide a firm and uniform foundation over the full length. Bedding materials should be free of organic material, roots, stumps or other undesirable material. Fines content should not exceed 12 percent as indicated by percent passing the U.S. No. 200 Sieve. Bedding materials should be scarified to a depth of 6 inches and compacted to a minimum of 98 percent of the soil's maximum dry density as determined by ASTM D 1557 (Modified Proctor).

The aforementioned recommendations would also apply to manhole structure bedding.

6.5 Pipeline and Structure Backfill

Pipeline backfill should meet the following material and compaction requirements.

Material Type (1)	USCS Classification	Acceptable Location for Placement	Maximum Lift Thickness (in.)(2)
General	SP (fines content < 5%)	All locations and elevations	12
	SP-SM (fines content between 5 and 12%)	All locations and elevations, except strict moisture control will be required during placement, particularly during the rainy season.	8

1. Materials should be free of organic matter and debris (i.e. less than 3% organic matter by weight), contain no particle (gravel or shell) size larger than 1 inch, and fines contents should not be greater than 12 percent.
2. Use 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is required.

Item	Description
Minimum Compaction Requirements [1]	98 percent of the material's maximum modified Proctor dry density (ASTM D 1557).
Moisture Content[2]	Within ±2 percent of optimum moisture content as determined by the Modified Proctor test, at the time of placement and compaction.
Minimum Testing Frequency	One field density test per 200 linear feet or fraction thereof per 1-foot lift.

7.0 GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless DUNKELBERGER reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

UNITED STATES — DEPARTMENT OF THE INTERIOR — GEOLOGICAL SURVEY

SCALE 1 : 7500

400 0 400 800 1200

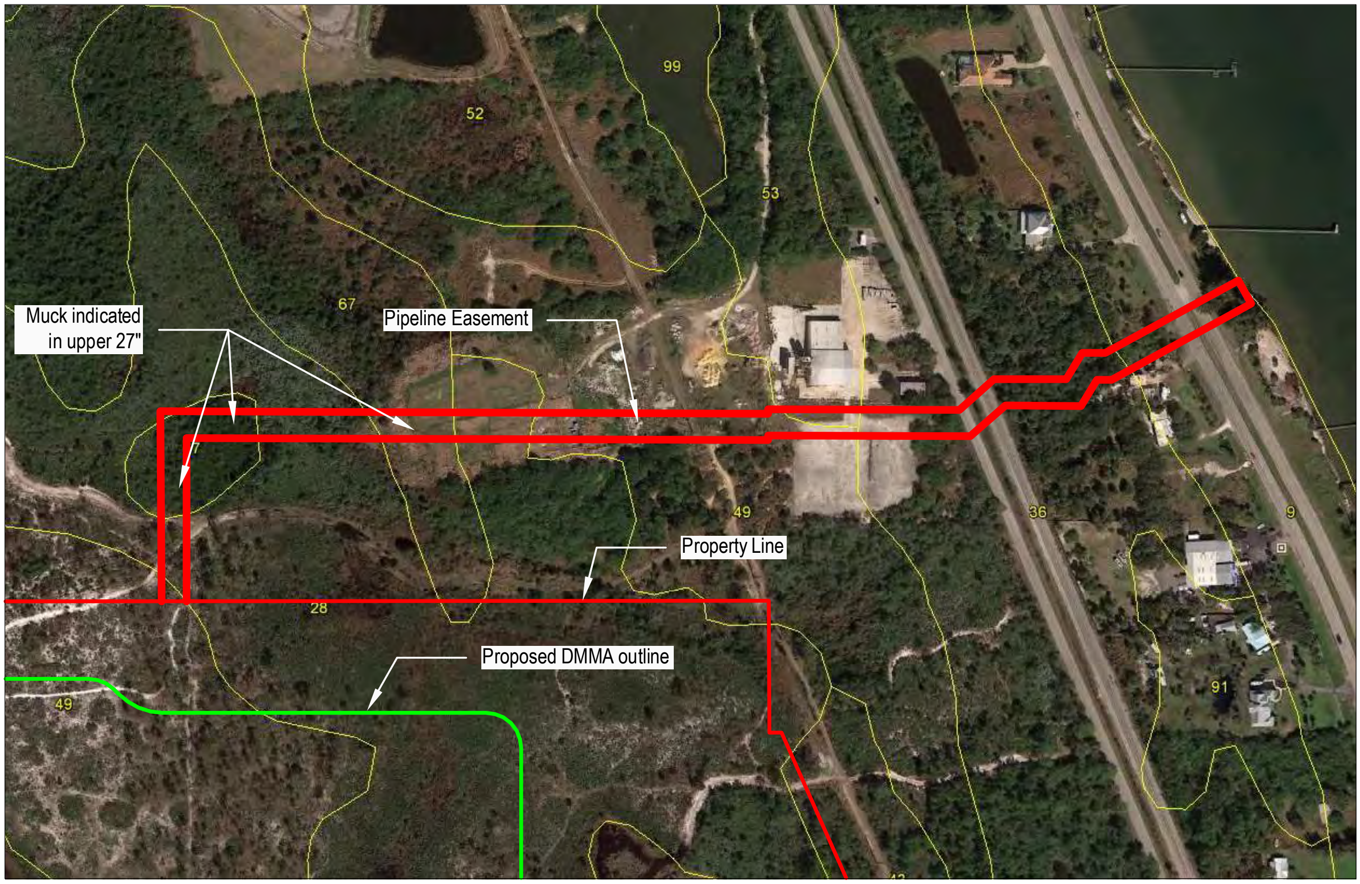
FEET

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GRANT, FLORIDA
1949; PHOTO REVISED 1970
7.5 MINUTE SERIES (TOPOGRAPHIC)

N

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	TOPOGRAPHIC VICINITY MAP	EXHIBIT
Drawn By: BL	Scale: AS SHOWN		GEOTECHNICAL SITE EXPLORATION	A-1
Checked By: DD	File No. -		TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 8/19/16	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986 PH. (772) 343-9787 FAX. (772) 343-9404	BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA) - PIPELINE STUDY Brevard County Florida	



SCALE 1 : 5200

300 0 300 600 900 1200

FEET

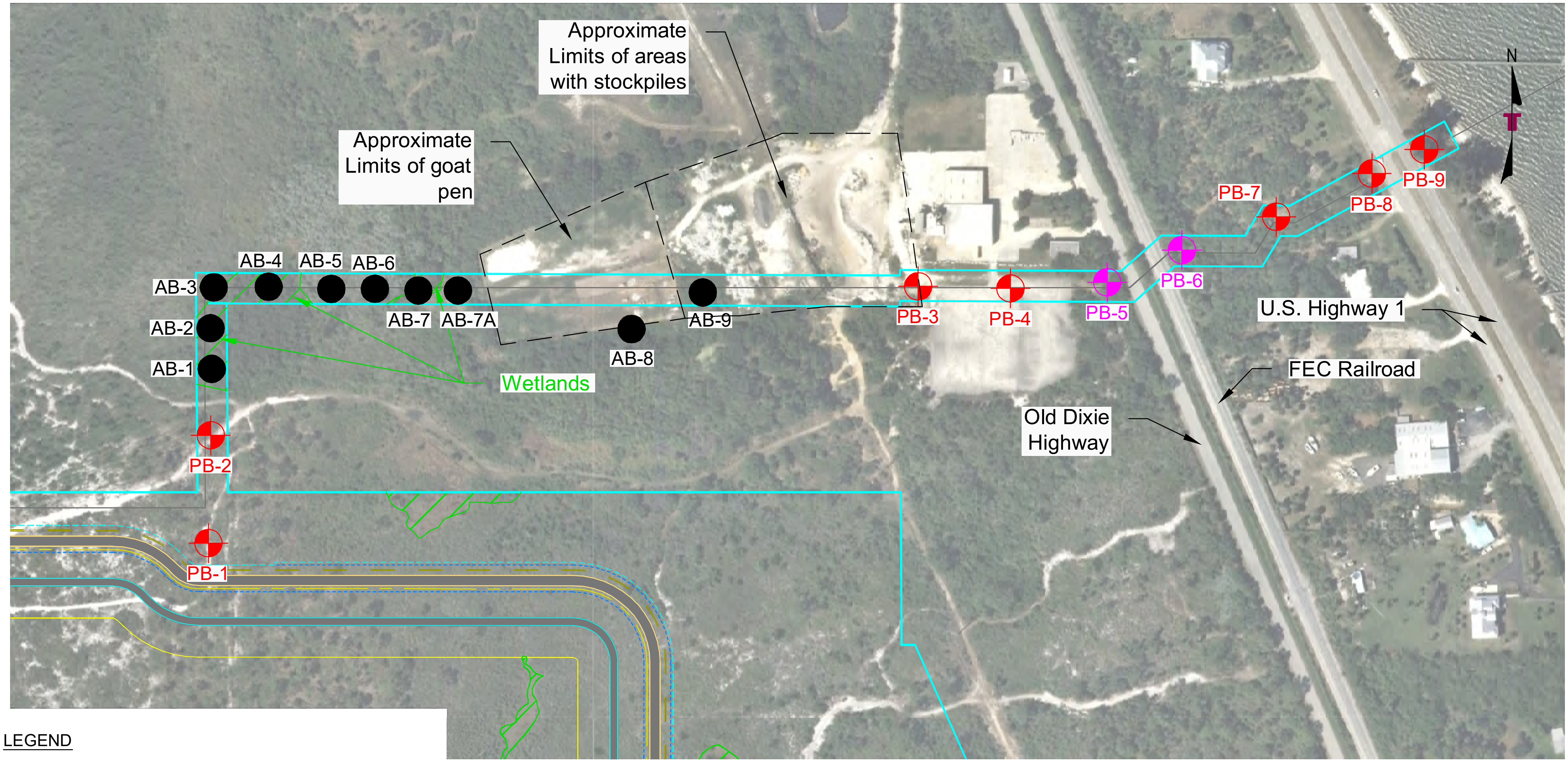
SOIL LEGEND

9	CANAVERAL-ANCLOTE COMPLEX, GENTLY UNDULATED
28	IMMOKALEE SAND
36	MYAKKA SAND, 0 TO 2 PERCENT SLOPES
49	POMELLO SAND
53	SATELLITE SAND, 0 TO 2 PERCENT SLOPES
67	TOMOKA MUCK, UNDRAINED

N

U.S.D.A. SOIL SURVEY FOR BREVARD COUNTY, FLORIDA
ISSUED: JANUARY 1987

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SOIL SURVEY MAP	EXHIBIT
Drawn By: BL	Scale: AS SHOWN	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	A-2
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 8/19/16		BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA) - PIPELINE STUDY	
			Brevard County Florida	



LEGEND

PB-1	-	STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER - 20 FEET DEEP
PB-5	-	STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER - 40 FEET DEEP
AB-1	-	AUGER BORING OR MUCK PROBE LOCATION AND NUMBER

Locations are approximate

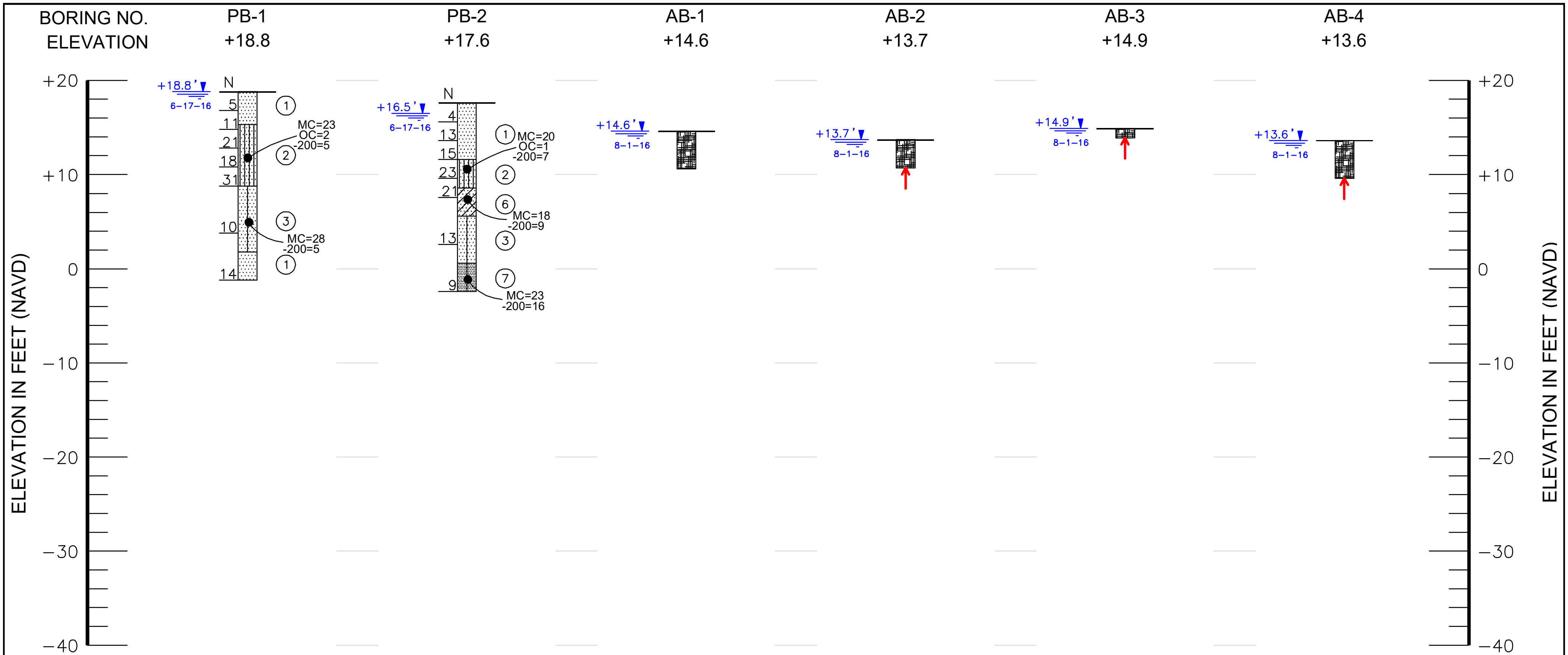
SOURCE: TAYLOR ENGINEERING, INC.

0' 100' 200' 400' 600'

Project Mngr: DD	Project No. HB155022	Terracon Consulting Engineers and Scientists	BORING LOCATION PLAN
Drawn By: BL	Scale: AS SHOWN	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING
Approved By: KA	Date: 8/19/16		BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA) - PIPELINE STUDY
			Brevard County Florida

EXHIBIT

A-3



LEGEND

- Tan to brown medium to fine SAND, some areas with shell and rock (Fill). (SP)
- Organic SAND (Muck). (PT)
- (1) Gray or brown medium to fine SAND. (SP)
- (2) Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM)
- (3) Brown to tan trace to slightly silty medium to fine SAND. (SP / SP-SM)
- (4) Dark gray to green sandy SILT. (ML)
- (5) Gray to tan shelly SAND with varying amounts of silt. (SP, SP-SM, SM)
- (6) Brown slightly clayey medium to fine SAND. (SP-SC)
- (7) Gray to green silty fine SAND. (SM)

SP - Unified Soil Classification System Group Symbol (ASTM D 2487)

N - Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586

PB-1 - Standard Penetration Test (SPT) boring and number

AB-1 - Auger boring or hand probe

MC - Moisture Content (%)

OC - Organic Content (%)

-200 - Amount finer than the U.S. No. 200 Sieve (%)

↑ - Indicates depth of firm tip resistance on hand probe

+22.9' 2-17-16 - Elevation of groundwater (feet-NAVD) and date measured

WOH - Indicates sampler advanced due to weight of hammer

50/1 - Indicates fifty blows required to drive sampler 1 inch

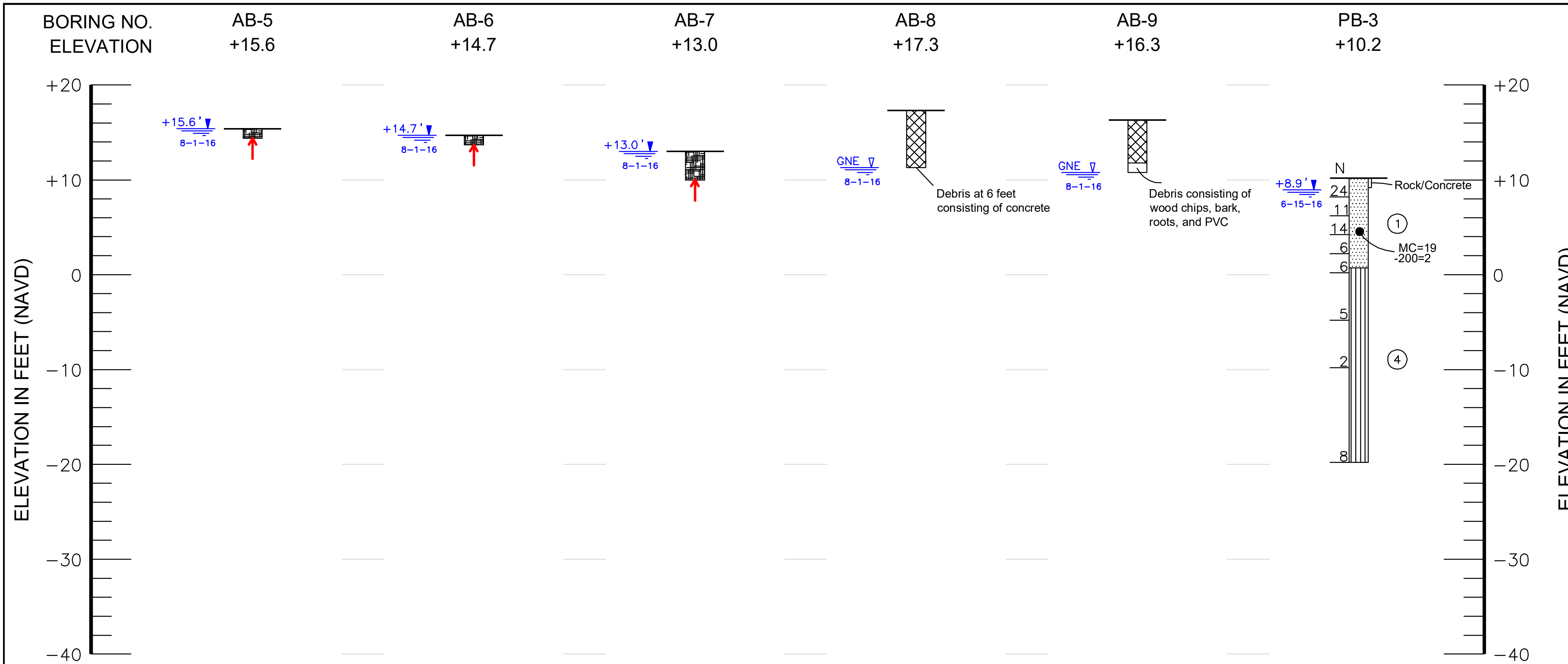
LL - Liquid Limit (%)

PI - Plasticity Index (%)

NOTES

1. Borings were drilled June 15, 2016 through June 17, 2016 using a rubber track mounted BR-2500 drill rig and August 1, 2016 using hand turned auger and hand pressed equipment.
2. Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.
3. Groundwater elevations shown on the subsurface profiles represent groundwater surfaces on the dates shown. Groundwater level fluctuations should be anticipated throughout the year.

Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES	EXHIBIT
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	A-4
Checked By: DD	File No. -	PH. (772) 343-9787 FAX (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 8/19/16		BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA) - PIPELINE STUDY	
			Brevard County Florida	



LEGEND

	Tan to brown medium to fine SAND, some areas with shell and rock (Fill). (SP)
	Organic SAND (Muck). (PT)
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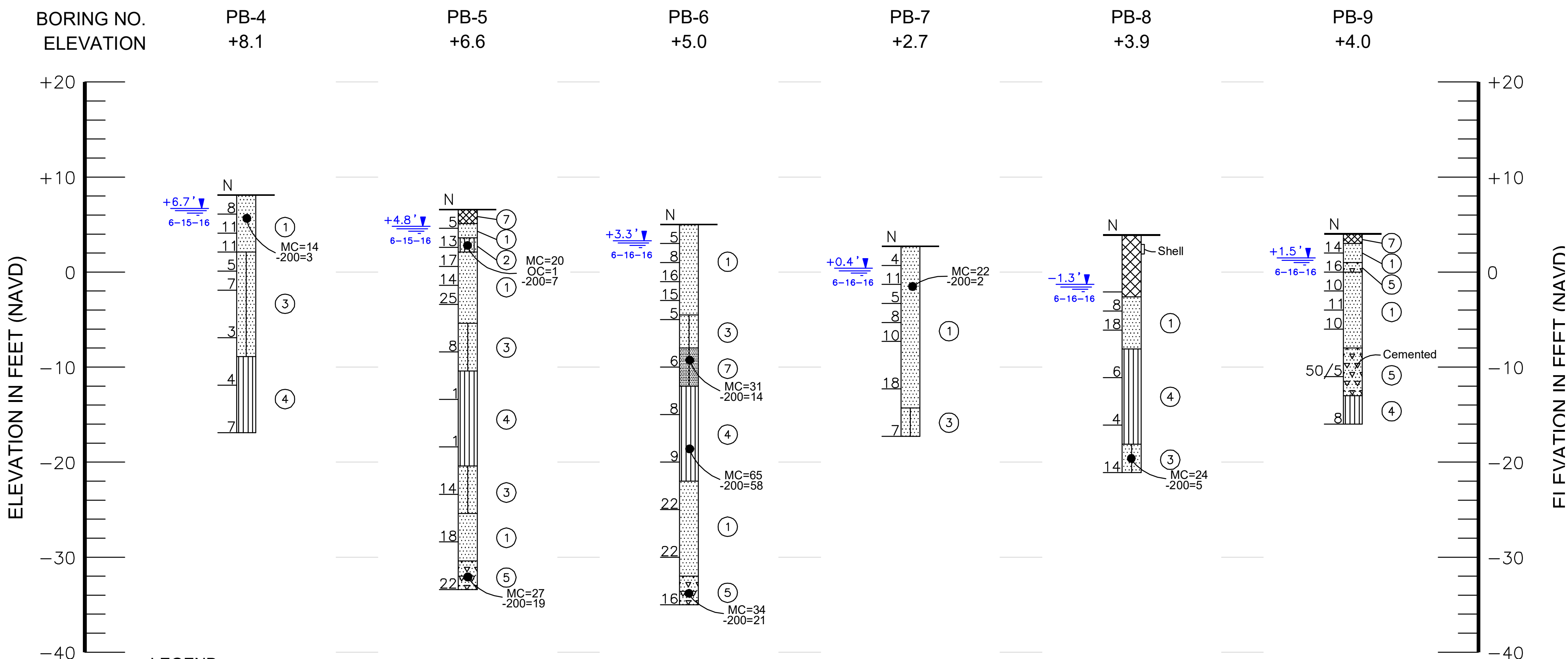
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	A-5
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 8/19/16		BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA) - PIPELINE STUDY	
			Brevard County Florida	



LEGEND

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Project Mngr: DD	Project No. HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By: DD	File No. -	PH. (772) 343-9787 FAX. (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By: KA	Date: 8/19/16		BV-24A DREDGED MATERIAL MANAGEMENT AREA (DMMA) - PIPELINE STUDY
			Brevard County Florida

EXHIBIT A-6

APPENDIX B
SUPPORTING INFORMATION

Laboratory Testing

During the field exploration, a portion of each recovered sample was sealed in a glass jar and transported to our laboratory for further visual observation and laboratory testing. Selected samples retrieved from the borings were tested for moisture (water) content, fines content (soil passing a US standard #200 sieve), organic content, and Atterberg Limits. Those results are included on the respective boring logs. The visual-manual classifications were modified as appropriate based upon the laboratory testing results.

The soil samples were classified in general accordance with the appended General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of the Unified Soil Classification System is included in *Appendix C*.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-$^{3}/_{8}$" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube – 2" O.D., 3" O.D., unless otherwise noted	PA:	Power Auger (Solid Stem)
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB	Wash Boring or Mud Rotary

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling	ESH:	Estimated Seasonal High Groundwater
DCI:	Dry Cave in	BCR:	Before Casing Removal	ESL:	Estimated Seasonal Low Groundwater
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0 – 1	Very Soft
500 – 1,000	2 – 3	Soft
1,000 – 2,000	4 – 6	Medium Stiff
2,000 – 4,000	7 – 12	Stiff
4,000 – 8,000	13 – 26	Very Stiff
8,000+	> 26	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 50	Dense
> 50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	≥ 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 – 10
Medium	11 – 30
High	> 30

Rev. 4/10

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UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification: Group Symbol	Soil Classification: Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G,H,I]
			Fines classify as CL or CH	SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]	CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K,L,M]
		Organic:	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay [K,L,M,N]
					Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K,L,M]
			PI plots below "A" line	MH	Elastic Silt [K,L,M]
		Organic:	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay [K,L,M,P]
					Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand; add "sandy" to group name.

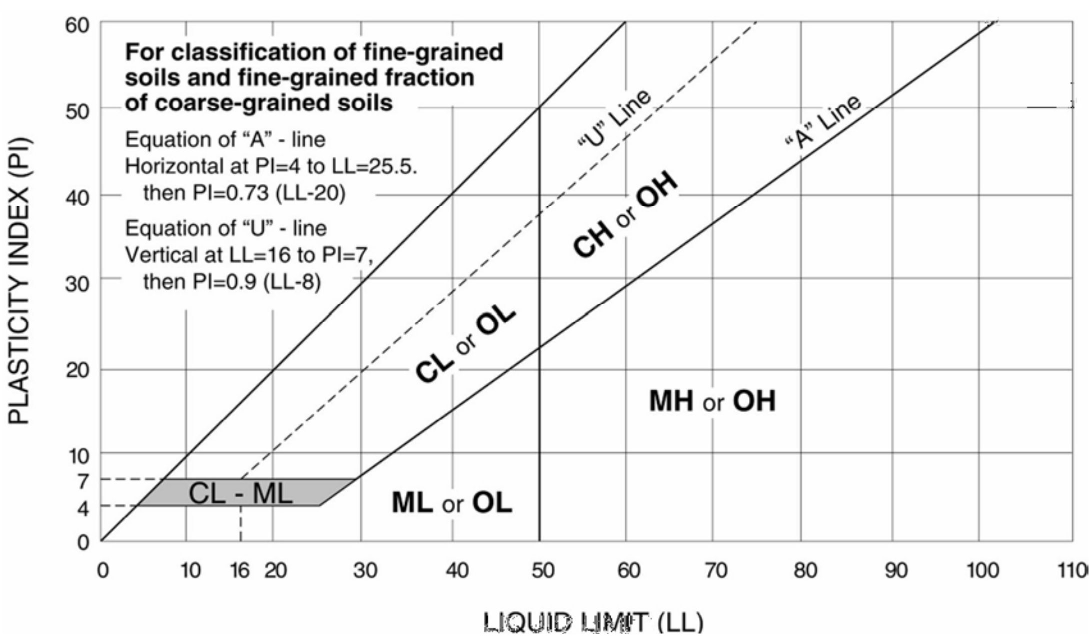
[M] If soil contains ≥ 30% plus No. 200 predominantly gravel; add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



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ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 12
SUPPLEMENTAL INFORMATION FOR DMMA CONSTRUCTION PROJECTS – DMMA BV-24A

SUPPLEMENTAL INFORMATION FOR DMMA CONSTRUCTION PROJECTS

FLORIDA INLAND NAVIGATION DISTRICT
DMMA BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

NOVEMBER 2017

The proposed dredged material management area (DMMA) BV-24A (refer to Environmental Resource Permit [ERP] Application Attachment 2, Figures 1 – 35), a site selected for development as a dredged material management facility, will provide long-term capacity for the management of sediments dredged from Brevard County, Reach IV of the Atlantic Intracoastal Waterway (ICWW). Reach IV extends from the vicinity of Turkey Creek (ICWW mile 180.87) southward 13.49 miles to the Brevard-Indian River County line at Sebastian Inlet (ICWW mile 194.36).

Located west of the ICWW, DMMA BV-24A resides in an isolated 116.03-acre area of northern Brevard County, surrounded by undeveloped lands. The site locates on undeveloped land with wetlands and upland habitats.

This document provides supplemental information to assist the Department with its regulatory review of the proposed dredged material management area (DMMA) construction project. This document specifically addresses design considerations and analyses related to four specific elements:

ELEMENT 1 Capacity and Settling Time for Meeting Water Quality Standards at the Discharge

ELEMENT 2 Dike Stability

ELEMENT 3 Stormwater Quality and Prevention of Offsite Flooding

ELEMENT 4 Other Specific Conditions (inclusive of minimum operation and maintenance requirements and documentation of pre- and post-construction records)

In addition, this document includes the following supporting appendices.

Appendix A Dike Construction Specifications

Appendix B Analysis of Pipeline Design

Appendix C Analysis of Stormwater Flow to Pipeline

Appendix D Analysis of the Stormwater Treatment Pond

Appendix E Water Quality Calculations

1.0 ELEMENT 1: CAPACITY AND SETTLING TIME FOR MEETING WATER QUALITY STANDARDS AT THE DISCHARGE

1.1 Storage Capacity and Containment Basin Design

1.1.1 Minimum Required Storage Capacity

The projected 50-year (yr.) material storage requirement for Reach II reflects two components — historical maintenance dredging over the life of the project and shoaling documented within the authorized channel. A comprehensive evaluation of dredging records indicates that to date, this reach of the Waterway has received maintenance only once since the establishment of the 12-ft. project depth in 1953 (Taylor et al., 1989). A 1987 reconnaissance survey revealed the presence of excessive shoaling in several locations.

Based on these findings, the projected 50-year storage requirement for Reach IV – **1,053,044 cy** – represents the documented in situ volume of recent shoaling, multiplied by a bulking plus over-dredging factor of 2.15. Site BV-24A will provide dredged material management capacity for Reach IV with a requirement of approximately **1,053,044 cy**.

1.1.2 Containment Basin Configuration

The BV-24A containment basin design meets four predominant design criteria: (1) to provide sufficient material storage capacity for 50-yr. material storage requirement; (2) to minimize the environmental impacts and comply with permitting constraints associated with site development; (3) to provide an adequate buffer from adjacent properties; and (4) to meet federal water quality standards (discussed in Section 1.2).

First, the BV-24A containment basin provides capacity in excess of the 50-yr maintenance volume requirement (**1,053,044 cy**). Second, Site BV-24A's selection has minimized the environmental impacts and ancillary permitting constraints associated with site construction. The site locates on undeveloped land with wetlands and upland habitats.

Third, the on-site buffer (ERP Application Attachment 2, Figure 9) that surround the containment basin provide additional isolation from adjacent properties. The containment dike's outside toe lies at least 130 ft. setback from the property boundary. Of this 130-ft. setback, a minimum of approximately 50-ft. will remain as undisturbed vegetation. The setbacks on the boundaries reduce the visibility of the DMMA from Brevard County residents and minimize impacts to natural habitat and wetlands.

With the basin footprint (ERP Application Attachment 2, Figure 9) determined, the following parameters specify the remaining containment basin design elements. Within the resulting 46-acre containment area, dike specifications include a final crest elevation of 35.4 ft. NAVD88 (North American Vertical Datum 88). The dike cross-sectional design (ERP Application Attachment 2, Figure 11), including side slopes of 3H:1V, 12 ft.-wide dike crest, stability berms, and access ramps, will require ±298,900 cy of material to construct. The basin design provides a material storage capacity of **1,035,818 cy** that meets 98% the projected 50-yr storage requirement for ICWW Reach IV. Excavating the basin interior to a mean elevation of approximately 14.55 ft. NAVD88 and the perimeter ditches to an elevation range between 10 – 22 ft. NAVD88 will provide sufficient material for dike and ramp construction.

With the containment basin filled to capacity, the surface of the deposition layer will lie a minimum 4-ft. (which include a 2-ft. freeboard and 2-ft. ponding depth) below the dike crest. Freeboard refers to the vertical distance between the dike crest and the water surface, while ponding depth refers to the height of the water column (with its suspended sediment load) maintained above the depositional surface during dredging operations.

1.1.3 Environmental Considerations

The boundaries of the property on which construction will occur were resolved through negotiation and land swap with Brevard County to minimize impacts to scrub jay habitat and territories. The facility design minimizes environmental impacts and ancillary permitting constraints associated with site construction.

The property is relatively undisturbed, but contains an interior network of primitive trails that appear to be generally used for unauthorized recreation (e.g., ATV riding, hunting) throughout the property and adjacent Brevard County properties in the Environmentally Endangered Lands (EEL) program. Palmetto Prairie (FLUCCS 321 – 46.4 acres) and Pine Flatwoods (FLUCCS 411 - 37.76 acres), much of which is Florida Scrub Jay habitat, dominate the project area and beyond. However, only the northwestern corner of the property includes high quality scrub jay habitat. The recent land swap with Brevard County that defined the current property boundaries moved the FIND ownership out of much of the high-quality habitat found on the original FIND BV-24 property (ERP Application Attachment 13). Wetland habitats are primarily freshwater marsh (FLUCCS 641 – 10.05 acres) along with a small area of wetland scrub (FLUCCS 631 – 0.45 acre) and a few ditches (FLUCCS 513 – 0.16 acre) (ERP Application Attachment 2, Figure 4). The documentation provides dominated species for the various communities and a list of potential listed plant species; none were observed during the fieldwork (ERP Application Attachment 10).

The existing environment provides habitat for a variety of birds, mammals, reptiles, and amphibians. Listed species likely to use the site include the Florida Scrub Jay, Gopher Tortoise, Eastern Indigo Snake, Wood Stork. The site also lies within the habitat boundaries of the Red-Cockaded Woodpecker, Audubon's Crested Caracara, and the Piping Plover, but the specific habitats for those species are much less abundant, or in the case of the piping plover, non-existent. Several gopher tortoise burrows were seen during the 2015 fieldwork, and the site has extensive high-quality gopher tortoise habitat. A formal survey and relocation efforts will occur prior to construction as specified by Florida law. A single abandoned bald eagle nest occurs on the site. The nest has been unused and examination of the nest and area around the tree in 2015, 2016, and 2017 identified no evidence of recent avian predator activity (excrement, kill remains, evidence of nest building). Additionally, the nest appears to be unkempt and falling apart providing further evidence of its abandonment.

Of the 116.03-acre site, about 70 acres will be developed to construct the DMMA. The remaining land will provide an undisturbed vegetative buffer from adjacent properties. In the summer of 2015, Taylor Engineering performed field investigations to record characteristics of the vegetative communities as part of the effort to develop a site-specific FLUCCS map, and assess the site for the presence of federal listed and state listed species (ERP Application Attachment 10). As part of the FIND efforts to minimize impacts to Florida Scrub-Jay habitat, Normandeau Associates, Inc. conducted a Florida Scrub-Jay Survey for the project property and an adjacent property in July 2015 (ERP Application Attachment 14). That survey was part of a land swap agreement with Brevard County to shift the FIND property away from scrub-jay territories (ERP Application

Attachment 13). Wetland delineation for FDEP and USACE Wetland Jurisdictional Determination efforts quantified wetlands on the site as part of the basis for calculation of wetland impacts and mitigation requirements. Wetland lines were surveyed by a licensed surveyor in Spring 2016 (ERP Application Attachment 7). A Wetland line verification visit on March 23, 2016 involved FDEP, USACE, and FIND consultant participation. Final FDEP and USACE jurisdictional wetlands are shown on Figure 6 of the ERP Application Attachment 2. Mitigation will occur through purchase of mitigation credits from banks authorized by State and Federal regulatory agencies.

1.2 Water Quality Standards

1.2.1 Dredged Material Sediment Characteristics

Available data from a county-wide study of Indian River sediments conducted by Trefry et. al (1990) indicates sediments within Reach IVI of the ICWW often contained significant deposits of fine-grain material. These fine-grain sediments varied in thickness between less than 1 cm to more than 70 cm. A previous study by Trefry and Stauble (1987), indicated that sediment deposits contained on average 66.5% fine-grain material. Taylor Engineering then analyzed the data with respect to the most recent ICWW channel survey data (1987). From this analysis, we determined that 32% of the in-place volume of shoal sediments consists of fine-grain material. Based on the above criterion, we determined an associated zone settling velocity of 0.30 cm/min based on an empirical correlation (Taylor and McFetridge, 1989) that related settling velocity to percentage of fine-grain material.

1.2.2 Retention Time and Effluent Water Quality

During the actual dredging event, the project specifications will require the dredging Contractor to meet Florida effluent water quality standards. The specification will require the Contractor to sample turbidity in the receiving water body (background sample) for comparison to the turbidity in the basin effluent (compliance sample). The environmental permits for dredging typically specify an allowable increase in turbidity (comparing compliance sample to background sample) in nephelometric turbidity units (NTU) based on the quality of the receiving waterbody. The environmental permits also typically specific the sampling frequency and general sampling location. Because turbidity — and the ability to meet Florida water quality standards — is highly dependent on several variables, this analysis applied in conjunction with the adjustable weir system, allows the design to meet water quality standards during the expected range of conditions during dredging event. This engineering analysis relies on two comparisons: 1.) particle settling velocity vs. withdrawal zone, and 2.) weir crest length vs. ponding depth.

The first comparison is between the particle settling velocity vs. the withdrawal zone. The withdrawal zone is the depth of water below the surface in which fine grained particles can be re-suspended due to turbulent flow as water accelerates over the weir crest. If the finest particles settle to a depth below the withdrawal zone before that column of water is released over the weir, solid particles do not resuspend, and water quality is considered acceptable. Based on an empirical correlation (Taylor and McFetridge, 1989) that related settling velocity to percentage of fine-grain material, Taylor Engineering estimated the zone settling velocity as 0.30 cm/min. This assumes 32% of the in-place volume of shoal sediments consist of fine grain material.

We then applied the estimated zone settling velocity to determine the retention time needed to settle out of the estimated withdrawal zone at the weir. The top of the withdrawal zone coincides with the top of the ponded water. The point in the water column where the velocity equals zero is considered to represent the bottom of the withdrawal zone. For DMMA basin design, Taylor Engineering applied the U.S. Army Corps of Engineers (USACE) Waterways Experiment Station (WES) Selective Withdrawal Model [Walski & Schroeder, 1978 (Eq. 1)] to estimate the depth of the withdrawal zone. The primary variables that the designer can control in this method are the head on the weir (H_w) and average velocity of water over the weir (V_w).

$$\frac{V_w}{\sqrt{\frac{\Delta\rho_w}{\rho_w}(gZ_0)}} = 0.60\left(\frac{Z_0 + H_w}{H_w}\right) \qquad (Eq. 1)$$

Where:

V_W =	average velocity over the weir, (ft./s)
$\Delta\rho_w$ =	density difference of fluid between the elevation of the weir crest and the lower limit of the withdrawal zone, (g/cm^3)
ρ_w =	density of fluid at the elevation of the weir crest, (g/cm^3)
g =	acceleration due to gravity, (ft./s^2)
Z_0 =	vertical distance from the elevation of the weir crest to the lower limit of the withdrawal zone, (ft.)
H_w =	head on the weir for free flow, (ft.)

This analysis considered the flow over the weir to balance the liquid discharge of the dredge. Based on dredging project experience, Taylor Engineering designed the BV-24A DMMA for a maximum hydraulic dredge of 24 inches operating at a discharge velocity of 16 ft./sec. This equates to a total flow rate equal to 32.8 cubic feet/sec (cfs) or 4373 cy/hr. Of this total flow rate, approximately 80% of the dredged volume will consist of water, and the remaining 20% will consist of solids. Therefore, the weirs must discharge clarified water at a rate of 26.2 cfs (3,498 cy/hr.) to balance the liquid discharge of the dredge. The remaining flow from the solids remains in the basin.

To solve Equation 1, we apply a weir length of 36 ft. and a liquid flow rate of 26.2 cfs. Using equations for weir hydraulics yields a head (H_w) of 0.31 ft., and an average velocity (V_w) of 2.36 ft./s. Based on engineering judgement, the model assumes a density profile of approximately 1.0 g/cm^3 to 1.1 g/cm^3 for the top and bottom of the withdrawal zone, respectively. Iteratively solving Equation 1 for Z_0 — the withdrawal zone — yields a value of 1.07 ft.

With the flow designed for a 24-inch dredge, we estimated the retention time for the average ponding depth of 2 ft. by dividing the volume of ponded water by the weir discharge rate. With an average basin settling area of 37.49 acres (1,633,215 ft^2), the ponded volume is 120,979 cy for a 2-ft. ponding depth. Based on the estimated flow stated in the last paragraph, the time required to discharge this volume is 34.62 hours for a 24-inch dredge. However, the USACE Confined Disposal of Dredged Material Engineering Manual (USACE, 1987) recommends reducing the theoretical retention time based on the length to width ratio of the basin. With a length to width ratio of approximately 0.5, the correction factor is 7.61. Therefore, the design retention time becomes 4.55 hours for a 24-inch dredge.

In comparison, the time required for the sediment to settle out of the 1.07 ft. withdrawal zone at a rate of 0.59 ft./hr. is 1.81 hours. However, to account for field conditions, USACE recommends applying a resuspension factor. Based on an average ponding depth of 2 ft. and a basin area less than 100 acres, the design applies a resuspension factor of 1.50. Adjusting the settling time by the resuspension factor yields a design settling time equal to 2.72 hours compared to the estimated 4.76 hours of retention time. **Therefore, the 2-ft minimum mean ponding depth recommended for the BV-24A containment basin will provide an effective retention time in excess of the time required to maintain adequate sedimentation and effluent water quality.**

1.2.3 Weirs

The BV-24A DMMA will use a parallel arrangement of three steel box weirs to control the release of the clarified water ponded within the containment basin. Adjustment of weir height controls ponding depth within the containment basin, which in turn controls basin retention time as described in section 1.1.2. However, several additional aspects of weir design affect the flow of water inside the basin and thereby strongly influence the efficiency of solids retention and the quality of effluent (i.e., water quality) released from the site. These design aspects include weir crest width, weir crest length, weir type, and the location of the weirs within the containment basin. The following paragraphs discuss each of these design aspects and their effect on basin efficiency.

The first two weir design parameters — weir crest width and weir crest length — affect weir performance by determining the weir's withdrawal zone depth as described in section 1.1.2. At the withdrawal zone, gravity forces on suspended sediment particles exceed the inertial forces associated with flow over the weir. Withdrawal zone depth, therefore, represents the depth of the surface layer of ponded water drawn over the weir crests and released from the containment basin. Maintaining a withdrawal zone depth (i.e. 1.0 ft.) above the ponding depth (average 2.0 ft.) reduces the possibility of re-suspending sediment that has settled out of the upper water column. Moreover, because the concentration of suspended sediment increases with depth, minimizing the depth of the withdrawal layer maximizes the retention of suspended solids.

The weir parameter that most directly influences withdrawal depth and effluent water quality is weir crest length. The Selective Withdrawal Model relates weir crest length to withdrawal depth through the parameter of *weir loading*. Weir loading is the ratio of the dredge's liquid discharge (Q) to the effective weir crest length (B). Project planning guidelines indicate future berth maintenance dredging will employ an 18-inch hydraulic dredge.

Given typical design output specifications for a 24-inch hydraulic dredge, the Selective Withdrawal Model indicates that a weir crest length of 36 ft. should produce a withdrawal zone depth (see section 1.2.2) of approximately equal to1 ft., based on a design weir loading (Q/B) of 0.73 cfs/ft. the dredge typically produces a discharge velocity of 16 ft./sec, with a total volumetric discharge of 4,373 cy/hr. and a 20/80 solids/liquid slurry mix.

Initial field research at the time of developing the Selective Withdrawal Model indicates that under field conditions, the actual withdrawal zone depth may fall significantly below that predicted by the Selective Withdrawal Model. Therefore, the use of the Selective Withdrawal Model provides a conservative containment basin design.

Three 4 ft. x 4 ft. metal box weirs, each with four 4-ft weir sections, will provide a 48-ft total crest length. However, weir walkways typically inhibit the adjustability of one of the weirs 4-ft sections. Considering each weir with three 4-ft weir sections, provides the required 36-ft design crest length required. The weirs will release the clarified effluent from the containment basin under the dike via two pipes connected by a common manifold. During dredging and dewatering operations, the return water pipeline will connect to this manifold and transport the clarified effluent to the Indian River Lagoon.

Setting the weirs at the minimum elevation permits the release, if required, of ponded stormwater or groundwater seepage before the basin's first use. The maximum crest elevation provides a 2-ft mean ponding depth and 2-ft of freeboard above the maximum deposition surface. The nominal 4-inch x 4-inch flashboards (nominal dimension) provide an adjustment increment roughly equivalent to the projected depth of flow (0.31 ft. / 3.7 inches) over the weir crests at the point the weir discharge approximately equals the liquid inflow to the containment basin — a balance reflected by the design weir loading, Q/B = 0.73 cfs/ft. **This design provides adequate adjustment resolution to maximize weir performance and effluent water quality throughout the dredging operation and subsequent release of ponded water.**

The final weir design parameter considered is the location of the weirs within the containment basin. First, to reduce the likelihood of flow constriction, sediment resuspension, and dike instability, the weir crest will offset a maximum of 50 ft. from the dike's inside toe. Second, weir placement must maximize the distance from the dredge pipe inlet and minimize the return distance to the receiving waters. Providing the maximum inlet-weir separation also maximizes the basin's effective area and ensures that the effluent released from the basin meets weir performance criteria. Results from the hydraulic analysis indicate that the ±2,100-ft separation distance provides adequate separation. Based on an average ponding depth of 2 ft. and a separation distance of 850 ft., the estimated ponding depth at the weir is 3.05 ft., compared to the withdrawal zone depth of approximately 1.0 ft. In addition, locating the weirs to minimize the return distance from the weirs to the Indian River Lagoon provides the most efficient effluent transport from the containment basin and allows the dredging contractor to use gravity flow to return the discharge.

Analysis of weir performance based on nomograms developed at the Waterways Experiment Station under the Dredged Material Research Program (Walski and Schroeder, 1978) indicates that the weir design described above will produce acceptable effluent suspended sediment concentration. Relating suspended solids concentration to Florida effluent water quality standards based on the turbidity of the effluent relative to the ambient turbidity of the receiving waters is problematic because turbidity depends highly on the physical characteristics and concentration of the suspended material. However, WES guidelines (Palermo et al., 1978; Walski and Schroeder, 1978) indicate that the effluent suspended sediment concentration falls below typical standards for effluent discharged into estuarine waters. Notably, State water quality standards require that discharge turbidity not exceed 29 NTU above background conditions for Class I waters, such as the Indian River Lagoon. All State permits for operations of dredged material management areas with discharges to Class I waters require ongoing monitoring during all discharge activities. If discharges exceed 29 NTU above background, permits require cessation of discharges until waters to be released meet the standard.

2.0 ELEMENT 2: DIKE STABILITY

2.1 Site Investigation

Dunkelberger Engineering & Testing, Inc. (DET) performed geotechnical investigations (ERP Application Attachment 11) of the site to determine the foundation conditions for the new dike and weir structure and to assess the on-site materials for use as dike fill. The geotechnical exploration consisted of 25 standard penetration test (SPT) borings and 7 Cone Penetrometer Test soundings. The SPT borings located along the footprint of proposed dike as well as in the proposed borrow area. The CPT soundings were completed around the proposed perimeter dike. The SPT borings ranged in depth from 45-100 ft. along the dike alignment and 15 ft. in the borrow area. The CPT soundings ranged in depth from 35-75 ft.

As described in ERP Application Attachment 11, in general borings found approximately 40 ft. of relatively clean fine to medium sand, followed by clays and silts with highly variable thicknesses of 5 to 40 ft. Below the clays and silts was typically shelly sands with varying amounts of silt extending to the respective boring termination depths.

Topographic relief at the site slopes downward from west to east. Ground elevations at the site range between +25.0 to +9.0 ft. NGVD. ERP Application Attachment 2, Figure 9 shows the proposed site plan, which will bring the finished elevation of the basin bottom to approximately 14.5 ft. NAVD.

Groundwater conditions at the site range from elevations of 14.6 – 22.5 ft. NAVD. Similar to the topographic relief at the site the groundwater flow gradient is relatively steep, dropping from west to east.

2.2 Soil Testing

DET collected disturbed samples from its soil borings for laboratory analysis. Analysis included moisture content, organic content, fines content, gradation, modified proctor compaction, limerock bearing ratio, hydraulic conductivity, triaxial shear strength, consolidation. ERP Application Attachment 11 provides the laboratory analysis results.

2.3 Stability/Seepage Analysis

DET completed the seepage and slope stability analyses for the representative dike cross sections using the design software, GeoStudio (ERP Application Attachment 11). The software uses finite element modeling to analyze seepage and limit equilibrium methods for slope stability. The seepage analyses estimated the seepage flow through the dike and into the internal drains, the pore water pressures within the dike, and the flow gradients through and exiting the dike. The slope stability analyses used the pore water pressures from the seepage analyses to determine the factor of safety against circular and block-type sliding slope failures.

Dunkelberger analyzed two design conditions: (1) End of Construction and (2) Steady-State Seepage. The first two conditions assume that the water elevation in the basin, and hence the pore water pressure conditions within the dike, remain constant with respect to time. The End of Construction condition assumes the groundwater table has exceeded the seasonal high groundwater table and locates at an elevation of +16.6 ft. NAVD for all cross sections. The analysis checked the stability of both the exterior and interior dike slopes for this condition.

The Steady-State Seepage condition locates the water within the basin at the maximum ponding elevation of +33.3 ft. NAVD (i.e. 2 ft. below the dike crest). The finite element analysis determines the phreatic surface within the dike (i.e. the surface where the pore water pressure equals zero) based on user-defined boundary conditions. The analysis checked the stability of the exterior dike slope for this condition.

ERP Application Attachment 11 contains detailed results for the seepage and slope stability analyses.

2.4 Design Safety Factors

For the seepage analysis, all the design sections had sufficiently low vertical gradients along the exit face of the dike. The greatest vertical exit gradient (0.42) provides a factor of safety of approximately 2.4 for a critical vertical exit gradient of approximately 1.0. This meets the minimum recommended factor of safety in the USACE Manual EM 1110-2-1901.

ERP Application Attachment 11 summarizes the stability analysis safety factor data. The USACE Manual EM 1110-2-5027 recommends a safety factor of 1.3 for Steady State Seepage and safety factor of 1.3 for End of Construction, and 1.0 for Rapid Drawdown for stability analysis. For the End of Construction, the calculated minimum safety factor of 1.55 exceeds the USACE recommendations. For the Steady State Seepage condition, the calculated minimum safety factor of 1.57 also exceed the USACE design safety factor. The rapid drawdown scenario was not considered for the dike embankment due to the dredged materials occupying the impoundment. It was not considered in the ditches due to the high permeability of the embankment and foundation soils which would quickly relieve pore water pressures.

2.5 Site Preparation

The contractor will establish all temporary erosion and turbidity control measures upon mobilization to the site (ERP Application Attachment 2, Figure 35) and will monitor and maintain these erosion control devices according to FDEP protocols. Following erosion control establishment and before starting dike construction, the contractor will proof roll the footprint of the dike foundation and perimeter road subgrade. A FIND representative will observe the proof rolling efforts and help the contractor identify areas of unsuitable foundation and subgrade material. The contractor will excavate and fill with suitable foundation and subgrade material any areas that exhibit excessive deformation. The contractor may begin dike construction once the entire foundation and subgrade contains suitable bearing material. Appendix A provides a standard guidance specification for dike construction. Notably, these specifications represent typical earthwork specifications and may require some modification during final design.

2.6 Material for Dike Construction

Construction of the containment dike, perimeter and access road subgrade, and dike access ramp will require the contractor to excavate material within the dike’s basin to use as fill material. Suitable material will consist of non-plastic sandy soil that contains no more than 12% fine materials (material that passes a 200 sieve), and no more that 5% organic matter by dry weight. Suitable material will generally classify as SP or SP-SM according to the Unified Soils Classification System (USCS). The contractor will use open site areas as well as the construction laydown area to temporarily stockpile unsuitable material. The Contractor will either bury unsuitable material within the basin area or will spread the unsuitable material within the basin area as directed by the Engineer.

2.7 Water Level Control

The contractor will construct three 4 ft. x 4 ft. metal box weirs to decant the clarified water received during dredging operations. The weirs, located in the northeastern corner of the containment area, will sit diagonally opposite the dredging inflow pipes. Each weir will release effluent over a narrow-crested weir section of 12-ft minimum length, for a total weir crest of 36 ft.

2.8 Seepage Control

The contractor will install an underdrain system within the dike along its entire perimeter. The underdrain system will consist of perforated plastic pipe enclosed in a gravel trench and geotextile fabric. The perforated pipe will run parallel to the crest of the dike and connect to nonperforated outfall pipes running perpendicular to the dikes crest and spaced at approximately 200 ft. on-center. The non-perforated outfall pipes will discharge seepage water into the perimeter ditch. Removing water from the dikes interior will maximize the soils shear strength and minimize pore pressure within the dike. The underdrain system serves to improve and maintain dike stability by lowering the phreatic surface.

2.9 Determination of Minimum Freeboards

With the containment basin filled to capacity, the surface of the deposition layer will lie a minimum 4-ft (which includes a 2-ft freeboard and 2-ft ponding depth above the maximum deposition surface) below the dike crest.

2.10 Methods of Construction

The contractor will select the earthmoving equipment most beneficial to construction operations. However, experience with past dredged material management area construction projects indicates that a project of this size and nature will require a minimum of two large hydraulic excavators, a minimum of two large off-road dump trucks, two to three large bulldozers, two to three vibratory rollers, and one to two graders. The contractor will hire an independent soil testing agency to perform quality control testing during construction. The agency will collect at least one bulk sample for each unique strata of material used during construction for compaction testing to determine the strata's maximum density and optimum moisture content. The contractor will place the excavated material in 12-in. loose lifts and compact each layer with a vibratory roller. Following placement and compaction, the agency will use appropriate testing methods (e.g., nuclear gauge or sand cone test) to determine in-place density. Once the soil layer has reached its maximum density, the contractor will scarify the surface to prepare for the next 12-in. loose lift of material. In-place density testing will occur at a maximum interval of 500 ft. on each 12-in. layer of soil. Following final grading, the contractor will place permanent erosion control measures (i.e., grass, hydroseed, or sod) on the face of the dike and all disturbed areas.

The contractor will fabricate the weirs at an off-site location and deliver them to the site for placement onto a cast-in-place concrete foundation. The contactor will select an appropriately sized crane system to install the box weirs. Following concrete foundation construction and weir placement, the contractor will construct a timber walkway connecting the box weirs to the crest of the dike.

2.11 Construction QA/QC

The FIND will conduct a pre-construction meeting before it issues a Notice to Proceed. This meeting will answer the contractor's questions regarding both technical and coordination issues. A FIND representative will observe the contractor's progress by conducting periodic site observation visits and will likely hire an independent company that specializes in geotechnical and construction services to perform daily site evaluation and verification testing. Throughout the project, a FIND representative will conduct progress meetings to discuss design, construction, and permit issues. These meetings will involve representatives from the owner, the Engineer, the contractor, the site observers, and the regulatory agencies. These communication techniques will provide quality assurance for the project.

Project specifications will reference accepted industry standards and require the contractor to provide the FIND with submittals and shop drawings demonstrating that each facet of the work meets the referenced standard. Typical specifications will reflect standards governed by such organizations as the American Society for Testing Materials (ASTM), the Florida Department of Transportation (FDOT), and the American Society of Mechanical Engineers (ASME). A representative of FIND will review the contractor's submittals and shop drawings to ascertain that the contractor selects the proper materials and construction techniques for the project. This communication technique will provide quality control for the project.

Following construction, the contractor will provide a set of as-built drawings, signed and sealed by a registered Professional Land Surveyor for acceptance by the Engineer. The as-built drawings will highlight any major deviations from the construction drawings. The Engineer of Record will certify the completed project and provide copies of the as-built drawings and as-built certifications to the FDEP.

3.0 ELEMENT 3: STORMWATER QUALITY AND PREVENTION OF OFFSITE FLOODING

3.1 Stormwater Quality

For this type of structure, the St. Johns River Water Management District (SJRWMD) requires treatment of the greater of the first 1.5-inch of runoff over the total drainage area or the first 1.75-inches of runoff over the impervious drainage area ("Applicants handbook: Regulation," 2010).

The rainwater that falls within the basin area and on the dike inside slopes will collect in the basin. At the weir locations inside the basin, adjustable weir boards will be placed 12 inches to 36 inches higher than the ground surface. This will effectively trap rainfall falling inside the basin area and allow it to slowly seep into the ground, providing zero runoff. Greatly reducing runoff from the site. Stormwater runoff from the dike crest, outside slopes, and perimeter road will collect in the perimeter swale where it will be routed via ditch flow into an approximately 50ft x 1000 ft. storage ditch on the East end capable of treating (holding) the required volume per SJRWMD regulations.

Stormwater runoff from the pipeline easement will be routed to two retention areas, at the east and west ends of the easement, via swales running parallel to the easement access road. The easterly retention area is approximately 25 ft. x 230 ft. The westerly retention area consists of two 4.5 ft. wide v-bottom ditches on the east and west side of the easement access road, approximately 200 ft. and 260 ft. long, respectively.

See stormwater calculations presented as appendices to this document.

3.2 Stormwater Quantity

For stormwater quantity, SJRWMD regulations state that post-development runoff flowrates should not exceed pre-development runoff flowrates. The post-development runoff will not exceed predevelopment condition because the majority of the on-site rainfall will fall within the containment basin, where it will be held until it percolates into the soil. The only proposed site changes outside the basin area are the addition of a shellrock stabilized road, which has very little impervious area compared to the basin interior area. For these reasons, the facility should not require additional controls to prevent post-construction stormwater runoff flowrates from exceeding pre-construction flowrates.

3.3 Floodway Protection

The majority of the site lies in an FEMA Unshaded Zone X. Small portions of the site lies in a Zone A, at the site's eastern and western borders. The pipeline easement, west of Dixie Highway, locates within an Unshaded Zone X and a Zone A. East of Dixie Highway, the easement locates within a Shaded Zone X, Zone AE (El. 3.7 NAVD 88), and Zone AE (El. 4.7 NAVD 88). (ERP Application Attachment 2, Figure 5). It is highly unlikely that the proposed containment basin will create any adverse impacts to floodways, floodplains, or levels of flood flows or velocities of adjacent streams, impoundments, or other watercourses.

4.0 ELEMENT 4: OTHER SPECIFIC CONDITIONS

4.1 MINIMUM OPERATION AND MAINTENANCE REQUIREMENTS

4.1.1 Dike Inspection Requirements

To comply with specific requirements of the Environmental Resource Permit (ERP) for the operation of Site BV-24A, the dredging contractor will conduct additional inspections of the containment facility throughout all phases of dredging and dewatering to ensure the integrity and stability of the containment dikes. The remainder of this chapter details specific inspection requirements.

Critical Inspections. The contractor shall perform periodic inspections of the containment dike to check for certain critical conditions that may require the implementation of remedial measures. A qualified geotechnical engineer or engineering technician with specific training and experience in performing inspections of earthen dams, earthen reservoirs, or earthen dredged material containment facilities shall conduct all inspections. As part of his required preconstruction submittals, the contractor must submit the qualifications of the designated dike inspector for review and approval of the Engineer.

The contractor shall conduct inspections for the items listed below every week. Any of these conditions indicates a critical condition that requires immediate investigation and may require emergency remedial action. Immediately upon confirming the existence of a critical condition, the contractor must inform the Engineer and increase the inspection frequency to a minimum of once daily. The Engineer will then notify the Florida Department of Environmental Protection (FDEP). Within 24 hours of confirming a critical condition, the contractor must submit to the Engineer documentation of the inspections and implemented remedial actions. The Engineer will then submit to the FDEP a written report detailing the condition and the implemented remedial actions within seven days of the confirmation of the critical condition. The following items constitute a critical condition:

- Seepage with boils, sand cones, or deltas on outer face of the dike or downstream from the dike's outer toe

- Silt accumulations, boils, deltas, or cones in the drainage ditches at the dike's base3) Cracking of soil surface on the dike's crest or on either face of the dike

- Bulging of the downstream face of the dike

- Seepage, damp area, or boils in vicinity of or erosion around a conduit through the dike

- Any subsidence of the crest or faces

Supplemental Inspections. During the critical inspections described above, the contractor will consider the indicators below as areas that warrant continued monitoring during subsequent inspections and may warrant repairs. Within 24 hours of confirming the presence of an indicator of a potential area of concern, the contractor must also inform the Engineer of the item and any required repairs undertaken. Indicators of potential areas of concern include the following:

- Overgrowth patches of vegetation on the downstream face or close area downstream from the toe

- Surface erosion, gullying, or wave erosion of the upstream face of the dike

- Surface erosion, gullying, or damp areas on the downstream face of the dike, including the berm and the area downstream from the outside toe

- Erosion below any conduit exiting the dike

- Wet areas or soggy soil in the downstream face of the dike or in the natural soil below dike

4.1.2 Establishment and Maintenance of Vegetative Cover

Following construction of the containment facility, and again following each use of the facility to receive and dewater dredged material, the FIND will remain responsible for establishing and maintaining a vegetative cover on all exposed surfaces of the dike. Maintenance includes regular mowing of the dike's slopes and crest to prevent the establishment of shrubs, trees, or other woody vegetation and to allow visual inspection of the soil surfaces in critical areas such as:

- The condition of vegetation on the dike and in areas for 50 ft. downstream from the outside toe

- The condition of soil surfaces on the top and slopes of the dike and in areas for 50 ft. downstream from the outside toe

- The condition of drainage ditches in the area of the base of the dike
- The water surface elevation and amount of freeboard
- The condition of weirs and water level control structures, including all conduits exiting the dikes

4.2 ADDITIONAL CONSIDERATIONS

4.2.1 Migratory Bird Protection

The FIND previously followed the Jacksonville District USACE district-wide migratory bird protection policy to ensure that operation and construction of the dredged material disposal area would not adversely impact migratory birds. However, recent communication with the USACE (USACE, personal communication, 2013) indicates that the USACE no longer follows this policy and has not replaced or updated this policy. The FIND will follow the specific conditions of the state and federal permits and any relevant local permits as they relate to migratory bird protection.

4.2.2 Cultural Resources

Review of the Florida Master File indicates no historical or archaeological sites known for this property, however the pipeline easement does intersect with two linear resources (ERP Application Attachment 16). These linear resources include both the Florida East Coast Railroad and US Highway 1 / Cocoa Boulevard. However, only US Highway 1/Cocoa Boulevard is eligible for further SHPO evaluation. A compliance and review request will be submitted to the Bureau of Historic Preservation, Division of Historical Resources, Florida Department of State; consultation is ongoing to determine effects of the project on this site.

4.2.3 Material Rehandling/Reuse

Site BV-24A is a dredged material management area the FIND is developing to serve the long-term maintenance requirements of the ICWW within Brevard County. This report has emphasized that although the site has been designed for a specific service life, the site will also operate as a permanent facility for the intermediate storage and rehandling of dredged material. Fulfilling this intended use requires the eventual removal of the dewatered material off site. The following paragraphs detail the ultimate use of this material.

Based on a comprehensive analysis of dredging records and survey data, the material volume projected for placement and temporary storage over the 50-year design service life of the BV-24A facility is estimated to be 1,300,900 cy. This volume represents a significant quantity of potentially valuable material. Disregarding the possible return on the sale of this material, the cost savings of permanent storage alone justifies an effort to determine, through a formal market analysis, the potential demand for dewatered dredged material.

If such a determination reveals that material resale or reuse is practical, the properties of the dredged material must then satisfy the requirements of commercial interests. The coarsest fraction of material (sand and gravel), having been partially segregated through differential settling, can likely serve commercial interests without additional treatment. However, exploring the feasibility of compartmentalized segregation of material during dredging or mechanical separation following dewatering may occur if market conditions dictate. Portions of the material determined unsuitable for fill or other construction purposes because of organic silt or clay content might serve as landfill capping or satisfy agricultural purposes.

A determination that resale or reuse is unfeasible will dictate locating and developing a centralized permanent storage facility. The appropriate location for such a facility would appear to be inland where lower real estate values and development potential make permanent storage more economically feasible. The optimal distance from the initial containment area to the permanent storage site would represent a compromise between lower land costs and higher transportation costs.

4.2.4 Site Security

Providing adequate site security will remain a key element in the proper management of BV-24A. Unsecured dredged material containment areas typically host a variety of unauthorized activities including illegal dumping, vandalism, hunting, and dike destruction by off-road vehicles. Security fencing installed around the site's upland perimeter should preclude such activities within the BV-24A containment facility. Access to the area within the fence will be limited to agents and representatives of the FIND and the Jacksonville District USACE, and authorized contractor personnel. Access gates will remain locked at all times except during dredging and maintenance operations. The presence of an on-site operator during such operations should further discourage unauthorized entry to the site and the occurrence of unsanctioned activities.

Between dredging operations, the site operator will conduct regularly scheduled inspections to ensure facility security maintenance. Other responsibilities of the operator during these inspections will include weir operation and stormwater release, and routine inspection of dike integrity, and buffer area conditions.

4.2.5 Dredging Pipeline

ERP Application Attachment 2, Figure 8 shows the location of the pipeline easement where the permanent dredged material pipeline will lie. The pipeline will be constructed in this easement permanently, as shown. During future dredging events, FIND will include specifications for temporary placement of a dredged material discharge pipeline within this easement. The pipeline will be placed parallel to the permanent discharge pipeline within the pipeline easement. The temporary pipe will allow the dredged material to be hydraulically pumped into the basin. These pipelines typically range from 24 to 36 inches in diameter. Dredging project specifications will include the following measures and best management practices to minimize any potential disturbance to resources.

- Contractor will place the pipeline with light construction equipment to minimize impact.
- Contract language will prohibit the contractor from causing any unauthorized impacts to sensitive natural resources. The contractor will be required to mitigate for any unauthorized disturbance.
- The contractor will remove temporary pipeline at the end of construction. The owner's representative will inspect the pipeline easement to verify no permanent impacts to the site.

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SUPPLEMENTAL INFORMATION FOR DMMA CONSTRUCTION PROJECTS

FLORIDA INLAND NAVIGATION DISTRICT
DMMA BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

APPENDIX A

DIKE CONSTRUCTION SPECIFICATIONS

SECTION 31 23 00

DIKE AND EARTHWORK CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work covered by this section includes furnishing all labor, equipment, and materials required to perform all necessary excavation, filling, and grading to construct the dredged material management area including dike, ditches, and roads described herein and in the Project Drawings. Completion of this work includes the removal of the existing 3-ft wide x 30-ft deep bentonite slurry wall to the bottom elevation of the DMMA expansion.

B. NOTE: A portion of the site was previously used as a Sludge Disposal Area. Estuary Corp. As of May 2016, the site has been successfully remediated and was issued a Conditional Site Rehabilitation Completion Order (SRCO) by the Florida Department of Environmental Protection (**APPENDIX G**). Due to the site's history, the Contractor shall visually pre-screen the material in the area of the former Dee Dee Dot Sludge Disposal Area No. 2 for the unlikely finding of any remaining contaminated materials. Should any suspect material be identified, the Contractor shall immediately notify the Engineer and place the material into the designated "Temporary Disposal Area for Suspect Material" stockpile area for further inspection. Should any monitoring wells associated with the clean-up of the former Dee Dot Sludge Disposal Area No, 2 be identified, the Contractor shall immediately notify the Engineer. The Engineer will notify the Florida Department of Environmental Protection and Dee Dot's consultant, Golder Associates, for formal abandonment of the identified well(s).

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. All publications are "Latest Edition" unless specified otherwise.

A. American Society of Testing Materials (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates
ASTM D1140	Standard Test Methods for Amount of Material in Soils Finer than the No. 200 Sieve
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3740	Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction
ASTM D6913	Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. American Association of State Highway and Traffic Officials (AASHTO)

AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe

C. Florida Department of Transportation (FDOT)
FDOT Standard Specifications for Road and Bridge Construction

1.3 DEFINITIONS

A. Dike Embankment: The term "dike embankment" as used in these specifications is defined as the earth fill portion of the dike and includes all types of earth fill for the dike, stability berms, roads, ditches, and all other specified or directed earth fill within the limits of the project, excepting those stone and filter material used for the dike toe drain system.

B. Dike Embankment Template: The dike embankment template is defined as follows: The bottom vertical limit of the template shall be the surveyed foundation grade. The top vertical limit of the template shall be the finished elevation of the top of dike as defined on the Project Drawings. The horizontal limits of the template shall be from the outside toe of placed/compacted fill necessary to construct the dike, perimeter road, ditch, and ditch berm to the interior toe of placed fill necessary to construct the dike.

C. FDOT Specifications: Latest edition of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

D. Fine Material: Fine material shall be defined as the amount of material by dry weight passing the U.S. standard No. 200 sieve (ASTM D1140 or ASTM D6913).

E. Maximum Density: Maximum density shall be defined as the maximum dry density obtained from modified proctor compaction curves (ASTM D1557) and approved by the Engineer.

F. Toe Drain: The toe drain is defined as the material making up the dike interior drain system and primarily includes a gravel trench wrapped in filter fabric. The system also includes the perforated and non-perforated collector pipes, filter fabric, concrete inlets, and outlet pipes.

G. Structure: Footings, foundations, retaining walls, slabs, piles or other man-made stationary features constructed above or below the ground surface.

1.4 SUBMITTALS

The following submittals shall be submitted in accordance with SECTION 01 33 00 SUBMITTAL PROCEDURES.

A. Geotechnical Engineer and Testing Laboratory Credentials

1. The Contractor shall submit the name and credentials of the geotechnical engineering consultant and personnel who will be performing the quality control tests for soil compaction, soil sieve analysis, concrete testing, etc. The company and personnel shall show experience in this type of work and the work shall be overseen by a registered professional engineer.

2. The Contractor shall submit the name and credentials of the testing laboratory which will be performing the material testing for Engineer's approval.

B. Foundation Preparation Grading Plan

1. Submit a foundation preparation grading plan to the Engineer for approval. The foundation preparation grading plan shall show the proposed grades and elevations of the foundation in section view and profile view. This may be done by marking the drawing cross sections with red pen (and sketching a profile view) or this may be performed digitally in AutoCAD.

C. Dewatering Plan

1. Submit a written dewatering plan describing the equipment required and the means and methods required to dewater the site for excavation. Provide sketches as necessary.

2. Submit a copy of any necessary dewatering permits

D. Toe Drain Material Information

1. Submit manufacturer’s information on perforated and non-perforated HDPE collector pipes.

2. Submit test data and gradation curves for toe drain gravel.

3. Submit manufacturer’s information on filter fabric for toe drain.

E. Water Source for Dike Compaction

1. Submit the source of the water to be used to achieve optimum moisture content during compaction operations.

2. Submit a copy of any necessary permits for temporary groundwater well if used.

F. Drainage Inlets and HDPE Drain Pipes

1. Submit shop drawings and information on pre-cast concrete inlets. Shop drawings shall also show how proposed inlets will be hydraulically connected to the existing toe drain system.

2. Submit manufacturer’s data on all sizes of HDPE drain pipe used for the toe drains or culvert crossings.

G. Dike Construction Quality Control Tests and Measurements

The Contractor shall submit quality control tests to the engineer for approval. These include:

1. Soil density and moisture tests

2. Soil gradation and classification tests

3. Toe drain material thickness measurements

4. Gravel gradation tests

H. Pipe Bedding Compaction Tests

1. The contractor shall submit a modified proctor (ASTM D1557) per each soil type and in place density testing results for every 200 linear ft of pipe installed but not less than one test per pipe or culvert location.

I. Foundation Survey

1. After foundation preparation is completed, submit topographic survey of the dike foundation footprint for Engineer approval.

J. Pipe Invert Surveys

1. Before backfilling, the contractor shall submit surveys of pipe elevations to the Engineer for approval.

K. Payment Surveys

1. Surveys for payment of dike construction shall be submitted at 30-day intervals in accordance with SECTION 01 29 00 MEASUREMENT AND PAYMENT. The Engineer shall have seven (7) working days to examine surveys and make recommendations for payment or non-payment.

L. Toe Drain TV Pipe Inspection Video/Report

1. Following dike construction, submit inspection video and a letter report for the existing and newly constructed toe drain system including any pipes passing beneath the perimeter road for Engineer approval. The Contractor shall repair any broken or non-functioning pipes in the newly constructed toe drain system at no charge to the District.

M. Aerial Photographs

1. The contractor shall submit aerial photographs of the site after initial site preparation but before shaping of the dike. An additional aerial site photograph shall be submitted after the completion of the containment basin.

1.5 GEOTECHNICAL ENGINEERING CONSULTANT AND TESTING LAB QUALIFICATIONS

A. Geotechnical Engineer Consultant Testing and Inspection Services: Contractor shall retain a qualified independent geotechnical engineering/testing consultant to perform soil testing and provide quality control testing services during earthwork operations.

B. Testing Laboratory Qualifications: The geotechnical testing laboratory shall demonstrate to the Engineer's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM D3740, that it has the experience and capability to conduct required field and laboratory geotechnical testing without delaying the progress of the work. AASHTO or FDOT certification may be substituted as approved by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS FOR DIKE EMBANKMENT

A. General

1. Materials for the dike embankment fills shall be acquired from excavation areas as shown on the Construction Drawings. The intention is to use the most suitable material obtainable from these sources. Materials containing brush, roots, sod, or other perishable materials, and stones larger than one (1) inch will not be considered suitable.
2. The suitability of the materials shall be subject to quality control tests. Mixing of the borrow materials during the excavating process may be required. The contractor shall not excavate below the finished interior basin elevation shown on the Project Drawings. Any soils excavated from below the water table will require dewatering prior to placement and compaction.
3. The Contractor shall examine the Geotechnical Report(s) before bidding to review the embankment fill material available at the project site.

B. Suitable Material

1. Material considered suitable for dike, road, and general earthwork construction shall consist of an inorganic, granular soil containing between 0 and 12 percent material passing the No. 200 mesh sieve (sand having a Unified Soil Classification of SP or SP-SM.

C. Unsuitable Material

1. Materials which <u>do not comply</u> with the requirements for “Suitable Material” are unsuitable. Additionally, materials unsuitable for use as dike embankment construction fill are defined as follows:

   a. Material containing more than 4% organic matter (by dry weight)

   b. Materials classified by the Unified Soil Classification System as PT, OH, OL, CH, SC, MH, SM, GM, GC, GW and GP.

   c. Materials containing roots greater than one (1) inch in diameter, logs, scrap lumber, metal objects, plastic and fiberglass objects, concrete construction refuse, and other objectionable debris.

   d. Materials containing brush, sod, organic, and other perishable materials.

   e. Material containing rocks greater than one (1) inch in diameter.

D. Topsoil Material

1. Material suitable for topsoil shall be natural in-situ topsoil taken from onsite areas within the clearing limits but outside the existing dike. Unless otherwise approved by the Engineer, suitable topsoil shall be dark colored soils discolored by the organic content of the soil and having at least 1.0 percent organic content by dry weight.

2.2 MATERIALS FOR TOE DRAIN SYSTEM

A. Toe Drain Gravel: Gravel for the dike drains shall be the size aggregate specified on the Project Drawings. Gravel shall be natural limestone or granite stone having a minimum unit weight of 140 pcf and meeting FDOT specifications for coarse aggregate.

B. Filter Fabric: Filter fabric shall be Mirafi 1100N non-woven filter fabric or engineer approved equivalent.

C. 6-inch Diameter Perforated HDPE Drain Pipe: 6-inch diameter perforated drain pipe shall be single wall HDPE corrugated pipe having a manning's n of 0.015 or less and capable of withstanding the cover requirements and construction loads. Pipe and fittings shall meet AASHTO specification M252, type CP, with class 2 perforations. Joints, tees, elbows, and other connections shall interlock so as to withstand a minimum of 40 lbs of tensile force and shall be soil-tight. If the manufacturer provides no test results on the tensile capacity of the joints, the Contractor shall place a minimum of two ½ inch wide beads of 3M Marine 5200 fast-cure adhesive around the inside perimeter of the joints and shall test 3 typical joints to see if the joints can hold a 40 lb tensile force for a minimum of 12 hours.

D. 6-inch Diameter Non-Perforated HDPE Drain Pipe: 6-inch diameter non-perforated drain pipe shall be single wall HDPE corrugated pipe having a manning's n of 0.015 or less and capable of withstanding the cover requirements and construction loading. Pipe shall meet AASHTO specification M252, type C. Joints, tees, elbows, and other connections shall interlock via mechanical means and shall withstand a minimum of 40 lbs of tensile force and shall be soil-tight.

2.3 DRAIN PIPE AND INLET MATERIALS

A. HDPE Double Wall Drain Pipe: Pipe greater than 6 inches in diameter, pipe specified as culverts or pipe specified as double-wall shall be of the diameter listed on the Drawings and shall be HDPE drain pipe with double wall corrugations. Pipe shall have a smooth-wall interior with a manning's n of 0.012 or less. Pipe shall be double wall meeting AASHTO specification M252 or M294, type S. Fittings shall be bell-and-spigot type and shall be water tight to a pressure rating of 10 psi per ASTM D3212. Fittings shall be a minimum of 8 ft apart. Pipe lengths less than 8 ft shall not be used unless all remaining pieces are the full ordered length.

B. Concrete Inlets and Grates: Concrete inlets shall be pre-cast concrete inlets meeting the requirements and dimensions outlined in the Project Drawings. Grates shall fit the inlets and meet requirements as outlined in the Project Drawings.

2.4 ACCEPTABLE SOILS FOR PIPE BEDDING

Where pipe bedding consists of soil material, soil shall be classified as SP or SP-SM per ASTM D2487 and have a fine material content less than 12% per ASTM D6913.

PART 3 - EXECUTION

3.1 DEWATERING

A. The Contractor shall dewater the site as necessary to construct the DMMA. The Contractor shall abide by all state and local laws regarding dewatering of construction sites. The Contractor shall monitor any discharge as necessary to ensure that the discharged water does not violate state water quality standards. The Contractor shall not discharge dewatered effluent to any location onsite except for the DMMA basin area unless approved by the Engineer. The Contractor shall submit a dewatering plan to the Engineer for approval.

3.2 FOUNDATION PREPARATION

A. Foundation Preparation

1. Excavate to a point so that the prepared foundation is level when measured perpendicular to the proposed dike centerline. The proposed dike footprint shall be defined as 15 ft (measured perpendicular to the dike centerline) beyond where any proposed cut or fill is required to construct the dike, interior shelf, perimeter road, and perimeter ditch. The intent is to have a roadway like preparation where compaction equipment can work effectively. The Engineer recognizes that the prepared foundation surface will vary in elevation.

2. Where the foundation intercepts existing dikes or grades having a slope in excess of 15 percent, bench cut the slope as described in the section herein entitled “Fill Placement and Compaction”.

3. Following the establishment of groundwater control, the foundation should be compacted by surface rolling with a self-propelled vibratory compactor. During compaction efforts, groundwater levels shall be maintained a minimum of two (2) ft below the stripped (cleared) ground surface. The compactor should impart a dynamic drum force of not less than 44,000 pounds. Each section of the subgrade shall be subjected to multiple, overlapping (20% overlap) coverages of the compactor as it operates at its full vibrational frequency and at a travel speed of not more than 1.5 miles per hour. Compaction shall continue until no further settlement is visibly discernible at the subgrade surface. In no case, however, should any section of the subgrade receive less than ten (10) coverages with the compactor. Soil in the top twelve (12) inches shall be compacted to 95% maximum density at a moisture content within 2% of optimum as determined by Modified Proctor (in accordance with ASTM D1557).

4. If during compaction efforts, the soil displays any signs of instability such as pumping, weaving, or shoving, the Contractor shall notify the Engineer. Should weak or instable soil conditions exist the Contractor shall, under direction of the Engineer, excavate the weak soils and store the material onsite. Upon completion of the dike, this material shall be buried in the interior basin unless otherwise directed by the Engineer.

5. After compaction, thoroughly scarify the ground surface within the entire dike base footprint to a depth of six (6) inches. Run scarifying parallel to the centerline of the dike. All earthwork operations, including excavation, handling, hauling, drying, and compacting of material shall account for variable groundwater conditions and surface ponding from any recent heavy rains.

B. Foundation Preparation Finished Grade Elevation:

1. The elevation of the prepared foundation surface shall match the existing grade to the greatest extent practical. Unless otherwise approved by the Engineer, excavation (cut) shall be no greater than necessary to provide a reasonable level and gently sloping surface with grades less than 5% measured parallel to the dike centerline and elevation differences less than 6 inches when measured along a line perpendicular to the dike centerline (unless benching is utilized). Excavation (cut) during construction of the foundation shall not be greater than 1 foot below the existing grade except to level humps or high spots less than 500 feet in length as measured parallel to the dike centerline.

2. The Contractor shall submit a foundation preparation plan to the Engineer for approval showing the cross sections and profiles of the proposed foundation grades. The final surveyed foundation elevations shall be within plus or minus 3 inches of the approved foundation grade elevations, unless otherwise directed by the Engineer

C. Foundation Survey

1. Upon completion of clearing/grubbing and dike foundation preparation, the contractor shall perform a topographic baseline survey that will used to determine future earthwork payment quantities. The survey shall encompass the entire area within the limits of clearing including the dike/roadway footprints and the interior basin area. The survey shall also include an area 25 ft outside the perimeter of the limits of clearing. Transects shall be taken perpendicular to the dike centerline at intervals not to exceed 100 ft with individual survey points taken at all breaks in grade or slope and at intervals not exceeding 50 ft on center. The survey shall be submitted to the Engineer for approval in electronic paper version (24x36) and in AutoCAD 2013 or later version containing point elevation data. Horizontal and vertical coordinate systems shall match those used on the Construction Drawings. The survey shall be signed and sealed by a licensed professional surveyor registered in the State of Florida.

3.3 HANDLING OF UNSUITABLE MATERIAL

A. The Contractor shall separate unsuitable material (as defined in Paragraph 2.1.C) from suitable material during excavation and shall place the material within the basin at the depth and location shown on the Drawings or as directed by the Engineer. Unsuitable material may be temporarily stockpiled in areas within the construction boundary where no construction activities are taking place. Disposal of unsuitable material under or within the dike and other constructed features is expressly forbidden. Dress all areas where unsuitable materials are placed smoothly and evenly. Place a minimum of one foot of sand cover over unsuitable material unless specified otherwise on the Drawings. Unless otherwise approved by the Engineer, the Contractor shall dewater the unsuitable material to the extent necessary to operate heavy tracked equipment over the material and evenly spread and grade any sand cover.

B. If the placement area for the unsuitable material is temporary, the Contractor shall survey the stockpile area after all material is stockpiled and again after all unsuitable material is removed from the stockpile area. If the placement area is permanent, the Contractor shall survey the unsuitable material placement area before and again after placement of the unsuitable material.

C. To get an accurate estimate of the quantity of unsuitable material, the Contractor shall survey the placement area (either temporary or permanent) with transects taken every 50 ft. Surveys shall clearly delineate the horizontal and vertical extent of the unsuitable material. Surveys shall conform to the same requirements designated in these specifications for dike payment surveys.

3.4 BASIN EXCAVATION AND DEWATERING

A. Fill material for DMMA construction shall be taken from the basin area. The Contractor shall excavate the basin to the lines and grades shown on the Drawings and shall dewater the basin area as necessary to maintain moisture control of fill material. The Contractor shall dewater the basin area for final grading.

3.5 FILL PLACEMENT AND COMPACTION

A. General

1. No fill shall be placed on any part of the embankment foundation until such areas have been inspected and approved by the Engineer. The gradation and distribution of material throughout the compacted earth fill section of the dike shall be such that the embankment will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material of the same class. Successive loads of material shall be dumped at locations on the dike as directed or approved.

B. Dike Embankment

1. Scarify the prepared foundation grade to a depth of six (6) inches prior to placing fill. After the first lift is placed, scarify the surface of the previously compacted lift to a depth of three (3) inches and moisten as required for bonding to overlying material. After dumping, the materials shall be spread by approved means in approximately horizontal layers over the entire fill areas. Thoroughly mix embankment materials by disking or harrowing. When succeeding lifts display differences in color or fines content material shall be uniformly mixed to a depth of two (2) ft.

2. Each lift placed adjacent to the existing dike shall overlap the existing dike at that elevation by ten (10) ft. Excavation of the existing dike shall be completed as necessary to place each new lift. The existing dike section that is overlapped by the new lift shall be scarified and moistened as described above.

3. Fill shall be placed at a moisture content within plus or minus 2% of the soils optimum moisture content as determined by ASTM D1557. Place fill in lifts 12 inches or less and compact using a vibratory compactor similar to the one used to prepare the foundation. Compact material to a minimum of 95% of the maximum density determined by the Modified Proctor Test (ASTM D1557). If the overlapping tracks of a bulldozer or lightweight vibratory compaction equipment are utilized as the only compaction means, then the fill loose lift thickness shall be reduced to six (6) inches. Construct the dike embankment to the lines, grades, and cross sections indicated on the Project Drawings.

4. Where the prepared foundation grade is too steep or too uneven, material shall be placed by benching.

5. The Contractor shall record field density tests as soon as practically possible after compacting the dike embankment fill.

C. Benching

1. Where benching is required, place and compact the material in horizontal layers. The horizontal face cut into the existing slope shall be a minimum of 6 feet. The vertical face cut into the existing dike resulting from benching shall not be greater than 3 feet in height unless otherwise approved by the Engineer.

D. Backfill for Pipes

1. Backfilling over pipes shall begin as soon as practical after the pipe has been laid, jointed, and inspected.

   Place and compact material in lifts. Space between the pipe and sides of the trench shall be packed by hand tamper, up to a level of one foot above the top of the pipe. Contractor shall compact backfill to 90% of maximum density as determined by the Modified Proctor Test (ASTM D1557) in layers not to exceed 4 inches in depth up to the centerline of the pipe from the trench bottom. The backfill shall be carried up evenly on both sides of the pipe.

2. Place remaining material within trench in 6 inch lifts and compact with hand tamper or walk-behind equipment.

3.6 TOE DRAIN SYSTEM INSTALLATION

A. Toe Drain General: Install the toe drain to the lines and grades shown on the Project Drawings. Place adequate soil or gravel cover over piping to prevent damage before allowing machinery over the buried pipe material.

B. Quality Control Testing Gravel: The Contractor shall provide gradation tests per ASTM for the first 10 cubic yards delivered to the project site and every 4,000 cubic yards thereafter. If any discrepancies are noted, additional tests shall be required.

C. Quality Control Toe Drain Dimensions: The geotechnical consultant shall measure and record the width and thickness of the gravel layer at every 300 linear ft (as measured along the dike centerline) and records shall include written documentation of the measured thickness. The geotechnical consultant shall keep written records of the field measurements and submit these in a brief weekly report to the Engineer. If the geotechnical consultant discovers any locations where the gravel thickness is not within specified tolerances described herein, the consultant shall bring it to the Contractor’s and Engineer’s attention for corrective action. The consultant shall note locations where tolerances were not met, the date corrective action was taken, and shall record the new thickness measurement demonstrating that the material thickness is now within specified tolerances.

D. Toe Drain Tolerances: The dimensions and tolerances of the gravel toe drain shall be plus or minus 6 inches unless otherwise specified on the Drawings. For perforated pipe placed within gravel backfill, the minimum thickness of gravel cover in any direction as measured from the outside edge of pipe shall be 12 inches.

E. Pipe Installation and Inspection: Place and compact soil bedding material to 95% maximum density per ASTM D1557. Where gravel or aggregate is specified as bedding material, compact to the requirements specified by the Engineer. Assemble pipes for the full lengths along bedding material and establish the final invert elevations. The slope of the pipe between specified invert elevations shall be straight and true and shall be within the tolerances specified herein. The Contractor and the Contractor’s construction surveyor shall install wooden stakes at 25-50 ft on center and shall install a string line along the top of pipe run (as specified on the Drawings) to assist the Engineer in evaluation of the assembled pipe. Notify the Engineer that the pipe is ready for inspection giving at least 48 hours advanced notice.

F. Survey of Pipe Installation: After the bedding is graded, the pipe is assembled and the final pipe inverts are set, the Contractor shall survey the horizontal and vertical locations of the pipe before backfilling. Record the pipe elevations on the top of pipe at pipe ends and every 25-35 ft along the pipe run. Where the open end of the pipe is accessible, survey the pipe invert elevation in addition to the top of pipe elevation. For each type/size of pipe, measure the distance from the top of the pipe to the invert and include this information in the survey. Submit the survey results to the Engineer for approval before backfilling. Include the surveyor’s data in the as-built survey with the pipe elevations marked invert or top of pipe.

G. Pipe Installation Tolerances: Pipe shall be installed to within plus or minus 0.1 ft vertically of the specified invert elevation. Between specified invert elevations, pipe shall be placed within plus or minus 0.1 ft vertically of a theoretical straight line drawn between the specified invert elevations. Pipe shall be placed horizontally to within plus or minus 3 inches of the specified horizontal location. Minimum soil cover over the top of pipes shall be 12 inches unless otherwise noted.

H. Filter Fabric: Install filter fabric of the type specified on the Project Drawings. Stake fabric as necessary to hold in place during backfilling. Lap joints a minimum of 18 inches.

I. Pipe Inspection: Following completed dike construction, the Contractor shall inspect the toe-drain collector pipes for blockage and crushing by running a remotely controlled television camera through the entire length of each pipe run. The Contractor shall video record the inspection for submittal. The Contractor shall note any locations where damage or excessive settlement has occurred and submit this information along with an inspection report to the Engineer for approval. The Contractor shall repair damaged or settled pipe at no additional cost to the Owner.

3.7 EARTHWORK WORK SEQUENCE

A. Fill placement for dike construction shall proceed on the lower end first until the partially constructed dike is approximately the same top elevation at any location. Dike construction can then proceed with the requirement that the dike shall be constructed so that the maximum elevation difference is 3 ft at any location along the top of the dike.

B. The expected work sequence for earthwork is as follows:

1. Clear and grub
2. Strip and stockpile topsoil
3. Prepare dike foundation
4. Construct dike and other earthwork features
5. Place unsuitable material in specified final location and cover with sand fill
6. Place and spread topsoil over dike and other areas designated for grassing

C. The Engineer may approve other work sequences proposed by the Contractor with consideration given for environmental impacts, site access, soil erosion, groundwater control, settlement, etc.

3.8 DIKE EMBANKMENT SOIL QUALITY CONTROL TESTING

A. Determination of Maximum Density

1. The compaction curves provided in the geotechnical report supplied with the specifications are considered preliminary.

2. The Contractor shall collect a minimum of five (5) bulk samples from the excavation area to perform Modified Proctor Test before dike embankment construction begins. All Contractor-supplied tests shall be performed by the approved geotechnical testing firm, and resulting test data shall be signed and sealed by a licensed professional engineer registered in the State of Florida. The Engineer will select the sampling locations and depths for Contractor-supplied testing.

3. The Engineer will determine if these tests may be averaged into previous test results or are suitable to be used to provide a new maximum dry density.

B. Quality-Control Testing: Dike, Perimeter Road, Ditch, Entrance Roads and Other Earthwork

1. In-Place Density (Compaction) Testing: The contractor's geotechnical engineering consultant shall perform a minimum of one soil density and moisture test for every 1,000

cubic yards of fill placed and compacted but not less three times per week during dike construction. Soil density and moisture testing shall conform to ASTM D6938. The tests shall be distributed over the dike, stability berms, and roadways as determined by the geotechnical consultant unless otherwise directed by the Engineer. The consultant shall record the elevation, dike station and approximate offset location of each test.

2. Soil Particle-Size (Gradation) Testing and Soil Classification: The contractor's geotechnical engineering consultant shall perform a minimum of one soil gradation test (ASTM D6913) and one soil classification test (ASTM D2487) for every 4000 cubic yards of material placed and compacted but less than once per week during dike construction. The Contractor shall test for organic content as a percent per dry weight every 8000 cubic yards of material, but not less than once every 2 weeks during dike construction. Sampling for gradation testing should occur at locations determined by the geotechnical consultant unless otherwise directed by the Engineer. The consultant shall record the elevation, dike station and approximate offset of the sample location.

3. The Contractor shall obtain test results in a timely manner and take corrective action to repair any part of the project not meeting the requirements of the Specifications.

3.9 DIKE AND EARTHWORK GRADE TOLERANCES

A. At all points along the dike crest a six (6) inch tolerance above indicated grade will be permitted in the final dressing, provided that any excess material is so distributed that the crown drains freely and that there are no abrupt humps or depressions in surfaces or bulges in the width of the crown. No points along the dike crest shall be below the indicated grade. No payment shall be made for material more than six (6) inches above the design template as measured perpendicular to and above the design template.

B. The final surveyed foundation elevations shall be within plus or minus 3 inches of elevations indicated on the approved foundation preparation grading plan, unless otherwise directed by the Engineer.

C. All other earthwork grades including roadways, ditches, shelves and other features shall be within plus or minus 3 inches of the specified grade elevation.

3.10 SLIDES

A. In the event of slides in any part of the embankment prior to final acceptance of the work, the Contractor shall remove material from the slide area, as directed, and shall rebuild such portion of the embankment. The removal and disposal of material and the rebuilding of the embankment shall be performed without cost to the Owner.

3.11 DIKE AND EARTHWORK FINAL GRADING

A. Bring the dike to the required grade and cross section at all points. Redress the dike surface as necessary to remove ruts and irregularities to the satisfaction of the Engineer. The Contractor is advised that this may require hand raking to achieve a suitable smooth surface.

B. The Contractor may utilize fill within the basin area as necessary but the final basin elevation shall be finish graded to within the elevation range shown on the drawings. All ruts and holes greater than 8 inches in depth shall be smoothed. Changes in elevation less than 2 ft shall be accomplished by slopes 10% or shallower and changes in elevation greater than 2 ft shall be accomplished with slopes of 4H:1V or shallower.

3.12 PERIMETER ROADS, ENTRANCE ROADS AND PERIMETER DITCHES

A. Perimeter roads, entrance roads, and perimeter ditches shall be constructed to the lines and grades shown in the Project Drawings. Final surveys of the perimeter roads, entrance roads, and perimeter ditches shall be included in the as-built survey for the dike construction.

3.13 GRASSING

A. Apply grassing in accordance with SECTION 32 92 19 GRASSING ESTABLISHMENT.

3.14 DIKE PROTECTION AND MAINTENANCE

A. Repair and reestablish grades to the specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact. Where settling occurs before project completion, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

B. After completion of the dike, maintain and repair the dike crest as necessary to eliminate any ruts or depressions caused by settlement or by the operation of vehicles or equipment for the remainder of the contract period. Leave the dike crest surfaces in such condition that they drain freely at all points. The Contractor shall take special care to protect the completed dike and adjoining areas affected by his operations from erosion with the use of erosion fencing, hay bales, temporary swales, or whatever other means necessary. If erosion occurs, make the necessary repairs immediately.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Place and grade surplus suitable and unsuitable soil in dike interior following construction. Remove trash and debris, and legally dispose of it offsite.

3.16 PAYMENT SURVEYS

A. The Contractor shall provide a topographic survey of the dike/roadway every 30 days or as needed for payment quantities. The Contractor’s foundation survey will serve as the base topographic survey to determine pay quantities. The signed and sealed survey shall be submitted to the Engineer for approval in electronic PDF paper version (24-in. x 36-in.) and in a digital AutoCAD file containing point elevation data. Horizontal and vertical coordinate systems shall match those used on the Construction Drawings. When measuring volumes for payment of dike embankment construction, the surveyor shall take survey points on cross sections perpendicular to the dike centerline at approximately every 200 ft.

B. The as-built survey shall serve as the final payment survey, but the surveyor shall take survey points on cross sections perpendicular to the dike centerline at approximately every 100 ft.

C. The Contractor’s payment survey drawings shall contain the following information:

1. Plan view of the site showing the proposed dike embankment, perimeter road, and perimeter ditch.

2. Plan view shall include 1-ft contour lines for the constructed dike embankment, perimeter road, perimeter ditch, and roads.

3. Plan view shall contain a table indicating the volume of dike embankment fill placed per each payment survey and a running total of the volume placed.

4. Cross section views at 200-ft intervals showing the dike embankment template and the most recent payment survey.

5. Payment survey drawings shall be signed and sealed by a licensed Professional Surveyor registered in the State of Florida.

D. The Contractor shall submit the electronic AutoCAD files containing point data with each payment survey.

E. The District may, at its' own expense, retain a qualified survey firm to observe and/or review any and all surveying methods and techniques used by the Contractor. Should the Contractor's methods or techniques not be in accordance with the Specifications, the Engineer will notify the Contractor regarding any discrepancies. The District may also elect to conduct independent quality control surveys at any time without any notice to the Contractor.

3.17 AS-BUILT SURVEY

A. The Contractor shall complete an as-built survey (see SECTION 01 78 00 PROJECT CLOSEOUT) of the completed dike, roads, ditches, and outfall. The survey shall display the constructed dike in plan and section view superimposed on the Drawings. The survey shall display elevations, inverts, and horizontal location of the dike, timber walkway, installed weirs, weir pipes, drainage pipe inverts, rip-rap splash pads, vegetation lines, drainage inlets, ditches, roads, and instrumentation.

-- End of Section --

SUPPLEMENTAL INFORMATION FOR DMMA CONSTRUCTION PROJECTS

FLORIDA INLAND NAVIGATION DISTRICT
DMMA BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

APPENDIX B

ANALYSIS OF PIPELINE DESIGN

Hydraulics and Flow Salt Water Intradiction Ditch

Q_{seep} = Max 50 yr seepage from rainfall

$= 1,220,000 \frac{ft^3}{day} \left(\frac{1\ day}{24\ hr}\right)\left(\frac{1\ hr}{3600\ sec}\right)$

= 19.91 cfs from geotech report

Say **20 cfs** from seepage GW estimated time of max flow = 16-24 hours

From 25 yr rainfall falling on ditch area

Q = **140 cfs** time of max flow = .5 hours (28 min tc)

From Retention Pond Overflow

Q = **2.77 cfs** time of max flow 16 hrs

Design flow = Seepage + Retention Pond Overflow at 16 hrs

= 20.0 cfs + 2.77 cfs

= 22.77

$\boxed{\text{Say 23 cfs}}$ at time = 16 hours

controls over 13.5 cfs at time = .5 hours

2/13

increased to 35 feet on the east, north, and south to properly control the phreatic surface. The following table presents the seepage flow rates into the drain under steady-state seepage conditions for the three cross-sections.

Table 10.5.3 Seepage Flow Rate into Toe-Drain

Cross Section	Seepage Flow Rates per foot of dike (ft^3/day)	Seepage Flow Rates per foot of dike (gpm)
East	238.2	1.2
North	179.5	0.9
South	236.9	1.2
West	106.9	0.6

The water flowing to the drain will need to be routed to the perimeter ditch via an outfall pipe with positive gravity flow. The total maximum (i.e. Year 50) seepage flow rate into the perimeter ditch under steady-state seepage conditions is estimated to be 1,720,000 cubic feet per day or about 9,000 gallons per minute. This rate is a combination of piped outfall from the toe drain as well as seepage that passes below the drain and flows directly into the ditch. The rate is based on 7,147 lineal feet of dike.

10.5.4 Seepage Exit Gradients

The quantitative results of the seepage analyses for the end-of-construction and steady-state seepage scenarios are provided on Exhibits F-1 through F-8 in Appendix F. The seepage results indicate that most seepage lost from the DMMA will flow through the dike and within the upper sands above the clay and/or silt strata. The SEEP/W results also show that the phreatic surface does not exit on the face of the downstream slope, but instead passes through the toe drain.

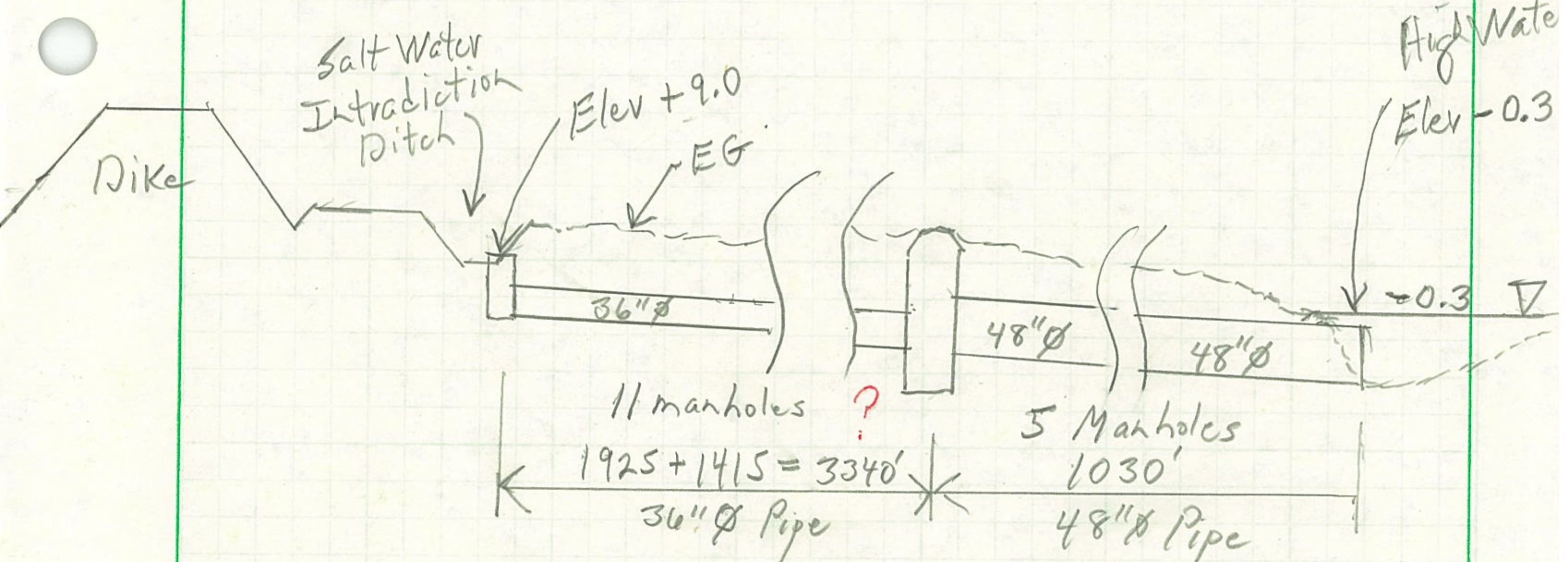
The exit gradients into the perimeter ditch and dike toe swale under steady-state seepage conditions were determined for each design section. The phreatic surface exit gradient into the perimeter ditch for each dike section is presented in the following table.

Table 10.5.4-1 Perimeter Ditch Seepage Exit Gradients

Cross Section	Perimeter Ditch Surface Exit Gradient	Corresponding Piping Safety Factor
East	0.24	4.17
North	0.35	2.86
South	0.53	1.89
West	0.27	3.70

Pipeline Capacity Not Dredging

When not used as a DMMA the only flow is from stormwater falling outside of dike and stormwater falling inside of dike and seeping through ground. Weir boards will be set approximately 24 inches above grade so that no stormwater is discharged directly over weirs.



Assume HDPE DR 26 Solid Wall Pipe

36" I.D. = 33" = 2.75' ✓

48" I.D. = 44 = 3.67' ✓

Design Flow = 23 cfs

PERFORMANCE PIPE
A Division of Chevron Phillips Chemical Company LP

Iron Pipe Size (IPS) and Dimension Data

DriscoPlex® Pipe for Municipal and Industrial Applications

PE4710 (PE3408)

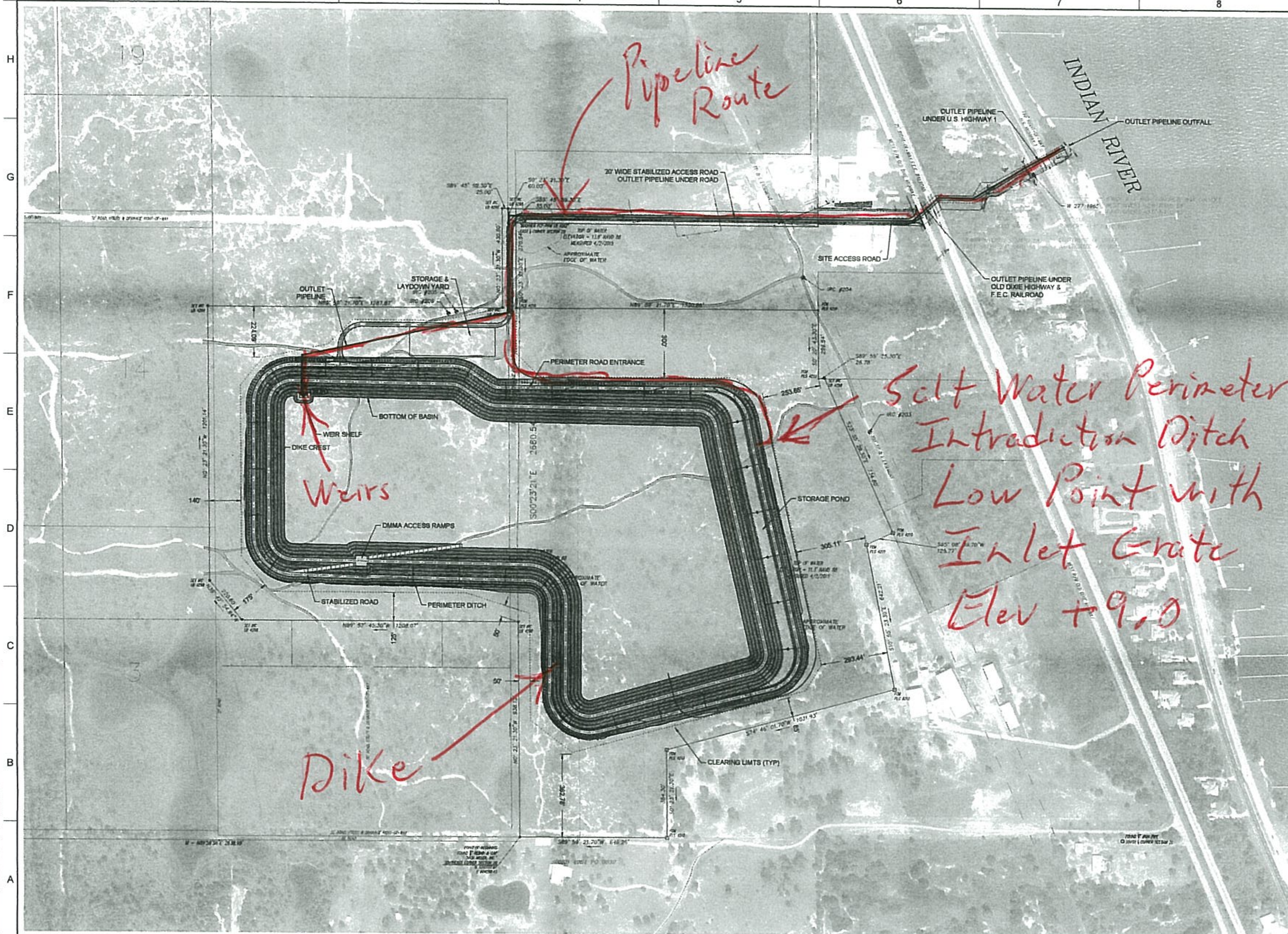
Pressure Ratings are calculated using 0.63 design factor for HDS at 73°F as listed in PPI TR-4 for PE 4710 materials. HDPE can accomodate up to 1.5 times the pipe pressure rating for a recurring surge and up to 2.0 times the pipe pressure rating for an occasional surge. Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		125 psi DR 17.0			100 psi DR 21.0			80 psi DR 26.0			63 psi DR 32.5			
Nominal Pipe Size	IPS OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Nominal Pipe Size
1 1/4"	1.660													1 1/4"
1 1/2"	1.900													1 1/2"
2"	2.375	0.140	2.078	0.43										2"
3"	3.500	0.206	3.063	0.94										3"
4"	4.500	0.265	3.938	1.55	0.214	4.046	1.27							4"
6"	6.625	0.390	5.798	3.36	0.315	5.957	2.75	0.255	6.084	2.24	0.204	6.193	1.81	6"
8"	8.625	0.507	7.550	5.69	0.411	7.754	4.66	0.332	7.921	3.80	0.265	8.063	3.07	8"
10"	10.750	0.632	9.410	8.83	0.512	9.665	7.24	0.413	9.874	5.91	0.331	10.048	4.77	10"
12"	12.750	0.750	11.160	12.43	0.607	11.463	10.19	0.490	11.711	8.31	0.392	11.919	6.71	12"
14"	14.000	0.824	12.253	14.98	0.667	12.586	12.28	0.538	12.859	10.02	0.431	13.086	8.09	14"
16"	16.000	0.941	14.005	19.57	0.762	14.385	16.04	0.615	14.696	13.09	0.492	14.957	10.56	16"
18"	18.000	1.059	15.755	24.77	0.857	16.183	20.30	0.692	16.533	16.57	0.554	16.826	13.37	18"
20"	20.000	1.176	17.507	30.58	0.952	17.982	25.07	0.769	18.370	20.45	0.615	18.696	16.50	20"
22"	22.000	1.294	19.257	37.00	1.048	19.778	30.33	0.846	20.206	24.75	0.677	20.565	19.97	22"
24"	24.000	1.412	21.007	44.03	1.143	21.577	36.10	0.923	22.043	29.45	0.738	22.435	23.76	24"
26"	26.000	1.529	22.759	51.67	1.238	23.375	42.36	1.000	23.880	34.57	0.800	24.304	27.89	26"
28"	28.000	1.647	24.508	59.93	1.333	25.174	49.13	1.077	25.717	40.09	0.862	26.173	32.34	28"
30"	30.000	1.765	26.258	68.80	1.429	26.971	56.40	1.154	27.554	46.02	0.923	28.043	37.13	30"
32"	32.000	1.882	28.010	78.28	1.524	28.769	64.17	1.231	29.390	52.36	0.985	29.912	42.24	32"
34"	34.000	2.000	29.760	88.37	1.619	30.568	72.44	1.308	31.227	59.11	1.046	31.782	47.69	34"
36"	36.000	2.118	31.510	99.07	1.714	32.366	81.21	1.385	33.064	66.27	1.108	33.651	53.46	36"
42"	42.000	2.471	36.761	134.84	2.000	37.760	110.54	1.615	38.576	90.20	1.292	39.261	72.77	42"
48"	48.000	2.824	42.013	176.12	2.286	43.154	144.38	1.846	44.086	117.81	1.477	44.869	95.05	48"
54"	54.000	3.176	47.266	222.90	2.571	48.549	182.73	2.077	49.597	149.10	1.662	50.477	120.29	54"

This size and dimension chart is intended for reference purposes. It should not be used in place of the advice from a licensed Professional Engineer. Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using IPS OD and Minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimension and tolerances in the applicable pipe manufacturing specification.

Visit www.performancepipe.com for the most current literature.

4/12



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JACKSONVILLE, FLORIDA 32256
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1221 AIRPORT ROAD
SUITE 210
DESTIN, FL 32541
(850)-460-7040
CERTIFICATE OF AUTHORIZATION # 4815

SEAL

PRELIMINARY DRAFT

KEITH A. KNIGHT P.E.# 58084

PROJECT TITLE

DREDGED MATERIAL MANAGEMENT SITE BV-24A
BREVARD COUNTY, FLORIDA

SUNSHINE STATE ONE CALL OF FLORIDA
SUNSHINE 811 - ALWAYS CALL 811 BEFORE YOU DIG
1-800-638-4097

NO	ZONE	REVISIONS / SUBMISSIONS	DATE
1	2		
2	2		
2	2		

PROJECT NO	C2015-014
DATE	JULY 2017
DESIGNED	RD
DRAWN	RLJ
CHECKED	CAS
REVIEWED	KAK
SCALE	AS SHOWN

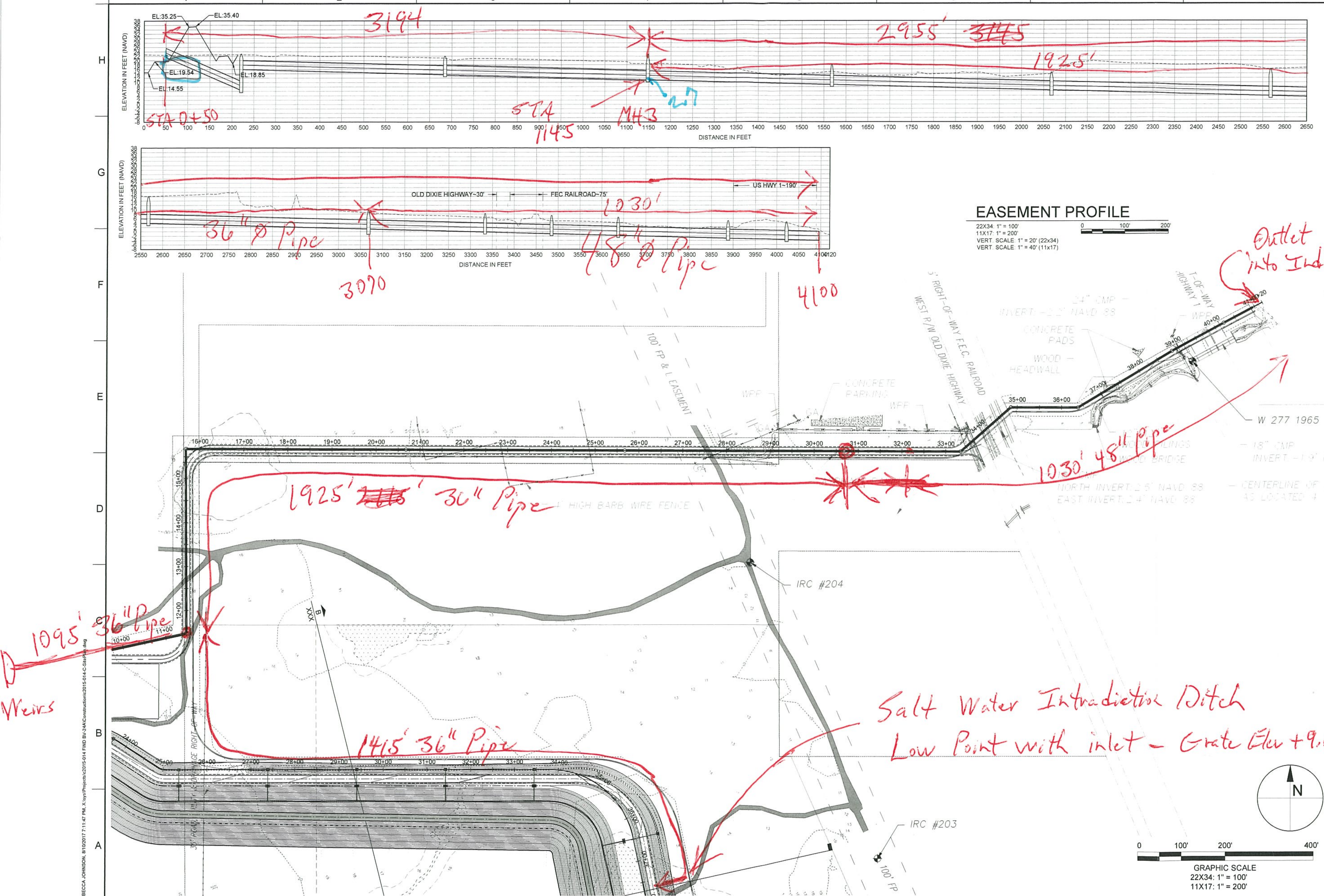
DRAWING TITLE

PROJECT OVERVIEW

C-3

SHEET XX OF XX

5/13



6/13

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PROJECT NO	C2015-014
DATE	JULY 2017
DESIGNED	RD
DRAWN	RLJ
CHECKED	CAS
REVIEWED	KAK
SCALE	AS SHOWN

DRAWING TITLE

PIPELINE EASEMENT SITE PLAN

C-5

SHEET XX OF XX

stormwater flow

$$\text{Avg } V_{36'' pipe} = \frac{Q}{A_{36}} = \frac{23 \text{ ft}^3/\text{sec}}{\frac{1}{4}\pi(2.75')^2} = \underline{\underline{3.87 \text{ ft/sec}}}$$ ✓

$$\text{Avg } V_{48} = \frac{Q}{A_{48}} = \frac{23 \text{ ft}^3/\text{s}}{\frac{1}{4}\pi(3.67')} = 2.17 \text{ ft/sec}$$ ✓

Driving Head Availible $= 9.0' - (-.3') = \underline{\underline{9.3'}}$ ✓

Assume pressurized flow - pipe full

head loss Hazen Williams $= h_{pipe} + h_{minor}$

$$h_{\substack{loss\\total}} = \frac{3.022 V^{1.85} L}{C^{1.85} D^{1.165}} + K \frac{V^2}{2g}$$

36" Pipe 3340' C=150

K Values

1 inlet $= 1 \times .8 = .8$

11 manholes $= 11 \times 1.0 = 11.0$

1 valve $= 1 \times .5 = .5$

K total 12.3 ✓

48" Pipe 1030' C=150

K values

5 manholes $= 5 \times 1.0 = 5.0$

1 outlet $= 1 \times 1.0 = 1.0$

total K 6.0 ✓

8/13

In a pipeline conveying liquids and running full, pressure in the pipe due to elevation exists whether or not liquid is flowing. At any low point in the line, internal pressure will be equal to the height of the liquid above the point multiplied by the specific weight of the liquid. If liquid is flowing in the line, elevation head and head loss due to liquid flow in the pipe are added to determine the pressure in the pipe at a given point in the pipeline.

Pressure Flow of Water – Hazen-Williams Equation

The Darcy-Weisbach method of flow resistance calculation may be applied to liquid and gases, but its solution can be complex. For many applications, empirical formulas are available and, when used within their limitations, reliable results are obtained with greater convenience. For example, Hazen and Williams developed an empirical formula for the flow of water in pipes at 60° F.

The Hazen-Williams formula for water at 60° F (16°C) can be applied to water and other liquids having the same kinematic viscosity of 1.130 centistokes which equals 0.00001211 ft^2/sec or 31.5 SSU (Saybolt Second Universal). The viscosity of water varies with temperature, so some error can occur at temperatures other than 60°F (16°C).

Hazen-Williams formula for friction (head) loss in feet of water head:

(2-11)

$$h_f = \frac{0.002083\,L}{D_I^{\,4.8655}}\left(\frac{100\,Q}{C}\right)^{1.85}$$

Hazen-Williams formula for friction (head) loss in psi:

(2-12)

$$p_f = \frac{0.0009015L}{D_I^{\,4.8655}}\left(\frac{100\,Q}{C}\right)^{1.85}$$

Use C = 150

Terms are as previously defined, and:

h_f **= friction (head) loss, ft. of water.**

p_f **= friction (head) loss, psi**

D_I **= pipe inside diameter, in**

C **= Hazen-Williams Friction Factor, dimensionless, c = 150-155 for PE, (not related to Darcy-Weisbach friction factor, *f*)**

Q **= flow rate, gpm**

The Hazen-Williams Friction Factor, C, for PE pipe was determined in a hydraulics laboratory using heat fusion joined lengths of pipe with the inner bead present. Other forms of these equations are prevalent throughout the literature.[21] The reader is referred to the references at the end of this chapter.

9/13

8. ENERGY LOSS DUE TO F LAMINAR FLOW

Two methods are available for cal energy loss for fluids experiencin most common is the *Darcy equatic Weisbach equation* or the *Darcy-* which can be used for both lamina One of the advantages to using t that the assumption of laminar fl be confirmed if f is known.

$$h_f = \frac{fLv^2}{2Dg} \qquad 17.22$$

$$E_f = h_f g = \frac{fLv^2}{2D} \qquad \text{[SI]} \qquad 17.23(a)$$

$$E_f = h_f \times \left(\frac{g}{g_c}\right) = \frac{fLv^2}{2Dg_c} \qquad \text{[U.S.]} \qquad 17.23(b)$$

If the flow is truly laminar and the fluid is flowing in a circular pipe, then the *Hagen-Poiseuille equation* can be used.

$$E_f = \frac{32\mu vL}{D^2\rho} \qquad \text{[SI]} \qquad 17.24(a)$$

$$E_f = \frac{32\mu vLg_c}{D^2\rho} \qquad \text{[U.S.]} \qquad 17.24(b)$$

An alternate form of the Hagen-Poiseuille equation substitutes $\dot{V}/A$ for v.

$$E_f = \frac{128\mu\dot{V}L}{\pi D^4\rho} \qquad \text{[SI]} \qquad 17.25(a)$$

$$E_f = \frac{128\mu\dot{V}Lg_c}{\pi D^4\rho} \qquad \text{[U.S.]} \qquad 17.25(b)$$

If necessary, h_f can be converted to an actual pressure drop in psi or Pa by multiplying by the fluid density.

$$\Delta p = h_f \times \rho g \qquad \text{[SI]} \qquad 17.26(a)$$

$$\Delta p = h_f \times \rho\left(\frac{g}{g_c}\right) \qquad \text{[U.S.]} \qquad 17.26(b)$$

Values of the Darcy friction factor, f, are often quoted for new, clean pipe. The friction head losses and pumping power requirements calculated from these values are minimal values. Depending on the nature of the service, scale and impurity buildup within pipes may decrease the pipe diameters over time. Since the frictional loss is proportional to the fifth power of the diameter, such diameter decreases can produce dramatic increases in the friction loss.

$$\frac{h_{f,\text{scaled}}}{h_{f,\text{new}}} = \left(\frac{D_{\text{new}}}{D_{\text{scaled}}}\right)^5 \qquad 17.27$$

[8]The difference is that the friction factor can be derived by hydrodynamics: $f = 64/\text{Re}$. For turbulent flow, f is empirical.

ts only for the decrease in diameughness (i.e., friction factor) will l increase in friction loss.

n" condition is transitory in most ng factor of 10 to 30% is often ap- tion factor, f, or the head loss, rger increases should be considling is expected.

iinates the need to estimate the scaled pipe diameter. This simplistic approach multiplies the initial friction loss by a factor based on the age of the pipe. For example, for schedule-40 pipe 4 to 10 in (10 to 25 cm) in diameter, the multipliers of 1.4, 2.2, and 5.0 have been proposed for pipe ages of 5, 10, and 20 years, respectively. For larger pipes, the corresponding multipliers are 1.3, 1.6, and 2.0. Obviously, use of these values should be based on a clear understanding of the method's limitations.

9. ENERGY LOSS DUE TO FRICTION: TURBULENT FLOW

The *Darcy equation* is used almost exclusively to calculate the head loss due to friction for turbulent flow.

$$h_f = \frac{fLv^2}{2Dg} \qquad 17.28$$

The head loss can be converted to pressure drop.

$$\cancel{\Delta p = h_f \times \rho g} \qquad \text{[SI]} \qquad 17.29(a)$$

$$\Delta p = h_f \times \rho\left(\frac{g}{g_c}\right) \qquad \text{[U.S.]} \qquad 17.29(b)$$

In problems where the pipe size is unknown, it will be impossible to obtain an accurate initial value of the friction factor, f (since f depends on velocity). In such problems, an iterative solution will be necessary.

It is not uncommon for civil engineers to use the *Hazen-Williams equation* to calculate head loss. This method requires knowledge of the Hazen-Williams *roughness coefficient*, C, values of which are widely tabulated.[9] (See App. 17.A.) The advantage of using this equation is that C does not depend on the Reynolds number.

$$h_f = \frac{(3.022)(v)^{1.85}L}{(C)^{1.85}(D)^{1.165}} \qquad \text{[U.S.]} \qquad 17.30$$

Or, in terms of other units, $= 4.73\left(\frac{Q^{1.85}\,L}{C^{1.85}\,D^{4.867}}\right)$

$$h_f = \frac{(10.44)(L)(\dot{V}_{\text{gpm}})^{1.85}}{(C)^{1.85}(d_{\text{inches}})^{4.8655}} \qquad \text{[U.S.]} \qquad 17.31$$

[9]An approximate value of $C = 140$ is often chosen for initial calculations for new water pipe. $C = 100$ is more appropriate for water pipe that has been in service for some time. For sludge, C values are 20 to 40% lower than the equivalent water pipe values.

Water Resources

$$= \frac{3.022\ V^{1.85}\ L}{C^{1.85}\ D^{1.165}} + K \frac{V^2}{2g}$$

$$h_{\substack{loss\\total\\36''\,Pipe}} = \frac{3.022\ (3.87)^{1.85}\ (3340')}{(150)^{1.85}\ (2.75)^{1.165}} + \frac{12.3\ (3.87)^2}{2\ (32.2)}$$

$$= 3.58' + 2.86$$

$$= 6.44'$$

$$h_{\substack{loss\\total\\48''\,Pipe}} = \frac{3.022\ (2.17)^{1.85}\ (1030')}{(150)^{1.85}\ (3.67)^{1.165}} + 6.0\ \frac{(2.17)^2}{2\ (32.2)}$$

$$= .27 + .439$$

$$= .71$$

$$h_{total} = h_{loss\ 36''} + h_{loss\ 48''}$$

$$= 6.44' + .71'$$

$$= \underline{\underline{7.15'}}$$

Availible driving head of 9.3 > 7.15' head loss

OK for stormwater flow of 23 cfs

Check dredging operations flow

Dredging Operations flow

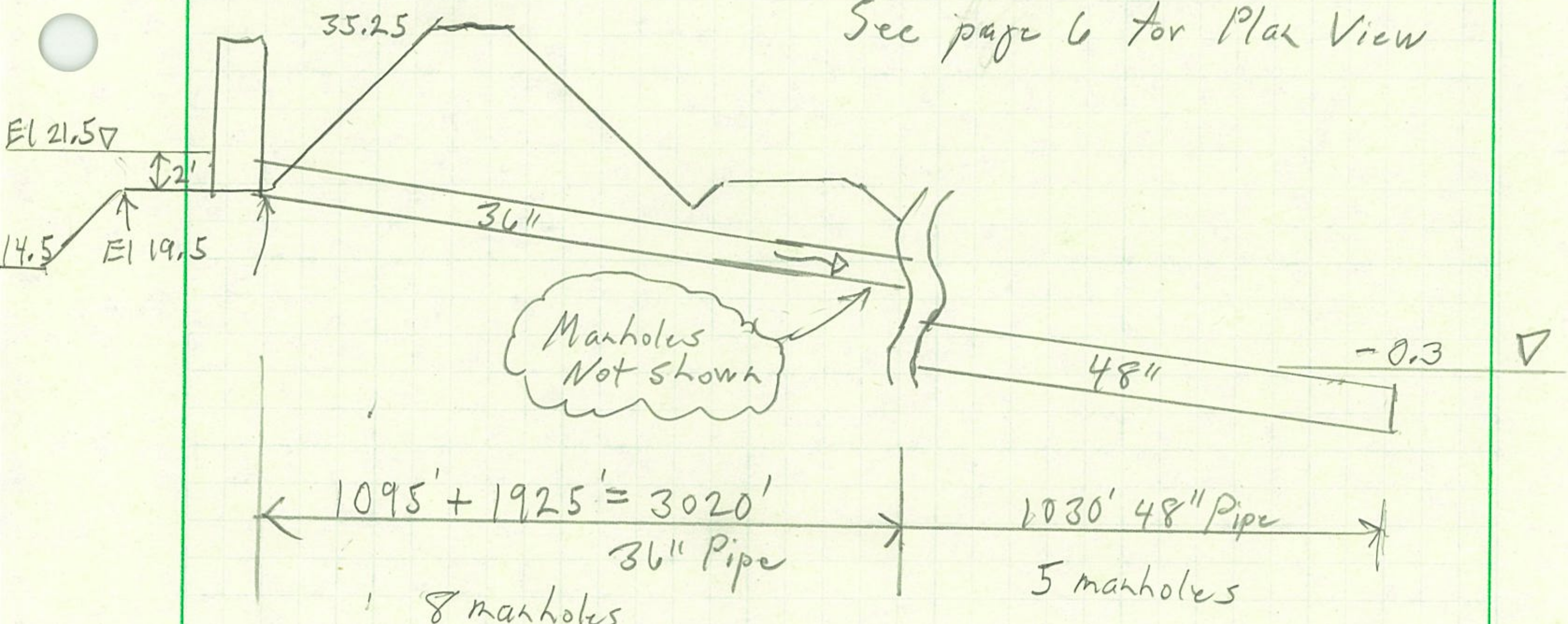
Management plan assumes 24" dredge at V = 16 ft/sec and a 20% solids slurry mix (80% water)

$$Q = .8\,VA$$

$$= .8\,(16\ \text{ft/sec})\left(\tfrac{1}{4}\pi(2')^2\right)$$

$$= \underline{\underline{40.2\ \text{ft}^3/\text{sec}}}$$ ✓

See page 6 for Plan View



36 inch Pipe C = 150			48" Pipe C = 150		
K value Weirs + 30" Pipe	1 × 1.0	= 1.0	5 manholes	5 × 1.0	= 5.0
8 manholes	= 8 × 1.0	= 8.0	1 outlet	1 × 1.0	= 1.0
	total	9.0 ✓		Total	6.0 ✓

$$V_{36''} = \frac{Q}{A} = \frac{40.2 \text{ ft}^3/\text{s}}{\frac{1}{4}\pi (2.75)^2} = 6.77 \text{ ft/sec} \quad 36'' \text{ Pipe}$$

$$V_{48''} = \frac{Q}{A} = \frac{40.2}{\frac{1}{4}\pi (3.67)^2} = 3.80 \text{ ft/sec} \quad 48'' \text{ Pipe}$$

$$h_{loss\ 36''} = \frac{3.022 V^{1.85} L}{C^{1.85} D^{1.165}} + K \frac{V^2}{2g}$$

$$= \frac{3.022 (6.77 \text{ ft/s})^{1.85} (3020')}{(150)^{1.85} (2.75)^{1.165}} + 9.0 \frac{(6.77)^2}{2(32.2)}$$

$$= 9.1 + 6.40$$

$$= 15.5 \text{ ft} \quad 36'' \text{ Pipe}$$

$$h_{loss\ 48''} = \frac{3.022 (3.8)^{1.85} (1030)}{(150)^{1.85} (3.67)^{1.165}} + 6.0 \frac{(3.8)^2}{2(32.2)}$$

$$= .76 + 1.35$$

$$= 2.1$$

Total head loss = $15.5' + 2.1' = \boxed{17.6'}$ @ 40.2 cfs

Availible head when water 2' above base of weir

= 21.8' which is greater than 12.6'

OK

Use 36" and 48" HDPE Solid Wall Pipe as shown in sketches

SUPPLEMENTAL INFORMATION FOR DMMA CONSTRUCTION PROJECTS

FLORIDA INLAND NAVIGATION DISTRICT
DMMA BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

APPENDIX C

ANALYSIS OF STORMWATER FLOW PIPELINE

Stormwater | Flow in Perimeter Ditch | Flow | by Mitch Doll Sept 2017 | 1

Checked KAK

Weighted Avg. of slope

$0.16(425) + 0.60(350) + 0.39(650) + 0.14(50) + 0.12(50) + 0.13(100)$

$+ 0.14(5) + 0.55(5) + 0.58(375) + 0.5(1000) = 1278.5$

$S = \frac{1278.5}{3010} = 0.42\%$, Weighted Average of slope of perimeter ditch

$L = 2750$ ft

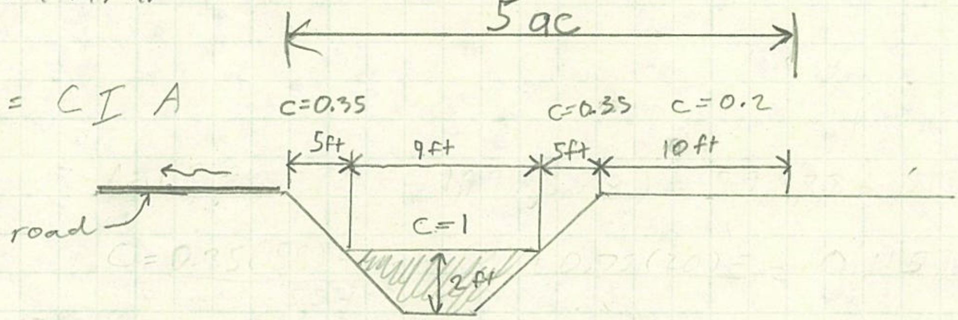
$F_s = 1.0$ (mowed grass channels)

$$t_c = 0.0078 \frac{L^{0.77}}{S^{0.385}} F_s = 0.0078 \frac{(2750 ft)^{0.77}}{(0.0042)^{0.385}} (1) = 28.5 \text{ min}$$

* Use tc in Zone 7 curves, 25 yr storm

$I = 5.4$ in/hr

$Q = C I A$



$$C = \frac{0.35(5') + 1.0(9') + 0.35(5) + 0.2(10)}{5' + 9' + 5' + 10'} = 0.5$$

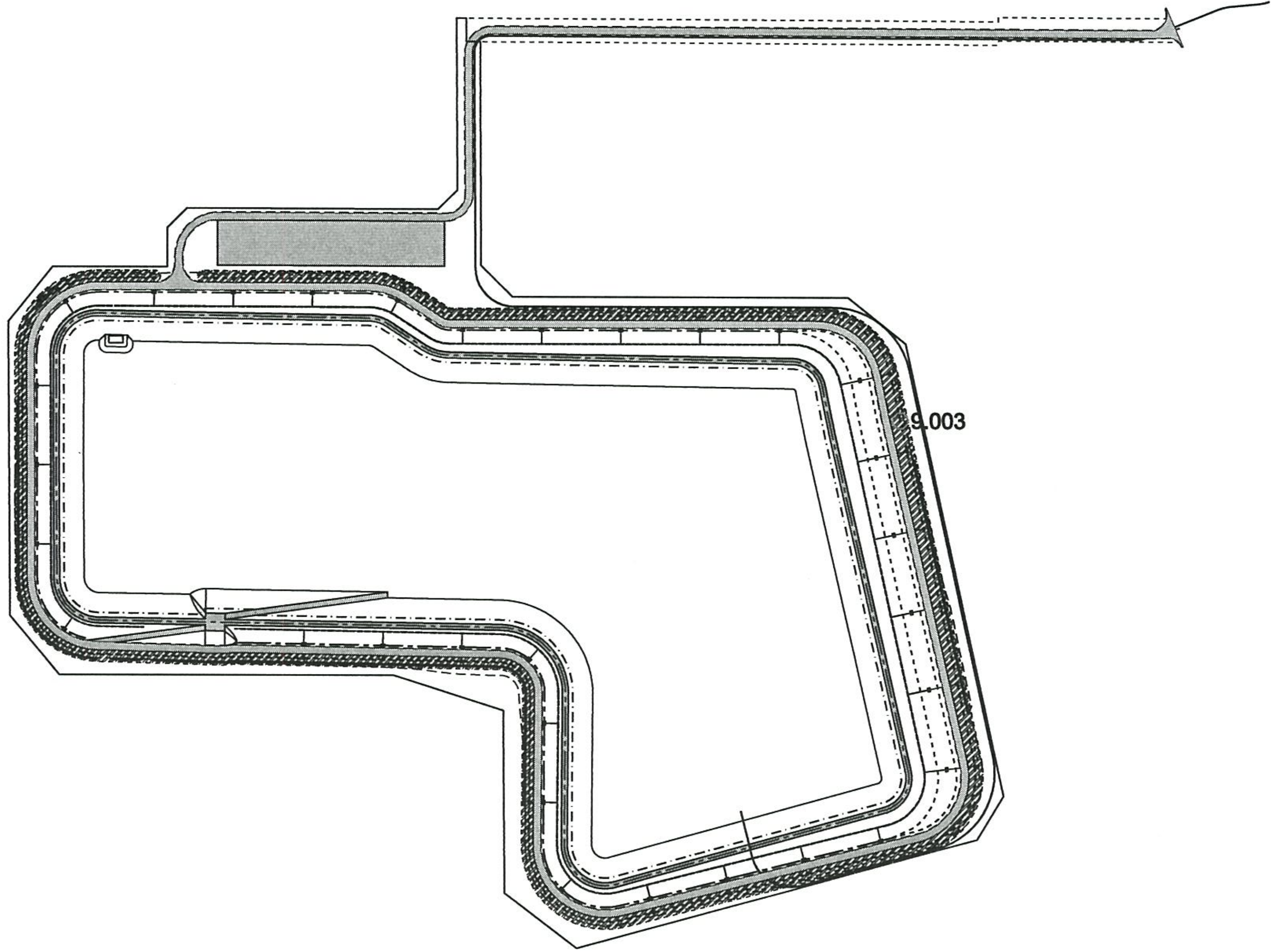
Ditch Area $A = 157{,}428$ sf ≈ 5.2 AC Total Drainage Area

$I = 5.4$ in/hr Zone 7 25 year $t_c = 28$ min

$Q = CIA = (0.5)(5.4 \text{ in/hr})(5.2 AC) = 14.0$ cfs over total ditch area

$time_c = 28$ min

2/



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TAYLOR ENGINEERING INC. 10151 DEERWOOD PARK BLVD BLDG 300, SUITE 300 JACKSONVILLE, FLORIDA 32256 CERTIFICATE OF AUTHORIZATION # 4815	DMMA BV-24A CONSTRUCTION STORMWATER DESIGN PERIMETER DITCH AREA (5.2 AC)	PROJECT C2015-XXX DRAWN BY DRWNBY SHEET XXX of XX DATE 00-00-15	SEAL DRAFT ENG DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

3

Table T-4
Runoff Coefficients for a Design Storm Return Period of 10 Years or Less[a]

Slope	Land Use	Sandy Soils Min.	Sandy Soils Max.	Clay Soils Min.	Clay Soils Max.
Flat (0-2%)	Woodlands	0.10	0.15	0.15	0.20
	Pasture, grass, and farmland [b]	0.15	0.20	0.20	0.25
	Bare Earth	0.30	0.50	0.50	0.60
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements [c]	0.75	0.95	0.90	0.95
	SFR: 1/2-acre lots and larger	0.30	0.35	0.35	0.45
	Smaller lots	0.35	0.45	0.40	0.50
	Duplexes	0.35	0.45	0.40	0.50
	MFR: Apartments, townhouses, and condominiums	0.45	0.60	0.50	0.70
	Commercial and Industrial	0.50	0.95	0.50	0.95
Rolling (2-7%)	Woodlands	0.15	0.20	0.20	0.25
	Pasture, grass, and farmland [b]	0.20	0.25	0.25	0.30
	Bare Earth	0.40	0.60	0.60	0.70
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements [c]	0.80	0.95	0.90	0.95
	SFR: 1/2-acre lots and larger	0.35	0.50	0.40	0.55
	Smaller lots	0.40	0.55	0.45	0.60
	Duplexes	0.40	0.55	0.45	0.60
	MFR: Apartments, townhouses, and condominiums	0.50	0.70	0.60	0.80
	Commercial and Industrial	0.50	0.95	0.50	0.95
Steep (7%+)	Woodlands	0.20	0.25	0.25	0.30
	Pasture, grass, and farmland [b]	0.25	0.35	0.30	0.40
	Bare Earth	0.50	0.70	0.70	0.80
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements [c]	0.85	0.95	0.90	0.95
	SFR: 1/2-acre lots and larger	0.40	0.55	0.50	0.65
	Smaller lots	0.45	0.60	0.55	0.70
	Duplexes	0.45	0.60	0.55	0.70
	MFR: Apartments, townhouses, and condominiums	0.60	0.75	0.65	0.85
	Commercial and Industrial	0.60	0.95	0.65	0.95

[a] Weighted coefficient based on percentage of impervious surfaces and green areas must be selected for each site.

[b] Coefficients assume good ground cover and conservation treatment.

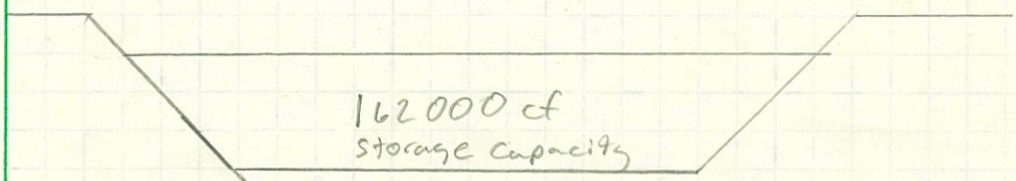
[c] Depends on depth and degree of permeability of underlying strata.

Note: SFR = Single Family Residential
MFR = Multi-Family Residential

M

Time to fill and Q overflow 25 yr Storm

Checked KAK



Assume 25 yr, 24 hr storm

Volume $= C P_{Tot} A$

25 yr Rainfall Event

$C = \dfrac{0.35(55') + 0.35(7') + 0.75(20')}{55' + 7' + 20'} = 0.45$ (See Section Details for Dimensions)

$P_{Tot} = 9$ in (see Storm Precipitation Data Maps)

$A = 598{,}886$ sf ≈ 13.7 AC (from CAD)

$V_{Tot} = (0.45)\left(\dfrac{9 \text{ in}}{12}\right)(13.7 \text{ AC} \times 43560) = \underline{201{,}410 \text{ cf}}$ (total volume of runoff) 25 yr storm

$\dfrac{V_{cap.}}{V_{runoff}} = \dfrac{162{,}000 \text{ cf}}{201{,}410 \text{ cf}} = 0.80$ Pond will hold 80% of 25 yr storm

From table, if $P/P_{Tot} = .8$ then time = 16 hrs

~~0.8(24 hr)~~ = 16 hr (The pond will take 16 hr to fill) ✓

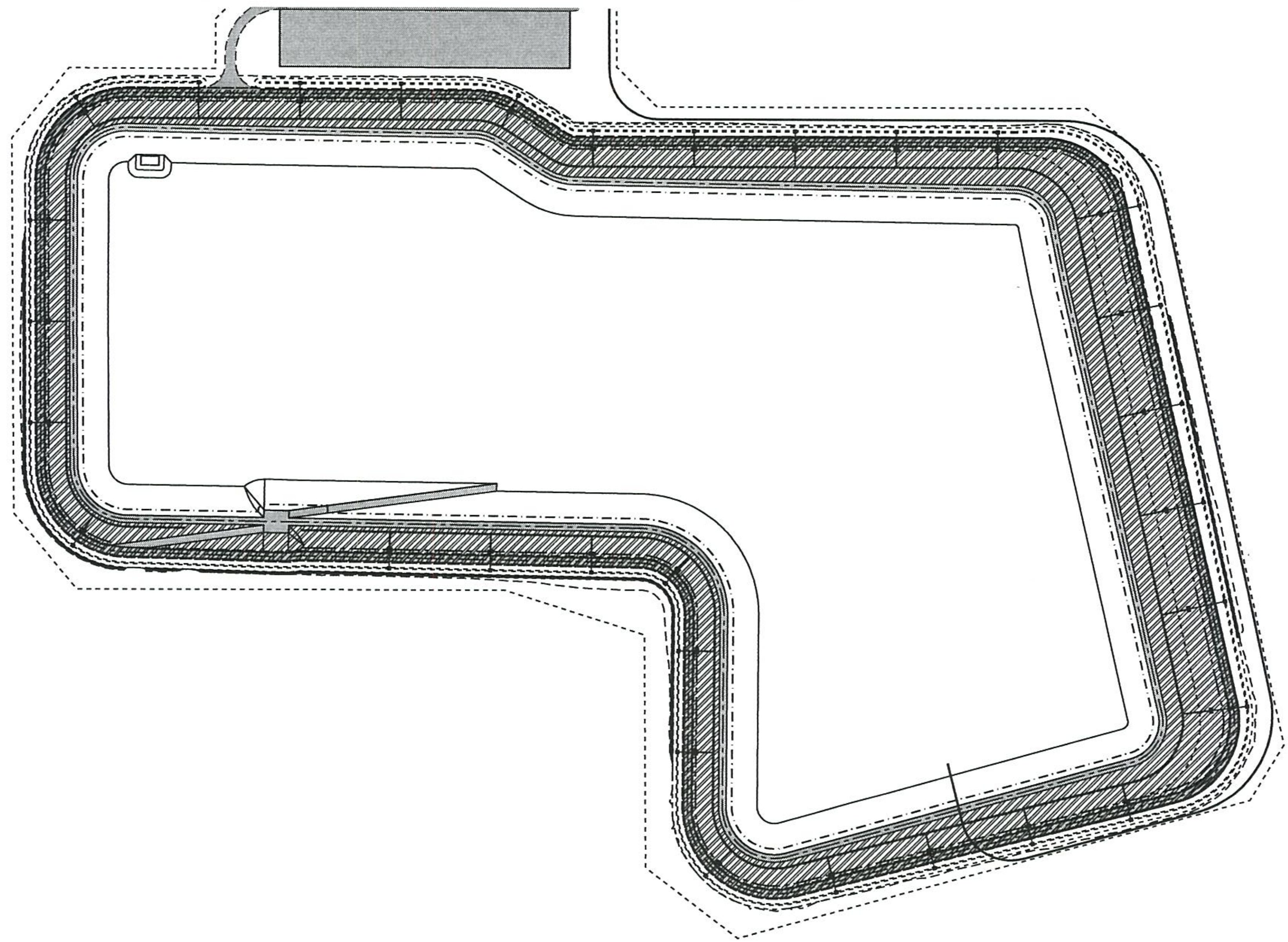
At 16 hr, $\dfrac{I}{P_{Tot}} = 0.05$ (see intensity curve)

$I = 0.05 P_{Tot} = 0.05(9 \text{ in}) = 0.45$ in/hr ✓

$Q = CIA = (0.45)(0.45)(13.7 \text{ AC}) = \underline{2.77 \text{ cfs}}$ (flow rate after pond has filled and begins to flow into inlet) @ time = 16 hrs

* As the pond takes 16 hrs to fill and the flow will have decreased by this time. The flow from the SW pond will be disregarded in calculating the flow to size the pipe. ✓

5/



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BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

DMMA BV-24A CONSTRUCTION
STORMWATER DESIGN
SURFACE DRAINAGE AREA (13.7 AC)

PROJECT	C2015-XXX
DRAWN BY	DRWNBY
SHEET	XXX of XX
DATE	00-00-15

SEAL

DRAFT

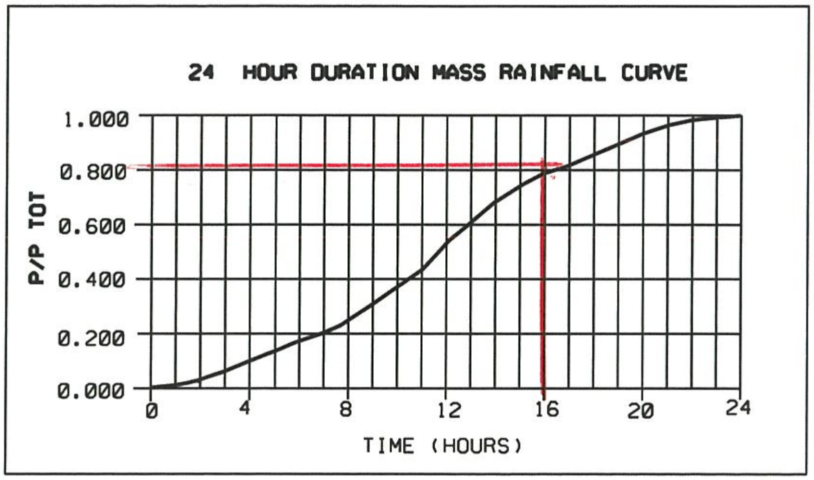
ENG

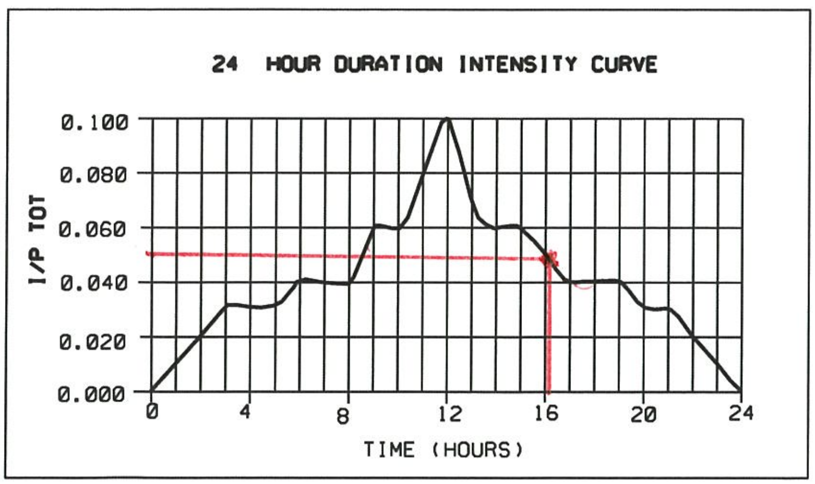
DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

RAINFALL DISTRIBUTION CURVES

24 HOUR DURATION



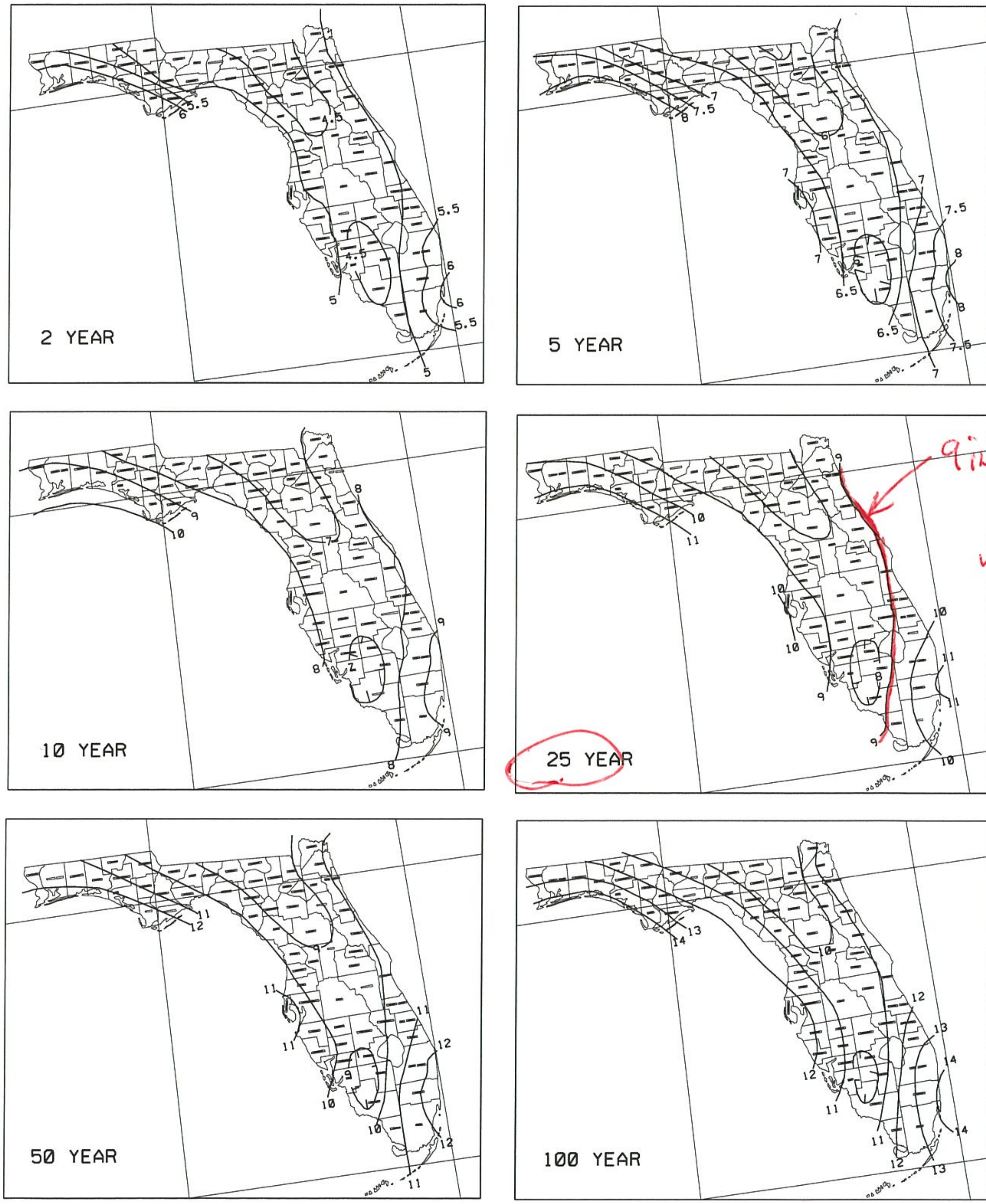


T(HRS.)	P/P TOT	I/PTOT
0	0.000	0.000
1	0.010	0.010
2	0.030	0.020
3	0.060	0.030
4	0.090	0.030
5	0.120	0.030
6	0.160	0.040
7	0.200	0.040
8	0.240	0.040
9	0.300	0.060
10	0.360	0.060
11	0.440	0.080
12	0.540	0.100
13	0.610	0.070
14	0.670	0.060
15	0.730	0.060
16	0.780	0.050
17	0.820	0.040
18	0.860	0.040
19	0.900	0.040
20	0.930	0.030
21	0.960	0.030
22	0.980	0.020
23	0.990	0.010
24	1.000	0.000

7

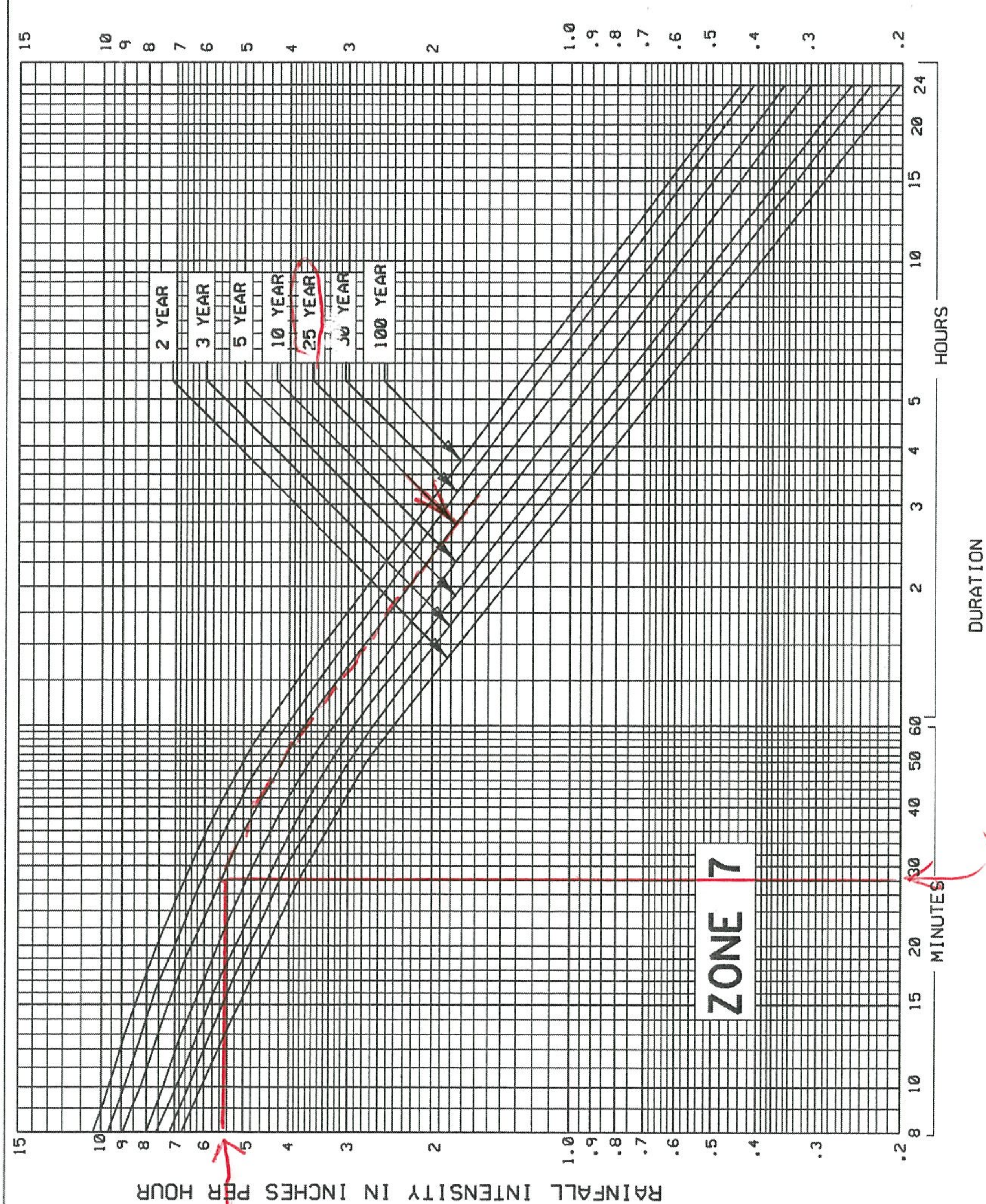
PRECIPITATION DEPTH DATA FOR 2-,5-,10-,25-, 50-, AND 100-YEAR FREQUENCIES

1 DAY



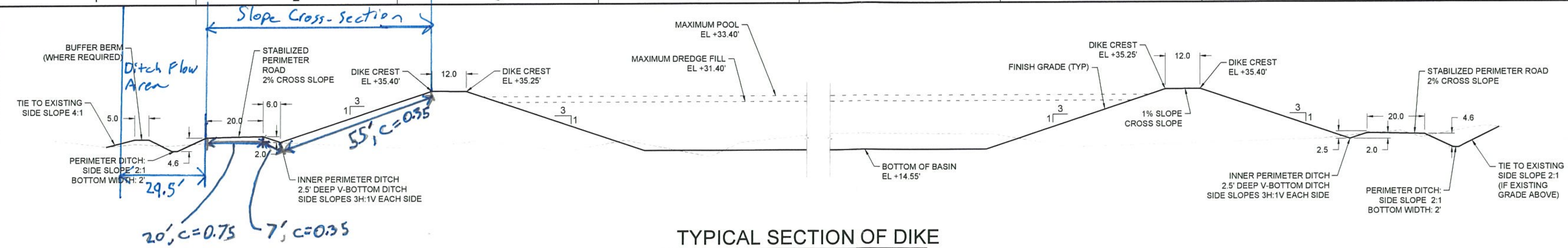
ALL DEPTH CONTOURS IN INCHES

8



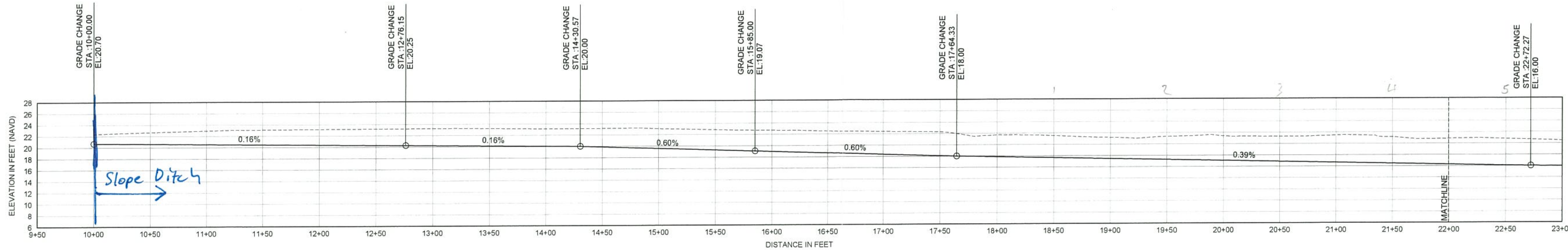
RAINFALL INTENSITY-DURATION-FREQUENCY CURVES
ZONE 7

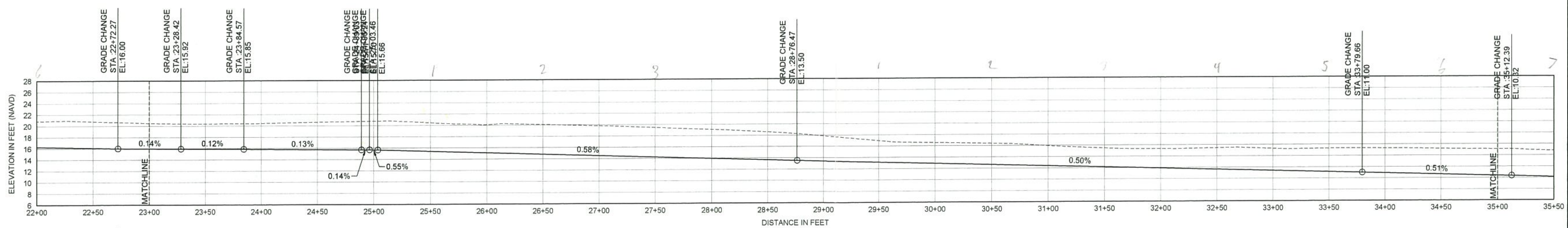
9

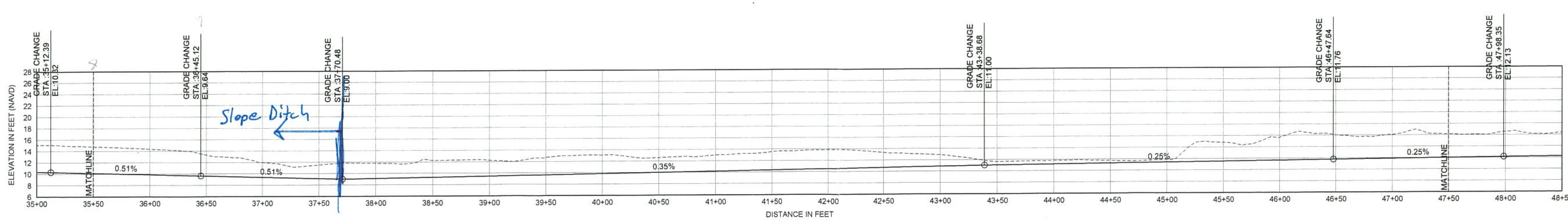


TYPICAL SECTION OF DIKE

22X34: 1" = 20'
11X17: 1" = 40'







* Ditch Typically Follows EG

PERIMETER DITCH INVERT DESIGN PROFILE

22X34: 1" = 50'
11X17: 1" = 100'
VERT. SCALE: 1" = 10' (22x34)
VERT. SCALE: 1" = 20' (11x17)

REBECCA JOHNSON, 8/10/2017 7:12:11 PM, X:\syy\Projects\2015-014 FIND BV-24A\Construction\2015-014-C-Details.dwg

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
(904)-731-7040
1221 AIRPORT ROAD
SUITE 210
DESTIN, FL 32541
(850)-460-7040
CERTIFICATE OF AUTHORIZATION # 4815

SEAL

PRELIMINARY DRAFT

KEITH A. KNIGHT P.E.# 58084

PROJECT TITLE

DREDGED MATERIAL MANAGEMENT SITE BV-24A
BREVARD COUNTY, FLORIDA

SUNSHINE STATE ONE CALL OF FLORIDA
SUNSHINE 811 - ALWAYS CALL 811 BEFORE YOU DIG
1-800-638-4097

REVISIONS / SUBMISSIONS | DATE | ZONE | NO

PROJECT NO	C2015-014
DATE	JULY 2017
DESIGNED	RD
DRAWN	RLJ
CHECKED	CAS
REVIEWED	KAK
SCALE	AS SHOWN

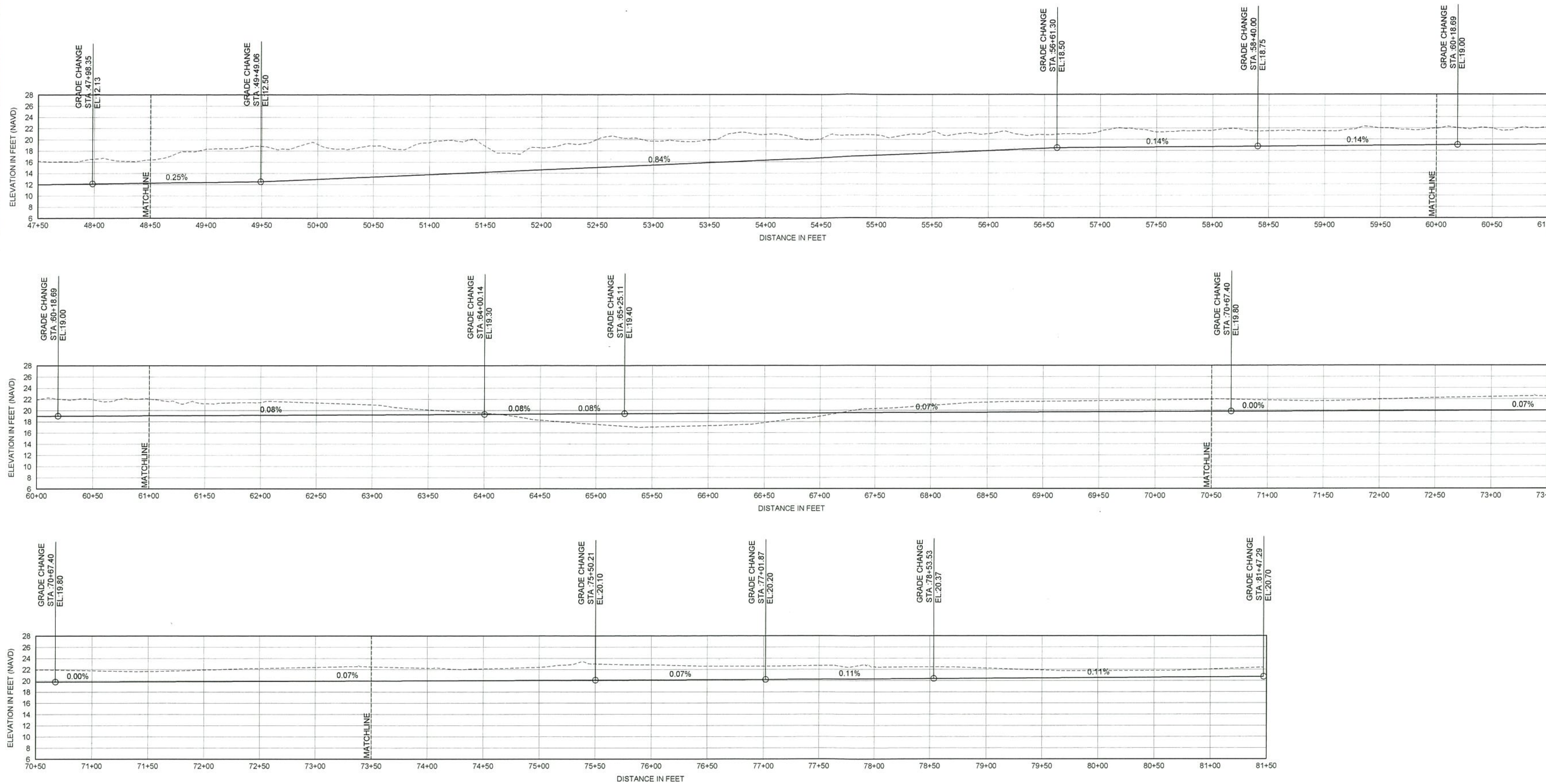
DRAWING TITLE

SECTION DETAILS

C-8

SHEET XX OF XX

10



PERIMETER DITCH INVERT DESIGN PROFILE

22X34: 1" = 50'
11X17: 1" = 100'
VERT. SCALE: 1" = 10' (22x34)
VERT. SCALE: 1" = 20' (11x17)

0 50' 100'

TAYLOR ENGINEERING INC.
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(904)-731-7040
1221 AIRPORT ROAD
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DESTIN, FL 32541
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SEAL

PRELIMINARY DRAFT

KEITH A. KNIGHT P.E.# 58084

PROJECT TITLE

DREDGED MATERIAL MANAGEMENT SITE BV-24A
BREVARD COUNTY, FLORIDA

SUNSHINE STATE ONE CALL OF FLORIDA
SUNSHINE 811 - ALWAYS CALL 811 BEFORE YOU DIG
1-800-638-4097

REVISIONS / SUBMISSIONS

NO	ZONE	DATE
1		
2		
2		
2		

PROJECT NO	C2015-014
DATE	JULY 2017
DESIGNED	RD
DRAWN	RLJ
CHECKED	CAS
REVIEWED	KAK
SCALE	AS SHOWN

DRAWING TITLE

PERIMETER DITCH DESIGN PROFILE

C-9

SHEET XX OF XX

SUPPLEMENTAL INFORMATION FOR DMMA CONSTRUCTION PROJECTS

FLORIDA INLAND NAVIGATION DISTRICT
DMMA BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

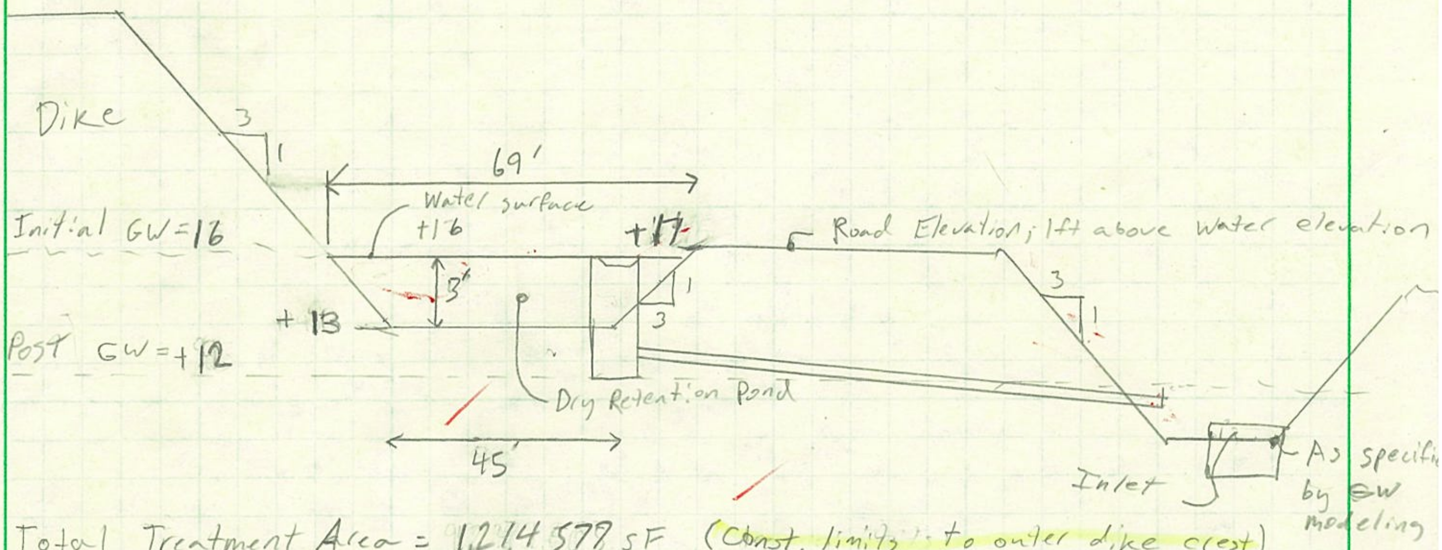
APPENDIX D

ANALYSIS OF THE STORMWATER TREATMENT POND

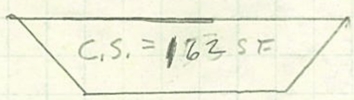
by Mitch Doll Sept 2017

North East End

Pond Size



Total Treatment Area = 1,214,578 sF (Const. limits to outer dike crest)
(27.9 ac)



Pond length = 1000 ft

Pond treatment Volume = 162 × 1000 = 162,000 cf actual

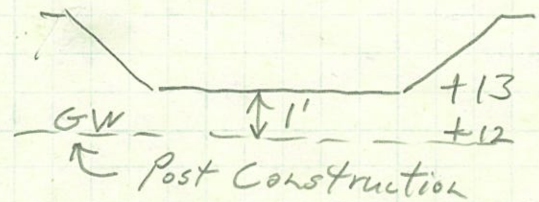
Storage Requirement = 1/2" for class III + 1/2" for online (Pond is online
= 1" then 50% more for Class I
= 1.5"

Required Storage Volume = $\left(\frac{1.5''}{12}\right)$ (1,214,577 sf) = 151,822 cf required

Design Treatment volume exceeds required ... OK

Pond Recovery

Treatment Volume = 151,827 cf



Stage One

$I_d = \frac{K_{vu}}{FS} = \frac{(2/3)(34.3\ ft/day)}{2} = 11.5\ ft/day$ ⇒ infiltration rate

$t_{sat} = \frac{f\ h_b}{I_d} = \frac{(0.3)(1)}{11.5} = 0.026\ day$ ⇒ time to saturate soil below basin

depth to GW

$V_u = A_b h_b f = (45\ ft \times 1000\ ft)(1)(0.3) = \underbrace{13{,}500\ cf}$

Volume of water to saturate soil below basin

$h_u = f\ h_b = 0.3(1\ ft) = 0.3$ ⇒ height of water required to saturate soil below basin bottom

$h_w > h_u$ ⇒ not adequate to treat required volume by unsaturated means, do saturated analysis

$3 > 0.3$

Stage Two

Water height after Stage One: $3\ ft - 0.3\ ft = 2.7\ ft$

Note: Pond must recover in 72 hours (3 days)

$F_y = \frac{h_c}{H_T} = \frac{1\ ft}{3.7\ ft} = 0.27 \approx 0.3$

$\frac{L}{W} = \frac{1000\ ft}{54\ ft} \approx 18.5$

$F_x = 0.5$ ⇒ from Nomograph

$t = \frac{W^2}{4 K_H D F_x^2} = 2.9\ day > 3\ day\ \ldots$ OK

$D = H + \frac{h_c}{2} = 84.5\ ft$, $K_H = 2/3(34.3) = 11.5\ ft/day$, $W = 39\ ft$

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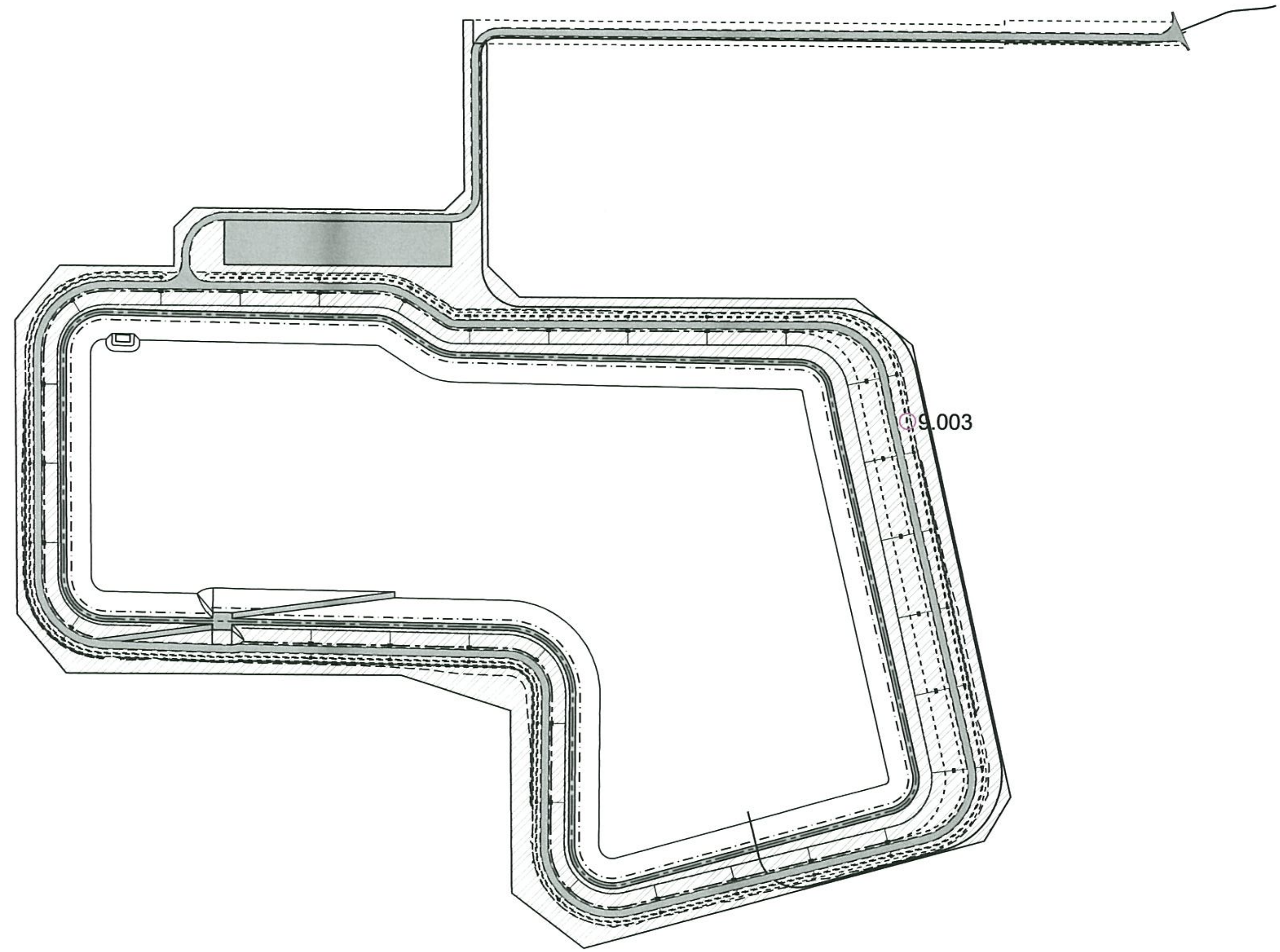

ROBERT DOLL X:\SYS\PROJECTS\C2015-014 FIND BV-24A\DESIGN\MITCH\DMMA LINEWORK_MD1.DWG 9/13/2017 8:51:19 AM

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

DMMA BV-24A CONSTRUCTION
STORMWATER DESIGN
TREATMENT AREA (27.9 AC)

PROJECT	C2015-XXX
DRAWN BY	DRWNBY
SHEET	XXX of XX
DATE	00-00-15

SEAL

DRAFT

ENG DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

4/18

5.2 Treatment Volume

The first flush of runoff should be routed to the retention basin and percolated into the ground. Retention systems that discharge to Class III receiving water bodies shall provide for one of the following:

(a) *Off-line* retention of the first one-half inch of runoff or 1.25 inches of runoff from the impervious area, whichever is greater.

(b) *On-line* retention of an additional one half inch of runoff from the drainage area over that volume specified for off-line treatment.

(c) *On-line* retention that provides for percolation of the runoff from the three year, one-hour storm.

(d) *On-line* retention of the runoff from one inch of rainfall or 1.25 inches of runoff from the impervious area, whichever is greater, for systems which serve an area with less than 40 percent impervious surface and that contain only U.S. Department of Agriculture Natural Resources Conservation Service (SCS) hydrologic group "A" soils.

For direct discharges to Class I, Class II, OFWs, or Class III waters which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting the applicant shall provide retention for one of the following:

(a) At least an additional fifty percent of the applicable treatment volume specified for off-line retention in (a), above. *Off-line* retention must be provided for at least the first one-half inch of runoff or 1.25 inches of runoff from the impervious area, whichever is greater, of the total amount of runoff required to be treated.

(b) *On-line* retention of an additional fifty percent of the treatment volume specified in (b), above.

(c) *On-line* retention of the runoff from the three-year, one-hour storm.

(d) *On-line* retention that provides at least an additional 50 percent of the runoff volume specified in (d), above, for systems which serve an area with less that 40 percent impervious surface and that contain only U.S. Department of Agriculture Natural Resources Conservation Service (SCS) hydrologic group "A" soils.

5.3 Recovery Time

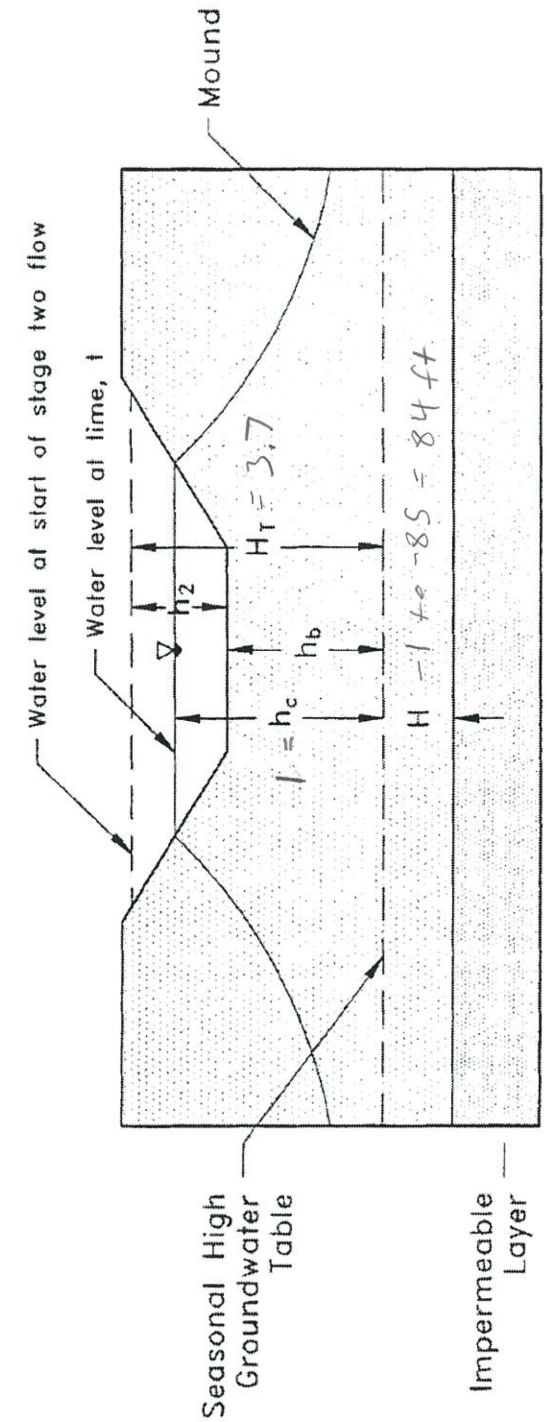

Figure 23-3. Design Parameters for Groundwater Mounding Analysis for Stage Two (Lateral) Flow (Source: Andreyev and Wiseman, 1989)

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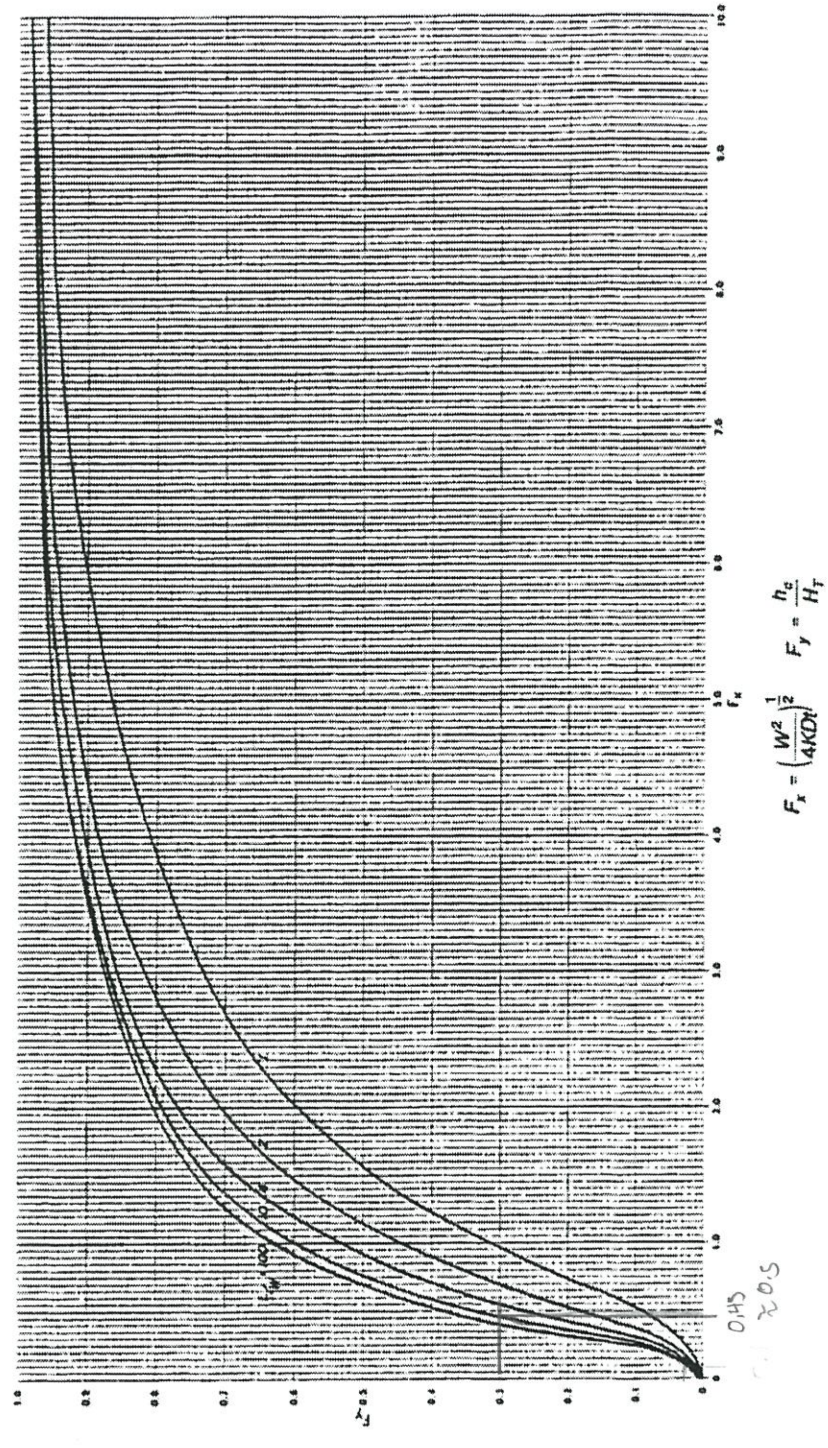

Figure 23-7. Dimensionless Curves Relating Basin Design Parameters to Basin Water Level in a Rectangular Retention Basin Over an Unconfined Aquifer ($f = 0.3$) (Source: Andreyev and Wiseman, 1989).

mounded water table condition may be remnant from a previous storm event, especially during the wet season.

It is also recommended that the filling of the pond with the treatment volume be simulated as a "slug" loading (i.e., treatment volume fills the pond within an hour).

23.3.3 Accepted Methodology for Estimating Vertical Unsaturated Flow

Vertical unsaturated flow consists of primarily downward movement of water stored in the basin into an unsaturated portion of the soil profile existing beneath the basin (Mongeau 1991). Vertical unsaturated flow only applies when the groundwater table or mound is below the retention basin bottom. Acceptable methodologies for calculating unsaturated vertical infiltration are included in Table 23-1. Each of the equations, however, are based on design assumptions that may not always be appropriate. In general the Green and Ampt equation is the most appropriate for conditions that typically occur in retention basin design. Andreyev and Wiseman (1989) utilized the following methodology in the MODRET computer program to estimate recovery in retention basins during unsaturated vertical flow. This methodology, which can easily be solved by hand, utilizes the modified Green and Ampt infiltration equation:

$$I_d = \frac{K_{vu}}{FS} \tag{23-1}$$

where: I_d = Design infiltration rate
K_{vu} = Unsaturated vertical hydraulic conductivity
FS = Factor of safety (recommend $FS = 2.0$)

The time to saturate (t_{sat}) the soil mass below the basin is:

$$t_{sat} = \frac{f\,h_b}{I_d} \tag{23-2}$$

where: t_{sat} = Time to saturate soil below the basin
h_b = Height of basin bottom above the groundwater table
f = Fillable porosity (generally 0.2 to 0.3)

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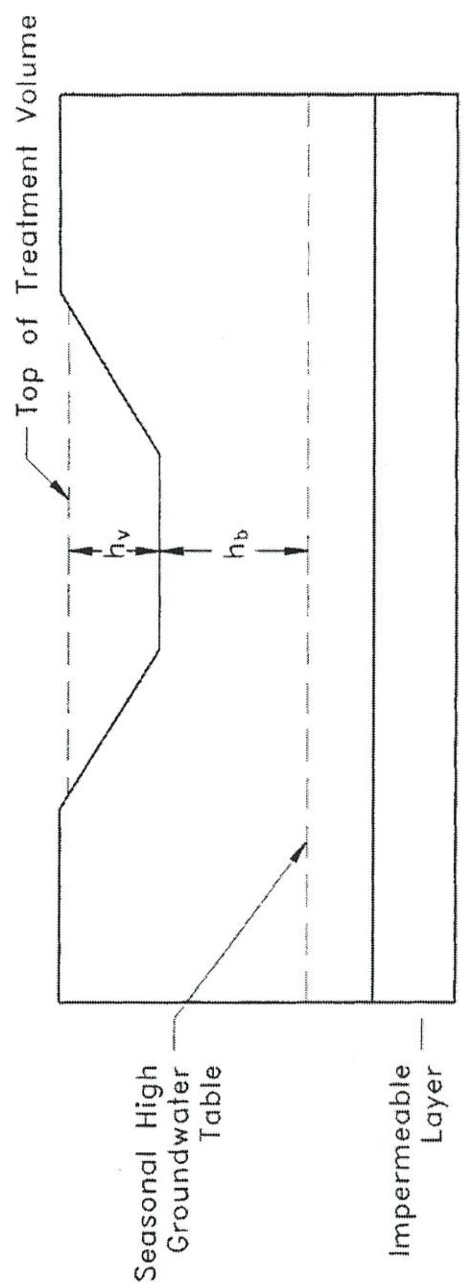

Figure 23-2. Design Parameters for Analysis of Stage One (Vertical) Flow (Source: Andreyev and Wiseman, 1989).

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See Figure 23-2 for a schematic of the retention basin with the appropriate design parameters illustrated for vertical unsaturated flow conditions.

The total volume of water required to saturate the soil below the basin bottom (V_u) can be calculated as follows:

$$V_u = A_b \; h_b \; f \tag{23-3}$$

where: A_b = Area of basin bottom

Likewise, the height of water required to saturate the soil below the basin bottom (h_u) can be calculated using:

$$h_u = f \; h_b \tag{23-4}$$

Recovery of the treatment storage will occur entirely under vertical unsaturated flow conditions when:

(a) Treatment volume $\leq V_u$; or

(b) Height of the treatment volume (h_v) in the basin $\leq h_u$

If recovery of the treatment storage occurs entirely under vertical unsaturated conditions, analysis of the system for saturated lateral flow conditions will not be necessary.

This simplified approach is conservative because it does not consider the horizontal movement of water from the ground water mound that forms during this stage. In cases where the horizontal permeability is great, a more accurate estimate of the total vertical unsaturated flow can be obtained by using the Hantush equation. However, horizontal permeability of the unsaturated zone must be determined using an appropriate field or laboratory test.

The factor of safety (*FS*) is recommended to account for flow losses due to basin bottom siltation and clogging. For most sandy soils the fillable porosity (f) is approximately 0.2 to 0.3. The unsaturated vertical hydraulic conductivity (K_{vu}) can be measured using the field testing procedures or laboratory methods recommended in section 23.4.

A design example for utilizing the above methodology is presented below in section 23.5.

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hydrograph from a storm event) and calculate saturated flow out of the basin during recharge (i.e., a storm event).

During the study presented in Special Publication SJ93-SP10, it was discovered that the MODRET model was producing unstable MODFLOW solutions when modeling the recovery of some of the sites. This problem generally occurs when one or a combination of the following is true:

- The pond dimensions are relatively large (greater than 100 feet)
- The aquifer is relatively thin (less than 5 feet)
- The horizontal hydraulic conductivity is relatively low (less than 5 ft/day)

Upon further review, the MODRET model was modified in the study to correct this instability problem by changing the head change criterion for convergence to 0.001 ft from 0.01 ft. The original MODRET model with this modification is therefore referred to as "Modified MODRET."

PONDFLOW

PONDFLOW is a retention recovery computer model developed by Kuhns (1990). It is similar to MODRET in that is uses a finite difference numerical technique to approximate the time varying ground water profile adjacent to the basin. Also, like MODRET it can accommodate a time-varying recharge to the pond, account for seepage during the storm, and also calculates vertical unsaturated flow using Darcy's Equation.

Simplified Analytical Method (SAM)
The Simplified Analytical Method is a product of the study presented in District Special Publication SJ93-SP10. Figure 23-9 depicts the basic elements of the SAM. The integral for recovery time may be solved numerically or using commercially available software.

The SAM is somewhat conservative since it assumes that, for a prescribed runoff volume, the rise in the pond stage occurs instantaneously and there is no credit for seepage during the storm event.

23.3.5 Methodology for Analyzing Recovery by Lateral Saturated Flow by Hand

One methodology for analyzing lateral saturated flow from retention basins by hand is presented by Andreyev and Wiseman (1989) as part of their MODRET report. During the District's retention basin study presented in Special Publication SJ93-SP10, it was discovered that the MODRET model was producing unstable MODFLOW solutions when modeling the recovery of some of the retention basins monitored. This problem generally occurs when one or a combination of the following is true:

11/18

$$H_T = h_b + h_2 \quad (23\text{-}8)$$

where: h_2 = Height of water in the basin above the basin bottom at the start of saturated lateral (Stage Two) flow (*ft*)

Figure 23-3 contains an illustration of the design parameters for analysis of saturated lateral (Stage Two) flow conditions. The design parameters for a retention system utilizing both unsaturated vertical (Stage One) and saturated lateral (Stage Two) flow is represented in Figure 23-4.

The equation for F_x can be rearranged to solve for the time (t) to recover the remaining treatment volume under saturated lateral (Stage Two) flow:

$$\boxed{t = \frac{W^2}{4\ K_H\ D\ F_x^2}} \quad (23\text{-}9)$$

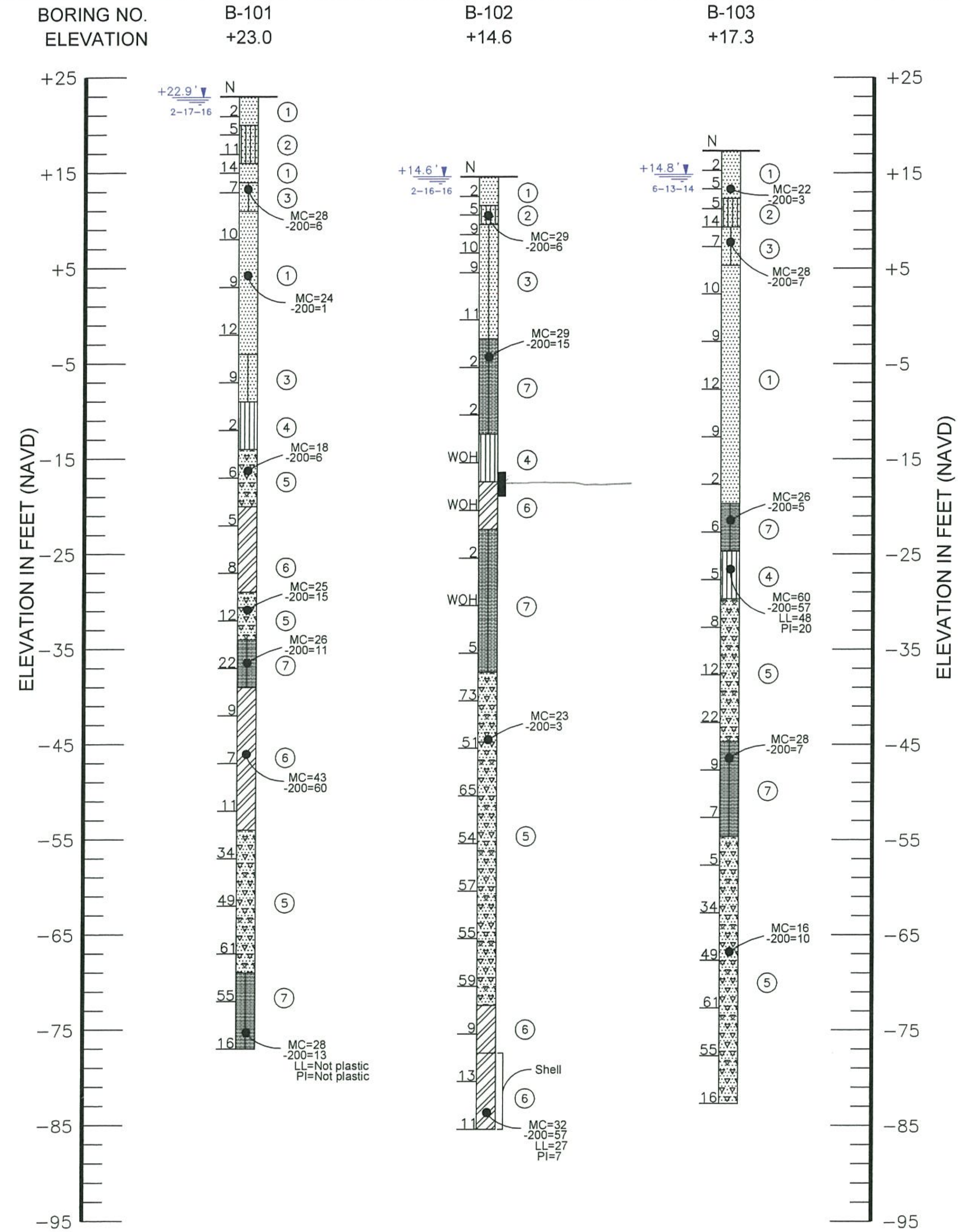
Andreyev and Wiseman (1989) developed four families of dimensionless curves for fillable porosity (f) = 0.1, 0.2, 0.3, and 0.4. Five individual curves, for length to width ratios of 1, 2, 4, 10, and 100 were developed for each family. The resulting dimensionless curves are presented on Figures 23-5 through 23-8. These curves can be used to calculate the recovery time given the hydraulic parameters of the aquifer, the recharge rate, and the physical configuration of the basin. An example design problem utilizing both unsaturated vertical (Stage One) and saturated lateral (Stage Two) flows to estimate the recovery time is given below in section 23.5.

23.4 Recommended Field and Laboratory Tests for Aquifer Characterization

The following field and laboratory investigation and testing guidelines are recommended for aquifer characterization and are described in more detail in Special Publication SJ93-SP10.

23.4.1 Definition of Aquifer Thickness

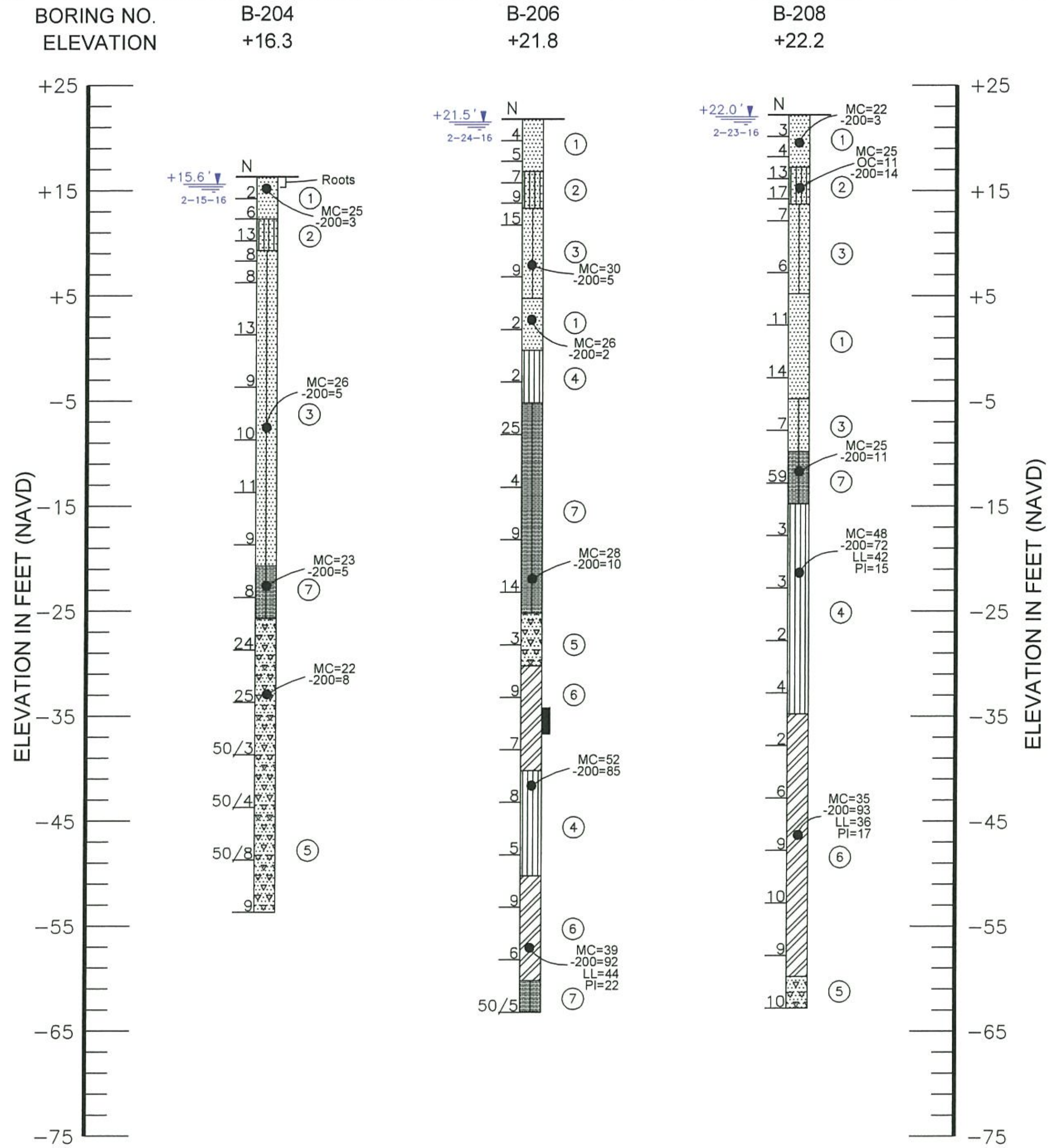
Standard Penetration Test (SPT) borings (ASTM D-1586) or auger borings (ASTM D 1452) should be used to define the thickness of the mobilized aquifer (i.e., depth to "hardpan" or restrictive layer) especially where the ground water table is high. This type of boring provides a continuous measure of the relative density/consistency of the soil (as manifested by the SPT "N" values) which is important for detecting the top of cemented or very dense "hardpan" type layers. Such layers restrict the vertical movement of ground water and are found over much of the District. If carefully utilized, manual "bucket" auger borings can also be used to define the thickness of the aquifer. Power flight auger borings may also be used with caution since this method may result in some mixing of soil from a given level with soils from strata above, thus masking the true thickness of the aquifer. To avoid this problem, technical guidelines for continuous flight auger borings are included in Appendix C of the District Special Publication SJ93-SP10.



LEGEND

- ① Gray or brown medium to fine SAND. (SP)
- ② Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)
- ③ Light brown slightly silty medium to fine SAND. (SP-SM)
- ④ Dark gray to green sandy SILT. (ML)
- ⑤ Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)
- ⑥ Green or light gray CLAY, traces of shell. (CL, CH)
- ⑦ Gray to green slightly silty fine to silty SAND. (SP-SM, SM)

Project Mngr: DD	Project No: HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES	SHEET
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	7
Checked By: DD	File No.: -	PH (772) 343-9787 FAX (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A	
			Brevard County Florida	



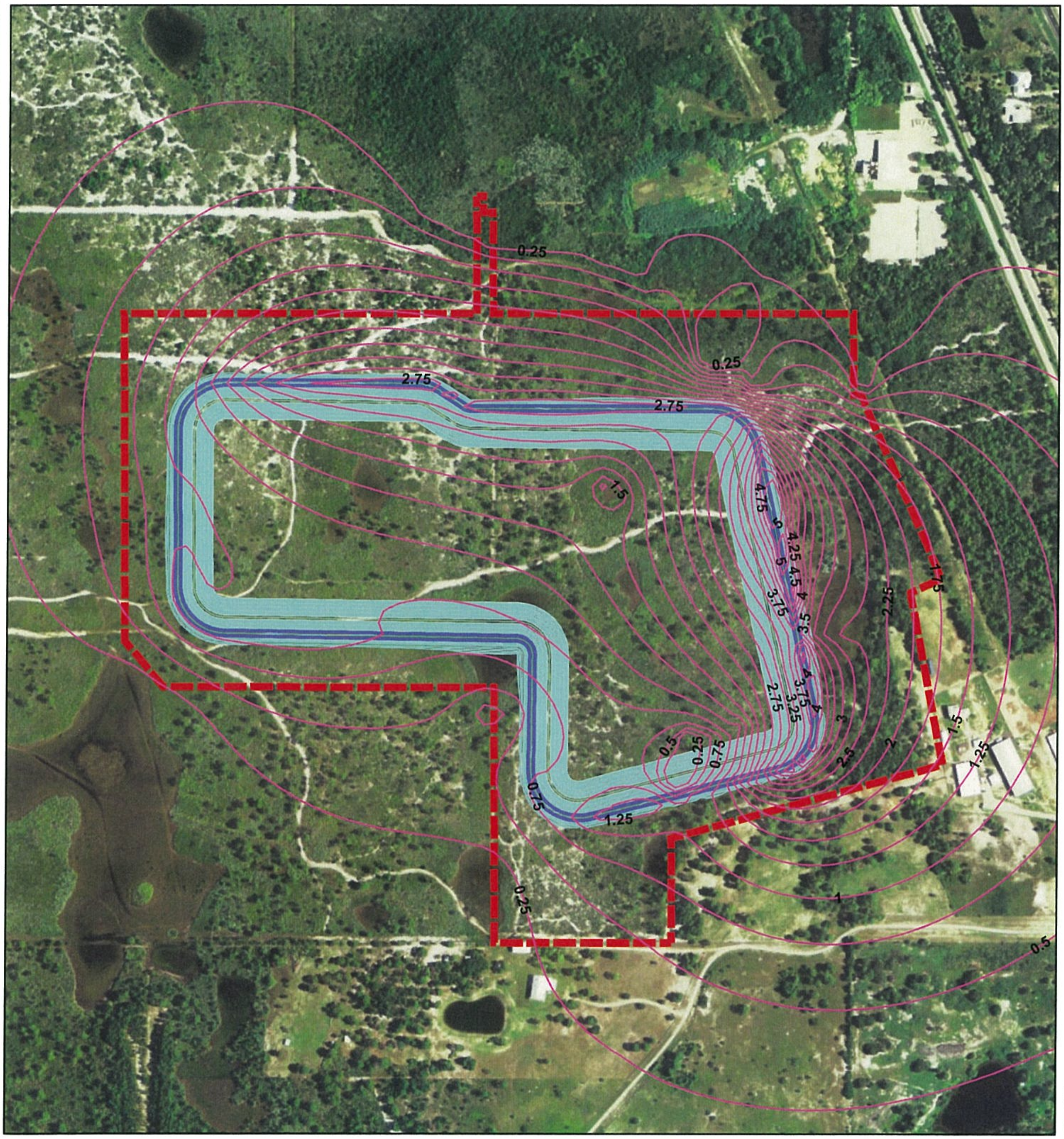
LEGEND

1. Gray or brown medium to fine SAND. (SP)
2. Black slightly silty to silty fine SAND, weakly cemented with an organic stain (Hardpan). (SP-SM, SM)
3. Light brown slightly silty medium to fine SAND. (SP-SM)
4. Dark gray to green sandy SILT. (ML)
5. Gray shelly SAND with varying amounts of silt. (SP, SP-SM, SM)
6. Green or light gray CLAY, traces of shell. (CL, CH)
7. Gray to green slightly silty fine to silty SAND. (SP-SM, SM)

Project Mngr: DD	Project No: HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	SUBSURFACE PROFILES	SHEET
Drawn By: BL	Scale: 1" = 10'	607 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION	9
Checked By: DD	File No: -	PH (772) 343-9787 FAX (772) 343-9404	TAYLOR ENGINEERING, INC.	
Approved By: KA	Date: 3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida	

13/18

14/18



N

0 500 1,000 Feet

1 " = 500 '

Legend:

Drawdown Contour (ft) End of 1st 10-year Load/ Rest Cycle - Normal Wet Season

Property Boundary

Perimeter Ditch

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE:	DATE: 12/01/16	ENGINEER:NA
AS SHOWN	PN:GPGW-16-013	DRAWN BY: DLS

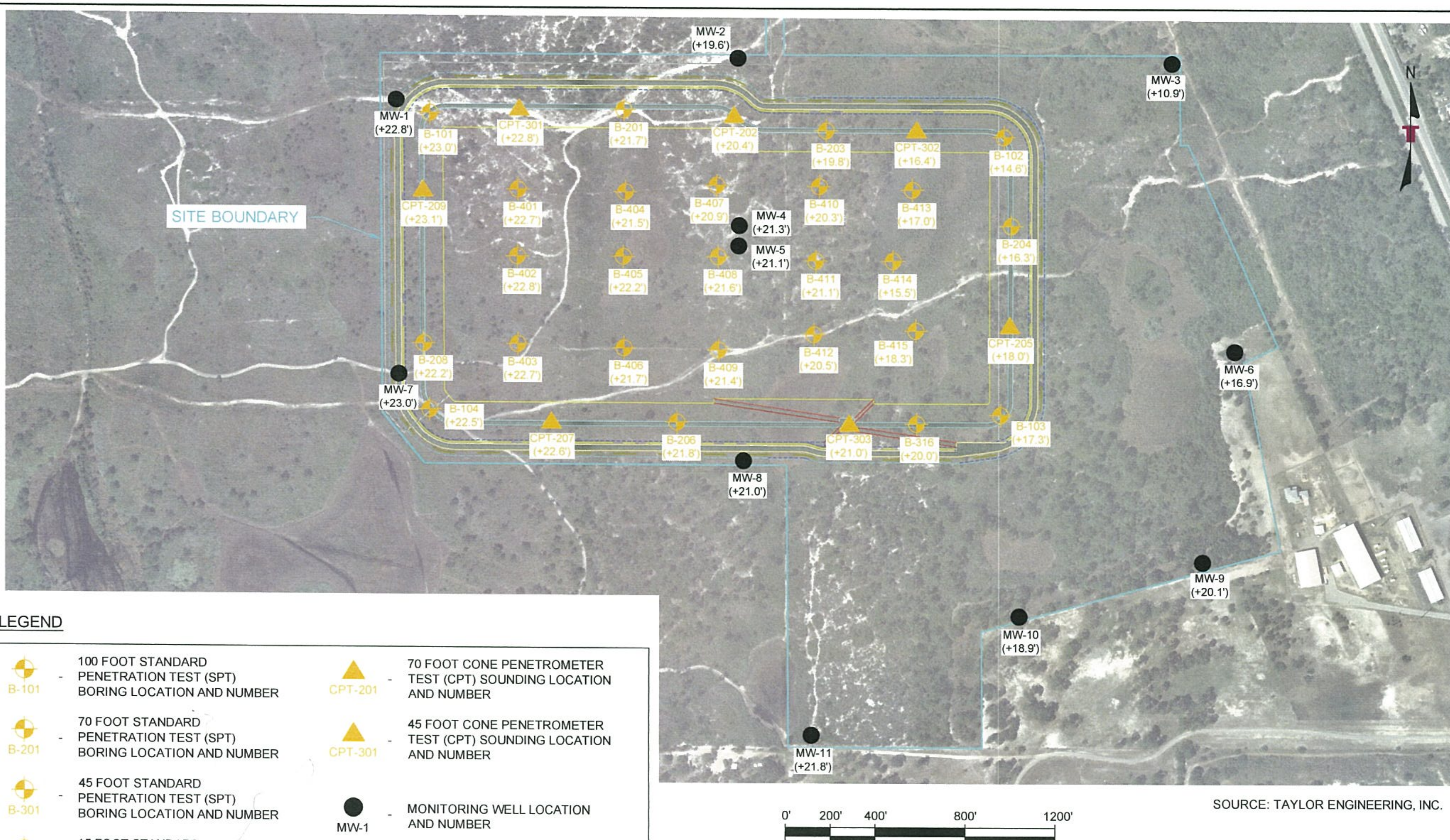
BV-24A

BREVARD COUNTY, FL

OFF-SITE WETLAND IMPACT LAYER 1

Exhibit F-32

15/18



SOURCE: TAYLOR ENGINEERING, INC.

LEGEND

B-101	-	100 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
B-201	-	70 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
B-301	-	45 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
B-401	-	15 FOOT STANDARD PENETRATION TEST (SPT) BORING LOCATION AND NUMBER
CPT-201	-	70 FOOT CONE PENETROMETER TEST (CPT) SOUNDING LOCATION AND NUMBER
CPT-301	-	45 FOOT CONE PENETROMETER TEST (CPT) SOUNDING LOCATION AND NUMBER
MW-1	-	MONITORING WELL LOCATION AND NUMBER
(+22.8')	-	INDICATED THE GROUND SURFACE ELEVATION WITH RESPECT TO NAVD88)

Locations are approximate

Project Mngr.	DD	Project No.	HB155022	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	TEST LOCATION PLAN
Drawn By	BL	Scale	AS SHOWN	597 NW COMMODITY COVE PORT ST. LUCIE, FL 34986	GEOTECHNICAL SITE EXPLORATION
Checked By	DD	File No.	-	PH. (772) 343-8787 FAX (772) 343-9404	TAYLOR ENGINEERING, INC.
Approved By	KA	Date	3/26/16		DREDGED MATERIAL MANAGEMENT AREA (DMMA) BV-24A Brevard County Florida

SHEET 5

16/18

N

Legend:

Model Predicted Groundwater Elevation Contour (ft NAVD) for 4/12/2016 - Layer 3

DMMA Boundary

Property Boundary

0 1,000 2,000 Feet

1 inch = 1,000 feet

ANDREYEV ENGINEERING, INC.

APPROXIMATE SCALE: AS SHOWN	DATE: 05/05/16	ENGINEER:NA	GROUNDWATER MODELING **BV-24A** BREVARD COUNTY, FL
	PN:GPGW-16-013	DRAWN BY: DLS	GROUNDWATER MODEL CALIBRATION EXHIBIT D-7

17/18

Table E.1
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Sand Samples

Sample Location	Sample Depth (ft)	USCS	Sample Type	Fines Content (%)	Initial Conditions			Confining Stress (psi)	Hydraulic Conductivity	
					Moisture Content (%)	Dry Unit Weight (pcf)	Estimated Relative Compaction (%)		cm/sec	ft/day
B-401	0 - 7	SP	Remolded	< 5	12.8	103.3	101.4	-	1.24E-02	35.2
B-401	0 - 7	SP	Remolded	< 5	12.3	94.9	93.1	-	2.48E-02	70.3
B-408	0 - 7	SP	Remolded	< 5	13.3	101.3	98.3	-	1.21E-02	34.3
B-408	0 - 7	SP	Remolded	< 5	13.2	94.7	91.9	-	1.70E-02	48.1
B-415	0 - 7	SP	Remolded	< 5	13.1	102.6	99.9	-	2.02E-02	57.3
B-415	0 - 7	SP	Remolded	< 5	13.1	94.7	92.2	-	2.38E-02	67.6

Samples collected in bulk using a continuous flight auger from proposed interior borrow area
Fines content refers to amount passing No. 200 Sieve

Table E.2
Summary of Hydraulic Conductivity Test Results
BV-24A DMMA, Brevard County, Florida
Fine Grained Samples

Sample Location	Sample Depth (ft)	USCS	Sample Type	Fines Content (%)	Initial Conditions		Confining Stress (psi)	Hydraulic Conductivity	
					Moisture Content (%)	Dry Unit Weight (pcf)		cm/sec	ft/day
B-102	31 - 33	CL	Undisturbed	85.0	51.6	68.7	3.0	4.87E-08	1.38E-04
B-203	66 - 68	CH	Undisturbed	98.7	53.6	67.4	3.0	5.57E-08	1.58E-04

Fines content refers to amount passing No. 200 Sieve

18/18

+10 to +25 feet-NAVD Ground Surface Elevations

-1	Surficial Aquifer (sand & silty sand)	LAYER 1
-17	Surficial Aquifer (sand & silty sand)	LAYER 2
-85	Surficial Aquifer (sand, clay, shell)	LAYER 3
-300	Aquitard (dense shell & hard clay)	LAYER 4
-600	Upper Floridan Aquifer (limestone)	LAYER 5

Figure 11.1 - Model Geologic Cross Section

Boundary conditions were applied in Layer 1 as illustrated in Figure 9.2 shown below. The Floridian Aquifer (Layer 5) was defined as a constant head boundary at +33 feet NAVD based on published potentiometric pressure maps (SJRWMD).

SUPPLEMENTAL INFORMATION FOR DMMA CONSTRUCTION PROJECTS

FLORIDA INLAND NAVIGATION DISTRICT
DMMA BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

APPENDIX E

WATER QUALITY CALCULATIONS

Depth of Withdrawl vs. Ponding Depth

$Q = 6{,}430 \frac{CY}{hr}$ 24" dredge at 16 ft/sec

$Q_{liquids} = 6430 \frac{CY}{hr} \times 0.80 = 5{,}144 \frac{CY}{hr}$

$= 5{,}144 \frac{CY}{hr} \times 27 \frac{CF}{CY} \times \frac{1 hr}{3{,}600 s} = 38.58 \frac{ft^3}{s}$ ✓

Assume weir flow balances liquid inflow

$Q = 38.58$ cfs

$B = 36$ ft for 3 Box weirs at 3 sides each ~~weir~~ weir

Weir loading $\frac{Q}{B} = \frac{38.58 \; ft^3/s}{36 \; ft} = 1.1 \frac{cfs}{ft}$

Withdrawl Depth = 2.15 ft, based on WES Selective withdrawl curve

Estimate ponding depth at weir by USACE EQ. 4-17

$H_{pd}(weir) = H_{pd} + \frac{1}{2} L_{ps} (0.001)$

$H_{pd}(weir)$ = ponding depth at weir

H_{pd} = average ponding depth = 2.0 ft

L_{ps} = length of ponding surface = 2100 ft

$H_{pd}(weir) = 2.0 ft + \frac{1}{2}(2{,}100 ft)(0.001) = 3.05 ft \approx 3.1 ft$

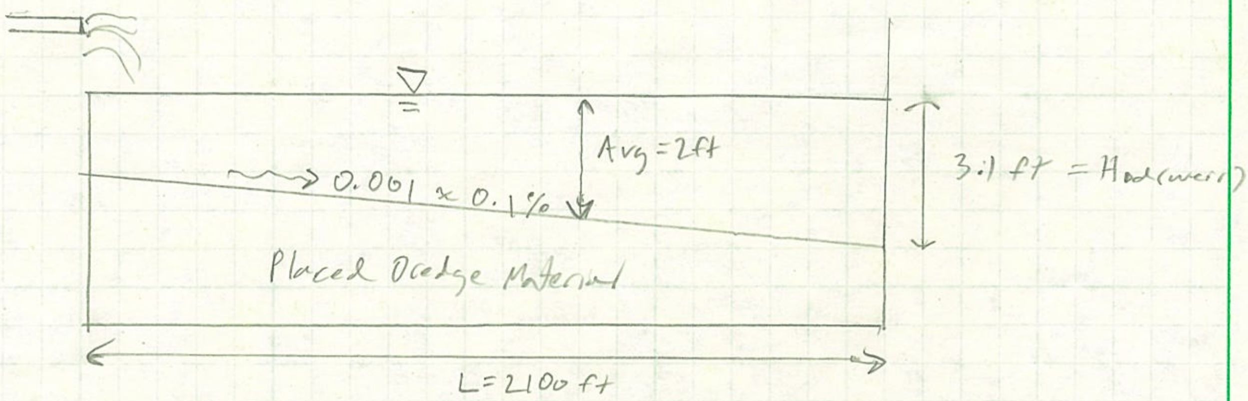
$\boxed{H_{pd}(weir) = 3.1 ft > D = 2.15}$ Doesn't apply

Weir is on weir shelf
Contractor to Keep depth at weirs
at approx 2 ft deep which equals 2.15 (approx)
OK

Basin Retention Time

From management plan, mean zone settling velocity = 0.30 cm/min

$V = 0.3 \text{ cm/min} \approx 0.0098 \text{ ft/min} \approx 0.59 \text{ ft/hr}$



Time for material to settle out of mean ponding depth = 2 ft

$$t = \frac{d}{V} = \frac{2\text{ ft}}{0.59\text{ ft/hr}} = 3.4\text{ hr}$$

WES/DRMP suggests multiplying by 2.25 to correct time for field conditions

$$t = 2.25(3.4) = \underline{7.65}\text{ hr}$$

How long does it take to withdraw 2.0 ft over the entire surface of the DMMA? The most conservative volume would occur at the bottom of the weir to 2 ft above. The weir is set to ≈ 19.5, so check volume between 19.5 & 21.5 ft.

$\text{Area Average} = (1{,}651{,}832 + 1{,}614{,}597)/2 = 1{,}633{,}215\text{ ft}^2$

$\text{Volume} = 1{,}633{,}215\text{ ft}^2 \times 2\text{ ft} = 3{,}266{,}429\text{ ft}^3 \approx 120{,}979\text{ cy}$

$Q = 38.58\text{ ft}^3/\text{s}$

$$t_{retention} = \frac{3{,}266{,}429\text{ ft}^3}{38.58\text{ ft}^3/\text{s}} \times \frac{\text{min}}{60\text{ s}} = 1411\text{ min} \approx \underline{23.5\text{ hr}}$$

OK

Check the height of water across weir boards to see if it appears reasonable

$Q = C_w B H_s^{3/2}$

$H_s = \left[\frac{Q}{C_w B}\right]^{2/3} = \left[\frac{38.58 \text{ ft}^3/\text{s}}{(3.3)(36 \text{ ft})}\right]^{2/3} = 0.5 \text{ ft}$

$\boxed{H_s = 0.5 \text{ ft} \;@\; Q = 38.58 \text{ cfs appears reasonable}}$

Hydraulic Efficiency of basin (based on square or irregular shape of 50% + 10 for each $\frac{L}{W}$ ratio higher than 1

$L = 2100$ ft
$W = 800$ ft

$\frac{L}{W} = 2.6 \approx 3$

$E = 0.50 + (3-1)(0.10) \approx 0.70 \approx 70\%$

Adjust $t_{retention}$ based on 70% hydraulic efficiency

$t_{retention} = 0.70(1411 \text{ min}) = 987 \text{ min} \approx \underline{16 \text{ hr}}$ ✓

$F.S. = \frac{t_{retention}}{t_{zone}} = \frac{16 \text{ hr}}{7.65 \text{ hr}} = 2.1$ considering 70% Efficiency

$F.S. = \frac{23.5 \text{ hr}}{7.65 \text{ hr}} = 3.1$ considering 100% efficiency $\Rightarrow$ 2ft Ponding Depth ✓

✓

For 4ft Ponding Depth

Average area $= (1689293 + 16{,}14{,}597)/2 = 1{,}651{,}945 \text{ ft}^2$

$V = 1{,}651{,}945 \text{ ft}^2 \times 4 = 6607792 \text{ ft}^3 \approx 244733$ cy

$Q = 38.58 \text{ ft}^3/s$

$t_{retention} = \frac{6607792 \text{ ft}^3}{38.58 \text{ ft}/s} \times \frac{\text{min}}{60 s} = 2854.5 \text{ min} \approx 47 \text{ hr}$ ✓

✓

$t_{zone} = 7.65$

$F.S. = \frac{47 \text{ hr} (0.7)}{7.65 \text{ hr}} = 4.3$ ✓

5/8

and shell. These deposits range in thickness from less than 1 cm to more than 70 cm. In a previous study Trefry and Stauble (1987) determined the deposited sediments contained on average 66.5 percent "fines," that is, sediments less than 0.074 mm grain size diameter. These fines are primarily composed of aluminosilicates derived from the erosion of upland soils with an additional small fraction of organic material. In contrast, the coarser native bottom material was determined to contain only 11.5 percent fines, again consisting primarily of aluminosilicates with an additional small fraction of organics.

These data were then analyzed with respect to the most recent ICWW channel survey data (1987). From this analysis it was determined that 32.9 percent of the in-place volume of shoal sediments within Reach VI is made up of fine material as previously defined. Organics, which represent a small component of the fines, make up only 5.0 percent of the total shoal volume.

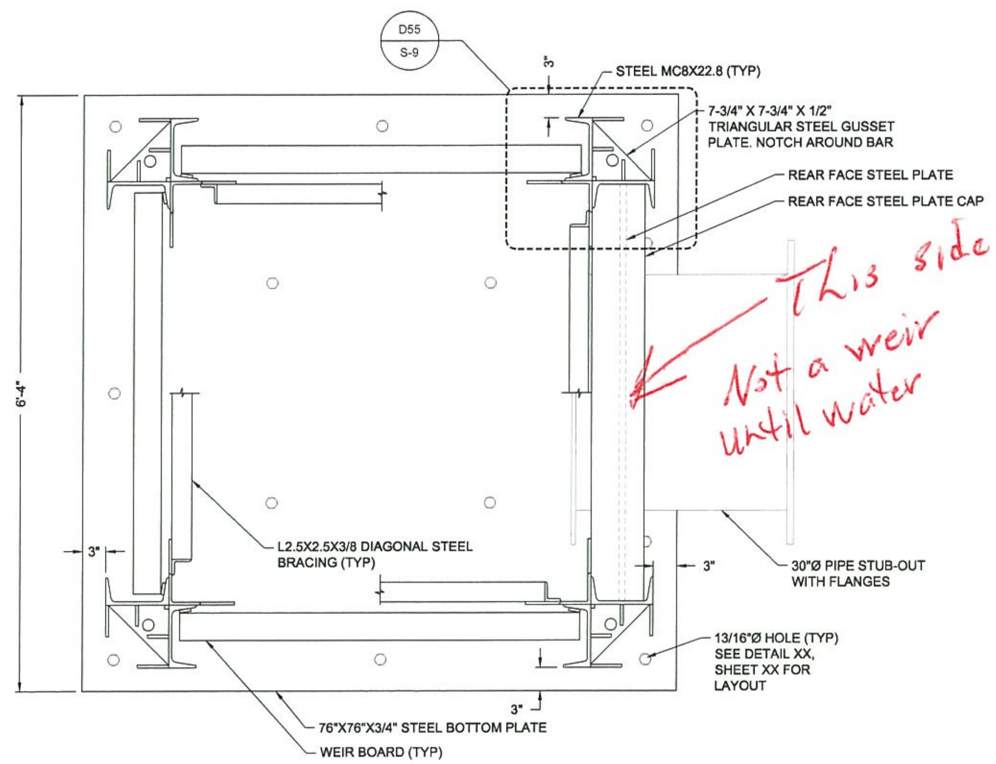
However, the Trefry report also indicates that some areas of the ICWW channel within Reach VI contain deposits of fine-grained sediments in excess of 30 cm thick. Dredging these areas could result in short periods during which the sediments entering the containment basin contain up to 60 percent fines. Therefore, to ensure that the containment basin is able to meet or exceed all effluent discharge and water quality criteria, its design is based on the "worst-case" assumption that the dredged material contains 60 percent fines. This does not imply that all or even a majority of the material to be stored in Site BV-24 contains such a high fraction of fines. As discussed, available data indicate that fines represent less than one-third of the Reach VI shoal material.

Based on design criteria, an associated zone settling velocity was then determined from an empirical relationship between the percentage of fines and settling behavior. This relationship was developed from COE sediment data characterizing a variety of ICWW channel sediments and the corresponding settling behavior of slurry concentrations similar to those typically encountered in dredging operations (Figure 2-4; Taylor and McFetridge, 1989). The resulting zone settling velocity for the sediment to be placed in Site BV-24 was determined to be 0.30 cm/min. This settling velocity was then used to determine the retention time needed to provide adequate sedimentation within the containment basin.

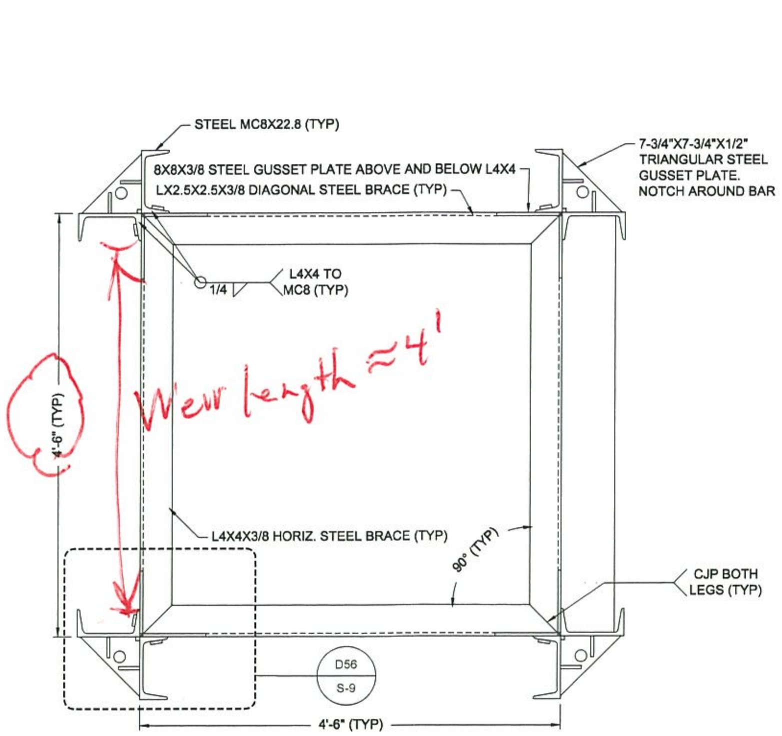
The preliminary design of the containment area and dikes provides for a minimum 2.0 ft ponding depth. That is, at capacity the containment dike will retain 2.0 ft of ponding plus 2.0 ft of freeboard above the maximum deposition surface. Analysis of the hydraulic characteristics of the proposed

Steel Box Weir

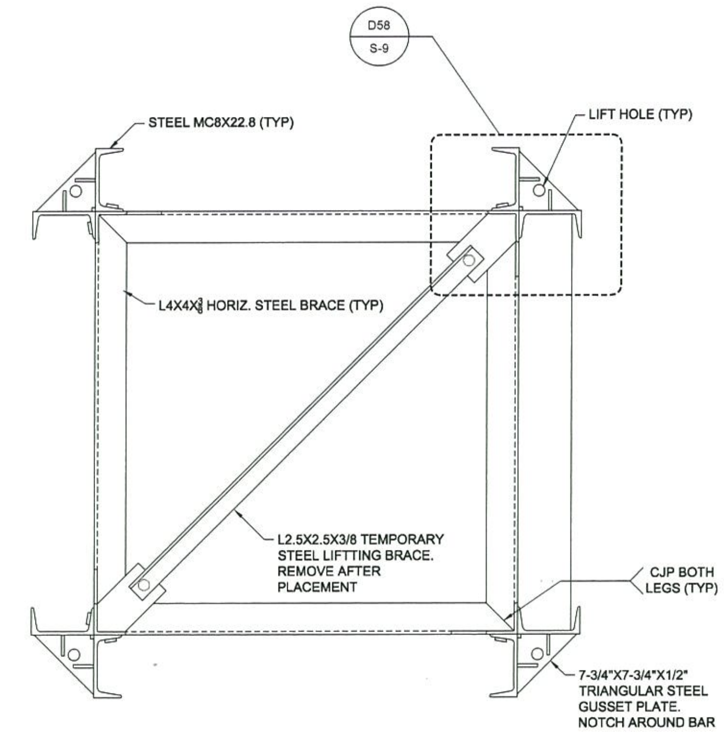
6/8



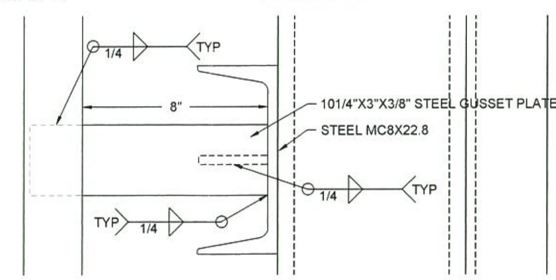
S57
S-7
LOWER WEIR SECTION
22X34: 1" = 1'
11X17: 1/2" = 1'



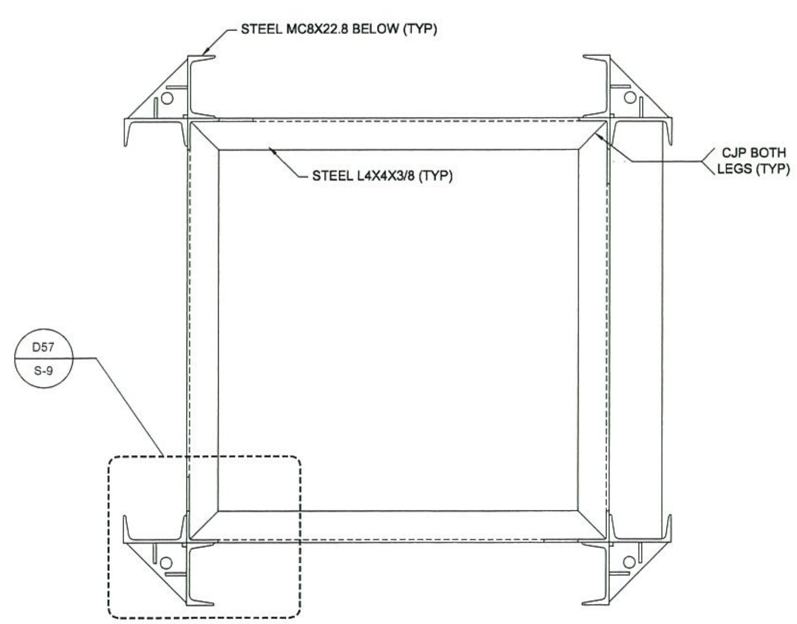
S56
S-7
MIDDLE WEIR SECTION
22X34: 1" = 1'
11X17: 1/2" = 1'



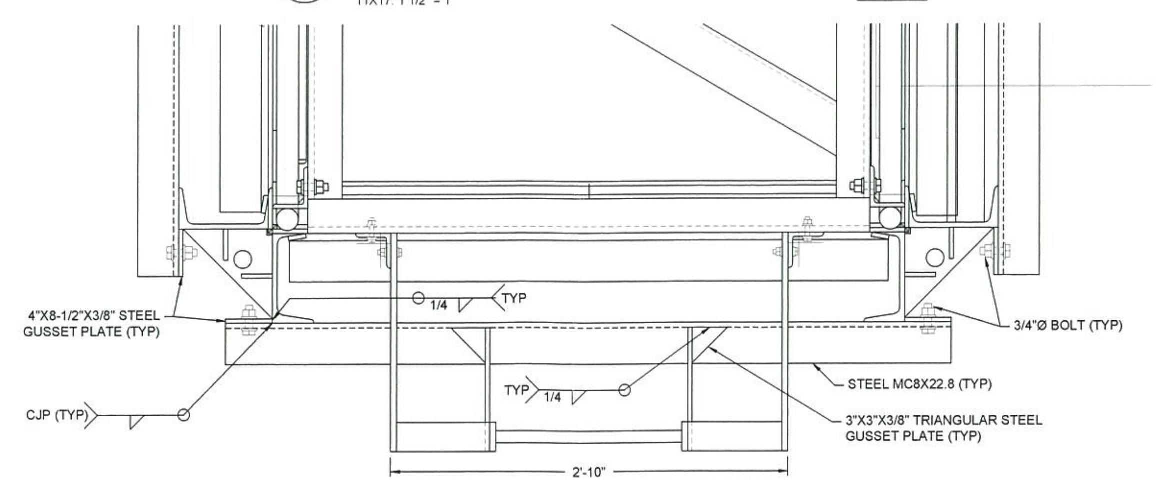
S55
S-7
UPPER WEIR SECTION
22X34: 1" = 1'
11X17: 1/2" = 1'



D62
S-11
TYPICAL LADDER SUPPORT DETAIL
22X34: 3" = 1'
11X17: 1 1/2" = 1'



S54
S-7
TOP WEIR SECTION
22X34: 1" = 1'
11X17: 1/2" = 1'



S58
S-11
WEIR LADDER TYPICAL PLAN
22X34: 1 1/2" = 1'
11X17: 3/4" = 1'

REBECCA JOHNSON, 8/10/2017 7:16:02 PM, X:\xys\Projects\c2015-014 FIND BV-24A\Construction\Weir Details 5.dwg

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
(904)-731-7040
1221 AIRPORT ROAD
SUITE 210
DESTIN, FL 32541
(850)-460-7040
CERTIFICATE OF AUTHORIZATION # 4815

SEAL

PRELIMINARY DRAFT

KEITH A. KNIGHT P.E.# 58084

PROJECT TITLE

DREDGED MATERIAL MANAGEMENT SITE BV-24A
DUVAL COUNTY, FLORIDA

SUNSHINE STATE ONE CALL OF FLORIDA
SUNSHINE 811 - ALWAYS CALL 811 BEFORE YOU DIG
1-800-638-4097

NO	ZONE	REVISIONS / SUBMISSIONS	DATE

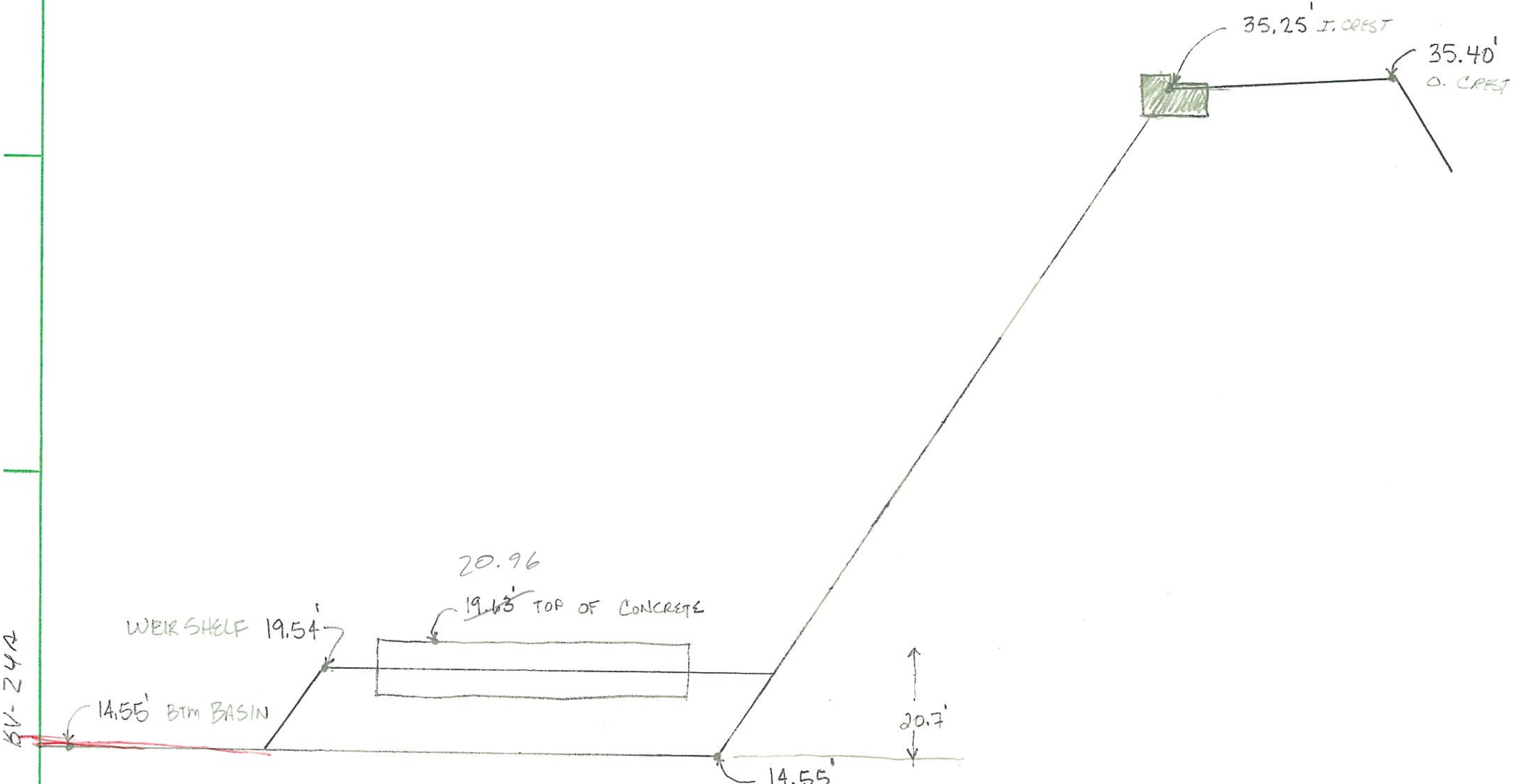
PROJECT NO	C2015-014
DATE	JULY 2017
DESIGNED	RJD
DRAWN	AF
CHECKED	RMD
REVIEWED	KAK
SCALE	AS SHOWN

DRAWING TITLE

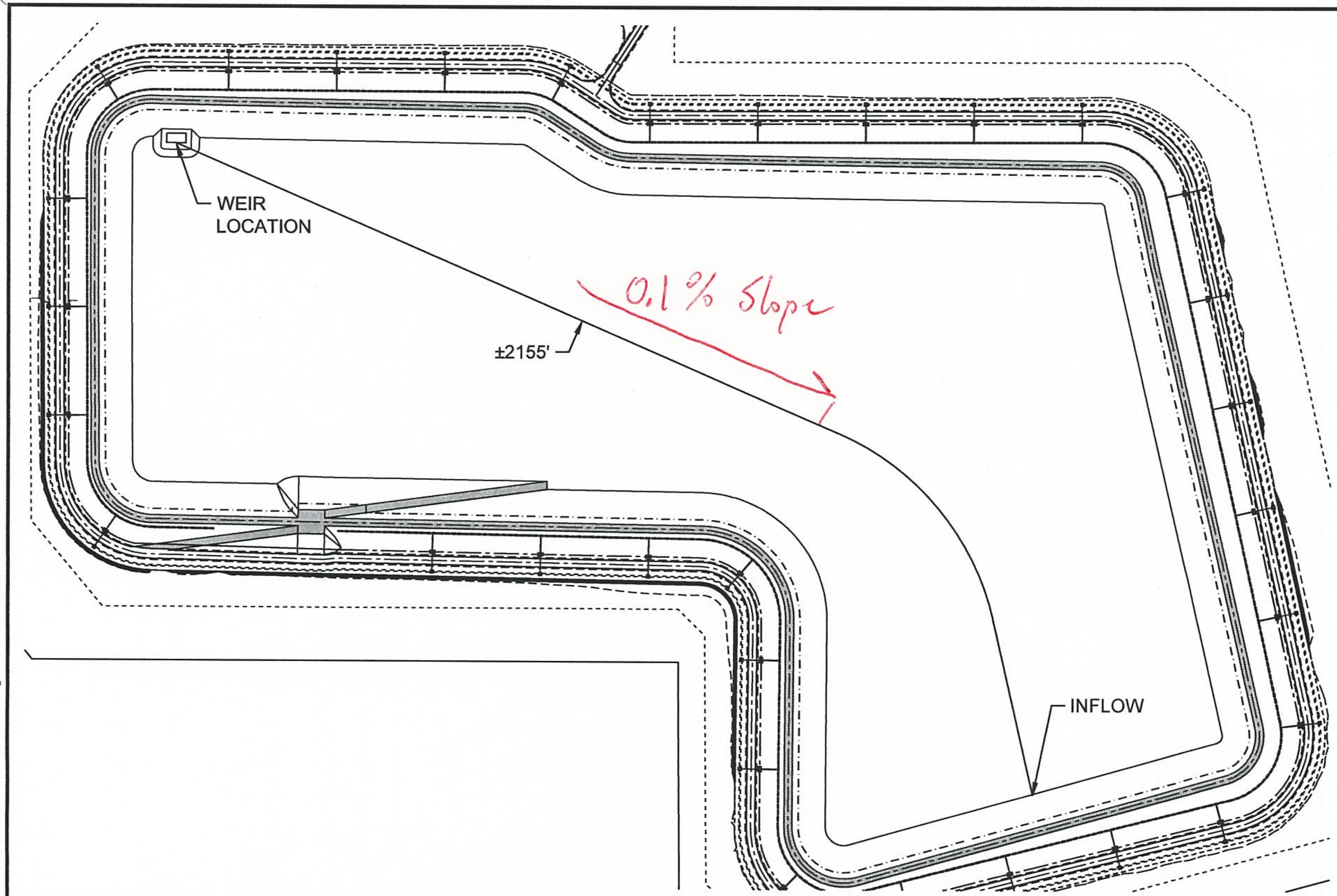
STEEL WEIR DETAILS

S-8

SHEET 26 OF 30


BV-24A
14.55' BTM BASIN
WEIR SHELF 19.54'
20.96
~~19.63'~~ TOP OF CONCRETE
14.55'
20.7'
35.25' I. CREST
35.40' O. CREST

8/8



TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

LENGTH FROM INFLOW TO WEIR

PROJECT	C2015-XXX
DRAWN BY	DRWNBY
SHEET	XX of XX
DATE	00-00-15

SEAL

DRAFT

ENG DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 13

EXCHANGE AGREEMENT

AP1

BREVARD County
BOARD OF COUNTY COMMISSIONERS

FLORIDA'S SPACE COAST

Tammy Etheridge, Clerk to the Board, 400 South Street • P.O. Box 999, Titusville, Florida 32781-0999

Telephone: (321) 637-2001
Fax: (321) 264-6972

SEAL OF BREVARD COUNTY FLORIDA

April 29, 2015

MEMORANDUM

TO: Jack Masson, Parks and Recreation Director

RE: Item V.A., Resolution and Exchange Agreement with Florida Inland Navigation District (FIND) for Land Exchange

The Board of County Commissioners, in regular session on April 28, 2015, adopted Resolution No. 15-055, and executed Exchange Agreement with Florida Inland Navigation District (FIND) for exchange property. Enclosed are a certified copy of the Resolution and three fully-executed copies of the Exchange Agreement.

Your continued cooperation is greatly appreciated.

Sincerely yours,

BOARD OF COUNTY COMMISSIONERS
SCOTT ELLIS, CLERK

Tammy Etheridge

Tammy Etheridge, Deputy Clerk

Encls. (4)

cc: EEL Program Manager
Contracts Administration
Finance
Budget

RESOLUTION NO. 2015- 055

A RESOLUTION PURSUANT TO SECTION 125.37, FLORIDA STATUTES AUTHORIZING THE EXCHANGE OF COUNTY PROPERTY FOR OTHER REAL PROPERTY OWNED BY THE FLORIDA INLAND NAVAGATION DISTRICT (FIND); AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the County owns 69.36 acres of certain real property within the Town of Grant-Valkaria (EEL Parcel) and desires to exchange this parcel for a 83.19 acre parcel owned by FIND, pursuant to the terms set forth in the Exchange Agreement attached as Exhibit "A" and incorporated herein; and

WHEREAS, FIND will combine the EEL Parcel with other lands it currently owns to create a new Dredged Material Management Area known as the FIND BV-24A Site; and

WHEREAS, the County will combine the FIND parcel with other lands it currently owns and manages for scrub jay habitat and preservation; and

WHEREAS, FIND has determined that such an exchange would be in the public interest and within its statutory responsibilities by providing the land required for dredged material management for the Atlantic Intracoastal Waterway; and

WHEREAS, COUNTY has determined that such an exchange would be in the public interest and within its statutory responsibilities by obtaining land for scrub jay habitat and preservation.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF BREVARD COUNTY, FLORIDA, that:

The County hereby agrees to exchange the above-described lands with FIND pursuant to the terms and conditions set forth in the Exchange Agreement.

IN WITNESS THEREOF, the parties hereto have caused these presents to the signed all as of the date and year first written above.

ATTEST:

Scott Ellis, Clerk
(SEAL)

BOARD OF COUNTY COMMISSIONERS
OF BREVARD COUNTY, FLORIDA

Robin Fisher, Chairman

As approved by the Board on 04-28-15

Exhibit "A"

EXCHANGE AGREEMENT

This Exchange Agreement ("Agreement") is made and entered into as of the 28th day of April, 2015, by and among FLORIDA INLAND NAVIGATION DISTRICT, an independent special district authorized and existing by virtue of the laws of the State of Florida ("FIND"), and the BOARD OF COUNTY COMMISSIONERS OF BREVARD COUNTY, FLORIDA, a political subdivision of the State of Florida ("COUNTY').

WHEREAS, FIND is the owner of certain property in Brevard County, Florida containing 83.19 acres, more or less, and depicted in red on Exhibit "A" as Parcel A, which will be more fully described in the boundary survey performed pursuant to Section 6 of this Agreement (the "FIND Parcel"); and

WHEREAS, County is the owner of a parcel of real property in Brevard County, Florida containing 69.36 acres, more or less, and depicted in green on Exhibit "A" as Parcel B, which will be more fully described in the boundary survey performed pursuant to Section 6 of this Agreement (the "EEL Parcel");and

WHEREAS, the COUNTY has proposed to FIND an exchange of properties between the parties, such that COUNTY will own the FIND Parcel, and FIND will own the EEL parcel; and

WHEREAS, FIND will combine the EEL Parcel with other lands it currently owns to create a new Dredged Material Management Area known as the FIND BV-24A Site; and

WHEREAS, FIND has determined that, subject to the provisions of this Agreement, such an exchange would be in the public interest and within its statutory responsibilities by providing the land required for dredged material management for the Atlantic Intracoastal Waterway; and

WHEREAS, COUNTY has determined that, subject to the provisions of this Agreement, such an exchange would be in the public interest and within its statutory responsibilities by obtaining land for scrub jay habitat and preservation.

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein contained and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

Section 1. Agreement to Exchange. FIND and the COUNTY,; hereby agree to exchange with one another parcels of real property, described in this Agreement, on the terms and conditions set forth in this Agreement.

Section 2. Property to be Transferred to the COUNTY. FIND will convey the FIND Parcel to the County. Should Brevard County, now or in the future, use the FIND Parcel for creation of a Scrub Jay (Aphelocoma coerulescens) Preserve, Brevard County shall, without cost to FIND, accept into such a Scrub Jay Preserve any and all scrub jays that require relocation from the FIND BV-24A Site. If Brevard County does not create a Scrub Jay Preserve but should habitat space be present within the FIND Parcel and state and federal agencies approve, the County shall allow the transfer of any and all Scrub Jays that require relocation from the FIND BV-24A Site as a result of the Dredged Material Management Area footprint on the BV-24A Site, without charge or cost for the transfer of Scrub Jays to County lands.

Section 3. Property to be Transferred to FIND. COUNTY will convey the EEL Parcel to FIND.

Section 4. Exchange Values. COUNTY and FIND stipulate that the EEL Parcel and the FIND Parcel are approximately equal in value and neither party shall owe the other party any additional consideration as a result of any actual difference between the values of the respective properties.

Section 5. Title to be Conveyed: Evidence of Title. Each party shall convey marketable title subject only to liens, encumbrances, exceptions or qualifications specified in this Agreement. Within thirty (30) days after the delivery of the boundary survey of the FIND Parcel, as described in Section 6, the COUNTY may obtain, at its expense, a title insurance commitment, to be followed by an owner's title insurance policy from a title insurance company insuring marketable title to the FIND Parcel. Within thirty (30) days after the delivery of the boundary survey of the EEL Parcel, as described in Section 6, FIND may obtain, at its expense, a title insurance commitment, to be followed by an owner's title insurance policy from a title insurance company, insuring marketable title to the EEL Parcel. Marketable title shall be determined according to applicable Title Standards adopted by authority of The Florida Bar and in accordance with law.

Section 6. Surveys. Within ninety (90) of the Effective Date, the COUNTY shall obtain a boundary survey of the FIND Parcel, at its expense and FIND shall obtain a boundary survey of the EEL Parcel, at its expense. The boundary surveys shall be prepared and certified by a Florida registered land surveyor and mapper. The legal descriptions of the respective parcels created pursuant to said boundary surveys shall be reasonably satisfactory to both parties and shall be used in the deeds of conveyance. In the event either boundary survey shows any encroachment on either parcel or that improvements intended to be located on either parcel encroach on the land of others, or if either survey shows evidence of unrecorded easements, the same shall be treated as a title defect in the manner provided in Section 7.

Section 7. Defects in Title. If the title insurance commitments of Surveys obtained pursuant to Section 6 of this Agreement disclose any matters that would render title to the FIND Parcel unmarketable and/or matters that would render title to the EEL parcel unmarketable, the affected party shall notify the other party, in writing, within fifteen (15) days of receipt of the title commitment or boundary survey, as the case may be, specifying the defect or defects. Such other party shall have one hundred twenty (120) days from the date of receipt of such notice to remove the defect or defects and shall use diligent efforts in connection therewith. However, such other party shall not be required to file a lawsuit to cure such defect or defects. If such other party is unsuccessful in removing the defects within such one hundred twenty (120) day period, the objecting party shall have the right to either (a) waive such defects and accept title as it then is, without any claim for damages, or (b) terminate this Agreement, in which event the COUNTY and FIND shall be released from any and all further obligations and liabilities hereunder. Any matters disclosed by the title insurance commitment or the survey which are not timely objected to by the grantee party, or which are waived by the grantee party, shall be deemed a "Permitted Exception" as to that parcel.

Section 8. Environmental Site Assessment. Each party, within ninety (90) days of the Effective Date and at its sole expense, may conduct an Environmental Site Assessment of the parcel to be conveyed to it to determine the existence and extent, if any, of any Hazardous Material on the parcel. In the event that the Environmental Site Assessment discloses one or more Recognized Environmental Conditions, the applicable party shall have an additional ninety (90) days to conduct such other and additional sampling, analysis and investigations as said party deems necessary. For purposes of this Agreement "Hazardous Materials" shall mean any hazardous or toxic substance, material or waste of any kind or any other substance which is regulated by any Environmental Law, as defined in Section 9 below.

Section 9. Hazardous Materials. If the environmental site assessment provided for in Section 8 confirms the presence of Hazardous Materials on either parcel, either party, at its sole option, may elect to terminate this Agreement and neither party shall have any further obligations under this Agreement. Should neither party elect to terminate this Agreement, the grantee of the contaminated parcel shall accept title "as-is" and is responsible, at its sole cost and expense, for pursuing any assessment, clean up and monitoring of the parcel necessary as to Hazardous Materials existing on the parcel, to bring the parcel into full compliance with Environmental Law. "Environmental Law" shall mean all federal, state and local laws, including statutes, regulations, ordinances, codes, rules, judgments, orders, decrees, permits, concessions, grants, franchises, licenses, agreements and other governmental restrictions relating to the protection of the environmental or human health, welfare or safety, or to the emission, discharge, seepage, release or threatened release of any contaminant, chemical, waste, irritant, petroleum product, waste product, radioactive material, flammable or corrosive substance, explosive, polychlorinated biphenyl, asbestos, hazardous or toxic substance, material or waste or any kind into the environment, including, without limitation, ambient air, surface water, ground water, or land including, but not limited to, the Federal Solid Waste Disposal Act, the Federal Clean Air Act, the Federal Clean Water Act, the Federal Resource and Conservation and Recovery Act of 1976, the Federal Comprehensive Environmental Response, Compensation and Liability Act of 1980, the Federal Superfund Amendments and Reauthorization Act of 1986, Chapters 161, 253, 373, 376 and 403, Florida Statutes, Rules of the U.S. Environmental Protection Agency, Rules of the Florida Department of Environmental Protection, and the rules of the Florida water management districts now or at any time hereafter in effect.

Nothing contained herein shall be construed to limit either party's legal liability under any Environmental Law for Hazardous Materials located on the property. Nothing contained herein shall constitute a waiver by either party of its sovereign immunity or the provisions of Section

768.28, Florida Statutes or other limitations imposed on potential liability under state or federal law.

Section 10. Representations and warranties. For the purpose of this section each party hereby represents and covenants, in its capacity as grantor of the parcel it proposes to convey to the other, as follows:

(a) This Agreement has been duly executed by, and is a valid and binding agreement enforceable in accordance with its terms;

(b) Neither the execution or delivery of this Agreement, nor the consummation of the transactions contemplated herein, will conflict with, or result in a breach of, any contract, license or undertaking to which the granting party or by which any of its property is bound, or constitute a default there under, or result in the creation of any lien or encumbrance upon the parcel it proposes to convey (or any part thereof), or contravene any provision of any law, administrative regulation, or judgment, order, decree, writ or injunction of any court of competent jurisdiction;

(c) No legal or administrative proceeding is pending or, to the best knowledge of the granting party, threatened against the granting party, which would or could adversely affect its right to convey the proposed parcel (or any part thereof) as contemplated in this Agreement. There are no condemnation or eminent domain proceedings pending or, to the best knowledge of the granting party, threatened with respect to the parcel proposed for conveyance (or any part thereof) and there are no legal or administrative proceedings pending or, to the best knowledge of the granting party, threatened affecting the parcel to be conveyed (or any part thereof);

(d) The granting party has good, clear, indefeasible, insurable and marketable title to the parcel to be conveyed, subject to no mortgage (other than existing mortgages satisfiable and which shall be satisfied at or prior to Closing), construction or other lien or encumbrance other than the grantee's Permitted Exceptions.

(e) All taxes, whether Federal, State, local or otherwise, which could become a lien against or otherwise affect all or any portion of the grantee's interest therein as the transferor thereof, or the grantee's interest therein as the transferee thereof, that have become due or payable at or prior to the date hereof, have been paid, including without limitation, all real estate taxes, tangible personal property taxes, sales taxes and any and all other taxes which relate to all or any portion of the parcel to be conveyed or could otherwise affect all or any portion of the parcel to be conveyed.

(f) The transfer of the parcel as contemplated herein, will not violate any subdivision statute, ordinance, law, or code or plat presently in existence;

(g) The parcel to be conveyed is not subject to any prescriptive easement or adverse possession;

(h) No "Hazardous Substance" (as hereinafter defined) has, to the knowledge of grantor, been disposed of, buried beneath, or percolated beneath the parcel to be conveyed or any improvements thereon, nor has any toxic, explosive or Hazardous Substance ever been removed from the parcel to be conveyed and stored off site. Further, to the knowledge of the grantor, there has been no "Release" (as hereinafter defined) of a Hazardous Substance on or from the parcel to be conveyed or any improvements thereon.

(i) The parcel to be conveyed and any improvements thereon have not, to the knowledge of the grantor, been used and are not presently being used for the handling, transportation or disposal of a Hazardous Substance. Neither the grantor, nor any lessee, licensee nor other party acting at the direction of or with consent of the grantor or said lessee or licensee, has manufactured, treated, stored or disposed of any Hazardous Substance on the parcel to be conveyed or any improvement thereon;

(j) With respect to the parcel to be conveyed, to the knowledge of the grantor, the Parcel is in material compliance with all applicable federal, state and local laws, administrative rulings, and regulations of any court, administrative agency or other governmental or quasi-governmental authority, relating to the protection of the environment (including, without limitation, laws prohibiting the creation of a public nuisance). With respect to said Parcel , the grantor has not received notification that it is a potentially responsible party under Section 107 of the Comprehensive Environmental Response Compensation and Liability Act of 1980, as amended ("CERCLA"), or Section 7003 of the Resource Conservation and

Recovery Act of 1976, as amended ("RCRA"), nor has the grantor received notification from any federal, state, or local government, agency, or regulatory body, of a violation under any federal, state, or local law regulating the disposal or discharge of any toxic, explosive or other Hazardous Substance.

(k) For purposes hereof, the term "Hazardous Substance" means any one or more of the following: (i) any substance deemed hazardous under Section 101(14) of CERCLA, (ii) any other substance deemed hazardous by the Environmental Protection Agency pursuant to Section 102(a) of CERCLA, (iii) petroleum (including, without limitation, crude oil or any fraction thereof), (iv) any substance deemed hazardous pursuant to Section 1004(5) of RCRA, (v) any solid waste identified in Section 1004(27) of RCRA or (vi) any other hazardous or toxic substance, material, compound, mixture, solution, element, pollutant, or waste regulated under any federal, state or local statute, ordinance or regulation. The term "Release" shall have the meaning given to such term in Section 101(22) of CERCLA.

(l) The grantor has not received notice of, nor does the grantor have any knowledge of, any default or breach by the grantor of any covenant, condition, restriction, right of way, easement, or agreement affecting the Parcel ; and

(m) All of the representations and other provisions contained in this Section, in other Sections in this Agreement and in any other document to be delivered by the grantor as contemplated hereby shall (i) be true, accurate and complete both as of the date hereof or the effective date of such other document, as the case may be and as of the Closing and (ii) shall survive the Closing. Further, the truth, accuracy and completeness of all of such representations and warranties of the grantor shall, notwithstanding anything contained herein to the contrary, be a condition precedent to the grantee's obligation to close hereunder; provided, however, the grantee shall not have any obligation to investigate the truth, accuracy or completeness of said representations and warranties and, in the event same are not true, accurate or complete, but the grantee nonetheless elects to close hereunder, such shall not constitute a waiver of any of the grantee's rights and remedies as a result of a breach thereof. The grantor shall, to the extent permitted by law, indemnify and hold the grantee harmless from any and all losses, claims, damages, costs, expenses, obligations and liability arising out of or with respect to any breach or violation of any of the grantor's representations contained in this Agreement or in any other document to be delivered by the grantor. Nothing contained in this

Agreement shall be construed as a waiver of either party's right to sovereign immunity under Section 768.28, *Florida Statutes*, or other limitations imposed on either party's potential liability under state or federal law.

Section 11. Conditions Precedent as to FIND. Notwithstanding anything contained herein to the contrary, this Agreement and FIND's obligations hereunder are, unless waived in whole or in part in writing by FIND (which FIND shall have the right to do), subject to and contingent upon each and all the following (hereinafter sometimes collectively referred to as "Conditions Precedent" and singularly as "Condition Precedent"):

(a) FIND has obtained a permit under the Endangered Species Act from the U.S. Fish and Wildlife Service to use the EEL Parcel, together with any adjacent FIND-owned land, as a dredged material management facility;

(b) FIND has obtained all other federal, state and water management district permits necessary to construct a dredged material management facility on the BV-24 site;

(c) FIND has not terminated this Agreement pursuant to Section 7 or 9;

(d) All the representations and warranties hereof of COUNTY shall be true, accurate and complete as of the date hereof and at all times thereafter through and including Closing; provided, however, in the event FIND elects to waive this Condition Precedent, such waiver shall not constitute a waiver of FIND's rights or remedies arising out of a breach or violation of any such representations or warranties of COUNTY;

(e) COUNTY shall have satisfied, fulfilled or performed all of its obligations which are to be satisfied, fulfilled or performed at or prior to Closing; provided, however, in the event FIND elects to waive this Condition Precedent, such waiver shall not constitute a waiver of FIND's rights or remedies hereunder to enforce any failure of COUNTY to fully satisfy, fulfill or perform such obligations;

(f) COUNTY shall not have furnished any notice of termination as may be permitted hereunder; and

(g) COUNTY shall, at its sole cost and expense, have caused the termination of any lease of the EEL Parcel (or any portion thereof) and shall have affected the removal of any tenant(s) there under.

(h) Should FIND cancel this Agreement due to the failure of any Condition Precedent or Conditions Precedent, all parties hereto shall, except if and to the extent provided herein to the contrary, be relieved from any and all further obligations and liability hereunder or arising here from.

Section 12. Conditions Precedent as to COUNTY. Notwithstanding anything contained herein to the contrary, this Agreement and COUNTY's obligations hereunder are, unless waived in whole or in part in writing by COUNTY (which COUNTY shall have the right to do), subject to and contingent upon each and all the following (hereinafter sometimes collectively referred to as "Conditions Precedent" and singularly as "Condition Precedent"):

(a) All the representations and warranties hereof of FIND shall be true, accurate and complete as of the date hereof and at all times thereafter through and including Closing; provided, however, in the event COUNTY elects to waive this Condition Precedent, such waiver shall not constitute a waiver of COUNTY's rights or remedies arising out of a breach or violation of any such representations or warranties of FIND;

(b) FIND shall have satisfied, fulfilled and/or performed all of their obligations which are to be satisfied, fulfilled or performed at or prior to Closing; provided, however, in the event COUNTY elects to waive this Condition Precedent, such waiver shall not constitute a waiver of COUNTY's rights or remedies hereunder to enforce any failure of FIND to fully satisfy, fulfill or perform such obligations;

(c) FIND shall not have furnished any notice of termination as may be permitted hereunder;

(d) FIND shall, at its sole cost and expense, have caused the termination of any lease of the FIND Parcel (or any portion thereof) and shall have affected the removal of any tenant(s) there under; and

(e) COUNTY has not terminated this Agreement pursuant to Section 7 or 9

(f) Should COUNTY cancel this Agreement due to the failure of any Condition Precedent or Conditions Precedent, all parties hereto shall, except if and to the extent provided herein to the contrary, be relieved from any and all further obligations and liability hereunder or arising here from.

Section 13. Closing: Costs and other expenses. The closing of this transaction ("Closing") shall occur and exchange of possession of the Parcels shall take place at the County Attorney's office in Viera, Florida (or at such other place as shall be mutually agreed upon) within thirty (30) days after all of the Conditions Precedent as to both parties have been satisfied or waived in writing by the parties (unless extended by other provisions hereof) or on such other date as shall be mutually agreed upon ("Closing Date"). In the event that all of the Conditions Precedent set forth in Sections 11 and 12 have not been satisfied or waived within twelve (12) months of the Effective Date, the party for whose benefit such Condition Precedent exists shall have the option of (i) terminating this Agreement whereupon all parties hereto shall, except if and to the extent provided herein to the contrary, be released and relieved from any and all further obligations and liability hereunder or arising here from or (ii) agreeing to an additional six-month period to satisfy such Conditions Precedent (or to waive them). The County Manager or designee is authorized to extend the closing deadline up to six months on behalf of the COUNTY in the event additional time is needed for FIND to obtain the permit described in paragraph 11(a) above. In the event this Agreement is so extended, and at the end of said six-month period the Conditions Precedent have not been satisfied or waived in writing by the party for whose benefit such Condition Precedent exists, this Agreement shall terminate and all parties hereto shall, except if and to the extent provided herein to the contrary, be released and relieved from any and all further obligations and liability hereunder or arising here from. Time is of the essence with respect to said Closing.

The cost of performing or obtaining the surveys, any state documentary stamps which are required to be affixed to the deeds, the cost of the title insurance commitments and policies issued pursuant to this Agreement, the cost of recording the deeds, and any other normal and customary closing costs shall be paid by each respective party of the parcel to be acquired. Each party shall pay its own attorney's fees incurred in connection with the negotiation, preparation, execution, and closing of this Agreement.

As to the FIND BV-24A Site for FIND's containment basin, County will reimburse FIND, at closing, for half of the quoted costs associated with deliverables for the re-design of the FIND BV-24A Site, after the exchange, charged by FIND's engineer, not to exceed a reimbursement of $88,823.38. The costs for deliverables from FIND's engineer will include:

- Site boundary and topographic survey with legal description
- Environmental Documentation Report
- Phase I and Phase II (if necessary) Environmental Site Assessment Report
- Preliminary permit-level drawings
- Site Management Plan
- Engineering narrative

Section 14. Closing Obligations.

(a) At Closing, COUNTY shall:

(i) deliver to FIND a county deed in the form prescribed in Section 125.411, Florida Statutes in form and substance satisfactory to FIND and its counsel, conveying the EEL Parcel to FIND subject only to the FIND Permitted Exceptions; The County shall not reserve any oil, gas, or mineral rights in the deed;

(ii) deliver to FIND possession of the EEL Parcel;

(iii) deliver to FIND a Non-Foreign Affidavit (i.e., Foreign Investment In Real Property Act ("FIRPTA") Affidavit) in form and substance satisfactory to FIND and its counsel;

(iv) deliver or cause to be delivered to FIND and the Title Insurance Company such documents as may be required by the Title Insurance Company or FIND or its counsel to release the EEL Parcel from any security interests created at any time at or prior to Closing and otherwise to insure marketable title to the EEL subject only to the FIND Permitted Exceptions as herein provided, and, to the extent that any of such documents are not available to the Title Insurance Company and the parties hereto at Closing, cause the Title Insurance Company to deliver copies thereof to FIND forthwith after Closing, and deliver to FIND and the Title Insurance Company any and all executed affidavits and other documents necessary to delete all standard exceptions which can be deleted upon the delivery of such affidavits and documents in the Owner's Policy without specific reference in the Owner's Policy to any matter contemplated by said standard exceptions;

(v) deliver to FIND an affidavit executed by COUNTY and dated the Closing Date stating that there: (1) exists no condemnation of or similar proceeding with respect to the EEL Parcel or any part thereof (or any threat of condemnation); (2) there exists no pending or threatened litigation involving the EEL Parcel (or any part thereof), COUNTY or this Agreement; and (3) the representations set forth in Section 4 hereof remain true and correct as of the date of Closing;

(vi) deliver to FIND or such other party designated by FIND or otherwise provided for herein all other instruments, documents and other matters required to be delivered or furnished by COUNTY at Closing as elsewhere provided in this Agreement;

(vii) deliver to FIND or such other party designated by FIND such other instruments, documents and matters as FIND may reasonably require.

(viii) reimbursement of costs associated with the redesign of the BV-24A Site, described above in Section 13.

(b) At Closing, FIND shall:

(i) deliver to COUNTY a Florida form of special warranty deed in form and substance satisfactory to COUNTY and its counsel, conveying the FIND Parcel to COUNTY subject only to the COUNTY Permitted Exceptions; FIND shall not reserve any oil, gas, or mineral rights in the deed;

(ii) deliver to COUNTY possession of the FIND Parcel;

(iii) deliver to COUNTY a Non-Foreign Affidavit (i.e., FIRPTA Affidavit) in form and substance satisfactory to COUNTY and its counsel;

(iv) deliver to COUNTY and the Title Insurance Company any and all executed affidavits and other documents necessary to delete all standard exceptions which can be deleted upon the delivery of such affidavits and documents in the Owner's Policy without specific reference in the Owner's Policy to any matter contemplated by said standard exceptions;

(v) deliver to COUNTY an affidavit executed by FIND and dated the Closing Date stating that: (1) there exists no condemnation of or similar proceeding with respect to the FIND Parcel or any part thereof (or any threat of condemnation); (2) there exists no pending or threatened litigation involving the FIND Parcel (or any part thereof), FIND or this Agreement; and (3) the warranties and representations set forth in Paragraph 4 hereof remain true and correct as of the date of Closing;

(vi) deliver to COUNTY or such other party designated by COUNTY or otherwise provided for herein all other instruments, documents and other matters required to be delivered or furnished by FIND at Closing as elsewhere provided in this Agreement; and

(vii) deliver to COUNTY or such other party designated by COUNTY such other instruments, documents and matters as COUNTY may reasonably require.

Section 15. Brokers. Each party hereto represents unto to the other that there are no real estate brokers, mortgage brokers, sales persons, finders or any like party involved with respect to the transactions contemplated hereby and that no brokerage fees, finders' fees, broker's commissions or the like are and/or shall be due as a result of their respective executions of this Agreement or which will be due as a result of the Closing or any other matters contemplated hereby by virtue of their respective acts, inactions, conduct or otherwise. Each party hereto hereby agrees to indemnify and hold the other harmless from all losses, claims, damages, costs, expenses and liability arising out of any breach of such indemnifying party's representations and warranties as set forth above in this Section including, but not limited to, costs and attorneys' fees through all trial and appellate levels and post judgment proceedings and regardless of whether or not any action may be instituted.

Section 16. Condemnation. In the event of the commencement of any condemnation or eminent domain proceedings for any public or quasi-public purpose at any time prior to the Closing, resulting or which could result in the taking of all or any part of the Parcels, any party shall have the option of canceling this Agreement, in which event this

Agreement shall be null, void and have no further force or effect and all parties hereto shall be released and relieved from any and all further liability and obligations hereunder. In the event that the parties agree not to cancel this Agreement and choose to close the transaction contemplated hereby, the transferor of the property thus affected shall assign to the transferee thereof any and all condemnation or eminent domain proceeds and the transferor's rights to receive same. Each party agrees not to enter into any settlement of any condemnation proceedings or eminent domain proceedings involving any of the properties comprising the Parcels without the prior written consent of the other parties.

Section 17. Default. In the event of a default by any party under this Agreement, the non-defaulting party shall have available to it all rights and remedies under the laws of the State of Florida including, but not limited to, the right to specifically enforce this Agreement or to obtain damages as a result of such default.

Section 18. Notices. Each notice, correspondence, document or other communication (collectively, "Notice") required or permitted to be given hereunder shall be in writing and shall be delivered either by personal delivery (including delivery by services such as Federal Express) or by depositing it with the United States Postal Service or any official successor thereto, certified mail, return receipt requested, with adequate postage prepaid, addressed to the appropriate party as follows:

If to COUNTY:	Brevard County Mike Knight, EEL Program Manager 91 East Drive Melbourne, Florida 32904
With copy to:	Office of the Brevard County Attorney Attn: Christine Lepore, Assistant County Attorney 2725 Judge Fran Jamieson Way, Bldg. C Viera, Florida 32940
If to FIND:	Florida Inland Navigation District 1314 Marcinski Road Jupiter, Florida 33477 Attention: Executive Director
With a copy to:	Peter L. Breton, Esq. Breton, Lynch, Eubanks et al.

1209 North Olive Avenue
West Palm Beach, FL 33401

Except as provided herein to the contrary, Notice shall be deemed delivered at the time of personal delivery, or, if mailed, on the third mail delivery day after the day of mailing as provided above, and the time period in which a response to any Notice must be given or any action taken with respect thereto shall commence to run from the date it is personally delivered or, if mailed, the date of receipt so deemed. In addition, the inability of the United States Postal Service to deliver because of a change of address of the party of which no Notice was given to the other party shall be deemed to be the receipt of the Notice sent. Changes of address and persons to whom Notice shall be addressed shall be made by Notice hereunder.

Section 19. Effective Date of Agreement. The date of this Agreement shall be the date the same has been last signed and/or initialed for final binding approval by all parties, with a fully executed duplicate original in the hands of the other parties. Said date shall be evidenced by the insertion of same in the introductory paragraph of this Agreement and is referred to herein as the "Effective Date."

Section 20. Waiver. No waiver of any rights or remedies hereunder by any party hereto shall be effective unless same shall be in writing executed by the party to be charged and any such waiver shall not be deemed to be a continuing or future waiver but shall be limited to the specific instance for which same was given.

Section 21. Governing Law, Venue and Attorneys' Fees. This Agreement and all matters related hereto shall be governed by the laws of the State of Florida and venue for any action or proceeding between the parties arising hereunder and/or in regard hereto shall be exclusively in Brevard County, Florida. In the event of any action or proceeding between the parties with respect to this Agreement or any document or instrument delivered in connection herewith, each party shall be responsible for its own attorney's fees and litigation costs.

Section 22. Successors. This Agreement shall be binding upon and inure to the benefit of all successors to and permitted assigns of the parties hereto.

Section 23. Counterparts. This Agreement may be executed in one or more counterparts each of which shall be deemed an original, and all such counterparts shall for all purposes constitute a single instrument.

Section 24. Pronouns, Singular and Plural. All pronouns and any variations thereof shall be deemed to refer to the masculine, feminine and neuter and the singular shall be deemed to refer to the plural and vice versa, all as the context of usage shall require.

Section 25. Section Captions. Section and Exhibit titles or captions contained in this Agreement are inserted as a matter of convenience and for reference only and in no way define, limit, extend or describe the scope of this Agreement or the intent of any provisions hereof.

Section 26. Time of the Essence. Time is of the essence in this transaction and it may be extended only by written agreement by and between the parties hereto.

SECTION 27. Weekends and Holidays. In the event any date for performance hereunder shall occur or any period hereunder shall expire on a Saturday, Sunday or legal holiday celebrated in the State of Florida, then the date for such performance or date of expiry shall be automatically extended until the next business day thereafter which is not a Saturday, Sunday or legal holiday celebrated in the State of Florida.

Section 28. Survival. All representations, warranties, covenants and other provisions of this Agreement shall survive Closing except to the extent provided herein to the contrary, if at all.

Section 29. No Presumption as to Drafting. The parties hereto acknowledge that they have extensively negotiated the terms and provisions hereof. Accordingly, the parties hereto intend and agree that this Agreement shall be construed without regard to any presumption, principle or other rule regarding construction of any or all terms and provisions against the party causing this Agreement to be drafted. Further, both parties hereto hereby waive, to the maximum extent permitted by law, all such aforesaid presumptions, principles and rules.

Section 30. Entire Agreement. This Agreement and all Exhibits and other attachments hereto, if any, embody the entire agreement and understanding of the parties hereto. This Agreement may not be changed, altered or modified except by an instrument in writing, signed by the party against whom the enforcement of any change, alteration or modification is sought.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed, the day and year first above written.

FLORIDA INLAND NAVIGATION DISTRICT

By: ______________________
Tyler Chappell, Chairman

BOARD OF COMMISSIONERS OF BREVARD COUNTY, FLORIDA

Attest:

____
Scott Ellis, Clerk

By: ______________________
Robin Fisher, Chairman

As Approved by the Board on ______________.

Reviewed for form and legal content:

____
Christine Lepore
Assistant County Attorney

hereto. This Agreement may not be changed, altered or modified except by an instrument in writing, signed by the party against whom the enforcement of any change, alteration or modification is sought.

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By:____________________________
Tyler Chappell, Chairman

BOARD OF COMMISSIONERS OF BREVARD COUNTY, FLORIDA

Attest:________________________
Scott Ellis, Clerk

By:____________________________
Robin Fisher, Chairman

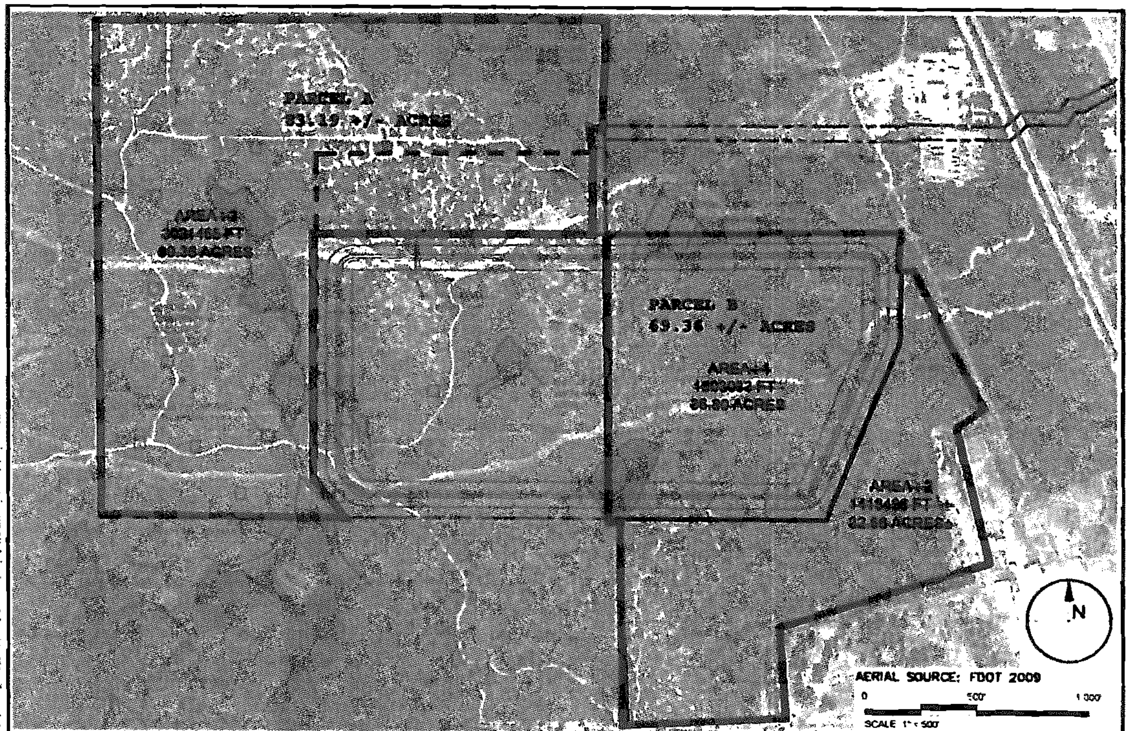
As Approved by the Board on 04-28-15 .

Reviewed for form and legal content:

____
Christine Lepore
Assistant County Attorney

EXHIBIT "A"

EXHIBIT "D"



TAYLOR ENGINEERING INC. 10151 DEERWOOD PARK BLVD BLDG. 300, SUITE 300 JACKSONVILLE, FL 32256 CERTIFICATE OF AUTHORIZATION # 4815	FIGURE 1 OPTIONAL LAND SWAP BV-24 DREDGED MATERIAL MANAGEMENT AREA BREVARD COUNTY, FL	C2002-016 CAS 1 of 1 MAY 2012

ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 14

FLORIDA SCRUB-JAY SURVEY

Florida Scrub-Jay Survey for the Proposed Florida Inland Navigation District and Brevard County Exchange

Brevard County, Florida

Prepared For

Taylor Engineering, Inc.
10151 Deerwood Park Blvd
Building 300, Suite 300
Jacksonville, FL 32256

Prepared By

Normandeau Associates, Inc.
102 NE 10th Avenue
Gainesville, FL 32601
(352) 372-4747
www.normandeau.com

NORMANDEAU ASSOCIATES
Environmental Consultants

July 21, 2015

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1 Introduction

The Florida Inland Navigation District (FIND) and Brevard County propose exchanging adjoining land parcels in southern Brevard County to minimize impacts to the Florida Scrub-Jay (*Aphelocoma coerulescens;* FSJ). To assess use of these two properties by this federally listed bird, Normandeau Associates Inc. conducted surveys following the U.S. Fish and Wildlife Service (USFWS) guidelines. The 30-ha (74 ac) proposed Brevard County property was found to have a high density of FSJs while the approximately 47-ha (116 ac) proposed FIND property was found to have few FSJs. Habitat mapping was conducted on both properties to assess habitat types and suitability of each site for FSJs.

2 Methods

Three biologists who are experienced in bird identification conducted 5 days of FSJ surveys from 24 March to 28 March 2015. A followup habitat survey was conducted on 28 April 2015. The surveys were designed and led by Adam Kent, an ornithologist and a former Florida Scrub-Jay Conservation Coordinator for the Florida Fish and Wildlife Conservation Commission.

A map created by Morgan & Eklund Inc. showing the FIND and Brevard County properties (see Appendix A) was used as a guide to draw the property boundaries using ArcGIS. Slight differences may exist between actual boundaries of the two areas and boundaries shown on the map due to inherent inaccuracies that occur when creating a GIS layer from a PDF. With these constraints in mind, areas in this report were rounded to the nearest hectare (ha), or in some cases half acre (ac), as opposed to smaller fractions, so as to not present false accuracy. Both units (hectares and acres) are included in this report because metric is the standard for scientific reporting and USFWS uses acres when determining mitigation.

2.1 Florida Scrub-Jay Survey Methods

Five days of FSJ surveys were conducted from 24 March to 28 March 2015. Surveys were conducted according to standards outlined in the *Florida Scrub-Jay General Survey Guidelines and Protocols* (USFWS 2007; see Appendix B). A network of survey points spaced 200 meters apart (Figure 2–1) was surveyed between 1 hour after sunrise and no later than 11:30 a.m. during weather conditions suitable for FSJ observation (i.e., not too hot, rainy, or windy). Survey points were situated starting at the northwest corner of the proposed Brevard County property, extending to the southwest corner of that property and the eastern side of the proposed FIND property, covering all potential FSJ habitat, including all optimal and suboptimal habitat but not all tertiary habitat. Habitats not suitable for FSJs (e.g., the heavily forested southeast portion of proposed FIND site) were not surveyed. Presence of raptors was noted during surveys. Surveys were paused if raptors were present and for a few minutes after the raptor had left the area. During surveys, recordings of FSJ calls, which included the female “hiccup” call, were played at a volume easily audible at 200 or more meters. Calls were broadcast for 1 minute in each of the four cardinal directions for a period of 10 minutes with breaks to observe FSJs.

Locations and movements of all FSJs seen were noted on a map and recorded on a datasheet (see Appendix C). Lines were drawn around all FSJ sightings to form minimum convex polygons for FSJ sightings. Polygons covering all FSJ sightings were mapped with a 100-m buffer to account for a variety of factors including potential habitat use and the possibility that FSJs were present but not detected in these areas.

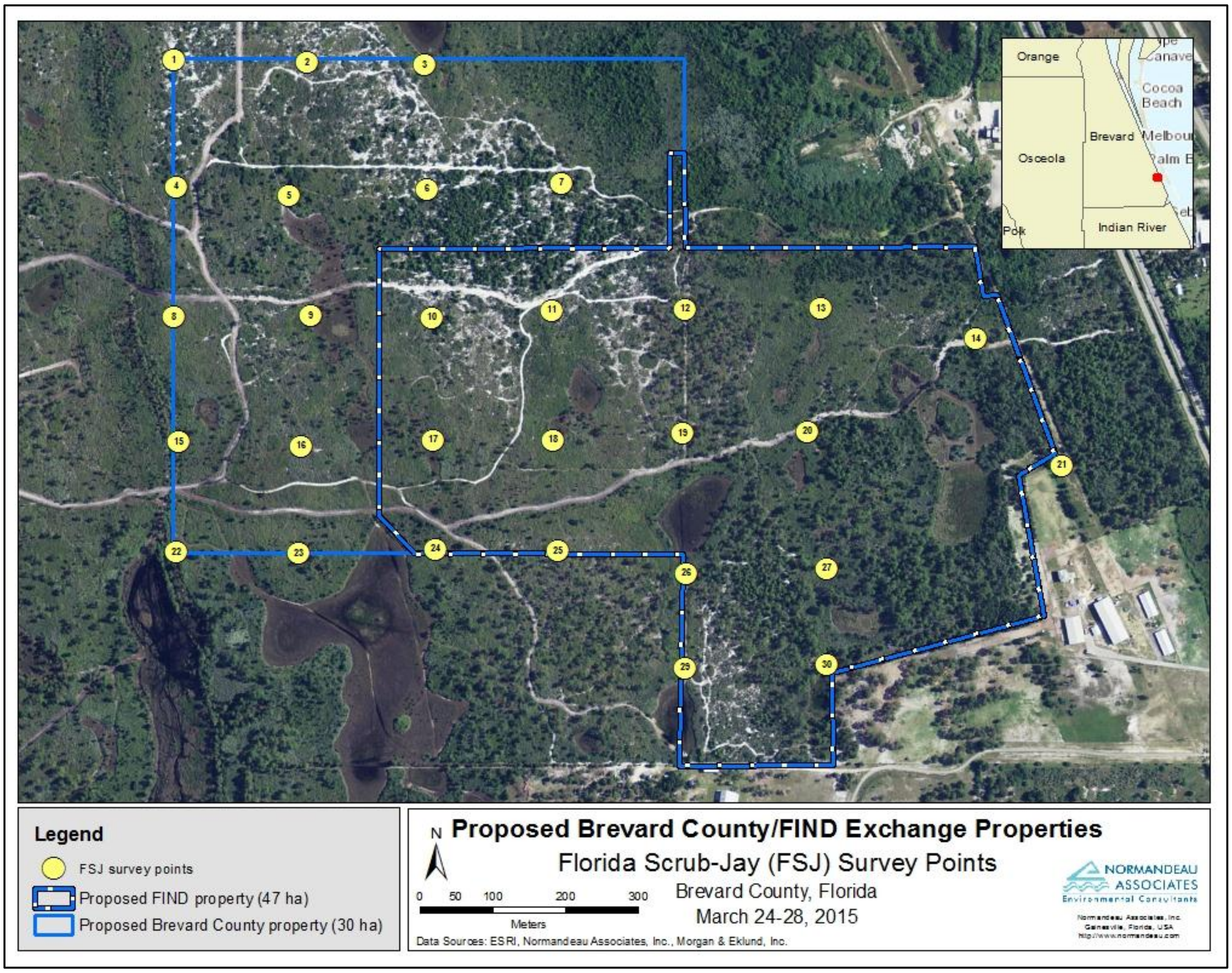

Figure 2–1. Florida Scrub-Jay survey points.

2.2 Estimating the Number of Florida Scrub-Jays

One limitation of the USFWS FSJ survey methods is that they cannot be used to estimate numbers of FSJs on a site for a variety of reasons including the inability to distinguish individual birds, the potential that an individual bird has been observed multiple times, and the short duration (5 days) of the surveys. To accurately estimate the number of FSJs on a site, the birds must be banded so they can be individually recognized, a process that takes considerably more time than called for in the USFWS survey methods. Nevertheless, minimum estimates of the number of FSJs in an area can be made based on the number of birds visible at a specific point in time. Maximum estimates of the number of birds using an area are much more difficult to estimate from USFWS survey methods due to the reasons mentioned above. To estimate the maximum number of FSJs on each site, all survey observations were reviewed. Observations that almost certainly represented the same individual birds were deleted, and observations that could potentially represent different individuals were kept, though this number still almost certainly represents a number higher than the actual number of birds at the site.

2.3 Habitat Survey Methods

Habitat on both sites was assessed during FSJ surveys from 24 March to 28 March 2015, and a followup habitat survey was conducted on 28 April 2015. All natural communities were visited and assessed for current FSJ habitat quality and FSJ potential habitat following characterizations in Breininger et al. 2006. Additionally, a map showing Florida Natural Areas Inventory (FNAI) community types and National Wetlands Inventory wetlands was produced and compared with a 1943 aerial image of the area.

2.3.1 Florida Scrub-Jay Habitat Quality Methods

Breininger et al. (2006) characterized FSJ habitat quality at the scale of FSJ territories (10 ha; 25 ac). At this scale, landscapes were subdivided into potential source and sink territories in which optimal territories produce enough recruits to offset mortality in suboptimal territories. Breininger et al. (2006) added their own variables (scrub patch size, shrub height, and tree cover) to refine this definition of optimal FSJ habitat from Woolfenden and Fitzpatrick 1984: “An optimal Florida Scrub-Jay territory is a mosaic of medium height oaks (1.2–1.7 m) and shorter scrub with open sandy areas.” This definition was used to distinguish lower quality territories that were more likely to experience FSJ population declines (sinks) from higher quality territories that can serve as sources. In general, when maintained in conditions preferred by FSJs, optimal quality territories are most likely to act as sources, suboptimal quality territories sometimes served as sources, and tertiary quality territories almost always serve as sinks, at least in the long term (Breininger et al. 2006).

We followed Breininger et al. (2006) in our habitat quality assessment. FSJ territory blocks (10 ha) were placed in the following three categories:

1. Optimal quality, based on the following three characteristics
    a. Well-drained scrub or scrub patches greater than 0.4 ha (1 ac)
    b. Medium height scrub (on average 1.2 to 1.7 m but potentially with shorter patches)
    c. Less than 15% tree cover
2. Suboptimal quality, containing the following three characteristics
    a. Well-drained scrub or scrub patches greater than 0.4 ha
    b. Short to tall shrubs (less than 1.2 to taller than 1.7 m)
    c. Less than 65% tree cover
3. Tertiary quality, based on one of the following two characteristics
    a. The largest scrub patches were smaller than 0.4 ha (1 ac)
    b. More than 65% tree cover

2.3.2 Florida Scrub-Jay Potential Habitat Methods

Our assessment of FSJ habitat potential (i.e., scrub oak cover within a matrix of FSJ habitat) was based on Breininger et al. (2006), Breininger (2004), and correspondence with members of the Florida Scrub-Jay Recovery Team (C. Faulhaber, Florida Fish and Wildlife Conservation Commission, personal communication), Areas of both primary and secondary potential habitat could serve as FSJ sources when habitat conditions are favorable for FSJs (e.g., medium height scrub, few to no trees, etc.), while tertiary areas normally serve as sinks. We identified grid cells in the following categories:

1. Primary: containing >0.4 ha (1 ac) of well-drained scrub surrounded by potentially suitable habitat

2. Secondary: containing palmetto oak scrub ridges >0.4 ha (1 ac) and surrounded by potentially suitable habitat. These scrub ridges are not as well defined as the scrub ridges in primary potential habitat, usually due to the presence of palmettos or a thicker non-oak shrub layer.
3. Tertiary: containing no patches of oak scrub >0.4 ha (1 ac), or, if containing small scrub patches, surrounded by low quality habitat
4. Unsuitable: containing no scrub patches

2.3.3 FNAI Community Types, National Wetlands Inventory, and 1943 Aerial Images

We produced a map showing FNAI community types overlain with a National Wetlands Inventory data layer. The National Wetlands Inventory data layer was used because it shows wetlands in more detail than the FNAI map. These wetlands and natural communities were also noted in the field. To confirm the accuracy of the data layers, the Normandeau team conducted field visits and made comparisons with 1943 aerial images.

3 Results

3.1 Florida Scrub-Jay Survey Results

FSJs were found in most parts of the proposed Brevard County property as well as in a small portion of the proposed FIND property (Figure 3–1). In the proposed Brevard County property, FSJs were not observed in the eastern part to the northeast and southwest of survey point 7 (likely due to the presence of thick vegetation and/or tall trees), and FSJs were seen less frequently in the flatwoods of the southern part around survey points 15 and 16 and to the south (likely due to the lack of oaks and/or presence of tall trees). In the proposed FIND property, FSJs were observed in the northwestern part near survey points 10 and 11 (Figure 2–1) and in the southwestern part to the west of survey points 17 and 24. No FSJs were observed on the central or eastern part of the FIND property, which is most heavily covered with trees and, apart from a few smaller patches of scrub, very few oaks.

By combining FSJ sightings from all surveys days, an overall minimum convex polygon can be created to show areas that were used by all observed FSJs during surveys. These polygons only represent areas used by observed FSJs, because it is possible that FSJs could have used other areas when a surveyor was not present to see them there. These polygons of FSJ use can be buffered by potential higher quality FSJ habitat (Figure 3–2) or by a 100-m buffer (Figure 3–3) to show habitat that could potentially be used by the birds. These buffered polygons show a more accurate estimate of areas potentially occupied by FSJs than the nonbuffered polygons because the nonbuffered polygons, which include only areas where FSJs were sighted, likely underrepresent the area of habitat occupied by FSJs.

Only better quality habitat is included in the habitat buffer (Figure 3–2), while the 100-m buffer (Figure 3–3) contains some areas of lower quality and unsuitable habitat. The benefit of the habitat buffer over the 100-m buffer is that it shows habitat most likely occupied by FSJs and excludes areas less likely to be used by FSJs such as areas adjoining tall trees (e.g., between survey points 11 and 12) or flatwoods with very small patches of oaks (e.g., around survey points 17 and 23).

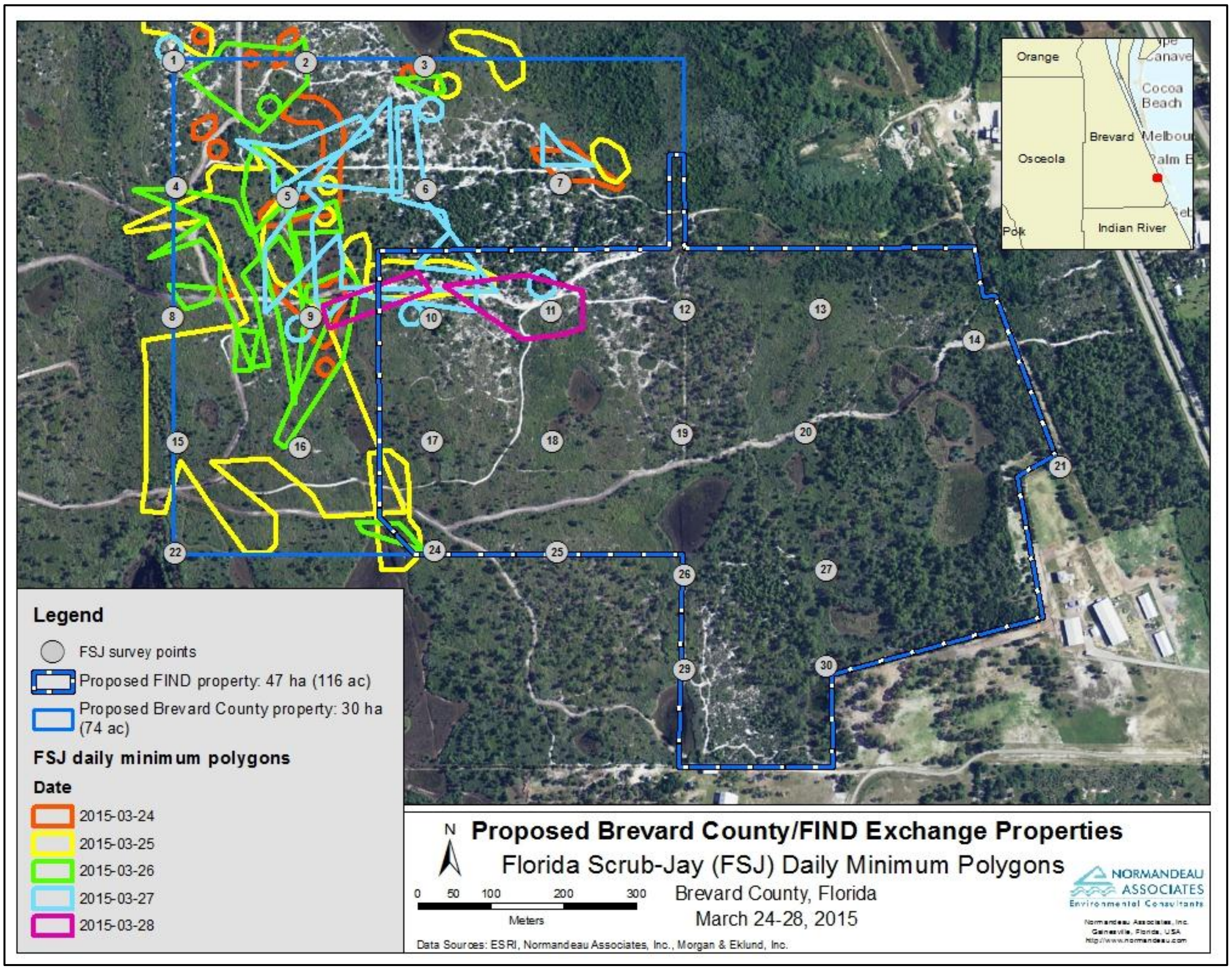

Figure 3–1. Florida Scrub-Jay survey daily minimum polygons.

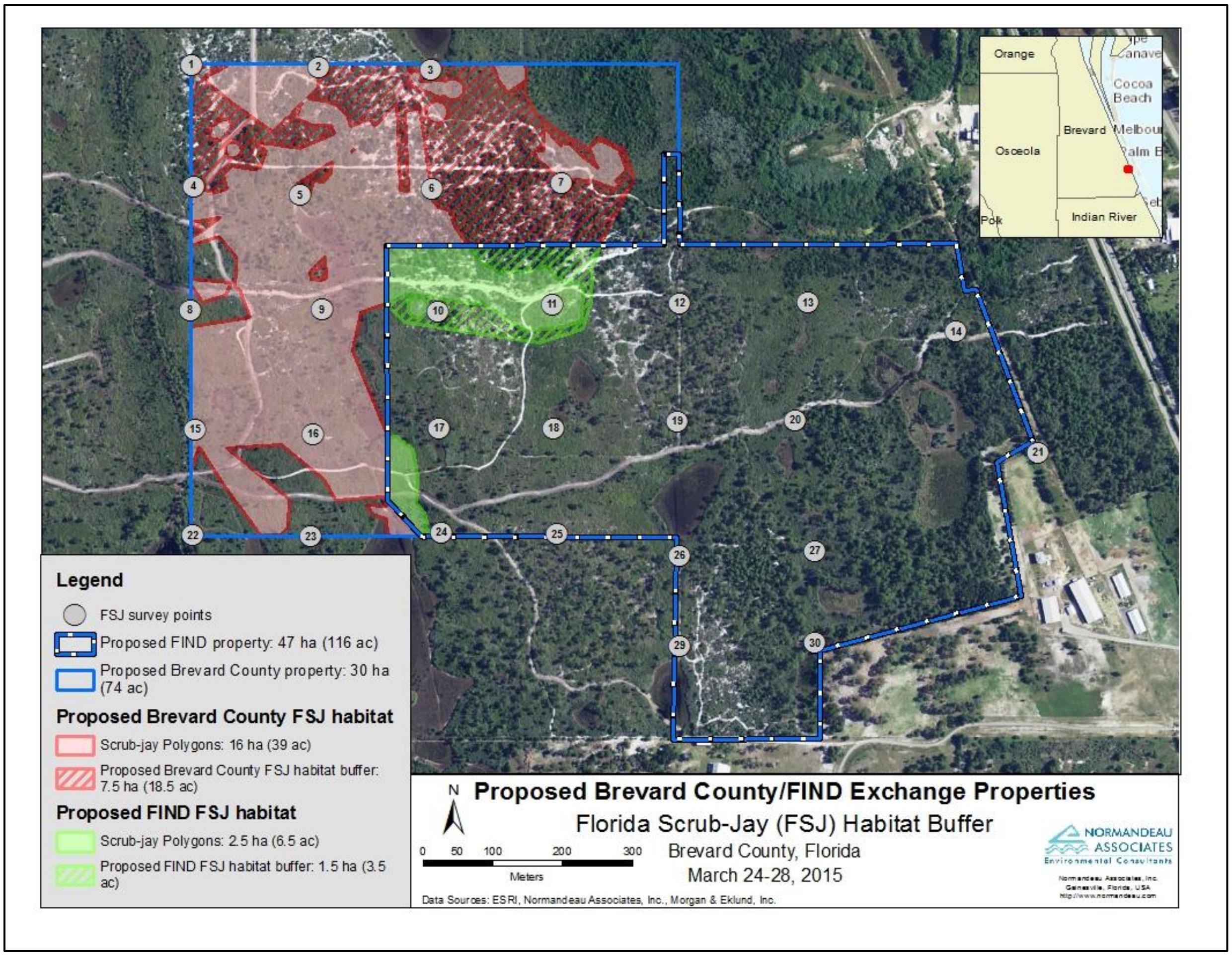

Figure 3–2. Florida Scrub-Jay survey results with habitat buffer.

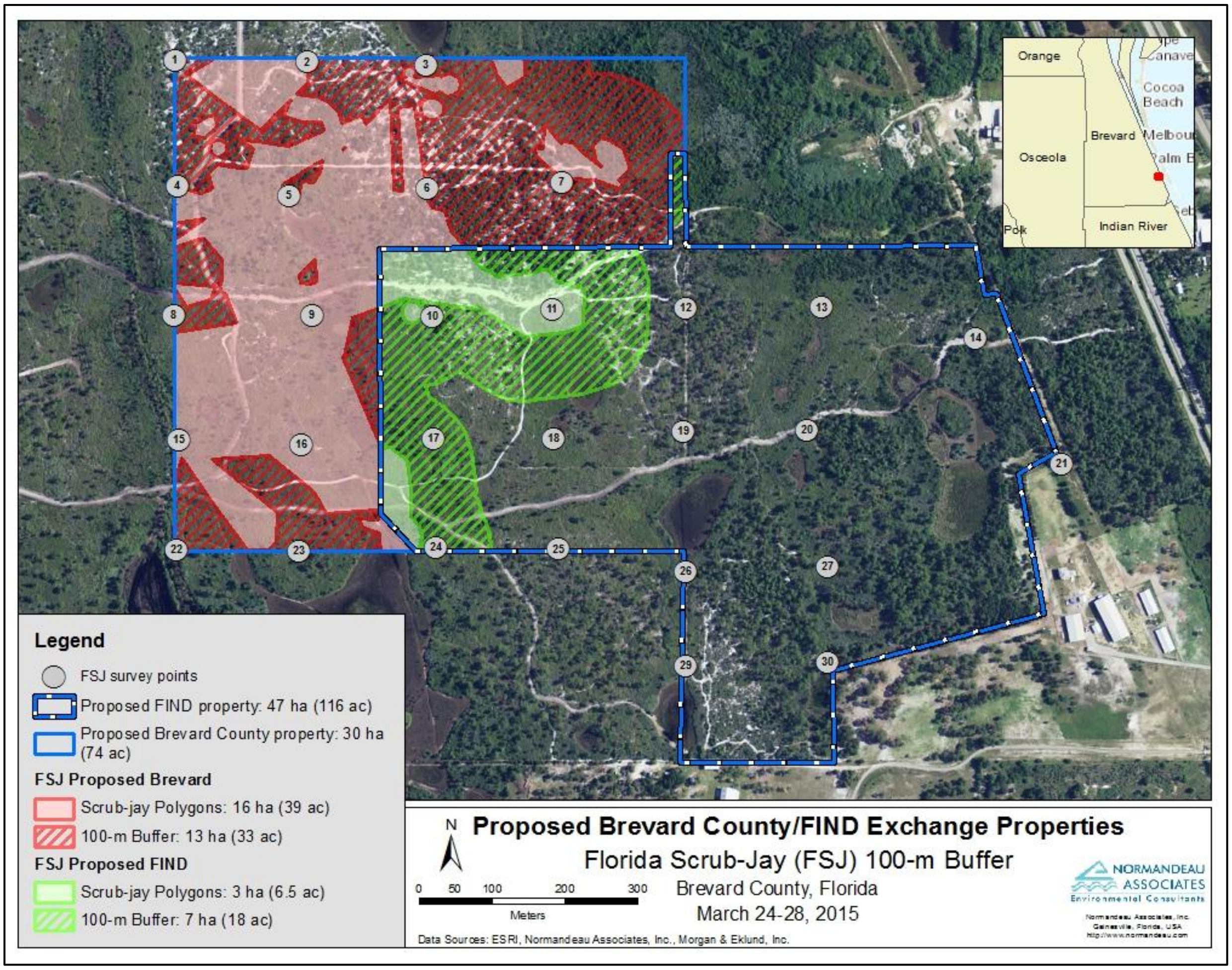

Figure 3–3. Florida Scrub-Jay survey results with 100-m buffer.

For this study, occupied FSJ habitat was analyzed in three ways (Table 3–1):

1. The minimum area used by FSJs observed during surveys (FSJ minimum polygon)
2. The FSJ minimum polygon plus a habitat buffer
3. The FSJ minimum polygon plus a 100-m buffer

Table 3–1. Estimated FSJ Polygons and Buffers for the Proposed FIND Property and the Proposed Brevard County Property

Proposed Property (ha [ac])	FSJ Minimum Polygon (ha [ac])	Polygon + Habitat Buffer (ha [ac])	Polygon + 100-m Buffer (ha [ac])
FIND (116 [47])	2.5 (6.5)	4 (10)	10 (24.5)
Brevard County (74 [30])	16 (39)	23.5 (57.5)	29 (69)

Using these three analyses of occupied FSJ habitat, the Brevard County property could contain approximately 6 (FSJ minimum polygon), 6 (habitat buffer), or 3 (100-m buffer) times as much habitat as the FIND property.

3.2 Estimated Number of Florida Scrub-Jays

3.2.1 Minimum Estimate

It is likely that at least the estimated minimum number of FSJs used one of the two properties, though some birds likely used both properties.

Proposed Brevard County Property

A minimum of at least 10 individual FSJs were encountered on of the Brevard County property. All 10 FSJs were visible at the same time.

Proposed FIND Property

During most surveys, no FSJs were encountered on the FIND property. During one survey, a minimum of 3 FSJs were observed within the property. On another survey, 4 FSJs were observed using this property, though all of these birds were first observed within the proposed Brevard County property before flying into the proposed FIND property. Based on the low number of FSJs observed within the Brevard County property, it is possible that all FSJ family groups using this property also use the proposed Brevard County property at some point in their daily movements.

3.2.2 Maximum Estimate

It is likely that fewer than the maximum number of FSJs estimated used one of the two properties, though some birds likely used both properties. The actual number of FSJs that used either property is likely much lower than estimated due to the high probability of counting individual birds multiple times.

Proposed Brevard County Property

An estimated maximum of 36 FSJs were observed on one day on the Brevard County property. As explained previously, some of these birds were likely counted more than once, thus the actual number of FSJs in the area was likely much lower. On each of the survey days, the maximum number of birds observed in this area was approximately 30 or more birds. Due to the high potential for double or even triple counting of some of these individuals, it is likely that the actual number of FSJs is half or less than half of these maximum estimates.

Proposed FIND Property

During most surveys no FSJs were encountered on the FIND property. However, a maximum of six FSJs were observed during one survey within the property. In some cases the birds observed within this property were first observed within the proposed Brevard County property, then flew into the FIND property.

3.3 Habitat Survey Results

3.3.1 Florida Scrub-Jay Habitat Quality

Each of the two proposed properties contains one 10-ha block in optimal habitat condition and approximately 2.5 blocks in suboptimal condition (Figure 3–4). Why, then, were so many more FSJs found on the proposed Brevard County property? An important difference between the two properties is the presence of tall pine trees, especially on the proposed FIND property. Not only do tall pines dominate the landscape on the proposed FIND property, but these pines are most prevalent in the matrix of mesic flatwoods that spreads thought the area, rendering the scrub and scrubby flatwoods less desirable to FSJs due to the tree shadow effect (Kent and Kindell 2010). In general, the distance from a forest to the nearest FSJ territory is greater the taller and thicker the trees, with FSJs tending to avoid areas as close as 300 m from sparse forest and as far as 1 km from dense forest (Burgman et al. 2001). Mesic flatwoods are generally considered tertiary habitat quality for FSJs due not only to the presence of pines but also to the scarcity of oaks (Breininger et al. 2006).

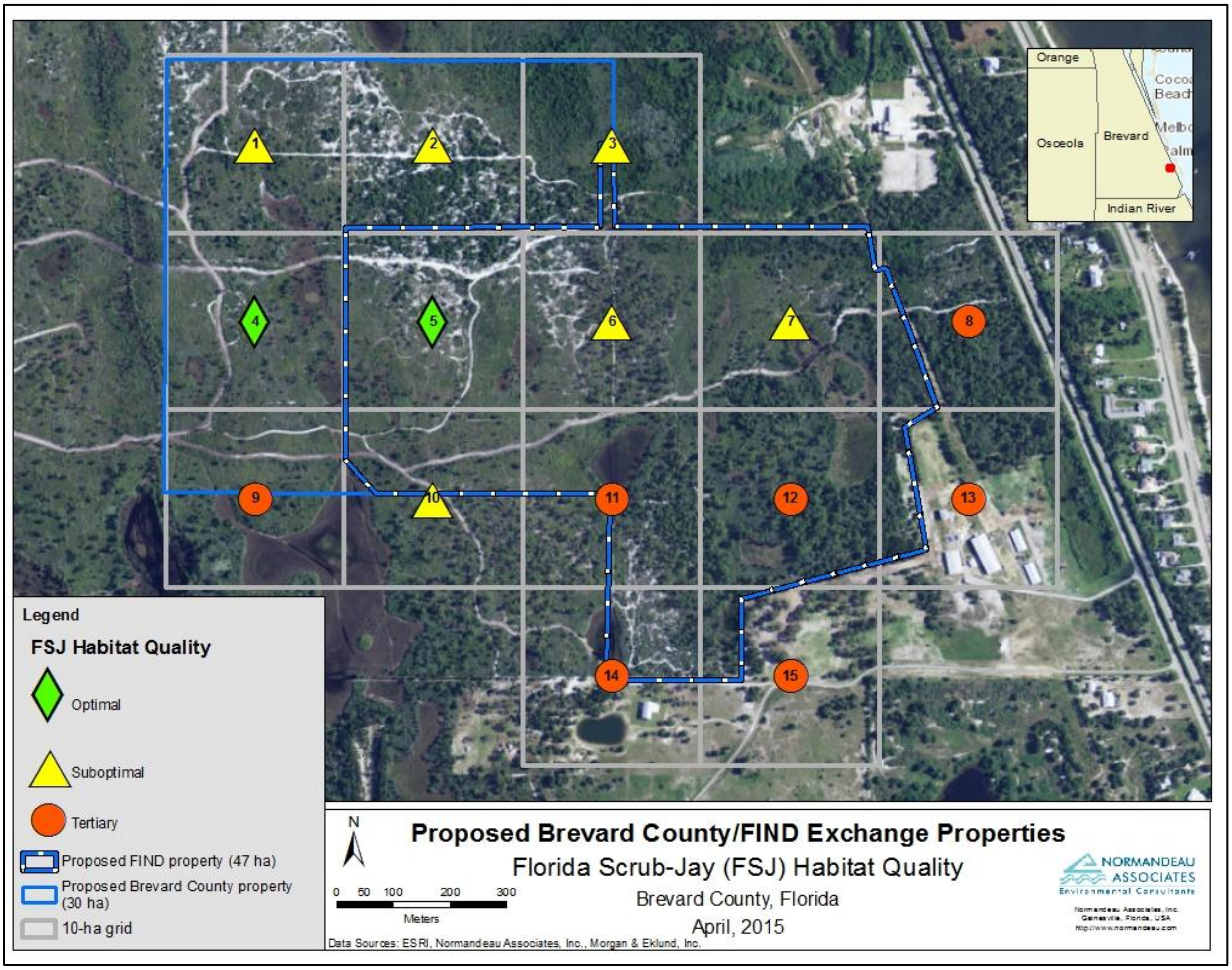

Figure 3–4. Florida Scrub-Jay habitat quality.

3.3.2 Florida Scrub-Jay Potential Habitat

The proposed Brevard County site contains two 10-ha blocks of potential primary habitat, approximately 1.5 blocks of potential secondary habitat and half a block of potential tertiary habitat. The proposed FIND site contains two blocks of potential primary habitat, slightly less than two blocks of potential secondary habitat, about a quarter block of potential tertiary habitat, and a little more than one block of unsuitable habitat (Figure 3–5). As with habitat quality, actual habitat potential in the proposed FIND site is still less than in the proposed Brevard County site due to the presence of pine flatwoods, which discourage FSJs from using otherwise suitable habitat. Despite containing a well-defined scrub ridge, habitat potential at point 14 is tertiary as opposed to secondary because surrounding habitat is low quality, containing either thick flatwoods or pasture/yard with tall trees and buildings. Habitat potential at points 12, 13, and 15 is unsuitable for FSJs because it contains no scrub patches.

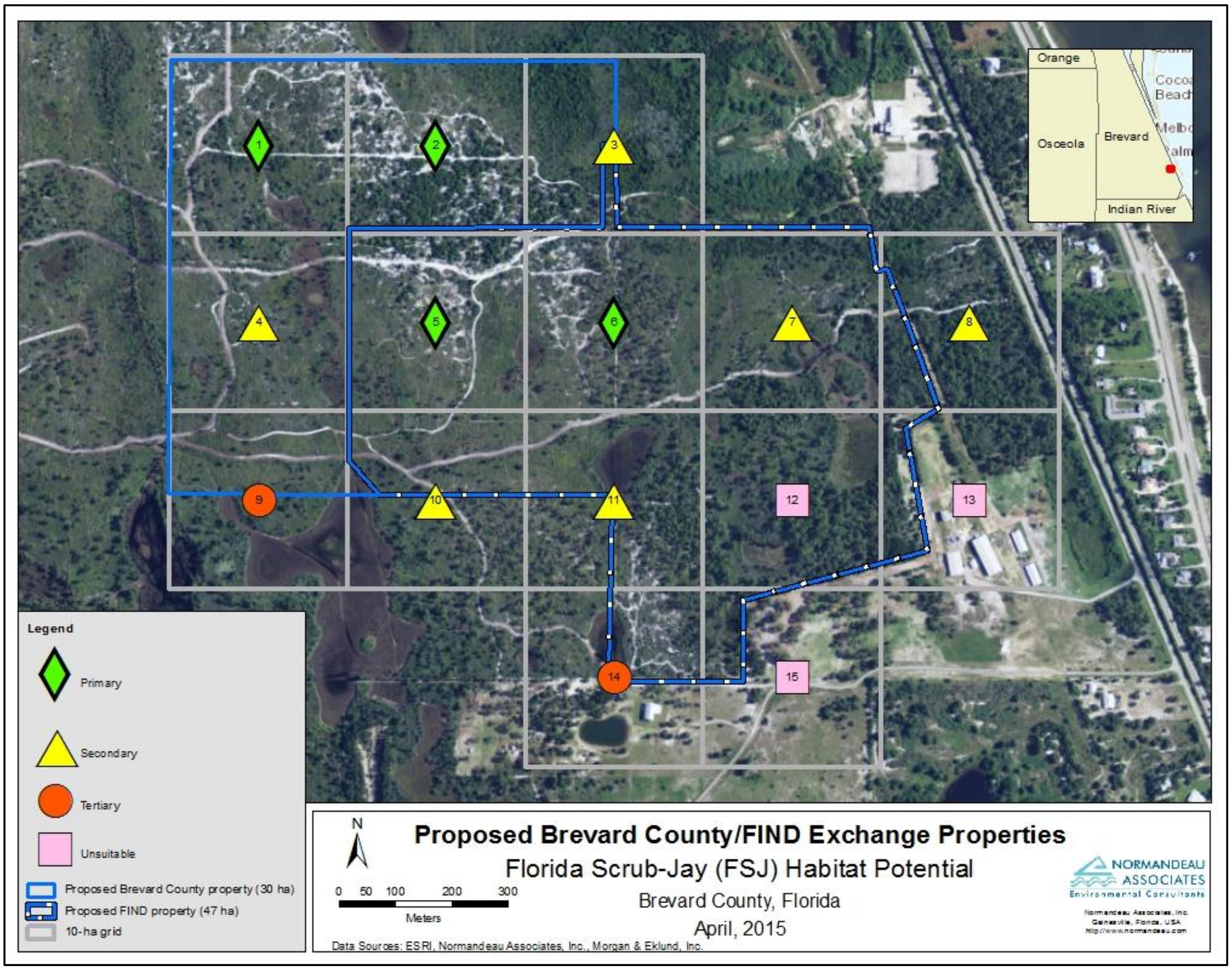

Figure 3–5. Florida Scrub-Jay potential habitat.

3.3.3 Natural Communities

The majority of the proposed FIND property is covered in mesic flatwoods, though portions are also covered with scrub, scrubby flatwoods, and wetlands (Figure 3–6, Figure 3–7). While both properties contain approximately equal area of scrub and scrubby flatwoods, the juxtaposition of these two natural community types on the landscape in the proposed Brevard County property is more contiguous than on the proposed FIND property. Additionally, fewer tall trees exist on or near these two FSJ habitats on the proposed Brevard County property than on the proposed FIND property, which also provides more favorable habitat for FSJs.

The difference between scrub and scrubby flatwoods can be gradual and difficult to distinguish at times, and some authors have considered scrubby flatwoods to be an ecotone between scrub and flatwoods (Myers 1990). When preland alteration aerials are available, these can help illustrate underlying natural communities that are often more difficult to distinguish in modern, altered landscapes. Aerial imagery from 1943 of the proposed exchange sites shows roughly what is shown in the current FNAI maps, though in some cases the line between scrub and scrubby flatwoods or scrubby flatwoods and mesic flatwoods is not clear (Figure 3–7).

The proposed Brevard County and FIND properties contain approximately the same number of hectares of scrub and scrubby flatwoods, while the proposed FIND property contains more than twice as much mesic flatwoods as the proposed Brevard County property (Table 3–2). Scrub and scrubby flatwoods can each provide optimal habitat quality for FSJs as long as habitat conditions are suitable (Kent and Kindell 2010). On the other hand, while FSJs are sometimes found in mesic flatwoods, they are not likely to persist long term in this habitat without patches of scrub larger than 0.4 ha (Breininger et al. 2006). The only patches of scrub embedded in the mesic flatwoods on either of the two properties were small and unlikely to provide the acorns and habitat structure needed for long term FSJ survival. The patches of scrubby flatwoods embedded in the flatwoods on the proposed FIND property are more overgrown with tall trees than the scrubby flatwoods on the proposed Brevard County property and thus less suitable for FSJs. In general mesic flatwoods, and in some cases scrubby flatwoods, have a tree canopy too dense to be ideal for FSJs.

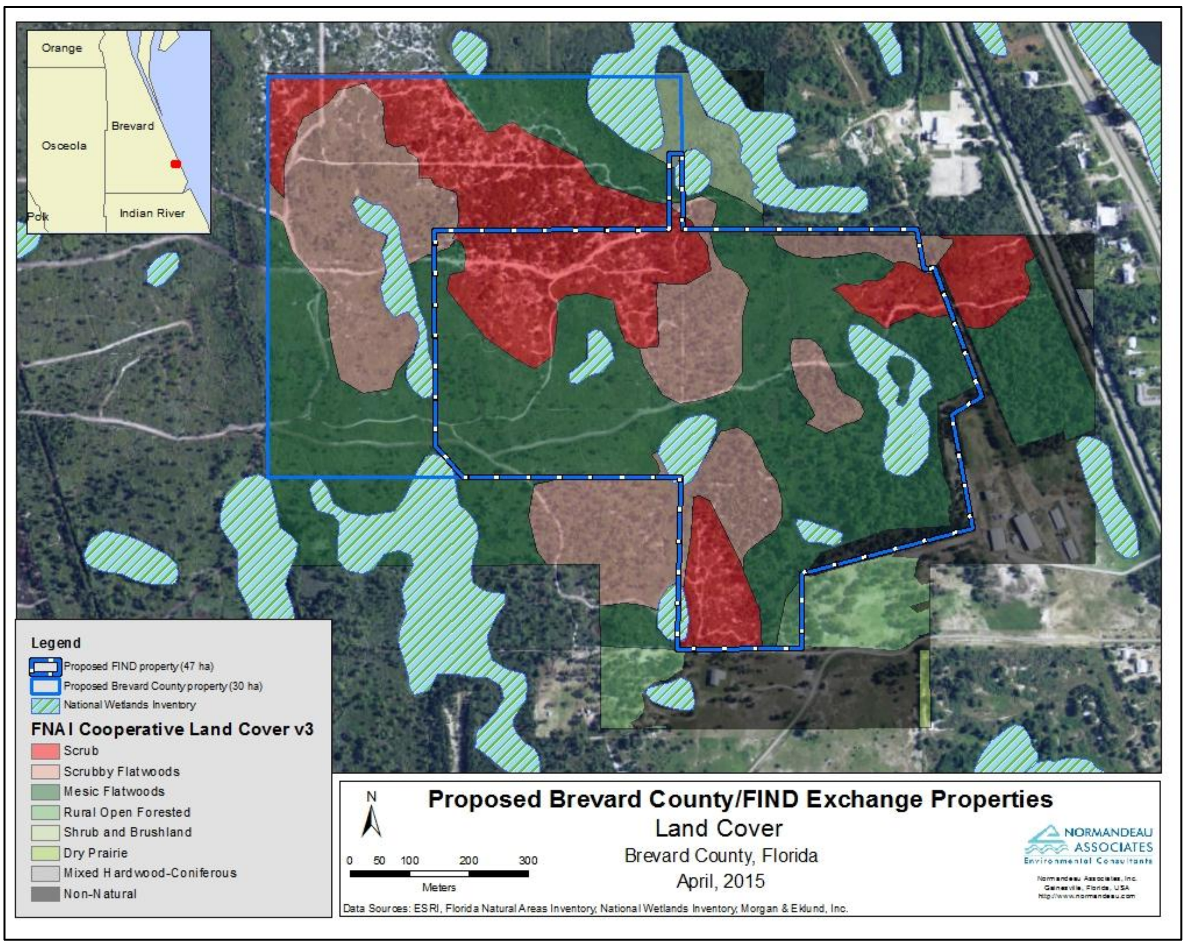

Figure 3–6. Land cover for proposed Brevard County and FIND properties.

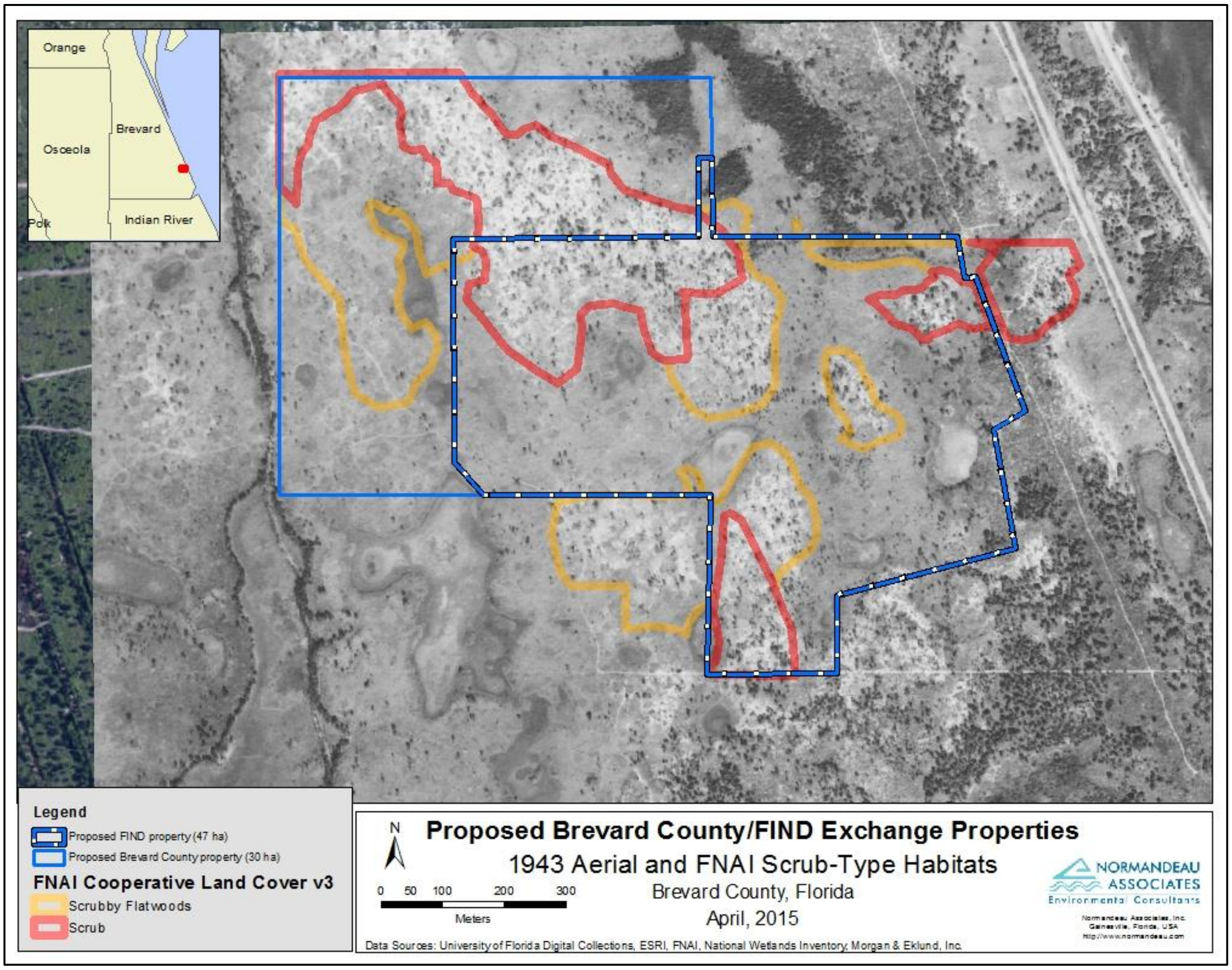

Figure 3–7. 1943 aerial imagery for proposed Brevard County and FIND properties.

Table 3–2. Acres of Natural Communities

Natural Community	Proposed Brevard (ha [ac])	Proposed FIND (ha [ac])
Mesic Flatwoods	25 (61.8)	57 (140.9)
Scrub	20 (49.5)	25 (61.8)
Scrubby Flatwoods	20 (49.5)	20 (49.5)
Shrub and Brushland	2.5 (6.2)	0 (0)
Wetland	7 (17.3)	7 (17.3)
Nonnatural	0 (0)	5 (12.4)
Rural Open Forested	0 (0)	0 (0)
Total	**74 (182.9)**	**116 (286.6)**

4 Conclusions and Recommendations

The proposed Brevard County property contained a higher density of FSJs and better FSJ habitat than the proposed FIND property during March and April 2015. Even within suitable habitat, FSJs were infrequently observed on the proposed FIND property, likely due to the presence of tall pine trees. Based on the estimated numbers of FSJs on each property, the proposed Brevard County property is used by between two and five times as many FSJs than the proposed FIND property. Of the four to six FSJs observed on the proposed FIND property, all but two were first encountered on the proposed Brevard County property. It is possible that all or all but one family of FSJs that use the proposed FIND property also use the proposed Brevard County property.

The creation of a dredged materials management area (DMMA) on the proposed FIND site would have 10 acres of impact to occupied FSJ habitat. Occupied habitat plus a buffer of good quality habitat is a better indication of potentially occupied habitat than occupied habitat plus a 100-m buffer, because the 100-m buffer includes some potentially unsuitable habitat. In addition, occupied habitat plus a buffer of good quality habitat is a better indication of potentially occupied habitat than habitat quality potential habitat because areas in the latter two habitat categories could be unoccupied. The amount of occupied habitat plus a good quality habitat buffer on the Brevard County site is approximately six times the amount on the FIND site.

While the surveys conducted for this study are only a snapshot in time and not a substitute for an intense demographic study, habitat conditions on both sites support these conclusions, both in terms of FSJ numbers and amount of occupied habitat. In general, the proposed FIND property has too many tall pine trees and too few oaks for FSJs, while the proposed Brevard County property has fewer tall trees and a higher density of oaks than the proposed FIND property and is thus better suited for FSJs. On the basis of these findings, we conclude that the Brevard County–FIND property exchange is beneficial for FSJs.

To manage both properties into the future for the maximum benefit of FSJs, all areas not used for dredge material disposal should be maintained in optimal FSJ habitat condition using prescribed fire when possible and mechanical treatments when fire is not possible.

5 References

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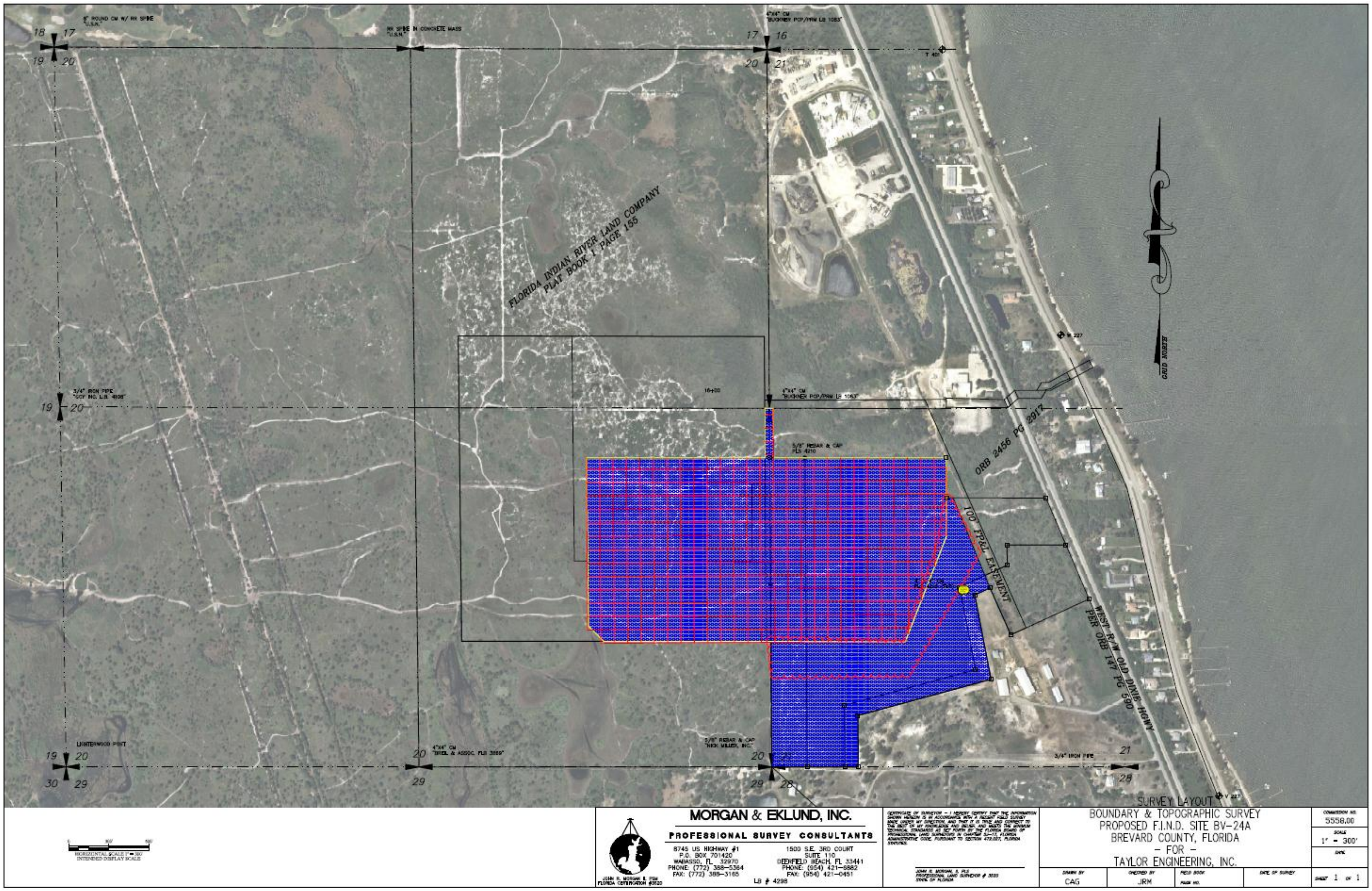
6 Appendices

Appendix A. Morgan & Eklund, Inc. Map



Appendix B. Florida Scrub-Jay Monitoring Protocol

Objectives

The primary objective of FSJ monitoring is to estimate the presence of Florida Scrub-Jays around a survey point.

Survey Methods

Survey methods are based on those outlined by Fitzpatrick and colleagues (1991) and those currently used in the Jay Watch program.

Surveys should be started in the morning about **60 minutes post-sunrise and end by 11:30 AM EDT**. This is the time when jays are most likely to respond. Surveys should **not** be conducted during heavy fog, in rain heavier than a light, intermittent drizzle, or in strong, steady winds (e.g., wind loud enough to disrupt your hearing).

At each survey point, the observers will look for predators (e.g., Cooper's Hawks) prior to playing the recording. If predators are present, do not survey at that point. Return to the point after predators depart. If no predators are present, observers will play the recording for **1 minute, pointing it in all 4 directions for 15 seconds each**. If jays respond the guidelines below should be followed. If jays do not respond the monitor should look and listen for 2 minutes and then repeat the procedure following the guidelines below.

- <u>**If jays respond**</u> to the tape, monitors will stop the playback and begin observing and recording data. The monitor should **spend as much time as needed** to observe family size, band color combinations, age differentiation (adults, juveniles), and any significant behavior that may help with the survey. Make note of direction and estimated distance from which the birds flew in the comments section, especially if birds flew to the point from different directions. Monitors are **encouraged to follow the birds (leave the survey point)** to obtain more detailed information when the birds are less than halfway to the next unsurveyed point (i.e., they are closer to your point than to another point yet to be surveyed). If Scrub-Jays are observed greater than halfway to an unsurveyed point, record the distance, direction, and other pertinent information, but do not leave the survey point to obtain more detailed information.
- <u>**If no jays respond**</u> during the 1-minute period, the observers will stop playback, then watch and listen for jays for 2 minutes after the tape has stopped. To ensure that no jays are missed, observers typically should repeat the playback/observation cycle for a minimum of 9 minutes. Appropriate comments should be recorded on the data sheet.

It is easy to underestimate the number of juveniles in a family. Sometimes, it can be helpful to approach observed juvenile Scrub-Jays. Under the right conditions, this can elicit calls from adults, making other family members appear.

Recording Data

- At the start of the survey, **complete all information** in the header of the data sheet, including observer names, sampling unit & stand number, date, temperature, and wind speed and direction.

- Write the **date of the survey on the map** at the start of the survey.
- At each station, record the survey point and start time.
- When two groups respond at a single point, use a separate row on the data sheet for each group.
- When birds are observed at a distance (i.e., greater than halfway to another point yet to be surveyed), use a separate row for the distant Scrub-Jays, and note the estimated distance and direction in the Comments.
- **Assign a letter to each Scrub-Jay group that is observed**. Record this letter in the beginning of the Comments section of the data sheet and on the accompanying map.
- Place the letter on the spot on the map where the birds first were seen. Use arrows to indicate direction and length of movement from the point where the birds were seen originally.
- If there is uncertainty about group membership (i.e., birds come from different directions, go to different directions, or are widely-spaced), use a separate letter for each potential group.
- **Do not record a letter for birds heard but not seen**. Make only a written comment on data sheet for birds heard but not seen.
- Continue to refer to a group with the same letter when moving from point to point *when you maintain visual contact*; use a different letter when you lose visual contact with birds.
- If you encounter a group of Scrub-Jays for the first time while traveling between survey points, record a letter on the map and write the survey point location on the data sheet as "Between *x* and *y*."
- Record the number of adults and number of juveniles observed. Use separate lines for each potential group.
- Record any bands observed.
- Record the letter designated for each group in the Map Ref column.
- Use the Comments section to record the direction and distance of observed movements, observed territorial behaviors, and any other information that could be useful to the data analyst.
- Be as detailed as possible. Write what you see in the Comments section; don't over-interpret and edit out details that could be helpful to the analyst later.
- Before moving on to the next survey point, make sure all information on the data sheet is complete and legible.
- Do not leave any blanks on the data sheet. Put a "-" in a cell on the data sheet rather than leaving it blank.

Fitzpatrick, J. W., G. E. Woolfenden, and M. T. Kopeny. 1991. Ecology and development-related habitat requirements of the Florida Scrub-Jay (*Aphelocoma coerulescens*). Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 8. Tallahassee, FL. 49 pp.

Appendix C. Florida Scrub-Jay Monitoring Data Sheet

FSJ survey datasheet Date: Page ___ of ___

Overall start time: Overall end time:

Monitor Name(s):					Weather (see reverse side):		
Sample Unit:				Temp start:			Temp end:
Point#	StartTime	#Adults	#Juvs	#UNKS	BANDS	MapRef	Comments (inc. direction FSJs travelled from and towards, behaviors, interactions, predators):

ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 15
LISTED SPECIES DETERMINATION KEYS

THE CORPS OF ENGINEERS, JACKSONVILLE DISTRICT, U. S. FISH AND WILDLIFE SERVICE, JACKSONVILLE ECOLOGICAL SERVICES FIELD OFFICE AND STATE OF FLORIDA EFFECT DETERMINATION KEY FOR THE WOOD STORK IN CENTRAL AND NORTH PENINSULAR FLORIDA

September 2008

Purpose and Background

The purpose of this document is to provide a tool to improve the timing and consistency of review of Federal and State permit applications and Federal civil works projects, for potential effects of these projects on the endangered wood stork (*Mycteria americana*) within the Jacksonville Ecological Services Field Office (JAFL) geographic area of responsibility (GAR see below). The key is designed primarily for Corps Project Managers in the Regulatory and Planning Divisions and the Florida Department of Environmental Protection or its authorized designee, or Water Management Districts. The tool consists of the following dichotomous key and reference material. The key is intended to be used to evaluate permit applications and Corps' civil works projects for impacts potentially affecting wood storks or their wetland habitats. At certain steps in the key, the user is referred to graphics depicting known wood stork nesting colonies and their core foraging areas (CFA), footnotes, and other support documents. The graphics and supporting documents may be downloaded from the Corps' web page at http://www.saj.usace.army.mil/permit or at the JAFL web site at http://www.fws.gov/northflorida/WoodStorks. We intend to utilize the most recent information for both the graphics and supporting information; so should this information be updated, we will modify it accordingly. **Note: This information is provided as an aid to project review and analysis, and is not intended to substitute for a comprehensive biological assessment of potential project impacts. Such assessments are site-specific and usually generated by the project applicant or, in the case of civil works projects, by the Corps or project co-sponsor.**

Explanatory footnotes provided in the key <u>must be closely followed</u> whenever encountered.

Scope of the key

This key should only be used in the review of permit applications for effects determinations on wood storks within the JAFL GAR, and not for other listed species. Counties within the JAFL GAR include Alachua, Baker, Bradford, Brevard, Citrus, Clay, Columbia, Dixie, Duval, Flagler, Gilchrist, Hamilton, Hernando, Hillsborough, Lafayette, Lake, Levy, Madison, Manatee, Marion, Nassau, Orange, Pasco, Pinellas, Putnam, St. Johns, Seminole, Sumter, Suwannee, Taylor, Union, and Volusia.

The final effect determination will be based on project location and description, the potential effects to wood storks, and any measures (for example project components, special permit conditions) that avoid or minimize direct, indirect, and/or cumulative impacts to wood storks and/or suitable wood stork foraging habitat. Projects that key to a "no effect" determination do not require additional consultation or coordination with the JAFL. Projects that key to "NLAA" also do not need further consultation; however, the JAFL staff will assist the Corps if requested, to answer questions regarding the appropriateness of mitigation options. Projects that key to a "may affect" determination equate to "likely to adversely affect" situations, and those projects should not be processed under the SPGP or any other programmatic general permit. For all "may affect" determinations, Corps Project Managers should request the JAFL to initiate formal consultation on the Wood stork.

Summary of General Wood Stork Nesting and Foraging Habitat Information

The wood stork is primarily associated with freshwater and estuarine habitats that are used for nesting, roosting, and foraging. Wood storks typically nest colonially in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Ogden 1991; Rodgers et al. 1996). Successful breeding sites are those that have limited human disturbance and low exposure to land based predators. Nesting sites protected from land-based predators are characterized as those surrounded by large expanses of open water or where the nest trees are inundated at the onset of nesting and remain inundated throughout most of the breeding cycle. These colonies have water depths between 0.9 and 1.5 meters (3 and 5 feet) during the breeding season.

In addition to limited human disturbance and land-based predation, successful nesting depends on the availability of suitable foraging habitat. Such habitat generally results from a combination of average or above-average rainfall during the summer rainy season, and an absence of unusually rainy or cold weather during the winter-spring breeding season (Kahl 1964; Rodgers et al. 1987). This pattern produces widespread and prolonged flooding of summer marshes that tends to maximize production of freshwater fishes, followed by steady drying that concentrate fish during the season when storks nest (Kahl 1964). Successful nesting colonies are those that have a large number of foraging sites. To maintain a wide range of foraging opportunities, a variety of wetland habitats exhibiting short and long hydroperiods should be present. In terms of wood stork foraging, the Service (1999) describes a short hydroperiod as one where a wetland fluctuates between wet and dry in 1 to 5-month cycles, and a long hydroperiod where the wet period is greater than five consecutive months. Wood storks during the wet season generally feed in the shallow water of short-hydroperiod wetlands and in coastal habitats during low tide. During the dry season, foraging shifts to longer hydroperiod interior wetlands as they progressively dry down (though usually retaining some surface water throughout the dry season).

Because of their specialized feeding behavior, wood storks forage most effectively in shallow-water areas with highly concentrated prey. Typical foraging sites for the wood stork include freshwater marshes, depressions in cypress heads, swamp sloughs, managed impoundments, stock ponds, shallow-seasonally flooded roadside or agricultural ditches, and narrow tidal creeks or shallow tidal pools. Good foraging conditions are characterized by water that is relatively calm, open, and having water depths between 5 and 15 inches (5 and 38 cm). Preferred foraging habitat includes wetlands exhibiting a mosaic of submerged and/or emergent aquatic vegetation, and shallow, open-water areas subject to hydrologic regimes ranging from dry to wet. The vegetative component provides nursery habitat for small fish, frogs, and other aquatic prey, and the shallow, open-water areas provide sites for concentration of the prey during daily or seasonal low water periods.

WOOD STORK KEY

Although designed primarily for use by Corps Project Managers in the Regulatory and Planning Divisions, and State Regulatory agencies or their designees, project permit applicants and co-sponsors of civil works projects may find this key and its supporting documents useful in identifying potential project impacts to wood storks, and planning how best to avoid, minimize, or compensate for any identified adverse effects.

A. Project within 2,500 feet of an active colony site[1]........................... *May affect*

Project more than 2,500 feet from a colony site................................go to B

B. Project does not affect suitable foraging habitat[2] (SFH)......................*no effect*

Project impacts SFH[2]...go to C

C. Project impacts to SFH are less than or equal to 0.5 acre[3]..........................*NLAA*[4]

Project impacts to SFH are greater than or equal to 0.5 acre..................go to D

D. Project impacts to SFH not within a Core Foraging Area[5] (see attached map) of a colony site, and no wood storks have been documented foraging on site..NLAA[4]

Project impacts to SFH are within the CFA of a colony site, or wood storks have been documented foraging on a project site outside the CFA ....go to E

E. Project provides SFH compensation within the Service Area of a Service-approved wetland mitigation bank or wood stork conservation bank preferably within the CFA, or consists of SFH compensation within the CFA consisting of enhancement, restoration or creation in a project phased approach that provides an amount of habitat and foraging function equivalent to that of impacted SFH (see *Wood Stork Foraging Habitat Assessment Procedure*[6] for guidance), is not contrary to the Service's *Habitat Management Guidelines For The Wood Stork In The Southeast Region* and in accordance with the CWA section 404(b)(1) guidelines......*NLAA*[4]

Project does not satisfy these elements...*May affect*

[1] An active nesting site is defined as a site currently supporting breeding pairs of wood storks, or has supported breeding wood storks at least once during the preceding 10-year period.

[2] Suitable foraging habitat (SFH) is described as any area containing patches of relatively open (< 25% aquatic vegetation), calm water, and having a permanent or seasonal water depth between 2 and 15 inches (5 to 38 cm). SFH supports and concentrates, or is capable of supporting and concentrating small fish, frogs, and other aquatic prey. Examples of SFH include, but are not limited to, freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. See above *Summary of General Wood Stork Nesting and Foraging Habitat Information.*

[3] On an individual basis, projects that impact less than 0.5 acre of SFH generally will not have a measurable effect on wood storks, although we request the Corps to require mitigation for these losses when appropriate. Wood Storks are a wide ranging species, and individually, habitat change from impacts to less than 0.5 acre of SFH is not likely to adversely affect wood storks. However, collectively they may have an effect and therefore regular monitoring and reporting of these effects are important.

[4] Upon Corps receipt of a general concurrence issued by the JAFL through the Programmatic Concurrence on this key, "NLAA" determinations for projects made pursuant to this key require no further consultation with the JAFL.

[5] The U.S. Fish and Wildlife Service (Service) has identified core foraging area (CFA) around all known wood stork nesting colonies that is important for reproductive success. In Central Florida, CFAs include suitable foraging habitat (SFH) within a 15-mile radius of the nest colony; CFAs in North Florida include SFH within a 13-mile radius of a colony. The referenced map provides locations of known colonies and their CFAs throughout Florida documented as active within the last 10 years. The Service believes loss of suitable foraging wetlands within these CFAs may reduce foraging opportunities for the wood stork.

[6]This draft document, *Wood Stork Foraging Habitat Assessment Procedure*, by Passarella and Associates, Incorporated, may serve as further guidance in ascertaining wetland foraging value to wood storks and compensating for impacts to wood stork foraging habitat.

Monitoring and Reporting Effects

For the Service to monitor cumulative effects, it is important for the Corps to monitor the number of permits and provide information to the Service regarding the number of permits issued that were determined "may affect, not likely to adversely affect." It is requested that information on date, Corps identification number, project acreage, project wetland acreage, and latitude and longitude in decimal degrees be sent to the Service quarterly.

Literature Cited

Kahl, M.P., Jr. 1964. Food ecology of the wood stork (*Mycteria americana*) in Florida. Ecological Monographs 34:97-117.

Ogden, J.C. 1991. Nesting by wood storks in natural, altered, and artificial wetlands in central and northern Florida. Colonial Waterbirds 14:39-45.

Rodgers, J.A. Jr., A.S. Wenner, and S.T. Schwikert. 1987. Population dynamics of wood storks in northern and central Florida, USA. Colonial Waterbirds 10:151-156.

Rodgers, J.A., Jr., S.T. Schwikert, and A. Shapiro-Wenner. 1996. Nesting habitat of wood storks in north and central Florida, USA. Colonial Waterbirds 19:1-21.

U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. Fish and Wildlife Service; Atlanta, Georgia. Available from: http://verobeach.fws.gov/Programs/Recovery/vbms5.html.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

May 18, 2010

Donnie Kinard
Chief, Regulatory Division
Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Service Federal Activity Code: 41420-2007-FA-1494
Service Consultation Code: 41420-2007-I-0964
Subject: South Florida Programmatic Concurrence
Species: Wood Stork

Dear Mr. Kinard:

This letter addresses minor errors identified in our January 25, 2010, wood stork key and as such, supplants the previous key. The key criteria and wood stork biomass foraging assessment methodology have not been affected by these minor revisions.

The Fish and Wildlife Service's (Service) South Florida Ecological Services Office (SFESO) and the U.S. Army Corps of Engineers Jacksonville District (Corps) have been working together to streamline the consultation process for federally listed species associated with the Corps' wetland permitting program. The Service provided letters to the Corps dated March 23, 2007, and October 18, 2007, in response to a request for a multi-county programmatic concurrence with a criteria-based determination of "may affect, not likely to adversely affect" (NLAA) for the threatened eastern indigo snake (*Drymarchon corais couperi*) and the endangered wood stork (*Mycteria americana*) for projects involving freshwater wetland impacts within specified Florida counties. In our letters, we provided effect determination keys for these two federally listed species, with specific criteria for the Service to concur with a determination of NLAA.

The Service has revisited these keys recently and believes new information provides cause to revise these keys. Specifically, the new information relates to foraging efficiencies and prey base assessments for the wood stork and permitting requirements for the eastern indigo snake. This letter addresses the wood stork key and is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The eastern indigo snake key will be provided in a separate letter.

Wood stork

Habitat

The wood stork is primarily associated with freshwater and estuarine habitats that are used for nesting, roosting, and foraging. Wood storks typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Ogden 1991, 1996; Rodgers et al. 1996). Successful colonies are those that have limited human disturbance and low exposure to land-based predators. Nesting colonies protected from land-based predators are characterized as those surrounded by large expanses of open water or where the nest trees are inundated at the onset of nesting and remain inundated throughout most of the breeding cycle. These colonies have water depths between 0.9 and 1.5 meters (3 and 5 feet) during the breeding season.

Successful nesting generally involves combinations of average or above-average rainfall during the summer rainy season and an absence of unusually rainy or cold weather during the winter-spring breeding season (Kahl 1964; Rodgers et al. 1987). This pattern produces widespread and prolonged flooding of summer marshes, which maximize production of freshwater fishes, followed by steady drying that concentrate fish during the season when storks nest (Kahl 1964). Successful nesting colonies are those that have a large number of foraging sites. To maintain a wide range of foraging sites, a variety of wetland types should be present, with both short and long hydroperiods. The Service (1999) describes a short hydroperiod as a 1 to 5-month wet/dry cycle, and a long hydroperiod as greater than 5 months. During the wet season, wood storks generally feed in the shallow water of the short-hydroperiod wetlands and in coastal habitats during low tide. During the dry season, foraging shifts to longer hydroperiod interior wetlands as they progressively dry-down (though usually retaining some surface water throughout the dry season).

Wood storks occur in a wide variety of wetland habitats. Typical foraging sites for the wood stork include freshwater marshes and stock ponds, shallow, seasonally flooded roadside and agricultural ditches, narrow tidal creeks and shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. Because of their specialized feeding behavior, wood storks forage most effectively in shallow-water areas with highly concentrated prey. Through tactolocation, or grope feeding, wood storks in south Florida feed almost exclusively on fish between 2 and 25 centimeters [cm] (1 and 10 inches) in length (Ogden et al. 1976). Good foraging conditions are characterized by water that is relatively calm, uncluttered by dense thickets of aquatic vegetation, and having a water depth between 5 and 38 cm (5 and 15 inches) deep, although wood storks may forage in other wetlands. Ideally, preferred foraging wetlands would include a mosaic of emergent and shallow open-water areas. The emergent component provides nursery habitat for small fish, frogs, and other aquatic prey and the shallow, open-water areas provide sites for concentration of the prey during seasonal dry-down of the wetland.

Conservation Measures

The Service routinely concurs with the Corps' "may affect, not likely to adversely affect" determination for individual project effects to the wood stork when project effects are insignificant due to scope or location, or if assurances are given that wetland impacts have been avoided, minimized, and adequately compensated such that there is no net loss in foraging potential. We utilize our *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (Service 1990) (Enclosure 1) (HMG) in project evaluation. The HMG is currently under review and once final will replace the enclosed HMG. There is no designated critical habitat for the wood stork.

The SFESO recognizes a 29.9 kilometer [km] (18.6-mile) core foraging area (CFA) around all known wood stork colonies in south Florida. Enclosure 2 (to be updated as necessary) provides locations of colonies and their CFAs in south Florida that have been documented as active within the last 10 years. The Service believes loss of suitable wetlands within these CFAs may reduce foraging opportunities for the wood stork. To minimize adverse effects to the wood stork, we recommend compensation be provided for impacts to foraging habitat. The compensation should consider wetland type, location, function, and value (hydrology, vegetation, prey utilization) to ensure that wetland functions lost due to the project are adequately offset. Wetlands offered as compensation should be of the same hydroperiod and located within the CFAs of the affected wood stork colonies. The Service may accept, under special circumstances, wetland compensation located outside the CFAs of the affected wood stork nesting colonies. On occasion, wetland credits purchased from a "Service Approved" mitigation bank located outside the CFAs could be acceptable to the Service, depending on location of impacted wetlands relative to the permitted service area of the bank, and whether or not the bank has wetlands having the same hydroperiod as the impacted wetland.

In an effort to reduce correspondence in effect determinations and responses, the Service is providing the Wood Stork Effect Determination Key below. If the use of this key results in a Corps determination of "no effect" for a particular project, the Service supports this determination. If the use of this Key results in a determination of NLAA, the Service concurs with this determination[1]. This Key is subject to revisitation as the Corps and Service deem necessary.

The Key is as follows:

A. Project within 0.76 km (0.47 mile)[2] of an active colony site[3] .... *"may affect[4]"*

Project impacts Suitable Foraging Habitat (SFH)[5] at a location greater than 0.76 km (0.47 mile) from a colony site.. .... *"go to* B"

---

[1] With an outcome of "no effect" or "NLAA" as outlined in this key, and the project has less than 20.2 hectares (50 acres) of wetland impacts, the requirements of section 7 of the Act are fulfilled for the wood stork and no further action is required. For projects with greater than 20.2 hectares (50 acres) of wetland impacts, written concurrence of NLAA from the Service is necessary.

[2] Within the secondary zone (the average distance from the border of a colony to the limits of the secondary zone is 0.76 km (2,500 feet, or 0.47 mi).

[3] An active colony is defined as a colony that is currently being used for nesting by wood storks or has historically over the last 10 years been used for nesting by wood storks.

[4] Consultation may be concluded informally or formally depending on project impacts.

[5] Suitable foraging habitat (SFH) includes wetlands that typically have shallow-open water areas that are relatively calm and have a permanent or seasonal water depth between 5 to 38 cm (2 to 15 inches) deep. Other shallow non-wetland water bodies are also SFH. SFH supports and concentrates, or is capable of supporting and concentrating small fish, frogs, and other aquatic prey. Examples of SFH include, but are not limited to freshwater marshes, small ponds, shallow, seasonally flooded roadside or agricultural ditches, seasonally flooded pastures, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs.

Project does not affect SFH.."no effect[1]".

B. Project impact to SFH is less than 0.20 hectare (one-half acre)[6]........................NLAA[1]"

Project impact to SFH is greater in scope than 0.20 hectare (one-half acre)..........go to C

C. Project impacts to SFH not within the CFA (29.9 km, 18.6 miles) of a colony site ....go to D

Project impacts to SFH within the CFA of a colony site ....go to E

D. Project impacts to SFH have been avoided and minimized to the extent practicable; compensation (Service approved mitigation bank or as provided in accordance with Mitigation Rule 33 CFR Part 332) for unavoidable impacts is proposed in accordance with the CWA section 404(b)(1) guidelines; and habitat compensation replaces the foraging value matching the hydroperiod[7] of the wetlands affected and provides foraging value similar to, or higher than, that of impacted wetlands. See Enclosure 3 for a detailed discussion of the hydroperiod foraging values, an example, and further guidance[8].................... NLAA[1]"

Project not as above.. "may affect[4]"

E. Project provides SFH compensation in accordance with the CWA section 404(b)(1) guidelines and is not contrary to the HMG; habitat compensation is within the appropriate CFA or within the service area of a Service-approved mitigation bank; and habitat compensation replaces foraging value, consisting of wetland enhancement or restoration matching the hydroperiod[7] of the wetlands affected, and provides foraging value similar

---

[6] On an individual basis, SFH impacts to wetlands less than 0.20 hectare (one-half acre) generally will not have a measurable effect on wood storks, although we request that the Corps require mitigation for these losses when appropriate. Wood storks are a wide ranging species, and individually, habitat change from impacts to SFH less than one-half acre are not likely to adversely affect wood storks. However, collectively they may have an effect and therefore regular monitoring and reporting of these effects are important.

[7] Several researchers (Flemming et al. 1994; Ceilley and Bortone 2000) believe that the short hydroperiod wetlands provide a more important pre-nesting foraging food source and a greater early nestling survivor value for wood storks than the foraging base (grams of fish per square meter) than long hydroperiod wetlands provide. Although the short hydroperiod wetlands may provide less fish, these prey bases historically were more extensive and met the foraging needs of the pre-nesting storks and the early-age nestlings. Nest productivity may suffer as a result of the loss of short hydroperiod wetlands. We believe that most wetland fill and excavation impacts permitted in south Florida are in short hydroperiod wetlands. Therefore, we believe that it is especially important that impacts to these short hydroperiod wetlands within CFAs are avoided, minimized, and compensated for by enhancement/restoration of short hydroperiod wetlands.

[8] For this Key, the Service requires an analysis of foraging prey base losses and enhancements from the proposed action as shown in the examples in Enclosure 3 for projects with greater than 2.02 hectares (5 acres) of wetland impacts. For projects with less than 2.02 hectares (5 acres) of wetland impacts, an individual foraging prey base analysis is not necessary although type for type wetland compensation is still a requirement of the Key.

to, or higher than, that of impacted wetlands. See Enclosure 3 for a detailed discussion of the hydroperiod foraging values, an example, and further guidance[8] .... *"NLAA[1]"*

Project does not satisfy these elements .... *"may affect[4]"*

This Key does not apply to Comprehensive Everglades Restoration Plan projects, as they will require project-specific consultations with the Service.

Monitoring and Reporting Effects

For the Service to monitor cumulative effects, it is important for the Corps to monitor the number of permits and provide information to the Service regarding the number of permits issued where the effect determination was: "may affect, not likely to adversely affect." We request that the Corps send us an annual summary consisting of: project dates, Corps identification numbers, project acreages, project wetland acreages, and project locations in latitude and longitude in decimal degrees.

Thank you for your cooperation and effort in protecting federally listed species. If you have any questions, please contact Allen Webb at extension 246.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

Enclosures

cc: w/enclosures (electronic only)
Corps, Jacksonville, Florida (Stu Santos)
EPA, West Palm Beach, Florida (Richard Harvey)
FWC, Vero Beach, Florida (Joe Walsh)
Service, Jacksonville, Florida (Billy Brooks)

Eastern Indigo Snake Programmatic Effect Determination Key

Scope of the key

This key should be used only in the review of permit applications for effects determinations within the North and South Florida Ecological Services Field Offices Geographic Areas of Responsibility (GAR), and not for other listed species or for aquatic resources such as Essential Fish Habitat (EFH). Counties within the **North** Florida GAR include Alachua, Baker, Bradford, Brevard, Citrus, Clay, Columbia, Dixie, Duval, Flagler, Gilchrist, Hamilton, Hernando, Hillsborough, Lafayette, Lake, Levy, Madison, Manatee, Marion, Nassau, Orange, Pasco, Pinellas, Putnam, St. Johns, Seminole, Sumter, Suwannee, Taylor, Union, and Volusia.

Counties in the **South** Florida GAR include Broward. Charlotte, Collier, De Soto, Glades, Hardee, Hendry, Highlands, Lee, Indian River, Martin, Miami-Dade, Monroe, Okeechobee, Osceola, Palm Beach, Polk, Sarasota, St. Lucie.

Habitat

Over most of its range, the eastern indigo snake frequents several habitat types, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats (Service 1999). Eastern indigo snakes appear to need a mosaic of habitats to complete their life cycle. Wherever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise *(Gopherus polyphemus),* the burrows of which provide shelter from winter cold and summer desiccation (Speake et al. 1978; Layne and Steiner 1996). Interspersion of tortoise-inhabited uplands and wetlands improves habitat quality for this species (Landers and Speake 1980; Auffenberg and Franz 1982).

In south Florida, agricultural sites, such as sugar cane fields, created in former wetland areas are occupied by eastern indigo snakes (Enge pers. comm. 2007). Formerly, indigo snakes would have only occupied higher elevation sites within the wetlands. The introduction of agriculture and its associated canal systems has resulted in an increase in rodents and other species of snakes that are prey for eastern indigo snakes. The result is that indigos occur at higher densities in these areas than they did historically.

Even though thermal stress may not be a limiting factor throughout the year in south Florida, indigo snakes still seek and use underground refugia. On the sandy central ridge of central Florida, eastern indigos use gopher tortoise burrows more (62 percent) than other underground refugia (Layne and Steiner 1996). Other underground refugia used include armadillo (*Dasypus novemcinctus*) burrows near citrus groves, cotton rat (*Sigmodon hispidus*) burrows, and land crab (*Cardisoma guanhumi*) burrows in coastal areas (Service 2006). Natural ground holes, hollows at the base of trees or shrubs, ground litter, trash piles, and crevices of rock-lined ditch walls are also used (Layne and Steiner 1996). These refugia are used most frequently where tortoise burrows are not available, principally in low-lying areas off the central and coastal ridges. In extreme south Florida (the Everglades and Florida Keys), indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats (Steiner et al. 1983). It is suspected that they prefer hammocks and pine forests, because most observations occur in these habitats disproportionately to their presence in the landscape (Steiner et al. 1983). Hammocks may be important breeding areas as juveniles are typically found there. The eastern indigo snake is a snake-eater so the presence of other snake species may be a good indicator of habitat quality.

Conservation Measures

The Service routinely concurs with the Corps' "not likely to adversely affect" (NLAA) determination for individual project effects to the eastern indigo snake when assurances are given that our *Standard Protection Measures for the Eastern Indigo Snake* (Service 2004) located at: http://www.fws.gov/northflorida/IndigoSnakes/indigo-snakes will be used during project site preparation and project construction. There is no designated critical habitat for the eastern indigo snake.

In an effort to reduce correspondence in effect determinations and responses, the Service is providing an Eastern Indigo Snake Effect Determination Key, similar in utility to the West Indian Manatee Effect Determination Key and the Wood Stork Effect Determination Keys presently being utilized by the Corps. If the use of this key results in a Corps' determination of "no effect" for a particular project, the Service supports this determination. If the use of this Key results in a determination of NLAA, the Service concurs with this determination and no additional correspondence will be necessary[1]. This key is subject to revisitation as the Corps and Service deem necessary.

A. Project is not located in open water or salt marsh.................................*go to* B

   Project is located solely in open water or salt marsh.............................*"no effect"*

B. Permit will be conditioned for use of the Service's *Standard Protection Measures For The Eastern Indigo Snake* during site preparation and project construction.......*go to* C

   Permit will not be conditioned as above for the eastern indigo snake, or it is not known whether an applicant intends to use these measures and consultation with the Service is requested[2] ....*"may affect"*

C. There are gopher tortoise burrows, holes, cavities, or other refugia where a snake could be buried or trapped and injured during project activities ....*go to* D

   There are no gopher tortoise burrows, holes, cavities, or other refugia where a snake could be buried or trapped and injured during project activities ....*"NLAA"*

D. The project will impact less than 25 acres of xeric habitat supporting less than 25 active and inactive gopher tortoise burrows...*go to* E

GOPHER TORTOISE BURROWS = ? (AWAITING SURVEY)
XERIC HABITAT = 59.93 ACRES (INCLUDING FLUCCS 321, 413, 421)

The project will impact more than 25 acres of xeric habitat or more than 25 active and inactive gopher tortoise burrows and consultation with the Service is requested[2]... *"may affect"*

E. Any permit will be conditioned such that all gopher tortoise burrows, active or inactive, will be evacuated prior to site manipulation in the vicinity of the burrow[3]. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Any permit will also be conditioned such that holes, cavities, and snake refugia other than gopher tortoise burrows will be inspected each morning before planned site manipulation of a particular area, and, if occupied by an indigo snake, no work will commence until the snake has vacated the vicinity of proposed work... *"NLAA"*

Permit will not be conditioned as outlined above and consultation with the Service is requested[2] .... *"may affect"*

---

[1]With an outcome of "no effect" or "NLAA" as outlined in this key, the requirements of section 7 of the Act are fulfilled for the eastern indigo snake and no further action is required.

[2]Consultation may be concluded informally or formally depending on project impacts.

[3] If burrow excavation is utilized, it should be performed by experienced personnel. The method used should minimize the potential for injury of an indigo snake. Applicants should follow the excavation guidance provided within the Florida Fish and Wildlife Conservation Commission's revised April 2009 Gopher Tortoise Permitting Guidelines located at **http://myfwc.com/License/Permits_ProtectedWildlife.htm#gophertortoise**. A member of the excavation team should be authorized for Incidental Take during excavation through an incidental take permit issued by the Florida Fish and Wildlife Conservation Commission.

ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 16
FLORIDA MASTER SITE FILE SEARCH FOR DMMA BV-24A

This record search is for informational purposes only and does NOT constitute a project review. This search only identifies resources recorded at the Florida Master Site File and does NOT provide project approval from the Division of Historical Resources. Contact the Compliance and Review Section of the Division of Historical Resources at 850-245-6333 for project review information.

Florida Master Site File

August 11, 2017

Kierstin Masse, Environmental Scientist/GIS Analyst
10151 Deerwood Park Blvd., Bldg. 300, Suite 300
Jacksonville, FL 32256
Office (904) 731-7040; Fax (904) 731-9847
E-mail kmasse@taylorengineering.com

In response to your inquiry of August 10, 2017, the Florida Master Site File lists one archeological site, two resource groups and no other cultural resources recorded at the following parcel of Brevard County, Florida:

T29S R38E Sections 20 & 21 as submitted with the search request

When interpreting the results of this search, please consider the following information:

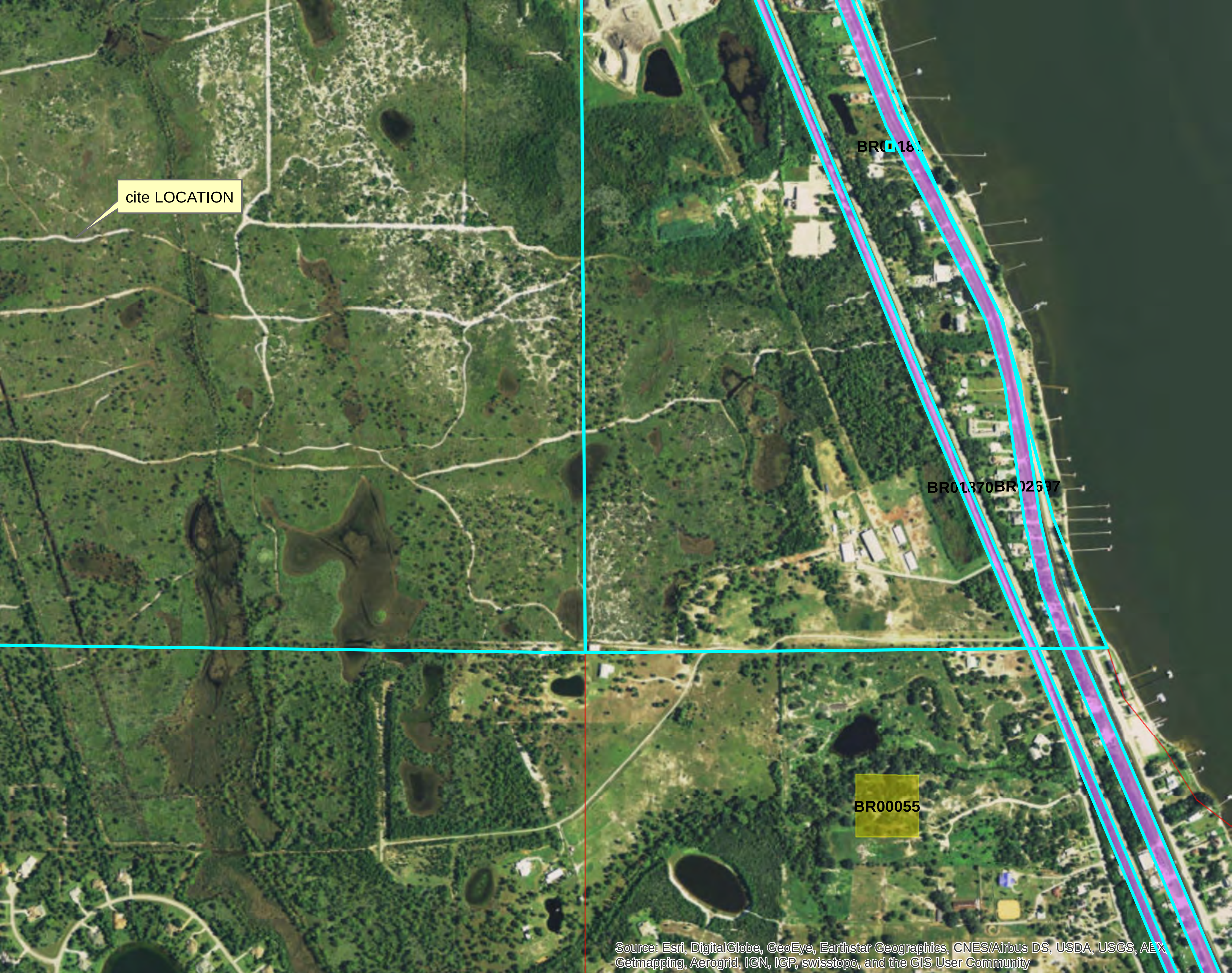
- **This search area may contain *unrecorded* archaeological sites, historical structures or other resources even if previously surveyed for cultural resources.**
- **Federal, state and local laws require formal environmental review for most projects. This search DOES NOT constitute such a review. If your project falls under these laws, you should contact the Compliance and Review Section of the Division of Historical Resources at 850-245-6333.**

Please do not hesitate to contact us if you have any questions regarding the results of this search.

Sincerely,

Eman M. Vovsi

Eman M. Vovsi
Data Base Analyst
Florida Master Site File
Eman.Vovsi@DOS.MyFlorida.com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BR01370BR02697
BR00055
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

AR=1
SS=0
CM=0
RG=2
BR=0
Total=3

Cultural Resource Roster

SiteID	Type	Site Name	Address	Additional Info	SHPO Eval	NR Status
BR00181	AR	SOUTH OF VALKARIA				
BR01870	RG	Florida East Coast Railroad	Cocoa	Linear Resource - 1 Contrib Resources	Eligible	
BR02697	RG	US Highway 1/Cocoa Blvd	Melbourne	Linear Resource - 1 Contrib Resources	Not Eligible	

ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 17

UMAM EVALUATION WORKSHEETS

UNIFORM MITIGATION ASSESSMENT METHOD SUMMARY - FDEP

Site/Project Name:	Application Number:	Date:
FIND DMMA BV-24A	FDEP - Pending	November 2017

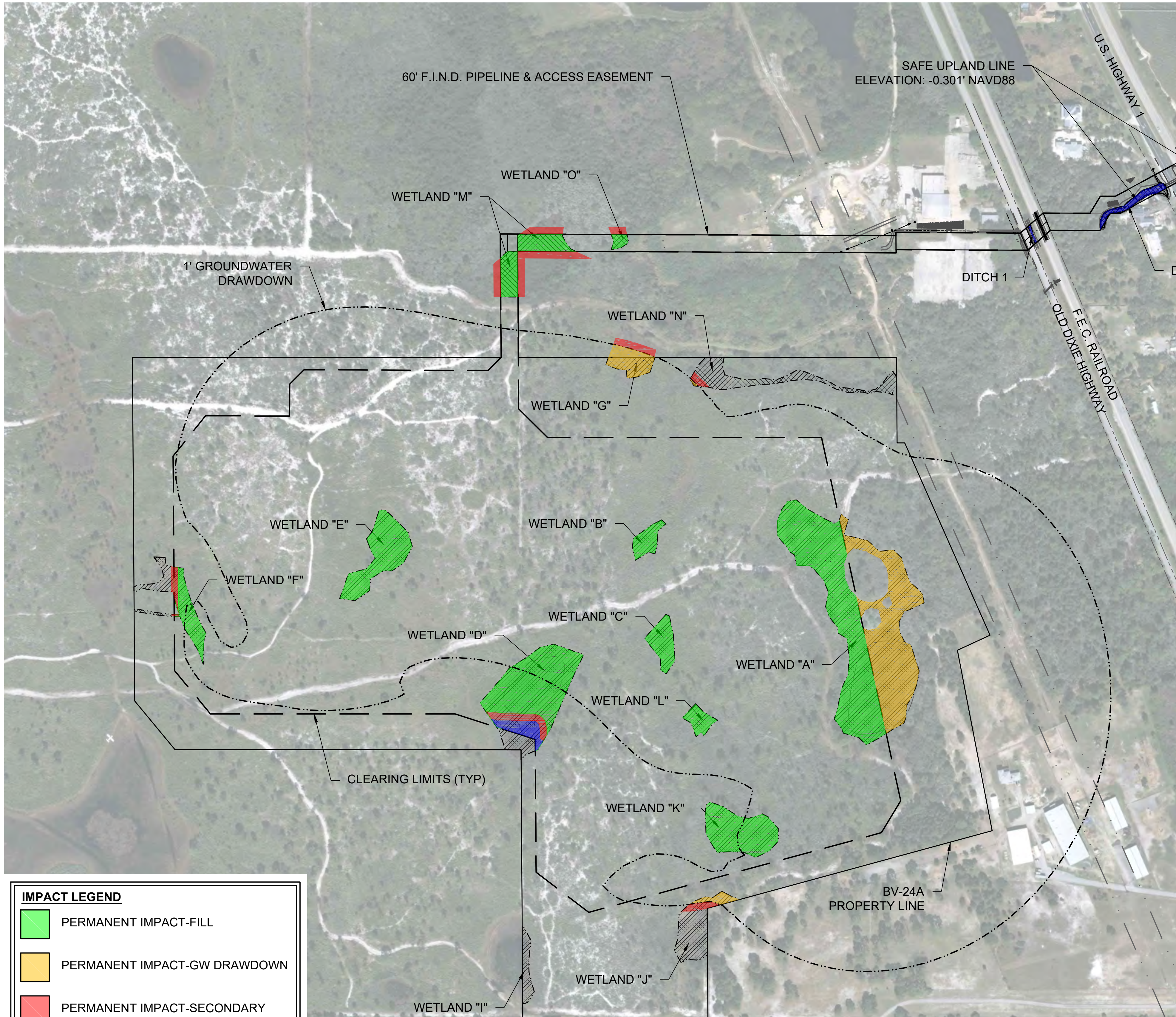
IMPACT SUMMARY

	Assessment Area	Impact Type	L&L Support		Water Environment		Community Structure		Impact Delta	Acres	Functional Loss
			Current	w/Impact	Current	w/Impact	Current	w/Impact			
1	A, D, E, F, K (Fill)	Fill	8	0	8	0	8	0	-0.800	5.47	-4.38
2	M (Fill)	Fill	8	0	8	0	8	0	-0.800	0.45	-0.36
3	A, G, J, N (GW Drawdown)	Hydrology	8	7	8	5	8	5	-0.233	2.12	-0.49
4	D, F, G, J, M, N (Secondary)	Secondary	8	7	8	8	8	8	-0.033	0.75	-0.03
5											
6											
7											
8											
9											
10											

MITIGATION SUMMARY

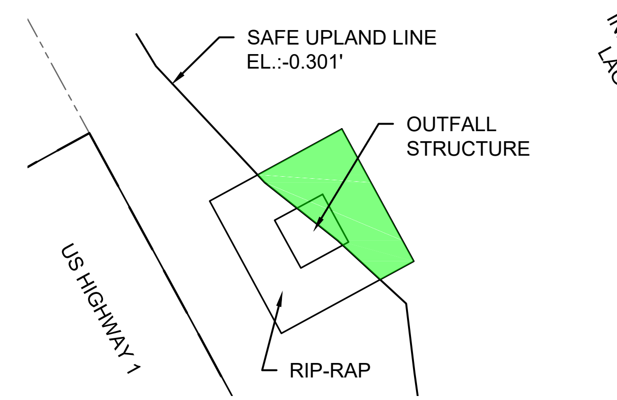
	Assessment Area	Mitigation Type	L&L Support		Water Environment		Community Structure		Mitigation Delta	Time Lag	Risk	Relative Functional Gain	Acres	Functional Gain
			Current	w/Mit	Current	w/Mit	Current	w/Mit						
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

Total Functional Loss	-5.26



WL & SW ID	JURISDICTION	IMPACT AREA (AC.)			
		TEMPORARY	PERMANENT		
			FILL	DRAWDOWN	SECONDARY
A	STATE	-	2.38	1.75	-
B	STATE	-	0.18	-	-
C	STATE	-	0.27	-	-
D	STATE	0.18	1.30	-	0.14
E	STATE	-	0.73	-	-
F	STATE	-	0.30	-	0.07
G	STATE & FED	-	-	0.28	0.09
I	STATE	-	-	-	-
J	STATE	-	-	0.08	0.06
K	STATE	-	0.76	-	-
L	STATE	-	0.15	-	-
M	STATE & FED	-	0.45	-	0.36
N	STATE & FED	-	-	0.006	0.03
O	STATE & FED	-	0.05	-	0.03
DITCH 1	STATE & FED	0.01	-	-	-
DITCH 2	STATE & FED	0.13	-	-	-
DITCH 3	STATE & FED	0.03	-	-	-
OUTFALL	STATE & FED	-	0.002	-	-
TOTAL		0.350	6.572	2.116	0.780

* ISOLATED WETLAND LESS THAN 0.5 ACRES IN TOTAL SIZE



OUTFALL IMPACT

SCALE: 1" = 20'

0 20'

0 400' 800'

SCALE: 1" = 400'

NOTES:

1. PERMANENT IMPACTS (FILL AND GROUNDWATER DRAWDOWN) WITHIN THE BV-24A PROPERTY DETERMINED BY THE LIMITS OF THE PROPOSED DMMA OR THE 1 FT GROUNDWATER DRAWDOWN CONTOUR, WHICHEVER RESULTS IN THE GREATEST IMPACT.
2. SECONDARY IMPACTS DETERMINED BY 25 - FT OFFSET FROM FILL AND GROUNDWATER DRAWDOWN IMPACTS.

REFERENCES:

AERIAL: BREVARD COUNTY, FLORIDA - FDOT 2015

SURVEY: MORGAN & EKLUND, INC., DATED MAY 18, 2015.

CATHY SHELL X:\SYS\PROJECTS\C2015-014 FIND BV-24A\PERMIT\C2015-014-P-WETLANDS-2.DWG 12/19/2017 4:32:24 PM

WETLAND IMPACTS
F.I.N.D. BV-24A DREDGED MATERIAL MANAGEMENT AREA
BREVARD COUNTY, FLORIDA

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

PROJECT C2015-065
DRAWN BY RLJ
SHEET 10 of 35
DATE DECEMBER 2017

SEAL
DRAFT
KEITH A. KNIGHT P.E.# 58084
DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

PART I – Qualitative Description
(See Rule 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	M (Fill)

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
631	Wetland Scrub	Impact - Fill	0.45 ac.

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation of im
Mitgation Basin 22		None

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

This wetland is contiguous with a larger wetland system northwest of the pipeline easement

Assessment area description

Located in the northwestern corner of the pipeline easement, the assessment area (AA) is a small wetland scrub community. The area consists of an open canopy with sparse loblolly bay (*Gordonia lasianthus*) and a thick impenetrable shrub layer woven tightly by wax myrtle (*Morella cerifera*), fetterbush (*Lyonia lucida*), and greenbrier (*Smilax* sp.). Patchy areas of groundcover include swamp fern (*Blechnum serrulatum*), royal fern (*Osmunda regalis*), soft rush (*Juncus effusus*), and redroot (*Lachnanthes caroliniana*).

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
Indian River to east	Not unique

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, and refuge; breeding; water storage; water quality improvement; groudwater recharge; wildlife habitat	None

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Birds (marsh wren, red-winged blackbird); Snakes (green water, cottonmouth, mud); turtles (musk, red-bellied cooter, mud); frogs (leopard, pig, bull, green tree)	None

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

leopard frog

Additional relevant factors:

Assessment conducted by:	Assessment date(s):
Taylor Engineering, Inc.	November 2017

PART II – Quantification of Assessment Area (impact or mitigation)
(See Rules 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	M (Fill)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Impact - Fill	Taylor Engineering, Inc.	November 2017

Scoring Guidance	Optimal (10)	Moderate(7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	8	0	Existing environment to the north, south, and west of AA consists of minimally-disturbed upland and wetland habitats that provide strong landscape support. Numerous human-created trails and tracks through the upland environment suggest regular recreational use. Post-construction, natural habitat to the south will be displaced by the DMMA resulting in reduced location and landscape support outside the AA.
.500(6)(b)Water Environment (n/a for uplands)	8	0	Current water environmental is minimally disturbed. Some low-density development to the south and east..Project constrution will eliminate the water environment within the AA.
.500(6)(c)Community structure **1. Vegetation and/or** 2. Benthic Community	8	0	AA currently has community structure typical of minimally-disturbed scrub wetland. The project will eliminate the wetland.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.800	0.000

If preservation as mitigation,	
Preservation adjustment factor =	
Adjusted mitigation delta =	

For impact assessment areas	
FL = delta x acres =	-0.36

Delta = [with-current]
-0.800

If mitigation	
Time lag (t-factor) =	
Risk factor =	

For mitigation assessment areas
RFG = delta/(t-factor x risk) =

Form 62-345.300(2) [effective date 02-04-2004]
Incorporated by reference in paragraph 62-345.300(3)(b), F.A.C.

PART I – Qualitative Description
(See Rule 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	A, D, E, F, K (Fill)

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
641	Freshwater Marsh	Impact - Fill	5.47 ac.

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designation
Mitgation Basin 22		None

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Wetlands lie within large, relatively undisturbed palmetto prairie / pine flatwoods-dominated landscape. Wetlands are not associated with any surface water drainage and are, with few exceptions, isolated from other wetlands within the landscape.

Assessment area description

Topographically-isolated freshwater marshes occur throughout the property. These shallow depressions locate in permeable sand soils within fire-maintained communities. The canopy stratum is noticeably absent within these wetland areas, and very few to no shrub species occurring. The groundcover species include blue maidencane, bushy bluestem, swamp fern, royal fern, maidencane, spikerush, yellow milkwort, meadow beauties, redroot, pipewort, bogbutton, and sand cordgrass.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
Indian River to east	Not unique

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, and refuge; breeding; water storage; water quality improvement; groudwater recharge; wildlife habitat	None

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Birds (snowy egret, great blue heron, green-backed heron, sandhill crane, marsh wren, red-winged blackbird); Snakes (green water, cottonmouth, mud); turtles (musk, red-bellied cooter, mud); frogs (leopard, pig, bull, green tree)	Little blue heron (state - T), tricolored heron (state - T), wood stork (state - T; federal - T)

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

White-tailed deer (scat), leopard frog

Additional relevant factors:

Assessment conducted by:	Assessment date(s):
Taylor Engineering, Inc.	November 2017

PART II – Quantification of Assessment Area (impact or mitigation)
(See Rules 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	A, D, E, F, K (Fill)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Impact - Fill	Taylor Engineering, Inc.	November 2017

Scoring Guidance	Optimal (10)	Moderate(7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	8	0	Existing environment is relatively undisturbed freshwater marshes interspersed within palmetto prairie/pine flatwoods ecosystem. Numerous human-created trails and tracks through the upland environment suggest regular recreational use. Post-construction, the landscape support outside the DMMA footprint will remain a relatively high quality vegetation community, Some reduction in quality will result from the intermittent maintenance activities and DMMA use as part of dredging projects.
.500(6)(b)Water Environment (n/a for uplands)	8	0	Current water environment reflects relatively undisturbed, isolated wetlands. Project will eliminate the assessment wetlands.
.500(6)(c)Community structure **1. Vegetation and/or** 2. Benthic Community	8	0	The relatively high quality wetlands and associated vegeation will be eliminated as part of the construction.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.800	0.000

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL = delta x acres = -4.38

Delta = [with-current]
-0.800

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG = delta/(t-factor x risk) =

Form 62-345.300(2) [effective date 02-04-2004]
Incorporated by reference in paragraph 62-345.300(3)(b), F.A.C.

PART I – Qualitative Description
(See Rule 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	A, G, J, N (GW Drawdown)

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
641	Freshwater Marsh	Impact - GW Drawdown	2.12 ac.

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designatio
Mitigation Basin 22		None

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Wetlands lie within large, relatively undisturbed palmetto prairie / pine flatwoods-dominated landscape. Wetlands are not associated with any surface water drainage and are, with few exceptions, isolated from other wetlands within the landscape.

Assessment area description

Topographically-isolated freshwater marshes occur throughout the property. These shallow depressions locate in permeable sand soils within fire-maintained communities. The canopy stratum is noticeably absent within these wetland areas, and very few to no shrub species occurring. The groundcover species include blue maidencane, bushy bluestem, swamp fern, royal fern, maidencane, spikerush, yellow milkwort, meadow beauties, redroot, pipewort, bogbutton, and sand cordgrass.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
Indian River to the east	Not unique

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, and refuge; breeding; water storage; water quality improvement; groudwater recharge; wildlife habitat	None

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Birds (snowy egret, great blue heron, green-backed heron, sandhill crane, marsh wren, red-winged blackbird); Snakes (green water, cottonmouth, mud); turtles (musk, red-bellied cooter, mud); frogs (leopard, pig, bull, green tree)	Little blue heron (state - T), tricolored heron (state - T), wood stork (state - T; federal - T)

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

White-tailed deer (scat), leopard frog

Additional relevant factors:

Assessment conducted by:	Assessment date(s):
Taylor Engineering, Inc.	November 2017

PART II – Quantification of Assessment Area (impact or mitigation)
(See Rules 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	A, G, J, N (GW Drawdown)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Impact - GW Drawdown	Taylor Engineering, Inc.	November 2017

Scoring Guidance	Optimal (10)	Moderate(7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with	Description
.500(6)(a) Location and Landscape Support	8	7	Existing environment is minimally disturbed freshwater marshes within relatively high quality adjacent uplands. Numerous human-created trails and tracks through the upland environment suggest regular recreational use. Post-construction the landscape support outside the DMMA footprint will remain a relatively high quality vegetation community, Some reduction in quality will result from the intermittent maintenance activities and DMMA use as part of dredging projects. localized surficial aquifer drawdown at locations within the property will have some affect on overall habitat quality by creating a drier condition within some areas in the assessment wetlands and potentially allowing upland development on the wetland edges. Those effects do not extend to the larger surrounding environment outside the property.
.500(6)(b)Water Environment (n/a for uplands)	8	5	Current water environment reflects relatively undisturbed, natural palmetto scrub / pine flatwoods ecosystem. Project will reduce the water elevations in the assessment wetlands and immediately adjacent. Some change in water quality may also occur during and post dredge material management operations.
.500(6)(c)Community structure **1. Vegetation and/or** 2. Benthic Community	8	5	The relatively high quality wetlands will experience permanent drawdown averaging about 1 ft as part of the design to manage stormwater and maintain appropriate groundwater quality potentially affected by intermittent DMMA operations. This may signficantly shift the vegetation community to a drier condition and possibly result in some upland community development of the wetland edges.

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0.800	0.56667

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL = delta x acres = -0.49

Delta = [with-current]
-0.233

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG = delta/(t-factor x risk) =

Form 62-345.300(2) [effective date 02-04-2004]
Incorporated by reference in paragraph 62-345.300(3)(b), F.A.C.

PART I – Qualitative Description
(See Rule 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	D, F, G, J, M, N (Secondary)

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
641	Freshwater Marsh	Impact - Secondary	0.75 ac.

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. OFW, AP, other local/state/federal designatio
Mitigation Basin 22		None

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Wetlands lie within large, relatively undisturbed palmetto prairie / pine flatwoods-dominated landscape. Wetlands are not associated with any surface water drainage and are, with few exceptions, isolated from other wetlands within the landscape.

Assessment area description

Topographically-isolated freshwater marshes occur throughout the property. These shallow depressions locate in permeable sand soils within fire-maintained communities. The canopy stratum is noticeably absent within these wetland areas, and very few to no shrub species occurring. The groundcover species include blue maidencane, bushy bluestem, swamp fern, royal fern, maidencane, spikerush, yellow milkwort, meadow beauties, redroot, pipewort, bogbutton, and sand cordgrass.

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)
Indian River to the east	Not unique

Functions	Mitigation for previous permit/other historic use
Provides cover, substrate, and refuge; breeding; water storage; water quality improvement; groudwater recharge; wildlife habitat	None

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Birds (snowy egret, great blue heron, green-backed heron, sandhill crane, marsh wren, red-winged blackbird); Snakes (green water, cottonmouth, mud); turtles (musk, red-bellied cooter, mud); frogs (leopard, pig, bull, green tree)	Little blue heron (state - T), tricolored heron (state - T), wood stork (state - T; federal - T)

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

White-tailed deer (scat), leopard frog

Additional relevant factors:

Assessment conducted by:	Assessment date(s):
Taylor Engineering, Inc.	November 2017

PART II – Quantification of Assessment Area (impact or mitigation)
(See Rules 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
FIND DMMA BV-24A	FDEP - Pending	D, F, G, J, M, N (Secondary)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Impact - Secondary	Taylor Engineering, Inc.	November 2017

Scoring Guidance	Optimal (10)	Moderate(7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Indicator	w/o pres or current	with
.500(6)(a) Location and Landscape Support	8	7
.500(6)(b)Water Environment (n/a for uplands)	8	8
.500(6)(c)Community structure **1. Vegetation and/or** 2. Benthic Community	8	8

Score = sum of above scores/30 (if uplands, divide by 20)

current or w/o pres	with
0.800	0.76667

If preservation as mitigation,

Preservation adjustment factor =

Adjusted mitigation delta =

For impact assessment areas

FL = delta x acres = -0.03

Delta = [with-current]

-0.033

If mitigation

Time lag (t-factor) =

Risk factor =

For mitigation assessment areas

RFG = delta/(t-factor x risk) =

Form 62-345.300(2) [effective date 02-04-2004]
Incorporated by reference in paragraph 62-345.300(3)(b), F.A.C.

ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 18

USDA/NRCS SOIL RESOURCE REPORT FOR DMMA BV-24A

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

Brevard County, Florida

Dredged Material Management Area BV-24A

September 21, 2017

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.

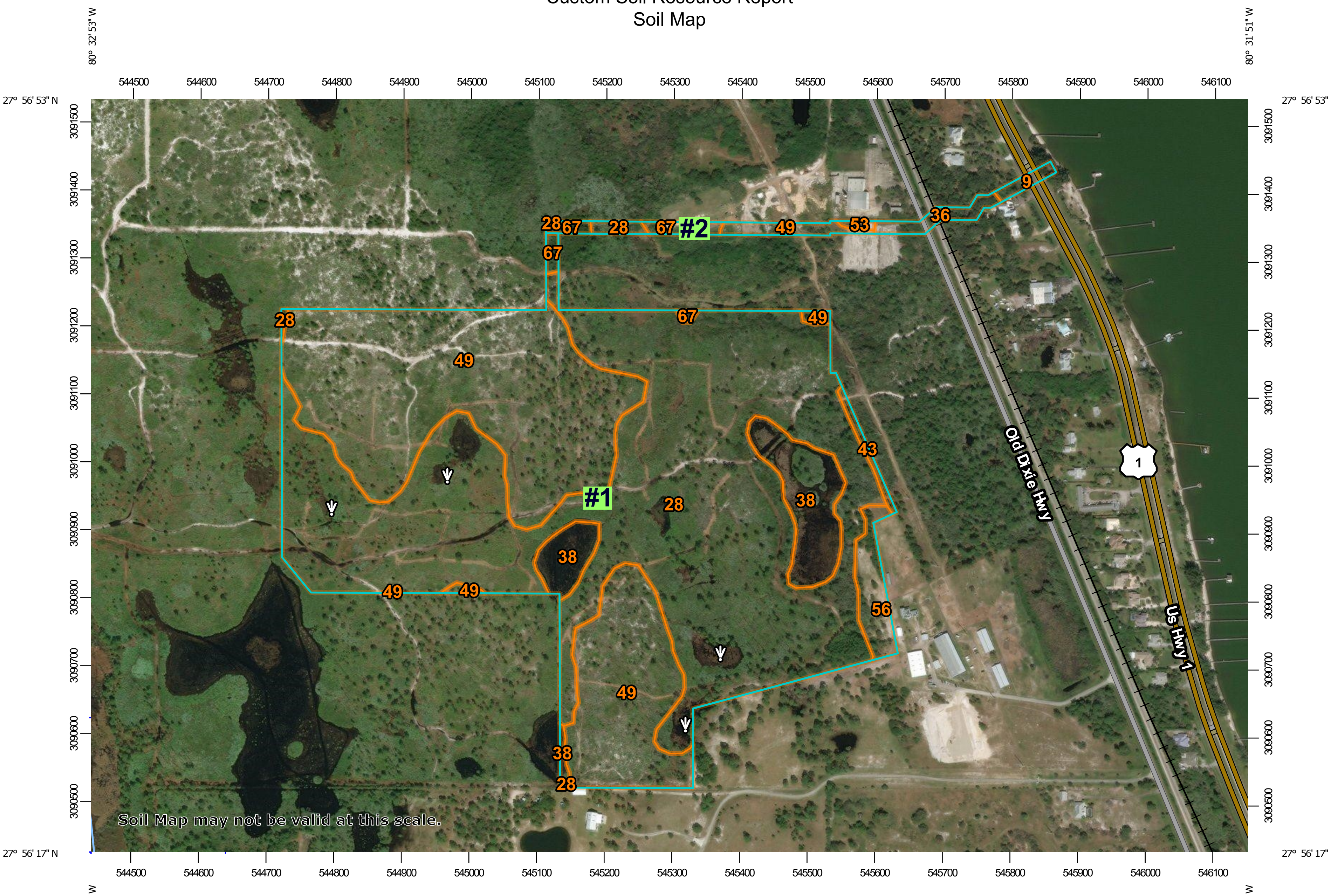
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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



Map Scale: 1:7,830 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 350, 700, 1400, 2100

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: Brevard County, Florida
Survey Area Data: Version 15, Sep 20, 2016

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

Date(s) aerial images were photographed: Dec 31, 2009—Jan 17, 2017

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

#1, Brevard County, Florida (FL009)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
28	Immokalee sand, 0 to 2 percent slopes	64.4	55.5%
38	Myakka sand, depressional	6.4	5.5%
43	Paola fine sand, 0 to 8 percent slopes	0.4	0.4%
49	Pomello sand	38.8	33.4%
56	St. Lucie fine sand, 0 to 5 percent slopes	2.1	1.8%
67	Tomoka muck, undrained	0.4	0.3%
Subtotals for #1		**112.5**	**96.9%**
Totals for Area of Interest		**116.0**	**100.0%**

#2, Brevard County, Florida (FL009)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
9	Canaveral-Anclote complex, gently undulating	0.4	0.4%
28	Immokalee sand, 0 to 2 percent slopes	0.6	0.5%
36	Myakka sand, 0 to 2 percent slopes	0.9	0.8%
49	Pomello sand	0.9	0.8%
53	Satellite sand, 0 to 2 percent slopes	0.2	0.1%
67	Tomoka muck, undrained	0.5	0.5%
Subtotals for #2		**3.5**	**3.1%**
Totals for Area of Interest		**116.0**	**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.

Brevard County, Florida

9—Canaveral-Anclote complex, gently undulating

Map Unit Setting

National map unit symbol: 1lg2n
Elevation: 10 to 60 feet
Mean annual precipitation: 49 to 57 inches
Mean annual air temperature: 68 to 75 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Canaveral and similar soils: 60 percent
Anclote and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canaveral

Setting

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

Typical profile

A - 0 to 6 inches: sand
C - 6 to 12 inches: sand
C - 12 to 80 inches: coarse sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 to 50.02 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 6.0
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A/D
Other vegetative classification: Forage suitability group not assigned (G156BC999FL)
Hydric soil rating: No

Description of Anclote

Setting

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

Typical profile

A - 0 to 19 inches: sand
Cg - 19 to 72 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G156BC141FL)
Hydric soil rating: Yes

Minor Components

Pomello

Percent of map unit: 5 percent
Landform: Flats on marine terraces, rises on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on rises and knolls of mesic uplands (G156BC131FL)
Hydric soil rating: No

Palm beach

Percent of map unit: 5 percent
Landform: Dunes on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on ridges and dunes of xeric uplands (G156BC111FL)

Hydric soil rating: No

28—Immokalee sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2s3ll
Elevation: 0 to 150 feet
Mean annual precipitation: 42 to 57 inches
Mean annual air temperature: 68 to 77 degrees F
Frost-free period: 335 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Immokalee

Setting

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

Typical profile

A - 0 to 9 inches: sand
E - 9 to 36 inches: sand
Bh - 36 to 55 inches: sand
C - 55 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: B/D
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Minor Components

Valkaria

Percent of map unit: 5 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Slough (R155XY011FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Oldsmar

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

Pomello

Percent of map unit: 3 percent
Landform: Knolls on marine terraces, ridges on marine terraces
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, interfluve, riser
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Sand Pine Scrub (R155XY001FL)
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on rises and knolls of mesic uplands (G155XB131FL)
Hydric soil rating: No

Satellite

Percent of map unit: 2 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on rises and knolls of mesic uplands (G155XB131FL)
Hydric soil rating: No

Felda

Percent of map unit: 1 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Slough (R155XY011FL)

Other vegetative classification: Slough (R155XY011FL), Sandy over loamy soils on flats of hydric or mesic lowlands (G155XB241FL)
Hydric soil rating: Yes

36—Myakka sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2twt9
Elevation: 10 to 130 feet
Mean annual precipitation: 43 to 62 inches
Mean annual air temperature: 64 to 77 degrees F
Frost-free period: 280 to 365 days
Farmland classification: Farmland of unique importance

Map Unit Composition

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

Description of Myakka

Setting

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

Typical profile

A - 0 to 6 inches: sand
E - 6 to 20 inches: sand
Bh - 20 to 36 inches: sand
C - 36 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Minor Components

Basinger

Percent of map unit: 5 percent
Landform: Drainageways on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Convex, linear
Across-slope shape: Linear, concave
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Oldsmar

Percent of map unit: 5 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Valkaria

Percent of map unit: 5 percent
Landform: Drainageways on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Convex, linear
Across-slope shape: Linear, concave
Other vegetative classification: Slough (R155XY011FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

38—Myakka sand, depressional

Map Unit Setting

National map unit symbol: 1lg3l
Mean annual precipitation: 49 to 57 inches
Mean annual air temperature: 68 to 75 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Myakka, depressional, and similar soils: 85 percent
Minor components: 15 percent

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

Description of Myakka, Depressional

Setting

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

Typical profile

A - 0 to 8 inches: sand
E - 8 to 22 inches: sand
Bh1 - 22 to 35 inches: sand
Bh2 - 35 to 46 inches: sand
C - 46 to 63 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: B/D
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy soils on stream terraces, flood plains, or in depressions (G156BC145FL)
Hydric soil rating: Yes

Minor Components

Eaugallie

Percent of map unit: 5 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy soils on stream terraces, flood plains, or in depressions (G156BC145FL)
Hydric soil rating: Yes

Holopaw

Percent of map unit: 5 percent

Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy soils on stream terraces, flood plains, or in depressions (G156BC145FL)
Hydric soil rating: Yes

Basinger

Percent of map unit: 5 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy soils on stream terraces, flood plains, or in depressions (G156BC145FL)
Hydric soil rating: Yes

43—Paola fine sand, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tzwh
Elevation: 0 to 100 feet
Mean annual precipitation: 44 to 68 inches
Mean annual air temperature: 66 to 77 degrees F
Frost-free period: 285 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Paola

Setting

Landform: Knolls on marine terraces, ridges on marine terraces, flats on marine terraces, hills on marine terraces
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope, riser, rise, talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 6 inches: fine sand
E - 6 to 26 inches: fine sand
B/E - 26 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very high (20.00 to 50.02 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on ridges and dunes of xeric uplands (G155XB111FL)
Hydric soil rating: No

Minor Components

Astatula

Percent of map unit: 5 percent
Landform: Knolls on marine terraces, ridges on marine terraces, hills on marine terraces
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope, riser, rise
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on ridges and dunes of xeric uplands (G155XB111FL)
Hydric soil rating: No

Candler

Percent of map unit: 5 percent
Landform: Knolls on marine terraces, ridges on marine terraces, hills on marine terraces
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope, riser, rise
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Longleaf Pine-Turkey Oak Hills (R154XY002FL), Sandy soils on ridges and dunes of xeric uplands (G155XB111FL)
Hydric soil rating: No

Cassia

Percent of map unit: 5 percent
Landform: Knolls on marine terraces, ridges on marine terraces, hills on marine terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, tread, rise
Down-slope shape: Convex, linear

Across-slope shape: Linear
Other vegetative classification: Sand Pine Scrub (R154XY001FL), Sandy soils on rises and knolls of mesic uplands (G155XB131FL)
Hydric soil rating: No

49—Pomello sand

Map Unit Setting

National map unit symbol: 1lg3y
Mean annual precipitation: 49 to 57 inches
Mean annual air temperature: 68 to 75 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Pomello

Setting

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

Typical profile

A - 0 to 3 inches: sand
E - 3 to 50 inches: sand
Bh - 50 to 62 inches: sand
Cg - 62 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on rises and knolls of mesic uplands (G156BC131FL)
Hydric soil rating: No

Minor Components

Immokalee

Percent of map unit: 5 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G156BC141FL)
Hydric soil rating: No

Myakka

Percent of map unit: 5 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G156BC141FL)
Hydric soil rating: No

53—Satellite sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2svzb
Elevation: 0 to 190 feet
Mean annual precipitation: 38 to 62 inches
Mean annual air temperature: 68 to 77 degrees F
Frost-free period: 300 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Satellite

Setting

Landform: Flats on marine terraces, rises on marine terraces
Landform position (three-dimensional): Tread, talf, rise
Down-slope shape: Convex, linear
Across-slope shape: Linear

Parent material: Sandy marine deposits

Typical profile

A - 0 to 6 inches: sand
C1 - 6 to 13 inches: sand
C2 - 13 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very high (20.00 to 50.02 in/hr)
Depth to water table: About 12 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

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

Minor Components

Myakka

Percent of map unit: 6 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Immokalee

Percent of map unit: 5 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Basinger

Percent of map unit: 3 percent
Landform: Drainageways on marine terraces, flats on marine terraces
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Convex, concave

Across-slope shape: Linear, concave
Other vegetative classification: Slough (R155XY011FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Pompano

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

56—St. Lucie fine sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1lg45
Elevation: 10 to 20 feet
Mean annual precipitation: 49 to 57 inches
Mean annual air temperature: 68 to 75 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of St. Lucie

Setting

Landform: Knolls on marine terraces, ridges on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Eolian or sandy marine deposits

Typical profile

A - 0 to 3 inches: fine sand
C - 3 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 to 50.02 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on ridges and dunes of xeric uplands (G156BC111FL)
Hydric soil rating: No

Minor Components

Palm beach

Percent of map unit: 5 percent
Landform: Dunes on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on ridges and dunes of xeric uplands (G156BC111FL)
Hydric soil rating: No

Pomello

Percent of map unit: 5 percent
Landform: Flats on marine terraces, rises on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on rises and knolls of mesic uplands (G156BC131FL)
Hydric soil rating: No

Paola

Percent of map unit: 5 percent
Landform: Flats on marine terraces, rises on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on ridges and dunes of xeric uplands (G156BC111FL)
Hydric soil rating: No

67—Tomoka muck, undrained

Map Unit Setting

National map unit symbol: 1lg4h

Elevation: 10 to 100 feet
Mean annual precipitation: 49 to 57 inches
Mean annual air temperature: 68 to 75 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Tomoka, Undrained

Setting

Landform: Marshes on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material over sandy and loamy marine deposits

Typical profile

Oa - 0 to 27 inches: muck
2Cg - 27 to 35 inches: sand
3Cg - 35 to 46 inches: sandy clay loam
4Cg - 46 to 55 inches: sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Organic soils in depressions and on flood plains (G156BC645FL)
Hydric soil rating: Yes

Minor Components

Floridana

Percent of map unit: 5 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave

Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy over loamy soils on stream terraces, flood plains, or in depressions (G156BC245FL)
Hydric soil rating: Yes

Canova

Percent of map unit: 5 percent
Landform: Marshes, marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Organic soils in depressions and on flood plains (G156BC645FL)
Hydric soil rating: Yes

Terra ceia

Percent of map unit: 5 percent
Landform: Marshes on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Organic soils in depressions and on flood plains (G156BC645FL)
Hydric soil rating: Yes

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ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 19

CONSTRUCTION METHODOLOGY

CONSTRUCTION METHODOLOGY

Anticipated Construction Sequence

The project entails the construction of dredged material management area (DMMA) BV-24A. The 112.4-acre BV-24A property is located in southeast Brevard County (Sections 20 and 21, Township 29 South, Range 38 East) approximately 1.30 miles south-southeast of the Valkaria Road and Old Dixie Highway intersection. Associated with BV-24A, a 60-foot wide, 3.8-acre pipeline easement extends off the northern property boundary and then east to the Indian River Lagoon

The DMMA will include an earthen containment basin with a stabilized perimeter road and a perimeter ditch and stormwater pond outside the exterior toe. A gravel toe drain will provide seepage control and route the flow of water to the perimeter ditch. A steel box weir system will be constructed to control the flow of effluent leaving the site during dredging via a HDPE discharge pipe system. An aluminum walkway will be fabricated to allow access to the weirs from the earthen dike.

The contractor is responsible for sequencing of the work, but the following describes one reasonable approach. Before all other items of work, erosion controls will be placed around the work area as required by permits; then clearing and grubbing of the site will occur. The dike foundation will then be prepared and compacted. Once the foundation is prepared the contractor will begin to place fill to construct the dike. Excavation of the basin provides the fill. The toe drain will be installed during the dike construction, at the elevation shown in the project drawings. Construction of the perimeter ditch and roads will take place at the same time as the dike construction. After the earthwork has been completed to the grades and elevations shown in the project drawings, the contractor will install the weirs and associated piping, along with the weir access walkway. This will include casting the weir foundation and walkway footers. During dike construction, weirs and walkway will be fabricated offsite and brought in when appropriate. All grassing of disturbed areas will occur after all other work items have been completed.

Construction Equipment

Equipment will depend on contractor methods. Earthwork equipment will likely include backhoes, graders, bulldozers, excavators, and dump trucks. Concrete trucks will deliver concrete necessary for pours to construct items such as weir foundation and walkway footers. A temporary construction trailer and a porta-potty will serve the work crew. Weekly or twice monthly porta-potty maintenance will be part of the rental contract for that service. The contractor will likely have small storage trailer on-site. Personal work vehicles will be parked on-site daily.

Construction Schedule

The project will likely take a full year to complete. This includes a 180-day grass establishment period. The earthwork, drainage installation, and weir and walkway fabrication and installation will likely take 6 months or more to complete.

ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 20

BV-24A EASEMENT ORDER OF TAKING

CLOSED

IN THE EIGHTEENTH JUDICIAL CIRCUIT COURT
FOR BREVARD COUNTY, FLORIDA

FLORIDA INLAND NAVIGATION DISTRICT, a special district of the State of Florida,

Petitioner,

vs.

RICHARD A. MACHIA, MARGARET F. MACHIA, his wife, et al.,

Defendants.

CIVIL ACTION NO. 91-14915-CA-F

PARCEL NOS. BV-24, BV-24.1

336778

FINAL JUDGMENT

93 MAR -1 AM 8:03

THIS CAUSE came on for trial and the jury, having been empaneled and sworn to try what compensation shall be made to the Defendants for the properties sought to be appropriated and having heard the evidence and charges of the Court, and having retired to consider its verdict, returned the following verdicts:

FILED IN OPEN COURT
This 24 Day Of Feb A.D. 93
SANDY CRAWFORD
CLERK, CIRCUIT COURT
By K Baker D.C.
@ 10:23pm

1123

RETURN TO
CIVIL LAW DIVISION

BK 3270 PG 2724

663

IN THE EIGHTEENTH JUDICIAL CIRCUIT COURT
FOR BREVARD COUNTY, FLORIDA

FLORIDA INLAND NAVIGATION DISTRICT, a special district of the State of Florida,

Petitioner,

vs.

RICHARD A. MACHIA, MARGARET F. MACHIA, his wife, et al.,

Defendants.

CIVIL ACTION NO. 91-14915-CA-F

PARCEL NOS. BV-24, BV-24.1

VERDICT

We, the jury, find for the Petitioner, as follows:

First: That accurate legal descriptions of the properties taken herein are as follows:

BV-24

A part of the Northeast quarter and the Southeast quarter of Section 20, Township 29 South, Range 38 East, Brevard County, Florida. Being more particularly described as follows:

Commence at the Southeast corner of said Section 20, run thence North 00 degrees 22 minutes 23 seconds West along the East line of said Section 20 a distance of 938.22 feet; thence North 89 degrees 56 minutes 47 seconds West a distance of 35.00 feet to the Point of Beginning; thence continue North 89 degrees 56 minutes 47 seconds West a distance of 2278.32 feet; thence North 00 degrees 37 minutes 55 seconds West a distance of 2282.08 feet; thence South 89 degrees 51 minutes 43 seconds East a distance of 2288.66 feet; thence South 00 degrees 22 minutes 23 seconds East, 35 feet West and parallel with the East line of said Section 20, a distance of 2278.60 feet to the Point of Beginning.

Said lands containing 119.533 acres more or less.

Said lands situate, lying, and being in Brevard County, Florida.

FILED IN OPEN COURT
This 24 Day Of Feb. A.D. 93
SANDY CRAWFORD
CLERK, CIRCUIT COURT
By K. Baker D.C.
@ 10:23pm

BK 3270 PG 2725

BV-24.1 (Easement Parcels)

Easement Parcel "B"

A portion of the Southwest quarter of the Northwest quarter of Section 21, Township 29 South, Range 38 East, Brevard County, Florida being more particularly described as follows:

The South 60.00 feet of the Southwest quarter of the Northwest quarter of said Section 21.

Containing 1.8206 acres more or less.

Said lands situate, lying, and being in Brevard County, Florida.

Easement Parcel "F"

A portion of Government Lot 2 of Section 21, Township 29 South, Range 38 East, Brevard County, Florida, being more particularly described as follows:

Commence at the Southwest corner of said Government Lot 2; thence South 89 degrees 45 minutes 01 seconds East along the South line of said Government Lot 2 a distance of 573.55 feet to the Easterly Right-of-Way line of Florida East Coast railway; thence North 23 degrees 04 minutes 03 seconds West along said Right-of-Way line a distance of 87.98 feet to the Point of Beginning.

Thence continue North 23 degrees 04 minutes 03 seconds West along said Right-of-Way line a distance of 65.34 feet; thence South 89 degrees 45 minutes 01 seconds East along a line 60 feet North and parallel with the South line of the property of Mae D. Bridges, a distance of 224 feet more or less to the centerline of a creek; thence meander the centerline of said creek in a Northeasterly direction a distance of 208 feet more or less to the Westerly Right-of-Way line of U. S. Highway No. 1; thence South 28 degrees 31 minutes 05 seconds East along said Right-of-Way a distance of 11 feet more or less; thence South 61 degrees 28 minutes 55 seconds West a distance of 169.97 feet to a point 60 feet North of the South line of the property of Mae D. Bridges; thence North 89 degrees 45 minutes 01 seconds West and parallel with said South line a distance of 34.00 feet; thence South 30 degrees 59 minutes 02 seconds West a distance of 69.80 feet to the South line of the property of Mae D. Bridges, thence North 89 degrees 45 minutes 01 seconds West along said South line a distance of 172.40 feet to the Point of Beginning.

Containing 0.3478 acres more or less.

Said lands situate, lying and being in Brevard County, Florida.

Easement Parcel "G"

A portion of Government Lot 2, Section 21, Township 29 South, Range 38 East, Brevard County, Florida, being more particularly described as follows:

Commence at the Southwest corner of said Government Lot 2; thence South 89 degrees 45 minutes 01 seconds East along the South line of said Government Lot 2 a distance of 573.55 feet to the Easterly Right-of-Way line of the Florida East Coast Railway; thence North 23 degrees 04 minutes 03 seconds West along said Right-of-Way line a distance of 153.32 feet; thence South 89 degrees 45 minutes 01 seconds a distance of 164.13 feet to the Point of Beginning.

Thence North 30 degrees 59 minutes 02 seconds East a distance of 69.80 feet; thence South 89 degrees 45 minutes 01 seconds East a distance of 52.74 feet; thence North 61 degrees 28 minutes 55 seconds East a distance of 154.58 feet to the Westerly Right-of-Way line of U. S. Highway No. 1; thence South 28 degrees 31 minutes 05 seconds East along said Right-of-Way line a distance of 49 feet more or less to the centerline of a creek; thence meander the centerline of said creek in a Southwesterly direction 208 feet more or less to the intersection with a line 60 feet North of the South line of the property of Mae D. Bridges. Thence North 89 degrees 45 minutes 01 seconds West and parallel with the said South line a distance of 60 feet more or less to the Point of Beginning.

Containing 0.2634 acres more or less.

Said lands situate, lying and being in Brevard County, Florida.

Second: That the compensation to be made by the Petitioner for the above-described parcels of land is as follows:

<u>Entire Takings</u>

	Value of land taken, including improvements
Parcel 12 (Machia)	$ 6300
Parcel 41 (MacPherson)	$ 3500
Parcel 61 (Merritt)	$ 4900
Parcel 62 (Yewell)	$ 6300
Parcel 72 (Creekmore)	$ 3500
Parcel 90 (Farm & Grove)	$ 5460
Parcel 91 (Farm & Grove)	$ 5460
Parcel 106 (Farm & Grove)	$ 6300
Parcel 758 (Ensminger)	$ 6300
Parcel 759 (Kennedy)	$ 6300
Parcel 760 (Carlson)	$ 6300
Parcel 762 (Nagel)	$ 6300
Parcel 763 (Formo)	$ 6300
Parcel 764 (Gozzi)	$ 5440
Parcel 766 (Thomas)	$ 3500
Parcel 767 (Blewer)	$ 6300
Parcel 769 (Farmers Grain & Coal)	$ 3500
Parcel 770 (Plummer)	$ 6300
Parcel 771 (Brian)	$ 6300
Parcel 773 (Stracener)	$ 3500
Parcel 774 (Stracener)	$ 3500
Parcel 775 (Stewart)	$ 5610
Parcel 777 (Watson)	$ 6300

[redacted]

Parcel 778 (Badgley)	$ 6130
Parcel 784 (Kennedy)	$ 5440
Parcel 785 (Poerio)	$ 6130
Parcel 788 (Wilkinson)	$ 6300
Parcel 789 (Graves Trust)	$ 6300
Parcel 798 (Graves)	$ 3500
Parcel 797 (Oxford)	$ 6300
Parcel 799 (Graves)	$ 6300
Parcel 800 (Crouse)	$ 6045
Parcel 802 (Fertig)	$ 6300
Parcel 803 (Oxford)	$ 3500
Parcel 804 (Upperque)	$ 3500
Parcel 805 (Zimmer)	$ 3500
Parcel 806 (McCullough)	$ 6300
Parcel 810 (Sheppard)	$ 3500
Parcel 818 (Hsu)	$ 6300
Parcel 819 (Farm & Grove)	$ 6300
Parcel 820 (Farm & Grove)	$ 6300
Parcel 821 (Farm & Grove)	$ 6300
Parcel 822 (Farm & Grove)	$ 6300
Parcel 827 (Farm & Grove)	$ 6300
Parcel 828 (Farm & Grove)	$ 6300
Parcel 829 (Farm & Grove)	$ 6300
Parcel 830 (Farm & Grove)	$ 6300
Parcel 831 (Farm & Grove)	$ 6300
Parcel 832 (Farm & Grove)	$ 6300
Parcel 833 (Farm & Grove)	$ 6300

[redacted]

Parcel 835 (Farm & Grove)	$ 5700
Parcel 836 (Farm & Grove)	$ 5440
Parcel 837 (Farm & Grove)	$ 5440
Parcel 838 (Farm & Grove)	$ 5265
Parcel 839 (Farm & Grove)	$ 6300
Parcel 840 (Farm & Grove)	$ 6300
Parcel 841 (Tietig)	$ 6300
Parcel 842 (Tietig)	$ 6300
Parcel 844 (Farm & Grove)	$ 6130
Parcel 845 (Farm & Grove)	$ 6300
Easement Parcel "B" (Shackelford)	$ 7300
Easement Parcel "F" (Whittaker)	$ 21,800

Partial Takings

Parcel 108 (Farm & Grove)

Value of the land taken, including improvements	$ 3150
Damages, if any, to the remaining property	$ 3150
TOTAL	$ 6300

Parcel 846 (Farm & Grove)

Value of the land taken, including improvements	$ 3150
Damages, if any, to the remaining property	$ 3150
TOTAL	$ 6300

Parcel 754 (Greider)

Value of the land taken, including improvements	$ 12,600
Damages, if any, to the remaining property	$ 5870
TOTAL	$ 18,470

Parcel 756 (Greider)

Value of the land taken, including improvements	$ 12,600
Damages, if any, to the remaining property	$ 5440
TOTAL	$ 18,040

Easements

Easement Parcel "G" (Preuss, Baron and Shore)

Value of the land taken, including improvements	$ 19,850
Damages, if any, to the remaining property	$ 13,540
TOTAL	$ 33,390

SO SAY WE ALL, this 24th day of February, 1993, at Titusville, Brevard County, Florida.

C.D. Eig Jr.
FOREPERSON
Conrad D. Eigenmann Jr.

It is thereupon,

ORDERED AND ADJUDGED as follows:

(a) That fee simple title to the real property described herein as BV-24 will vest in the Petitioner upon deposit of the total amount of the verdicts for said parcel in the court registry.

(b) That perpetual easements for Easement Parcels "B", "F", and "G" as described herein will vest in the Petitioner upon deposit of the total amount of the verdicts for said easements in the court registry. Said easements are for the purpose of ingress and egress and pipeline transmission.

(c) That Petitioner shall deposit the total amount of the verdicts set forth in this Final Judgment within twenty (20) days from the date of this Judgment or the proceeding shall be null and void.

(d) The Court retains jurisdiction for:

1. Apportionment and other supplemental proceedings as provided by Sec. 73.101, Fla. Stat.

2. Award of reasonable costs and attorneys' fees.

3. Entry of supplemental orders as may be required for disbursement of the Petitioner's deposit to those parties entitled to the verdicts contained herein.

DONE AND ORDERED in Titusville, Brevard County, Florida, this 24 day of February, 1993.

CLARENCE T. JOHNSON, JR.
CIRCUIT JUDGE (Ret.)
Clarence T. Johnson, Jr.
Senior Circuit Judge
Sup. Ct. Order: 93R-187

Copies furnished to:

Daniel L. McDermott, Esq.
Gordon H. Harris/
Jack A. Kirschenbaum, Esq.
Stanley R. Andrews, Esq.
Peter M. Brooke, Esq.
Robert W. Kievit, Esq.
Peter J. Tincher, Esq.
Alan D. Tucker, Esq.
George Allen DuFour, Esq.
Edward C. Tietig, Esq.

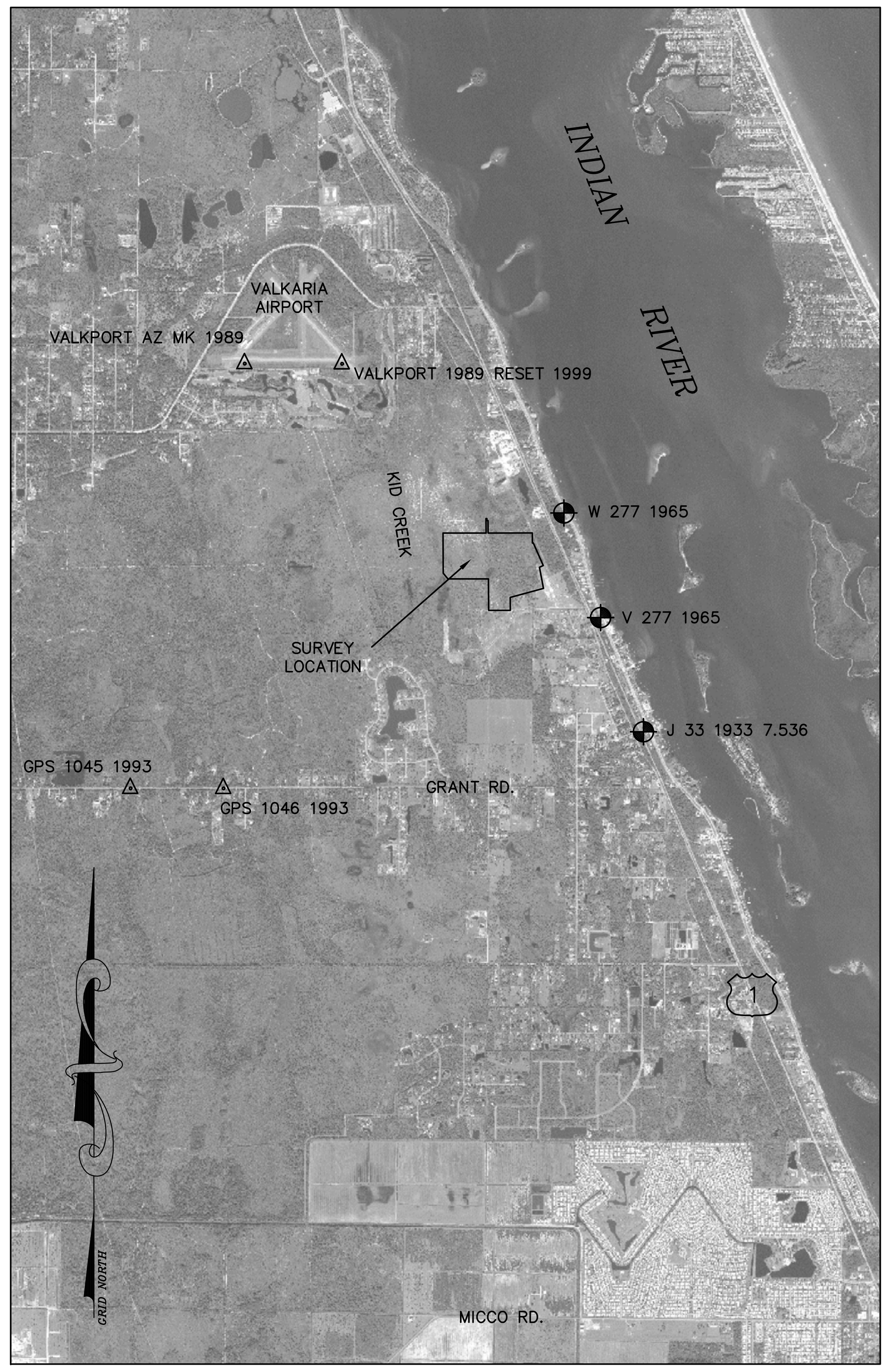
ENVIRONMENTAL RESOURCE PERMIT APPLICATION

DECEMBER 2017

FLORIDA INLAND NAVIGATION DISTRICT
DREDGED MATERIAL MANAGEMENT AREA BV-24A
BREVARD COUNTY, FLORIDA

ATTACHMENT 21

BOUNDARY SURVEY & LEGAL DESCRIPTION

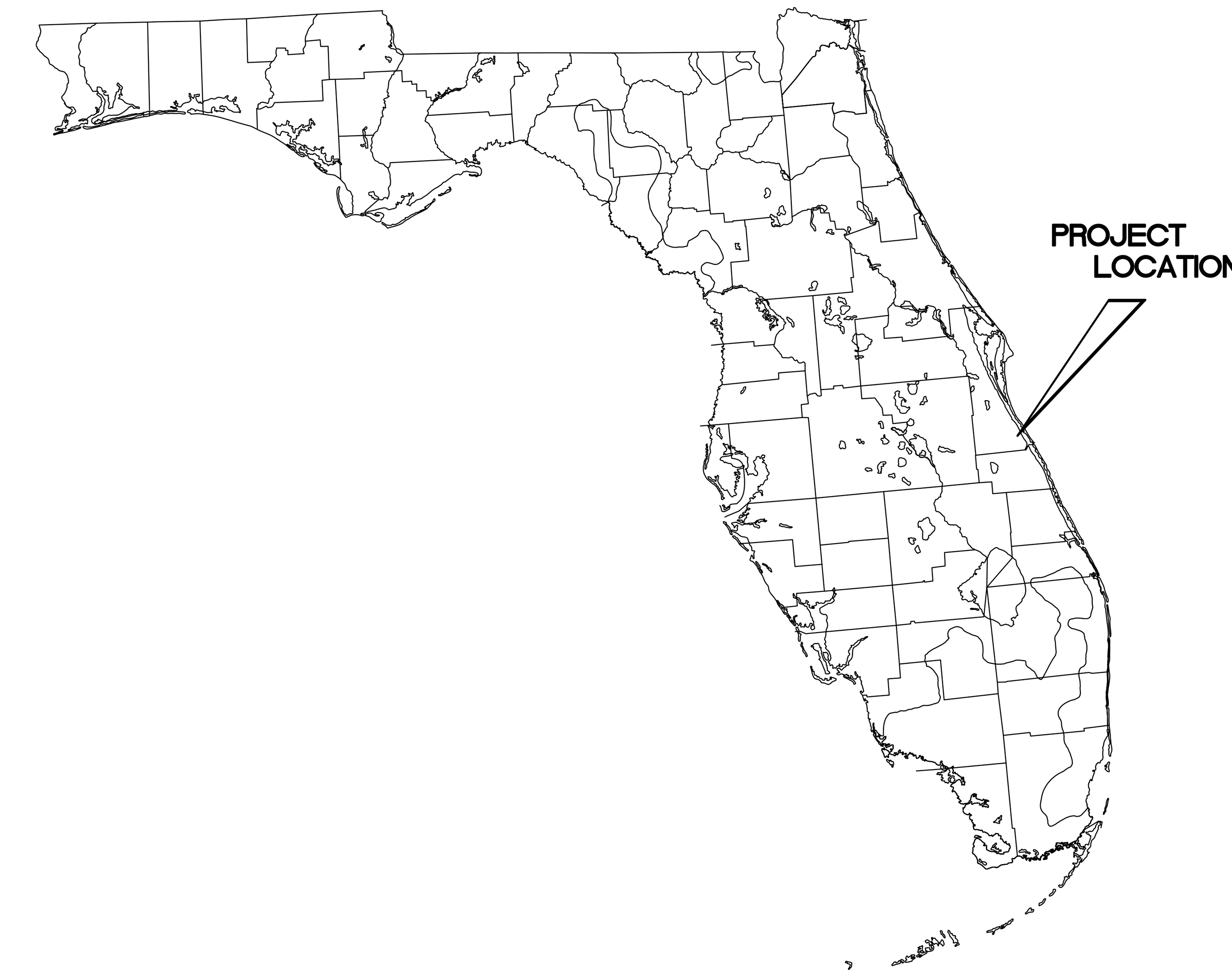


LOCATION MAP
1" INCH = 4,000 FEET

BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA

-FOR-

TAYLOR ENGINEERING, INC.



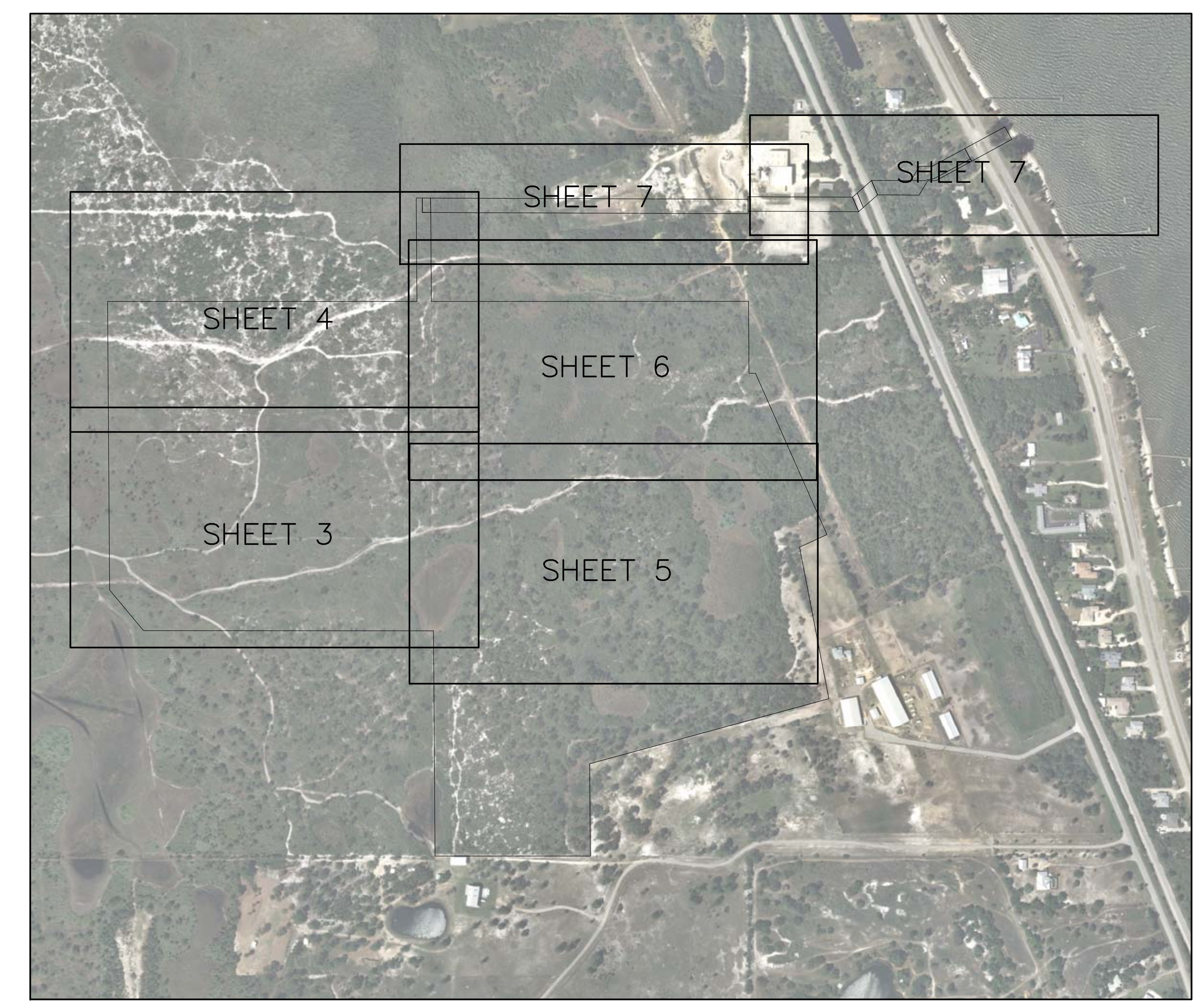
PREPARED BY:

MORGAN & EKLUND, INC.

PROFESSIONAL SURVEY CONSULTANTS

8745 US HIGHWAY #1
P.O. BOX 701420
WABASSO, FL 32970
PHONE: (772) 388-5364
FAX: (772) 388-3165

1159 SW 1ST WAY
DEERFIELD BEACH, FL 33441
PHONE: (954) 421-6882
FAX: (954) 421-0451



TOPOGRAPHIC SURVEY KEY MAP
1" INCH = 600 FEET

LEGAL DESCRIPTION

A PARCEL OF LAND LYING IN SECTIONS 20 AND 21, TOWNSHIP 29 S RANGE 38 E, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT A 4" X 4" BRIEL & ASSOCIATES CONCRETE MONUMENT AT THE SOUTH QUARTER CORNER OF SECTION 20 TOWNSHIP 29 S RANGE 38 E, SAID POINT HAVING COORDINATES OF NORTH 1310777.62 FEET AND EAST 801659.44 FEET AS REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983, NGS ADJUSTMENT OF 2007 (NAD 83/07), PROCEED N89°59'56"E ALONG THE SOUTH LINE OF SECTION 20, TOWNSHIP 29 SOUTH, RANGE 38 EAST A DISTANCE OF 2638.99 FEET TO A 5/8" REBAR & CAP "NICK MILLER, INC," AT THE SOUTHEAST CORNER OF SECTION 20, TOWNSHIP 29 SOUTH, RANGE 38 EAST, SAID POINT BEING THE POINT OF BEGINNING AND HAVING COORDINATES OF NORTH 1310777.67 FEET AND EAST 804298.43 FEET AS REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983, NGS ADJUSTMENT OF 2007 (NAD 83/07), SAID POINT ALSO BEING THE SOUTHWEST CORNER OF PARCEL A AS DESCRIBED IN THE OFFICIAL RECORDS OF BREVARD COUNTY, FLORIDA, BOOK 3539 PAGE 4402; THENCE N00°23'21"W ALONG THE EAST LINE OF SAID SECTION 20, WHICH IS ALSO THE WEST LINE OF SAID PARCEL A AND THE EAST LINE OF A 35 FOOT WIDE ROAD, UTILITY AND DRAINAGE RIGHT-OF-WAY DESCRIBED IN THE OFFICIAL RECORDS OF BREVARD COUNTY, FLORIDA, BOOK 1087 PAGE 373, A DISTANCE OF 938.12 FEET (938.22 FEET PER DEED), THENCE N89°57'45"W ALONG THE SOUTH LINE OF PARCEL BV-24 AS DESCRIBED IN THE OFFICIAL RECORDS OF BREVARD COUNTY, FLORIDA, BOOK 3270 PAGE 2724, A DISTANCE OF 1208.07 FEET, THENCE N39°42'55"W A DISTANCE OF 220.60 FEET, THENCE N00°23'21"W A DISTANCE OF 1201.14 FEET, THENCE N89°59'22"E A DISTANCE OF 1287.87 FEET, THENCE N00°23'21"W ALONG A LINE PARALLEL TO AND 60 FEET WEST OF THE EAST LINE OF SAID SECTION 20 A DISTANCE OF 430.80 FEET, THENCE S89°45'59"E A DISTANCE OF 25.00 FEET TO THE WEST LINE OF SAID 35 FOOT WIDE ROAD, UTILITY AND DRAINAGE RIGHT-OF-WAY, THENCE S00°23'21"E ALONG SAID WEST RIGHT-OF-WAY LINE A DISTANCE OF 60.00 FEET, THENCE S89°45'59"E A DISTANCE OF 35.00 FEET TO A 4" X 4" CONCRETE MONUMENT "BUCKNER PCP/PRM LB 1083" MARKING THE NORTHEAST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 20, THENCE S00°23'21"E ALONG THE EAST LINE OF SAID SECTION 20, WHICH IS ALSO THE EAST LINE OF SAID 35 FOOT WIDE ROAD RIGHT-OF-WAY, A DISTANCE OF 370.54 FEET TO THE NORTHWEST CORNER OF PARCEL A AS DESCRIBED IN BOOK 3539 PAGE 4402 OF THE OFFICIAL RECORDS OF BREVARD COUNTY, FLORIDA, THENCE N89°59'22"E ALONG THE NORTH LINE PARCEL A AND PARCEL B AS DESCRIBED IN SAID BOOK 3539 PAGE 4402, A DISTANCE OF 1320.86 FEET, THENCE ALONG THE EAST LINE OF SAID PARCEL B THE FOLLOWING TWO COURSES, S00°20'43"E A DISTANCE OF 299.54 FEET AND S89°59'25"E A DISTANCE OF 26.78 FEET, THENCE S23°55'29"E ALONG THE WEST LINE OF THE REMAINDERS OF PARCELS B AND C AS DESCRIBED IN SAID BOOK 3539 PAGE 4402, A DISTANCE OF 734.80 FEET TO A POINT ON THE SOUTH LINE OF SAID PARCEL C, THENCE ALONG THE SOUTH LINE OF SAID PARCEL C THE FOLLOWING FOUR COURSES, S65°08'40"W A DISTANCE OF 125.77 FEET, S10°55'23"E A DISTANCE OF 642.21 FEET, S74°46'02"W A DISTANCE OF 1031.93 FEET, S00°23'21"E A DISTANCE OF 384.30 FEET TO THE SOUTH LINE OF SECTION 21 TOWNSHIP 29 S RANGE 38 E, THENCE S89°59'22"W, ALONG THE SOUTH LINE OF SAID SECTION 21 AND PARCELS A, B AND C, A DISTANCE OF 646.26 FEET, TO THE POINT OF BEGINNING.

SAID LANDS BEING IN BREVARD COUNTY, FLORIDA AND CONTAINING 112.522 ACRES MORE OR LESS.

SURVEY NOTES:

1. GRID COORDINATES SHOWN ARE IN FEET, AND ARE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983, NGS ADJUSTMENT OF 2007 (NAD 83/07).
2. THE BASIS OF BEARINGS IS THE EAST LINE OF SECTION 20, TOWNSHIP 29 SOUTH, RANGE 38 EAST, HAVING A BEARING OF N0°23'21"W. BEARINGS DISPLAYED HEREON ARE REFERENCED TO GRID NORTH AS ESTABLISHED BY THE NATIONAL OCEAN SERVICE.
3. DEED BEARINGS SHOWN HEREON HAVE BEEN ADJUSTED TO THE BASIS OF BEARINGS.
4. GRID COORDINATES ARE BASED ON MONUMENTS AS SHOWN IN THE CONTROL TABLE.
5. ELEVATIONS SHOWN ARE IN FEET AND ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
6. ELEVATIONS ARE BASED ON MONUMENTS AS SHOWN IN THE CONTROL TABLE.
7. TOPOGRAPHIC INFORMATION DEPICTED ON THIS SURVEY REPRESENTS THE EXISTING CONDITIONS ON THE DATE OF THE FIELD SURVEY.
8. AERIAL IMAGERY WAS TAKEN IN 2012 AND WAS PROVIDED BY THE FLORIDA DEPARTMENT OF TRANSPORTATION.
9. AERIAL IMAGERY IS DISPLAYED HEREON FOR INFORMATION PURPOSES ONLY, NO PHOTOGRAPHIC ACCURACY IS IMPLIED BY THIS MAP.
10. NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.
11. UNDERGROUND UTILITIES AND IMPROVEMENTS NOT LOCATED.
12. NOT ABSTRACTED FOR RIGHTS-OF-WAY, EASEMENTS OF RECORD OR OWNERSHIP.

SYMBOLS LEGEND:

- CONCRETE MONUMENT
- 5/8" REBAR & CAP
- 3/4" IRON PIPE
- POWER POLE
- GUY ANCHOR
- OHW — OVERHEAD WIRE
- BWF — BARBED WIRE FENCE
- HORIZONTAL CONTROL POINT
- VERTICAL CONTROL POINT

ABBREVIATIONS LEGEND:

WPP	WOOD POWER POLE
CPP	CONCRETE POWER POLE
GA	GUY ANCHOR
OHW	OVERHEAD WIRE
BWF	BARBED WIRE FENCE
CMP	CORRUGATED METAL PIPE
FCM	FOUND 4" X 4" CONCRETE MONUMENT
IRC	5/8" REBAR & CAP
NAVD 88	NORTH AMERICAN VERTICAL DATUM OF 1988
C –	CALCULATED
D –	DEED
M –	MEASURED

CONTROL TABULATION

	NAD 83/07 SPCS 0901		NAVD 88			
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION	AGENCY	STAMPING
101	1305460.19	793607.70	-----	DEEP ROD MONUMENT	BREV CO	GPS 1045 1993
102	1305458.24	796383.93	-----	DEEP ROD MONUMENT	BREV CO	GPS 1046 1993
104			6.13	CONCRETE MONUMENT	CGS	J 33 1933 7.536
105			2.40	DISK IN HEADWALL	CGS	V 227 1965
106	1313686.00	806544.67	3.22	DISK IN HEADWALL	CGS	W 277 1965
108	1318142.36	799924.12	-----	DEEP ROD MONUMENT	NGS	VALKPORT 1989 RESET 1999
109	1318148.91	797017.43	-----	DEEP ROD MONUMENT	NGS	VALKPORT AZ MK 1989
202	1311850.37	806145.54	17.08	5/8" REBAR & CAP	M&E	202
203	1312556.69	805829.02	15.54	5/8" REBAR & CAP	M&E	203
204	1313229.69	805536.34	15.25	5/8" REBAR & CAP	M&E	204
205	1313069.50	804020.09	19.62	5/8" REBAR & CAP	M&E	205
206	1313061.41	803985.95	19.80	5/8" REBAR & CAP	M&E	206

SHEET INDEX

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	BOUNDARY SURVEY MAP
3-7	TOPOGRAPHIC SURVEY MAPS
8	PROFILE VIEW PIPELINE EASEMENT
9-10	CROSS SECTION VIEW PIPELINE EASEMENT

FIELD BOOKS: BREVARD 125 PAGES 43-44
BREVARD 126 PAGES 1-15
BREVARD 164 PAGES 39-48
BREVARD 165 PAGES 1-48

0 200' 400'
HORIZONTAL SCALE 1" = 200'
INTENDED DISPLAY SCALE

* PLATTED ROAD RIGHTS-OF-WAY ARE DEDICATED TO THE TOWN OF GRANT-VALKARIA (GRANT DRAINAGE DISTRICT) PER THE OFFICIAL RECORDS OF BREVARD COUNTY, FLORIDA BOOK 1087 PAGE 373 AND MAY NEED TO BE VACATED FOR THIS PROJECT.

SEE SHEET 1 FOR SURVEY NOTES

JOHN R. MORGAN II, PSM
FLORIDA CERTIFICATION #3520

MORGAN & EKLUND, INC.
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1159 SW 1ST WAY
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PHONE: (954) 421-6882
FAX: (954) 421-0425

LB #4298

CERTIFICATE OF SURVEYOR – I HEREBY CERTIFY THAT THE INFORMATION SHOWN HEREON IS IN ACCORDANCE WITH A RECENT FIELD SURVEY MADE UNDER MY DIRECTION, AND THAT IT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND MEETS THE STANDARDS OF PRACTICE AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL LAND SURVEYORS IN CHAPTER 5J–17, FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

MAP OF BOUNDARY SURVEY
BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV–24A
BREVARD COUNTY, FLORIDA
– FOR –
TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK SEE / PAGE NO. COVER	DATE OF SURVEY
CAG	JRM		–

COMMISSION NO.	5558.00
SCALE	1" = 200'
DATE	5/18/15
SHEET	2 OF 10

TOPOGRAPHIC SURVEY MAP (NAVD 88)

0 50' 100'
HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

SEE SHEET 1 FOR SURVEY NOTES

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STATE OF FLORIDA

BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA
– FOR –
TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK SEE	DATE OF SURVEY
CAG	JRM	PAGE NO. COVER	4/7/15

COMMISSION NO.	5558.00
SCALE	1" = 50'
DATE	5/18/15
SHEET 3 OF 10	

0 50' 100'
HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

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STATE OF FLORIDA

TOPOGRAPHIC SURVEY MAP (NAVD 88)

BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA
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COMMISSION NO.	5558.00
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DATE OF SURVEY	4/7/15
SHEET	4 OF 10

0 50' 100'
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TOPOGRAPHIC SURVEY MAP (NAVD 88)

BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA
– FOR –
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CAG	JRM	SEE COVER	4/7/15

COMMISSION NO.	5558.00
SCALE	1" = 50'
DATE	5/18/15
SHEET	5 of 10

0 50' 100'
HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

SEE SHEET 1 FOR SURVEY NOTES

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TOPOGRAPHIC SURVEY MAP (NAVD 88)
BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA
– FOR –
TAYLOR ENGINEERING, INC.

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COMMISSION NO.	5558.00
SCALE	1" = 50'
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SHEET	6 OF 10

0 50' 100'
HORIZONTAL SCALE 1" = 50'
INTENDED DISPLAY SCALE

SEE SHEET 1 FOR SURVEY NOTES

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TOPOGRAPHIC SURVEY MAP (NAVD 88)
BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
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– FOR –
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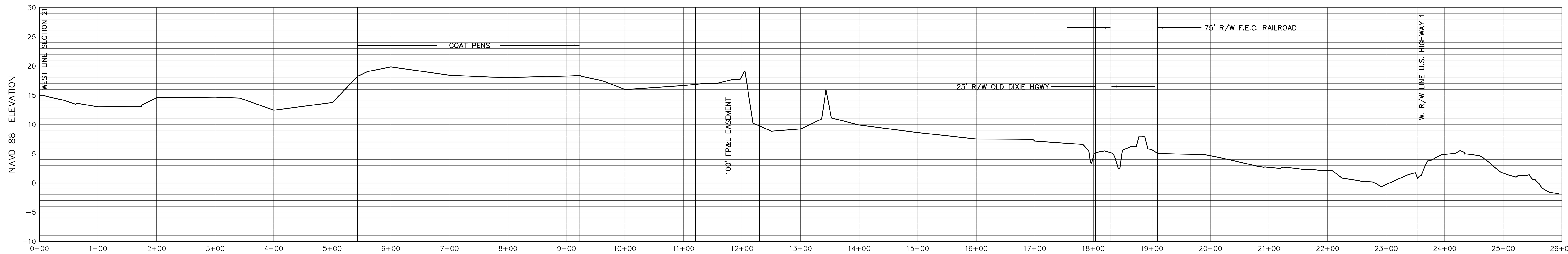
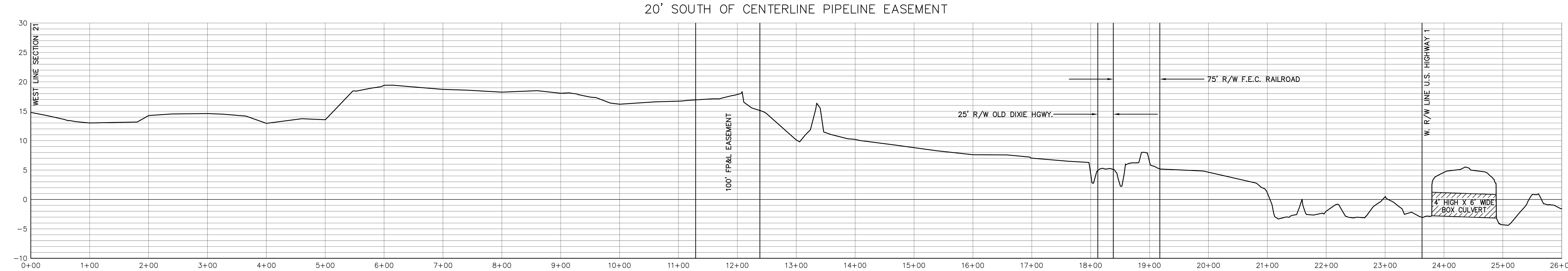
DRAWN BY: CAG	CHECKED BY: JRM	FIELD BOOK SEE / PAGE NO. COVER	DATE OF SURVEY: 4/7/15

COMMISSION NO. 5558.00
SCALE 1" = 50'
DATE 5/18/15
SHEET 7 OF 10

APPROXIMATE CENTERLINE PIPELINE EASEMENT



20' SOUTH OF CENTERLINE PIPELINE EASEMENT



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JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

PIPELINE EASEMENT PROFILE VIEW (NAVD 88)
BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA
– FOR –
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				DATE 5/18/15
				SHEET 8 OF 10

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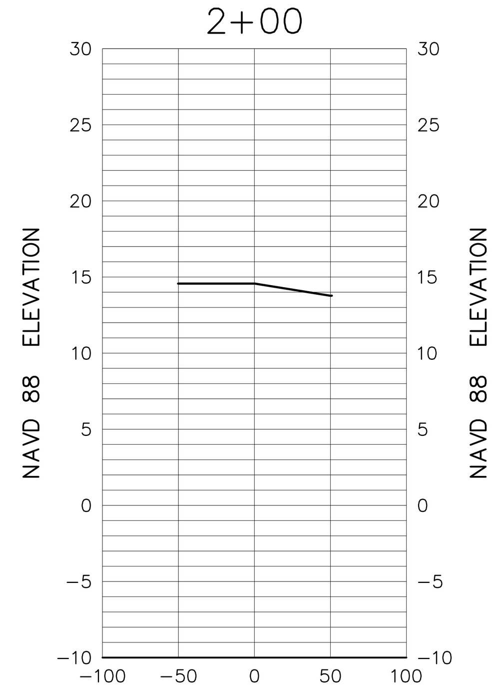

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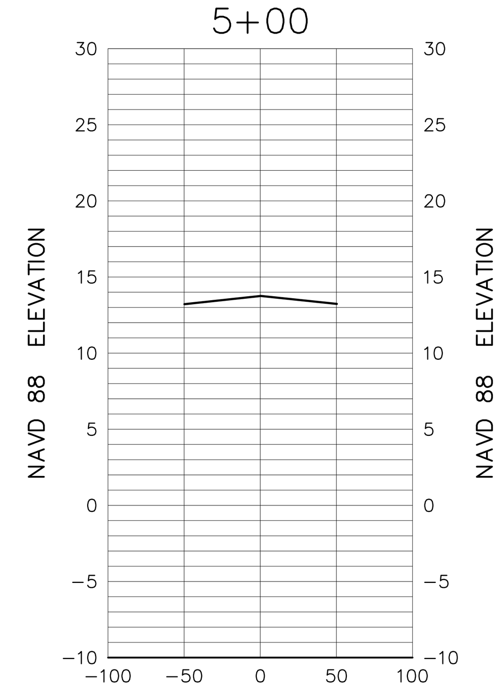

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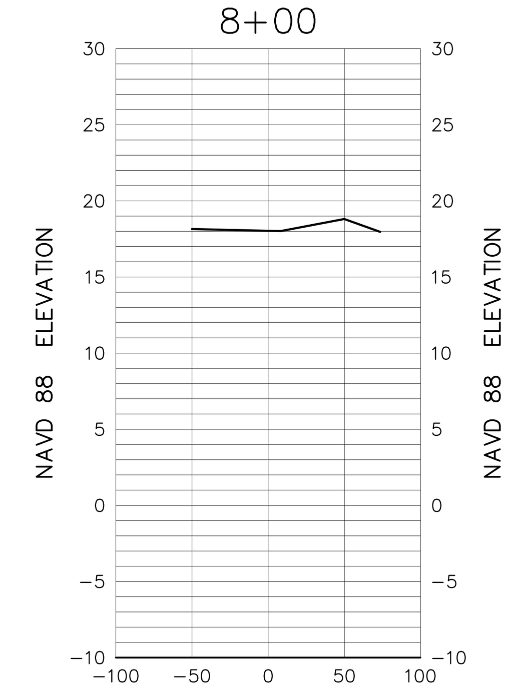

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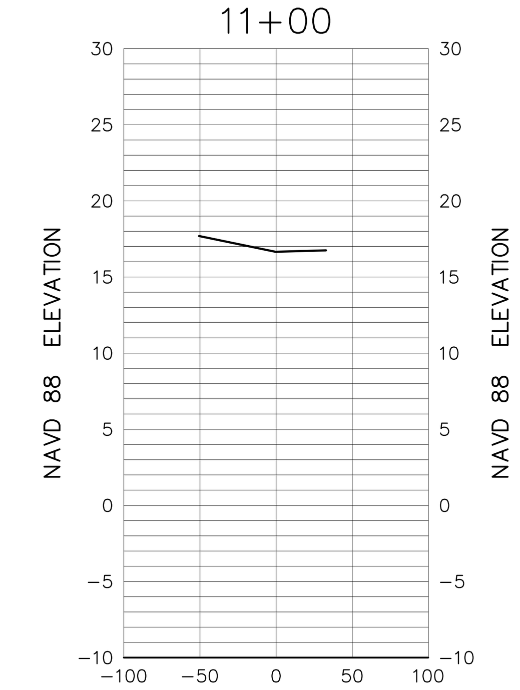

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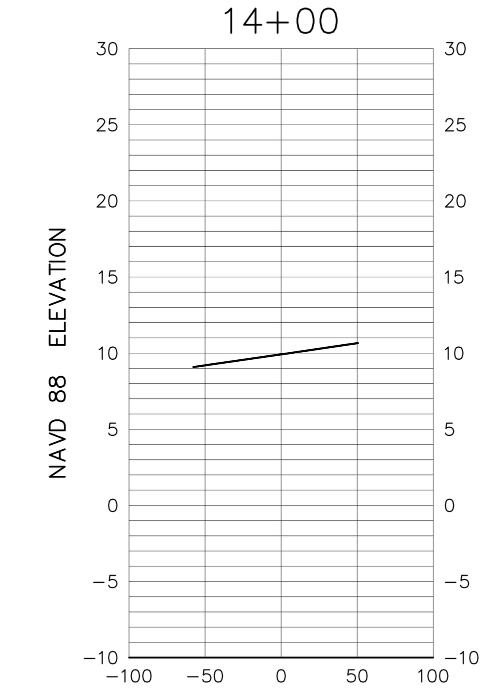

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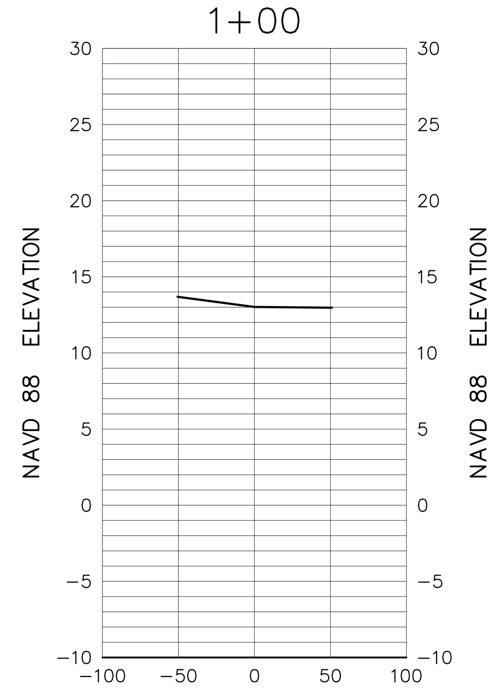

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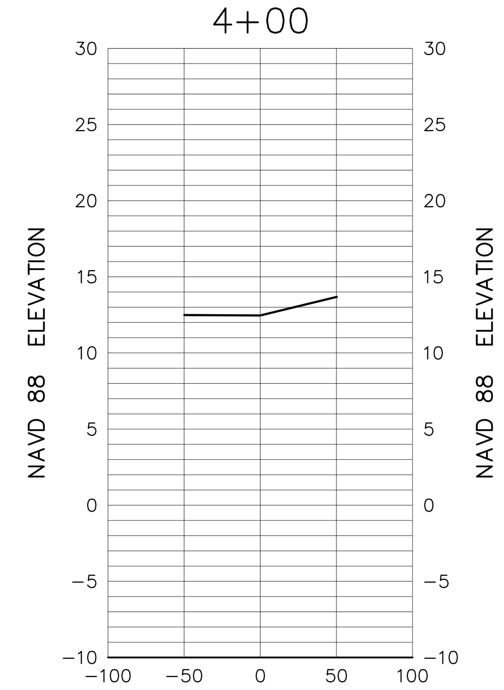

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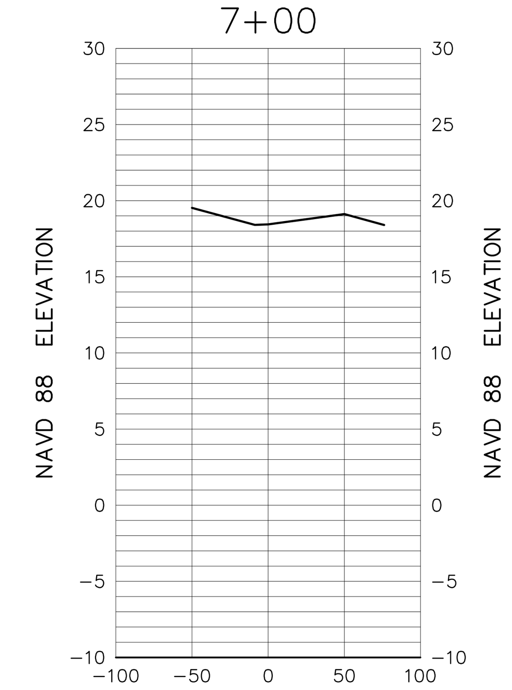

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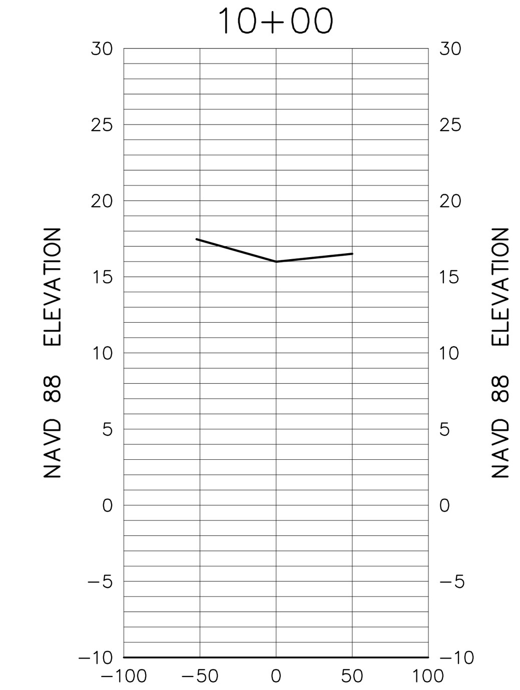

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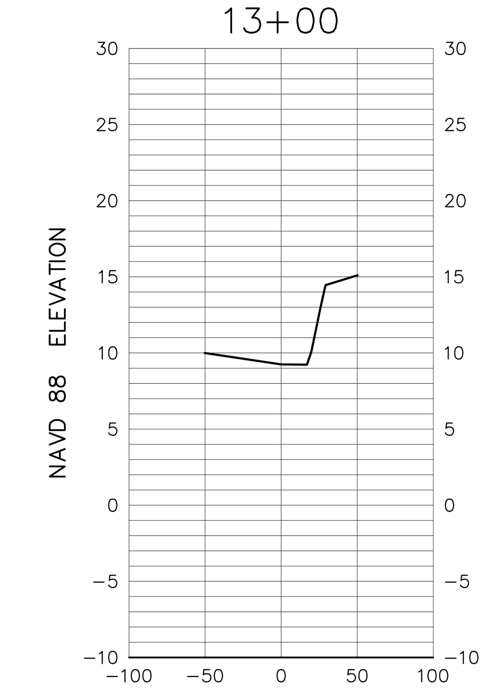

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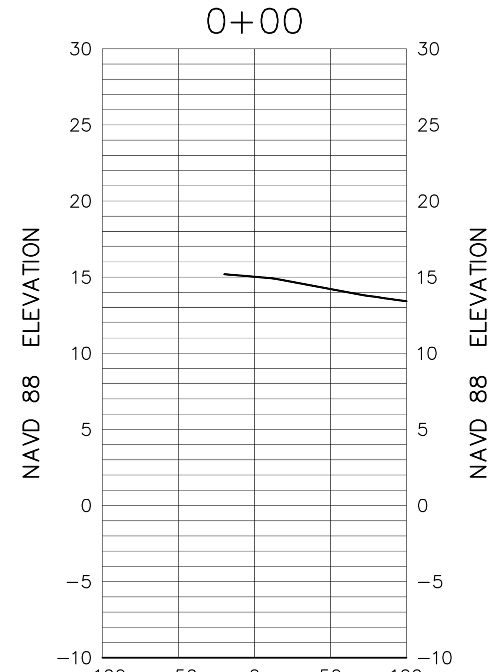

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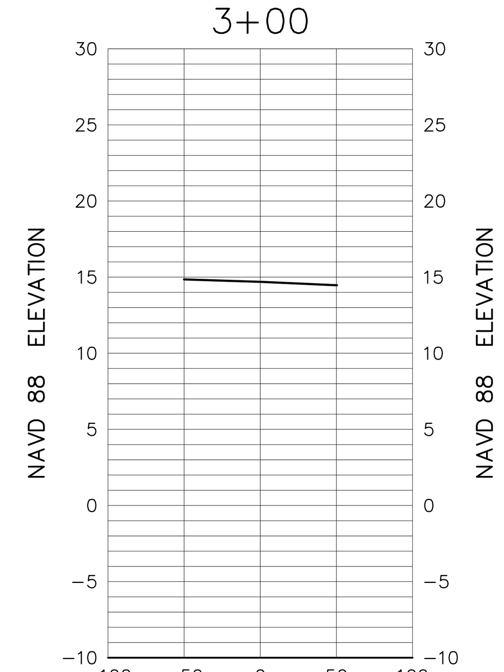

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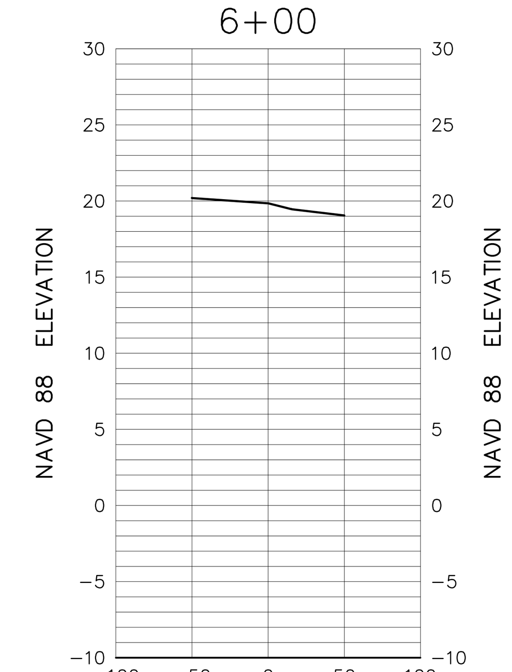

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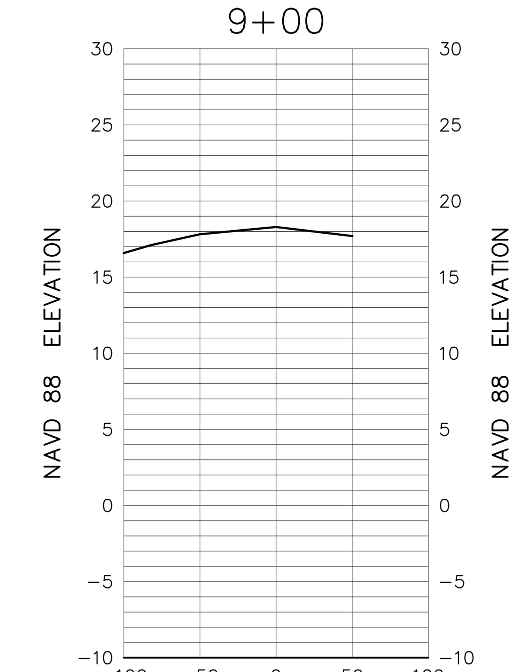

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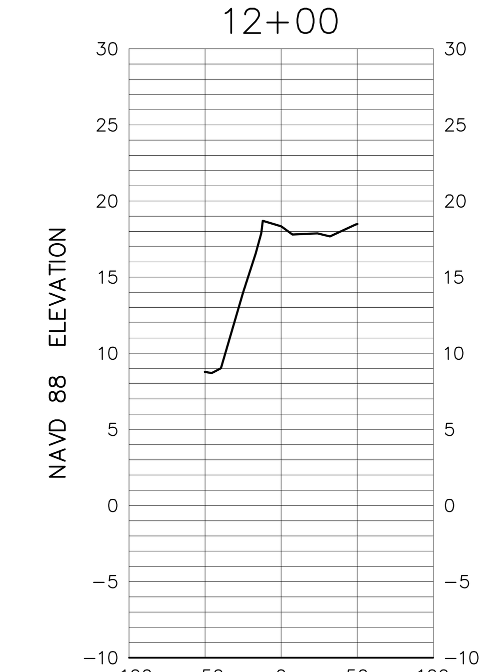

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HORIZONTAL SCALE 1" = 100'
INTENDED DISPLAY SCALE

0 10' 20'
VERTICAL SCALE 1" = 10'
INTENDED DISPLAY SCALE

H:\Sdskproj\5558-00\dwg\5558-00.dwg Chris Tue, 06 Oct 2015 - 10:54am

JOHN R. MORGAN II, PSM
FLORIDA CERTIFICATION #3520

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JOHN R. MORGAN, II, PLS
PROFESSIONAL LAND SURVEYOR #3520
STATE OF FLORIDA

PIPELINE EASEMENT CROSS SECTION VIEW (NAVD 88)

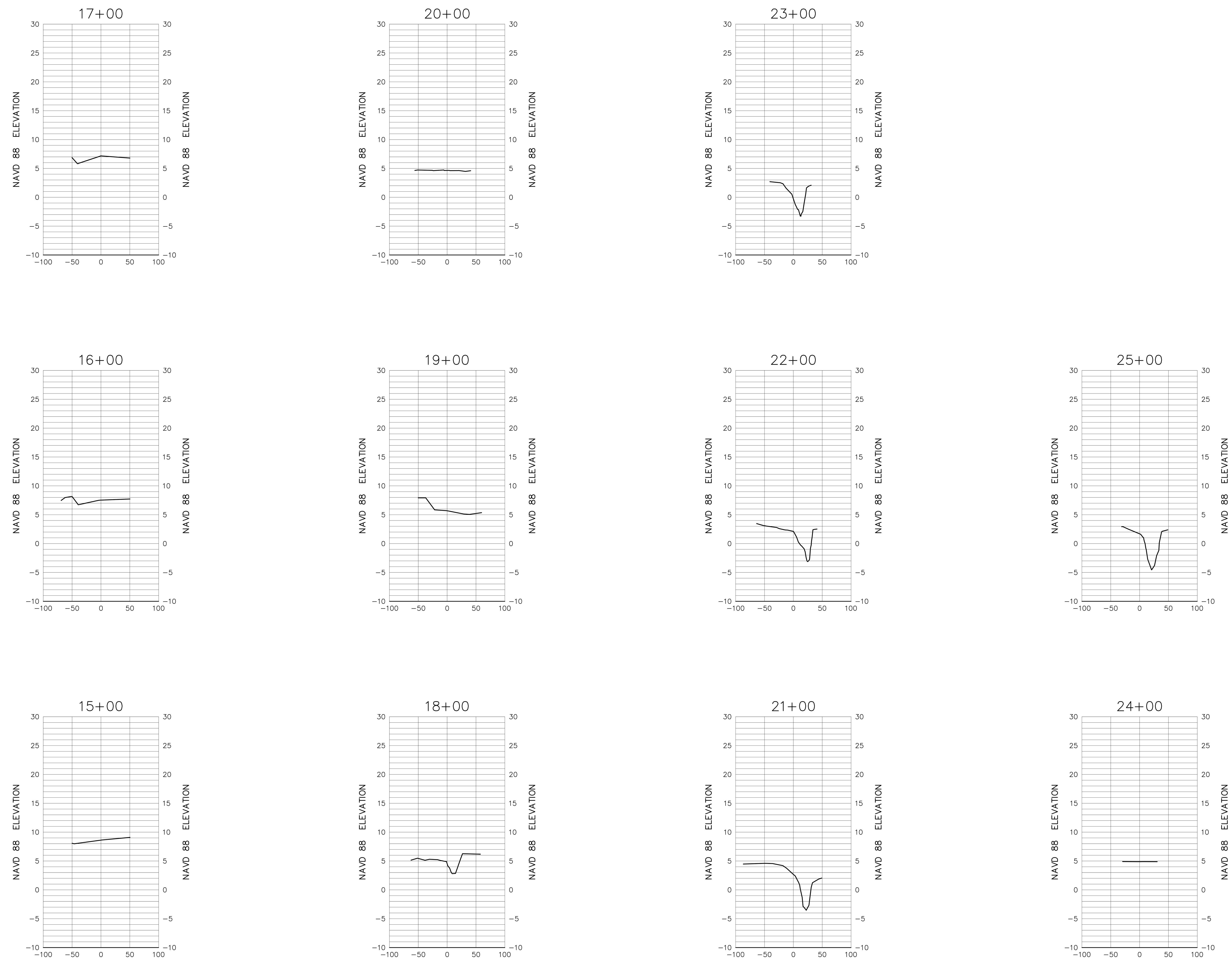
BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA
– FOR –
TAYLOR ENGINEERING, INC.

DRAWN BY	CHECKED BY	FIELD BOOK SEE / PAGE NO. COVER	DATE OF SURVEY
CAG	JRM		–

COMMISSION NO. 5558.00

SCALE AS SHOWN

DATE 5/18/15



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0 10' 20'
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PIPELINE EASEMENT CROSS SECTION VIEW (NAVD 88)

BOUNDARY AND TOPOGRAPHIC SURVEY
PROPOSED F.I.N.D. SITE BV-24A
BREVARD COUNTY, FLORIDA
– FOR –
TAYLOR ENGINEERING, INC.

COMMISSION NO.	SCALE	DATE
5558.00	AS SHOWN	5/18/15

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