TECHNICAL PROVISIONS

FOR

LAKE LAWNE REGIONAL STORMWATER FACILITY AT BARNETT PARK

ORANGE COUNTY, FLORIDA

PREPARED FOR:

ORANGE COUNTY

STORMWATER MANAGEMENT DIVISION

4200 S. John Young Parkway, Orlando Florida 32839 &

ENVIRONMENTAL PROTECTION DIVISION

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April 2017

PART H
TECHNICAL PROVISIONS

for:

LAKE LAWNE REGIONAL STORMWATER FACILITY AT BARNETT PARK
ORANGE COUNTY, FLORIDA

ACKNOWLEDGMENTS

As always, CPWG has enjoyed the opportunity to serve Orange County on this assignment, and would like to express our appreciation for the continued support of the County Commissioners.

Orange County Board of County Commissioners

- Teresa Jacobs, County Mayor
- Betsy VanderLey, District 1
- Bryan Nelson, District 2
- Pete Clarke, District 3
- Jennifer Thompson, District 4
- Emily Bonilla, District 5
- Victoria P Siplin, District 6

CERTIFICATION

The engineering material and data contained within the following Technical Provisions was prepared by CPWG for the sole use by the Orange County Environmental Protection Division.

_____, P.E.
Jeffrey J. Earhart, P.E.
Florida Registration No. 49935
Date: May 5, 2017

PART H
TECHNICAL PROVISIONS

for

LAKE LAWNE REGIONAL STORMWATER FACILITY AT BARNETT PARK
ORANGE COUNTY, FLORIDA

SCOPE OF WORK

This contract includes the work necessary to properly construct the Lake Lawne Regional Stormwater Facility at Barnett Park. The project includes widening and deepening a portion of the C-6 Canal within Barnett Park. The excavation amount is estimated at 53,500 CY. The project also includes, 1) concrete weir; 2) extending concrete endwalls; 3) multiple pedestrian walkways, 4) irrigation pump; 5) sidewalks; 6) stormwater piping; 7) disc golf course adjustments; and 8) landscaping.

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TP 101

MOBILIZATION

Mobilization shall include all items detailed in Article 101 of the Standard Specifications, the Special Provisions and on the plans, except as directed by the Engineer.

Preservation of Property Corners including all items detailed in Section 7-11 of the Standard Specifications shall be included in the contract price for mobilization.

Basis of Payment

The work and incidental costs covered under Mobilization will be paid for at the contract lump sum price and will be paid in partial payments in accordance with the following:

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Items*
5	25
10	50
25	75
50	100

*Partial payments as detailed above will be limited to 10% of the original Contract amount for the roadway pay items. Any amount of mobilization in excess of 10% of the roadway pay items will be paid upon completion of all work.

Payment shall be made under:

Pay Item:

101-1	Mobilization	Lump Sum

Pay Item Footnote No. 101-1
Pay item 101-1 includes installation and removal of temporary chain link security fence, needed gates around project limits during construction, and mailboxes, etc.

END OF SECTION 101

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TP 102

MAINTENANCE OF TRAFFIC

All Maintenance of Traffic work shall conform to the requirements of Section 102 of the Standard Specifications, Index 600 of the FDOT Design Standards, the plans, and/or as herein modified, except as directed by the Engineer.

The road shall be kept open to two-way traffic on a paved surface during construction except when full closures are allowed by the plans or by the Engineer. The Contractor shall not be permitted to isolate residences or places of business. Access shall be provided to all residences and all places of business whenever construction interferes with the existing means of access.

The Contractor shall furnish, erect and maintain all necessary traffic control devices, including flagmen and pilot cars, in accordance with the *Manual of Uniform Traffic Control Devices for Streets and Highways,* published by the U.S. Department of Transportation, Federal Highway Administration. The Contractor shall provide and maintain in a safe condition the entire project limits included, but not limited to pre existing conditions, driving lanes, temporary approaches, crossings, and intersections with trails, roads, streets, business parking lots, residences, garages and completed work. The Contractor shall take all necessary precautions for the protection of the work and the safety of the public in accordance with Section 102.

The Contractor shall present his signed and sealed Maintenance of Traffic Plan to the Engineer at the preconstruction conference, and shall be fully and solely responsible for the adequacy of the Maintenance of Traffic plan regardless of the source. The plan shall be signed and sealed by a professional engineer licensed in the State of Florida.

The Contractor shall be responsible for installation of signs for all business along the project corridor. Signs should be manufactured and installed in accordance with FDOT design standards. No special compensation will be made to the Contractor to defray costs of any of the work or delays for complying with the requirements of installing business signs, but such costs shall be considered as having been included in the price stipulated for the Maintenance of Traffic pay item.

Basis of Payment

All materials, work and incidental costs related to Maintenance of Traffic will be paid for at the contract lump sum price. All material, labor and equipment necessary for the construction and maintenance of the entire project limits included, but not limited to pre-existing conditions, driving lanes, temporary approaches, crossings, intersections with trails, roads, streets, business parking lots, residences, garages, temporary driving lanes, side streets, driveway connections, and completed work, as may be directed by the Engineer shall be included in the contract price.

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Payment will be made under:

Pay Item:

102-1	Maintenance of Traffic	Lump Sum

END OF SECTION 102

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TP 104

PREVENTION, CONTROL AND ABATEMENT OF EROSION AND WATER POLLUTION

Prevention, control and abatement of erosion and water pollution shall conform to the requirements of Section 104 of the Standard Specifications, National Pollution Discharge Elimination System (NPDES) requirements, except as modified by these Technical Provisions or as directed by the Engineer.

The Contractor shall present at the Preconstruction Conference its Storm Water Pollution Prevention Plan (SWPPP) and a separate schedule to manage erosion and water pollution. This schedule shall include a complete outline of the proposed construction of all erosion and pollution control and abatement items required.

The Contractor shall be responsible for the preparation and submittal of the Notice of Intent (NOI) and Notice of Termination (NOT) to the Florida Department of Environmental Protection (FDEP) and shall obtain the FDEP Generic Permit for Stormwater Discharge from Large and Small Construction Activities.

Basis of Payment

All work and incidental costs required to comply with the articles of this specification will be paid at the contract lump sum price for Prevention, Control and Abatement of Erosion and Water Pollution.

Payment will be made under:

Pay Item:		
104-14	Prevention, Control and Abatement of Erosion and Water Pollution	Lump Sum

Pay Item Footnote No. 104-14
Pay item 104-14 includes floating turbidity barrier, staked silt fence (Type III), soil tracking prevention device, temporary coffer dam, energy dissipator, cost for pumping, and all elements associated with by-passing the flow.

END OF SECTION 104

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TP 110

CLEARING AND GRUBBING

All clearing and grubbing shall be performed in accordance with the requirements of Section 110 of the Standard Specifications, except as directed by the Engineer.

Scope of work to include but not be limited to, the removal of all rigid, asphalt pavement, Portland cement concrete pavement, curb, curb and gutter, ditch pavement, sidewalk, driveway aprons, concrete slabs, concrete structures, brick, fences, gravity walls, retaining walls, pipes, etc.

Clearing and Grubbing shall also include the removal of existing pavement and base course and backfilling with suitable material, as shown in the construction plans. Removal of the existing roadway shall also include the proper disposal of the removed materials as specified above.

Basis of Payment

All work and incidental costs required to perform clearing and grubbing as herein specified will be paid for at the contract lump sum price.

Payment shall be made under:

Pay Item:

110-1-1	Clearing and Grubbing	Lump Sum

Pay Item Footnote No. 110-1-1
Pay item 110-1-1 includes the cost of removal of existing concrete pavement, existing asphalt pavement and base, existing concrete sidewalks, removal of storm pipes, control structures, mitered end sections, existing wood bridges, trees, chain link security fences and gates, chain link fence, electrical conduit, wiring, water lines, sewer lines, etc.

END OF SECTION 110

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TP 120

EXCAVATION, EMBANKMENT AND GRADING

All excavation and embankment work shall conform to the requirements of Section 120 of the "Standard Specifications", and the provisions of this section, except as directed by the Engineer.

Basis of Payment

Subsoil Excavation will be paid for at the contract price per cubic yard.

Payment shall constitute full compensation for all work described herein and in the Special Provisions and shall include the excavation and disposal of muck, clay, rock, or any other material that is unsuitable in its original position and that is excavated below the finished grading template. Work under this pay item shall also include the excavation of all suitable material within the specified limits as necessary to excavate the unsuitable material. The bottom of the finished grading template shall be considered to be the top of the finished base, shoulders, and slopes for stabilized bases and the finished shoulder and slope lines and bottom of base or rigid pavement for rigid pavement or all other bases. Payment shall also include the provision, placement, shaping, and compaction of suitable backfill material to replace the removed unsuitable material up to the original grade line or to the bottom of the proposed roadway base material, whichever is lower.

The limits of Subsoil Excavation indicated in the construction plans are considered to be particularly variable, in accordance with field conditions actually encountered.

Excavation, Embankment and Grading will be paid for at the contract lump sum price.

Payment shall constitute full compensation for all work described herein and in the Special Provisions and shall include grading of shoulders, graded road connections, slopes, compaction, final dressing, subsoil excavation, replacement material and all work required for completing the project that is not paid for under the other pay items. Also included are removals and off-site disposal or on-site utilization of all materials, structures, abandoned utilities and obstructions as directed by the Engineer.

Note that according to the geotechnical report, no muck was encountered below the proposed grading surface, but a contingency is being included in the event of encountering such soils when excavating below the proposed surface.

Payment shall be made under:

Item 120-4 Muck Removal (A-8 soil) - contingency–Per Cubic Yard

Item 120-9 Excavation Embankment and Grading –Lump Sum (LS)

Pay Item Footnote No. 120-4
Pay item 120-4 includes the muck removal underneath finished grade. This is a contingency amount and will only be approved if muck is discovered during construction. The Contractor shall provide Orange County Highway Construction and/or Orange County Stormwater Management with a signed and sealed survey, prepared by a registered Florida surveyor, including elevations and cross sections of the area where unsuitable soils are found. The elevations shall be provided every 25 feet and shall be representative of the conditions. The purpose of the survey, with cross sections, is to verify the quantity of the unsuitable soils removed.

Pay Item Footnote No. 120-9
Pay item 120-9 includes the removal of all material above finished grade, regardless of soil type. All excess materials, excluding any materials requested to be placed on County owned property, are the property and responsibility of the Contractor. The County may request that a portion of the excess material be placed on County owned property. The placement shall be performed at no additional cost.

END OF SECTION 120

STABILIZED SUBGRADE

All work shall be performed in accordance with the requirements of Section 160 of the Standard Specifications (Stabilizing) and shall be constructed to the limits, thickness, and specified limerock bearing ratio as shown on the plans, except as directed by the Engineer.

Method of Measurement

Quantities of stabilized subgrade measured for payment under this Section shall be the actual area in square yards of satisfactorily installed stabilized subgrade.

Basis of Payment

Stabilized subgrade will be paid for at the contract unit price per square yard installed and accepted and shall include the cost of furnishing and hauling additional stabilizing materials required, and all mixing, shaping and compacting of the stabilized area. The increased thickness of the Type B stabilization under curb and gutter sections shall be considered incidental and included in the contract unit price.

Payment shall be made under:

Pay Item:

160-4	Stabilized Subgrade, Type B Stabilization (12") (Min LBR 40)	- Per Square Yard

END OF SECTION 160

SOIL CEMENT BASE (PRIMED)

Construction of a Soil Cement Base shall consist of soil, water, and portland cement uniformly mixed, moistened, compacted, finished and cured in accordance with these specifications and shall conform to the lines, grades, thicknesses and typical cross-sections shown on the plans. Soil cement base that is not finished and cured within (36) hours after compaction has been achieved may be rejected and subject to removal and replacement if so directed by the Engineer.

Testing

A. The Contractor shall submit a mix design prepared by an independent Geotechnical Engineer to the Engineer for acceptance before using the material for road construction. Processing of the base shall proceed after the design mix is accepted by the Engineer. A modified Portland Cement Association (PCA) Short Cut Procedure for sand soil test method may be used in lieu of the wet-dry/freeze-thaw test method. However, a 7-day minimum laboratory compressive strength of 300 psi shall be used to determine the cement content when using the modified PCA test method.

B. Construction of the soil cement base shall proceed only after 48 hours prior notice has been received by the Engineer and the County's geotechnical engineer. The geotechnical engineer shall be present during construction. The following is the minimum information/test data to be obtained during construction:

1. Area & Date of Construction
2. Average Cement Content
3. Uniformity of Mix
4. Moisture Content at Time of Compaction
5. Percent Compaction
6. Compacted Thickness
7. 7-Day Compressive Strength Tests

The geotechnical engineer will prepare and submit to the Engineer a signed report documenting all field tests and observations.

Materials

A. Portland Cement

Portland Cement shall be Type I, II, III, or Type I-S or Type I-P and shall comply with FDOT Standard Specification Section 921. Portland Cement shall also comply with ASTM C-150 and/or AASHTO M-85 and be produced in the United States. Cement which is

partially set, lumpy or caked shall not be used. One cubic foot of Portland Cement shall be considered to weigh 94 lbs.

B. Water

Water shall be clean and free from substances deleterious to the hardening of the soil cement mixture.

C. Soil

Only soils which have proven themselves to produce a high quality soil cement base shall be acceptable. New sources of soil cement material shall be accepted by the County prior to use.

Specific Requirements for Soil:

Organic Material (As per FM 1-T267) Maximum 5%
Total Clay and Silt Content (minus No. 200 [75µm sieve) (As per AASHTO T 88, no hydrometer test) Maximum 25%
Plastic Index (As per AASHTO T 90) Maximum 10%
Liquid Limit (As per AASHTO T 89) Maximum 25%
Gradation: (As per AASHTO T 88)
Passing 2 inch [50 mm] sieve Minimum 100%
Passing No. 4 [4.75 mm] sieve Minimum 55%
Passing No. 10 [2.00 mm] sieve Minimum 37%

As an exception to the above requirements, the Contractor may use any material meeting the requirements for Limerock in Section 911 of the FDOT Standard Specifications.

D. Prime Coat

The prime coat shall be emulsified Asphalt Grades SS-l or SS-lH, or Special MS-Emulsion, diluted per the manufacturer's recommendations.

Equipment

Soil Cement may be constructed with any machine, combination of machines or equipment that will produce the results meeting the requirements for soil pulverization, cement application, mixing, uniform depth control, water application, incorporation of materials, compaction, finishing and curing as required to comply with these specifications.

Construction Methods

A. General

The Soil-Cement base shall be placed under the supervision of a competent superintendent having a minimum of two (2) years experience in the construction of soil-cement base courses.

Soil-Cement base proportioning and construction shall only be performed when ambient temperatures measured in the shade are at 45°F and rising and that temperatures are not forecast to fall below 35°F for 48 hours following placement of the material. All mixing, shaping, finishing and compaction shall be completed within four hours starting from the time mixing commences.

B. Mix Proportioning

The Soil-Cement base shall be proportioned using Strength Design criteria. Proportioning of the soil, cement and water shall be performed in a pugmill at a central mix plant. Mixing shall be sufficiently achieved to prevent cement balls from forming when water is added. The Contractor shall continuously monitor plant batching and mixing of the materials and submit to the Engineer reports of the gradation, cement content and moisture content prepared by the independent Geotechnical Engineer. The County's Geotechnical Engineer shall monitor the installation and conduct applicable tests and inspections as outlined in this Section.

C. Preparation

Before construction operations are begun, the area to be paved shall be graded and shaped as required to receive the spread of soil-cement mixture delivered from the plant and allow construction in conformance with the grades, lines, thicknesses and typical cross sections shown on the plans. Additional soil needed, if any, shall be placed as directed. Unsuitable soil or materials shall be removed and replaced with acceptable soil. The subgrade shall be compacted to the density, thickness, lines, grades, and typical sections shown on the plans. The Contractor shall maintain the required density until the base is placed on the subgrade.

D. Pulverization

The soil to be used in mixing shall be so pulverized that, at the completion of moist-mixing, 100 percent by dry weight passes a 1" sieve, and a minimum of 80% passes a No. 4 sieve, exclusive of gravel or stone retained on these sieves.

E. Application of Cement

The specified quantity of Portland Cement required for full depth treatment shall be metered out at the plant in accurate proportion in accordance with the mix design. The percentage of moisture in the soil, at the time of cement application at the plant, shall not exceed the quantity that will permit a uniform and intimate mixture of soil and cement during proportioning and shall not exceed 2% below the optimum moisture content for the soil cement mixture.

F. Mixing

After the cement has been applied, it shall be thoroughly mixed with the soil at the pugmill. Mixing shall continue until the cement has been thoroughly blended with the soil in order to prevent the formation of cement balls when water is applied. Any uncompacted soil and cement mixture that has not been compacted and finished shall not remain undisturbed for more than thirty (30) minutes.

G. Application of Water and Moist Mixing

Immediately after and/or during the mixing of soil and cement, the moisture content of the soil cement mixture shall be determined by the laboratory. Water shall be applied uniformly in quantities required to obtain the proper design moisture content within the range provided by the Contractor's geotechnical engineer. After the final application of water, mixing shall continue until a uniform and intimate mixture of soil, cement and water is obtained.

When water application and mixing have been completed, the percentage of moisture in the mixture, based on oven-dry weights, shall be no more than two percentage points above the specified optimum moisture content, and shall be less than that quantity which will cause the soil cement mixture to become unstable during compaction and finishing.

H. Spreading

The mixed base material shall be hauled to the placement site in trucks equipped with protective covers and immediately placed on top of the prepared subgrade. The material shall be graded to conform to the lines and grades of the finished pavement section as shown on the project drawings and shall be placed in a sufficient thickness to assure the minimum required compacted thickness free from high and low spots. No more than 60 minutes will be allowed between placement of adjacent passes of the spreader at any location, except at construction joints.

I. Compaction

The material shall be placed in a single, uniformly thick, loose layer and evenly compacted to a density not less than 97% of the modified maximum density determined by AASHTO T-134 on representative samples of soil cement mixture obtained from the roadway at the time compaction begins. Not more than four hours shall elapse from the time of batching to final compaction and the material shall not remain undisturbed for more than two hours. The surface of the base course may require the addition of water during the final rolling and shaping operation to prevent excessive surface moisture losses prior to sealing the base.

J. Finishing

After the mixture has been initially compacted, the surface of the soil cement shall be shaped to the required lines, grades and cross-section. During the shaping operations, the surface shall be lightly scarified to loosen any imprints left by the compacting or shaping equipment, when deemed necessary. The resulting surface shall then be compacted to the specified density with a pneumatic tire roller. Rolling shall be supplemented by broom-dragging, if required.

The moisture content of the surface material must be maintained at not less than its specified optimum moisture content during finishing operations. Surface compaction and finishing shall be done in such a manner as to produce a smooth, dense surface, free of surface compaction planes, cracks, ridges, or loose material. Surface-finishing methods may vary, provided a smooth, dense surface free of surface compaction planes is produced. The moisture and density requirements shall be determined by the methods prescribed in AASHTO T-134.

K. Surface Requirements (Scalping or Hard-Planing)

After completing compaction and finishing but not later than the beginning of the next calendar day after constructing any section of the base, the surface shall be tested with a template cut to the required crown and/or with a 15 foot straight-edge laid parallel to the centerline. All irregularities greater than 1/4 inch shall be immediately corrected with a blade adjusted to the lightest cut which will insure a surface that does not contain depressions greater than 1/4 inch under the template or the straight-edge. The material removed shall be wasted. Additional wetting during and after that final shaping operation shall be provided to keep the base continuously moist.

L. Prime/Curing

After finishing the soil cement it shall be protected against drying for 7 days by applying a bituminous curing material as soon as possible after completing finishing operations. The finished soil cement shall be kept continuously wet until the curing material is placed. Curing material shall consist of a mixture of 60% grade SS-1 and 40% water applied at the rate of 0.15 to 0.20 gallons per square yard.

The prime coat bituminous material specified shall be uniformly applied to the surface of the completed soil cement. The exact rate and temperature of application to give complete coverage without excessive runoff will be accepted by the Engineer. At the time the bituminous material is applied, the soil cement surface shall be dense, free of all loose and extraneous material, and contain sufficient moisture to prevent penetration of the bituminous material. Water shall be applied in sufficient quantity to fill the surface voids of the soil cement immediately before the bituminous curing material is applied. The bituminous material shall be sanded using a sufficient amount of clean sand to prevent bleeding or traffic pick-up.

M. Construction Joints

Prior to the beginning of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face.

N. Thickness

During various stages of construction test holes or trenches shall be dug in the mixture to determine the thickness. After completing the base, test holes shall be dug or drilled at intervals of not more than 300 feet (closer intervals if necessary) and the thickness of the base shall be determined from measurements made in these test holes.

Where the base is deficient in thickness by more than 1/2 inch, the area of deficient base shall be removed and replaced with base of the required thickness at the Contractor's sole expense. At the Engineer's option such deficient thickness base may be left in place, provided the deficiency is not more than one inch. This deficiency shall be made up in asphaltic concrete, provided the control grades can be maintained. Payment will be made on the basis of full depth soil-cement. No additional payment will be made for asphaltic concrete required to make up deficiencies in soil-cement base thicknesses.

TP 270

Opening To Traffic

The Contractor will not be permitted to drive heavy equipment over the completed sections, but light weight pneumatic-tired equipment may be permitted after 24 hours, provided the surface has hardened sufficiently to prevent the equipment's marking the surface and provided the protection and curing specified are not impaired.

Maintenance

The Contractor shall maintain the base to a true and satisfactory surface until the wearing surface is constructed. Should any repairs or patching be necessary, they shall extend to the full depth of the base and shall be made in a manner that will assure restoration of a uniform base course conforming to the requirements of these specifications. The bituminous curing coating shall be maintained until the wearing surface is constructed.

Inspection

The Engineer, Geotechnical Engineer and Contractor shall inspect the base for deficiencies after a minimum of seven 7 days have elapsed and prior to applying the asphalt wearing surface. All deficiencies shall be corrected and accepted by the Engineer 48 hours prior to commencing paving operations.

Method of Measurement

Quantities measured for payment under this Section shall be the actual area in square yards of soil cement base constructed to limits, thicknesses, lines and grades shown on the plans, completed and accepted.

Basis of Payment

Soil Cement Base will be paid for at the contract unit price per square yard completed and accepted. The cost of the cement, prime coat and cover material, including the spreading of each, shall be included in the contract unit price.

Payment shall be made under:

Item No		
270-8	Soil Cement Base, (Primed) (8”) (300 psi)	Per Square Yard

END OF SECTION 270

MILLING OF EXISTING ASPHALT PAVEMENT

327-1 Description.
Remove existing asphalt concrete pavement by milling to improve the rideability and cross slope of the finished pavement, to lower the finished grade adjacent to existing curb prior to resurfacing, or to completely remove existing pavement. When milling to improve rideability, the Plans will specify an average depth of cut. Take ownership of milled material.

327-2 Equipment.
Provide a milling machine capable of maintaining a depth of cut and cross slope that will achieve the results specified in the Contract Documents. Use a machine with a minimum overall length (out to out measurement excluding the conveyor) of 18 feet and a minimum cutting width of 6 feet. Equip the milling machine with a built-in automatic grade control system that can control the transverse slope and the longitudinal profile to produce the specified results.

To start the project, the Engineer will approve any commercially manufactured milling machine that meets the above requirements. If it becomes evident after starting milling that the milling machine cannot consistently produce the specified results, the Engineer will reject the milling machine for further use.

The Contractor may use a smaller milling machine when milling to lower the grade adjacent to existing curb or other areas where it is impractical to use the above described equipment. Equip the milling machine with means to effectively limit the amount of dust escaping during the removal operation.

For complete pavement removal, the Engineer may approve the use of alternate removal and crushing equipment in lieu of the equipment specified above.

327-3 Construction.
327-3.1 General: Remove the existing raised reflective pavement markers prior to milling. Include the cost of removing existing pavement markers in the price for milling.

When milling to improve rideability or cross slope, remove the existing pavement to the average depth specified in the Plans, in a manner that will restore the pavement surface to a uniform cross-section and longitudinal profile. The Engineer may require the use of a stringline to ensure maintaining the proper alignment.

Establish the longitudinal profile of the milled surface in accordance with the milling plans. Ensure that the final cross slope of the milled surface parallels the surface cross slope shown in the Plans or as directed by the Engineer. Establish the cross slope of the milled surface by a second sensing device near the outside edge of the cut or by an automatic cross slope control mechanism. The Plans may waive the requirement of automatic grade or cross slope controls where the situation warrants such action.

Operate the milling machine to minimize the amount of dust being emitted. The Engineer may require prewetting of the pavement.

Provide positive drainage of the milled surface and the adjacent pavement. Perform this operation on the same day as milling. Repave all milled surfaces no later than the day after the surface was milled unless otherwise stated in the Plans.

If traffic is to be maintained on the milled surface prior to the placement of the new asphalt concrete, provide suitable transitions between areas of varying thickness to create a smooth longitudinal riding surface. Produce a pattern of striations that will provide an acceptable riding surface. The Engineer will control the traveling speed of the milling machine to produce a texture that will provide an acceptable riding surface.

Prior to opening an area which has been milled to traffic, sweep the pavement with a power broom or other approved equipment to remove, to the greatest extent practicable, fine material which will create dust under traffic. Sweep in a manner that will minimize the potential for creation of a traffic hazard and to minimize air pollution.

Sweep the milled surface with a power broom prior to placing asphalt concrete.

In urban and other sensitive areas, use a street sweeper or other equipment capable of removing excess milled materials and controlling dust. Obtain the Engineer's approval of such equipment, contingent upon its demonstrated ability to do the work.

Perform the sweeping operation immediately after the milling operations or as directed by the Engineer.

327-3.2 Quality Control Requirements: Furnish an electronic level with a length of 4 feet and an accuracy of plus or minus 0.1 degree approved by the Engineer for the control of cross slope. Make this electronic level available at the jobsite at all times during milling operations. Calibrate and compare electronic levels in accordance with 330-9.3.1 at a minimum frequency of once per day before any milling operation.

Multiple cuts may be made to achieve the required pavement configuration or depth of cut. Measure the cross slope of the milled surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. Record all the measurements to the nearest 0.1% on an approved form and submit to the Engineer for documentation.

1. Tangent Sections: Measure the cross slope per lane at a minimum frequency of one measurement every 100 feet. Calculate the absolute deviation of cross slope at each measurement and then average the absolute deviation of ten consecutive cross slope measurements. The absolute deviation is the positive value of a deviation. When the average absolute deviation cross slope is consistently within the acceptance tolerance as shown in Table 327-1 and upon approval by the Engineer, the frequency of the cross slope measurements can be reduced to one measurement every 200 feet during milling

operations.

2. Superelevated Sections: Measure the cross slope every 100 feet per lane within the length of full superelevation. Calculate the absolute deviation of each measurement and then average the absolute deviation of ten consecutive cross slope measurements. For every transition section, measure the cross slope at control points identified in the Plans or, if not shown in the Plans, at a control point at a location of 0.0% cross slope. For curves where the length of the fully superelevated section is less than 250 feet, measure the cross slope at the beginning point, midpoint and ending point of the fully superelevated section, calculate the absolute deviation and average. When the number of measurements is less than ten and the length of full superelevation is greater than 250 feet, average the absolute deviation of all measurements.

If the average absolute deviation of the cross slope measurements falls outside the acceptance tolerance shown in Table 327-1, stop the milling operations and make adjustments until the problem is resolved to the satisfaction of the Engineer. If an individual cross slope deviation falls outside the acceptance tolerance as shown in Table 327-1, make corrections only in the deficient area to the satisfaction of the Engineer at no cost to the Department. For pavement with multiple cuts, the deficient areas not caused by the final cut may be left in place upon approval of the Engineer. All milling corrections shall be completed before placement of the asphalt course unless stated otherwise in the Plans or as determined by the Engineer.

The limits of deficient areas requiring correction may be verified and adjusted with more accurate measurement methods, including survey instruments, upon approval by the Engineer at no cost to the Department. Should the Contractor wish to have any corrections waived, submit a request to the Engineer for approval. The Engineer may waive the corrections at no reduction in payment if an engineering determination indicates that the deficiencies are sufficiently separated so as not to significantly affect the final cross slope or project grade.

For intersections, tapers, crossovers, transitions at the beginning and end of the project, bridge approaches and similar areas, adjust the cross slope to match the actual site conditions, or as directed by the Engineer.

TABLE 327-1
Cross Slope Milling Acceptance Tolerance

Roadway Feature	Individual Absolute Deviation	Average Absolute Deviation
Tangent section (including turn lanes)	0.4%	0.2%
Superelevated curve	0.4%	0.2%
Shoulder	0.5%	0.5%

TP 327

Method of Measurement

Quantities measured for payment under this Section shall be the actual area in square yards of milling constructed to limits, thicknesses, lines and grades shown on the plans, completed and accepted.

Basis of Payment

Milling will be paid for at the contract unit price per square yard completed and accepted. The cost of the milling, milling removal and site maintenance, shall be included in the contract unit price.

Payment shall be made under:

Item No		
327-70-6	Milling Existing Asphalt Pavement, 1-1/2" Avg Depth	Per Square Yard

END OF SECTION 327

SUPERPAVE ASPHALTIC CONCRETE PAVING

334-1 GENERAL

Work specified in this Provision consists of the application of Asphaltic Concrete structural courses properly produced and laid upon a prepared and accepted base in accordance with these specifications and in conformity with the lines, grades, thicknesses and cross-sections provided in the plans. Base preparation and Asphaltic Concrete Friction Courses are covered under separate provisions.

This Provision is intended to stand alone for the production and placement of structural course asphalt and replaces Sections 330 and 334 of the FDOT Standard Specifications for Road and Bridge Construction except when specific references are made to these or other Sections. Any references to FDOT Specification Sections shall mean the latest FDOT Standard Specifications for Road and Bridge Construction, including Supplements. Any incorrect references to or conflicts with the FDOT specifications, test methods, or standards shall be brought to the attention of the Engineer for clarification.

The Engineer will have the right to disapprove of any material or process that does not conform to these specifications.

The Contractor shall document all QC procedures, Process Control, inspection, and all test results and make them available for review by the Engineer throughout the Contract duration.

All test methods designated as FM refer to the FDOT Florida Sampling and Testing Methods.

334-2 CONTRACTOR QUALITY CONTROL REQUIREMENTS

334-2.1 GENERAL: The Contractor shall be responsible for the overall quality of the materials and workmanship of the work covered under this Provision.

Ensure that the qualifications and certifications of personnel and laboratories are maintained throughout the Contract duration. Provide proof of qualifications and all applicable certifications to the County prior to construction operations commencing. Notify the County immediately when there is a change in any qualification or certification during the Contract duration.

334-2.2 PERSONNEL: Provide personnel who are both qualified and certified in all activities related to asphalt mix production at the plant and placement on the roadway, especially for the sampling, testing and inspection of materials and construction activities. At a minimum, a certified Paving Level II technician shall be present on site at all times during paving operations. Provide documentation to the Engineer that the personnel responsible for the production and placement of asphalt products under the Contract are qualified and certified.

334-2.3 TESTING LABORATORY: Furnish or have furnished a fully equipped asphalt laboratory (permanent or portable) at the production site. Provide documentation to the Engineer that any Laboratory used is FDOT qualified and certified.

334-2.4 EQUIPMENT: Provide equipment and methods conforming to Section 320 of the FDOT Standard Specifications for Road and Bridge Construction. Provide a sufficient number of trucks to transport the asphalt mixture from the plant to the job site such that paving of each lane can proceed in one smooth uninterrupted operation. In determining the number of trucks required the Contractor shall consider the capacity of the trucks, the length of the approved haul route from the plant to the job site, traffic conditions, weather conditions, and any other factors that could impact the round trip travel time. Stopping the paver to wait for trucks bringing the asphalt mixture will not be acceptable. In addition to meeting the requirements in Section 320-5, the paving machine shall be capable of pushing the asphalt truck as it dumps the asphalt mixture into the hopper. Stopping the paving machine to allow the next asphalt truck to back up to it to fill the hopper is not an acceptable procedure, and shall not be allowed.

Unless otherwise approved by the Engineer, the paving machine shall weigh a minimum of 26,000 pounds.

334-2.5 MINIMUM QUALITY CONTROL REQUIREMENTS: Perform the following activities necessary to maintain quality and process control and meet specification requirements:

Stockpiles: Ensure each aggregate component is placed in an individual stockpile, and separated from adjacent stockpiles, either by space or by a system of bulkheads. Prevent the intermingling of different materials in stockpiles. Form and maintain stockpiles in a manner that will prevent separation, contamination, segregation, etc. Identify each individual stockpile, including RAP, as shown on the mix design.

Incoming Aggregate: Obtain gradations and bulk specific gravity (Gsb) values from aggregate supplier for reference; determine the gradation of all component materials; routinely compare gradations and Gsb values to mix design.

Cold Bins: Calibrate the cold gate/feeder belt for each material; determine cold gate/feeder belt settings; observe operation of cold feeder for uniformity.

Dryer: Observe pyrometer for aggregate temperature control; observe efficiency of the burner.

For Batch Plants: Determine percent used and weight to be pulled from each bin to assure compliance with Mix Design, check mixing time, and check operations of weigh bucket and scales.

For Drum Mixer Plants: Determine aggregate moisture content, and calibrate the weigh bridge on the charging conveyor.

Control Charts: Plot and keep charts updated daily for all Quality Control Sampling and Testing and post in the asphalt lab where they can be seen. Maintain the following charts:

1. Sample test results for the following: No. 8 sieve, No. 200 sieve, asphalt binder content, air voids, and density.

2. Gradation of incoming aggregate.

3. Gradation and asphalt content of RAP.

4. Any other test result or material characteristic (as determined by the Contractor) necessary for process control.

The above listed minimum activities are to be considered normal activities necessary to control the production of hot mix asphalt at an acceptable quality level. It is recognized, however, that depending on the type of process or materials, some of the activities listed may not be necessary and in other cases, additional activities may be required. The frequency of these activities will also vary with the process and the materials. When the process varies from the defined process average and variability targets, the frequency of these activities will be increased until the proper conditions have been restored.

334-2.6 MINIMUM PROCESS CONTROL TESTING REQUIREMENTS:

Asphalt Plant

1. Hot Mix Asphalt: Determine the asphalt binder content; mix gradation and volumetric properties at a minimum frequency of one per day. In the event that the daily production exceeds 1,000 tons, perform these tests a minimum of two times per day.

2. Aggregate (Including RAP): One sample per 1,000 tons of incoming material as it is stockpiled for gradation. The testing of RAP material shall include the determination of asphalt binder content and gradation of extracted aggregate.

3. Monitor the mix temperature for the first five loads and every fifth load thereafter.

4. Monitor the aggregate moisture content from stockpiles or combined cold feed aggregate - one per day.

5. Other tests (as determined necessary by the Contractor) for process control.

Roadway

1. Monitor the mix temperature for the first five loads and every fifth load thereafter.

2. Monitor the prime/tack spread rate as needed to control operations and ensure that it meets or exceeds the target spread rate.

3. Monitor the pavement cross slope at a frequency necessary to fulfill the requirements of the plans and section 334-3.10.3 below, and identify a system to control the cross slope of each pavement layer during construction.

4. Monitor the mix spread rate at the beginning of each day's production, and as needed to control the operations, at a minimum of once per 200 tons placed to ensure that the spread rate meets or exceeds the target spread rate. When determining the spread rate, use an average of five truckloads of mix.

5. Monitor mat placement thickness every 25' to ensure the minimum design thickness is met.

6. Monitor the pavement temperature with an infrared temperature device. Monitor the roadway density with either 6 inch diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet of pavement. When the layer thickness is greater than or equal to 1 inch (or the spread rate is greater than or equal to 105 lb/yd2) and an approved rolling pattern may be used in lieu of density testing, monitor the density (for informational purposes only) by cutting and testing a 6 inch diameter core at a minimum frequency of three cores per day. Maintain daily records of the testing results and make them available for review by the Engineer throughout the life of the Contract.

7. Monitor the pavement smoothness with a 15-foot rolling straightedge as required by section 334-3.10.4 below.

334-3 GENERAL CONSTRUCTION REQUIREMENTS

334-3.1 DESCRIPTION

Construct plant-mixed hot bituminous pavements. Establish and maintain a quality control system in accordance with section 334-2 above that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

334-3.2 LIMITATIONS OF OPERATIONS

334-3.2.1 Weather Limitations: Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the laying operations.

334-3.2.2 Limitations of Laying Operations:

334-3.2.2.1 General: Spread the mixture only when the surface upon which it is to be laid has been previously prepared, is intact, firm, and properly cured, and is substantially dry. Do not place friction course until the adjacent shoulder area has been dressed and grassed.

334-3.2.2.2 Temperature: Spread the mixture only when the air temperature in the shade and away from artificial heat is at least 40ºF and rising for layers greater than 1 inch in thickness and at least 45ºF and rising for layers 1 inch or less in thickness (including leveling courses). The minimum temperature requirement for leveling courses with a spread rate of 50 lb/yd2 or less is 50ºF and rising.

334-3.2.2.3 Wind: Do not spread the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

334-3.2.2.4 Night Paving: Provide sufficient lighting for night operations.

334-3.3 ROADWAY SURFACE PREPARATION

334-3.3.1 Cleaning: Prior to the laying of the mixture, clean the surface of the base or pavement to be covered of all loose and deleterious material by the use of a vacuum truck. Power brooms or blowers may be used when the use of a vacuum truck is impractical, supplemented by hand brooming where necessary.

334-3.3.2 Patching and Leveling Courses: Where an asphalt mix is to be placed on an existing pavement or old base which is irregular, or wherever the plans indicate, bring the existing surface to proper grade and cross-section by the application of patching or leveling courses. Wherever a patch is required, the width shall be taken out to the full width of each lane affected and the length shall extend far enough longitudinally to fully

encompass the affected area. The existing pavement receiving a patch or leveling course shall be milled as shown on the plans or as required by the Engineer.

334-3.3.3 Application Over Surface Treatment: Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep and dispose of all loose material from the paving area.

334-3.3.4 Coating Surfaces of Contacting Structures: Paint all structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.

334-3.3.5 Tack Coat:

334-3.3.5.1 Tack Coat Required: Apply a tack coat, meeting the requirements of Section 300 in the FDOT Standard Specifications for Road and Bridge Construction, on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes. The use of Trackless Polymer Modified Asphalt Emulsion Tack Coat (MTSS-1HM) is not allowed unless approved by the Engineer.

334-3.3.5.2 Tack Coat at Engineer's Option: Apply a tack coat on the following surfaces only when so directed by the Engineer:

1. Freshly primed bases.
2. Surface treatment.

334-3.4 ASPHALT PLANT PREPARATION

Ensure the following requirements are met at the asphalt plant:

Asphalt Cement

- Asphalt cement is delivered to the asphalt plant at a temperature not to exceed 370ºF.
- Asphalt cement is maintained in storage within a range of 230 to 370ºF in advance of mixing operations.
- Constant heating is maintained within these limits, and that high fluctuations in temperature during a day's production is avoided.

Aggregate Blending:

- All aggregates to be blended or proportioned are placed in separate bins at the cold hopper.
- Proportioning is performed by means of securely positioned calibrated gates or other

approved devices.

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Aggregate Cold Bins:

- Bin compartments are constructed to prevent any spilling or leakage of aggregate from one bin to another.
- Bin compartments have the capacity and design to permit a uniform flow of aggregates.
- Bin compartments are mounted over a feeder of uniform speed, which will deliver the specified proportions of aggregate to the drier.
- Bins are equipped with vibrators to ensure a uniform flow of aggregate at all times.
- Each bin compartment is provided with a gate which is adjustable in the vertical direction.
- Gates can be held securely at any specified vertical opening.
- Gates are equipped with a measuring device for measuring the vertical opening of the gates from a horizontal plane level with the bottom of the feeder.

Mineral Filler:

Mineral filler (if required in the mix design) is fed or weighed in separately from the other aggregates.

Aggregate Heating and Drying:

- Aggregates are heated and dried before screening.
- The temperature of the aggregates is controlled so that the temperature of the completed mixture at the plant falls within the permissible range allowed by this Section.

Aggregate Screening:

- Oversized pieces of aggregate are removed by the use of a scalping screen.
- Oversized material is not returned to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen.
- The quantity of aggregates being discharged onto the screens does not exceed the capacity of the screens to actually separate the aggregates into the required sizes.
- A maximum of 10% plus-10 material in the minus-10 bin is maintained.

334-3.5 MIXTURE PREPARATION

Ensure the following requirements are met:

334-3.5.1 Batch Mixing: The dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the verified mix design, shall be conveyed to the empty mixer. The accurately measured hot asphalt binder shall be introduced into the

mixer simultaneously with, or after, the hot aggregates. The blended materials shall be continuously mixed until thoroughly uniform with all particles fully coated. The mixing time begins when the measuring devices for both the asphalt and the aggregates indicate that all the material is in the mixer, and continues until the material begins to leave the mixing unit. In no case will the mixing time be less than 35 seconds.

334-3.5.2 Continuous Mixing: The dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the verified mix design, shall be introduced into the mixer in synchronization with the accurate feeding of the hot asphalt cement. The blended materials shall be sufficiently mixed until thoroughly uniform with all particles fully coated.

334-3.5.3 Mix Temperature: The ingredients of the mix shall be heated and combined in such a manner as to produce a mixture with a temperature, when discharged from the pugmill or surge bin, which is within the master range as defined below.

The temperature of the completed mixture shall be determined using a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. A 1/4 inch hole on both sides of the truck body within the middle third of the length of the body, and at a distance from 6 to 10 inches above the surface supporting the mixture shall be provided.

The normal frequency for taking asphalt mix temperatures will be for each day, for each design mix on the first five loads and once every five loads thereafter. The temperature of the asphalt mix at the plant and at the roadway shall be taken at the normal frequency before the mix is placed. The temperature shall be recorded on the front of the respective delivery ticket. The Engineer shall review the plant and roadway temperature readings and may take additional temperature measurements at any time.

The master range for all mix designs will be the established temperature from the mix design ±30ºF. Reject for use on the project any load or portion of a load of asphalt mix at the plant or at the roadway with a temperature outside of this master range. The Engineer will be immediately notified of the rejection.

If any single load at the plant or at the roadway is within the master range but differs from the established mix temperature by more than ±25ºF or if the average difference of

the temperature measurements from the established mix temperature for five loads exceeds ±15ºF, the temperature of every load will be monitored until the temperature falls within the specified tolerance range in Table 334-1; at this time the normal frequency may be resumed.

Table 334-1
Temperature Tolerance From Verified Mix Design

Any Single Measurement
±25ºF

Average of Any Five Consecutive Measurements
±15ºF

334-3.5.4 Maximum Period of Storage: The maximum time that any mix may be kept in a hot storage or surge bin shall be 72 hours.

334-3.5.5 Contractor's Responsibility for Mixture Requirements: Produce a homogeneous mixture, free from moisture and with no segregated materials, that meets all specification requirements. Also apply these requirements to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

334-3.6 MIXTURE TRANSPORT

Transport the mixture in tight vehicles previously cleaned of all foreign material. After cleaning, thinly coat the inside surface of the truck bodies with soapy water or an asphalt release agent as needed to prevent the mixture from adhering to the beds. Do not allow excess liquid to pond in the truck body. Do not use diesel fuel or any other hazardous or environmentally detrimental material as a coating for the inside surface of the truck body. Cover each load during cool and cloudy weather and at any time there is a probability of rain.

334-3.7 MIXTURE PLACEMENT

334-3.7.1 Requirements Applicable to All Mixture Types:

334-3.7.1.1 Alignment of Edges: Lay all asphalt concrete mixtures, including leveling courses, other than the pavement edge just adjacent to curb and gutter or other true edges, by the stringline method to obtain an accurate, uniform alignment of the pavement edge. Control the unsupported pavement edge to ensure that it will not deviate more than ±1.5 inches from the stringline.

334-3.7.1.2 Temperature of Spreading: Maintain the temperature of the mix at the time of spreading within the master range as defined in 334-3.5.3.

334-3.7.1.3 Rain and Surface Conditions: Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is standing water on the surface to be covered. Once the rain has stopped and water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in 334-3.7.1.2, the Contractor may then place the mixture caught in transit.

334-3.7.1.4 Speed of Paver: Establish the forward speed of the asphalt paver based on the rate of delivery of the mix to the roadway but not faster than the optimum speed needed to adequately compact the pavement.

334.3.7.1.5 Automatic Screed Control: For all asphalt courses placed with an asphalt paver, equip the paver with automatic longitudinal screed controls of either the skid type, traveling stringline type, or non-contact averaging ski type with a minimum length of 25 feet. On the final layer of asphalt base, overbuild, and structural courses, and for friction courses, use the joint matcher in lieu of the skid, traveling stringline, or non-contact averaging ski on all passes after the initial pass. Equip the asphalt paver with electronic cross slope controls.

334-3.7.1.6 Number of Crews Required: For each paving machine operated, use a separate crew, each crew operating as a full unit. The technician who will be in charge of all paving operations shall be state approved and properly certified as deemed appropriate by the Engineer. The Contractor's technician in charge of the paving operations may be responsible for more than one crew but must be physically accessible to the Engineer at all times when placing mix.

334-3.7.1.7 Checking Depth of Layer: Check the depth of each layer at frequent intervals, and make adjustments when the thickness deviates from the design thickness. When making an adjustment, allow the paving machine to travel a minimum distance of 32 feet to stabilize before the second check is made to determine the effects of the adjustment.

334-3.7.1.8 Hand Spreading: In limited areas where the use of the spreader is impossible or impracticable, the Contractor may spread and finish the mixture by hand.

334-3.7.1.9 Straightedging and Back-patching: Straightedge and backpatch after obtaining initial compaction and while the material is still hot.

334-3.7.2 Requirements Applicable to Courses Other Than Leveling:

334-3.7.2.1 Spreading and Finishing: Upon arrival, dump the mixture in the approved mechanical spreader, and immediately spread and strike-off the mixture to the full width required, and to such loose depth for each course that, when the work is completed, the required specified thickness is placed. Carry a uniform amount of mixture ahead of the screed at all times.

334-3.7.2.2 Thickness of Layers: Construct each course of Type SP mixture in layers of thickness as shown in Section 334-4.1.3.

334-3.7.2.3 Laying Width: For regular roadways, pave to the full lane width, except in areas where physically constrained. For other applications such as sidewalks, provide a spreader capable of placing and screeding to the plan width. If necessary due to the traffic requirements, lay the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, lay the mixture to the full width with machines traveling in echelon. Plan longitudinal joints such that they are not placed where a permanent wheel path will occur.

334-3.7.2.4 Correcting Defects: Before starting any rolling, check the surface. Correct any irregularities; remove all drippings, fat sandy accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

334-3.7.3 Requirements Applicable Only to Leveling Courses:

334-3.7.3.1 Patching Depressions: Before spreading any leveling course, fill all depressions in the existing surface more than 1 inch deep by spot patching with leveling course mixture, and then compact them thoroughly.

334-3.7.3.2 Spreading Leveling Courses: Place all courses of leveling by the use of two motor graders, equip one with a spreader box. Other types of leveling devices may be used if approved by the Engineer.

334-3.7.3.3 Rate of Application: When using Type SP-9.5 (fine graded) for leveling, do not allow the average spread of a layer to be less than 50 lb/yd2 or more than 75 lb/yd2. The quantity of mix for leveling shown in the plans represents the average for the entire project.

334-3.8 MIXTURE COMPACTION

334-3.8.1 Equipment and Sequence: For each paving or leveling train in operation, furnish a separate set of rollers, with their operators.

Select equipment, sequence, and coverage of rolling to meet the specified mix design density. The coverage is the number of times the roller passes over a given area of pavement.

Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

334-3.8.2 Standard Rolling Procedure: Meet the following equipment, sequence, and coverage requirements:

1. Seal Rolling: Provide two coverages with a tandem steel-wheeled roller, weighing 5 to 12 tons, following as close behind the spreader as possible without pick-up, undue displacement, or blistering of the material. Use static mode only for all compaction. No vibration will be allowed.

2. Intermediate rolling: Provide five coverages with a self-propelled pneumatic-tired roller, following as close behind the seal rolling operation as the mix will permit.

3. Final rolling: Provide one coverage with a tandem steel-wheeled roller (static mode only), weighing 5 to 12 tons, after completing the seal rolling and intermediate rolling, but before the surface pavement temperature drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

For patching and leveling courses, the first structural layer placed on a milled surface, and on the first overbuild course, use only a self-propelled pneumatic-tired roller.

The Contractor may use equipment, sequences, or coverages other than those specified in the standard rolling procedure if so authorized by the Engineer.

334-3.8.3 Compaction at Crossovers, Intersections, etc.: When using a separate paving machine to pave the crossovers, compact the crossovers with one, 8 to 12 ton tandem steel roller (static mode only). If placing crossovers, intersections, and acceleration and deceleration lanes with the main run of paving, also use a traffic roller to compact these areas.

334-3.8.4 Rolling Procedures: Ensure that the initial rolling is longitudinal.

Where the lane being placed is adjacent to a previously placed lane, pinch or roll the center joint prior to the rolling of the rest of the lane.

Roll across the mat, overlapping the adjacent pass by at least 6 inches. Roll slowly enough to avoid displacement of the mixture, and correct any displacement at once by the use of rakes and the addition of fresh mixture if required.

Continue final rolling to eliminate all roller marks.

334-3.8.5 Number of Pneumatic-tired Rollers Required: Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling of the surface for the required number of passes does not delay any other phase of the laying operation and does not result in excessive cooling of the mixture before completing the rolling. In the

event that the rolling falls behind, discontinue the laying operation until the rolling operations are sufficiently caught up.

334-3.8.6 Compaction of Areas Inaccessible to Rollers: Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, headers, gutters, bridges, manholes, etc.

334-3.8.7 Correcting Defects: Do not allow the rollers to deposit gasoline, oil, or grease onto the pavement. Remove and replace any areas damaged by such deposits as directed by the Engineer. While rolling is in progress, test the surface continuously, and correct all discrepancies to comply with the surface requirements.

Remove and replace all drippings, fat or lean areas, and defective construction of any description. Remedy depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface.

Correct all high spots, high joints, and honeycombing as directed by the Engineer.

Remove and replace any mixture remaining unbonded after rolling. Correct all defects prior to laying the subsequent course.

334-3.9 JOINTS

334-3.9.1 General: When laying fresh mixture against the exposed edges of joints (trimmed or formed as provided below), place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

334-3.9.2 Transverse Joints: Place the mixture as continuously as possible. Do not pass the roller over the unprotected end of the freshly laid mixture except when discontinuing the laying operation long enough to permit the mixture to become chilled.

When thus interrupting the laying operation, construct a transverse joint by cutting back on the previous run to expose the full depth of the mat.

334-3.9.3 Longitudinal Joints: For all layers of pavement except the leveling course, place each layer so that longitudinal construction joints are offset 6 to 12 inches laterally between successive layers. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

334-3.10 SURFACE REQUIREMENTS

334-3.10.1 General: Construct a smooth pavement with good surface texture and the proper cross-slope.

334-3.10.2 Texture of the Finished Surface of Paving Layers: Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Correct any area of the surface that does not meet the foregoing requirements in accordance with 334-3.10.5.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface in sections less than 1 mile in length and across the full width of the roadway unless approved by the Engineer.

334-3.10.3 Cross Slope: Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish a level with a minimum length of 4 feet or a digital measuring device approved by the Engineer for the control of cross slope. Make this level or measuring device available at the jobsite at all times during paving operations. Utilize electronic transverse screed controls on the paving machine (unless directed otherwise by the Engineer) to obtain an accurate transverse slope of the pavement surface.

334-3.10.3.1 Quality Control Checks: Measure the cross slope of the pavement surface by placing the measuring device perpendicular to the roadway centerline. Report the cross slope to the nearest 0.1%. Record all the measurements on an approved form and submit to the Engineer for documentation. The cross slope report shall be submitted to the Engineer prior to the next scheduled paving operation.

Measure the cross slope at a minimum frequency of one measurement every 100 feet during paving operations to ensure that the cross slope is uniform and in compliance with the design cross slope. When the difference between the measured cross slope and the design cross slope exceeds ±0.2% for travel lanes (including turn lanes) or ±0.5% for shoulders, make all corrections immediately to bring the cross slope into the acceptable range.

When the cross slope is consistently within the acceptable range, upon the approval of the Engineer, the frequency of the cross slope measurements can be reduced to one measurement every 250 feet during paving operations.

For intersections, tapers, crossovers, transitions at beginning and end of project and similar areas, adjust the cross slope to match the actual site conditions or as directed by the Engineer.

334-3.10.4 Pavement Smoothness: Construct a smooth pavement meeting the requirements of this Specification. The County will provide a representative to be present when smoothness testing is performed.

334-3.10.4.1 General: Furnish a 15 foot manual and a 15 foot rolling straightedge meeting the requirements of FM 5-509. Make them available at the job site at all

times during paving operations. Obtain a smooth surface on all pavement courses placed, and then straightedge all final structural and friction course layers in accordance with 334-3.10.4.5.

334-3.10.4.2 Test Method: Perform all straightedge testing in accordance with FM 5-509 with one pass of the rolling straightedge operated along the outside wheel path of each lane being tested. The Engineer may require additional testing at other locations within the lane.

334-3.10.4.3 Traffic Control: Provide traffic control in accordance with 334-3.2 and FDOT Design Standard Indices (600 series as applicable) during all testing. When traffic control cannot be provided in accordance with the applicable indices, submit an alternative Traffic Control Plan. The cost of this traffic control is included in the Contract bid prices for other pay items.

334-3.10.4.5 Quality Control Checks:

334-3.10.4.5.1 General: Straightedge the final Type SP structural layer and friction course layer with a rolling straightedge. Test all pavement lanes and ramps where the width is constant using a rolling straightedge and document all deficiencies on a form approved by the Engineer. Notify the Engineer of the location and time of all straightedge checks a minimum of 48 hours before beginning. Testing shall be conducted by a certified Paving Level I or higher technician. Maintain a field record during testing on a form approved by the Engineer identifying the areas tested and listing the location and degree of all deficiencies found. The field record shall be signed by the technician conducting the test and the Engineer or Engineer's Representative observing the test.

334-3.10.4.5.2 Rolling Straightedge Exceptions: Testing with the rolling straightedge will not be required in the following areas: intersections, tapers, crossovers, parking lots and similar areas. In addition, testing with the rolling straightedge will not be performed on the following areas when they are less than 50 feet in length: turn lanes, acceleration/deceleration lanes and side streets. However, correct any individual surface irregularity in these areas that deviates from the plan grade in excess of 3/8 inch as determined by a 15 foot manual straightedge, and that the Engineer deems to be objectionable, in accordance with 334-3.10.5.

In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.

334-3.10.4.5.3 Intermediate Layers: Straightedge all intermediate Type SP layers (structural and overbuild) as necessary to construct a smooth pavement.

On roadways with a design speed 50 miles per hour or greater, when an intermediate Type SP layer will be opened to traffic, straightedge the pavement with a rolling straightedge and correct all deficiencies in excess of 3/8 inch within 72 hours of placement, unless directed otherwise by the Engineer. Correct all deficiencies in accordance with 334-3.10.5.

334-3.10.4.5.4 Final Type SP Structural Layer: Straightedge the final Type SP structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations. Correct all deficiencies in excess of 3/16 inch in accordance with 334-3.10.5, and retest the corrected areas prior to placing the friction course.

For bicycle paths, straightedge the final structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. Correct all deficiencies in excess of 5/16 inch in accordance with 334-3.10.5. Retest all corrected areas. If the Engineer determines that the deficiencies on the bicycle path are due to field geometrical conditions, the Engineer will waive corrections.

334-3.10.4.5.5 Friction Course Layer: Acceptance for pavement smoothness will be based on verified Quality Control measurements using the rolling straightedge. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations.

At the completion of all paving operations, straightedge the friction course as a separate operation. As an exception, if approved by the Engineer, straightedge the friction course behind the final roller of the paving train. Correct all deficiencies in excess of 3/16 inch in accordance with 334-3.10.5. Recheck all corrected areas.

334-3.10.5 Correcting Unacceptable Pavement: Correct all areas of unacceptable pavement at no cost to the County. Correct deficiencies in the Type SP structural layers or in the friction course by removing and replacing the full depth of the layer, extending for a distance on either side of the defective area as determined by the Engineer, but in no case less than 50 feet on either side of the defective area for the full width of the paving lane. At the discretion of the Engineer, removal and replacement of the entire limits of the new pavement may be required.

334-3.11 FINISHED SURFACE PROTECTION

Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.

Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

Equip blade graders operating adjacent to the pavement during shoulder construction with a 2 by 8 inch or larger board, or other attachment providing essentially the same results, attached to their blades in such manner that it extends below the blade edge in order to protect the pavement surface from damage by the grader blade.

To prevent rutting or other distortion, protect sections of newly finished dense graded friction course and the last structural layer prior to the friction course from traffic until the surface temperature has cooled below 160ºF.

The Contractor may use artificial methods to cool the pavement to expedite paving operations. The County may direct the Contractor to use artificial cooling methods when maintenance of traffic requires opening the pavement to traffic at the earliest possible time.

334-3.12 STRIPING

Following final cooling and compaction of the mat and prior to opening to traffic, place temporary painted traffic stripes in accordance with TP-710 and Standard Specification 710 on each paved surface that will receive traffic, including intermediate structural courses, final structural courses that will serve as the surface course, and friction courses. Following thirty (30) days after placement of the final surface course, structural or friction, place thermoplastic striping in accordance with TP-711 and Standard Specification 711 and place raised reflective pavement markers. Final pavement markings are subject to a 180 day observation period under normal traffic. The observation period shall begin with the satisfactory completion and acceptance of the work. The pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of reflectivity or vehicular damage. The County reserves the right to check the color and retroreflectivity within 30 days prior to the end of the observation period. Replace, at no additional expense to the County, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

334-4 SUPERPAVE ASPHALTIC CONCRETE

334-4.1 DESCRIPTION

334-4.1.1 General: Construct a Superpave Asphaltic Concrete pavement using the type of mixture specified in the Contract on a properly prepared and accepted base.
Superpave mixes are identified as Type SP-9.5, Type SP-12.5 or Type SP-19.0.

Meet the requirements of 334-2 for personnel, plant, methods and equipment. Meet the general construction requirements of 334-3.

334-4.1.2 Traffic Levels: The requirements for Type SP Asphaltic Concrete mixtures are based on the design traffic level of the project, expressed in 18-Kip Equivalent Single

Axle Loads (ESAL's). The traffic levels applicable for this specification are as shown in Table 1.

Table 1
Superpave Traffic Levels

Traffic Level	Million ESAL's	Typical Applications
A	<0.3	Local roads, county roads, and city streets where truck traffic is light or prohibited
B	0.3 to <3	Arterial roads, Collector roads, access streets, medium duty city streets and the majority of county roadways
C	3 to < 10	

The traffic level(s) for the project are as specified in the Contract. A Type SP mix one traffic level higher than the traffic level specified in the Contract, up to a Traffic Level C mix, may be substituted at no cost to the County. In situations where the design traffic level is not specified in the Contract, a Traffic Level C mix shall be used.

334-4.1.3 Layers: Use only fine graded Superpave mixes.

334-4.1.3.1 Layer Thickness: The allowable structural layer thicknesses for fine Type SP Asphaltic Concrete mixtures are as follows:

Type SP-9.5.....1 1/4 – 1 1/2 inches
Type SP-12.5.....1 1/2 – 2 1/2 inches
Type SP-19.0.....2- 3 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on fine mixes when used as a structural course:

Type SP-9.5 - Limited to the top two structural layers, two layers maximum.
Type SP-12.5 - May not be used in the first layer of courses over 3 1/2 inches thick, nor in the first layer of courses over 2 3/4 inches thick on limited access facilities.
Type SP-19.0 - May not be used in the final (top) structural layer.

334-4.1.3.2 Additional Requirements: The following requirements also apply to fine Type SP Asphaltic Concrete mixtures:

334-4.1.3.2.1 When construction includes the paving of adjacent shoulders (≤5 feet wide), the layer thickness for the upper pavement layer and shoulder shall be the same and paved in a single pass, unless called for differently in the contract documents.

334-4.1.3.2.2 All overbuild layers shall be Type SP Asphalt Concrete designed at the traffic level as stated in the Contract. Use the minimum and maximum layer thicknesses as specified above unless called for differently in the contract documents. On variable thickness overbuild layers, the minimum allowable thickness may be reduced by 1/4 inch, and the maximum allowable thickness may be increased 1/2 inch, unless called for differently in the contract documents.

334-4.2 MIX COMPOSITION

334-4.2.1 General: Compose the asphalt mixture using a combination of aggregates (coarse, fine or mixtures thereof), mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate proportions to meet the grading and physical properties of the approved mix design. Aggregates from various sources may be combined.

334-4.2.2 Mix Design: Submit to the Engineer the proposed mix design and proof that this mix design is on the FDOT District 5 accepted list. The Engineer will verify with the FDOT District 5 Bituminous Engineer that the mix is on the approved list. No mix design revisions will be allowed. A new design mix will be required for any substitution of an aggregate product, binder, or other design component unless approved by the Engineer. The Engineer will consider any marked variations from mix design parameters or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of that mix design. Provide certification from the plant (either in a statement on the delivery ticket or on a separate sheet) that the mix provided is in conformance with the design mix.

334-4.2.3 Additional Information: Provide the following information to the Engineer with each FDOT approved mix design submitted for use:

- The approved FDOT Mix Design Number.
- The design traffic level and the design number of gyrations (N_{design}).
- The source and description of the materials to be used.
- The FDOT source number product code of the aggregate components furnished from an FDOT approved source.

- The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation in handling and processing as necessary.
- A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly -No. 200 [-75 µm]) should be accounted for and identified for the applicable sieves.
- The bulk specific gravity value for each individual aggregate (and RAP) component, as identified in the FDOT aggregate control program.
- A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%.
- A target temperature at which the mixture is to be discharged from the plant and a target roadway temperature. Do not exceed a target temperature of 340°F for modified asphalts and 315°F for unmodified asphalts.
- The physical properties achieved at four different asphalt binder contents, one of which shall be at the optimum asphalt content, and must conform to all specified physical requirements.
- The ignition oven calibration factor.

334-4.3 MATERIALS

334-4.3.1 General Requirements: Meet the material requirements specified in Division III of the FDOT Standard Specifications for Road and Bridge Construction. Specific references are as follows:

Coarse Aggregate: Stone, Slag, Crushed Gravel, Crushed Reclaimed Portland Cement Concrete Pavement, Crushed Glass.....Section 901
Fine Aggregate.....Section 902
Superpave PG Asphalt Binder ..... Section 916-1

334-4.3.2 Superpave Asphalt Binder: Unless specified otherwise in the Contract, use a PG 58-22 or PG 67-22 asphalt binder unless the use of a different binder or recycling agent has been approved by the Florida Department of Transportation and the Engineer for a particular mix design.

334-4.3.3 Use of Reclaimed Asphalt Pavement (RAP) Material:

334-4.3.3.1 General Requirements: Reclaimed Asphalt Pavement (RAP) may be used as a component material of the asphalt mixture, with the exception of Friction Course mixes, subject to the following requirements:

- Assume responsibility for the production and placement of asphalt mixes which incorporate RAP as a component material.
- Use only RAP that has been approved by the FDOT. Provide documentation of the FDOT approval.
- Limit the amount of RAP material used in the mix to a maximum of 30% by weight of total aggregate, unless otherwise approved the Engineer.
- Use any suitable means to prevent oversized RAP material from showing up in the completed recycled mixture. Take immediate corrective action if oversized RAP material appears in the completed recycled mix.
- Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.
- Provide RAP having a minimum average asphalt content of 4.0% by weight. The Engineer may sample the stockpile to verify that this requirement is met.

334-4.4 ACCEPTANCE

334-4.4.1 General: The asphalt mixture will be accepted based on one of the following methods as determined by the Engineer and/or the Contract Documents:

1) Certification, Contractor Process Control Testing, and Acceptance Testing by the Engineer
2) Other method(s) as determined by the Contract

334-4.4.2 Certification by the Contractor: Submit a Notarized Certification of Specification Compliance letter by an officer of the company who is in responsible charge of paving operations. The letter shall be submitted on company letterhead to the Engineer and shall state that all material produced and placed on the project was in substantial compliance with the Specifications.

334-4.4.3 Contractor Process Control Testing: Provide supporting test data documenting all quality and process control testing as described in 334-2 above. A pre-qualified Independent Laboratory as approved by the Engineer may be utilized for the Process Control testing.

334-4.4.4 Acceptance Testing by the Engineer: The Engineer may employ the use of a pre-qualified Independent Geotechnical Engineering firm and/or Laboratory to perform acceptance testing. For every 500 feet of pavement placed per lane per day, take a set of three (3) randomly placed cores, at least two (6") inches in diameter, for determining density and thickness. A minimum of two sets of three cores will be taken per roadway. Acceptance will be based on the following:

334-4.4.4.1 Density: The minimum acceptable average density for each course of asphaltic concrete placed shall be ninety-two (92%) percent of the design unit weight (G_{mm}) of the job mix, with no test lower than ninety and eight tenths (90.8%) percent or higher than ninety-five (95%) percent.

334-4.4.4.2 Thickness: Meet the minimum design thickness on all cores. When a deficiency in thickness is found, the Engineer may require additional cores to be taken to determine the extent of the thickness deficiency. For any thickness that is less than the design thickness, remove and replace the full depth of the layer, extending for a distance on either side of the defective area as determined by the Engineer, but in no case less than 50 feet on either side of the defective area for the full width of the paving lane. At the discretion of the Engineer, removal and replacement of the entire limits of the new pavement may be required. For any thickness that is greater than the design thickness, the Engineer will make a determination about acceptance.

334-4.4.4.3 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 334-3.10.

334-4.4.4.4 Additional Tests: The County reserves the right to run any test at any time for informational purposes and for determining the effectiveness of the Contractor's quality control and process control.

334-4.5 METHOD OF MEASUREMENT

For the work specified under this Section the quantity to be paid for shall be the actual area in Square Yards (SY) of asphaltic concrete placed and accepted within the limits of the contract.

334-4.6 BASIS OF PAYMENT

Type SP Asphaltic Concrete will be paid for at the contract unit price per square yard, completed and accepted. No additional payment will be made for thickness of asphalt greater than the design thickness.

The bid price for the asphalt mix will include the cost of the liquid asphalt or the asphalt recycling agent. There will be no separate payment for the asphalt binder material in the asphalt mix.

Payment shall be made under:

Item No. 334-2-15 Superpave Asphaltic Concrete, (Traffic C) (1-1/2") (SP-12.5) - per square yard (SY)

Pay Item Footnote No. 334-2-15
Pay item 334-2-15 includes all asphalt restoration, such as asphalt restoration at pipe crossings.

END OF SECTION 334

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 400

CONCRETE STRUCTURES

The work specified in this Section consists of the construction of concrete structures and other concrete members at the locations and to the dimensions shown on the plans in accordance with Section 400 of the FDOT Standard Specifications for Road and Bridge Construction. All concrete construction not covered under a separate specific technical provision or pay item should be constructed in accordance with this technical provision.

Exposed concrete surfaces shall receive a Class I Surface Finish as required by Article 400-15.2.2 of the Standard Specifications, unless otherwise noted in the construction plans.

Method of Measurement

The quantity to be paid for under this Section shall be the volume, in cubic yards, of the classes of concrete shown in the plans, completed, in place, and accepted, except as noted herein.

Basis of Payment

Price and payment will be full compensation for the classes of concrete shown in the plans and shall include all labor, excavation, backfilling, compaction, forms, bracing, reinforcing steel, concrete, dewatering, and all items and incidentals necessary to complete this item of work. No separate payment will be made for obtaining the required concrete finish.

Approach slabs will be paid at the contract unit price each for concrete approach slab.

Payment shall constitute full compensation for all work and materials specified herein, and in Sections 400 and 415 of the FDOT Standard Specifications for Road and Bridge Construction.

Payment shall be made under:

Pay Item:		
400-2-2	Endwall, Extend Concrete Endwall (including reinforcing steel)	- per Cubic Yard
400-2-10	Approach Slab, Slab between Weir and Endwall (including reinforcing steel)	- per Cubic Yard
400-2-11	Retaining Wall, Weir and Weir Footer (including reinforcing steel)	- per Cubic Yard

Pay Item Footnote No. 400-2, 400-2-10, and 400-2-11
Pay item 400-2-2, 400-2-10, and 400-2-11 include the construction of everything shown on Sheets S001 and S101, including but not limited to cost of reinforcement, includes all materials,

such as reinforcing steel, concrete, extending end wall, constructing weir, constructing slab, etc. Handrail is excluded from these pay item numbers.

END OF SECTION 400

INLETS, MANHOLES, AND JUNCTION BOXES

Construction of Inlets, Manholes and Junction Boxes shall conform to the requirements of Section 425 of the "Standard Specifications" and applicable FDOT Design Standards and Details contained in the plans, except as directed by the Engineer.
Precast inlet tops shall not be used for any type of inlet.

Method of Measurement

The quantities measured for payment under this Section shall be the number of inlets, manholes, junction boxes, yard drains, special end walls, and shallow ditch drains satisfactorily completed and accepted, including drainage structure under drains where required.

Basis of Payment

Structures included in this Section will be paid for at the contract unit price each, completed and accepted. Payments shall constitute full compensation for furnishing all materials and completing all work described herein or shown on the plans, including all excavation; dewatering; subsoil excavation and replacement material; backfilling and compacting around structures; disposal of surplus material; and furnishing and placing of all concrete; reinforcing steel; gratings; frames; covers, and any other necessary fittings as shown in the plans, required for acceptable construction, or as directed by the Engineer. Where required, drainage structure underdrains shall be included in the unit price for inlets and manholes. Any alteration of pipe grades up to one (1) foot to clear utilities shall be made and connections to structures made at no additional cost to the County or utility.

Payment shall be made under:

Item No. 425-1-0	Yard Drain (24” HDPE)	Each
Item No. 425-1-521	Inlets (DT Bot)(Type C)(<10’)	Each
Item No. 425-1-541	Inlets (DT Bot)(Type D)(<10’)	Each
Item No. 425-4	Modify Existing Inlet	Each

END OF SECTION 425

PIPE CULVERTS AND STORM SEWERS

Construction of Pipe Culverts, Storm Sewers and Mitered End Sections shall conform to the requirements of Section 430 of the Standard Specifications, except as modified herein or as directed by the Engineer. All round and elliptical pipes shall be steel reinforced concrete pipe (SRCP).

Lifting holes in reinforced concrete pipe are prohibited.

Proposed storm sewer pipe to be connected to existing structures shall have openings cut into the existing structure without permanently damaging the structure. All structure openings shall be grouted watertight, with non-shrink grout, after pipe installation, and the structure shall be restored as approved by the Engineer.

The cost of connections to existing structures shall be included in the price bid for the pipe.

Final pipe inspection requirements shall conform to Section 430-4.8 of the Standard Specifications. All culverts and storm sewer pipes shall be videoed by the contractor and inspected and approved by the Engineer prior to final paving.

The only acceptable repair method shall be remove and relay / replace, or as otherwise directed by the Engineer. The repair cost shall be borne solely and completely by the Contractor.

All pipe culvert designated in the plans to be desilted shall be videoed in accordance to Section 430-4.8 of the Standard Specifications and approved by the Engineer prior to payment.

Concrete Pipe Joints

Each joint in a concrete pipe culvert or storm sewer shall be wrapped on the exterior of the pipe with a band of filter fabric measuring 3 feet wide centered on the joint and lapped a minimum of 2 feet. The filter fabric shall meet the requirements of Section 985 of the Standard Specifications and shall be secured against the outside of the pipe by stainless metal or plastic strapping or by other methods approved by the Engineer. These costs shall be included in the per linear foot price for the pipe.

Method of Measurement

Quantities measured for payment under this Section shall be the length in linear feet of pipe culvert or storm sewer measured in place, completed and accepted. Measurements shall be from the inside face of structure wall to inside face of structure wall.

For mitered end sections the quantity measured for payment shall be the number completed and accepted.

Basis of Payment

Pipe Culverts and Storm Sewers will be paid for at the contract unit price completed and accepted. The unit price shall include connection of proposed pipes to existing structures and the replacement of the backfill, base course, and pavement removed for

pipe trenching. Payment shall be full compensation for all work and materials described herein, including excavation (in whatever material is encountered), dewatering, removing unsuitable material and replacing with select bedding material, backfilling, compaction, furnishing and installing all pipe, disposing of surplus materials, and other work as may be required for an acceptable installation.

Payment shall be made under:

Item No		
430- 14-112	Pipe Culvert, HDPE (Round) (12")	LF
430- 14-118	Pipe Culvert, SRCP (Round) (18" SS)	LF
430- 14-124	Pipe Culvert, SRCP (Round) (24" SS)	LF
430- 14-218	Pipe Culvert, SRCP (Elliptical) (18" SS)	LF
430- 982-125	Mitered End Section (18")	EA
430- 982-129	Mitered End Section (24")	EA

END OF SECTION 430

PIPE HANDRAIL

The word specified under this Section consists of the furnishing and erection of steel pipe handrail, in accordance with the requirements of Section 962 of the FDOT Specifications, as amended herein.

Steel Pipe Handrail shall be constructed of galvanized steel pipe railings, with galvanized steel diamond wire fabric, assembled and erected as shown on the Plans.

Steel handrail shall be constructed in accordance with the requirements of Section 962 of the FDOT Specifications, and Index No 880 of the FDOT Design Standards, latest edition.

The work specified in this Section includes that furnishing and erection of all posts, railing, bracing, wire fabric, welding, painting and anchorage assemblies required to complete the work. For handrails that are an extension of an existing handrail. The extension handrail shall match the existing handrail. When an extension the price of painting the entire handrail (existing and proposed) will be included the price of the proposed handrail.

Method of Measurement

Quantities measured for payment under this Section shall be the linear feet of handrail steel pipe actually constructed and accepted.

Basis of Payment

Steel pipe handrail will be paid for at the contract unit price completed and accepted. The unit price shall include all posts, railing, bracing, wire fabric, welding, painting and anchorage assemblies required to complete the work. Payment shall be full compensation for all work and materials described herein, and all other work as may be required for an acceptable installation.

Payment shall be made under:

Item No		
515-1-1	Pipe Handrail (Steel)	- LF

Pay Item Footnote No. 515-1-1
Pay item 515-1-1 includes the construction of handrail detail on Sheet 17, and all associated work including but not limited to cost of extending handrail, painting entire handrail, painting entire railing, welding

END OF SECTION 515

TP 519

BOLLARDS

A complete working, structurally stable, straight removal or permanent bollard shall be provided. A detail for the bollard is located in the plan set.

The bollard can be cast-in-place or precast. Shop drawings shall be submitted for the bollards.

The bollard shall be 6-inches in diameter and 36-inches above grade. The permanent bollards shall consist of a concrete filled 6-inch diameter pipe. The concrete shall be 3000 psi at 28 days.

The bollard shall be bright yellow in color.

A concrete foundation that will provide a straight and stable bollard shall be provided.

Removal bollards shall be installed with a lock matching the Park Departments key.

The cost of foundation, painting, accessories or other needed equipment shall be included in the price bid for the bollard.

Method of Measurement

Quantities measured for payment under this Section shall be the number of bollards in place, completed and accepted.

Basis of Payment

Bollards will be paid for at the contract unit price completed and accepted. The unit price shall include foundation, paint, accessories or other needed equipment.
Payment shall be full compensation for all work and materials described herein, and all other work as may be required for an acceptable installation.

Payment shall be made under:

Item No		
519-78	Bollards	- Each

END OF SECTION 519

CONCRETE GUTTER, CURB ELEMENTS, AND TRAFFIC SEPARATOR

Construction of concrete curb and gutter, concrete traffic separator, and concrete valley gutter shall conform to the requirements of Section 520 of the Standard Specifications, except as directed by the Engineer.

Foundation

Foundation material upon which the concrete is to be placed shall be compacted to meet the specified densities and shall be thoroughly wetted but free of standing water just prior to placing concrete.

Contraction Joints

Contraction joints shall be sawed to a minimum depth of 1 1/2 inches. Sawing shall begin as soon as the concrete has hardened to the degree that excessive raveling will not occur. Sawing shall progress in the same direction and sequence as the concrete placement. Every third joint shall be sawed first, then saw intermediate joints.

For concrete placed before noon, all joints shall be sawed the same day of placement. For concrete placed after noon, all third joints shall be sawed the day of placement; all other joints prior to noon the following day.

Curing

Concrete shall be cured as provided in Section 520-8, except as modified herein or as approved by the Engineer. Curing material shall be applied to the concrete surfaces after finishing as soon as the concrete has hardened sufficiently to prevent marring the surface or within one hour after finishing is completed, whichever occurs first. Applying curing materials shall not be held up due to other activities on the project. Contractor shall schedule and provide manpower necessary to conform to these requirements.

Spraying equipment, including spray tip and nozzle, shall be as recommended by manufacturer's printed literature, or an acceptable equal. Suggested equivalent spraying equipment is:

Pump Sprayer: Model No. 1949, Chapin Mfg., (800) 444-3140
Drum Pump Sprayer: 12 Volt DC # 6061, Chapin Mfg.

Equipment shall be maintained and nozzles replaced as required to provide consistent uniform spray pattern.

A uniform coating meeting the manufacturer's recommended minimum application rate shall be applied. Areas appearing to have insufficient curing compound, as determined solely by the

Engineer, shall be re-coated immediately to provide required uniform coverage.

Storage containers having greater than a five gallon capacity may be utilized only with prior approval by the Engineer. The contractor shall submit the manufacturer's descriptive literature describing the placement, storage and mixing requirements for storage containers exceeding five gallons. The contractor shall provide and utilize mechanical mixers for all containers larger than five gallons. The mixers shall be equivalent to the manufacture's requirements. The contractor shall conform to all storage, mixing and application requirements.

Repairs

Where replacement is necessary, complete sections between existing contraction joints shall be removed and replaced.

Method of Measurement

For curb or curb and gutter, the quantity to be paid will be plan quantity, in linear feet, measured along the face of the completed and accepted curb or curb and gutter.

For valley gutter or shoulder gutter, the quantity to be paid will be plan quantity, in linear feet, measured along the gutter line of the completed and accepted valley gutter or shoulder gutter.

For concrete traffic separator of constant width, the quantity to be paid will be plan quantity, in linear feet, measured along the center of its width, completed and accepted, including the length of the nose.

For concrete traffic separator of varying width, the quantity to be paid will be plan quantity, in square yards, completed and accepted.

Basis of Payment

Items covered by this Section will be paid for at the contract unit price. Payment shall constitute full compensation for all work described herein, including all labor, equipment, materials and incidentals necessary to complete each item of work.

Payment shall be made under:

Pay Item:		
520- 2-4	Concrete Curb, Type D	per linear foot

CONCRETE SIDEWALKS, 4 INCH AND 6 INCH THICKNESS

Construction of 4-inch and 6-inch thick concrete sidewalk shall conform to the requirements of Section 522 of the Standard Specifications, and Indexes 304 and 310 of the FDOT Design Standards, except as directed by the Engineer.

Foundation

Foundation material shall meet the specified densities and shall be thoroughly wetted but free of standing water just prior to placing concrete.

Contraction Joints

Contraction joints shall be sawed. All joints shall be straight lines oriented at 90 degrees to the edge of sidewalk, radially if in a curve, or as directed otherwise. The minimum depth of joints shall be 1 1/2 inches or 1/4 the nominal thickness of concrete placed, whichever is greater.

Joint installation shall proceed in the same direction and sequence as the concrete placement. Sawing shall begin as soon as the concrete has hardened to the degree that excessive raveling will not occur. Every third transverse joint and all longitudinal joints shall be sawcut within 8 hours after finishing. Remaining transverse joints, shall be sawcut by noon the following day.

Construction Joints

Construction joints shall be constructed at the end of all pours and at other locations where the concrete placement operations are stopped for as long as 30 minutes. They shall be placed at least 10 feet from any other transverse construction joint or end of pavement section.

Metal keyways shall be installed at all construction joints in sidewalks 6-inches and greater in thickness. Concrete thickness shall be increased by 2-inches for a minimum distance of 6-inches either side of construction joints.

Curing

Concrete shall be cured as provided in Section 520-8, except as modified herein. Curing material shall be applied to the concrete surfaces after finishing as soon as the concrete has hardened sufficiently to prevent marring the surface or within one hour after finishing is completed, whichever occurs first. Applying curing materials shall not be held up due to other activities on the project. Contractor shall schedule and provide manpower necessary to conform to these requirements.

Spraying equipment, including spray tip and nozzle, shall be as recommended by the manufacturers' printed literature, or an acceptable equal. Suggested equivalent spraying equipment is as follows:

Pump Sprayer:	Model No. 1949, Chapin Mfg., (800) 444-3140
Drum Pump Sprayer:	12 Volt DC # 6061, Chapin Mfg.

Equipment shall be maintained and nozzles replaced as required to provide a consistently uniform spray pattern.

A uniform coating meeting the manufacturer's recommended minimum application rate shall be applied. Areas appearing to have insufficient curing compound, as determined solely by the County, shall be re-coated immediately to provide the required uniform coverage.

Storage containers having greater than a five gallon capacity may be utilized only with prior approval of the Engineer. The Contractor shall submit the manufacturer's descriptive literature describing the placement, storage and mixing requirements for storage exceeding five gallons. The Contractor shall provide and utilize mechanical mixers for all containers larger than five gallons. The mixers shall be equivalent to or exceed the manufacture's requirements.

The Contractor shall conform to all storage, mixing and application requirements.

Replacement

Where 6-inch concrete has to be replaced due to cracks, it shall be replaced with a uniform thickness of 8-inch concrete covering no less than 40 square feet and extending to existing sawed contraction joints. Replacement concrete shall extend at least 3-inches beneath existing concrete at a minimum thickness of 3-inches.

Method of Measurement

Quantities measured for payment under this Section shall be the actual area in square yards of concrete constructed in place.

Basis of Payment

Concrete Sidewalk including ramps, detectable warning surfaces (armor tiled domes) and driveways will be paid for at the contract unit prices, completed and accepted. Payment shall constitute full compensation for all work described herein, and shall include all labor, equipment, materials, clearing and grubbing, excavation, grading, compaction, expansion material (asphalt impregnated), and all incidentals necessary to complete the work to the lines, grades, and thickness indicated on the plans.

Subgrade preparation and additional concrete required for thickened slabs as indicated on the plans or as directed by the Engineer shall be included in the contract unit price for 6-inch Concrete Sidewalk.

Payment shall be made under:

Pay Item:		
522-1	Concrete Sidewalk, 4" Thick	Per Square Yard
522-2	Concrete Sidewalk, 6" Thick	Per Square Yard

Pay Item Footnote No. 522-1 and 522-2
Pay item 522-1 and 522-2 includes the cost of all truncated domes for all ramps. Pay item 522-2 includes the concrete pad for the irrigation pump house.

END OF SECTION 522

RIPRAP (RUBBLE)

530-1 Description.
Constructing Riprap (Rubble) shall conform to the requirements of Section 530 of the Standard Specifications, except as directed by the Engineer.

Construct riprap composed of sand-cement or rubble (consisting of broken stone or broken concrete) as shown in the Design Standards and in the plans. This price shall include the filter fabric and bedding stone placed under the riprap.

530-2 Materials.

530-2.1 Sand-Cement:
(1) Portland Cement: Provide cement from an approved source meeting the requirements of Section 921. Certify that cement meets the requirements of the Contract Documents.

(2) Fine Aggregate: Meet the requirements of 902-3.3.

(3) Sacks: Provide sacks made of jute, cotton, or scrim reinforced paper capable of holding the sand-cement mixture without leakage. Ensure that sack material is permeable and absorptive enough to permit passage of water to provide for hydration of the cement. Ensure that paper used in sacks is non-asphalt laminated with a polyester fiber scrim reinforcement in a three-way directional pattern, has an embossed finish, and is perforated approximately 3/32 inch in approximate 1 inch centers. Extend perforations continuously through the entire wall.

Provide sacks of uniform size and dimensions, in order to provide uniformity of lines in the completed work. Use sacks that are free from holes and strong enough to withstand handling without ripping or splitting. Use only one type and size of sack at any one structure.

(4) Grout: Provide sand from an approved source meeting the requirements of 902-3.3. Provide cement from an approved source meeting the requirements of Section 921.

(5) Geotextile Fabric: Meet the requirements of Section 514 and Design Standards, Index 199.

530-2.2 Rubble:

530-2.2.1 Rubble (Bank and Shore Protection): Provide sound, hard, durable rubble, free of open or incipient cracks, soft seams, or other structural defects, consisting of broken stone with a bulk specific gravity of at least 2.30. Ensure that stones are rough and angular.

For this application, use broken stone meeting the following gradation and thickness requirements:

Weight Maximum Pounds 700
Weight 50% Pounds 300
Weight Minimum Pounds 60
Minimum Blanket Thickness in Feet 2.5

Ensure that at least 97% of the material by weight is smaller than Weight Maximum pounds].
Ensure that at least 50% of the material by weight is greater than Weight 50% pounds].
Ensure that at least 85% of the material by weight is greater than Weight Minimum pounds.

530-2.2.2 Rubble (Ditch Lining): Use sound, hard, durable rubble, free of open or incipient cracks, soft seams, or other structural defects, consisting of broken stone or broken concrete with a bulk specific gravity of at least 1.90. Ensure that stones or broken concrete are rough and angular.

Use broken stone or broken concrete meeting the following gradation and thickness requirements:

Weight Maximum Pounds 75
Weight 50% Pounds 30
Weight Minimum Pounds 4
Minimum Blanket Thickness in Feet 1.5

Ensure that at least 97% of the material by weight is smaller than Weight Maximum pounds.
Ensure that at least 50% of the material by weight is greater than Weight 50% pounds].
Ensure that at least 90% of the material by weight is greater than Weight Minimum pounds].

530-2.2.3 Physical Requirements of Broken Stone and Broken Concrete: Use broken stone and broken concrete meeting the following physical requirements:

Absorption (FM 1-T85) Maximum 5%

Los Angeles Abrasion (FM 1-T 096) Maximum loss 45%*

Soundness (Sodium Sulphate) (AASHTO T 104) Maximum loss 12%** (after five cycles)

Flat and elongated pieces Materials with least dimension less than one third of greatest

dimension not exceeding 10% by weight.

Dirt and Fines Materials less than 1/2 inch in maximum dimension accumulated from interledge layers, blasting or handling operations not exceeding 5% by weight.

Drop Test***(EM 1110-2-2302) No new cracks developed, or no existing crack widened additional 0.1 inch, or final largest dimension greater than or equal to 90% original largest dimension of dropped piece.

* Ensure that granite does not have a loss greater than 55% and that broken concrete does not have a loss greater than 45%.
** The Engineer may accept rubble exceeding the soundness loss limitation if performance history shows that the material will be acceptable for the intended use. The Engineer will waive the soundness specification for rubble riprap (broken stone and broken concrete) when project documents indicate it will be placed in or adjacent to water or soil with a sulfate content less than 150 parts per million and a pH greater than 5.0.
*** The Engineer will waive the Drop Test unless required to ensure structural integrity. Provide all equipment, labor and testing at no expense to the Department. EM refers to the US Army Corps of Engineer's Specification Engineering Method.

530-2.2.4 Source Approval and Project Control: The Engineer will approve mineral aggregate sources in accordance with 6-2.3 as amended by the following:

(1) The Engineer may perform Independent Verification tests on all materials placed on the project.
(2) The Engineer will check the gradation of the riprap by visual inspection at the project site. Resolve any difference of opinion with the Engineer in accordance with the method provided in FM 5-538. Provide all equipment, labor, and the sorting site at no expense to the Department.
(3) The Engineer may test components in a blend of rubble processed from different geologic formations, members, groups, units, layers or seams. The Engineer may select components based on like color, surface texture, porosity, or hardness. The Engineer will reject any blend if a component that makes up at least five percent by volume of the blend does not meet these specifications.

530-2.3 Bedding Stone: Use Bedding Stone of either a durable quality limestone or other quarry run stone, with a bulk specific gravity of not less than 1.90 and that is reasonably free from thin, flat and elongated pieces. Ensure that the bedding stone is also reasonably free from organic matter and soft, friable particles. Meet the following gradation limits:

Standard Sieve Sizes Inches	Individual Percentage by Weight Passing
12 inches	100

10 inches	70 to 100
6 inches	60 to 80
3 inches	30 to 50
1 inch	0 to 15

The Engineer will conduct source approval and project control of bedding stone as specified in 530-2.2.4. In lieu of limestone or other quarry run stone, the Contractor may substitute non-reinforced concrete from existing pavement that is to be removed and which meets the above requirements for commercial bedding stone.

530-2.4 Geotextile Fabric: Meet the requirements of Section 514 and Design Standards, Index 199.

530-3 Construction Methods.

530-3.1 Sand-Cement:

530-3.1.1 Mixing Materials: Proportion sand and cement in the ratio of 5 cubic feet of sand to 94 lbs. (1 bag) of cement. If proportioning the materials by mass, use a density of 85 lbs\ft3 (loose volume) for sand. The Contractor may batch sand at the moisture content occurring in the stockpile.

Mix the sand and cement until the mixture is of uniform color.

530-3.1.2 Filling Sacks: Accurately measure the mixed material into each sack, taking care to place the same amount of material in each sack; keep at least the top 6 inches of the sacks unfilled to allow for proper tying or folding and to ensure against breaking of the sack during placing.

530-3.1.3 Placing: Place the filled sacks with their tied or folded ends all in the same direction. Lay the sacks with broken joints, in a regular pattern. Ram or pack the sacks against each other so as to form a close and molded contact after the sand and cement mixture has set up. Remove and replace sacks ripped or torn in placing with sound, unbroken sacks. Then, thoroughly saturate all sacks with water.

530-3.1.4 Grouting: Immediately after watering, fill all openings between sacks with dry grout composed of one part Portland cement and five parts sand.

530-3.1.5 Toe Walls: The Contractor may construct toe walls of riprap for fill slopes of poured in place concrete in lieu of sand cement in sacks. Meet the concrete requirements as specified in Section 347. If using sand cement in sacks for the toe walls, fill the entire trench excavated for the toe walls with sand cement in sacks.

530-3.2 Rubble: Dump rubble in place forming a compact layer conforming to the neat lines and thickness specified in the plans. Ensure that rubble does not segregate so that smaller pieces evenly fill the voids between the larger pieces.

530-3.3 Bedding Stone: Place bedding stone without puncturing or tearing the geotextile fabric. Remove and replace geotextile fabric damaged as a result of operations at no expense to the Department.

The Engineer will allow an in place thickness tolerance of ±1 inch.

530-4 Method of Measurement.

530-4.1 Sand-Cement: The quantity to be paid for will be the volume, in cubic yards, of sand actually used in the sand cement mixture and grout, satisfactorily placed and accepted.

If sand cement is proportioned by volume, the sand will be measured loose in an approved measure prior to mixing with cement. If sand cement is proportioned by weight, approved scales will be used for this purpose and the volume will be calculated using a standard conversion factor for sand of 85 lbs/ft3. No adjustment of batch weights to allow for varying moisture content of the sand will be made.

For toe walls, the quantity to be paid for will include only the volume of sand cement in sacks or concrete placed within the neat lines shown in the plans for the toe walls.

530-4.2 Rubble and Bedding Stone: The quantities to be paid for will be the weight, in tons, in surface dry natural state, by railroad scales, truck scales, or barge displacement. The Contractor shall determine the weights as follows:

(1) Railroad Weights: The Contractor shall weigh railroad cars on railroad scales, before and after loading or before and after unloading. If weighed by other than the Engineer, a certified statement of weights will be required. Certificates of weight, furnished by the railroad company, will be acceptable without further certification.
(2) Truck Weights: The Contractor shall weigh trucks on certified scales, loaded and empty, as prescribed above for railroad weights. The Contractor shall weigh trucks in the presence of the Engineer, or furnish certificates of weights.
(3) Barge Displacement: The Engineer will measure each barge. The Contractor shall fit each barge with gauges graduated in tenths of a foot increments. The Contractor shall locate a gauge at each corner of the barge near the lower end of the rake. The Contractor shall furnish additional gauges amidships if the Engineer deems necessary. The Engineer will compute all weights.

530-5 Basis of Payment.

530-5.1 Sand-Cement: Price and payment will be full compensation for all work specified in this Section, including all materials, labor, hauling, excavation, and backfill.
Include the cost of dressing and shaping the existing fills (or subgrade) for placing riprap in the Contract unit price for Riprap (Sand-Cement).

530-5.2 Rubble: Price and payment will be full compensation for all work specified in this Section, including all materials, hauling, excavation, and backfill.
Include the cost of dressing and shaping the existing fills (or subgrade) for placing riprap in the Contract unit price for Riprap (Rubble).
As an exception to the above, concrete that is shown to be removed from an existing structure and subsequently disposed of by being used in the embankment as riprap will not be paid for under this Section. Include the cost of such work under Removal of Existing Structures.

530-5.3 Bedding Stone: Include the cost of materials and installation of the Bedding Stone in the contract unit price for Riprap.

530-5.4 Geotextile Fabric: Include the cost of materials and installation of the Geotextile fabric in the contract unit price for Riprap.

Basis of Payment

Rubble riprap will be paid for at the contract unit price, completed and accepted. Payment shall be full compensation for all work described herein and shall include all materials, bedding stone, filter fabric, hauling, excavation and backfill.

Pay Item:

530-3-4	Riprap-Rubble, F&I, Ditch Lining	Per Ton

Pay Item Footnote No. 530-3-4
Pay item 530-3-4 includes geotextile underlayment and bedding stone

END OF SECTION 530

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 550

FENCING

550-1 Description.
Construction of fencing shall conform to the requirements of Section 550 of the Standard Specifications, except as directed by the Engineer. Furnish, erect and reset metal fence of the type and at the locations shown in the Plans.

550-2 Types of Fence.
The types of fence are designated as follows:

Type A (Farm Fence).
Type B (Chain-Link Fence).
Type R (Chain-Link Fence for Pedestrian Overpass).

550-3 Materials.

550-3.1 Type A Fence (Farm Fence): Meet the requirements of Section 954 for timber posts and braces. For metal posts and braces, and for recycled plastic fence posts, meet the requirements of the Design Standards. For the fabric and all other accessories, meet the requirements of the Design Standards.

550-3.2 Type B Fence (Chain-Link): For the posts, braces, fabric and all accessories other than the concrete for bases, meet the requirements of the Design Standards. Use concrete as specified in Section 347, or a premix approved by the Engineer for bases. The requirements contained in 347-2.2, and 347-3 will not apply.

550-3.3 Type R Fence (Chain-Link for Pedestrian Overpass): Use the fabric and accessories specified in the Plans.

550-3.4 Resetting Fence: Use material from the existing fence. For any additional materials required, provide the same type of material as in the existing fence and as specified herein, including gates when applicable.

550-3.5 Optional Use of Materials: For Type A Fence, a combination of steel, aluminum, timber, recycled plastic or concrete posts may be used. Unless otherwise called for in the Plans, line posts of one material may be used with corner, pull and end post assemblies of a different material. The Engineer will permit the use of line posts of only one optional material and pull posts assemblies of only one optional material between corner and end post assemblies. Within individual corner and end post assemblies, the Engineer will allow the use of only one optional material.

For Type B Fence, a combination of zinc-coated steel fence members, aluminum coated fence members and aluminum alloy fence members may be used. Unless otherwise indicated in the Plans, the Engineer will allow the use of only one type of fabric material, one type of line post material and one type of pull assembly material between corner and end post assemblies.

550-3.6 Certification: Provide the Engineer with certified test reports from the manufacturer confirming that all materials (posts, braces, fabric and all other accessories) conform to the requirements of this Section, Section 6 and the Design Standards. Provide the Engineer a copy of the certification at least ten days prior to fence construction. Also furnish the Engineer a Certificate of Compliance certifying that the fencing system, materials and construction practices comply with the applicable Design Standards and Specifications.

Acceptance of furnished material will be based on the Certificate of Compliance, accompanying test reports and visual inspection by the Engineer.

550-4 Construction Methods.

550-4.1 General: Install the fence in accordance with the specific requirements of this Article and with the details shown on the Design Standards for the particular type of fence called for, except for Type R Fence which shall be detailed in the Plans. Construct the fence in close proximity to the right of way line except as otherwise detailed in the Plans. Assume responsibility for obtaining satisfactory permits or permission from property owners for any encroachments required to perform the work, and for proper scheduling of the fence installation with the removal of existing fence where it is necessary to provide continuous security to adjacent areas already fenced. In order to meet this requirement, where necessary for maintaining security of livestock on adjacent property during construction of the new fence, the Engineer may require the erection and subsequent removal of temporary fencing.

550-4.2 Spacing of Posts: Space posts as shown in the Design Standards, within a tolerance of 12 inches, except where definite spotting of corner posts is required. Ensure that in any line of fence, the over-spacings and the under-spacings shall approximately compensate. Set additional line posts at abrupt changes in grade.

550-4.3 Clearing: Where the clearing and grubbing for the project includes the area occupied by the fence, clear the area to the limits shown in the Plans. If the limits are not shown in the Plans, clear the area at least 2 feet wide on each side of the fence line. The Engineer may direct that desirable trees be left in place and may restrict clearing where permission from the property owners cannot be obtained.

550-4.4 Construction Over Irregular Terrain and Other Obstructions:

550-4.4.1 Clearance of Bottom of Fence: Install the fence such that the bottom of the fence, in general, follows the contour of the ground. The fence is detailed in the Plans at approximately 3 inches above ground line. Over irregular ground, however, the Engineer will permit a minimum clearance of 1 inch and a maximum of 6 inches for a length not to exceed 8 feet, and, for Type A fence, with the barbed wire spaced midway between ground and bottom of fabric.

550-4.4.2 Grading: Where necessary to secure proper vertical alignment and to meet the clearance requirements, fill depressions (except where filling would obstruct proper drainage) and cut down knolls and ridges. Provide a substantial and permanent foundation for the fence.

550-4.4.3 Use of Extra-Length Posts. At locations where it is impracticable to adjust the ground level, the Engineer may require that posts of additional length be set and that the opening at the bottom be closed by additional barbed wire, stretched taut between poles, with no vertical distance between wires greater than 3 inches. For all such posts requiring a concrete base, extend the concrete downward to the bottom of the extra-length post.

550-4.5 Setting Posts: If rock occurs within the required depth of the post hole, or pavement which is to remain in place exists at the location of a post, drill a hole of a diameter slightly larger than the greatest dimension of the post or footing and grout in the post or footing. Set timber posts either by digging or by driving. Set recycled plastic fence posts in accordance with the Design Standards.

550-4.6 Placing Fabric: Do not place fabric and barbed wire until the posts have been permanently positioned and concrete foundations have attained adequate strength. Place the fabric by securing one end and applying sufficient tension to remove all slack before making permanent attachments at intermediate points. Fasten the fabric to all end, corner and pull posts by approved means. Fasten the fabric using tools designed for the purpose, in accordance with the manufacturer’s recommendations. Apply the tension for stretching by mechanical fence stretchers or with single-wire stretchers designed for the purpose.

550-4.7 Electrical Grounds: Wherever a power line passes over the fence, install a ground directly below the point of crossing. Install a ground rod consisting of a galvanized rod with connection of similar metal if required, or of other appropriate material, 8 feet in length and at least 5/8 inch in diameter. Drive the rod vertically until the top of the rod is approximately 6 inches below the ground surface. Use a No. 6 conductor to connect the rod and all fence elements. Connect the conductor to each fence element and the ground rod by means of noncorrosive electrical-type clamps.

550-5 Method of Measurement.

550-5.1 General: The quantities to be paid for will be plan quantity for the number of gates and the length of each type of fence constructed and accepted. In addition, extra payment will be

made, in accordance with 550-6.2, for additional lengths of post approved by the Engineer for the crossing of depressions in accordance with 550-4.4.3, muck areas, or other areas of inadequate support for a post of standard length.

550-5.2 Measurement of Fence Length, and Payment: The length of fence to be paid for will be plan quantity completed and accepted. Measurement for resetting fence will be the actual length of existing fence reset, including gates when applicable.

550-6 Basis of Payment.

550-6.1 Basic Items of Fencing: The Contract unit price per foot for the item of fencing, will be full compensation for all work and materials necessary for the complete installation, including line posts, corner, end, and pull posts. Such price and payment will include, but not be limited to, the following specific incidental work.

(a) Any work required to level and prepare the terrain along the line of the fence.
(b) Any additional clearing incidental to construction of the fence.
(c) All preparation for post holes, in whatever type of material, as specified herein.
(d) Any furnishing and installing of electrical grounds.
(e) Any additional work or materials required for special construction over irregular terrain, or terrain of inadequate support for the posts, including the additional barbed wire, but not including the extra lengths of posts ordered by the Engineer.
(f) Any cost of erection and removal of any temporary fencing, which may be necessary for maintaining security of livestock, etc., on adjacent property during construction of the new fence.

550-6.2 Payment Rates for Extra-Length Posts: Any extra length posts added to complete installation of the fence will require an invoice. The Contractor will be compensated for invoice price plus 10% as payment for any extra length posts. The standard length of steel, recycled plastic and aluminum posts will be the required length as indicated in the Plans or Design Standards for each type and case. The payment for additional length of post will include the cost of additional concrete to extend concrete bases, as applicable.

550-6.3 Gate Payment: The quantities to be paid for will be full compensation for all labor, materials, posts, and associated hardware for the complete installation of the type gate specified in the Plans, and accepted by the Engineer.

550-6.4 Payment Items: Payment shall be made under:
Item No. 550-10-222- Fencing, Type "B" Chain Link Fence (6' High) Black Vinyl Coated -LF
Item No. 550-60-211 – Single Fence Gate, Type “B” (4’ Wide Opening) (6’-High)(Black Vinyl Coated - EA

END OF SECTION 550

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 570

PERFORMANCE TURF

The Contractor shall establish a stand of grass in all areas designated on the plans and disturbed by construction in accordance with Chapter 15, Environmental Control, Article XVII, Fertilizer Management Ordinance of the Orange County Code; Sections 162 and 570 of the Standard Specifications, except as directed by the Engineer.
Work under this Section shall include all seeding, mulching, sodding, fertilizing and watering necessary to provide routine maintenance of the grassed area until the work is accepted by the Engineer.
There must be at least 90% coverage of healthy grass prior to acceptance by the Engineer. The Engineer, at any time, may require replanting of any areas in which the establishment of the grass stand does not appear to be developing satisfactorily.
The Contractor shall mow grassed areas from right-of-way to right-of-way within the entire project twice monthly, or as required by the Engineer, until final acceptance of the work.

Seeding and Mulching

Grass seed shall be common Bermuda and Bahia. In addition, brown top-millet will be included during summer months and annual rye in the winter months. All seed shall meet the requirements of the State Department of Agriculture.

Sodding

Sodding shall be Bahia. It may be placed in rolls or as individual pieces. In established areas, replacement sod shall be of the same type as the existing sod, unless otherwise approved by the Engineer.

Fertilizers

Fertilize as necessary based on soil testing performed in accordance with Section 162. For fertilizer rates and application times follow Chapter 15 Environmental Control, Article XVII Fertilizer Management Ordinance of the Orange County Code.

Method of Measurement

Payment shall be calculated based on the quantity in square yards as specified in the completed and accepted plans. The cost of establishing grass in other areas disturbed by construction activities shall be borne by the Contractor.

Basis of Payment

Payment shall be paid for at the contract unit price per square yard. Payment shall constitute full compensation for furnishing all materials and completing all the work specified herein, including ground preparation, fertilizing, seeding, mulching, sodding, watering, mowing and complete maintenance of the grassed area until final completion and acceptance by the Engineer.

Payment shall be made under:

Pay Item:		
570-1-2A	Performance Turf (Bahia) - pegged	Per Square Yard
570-1-2B	Performance Turf (Bahia) - unpegged	Per Square Yard

END OF SECTION 570

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 580

LANDSCAPE INSTALLATION

The Landscape Installation includes all items detailed in Section 580 of the Standard Specifications, the Special Provisions and on the plans, except as directed by the Engineer.

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Trees work, as indicated on the drawings, as specified herein or both. In addition, the work shall include the maintenance of all trees and planting areas during the maintenance period as described in section 3.10. Mowing from right-of-way to right-of-way within the entire project limits.

1.03 QUALITY ASSURANCE

A. Inspection

1. Furnish plant materials inspected by State Department of Agriculture at the growing site and tagged or otherwise accepted for delivery by Orange County Representative.

2. Inspection at growing site does not preclude right of rejection at project site.

B. Furnish plant materials certified by State Department of Agriculture to be free from harmful insects or apparent disease. Submit verification that all plant material is free of harmful insects and disease.

C. All plant material shall meet or exceed the minimum grade of Florida No.1 in accordance with "Grades and Standards for Nursery Plants" published by the State of Florida Department of Agriculture.

D. Plant material shall be shade or sun grown, and/or acclimatized depending on planting location.

E. Any plants that do not conform to these plans, specifications, or approved trees shall be rejected.

1.04 SUBMITTALS

A. Certificate of Inspection of plant material by State Authorities.

B. Test Reports

Analyses of samples from planting soil supply areas (i.e., signed original copy by testing laboratory only). If Contractor elects to divide the project area into incremental substantial completion areas, soil samples and test reports shall be required for each increment 14 days prior to beginning each increment.

C. Maintenance Instruction

Prior to the end of the maintenance period, furnish three copies of written maintenance records and instructions to the Orange County Representative for maintenance and care of installed plants throughout their full growing season.

D. Plant Photographs

Contractor shall provide representative photographs of all plant materials with a measuring rod included in photograph. Contractor shall coordinate with Orange County Representative one tagging trip to cover all larger plant materials at Contractor's cost.

E. Project Schedule

Provide five (5) copies of a comprehensive project schedule indicating Contractor’s proposed work and installation schedule. Schedule shall include breakdown for site preparation and grading, irrigation, trees, sod restoration, and final clean up. Contractor shall also include project "milestones" for designated project areas within the total project area as required including substantial completion dates.

F. All certificates, reports, and samples shall be submitted by the Contractor to the Orange County Representative a minimum of one week prior to the installation of any of the materials. Contractor shall not begin work until all submittals have been

verified by the Orange County Representative. Submittals required but not limited to the following:

1. Existing soil analysis and sample
2. Prepared soil analysis and sample
3. Mulch sample
4. Erosion control fabric sample and product sheet
5. Pre- and post-emergent herbicide
6. Weed eradication treatment for lawn grass
7. Foliar spray fertilizer(s)
8. Sod certification(s)
9. Plant photographs
10. Plant schedule with quantities
11. List of Personnel, qualifications, and schedule
12. Guying methodologies
13. Leaf antidessicent spray
14. Drainage gravel
15. Maintenance manual

1.05 DELIVERY, STORAGE AND HANDLING

A. Inventory

Verify that plant species, quantity, and quality of plants in the Contractor's plant schedule is consistent with that on plant list and drawings.

B. Preparation for delivery

1 Prune head and/or roots of all trees only under direction of Orange County Representative, and as required to assure safe loading, shipment and handling without damaging the natural form and health of the plant.

2 Stabilize all trees in containers and prepare tree for shipping.

C. Delivery

1 Deliver soil conditioners (pesticides, herbicides, fumigants, and fertilizers) to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to state law. Store in designated areas only.

2 Deliver planting soil mixes and mulch in bulk with manufacturer's guaranteed mix, name, and conformance to State law. Store in designated areas only.

3 Deliver plant with legible identification labels.

a. Label groups of trees of the same species.

b. State correct plant name and size indicated on Plant List.

c. Use durable waterproof labels with water-resistant ink, which will remain legible for at least 60 days.

4. Protect all plant materials during transport/ delivery with shade cloth or other acceptable means to prevent wind burn.
5. Protect all plant material during delivery to prevent damage or desiccation to root ball or desiccation of crown and leaves.
6. Mist periodically each day all tree/palm root balls and crowns/tops during delivery, handling, and storing on site to ensure against drying.
7. Notify Orange County Representative of delivery schedule in advance so plant material may be inspected upon arrival at job site.
8. Remove unacceptable plant material immediately from job site.
9. Delivery of fluid applied membrane waterproofing shall be to the job site in sealed undamaged containers. Each container shall be identified with material name, date of manufacture and lot number.

D. Storage

1 Container grown plants: Deliver direct from nursery.
2 Protect roots of all plant material from drying or other possible injury with shade cloths, tarps or other means. Keep plant root ball and crown moist at all times.
3 Store plants in shade and protect from weather. Heel in palms in a vertical position as required. Irrigate all stored plants as required.
4 Maintain and protect plant material not to be planted within four hours. Plant palms upon delivery.

E. Handling

1 Do not drop plants.
2 Do not pick up container or balled plants by stems or trunks.
3 Do not use chains or cables on any trees or palms. Handle using nylon straps, 2" width minimum on root ball or container only.

1.06 JOB CONDITIONS

A. Planting Season

Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

B. Locate all underground utilities and other non-readily visible structures prior to digging. Utility drawings will be available at the job site or from Orange County Representative. Landscape Contractor shall repair all damage to underground utilities, and/or construction caused by utility damage, at no cost to Orange County.

C. Verify that all existing trees to remain are properly identified and barricaded to prevent damage under this and future construction. Landscape Contractor shall be responsible for maintaining adequate identification and barricading of all existing plant material to remain throughout the installation and required maintenance period.

1.07 GUARANTEE

A. Guarantee all trees and palms for a period of 12 months after date of Final Inspection and Acceptance by Orange County. Replacement plants under this guarantee shall be replaced within (2) two weeks of rejection and guaranteed for 12 months from date of installation.

B. Repair damage to other plants, lawn or construction work during plant replacement at no cost to Orange County (this includes, but is not limited to, damage to curbs, walks, roads, fences site furnishings, etc.).

1.08 SCHEDULING

A. Coordinate work and installation as required with other Contractors within the project area that may be in progress.

B. Install trees, then restore lawns.

C. Notify Orange County Representative of anticipated installation date at least (2) two weeks in advance.

PART 2 - PRODUCTS

2.01 PLANT MATERIAL

A. Well formed and shaped, true to type, and free from disease, insects, and defects such as knots, sun scald, windburn, injuries, abrasion or disfigurement.

B. True to botanical and common name and variety: ***American Joint Committee on Horticultural Nomenclature, Standardized Plant Names***, latest edition.

C. Minimum grade of Florida No. 1 in accordance with ***"Grades and Standards for Nursery Plants"*** published by the State of Florida Department of Agriculture and Consumer Services.

All plants not listed in ***"Grades and Standards for Nursery Plants"***, published by the Division of Plant Industry, shall conform to a minimum grade of Florida No. 1 as to:

1. Health and vitality
2. Condition of foliage
3. Root system
4. Freedom from pests or mechanical damage
5. Heavily branched and densely foliated according to the accepted normal shape
6. Freedom of low and/or tight "V" shaped crotches

D. Nursery Grown: ANSI Z60.1-1969

1. Grown under climatic conditions similar to those in locality of project.

2. Container grown stock:

   a. Growing in container for minimum 180 days before delivery, with sufficient root system for container size.

   b. Not root bound or with root systems hardened off.

3. Use only groundcover plants well established in removable containers.

4. Trees shall be nursery/tree farm grown. Collected and Grow Bag trees will not be accepted.

E. Minimum root ball sizes for all palms shall be as specified in "Grades and Standards for Nursery Plants", published by the State of Florida Department of Agriculture and Consumer Services.

2.02 SOD

A. Sod to restoration of all disturbed areas shall be of the variety found in the immediate area. Where grasses do not cover the entire area Argentine bahia grass, Paspalum notatum ‘Argentine,’ shall be used.

B. Sod shall be free of weeds and other grasses, insects and diseases.

C. Sod shall be delivered to the site in sizes typical of the industry and shall be placed within two days of having been lifted from the field.

2.03 PLANTING SOIL

A. Soil for back filling planting areas and plant pits shall be the existing surface soil, free from subsoil, objectionable weeds, litter, sod, stiff clay, stones, stumps, roots, trash, toxic substances, mortar, cement, or any other material which may be deleterious to plant growth or hinder planting operations. Poorly drained soil shall not be accepted.

B. Soil amendments shall be added to the soil in the amount and manner prescribed by soil analysis to achieve optimum growth for each plant type. Results from soil analysis and a list of prescribed amendments shall be submitted to the Orange County Representative prior to being incorporated in the soil.

C. If additional soil is required, it shall be furnished by the Landscape Contractor and shall be a natural, friable soil representative of productive, well-drained soils in the vicinity. It shall be obtained from well-drained areas, which have never been stripped before; and shall be free of any material deleterious to plant growth.

D. The Landscape Contractor shall submit to Orange County Representative the following information on imported soils: Specific location from which topsoil will be stripped, test results showing topsoil composition and analysis, and amendments required.

E. A qualified soils laboratory, in accordance with "Methods of Soils Analysis Agronomy #9 as published by the American Society of Agronomy, shall perform soil test at the Landscape Contractor's expense.

2.04 SOIL CONDITIONERS

A. Soil conditioners shall be as specified.

1. As a fertilizer supplement to Palms, a foliar spray shall be applied one week after installation (excluding summer months) and repeated 3 months after first application. The chemical designation shall be 20-20-20 with the primary plant nutrient sources derived from Urea, Ammonium Phosphate, and Potassium Nitrate add chelated iron mix per manufacturer's recommendation.

2. Apply foliar spray with a wetting agent.

3. Peterson's General Purpose 20-20-20 liquid fertilizer or acceptable equal.

B. It shall be the responsibility of the Contractor to supply and transport water to all landscape areas during construction and maintenance periods. Care shall be exercised to assure that water is kept free of harmful substances to plant growth.

2.05 FERTILIZER

A. Commercial fertilizer shall be 14-14-14 formulation of slow release fertilizer, 3-4 months release of which 60 percent of the nitrogen is in urea-formaldehyde and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition, dry and free flowing. (Osmocote brand or approved equal)

2.06 DOLOMITIC LIMESTONE

A. Dolomitic limestone shall be a natural limestone, designed for agriculture use, shall contain no less than 85 percent of total carbonates, and shall be ground so that 50 percent will pass a 100 mesh sieve and 90 percent will pass a 20 mesh sieve.

2.07 ANTIDESICCANT

A. Antidesiccant shall be an emulsion type, film-forming agent designed to permit transpiration, but retard excessive loss of moisture from plants, such as Dowax by Dow Chemical Co. or acceptable equal. The antidesiccant shall be delivered in the manufacturer's fully identified containers and shall be mixed and applied per manufacturer's recommendation.

2.08 BORICIDE

A. Boricide shall be Lindane as manufactured by Platt, or acceptable equal.

2.09 TOP MULCH

A. Pine bark, shredded and not larger than 1 ½" in any dimension, loose, 100 percent organic, substantially free of mineral waste materials, and showing an acid reaction.

B. Minimum organic matter by weight on an oven dry basis: 85%.

C. Processed specifically for use as top mulch around plant beds.

2.10 GUYING AND STAKING MATERIAL

A. Stakes for tree support:

1. Construction grade lumber, pressure treated pine or lodge poles.

2. Vertical Stakes: Nominal 2"x 4"x 8' long pressure treated pine and pointed at one end.

3. Braces for Palm Trees: Nominal 2"x 4"x 8' long pressure treated pine.

4. Stakes: Nominal 2"x 4"x 3' long pressure treated pine and pointed at one end.

5. All above grade, 2"x 4" stakes and braces shall be painted with one coat of Olympic stain. Stain and color to be accepted by the Orange County Representative.

B. Guying Wires

Annealed, galvanized iron or galvanized steel not less than 12 gauge wire. Wire shall be flagged with white surveyor tape minimum 2 per guy wire, (one flag near ground level and one flag near the middle of the length of wire, above turnbuckle if used). Nylon tape systems manufactured for guying trees may be used.

C. Hose

1. Type: New 1/2" diameter 2-ply reinforced black rubber or plastic hose.

2. Minimum length: 6"

D. Turnbuckles

1. Turnbuckles are required. Landscape Contractor shall be responsible for keeping taut all guyed plant material and for keeping flagging in place. One turnbuckle per guy wire is required.

2. Guying to be tightened as needed, but always within one day of when found necessary.

3. Install hand tensioner when nylon tape systems are used.

2.11 SLOPE STABILIZATION

A. Landscape Contractor shall be responsible to stabilize grades by approved methods where necessary.

B. Contractor shall stabilize all sloped areas greater than 3 to 1 and areas found to be required to reduce surface erosion by the Orange County Representative with erosion control fabric. Contractor shall install erosion control fabric according to the manufacturer's instructions.

2.12 SOIL SEPARATOR

A. Soil separator material shall be used to cover the gravel layer in tree or palm pits where percolation may not be adequate (see part 3.03, "Preparation", within this section).

B. The soil separator in tree planting pits shall consist of a sheet of structure composed entirely of preferentially oriented isotactic polypropylene continuous filaments thermally bounded mostly at the crossover points.

1. "Typar" style 3341, by Dupont, as manufactured by REEMAY, Inc. or approved equal.

2. Soil Separator Installation:

a. Roll, size and overlap as required and indicated, and complete installation as per manufacturer's standard printed specifications, inspections and recommendations.

b. Contractor shall be responsible for securing top edges of soil separator by an approved method.

2.13 DRAINAGE GRAVEL

A. Gravel shall be river gravel and shall be of graduated sizes.

B. River gravel shall be no smaller than 3/4" nor larger than 1 1/2" in any dimension.

C. Gravel shall be installed as shown on drawings or to a minimum of 4" depth.

D. Gravel shall be washed clean and contain no chemical elements harmful to plant growth.

E. Drainage gravel shall be provided and installed in the bottom of tree/palm planting pits where percolation may not be adequate (see Part 3.03 "Preparation", within this section).

2.14 DRAINAGE MAT

A. Drainage mat shall be Enka-Drain #3120 as manufactured by BASF Corporation (704/677-7713) or acceptable equal installed as per manufacturer's recommendations where shown on details.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that final grades and drainage have been established prior to the beginning of the planting operation.

B. Inspect trees for injury, insect infestation, and trees and shrubs for improper pruning.

C. Do not begin planting of trees until deficiencies are corrected, or plants replaced.

3.02 LOCATION/STAKING

A. Stake out locations for plants and outline of planting beds on ground.

B. Do not begin excavation until stake out of plant locations and plant beds are acceptable to the Orange County Representative.

C. The location of all plant materials shall be field staked prior to installation for Orange County Representative's acceptance.

3.03 PREPARATION

A. Pits shall be circular with vertical sides and flat bottom. Tree/palm pits shall have mounded bottoms to improve drainage as detailed. The depth of all plant pits shall be enough to accommodate the ball or roots. Pits to be 2-3 times root ball diameter.

B. Disposal of Excess Soil

1. Use acceptable excess excavated topsoil to form watering berms around the plants.

2. Dispose of additional excess soil at direction of Orange County Representative.

3. Dispose of unacceptable or unused excess soil in designated staging area as directed by the Orange County Representative

4. All spoilage shall be deposited, spread and fine graded to a maximum 2" layer as directed by the Orange County Representative.

C. Test fill all plant beds and tree pits with water before planting to assure that proper drainage and percolation is available (twice in succession). Condition permitting the retention of more than 6" of water in 1 hour shall be brought to the attention of Orange County Representative. Pits, which are not adequately draining, shall be excavated to a depth sufficient for additional drainage and backfilling with gravel. No allowances will be made for lost plants due to improper drainage. Landscape Contractor shall replace with same species size and specification at no cost to Orange County.

3.04 PLANTING

A. General

1. Center plant in pit.

2. Face for best effect, or as directed by Orange County Representative.

3. Set plants plumb and hold rigidly in position until soil has been tamped firmly around planting ball.

4. Use only planting soil backfill as specified.

5. Place sufficient planting soil under plant to bring top of planting ball to finish grade (top of tree/ palm root balls shall not be set below finished grade).

6. Backfill pit or trench with planting soil in 9" layers and water each layer thoroughly to settle soil and work soil completely around roots and planting ball.

7. After soil settles fill pit with planting soil, water, and leave pit surface even with finish grade.

8. Topsoil Berm:

   a. Construct a topsoil berm 6" above finish grade forming a watering basin with a level bottom around each palm or tree.

   b. Size: 12" greater than diameter of planting ball. Maintain 4-ft. diameter grass circle around all trees in sod areas.

c. Construct a topsoil berm 6" above finished grade for all planting beds on slopes per planting details.

d. Leave saucer for 3 months or as directed by Orange County Representative. At the end of 3 months, regrade area and re-mulch planting circle (or planting bed) for all plantings. Remove excess from basin and clean area. Replace any damaged plant material or sod at no cost to Orange County.

B. Container Grown Plants

1. Can/container removal

a. Carefully remove plants without injury or damage to planting ball.

b. After removing plant: Superficially cut edge roots with knife on three sides. Note: Rootbound plants shall not be accepted.

2. Do not cover top of root ball.

3.05 FERTILIZER APPLICATIONS

A. Apply granular fertilizer at time of planting and repeat 3 months from first application. Schedule time of fertilization with Orange County Representative to verify compliance of fertilization of plant materials. Apply fertilizer per manufacture's recommendation to all plant material.

B. Broadcast under foliage canopy and incorporate into soil.

C. Water immediately until root structure of plant is wet. Assure protection from fertilizer burn.

D. Apply foliar nutrient spray to all Palm species at time of planting and repeat 3 months from first application. Do not apply foliar sprays in summer months (i.e., June through August). Schedule fertilization with Orange County Representative. Drench palm leaves with foliar nutrient spray at the manufacturer's recommended rate to all palm species.

3.06 WEED AND INSECT CONTROL

A. Apply post-emergent herbicide, "Roundup" as manufactured by Monsanto Corp. or approved equal, per manufacturer's rate and method of application to all landscape areas as necessary.

B. Provide viable application of pre-emergent herbicide Dow Elanco “Snapshot" in accordance with manufacturer’s recommendations before mulching and again as necessary throughout required maintenance period to prevent weed seed germination.

1. Contractor shall schedule application with Orange County Representative to verify compliance with specifications.

C. The Landscape Contractor shall verify that the herbicide and application technique will not damage plant material prior to application, and shall replace, and/or damage to any plant injured by herbicide application at no cost to Orange County.

D. Provide written certification that all plant materials including palms have been specifically treated for insect control.

3.07 TOP MULCHING

A. Top mulch planting pits within two days after planting.

B. Cover water basin or bed evenly with 2" compacted depth of top mulch material.

C. Water thoroughly, immediately after mulching.

D. "Cut in" mulch at plant pit/sod line.

E. Hose down tree canopy with fine spray to wash leaves of plants at least twice a week or as required.

3.08 GUYING AND STAKING OF TREES

A. Guy trees as shown on the drawings except where they are planted in special locations where guying is not feasible. Staking and guying of trees shall be done immediately after they are planted. It shall be the Contractor’s responsibility to ensure that all trees are plumb and secure after planting.

1. Stake installation (See planting detail)

a. Drive stakes perpendicularly, 3 ft. into ground at edge of root ball. Do not drive stake through soil separator or drainage gravel if present. Do not drive stakes through root ball.
b. Number of stakes as shown.

2. Tying and Cross-bracing:(See planting detail)

    a. For trees 4" or greater in caliper:
        (1) Stake and tie firmly with guy wire as shown.
        (2) Separate guy wire from bark by hose section.

B. Stake palm trees as shown. Contractor shall not deepen the burial of trees and palms for stabilization in lieu of staking. The clear trunk height shall be required as specified on plans after installation. The Contractor shall be responsible for and guarantee the installation against toppling and be responsible for any and all damage incurred by toppling over of palms.

C. Contractor shall leave all guying and staking in place and maintain in good repair until project is substantially complete, or as directed by Orange County Representative. Ensure no guys or stakes occur in grassed areas.

3.09 PRUNING

A. Prune minimum necessary to remove injured twigs and branches, deadwood, and suckers. Pruning shall be done with regard to natural form of tree or as directed by the Orange County Representative.

1. Prune trees prior to delivery to site only under direction of Orange County Representative. (Note: Pruning is required for collected palms as specified in "Grades and Standards for Nursery Plants.")

B. Do not paint cuts unless directed by Orange County Representative.

C. Pruning cuts shall be monitored to ensure proper healing and to prevent insect/disease infestation.

D. Landscape Contractor shall perform all pruning as directed by the Orange County Representative and as shown on the drawings at no additional cost to Orange County.

3.10 MAINTENANCE

A. Landscape Contractor shall begin daily maintenance immediately after each item is planted and continue daily maintenance through the 12-month maintenance period for each designated portion of the project as defined in the specifications of the Contract. The 12-month maintenance period shall begin immediately after Final Inspection and Acceptance is completed.

B. Maintain a healthy growing condition by pruning, watering, cultivating, weeding, mowing, mulching, tightening, and repairing of guys, resetting plants to proper grades or upright position, restoration of plant saucer, and furnishing and applying such sprays as necessary to keep planting free of insects and diseases.

C. The root system of plants shall be watered by the Contractor as often as conditions require at such intervals as will keep the surrounding soil in best condition for promotion of root growth and plant life. Watering is the responsibility of the Contractor until the end of the maintenance period and final acceptance.

D. Keep planting saucers and beds free of weeds, grass, and other undesired vegetation growth. All areas must be 98% weed free upon final acceptance by Orange County Representative.

E. Protect planting areas and plants against trespassing and damage of any kind for the duration of the maintenance period.

F. Inspect plants at least once a week and perform maintenance promptly. Replace impaired or dead plants promptly. Do not wait until near the end of the guarantee period to make replacements of plants that have become unacceptable.

G. Maintain guying/staking and water basins unless otherwise directed by the Orange County Representative until substantially complete.

H. Water following schedule and when soil moisture is below optimum level for best plant growth. It is the Contractor's responsibility to provide water as may be required above until all trees and palms are well established or to the end of the maintenance period.

I. Contractor shall be responsible to protect all cold sensitive approved trees stored or planted on-site by approved methods from cold or freeze damage as may be required. Contractor shall use approved horticultural practices typical for the Central Florida area and shall submit intended methods, schedules and plans of protection with required submittals for review and approval. In the event the Orange County Representative verifies that non-protected materials were damaged during a cold period or freeze, the damaged materials shall be replaced by the Contractor at no additional cost to Orange County. The Contractor shall use reasonable measures to protect all cold sensitive plant materials.

3.11 CLEANUP

A. When appropriate, fill all pits/depressions in holding area and rough grade to meet surrounding elevations. Remove any organic or other debris resulting from the plant relocation process.

B. Sweep and pressure wash all paved surfaces.

C. Remove planting debris from project site and holding area.

D. Remove soil conditioners, soil mixes, gravel, etc. from project site and holding area.

E. All areas outside of the limits of work that are disturbed by the Contractor's construction activities shall be repaired and replanted to its original condition.

3.12 SUBSTANTIAL COMPLETION, FINAL INSPECTION AND ACCEPTANCE

A. Inspection of the entire project or designated portions thereof shall be made upon written request of the Contractor. At that time, if all work is satisfactory and complete according to the conditions of the Contract, the Orange County Representative shall declare the work substantially complete.

B. Contractor's written request for review of the work or any designated portion thereof shall be received by Orange County Representative at least five (5) days before anticipated date of inspection.

C. Plants that have died or are in unhealthy or badly impaired condition on inspection shall be treated or replaced within 14 days at no additional cost to Orange County. The same warranty applies to replace plant material.

D. Replace rejected plants within two weeks of inspection.

E. Acceptance of the work for the entire project or designated portions thereof shall constitute the beginning of Maintenance period.

F. Contractor's responsibility for maintenance (exclusive of replacement within guarantee period) shall terminate after the 12-month maintenance period described in section 3.10. The Contractor shall supply Orange County with three (3) copies of written maintenance records and instructions as required under Paragraph 1.04 of this section.

Basis of Payment

All work and incidental costs required to perform the following items as herein specified will be paid for at the contract unit price.

Payment shall be made under:

Pay Item:

ITEM	UNIT	DESCRIPTION
580-1-1A	EA	Sand Cord Grass (Spartina bakeri) 1 gal 18" x 12", Full (LIT-SPP)
580-1-1B	EA	Pickerelweed (Pontederia cordata) 1 gal (LIT-SPP)
580-1-1C	EA	Duck Potato/Arrowhead (Sagittaris Iancifoliz) 1 gal (LIT-SPP)
580-1-1D	EA	Soft Rush (Jancus effusus) 1 gal (LIT-SPP)
580-2-1A	EA	Bald Cypress (Taxodium distichum) 8'x3', 2-inch min. Cal (TD-1)
580-2-1B	EA	Bald Cypress (Taxodium distichum) 11'x4', 3-inch min. Cal (TD-2)
580-2-1C	EA	Live Oak (Quercus virginiana) 12'x5', 3-inch min. Cal (QV)

END OF SECTION 580

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 590

IRRIGATION SYSTEM AND PUMP

Construct complete irrigation system and pump as detailed in the plan set. In addition to the overall plan sheets, specific information related to the irrigation and pump system is presented on the following sheets: "Utility Details and Irrigation Details," "Utility Adjustment Plans" and the Electrical Plans.

In addition to the stormwater pump system shown on the plans. The Contract shall also provide a complete working drip irrigation system for the new trees installed around the pond.

Provide the following

1. Complete float system and pipe to bring water from the pond to the pump station. Approximate pipe length is presented on the plans. The bid should include all needed piping, material and equipment to make the connection regardless of length.

2. A 5 HP pump, Hoover pump HCF-5CS-460/3-L,M-Z, or approved equal

3. 4-ft x 4-ft fiberglass irrigation pump enclosure by Hoover Pump or approved equal

4. All piping, panels, meters, skids, valves as depicted on the plans

5. Electrical connection to the existing electrical system near the football fields

6. Flow and pressure test will be provided

7. Irrigation pump from the pump station and the associated spray heads will be provided by other after construction is complete.

8. Totalizing Meter (accurate to 1 gallon)

9. Irrigation Equipment (estimated quantities are presented in table below)

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 590

Item	Quantity	Unit
Controller 1-core 6 zone	1	EA
Rain sensor hunter or equal	1	EA
2-1/2" mainline – purple schedule 40 PVC	520	LF
1-1/2" valve commercial grade Rainbird or equal	4	EA
Ametek valve box 12"x18"x8" high or equal purple lid	4	EA
2" purple PVC class 200 pipe	1050	LF
1-1/2" purple PVC class 200 pipe	650	LF
1-1/4" purple PVC class 200 pipe	600	LF
1" purple PVC class 200 pipe	450	LF
¾" purple PVC class 200 pipe	300	LF
½" purple PVC class 315 pipe	1000	LF
½" flex pipe 3-ft per bubbler	570	LF
½" male adaptors	190	EA
Rainbird tree bubblers (or equal)	190	EA
2 step solvent weld enough to complete project	1	LS
Control wire for 24V low voltage 12 gauge (red)	2500	LF
Common wire for 24V low voltage 12 gauge (white)	550	LF
4" Sleeve PVC Schedule 40, 10-ft long at 9 locations	90	LF
6" Sleeve PVC Schedule 40, 10-ft long at 1 location	10	LF
8" Sleeve PVC Schedule 40, 10-ft long at 2 locations	20	LF
12" Sleeve PVC Schedule 40, under roadway	40	LF
110 volt service for irrigation controller	1	LS

Notes 1) Mainline and control wire trenches depth 24-inch minimum, 2) Perform Utility locates as required.

Method of Measurement

A complete working irrigation pump system and drip irrigation to the new trees around the pond.

Basis of Payment

Payment shall constitute full compensation for all work described herein and shown in the plans.

Payment shall be made under:

Item No. 590-70 Irrigation System and Pump Lump Sum

Pay Item Footnote No. 590-70
Pay item 590-70 includes all items associated with irrigation system, such as pump, pump enclosure, controller, open cut or directional drilling of 12" PVC underneath the Ferrand Drive, piping to bottom of pond, float assembly, totalizing meter (See Sheet 20)

END OF SECTION 590

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 700

HIGHWAY SIGNAGE

The furnishing and installing of all Highway Signing as shown on the plans shall conform to the requirements of Section 700 of the Standard Specifications, except as amended herein or as directed by the Engineer. All highway signs shall be of the type specified and installed at the locations shown on the plans.

The materials and methods shall comply with Sections 700-3 through 700-6 of the Standard Specifications and shall be accepted by the Orange County Traffic Engineering Division prior to installation.

Sign posts for single column signs shall be a minimum of 14 gauge 2"x2" square welded steel with 3/8" knockouts on 1" centers on all four sides. The posts shall be listed on the FDOT's Qualified Products List and shall be galvanized and sealed with a polymer topcoat.

Method of Measurement

The quantities measured for payment under this Section shall be in accordance with Article 700-11 of the Standard Specifications.

Basis of Payment

Payment for furnishing and installing highway signs shall be in accordance with Section 700-12 of the Standard Specifications.

Payment shall be made under:

Pay Item:

700-20-11	Single Post Sign, F&I, less than 12 SF	AS

Pay Item Footnote No. 700-20-11
Pay item 700-20-11 is Handicap Parking Sign

END OF SECTION 700

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 710

PAINTED PAVEMENT MARKINGS

The placing of painted traffic stripes and markings as shown on the plans shall conform to the requirements of Section 710 of the Standard Specifications, except as amended herein or as directed by the Engineer.

Method of Measurement

Quantities measured for payment shall be the units for each designated item in the proposal. The quantity to be paid for under this Section shall include all labor and material for the placing of all pavement markings as shown on the plans, including the removal of any existing pavement markings.

Basis of Payment

Payment for items under this Section shall be made at the contract unit prices completed and accepted. Payment shall be full compensation for all the work specified herein and shall include all equipment, labor and materials required for an acceptable installation.

Payment shall be made under:

Pay Item:		
710-90	Painted Pavement Markings (Final Surface)	LS

Pay Item Footnote No. 710-90
Pay item 710-90 includes -240 LF of 4-inch white stripe for parking area, 40 LF of 4-inch blue strip for HC parking, 80 LF of 6-inch white for HC parking, 1-Handicap symbol, 110 LF of 12-inch white stripe for cross walk, 12 LF of 24-inch White Stripe for Stop Bar

END OF SECTION 710

AS-BUILT PLANS

The As-Built Plans shall incorporate all the changes made to the red line As-Built plans. They shall show locations and elevations of paving, swales, ditches, pipe inverts and structures constructed and all relocated or reset property corners, section corners and 1/4 section corners. They shall be submitted in paper and ACAD format.

Upon the completion of the project, the Contractor shall submit to the County one (1) set of 24"x36" paper Full Size Drawings with Statement of Certifications, certifying that the project was constructed according to the Construction Plans and Specifications, and that the AS BUILT PLANS are correct representation of what was constructed. The plans shall delineate all red line information contained on the As-Built Plans.

The Contractor shall include the Statement of Certification on either the cover sheet certifying all of the sheets or certify each individual sheet. The Statement of Certifications shall be signed and sealed by a Professional Engineer and/or a Professional Surveyor and Mapper, both registered in the State of Florida.

Basis of Payment

As-Built Plans will be paid for at the contract lump sum price, completed and accepted.

Payment shall be made under:

Pay Item:

900-1	As-Built Plans	Lump Sum

END OF SECTION 900-1

INDEMNIFICATION

The Contractor shall indemnify, defend, and hold harmless the County and all its officers, agents, and employees, from all claims, losses, damages, costs, charges, or expenses arising out of any acts, action, neglect, or omission by the Contractor during the performance of the Contract, whether direct or indirect, and whether to any person or property to which the County or said parties may be subject, except that neither the Contractor nor any of its sub-contractors are liable under this Section for damages arising out of the injury or damage to persons or property directly caused or resulting from the sole negligence of the County or any of its officers, agents, or employees.

Payment shall be made under:

Pay Item:	900-2	Indemnification	Lump Sum

END OF SECTION 900-2

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 900-3

GROUNDWATER TREATMENT AND DISPOSAL

General

If concentrations of tested groundwater quality parameters exceed those allowable in the Florida Department of Environmental Protection (FDEP) Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity (62-621.300(2), F.A.C.), treatment may be required under this technical provision.

The term treatment as used in this technical provision means the application of all FDEP approved techniques and/or methods available to remove the exceedances out of dewatering effluent except impounding. Impounding is not considered a treatment method for purposes of compensation under this technical provision.

The Contractor shall include in his/her bid all applicable costs, including monitoring, resulting from treatment and disposal of contaminated groundwater with concentration levels that exceed the allowable limits of the FDEP generic permit, and shall not be entitled to any adjustment in the Contract Price as a result of any change in the permit fees or unanticipated treatment and disposal costs.

Prior to any work commencing, and for the duration of the work, the Contractor is responsible for meeting all the conditions of the applicable permits and submitting any required reports to the appropriate agencies.

The Contractor shall dewater only in relation to the location and relocation of facilities owned by the County. No compensation shall be provided for dewatering performed for facilities that are not owned by the County.

Permitting

If exceedances are found in the dewatering effluent, the Contractor will be required to:

1. Immediately notify the County and report the exceedances that are encountered.
2. Meet with the FDEP to determine any and all alternatives that are acceptable.
3. Obtain prior County approval of treatment and disposal alternatives.
4. Obtain prior written County authorization to use pay item TP 900-3-1.
5. Apply and obtain any and all permits and/or treatment approvals that FDEP requires including, but not limited to:

    a. Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1), F.A.C.). Allows discharges from sites with automotive gasoline, aviation gasoline, jet fuel, or diesel fuel contamination.

b. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660, F.A.C.). The coverage is available only through the individual NPDES permit issued by FDEP. Allows discharges from sites with general contaminant issues, i.e. ground water and/or soil contamination other than petroleum fuel contamination.

c. Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity (62-621.300(2), F.A.C.).

d. Generic Permit for Stormwater Discharge from Large or Small Construction Activities (62-621.300(4) (a), F.A.C.).

6. Apply and obtain any and all permits and/or treatment approvals that the Water Management District requires including, but not limited to:

a. No-Notice Short-Term Dewatering Permit (40E-20.302(3), F.A.C.) If the Contractor's proposed work is expected to exceed 90 days in duration, or does not meet any of the other requirements listed with the requirements of Rule 40E-20.302(3), the Contractor must apply for and obtain a Dewatering General Water Use Permit (40E-20.302(2) F.A.C.)

The Contractor shall not be entitled to file, or recover under, any delay claim based on preparation of permit applications and the time required for obtaining the applicable permits. If, prior to or during the dewatering, it is determined that the disposal or discharge of the dewatering effluent is not authorized by the FDEP's Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity, the Contractor shall diligently pursue further required permit(s) from FDEP or other agencies without resort to delay claims or recompense from the County for either permit application activities or the time required to obtain such permits.

The Contractor shall consider and anticipate the potential need to obtain the herein discussed permits in developing his schedule, and shall make every effort to avoid or minimize potential impacts to his critical path that might result from delays in dewatering activities due to the time necessary for the Contractor to obtain the necessary permits. The Contractor shall make every effort to schedule activities requiring dewatering as late as possible during his schedule, and shall schedule activities not impacted by dewatering as early as possible. For each day, up to a maximum of one hundred eighty (180) days that the Contractor diligently pursues such permit(s) and is unable to avoid adversely impacting his critical path, a day will be added to the time allotted to the Contractor to complete performance of the Project.

TP 900-3

Treatment

The Contractor shall implement the appropriate treatment that is acceptable to FDEP, COUNTY, and, if necessary, the Water Management District to attain compliance for all exceedances encountered during dewatering activities. Treatments may include, but are not limited to: chemical treatment, ion exchange treatment, filtration, and disposal of discharged groundwater in a properly permitted facility.

The Contractor shall:

1. Make every effort to minimize the spread of contamination into uncontaminated areas;
2. Provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions;
3. Ensure such provisions adhere to all applicable laws, rules or regulations covering hazardous conditions in a manner commensurate with the level of severity of the conditions;
4. If necessary, provide contamination assessment and remediation personnel to handle site assessment, determine the course of action necessary for site security, and perform the necessary steps under applicable laws, rules, and regulations for additional assessment and/or remediation work to resolve the contamination issue;
5. Delineate the contamination area(s), any staging or holding area required, and develop a work plan that will provide the schedule of projected completion dates for the final resolution of the contamination issue;
6. Maintain jurisdiction over activities inside any delineated contamination areas and any associated staging or holding areas;
7. Be responsible for the health and safety of workers within the delineated areas; and
8. Provide continuous access to representatives of regulatory or enforcement agencies having jurisdiction.

Method of Measurement

Quantities to be paid for under this Section shall be the actual number of calendar days, when Groundwater Treatment & Disposal occurs. This does not include preparation of permit application(s) or time to obtain the permit(s).

Basis of Payment

Groundwater Treatment & Disposal will be paid for at the contract unit price per day. The price and payment for groundwater treatment and disposal shall constitute full compensation for cost of permitting and providing all labor, materials, tools, equipment, monitoring, reporting, treating and disposing of groundwater produced from dewatering systems.

Item No: 900-3 Groundwater - Treatment & Disposal - Per Day

END OF SECTION 900-3

PRECAST CONCRETE BOARDWALK SYSTEM

PART 1-GENERAL

1.1 SUMMARY

A. These specifications are for a precast concrete boardwalk and shall be regarded as minimum standards for this project. These specifications are based upon products designed and supplied by:

PermaTrak North America LLC
16607 Riverstone Way
Suite 200
Charlotte, NC 28277
Ph: 980-229-3036
Fax: 704-541-3675
www.permatrak.com

This item shall also include the design, specification, and construction of a foundation system to support the proposed boardwalk system.

1.2 ALTERNATE REQUIREMENTS: Alternates are allowed provided that the following minimum standards and these "Precast Concrete Boardwalk System" specifications are met.

A. "Minimum Standards" as outlined in section 1.3 below must be met.
B. A drawing of the precast boardwalk system (including tread layout, structural details designed for the design loads shown on the contract documents, foundation design and layout) must be submitted 2 weeks before the bid date and signed and sealed by a Professional Engineer.
C. Submittal must meet the requirements set forth in section 1.6a.

1.3 MINIMUM STANDARDS: The selected boardwalk shall have the following minimum characteristics:

A. Walking surface (treads) shall be made of precast concrete, and supported by precast concrete beams. Where applicable, edges of treads will receive precast concrete curbs.

B. Walking surface (finish) of top surface of treads shall have a formliner finish with one of PermaTrak's standard textures (sandblast, broom or timber). Texture must be integral with the concrete and shall not be an applied post pour wearing surface.

C. Precast concrete treads shall be structural load bearing elements and shall interlock with one another via a "tongue and groove" connection.

D. All precast shall consist of integrally colored concrete in a color selected by the owner from one of PermaTrak's "standard colors".

E. DESIGN LOADS: Designed for the following live loads:
   1. Pedestrian live load of 100 psf.
   2. 5000 lb maintenance vehicle. Two axles spaced 96 inches apart and equally distributed.

F. Treads shall maintain a "boardwalk appearance", specifically meaning each tread shall have a width: length ratio ranging from a minimum of 3:1 to a maximum of 14:1. Width is defined as the tread dimension perpendicular to the normal direction of travel. Length is defined as the tread dimension measured in the direction of travel.

G. Tread width shall be as noted on the contract drawings. Alignment should follow the horizontal and vertical alignment shown on the contract plans.

H. Connectors for curbs (if applicable) to treads shall not be visible to boardwalk users while viewed from the top of the walkway.

1.4 QUALITY ASSURANCE

A. The Contractor performing the installation of the pile foundations shall have installed piles of size and length similar to those shown on the plans for a minimum of three (3) years prior to the bid date for this project. The Contractor shall submit a list containing at least three (3) projects completed in the last three (3) years on which the Contractor has installed piles of a size and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects.

B. Manufacturer Qualifications: Not less than 10 years experience in the actual production of precast products as described below.

   1. Components shall be factory fabricated and engineered by single entity.
   2. Precaster for the boardwalk shall have on site color mixing facilities and shall use dyes for color pigmentation.
   3. Precaster shall have a minimum of 3 years experience in the production of above ground precast products or boardwalk structures.
   4. Precaster must be certified by PCI or NPCA.

C. Installer Qualifications: Firm with 3 years experience in installation of systems similar in complexity to those required for this Project, plus the following:

1. Trained and authorized by railing manufacturer to engineer and install the specified railing system.

D. Mock-Up: Provide, if required by Architect/ Engineer, a mock-up for evaluation of the boardwalk showing the surface preparation techniques and application workmanship.

1. Finish areas designated by Architect / Engineer.
2. Do not proceed with remaining work until mock-up is accepted by Architect / Engineer.
3. Refinish mock-up area as required to produce acceptable work.

1.5 DESIGN

A. The designer of the boardwalk and foundation system (designer) shall be a qualified registered Professional Engineer licensed in the State of Florida and experienced in the design of concrete structures and supporting foundation systems.

GEOTECHNICAL INFORMATION AND SOIL INVESTIGATION

1. A geotechnical investigation report has been prepared and is available for reference. The report was produced by DEVO Consulting Geotechnical Engineers, dated September 2012. Also available is a Supplement #1 Muck Investigation Report, dated July 22, 2013.

B. DESIGN CRITERIA: The design of the boardwalk and foundation shall comply with the following guidelines:

1. AASHTO Guide Specifications for the Design of Pedestrian Bridges
2. AASHTO Standard Specifications for Highway Bridges, 17th Edition.
3. American Concrete Institute 2005 – Building Code and Commentary.
4. In addition to the dead loads of the system, the structure shall be designed for the live loads defined in Section 1.2.E above.
5. Railings structural requirements:

a. Handrail and railing assemblies and attachments shall resist a minimum concentrated load of 200 pounds (91 kg) applied in any direction at any point on the top rail and a vertical and horizontal thrust of 50 lb/lf (0.73 kN/m) applied to the top railing without permanent set or damage. The two loads are not cumulative.

b. Infill area of railing system capable of resisting a horizontal concentrated load of 200 pounds applied to one square foot (8165 g/sq. m) at any point in the system. This loading shall not be applied simultaneously with other loading conditions.
c. Handrail assemblies and guards shall be designed to resist a load of 50 pounds per linear foot (0.73 kN/m) applied in any direction at the top and to transfer this load through the supports to the structure.

6. Railings shall be suitable for pedestrian traffic and shall be a minimum of 42-inches above the tread / deck surface.
7. In addition to the dead loads of the system, the structure shall be designed for the live loads defined in Section 1.2.E above

1.6 SUBMISSIONS: Prior to the start of fabrication or construction, the Contractor shall submit to the Engineer a design package, which shall include, but is not limited to, the following:

A. PRELIMINARY SUBMISSIONS: Prior to the start of fabrication or construction, the Contractor shall submit to the Engineer a design package, which shall include but not limited to the following:

1. DETAILED PLANS:

a. REGISTRATION / SEAL: Sealed by a licensed Professional Engineer (Florida).
b. PLAN VIEW: Full plan view of the boardwalk and foundation system drawn to scale. The plan view must reflect the proposed horizontal alignment as shown on the design plans.
c. ELEVATION VIEW: Full elevation view of the boardwalk, railing and foundation system drawn to scale which reflect the actual vertical alignment. Elevation views shall indicate the elevation at the top and bottom of the boardwalk and foundation system components, horizontal and vertical break points, and location of the finished grade.
d. DETAILS: Details of all boardwalk, railing, and foundation system components and their connections such as the length, size and where changes occur; connections; etc.
e. FOUNDATION: Detailed layout plans for location of all foundation system components, including working points with coordinates for survey stakeout.
f. CODE REFERENCE: Design parameters used along with AASHTO references.

2. DESIGN COMPUTATIONS: computations shall:

   a. Be stamped by a licensed Professional Engineer in the state of Florida.
   b. Computations shall clearly refer to the applicable AASHTO provisions
   c. Documentation of computer programs including all design parameters.

3. CONSTRUCTION SPECIFICATIONS:

   a. Construction methods specific to the boardwalk vendor chosen. Submittal requirements such as certification, quality and acceptance/rejection criteria shall be included. Details on connection of boardwalk units and foundation system such that assurance of uniform load transfer shall be checked.

B. FINAL SUBMISSION: Once a boardwalk and foundation system design has been reviewed and accepted by the Owner, the Contractor shall submit the final plans. The designer of the boardwalk and foundation system is responsible for the review of any drawings prepared for fabrication. One set of all approved shop drawings shall be submitted to the Engineer's permanent records.

C. SUBMITTALS: Product Data: Submit Manufacturer's technical product data for railing components and accessories.

Manufacturer to supply submittal drawings for approval to include the following:
1. Section-thru details.
2. Mounting methods.
3. Typical Elevations.
4. Key plan layout.

D. Shop Drawings: Shop drawing showing actual field conditions and true elevation and location supplied after field verification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings:

1. Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the

Contractor and proceed with fabrication of products so as not to delay fabrication, delivery and installation.

C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

1.8 WARRANTY:

A. Contractor will be responsible for installation defects associated with the boardwalk and abutment components, foundation system, and railings for a period of 12 calendar months from the date of final acceptance by the Owner.

B. Boardwalk manufacturer shall warranty all precast concrete components against defects in material and workmanship for a period of ten years.

1.9 MEASUREMENT AND PAYMENT

A. Precast concrete boardwalk, railings, piers, and abutments shall be paid for at the contract square footage price as listed in the bid proposal for "Boardwalk". This price shall include all materials, equipment, labor and work necessary for and incidental to the design, construction, delivery, unloading, assembly, and placement of the boardwalk and abutments as shown in the contract plans including all railings on the superstructure.

PART 2-MATERIALS & TESTING

2.1 PRECAST CONCRETE: shall conform to the following:

a. The minimum compressive strength of the concrete shall be 4000 psi measured at 28 days.

b. All precast concrete components shall be air entrained composed of Portland cement, fine and course aggregates, admixtures and water. The air-entraining feature may be obtained by the use of either an air entraining Portland cement or an air entraining admixture. The entrained air-content shall be not less than four percent or more than seven percent.

PART 3 - EXECUTION

1.1 PRECAST CONCRETE BOARDWALK

A. Installation of the precast concrete boardwalk system and abutments, if applicable, shall be performed in accordance to the approved plans and manufacturers installation instructions. Boardwalk manufacturer shall provide a field representative to review

installation instructions with the Contractor and Engineer and to certify that the installation has been performed according to the approved drawings and manufacturer's instructions.

Basis of Payment

Payment shall constitute full compensation for all work described herein and shown in the plans.

Payment shall be made under:

Item No. 900-5C	Boardwalk (F&I) – central boardwalk	SF
Item No. 900-5S	Boardwalk (F&I) – southern boardwalk	SF

Pay Item Footnote No. 900-5C and S
Pay item 900-5C and S includes everything to construct the pedestrian boardwalk on sheets PT-01 to PT-04 and PT08 to PT-09

END OF SECTION 900-5

KIOSK (F&I)

Provide a complete pavilion as detailed in the plan set.

Includes all material and labor to construct and install the kiosk. Pre-manufactures kiosk may be submitted for consideration as an approved equal.

The Contractor shall obtain all additional permits, ensure all needed inspections are passed, and that the kiosks are safe and useable for the public.

Basis of Payment

The kiosk will be paid for at the contract lump sum price, completed and accepted.

Payment shall be made under:

Pay Item:

900-10	Kiosk (F&I)	Each

END OF SECTION 900-10

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 900-11

RELOCATE BENCH, TRASH RECEPTACLE, BRICK PAVERS AND DOG DRINKING FOUNTAIN AT TWO DOG PARKS

The new pond is impacting the entrance to the large dog park area. All of the existing amenities at the existing dog park entrance are to be relocated to the new dog park entrance. The items to be relocated include

1. Bench
2. Trash Receptacle
3. Brick Pavers
4. Dog Drinking Fountain
5. The concrete slab is to be replaced or extended to allow the same type of access to the dog park

Basis of Payment

The dog park entrance relocations will be paid for at the contract lump sum price, completed and accepted.

Payment shall be made under:

Pay Item:

900-11	Relocate Bench, Trash Receptacle, Brick Pavers and Dog Drinking Fountain at Two Dog Parks	Lump Sum

END OF SECTION 900-11

PART H
TECHNICAL PROVISIONS

Lake Lawne Regional Stormwater Facility at Barnett Park

TP 900-12

RELOCATE GOLF HOLES WITH NEW SIGNAGE

1.0 Scope: Relocate Frisbee golf holes and tees as depicted on the plans. Trim or remove trees and/or shrubs as directed by the County. Furnish and install new signs at each of the 18 frisbee golf holes.

1.1 Color Deluxe Framed Sponsor Tee Signs

Provide Sponsor Tee Sign Frame from Disc Golf Associations (http://www.discgolf.com/disc-golf-tee-signs/color-deluxe-framed-sponsor-tee-signs/#) or approved equal.

Sponsor Tee Sign Frame Color Deluxe Framed Sponsor Tee Signs are to be designed to provide a durable disc golf sponsor tee sign with custom full color graphical layout. Color Deluxe Framed Sponsor Tee Signs should look professional, are not easily damaged and provide for hole sponsorship. Sturdy Frames and pipe are hot-dipped galvanized, welded steel construction. Standard Framed Sponsor Tee Signs consist of a steel frame surrounding two separate 8-inch x 11-inch tee panels, one panel for tee information and one panel for sponsor information.

The first panel will be an attractive full color custom tee sign with great graphics, hole detail and available with choice of colors and fonts. The course logo will be incorporated into the design and there are different custom layout themes to start from. The second mounted white lexan panel comes with a clear lexan cover panel installed with locking bolts. Sponsor information can be placed between the white and clear lexan panels. Color Deluxe Framed Sponsor Tee Signs are durable and functional and perfect for heavy use parks where vandalism is a concern.

The system should be

- Extremely durable and designed for heavily used Park
- Provides a means to sponsor a hole
- Two Panels (8″x11″ Aluminum Sign with UV-resistant Ink & 8″x11″ lexan plate insert)
- Customized Full Color Tee Layout
- Professional graphics design
- Graphical fairways hazards, trees, water, etc.
- Logo or Custom Naming
- Hot-dipped galvanized steel pipe and frame for extra security & durability

Signs: Two (8” x 11”) panes. Hole Layout Pane: Aluminum Panel with clear Lexan cover panel, pop riveted into place. Custom printing on Aluminum panel with par, feet and custom hole layout. Sponsor Pane: White Lexan Panel with clear Lexan cover panel installed with locking bolts.

Specifications include:

- Sign Frames: Welded and hot dipped galvanized.
- Collar: 10.25” x 115/16” I.D., sleeve. Welded and hot dipped galvanized pipe, drilled.
- Frames: Two (8” x 11”), 11” x 17” total. Angle iron 1”x1”x1/8” hot rolled steel and hot dipped galvanized. Bolt, hex head nut and nylon locknut, tec screw and star lock washer mounting hardware.
- Pop Rivets: Pre-installed on Hole Layout Pane (locking bolts used on Sponsor Pane for accessibility).
- Pole: 63” x 1” I.D., 115/16” O.D., hot dipped galvanized, drilled.

Method of Measurement

A complete working 18-hole Frisbee golf course with new Tee signs at each hole.

Basis of Payment

Payment shall constitute full compensation for all work described herein and shown in the plans.

Payment shall be made under:

Item No. 900-12	Relocate Golf Holes with New Signage at all holes	Each

END OF SECTION 900-12

UTILITY WORK (WATER)

All potable water utility work not specifically addressed in other pay items is to be included in this pay item number.

This includes, but is not limited to, the following:
1. Constructing a new potable water line across the new pedestrian bridge to service the existing restroom building and the existing dog park.
2. Constructing a new potable water line to the dog parks drinking fountains and hose bibs.
3. 12-inch PVC conduit under Ferrand Drive

Method of Measurement

A complete installed and working potable water system.

Basis of Payment

Payment shall constitute full compensation for all work described herein and shown in the plans.

Payment shall be made under:

Item No. 1000-1 Utility Work (water) Lump Sum

Pay Item Footnote No. 1000-1
Pay item 1000-1 includes new water line across central boardwalk, water line to the dog park, capping both sides of abandoned DI pipe and 12-inch PVC conduit under Ferrand Drive.

END OF SECTION 1000-1

UTILITY WORK (POWER)

All power/electric utility work not specifically addressed in other pay items is to be included in this pay item number.

This includes, but is not limited to, the following:

1. Constructing a new conduit and power line across the new pedestrian bridge to service the existing restroom building.
2. Constructing the conduit and power line from the irrigation pump to the electric source.

Additional Technical Specifications to reference include 260100, 260519, 260526, 260529, 260533, and 260534

Method of Measurement

A complete installed and working power system.

Basis of Payment

Payment shall constitute full compensation for all work described herein and shown in the plans.

Payment shall be made under:

Item No. 1000-2 Utility Work (power) Lump Sum

Pay Item Footnote No. 1000-2
Pay item 1000-2 includes electrical conduit and wiring across central boardwalk and conduit and wiring to irrigation pump.

END OF SECTION 1000-2

SECTION 260100 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL

A. Basic Requirements: The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Provide and Install: The word "provide" where used on the Drawings or in the Specifications shall mean "furnish, install, mount, connect, test, complete, and make ready for operation". The word "install" where used on the Drawings or in the Specifications shall mean "mount, connect, test, complete, and make ready for operation". Perform work required by, and in accordance with, the Contract Documents.

C. Field Connections: Provide field connections to remote equipment and control panels provided under other Divisions of these Specifications. Provide raceway, wire, and interconnections between equipment, transmitters, local indicators, and receivers.

1.02 SCOPE OF WORK

A. General: Provide labor, materials, permits, inspections and re-inspection fees, tools, equipment, transportation, insurance, temporary protection, temporary power and lighting, supervision and incidental items essential for proper installation and operation of the Electrical systems indicated in the Contract Documents. Provide materials not specifically mentioned or indicated but which are usually provided or are essential for proper installation and operation of the Electrical systems indicated in the contract documents.

B. Notices: Give notices, file Plans, pay fees, and obtain permits and approvals from authorities having jurisdiction. Include all fees in the Bid Price.

1.03 INTERPRETATION OF DRAWINGS

A. General: The Drawings are diagrammatic and are not intended to show exact locations of Raceway runs, outlet boxes, junction boxes, pull boxes, etc. The locations of equipment, appliances, fixtures, Raceways, outlets, boxes and similar devices shown on the Drawings are approximate only. Exact locations shall be determined and coordinated in the field. The right is reserved to change, without additional cost, the location of any outlet within the same room or general area before it is permanently installed. Obtain all information relevant to the placing of electrical work and in case of interference with other work, proceed as directed by the Architect.

B. Discrepancies: Notify the Owner’s representative of any discrepancies found during construction of the project. The designated representative will provide written instructions as to how to proceed with that portion of work. If a conflict exists between the Contract Documents and an applicable code or standard, the most stringent requirement shall apply.

C. Wiring: Each three-phase circuit shall be run in a separate Raceway unless otherwise shown on the Drawings. Unless otherwise accepted by the Architect, Raceway shall not be installed exposed.

Where circuits are shown as "home-runs" all necessary fittings, supports, and boxes shall be provided for a complete raceway installation.

D. Layout: Circuit layouts are not intended to show the number of fittings, or other installation details. Connections to equipment shall be made as required, and in accordance with the accepted shop and manufacturer's setting drawings.

E. Coordination: Coordinate final equipment locations with drawings or other disciplines. Layout before installation so that all trades may install equipment in available space. Provide coordination as required for installation in a neat and workmanlike manner.

1.04 EQUIPMENT SIZE AND HANDLING

A. Coordination: Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, ship the equipment in sections of specific sizes to permit the passing through the necessary areas within the structure.

B. Handling: Equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

1.05 RECORD DRAWINGS

A. Recording: Record information concurrent with construction progress. Make entries within 24 hours upon receipt of information. The "As-Built" drawings shall accurately reflect installed electrical work specified or shown on the Contract Documents.

B. Final: Upon Contractor’s completion of the Engineer’s final punch list, transfer all “As-Built” conditions and all requirements by the Engineer to a reproducible set of drawings and CAD files. Submit drawings and CAD disks for review and acceptance. The Contractor shall provide updated disks which include final As-Built conditions.

1.06 ABBREVIATIONS

A. Abbreviations: The following abbreviations or initials may be used:

A/C	Air Conditioning
AC	Alternating Current
ABV CLG	Above Ceiling
ADA	Americans with Disabilities Act
AF	Ampere Frame
AFF	Above Finished Floor
AFG	Above Finished Grade
AHU	Air Handler Unit
AIC	Amps Interrupting Capacity
AL	Aluminum
AMP	Ampere
ANSI	American National Standards Institute
ASA	American Standards Association

AT	Ampere Trip
ATS	Automatic Transfer Switch
AUX	Auxiliary
AWG	American Wire Gauge
BC	Bare Copper
BIL	Basic Impulse Level
BMS	Building Management System
BRKR or BKR	Breaker
CAB	Cabinet
C	Conduit or Raceway
CB	Circuit Breaker
CBM	Certified Ballast Manufacturers
CCTV	Closed Circuit Television
CKT	Circuit
CLEC	Clock Equipment Cabinet
CLG	Ceiling
CO	Conduit or Raceway Only
COAX	Coaxial Cable
COND	Conductor
CONN	Connection
CPU	Central Processing Unit
CRT	Cathode Ray Terminal (Video display terminal)
CT	Current Transformer
CU	Copper
CW	Cold Water
DC	Direct Current
DDC	Direct Digital Control
DEG	Degree
DISC	Disconnect
DO	Draw Out
DN	Down
DPST	Double Pole Single Throw
EMT	Electrical Metallic Tubing
EO	Electrically Operated
EOL	End of Line Resistor
EWC	Electric Water Cooler
FAAP	Fire Alarm Annunciator Panel
FACP	Fire Alarm Control Panel
FCU	Fan Coil Unit
FLA	Full Load Amperes
FM	Factory Mutual
FPL	Florida Power & Light
GF	Ground Fault
GFCI	Ground Fault Circuits Interrupter
GND	Ground
HOA	Hand-Off-Automatic
HORIZ	Horizontal
HP	Horsepower
IC	Intercom

ICU	Intensive Care Unit
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IMC	Intermediate Metallic Raceway
IN	Inches
IT	Instantaneous Trip
IPCEA	Insulated Power Cable Engineers Association
JB	Junction Box
KCMIL	Thousand Circular Mills
KV	Kilovolt
KVA	Kilo-Volt-Amps
KW	Kilowatts
LBS	Pounds
LED	Light Emitting Diode
LT	Light
LTD	Long Time Delay
LTT	Long Time Trip
LTG	Lighting
MAX	Maximum
MCB	Main Circuit Breaker
MCC	Motor Control Center
MCP	Motor Circuit Protector
MIC	Microphone
MIN	Minimum
MLO	Main Lugs Only
MTD	Mounted
MTG	Mounting
MUX	Multiplex (Transponder) Panel
MVA	Mega Volt Amps
N	Neutral
NC	Normally Closed
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIC	Not in Contract
NF	Non Fused
NL	Non Linear
NO	Number or Normally Open
#	Number
∅	Phase
OL	Overload
OSHA	Occupational Safety and Health Administration
P	Pole
PB	Pullbox
PE	Progress Energy
PIV	Post Indicator Valve
PNL	Panel
PR	Pair

PWR	Power
PF	Power Factor
PRI	Primary
PT	Potential Transformer
PVC	Polyvinylchloride
REF	Refrigerator
RGC or GRC	Rigid Galvanized Raceway
RMS	Root-Mean-Square
RPM	Revolutions Per Minute
RECPT	Receptacle
SCA	Short Circuit Amps
SD	Smoke Detector
SEC	Secondary
S/N	Solid Neutral
SPKR	Speaker
SPST	Single Pole Single Throw
SST	Solid State Trip
ST	Short Time Trip
STD	Short Time Delay
SW	Switch
SWGR	Switchgear
SWBD	Switchboard
TEL	Telephone
TTB	Telephone Terminal Board
TTC	Telephone Terminal Cabinet
TVEC	Television Equipment Cabinet
TYP	Typical
UL	Underwriters Laboratories
UON	Unless Otherwise Noted
V	Volt
VFD	Variable Frequency Drive
VSD	Variable Speed Drive
W	Wire
WP	Weatherproof
XFMR	Transformer

1.07 CODES, FEES, AND STANDARDS

A. Application: The codes, standards and practices listed herein generally apply to the entire project and specification sections. Other codes, standards or practices that are more specific will be referenced within a particular specification.

B. Requirements: All materials and types of construction covered in the specifications will be required to meet or exceed applicable standards of manufacturer, testing, performance, and installation according to the requirements of UL, ANSI, NEMA, IEEE, and NEC referenced documents where indicated and the manufacturer's recommended practices. Requirements indicated on the contract documents that exceed but are not contrary to governing codes shall be followed.

C. Compliance and Certification: The installation shall comply with the governing state and local codes or ordinances. The completed electrical installation shall be inspected and certified by applicable agencies that it is in compliance with codes.

D. Applicability: The codes and standards and practices listed herein, and their respective dates are furnished as the minimum latest requirements.

1. State of Florida.
2. Orange County.

E. Utility Company: Comply with latest utility company regulations.

F. Building Code: 2014 Florida Building Code.

G. Standards: American Society of Mechanical Engineers

H. Labels: Materials and equipment shall be new and free of defects, and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available or desired for certain types of equipment, test data shall be submitted to validate that equipment meets or exceeds available standards.

I. NFPA: National Fire Protection Association (NFPA) Standards

NFPA-1	Uniform Fire Code™
NFPA-70	National Electrical Code

1.08 SUPERVISION OF THE WORK

A. Supervision: Provide one field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable sizes, type and complexity. The Superintendent shall be present at all times when work is being performed. At least one member of the Electrical Contracting Firm shall hold a State Master Certificate of Competency.

1.09 COORDINATION

A. General: Compare drawings and specifications with those of other trades and report any discrepancies between them to the Architect. Obtain written instructions to make the necessary changes in any of the affected work. Work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Trades shall make proper provisions to avoid interferences.

B. Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this Division. Work required under other divisions, specifications or drawings to be performed by this Division shall be coordinated with the Contractor and such work performed at no additional cost to Owner including but not limited to electrical work required for:
1. Signage

2. Civil engineering drawings and specifications

C. Secure approved shop drawings from all required disciplines and verify final electrical characteristics before roughing power feeds to any equipment. When electrical data on approved shop drawings differs from that shown or called for in Construction Documents, make adjustments to the wiring, disconnects, and branch circuit protection to match that required for the equipment installed.

D. Adjustments: Locations of raceway and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Determine the exact routing and location of systems prior to fabrication or installation.

E. Layout: The Contract Drawings are diagrammatic only intending to show general runs and locations of raceway and equipment, and not necessarily showing required offsets, details and accessories and equipment to be connected. Work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation, which will afford maximum accessibility for operation, maintenance and headroom.

F. Contract Conflicts: Where discrepancies exist in the Scope of Work as to what Trade provides items such as starters, disconnects, flow switches, etc. such conflicts shall be coordinated between the divisions involved. It is the intent of the Contract Documents that all work shall be provided complete as one bid price.

G. Drawing Conflicts: Where drawing details, plans or specification requirements are in conflict and where sizes of the same item run are shown to be different within the contract documents, the most stringent requirement shall be included in the Contract. Systems and equipment called for in the specification or as shown on the drawings shall be provided as if it was required by both the drawings and specifications. Prior to ordering or installation of any portion of work, which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.

H. Working Clearances: Minimum working clearances about electrical equipment shall be as referenced in the applicable edition NEC Article 110, and shall include equipment installed in ceiling spaces.

I. Coordination Drawings

1. Prepare coordination drawings to a scale of 1/4 inch = 1 foot–0 inches or larger, detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work, including (but not necessarily limited to) the following:

   a. Submit equipment, conduit and busway layout drawings showing physical sizes and dimensions. Include the number and size of each conductor installed in each conduit, and its intended use. Drawings should clearly delineate method of installation and should include details of any special installation method. All wiring devices, lighting fixtures, and equipment supplying or requiring electrical power shall be located on the layout drawings. In addition, include the following:

(1) Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
(2) Exterior wall and foundation penetrations.
(3) Fire-rated wall and floor penetrations.
(4) Equipment connections and support details. Demonstrate evidence of dimensional coordination.
(5) Sizes and location of required concrete pads and bases.
(6) Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
(7) Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
(8) Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Specified Method: Where several brand names, make or manufacturers are listed as acceptable each shall be regarded as equally acceptable, based on the design selection but each must meet all specification requirements. Where a manufacturer's model number is listed, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to Engineer's review and acceptance. Where manufacturers are listed, one of the listed manufacturers shall be submitted for acceptance. No substitutions are permitted.

B. Certification: When a product is specified to be in accordance with a trade association or government standard requested by the Engineer, Contractor shall provide a certificate that the product complies with the referenced standard. Upon request of Engineer, Contractor shall submit supporting test data to substantiate compliance.

2.02 SHOP DRAWINGS

A. Responsibility: It is the Contractors responsibility to provide material in accordance with the plans and specifications. Material not provided in accordance with the plans and specifications shall be removed and replaced at the Contractors expense.

B. Official Record: The shop drawing submittal shall become the official record of the materials to be installed. If materials are installed which do not correspond to the record submittal they shall be removed from the project without any additional cost or delays in construction completion.

C. Information: The shop drawing record submittal shall include the following information to the extent applicable to the particular item;

1. Manufacturer's name and product designation or catalog number.
2. Standards or specifications of ANSI, ASTM, ICEA, IEEE, ISA, NEMA, NFPA, OSHA, UL, or other organizations, including the type, size, or other designation.
3. Dimensioned plan, sections, and elevations showing means for mounting, raceway connections, and grounding, and showing layout of components.

4. Materials and finish specifications, including paints.
5. List of components including manufacturer's names and catalog numbers.
6. Internal wiring diagram indicating connections to components and the terminals for external connections.
7. Manufacturer's instructions and recommendations for installation, operation, and maintenance.
8. Manufacturer's recommended list of spare parts.
9. Provide 1/2" = 1'-0" enlarged electrical room layout drawings for all electrical rooms. All equipment shall be indicated at actual size of equipment being provided. All dimensions and required working clearances shall be shown.

D. Preparation: Prior to submittal, shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned to Contractor unreviewed.

E. Basis of Review: Approval is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Contractor is responsible for quantities, dimensions, fabrication processes, and construction techniques.

F. Responsibility: The responsibility that dimensions are confirmed and correlated with proper coordination of other trades shall be included as part of the Contract Documents. The responsibility and the necessity of providing materials and workmanship required by the Specifications and Drawings which may not be indicated on the shop drawings shall be included as part of the Contract Documents.

G. Ordering Equipment: No material shall be ordered or shop work started until the Engineer has officially received the shop drawings record submittal and has formally released the Contractor for submittal requirements.

H. Contractor's Review: Review the brochures before submitting to the Engineer. No request for payment shall be considered until the brochure has been reviewed, stamped and submitted for review.

I. Technical Data: Submit technical data verifying that the item submitted complies with the requirements of the specifications. Technical data shall include manufacturer's name and model number, dimensions, weights, electrical characteristics, and clearances required. Indicate optional equipment and changes from the standard item as called for in the specifications. Provide drawings, or diagrams, dimensioned and in correct scale, covering equipment, showing arrangement of components and overall coordination.

J. Same Manufacturer: In general, relays, contactors, starters, panelboards, dry type transformers, disconnect switches, circuit breakers, manual motor starter switches, etc., shall be supplied and manufactured by the same manufacturer. This requirement shall apply to same type of electrical components specified in other Divisions.

2.03 EQUIPMENT, MATERIALS, AND SUPPORTS

A. General: Each item of equipment or material shall be manufactured by a company regularly engaged in the manufacturer of the type and size of equipment, shall be suitable for the environment in which it is

to be installed, shall be approved for its purpose, environment, and application, and shall bear the UL label.

B. Installation Requirements: Each item of equipment or material shall be installed in accordance with instructions and recommendations of the manufacturer, however, the methods shall not be less stringent than specified herein.

C. Required Accessories: Provide all devices and materials, such as expansion bolts, foundation bolts, screws, channels, angles, and other attaching means, required to fasten enclosures, raceways, and other electrical equipment and materials to be mounted on structures which are existing or new.

D. Protection: Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by the elements. Equipment shall be stored in dry permanent shelters. If apparatus has been damaged, such damage shall be repaired at no additional cost or time extension to the Contract. If apparatus has been subject to possible injury, it shall be thoroughly cleaned, dried out and put through tests as directed by the Manufacturer and Engineer, or shall be replaced, if directed by the Engineer, at no additional cost to the Contract. EC shall not be responsible for equipment provided by others.

2.04 IDENTIFICATION OF EQUIPMENT

A. General: Electrical items shall be identified as specified in the Contract Documents. Such identification shall be in addition to the manufacturer's nameplates and shall serve to identify the item's function and the equipment or system, which it serves or controls. Refer to Identification Section of the specifications for additional information.

2.05 CONCRETE PADS

A. General: Provide reinforced concrete pads for floor mounted electrical equipment. Unless otherwise noted, pads shall be nominal four (4) inches high and shall exceed dimensions of equipment being set on them, including future sections, by six (6) inches on all sides, except when equipment is flush against a wall, then the side or sides against the wall shall be flush with the equipment. Chamfer top edges 1/2". Trowel surfaces smooth. Reinforce pads with #5 reinforcing bars at 24" centers each way, unless specifically detailed on drawings.

2.06 SURFACE MOUNTED EQUIPMENT

A. General: Surface mounted fixtures, outlets, cabinets, panels, etc. shall have a factory-applied finish or shall be painted as accepted by Engineer. Raceways and fittings, where allowed to be installed surface mounted, shall be painted to match the finish on which it was installed. Paint shall be in accordance with other applicable sections of these specifications.

2.07 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: Thoroughly instruct the Owner's Representative, to the complete satisfaction of the Architect and Engineer, in the proper operation of all systems and equipment provided. The Contractor shall make all arrangements, via the Architect, as to whom the instructions are to be given in the operation of the systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner's Representative has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Contractor to the Owner's Representative, then the Contractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this paragraph of the Specification has been complied with.

B. Submittals: Submit to the Architect for approval five (5) typed sets, bound neatly in loose-leaf binders, of instructions for the installation, operation, care and maintenance of equipment and systems, including instructions for the ordering and stocking of spare parts for equipment installed under this contract. The lists shall include part number and suggested suppliers. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.

C. Information Requirements: Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub index for each section shall also be provided.

D. Instructions: The instructions shall contain information deemed necessary by the Architect and include but not limited to the following:

1. Introduction:
    a. Explanation of Manual and its use.
    b. Summary description of the Electrical Systems.
    c. Purpose of systems.

2. System:
    a. Detailed description of all systems.
    b. Illustrations, schematics, block diagrams, catalog cuts and other exhibits.

3. Operations:
    a. Complete detailed, step by step, sequential description of all phases of operation for all portions of the systems, including start up, shutdown and balancing. Include posted instruction charts.

4. Maintenance:
    a. Parts list and part numbers.
    b. Maintenance and replacement charts and the Manufacturer's recommendations for preventive maintenance.
    c. Trouble shooting charts for systems and components.
    d. Instructions for testing each type of part.
    e. Recommended list of on-hand spare parts.
    f. Complete calibration instructions for all parts and entire systems.
    g. General and miscellaneous maintenance notes.

5. Manufacturer's Literature:
    a. Complete listing for all parts.

b. Names, addresses and telephone numbers.
c. Care and operation.
d. All pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
e. Internal wiring diagrams and Engineering data sheets for all items and/or equipment furnished under each Contract.
f. Guarantee and warranty data.

2.08 TEMPORARY LIGHT AND POWER

A. Each contractor to provide own power. Provide temporary power as required by Hensel Phelps.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Acceptable Workmanship: Acceptable workmanship is characterized by first-quality appearance and function, conforming to applicable standards of building system construction, and exhibiting a high degree of quality and proficiency which is judged by the Architect as equivalent or better than that ordinarily produced by qualified industry tradesmen.

3.02 PROTECTION AND CLEAN UP

A. Protection and Restoration: Suitably protect equipment provided under this Division during construction. Restore damaged surfaces and items to "like new" condition before a request for substantial completion inspection.

B. Handling: Materials shall be properly protected and Raceway openings shall be temporarily closed by the Contractor to prevent obstruction and damage. Post notice prohibiting the use of systems provided under this Contract, prior to completion of work and acceptance of systems by the Owner's representative. The Contractor shall take precautions to protect his materials from damage and theft.

C. Safeguards: The Contractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or systems provided under this contract.

3.03 SYSTEMS GUARANTEE

A. General: Provide a one-year guarantee. This guarantee shall be by the Contractor to the Owner for any defective workmanship or material, which has been provided under this Contract at no cost to the Owner for a period of one year from the date of substantial completion of the System. The guarantee shall include lamps, for ninety days after date of Substantial Completion of the System. Explain the provisions of guarantee to the Owner at the "Demonstration of Completed System".

3.04 FINAL OBSERVATION

A. General: Work shall be completed, and forms and other information shall be submitted for acceptance one week prior to the request for final observation of the installation.

END OF SECTION 260100

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

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

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: S ubject to compliance with requirements, provide products by one of the following or equal:

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Senator Wire & Cable Company.
4. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: S ubject to compliance with requirements, provide products by one of the following or equal:

1. Hubbell Power Systems, Inc.
2. O-Z/Gedney; EGS Electrical Group LLC.
3. 3M; Electrical Products Division.
4. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Aluminum. Solid for ground conductors only; stranded for No. 12 AWG and larger.

B. Branch Circuits: Aluminum. Stranded, for No. 12 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. All Low Voltage Power Wiring Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

K. All grounding/counterpoise conductors shall be copper.

L. All equipment/structural grounding conductors shall be aluminum.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

D. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

E. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.
   1. Underground distribution grounding.
   2. Common ground bonding with lightning protection system.

1.3 GROUNDING ELECTRODES

A. General: Provide a grounding electrode system, as described in NEC 250, as specified herein and as indicated on plans.

B. Ground solar racking system as shown on the drawings.

C. Resistance: Grounding electrode resistance shall not exceed 10 ohms. Overall resistance of the entire grounding electrode system shall not exceed 5 ohms. Provide additional grounding electrodes as required to meet this value.

1.4 GROUNDING ELECTRODE CONDUCTOR

A. Grounding Electrode Conductor: A main grounding electrode conductor, bare copper, sized per NEC, shall be run in PVC conduit from main service equipment to the grounding electrodes. This conductor shall also be bonded to the following:
   1. Lightning protection system.

1.5 SEPARATELY DERIVED GROUNDING SYSTEMS

A. Description: Provide a separately derived grounding system where indicated herein and as required by the National Electrical Code. Bond neutral and ground busses together.

B. Services: Provide a separately derived grounding system for all building electrical services and step-down transformers.

1.6 BONDING AND EQUIPMENT GROUNDING

A. Description of System: In general, all electrical equipment (metallic conduit, motor frames, panelboards, etc.) shall be bonded together with a green insulated copper system grounding conductor in accordance with specific rules of Article 250 of the NEC Equipment grounding conductors through the raceway system shall be continuous from main switch ground bus to panel ground bar of each panelboard, and from panel grounding bar of each panelboard to branch circuit equipment and devices.

B. Equipment Grounding Conductors: All raceways shall have an insulated copper system ground conductor run throughout the entire length of circuit installed within conduit in strict accordance with NEC. Grounding conductor shall be included in total conduit fill when determining conduit sizes, even though not included or shown on drawings.

C. Redundant Grounding: In general all branch circuits shall be provided with a redundant grounding system through the use of grounding conductors and metallic conduit.

D. Bonding: Provide bonding of the equipment grounding terminal busses of all panelboards.

E. Bonding: In addition to connections to grounding electrodes, the main service ground shall be bonded to the lightning protection system and other underground metal piping.

F. Bushings: Provide insulated grounding bushings on all metallic feeder conduits terminated within panelboards, switchboards or enclosed overcurrent devices. Provide insulated grounding bushings on all branch circuit conduits where concentric knockouts are used.

G. Connection to Other Systems: Provide all required grounding and bonding connections as specified herein and as required by the National Electrical Code.

1.7 SUBMITTALS

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

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Grounding arrangements and connections for separately derived systems.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, grounding connections for separately derived systems based on NETA MTS.

a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
b. Include recommended testing intervals.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Cadwells.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch diameter by10 feet in length.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.

2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 6 AWG and smaller, and stranded conductors for No. 4 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum.

1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above conduit.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

F. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 4/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building foundation.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer of Record promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

EQUIPOTENTIAL GROUND TEST REPORT

FACILITY NAME:_____ PROJECT NAME:_____

DATE: _____TESTED BY:_____

MAXIMUM TEST INTERVALS: NA ME:_____
COMPANY:_____
WET LOCATIONS - 12 MOS.

TYPE METER USED AND EXTERNAL NETWORK IF USED:

NOTE: MAXIMUM READINGS PERMITTED - 20 MV NEW - CONSTRUCTION
0.1 OHM NEW - CONSTRUCTION

Room No.	AREA TYPE Description	VOLTAGE MEASUREMENT			IMPEDANCE MEASUREMENT		REMARKS - IF VOLTAGE READINGS MORE THAN 20MV IN EXISTING CONST. NOTE TESTS & INVESTIGATION REQUIRED.
		NO. OF RECEPTS.	NO. OF OTHER	MAX. READING IN MILIVOLTS	NO. OF RECEPTS.	MAX READING IN OHMS	

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.

3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. ERICO International Corporation.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut; Tyco International, Ltd.
   g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Mounting, Anchoring, and Attachment Components:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

4. Through Bolts: Structural type, hex head, and high strength. C omply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. LFMC: Liquidtight flexible metal conduit.

B. LFNC: Liquidtight flexible Nonmetallicl conduit.

C. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For conduit, fittings, and junction boxes.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:
    a. Frame and cover design.
    b. Grounding details.
    c. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
    d. Joint details.

C. Qualification Data: For professional engineer and testing agency.

D. Source quality-control test reports.

PART 2 - PRODUCTS

2.1 SURFACE RACEWAYS

A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

a. Butler Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

B. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

3.2 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom
2. Install backfill.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

END OF SECTION 260533

SECTION 260554 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

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. This Section includes the following:
   1. Identification for conductors and communication and control cable.
   2. Underground-line warning tape.
   3. Warning labels and signs.
   4. Instruction signs.
   5. Equipment identification labels.
   6. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.3 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange snap-around label.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:
1. Security System: Blue and yellow.
2. Electrical Supervisory System: Green and blue.
3. Telecommunication System: Green and yellow.
4. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Limit use of underground-line warning tape to direct-buried cables.

H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
a. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

I. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Stenciled legend 4 inches high.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Transformers.
d. Disconnect switches.
e. Motor starters.
f. Push-button stations.
g. Contactors.
h. Remote-controlled switches, dimmer modules, and control devices.
i. Battery inverter units.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

END OF SECTION 260554

PART H
TECHNICAL PROVISIONS

for

LAKE LAWNE REGIONAL STORMWATER FACILITY AT BARNETT PARK
ORANGE COUNTY, FLORIDA

GEOTECHNICAL REPORT

Geotechnical Engineering Report for

LAWNE LAKE WATER QUALITY ENHANCEMENTS

Canal C-6, Barnett Park, Orlando, Orange County, florida

[Section 19, Township 25 South, Range 27 East]

SEPTEMBER 2012

Prepared for

Inwood consulting engineers

Inwood Consulting Engineers, Inc.

3000 Dovera Drive
Suite 200
Oviedo, Florida 32765

Prepared by

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CONSULTING GEOTECHNICAL ENGINEERS

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Date: September 13, 2012	*Devo's Project No:* 11-310.40

To:

INWOOD CONSULTING ENGINEERS, INC.
3000 Dovera Drive
Suite 200
Oviedo, Florida 32765
phone: (407) 971-8850 ext. 6587; cell: (321) 303-6256; email: dcoleman@inwoodinc.com

attention: **STEVE SOMMERFELDT, P.E.**

Re:

Geotechnical Engineering Report for ...

LAWNE LAKE WATER QUALITY ENHANCEMENTS

Canal C-6, Barnett Park, Orlando, Orange County, Florida
[Section 19, Township 25 South, Range 27 East]

Dear Mr. Sommerfeldt:

Attached is our geotechnical report for the above referenced project.

Our site specific geotechnical investigation included drilling of four (4) Standard Penetration Test (SPT) borings and four (4) hand auger penetrometer borings, retrieval of soil samples for laboratory testing, installation of piezometers and measurements to the ground water table.

The data obtained from the investigation was used to characterize the soil stratigraphy. Included in the report are the data, assessment and recommendations for the proposed sheetpile walls at the grade control structures, environmental classification for the structures at the various locations, particle size analyses and recommended D_{50} values for scour computations.

Included in this report are the recommended sheetpile section sizes and pile tip elevations, as well as, the results of the global stability analyses for the weir structures.

We trust that the geotechnical assessment and recommendations presented in this report meets the need of the design engineer. Please contact us if there are any questions.

Sincerely,

Vijay Boodhoo Project Geotechnical Engineer	Devo Seereeram, Ph.D., P.E. Florida Registration No. 48303 Date: September 13, 2012

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I.0 BACKGROUND INFORMATION

The proposed regional stormwater facility (RSF) is to be integrated into the C-6 drainage canal which runs through Orange County's Barnett Park (in the Pine Hills area) and ultimately discharges into Lawne Lake. Lawne Lake is an impaired water body due to elevated nutrients. Inwood Consulting Engineers, Inc., are working on the design for the Lawne Lake Water Quality Enhancements Project.

Exhibit A shows the site area and the 1,500± lineal feet of canal which is to be expanded into a stormwater treatment/harvesting pond with a solar-powered irrigation system. The harvested stormwater will be used to irrigate the BMX, multi-sport, and softball fields. As noted in Exhibit A, there is a wetland system to the west of the proposed pond. The proposed enhancements work include two (2) grade control structures within the pond. These structures are expected to be sheetpile walls. Inwood had requested Devo Engineering to perform the necessary geotechnical investigation for the grade control structures and the pond.

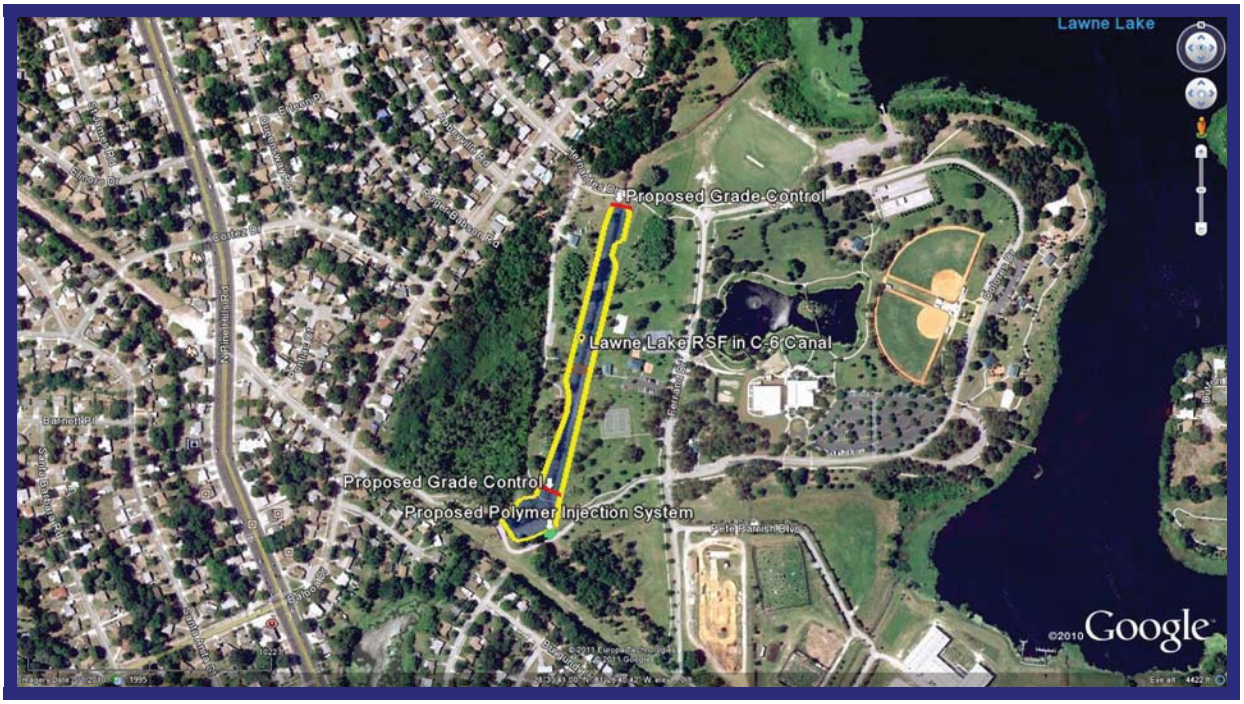

Exhibit A. Proposed RSF Within Barnett Park

The site area is shown on a scanned image of the USGS 7.5 minute series quadrangle map for Orlando West, Florida (Photo revised 1980). As noted in Figure 1.1, the site area is located within Section 19, Township 25 South, Range 27 East. Figure 1.2 shows the canal alignment on a May 2010 aerial image. The closest point to Lawne Lake is about 600 ft to the northeast. According to information shown on the quadrangle map, the published water elevation at Lawne Lake is +89 ft.

Exhibit B. Transverse view of existing ditch (proposed pond)

Review of the site topography map prepared by Southeastern Surveying & Mapping Corp. (SSMC), shows the existing ditch inverts range generally between +86 ft and +87 ft NGVD and the top of bank elevations range between +92 ft and +96 ft NGVD. The existing ditch slopes are estimated to be about 1V:3H. The surveyed water elevation in the existing ditch was +88.97 ft NGVD on August 3, 2011. Some flagged seasonal high water elevation (SHWT) points on the ground surface adjacent to the western ditch bank ranged from +90.9 ft to +92.0 ft NGVD.

The proposed enhancement works include grade control structures at the northern and southern ends of the pond. For the purposes of this report, the grade control structure to the north is designated, Grade Control Structure 1 (GCS-1) and the grade control structure to the south is designated, Grade Control Structure 2 (GCS-2).

2.0 OBJECTIVES

The objectives of the investigation and assessment were as follows:

Stormwater Pond:

Investigate soil & ground water conditions in proposed wet detention pond to assess:

① soil stratigraphy and type of soils which will be excavated and their potential engineering uses,
② hydraulic conductivity properties to compute drawdown impacts, and
③ estimated seasonal high, low, and average wet season water table elevations to facilitate design of the pond control structure.
④ assess safe setback distances from the wetland for the proposed range of operating water levels in the harvesting pond.

Cantilevered Sheetpile Weirs:

- ☞ Subsurface investigation program to collect data for the design of the weir.
- ☞ Field and laboratory testing.
- ☞ Data interpretation and analysis.
- ☞ Recommended geotechnical parameters for use by the structural engineer in the design/analysis of the sheet pile wall including soil strength, unit weight, soil-structure interface friction angle, and active & passive earth pressure coefficients (Coulomb) for the Load & Resistance Factor Design (LRFD).
- ☞ Global stability analyses for the sheet pile wall.
- ☞ D_{50} determination for scour analyses.
- ☞ Corrosivity potential.
- ☞ Potential vibration impacts (from driving the sheetpiles) to adjacent residential structures

The sheetpile wall analysis and design will be performed by Devo Engineering using the parameters provided.

General Foundation Support:

Address general foundation support for the bridge and other minor structures which are part of the project.

3.0 NRCS SOIL MAP UNITS

The Natural Resources Conservation Service (NRCS), an agency of the US Department of Agriculture, has mapped and published descriptions of the shallow soils (i.e., within 80 inches of land surface) in Orange County (Fl). In undeveloped areas (without the addition of impervious areas, the establishment of drainage systems, and/or site grading), the NRCS soil mapping is usually fairly reliable and it is good engineering practice to compare the published NRCS characterization data to the site-specific geotechnical data.

Figure 1.3 (attached) shows the site limits on the NRCS soils map for the area. Review of this figure indicates that the area is mapped with Arents, nearly level (#1), a fill soil that is variable and consists of material dug from several areas. Areas mapped with this soil have a seasonal high water table at a depth of 24 inches to 36 inches below the ground surface.

Key NRCS characterization data for this soil map unit is presented in Table 1.

Table 1. Key NRCS Data for Arents, nearly level (#1)

Arents consists of material dug from several areas that have different kinds of soil. This fill material is the result of earth moving operations. This soil is used to fill such areas as sloughs, marshes, shallow depressions, swamps, and other low-lying areas above their natural ground levels during land-leveling operations; or it is used as a cover for sanitary landfills. The slopes are smooth to concave and range from 0 to 2 percent. Most soil properties are variable. A seasonal high water table varies with the amount of fill material and artificial drainage in any mapped area. In most years, a seasonal high water table is at a depth of 24 to 36 inches for 2 to 4 months. It recedes to a depth of about 60 inches or more during extended dry periods.

4.0 FIELD & LABORATORY TEST PROGRAMS

The following program of work was performed to obtain the necessary data for this assessment:

- ❑ Site reconnaissance and stake out of borings by our senior geotechnician.
- ❑ Mobilization of our drill rig.
- ❑ Drilling of four (4) hand auger piezometer borings to depths of 7 ft to 10 ft within the proposed pond area. These borings are labeled, HA-1 to HA-4, as shown in Figure 1.4.
- ❑ Drilling of four (4) Standard Penetration Test (SPT) borings to depths of 25 ft within the general footprint of the proposed stormwater pond and at the proposed structure locations. These borings are labeled, TB-1 to TB-4, as shown in Figure 1.4.
- ❑ Extraction to two (2) undisturbed soil samples (Shelby Tubes) for permeability testing. These test locations are labeled, KV-1 and KV-2, as shown in Figure 1.4.
- ❑ Installation of piezometers and measurement of the depth to ground water table at each borehole location.
- ❑ Elevation survey of borings and piezometers.
- ❑ Visual and tactile examination of soil samples.
- ❑ Eight (8) fines fraction (minus #200 Sieve) and natural field moisture content tests on selected soil samples.
- ❑ Two (2) vertical hydraulic conductivity tests using a laboratory falling head permeameter.
- ❑ Performance of two (2) complete grain size analysis to facilitate estimation of D_{50} for scour analyses and two (2) corrosivity tests on selected soil samples.

5.0 SOIL AND WATER TABLE CONDITIONS

5.1 PRESENTATION OF DATA

Boring locations are shown in Figure 1.4 (attached).

Soil profiles for the four (4) hand auger borings, HA-1 through HA-4, are presented in Figure 2.1 (attached) while, profiles for the four (4) SPT borings, TB-1 through TB-4, are presented in Figure 2.2 (attached).

In reviewing the SPT soil boring profiles in Figure 2.2, the reader is referred to Table 2 which, shows the correlation between the SPT N-Value and the degree of compaction of granular soils and consistency of cohesive soils.

Water table readings and laboratory test data, where applicable, are annotated adjacent to the soil profiles.

Table 2. Typical Correlations between SPT "N" Values & Soil Properties

Sandy (granular) Soils					Clayey (cohesive) soils			
N	φ°	γ_m (lb/ft³)	γ'_{sat} (lb/ft³)	Compactness	N	q_u (lb/ft²)	γ_{sat} (lb/ft³)	Consistency
0-4	28	< 100	< 60	very loose	0-2	500	100-120	very soft
4-10	30	95-125	55-65	loose	2-4	1,000		soft
10-30	36	110-130	60-70	medium dense	4-8	2,000	110-130	firm
30-50	41	110-140	65-85	dense	8-15	4,000		stiff
>50	>41	>130	>75	very dense	15-30	8,000	120-140	very stiff
					>30	>8,000	>130	hard

Key to Symbols
N = Standard Penetration Resistance in blows/ft
φ° = Friction angle in degrees
γ_m = moist unit weight in lb/ft³
γ_{sat} = saturated unit weight in lb/ft³
q_u = unconfined compressive strength in lb/ft²

5.2 SOIL STRATIGRAPHY

Hand Auger Borings [Borings HA-1 to HA-4, Figure 2.1]

Boring HA-1, drilled along the east bank at the northern end of the proposed pond, disclosed a 0.75 ft thick surficial layer of fine sand underlain by muck to about 5.5 ft depth followed by sandy muck to 6.0 ft depth and then mucky sand through to about 7.5 ft depth, at which point the boring was terminated as a result if non-recovery of material with the hand auger.

Boring HA-2, drilled along the west bank at about the northern third point along the length of the pond, disclosed a 0.5 ft thick surficial layer of slightly silty fine sand, followed by muck to about 1.6 ft depth and then layers of fine sands to 3.5 ft depth. From 3.5 ft depth, the boring disclosed a 0.3 ft layer of mucky sand followed by layers of fine sands to 5.5 ft depth and then clayey fine sand through to the termination of the boring at 7.0 ft depth.

Boring HA-3, drilled along the east bank at about the southern third point along the length of the pond, disclosed a 1.0 ft thick surficial layer of fine sand, followed by several thin layers of fine sand to 4.0 ft depth and then slightly silty fine sand through to the termination of the boring at 7.5 ft depth.

The fourth hand auger boring drilled in this investigation, HA-4, was drilled along the east bank at the southern end of the pond footprint. This boring disclosed a 0.5 ft thick surficial layer of fine sand followed by a thin (0.2 ft) layer of clayey fine sand and then several thin layers of fine sand to 3.5ft depth. From 3.5 ft depth the boring disclosed a 1.5 ft layer of slightly silty fine sand followed by fine sands to 7 ft depth and then silty and clayey fie sands through to the termination of the boring at 10.0 ft depth.

SPT Boring At Grade Control Structure 1 [Boring TB-4, Figure 2.2]

Boring TB-4 was drilled on the western bank at Grade Control Structure 1 (GCS-1). This boring disclosed surficial layers of loose fine sands to 5 ft depth followed layers of medium dense and dense fine sands to 9.5 ft depth and then layers of dense and very dense slightly silty fine sands to 19 ft depth. From 19 ft depth the boring disclosed medium dense clayey fine sand through to the termination of the boring at 25 ft depth.

SPT Borings - Grade Control Structure 2 [Borings TB-1 & TB-2, Figure 2.2]

The two borings were drilled at Grade Control Structure 2 (GCS-2), one each on opposite sides of the ditch banks. These borings disclosed varying soil stratigraphy.

Boring TB-1, drilled on the eastern bank, disclosed a 2 ft surficial layer of very loose fine sand underlain by 1 ft of muck and then 3 ft of very loose slightly mucky fine sands followed by loose and medium dense fine sands to 7 ft depth. From 7 ft depth the boring disclosed layers of medium

dense and dense silty fine sands to 19 ft depth and then a layer of stiff clay to 23.5 ft depth followed by medium dense fine sands through to the termination of the boring at 25 ft depth.

Boring TB-2, drilled on the western bank of the ditch, disclosed surficial layers of very loose and loose fine sands to 3 ft depth underlain by layers of loose and medium dense fine sands and slightly silty fine sands to 13.5 ft depth. From 13.5 ft depth the boring disclosed a 5 ft layer of loose slightly mucky sand underlain by a 5 ft layer of loose silty fine sand and then medium dense fine sand through to the termination of the boring at 25 ft depth.

SPT Boring At Midway Along Western Ditch Bank [Boring SPT-3, Figure 2.2]

Boring TB-3, drilled about midway along the western bank, disclosed surficial layers of very loose and loose fine sands to 2 ft depth underlain by layers of loose and medium dense fine sands to 7 ft depth. From 7 ft depth the boring disclosed layers of medium dense fine sands, silty fine sands and clayey fine sands to 24.5 ft depth followed by loose silty to clayey fine sand through to the termination of the boring at 25 ft depth.

5.3 LABORATORY TESTS

Grain Size Distribution

The results of the full grain size distribution tests performed on the selected samples taken from the borings locations are presented in Table 3. The D_{50} values to be used in scour computations are also included in Table 3. The grain size distribution curves are shown in Exhibits C and Exhibit D.

Table 3. Grain Size Distribution of Selected Boring Samples

Sieve		Percent Passing by Weight	
#	Size (mm)	GCS-1 - Borings TB-1 & TB-2 Samples #5 & #6 Depth range 10' to 16'	GCS-2 - Boring TB-4 Samples #5 & #6 Depth range 10' to 16'
#18	1.000	100.0	100.0
#40	0.425	95.7	97.3
#60	0.250	86.5	86.7
#80	0.180	67.6	57.2
#200	0.075	17.5	7.0
D_{50}		**0.14**	**0.17**

The grain size analyses disclosed D_{50} values of 0.14 mm and 0.17 mm on samples taken in the 10 ft 16 ft depth range below the ditch bank surface.

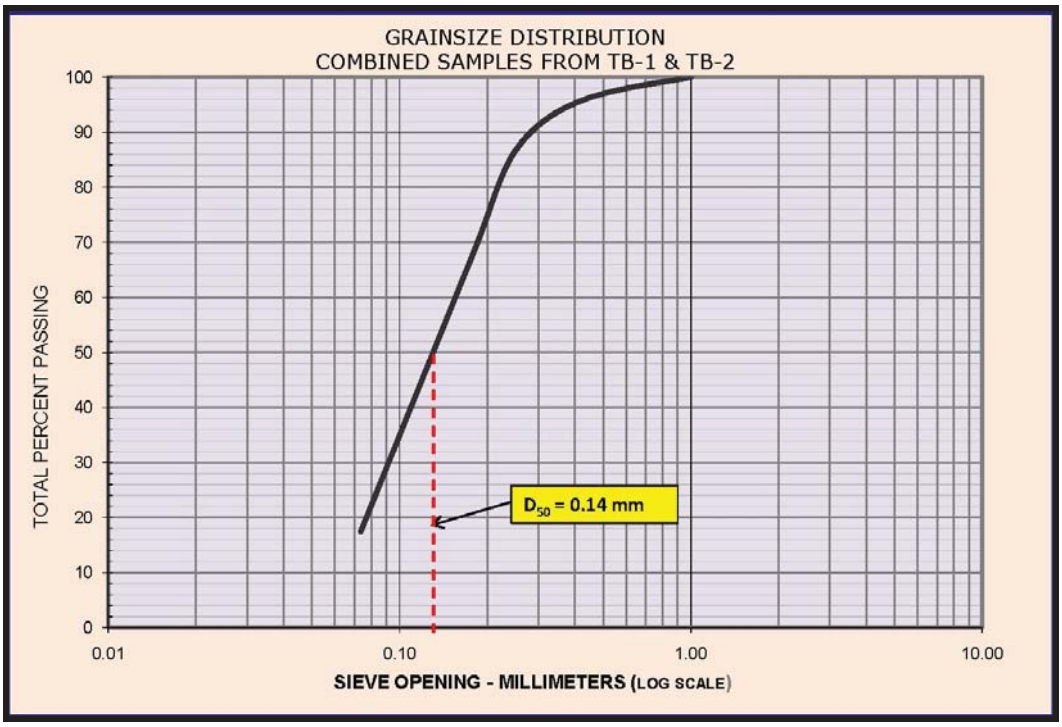

Exhibit C. Grainsize Distribution Combined Samples From TB-1 & TB-2

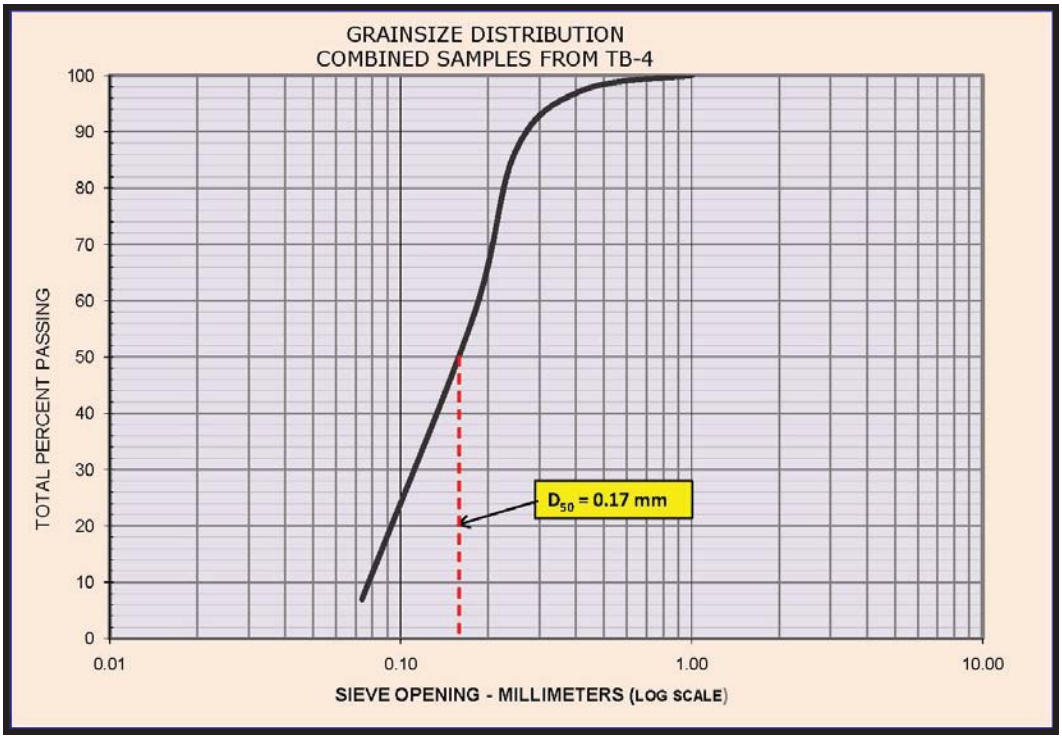

Exhibit D. Grainsize Distribution Combined Samples From TB-4

Environmental Classification

Table 4 presents the results of pH test results obtain from selected soil samples taken at GCS-1 and GCS-2. As noted in Table 4, the pH value at GCS-1 was 3.88, while the value at GCS-2 was 4.7. Based on the criteria presented in Chapter 7 of the FDOT "Structures Design Guidelines", summarized in Table 5 and the NRCS soil map unit characteristics, the environmental classifications for steel and concrete sub structures at GSC-1 & GSC-2 would both be highly aggressive.

Table 4. Corrosivity Test Results

STRUCTURE NO.	BORING NO.	SAMPLE DEPTH (ft)	pH
GCS-1	**TB-1 & TB-2**	6 to 12	3.9
GCS-2	**TB-4**	6 to 12	4.7

Table 5. FDOT Environmental Classification Guidelines

Parameter	Unit	Slightly Aggressive Range	Moderately Aggressive Range	Extremely Aggressive Range
pH	-	> 6.6	≤ 6.6; ≥ 5.0	< 5.0 (concrete)
pH	-	> 6.6	≤ 6.6; ≥ 6.0	< 6.0 (Steel)
Chlorides	ppm	< 500	≤ 2,000; ≥ 500	>2,000
Sulfates	ppm	< 150	≤ 1,500; ≥ 150	> 1,500
Resistivity	ohm-cm	> 3,000	≤ 3,000; ≥ 500	< 500

1. For extremely aggressive conditions, only one of the above extremely aggressive criteria need to be met for an area to be extremely aggressive.
2. All parameters under "slightly aggressive" must be met for a slightly aggressive area.
3. Moderately aggressive; all sites not meeting criteria for slightly aggressive or extremely aggressive.

Hydraulic Conductivity

Vertical hydraulic conductivity test performed on undisturbed (Shelby Tube) samples extracted at Borings HA-2 and HA-4 in the 4.0 ft to 4.5 ft depth range, disclosed values of 0.72 ft/day and 4.5 ft/day respectively, as shown in Figure 2.1. These values are typical for the slightly silty fine sands present.

5.4 WATER TABLE VALUES

Table 6 presents a summary of the measured depths to the water table at the boring locations. The measured depths to the water table ranged from 3.5 ft to 6.0 ft below the ground surface.

The investigation was performed in August 2011 which, was well into wet season. The ground water table would therefore be close to seasonal high levels. The water table altitude fluctuates seasonally due to short-term and long-term differences in rainfall and evapotranspiration. However, at these locations along the ditch bank, the water table would also be influenced by the sustained water elevation in the ditch. The estimated seasonal high water table elevations at the boring locations are included in Table 6. These estimates were made by reviewing the soil stratigraphy, the measured depths to the water table, the antecedent rainfall, the NRCS soil map units, the site topography and wetland line elevations.

Table 6. Water Table Measurements

Structure #	Boring No.	Boring Elevation (ft NGVD)	Measured depth to water table (ft)	Water table elevation (ft NGVD)	Estimated SHWT elevation (ft NGVD)
GCS-1	HA-1	93.3	3.5	89.8	91.5
	HA-2	93.4	3.5	89.9	91.5
	HA-3	94.6	5.0	89.6	91.0
GCS-2	HA-4	96.2	6.5	89.7	91.0

6.0 ASSESSMENT & RECOMMENDATIONS

6.1 GENERAL ASSESSMENT & RECOMMENDATIONS

The shallow hand auger borings drilled along the length of the site disclose a variable soil stratigraphy. The two borings, HA-1 & HA-2, drilled in the northern portion of site both disclosed layers of buried muck and some mucky sands. Boring HA-1, drilled along the east bank at the northern end of the proposed pond, disclosed mucky soils generally from 0.75 ft depth to 7.5 ft depth. Boring HA-2, drilled along the west bank at about the northern third point along the length of the pond, disclosed muck from 0.5 ft depth to about 1.6 ft depth. These shallow hand auger borings along with HA-3 & HA-4, otherwise disclosed layers of fine sands and slightly silty and silty fine sands.

The ground water table was measured in the elevation range +89.6 ft to +89.9.5 ft NGVD while, the estimated seasonal high water table elevations at the boring locations are shown in Table 7.

The SPT borings also disclosed a variable soil stratigraphy. Generally the surficial 3 ft of soils are very loose and loose fine sands (except for some muck at TB-1), followed generally by layers of loose and medium dense fine sands and silty fine sands to 19 ft depth (except for some dense layers at TB-4), and then layers of loose and medium dense fine sands, silty fine sands and stiff clay, through the termination of the borings at 25 ft depth.

Surficial mucky soils, where present beneath foundation level for any shallow foundations, should be removed and replaced with clean compacted sands as per our demucking recommendations in Table 7.

Table 7. Recommendations for Site Preparation & Demucking/Backfill

Item	Discussion & Recommendations
A.1 General	Soils-related aspects of development will be typical for this area. In the areas where only a thin layer of topsoil or organic soil is present, site preparation will include removing the existing topsoil and vegetation followed by compaction of the subgrade soils and any fill soils required to achieve final grades within the area to be filled. Structure footprint areas containing thicker deposits of surficial organics will require demucking and backfilling as described in Section A.2 of this table.
A.2 Demucking in Areas to be Filled	It is recommended that areas that are to be backfilled, if any, and which contain surficial and/or buried organics be completely demucked and backfilled with clean sand. The demucking excavation should have a 2H:1V transition slope adjacent to organic deposits which are to remain. Any removal of muck within the pavement limits shall be in accordance with Index 500 of the FDOT Roadway and Traffic Design Standards. Demucking and backfilling should be performed as follows: 1. The areas which contains organic deposits should be demucked and backfilled with clean fine sand or slightly silty fine sand relatively free of organics and debris. The surficial organic material shall be excavated to expose the underlying mineral soil. 2. Dewatering during excavating and backfilling shall be anticipated and may be accomplished by ditching and the use of sump pumps and/or other methods such as sanded well points, and vertical or horizontal suction wells. The water table shall be maintained a minimum of 2 feet below the excavated surface. *The vertical wells shall extend into the more transmissive sands beneath the organic layer to avoid blow-out during excavation*. The method of dewatering is the sole responsibility of the contractor. 3. Upon approval of the project geotechnical engineer, the excavated area may be backfilled with clean fine sand free of unsuitable or deleterious material. The fill should not be placed in standing water. 4. The backfill material shall consist of relatively clean fine sand with less than 7 percent passing the U.S. No. 200 sieve and shall be free of roots and/or other deleterious material. The material shall be compacted to a minimum density equal to at least 95 percent of the soil's Modified Proctor Density value (AASHTO T-180). The fill shall be placed in loose lift thicknesses not exceeding 12 inches. 5. A representative of the project geotechnical engineer should be retained to provide onsite inspection during the demucking operation and testing of the compacted fill to ensure compliance with the recommendations above.

6.2 STORMWATER POND

Given the estimated seasonal high water table elevations at the boring locations in Table 6, the wetland line elevations in the immediate vicinity and the pond location, a pond control elevation of +91.0 ft NGVD is recommended. The estimated seasonal low elevation is anticipated to be approximately 3 ft below the pond control elevation.

Once set at a control elevation of + 91.0 ft NGVD, no significant drawdown impacts are anticipated in the adjacent wetland areas.

A preliminary horizontal hydraulic conductivity value (K_h), if required for modeling purposes, shall be 6.0 ft/day, however, the final weighted value to be used will depend on the actual pond depth.

6.3 SHEETPILE WEIR STRUCTURES

The presence of shallow buried muck disclosed in Boring TB-1 and the deeper buried layer of slightly mucky sand shown in boring TB-2, would not adversely affect the design of the sheetpile walls for the weir structures.

These soil conditions pose no constraints to be use of sheetpile walls at the structure locations. Tables 8.a provides the recommended soil strength and unit weight parameters for design of the sheetpile wall at GCS-1, which are based on the soil stratigraphy disclosed in Boring TB-4. Table 8.b provides the recommended soil strength parameters for GCS-2, which are based on the generalized soil stratigraphy for Borings TB-1 & TB-2.

Note however, that the sheetpile walls are to serve as weirs. Apart from the active and passive soil pressures, the design of these structures must consider the maximum hydrostatic head that can be generated from worst case stages upstream and downstream stages, as well as, the hydrodynamic forces associated with the changes in momentum of the water mass.

Another factor to consider in design is scour. Although it is envisaged that scour protection will be utilized, in designing the sheetpile wall, the Engineer may wish to consider loss of soil on the passive side in the event of failure of the scour protection system.

Table 8.a. Recommended Soil Design Parameters for Sheetpile Wall at GCS-1

Approximate elevation range (ft NGVD)		Friction angle φ (degrees)	Cohesion [c] psf	Moist Unit Weight γ_m (pcf)	Saturated unit weight γ_{sat} (pcf)	Wall friction angle φ (degrees)	Adhesion (psf)
From	To						
100	98	25	0	108	112	14	0
98	95	26	0	108	112	14	0
95	93	28	0	114	120	15	0
93	90.5	26	0	114	120	15	0
90.5	86.5	30	0	118	125	16	0
86.5	81	34	0	122	130	17	0
81	75	29	500	122	130	14	250

Table 8.b. Recommended Soil Design Parameters for Sheetpile Wall at GCS-2

Approximate elevation range (ft NGVD)		Friction angle φ (degrees)	Cohesion [c] psf	Moist Unit Weight γ_m (pcf)	Saturated unit weight γ_{sat} (pcf)	Wall friction angle φ (degrees)	Adhesion (psf)
From	To						
93	86	26	0	105	110	13	0
86	80	28	0	112	118	14	0
80	77	27	0	109	115	13	0
77	74	25	0	108	114	12	0
74	69	25	0	108	114	12	0
69	68	28	0	112	118	14	0

Allowing for 2 ft scour at bed level and a peak stage of 2 ft above weir elevation, the canal bed elevation at weir is assumed to be +85 ft and the maximum water depth, 7 ft. Using SPW911, v2.39 software by Pile Buck®, Inc., the pile embedment required for overturning stability is 12.7 ft (pile tip Elev. +72.8 ft) for steel sheetpiles at GCS-1. It was understood that sheetpiles was no longer required for the weir at GCS-2. If however, a sheetpile weir is contemplated in the future at this location, according to our analysis, a pile penetration of 18.3 ft is required below bed level for maximum water height of 7 ft. Although a thinner, lighter section may suffice structurally, we recommend the heavier section, AZ-26, which reduces deflection and provides a fair degree of corrosion allowance and reserve capacity. Note that an equivalent surcharge load of 100 psf was

included in the analyses to cater for any extreme peak flow stages above the weir that might occur during storms. Computer printouts of the sheetpile analyses are included in Appendix A.

6.4 Environmental Classification

Laboratory test results presented and discussed in Section 5.3. Based on the criteria presented in Chapter 7 of the FDOT "Structures Design Guidelines", summarized in Table 6 and the NRCS soil map unit characteristics, the environmental classification for steel and concrete sub structures at GCS-1 & GCS-2 would both be highly aggressive.

6.5 Global Stability Analyses - Sheetpile Weir

Global stability analyses were performed for the recommended pile embedment depth given for the weir structures in Section 6.3. The state of the art SVSlope software was used to perform the slope stability calculations. The soil unit weight and strength parameters tabulated in Tables 8.a and 8.b, were used to define the soil layers for the analysis. The water differential between the upstream side and the downstream side on the sheetpile wall was conservatively set at 8 ft.

The calculated safety factor is shown graphically in Appendix B for the embedment depths at GCS-1 and GCS-2. As noted in Attachment B, the Factor of Safety (FS) against global slope failure is approximately 6.4 at GCS-1 and 3.1 at GCS-2, which are both well above the minimum recommended FS of 1.5 for global stability. With type of soils present at the lower depths, the factor of safety increases as the depth of embedment increases.

6.6 Backfill Behind Sheetpile Walls

The potential for seepage boils forming at the downstream side of the sheetpile wall is low due to the anticipated depth of embedment and the resulting long seepage path. However, some backfill material may be required behind or in front or at the end of the sheetpile wall. Normally, backfill to sheetpile walls is of fine sands or slightly silty fine sand (preferably with less than 8% passing the U.S. #200 sieve), however, for weir structures, particularly at the ends of the sheetpile wall, where seepage can pose problems, the backfill material shall be relatively impermeable materials such as, clayey fine sands with a minimum of 15% fines. Careful detailing had to be addressed in the drawings so that material is placed and keyed on properly prepared surfaces.

Backfilling material, where placed behind or in front the sheetpile walls shall be placed and compacted in 6 inch layers (compacted thickness) and compacted with appropriate equipment to a minimum density of 95% of the AASHTO T180 (Modified) maximum dry density.

6.7 VIBRATIONS CONSIDERATIONS DURING INSTALLATION OF SHEETPILES

The Contractor shall provide survey and vibration monitoring of any structures within 150 feet of the sheetpile alignment that may be affected by vibration from sheet piling. Pre-condition survey for all structures shall be completed prior to the start of sheet pile installation. The survey and vibration monitoring procedures shall meet the requirements of Section 455-1.1 of the FDOT Standard Specifications. The Contractor shall monitor for settlement as required in Section 455-1.1 of the FDOT Standard Specifications.

Based on our review of the aerial photographs and observations on the site visit, there are existing structures that may be marginally within the 150 ft radius.

6.8 FOUNDATION SUPPORT FOR PEDESTRIAN BRIDGES AND MINOR STRUCTURES

Recommendations for minor retaining walls, if required, are included in Table 9.

Table 9. Geotechnical Recommendations for RC Retaining Walls

ITEM	DISCUSSION & RECOMMENDATIONS
DESIGN RECOMMENDATIONS	
Lateral earth pressure	These walls should be designed to resist the active earth pressure exerted by the backfill. In this case, *the active earth pressure should be taken as equivalent to the pressure exerted by a fluid weighing 36 lb/ft³*. This recommendation assumes that *adequate drainage is provided to prevent the buildup of hydrostatic pressure behind the wall*. Free-draining sand or a prefabricated drainage composite such as Miradrain™ 6000 (with weepholes) can be used to prevent buildup of such hydrostatic pressure. If it is assumed that full hydrostatic pressure builds up behind the wall, *the active earth pressure should be taken as equivalent to the pressure exerted by a fluid weighing 80 lb/ft³*. These equivalent fluid densities do not include a factor of safety; they also do not include lateral pressures from any surcharge loads (i.e., traffic, construction equipment, etc.)
Particle diameter for scour analysis	***0.14 mm.***
Corrosion classification	**Extremely aggressive for concrete.** **Extremely aggressive for steel**
Global stability	Retaining walls, if any, are expected to be minor and global stability is not expected to be an issue. However, if there are significant retaining walls, global stability of the walls will be addressed at the final design level stage when the depths are being finalized.

Based on the soil conditions disclosed by the borings, no major geotechnical constraints are anticipated for construction of minor drainage structures and shallow foundations for pedestrian bridges. Provided that organic soils, if present beneath the structure foundation, are removed and replaced with clean compacted sands as per our recommendations in Table 7, the foundation soils will be capable of sustaining a net increase in soil bearing pressure of up to 2,000 psf.

The net bearing pressure is equal to the gross bearing pressure minus the weight of the soil between the elevation of the bottom of the footing and the finished grade alongside. When the soil surcharge above the bottom of a footing is at different elevations on the two sides, the shallower surcharge is used to determine the net bearing pressure.

Figures

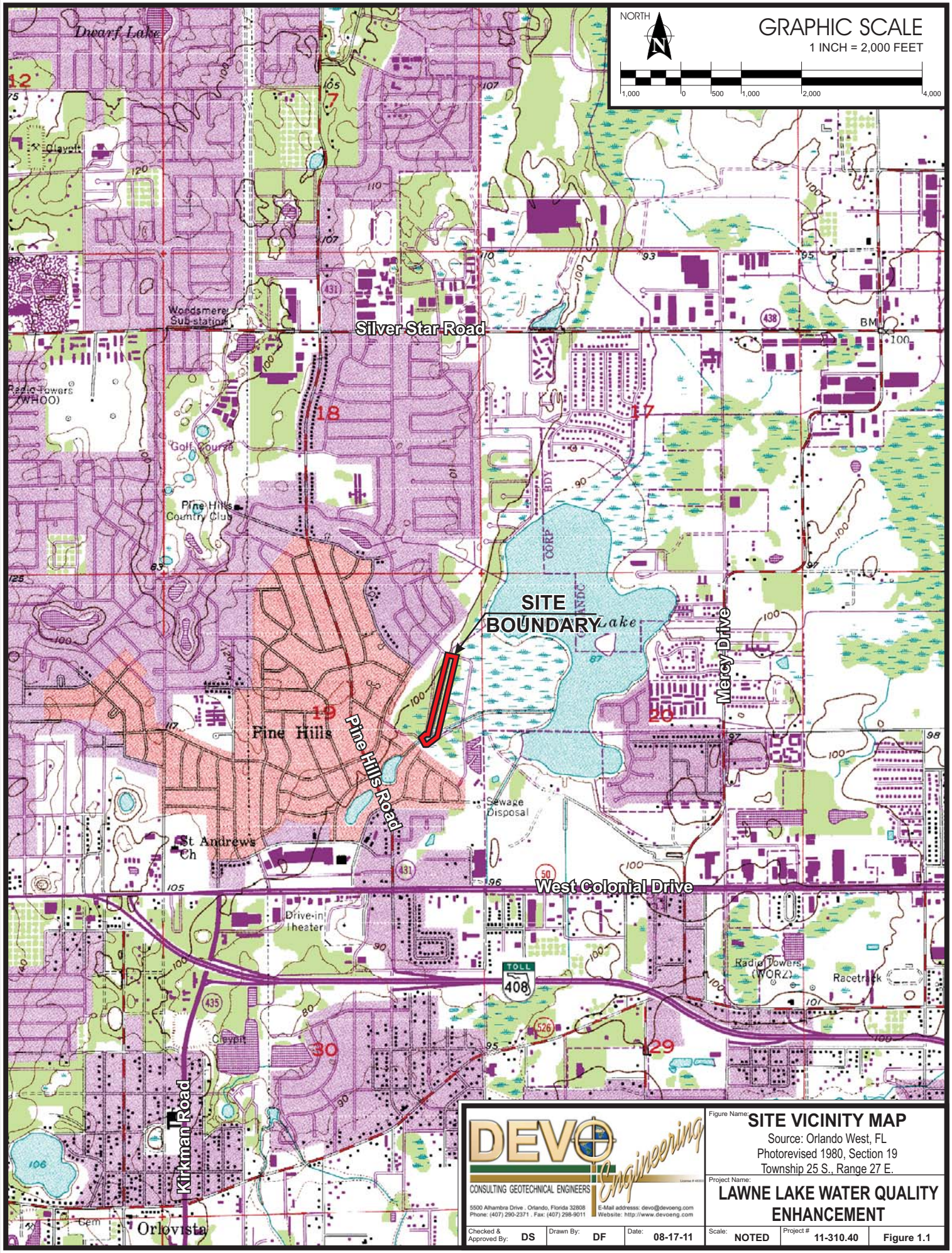

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Figure Name: **SITE VICINITY MAP**
Source: Orlando West, FL
Photorevised 1980, Section 19
Township 25 S., Range 27 E.

Project Name: **LAWNE LAKE WATER QUALITY ENHANCEMENT**

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	DF	08-17-11	NOTED	11-310.40	Figure 1.1

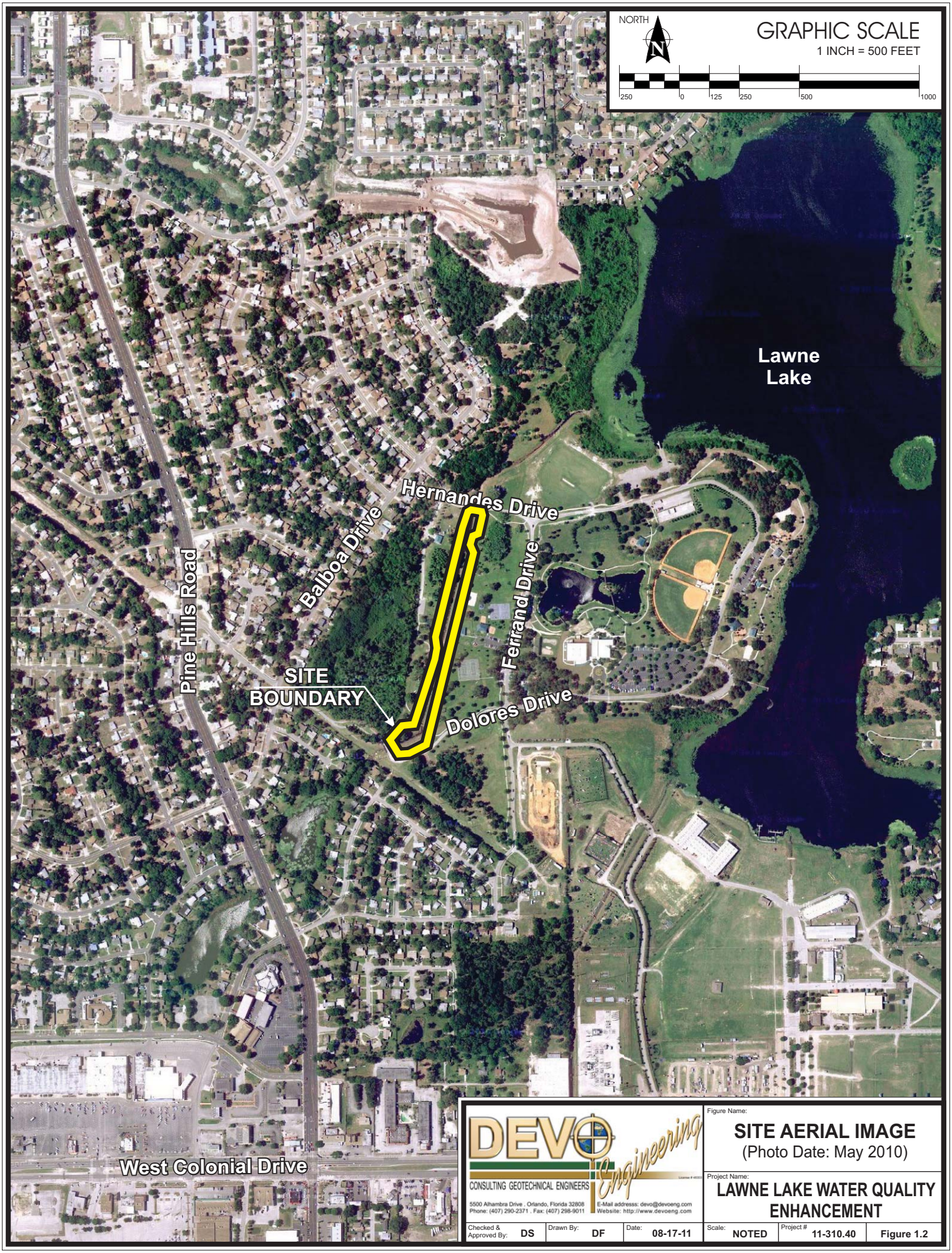

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Figure Name:
SITE AERIAL IMAGE
(Photo Date: May 2010)

Project Name:
LAWNE LAKE WATER QUALITY ENHANCEMENT

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	DF	08-17-11	NOTED	11-310.40	Figure 1.2

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Website: http://www.devoeng.com

Figure Name: **NRCS SOILS MAP**
Source: Soil Survey Of Orange County Area, FL. Sheet # 19 & 30

Project Name: **LAWNE LAKE WATER QUALITY ENHANCEMENT**

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	DF	08-17-11	NOTED	11-310.40	Figure 1.3

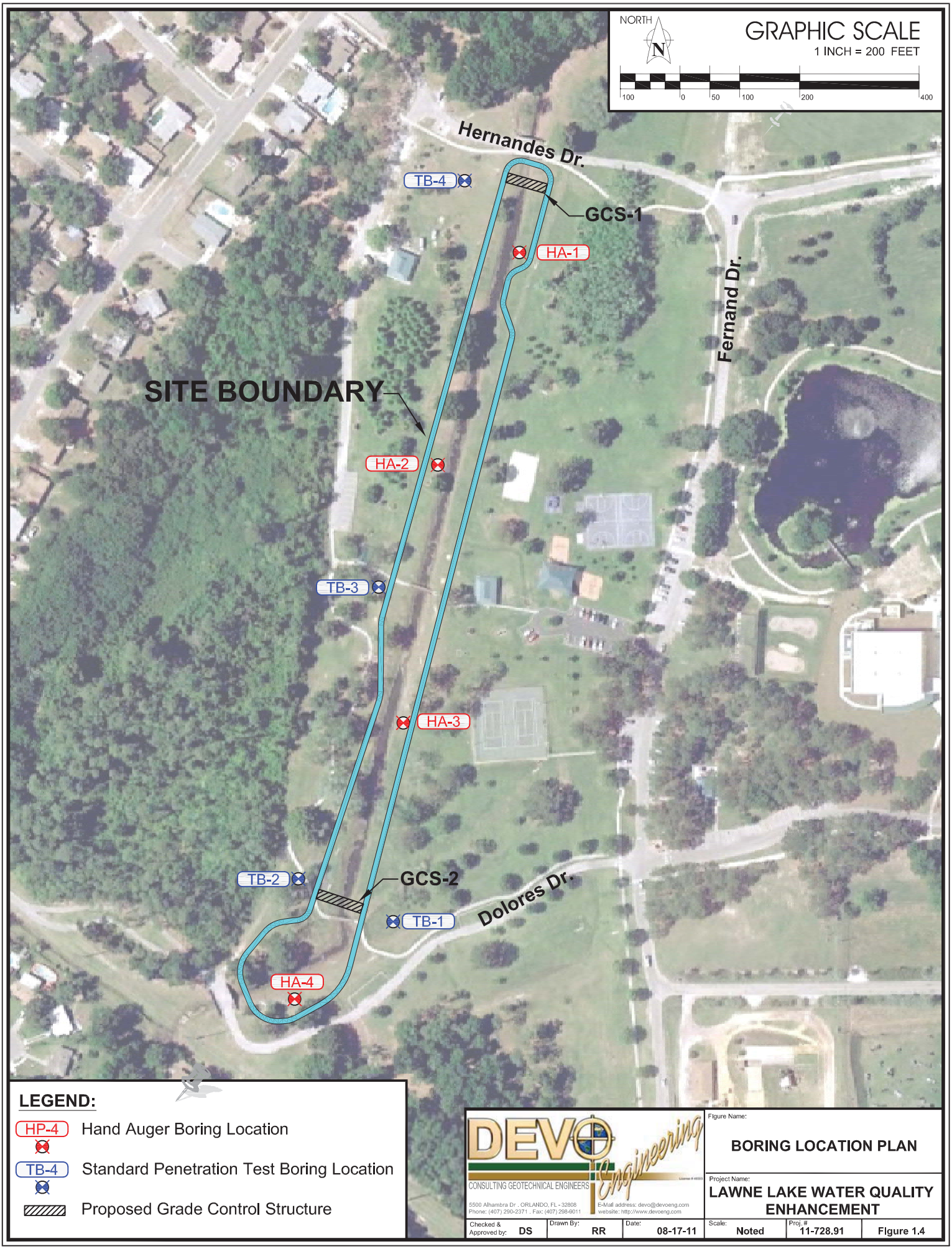

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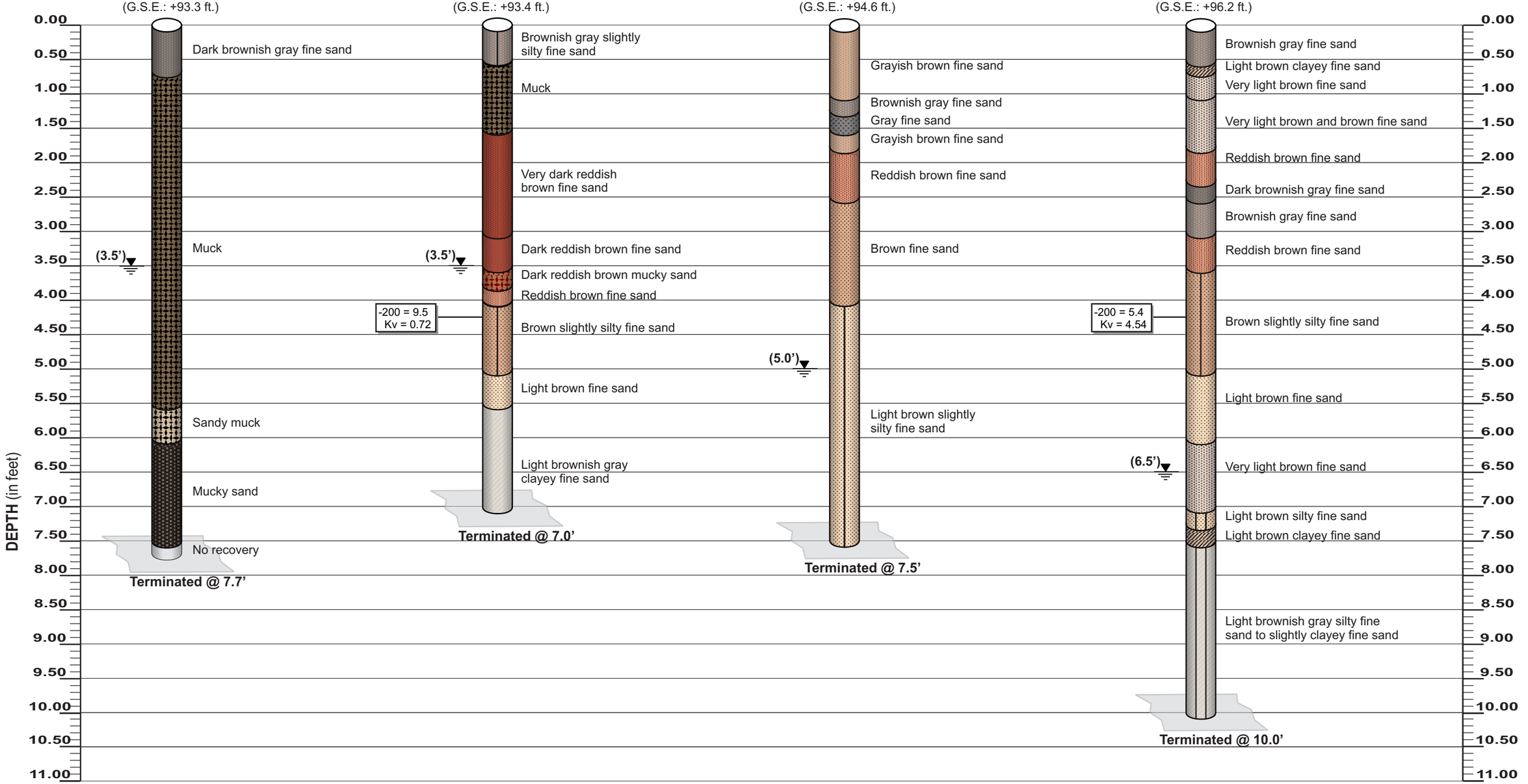
Figure Name: **BORING LOCATION PLAN**

Project Name: **LAWNE LAKE WATER QUALITY ENHANCEMENT**

Checked & Approved by:	Drawn By:	Date:	Scale:	Proj. #	Figure
DS	RR	08-17-11	Noted	11-728.91	Figure 1.4



NOTES:

	Borings drilled on **August 03, 2011**
▼	Water level measured on date of drilling
(G.S.E.)	Surveyed ground surface elevation (ft NGVD)
-200	Percent passing US #200 Sieve
Kv	Vertical hydraulic conductivity (ft/day)

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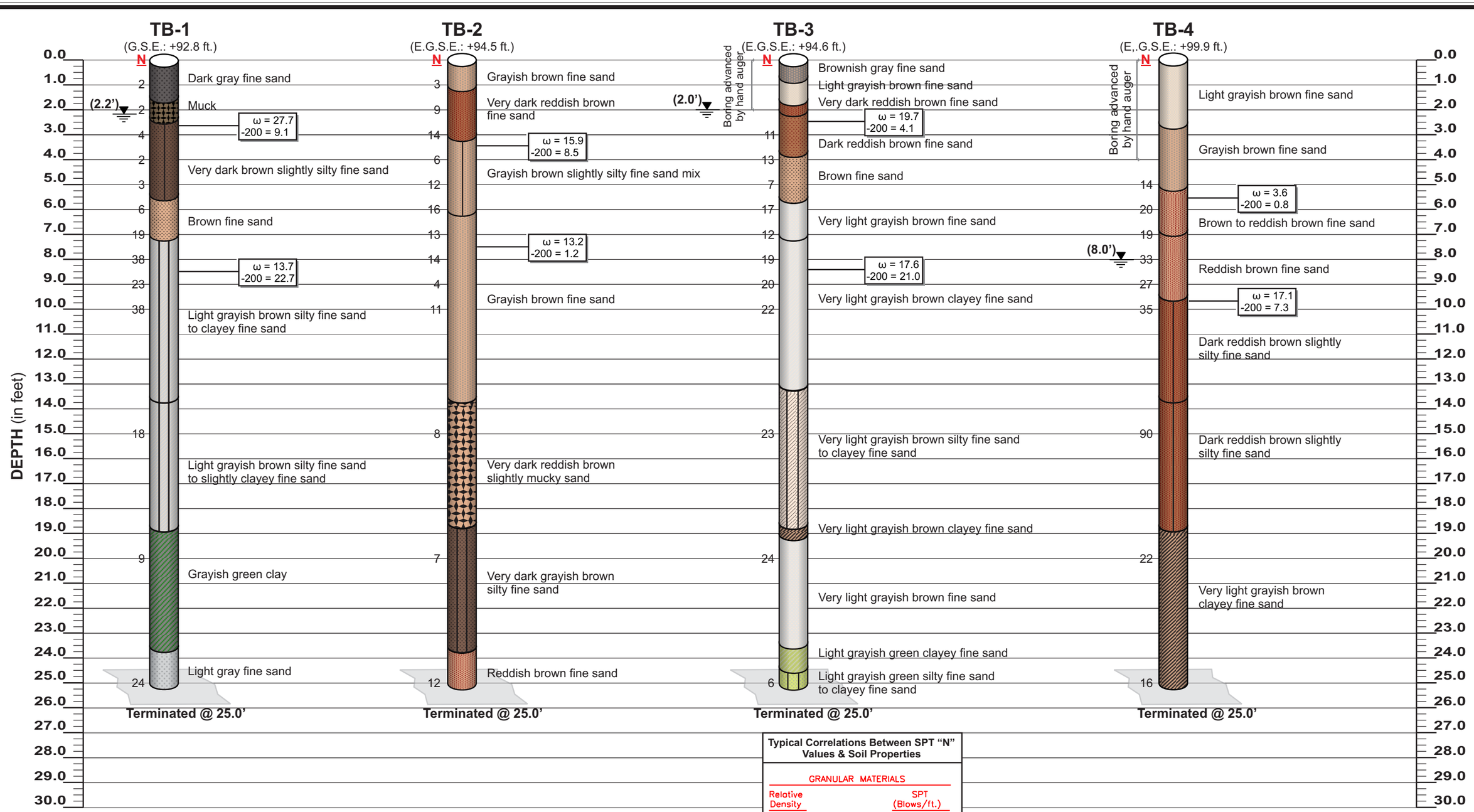
Figure Name: **Soil Profiles for HA-1 to HA-4**

Project Name: **LAWNE LAKE WATER QUALITY ENHANCEMENT**

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	DF	08-17-11	NOTED	11-310.40	Figure 2.1



NOTES:

Borings drilled on **August 03, 2011**

Water level measured on date of drilling

(G.S.E.) Surveyed ground surface elevation (ft NGVD)

(E.G.S.E.) Estimate surveyed ground surface elevation (ft NGVD)

NOTES:

-200 Percent passing US #200 Sieve

ω Field moisture content %

Typical Correlations Between SPT "N" Values & Soil Properties

GRANULAR MATERIALS

Relative Density	SPT (Blows/ft.)
Very loose	Less than 4
Loose	4–10
Medium Dense	10–30
Dense	30–50
Very Dense	Greater than 50

SILTS AND CLAYS

Consistency	SPT (Blows/ft.)
Very soft	Less than 2
Soft	2–4
Firm	4–8
Stiff	8–15
Very stiff	15–30
Hard	Greater than 30

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Figure Name:
SOIL PROFILES FOR TB-1 TO TB-4

Project Name:
LAWNE LAKE WATER QUALITY ENHANCEMENT

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	DF	08-17-11	NOTED	11-310.40	Figure 2.2

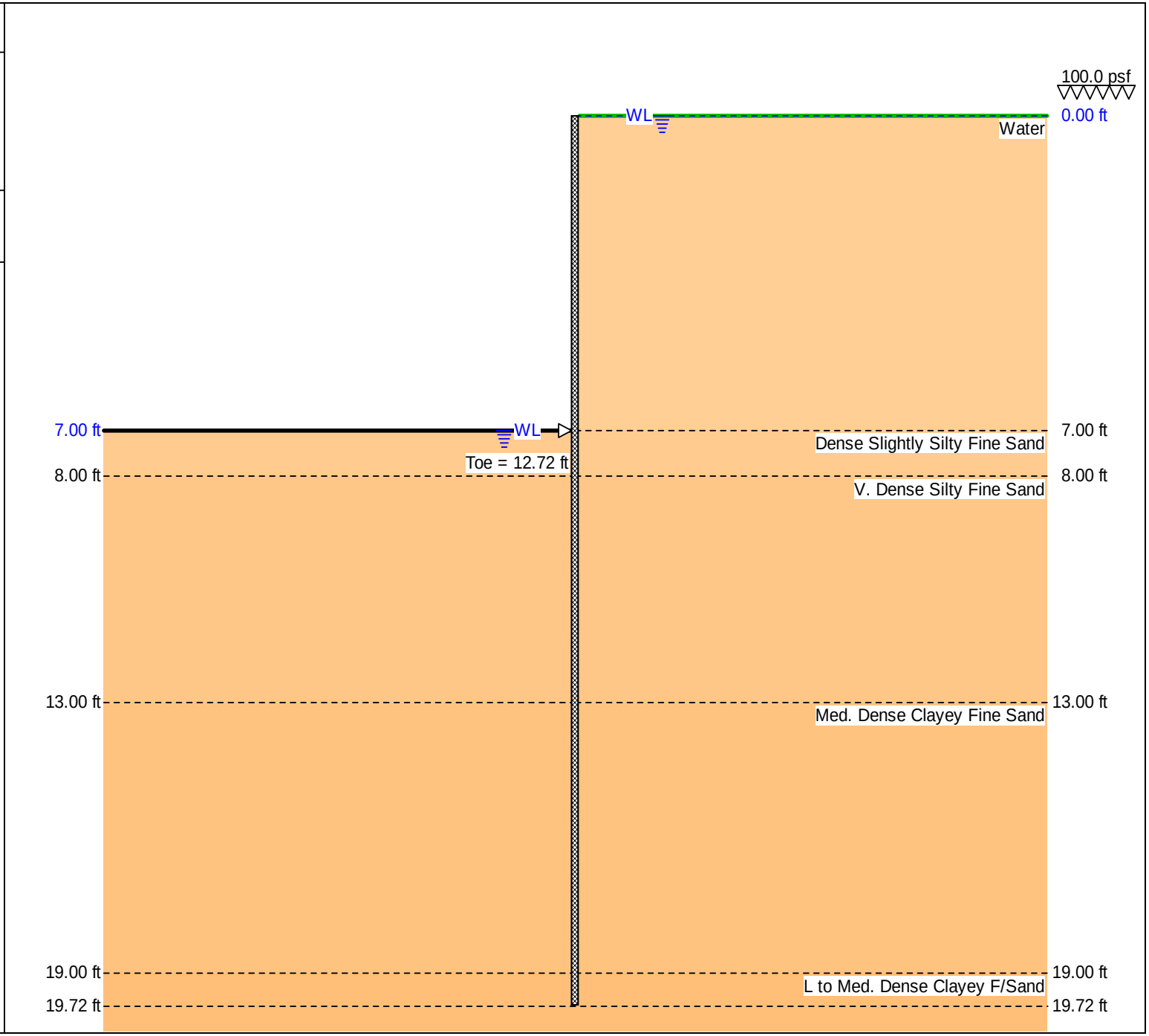
APPENDIX A

SHEET PILE ANALYSES PRINTOUTS

Client: Inwood/OCPW
Site: Orlando

Title: Lawne Lake GCS-1 7ft WL
AZ-26
Designer: DS/GR/VB
Ref: 11-310.40
Page: 1
Date: 9.13.11

Sheet: Arbed AZ26
Pressure: Rankine
Toe: Cantilever



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SPW911, v2.39

Client: Inwood/OCPW
Site: Orlando

Title: Lawne Lake GCS-1 7ft WL AZ-26
Designer: DS/GR/VB
Ref: 11-310.40
Page: 2
Date: 9.13.11

Sheet: Arbed AZ26
Pressure: Rankine
Toe: Cantilever

Input Data

Depth Of Excavation = 7.00 ft Depth Of Active Water = 0.00 ft Water Density = 62.43 pcf
Surcharge = 100.0 psf Depth Of Passive Water = 7.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ(°)	δ(°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Water	62.50	0.00	0.0	0.0	0.0	0.0	1.00	0.00	1.00	0.00
7.00	Dense Slightly Silty Fine Sand	118.00	65.55	0.0	0.0	28.0	14.0	0.33	0.00	4.10	0.00
8.00	V. Dense Silty Fine Sand	124.00	68.73	0.0	0.0	30.0	15.0	0.30	0.00	4.43	0.00
13.00	Med. Dense Clayey Fine Sand	112.00	68.73	0.0	0.0	28.0	14.0	0.33	0.00	4.10	0.00
19.00	L to Med. Dense Clayey F/Sand	120.00	65.55	500.0	0.0	25.0	13.0	0.41	1.27	2.46	3.14

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
Arbed AZ26	406.50	3.04E+07	48.40	24970.3	100713.2	0.00	12.72	19.72

Maxima

	Maximum	Depth
Bending Moment	17800.4 ftlb/ft	13.01 ft
Deflection	0.3 in	0.00 ft
Pressure	537.4 psf	7.00 ft
Shear Force	2641.4 lb/ft	8.69 ft

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Site: Orlando

Title: Lawne Lake GCS-1 7ft WL
AZ-26
Designer: DS/GR/VB
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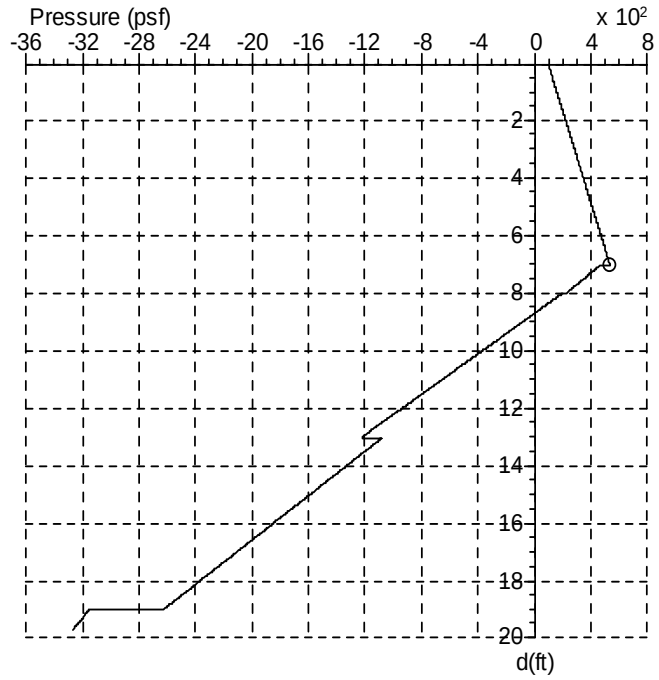
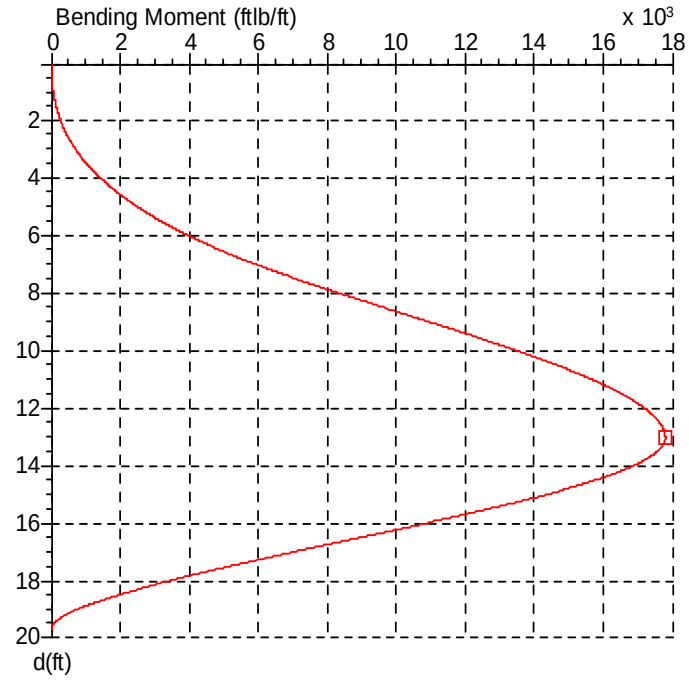
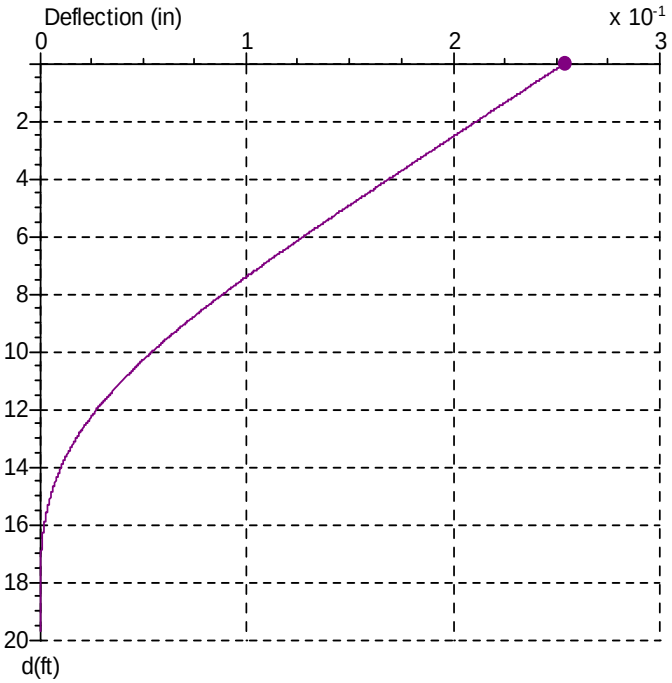
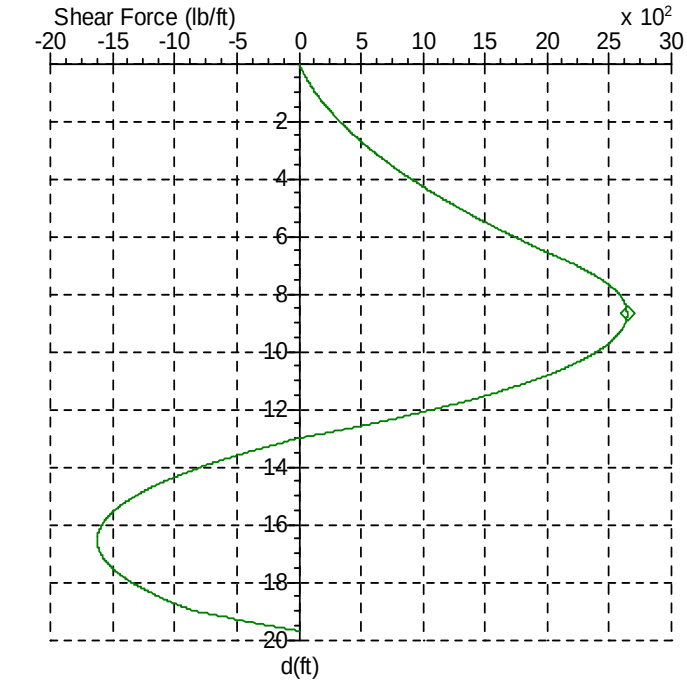
Sheet: Arbed AZ26
Pressure: Rankine
Toe: Cantilever

Maximum		d (ft)
○	537.4 psf	7.00
□	17800.4 ftlb/ft	13.01
◇	2641.4 lb/ft	8.69
●	0.3 in	0.00









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SPW911, v2.39

Client: Inwood/OCPW
Site: Orlando

Title: Lawne Lake GCS-1 7ft WL AZ-26
Designer: DS/GR/VB
Ref: 11-310.40
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Sheet: Arbed AZ26
Pressure: Rankine
Toe: Cantilever

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	100.0	0.0	0.3	1.6	6.63	513.8	5205.2	0.1	2038.3	13.26	-1144.2	17731.2	0.0	-232.2
0.17	110.3	1.5	0.2	19.0	6.81	525.0	5579.9	0.1	2132.4	13.44	-1186.7	17616.2	0.0	-368.2
0.35	121.6	6.6	0.2	40.1	6.98	535.3	5935.4	0.1	2219.6	13.61	-1233.6	17429.6	0.0	-509.8
0.52	131.8	14.7	0.2	61.0	7.15	429.8	6342.2	0.1	2303.3	13.78	-1276.2	17208.5	0.0	-631.1
0.70	143.1	27.7	0.2	85.9	7.33	385.1	6763.1	0.1	2376.7	13.96	-1323.0	16911.9	0.0	-756.5
0.87	154.4	45.4	0.2	112.9	7.50	344.5	7156.6	0.1	2436.3	14.13	-1369.8	16563.1	0.0	-873.4
1.05	164.7	65.8	0.2	139.3	7.68	299.9	7600.2	0.1	2494.2	14.31	-1412.4	16203.6	0.0	-972.3
1.22	176.0	93.3	0.2	170.2	7.85	259.3	8011.9	0.1	2539.9	14.48	-1459.3	15764.9	0.0	-1073.0
1.40	186.2	123.4	0.2	200.0	8.03	191.4	8472.9	0.1	2581.5	14.66	-1506.1	15284.6	0.0	-1165.3
1.57	197.5	162.2	0.2	234.8	8.20	135.4	8940.2	0.1	2610.2	14.83	-1548.7	14814.7	0.0	-1241.8
1.74	208.8	207.5	0.2	271.6	8.38	88.7	9368.9	0.1	2628.3	15.01	-1595.5	14264.9	0.0	-1318.0
1.92	219.1	254.5	0.2	306.9	8.55	37.4	9843.2	0.1	2639.2	15.18	-1638.1	13737.9	0.0	-1379.8
2.09	230.4	313.1	0.2	347.6	8.72	-9.2	10275.5	0.1	2641.3	15.36	-1684.9	13131.7	0.0	-1439.7
2.27	241.7	379.2	0.2	390.4	8.90	-60.5	10750.8	0.1	2635.4	15.53	-1731.8	12501.5	0.0	-1491.2
2.44	251.9	446.0	0.2	431.1	9.07	-111.8	11224.2	0.1	2620.2	15.70	-1774.4	11910.6	0.0	-1530.7
2.62	263.2	527.5	0.2	477.8	9.25	-158.5	11651.7	0.1	2598.4	15.88	-1821.2	11244.3	0.0	-1566.0
2.79	273.5	608.9	0.2	522.0	9.42	-209.8	12117.0	0.1	2565.5	16.05	-1863.8	10626.8	0.0	-1590.8
2.97	284.8	707.0	0.2	572.6	9.60	-261.1	12575.7	0.1	2523.4	16.23	-1910.6	9937.8	0.0	-1609.9
3.14	296.1	814.4	0.2	625.2	9.77	-307.7	12985.4	0.1	2477.1	16.40	-1957.5	9242.2	0.0	-1620.6
3.32	306.4	920.4	0.2	674.8	9.95	-359.1	13426.7	0.1	2417.2	16.58	-2000.0	8607.3	0.0	-1623.0
3.49	317.7	1046.5	0.2	731.3	10.12	-405.7	13817.9	0.1	2354.8	16.75	-2046.9	7909.2	0.0	-1617.5
3.66	328.9	1182.9	0.2	789.9	10.30	-457.0	14235.7	0.0	2277.2	16.93	-2093.7	7215.2	0.0	-1603.6
3.84	339.2	1316.2	0.2	844.9	10.47	-508.3	14638.8	0.0	2190.4	17.10	-2136.3	6590.8	0.0	-1583.6
4.01	350.5	1473.5	0.2	907.3	10.64	-555.0	14991.1	0.0	2103.4	17.27	-2183.1	5914.6	0.0	-1553.5
4.19	360.8	1626.3	0.2	965.9	10.82	-606.3	15361.4	0.0	1998.9	17.45	-2225.7	5312.4	0.0	-1518.8
4.36	372.1	1805.6	0.2	1032.3	10.99	-657.6	15712.2	0.0	1885.1	17.62	-2272.6	4667.2	0.0	-1472.5
4.54	383.4	1997.1	0.2	1100.7	11.17	-704.2	16012.7	0.0	1773.6	17.80	-2319.4	4043.6	0.0	-1417.8
4.71	393.6	2181.9	0.2	1164.6	11.34	-755.6	16321.4	0.0	1642.1	17.97	-2362.0	3498.5	0.0	-1360.7
4.89	404.9	2397.5	0.2	1236.9	11.52	-802.2	16580.9	0.0	1514.5	18.15	-2408.8	2926.2	0.0	-1289.8
5.06	415.2	2605.0	0.1	1304.4	11.69	-853.5	16841.6	0.0	1365.3	18.32	-2455.7	2386.0	0.0	-1210.5
5.23	426.5	2846.1	0.1	1380.6	11.87	-904.8	17074.6	0.0	1206.8	18.50	-2498.2	1926.0	0.0	-1131.0
5.41	437.8	3101.0	0.1	1458.9	12.04	-951.5	17261.1	0.0	1054.7	18.67	-2545.1	1457.4	0.0	-1035.5
5.58	448.0	3345.2	0.1	1531.8	12.21	-1002.8	17436.7	0.0	878.5	18.85	-2587.7	1068.5	0.0	-941.3
5.76	459.3	3627.7	0.1	1613.9	12.39	-1049.4	17568.2	0.0	710.3	19.02	-3158.5	684.7	0.0	-821.1
5.93	470.6	3925.2	0.1	1698.1	12.56	-1100.7	17680.4	0.0	516.4	19.19	-3187.7	372.7	0.0	-608.0
6.11	480.9	4208.9	0.1	1776.4	12.74	-1152.0	17756.9	0.0	313.3	19.37	-3214.2	169.5	0.0	-409.7
6.28	492.2	4536.0	0.1	1864.5	12.91	-1198.7	17794.1	0.0	120.5	19.54	-3243.3	36.6	0.0	-186.5
6.46	502.5	4847.2	0.1	1946.4	13.09	-1097.3	17794.5	0.0	-74.5	19.72	-3267.2	0.0	0.0	0.0

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SPW911, v2.39

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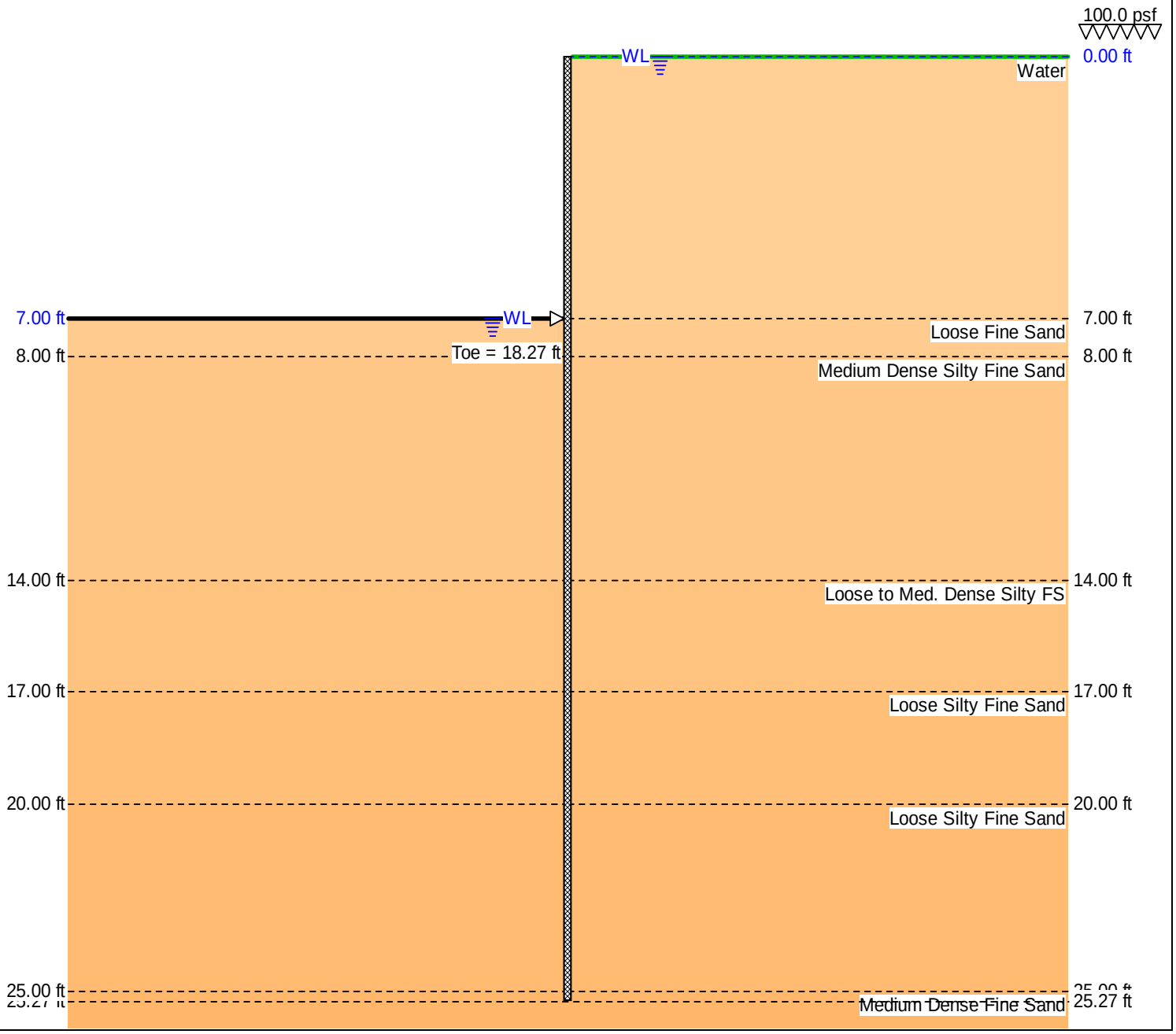
Site: Orlando
Tel: 4079718850

Title: Lawne Lake GCS-2 7 ft WL AZ26
Designer: DS/GR/VB
Ref: 11-310.40
Page: 1
Date: 9.13.11

Sheet: Arbed AZ26
Pressure: Rankine
Toe: Cantilever



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Toe: Cantilever

Input Data

Depth Of Excavation = 7.00 ft Depth Of Active Water = 0.00 ft Water Density = 62.43 pcf
Surcharge = 100.0 psf Depth Of Passive Water = 7.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ(°)	δ(°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Water	62.50	0.00	0.0	0.0	0.0	0.0	1.00	0.00	1.00	0.00
7.00	Loose Fine Sand	110.00	65.55	0.0	0.0	26.0	0.0	0.39	0.00	2.56	0.00
8.00	Medium Dense Silty Fine Sand	118.00	68.73	0.0	0.0	28.0	0.0	0.36	0.00	2.77	0.00
14.00	Loose to Med. Dense Silty FS	115.00	68.73	0.0	0.0	27.0	0.0	0.38	0.00	2.66	0.00
17.00	Loose Silty Fine Sand	114.00	65.55	0.0	0.0	25.0	0.0	0.41	0.00	2.46	0.00
20.00	Loose Silty Fine Sand	114.00	65.55	0.0	0.0	25.0	0.0	0.41	0.00	2.46	0.00
25.00	Medium Dense Fine Sand	118.00	0.00	0.0	0.0	28.0	0.0	0.36	0.00	2.77	0.00

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
Arbed AZ26	406.50	3.04E+07	48.40	24970.3	100713.2	0.00	18.27	25.27

Maxima

	Maximum	Depth
Bending Moment	25604.4 ftlb/ft	16.00 ft
Deflection	0.6 in	0.00 ft
Pressure	536.4 psf	7.00 ft
Shear Force	2936.8 lb/ft	9.90 ft

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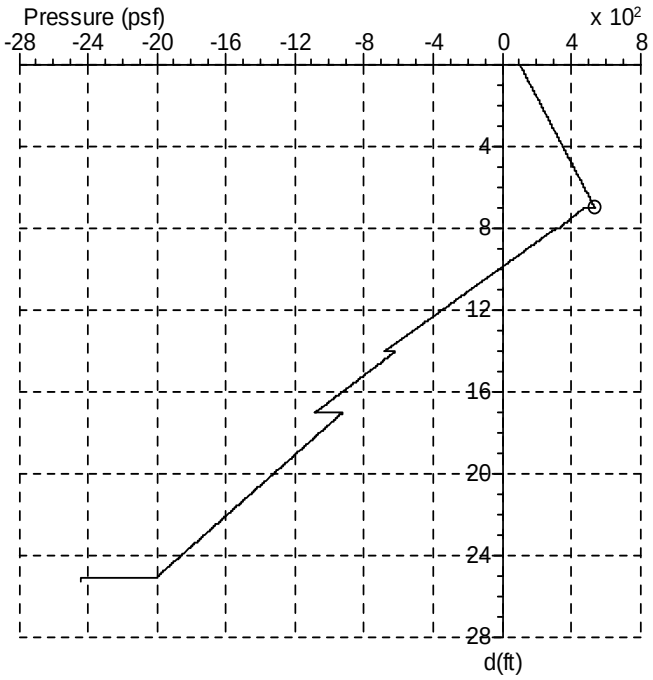
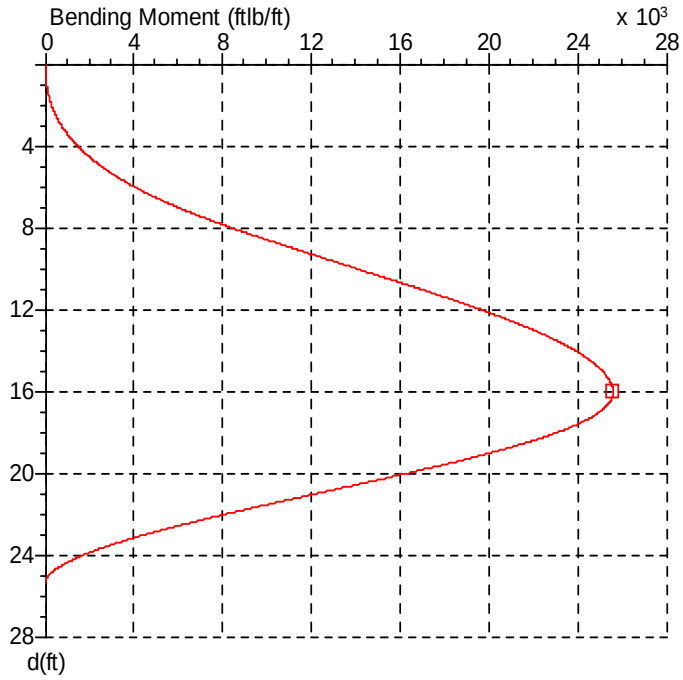
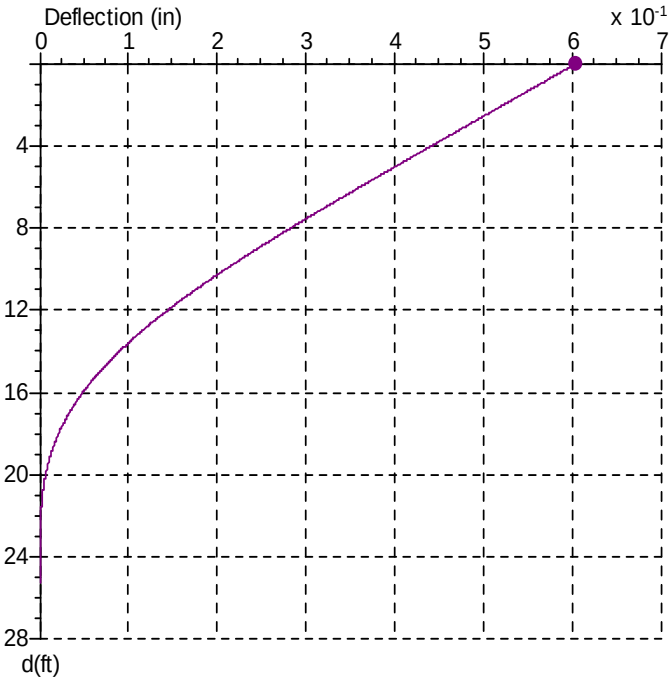
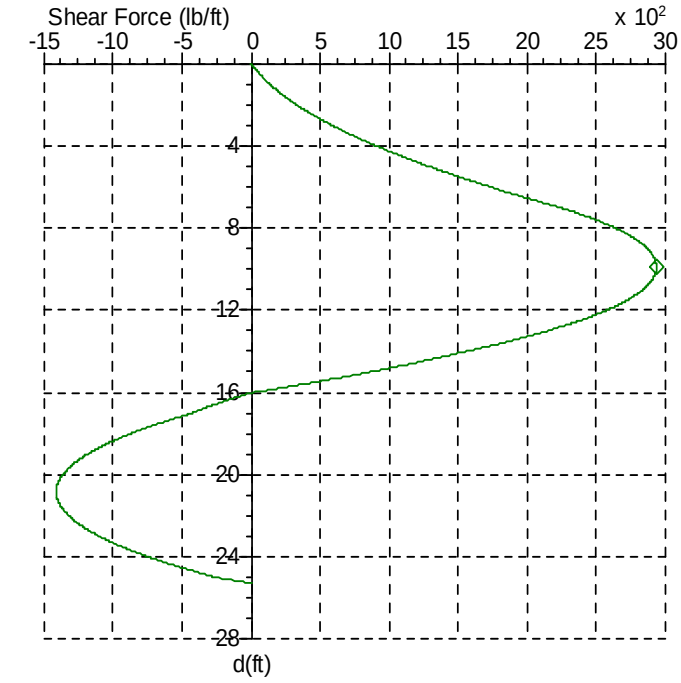
Sheet: Arbed AZ26
Pressure: Rankine
Toe: Cantilever

Maximum		d (ft)
○	536.4 psf	7.00
□	25604.4 ftlb/ft	16.00
◇	2936.8 lb/ft	9.90
●	0.6 in	0.00









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Sheet: Arbed AZ26
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Toe: Cantilever

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	101.3	0.0	0.6	2.1	8.50	231.1	9797.2	0.3	2778.0	16.99	-1084.8	24928.3	0.0	-435.1
0.22	114.5	2.6	0.6	25.0	8.72	192.7	10443.4	0.3	2826.7	17.22	-954.6	24627.9	0.0	-540.0
0.45	128.9	11.2	0.6	53.4	8.94	157.8	11039.9	0.2	2863.2	17.44	-985.8	24224.1	0.0	-648.5
0.67	142.1	25.1	0.6	82.1	9.17	119.4	11704.0	0.2	2895.0	17.67	-1014.1	23794.4	0.0	-740.9
0.89	156.5	47.6	0.6	116.8	9.39	81.1	12374.5	0.2	2917.8	17.89	-1045.2	23257.4	0.0	-835.6
1.12	171.0	78.5	0.6	154.9	9.62	46.2	12987.8	0.2	2930.8	18.11	-1076.3	22657.8	0.0	-923.1
1.34	184.1	114.5	0.6	192.5	9.84	7.8	13664.8	0.2	2936.7	18.34	-1104.6	22062.6	0.0	-996.4
1.57	198.6	163.5	0.5	237.0	10.06	-27.1	14280.7	0.2	2934.8	18.56	-1135.7	21357.3	0.0	-1070.1
1.79	211.7	217.2	0.5	280.4	10.29	-65.4	14956.9	0.2	2924.5	18.78	-1166.9	20603.7	0.0	-1136.6
2.01	226.2	287.2	0.5	331.3	10.51	-103.8	15629.8	0.2	2905.3	19.01	-1195.2	19880.9	0.0	-1190.8
2.24	240.7	369.3	0.5	385.5	10.73	-138.7	16236.9	0.2	2880.2	19.23	-1226.3	19049.0	0.0	-1243.6
2.46	253.8	455.0	0.5	437.8	10.96	-177.0	16897.8	0.2	2844.0	19.45	-1254.6	18263.1	0.0	-1285.3
2.68	268.3	562.3	0.5	498.4	11.18	-211.9	17490.6	0.2	2803.4	19.68	-1285.7	17370.8	0.0	-1324.3
2.91	282.7	683.9	0.5	562.4	11.40	-250.3	18132.0	0.2	2750.3	19.90	-1316.8	16454.0	0.0	-1356.1
3.13	295.9	807.6	0.5	623.5	11.63	-288.6	18760.3	0.2	2688.3	20.13	-1345.1	15603.5	0.0	-1378.8
3.35	310.3	958.8	0.5	693.9	11.85	-323.5	19318.2	0.1	2624.2	20.35	-1376.2	14653.7	0.0	-1396.8
3.58	323.5	1110.6	0.5	760.9	12.08	-361.9	19915.5	0.1	2545.2	20.57	-1404.5	13781.4	0.0	-1407.0
3.80	337.9	1294.2	0.4	837.7	12.30	-400.3	20493.7	0.1	2457.4	20.80	-1435.7	12816.6	0.0	-1411.2
4.03	352.4	1495.8	0.4	917.8	12.52	-435.1	21001.0	0.1	2369.8	21.02	-1466.8	11851.2	0.0	-1408.3
4.25	365.5	1695.4	0.4	993.6	12.75	-473.5	21537.0	0.1	2265.0	21.24	-1495.1	10977.1	0.0	-1399.3
4.47	380.0	1933.6	0.4	1080.2	12.97	-508.4	22002.4	0.1	2161.9	21.47	-1526.2	10024.0	0.0	-1382.6
4.70	394.5	2192.2	0.4	1170.1	13.19	-546.8	22488.6	0.1	2040.1	21.69	-1557.3	9084.7	0.0	-1358.7
4.92	407.6	2445.6	0.4	1254.7	13.42	-585.1	22945.8	0.1	1909.5	21.91	-1585.6	8246.8	0.0	-1330.7
5.14	422.1	2745.1	0.4	1351.0	13.64	-620.0	23334.5	0.1	1783.0	22.14	-1616.8	7347.3	0.0	-1293.0
5.37	435.2	3037.0	0.4	1441.5	13.86	-658.4	23730.5	0.1	1635.3	22.36	-1645.1	6553.7	0.0	-1252.5
5.59	449.7	3380.3	0.4	1544.2	14.09	-631.6	24091.8	0.1	1484.3	22.58	-1676.2	5712.0	0.0	-1201.0
5.81	464.1	3747.6	0.4	1650.3	14.31	-664.6	24390.4	0.1	1348.2	22.81	-1707.3	4907.7	0.0	-1142.4
6.04	477.3	4103.1	0.4	1749.6	14.53	-700.9	24685.0	0.1	1190.4	23.03	-1735.6	4213.3	0.0	-1082.8
6.26	491.8	4518.5	0.4	1862.0	14.76	-733.9	24920.6	0.1	1039.7	23.26	-1766.7	3494.2	0.0	-1010.4
6.48	504.9	4918.9	0.3	1967.2	14.98	-770.2	25142.4	0.1	865.9	23.48	-1797.9	2827.0	0.0	-930.7
6.71	519.4	5385.2	0.3	2086.0	15.21	-806.5	25323.3	0.1	683.7	23.70	-1826.2	2269.6	0.0	-852.1
6.93	533.8	5879.2	0.3	2208.2	15.43	-839.5	25450.5	0.1	510.7	23.93	-1857.3	1715.0	0.0	-758.7
7.16	453.3	6352.4	0.3	2310.4	15.65	-875.8	25547.7	0.1	312.4	24.15	-1885.6	1268.1	0.0	-667.5
7.38	420.4	6896.2	0.3	2411.3	15.88	-908.8	25595.6	0.1	124.9	24.37	-1916.7	844.1	0.0	-560.4
7.60	387.5	7462.5	0.3	2504.6	16.10	-945.1	25597.8	0.0	-52.8	24.60	-1947.8	495.7	0.0	-446.0
7.83	357.5	7995.3	0.3	2582.8	16.32	-981.4	25526.9	0.0	-162.8	24.82	-1976.1	248.7	0.0	-335.8
8.05	304.3	8599.5	0.3	2660.3	16.55	-1014.4	25399.3	0.0	-255.5	25.04	-2439.6	58.9	0.0	-189.4
8.27	269.4	9163.3	0.3	2720.4	16.77	-1050.7	25194.7	0.0	-349.5	25.27	-2439.6	0.0	0.0	0.0

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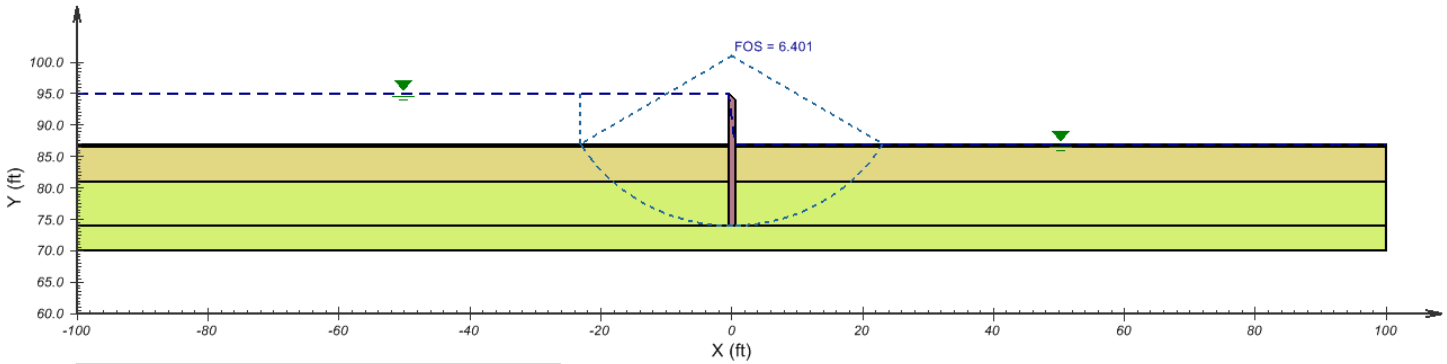
SPW911, v2.39

APPENDIX B

GLOBAL STABILITY ANALYSES PRINTOUTS

Calculation Method: Spencer's
Search Method: Grid and Tangent
FOS: 6.401
Total Weght: 6.468E+004 lb
Total Volume: 6.138E+002 ft^3
Total Activating Moment: 1.557E+005 lbsf
Total Resisting Moment: 9.969E+005 lbsf
Total Activating Force: 5.210E+003 lb
Total Resisting Force: 3.335E+004 lb

GCS-1

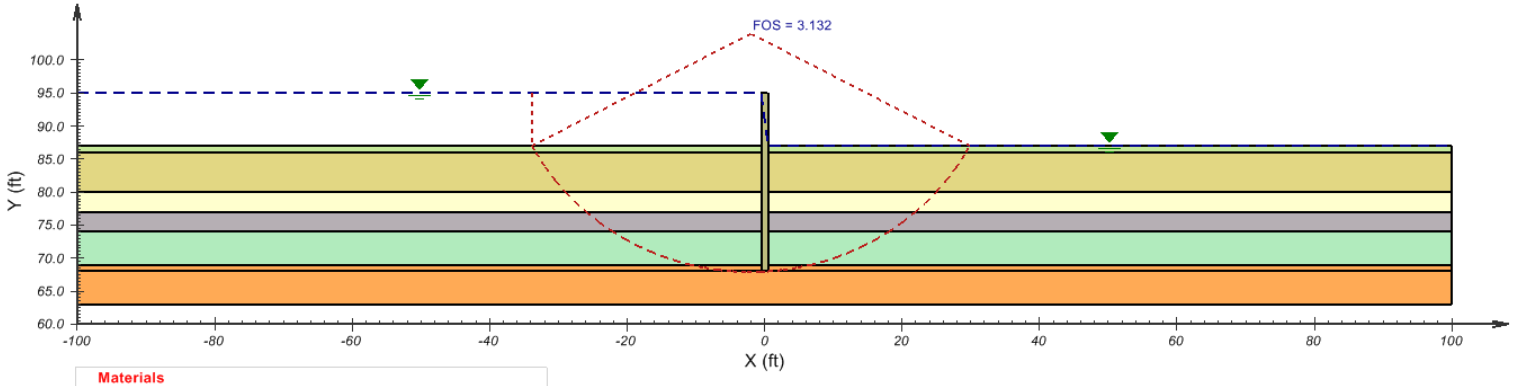


Materials

Sheetpile			
Soil 1	Cohesion = 0 (psf)	Phi = 30 (deg)	Unit Weight = 125 (lb/ft^3)
Soil 2	Cohesion = 0 (psf)	Phi = 34 (deg)	Unit Weight = 130 (lb/ft^3)
Soil 3	Cohesion = 500 (psf)	Phi = 29 (deg)	Unit Weight = 130 (lb/ft^3)

Calculation Method: Spencer's
Search Method: Grid and Tangent
FOS: 3.132
Total Weght: 1.145E+005 lb
Total Volume: 1.141E+003 ft^3
Total Activating Moment: 2.856E+005 lbsf
Total Resisting Moment: 8.945E+005 lbsf
Total Activating Force: 6.999E+003 lb
Total Resisting Force: 2.192E+004 lb

GCS-2



Materials

Sheetpile			
Soil 1	Cohesion = 0 (psf)	Phi = 26 (deg)	Unit Weight = 110 (lb/ft^3)
Soil 2	Cohesion = 0 (psf)	Phi = 28 (deg)	Unit Weight = 118 (lb/ft^3)
Soil 3	Cohesion = 0 (psf)	Phi = 27 (deg)	Unit Weight = 115 (lb/ft^3)
Soil 4	Cohesion = 0 (psf)	Phi = 25 (deg)	Unit Weight = 114 (lb/ft^3)
Soil 5	Cohesion = 0 (psf)	Phi = 25 (deg)	Unit Weight = 114 (lb/ft^3)
Soil 6	Cohesion = 0 (psf)	Phi = 28 (deg)	Unit Weight = 118 (lb/ft^3)

- Supplement #1 -

Supplementary Geotechnical Engineering Report For ...

LAWNE LAKE WATER QUALITY ENHANCEMENTS

Canal C-6, Barnett Park

[Section 19, Township 25 South, Range 27 East]

ORLANDO, ORANGE COUNTY, FLORIDA

JULY 2013

Prepared by

DEVO Engineering

DEVO SEEREERAM, PH.D., P.E., LLC.

5500 ALHAMBRA DR., ORLANDO, FL-32808

PHONE: (407) 290-2371 - FAX: (407) 298-9011

Prepared for

INWOOD CONSULTING ENGINEERS, INC.

3000 Dovera Drive

Suite 200

Oviedo, FL 32765

Inwood consulting engineers

DEVO SEEREERAM, PH.D., P.E.
CONSULTING GEOTECHNICAL ENGINEER
FLORIDA REGISTRATION NO. 48303

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Date: July 22, 2013	*Devo's Project No:* 11-610.40

To:

INWOOD CONSULTING ENGINEERS, INC.
3000 Dovera Drive
Suite 200
Oviedo, Florida 32765
phone: (407) 971-8850 ext. 6587

attention: STEVE SOMMERFELDT, P.E.

Re:

Supplement #1 - Supplementary Geotechnical Engineering Report for ...

LAWNE LAKE WATER QUALITY ENHANCEMENTS

Canal C-6, Barnett Park, Orlando, Orange County, Florida
[Section 19, Township 25 South, Range 27 East]

Dear Mr. Sommerfeldt:

This is not a stand alone report, but is Supplement #1 to our baseline report titled, "Geotechnical Assessment - Lake Lawne Water Quality Enhancements", dated September 13, 2012.

This report supplement covers the supplementary work involved in exploring the soil conditions of the proposed pond in the bayhead area and assessment of organic soils within the overall excavation limits, and silt deposits in the existing canal.

Our supplementary geotechnical investigation included drilling of four (4) Standard Penetration Test (SPT) borings and probing the bottom of existing canal for silt and muck deposits.

The data obtained from the investigation was used to characterize the soil stratigraphy. Included in the report are the data, assessment and recommendations for demucking and backfilling. The locations of all borings where mucky soils were disclosed are presented in Figure 4.1 . Also included in the report are the pile geotechnical recommendations for the pedestrian bridge at specific locations.

We trust that the geotechnical assessment and recommendations presented in this supplement meet the needs of the design engineer and the reviewing agencies. Please contact us if there are any questions.

Sincerely,

Vijay Boodhoo Project Geotechnical Engineer	Devo Seereeram Devo Seereeram, Ph.D., P.E. Florida Registration No. 48303 Date: July 22, 2013

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General Figures

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Muck Probe Data

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1.0 BACKGROUND INFORMATION

During the geotechnical investigation for the Lawne Lake Water Quality Enhancement Project in August 2011, several of the borings disclosed surficial and some buried muck deposits. A key element of the project is the construction of a pond, which would facilitate stormwater harvesting for irrigation of the adjacent landscaped areas. The final pond footprint includes excavation of the bayhead area on the eastern side of canal bank at the northern end of the pond.

A few of the borings drilled along the canal bank in the previous investigation disclosed surficial and buried deposits of mucky soils, however, at the time of that investigation, the enlarged pond was not envisaged and no borings were drilled in the bayhead area. Mucky soil deposits, if present within the pond, will impact construction of the pond and the yield of usable fill material available from within the pond. Therefore, it is prudent to know the following:

1. The extent of the mucky soil deposits, if present, within the pond excavation area.

2. The quality of the mucky soils and recommendations for demucking.

3. The suitability of the inorganic soils available from the proposed pond expansion.

In addition, piling recommendations are to be provided for the boardwalk based on a pile load of 10 kips. It is understood that 10" timber piles are being considered.

2.0 FIELD AND LABORATORY TEST PROGRAM

In order to obtain the additional data for this supplementary assessment the following program of geotechnical field and laboratory testing was performed:

- ❑ Site reconnaissance and stake out of borings by our senior geotechnician.

- ❑ Call-in and obtain utility clearance.

- ❑ Mobilization of the drill rig.

- ❑ Drilling of four (4) 25-ft deep Standard Penetration Test (SPT) borings within the general footprint of the proposed stormwater pond. These boring locations are labeled B-1 to B-4, as shown in Figure 1.4 (attached).

- ❑ Muck/silt probing along the bottom of the existing 1280± section of canal, as shown in Figures 3.1 and 3.2. The muck probe procedure and its limitations are shown in Exhibit A.

- ❑ Visual and tactile examination of soil samples.

- ❑ Thirteen (13) fines fraction (minus #200 Sieve) and natural field moisture content tests on selected soil samples.

- ❑ Three (3) organic content tests on mucky soil samples.

Boring locations were staked by our field crew and the locations and elevations were subsequently surveyed by the project surveyor Southeastern Surveying and Mapping Corp.

NOTE:
The manual muck probe procedure involves pushing a slender metal rod into the surficial organics and evaluating the relative resistance of the soil to this manual penetration. Highly organic soils such as muck and peat are characteristically very soft and/or fibrous and will typically yield to the penetration of the manual muck probe. However, manual muck probes cannot detect peat or muck layers which exist beneath layers of sand or dense soils which cannot be penetrated. The probes can also penetrate to some extent in loose granular soils which may exist beneath peat or muck layers. These limitations can at times lead to some overestimation or underestimation of peat or muck thicknesses and the data must be treated with these limitations in mind. It is not recommended that muck probe data be used for earthwork quantity estimates except on a very preliminary basis. Backhoe test pits or auger borings are recommended where more definite information is needed on the thickness of surficial organics and the texture and stratification of underlying soil.

Exhibit A. Limitations of muck probe procedure

3.0 GEOTECHNICAL DATA

3.1 PRESENTATION OF DATA

Boring locations for the previous investigation, as well as, this supplementary investigations, are shown in Figure 1.4 (attached).

Soil profiles for the four (4) deep SPT borings, drilled in this supplementary investigation, B-1 through B-4, are presented in Figure 2.3 (attached). Muck probe data for the existing canal bottom is presented in Figures 3.1 and 3.2.

In reviewing the SPT soil boring profiles in Figure 2.3, the reader is referred to Table 1 which, shows the correlation between the SPT N-Value and the degree of compaction of granular soils and consistency of cohesive soils. Water table readings and laboratory test data, where applicable, are annotated adjacent to the soil profiles.

Table 1. Typical Correlations between SPT "N" Values & Soil Properties

Sandy (granular) Soils					Clayey (cohesive) soils			
N	φ°	γ_m (lb/ft³)	γ'_{sat} (lb/ft³)	Compactness	N	q_u (lb/ft²)	γ_{sat} (lb/ft³)	Consistency
0-4	28	< 100	< 60	very loose	0-2	500	100-120	very soft
4-10	30	95-125	55-65	loose	2-4	1,000		soft
10-30	36	110-130	60-70	medium dense	4-8	2,000	110-130	firm
30-50	41	110-140	65-85	dense	8-15	4,000		stiff
>50	>41	>130	>75	very dense	15-30	8,000	120-140	very stiff
					>30	>8,000	>130	hard

Key to Symbols
N = Standard Penetration Resistance in blows/ft
φ° = Friction angle in degrees
γ_m = moist unit weight in lb/ft³
γ_{sat} = saturated unit weight in lb/ft³
q_u = unconfined compressive strength in lb/ft²

3.2 SOIL STRATIGRAPHY

SPT Borings At Southern Pond Lobe [Boring B-1, Figure 2.3]

Boring B-1, drilled on the eastern bank within the proposed southern pond lobe, disclosed a 2 ft surficial layer of very loose peat, underlain by 4 ft layer of very loose fine sand, 2 ft layer a medium dense silty to clayey fine sand and medium dense fine sand to 13.5 ft depth. From 13.5 ft depth the boring disclosed loose silty to clayey fine sand through to the termination of the boring at 25 ft depth.

SPT Borings At Bay Head Area [Borings B-2 to B-4, Figure 2.3]

Borings B-2 and B-3 drilled within the bayhead area, disclosed a similar soil stratigraphy of loose and very loose fine sands from the ground surface to 5 ft depth underlain by loose, medium dense and dense, fine sands to 13.5 ft depth and then layers of loose and medium dense silty fine sand and some clayey fine sands through to the termination of the borings at 25 ft depth. However, Boring B-4, drilled in the northern portion of the bayhead area, disclosed 2 ft layer of very soft peat at the ground surface, underlain by very loose mucky sand to 4 ft depth. From 4 ft depth, the boring disclosed layers of loose and medium dense fine sands to 10 ft depth, followed by loose clayey to silty fine sand to 13.5 ft depth and then layers of silty fine sands through to the termination of the boring at 25 ft depth.

Muck Probe Data [Figures 3.1 & 3.2]

A total of seventy-eight (78) probes were performed along the bottom of the existing canal at locations shown in Figures 3.1 & 3.2. These probes generally disclosed a thin layer of soft slush on top of a thin layer of silt at nearly all probe locations. The slush deposits ranged from, 0.1 ft to 1.5 ft thick, while the silt ranged from, 0.1 ft to 3 ft thick. Standing water was present at all the probe locations, the depth of standing water ranged from, 0.2 ft to 3 ft deep, on the date of probing, June 12, 2013.

3.3 ORGANIC CONTENT TESTS

Laboratory content tests on selected samples of mucky soils disclosed organic losses of 7.2% to 89.7% as shown in Table 2. Some of these organic content values and moisture contents are quite significant and are consistent with values typically obtained for mucky soils. Soils with high organic contents compress significantly under load.

Table 2. Organic Content Test Results

Boring No.	Sample depth range (ft)	Fines fraction (%)	Moisture content (%)	Organic loss (%)
B-1	0 to 2.0	81.3	241	62.8
B-4	0 to 2.0	86.8	1056	89
B-4	2.0 to 4.0	17.7	29	7.2

4.0 ASSESSMENT AND RECOMMENDATIONS

4.1 SUITABILITY OF POND MATERIALS

The pond boring disclosed a variable soil soil stratigraphy. The graphic soil profiles for the pond borings are presented in Figure 2.3. As noted in the soil profiles, the stratigraphic conditions are variable and hence a color code is assigned to each soil stratum to give the reader a visual indication of the vertical extent of the materials which are considered:

❶ suitable,
❷ less suitable, or
❸ unsuitable.

The following color shading is used in Figure 2.3:

Color	Soil Texture	Suitability
green	Fine sand & slightly silty fine sands	Suitable
yellow	Silty fine sands, slightly clayey fine sand	Suitable but with limitations on where the material can be placed. There are potential problems with compaction.
red	Clayey fine sand, sandy clay, clay	Unsuitable for fill material - Can be used in the lower layers where large fill thickness are required but compaction/working would be difficult due to high moisture content.

The distinction between these classifications is based on the percent of the soil fraction passing the U.S. No. 200 sieve (i.e., the fines fraction) and visual and tactile examinations. This distinction and the engineering suitability of the soils are described in Table 3.

Note that organic soils were disclosed at the several locations in this supplementary and in the baseline investigations. These organic deposits were mostly at the surface, however, there was a deep buried layer of muck in TB-2. Figure 4.1 (attached) shows the location and depths of the organic deposits in plan view. Review of the appropriate soil profiles for each of these locations would also show the depths and thicknesses of organic deposit graphically.

Following is a list of the organics deposits disclosed by the borings:

- HA-1: Mucky sand from 0.75 ft to 7.5 ft depth.
- HA-2: Muck from 0.5 ft to 1.5 ft depth.
- TB-1: Muck from 1.5 ft to 2.0 ft depth.
- TB-2: Muck from 13.5 ft to 18.5 ft depth.
- B-1: Peat from 0 to 2 ft depth.
- B-4: Peat from 0 to 2 ft; mucky sand 2 ft to 4 ft depth.

These deposits of mucky soils generally have a high organic content. Soils with the organic content disclosed by the borings are highly compressible, even when lightly loaded. Therefore, the mucky soil deposits disclosed in the borings will need to demucked if any of the development elements fall within. Mucky soils directly beneath the pond bottom may also affect the water quality in the pond. Our standard demucking recommendations are contained in Table 4.

TABLE 3. ENGINEERING USES OF SOILS

Textural Description	Engineering Uses
fine sand with roots (topsoil) fines fraction < 5%	Suitable as non-structural landscape and bulk fill outside structural areas
fine sand fines fraction: ≤ 5%	Suitable for use as structural backfill, pavement subgrade, or general purpose fill. This material is easy to work in the wet season as it is free-draining and dries fairly rapidly. When compacted, its permeability is not reduced to a degree which causes ponding.
slightly silty fine sand fines fraction: > 5%, ≤ 12%	Suitable for use as structural backfill or general purpose fill. This material can be difficult to work if its fines fraction exceeds 10%. At the higher fines fractions, it tends to become hydraulically restrictive when compacted resulting in slow subsurface drainage and "wetness" during periods of heavy rainfall.
silty fine sands fines fraction: > 12%	Suitable for use as structural backfill or general purpose fill. However, it will be excavated from below water table and may be difficult to handle and compact for the following reason: *The moisture content of the silty sands below the water table is generally 19 to 25% and its optimum moisture content for compaction is generally in the range 10 to 14%. Since the material is not free-draining, the drying process can be protracted and involve spreading of the material in thin lifts during dry spells, etc.* The material is not free-draining when compacted and can cause a perched water table. Within lots and roads, it is better to place this material 2 ft below the final grade and not in the uppermost zone of fill.
clayey sands	Marginally suitable for structural or general purpose fill. May be difficult to compact. Should be capped with a minimum of 24 inches of fine sand. Contractors generally have problems excavating shallow footings in compacted fill material comprising stiff clayey sands.

TABLE 4. RECOMMENDATIONS FOR SITE PREPARATION & DEMUCKING/BACKFILL	
ITEM	**DISCUSSION & RECOMMENDATIONS**
A.1 GENERAL	Soils-related aspects of development will be typical for this area. In the areas where only a thin layer of topsoil or organic soil is present, site preparation will include removing the existing topsoil and vegetation followed by compaction of the subgrade soils and any fill soils required to achieve final grades within the area to be filled. Structure footprint areas containing thicker deposits of surficial organics will require demucking and backfilling as described in Section A.2 of this table.
A.2 DEMUCKING IN AREAS TO BE FILLED	It is recommended that areas that are to be backfilled, if any, and which contain surficial and/or buried organics be completely demucked and backfilled with clean sand. The demucking excavation should have a 2H:1V transition slope adjacent to organic deposits which are to remain. Any removal of muck within the pavement limits shall be in accordance with Index 500 of the FDOT Roadway and Traffic Design Standards. Demucking and backfilling should be performed as follows: 1. The areas which contains organic deposits should be demucked and backfilled with clean fine sand or slightly silty fine sand relatively free of organics and debris. The surficial organic material shall be excavated to expose the underlying mineral soil. 2. Dewatering during excavating and backfilling shall be anticipated and may be accomplished by ditching and the use of sump pumps and/or other methods such as sanded well points, and vertical or horizontal suction wells. The water table shall be maintained a minimum of 2 feet below the excavated surface. *The vertical wells shall extend into the more transmissive sands beneath the organic layer to avoid blow-out during excavation*. The method of dewatering is the sole responsibility of the contractor. 3. Upon approval of the project geotechnical engineer, the excavated area may be backfilled with clean fine sand free of unsuitable or deleterious material. The fill should not be placed in standing water. 4. The backfill material shall consist of relatively clean fine sand with less than 7 percent passing the U.S. No. 200 sieve and shall be free of roots and/or other deleterious material. The material shall be compacted to a minimum density equal to at least 95 percent of the soil's Modified Proctor Density value (AASHTO T-180). The fill shall be placed in loose lift thicknesses not exceeding 12 inches. 5. A representative of the project geotechnical engineer should be retained to provide onsite inspection during the demucking operation and testing of the compacted fill to ensure compliance with the recommendations above.

4.2 SILT DEPOSITS ALONG THE EXISTING CANAL BOTTOM

Muck probe data along the existing canal bottom is shown in Figures 3.1 and 3.2. The probes generally disclosed a thin layer of soft slush on top of a thin layer of silt at nearly all probe locations. The slush deposits ranged from, 0.1 ft to 1.5 ft thick, while the silt ranged from, 0.1 ft to 3 ft thick. The silt and slush deposits will have to removed when the pond is being excavated.

4.3 Pile Recommendations For Pedestrian Walkways

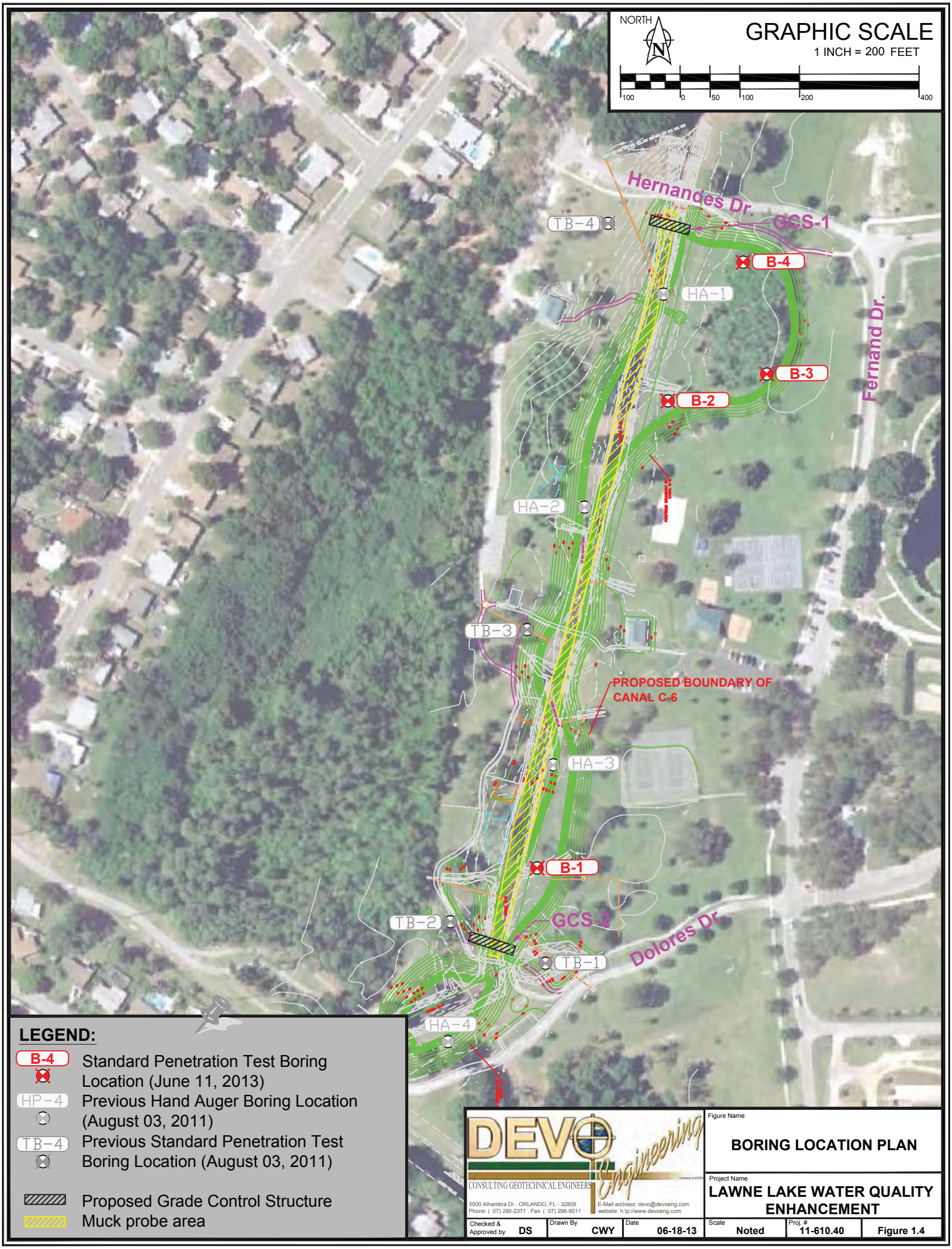
Piling recommendations are required for provided for the pedestrian walkway crossings. According to the layout provided, walkways cross the canal at three locations as follows:

A. Just south east of Boring HA-1 and east of B-2 and B-4, but within the proposed pond.
B. Just north of Boring TB-3.
C. Between TB-1 and TB-2.

Based on a pile load of 10 kips and with the understanding that 10" timber piles are being considered and the proposed pond bottom elevation is +81.0 ft, it our opinion that timber piles driven to a depth of 12 ft below the pond bottom (Pile tip Elev. +69.0 ft) or lower, will provide a safe vertical axial load capacity of approximately 10 kips at the approximate boring locations listed above. Note that these piling recommendations are not applicable to areas with deep buried layers of mucky soils below Elev. +81.0 ft. Figure 4.1 shows the boring locations where mucky soils were disclosed in the current and in the previous investigations.

In the design of the deck support system the structural engineer should give consideration to bracing the piles to restrict lateral deflection of the deck where the piles are within the pond or the canal.

Figures



LEGEND:

- B-4 — Standard Penetration Test Boring Location (June 11, 2013)
- HP-4 — Previous Hand Auger Boring Location (August 03, 2011)
- TB-4 — Previous Standard Penetration Test Boring Location (August 03, 2011)
- Proposed Grade Control Structure
- Muck probe area

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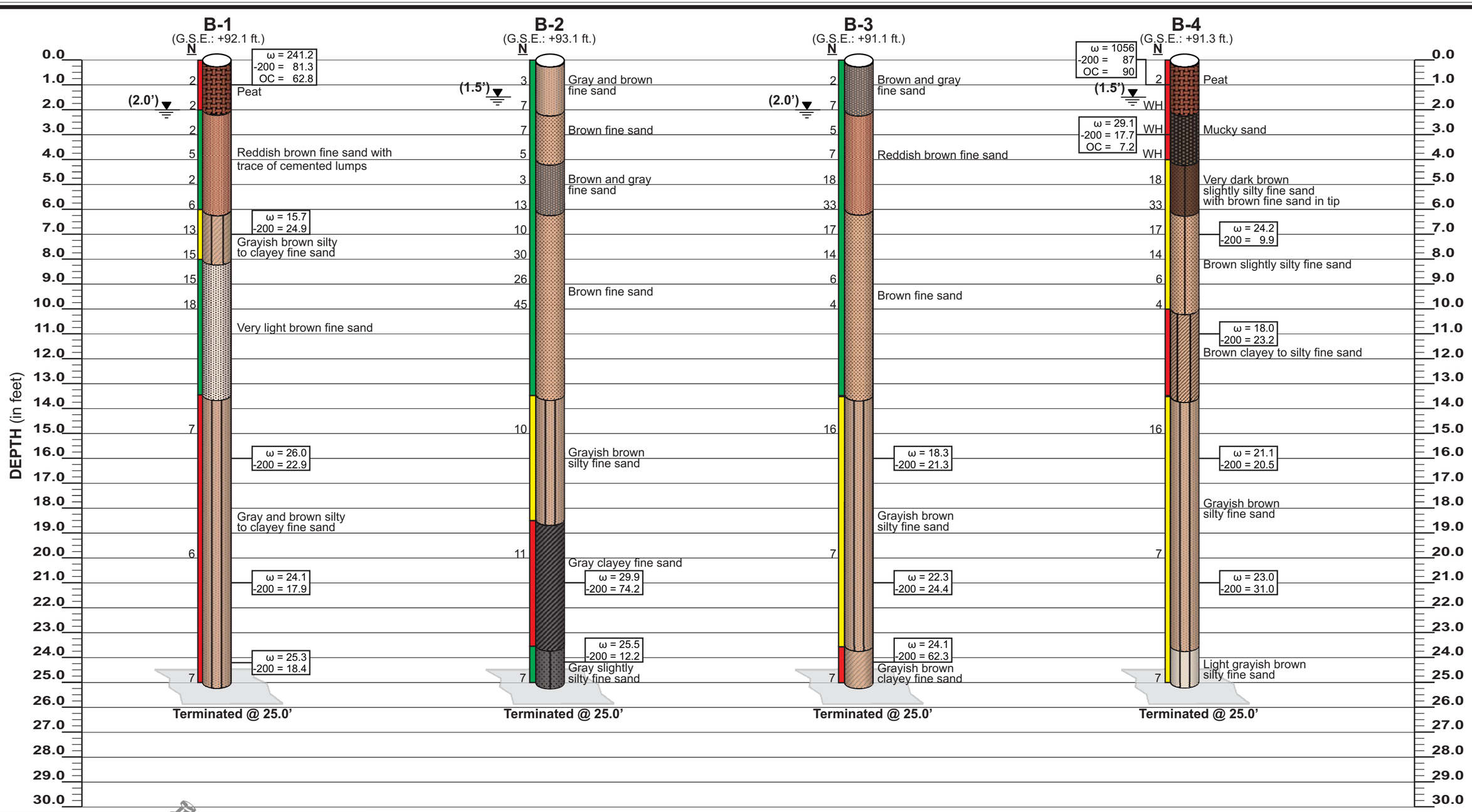
website: h tp://www.devoeng.com

Figure Name: **BORING LOCATION PLAN**

Project Name: **LAWNE LAKE WATER QUALITY ENHANCEMENT**

Checked & Approved by	Drawn By	Date	Scale	Proj. #	
DS	CWY	06-18-13	Noted	11-610.40	Figure 1.4



NOTES:

- Borings drilled on June 11, 2013
- Water level measured on date of drilling
- ω = Field moisture content %
- -200 Percent fines passing US #200 Sieve
- OC Organic content
- (G.S.E.) Surveyed ground surface elevation (ft NAVD)

Typical Correlations Between SPT "N" Values & Soil Properties

GRANULAR MATERIALS		SILTS AND CLAYS	
Relative Density	SPT (Blows/ft.)	Consistency	SPT (Blows/ft.)
Very loose	Less than 4	Very soft	Less than 2
Loose	4–10	Soft	2–4
Medium Dense	10–30	Firm	4–8
Dense	30–50	Stiff	8–15
Very Dense	Greater than 50	Very stiff	15–30
		Hard	Greater than 30

NOTES:

- Suitable fill (fine sand & slightly silty fine sand)
- Suitable but with limitations on placement and compaction (silty sand & slightly clayey sand)
- Unsuitable (clayey sand, sandy clay, clay & Muck)

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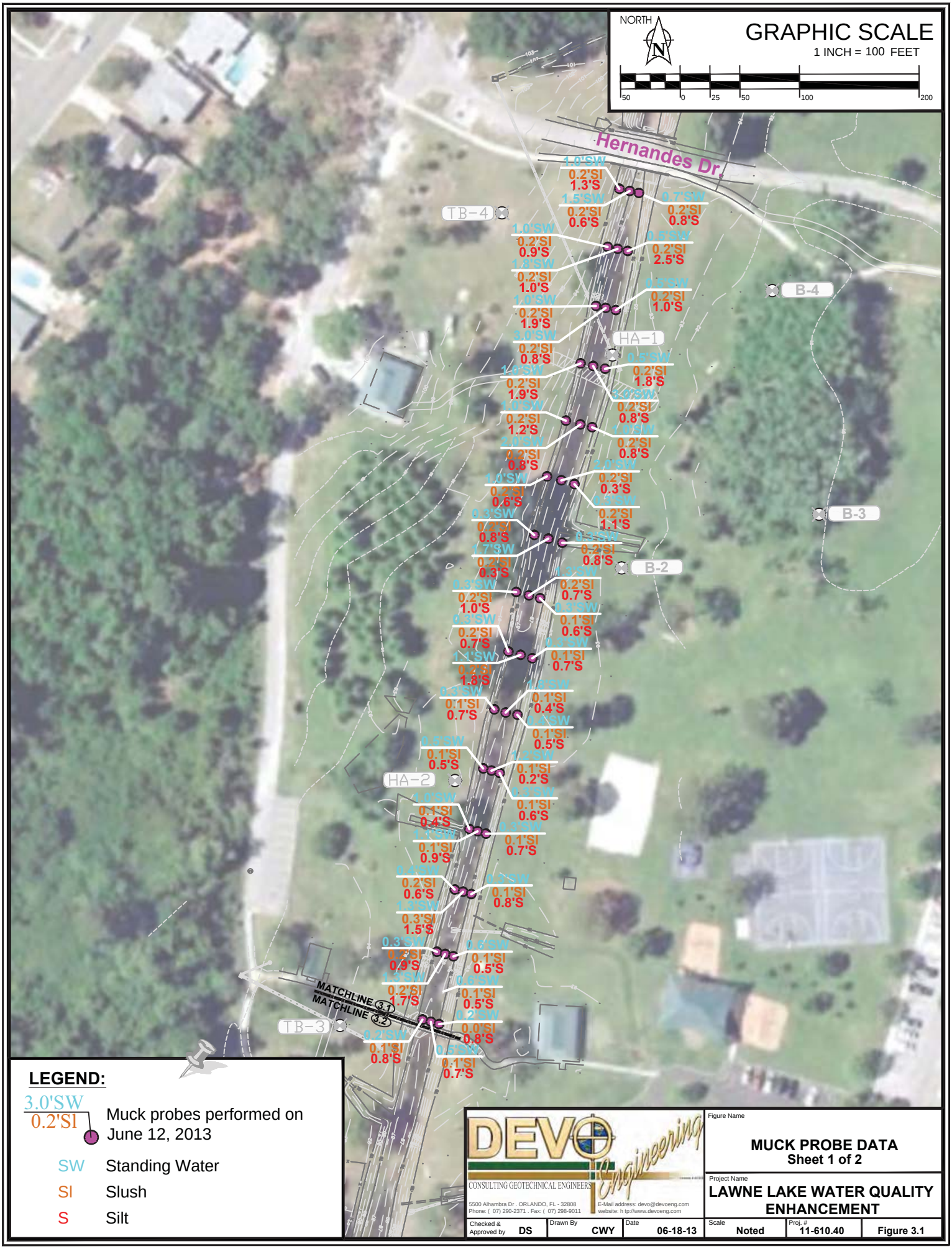
Figure Name: **SOIL PROFILES FOR B-1 TO B-4**

Project Name: **LAWNE LAKE WATER QUALITY ENHANCEMENT**

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	CWY	06-18-13	NOTED	11-610.40	Figure 2.3



LEGEND:

3.0'SW
0.2'SI

Muck probes performed on June 12, 2013

SW Standing Water

SI Slush

S Silt

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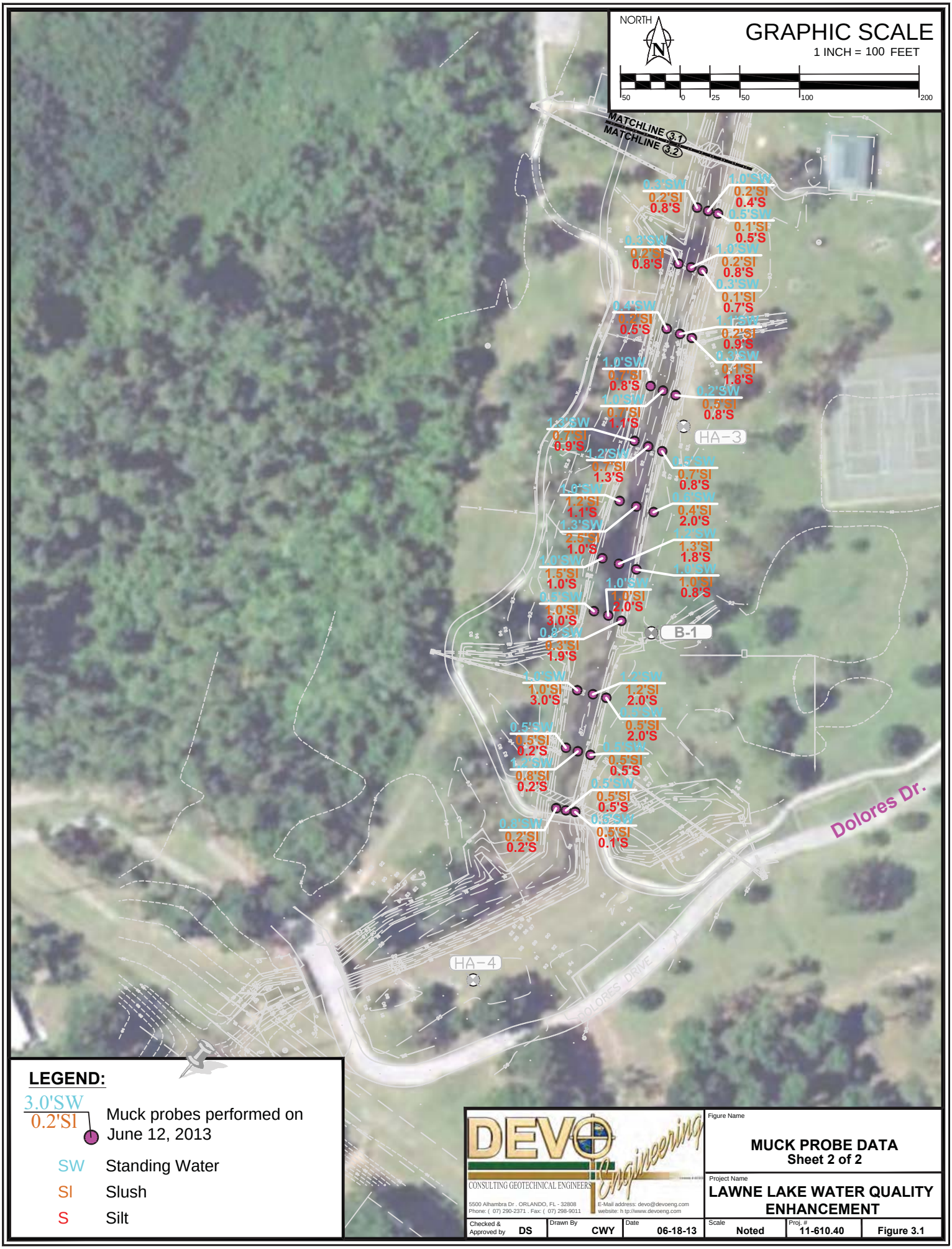
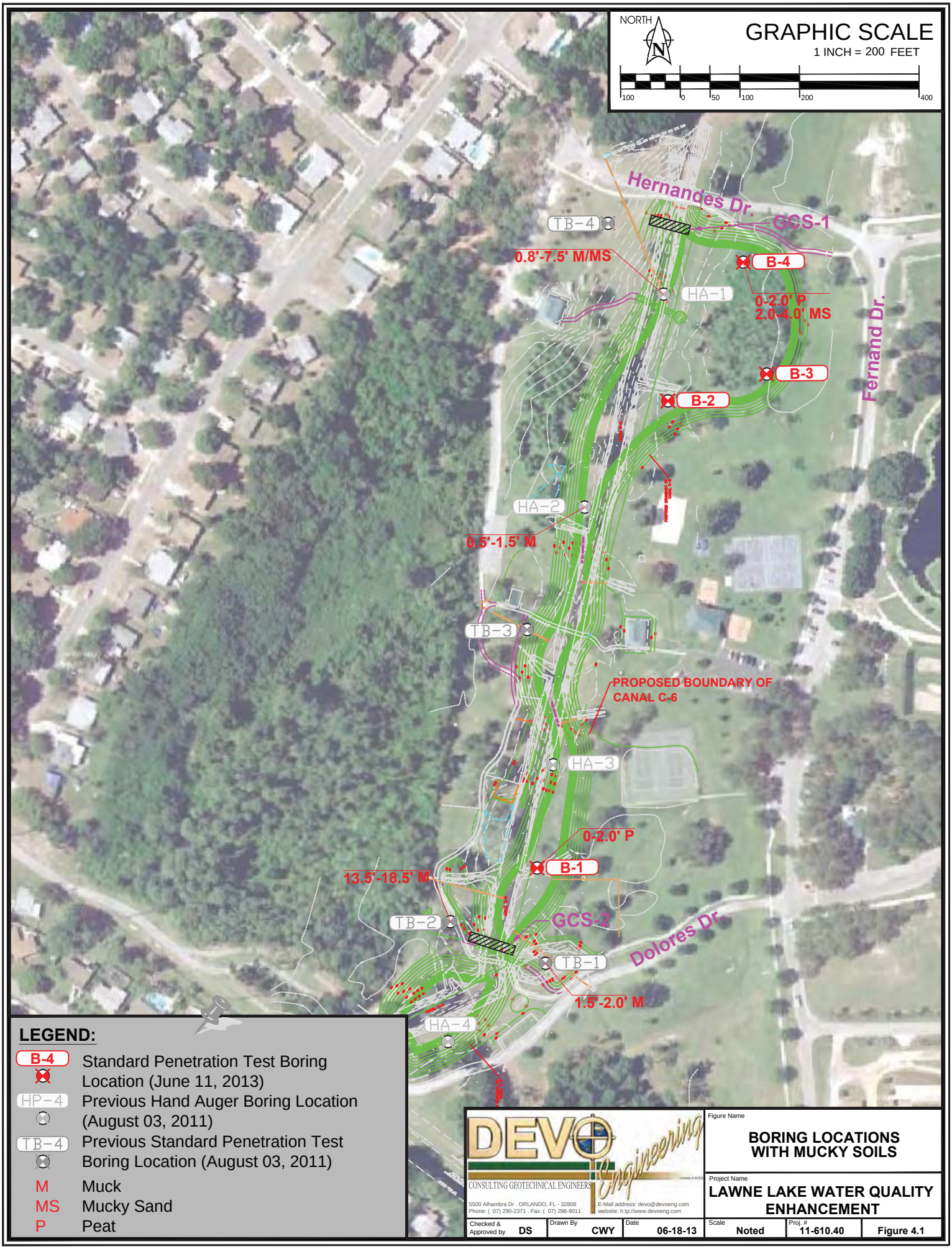
Checked & Approved by	Drawn By	Date
DS	CWY	06-18-13

Figure Name
MUCK PROBE DATA
Sheet 1 of 2

Project Name
LAWNE LAKE WATER QUALITY ENHANCEMENT

Scale	Proj. #	
Noted	11-610.40	Figure 3.1


NORTH
GRAPHIC SCALE
1 INCH = 100 FEET
50 0 25 50 100 200
MATCHLINE 3.1
MATCHLINE 3.2
HA-3
B-1
HA-4
Dolores Dr.
DOLORES DRIVE
0.3'SW 0.2'SI 0.8'S
1.0'SW 0.2'SI 0.4'S
0.5'SW 0.1'SI 0.5'S
0.3'SW 0.2'SI 0.8'S
1.0'SW 0.2'SI 0.8'S
0.3'SW 0.1'SI 0.7'S
0.4'SW 0.2'SI 0.5'S
1.1'SW 0.2'SI 0.9'S
0.3'SW 0.1'SI 1.8'S
1.0'SW 0.7'SI 0.8'S
0.2'SW 0.5'SI 0.8'S
1.0'SW 0.7'SI 1.1'S
1.2'SW 0.7'SI 0.9'S
1.2'SW 0.7'SI 1.3'S
1.5'SW 0.7'SI 0.8'S
1.0'SW 1.2'SI 1.1'S
0.6'SW 0.4'SI 2.0'S
1.3'SW 2.5'SI 1.0'S
1.2'SW 1.3'SI 1.8'S
1.0'SW 1.5'SI 1.0'S
1.0'SW 1.0'SI 0.8'S
0.5'SW 1.0'SI 3.0'S
1.0'SW 1.0'SI 2.0'S
0.8'SW 0.3'SI 1.9'S
1.0'SW 1.0'SI 3.0'S
1.2'SW 1.2'SI 2.0'S
1.5'SW 0.5'SI 2.0'S
0.5'SW 0.5'SI 0.2'S
0.5'SW 0.5'SI 0.5'S
1.2'SW 0.8'SI 0.2'S
0.5'SW 0.5'SI 0.5'S
0.8'SW 0.2'SI 0.2'S
0.6'SW 0.5'SI 0.1'S
LEGEND:
3.0'SW
0.2'SI
Muck probes performed on June 12, 2013
SW Standing Water
SI Slush
S Silt
DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS
5500 Alhambra Dr . ORLANDO, FL - 32808
Phone: (07) 290-2371 . Fax: (07) 298-9011
E-Mail address: devo@devoeng.com
website: h tp://www.devoeng.com
Figure Name
MUCK PROBE DATA
Sheet 2 of 2
Project Name
LAWNE LAKE WATER QUALITY ENHANCEMENT
Checked & Approved by DS
Drawn By CWY
Date 06-18-13
Scale Noted
Proj. # 11-610.40
Figure 3.1


NORTH
GRAPHIC SCALE
1 INCH = 200 FEET
100
0
50
100
200
400
Hernandes Dr.
GCS-1
TB-4
0.8'-7.5' M/MS
B-4
HA-1
0-2.0' P
2.0-4.0' MS
B-3
B-2
Fernand Dr.
HA-2
0.5'-1.5' M
TB-3
PROPOSED BOUNDARY OF
CANAL C-6
HA-3
0-2.0' P
B-1
13.5'-18.5' M
TB-2
GCS-2
Dolores Dr.
TB-1
1.5'-2.0' M
HA-4
LEGEND:
B-4
Standard Penetration Test Boring Location (June 11, 2013)
HP-4
Previous Hand Auger Boring Location (August 03, 2011)
TB-4
Previous Standard Penetration Test Boring Location (August 03, 2011)
M
Muck
MS
Mucky Sand
P
Peat
DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS
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Phone: (07) 290-2371 . Fax: (07) 298-9011
E-Mail address: devo@devoeng.com
website: h tp://www.devoeng.com
Figure Name
BORING LOCATIONS WITH MUCKY SOILS
Project Name
LAWNE LAKE WATER QUALITY ENHANCEMENT
Checked & Approved by DS
Drawn By CWY
Date 06-18-13
Scale Noted
Proj. # 11-610.40
Figure 4.1

Geotechnical and Environmental Consultants, Inc.
At the very foundation of our community

February 9, 2017

Inwood Consulting Engineers
3000 Dovera Dr., Suite 200
Oviedo, FL 32765

Attention: Mr. Steve Sommerfeldt, P.E., CFM

Subject: Letter of Geotechnical Engineering Investigation
LAKE LAWNE IRRIGATION STORMWATER FACILITY AT BARNETT PARK
Muck Removal Evaluation
Orange County, Florida
GEC Project No. 3935G

Dear Mr. Sommerfeldt:

Geotechnical and Environmental Consultants, Inc. (GEC) is pleased to present this letter of Geotechnical Engineering Investigation for the above-referenced project. This investigation was performed in general accordance with the scope of work described in our Proposal No. 8620G, dated April 21, 2016 and revised June 16, 2016. The purpose of this additional investigation was to explore soil and groundwater conditions at the project site to better evaluate the extent of the muck soils encountered in the previous investigation and to correlate with previous geotechnical data to estimate the limits and quantity of muck removal needed for stormwater pond construction. This letter presents the results of our field investigation and our geotechnical engineering recommendations.

SITE LOCATION AND PROJECT DESCRIPTION

The project site is located just north of Dolores Drive and south of Hernandes Drive within the existing C-6 drainage canal system (in Orange County's Barnett Park) in Orlando, Florida. The subject site occupies about 1,750 linear feet and currently serves as a conveyance system for stormwater from surrounding areas and discharges into Lawne Lake. The canal system is bordered by grassed fields, recreational areas and paved walkways and roads. According to the United States Geological Survey (USGS) Orlando West, Florida Quadrangle map, the topography at the site

grades from approximately +96 to +92 feet NGVD south to north. The USGS Quadrangle map, Orlando West, depicts this area as a former wetland/swamp feature prior to development.

Project plans include the design and construction of a regional stormwater facility (RSF) that will be integrated into the existing C-6 canal system. The RSF is planned to treat stormwater influent and reuse for irrigation purposes.

NRCS Soil Survey Map

The Natural Resources Conservation Service (NRCS) Soil Survey of Orange County, Florida was reviewed for near-surface soil and groundwater information at the project site. The NRCS soils at the project site are predominately identified as Basinger fine sand, depressional, 0 to 1 percent slopes (Soil Unit No. 3). This soil type is nearly level and very poorly drained in shallow depressions. Undrained areas containing this soil type can be ponded for 6 to 9 months or more each year. According to the NRCS Soil Survey the estimated seasonal high groundwater levels ranges from the existing ground surface to 2 feet above the ground surface.

In addition, the NRCS Soil Survey map depicts Arents, nearly level soils (Soil Unit No. 1) at the project site. Arents soils are the result of numerous earthmoving and filling activities which result in non-indigenous soils with high variability in physical and chemical properties.

Information contained in the NRCS Soil Survey is very general and may be outdated. It may not, therefore, be reflective of the actual soil and groundwater conditions, particularly if recent development in the site vicinity has modified soil conditions or surface/subsurface drainage. The NRCS seasonal high groundwater levels do not account for changes in groundwater due to development and are only relevant for the natural, undisturbed condition of the soils. The information obtained from the soil borings presented in this report should be considered a more current and accurate characterization of actual site soil and groundwater conditions.

Figure 1 shows the project site on an excerpt from the USGS Orlando West, Florida Quadrangle Map and an excerpt from the NRCS Soil Survey Map of Orange County.

USGS Potentiometric Map Data

Based on the USGS map entitled "The Potentiometric Surface of the Upper Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 2008" the potentiometric level of the Floridan aquifer in the vicinity of the subject site is approximately +55 feet NGVD. Based on review of the USGS Quadrangle map and topographic survey information provided by Southeastern Surveying and Mapping Corporation, the ground surface elevations at

the subject site ranges from approximately +91 to +94 feet NAVD; therefore, artesian flow conditions are not anticipated at this site. Artesian groundwater conditions were not encountered in our soil borings.

FIELD INVESTIGATION PROGRAM

GEC conducted an additional subsurface exploration to evaluate the soil and groundwater conditions at the project site to evaluate the extent of the muck soils. Our subsurface exploration program consisted of performing 6 machine auger borings to a planned depth of 20 feet below the existing ground surface near previous borings that encountered organic (muck) soils along the C-6 canal alignment.

The locations of the borings were established in the field by using aerial plan views (**Figure 2**) and handheld, sub-meter accuracy Global Positioning Satellite (GPS) unit (Trimble GEO XH), but later surveyed by Southeastern Surveying and Mapping Corp., for horizontal and vertical control.

LABORATORY TESTING

Selected soil samples retrieved from the boring was tested in general accordance with Florida Standard Testing Methods (FM). Florida Standard Testing Methods are adaptations of recognized standard methods, e.g., ASTM and AASHTO, which have been modified to accommodate Florida's geological conditions. The GEC laboratory is reviewed annually by the Construction Materials Engineering Council, Inc. (CMEC) to verify compliance with FM. Our laboratory testing program is summarized in the following table:

Table 1
Summary of Laboratory Testing Program

Type of Test	Number of Tests
Percent Fines (FM 1-T088)	4
Organic Content (FM 1 - T267)	6
Natural Moisture Content (FM 1-T265)	6

The results of our laboratory tests are shown adjacent to the soil profiles on the attached Pond Boring Results sheet **Figure 2**.

DESCRIPTION OF SUBSURFACE CONDITIONS

…5 of the 6 borings encountered …mucky fine sand to sandy muck to muck

The six machine auger borings (AB-1 to AB-6) mainly encountered fine sand soils with varying amounts of silt content (SP, SP-SM, SM, SC or Strata Nos. 1 and 2) from the existing ground surface to the boring termination depth of 20 feet below grade. However, 5 of the 6 borings encountered a layer of mucky fine sand to sandy muck to muck (PT or Stratum No. 4) from ground surface to depths of 1 to 7.5 feet. The organic content of this muck soil ranged from 8% to 147%. A layer of sandy lean clay to clay (CL or Stratum No. 3) was encountered at boring locations AB-1 and AB-3 from approximate depths of 12 to 19 feet below grade.

The encountered groundwater elevations at the site ranged from +88.7 to +89.7 feet NAVD (or about 2.3 to 4.9 feet below the ground surface). However, groundwater elevations ranged from +90.3 to +90.5 at boring locations AB-5 and AB-6. These shallower groundwater tables are due to the proximity of the borings to the low-lying, wetland feature at the proposed stormwater pond bayhead. The estimated seasonal high groundwater elevations range from approximately +90.1 to +91.0 feet NAVD. The estimated seasonal high water elevation for boring locations AB-5 and AB-6 is anticipated to be above the ground surface, indicated by "AGS" on the boring profiles. The height to which the water may rise above ground should be evaluated by the Drainage Engineer

Please refer to the attached Pond Boring Results sheet **Figure 3** for the specific subsurface profile at the boring locations, as well as the encountered and estimated seasonal high groundwater elevations.

FILL SUITABILITY

The following summarizes the suitability of the encountered soil strata as described above. In addition, a color code has been assigned to each soil stratum to aid in visual identification of the soil utilization on the Pond Boring Results sheet. The color code system utilized herein coincides with the color codes used in the previous study.

Summary of Stratum Fill Utilization

Color Code	Stratum Nos.	Unified Soil Classification	Fill Suitability	Limitations As Fill Material
	1	SP, SP-SM	Suitable	Strip surficial organic top soil.
	2	SM, SC	Suitable with Limitations	Will require more handling to dry, place and compact. Thinner lifts may be required.
	3	CL	Not Suitable	Not suitable due to high fines and plasticity.
	4	PT	Not Suitable	Not suitable due to organic content (8% to 147%)

ANALYSES AND RECOMMENDATIONS

The analyses and recommendations contained in this letter are based in part on the data obtained from a limited number of soil samples and groundwater measurements obtained from a limited amount of borings. The investigation methods used indicate subsurface conditions only at specific boring locations, only at the time it was performed, and only to the depth penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist outside of boring locations and these variations may not become evident until construction. If variations from the conditions described in this report do become evident during construction, or if project characteristics described in this report change, GEC should be retained so that we can reevaluate this report's conclusions and recommendations in light of such changes.

If variations …become evident during construction, …GEC should be retained so that we can reevaluate this report's conclusions and recommendations…

Subsurface conditions, including groundwater levels, at other areas of the site may differ from conditions we encountered at the boring locations to compute this muck removal estimate. Moreover, conditions at the boring locations can change over time. Groundwater levels fluctuate seasonally, and soil conditions can be altered by earthmoving operations.

The depths and thicknesses of the subsurface strata indicated on the boring logs were interpolated between samples obtained at different depths in the borings. The actual transition between soil layers may be different than indicated. *These stratification lines were used for our analytical purposes. Earthwork quantity estimates based on the results of the borings will vary from the actual quantities measured during construction.*

Estimated Muck Removal Quantity

GEC has utilized previous geotechnical data performed by others (5 auger borings) and current data obtained during this investigation (6 auger borings) to evaluate the extent of the muck soils

present at the project site. This data was then used to estimate of total quantity of muck soils to be removed during the proposed pond excavation. GEC used the soil boring data and provided ASCII files to CPWG to plot the borings on the cross sections. Then GEC drew estimated muck removal limits on the cross sections for CPWG to plot. GEC then used the plotted cross sections to calculate the areas and volumes of muck to be removed during the proposed pond construction. Based on this methodology, GEC estimated approximately 12,558 cubic yards of muck soils to be removed from the stormwater pond footprint from approximate station 10+75 to 26+50. Based on the pond cross sections and available borings, all identified muck soils occur above the proposed pond bottom. Therefore, it is anticipated that the encountered muck would be removed as part of the normal pond excavation. No additional muck over-excavation is required for the pond. The estimate specified herein was quantified using the FDOT Average End Area methodology from the Plans Preparation Manual Section 3.4.1. The cross sections and calculations for muck removal are included in the **Appendix**.

…GEC estimated approximately 12,558 cubic yards of muck soils to be removed…

Please note that this muck soil removal quantity should be considered an approximate quantity and is dependent on the methodology and limitations described herein. Depths of muck soils can vary widely from boring to boring and resulting volumes will adjust accordingly. We recommend that a geotechnical engineering technician be retained during construction to observe and monitor demucking as detailed in the **Quality Assurance** section of this report.

…muck soil removal quantity should be considered an approximate quantity…

QUALITY ASSURANCE

We recommend establishing a comprehensive quality assurance program to verify that all site preparation is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by Geotechnical and Environmental Consultants, Inc. due to our familiarity with the site conditions and the intent of our recommendations.

As a minimum, we recommend that a geotechnical engineering technician provide on-site visual inspection during stripping, grubbing and pond excavation operations to ensure that the contractor removes all the deleterious soils, yet does not remove acceptable fill soils and treat them as muck. It is our experience that acceptable soils are sometimes conservatively removed by the contractor because the soils are dark brown in color and appear similar to the unsuitable muck soils. A geotechnical engineering technician proficient in soil classification can easily determine which soils can remain and thereby save unsuitable

…we recommend that a geotechnical engineering technician provide on-site visual inspection…

soil removal and backfill costs.

USE OF THIS LETTER

GEC has prepared this letter for the exclusive use of our client, Inwood Consulting Engineers, and Orange County for specific application to our client's project. GEC will not be held responsible for any other party's interpretation or use of this letter's subsurface data or engineering analysis without our written authorization.

The sole purpose of the borings performed by GEC at this site was to obtain indications of subsurface conditions as part of a geotechnical exploration program. GEC has not evaluated the site for the potential presence of contaminated soil or groundwater, nor have we subjected any soil samples to analysis for contaminants.

GEC has strived to provide the services described in this report in a manner consistent with that level of care and skill ordinarily exercised by members of our profession currently practicing in Central Florida. No other representation is made or implied in this document.

GEC appreciates the opportunity to work with Inwood and Orange County on this project. If you should have any questions regarding the contents of this letter, or if we may be of further assistance, please contact us.

Very truly yours,

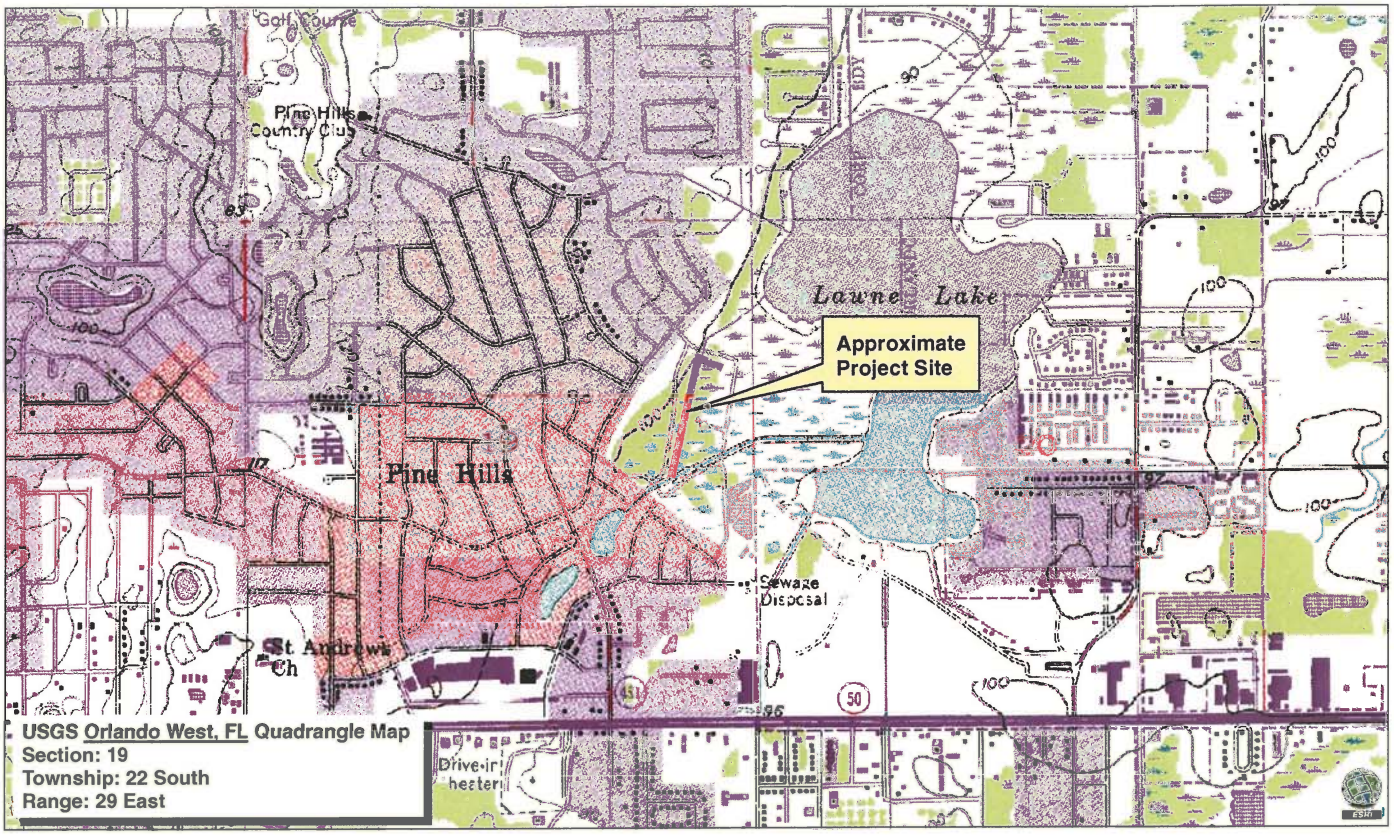
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS, INC.
919 Lake Baldwin Lane
Orlando, Florida 32814
Certificate of Authorization No. 5882

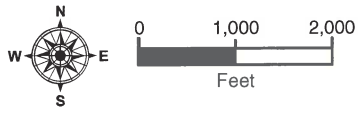
2/9/17
Kevin Baboolall, E.I.
Engineer Intern

Christopher P. Meyer, P.E.
Geotechnical Services Manager
Florida License No. 49328

GPB/CPM/dbj

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS





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Certificate of Authorization No. 00005882
CHRISTOPHER P. MEYER P.E. NO. 49328

GEC

PROJECT NO.	3935G
DATE	10/11/2016
DRAWN BY	SKR
CHECKED BY	GPB
CHECKED BY	CPM 49328

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS

LAKE LAWNE IRRIGATION STORMWATER FACILITY AT BARNETT PARK

FIGURE NO. 1

J:\D121\3935G Lake Lawne Irrigation\3935Gmaps.mxd 10/11/2016

BORING LOCATION PLAN

APPROXIMATE AUGER BORING LOCATION

APPROXIMATE BORING LOCATIONS PERFORMED BY OTHERS

0 100 200
Feet

N W E S

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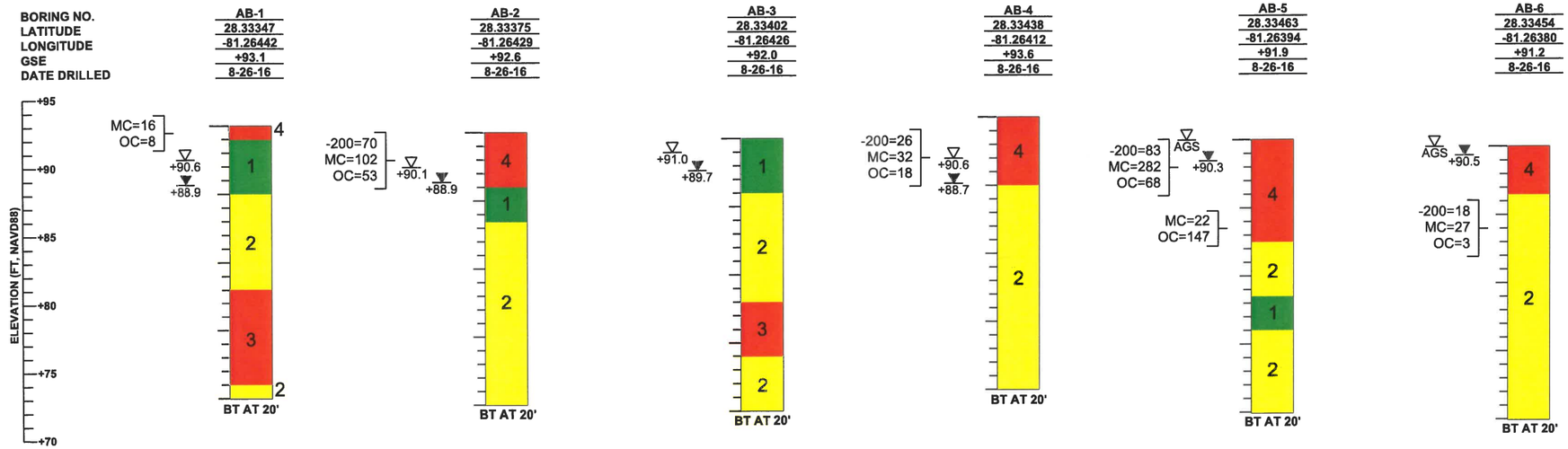
BORING LOCATION PLAN

LAKE LAWNE IRRIGATION STORMWATER FACILITY AT BARNETT PARK

FIGURE NO. 2

J:\D121\3935G Lake Lawne Irrigation\3935G.mxd 11/9/2016

POND BORING RESULTS



LEGEND

- **GSE** GROUND SURFACE LEVATION (FT. NAVD88)
- ▽ AGS ESTIMATED SEASONAL HIGH WATER LEVEL ABOVE GROUND SURFACE
- ▽ +90.6 ESTIMATED SEASONAL HIGH GROUNDWATER ELEVATION (FT. NAVD88)
- ▼ +88.9 ENCOUNTERED GROUNDWATER ELEVATION (FT. NAVD88) 24 HRS. AFTER DATE DRILLED
- **BT** BORING TERMINATED AT DEPTH INDICATED
- -200= PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
- MC= PERCENT NATURAL MOISTURE CONTENT
- OC= PERCENT ORGANIC CONTENT

GENERAL NOTES

SUBSURFACE CONDITIONS SHOWN ON THE BORINGS REPRESENT THE CONDITIONS ENCOUNTERED AT THE BORING LOCATIONS. ACTUAL CONDITIONS BETWEEN THE BORINGS MAY VARY FROM THOSE SHOWN. UNIFIED SOIL CLASSIFICATIONS SHOWN ON THE BORINGS ARE BASED ON VISUAL EXAMINATION AND THE LABORATORY TESTING SHOWN.

BORING LOCATIONS WERE ESTABLISHED IN THE FIELD USING AERIAL PLAN VIEWS AND A SUB-METER ACCURACY GPS UNIT (TRIMBLE GEO XH), BUT LATER SURVEYED BY SOUTHEASTERN SURVEYING AND MAPPING CORPORATION FOR HORIZONTAL AND VERTICAL CONTROL.

FILL UTILIZATION COLOR CODE	STRATUM NO.	UNIFIED CLASSIFICATION	SOIL DESCRIPTION	FILL SUITABILITY	LIMITATIONS AS FILL MATERIAL
	1	SP, SP-SM	BROWN TO DARK BROWN FINE SAND TO FINE SAND WITH SILT, OCCASIONAL TRACE ORGANIC MATERIAL	SUITABLE	STRIP ORGANIC TOP SOIL
	2	SM, SC	GRAY TO BROWN TO LIGHT BROWN SILTY FINE SAND TO CLAYEY FINE SAND	SUITABLE WITH LIMITATIONS	WILL REQUIRE MORE HANDLING TO DRY, PLACE AND COMPACT. THINNER LIFTS MAY BE REQUIRED
	3	CL	GRAY SANDY LEAN CLAY TO LEAN CLAY	NOT SUITABLE	NOT SUITABLE DUE TO HIGH FINES AND PLASTICITY
	4	PT	DARK BROWN MUCKY FINE SAND TO SANDY MUCK TO MUCK	NOT SUITABLE	NOT SUITABLE DUE TO ORGANIC CONTENT (8% TO 147%)

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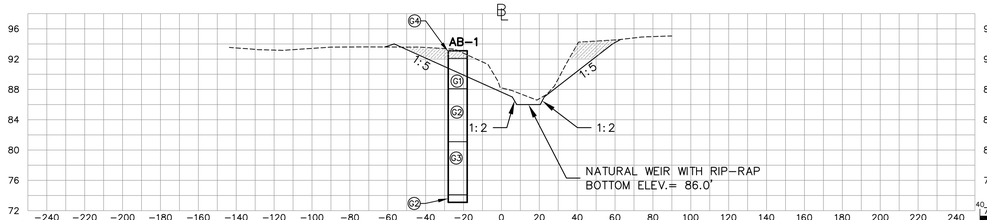
CHECKED BY	GPB
CHECKED BY	CPM 49328

POND BORING RESULTS
LAKE LAWNE IRRIGATION STORMWATER FACILITY AT BARNETT PARK

FIGURE NO. 3

PROJECT CROSS SECTIONS AND ESTIMATED MUCK REMOVAL QUANITY

13+50



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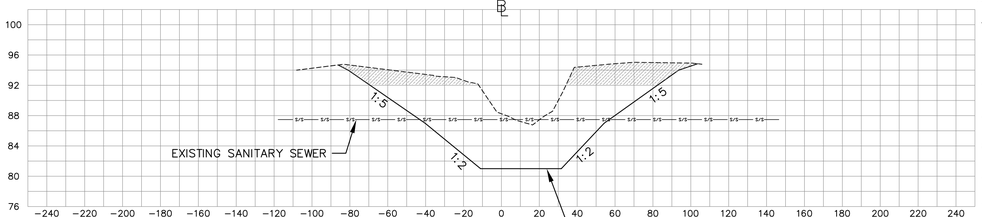

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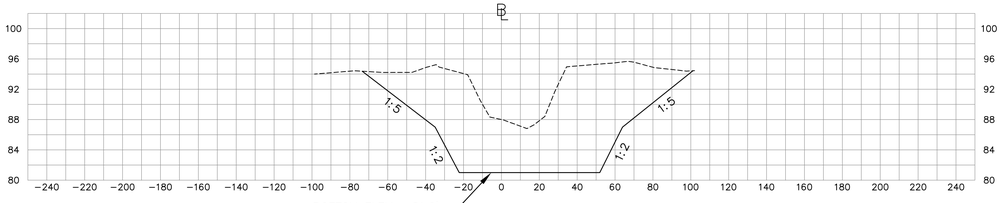

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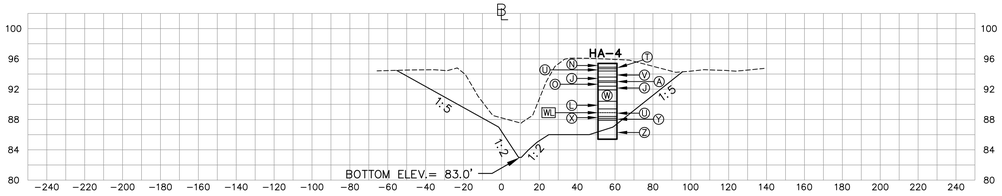

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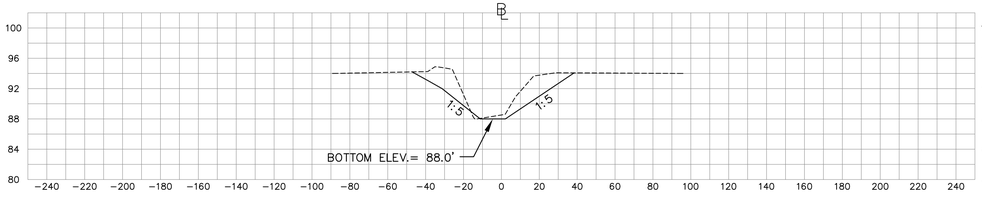

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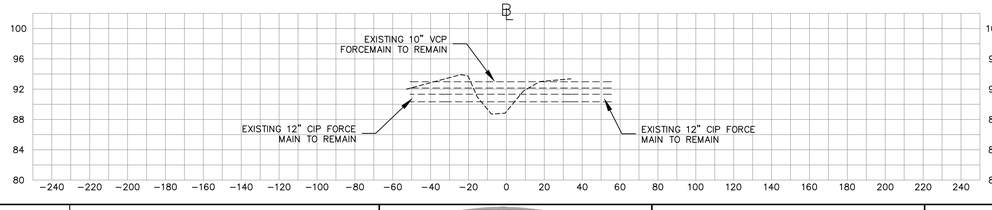
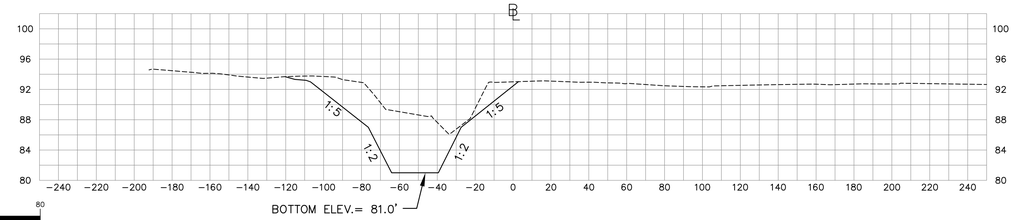


HORIZ. 1"=40' / VERT. 1"=10'

19+00



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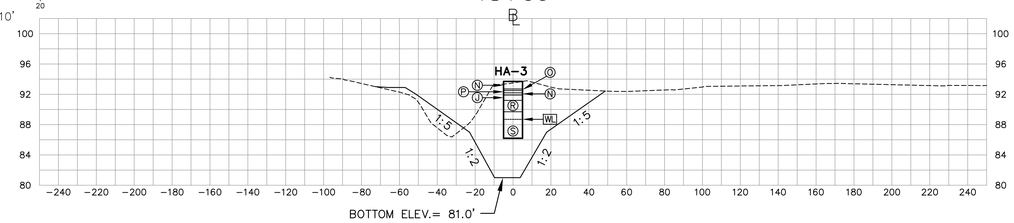

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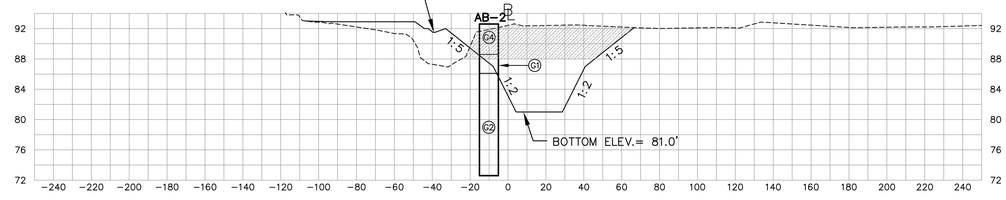

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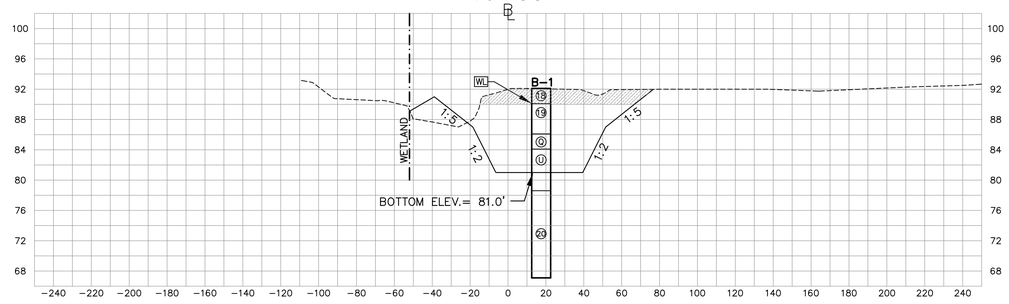

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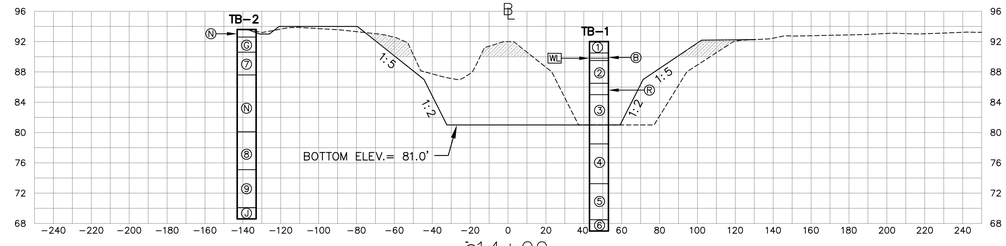

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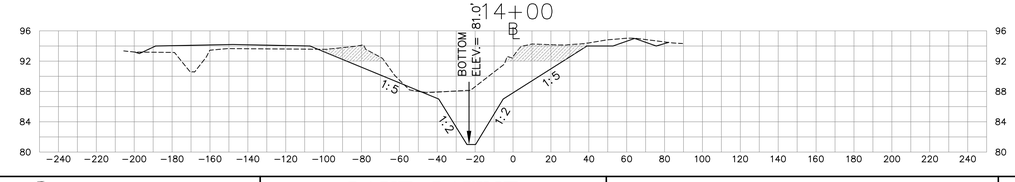

NO.	DATE	REVISION

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3000 Dovera Drive, Suite 200
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Phone: 407.971.8890

CPWG
CRIBB PHILBECK WEAVER GROUP
COA NO. 26618

JEFFREY EARHART, PE
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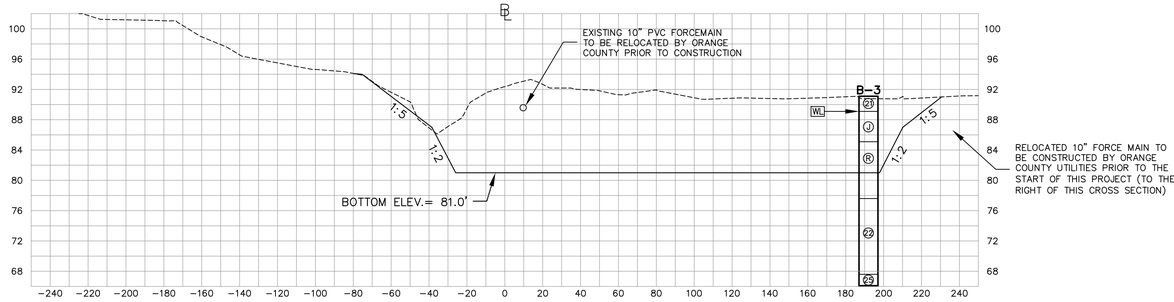
ORANGE COUNTY GOVERNMENT FLORIDA

LAKE LAWNE
REGIONAL STORMWATER FACILITY AT BARNETT PARK
ORANGE COUNTY, FLORIDA

POND CROSS SECTIONS

SHEET NUMBER 15
OF 26 SHEETS

25+00



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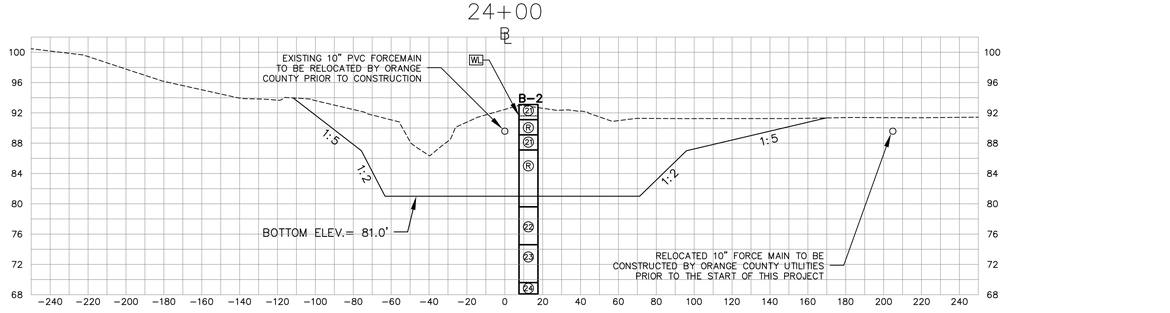

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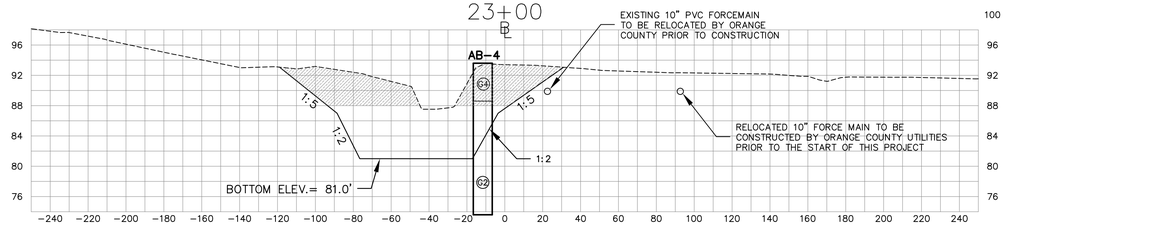

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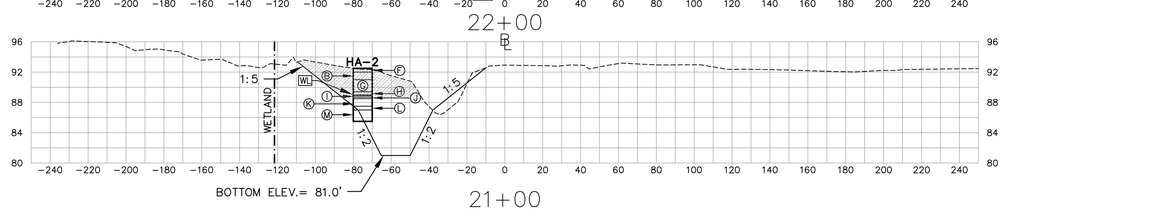

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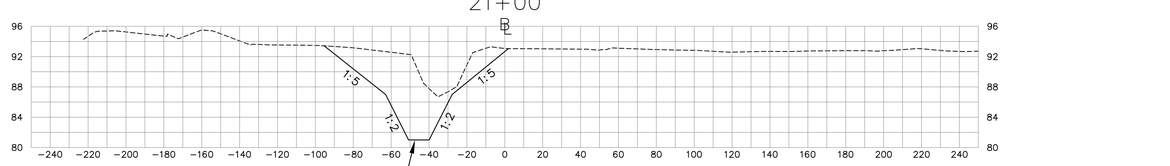

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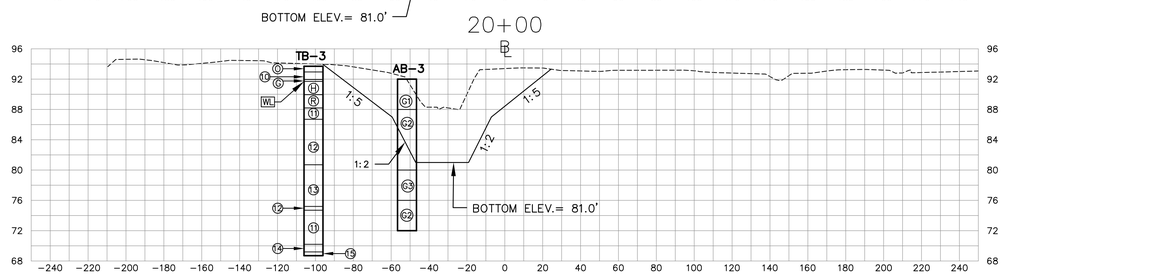


STATION	CUT OR FILL	VOLUME (CY)	STATION	CUT OR FILL	VOLUME (CY)
10+75	Cut	0	10+75	Fill	0
11+00	Cut	89	11+00	Fill	2
12+00	Cut	1,607	12+00	Fill	3
12+50	Cut	1,899	12+50	Fill	0
13+00	Cut	2,256	13+00	Fill	0
13+50	Cut	1,754	13+50	Fill	2
14+00	Cut	1,109	14+00	Fill	81
15+00	Cut	1,970	15+00	Fill	575
16+00	Cut	2,541	16+00	Fill	531
17+00	Cut	2,458	17+00	Fill	402
18+00	Cut	1,989	18+00	Fill	391
19+00	Cut	1,724	19+00	Fill	103
20+00	Cut	1,987	20+00	Fill	0
21+00	Cut	1,872	21+00	Fill	0
22+00	Cut	1,475	22+00	Fill	39
23+00	Cut	2,537	23+00	Fill	39
24+00	Cut	5,232	24+00	Fill	0
25+00	Cut	8,048	25+00	Fill	6
26+00	Cut	8,771	26+00	Fill	166
26+50	Cut	4,004	26+50	Fill	136
TOTAL	Cut	53,323	TOTAL	Fill	2,475

NOTE: CROSS SECTIONS 25+00, 26+00 AND 26+50 HAVE A RELOCATED 10" FORCE MAIN TO THE RIGHT AND EXTANEDS OFF OF THE CROSS SECTION THAT IS TO BE CONSTRUCTED BY ORANGE COUNTY UTILITIES PRIOR TO THE START OF THIS PROJECT.

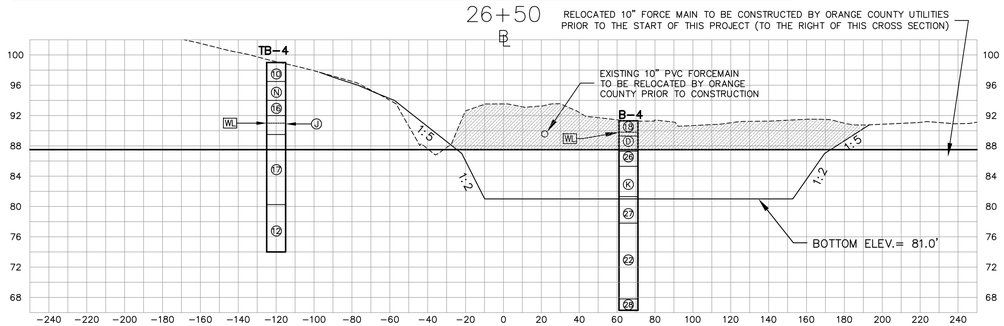
= APPROXIMATE LIMITS OF MUCK

HORIZ. 1"=40' / VERT. 1"=10'

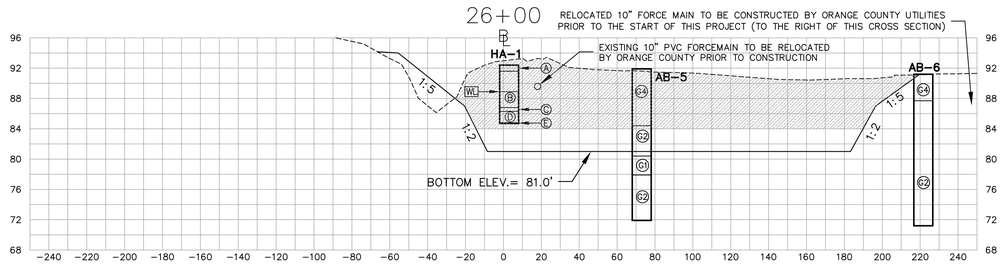
WL = WATER LEVEL MEASURED ON DATE OF DRILLING

ID	SOIL TYPE	ID	SOIL TYPE	ID	SOIL TYPE
A	DARK BROWNISH GRAY FINE SAND	4	LIGHT GRAYISH BROWN SILTY FINE SAND TO SLIGHTLY CLAYEY FINE SAND	G1	SPSM - SAND
B	MUCK			G2	SILTY FINE SAND/CLAY FINE SAND
C	SANDY MUCK	5	GRAYISH GREEN CLAY	G3	LEAN CLAY
D	MUCKY SAND	6	LIGHT GRAY FINE SAND	G4	MUCK
E	NO RECOVERY	7	GRAYISH BROWN SLIGHTLY SILTY FINE SAND MIX		
F	BROWNISH GRAY SLIGHTLY BROWN FINE SAND	8	VERY DARK REDDISH BROWN SLIGHTLY MUCKY SAND		
G	VERY DARK REDDISH BROWN FINE SAND	9	VERY DARK GRAYISH BROWN SILTY FINE SAND		
H	DARK REDDISH BROWN FINE SAND	10	LIGHT GRAYISH BROWN FINE SAND		
I	DARK REDDISH BROWN MUCKY SAND	11	VERY LIGHT GRAYISH BROWN FINE SAND		
J	REDDISH BROWN FINE SAND	12	VERY LIGHT GRAYISH BROWN CLAYEY FINE SAND		
K	BROWN SLIGHTLY SILTY FINE SAND	13	VERY LIGHT GRAYISH BROWN SILTY FINE SAND TO CLAYEY FINE SAND		
L	LIGHT BROWN FINE SAND				
M	LIGHT BROWNISH GRAY CLAYEY FINE SAND	14	LIGHT GRAYISH GREEN CLAYEY FINE SAND		
N	GRAYISH BROWN FINE SAND	15	LIGHT GRAYISH GREEN SILTY FINE SAND TO CLAYEY FINE SAND		
O	BROWNISH GRAY FINE SAND				
P	GRAY FINE SAND	16	BROWN TO REDDISH BROWN FINE SAND		
Q	GRAYISH BROWN FINE SAND	17	DARK REDDISH BROWN SLIGHTLY SILTY FINE SAND		
R	BROWN FINE SAND	18	PEAT		
S	LIGHT BROWN SLIGHTLY SILTY FINE SAND	19	REDDISH BROWN FINE SAND WITH TRACE OF CEMENTED LUMPS		
T	LIGHT BROWN CLAYEY FINE SAND				
U	VERY LIGHT BROWN FINE SAND	20	GRAY AND BROWN SILTY TO CLAYEY FINE SAND		
V	VERY LIGHT BROWN AND BROWN FINE SAND	21	BROWN AND GRAY FINE SAND		
W	BROWN SLIGHTLY SILTY FINE SAND	22	GRAYISH BROWN SILTY FINE SAND		
X	LIGHT BROWN SILTY FINE SAND	23	GRAY CLAYEY FINE SAND		
Y	LIGHT BROWN CLAYEY FINE SAND	24	GRAY SLIGHTLY SILTY FINE SAND		
Z	LIGHT BROWNISH GRAY SILTY FINE SAND TO SLIGHTLY CLAYEY FINE SAND	25	GRAYISH BROWN CLAYEY FINE SAND		
		26	VERY DARK BROWN SLIGHTLY SILTY FINE SAND WITH BROWN FINE SAND IN TIP		
1	DARK GRAY FINE SAND				
2	VERY DARK BROWN SLIGHTLY SILTY FINE SAND	27	BROWN CLAYEY TO SILTY FINE SAND		
3	LIGHT GRAYISH BROWN SILTY FINE SAND TO CLAYEY FINE SAND	28	LIGHT GRAYISH BROWN SILTY FINE SAND		

26+50



26+00



NO.	DATE	REVISION

Inwood consulting engineers
3000 Dovera Drive, Suite 200
Oviedo, Florida 32765
Phone: 407.971.8850

CPWG
CRIBB PHILBECK WEAVER GROUP
COA NO. 26618

JEFFREY EARHART, PE
ENGINEER OF RECORD
FLORIDA REG. PROF. ENGINEER No.: 49935
CPWG, COA No.: 26618
2215 WEMBLEY PLACE, OVIEDO, FL 32765
PHONE: 407-267-8905

ORANGE COUNTY GOVERNMENT FLORIDA

LAKE LAWNE
REGIONAL STORMWATER FACILITY AT BARNETT PARK
ORANGE COUNTY, FLORIDA

POND CROSS SECTIONS

SHEET NUMBER 16

OF 26 SHEETS

Lake Lawne Irrigation Stormwater Facility at Barnett Park

Estimated Muck Removal Quantity

GEC Project No. 3935G

Station	10+75	11+00	12+00	12+50	13+00	13+50	14+00	15+00	16+00	17+00	18+00	19+00	20+00	21+00	22+00	23+00	24+00	25+00	26+00	26+50	Total
Estimated Muck Removal Quantity (cubic yards)	0	0	0	0	228	343	250	500	574	963	606	0	0	0	440	1339	815	0	3556	2944	12,558

Estimated Muck Removal Quanity (Cubic Yards) **12,558**

Note:

Calculation performed by GEC using FDOT Average End Area Method (PPM 3.4.1)

PART H
TECHNICAL PROVISIONS

for

LAKE LAWNE REGIONAL STORMWATER FACILITY AT BARNETT PARK
ORANGE COUNTY, FLORIDA

SJRWMD Permit

St. Johns River
Water Management District
Hans G. Tanzler III, Executive Director

4049 Reid Street • P.O. Box 1429 • Palatka, FL 32178-1429 • (386) 329-4500
On the Internet at floridaswater.com.

January 2, 2013

Orange County Parks & Recreation
4801 W Colonial Dr
Orlando, FL 32808

SUBJECT: Permit Number 40-095-27587-5
Lake Lawne Water Quality Improvement Project

Dear Sir/Madam:

Enclosed is your permit issued by the St. Johns River Water Management District on January 2, 2013. This permit is a legal document and should be kept with your other important documents. Permit issuance does not relieve you from the responsibility of obtaining any necessary permits from any federal, state, or local agencies for your project.

Technical Staff Report:
If you wish to review a copy of the Technical Staff Report (TSR) that provides the District's staff analysis of your permit application, you may view the TSR by going to the Permitting section of the District's website at floridaswater.com/permitting. Using the "search applications and permits" feature, you can use your permit number or project name to find information about the permit. When you see the results of your search, click on the permit number.

Noticing Your Permit:
For noticing instructions, please refer to the noticing materials in this package regarding closing the point of entry for someone to challenge the issuance of your permit. Please note that if a timely petition for administrative hearing is filed, your permit will become nonfinal and any activities that you choose to undertake pursuant to your permit will be at your own risk.

Compliance with Permit Conditions:
To submit your required permit compliance information, go to the District's website at floridaswater.com/permitting. Under the "Apply for a permit or submit compliance data" section, click to sign-in to your existing account or to create a new account. Select the "Compliance Submittal" tab, enter your permit number, and select "No Specific Date" for the Compliance Due Date Range. You will then be able to view all the compliance submittal requirements for your project. Select the compliance item that you are ready to submit and then attach the appropriate information or form.

The forms to comply with your permit conditions are available at floridaswater.com/permitting under the section "Handbooks, forms, fees, final orders". Click on forms to view all permit compliance forms, then scroll to the ERP application forms section and select the applicable compliance forms. Alternatively, if you have difficulty finding forms or need copies of the appropriate forms, please contact the Bureau of Regulatory Support at (386) 329-4570.

Transferring Your Permit:
As required by a condition of your permit, you must notify the District in writing within 30 days of any sale, conveyance or other transfer of a permitted system or facility, or within 30 days of any transfer of ownership or control of the real property where the permitted system or facility is located. You will need to provide the District with the information specified in District rule 40C-1.612, Florida Administrative Code (name and address of the transferee and a copy of the instrument effectuating the transfer). Please note that a permittee remains liable for any corrective actions that may be required as a result of any permit violations that occur before the sale, conveyance, or other transfer of the system or facility, so it is recommended that you request a permit transfer in advance.

Thank you and please let us know if you have additional questions. For general questions contact e-permit@sjrwmd.com or (386) 329-4570.

Sincerely,

M. Daniels

Margaret Daniels, Bureau Chief
Bureau of Regulatory Support
St. Johns River Water Management District
4049 Reid Street
Palatka, FL 32177

Enclosures: Permit with As-built Certification Form
Notice of Rights
List of Newspapers for Publication

cc: District Permit File

Consultant: Susan M Woodbery
CPWG
PO Box 560833
Orlando, FL 32856

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
Post Office Box 1429
Palatka, Florida 32178-1429

PERMIT NO. 40-095-27587-5 **DATE ISSUED:** January 2, 2013
PROJECT NAME: Lake Lawne Water Quality Improvement Project

A PERMIT AUTHORIZING:

Modification and construction of a Surface Water Management System for Lake Lawne Water Quality Improvement Project, a 9.0 - acre project to be constructed and operated as per plans received by the District on December 7, 2012, as amended by Sheet 4, received by the District on December 26, 2012 and Sheet 3, received by the District on December 28, 2012.

LOCATION:

Section(s): 20 Township(s): 22S Range(s): 29E

Orange County

ISSUED TO:

Orange County Parks & Recreation
4801 W Colonial Dr
Orlando, FL 32808

Permittee agrees to hold and save the St. Johns River Water Management District and its successors harmless from any and all damages, claims, or liabilities which may arise from permit issuance. Said application, including all plans and specifications attached thereto, is by reference made a part hereof.

This permit does not convey to permittee any property rights nor any rights or privileges other than those specified herein, nor relieve the permittee from complying with any law, regulation or requirement affecting the rights of other bodies or agencies. All structures and works installed by permittee hereunder shall remain the property of the permittee.

This permit may be revoked, modified or transferred at any time pursuant to the appropriate provisions of Chapter 373, Florida Statutes:

PERMIT IS CONDITIONED UPON:

See conditions on attached "Exhibit A", dated January 2, 2013

AUTHORIZED BY: St. Johns River Water Management District
Division of Regulatory Services

By: David Dewey/cbs

David Dewey
Service Center Director - Maitland

"EXHIBIT A"
CONDITIONS FOR ISSUANCE OF PERMIT NUMBER 40-095-27587-5
Orange County Parks & Recreation
DATED JANUARY 2, 2013

1. All activities shall be implemented as set forth in the plans, specifications and performance criteria as approved by this permit. Any deviation from the permitted activity and the conditions for undertaking that activity shall constitute a violation of this permit.

2. This permit or a copy thereof, complete with all conditions, attachments, exhibits, and modifications, shall be kept at the work site of the permitted activity. The complete permit shall be available for review at the work site upon request by District staff. The permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

3. Activities approved by this permit shall be conducted in a manner which do not cause violations of state water quality standards.

4. Prior to and during construction, the permittee shall implement and maintain all erosion and sediment control measures (best management practices) required to retain sediment on-site and to prevent violations of state water quality standards. All practices must be in accordance with the guidelines and specifications in chapter 6 of the Florida Land Development Manual: A Guide to Sound Land and Water Management (Florida Department of Environmental Regulation 1988), which are incorporated by reference, unless a project specific erosion and sediment control plan is approved as part of the permit, in which case the practices must be in accordance with the plan. If site specific conditions require additional measures during any phase of construction or operation to prevent erosion or control sediment, beyond those specified in the erosion and sediment control plan, the permittee shall implement additional best management practices as necessary, in accordance with the specifications in chapter 6 of the Florida Land Development Manual: A Guide to Sound Land and Water Management (Florida Department of Environmental Regulation 1988). The permittee shall correct any erosion or shoaling that causes adverse impacts to the water resources.

5. Stabilization measures shall be initiated for erosion and sediment control on disturbed areas as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 7 days after the construction activity in that portion of the site has temporarily or permanently ceased.

6. At least 48 hours prior to commencement of activity authorized by this permit, the permittee shall submit to the District a Construction Commencement Notice Form No. 40C-4.900(3) indicating the actual start date and the expected completion date.

7. When the duration of construction will exceed one year, the permittee shall submit construction status reports to the District on an annual basis utilizing an Annual Status Report Form No. 40C-4.900(4). These forms shall be submitted during June of each year.

8. For those systems which will be operated or maintained by an entity which will require an easement or deed restriction in order to provide that entity with the authority necessary to operate or maintain the system, such easement or deed restriction, together with any other final operation or maintenance documents as are required by subsections 7.1.1 through 7.1.4 of the Applicant's Handbook: Management and Storage of Surface Waters, must be submitted to the District for approval. Documents meeting the requirements set forth in these subsections of the Applicant's Handbook will be approved. Deed restrictions, easements and other operation and maintenance

documents which require recordation either with the Secretary of State or the Clerk of the Circuit Court must be so recorded prior to lot or unit sales within the project served by the system, or upon completion of construction of the system, whichever occurs first. For those systems which are proposed to be maintained by county or municipal entities, final operation and maintenance documents must be received by the District when maintenance and operation of the system is accepted by the local governmental entity. Failure to submit the appropriate final documents referenced in this paragraph will result in the permittee remaining liable for carrying out maintenance and operation of the permitted system.

9. Each phase or independent portion of the permitted system must be completed in accordance with the permitted plans and permit conditions prior to the initiation of the permitted use of site infrastructure located within the area served by the portion or phase of the system. Each phase or independent portion of the system must be completed in accordance with the permitted plans and permit conditions prior to transfer of responsibility for operation and maintenance of that phase or portion of the system to local government or other responsible entity.

10. Within 30 days after completion of construction of the permitted system, or independent portion of the system, the permittee shall submit a written statement of completion and certification by a registered professional engineer or other appropriate individual as authorized by law, utilizing As Built Certification Form 40C-1.181(13) or 40C-1.181(14) supplied with this permit. When the completed system differs substantially from the permitted plans, any substantial deviations shall be noted and explained and two copies of as-built drawings submitted to the District. Submittal of the completed form shall serve to notify the District that the system is ready for inspection. The statement of completion and certification shall be based on on-site observation of construction (conducted by the registered professional engineer, or other appropriate individual as authorized by law, or under his or her direct supervision) or review of as-built drawings for the purpose of determining if the work was completed in compliance with approved plans and specifications. As-built drawings shall be the permitted drawings revised to reflect any changes made during construction. Both the original and any revised specifications must be clearly shown. The plans must be clearly labeled as "as-built" or "record" drawing. All surveyed dimensions and elevations shall be certified by a registered surveyor. The following information, at a minimum, shall be verified on the as-built drawings: 1. Dimensions and elevations of all discharge structures including all weirs, slots, gates, pumps, pipes, and oil and grease skimmers; 2. Locations, dimensions, and elevations of all filter, exfiltration, or underdrain systems including cleanouts, pipes, connections to control structures, and points of discharge to the receiving waters; 3. Dimensions, elevations, contours, or cross-sections of all treatment storage areas sufficient to determine state-storage relationships of the storage area and the permanent pool depth and volume below the control elevation for normally wet systems, when appropriate; 4. Dimensions, elevations, contours, final grades, or cross-sections of the system to determine flow directions and conveyance of runoff to the treatment system; 5. Dimensions, elevations, contours, final grades, or cross-sections of all conveyance systems utilized to convey off-site runoff around the system; 6. Existing water elevation(s) and the date determined; and Elevation and location of benchmark(s) for the survey.

11. The operation phase of this permit shall not become effective until the permittee has submitted the appropriate As-Built Certification Form, the District determines the system to be in compliance with the permitted plans, and the entity approved by the District in accordance with subsections 7.1.1 through 7.1.4 of the Applicant's Handbook: Management and Storage of Surface Waters, accepts responsibility for operation and maintenance of the system. The permit may not be transferred to such an approved operation and maintenance entity until the operation phase of the permit becomes

effective. Following inspection and approval of the permitted system by the District, the permittee shall request transfer of the permit to the responsible approved operation and maintenance entity, if different from the permittee. Until the permit is transferred pursuant to section 7.1 of the Applicant's Handbook: Management and Storage of Surface Waters, the permittee shall be liable for compliance with the terms of the permit.

12. Should any other regulatory agency require changes to the permitted system, the permittee shall provide written notification to the District of the changes prior implementation so that a determination can be made whether a permit modification is required.

13. This permit does not eliminate the necessity to obtain any required federal, state, local and special district authorizations prior to the start of any activity approved by this permit. This permit does not convey to the permittee or create in the permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the permittee, or convey any rights or privileges other than those specified in the permit and chapter 40C-4 or chapter 40C-40, F.A.C.

14. The permittee shall hold and save the District harmless from any and all damages, claims, or liabilities which may arise by reason of the activities authorized by the permit or any use of the permitted system.

15. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under rule 40C-1.1006, F.A.C., provides otherwise.

16. The permittee shall notify the District in writing within 30 days of any sale, conveyance, or other transfer of ownership or control of the permitted system or the real property at which the permitted system is located. All transfers of ownership or transfers of a permit are subject to the requirements of rule 40C-1.612, F.A.C. The permittee transferring the permit shall remain liable for any corrective actions that may be required as a result of any permit violations prior to such sale, conveyance or other transfer.

17. Upon reasonable notice to the permittee, District authorized staff with proper identification shall have permission to enter, inspect, sample and test the system to insure conformity with the plans and specifications approved by the permit.

18. If historical or archaeological artifacts are discovered at any time on the project site, the permittee shall immediately notify the District.

19. The permittee shall immediately notify the District in writing of any previously submitted information that is later discovered to be inaccurate.

20. This permit for construction will expire five years from the date of issuance.

21. At a minimum, all retention and detention storage areas must be excavated to rough grade prior to building construction or placement of impervious surface within the area to be served by those facilities. To prevent reduction in storage volume and percolation rates, all accumulated sediment must be removed from the storage area prior to final grading and stabilization.

22. All wetland areas or water bodies that are outside the specific limits of construction authorized by this permit must be protected from erosion, siltation, scouring or excess turbidity, and dewatering.

23. Prior to construction, the permittee must clearly designate the limits of construction on-site. The permittee must advise the contractor that any work outside the limits of construction, including clearing, may be a violation of this permit.

24. The operation and maintenance entity shall inspect the stormwater or surface water management system once within two years after the completion of construction and every two years thereafter to determine if the system is functioning as designed and permitted. The operation and maintenance entity must maintain a record of each required inspection, including the date of the inspection, the name, address, and telephone number of the inspector, and whether the system was functioning as designed and permitted, and make such record available for inspection upon request by the District during normal business hours. If at any time the system is not functioning as designed and permitted, then within 14 days the entity shall submit an Exceptions Report to the District, on form number 40C-42.900(6), Exceptions Report for Stormwater Management Systems Out of Compliance.

25. The proposed project shall be constructed and operated as per plans received by the District on December 7, 2012, as amended by Sheet 4, received by the District on December 26, 2012 and Sheet 3, received by the District on December 28, 2012.

26. The engineer of record must provide the Sign and Seal document for Sheets 3 and 4 of the plans that were uploaded on the District's E-Permitting website on December 26 and December 28, 2012, within 30 days permit issuance.

Notice Of Rights

1. A person whose substantial interests are or may be affected has the right to request an administrative hearing by filing a written petition with the St. Johns River Water Management District (District). Pursuant to Chapter 28-106 and Rule 40C-1.1007, Florida Administrative Code, the petition must be filed (received) either by delivery at the office of the District Clerk at District Headquarters, P. O. Box 1429, Palatka Florida 32178-1429 (4049 Reid St., Palatka, FL 32177) or by e-mail with the District Clerk at Clerk@sjrwmd.com, within twenty-six (26) days of the District depositing the notice of District decision in the mail (for those persons to whom the District mails actual notice), within twenty-one (21) days of the District emailing the notice of District decision (for those persons to whom the District emails actual notice), or within twenty-one (21) days of newspaper publication of the notice of District decision (for those persons to whom the District does not mail or email actual notice). A petition must comply with Sections 120.54(5)(b)4. and 120.569(2)(c), Florida Statutes, and Chapter 28-106, Florida Administrative Code. The District will not accept a petition sent by facsimile (fax), as explained in paragraph no. 4 below.

2. Please be advised that if you wish to dispute this District decision, mediation may be available and that choosing mediation does not affect your right to an administrative hearing. If you wish to request mediation, you must do so in a timely-filed petition. If all parties, including the District, agree to the details of the mediation procedure, in writing, within 10 days after the time period stated in the announcement for election of an administrative remedy under Sections 120.569 and 120.57, Florida Statutes, the time limitations imposed by Sections 120.569 and 120.57, Florida Statutes, shall be tolled to allow mediation of the disputed District decision. The mediation must be concluded within 60 days of the date of the parties' written agreement, or such other timeframe agreed to by the parties in writing. Any mediation agreement must include provisions for selecting a mediator, a statement that each party shall be responsible for paying its pro-rata share of the costs and fees associated with mediation, and the mediating parties' understanding regarding the confidentiality of discussions and documents introduced during mediation. If mediation results in settlement of the administrative dispute, the District will enter a final order consistent with the settlement agreement. If mediation terminates without settlement of the dispute, the District will notify all the parties in writing that the administrative hearing process under Sections 120.569 and 120.57, Florida Statutes, is resumed. Even if a party chooses not to engage in formal mediation, or if formal mediation does not result in a settlement agreement, the District will remain willing to engage in informal settlement discussions.

3. A person whose substantial interests are or may be affected has the right to an informal administrative hearing pursuant to Sections 120.569 and 120.57(2), Florida Statutes, where no material facts are in dispute. A petition for an informal hearing must also comply with the requirements set forth in Rule 28-106.301, Florida Administrative Code.

4. A petition for an administrative hearing is deemed filed upon receipt of the complete petition by the District Clerk at the District Headquarters in Palatka, Florida during the District's regular business hours. The District's regular business hours are 8:00 a.m. – 5:00 p.m., excluding weekends and District holidays. Petitions received by the District Clerk after the District's regular business hours shall be deemed filed as of 8:00 a.m. on the District's next regular business day. The District's acceptance of petitions filed by e-mail is subject to certain conditions set forth in the District's Statement of Agency Organization and Operation (issued pursuant to Rule 28-101.001, Florida Administrative Code), which is available for viewing at floridaswater.com. These conditions include, but are not limited to, the petition being in the form of a PDF or TIFF file and being capable

of being stored and printed by the District. Further, pursuant to the District's Statement of Agency Organization and Operation, attempting to file a petition by facsimile is prohibited and shall not constitute filing.

5. Failure to file a petition for an administrative hearing within the requisite timeframe shall constitute a waiver of the right to an administrative hearing. (Rule 28-106.111, Florida Administrative Code).

6. The right to an administrative hearing and the relevant procedures to be followed are governed by Chapter 120, Florida Statutes, Chapter 28-106, Florida Administrative Code, and Rule 40C-1.1007, Florida Administrative Code. Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means the District's final action may be different from the position taken by it in this notice. A person whose substantial interests are or may be affected by the District's final action has the right to become a party to the proceeding, in accordance with the requirements set forth above.

7. Pursuant to Section 120.68, Florida Statutes, a party to the proceeding before the District who is adversely affected by final District action may seek review of the action in the District Court of Appeal by filing a notice of appeal pursuant to Rules 9.110 and 9.190, Florida Rules of Appellate Procedure, within 30 days of the rendering of the final District action.

8. A District action is considered rendered, as referred to in paragraph no. 7 above, after it is signed on behalf of the District and filed by the District Clerk.

9. Failure to observe the relevant timeframes for filing a petition for judicial review as described in paragraph no. 7 above will result in waiver of that right to review.

Notice Of Rights

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing Notice of Rights has been sent to the permittee:

Orange County Parks & Recreation
4801 W Colonial Dr
Orlando, FL 32808

This 2nd day of January, 2013.

M. Daniels

Margaret Daniels, Bureau Chief
Bureau of Regulatory Support
St. Johns River Water Management District
4049 Reid Street
Palatka, FL 32177
(386) 329-4570
Permit Number: 40-095-27587-5

NOTICING INFORMATION

Dear Permittee:

Please be advised that the St. Johns River Water Management District has not published a notice in the newspaper advising the public that it has issued a permit for this project.

Newspaper publication, using the District's form, notifies members of the public of their right to challenge the issuance of the permit. If proper notice is given by newspaper publication, then there is a 21-day time limit to file a petition challenging the issuance of the permit.

To close the point of entry for filing a petition, you may publish (at your own expense) a one-time notice of the District's decision in a newspaper of general circulation within the affected area as defined in Section 50.011 of the Florida Statutes. If you do not publish a newspaper notice, the time to challenge the issuance of your permit will not expire.

A copy of the notice and a partial list of newspapers of general circulation are attached for your convenience. However, you are not limited to those listed newspapers. If you choose to close the point of entry and the notice is published, the newspaper will return to you an affidavit as proof of publication. Please submit this original affidavit of publication to:

Margaret Daniels, Bureau Chief
Bureau of Regulatory Support
4049 Reid Street
Palatka, FL 32177

If you have any questions, please contact the Bureau of Regulatory Support at (386) 329-4570.

Sincerely,

M. Daniels

Margaret Daniels, Bureau Chief
Bureau of Regulatory Support

NOTICE OF AGENCY ACTION TAKEN BY THE
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

Notice is given that the following permit was issued on _____:

(Name and address of applicant)_____
permit#_____. The project is located in _____County, Section _____, Township _____ South, Range _____ East. The permit authorizes a surface water management system on _____ acres for _____ known as _____. The receiving water body is _____.

A person whose substantial interests are or may be affected has the right to request an administrative hearing by filing a written petition with the St. Johns River Water Management District (District). Pursuant to Chapter 28-106 and Rule 40C-1.1007, Florida Administrative Code (F.A.C.), the petition must be filed (received) either by delivery at the office of the District Clerk at District Headquarters, P.O. Box 1429, Palatka FL 32178-1429 (4049 Reid St, Palatka, FL 32177) or by e-mail with the District Clerk at Clerk@sjrwmd.com, within twenty six (26) days of the District depositing the notice of intended District decision in the mail (for those persons to whom the District mails actual notice), within twenty-one (21) days of the District emailing notice of intended District decision (for those persons to whom the District emails actual notice), or within twenty-one (21) days of newspaper publication of the notice of intended District decision (for those persons to whom the District does not mail or email actual notice). A petition must comply with Sections 120.54(5)(b)4. and 120.569(2)(c), Florida Statutes (F.S.), and Chapter 28-106, F.A.C. The District will not accept a petition sent by facsimile (fax). Mediation pursuant to Section 120.573, F.S., is not available.

A petition for an administrative hearing is deemed filed upon receipt of the complete petition by the District Clerk at the District Headquarters in Palatka, Florida during the District's regular business hours. The District's regular business hours are 8 a.m. – 5 p.m., excluding weekends and District holidays. Petitions received by the District Clerk after the District's regular business hours shall be deemed filed as of 8 a.m. on the next regular District business day. The District's acceptance of petitions filed by e-mail is subject to certain conditions set forth in the District's Statement of Agency Organization and Operation (issued pursuant to Rule 28-101.001, Florida Administrative Code), which is available for viewing at floridaswater.com. These conditions include, but are not limited to, the petition being in the form of a PDF or TIFF file and being capable of being stored and printed by the District. Further, pursuant to the District's Statement of Agency Organization and Operation, attempting to file a petition by facsimile (fax) is prohibited and shall not constitute filing.

The right to an administrative hearing and the relevant procedures to be followed are governed by Chapter 120, Florida Statutes, Chapter 28-106, Florida Administrative Code, and Rule 40C-1.1007, Florida Administrative Code. Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means the District's final action may be different from the position taken by it in this notice. **Failure to file a petition for an administrative hearing within the requisite time frame shall constitute a waiver of the right to an administrative hearing. (Rule 28-106.111, F.A.C.).**

If you wish to do so, please visit http://floridaswater.com/noticeofrights/ to read the complete Notice of Rights to determine any legal rights you may have concerning the District's intended decision(s) on the permit application(s) described above. You can also request the Notice of Rights by contacting the Bureau Chief, Bureau of Regulatory Support (RS), 4049 Reid St., Palatka, FL 32177-2529, tele. no. (386)329-4570.

NEWSPAPER ADVERTISING

ALACHUA
The Alachua County Record, Legal Advertising
P. O. Box 806
Gainesville, FL 32602
352-377-2444/ fax 352-338-1986

BAKER
Baker County Press, Legal Advertising
P. O. Box 598
Maclenny, FL 32063
904-259-2400/ fax 904-259-6502

BRAFORD
Bradford County Telegraph, Legal Advertising
P. O. Drawer A
Starke, FL 32901
904-964-6305/ fax 904-964-8628

BREVARD
Florida Today, Legal Advertising
P. O. Box 419000
Melbourne, FL 32941-9000
321-242-3832/ fax 321-242-6618

CLAY
Clay Today, Legal Advertising
1560 Kinsley Ave., Suite 1
Orange Park, FL 32073
904-264-3200/ fax 904-264-3285

DUVAL
Daily Record, Legal Advertising
P. O. Box 1769
Jacksonville, FL 32201
904-356-2466 / fax 904-353-2628

FLAGLER
Flagler Tribune, c/o News Journal
P. O. Box 2831
Daytona Beach, FL 32120-2831
386- 681-2322

INDIAN RIVER
Vero Beach Press Journal, Legal Advertising
P. O. Box 1268
Vero Beach, FL 32961-1268
772-221-4282/ fax 772-978-2340

LAKE
Daily Commercial, Legal Advertising
P. O. Drawer 490007
Leesburg, FL 34749
352-365-8235/fax 352-365-1951

MARION
Ocala Star Banner, Legal Advertising
2121 SW 19th Avenue Road
Ocala, FL 34474
352-867-4010/fax 352-867-4126

NASSAU
News-Leader, Legal Advertising
P. O. Box 766
Fernandina Beach, FL 32035
904-261-3696/fax 904-261-3698

OKEECHOBEE
Okeechobee News, Legal Advertising
P. O. Box 639
Okeechobee, FL 34973-0639
863-763-3134/fax 863-763-5901

ORANGE
Sentinel Communications, Legal Advertising
633 N. Orange Avenue
Orlando, FL 32801
407-420-5160/ fax 407-420-5011

OSCEOLA
Little Sentinel, Legal Advertising
633 N. Orange Avenue
Orlando, FL 32801
407-420-5160/ fax 407-420-5011

PUTNAM
Palatka Daily News, Legal Advertising
P. O. Box 777
Palatka, FL 32178
386-312-5200/ fax 386-312-5209

ST. JOHNS
St. Augustine Record, Legal Advertising
P. O. Box 1630
St. Augustine, FL 32085
904-819-3436

SEMINOLE
Seminole Herald, Legal Advertising
300 North French Avenue
Sanford, FL 32771
407-323-9408

VOLUSIA
News Journal Corporation, Legal Advertising
P. O. Box 2831
Daytona Beach, FL 32120-2831
(386) 681-2322