



# **NORTH BAY VILLAGE VOGEL PARK MARINE FACILITY PHASE II**

## **TECHNICAL SPECIFICATIONS**

**North Bay Village  
Public Works & Engineering  
1666 Kennedy Causeway, 3<sup>rd</sup> Floor  
North Bay Village, FL 33141**

**Prepared by:**



## **NORTH BAY VILLAGE COMMISSION**

**Brent Latham**  
Mayor

**Dr. Richard Chevrony**  
Vice Mayor

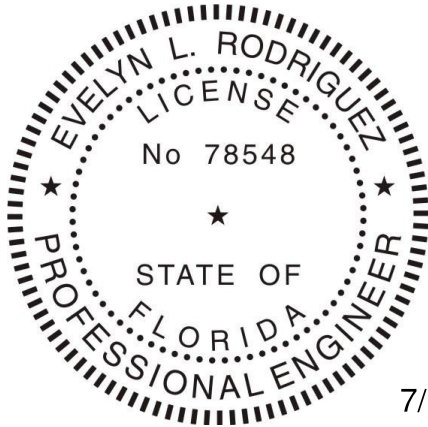
**Goran Cuk**  
Commissioner

**Rachel Strefeld, ESQ**  
Commissioner

**Andy Daro**  
Commissioner

**July 2023**

## LIST OF RESPONSIBLE ENGINEERS OF RECORD



7/17/23

---

CIVIL  
EVELYN L. RODRIGUEZ, P.E.  
FL. REGISTRATION NO. 78548

THIS DOCUMENT HAS BEEN DIGITALLY SIGNED AND SEALED BY EVELYN L RODRIGUEZ , P.E, ON THE DATE ADJACENT TO THE SEAL

PRINT COPIES OF THIS DOCUMENTS ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

EAC CONSULTING  
5959 BLUE LAGOON DR, SUITE 410  
MIAMI FL, 33126

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR THE FOLLOWING SPECIFICATIONS IN ACCORDANCE WITH RULE 61G15-23.004, FAC:  
DIVISION 31, DIVISION 32, DIVISION 33

## TABLE OF CONTENTS

### TECHNICAL SPECIFICATIONS

#### 1.01 DIVISION 31 – EARTHWORK

- A. Section 31 10 00 – Site Clearing
- B. Section 31 20 00 – Earth Moving
- C. Section 31 23 19 – Dewatering
- D. Section 31 50 00 – Excavation Support and Protection

#### 1.02 DIVISION 32 – EXTERIOR IMPROVEMENTS

- A. Section 32 12 16 – Asphalt Paving
- B. Section 32 13 13 – Concrete Paving
- C. Section 32 13 73 – Concrete Paving Joint Sealants

#### 1.03 DIVISION 33 – UTILITIES

- A. Section 33 11 00 – Water Utilities

#### 1.04 LISTING OF APPLICABLE REGULATORY JURISDICTION TECHNICAL SPECIFICATIONS

#### 1.05 APPENDICES

- A. Appendix A – Geotechnical Report

## SECTION 311000

### SITE CLEARING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities and abandoning site utilities in place.
8. Temporary erosion and sedimentation control.

##### 1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.



- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction as indicated on landscape architecture drawings.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

#### 1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
  - 1. Use sufficiently detailed photographs or video recordings.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

#### 1.6 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property shall be coordinated with Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store as designated by Owner.
- D. Utility Locator Service: Notify utility locator service and Call Before You Dig Sunshine One Call before site clearing.

- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.
- B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with Owner requirements and standards.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

### 3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to established requirements.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

### 3.4 EXISTING UTILITIES

- A. Contractor shall arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Contractor shall coordinate and arrange to shut off indicated utilities in coordination with Owner.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify A/E at 15 days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without written permission from Owner and A/E.
- E. Excavate for and remove underground utilities indicated to be removed.

### 3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Grind down stumps and remove roots larger based on requirements specified in landscape architecture plans.
  - 3. Use only hand methods or air spade for grubbing within protection zones.

- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

### 3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
  - 1. Limit height of topsoil stockpiles to 72 inches.
  - 2. Do not stockpile topsoil within protection zones.
  - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
  - 4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

### 3.7 STOCKPILING ROCK

- A. Remove from naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.
  - 1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
  - 1. Limit height of rock stockpiles to 36 inches.
  - 2. Do not stockpile rock within protection zones.
  - 3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.
  - 4. Stockpile surplus rock to allow later use by the Owner.

### 3.8 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
  - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

### 3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

## SECTION 312000

### EARTH MOVING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for walks, pavements and grasses.
3. Subbase course for concrete walks and pavements.
4. Subbase course and base course for asphalt paving.
5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

- B. Related Requirements:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

##### 1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

- E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by A/E. Authorized additional excavation and replacement material will be paid for according to Contract provisions.

2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
  3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by A/E. Unauthorized excavation, as well as remedial work directed by A/E, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades.
- G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
1. Geotextiles.
  2. Geogrid
  3. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
1. Geotextile: 12 by 12 inches
  2. Geogrid
  3. Warning Tape: 12 inches long; of each color.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each [on-site] [and] [borrow] soil material proposed for fill and backfill as follows:
1. Classification according to ASTM D2487.
  2. Laboratory compaction curve according to [ASTM D698] [ASTM D1557].

- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

## 1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

## 1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by A/E.
- C. Utility Locator Service: Notify Sunshine One Call Florida before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.
- E. Do not commence earth-moving operations until plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.



## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification [Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487] [Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145], or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification [Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487] [Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145], or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- I. Sand: ASTM C33/C33M; fine aggregate.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

### 2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
  - a. Grab Tensile Strength: 157 lbf ; ASTM D4632.
  - b. Sewn Seam Strength: 142 lbf ; ASTM D4632.
  - c. Tear Strength: 56 lbf ; ASTM D4533.
  - d. Puncture Strength: 56 lbf ; ASTM D4833.
3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
4. Permittivity: 0.2 per second, minimum; ASTM D4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
  - a. Grab Tensile Strength: 247 lbf ; ASTM D4632.
  - b. Sewn Seam Strength: 222 lbf ; ASTM D4632.
  - c. Tear Strength: 90 lbf ; ASTM D4533.
  - d. Puncture Strength: 90 lbf ; ASTM D4833.
3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
4. Permittivity: 0.02 per second, minimum; ASTM D4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

## 2.3 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.

5. Green: Sewer systems.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils. Remove temporary protection before placing subsequent materials.

### 3.2 DEWATERING

- A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- E. Obtain dewatering permit from regulatory jurisdictions.

### 3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

### 3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms other than at footings.
    - b. 12 inches outside of concrete forms at footings.
    - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches beneath bottom of concrete slabs-on-grade.
    - f. 6 inches beneath pipe in trenches and the greater of 24 inch wider than pipe or 42 inches wide.
- B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
    - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
  2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms other than at footings.
    - b. 12 inches outside of concrete forms at footings.
    - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches beneath bottom of concrete slabs-on-grade.
    - f. 6 inches beneath pipe in trenches and the greater of 24 inch wider than pipe or 42 inches wide.

### 3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch . If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch . Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements established in landscape architecture drawings.

### 3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### 3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

### 3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade with a pneumatic-tired [and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for [unit prices] [changes in the Work].
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by A/E.
  1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### 3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring, bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud.

### 3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Initial Backfill:
  - 1. Soil Backfill: Place and compact initial backfill of [subbase material] [satisfactory soil], free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

- a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
  - 2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- G. Final Backfill:
- 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
  - 2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### 3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud.

### 3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.



- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to [ASTM D698] [ASTM D1557]:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at [95] <Insert number> percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent except if otherwise specified by regulatory standards and indicated on drawings.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent except if otherwise specified by regulatory standards and indicated on drawings.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent except if otherwise specified by regulatory standards and indicated on drawings.

### 3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
  - 1. Grass or Unpaved Areas: Plus or minus 1 inch
  - 2. Walks: Plus or minus 1 inch
  - 3. Pavements: Plus or minus 1/2 inch
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### 3.17 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698
  2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

### 3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place base course material over subbase course under hot-mix asphalt pavement.
  3. Shape subbase course and base course to required crown elevations and cross-slope grades.
  4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
  5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698 and ASTM D1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D698 and ASTM D1557.

### 3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place drainage course 6 inches or less in compacted thickness in a single layer.

3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

### 3.20 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
  2. Determine that fill material classification and maximum lift thickness comply with requirements.
  3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:
  1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
  2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades to 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.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
  - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

## SECTION 312319

### DEWATERING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes construction dewatering.
- B. Related Requirements:
  - 1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

##### 1.3 ALLOWANCES

- A. Dewatering observation wells are part of dewatering allowance or payment.

##### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
  - 3. Review geotechnical report.
  - 4. Review proposed site clearing and excavations.
  - 5. Review existing utilities and subsurface conditions.
  - 6. Review observation and monitoring of dewatering system.

##### 1.5 ACTION SUBMITTALS

- A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
  - 1. Include plans, elevations, sections, and details.
  - 2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, hydrogeologist and professional engineer.
- B. Field quality-control reports.
- C. Existing Conditions: Using photographs and video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.
- D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer, hydrogeologist and professional engineer that are specialized in design of dewatering systems and dewatering work.

## 1.8 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
  1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
  2. The geotechnical report is referenced elsewhere in Bid Documents.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic

pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
  2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
  3. Prevent surface water from entering excavations by grading, dikes, or other means.
  4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
  5. Remove dewatering system when no longer required for construction.
- B. Regulatory Requirements: Secure all applicable local permits (DERM/RER and North Bay Village) Permits. Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
  2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Protect and maintain temporary erosion and sedimentation controls, during dewatering operations.

### 3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
  - 1. Space well points or wells at intervals required to provide sufficient dewatering.
  - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

### 3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
  - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
  - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
  - 3. Maintain piezometric water level a minimum below bottom of excavation as directed by hydrogeologist and professional engineer.
- C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum below overlying construction .

### 3.4 FIELD QUALITY CONTROL

- A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.



1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
  2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
  3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.
- B. Survey-Work Benchmarks: Resurvey benchmarks during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify A/E if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
- C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

### 3.5 PROTECTION

- A. Protect and maintain dewatering system during dewatering operations.
- B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 312319

## SECTION 315000

### EXCAVATION SUPPORT AND PROTECTION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Requirements:
  - 1. Section 312000 "Earth Moving" for excavating and backfilling, for controlling surface-water runoff and ponding, and for dewatering excavations.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.
- B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.
  - 1. Include plans, elevations, sections, and details.
  - 2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
  - 3. Indicate type and location of waterproofing.
  - 4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.
- C. Delegated-Design Submittal: For excavation support and protection systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:

1. Land surveyor.
  2. Professional Engineer: Experience with providing delegated-design engineering services of the type indicated, including documentation that engineer is licensed in the state in which Project is located.
- B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Existing Conditions: Using photographs and video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

## 1.5 CLOSEOUT SUBMITTALS

- A. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

## 1.6 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility-serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
1. Notify A/E and Owner no fewer than five days in advance of proposed interruption of utility.
  2. Do not proceed with interruption of utility without Owner's written permission.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design excavation support and protection systems to resist all lateral loading and surcharge, including but not limited to, retained soil, groundwater pressure, adjacent building loads, adjacent traffic loads, construction traffic loads, material stockpile loads, and seismic loads, based on the following:
1. Compliance with OSHA Standards and interpretations, 29 CFR 1926, Subpart P.
  2. Compliance with AASHTO Standard Specification for Highway Bridges or AASHTO LRFD Bridge Design Specification, Customary U.S. Units.

3. Compliance with requirements of authorities having jurisdiction.
4. Compliance with utility company requirements.

## 2.2 MATERIALS

- A. Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A36/A36M, ASTM A690/A690M, or ASTM A992/A992M.
- C. Steel Sheet Piling: ASTM A328/A328M, ASTM A572/A572M, or ASTM A690/A690M; with continuous interlocks.
- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness
- E. Shotcrete: Comply with regulatory and jurisdictional requirements for materials and mixes, reinforcement, and shotcrete application.
- F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- G. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- H. Tiebacks: Steel bars, ASTM A722/A722M.
- I. Tiebacks: Steel strand, ASTM A416/A416M.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
  1. Shore, support, and protect utilities encountered.

### 3.2 INSTALLATION - GENERAL

- A. Locate excavation support and protection systems clear of permanent construction, so that construction and finishing of other work is not impeded.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

- C. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

### 3.3 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation.
  - 1. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement.
  - 2. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.
  - 3. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment
- B. Install wood lagging within flanges of soldier piles as excavation proceeds.
  - 1. Trim excavation as required to install lagging.
  - 2. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

### 3.4 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.
- B. Accurately place the piling using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer.
  - 1. Limit vertical offset of adjacent sheet piling to 60 inches.
  - 2. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- C. Cut tops of sheet piling to uniform elevation at top of excavation.

### 3.5 TIEBACKS

- A. Drill, install, grout, and tension tiebacks.
- B. Test load-carrying capacity of each tieback, and replace and retest deficient tiebacks.
  - 1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.
- C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### 3.6 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
  - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
  - 2. Install internal bracing if required to prevent spreading or distortion of braced frames.
  - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### 3.7 MAINTENANCE

- A. Monitor and maintain excavation support and protection system.
- B. Prevent surface water from entering excavations by grading, dikes, or other means.
- C. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

### 3.8 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks regularly but no longer than weekly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.
  - 1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
  - 2. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

### 3.9 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures.
  - 1. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
  - 2. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction, and abandon remainder.

3. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
  4. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

## SECTION 321216

### ASPHALT PAVING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:

- 1. Hot-mix asphalt paving.
- 2. Hot-mix asphalt overlay.
- 3. Cold milling of existing asphalt pavement.
- 4. Hot-mix asphalt patching.

- B. Related Requirements:

- 1. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
- 2. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
- 3. Section 321400 "Unit Paving" for bituminous setting bed for pavers and for stone and precast concrete curbs.

##### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

- 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
  - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
  - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: Include technical data and tested physical and performance properties.
  - 1. Paving geotextile/geogrid
  - 2. Joint sealant.



B. Hot-Mix Asphalt Designs:

1. Certification, by authorities having jurisdiction, of approval of each hot-mix asphalt design proposed for the Work.
2. For each hot-mix asphalt design proposed for the Work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: FDOT certification for paving-mix plant.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Paving-mix plant registered with and approved by FDOT
- B. Testing Agency Qualifications: Qualified in accordance with ASTM D3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of FDOT for asphalt paving work.
  1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  1. Prime Coat: Minimum surface temperature of 60 deg F or as specified in FDOT Standard Specifications (current edition)
  2. Tack Coat: Minimum surface temperature of 60 deg F or as specified in FDOT Standard Specifications (current edition)
  3. Asphalt Binder Course: Minimum surface temperature of 40 deg F or as specified in FDOT Standard Specifications (current edition)
  4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (or as specified in FDOT Standard Specifications (current edition) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.

- B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
  - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D242/D242M rock or slag dust, hydraulic cement, or other inert material.

## 2.2 ASPHALT MATERIALS

- A. Asphalt Binder: As specified in FDOT Standard Specifications (current edition)
- B. Asphalt Cement: As specified in FDOT Standard Specifications (current edition)
- C. Cutback Prime Coat: As specified in FDOT Standard Specifications (current edition)
- D. Emulsified Asphalt Prime Coat: As specified in FDOT Standard Specifications (current edition)
- E. Tack Coat: As specified in FDOT Standard Specifications (current edition).
- F. Fog Seal: As specified in FDOT Standard Specifications (current edition).
- G. Water: Potable.
- H. Undersealing Asphalt: ASTM D3141/D3141M; pumping consistency.

## 2.3 AUXILIARY MATERIALS

- A. Sand: ASTM D1073 Grade No. 2 or No. 3.
- B. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- C. Joint Sealant: As specified in FDOT Standard Specifications (current edition)

## 2.4 MIXES

- A. Hot-Mix Asphalt: As specified in FDOT Standard Specifications (current edition)
- B. Provide mixes with a history of satisfactory performance in project area
- C. Emulsified-Asphalt Slurry: As specified in FDOT Standard Specifications (current edition)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

### 3.3 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
  - 1. Mill to a depth as specified in drawings.
  - 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
  - 3. Control rate of milling to prevent tearing of existing asphalt course.
  - 4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
  - 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
  - 6. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.
  - 7. Keep milled pavement surface free of loose material and dust.
  - 8. Do not allow milled materials to accumulate on-site.

### 3.4 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into

perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
  - 1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
  - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

### 3.5 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
  - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch
  - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
  - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
  - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

### 3.6 SURFACE PREPARATION

- A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.
- B. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
- C. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.7 INSTALLATION OF PAVING GEOTEXTILE

- A. Place paving geotextile / geo-grid promptly in accordance with manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.
- B. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

### 3.8 HOT-MIX ASPHALT PLACEMENT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt binder course in number of lifts and thicknesses indicated.

2. Place hot-mix asphalt surface course in single lifts.
  3. Spread mix at a minimum temperature as specified in FDOT Standard Specifications (current edition)
  4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
  2. Complete a section of asphalt binder course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.9 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat to joints.
  2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time.
  5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.10 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
1. Complete compaction before mix temperature cools to 185 deg F
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  - 1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with ASTM D6927, but not less than 94 percent or greater than 100 percent.
  - 2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.11 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:
  - 1. Binder Course: As specified in FDOT Standard Specifications (current edition)
  - 2. Surface Course: As specified in FDOT Standard Specifications (current edition)
- B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Binder Course: As specified in FDOT Standard Specifications (current edition)
  - 2. Surface Course: As specified in FDOT Standard Specifications (current edition)
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

### 3.12 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness in accordance with ASTM D3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

### 3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with ASTM D979/D979M
  1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041/D2041M, and compacted in accordance with job-mix specifications.
  2. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726/D2726M.
    - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
    - b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950/D2950M and coordinated with ASTM D1188 or ASTM D2726/D2726M.
- F. Replace and compact hot-mix asphalt where core tests were taken.
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

### 3.14 WASTE HANDLING

- A. General: Handle asphalt-paving waste in accordance with approved waste management plan.

END OF SECTION 321216



**SECTION 321313**  
**CONCRETE PAVING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes Concrete Paving

- 1. Driveways.
- 2. Roadways.
- 3. Parking lots.
- 4. Curbs and gutters.
- 5. Walks.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete for general building applications of concrete.

**1.3 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

- B. W/C Ratio: The ratio by weight of water to cementitious materials.

- a. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

- C. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:

- 1. Exposed Aggregate: 10-lb Sample of each mix.

- D. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Ready-mix concrete plant and testing agency.
- B. Material Certificates: For the following, from manufacturer:
  - 1. Cementitious materials.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Fiber reinforcement.
  - 4. Admixtures.
  - 5. Curing compounds.
  - 6. Applied finish materials.
  - 7. Bonding agent or epoxy adhesive.
  - 8. Joint fillers.
- C. Material Test Reports: For each of the following:
  - 1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

## 1.7 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

### 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

### 2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from steel wire into flat sheets. (In accordance with prevailing FDOT standard specifications)
- B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet. (In accordance with prevailing FDOT standard specifications)
- C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A, plain steel. (In accordance with prevailing FDOT standard specifications)
- D. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed. (In accordance with prevailing FDOT standard specifications)
- E. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A615/A615M, Grade 60 deformed bars. (In accordance with prevailing FDOT standard specifications)
- F. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M; with ASTM A615/A615M, Grade 60 deformed bars. (In accordance with prevailing FDOT standard specifications)

- G. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 deformed bars; assembled with clips. (In accordance with prevailing FDOT standard specifications)
- H. Plain-Steel Wire: ASTM A1064/A1064M (In accordance with prevailing FDOT standard specifications)
- I. Deformed-Steel Wire: ASTM A1064/A1064M. (In accordance with prevailing FDOT standard specifications)
- J. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A; coated (In accordance with prevailing FDOT standard specifications)
- K. Joint Dowel Bars: ASTM A615/A615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs. (In accordance with prevailing FDOT standard specifications)
- L. Epoxy-Coated, Joint Dowel Bars: ASTM A775/A775M; with ASTM A615/A615M, Grade 60 plain-steel bars. (In accordance with prevailing FDOT standard specifications)
- M. Tie Bars: ASTM A615/A615M, Grade 60; deformed. (In accordance with prevailing FDOT standard specifications)
- N. Hook Bolts: ASTM A307, Grade A internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt. (In accordance with prevailing FDOT standard specifications)
- O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- Q. Zinc Repair Material: ASTM A780/A780M. (In accordance with prevailing FDOT standard specifications)

## 2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C150/C150M (In accordance with prevailing FDOT standard specifications)
  2. Fly Ash: ASTM C618 (In accordance with prevailing FDOT standard specifications)
  3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
  4. Blended Hydraulic Cement: ASTM C595/C595M (In accordance with prevailing FDOT standard specifications).
- B. Normal-Weight Aggregates: ASTM C33/C33M (In accordance with prevailing FDOT standard specifications).
- C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
1. Aggregate Sizes: In accordance with prevailing FDOT standard specifications
  2. Aggregate Source, Shape, and Color: In accordance with prevailing FDOT standard specifications
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
  2. Retarding Admixture: ASTM C494/C494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
1. Color: As selected by Architect from manufacturer's full range
- G. Water: Potable and complying with ASTM C94/C94M.

## 2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116/C1116M, Type III (In accordance with prevailing FDOT standard specifications)
- B. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116/C1116M, Type III, (In accordance with prevailing FDOT standard specifications).

## 2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182 (In accordance with prevailing FDOT standard specifications)
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B, dissipating.

## 2.7 RELATED MATERIALS

- A. Joint Fillers: (In accordance with prevailing FDOT standard specifications).
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
- F. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
  - 1. Color: As selected by Architect from manufacturer's full range
- G. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

## 2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301 , for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.
- B. Cementitious Materials: In accordance with prevailing FDOT standard specifications
- C. Add air-entraining admixture at manufacturer's prescribed rate (In accordance with prevailing FDOT standard specifications)
- D. Limit water-soluble, chloride-ion content in hardened concrete to percent by weight of cement as required per prevailing FDOT standard specifications
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate (In accordance with prevailing FDOT standard specifications)
- G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.
- H. Concrete Mixtures: Normal-weight concrete. (In accordance with prevailing FDOT standard specifications)

## 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M and ASTM C1116/C1116M. Furnish batch certificates for each batch discharged and used in the Work.
  - 1. When air temperature is between 85 and 90 deg F , reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
  1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
  2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.



- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D3963/D3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Butt Joints: Use epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
  - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals as required by prevailing FDOT standard specifications, unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes
    - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
    - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
  3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- D. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.
- G. Screed paving surface with a straightedge and strike off.
- H. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- I. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- J. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
  - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
  - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
  - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

### 3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
  3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.
1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
  3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb/100 sq. ft. of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
  2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
  3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
  4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.
- D. Rock-Salt Finish: In accordance with prevailing FDOT standard specifications
- E. Pigmented Mineral Dry-Shake Hardener Finish: In accordance with prevailing FDOT standard specifications.

### 3.9 DETECTABLE WARNING INSTALLATION

- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Section 321726 "Tactile Warning Surfacing."
  - 1. Tolerance for Opening Size: In accordance with prevailing FDOT standard specifications
- B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles specified in Section 321726 "Tactile Warning Surfacing." Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Section 321726 "Tactile Warning Surfacing" immediately after screeding concrete surface.

### 3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by [moisture curing] [moisture-retaining-cover curing] [curing compound] [or] [a combination of these] as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

### 3.11 PAVING TOLERANCES

#### A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet- long; unlevelled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch
6. Vertical Alignment of Dowels: 1/4 inch
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch , no minus.
10. Joint Width: Plus 1/8 inch, no minus.

### 3.12 FIELD QUALITY CONTROL

#### A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

#### B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 10 cu. yd. or 500 sq. ft. or fraction thereof of each concrete mixture placed each day.
  - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
  - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

### 3.13 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

## SECTION 321373

### CONCRETE PAVING JOINT SEALANTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Cold-applied joint sealants.
  - 2. Hot-applied joint sealants.
  - 3. Cold-applied, fuel-resistant joint sealants.
  - 4. Hot-applied, fuel-resistant joint sealants.
  - 5. Joint-sealant backer materials.
  - 6. Primers.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Paving-Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of joint sealant and accessory.



## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.

## 1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

### 2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D5893/D5893M, Type NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D5893/D5893M, Type SL.
- C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.
- D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.
- E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T.

## 2.3 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I.
- B. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I or Type II.
- C. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I, II, or III.
- D. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type IV.

## 2.4 COLD-APPLIED, FUEL-RESISTANT JOINT SEALANTS

- A. Fuel-Resistant, Single-Component, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.
- B. Fuel-Resistant, Multicomponent, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 12-1/2 or 25, for Use T.

## 2.5 HOT-APPLIED, FUEL-RESISTANT JOINT SEALANTS

- A. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants: ASTM D7116, Type I or Type II.
- B. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants: ASTM D7116, Type III.

## 2.6 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

## 2.7 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
  - 1. Place joint sealants so they fully contact joint substrates.
  - 2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
    1. Remove excess joint sealant from surfaces adjacent to joints.
    2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

### 3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

### 3.5 PAVING-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within concrete paving
  1. Joint Location:
    - a. Expansion and isolation joints in concrete paving.
    - b. Contraction joints in concrete paving.
    - c. Other joints as indicated.
  2. Joint Sealant: Comply with prevailing FDOT standard specifications requirements.
  3. Joint-Sealant Color: Manufacturer's standard
- B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.
  1. Joint Location:
    - a. Joints between concrete and asphalt paving.
    - b. Joints between concrete curbs and asphalt paving.
    - c. Other joints as indicated.

2. Joint Sealant: Comply with prevailing FDOT standard specifications requirements.
  3. Joint-Sealant Color: Manufacturer's standard.
- C. Joint-Sealant Application: Fuel-resistant joints within concrete paving.
1. Joint Location:
    - a. Expansion and isolation joints in concrete paving.
    - b. Contraction joints in concrete paving.
    - c. Other joints as indicated.
  2. Joint Sealant: Comply with prevailing FDOT standard specifications requirements.
  3. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION 321373

## SECTION 331100

### WATER UTILITIES

#### PART 1 GENERAL

##### 1.1 SCOPE

- A. The Contractor shall furnish all labor, equipment, and materials and perform all operations necessary to construct a complete, functioning water distribution system including potable water service, fire line and irrigation system service.
- B. All materials and work performed shall be in accordance with plans, specifications, applicable codes, and standards, and of first-class workmanship.

##### 1.2 SAFETY PROVISIONS

- A. It shall be the responsibility of the Contractor to protect persons from injury and to avoid property damage.
- B. Contractor shall provide and maintain adequate barricades, construction signs, torches, red lanterns and guards during the progress of the construction work and until it is safe for traffic to drive over the trenches in the roadway or traffic pavement areas.
- C. Contractor shall perform all construction in a safe manner, specifically, the rules and regulations of the Occupational Safety and Health Administration (OSHA) and the Manual of Uniform Traffic Control Devices (MUTCD).

##### 1.3 REFERENCES

- A. Miami-Dade Water and Sewer Department
- B. Florida Building Code, all volumes
- C. Florida Fire Prevention Code
- D. Manual of Uniform Traffic Control Devices (MUTCD)
- E. NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances
- F. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings
- G. ASTM B88 - Standard Specification for Seamless Copper Water Tube
- H. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable
- I. ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
- J. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- K. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- L. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing
- M. AWWA C110 - Ductile-Iron and Gray-Iron Fittings
- N. AWWA C500 - AWWA Standard for Metal-Seated Gate Valves for Water Supply Service - International Restrictions
- O. AWWA C600 - Installation of Ductile-Iron Water Mains and their Appurtenances - International Restrictions
- P. AWWA C651 - Disinfecting Water Mains - International Restrictions
- Q. AWWA C800 - Underground Service Line Valves and Fittings - International Restrictions

- R. AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in.(100 mm Through 300 mm), for Water Transmission and Distribution - International Restrictions

#### 1.4 EXISTING UTILITIES

- A. The contractor shall obtain a Sunshine State One Call Center Certification number at least 48 hours prior to beginning any excavation. (Call Sunshine 1-800-638-4097)
- B. Prior to beginning construction, the Contractor shall verify the size, location, elevation, and material of all existing utilities within the area of construction by use of record drawings and/or electronic locating devices.
- C. Existing utility locations shown on the plans are approximate and based on available records.
- D. The Contractor is responsible for verifying all utilities and notifying the A/E of conflicts and variations.
- E. The Contractor is responsible for damage to any existing utilities for which he fails to request locations from the utility owner, and for damage to existing utilities that are properly located.
- F. The Contractor shall immediately notify the A/E, if upon excavation finds the existing utility in conflict with the proposed construction or of a different size or material from that shown on the plans.
- G. Where existing utility structures such as conduits, ducts, pipe branch connections to main sewers, or main drains obstruct the grade or alignment of the pipe, the Contractor shall permanently support, relocate, remove, or reconstruct, the existing structure with the cooperation of the their owners.
  - 1. Do not deviate from the required line or grade except, as directed, in writing by the A/E.

#### 1.5 SHOP DRAWINGS AND SUBMITTALS

- A. Prior to installation, the Contractor shall furnish to the A/E the manufacturers' literature and data for all materials installed under this section for his approval.
- B. Complete As-Built information and plans required before final acceptance of the system.
  - 1. Contractor shall provide accurate record of complete system relative to manholes, cleanouts, services, fittings, pipe size, pipe material, pipe lengths, and the like.
  - 2. Registered Surveyor shall provide all horizontal and vertical information in the Contractor's As-Built information.
  - 3. Provide final approval of the project "As-Built" information from the regulatory agencies having jurisdiction.
  - 4. Contractor shall camera all of the sewer lines and provide the Owner with a copy of the video files.

#### 1.6 APPLICABLE CODES

- A. General: All construction and materials shall conform to the Florida Building Code-Plumbing, all local and national codes where applicable, and Miami-Dade Water and Sewer Department Standards and Specifications
- B. Construction Safety: Perform all construction in a safe manner; follow (OSHA) and the Manual of Uniform Traffic Control Devices (MUTCD) regulations.

- C. Survey Data: All elevations on the plans or referenced in the specifications are based on North American Vertical Datum of 1988 (NAVD).

## 1.7 RELATED DOCUMENTS

- A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under, Division 1, General Requirements, are included as part of this section.

## PART 2 PRODUCTS

### 2.1 PIPE

#### A. GENERAL

1. For water main construction within the public right-of-way, utility easements and service connections refer to Miami-Dade Water and Sewer Department standards and specifications.
2. The water main shall be polyethylene pipe, as indicated on drawings.

### 2.2 VALVES

- A. Gate valves 2½" or less in size shall be standard 125 pound, non-rising stem, bronze, double-disc, screwed type, equipped with hand wheel.
- B. Gate valves over 2½" shall be resilient seat gate valves with iron body, non-rising stem, fully coated disc with rubber seat ring manufactured in accordance with AWWA C500.

### 2.3 VALVE BOXES

- A. Valve boxes shall be of standard extension design manufactured with top cover marked "water."
- B. The top section shall be adjustable for elevation and shall be set to allow equal movement above and below grade.
- C. Provide valve box appropriate in size for the required valve.
- D. Center the base of valve box over the valve and rest firmly on compacted backfill and the entire assembly shall be plumb.
- E. Valve boxes shall be like Figure H-10364, as manufactured by Mueller Company, or an approved equal.

### 2.4 SERVICE CONNECTION

- A. Contractor shall submit shop drawings for piping and fittings.
- B. Contractor is responsible for all costs associated with connections in accordance with Miami-Dade Water and Sewer Standards.



## 2.5 WATER SERVICES

- A. Polyethylene Tubing – Material shall comply with ASTM D1248 and the following:
  - 1. Polyethylene extrusion compound for extruding the polyethylene tubing shall comply with applicable requirements for PE-3406 or 3408 ultra high molecular weight polyethylene plastic material
  - 2. Tubing shall have a working pressure rating of 160 psi at 73.4°F.
  - 3. Tubing must be capable of maintaining pressure of 340 psi at 73.4°F for 1,000 hours when tested in accordance with ASTM D1599.
  - 4. Tubing surfaces shall be free from bumps and irregularities. Materials must be completely homogeneous and uniform in appearance.
  - 5. Tubing dimensions and tolerances shall correspond with the valves listed in ASTM D2737 with a standard dimension ratio (SDR) of 9.
  - 6. Provide label on tubing with brand name and manufacturer, NSF Seal, size, type of plastic material, and ASTM applicable designation with which the tubing complies.
- B. Joints:
  - 1. Joints for polyethylene tubing shall be of the compression type utilizing a totally confined grip seal and coupling nut.
    - a. Provide stainless steel tube stiffener insert for P.E. tubing service.
  - 2. Other type joints may be considered for specific installations, upon submissions of specifications and approval by the EOR.

## 2.6 CORPORATION STOPS

- A. Provide corporation stops manufactured of brass alloy in accordance with ASTM B62.
- B. Inlet thread shall be taper thread in all sizes in accordance with AWWA C800.
- C. Outlet connections shall have a compression type fitting.

## PART 3 EXECUTION

### 3.1 UNLOADING MATERIAL

- A. The Contractor shall exercise care in unloading and handling pipe, valves, fittings, and all other material.
- B. Do not drop pipe from trucks or allow pipe to roll against other pipe.

### 3.2 EXCAVATION

- A. All excavation to conform to Section 31 20 00

### 3.3 SEPARATION OF WATER AND SEWER MAINS

- A. See design drawings for water and sewer separation statement and requirements.

### 3.4 INSTALLATION OF PIPE

- A. Obtain approval of the Building Department, before installing water mains.

- B. All installation of pipe shall conform to AWWA C600.
  - 1. Do not roll or push pipe into the trench from the bank.
  - 2. Contractor shall thoroughly inspect all pipes before lowering into the trench, to insure its sound condition and eliminate the possibility of leakage or bursting under test pressure.
  - 3. Do not use pipes, valves, fittings or any other materials showing defects.
  - 4. Remove all such defective materials from the construction site immediately.
  - 5. Before lowering pipe into the trench, swab or brush it to insure that no dirt or foreign matter is in the finished line.
  
- C. Lay pipe on a flat bottom trench and backfill tamped to 6" above the top of the pipe.
  - 1. Pipe installation shall conform to "Type B Method" as adopted by Committee A21 of the American Standards Association.
  - 2. Provide a firm even bearing throughout the length of each section of pipe.
  - 3. Pipe shall not bear on any un-yielding structures, nor shall it support any other structures.
  - 4. Plug or cap all dead ends, anchor, and hold in place with concrete backing as required.
  - 5. Except while work is in progress, plug all pipe openings to prevent entrance of water or any foreign matter.
  - 6. Remove material deemed unstable for providing adequate support for pipe and replace with a suitable material.
  - 7. Provide an adequate backfill material on the pipe to prevent floating, remove, and relay any pipe that floats as directed by the EOR

### 3.5 JOINTS

- A. All joints shall be suitable for the type of pipe being jointed and shall be made in accordance with manufacturer's recommendations.
  
- B. Compression Joints:
  - 1. Compression joints shall be a rubber seal joint, made pressure tight by a molded rubber gasket and lubricant to facilitate assembly.
  - 2. Make the joint tight by inserting the plain end into the bell after lubrication.
  - 3. The compression joint shall be similar and equal to "Altite" b as manufactured by Alabama Pipe Company.
  - 4. Follow the manufacturer recommendations in making up the joints.

### 3.6 INSTALLATION OF FITTINGS

- A. Applicable portions of these specifications shall apply to installation of fittings.
  
- B. Provide reaction or thrust blocking where changes in pipe diameter occur at reducers or fittings, bends, and tees.
  
- C. Refer to details for concrete strength and dimensions.
  
- D. Provide restrained joints for all fittings and as directed on drawings.

### 3.7 BACKFILL

- A. On completion of pressure and leakage tests, the exposed joints shall be backfilled to a depth of 12" above the top of the pipe.
  - 1. Backfill shall be carefully compacted until 12" of cover exists over the pipe.

2. Place the remainder of the backfill and compacted thoroughly by puddling and tamping.
3. When directed, the contractor may backfill the trench neatly rounded to a sufficient height allowing for settlement to grade after consolidation.

### 3.8 STERILIZATION OF COMPLETED PIPELINE

- A. Before final acceptance of completed pipeline, all requirements of the Building Department shall be satisfied.
  1. Forward satisfactory bacteriological test results from Health Department to EOR.
- B. Prior to chlorination of mains, remove all dirt and foreign matter by high velocity flushing through fire hydrants or other approved blow-offs.
  1. Disinfect the main in accordance with the application sections of AWWA C651 and with local health department requirements.

### 3.9 RESTORATION OF SURFACES

- A. The Contractor shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points, or other disturbed surfaces or structures to a condition equal to that before the work was begun and to satisfaction of the EOR, and shall furnish all labor and materials incidental thereto.
- B. Restoration of surfaces shall comply with all requirements of the applicable governing agencies including Village, County, and State.

### 3.10 CLEANING UP

- A. The Contractor shall remove surplus pipeline material, tools, temporary structures, etc., and as directed by the Village and A/E, shall dispose of all dirt, rubbish, and excess earth.
- B. The construction site shall be left clean, to the satisfaction of the Village and A/E

### 3.11 INSPECTIONS

- A. The Contractor shall notify the Village and the EOR 72 hours prior to beginning construction to arrange the required inspection of the water system.

### 3.12 PROJECT RECORD DOCUMENTS

- A. The Contractor shall maintain accurate and complete records of work items completed.
- B. Prior to the placement of any asphalt or concrete pavement, the Contractor shall submit to the EOR, "as-built" plans showing water improvements.
  1. Paving operations shall not commence until the EOR has reviewed the "as-built."
- C. All "as-built" information submitted to the EOR shall be sufficiently accurate, clear, and legible to satisfy the EOR that the information provides a true representation of the improvements constructed.
- D. Upon completion of construction, the Contractor shall submit to the EOR five complete sets of "as-built" construction drawings and one set of mylars.
  1. Clearly mark these drawings "as-built" show all construction changes and dimensioned locations and elevations of all improvements and signed by the Contractor.
  2. A Professional Land Surveyor registered in the State of Florida shall sign and seal the "As-Built drawings.

- E. "As-built" information on the water system shall include vertical and horizontal locations of all valves, fittings, water services, and connection points.
  - 1. They shall show the associated pipe size and material type, and must also show the sample points and the sample point numbers must conform to the numbers used on the bacteriological test results.

END OF SECTION 331100

## LISTING OF APPLICABLE REGULATORY JURISDICTION TECHNICAL SPECIFICATIONS

### Miami-Dade Water and Sewer Department (WASD)

Design and Construction Standard Specifications and Details (Current Edition)

Section	Description
01011	Site Conditions
01016	Safety Requirements and Protection of Property
01031	Grades, Lines and Levels
01090	Reference Standards
01100	Special Project Procedures
01150	Preconstruction Conference
01340	Shop Drawings
01600	Materials and Equipment Shipping, Handling, Storage and Protection
01710	Cleaning
01720	Project Record Documents
01725	Project As-Builts
01740	Permits
02315	Trenching and Backfilling for Piping Systems
02741	Prime and Tack Coats
02745	Pavement Marking and Traffic Signs
15010	Basic Mechanical Requirements
15060	Piping and Fittings
15065	Miscellaneous Materials
15100	Valves, General
15120	Gates Valves

**Florida Department of Transportation (FDOT)**  
Standard Specifications for Road & Bridge Construction (Current Edition)

<b>Section</b>	<b>Description</b>
100	Construction Equipment- General Requirements
101	Mobilization
102	Maintenance of Traffic
105	Contractor Quality Control General Requirements
107	Litter Removal and Mowing
110	Clearing and Grubbing
120	Excavation and Embankment
125	Excavation for Structures and Pipe
160	Stabilizing
230	Limerock Stabilized Base
285	Optional Base Course
300	Prime and Tact Coat
330	Hot Mix Asphalt- General Construction Requirements
334	Superpave Asphalt Concrete
347	Portland Cement Concrete- NS
350	Cement Concrete Pavement
415	Reinforcing for Concrete
522	Concrete Sidewalk
570	Performance Turf
603	General Requirement for Traffic Control Signals and Devices
901	Coarse Aggregate
902	Fine Aggregate
911	Base and Stabilized Base Materials
914	Stabilized Materials
981	Turf Materials

**Miami-Dade Public Works**  
Standard Specifications for Design and Construction

<b>Section</b>	<b>Description</b>
101	Mobilization
102	Maintenance of Traffic
105	Contractor Quality Control General Requirements
107	Litter Removal and Mowing
110	Clearing and Grubbing

120	Earthwork and Related Operations
160	Type "B" Stabilization
200	Limerock Base
327	Milling of Existing Asphalt Pavement
334	Hot Mix Asphalt
344	Portland Cement Concrete
522	Concrete Sidewalk
575	Sodding
600	General Provisions For Traffic Control Devices

**APPENDIX A**

**GEOTECHNICAL REPORT**



# **EAC CONSULTING, INC**

**Vogel Marine Park Facility  
North Bay Village  
Miami-Dade County, FL  
GCES Project No. G10201005-2**

## **Geotechnical Engineering Services Report of Subsurface Exploration**



### **GCES ENGINEERING SERVICES, LLC**

10860 NW 138th Street, Unit 4  
Hialeah Gardens, FL 33018  
305.964.0669 | C: 954.440.8623  
[www.gces-usa.com](http://www.gces-usa.com)

**March 19, 2021  
(Rev May 12, 2021)**

March 19, 2021 (Revised May 12, 2021)

Evelyn Rodriguez, P.E., ENV SP  
Assistant Project Manager  
EAC Consulting, Inc.  
5959 Blue Lagoon Drive, Suite 410  
Miami, FL 33126

Subject: Geotechnical Engineering Services  
Report of Subsurface Exploration  
Vogel Marine Park Facility  
North Bay Village, Miami-Dade County, FL  
GCES Project Number G10201005-2


Dear Evelyn:

GCES Engineering Services, LLC (GCES) has completed the Geotechnical Report for the North Bay Village Vogel Marine Park Facility Assessment for the above referenced project. This work was performed as authorized in our agreement with EAC Consulting, Inc.

The report presents the results of our field exploration and laboratory testing programs along with our geotechnical data for use in design of the proposed seawalls.

We appreciate the opportunity to provide our services on this project. If you have any questions concerning the information provided, please do not hesitate to contact our office.

**GCES ENGINEERING SERVICES, LLC**

  
Dhayana Chacon  
Engineering Staff

  
Alejandro R. Montenegro, P.E.  
Senior Geotechnical Engineer  
Florida PE # 59426



**TABLE OF CONTENTS**

**1.0 INTRODUCTION..... 1**

1.1 GENERAL ..... 1

1.2 PROJECT LOCATION ..... 1

1.3 PROJECT DESCRIPTION ..... 1

**2.0 SCOPE OF SERVICES..... 1**

**3.0 FIELD EXPLORATION AND LABORATORY TESTING ..... 2**

3.1 STANDARD PENETRATION TEST (SPT) ..... 2

3.2 WATER LEVEL MEASUREMENTS..... 3

3.3 LABORATORY TESTING..... 3

**4.0 SITE AND SUBSURFACE CONDITIONS ..... 4**

4.1 SITE CONDITIONS ..... 4

4.2 SOIL SURVEY ..... 5

4.3 SUBSURFACE CONDITIONS..... 6

4.3.1 REGIONAL GEOLOGY..... 6

4.3.2 STANDARD PENETRATION TEST (SPT) ..... 7

4.4 GROUNDWATER CONDITIONS ..... 8

**5.0 EVALUATIONS AND RECOMMENDATIONS ..... 8**

5.1 PILE SYSTEMS ..... 9

5.2 GEOTECHNICAL DESIGN PARAMETERS ..... 9

**6.0 CONSTRUCTION CONSIDERATIONS ..... 10**

**7.0 ADDITIONAL CONSTRUCTION CONSIDERATIONS ..... 11**

7.1 QUALITY ASSURANCE ..... 11

**8.0 LIMITATIONS ..... 11**

**APPENDICES**

**APPENDIX A**

Vicinity Map - Figure 1  
Boring Location Plan - Figure 2  
Soil Survey Map - Figure 3

**APPENDIX B**

Boring Log – (B-1)

**APPENDIX C**

General Notes  
Unified Soil Classification System  
Field Exploratory Description  
Laboratory Testing Description

## **1.0 INTRODUCTION**

### **1.1 GENERAL**

GCES Engineering Services, LLC, (GCES) has completed the subsurface exploration for the proposed police boat dock and Kayak at Vogel Marine Park in North Bay Village, Miami-Dade County, Florida.

This report describes the subsurface conditions encountered in the boring, analyzes and evaluates the field and laboratory test data, and provides geotechnical information for the design of the proposed police boat dock and Kayak.

### **1.2 PROJECT LOCATION**

The subject sites is located at 7920 West Dr in North Bay Village, FL. We have appended a project Vicinity Map, Figure 1, which identifies the location of each study area. This map is presented in Appendix A.

### **1.3 PROJECT DESCRIPTION**

GCES understands that the project consists of a police boat dock and a new kayak launch at Vogel Park. We have assumed the police boat dock and the kayak launch will be a permanent concrete platform structure on the water supported by piles. Ground surface and mud elevations at the boat dock and kayak locations were provided by EAC and prepared by Sea Diversified Inc, dated March 2021. Based on the elevations shown on the drawings, the ground surface elevation at the boring location is approximately at El. +4.5 (NAVD 88).

If any of our understandings is not correct or if the structure differs from the characterization we have provided in this report, please inform us immediately so that we may re-evaluate our analyses.

## **2.0 SCOPE OF SERVICES**

Our services for this project consisted of providing the following geotechnical engineering services:

- Conducted a field reconnaissance prior to the subsurface exploration.

- Assessed conditions with respect to the drilling equipment access, general topographic site conditions, property restrictions, overhead utilities, and utility underground.
- Marked the boring location in the field by GCES personnel using layout procedures.
- Coordinated with utility locating service to locate utilities within rights-of-ways and easements for the boring.
- Reviewed of available subsurface test data, such as the "Soil Survey of Miami-Dade County, Florida" published by the United States Department of Agriculture (USDA).
- Performed one Standard Penetration Test (SPT) boring within the existing park to a depth of 40 feet deep below existing grades.
- Visually classified soil samples using the Unified Soil Classification System (USCS) and performed laboratory tests on selected representative samples to evaluate the physical and engineering properties of the strata observed.
- Provide estimated soil design parameters (i.e. unit weights, angle of friction and earth pressure coefficients) for use in pile design.
- Reviewed field and laboratory data, then prepared an engineering report summarizing our field and laboratory testing, subsurface soil and groundwater conditions for design of the proposed structure.

### **3.0 FIELD EXPLORATION AND LABORATORY TESTING**

#### **3.1 STANDARD PENETRATION TEST (SPT)**

GCES's field exploration consisted of performing one (1) Standard Penetration Test (SPT) boring, B-1 to a depth of 40 feet below existing grade for the proposed seawalls. The field exploration was conducted on March 11, 2021.

The boring was performed in an area accessible to our drilling equipment and in area that was not conflicting with existing underground utilities.

The SPT boring was performed using a truck-mounted drill rig equipped with a calibrated automatic hammer. The borehole was advanced using drilling mud techniques and casing. The boring was performed in general accordance with ASTM Standard D-1586.

The SPT boring was continuously sampled in the upper 10 feet. Thereafter, the sampling interval was every 5 feet. The boring was logged by the on-site personnel during the field exploration. Disturbed soil samples were placed in glass jars or sealed plastic bags and returned to our laboratory for additional visual classification by a GCES Engineer. Upon completion of the SPT boring, the borehole was backfilled with cement grout, the surface restored (with cold mix asphalt where applicable), and the site cleaned as required.

The results of the SPT tests are presented on the boring log included in Appendix B. The boring log represent an interpretation of the field log and includes modifications based on a geotechnical engineer's visual classification of the samples returned to the laboratory.

A brief description of the field exploration procedures employed in our subsurface investigation is provided in Appendix C of this report.

### **3.2 WATER LEVEL MEASUREMENTS**

Water level depths were obtained during the test boring operations. In relatively previous soils, such as sandy (granular) soils, the indicated depths are usually groundwater levels. Seasonal variations, tidal conditions, temperature, land use, and recent rainfall conditions may influence the depths of the groundwater.

### **3.3 LABORATORY TESTING**

Representative samples collected from the SPT boring were visually reviewed in the laboratory by a geotechnical engineer to confirm the field classifications. The descriptions of the soils indicated in the boring log are in general accordance with the enclosed General Notes, Unified Soil Classification System (USCS), and American Society of Testing and materials (ASTM-2488).

The classification was based on visual observations, texture, and consistency with the aids of laboratory testing. The tests were performed on selected samples believed to be representative of the materials encountered. Designated group symbols according to the Unified Soil Classification System are given on the boring log.

A summary of the laboratory test results are provided in the Table below.

**Summary of Laboratory Tests**

<b>TEST BORING #</b>	<b>SAMPLE DESCRIPTION</b>	<b>SAMPLE DEPTH INTERVAL (FEET)</b>	<b>NO. 200 SIEVE PERCENT PASSING (%)</b>	<b>ORGANIC CONTENT (%)</b>	<b>MOISTURE CONTENT (%)</b>	<b>USCS CLASSIFICATION</b>
B-1	Fine SAND, Trace Limerock Fragments	6 -8	9	-	17	SP, FILL
B-1	ORGANIC Silty Fine SAND, Trace Limestone and Shell Fragments	13 -15	-	5	37	OL
B-1	Silty Fine SAND, Trace Limestone Fragments	38 -40	17	-	24	SM

A brief description of the USCS classification system is attached to this report, Appendix C. A brief description of the laboratory testing procedure employed in our subsurface investigation is provided in Appendix C of this report.

**4.0 SITE AND SUBSURFACE CONDITIONS**

**4.1 SITE CONDITIONS**

Our understanding of the existing site conditions is based on the information provided to us by EAC Consulting and our observations during the field exploration.



The area where the boring was performed was covered by grass and it appears relatively level. Biscayne bay is situated to the west of the park. The areas adjacent are generally developed and include residential\commercial\office activities.

#### **4.2 SOIL SURVEY**

The Soil Surveys of Miami-Dade County, Florida, as prepared by the U.S. Department of Agriculture, Soil Conservation Service (later renamed the Natural Resource Conservation Service), dated 1967, identifies one soil type at and near the subject site as follows:

**15 - Urban Land**. This map unit is in areas where more than 85 percent of the surface is covered by shopping centers, parking lots, streets, sidewalks, airports, large buildings, houses, and other structures. The natural soil cannot be observed. The soils in open areas, mostly lawns, vacant lots, playgrounds, and parks, are mainly Udorthents.

These soils generally have been altered by land grading and shaping or have been covered with about 18 inches of extremely stony, loamy fill material. Areas of these soils are so small that mapping them separately is impractical. We note that the maximum depth of the survey is six feet.

The soil survey of Miami-Dade County, Florida from 1947 as prepared by the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) was also reviewed. Based on our review, the survey revealed that at the time the survey was conducted, the soils were described as Made Land. This land type was built up from dredging from the bay bottoms in the vicinity of Miami and Miami Beach. Made land is used mainly as building sites for homes, hotels and business establishments.

A USDA Soil Survey Map of the site, Figure 3, is included in Appendix A.

It should be noted that 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 soil types on the Soil Survey maps are approximate.

### **4.3 SUBSURFACE CONDITIONS**

#### **4.3.1 REGIONAL GEOLOGY**

Miami-Dade County is located in the Coastal Lowlands region of the Florida peninsula. The coastal lowlands consist of nearly level plains, and within Dade County the land surface is generally below Elevation +25 MSL. The surficial soils are comprised of pockets and remnants of Pamlico Sands. The sands are underlain by Miami Limestone (oolitic limestone) followed by limestone and/or sandstone and sand lenses of the Fort Thompson and Tamiami Formations.

The Pamlico Formation is composed of non-fossiliferous, unconsolidated quartz fine sand. Except where outcrops of limestone and man-made fills occur, this formation covers the Miami Limestone. Miami Limestone can be found at or near the surface in the Miami-Dade area. This formation is an oolitic limestone that is generally less than 40 feet thick. It characteristically contains large quantities of ooliths, which are small, spherical particles formed when calcite or aragonite was deposited in concentric layers around a nucleus of some type.

This formation contains solution channels in the limestone which may be up to several feet in diameter at some locations and are filled with quartz fine sand and uncemented calcareous materials. The limestone varies in both thickness and competency within the investigated area. The degree of cementation, and therefore the competency of the rock, was influenced by both the abundance and the type of calcareous material in the original deposit.

The Fort Thompson Formation, which consists of interbedded limestone, sand, and shells, is one of the most productive units within the Biscayne aquifer. It averages 50 to 70 feet in thickness. It typically consists of alternating freshwater and marine sediments, which generally are permeable. The limestone beds in the Fort Thompson Formation can be cavernous and interconnected, thus providing channels through which water can flow.

The Fort Thompson Formation is composed of sediments of variable lithologies. The lithologies include non-fossiliferous quartz fine sand, fossiliferous quartz sandy limestone, coralline limestone, freshwater limestone and quartz sandstone. These lithologies alternate abruptly in thickness and lateral extent.

### **4.3.2 STANDARD PENETRATION TEST (SPT)**

Our understanding of the subsurface conditions at the project site is derived by performing subsurface explorations, our understanding of geological conditions at the project site, and laboratory testing performed on samples recovered from the project site.

Soil stratification is based on an examination of the recovered soil samples, the laboratory testing, and interpretation of field boring log by a geotechnical engineer or geologist. The stratification lines represent the approximate boundaries between soil types of significantly different engineering properties. The actual transition may be gradual.

In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The logs represent the conditions at the boring location only and variations may occur among the boring.

The stratigraphy generally consists of three (3) distinct strata consisting of an upper layer of granular fill; a middle layer of organic silty sand, which is associated with marine sediments deposited on the former sea floor; and a lower layer consisting of alternating layers of limestone, interbedded limestone/sand, and silty sands. The strata are generalized as shown on the following table:

#### **Generalized Site Stratigraphy**

<b>STRATUM</b>	<b>SOIL DESCRIPTION</b>	<b>USCS SOIL CLASSIFICATION</b>
0	TOPSOIL	-
1	Granular FILL comprised of LIMEROCK/SAND/SAND WITH LIMEROCK FRAGMENTS	FILL/SP
2	ORGANIC SILTY SAND	OL
3	LIMESTONE with Fine Sand	
4	SILTY SAND	SM

Standard Penetration Values (N-values) within the upper fill material, Stratum 1, varied from 8 to 18 blows per foot (bpf). A single N-value of 3 bpf was recorded in the in the organic silty fine sand. N values within the Limestone formation, Stratum 3,

ranged from 7 to 28 blows For Stratum 4, the sand recorded a single N-value of 8 bpf.

For a more detailed description of the subsurface conditions encountered, please refer to the boring log in Appendix B.

#### **4.4 GROUNDWATER CONDITIONS**

Groundwater levels were measured while drilling for the presence and level of groundwater. Groundwater levels observed at these times are indicated on the boring log. During the subsurface exploration, groundwater was observed in each of the soil boring at a depth of about 6 feet (el -1.5) below the existing ground surface.

These groundwater level observations provide an approximate indication of the groundwater conditions existing on the site at the time the boring was drilled. It should be noted that fluctuations in the groundwater table can occur due to seasonal variations, tidal conditions, recent rainfall conditions and other site specific conditions.

### **5.0 EVALUATIONS AND RECOMMENDATIONS**

Based on the results of our study, the subsurface conditions appear to be suitable for the proposed police boat dock and kayak to be constructed at Vogel Marine Park in North Bay Village. We have assumed that the proposed police boat dock and kayak platform will be a concrete platform supported by driven piles.

Based on the information provided in our soil boring, the boring found the presence of very soft buried organic silty sand soils (OL) at a depth of about 12 feet (el – 7.5) and extending to a depth of 15 feet (-10.5) below existing ground surface. Organic content measured in the organic silty sand soils was about 5 percent.

Based on the laboratory results, these organic soils demonstrate very poor engineering characteristics, most notably low strength and high compressibility and are considered unsuitable. The presence of these unsuitable soils should be taken into consideration in the design of the piles.

The transition between the very soft organic silty soils to a limestone formation may be to some extent abrupt. The pile contractor should be ready to perform predrilling at the limestone formation immediately below the organic silty soils in order to achieve the design target depth.

The following sections provide discussions regarding geotechnical recommendations for the construction of a police boat dock and a new kayak.

## **5.1 PILE SYSTEMS**

Driven Precast Concrete Piles may be used to support the lateral and compression load for the proposed police boat dock and kayak platform. The driven piles to support the proposed dock and kayak platform should be installed using a barge to provide access to the pile locations. In order to install the driven piles, predrilling of the medium cemented limestone may be needed.

An evaluation of the field data collected was conducted and geotechnical design parameters were obtained based on the empirical correlations and our experiences. Geotechnical parameters for pile evaluation are provided in the next section of the report

## **5.2 GEOTECHNICAL DESIGN PARAMETERS**

Geotechnical parameters for pile evaluation shown in the table below were derived empirically using established relationships between the SPT “N” values, soil/rock properties, literature review and our local experience. The following strata encountered during the performance of the field exploration program have been assigned geotechnical parameters. The table below presents a summary of the geotechnical parameters for use in pile analysis and design.

**SUMMARY OF GEOTECHNICAL DESIGN SOIL/ROCK PARAMETERS**

Stratum	Material Type	Approximate Layer Thickness (feet) (*)	Unit Weight (pcf)		Friction Angle (Degrees)	Allowable Side Shear, fs (tsf)	Wall Friction Angle, $\delta$ (Degrees)	Earth Pressure Coefficients		
			Total	Eff.				Active	Passive	At-Rest
			$\gamma$	$\gamma'$						
1	FILL	13.5	115	53	31	-	23	0.32	3.12	0.48
2	ORGANIC SILTY SAND	2	80	18	-	-	-	-	-	-
3	LIMESTONE	20	120	58	37	(*) 0.5 – 1.0	28	0.25	4.02	0.40
4	SAND	5	108	46	30	0.5	23	0.33	3.00	0.50

**Notes:**

Depths measured from existing grade at time of boring.

Groundwater shall be assumed at the ground surface for calculation design purposes

Refer to the boring log for Complete Soil Description

At rest earth pressure,  $K_o$ , is calculated as  $1 - \sin \phi$  for sands.

Friction angle between concrete and soil should be taken as  $\phi = 3/4 \phi$  (NAVFAC DM-7.2)

Limestone layers modeled as sand to sandy gravel for estimation of friction angle,  $\phi$ . Friction Angle,  $\phi = N/4 + 33$ .

Strata 0 is topsoil. This top layer should be ignored for calculation purposes.

(\*) Use lower shear value for the weakly limestone layer (22 ft to 28 ft from ground surface level)

**6.0 CONSTRUCTION CONSIDERATIONS**

The following are our suggestions for the installation of the proposed piles based on the results of the test boring.

It should be noted that pile refusal may occur on a random and unpredictable basis since zones of dense rock/soils may be encountered. In this case, we recommend that predrilling be considered prior to the installation of the piles. Predrilling is required in order to prevent refusal conditions, damage of the structural section of the pile and minimize vibrations-induced settlements to nearby structures. Following predrilling, the piles should be set in place and driven to the required tip elevations.

The pile installation equipment will produce vibration and noise levels that may be considered disturbing to people and can produce vibrations noticeable in structures. The potential for damage to any adjacent structures during the pile installations will be dependent on the distance from the adjacent structures to the location of the piles installation, the subsurface conditions, and the level of sensitivity of the structure to any type of vibration. The recommendations provided in Section 455-1.1 in the latest version of the FDOT Standard Specifications for Road and Bridge Construction should be followed for the protection of the existing structures during sheet piling operations. All those structures and or utilities located adjacent to the proposed excavation shall be surveyed as well as monitored for vibrations and settlements in accordance with Section 455-1.1 of the latest version of the FDOT Standard Specifications for Road and Bridge Construction

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that GCES is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

## **7.0 ADDITIONAL CONSTRUCTION CONSIDERATIONS**

### **7.1 QUALITY ASSURANCE**

We recommend establishing a comprehensive quality assurance program to verify that all foundation construction is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by GCES. In-situ density tests should be conducted during backfilling activities to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for each of the different natural and fill soils encountered.

## **8.0 LIMITATIONS**

The evaluations presented in this Report of Geotechnical Exploration were prepared for exclusive use of EAC Consulting, Inc. for specific application of the proposed police boat dock and kayak at Vogel Marine Park Facility in North Bay Village, Miami-Dade County, FL. The scope of investigation was intended to specifically evaluate subsurface conditions within the influence of the proposed



structures mentioned herein. These evaluations and recommendations were prepared using generally accepted standards of geotechnical engineering practices. No other warranty is expressed or implied.

Our geotechnical engineering evaluation of the site and subsurface conditions with respect to structures submittal and our recommendations are based upon the following: 1) site observations; 2) the field exploratory test data obtained during this phase of the study, and 3) our understanding of the project information as presented in this report.

Since this is an exploration, further consultation with GCES during the design process will be required so that these recommendations can be adjusted to the actual design. Furthermore, upon the discovery of any site or subsurface condition during construction which appears to deviate from the data presented and documented herein, please contact us immediately so that we may visit the site, observe the differing conditions, and thus evaluate this new information concerning these recommendations.

The recommendations presented represent design information that GCES believes are both applicable and feasible for the planned construction and as noted above, it is based on the information provided to GCES as summarized.

Involvement of the geotechnical engineer during the design process and subsequently with the construction process is vitally important to ensure the project is constructed in accordance with the recommendations from the geotechnical report. Should subsurface changes be encountered, early involvement of the geotechnical engineer can hasten subsequent recommendations. In addition, if varying subsurface conditions are encountered, resolutions can be obtained more quickly.

The assessment of site environmental conditions for the presence of contaminants in the soil, rock, surface, or groundwater of the site was beyond the scope of this exploration.

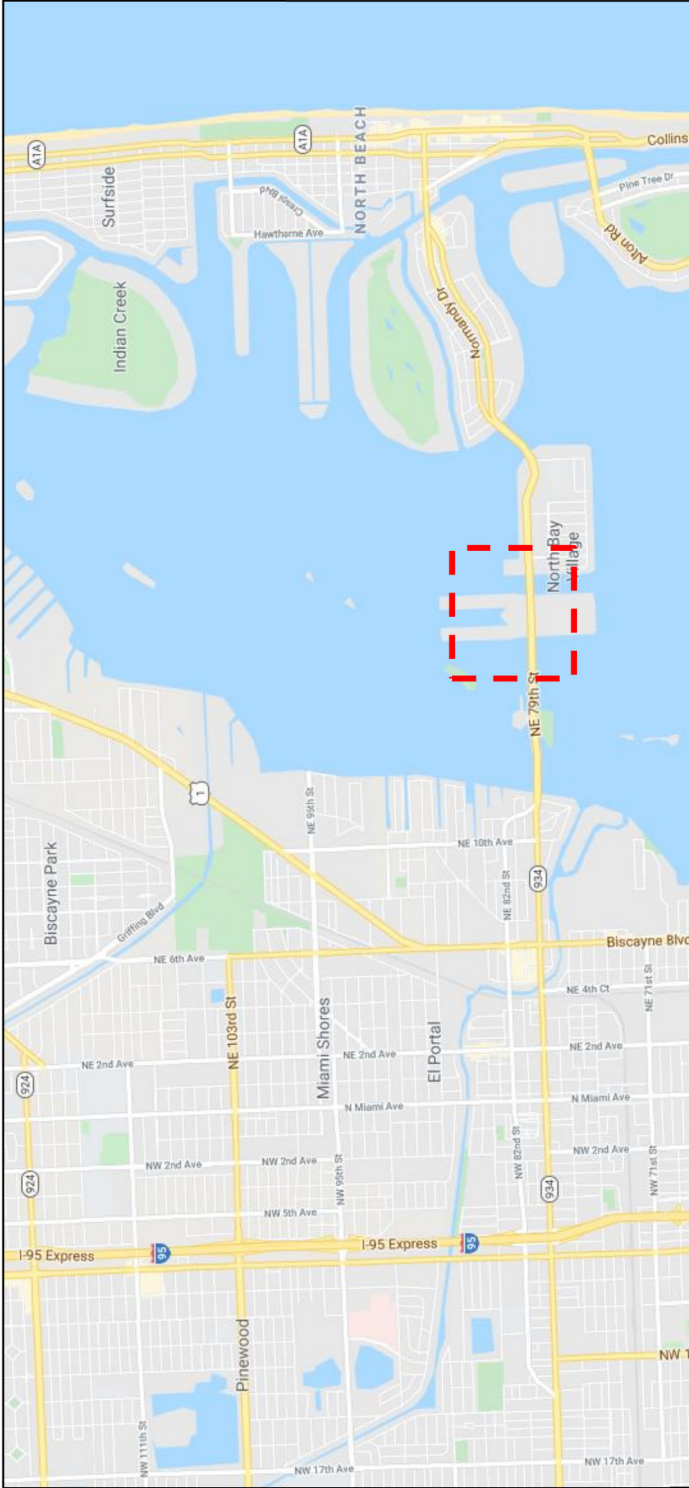


# **APPENDIX A**

**VICINITY MAP – FIGURE 1**

**BORING LOCATION PLAN – FIGURE 2**

**SOIL SURVEY MAP – FIGURE 3**



**VICINITY MAP**

Reference: <http://www.googlemap.com>

**LEGEND**

--- Subject Sites

Project Manager:	ARM
Drawn by:	DC
Checked by:	ARM
Approved by:	ARM

Project No.	G:10201005-2
Scale:	N.T.S.
File Name:	
Date:	03/19/2021

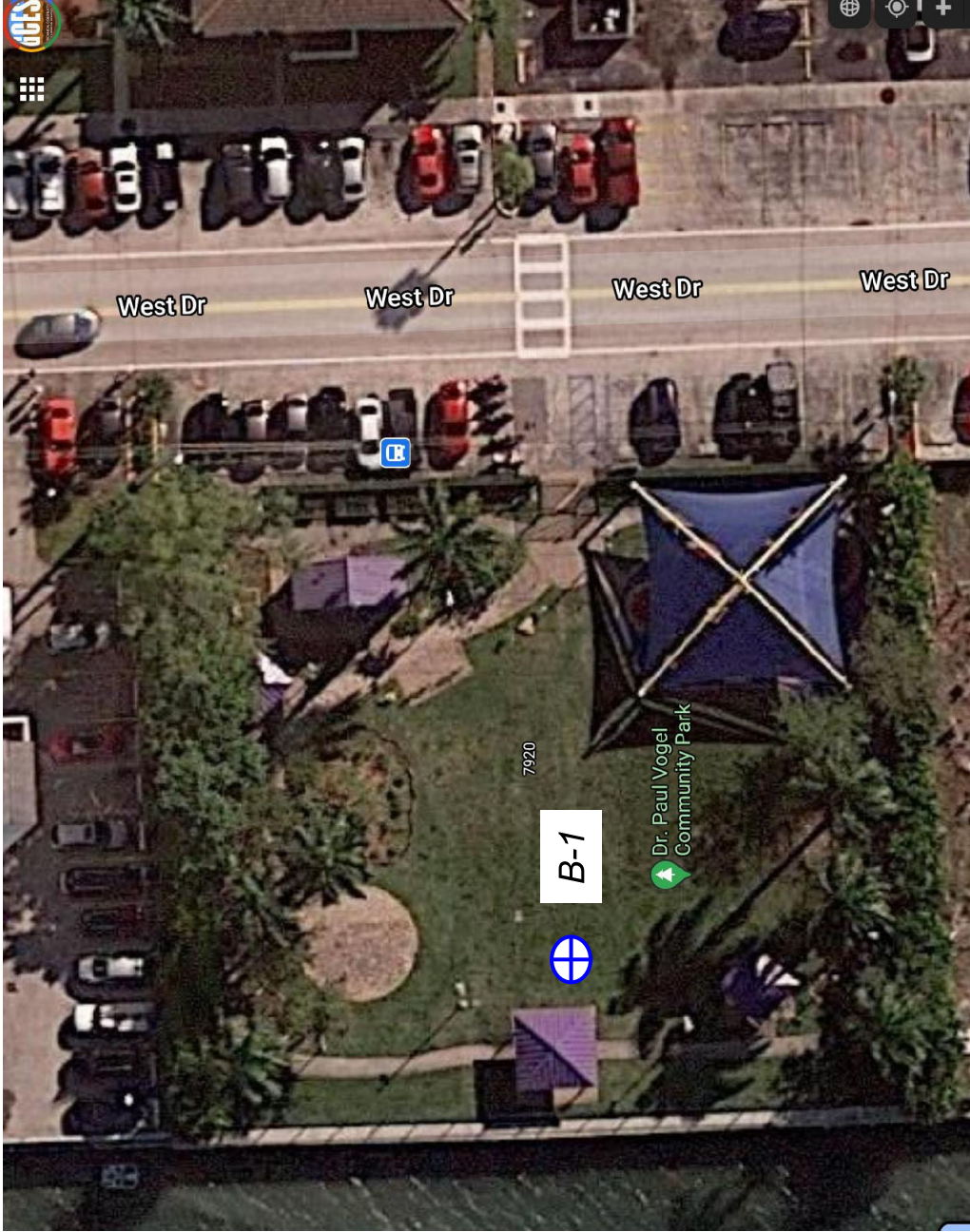


**VICINITY MAP**

Geotechnical Engineering Services  
 Vogel Marine Park Facility  
 North Bay Village, Miami Dade County, FL

FIG

1



**LEGEND**

⊕ Approximate Boring Location

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	ARM
Drawn by:	DC
Checked by:	ARM
Approved by:	ARM

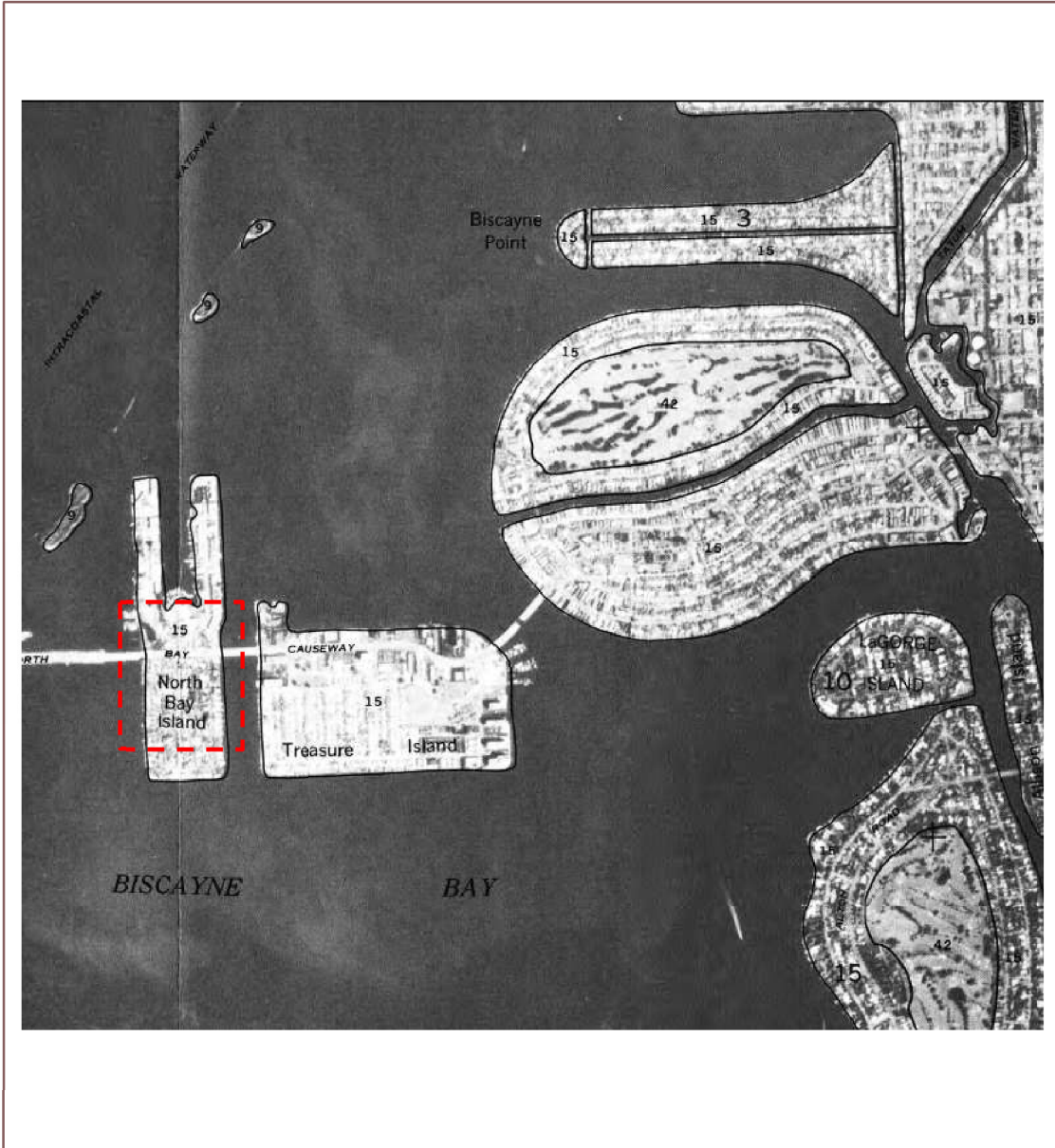
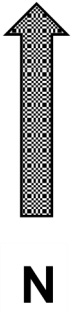
Project No.	G:10201005-2
Scale:	N.T.S.
File Name:	
Date:	03/19/2021



**BORING LOCATION PLAN**  
 Geotechnical Engineering Services  
 Vogel Marine Park Facility  
 North Bay Village, Miami Dade County, FL

FIG 2





## SOIL SURVEY MAP

From U.S. Department of Agriculture, Soil Conservation Service (later renamed the Natural Resource Conservation Service), dated 1967

### LEGEND

- - - SUBJECT SITE
- 15 - Urban Land Complex

Site Boundaries Are Approximate

Project Manager: ARM	Project No. G10201005-2
Drawn By: DC	Scale: N.T.S.
Checked By: ARM	Date: 03/19/2021



**FIG. No. 3**  
 Geotechnical Engineering Services  
 Vogel Marine Park Facility  
 North Bay Village  
 Miami Dade County, FL

# **APPENDIX B**

## **Boring Log – (B-1)**



10860 NW 138th Street, Unit 4  
 Hialeah Gardens, FL 33018  
 P: 305.964.0669/954.440.8623

**BORING NUMBER B- 1**

PROJECT NUMBER G10201004A

CLIENT EAC Consulting, Inc.

PROJECT NAME Vogel Marine Park Facility

PROJECT LOCATION 7920 West Drive, North Bay Village, FL 33141

DATE STARTED	3/11/2021	COMPLETED	3/11/2021	SURFACE ELEVATION REFERENCE	Same as road crown
DRILLING METHOD	Standard Penetration Boring			LEVELS AT TIME OF DRILLING	6 feet
LOGGED BY	L.T.	CHECKED BY	ARM		
APPROXIMATE LOCATION OF BORING	See site plan				

DEPTH	ELEVATION	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS	N-VALUE	▲ SPT N VALUE ▲						
							10	20	30	40	50		
							PL MC LL						
							20	40	60	80	FINES CONTENT %		
	3.5		TOPSOIL - Dark Brown Fine SAND, Medium Dense (FILL)	SS	10 9 7 8	16							
	2.5		Light Brown to Brown Fine SAND with Limerock Fragments, Trace Silt, Loose to Medium Dense (FILL - SP)	1									
	1.5			SS	2 1 1 1	2							
5	0.5												
	-0.5												
	-1.5												
	-2.5												
	-3.5												
	-4.5												
10	-5.5												
	-6.5												
	-7.5												
	-8.5		Gray ORGANIC SILTY Fine SAND with Shell, Trace Limestone Fragments, Very Loose (SM)	SS	2 1 4 7	5							
15	-9.5												
	-10.5												
	-11.5												
	-12.5												
	-13.5		Tan LIMESTONE with Silt, Trace Fine Sand										
	-14.5												
20	-15.5												
			Continue Next Page										

Disclaimer: GCES Engineering Services, LLC. , accepts no Liability for the consequences of the independent interpretation of drilling logs by others



10860 NW 138th Street, Unit 4  
 Hialeah Gardens, FL 33018  
 P: 305.964.0669/954.440.8623

**BORING NUMBER B- 1**

Page 2 of 3

PROJECT NUMBER G10201004A

CLIENT EAC Consulting, Inc.

PROJECT NAME Vogel Marine Park Facility

PROJECT LOCATION 7920 West Drive, North Bay Village, FL 33141

DATE STARTED 3/11/2021

COMPLETED 3/11/2021

SURFACE ELEVATION

DRILLING METHOD Standard Penetration Boring

REFERENCE

Same as road crown

LOGGED BY L.T.

CHECKED BY ARM

LEVELS AT TIME OF

APPROXIMATE LOCATION OF BORING See site plan

DRILLING

6 feet

DEPTH	ELEVATION	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS	N-VALUE	▲ SPT N VALUE ▲							
							10	20	30	40	50			
							PL MC LL							
							20	40	60	80	FINES CONTENT %			
25	-16.5		Tan LIMESTONE with Silt, Trace Fine Sand	X	SS	5 4 2 3	6	▲						
	-17.5													
	18.5													
	-19.5													
30	-20.5			X	SS	10 18 19 10	37						▲	
	-21.5													
	-22.5													
	-23.5													
35	-24.5		Light Gray LIMESTONE with Silt, Trace Fine Sand	X	SS	3 4 22 19	26						▲	
	-25.5													
	-26.5													
	32 -27.5													
40	-28.5		Light Green SILTY Fine SAND, Loose (SM)	X	SS	3 4 6 5	10	▲						
	-29.5													
	-30.5													
	36 -31.5													
40	-32.5			X	SS									
	-33.5													
	-34.5													
-35.5														
Continue Next Page														

Disclaimer: GCES Engineering Services, LLC. . accepts no Liability for the consequences of the independent interpretation of drilling logs by others

# **APPENDIX C**

## **GENERAL NOTES**

**UNIFIED SOIL CLASSIFICATION SYSTEM**

**FIELD EXPLORATORY DESCRIPTION**

**LABORATORY TESTING DESCRIPTION**



## GENERAL NOTES

### DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1- <sup>3</sup> / <sub>8</sub> " I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
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

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". For 3" O.D. ring samplers (RS) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as "blows per foot," and is not considered equivalent to the "Standard Penetration" or "N-value".

### WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
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 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

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Consistency</u>
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

#### RELATIVE DENSITY OF COARSE-GRAINED SOILS

<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Ring Sampler (RS) Blows/Ft.</u>	<u>Relative Density</u>
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
50+	99+	Very Dense

#### RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 – 29
Modifier	> 30

#### GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

#### RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 – 12
Modifiers	> 12

#### PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

# UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests<sup>A</sup>

				Soil Classification	
				Group Symbol	Group Name <sup>B</sup>
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 <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel <sup>F</sup>
		Gravels with Fines More than 12% fines <sup>C</sup>	Fines classify as ML or MH Fines classify as CL or CH	GP	Poorly graded gravel <sup>F</sup>
		Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$ $Cu < 6$ and/or $1 > Cc > 3^E$	GM
	Sands with Fines More than 12% fines <sup>D</sup>	Fines classify as ML or MH Fines Classify as CL or CH	GC	Clayey gravel <sup>F,G,H</sup>	
	Sands with Fines More than 12% fines <sup>D</sup>	Fines classify as ML or MH Fines Classify as CL or CH	SW	Well-graded sand <sup>I</sup>	
	Sands with Fines More than 12% fines <sup>D</sup>	Fines classify as ML or MH Fines Classify as CL or CH	SP	Poorly graded sand <sup>I</sup>	
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silt and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line <sup>J</sup> $PI < 4$ or plots below "A" line <sup>J</sup>	CL	Lean clay <sup>K,L,M</sup>
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	ML	Silt <sup>K,L,M</sup>
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	OL	Organic clay <sup>K,L,M,N</sup> Organic silt <sup>K,L,M,O</sup>
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	OH	Organic clay <sup>K,L,M,P</sup> Organic silt <sup>K,L,M,Q</sup>
	Silt and Clays Liquid limit 50 or more	inorganic	$PI$ plots on or above "A" line $PI$ plots below "A" line	CH	Fat clay <sup>K,L,M</sup>
		inorganic	$PI$ plots on or above "A" line $PI$ plots below "A" line	MH	Elastic Silt <sup>K,L,M</sup>
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	OH	Organic clay <sup>K,L,M,P</sup> Organic silt <sup>K,L,M,Q</sup>
		organic	Liquid limit - oven dried < 0.75 Liquid limit - not dried	OH	Organic clay <sup>K,L,M,P</sup> Organic silt <sup>K,L,M,Q</sup>
Highly organic soils	Primarily organic matter, dark in color, and organic odor		PT	Peat	

<sup>A</sup>Based on the material passing the 3-in. (75-mm) sieve

<sup>B</sup>If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup>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.

<sup>D</sup>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

$$^E C_u = D_{60}/D_{10} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup>If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup>If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup>If fines are organic, add "with organic fines" to group name.

<sup>I</sup>If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup>If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup>If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup>If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

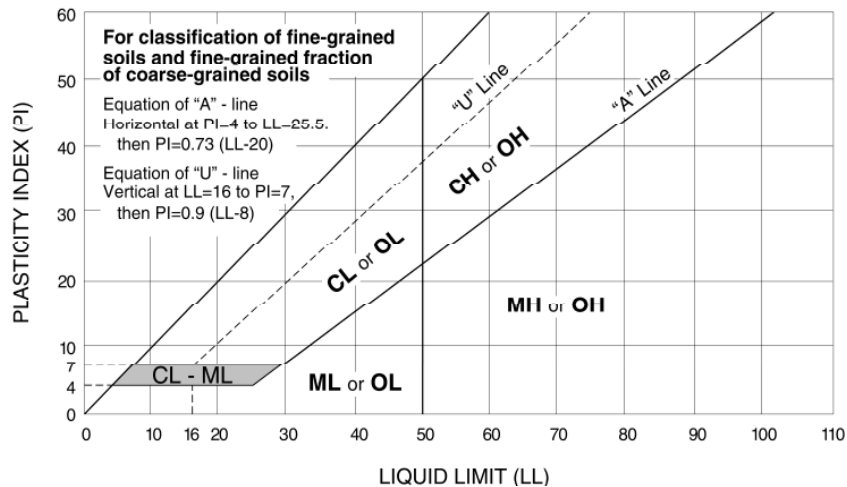
<sup>M</sup>If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup> $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup> $PI < 4$  or plots below "A" line.

<sup>P</sup> $PI$  plots on or above "A" line.

<sup>Q</sup> $PI$  plots below "A" line.



## FIELD EXPLORATORY DESCRIPTION

### Standard Penetration Test (SPT)

Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure ASTM Standard D-1586. The SPT procedure consists of driving a split-barrel sampler to obtain a soil sample and to measure the resistance (N-value) of the soil to penetration of the sampler. In the split barrel sampling procedure, the number of blows required to advance a standard 2 inch O.D. split barrel sampler 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).

The N-values provide a measure of the relative density of cohesionless soils (sands) and the consistency of cohesive soils (clays) sampled during drilling. Engineering properties of the soils are inferred from SPT N-values and index property soil classification, based on published empirical correlations.

The N-values also provide a general indication of hardness for rock formations such as the limestone commonly encountered in the Southeast Florida area. Where limestone is encountered, the Standard Penetration Test is used as a general indication of hardness. Where low blows per foot are encountered, it is assumed that solution cavities filled with loose sands or soft silt soils are present within the limestone formation.

## LABORATORY TESTING PROCEDURE

### **Percent Passing No. 200 Sieve**

The grain size analysis were conducted in general accordance with FDOT test Designation (FM-1-T88 (ASTM Designation D-422, titled "Particle Size Analysis of Soils"). The grain-size analysis test measures the percentage passing the No. 200 Sieve. In this manner, the grain-size distribution of a soil is measured. The percentage by weight passing the No. 200 Sieve is the amount of silt and clay sized particles. Other samples were analyzed for fines content only by measuring the percentage by weight of dry soil sample passing a U.S. standard No. 200 sieve in general accordance with ASTM-D1140.

### **Moisture Content**

In order to determine the moisture content of soil samples, test specimens were dried in an oven to constant mass in general accordance with ASTM-D2216. The water content is then calculated using the mass of the water and the mass of the dry specimen. The water content is used to express the phase relationship of air, water, and solid in a given volume of material. In fine grained soils, the consistency of a given soil type depends on its water content.

### **Organic Content**

In order to determine the compressibility of soil over time, organic content tests were performed on soil sample collected from soil layers suspected of containing significant amounts of organic materials. Organic content is determined by methods similar to those employed to find water content. The dry test specimen is burnt in a hot oven until it reaches a constant mass. The loss of mass due to burning is considered to be organic materials in the soil. The organic soil content is then calculated using the mass of the organics and the mass of the burnt specimen.