March 2, 2018
BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY, FLORIDA

IFB Y18–729-TA, ADDENDUM NO. 4

SOUTH WATER RECLAMATION FACILITY (SWRF) INFLUENT PUMP STATION IMPROVEMENTS

BID OPENING DATE: March 15, 2018

This Addendum is hereby incorporated into the bid documents of the project referenced above. The following items are clarifications, corrections, additions, deletions, and/or revisions to and shall take precedence over the original documents. Additions are indicated by **underlining** and deletions via ~~strikethrough~~.

A. BIDDERS QUESTIONS

1. Sheet C06 calls for FLG x Lok-Joint Couplings to be used when connecting the 54" and 66" FLG plug valves. We are unaware of this type of coupling. Please confirm that a fabricated ductile iron spool that is FLG x FRE (Flex-Ring End) will be acceptable for transition to a factory restrained joint fitting.

   Response No. 1: Any approved mechanical restrained joint (acceptable equal), equal to Lok-Ring will be acceptable to use for Flange x Restrained joint connection on each side of the Plug Valve.

2. Per Article 18 on page F-32 of the General Conditions the critical path schedule shall include a minimum 10% float time as part of the contract time for unforeseen conditions. In accordance with section 01010 the Partial Utilization Milestone must be completed within 570 days from NTP. Due to the 10% float requirement please confirm the contractor must submit a construction schedule of 513 days to complete this Milestone.

   Response No. 2: Confirmed. The Contractor shall submit a construction schedule of 513 days to complete the milestone.

3. If the Partial Utilization Milestone must be completed in a 513 day construction schedule we request additional time to complete this milestone.

   Response No. 3: The construction times in the specifications remain unchanged.

4. Due to the partial utilization milestone schedule we expect construction activities to be completed on Saturday's. Please confirm this is acceptable.

   Response No. 4: Yes, the Contractor shall include the cost of RPR overtime in their bid.

5. If overtime or Saturday work will be allowed will the county wave the RPR's overtime rate of $51.00 to be paid by the contractor per specification 01000-1.08A.

   Response No. 5: No, the County will not waive the RPR's overtime rate of $51.00 to be paid by the Contractor per specification 01000-1.08A.

6. Per specification Wastewater System Bypass 01516-3.03B the contractor shall provide electronic monitoring with SCADA. Please confirm contractor must include electronic flow monitors in each bypass line for onsite monitoring.

   Response No. 6: Electronic monitoring with SCADA is required for all locations.

7. Per specification Wastewater System Bypass 01516-3.03D "the contractor shall provide screening for bypass flow". It appears all bypass flow will be discharged into collection box before it flows into the screening structure. Please confirm contractor must include screening the flow from bypass to the screening structure.

   Response No. 7: Screening is not required. The Contractor shall provide bypass pumps that can handle raw wastewater.

8. Please confirm if a bypass operation can be completed by gravity flow, a pumping or standby pumping system will not be required at that location.

   Response No. 8: Not confirmed. A standby pumping system is required.

9. Per Note on Drawing G09: "At a minimum, the groundwater cutoff wall (if utilized) is to be installed around the existing influent structure". Please confirm if this groundwater cutoff wall is required or if it is on the contractor to determine if it shall be utilized?

   Response No. 9: The Contractor is responsible for means and methods necessary to construct the project and protect existing plant infrastructure from settlement and other potential impacts that can result from dewatering operations. It is the Contractor's responsibility to determine if the cutoff wall is to be used or propose other methods to eliminate impact to the existing infrastructure from dewatering operations. If indeed a cutoff wall is chosen as the method of limiting groundwater loss below structures then, at a minimum, the dewatering cutoff wall shall be placed at the limits shown.

10. If Groundwater Cutoff Wall identified on Drawing G09 is utilized will it be required to remain in place permanently?

    Response No. 10: Removal of the cutoff wall is at the Contractor's discretion. Contractor shall ensure that if the cutoff wall is removed, the removal process will not impact existing and new structures.

11. Per Drawing G09 and specification 02160: "Groundwater Cutoff walls which are independent of the excavation support systems may be required". Further soil borings and existing structure inspection may be required to determine extent of Groundwater Cutoff walls that will not be able to be completed before bid date. Due to that this scope of work is difficult to be determined at this time please consider moving this scope of work into a bid alternate or owner allowance outside of the base bid.

    Response No. 11: Additional information is provided in the revised geotechnical report attached. The cost for constructing the cut off wall shall be included in the bid price and no bid alternatives or allowances will be included in the contract.

12. There are a number of references to specification 09901. Could not find specification 09901 please confirm.

    Response No. 12: All references to 09901 – Coatings and Linings shall be revised to 09900.

13. The Geotechnical Report includes 50' deep borings. Excavation support sheeting will be deeper than the borings provided, more information on the material deeper than 50' below surface would be useful. Does the owner have any old soil borings on this site deeper than 50' that can be made available?

    Response No. 13: See updated Geotechnical Report, dated June 2, 2017, attached and replaced in Appendix A of the specifications.

14. Process flow diagram on drawings G06 & G07 identify different flows than what are identified on the by-pass plan drawing C03. This discrepancy is primarily on the west side lines that are identified as 750GPM and 370GPM on the process flow diagram and 4,000GPM on the by-pass plan drawing. Please confirm flows that will be needed to be by-passed.

    Response No. 14: 4,000 gpm is to be assumed.

15. Please identify the quantity and location of any Asbestos material that is part of this project.

    Response No. 15: All asbestos material identified in the report has been removed by the County.

16. Please identify the quantity and location of any contaminated liquids that is part of this project.

    Response No. 16: Contractor to assume the old IPS wet wells and pipes contain wastewater. Quantity is not confirmed.

17. What rate will the contractor be charged for water usage for testing purposes?

Response No. 17: If reclaimed water is utilized for testing purposes there will be no charge to the Contractor.

18. Please confirm that the contractor does not have to install any new or re-route any CLS (Chlorine) lines.

Response No. 18: All work is identified on the drawings.

19. Please confirm if the 4" NG (Natural Gas?) line shown on drawing C-06 under the proposed 36" Sanitary Sewer is an active line.

Response No. 19: The natural gas line is active.

20. Architectural Drawing A06 identifies the electrical building parapet and beams as cast in place concrete. Structural Drawing S20 identifies parapet and beams as CMU. Please confirm.

Response No. 20: The parapets and beams shall be constructed per the structural drawings S20.

21. Due to the complexity of this project we request the bid date be extended.

Response No. 21: See addendum No. 3.

22. Per specification Leakage Testing of Water Retaining Structures 03900-3.01C "Conduct testing before backfill is placed against walls." Due to the intermediate slab at elevation 70.5' on the east side of the structure backfill will have to be place up to this elevation before the full height of walls are poured. Please confirm if two water tests can be completed. The first test would be after the walls are poured to elevation 71.5'. Then the walls will be backfilled to elevation 70' so intermediate slab can be poured. The second would occur once walls poured to full height.

Response No.22: Leakage testing of the influent pump station is no longer required. See additions to specification sections 01014 and 09970 in Part B of this addendum.

23. Refer to Drawing C-06. Connection to the existing 42" RS PCCP and 54" RS PCCP is called out as a F.A.C. (Flanged Adapter Coupling). Is a PCCP Adapter Coupling also required?

Response No. 23: The Contractor shall provide all materials and installation as required per Section 02282, Connections to Existing Buried Pipelines.

24. Specification Section 13210 (Physical Hydraulic Modeling) requires the Contractor to arrange for and pay for all costs associated with Physical Hydraulic Modeling for the Influent Pumping Station. Paragraph 1.01-B goes on to state that the results from this

modeling may result in changes to the shape and depth of the structure or changes to the pump intake cones. This Hydraulic Modeling should have been done during design phase of this project. It is unreasonable to push this burden on to the contractor. We are requesting that this language be changed.

Response No. 24: The physical modeling is a part of the scope of work. Any changes to the contract documents will be addressed in accordance with Article 12 Change of Work and Article 13 Change of Contract Amount and Time.

25. Refer to Drawing C-11. To the north of the Existing Influent Pump Station, there is a .65' wide wall drawn around the existing wet well metal lids that is like the existing perimeter wall. This wall is also shown around the Old Influent Pump Station Metal Lid Are these walls existing to remain? If they are to be constructed, what are the details on these walls?

Response No. 25: Refer to demolition sheets for items to be demolished.

26. Is Eaton an acceptable manufacturer for the low voltage switchgear on this project (16361, 2.01 does not currently list them)?

Response No. 26: See Addendum No. 3

27. Is Eaton an acceptable manufacturer for the VFD's on this project (16260, 2.01 does not currently list them)?

Response No. 27: See Addendum No. 3

28. On Page E04 appears a Box to be intercepting the Fiber Optic to the PLC-04A without any information. Is this box will be a N3R Box Wall mounted? Please advise.

Response No. 28: The box is being removed from the project. See revised drawing E-04 for revised conduit run, and revised drawing E-18.

29. Who is the SWRF Fire Alarm contractor that gives support to the existing system?

Response No. 29: The County currently has a monitoring term contract with Signature Systems.

30. On the crossroads ductbank went the rebar will be install, has to be grounded to the #4/0AWG Tinned Wire?

Response No. 30: All ductbanks shall be concrete encased. The rebar within the ductbank does not have to be bonded to the #4/0 ground wire.

31. On page E21 Detail #3, the detail doesn't indicate the compressive strength of the concrete for the ductbank. Is this concrete will be 3000psi with Red Dye? Please advise.

Response No. 31: See Section B for modifications to Specification section 16402.

32. On the specs or detail#1 on E20 not mention if the long radius elbows for the stub ups are RGS, PVC Coated or PVC. Which will be use if is required to use other that PVC. Please advise.

    Response No. 32: See Section B for modifications to Specification section 16402.

33. Can you give more information about the VFD Wire to be use on the job? If this wire will be a DLO or VFD Rated TC-ER? Please advise.

    Response No. 33: Feeders used between Variable Frequency Drives and motor disconnect switches shall be special three conductor VFD cables with three symmetrical ground wires spiral wound to minimize the over voltages and electromagnetic interference caused due to fast rise time switching pulses inherent in the pulse width modulated drives. Copper conductors shall have cross-linked polyethylene insulation with an overall Polyvinylchloride jacket. Cable shall be manufactured by Belden, Southwire or equal.

34. I was inquiring to see if Alpha Power Systems, LLC, can get added to the spec or approved as “or equal” for Surge Protective Devices (SPD) for the South Water Reclamation Facility Influent Pump Station Improvements Project?

    Response No. 34: The County does not consider requests for substitution during bidding. The selected Contractor may submit a request for a product substitution as a submittal after Notice to Proceed, in accordance with the General Conditions.

35. Drawing C05 Note states that the gates are to remain in operation. The 30” Sanitary between New Manhole #3 and the Metering Manhole/Vault runs directly through that area. Please clarify that the gate can be taken out of service during that work.

    Response No. 35: The County is not aware of any gate that is required for the work in this area referenced.

36. Specification 02050 states that there may be Items to Be Salvaged for the Owner to retain. Can we get list of these items?

    Response No. 36: The Contractor is not required to salvage any material.

37. Has there been an asbestos, lead or and other hazardous materials survey completed for the structures and other items to be demolished? If so, can we get a copy of that survey?

    Response No. 37: Yes, see Addendum No. 3.

38. Specification 02050, 1.11.A discussed extermination. Has there been a survey of the areas to be demolished to determine if there may be any rodent, insects, or vermin present requiring extermination? If so, can we get a copy of that survey?

Response No. 38: No survey has been completed.

39. Specification 02140, 3.03 discussed Groundwater that may be contaminated. Has there been any testing of the surrounding areas for contamination plumes or other issues? The specification does not clarify if the Contractor would be responsible for the costs associated with disposing of contaminated groundwater that may be incurred as a result of dewatering activities. Can we clarify who would pay these costs?

    Response No. 39: There are no known contamination issues in the area of construction. If contaminated groundwater is encountered, it will be addressed in accordance with Article 12 Change of Work and Article 13 Change of Contract Amount and Time.

40. Specification 02160, 3.01.1 states that all sheeting shall be left in place. Please confirm that this is required for all sheeting used for temporary excavation support systems. Also, please confirm that this is required for the groundwater cutoff wall (if utilized).

    Response No. 40: Removal of the cutoff wall is at the Contractor's discretion. Contractor shall ensure that if the cutoff wall is removed, the removal process will not impact existing and new structures. All other temporary sheeting for excavations shall be removed.

41. Drawing G06 states that the 36" and 42" Old Pump Station Effluent Pipes are Inactive. Can we clarify what that specifically means?

    Response No. 41: There are no flows in these pipes.

    a. Is flow completely blocked from entering the pipes? If so, how and where are they blocked?

    Response No. 41a: Flow is blocked at the entrance to the old IPS.

    b. Do they have any Raw Sewage still in the pipes? If so, are they full? If they have Raw Sewage in them can we pump the materials to the Existing Influent Pump Station?

    Response No. 41b: It is unknown if there is raw sewage in the pipes. No, the Contractor may not pump the materials to the Existing Influent Pump Station. Following the removal of any material encountered, the Contractor will be allowed to dispose of the material on site as directed by the County at a drying/drain area.

    c. What materials are the pipes? Drawing G09 shows the 42" RS as PCCP. Is that consistent all the way to the Old Influent Pump Station Effluent Box?

    Response No. 41c: Material of the existing pipe is unknown. The PCCP is not consistent.

d. The 42” RS on C06 shows a 42” Plug Valve directly west of the 54” x 48” Tee. Is that valve operable? Are there any valves on the 42” RS west of the 42” Tee to isolate flow from that point to the Old Pump Station Effluent Box?

Response No. 41d: No, the valve is not operable. There are no other valves.

e. Note 11 on C04 discusses a 42” Linestop. Is that linestop in addition to the 42” Linestop specifically shown on C06?

Response No. 41e: Yes, that line stop is in addition the 42” linestop.

42. C06 and C07 show to Remove and Replace Existing 6’ DIA Manhole with New FRP Lined Manhole. The lightly shaded notes next to the existing manhole indicate that there is a 30” Sanitary Pipe from the West at Invert Elevation 79.72. Is this pipe still active? It does not seem to be accounted for in the By-Pass Plan shown on C03. If it is still active, can we get the flow amount and a location at which it can be intercepted? Is that supposed to be the 30” Sanitary coming from the Manhole SW of MH#3 with 4,000 GPM flow?

Response No. 42: The pipe is still active. The flow amount to be intercepted is 4,000 gpm. Yes, it is the 30” Sanitary coming from MH#3.

43. Item 11 on C05 states that all equipment and miscellaneous items in covered storage area to be removed. Can we clarify who is responsible for removing those items? If the Contractor is responsible, can we get a list of items in the area?

Response No. 43: The items in this area will be removed by the County prior to issuance of the Notice to Proceed.

44. Is there a location on site that can be utilized for the storage and/or disposal of excavated materials? If so, can we be provided that location relevant to the Proposed Influent Pump Station?

Response No. 44: An area on the plant site will provided to temporarily stockpile excavated material within 1,000 feet of the excavation.

45. Specification 02222, 3.05 calls the Contractor’s attention to the possible existence of thrust blocks on existing piping.
    a. Are there any specifically known by the County that may require protecting during this construction project? If so where are they and what are they restraining?
    b. For instance, the 42” FM just east of the 48” Bypass Piping dead ends in a plug or cap. Is that cap or the 90-bend prior to it restrained with a thrust block?
    c. If an unknown thrust block is uncovered and requires protection, will the Contractor be reimbursed for the costs to provide that protection or will the County provide the protection?

Response No. 45: The Contract shall assume all PCCP is unrestrained. Refer to reference drawings provided in Addendum No. 3 as the best available information

for existing site conditions. Any changes to the contract documents will be addressed in accordance with Article 12 Change of Work and Article 13 Change of Contract Amount and Time.

46. Are the Existing 42" and 54" PCCP pipes restrained joint style piping? Are the initial pipe lay drawings and schedules available from the original manufacturer? If the PCCP pipes are not restrained joint style what type of restraint is required to protect existing joints south of the linestops and connection locations?

    Response No. 46: Assume all PCCP is unrestrained.

47. C06 shows a 4" Natural Gas Pipe running directly over the proposed 36" Sanitary just East of the MH#3. Can you provide the Utility contact information for that line?

    Response No. 47: The gas line is active. The utility provider isTECO/People's Gas. 866-832-6249.

48. Drawing M11 shows a 4" drain pipe coming into through the outside wall next to Slide Gate No 6. This 4" drain pipe does not show up on any of the site drawings. Can we clarify where that pipe comes from and its flow rates?

    Response No. 48: Refer to CDM, 1988 Drawings M-6, M-7 and M-8 for additional information on the drain.

49. There seem to be many inconsistencies with regard to the by-pass information provided on the Drawings.
    a. G07 states that a 20" plug is to be installed on the existing 30" sanitary sewer after the MH#3 is installed. Can we confirm that this is a 30" and can we confirm the 30" Sanitary Sewer pipe materials?

       Response No. 49a: Drawing G07, 20-inch plug to be revised to 30-inch plug.

    b. There seems to be an 8" Drain line heading in the direction of the Old Influent Box from the south. Can we confirm is that or any other smaller drain lines tie into that Influent Box?

       Response No. 49b: Refer to reference drawings provided in Addendum No. 3 as the best available information for existing site conditions.

    c. Detail B on S21 shows a 4'-10" x 4'-10" stainless steel plate over the Old Influent Box Sluice Gate openings. M02 only shows a 30" x 36" Access Hatch on top of that structure. Can we cut a larger opening in that top slab to allow for installation of those plates? If so, can details be provided for that to be repaired or permanently patched after installation?

       Response No. 49c: The cover plate (Detail B on Sheet S21) may be eliminated. The area behind the openings (screen channels) and the openings themselves

are to be filled with concrete as specified on sheet M04. Provide waterstop equivalent to Lockstop by Sika on the inside faces of the openings.

d. M02 shows a very different piping configuration in and out of the Old Influent Box. It has (3) 30" pipes to the south plugged. It shows 30" and 24" pipes coming in from the West. It shows 42", 12" and 14" pipes leaving to the North. M04 shows only (4) 42" Pipes on the North and West Walls. G06 shows a 48" pipe from the West and (2) 42" pipes leaving to the North. G09 shows (2) 48" pipes and possibly a 42" pipe coming from the West. Can we confirm which is correct and the flow rates for all these pipes?

Response No. 49d: The old IPS influent box configuration for pipe carrying wastewater, include one (1) 48 inch influent pipe from the West, and two (2) 42 inch discharge pipes to the North

e. G06 shows the 36" RS coming from the West to the Pump-out connection with a flow rate of 31,600 GPM. But Drawing C03 says to intercept 11,000 GPM at the Pump-out connection. Can we confirm which is correct?

Response No. 49e: 11,000 gpm is correct.

f. G06 shows a 24" RS coming from the NW to the Shingle Creek Manhole. This pipe does not show on the C03 but it is referenced to intercept 7,000 GPM from a 24" Force Main. Is that the same pipe?

Response No. 49f: Yes, that is the same pipe.

g. Can we confirm the pipe materials for the 48" between the Shingle Creek MH and the Old Influent Box?

Response No. 49g: Pipe Materials are PVC DR-25.

h. Can we confirm the pipe materials for the 42" between the Old Influent Box and MH#6? Can we confirm the distance between these pipes?

Response No. 49h: Material cannot be confirmed. Drawings are to scale from which piping length can be obtained.

i. G06 shows 370 GPM and 730 GPM coming from the South and SW to MH#3. C03 shows these flow rates as 4,000 GPM for both. Can we confirm these flow rates?

Response No. 49i: 4,000 gpm is to be used for both.

j. C03 shows by-passing 1,000 GPM from existing 5' diameter manhole to the Existing IPS Wetwell. C06 and C07 show this manhole to be rehabbed in accordance with

Specification 02775 and Figure A-607 on C13. How is the contractor to bypass from this manhole while the manhole is being rehabbed? C03 shows (2) 12" PVC pipes coming from the South. Can we get a location for intercepting those flows and pipes other than the manhole be rehabbed?

Response No. 49j: Include manhole relining as specified and assume by-pass will not be needed.

k. In general, the flow rates shown on G06 do not seem to match those on C03 for the bypass required on the West side of the plant. Can we confirm these flow rates and piping configurations?

Response No. 49k: See responses to question 48 in Addendum 4.

50. Reference Specification 01014: Sec 1.01, 3f: Please confirm that the Contractor will be responsible for providing the physical hydraulic modeling for the new IPS before construction of the Pump Station can begin. This is typically not the responsibility of the contractor and will add significant risks to the contractors.

Response No. 50: Confirmed, the Contractor shall provide the physical hydraulic modeling for the new IPS before Construction of the Pump Station can begin.

51. Reference Specification 13210: Sec1.01, b: Specification states "The results of the Physical Hydraulic Modeling may result in changes to the internal shape of the influent isolation box and baffling; or the shape or depth of the self-cleaning wet wells; or the length and shape of the pump intake cones; or any combination of these. The final model report must be completed and approved before construction of structural reinforced concrete walls for the new IPS has begun or the new submersible pumps have been ordered." If the results of the modeling requires the Pump Station to have additional construction activities what method will be used to determine the pricing? How will the Contractor be compensated?

Response No. 51: The physical modeling is a part of the scope of work. Any changes to the contract documents will be addressed in accordance with Article 12 Change of Work and Article 13 Change of Contract Amount and Time.

52. Reference Specification 03300: Sec. I, 9a: Specification states a Crystalline waterproofing admixture is required for walls and slabs of water retaining structures, does this include columns, fillet bases, sloped fillets and sloped chutes?

Response No. 52: See addendum No. 3.

53. Reference Specification 03300: Sec. I, 9a: Specification states a Crystalline waterproofing admixture is required for walls and slabs of water retaining structures, does this include the elevated slab deck?

Response No. 53: See addendum No. 3.

54. Reference Specifications: 01410-2 the table shows concrete testing paid by the County however 03300-6 Sec H states that it is the Contractor who shall employ an independent testing company. Which is correct?

    Response No. 54: See addendum No. 3.

55. The Electrical Building is shown on the Architectural drawings to include CMU, however Specification 03480 states that the Electrical Building is a pre-cast concrete structure. Which is correct?

    Response No. 55: See addendum No. 3.

56. The specification for pre-cast hollow-core floor is missing from the contract documents, please issue one on upcoming addenda.

    Response No. 56: See addendum No. 3.

57. Is there is a place on site that could be designated to receive all the excavated materials or if all the materials must leave the jobsite?

    Response No. 57: An area on the plant site will provided to temporarily stockpile excavated material within 1,000 feet of the excavation.

58. Please confirm that the final day for questions to be submitted is 10 days prior to the final bid opening and not only the original posted date of bid opening.

    Response No. 58: Questions to be submitted is 10 days prior to the final bid opening date.

59. Specification number 01000 – 17 - 1.19 C. Salvage please identify the items that are designated as salvage for this project?

    Response No. 59: The Contractor is not required to salvage any material.

60. Please provide us with a list of the fiber optic utility owners that will be impacted per note 8 on Drawing G04.

    Response No. 60: The existing fiber optic line within the limits of construction will be relocated by the County prior to construction starting. We are not aware of any other fiber optic lines within the construction limits.

61. Spec 11305 Section 1.01A2.h – Do we need to supply qty. 2 blind flanges for pump slot No4 and No8. Will the spare pump be used in Slots 1,2,3,5,6,7? If not the bracket will have to be removed from the pump being taken out of service and then reattached to spare pump.

Response No. 61: Two blind flanges are required per the contract drawings. Spare pump will be stored on-site.

62. Spec 11305 Section 2.04R.6.a - Please clarify the correction factor described under this section for testing without pump tubes. The test pit cannot replicate the trench design performance as any test pit is static at pump start/run.

    Response No. 62: The correction factor will take into account the headloss due to the suction tail pipe if the test pit cannot accommodate the tail pipe. The headloss will be subtracted from the pump head measured at each of the test points.

63. Section 16260 – please clarify the number of VFDs to be supplied.

    Response No. 63: Response: There are six (6) 500 HP VFDs with reduced voltage solid state bypass starters and two (2) Future units shown on drawings E14 and E15.

    Specification section 16260-2.09.B calls for" one complete spare VFD of each amp rating".

    Provide a total of seven (7) VFDs – six (6) installed and one (1) spare.

64. Please provide a specification for the VFD cable on this project.

    Response No. 64: Feeders used between Variable Frequency Drives and motor disconnect switches shall be special three conductor VFD cables with three symmetrical ground wires spiral wound to minimize the over voltages and electromagnetic interference caused due to fast rise time switching pulses inherent in the pulse width modulated drives. Copper conductors shall have cross-linked polyethylene insulation with an overall Polyvinylchloride jacket. Cable shall be manufactured by Belden, Southwire or equal.

65. Yard Piping Demolition Plan – C04 shows removing the 42" IPS Discharge to what looks to be a splitter box between the Old IPS and Existing IPS. There are no details of that splitter box on any drawings. Can we get any details on that splitter box? Is it to be removed? Is it to be filled with Light Weight Concrete or Common Fill?

    Response No. 65: The splitter box is to be removed.

B. SPECIFICATIONS

1. Appendix A – Geotechnical report in Appendix A is deleted in its entirety and replaced with attached Geotechnical Report dated June 2, 2017.

2. Specification Section 02012 -Geotechnical Instrumentation

- Delete Section 1.01 A in its entirely and replace with the following:

A. The purpose of geotechnical instrumentation is to provide data to the Contractor to control operations, to monitor and detect ground movement near excavations, monitor groundwater levels and pressures in aquifers affected by the work and detect potential impact the Contractor's work may have on adjacent infrastructure, structures and plant operations.

3. Specification Section 02012 -Geotechnical Instrumentation

- Delete Section 1.01 D.(2) in its entirely and replace with the following:

  2. Monitor ground movement and groundwater conditions that may impact adjacent plant infrastructure, structures and plant operations and on both sides of the dewatering cutoff wall.

4. Specification Section 02012 -Geotechnical Instrumentation

- Section 1.02 Description, delete Section 1.02 A. in its entirely and replace with the following:

A. The purpose of the geotechnical instrumentation program includes but is not limited to the following goals and objectives.

  1. Document pre-construction baseline data for monitoring and comparison with instrumentation readings and groundwater levels during and after construction is completed.
  2. Continuous monitoring of vibrations and groundwater conditions for the Contractor to identify conditions that may indicated potential impacts to existing plant infrastructure, structures and plant operations.
  3. Provide information to the Contractor for developing and implementing corrective actions that will counter and correct conditions that may impact existing plant infrastructure, structures and plant operations.

5. Specification Section 02012 -Geotechnical Instrumentation

- Section 1.03 C.(1), Quality Control Methods, deleted:

~~trenchless utility construction operations~~ and replace with:

existing infrastructures, structures and plant operations.

6. Specification Section 02012 -Geotechnical Instrumentation

- Section 1.04 A., Quality Assurance, add new paragraphs:

3. Collected data shall be reviewed and evaluated by a qualified professional geotechnical engineer, registered in the State of Florida.
4. Collected geotechnical monitoring data, data evaluation, conclusions and recommendations shall be submitted monthly and discussed at each progress meeting,

7. Specification Section 02012 -Geotechnical Instrumentation

- Section 2.01 E., Materials, deleted paragraph 4 in its entirety and replace with the following:

  4. Provide groundwater monitoring wells at both ends of the groundwater cutoff wall and at all adjacent structures.

8. Specification section 16402 Underground Ducts and Raceways for Electrical Systems

- Section 2.03: Concrete: Minimum compressive strength, 3,000 psi., add the following:

  2.02.D Concrete Red Pigment:
  1. Pulverized natural Iron Ore, Number 302 by DCS, Milwaukee, Wisc.
  2. Red Iron Oxide Pigment by Bayer Corporation, Pittsburgh, PA.
  3. Red Iron Oxide Pigment by Davis Colors, Beltville, MD.
  4. Or equal

  2.03.F Colorant
  1. The concrete shall be dyed red throughout the ducts; surface treatment will not be accepted.
  2. Provide colorant consisting of an integral red-oxide coloring pigment in the proportion of 8 pounds per cubic yard of concrete.
  3. The costs, if any, of cleaning coloring pigment from the concrete delivery equipment and other related cleanings shall be considered as part of the work.

9. Specification section 16402 Underground Ducts and Raceways for Electrical Systems

- Section 1.01: Description, add the following to 1.01.E:

  All elbows in Schedule 80 PVC conduit runs below grade shall be PVC- coated rigid galvanized steel. Provide PVC-coated rigid galvanized steel long radius elbows for transitioning to above ground.

10. Specification section 09970 Specialty Coatings for Concrete

- Section 3.04: Surface Preparation, add the following to 3.04.A:

  After construction of the IPS structural concrete components including all slabs, walls, fillets, columns and beams has been complete along with backfilling activities, the dewatering system in this vicinity shall be eliminated allowing groundwater to rise to a naturally occurring location prior to the application of the coating system. Injections and other activities ensuring water-tightness of the structure shall be performed as required to provide a watertight structure in accordance with the coating system manufacturer requirements.

11. Specification section 01014 Sequence of Construction

- Section 1.01: Summary, add the following:

n. After construction of the IPS structural concrete components including all slabs, walls, fillets, columns and beams has been complete along with backfilling activities, the dewatering system in this vicinity shall be eliminated allowing groundwater to rise to a naturally occurring location prior to the application of the coating system. Injections and other activities ensuring water-tightness of the structure shall be performed as required to provide a watertight structure in accordance with the coating system manufacturer requirements.

12. Specification section 02050 Demolition of Existing Structures

- Section 1.01 A: Description, add the following paragraph:

7. Lead-Based Paint: Several areas of lead-based paint were documented in the report. Each item shall be addressed as follows:

Old IPS bridge crane beam: The County will remove a 6-inch band of the paint at 8 foot intervals along the beam to allow the Contractor to safely cut and remove the beam in sections. Areas with bolts will also have paint removed to allow safe disassembly.

Old IPS exterior paint: Following demolition of the structure, the combined sample of all demolition waste should pass a TCLP test and be suitable for disposal as non-hazardous waste. Should this not be the case this will be addressed in accordance with Article 12 Change of Work and Article 13 Change of Contract Amount and Time.

Existing IPS paint: The pump shafts and the pumps can be unbolted, disassembled and removed without interfering with the lead-based paint.

C. DRAWINGS

1. Drawing E04 to be deleted in its entirety and replaced with the attached revised drawing sheet E04.

2. Drawing E18 to be deleted in its entirety and replaced i with the attached revised drawing sheet E18.

D. ACKNOWLEDGEMENT OF ADDENDA

a. The Bidder shall acknowledge receipt of this addendum by completing the applicable section in the solicitation or by completion of the acknowledgement information on the addendum. Either form of acknowledgement must be completed and returned not later than the date and time for receipt of bid.

b. All other terms, conditions and specifications remain the same.

c. Receipt acknowledged by:

____________________________________ __________________________

Authorized Signature Date Signed

____

Title

____

Name of Firm

GEOTECHNICAL INVESTIGATION REPORT
FOR UPDATED INFLUENT PUMP STATION
SOUTH WATER RECLAMATION FACILITY
ORANGE COUNTY, FLORIDA
AEA PROJECT No. 20610

Antillian Engineering Associates, Inc.
3331 Bartlett Boulevard
Orlando, Florida 32811
(407) 422-1441

ANTILLIAN
ENGINEERING ASSOCIATES, INC.

June 2, 2017

Reiss Engineering, Inc.
1016 Spring Villas Point
Winter Springs, Florida 32708

Attention: Stefano Ceriana, P.E.

Reference: Geotechnical Investigation Report
For Updated Influent Pump Station
South Water Reclamation Facility
Orange County, Florida
AEA Project No. 201610

Dear Mr. Ceriana:

Antillian Engineering Associates, Inc. has completed a geotechnical-engineering investigation with additional analyses for the influent pump station at the Orange County South Water Reclamation Facility. The investigation was conducted in general accordance with the scope of services presented in our proposal dated February 2, 2016. We conducted additional analyses as requested to reflect updates to the design. This report contains the results of our investigations, our recommendations for pump station design and installation, structural foundations, pipeline installation, earthwork, and groundwater control, and other concerns as appropriate. It supersedes our report for the pump station dated February 7, 2017.

It has been our pleasure to serve Reiss Engineering, Inc. and Orange County Utilities on this project. Please contact our office if you have any questions, or if you need additional information.

Respectfully submitted,
ANTILLIAN ENGINEERING ASSOCIATES, INC.
Certificate of Authorization No. EB6685

06.05.2017

Peter G. Suah, P.E.
Florida PE No. 46910
Principal Engineer

Attachments: Figures
Appendix A: Field and Laboratory Testing Results
Appendix B: Important Information About This Geotechnical-Engineering Report
Appendix C: Constraints and Restrictions

PROJECT DESCRIPTION

Orange County Utilities ("OCU") is planning to expand influent pumping capability at the South Water Reclamation Facility by constructing a larger, influent pump-station on a site adjacent to the existing pump-station. The South Water Reclamation Facility is situated on Sand Lake Road about one-quarter mile west of Shingle Creek. Its approximate location is shown on Figure 1.

The new influent pump station will include the following components:

1. Two wet wells between 38 feet and 41 feet deep, each with a cast-in-place- concrete bottom-slab between four feet and five feet thick.

2. A junction ("splitter") box about 25 feet deep, with a concrete bottom slab about three feet thick.

3. A new single-story electrical service building measuring about 24 feet by 30 feet in plan, on a cast-in-place-concrete, slab-on-grade foundation.

4. Underground pipes and service lines buried up to 20 feet below the ground surface.

Reiss advised that underground pipes and service lines will be buried up to 20 feet below the ground surface, and that the wet wells will be installed "in the dry" using conventional excavation and dewatering techniques.

OCU selected the design team led by Reiss Engineering, Inc. ("Reiss") to design this project. Reiss retained Antillian Engineering Associates, Inc. ("AEA") to conduct the geotechnical-engineering investigation and develop recommendations for design of the structures and the pipelines.

As the design neared completion, members of the design team expressed concerns about the difficulties that potential bidders might face with controlling the quality of construction using the caisson/tremie method. The design was updated so that the wet wells would be installed "in the dry" using conventional excavating, temporary excavation support, and dewatering methods. We advised the design team that the subsurface exploration originally conducted for the wet wells would not be deep enough for the revised construction approach, and that deeper drilling would be needed. Reiss authorized the extension of one test boring to obtain deeper subsurface information for developing revised recommendations for the updated design.

AVAILABLE INFORMATION

We examined the United States Geological Survey (USGS) quadrangle topographic map for the project vicinity, the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey of Orange County and the USGS map "Potentiometric Surface of the Upper Florida Aquifer in the St Johns River Water Management District" dated

September, 2008 to obtain general information about the project site. We also examined preliminary drawings and other documents furnished by Reiss, for site-specific information.

The USGS map showed a "Sewage Disposal" facility on the southern side of a divided roadway that appeared to be Sand Lake Road. The facility was on a broad plain about 1,500 feet west of Shingle Creek. Ground surface elevations near the facility were between the Elevation 80 feet NGVD (El. 80) contour and the El. 95 contour. The Shingle Creek floodplain was mapped as wetlands or marsh below the El. 80 contour.

The NRCS Soil Survey reported Immokalee fine sand, Ona fine sand, St Johns fine sand and Smyrna fine sand as the predominant soil units near the "Sewage Disposal" facility shown on the USGS map. These soils are typically found at lower elevations on the broad plains of Orange County. They tend to be nearly level to level and poorly drained, with a seasonal high groundwater level reported less than a foot below the natural ground surface. Basinger fine sand and the Samsula-Hontoon-Basinger association were mapped in the Shingle Creek floodplain. These low-lying, "depressional" soils are typically found in freshwater swamps, marshes and other low-lying features on the plains, and are usually submerged. Organic materials from derived from plants decomposed in the water are typically associated with these soils. Depths are reported to range from four feet to more than seven feet, which was the maximum depth of exploration in the NRCS soils survey.

The potentiometric surface map showed the elevation of the potentiometric surface of the Upper Floridan aquifer near the El. 50 feet NGVD contour in the general area of the project.

The preliminary drawings included a layout of the proposed pump station, a preliminary engineering report/scope document and a topographic survey of the site by BFA Environmental. The layout plan showed two wet wells with associated pipelines and the electrical building south of the existing pump station building. The splitter box was shown adjacent to the west wall of the existing pump station building. Reiss had also marked preferred test boring locations on a second copy of the plans.

The preliminary engineering report had indicated that the wet wells would be installed using the "caisson/tremie method . . . to reduce the required excavation area and . . . decrease the required dewatering." The report further stated that a "separate caisson was anticipated for each of the proposed trench type wet wells," but the wet-well depth was not stated. The report also noted that each "trench will be cast in sections directly above the installation area. Once each section is cured, the structure can be incrementally lowered into place. Once all the caissons are sunk, tremie concrete can be installed to provide the bottom slab and ballast against flotation forces from groundwater." The report did note that "other construction methods should be considered such as conventional excavation and cast-in-place structures or sheeting and shoring and cast-in-place structures."

The BFA survey showed the proposed site, existing buildings and underground utility services. Ground surface elevations were mapped between Elevation 92 feet and Elevation 95 feet NAVD88.

FIELD INVESTIGATIONS

We developed a test-boring location plan based on a preliminary exploration plan furnished by Reiss, and designated the boring locations for the various project elements as shown below in Table 1.

We visited the site on September 27, 2016 to observe the surface conditions at the pump-station site and prepare the field investigation program. We set out the test-boring locations on the site near the locations Reiss had selected by using the preliminary plan as a reference and adjusting as needed to avoid possible conflicts with marked utilities or other visible obstructions. We spray-painted the test-boring locations on the ground surface for underground utility location and marking as required by Florida Statutes, and staked them to facilitate identification by the underground-utility locators and our drilling crew.

Our crew drilled six test borings on October 24, 2016. They returned to the site on April 6, 2017 to extend test-boring WB-2 from 50 feet to 80 feet below the existing ground surface as we had recommended and Reiss had authorized. Boring locations, designations and depths are summarized below in Table 1. Approximate locations are shown on Figure 2.

TABLE 1
SUMMARY OF SUBSURFACE EXPLORATIONS

STRUCTURE DESCRIPTION	BORING DESIGNATIONS	DEPTH (feet)
Influent pump- station wet-wells	WB-1, WB-2	50, 80
Electrical building	EB-1	25
Splitter Box	SB-1	40
Pipelines	PB-1, PB-2	25

The field crew drilled the test borings to the intended depths shown in Table 1. They advanced the boreholes by hand to depths between four feet and seven feet using a bucket auger to reduce the likelihood of damaging possibly unmarked underground utilities. Auger drilling and sampling were conducted in accordance with ASTM D 1452. The crew advanced the test borings from the augered depths to the completion depths by split-spoon soil sampling and mud-rotary drilling, and conducted the Penetration Test (SPT) with the split-spoon sampling in accordance with ASTM D 1586.

The crew logged the soils recovered from the auger and the samplers, sampler penetration resistance expressed in hammer blows per foot ("SPT N-values"), and other noteworthy field observations. They measured the depth to groundwater in each borehole, recorded those depths on the field logs, and sealed representative soil samples in clean, airtight containers for transportation to our office. The field crew backfilled the completed boreholes with soil cuttings.

LABORATORY TESTING

A geotechnical engineer examined the recovered soil samples in our office, confirmed the field descriptions, classified the soils visually in accordance with the Unified Soil Classification System, ASTM D 2488, and developed a representation of the soil stratigraphy at each boring location. The engineer selected representative soil samples for laboratory testing, which consisted of 20 percent fines tests, three Atterberg limits test series, and three natural moisture content tests. The tests were done in accordance with the applicable ASTM standards. Results are presented on the boring logs and on the Summary of Laboratory Test Results sheet in Appendix A.

[END OF SECTION]

SURFACE CONDITIONS

The influent pump station site was an unpaved area south of the existing pump station building, which was about 110 feet east of the west entrance to the South Water Reclamation Facility. Above-ground tanks, operations and maintenance buildings, industrial pipe-runs, and other features of a typical wastewater recovery facility were observed. The proposed locations for the structures were nearly level to level, and were covered with well-maintained grass turf or asphalt-concrete pavement. Plastic flags, paint markings, and manhole covers indicated numerous buried, underground utility pipelines, conduits or ducts.

SUBSURFACE CONDITIONS

The stratigraphy, soil types and groundwater levels described below are based on the results of the test borings and laboratory testing programs. SPT N-values were used as empirical indications of soil condition, when available. Unified Soil Classification System group names and group symbols were used for soil classification. The descriptions below are general and describe the major soil types that we encountered. Detailed subsurface characteristics at each boring location are shown on the boring logs and on the Summary of Laboratory Test Results sheet in Appendix A.

The uppermost materials encountered in the borings were gray, dark gray, brown, dark brown, very dark brown, grayish brown, dark grayish brown, and very dark grayish brown sands that contained silt. Pieces of crushed limestone, broken pieces of cemented sand, and clayey sand nodules were occasionally encountered within these soils. The field crew reported lost fluid circulation while drilling between ten feet and 13 feet below the ground surface at SB-1. The encountered thicknesses of these soils ranged from four feet to about 12 feet. SPT N-values ranged from 3 blows per foot (bpf) to 51 bpf, with most values lower than 20 bpf, indicating soil conditions that ranged from very loose to very dense but were mostly very loose to medium dense. Percent fines testing of four samples indicated fines contents between 9 percent and 18 percent. Based on visual examination and laboratory testing, these soils were classified as sand with silt ("SP-SM") and silty sand ("SM"). Because of the limestone fragments and other inclusions, and observed variations in soil composition and condition, we also characterized these soils as "possible fill."

Beneath the possible fill were brown, dark brown, grayish brown, dark grayish brown, and occasionally light brownish gray sands that contained more silt. Some samples had a slightly plastic texture. Encountered thicknesses ranged from about 12 feet to about 30 feet. Actual thicknesses could not be verified in EB-1, SB-1, PB-1 and PB-2, which had been terminated at their intended depths without fully penetrating these soils. SPT N-values ranged from 5 bpf to 16 bpf, indicating loose to medium dense conditions. Percent fines testing of 11 samples indicated fines contents between 14 percent and 36 percent. Based on visual examination and laboratory testing, these soils were classified as silty sand ("SM").

Beneath the silty sands in WB-1 and WB-2 was light greenish gray and greenish gray clayey sand, sandy clay, and clay. Encountered thicknesses of these soils were about 12 feet in WB-1 and about

25 feet in WB-2. The actual thickness could not be verified on WB-1, which had been terminated at its intended depth before completely penetrating these soils. SPT N-values ranged from 5 bpf to 14 bpf, indicating firm to stiff consistency. Percent fines testing of three samples indicated fines contents between 43 percent and 87 percent. Atterberg limits testing of three samples yielded liquid limit values between 45 and 98, and plasticity index values between of 25 and 72. Additional testing indicated natural moisture contents between 39 percent and 70 percent. Based on visual examination and laboratory testing, we classified these soils as clayey sand (“SC”), low-plasticity (“lean”) sandy clay (“CL”) and high-plasticity (“fat”) clay (“CH”).

Beneath the clay in WB-2 was olive gray and dark olive gray sand that contained silt and varying amounts of shell fragments. The encountered thickness of this soil was about 17 feet. Its actual thickness could not be verified because WB-2 had been terminated at its intended depth before completely penetrating these soils. SPT N-values ranged from 35 bpf to 58 bpf, indicating dense to very dense conditions. Percent fines testing of one sample indicated a fines content of 19 percent. Based on visual examination and laboratory testing, we classified these soils as silty sand (“SM”).

Groundwater was encountered in these boreholes at depths between five feet and nine feet below the existing ground surface. Encountered groundwater levels and details of the subsurface characteristics encountered at each location are shown on the boring logs in Appendix A.

[END OF SECTION]

GENERAL COMMENTS ON RECOMMENDATIONS

The following recommendations are based on a review of the field and laboratory test data, our understanding of the proposed construction and our experience with similar projects and subsurface conditions. If plans for the proposed pump station change from those discussed in this report, we request the opportunity to review those changes and revise our recommendations as needed to accommodate them. In addition, if subsurface conditions encountered during construction differ significantly from those discussed in this report, those conditions should be reported to us immediately for our observation and recommendations.

GENERAL DISCUSSION OF ENCOUNTERED SUBSURFACE CONDITIONS

As discussed earlier in the SUBSURFACE CONDITIONS section this report, the uppermost soils encountered during the subsurface investigations were sands that contained varying amounts of silt. Those sands were mostly very loose to medium dense; some dense to very dense conditions were also encountered. Some sands were characterized as “possible fill” because of observed variations in color, composition and condition and pieces of cemented sand, and limestone fragments. The possible fill was underlain by loose to medium dense sands that were more silty. Some samples had a slightly plastic texture. Firm clays of unknown thickness were encountered beneath the silty sands, at depths near 38 feet.

Groundwater was encountered between five feet and nine feet below the existing ground surface at the boring locations. Deep excavations will be needed to build the below-grade structures for this project, so significant efforts will be needed to support those excavations temporarily and control the groundwater effectively. Recommendations are provided in the GROUNDWATER CONTROL and BELOW-GRADE CONSTRUCTION sections of this report.

In our opinion, the subsurface conditions encountered during this investigation pose some challenges to the proposed construction of this project, but those challenges can be met if they are carefully taken into consideration and handled competently. Geotechnical-engineering recommendations for design and construction are discussed in the following sections of this report.

GENERAL COMMENTS ON SOIL BEARING PRESSURE

The vertical design load of a structure distributed over the area beneath its foundation is known as the “gross bearing pressure.” Excavating soil to install a buried structure on a footing reduces the vertical stress on the intended bearing surface by an amount equal to the stress that had been imposed by the self-weight of the soil that was removed, i.e., the “overburden” pressure. The stress increase induced by the structure on the bearing soils is the difference between the gross bearing pressure and the overburden stress, and is known as the “net bearing pressure.” Structural analysis and design of a footing are based on gross bearing pressure, while geotechnical engineering analysis of that footing (typically settlement and bearing resistance) is based on net bearing pressure.

Bearing capacity is the net bearing pressure that would induce a sudden, shear failure in the soils beneath the footing. It is a function of the size and depth of the foundation and the properties of the bearing soils. Bearing capacity failure is generally not a concern for large footings, mat foundations, foundations bearing more than four feet below the ground surface, or foundations bearing in medium dense to very dense soils. Foundation settlement is the cumulative, primary compression of the soils in the zone of influence beneath the footing in response to the net bearing pressure. In many cases, the net bearing pressure beneath deeply buried structures is zero, and settlement does not occur.

DESIGN OF BURIED STRUCTURES

Based on the anticipated structure depths and footing thicknesses discussed earlier in this report, the wet-well footings are expected to bear between 34 feet and 38 feet below the existing ground surface. Similarly, the splitter box footing is expected to bear about 20 feet below the ground surface.

To design the walls of these structures, we recommend setting the groundwater level with the existing grade. In addition, we recommend a saturated soil unit weight of 120 pounds per cubic foot (pcf), a soil friction angle of 30 degrees and a lateral earth pressure coefficient of 0.5. That coefficient represents the "at-rest" condition because enclosed, buried structures tend to be self-bracing, and so are not likely to allow the soil to displace to the extent needed to attain the active condition. The lateral earth pressure coefficient of 0.5 should also be applied to loads on the ground surface around the buried structures, including any nearby shallow foundations and incidental vehicular traffic. In the absence of specific load information, incidental traffic should be represented by a uniformly distributed vertical load of 250 pounds per square foot (psf). If the groundwater is assumed to level with the ground surface, the lateral earth pressure induced by the soil only may be represented by an equivalent fluid pressure of 29 pcf for structural design purposes only. The unit weight of water should be added to that equivalent fluid pressure value in order to represent the full lateral load being imposed by the saturated soils on the exterior walls of the buried structures.

The structures should be designed to ensure that they have adequate resistance against uplift when empty. Uplift resistance should be derived from the overall weight of the empty structures and their thick concrete bases, which should be sized to provide the necessary uplift resistance. The buoyant weight of soils resting on any parts of the foundation projecting horizontally beyond the exterior walls may be used to augment uplift resistance, but soil friction against the exterior walls should not be considered as contributing to uplift resistance.

The worst-case loading condition on a wet-well foundation installed conventionally in a braced, dewatered, excavation typically occurs during hydro-testing, when the structure is full of water but has not been backfilled and the groundwater has been lowered to at least two feet below the lowest foundation bearing surface. Structures installed by the "caisson/tremie" method may not impose the same bearing pressure, but since we do not know which method will be used for construction, we assumed the worst-case condition described above for the purposes of settlement analysis.

The project structural engineer advised that the foundation bearing pressure during water testing, i.e., the gross bearing pressure, beneath the wet wells would be about 5,000 psf. Based on the depths provided for the splitter box, we assumed a gross bearing pressure of about 2,800 psf for the splitter box. Excavating soils to the depth of the wet-well footings should reduce the overburden stress by about 4,800 psf, and resulted in an estimated net bearing pressure of about 200 psf. Similarly, the reduction in overburden stress for the splitter box would be about 2,500 psf, yielding an estimated net bearing pressure of about 300 psf.

These net bearing pressures are so small that they are effectively negligible. In addition, water tests typically last about 24 hours, whereas even clean, granular soils take two to three days to settle under vertical loading. Once the water testing is completed, the structures are not likely to be as heavy for very long during their service lives, As a result, we do not anticipate significant settlement beneath them, so it is our opinion that the wet wells can be supported on large, spread footings as planned, provided the recommendations in the EARTHWORK FOR BELOW-GRADE CONSTRUCTION sections of this report are followed.

WET WELL CONSTRUCTION

As discussed earlier in this report, OCU intends for the wet wells and the splitter box to be constructed "in the dry" using conventional methods of excavation, excavation support, dewatering, and backfilling. Temporary, excavation-support systems should be designed to maintain stability of the excavations, the surrounding soils, and the adjacent structures for the duration of the below-grade construction activity. Excavations must be dewatered properly to provide dry, stable, and safe work areas. Recommendations for excavation safety and dewatering are provided later in this report.

Careful attention must be paid to selection, installation, operation, and decommissioning of the systems for temporary dewatering and excavation support. Potential complications and constraints that these systems may impose on below-grade construction should be considered carefully along with the possible impacts of dewatering, such as induced settlement of nearby structures. Potential settlements are discussed in the following section.

POTENTIAL GROUND SETTLEMENTS IN RESPONSE TO DEWATERING

Dewatering of a site to enable below-grade construction to proceed "in the dry" typically causes unwanted settlement at the ground surface. This is because lowering the groundwater level reduces the buoyant force on the soil being dewatered and increases the vertical effective stresses within the soil profile. The increased vertical effective stresses compress the soils, and it is the cumulative compression of those soils that is observed as settlement at the ground surface. Drawdown-induced settlements are of particular concern when the site being dewatered for below-grade construction is adjacent to existing buildings or other facilities that may not tolerate those settlements.

The magnitude of the anticipated settlement depends mostly on the vertical distance that the groundwater is being lowered (the “drawdown”). Settlement can also be affected by the duration of the below-grade construction activity if the soils contain silts or clays, if the duration is long enough for the characteristic, long-term settlement of those fine-grained oils to take place. Other common factors that can affect anticipated settlement include the thickness, composition, compressibility, and permeability of the individual soil strata within the subsurface profile. However, those subsurface characteristics are generally considered unchangeable for a given site, at least initially.

We analyzed the potential impacts of dewatering the excavations for the wet well and the splitter box based on an anticipated drawdown of about 48 feet, i.e., from the ground surface to two feet below the bottom of the wet-well bottom-slab. We based that depth on the wet-well and bottom-slab dimensions discussed in the AVAILABLE INFORMATION section of this report. The increase in effective vertical stress resulting from that drawdown was about 3,000 psf. We calculated settlements using estimated compressibility characteristics derived from approximate correlations between the soils we encountered on the wet-well site with soils we encountered while conducting investigations in 2013 and 2014 for the Phase V expansion of the water reclamation facility.

Our analyses yielded a total, estimated, drawdown-induced settlement of about seven-and-a half inches at the wet-well site. About four-and-a-half inches of that estimated settlement were obtained in granular soils and are expected to occur within about two weeks after the groundwater has been drawn down. The remaining three inches of settlement were obtained for the fine-grained soils in the soil profile and are expected to take about four months to occur. We estimated similar settlements for the splitter-box site even though its excavation will be shallower, because the two sites are so close together that the drawdown needed to build the wet well will effectively be the same at the splitter-box site.

In the absence of more detailed subsurface information, and given the proximity of the below-grade construction sites to the adjacent buildings and possible underground piping, it is our professional opinion that the estimated settlements should be treated as if they were occurring at the building foundations facing the below-grade construction sites.

In our experience, it is unlikely that the adjacent buildings or the possible underground piping can tolerate the anticipated settlements discussed above. As a result, we recommend revising the design to reduce the amount and the duration of drawdown needed to build the wet well and the splitter box in the dry. If that is not possible, other options could be considered, including hydraulically isolating the building foundations from the below-grade construction sites using sheet-pile seepage cutoff walls, cast-in-place concrete secant-pile walls, or slurry walls. Another option would be to underpin the foundations using steel H-piles or cast-in-place concrete mini-piles. Immobilizing the soils beneath the foundations by grouting or chemical grouting is probably not a realistic option on these sites because soils with high fines contents are not likely to be permeable enough. Immobilizing the soils temporarily by freezing can be effective in fine-grained soils but it is a very expensive option. We would be pleased to explore these and possibly other approaches in more detail with the design team, and with OCU if needed. OCU should to anticipate the need for a specialty contractor for part of the below-grade construction, and the likelihood of higher construction cost.

PIPELINE DESIGN

A minimum modulus of soil reaction (E') value of 1,000 pounds per square inch (psi) may be used to design the pipelines for this project, provided the earthwork, compaction and subgrade preparation recommendations described in the EARTHWORK FOR BELOW-GRADE CONSTRUCTION section of this report are implemented.

PIPELINE FOUNDATIONS SUPPORT

Manholes, thrust blocks, anchor blocks and other underground structures should be supported on natural soils or backfill compacted as recommended in the EARTHWORK FOR BELOW-GRADE CONSTRUCTION section later in this report. Soils compacted to that condition should support bearing pressures up to 1,500 pounds per square foot (psf) with total settlements less than an inch.

UPLIFT RESISTANCE

All buried pipes and structures should be designed to resist hydrostatic pressure corresponding to the design high groundwater level. Uplift-resistance calculations should consider the weight of the structure, the weight of any soils directly above the structure and the weight of backfill over any parts of the foundation that project horizontally beyond the side walls. Side friction resistance along the walls should not be considered.

SOIL RESISTANCE TO HORIZONTAL PIPELINE FORCES

Changing fluid pressure inside a pipeline can induce horizontal forces at junctions with buried structures and in locations where the pipe changes direction. Those forces can cause the pipe to move uncontrollably and eventually lead to distress, so anchor blocks or thrust blocks are typically provided to restrain the pipe. Those blocks resist horizontal forces by virtue of their mass as well as the ability to mobilize the shear resistance of the soil beneath their bases and the passive resistance of the soil in contact with their vertical faces.

In order to provide effective resistance, soils in contact with anchor blocks or thrust blocks should be in a medium dense to dense condition. Naturally loose soils (and all fill or backfill materials) should be compacted as recommended in the EARTHWORK FOR BELOW-GRADE CONSTRUCTION section later in this report to at least two feet below the base of any block or structure and at least five feet beyond its vertical face in contact with the soil. The soils should be continuous with no voids or other discontinuities.

Shear resistance beneath the base of any block or structure may be estimated using the following expression:

$$S = \frac{(W + \gamma_s A H_t - U) \tan(0.67\phi)}{FS_b}$$

where
S = allowable shear resistance, in pounds
W = total weight of the block, in pounds
γ_s = unit weight of the soil above the block, in pounds per cubic foot
A = area of base of structure, in square feet
H_t = depth from ground surface to the top of the block, in feet
U = total uplift force, in pounds
ϕ = soil friction angle (30 degrees typically assumed)
FS_b= desired factor of safety for base shear (1.5 typically assumed)

The unit weight for compacted soil in central Florida is often estimated to be about 110 pounds per cubic foot (pcf) for moist soil and about 120 pcf for saturated soil.

Passive soil resistance against the face of any block or structure may be calculated conventionally using the estimated soil properties and the desired factor of safety for passive resistance. Surcharges, traffic loads and the weight of construction equipment should not be considered in these analyses.

SLAB-ON-GRADE FOUNDATIONS

As discussed earlier in this report, the electrical building will be supported on slab-on-grade foundations bearing near existing grade. Detailed structural information was not available at the time, so a gross bearing pressure (the increase in vertical pressure induced in the soil beneath a structure by the total weight on its foundation) of 500 psf was assumed for settlement analysis of the slab-on-grade foundations.

Potential settlement was calculated by applying the gross bearing pressure to the soil stratification developed from the boring log. The foundation was assumed to bear on compacted soils. Engineering properties were then estimated for each soil type within the anticipated zone of foundation influence using empirical correlations with the SPT N-values.

The result of the settlement analysis indicated that the slab-on-grade foundations should settle less than one-half inch under the assumed bearing pressure. Since the actual bearing pressure is expected to be lower than the assumed value, the actual settlement also should be less. Measurable long-term foundation settlement is not expected because fine-grained soils and plastic soils were not encountered within the anticipated zone of influence of the foundation.

EARTHWORK FOR BELOW-GRADE CONSTRUCTION

All below-grade construction should be conducted in accordance with the recommendations for excavation safety and groundwater control presented later in this report. Below-grade construction is likely to require temporary excavation support systems to withstand the anticipated lateral loads and limit unacceptable movement of surrounding soils and adjacent structures. Dewatering will probably be needed in order to establish and maintain dry, stable, safe, below-grade work areas.

Careful attention must be paid to the selection, installation, operation, monitoring, maintenance and removal of temporary excavation support systems. They should provide sufficient working room for anticipated below-grade activities such as installation of formwork and compaction of backfill. Temporary excavation support systems should be removed so as not to disturb completed structures, the backfill nor adjacent structures. The contractor should prepare contingency plans so that the cause(s) of any observed distress to excavation support systems, surrounding soils, or adjacent structures can be identified promptly and accurately, and addressed decisively.

Pavement materials, grass and other vegetation, roots, topsoil or any other unsuitable materials within the limits of the proposed construction should be removed and either discarded or stockpiled away from the immediate work areas for reuse as appropriate, possibly as landscaping material. Any organic materials encountered deeper below the ground surface should be treated in a similar fashion.

Conventional construction equipment should be able to dig excavations for the anticipated pump station improvements. However, some medium dense soils and silty sands may be difficult to excavate. Roots, organic materials, debris, dense to very dense soils and cemented soils are also possible and should be expected, even though they were not encountered in the borings.

The excavations should be dug to the depths and widths needed for installation of the buried structures, piping, excavation support systems, and any below-grade construction equipment or materials that may be needed. This work should be closely supervised to ensure that excavations are not being over-dug and that the bearing soils are not being disturbed. Any soft, loose or muddy materials should be carefully and completely removed to expose uniform, undisturbed soil.

Below-grade concrete foundations need uniform support to function effectively, even when lightly loaded. Exposed subgrade soils at the bearing depths should be examined and probed by a geotechnical engineer or qualified representative to locate soft or yielding areas, hard spots or other non-uniform conditions. Non-uniform conditions should be treated as directed by the OCU on-site representative in consultation with the examining geotechnical engineer.

Exposed subgrade soils at the bottoms of excavations should be thoroughly and uniformly compacted to achieve not less than 95 percent of the maximum dry density obtained by the Modified Proctor method (ASTM D 1557) to a depth at least one foot below subgrade level.

Backfill should be placed uniformly on all sides of the proposed pipelines and manholes in loose lifts approximately eight inches thick before initiating compaction. Each lift should be compacted to not less than 95 percent of the maximum dry density by the Modified Proctor method (ASTM D 1557).

EARTHWORK FOR SLAB-ON-GRADE FOUNDATIONS

All vegetation, topsoil, organic matter and debris within the foundation area should be removed to expose clean, undisturbed soils. Clearing and grubbing should extend at least five feet beyond the edges of the foundation area and should be expected to a depth of at least one foot.

The cleared ground surface should be examined and probed by a geotechnical engineer or designated representative to locate soft or yielding areas, hard spots or other non-uniform conditions. Non-uniform conditions should be treated as directed by the OCU on-site representative in consultation with the examining geotechnical engineer. The cleared ground surface should be compacted to not less than 95 percent of the maximum dry density obtained by the Modified Proctor method (ASTM D 1557) to a depth at least two feet.

Minor filling and regrading of the site is anticipated. Fill soils should be placed in uniform lifts approximately 10 to 12 inches in loose thickness and compacted to not less than 95 percent of the maximum dry density obtained by the Modified Proctor method (ASTM D 1557).

CONSTRUCTION MONITORING

A program should be established to ensure that excavation, backfilling and compaction operations are conducted in accordance with the project plans and specifications. In-place density testing should be conducted at the bottoms of excavations and during backfilling and compaction operations. Trench subgrade and trench backfill should be tested for adequate compaction at a frequency not less than one test per vertical foot per 300-foot run of pipe. Subgrade soils beneath buried structures should be tested for adequate compaction at a minimum of one location. Backfill around buried structures should be tested for adequate compaction at a frequency not less than one test per vertical foot of backfill. The moisture content of the subgrade soils and backfill soils should be within the range that will optimize the densification process. The contractor should be prepared to adjust the moisture content and change equipment, procedures and lift thickness as needed at no additional cost to the Owner in order to achieve the recommended compaction. We also recommend that a geotechnical engineer or the OCU on-site representative be present during construction to confirm that the contractor complies with the plans, specifications, and approved submittals.

REUSE OF EXCAVATED SOILS

We anticipate that excavated soils will be reused as backfill and fill. Most of the soils encountered in the borings may be too for immediate reuse as backfill and are likely to require proper moisture conditioning to achieve the recommended degree of compaction. Clayey sands and clays are likely to be too difficult to work efficiently. Fill and backfill should consist of sand with a fines content less than 12 percent that is free from debris and rubbish, topsoil, mud, muck, peat, stumps, roots, vegetable matter or other unsuitable materials that might decompose or cause excessive settlement. It should be non-plastic and contain no more than 5 percent by dry weight of organic matter.

Dewatering in preparation for excavation should not be expected to reduce in-situ water contents to more favorable levels. Excavated soils are often stockpiled to drain, spread to dry or blended with drier materials to achieve a suitable moisture condition. Despite the cost, off-site borrow material meeting the criteria discussed above may be more beneficial in terms of ease and efficiency of use.

Because a limited number of borings were drilled for this investigation, variations in consistency and fines content of the uppermost soils are likely, and should be expected. As a result, soil types encountered during excavations are likely to vary. Possible soil types that might be encountered within the planned depths of excavation and general recommendations for their reuse are discussed below for general guidance. These guidelines should not override the project specifications. There is the possibility that other soils may be encountered during construction that do not fall into one of the categories discussed below.

Poorly Graded Sands (SP)

These soils had fines contents of 5 percent or less, and are commonly referred to as “clean” sands. They are highly desirable for use as fill and backfill in central Florida because they drain freely. That characteristic allows these soils to be placed and compacted readily, even if they have been excavated from below the groundwater level. Satisfactory levels of compaction can be achieved using a wide variety of compaction equipment and across a relatively broad range of moisture contents. Some instability or “pumping” should be expected if these soils are compacted near saturation.

Sands with Silt and Sands with Clay (SP-SM, SP-SC)

These soils consisted of sands with fines contents between 5 percent and 12 percent. Although they do not drain as freely as clean sands, these soils are still quite suitable for use as fil or backfilll. If excavated from below the groundwater surface, they may have to be stockpiled and allowed to drain (or spread to dry) before being placed as fill. Satisfactory compaction can be achieved using a variety of compaction equipment and across a moderate to wide range of moisture contents. However, efforts should be made during compaction to maintain the moisture content below the optimum. Some instability or “pumping” should also be expected if these soils are compacted near saturation.

Silty Sands and Clayey Sands (SM, SC)
These soils consisted of sands with fines contents higher than 12 percent. They do not drain as well as sands. These soils can be reused as fill, but they will require very close attention to moisture content and careful selection of compaction equipment. Excavated soils of these types can be stockpiled to drain and/or possibly spread to dry before being used as fill. However, the contractor should be discouraged from considering this option because of the limited room that is available at the pump station site. Suitable compaction is generally achieved in these soils only across a narrow range of moisture contents, and this range narrows even further as the fines content increases. Silty sands should be compacted below the optimum moisture content to reduce the potential for moisture-related instability. Soils with more than 20 percent fines should not be used as backfill.

GROUNDWATER CONTROL

Based on the encountered soil and groundwater conditions and the anticipated excavation depths, significant dewatering efforts will be needed to enable below-grade construction. The methods typically used to dewater excavations for manholes and small pump stations should not be expected to be adequate for the larger, deeper below-grade structures such as the clarifier, pump stations and ROF controller.

In addition, USGS maps of the area had shown the ground surface between the El. 80 and El. 95 contours, while the potentiometric surface of the Upper Floridan aquifer (the approximate level to which water in the aquifer would rise were it not confined by low-permeability materials above the aquifer) was shown near El 50. These elevations suggested that excavations for the deeper structures might encounter artesian conditions, so those conditions should be expected. Near-surface seepage from higher elevations after rainfall events may also cause inflows similar to artesian conditions. That situation can be exacerbated by isolated horizons of material with lower permeability than the surficial sands, which can impede percolation and cause perched groundwater.

Suggested dewatering efforts for the larger, deeper excavations may include, but are not limited to, single-stage or multi-stage systems using well casings, high-volume or high-lift submersible pumps, deep wells to relieve pressure locally in the Floridan aquifer, or other methods.

The contract documents should require the contractor to verify groundwater levels before starting construction, and to be responsible for all aspects of dewatering, regardless of those groundwater levels. That responsibility includes not just the installation and operation of an effective dewatering system, but also all permits needed to satisfy applicable environmental regulations, and all systems needed to monitor groundwater volume and quality. The contractor should monitor groundwater levels during below-grade construction using piezometers or other devices that can provide efficient, accurate and reliable groundwater level measurements. The contractor should also monitor the adjacent ground surface and equipment, nearby structures, utilities, roadways and other facilities for subsidence, cracking or other distress that may result from temporarily lowered groundwater levels.

All excavations and below-grade construction should be conducted in the dry. The contractor should be prepared to lower and maintain the groundwater level at least two feet below the bottoms of all excavations for the duration of below-grade construction activities. Groundwater should be lowered to the recommended levels prior to excavation in order to minimize the potential for instability of excavations, bottom heave or quick conditions within the excavations. Dewatering systems should be maintained in operation until foundation construction is complete and the excavations have been completely backfilled in a satisfactory manner to prevent uplift. Dewatering systems should be decommissioned progressively to avoid any heave or other potential instability of the below-grade structures and should be addressed in the contractor's dewatering submittal.

Water from dewatering pumps should be discharged as far as practically possible away from the work areas to prevent return flow or erosion into the excavations. The contractor should also have submersible pumps ready on site to intercept and remove any localized inflows. The ground surface around excavations should be graded to minimize inflow of runoff.

GROUNDWATER QUALITY SCREENING

Groundwater screening was not part of our scope for this project.

EXCAVATION SAFETY

The sides of all excavations more than four feet deep must be sloped or supported to withstand lateral forces exerted by the existing soils in accordance with the latest regulations promulgated by the Occupational Safety and Health Administration ("OSHA"). Any excavation support system must also be able to support possible hydrostatic pressures and surcharge loads. For calculating the lateral loads from the site soils on unbraced temporary excavation support systems, we recommend a soil unit weight of 125 pcf and a lateral earth pressure coefficient of 0.4. This coefficient should be increased to 0.5 if the system is braced (the "at-rest" condition). The same coefficients should be applied to loads on the ground surface and from traffic (including construction equipment) around the excavations. Traffic loads should be represented by a uniformly distributed surcharge of 250 psf.

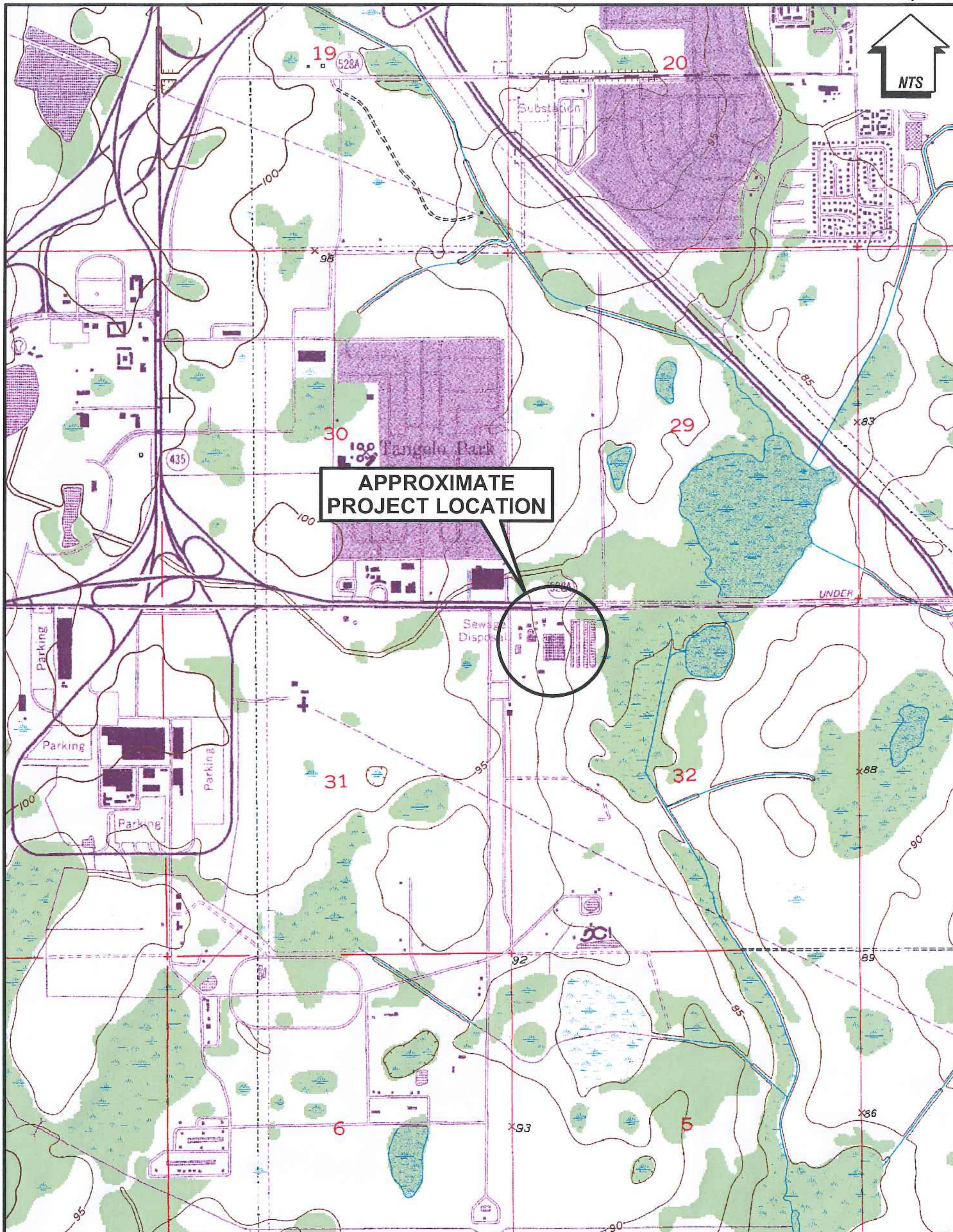
All excavations must be kept dry so that work can proceed safely and efficiently. As discussed in the GROUNDWATER CONTROL section, the groundwater level should be maintained at least two feet below the bottoms of all excavations. However, dewatering systems can fail, which would allow the groundwater to return to its pre-construction level and possibly fill the excavation. Pumping water out the excavations to resume work can temporarily reduce soil strength. This "rapid drawdown" condition should be analyzed using the design high water level.

LIMITATIONS

This report presents an evaluation of the subsurface conditions on the basis of accepted geotechnical engineering procedures for site characterization. The investigation was confined to the zone of soil which is likely to be affected by the proposed construction, and did not address the potential of surface expression of deep geologic activity such as sinkholes. This type of evaluation requires a more extensive range of field services than those performed for this study.

Because of the natural limitations inherent in working below the ground surface, a geotechnical engineer cannot predict and address all possible soil-related problems. During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. The bulletin "Important Information About This Geotechnical Engineering Report" published by the Geoprofessional Business Association (GBA) is presented in Appendix B to help explain the nature of geotechnical engineering analysis. Additional information is presented in Appendix C to bring to your attention basic limitations of a typical geotechnical engineering report.

FIGURES



SITE LOCATION MAP

201610	ORANGE COUNTY SOUTH WRF INFLUENT PUMP STATION	FIG. 1

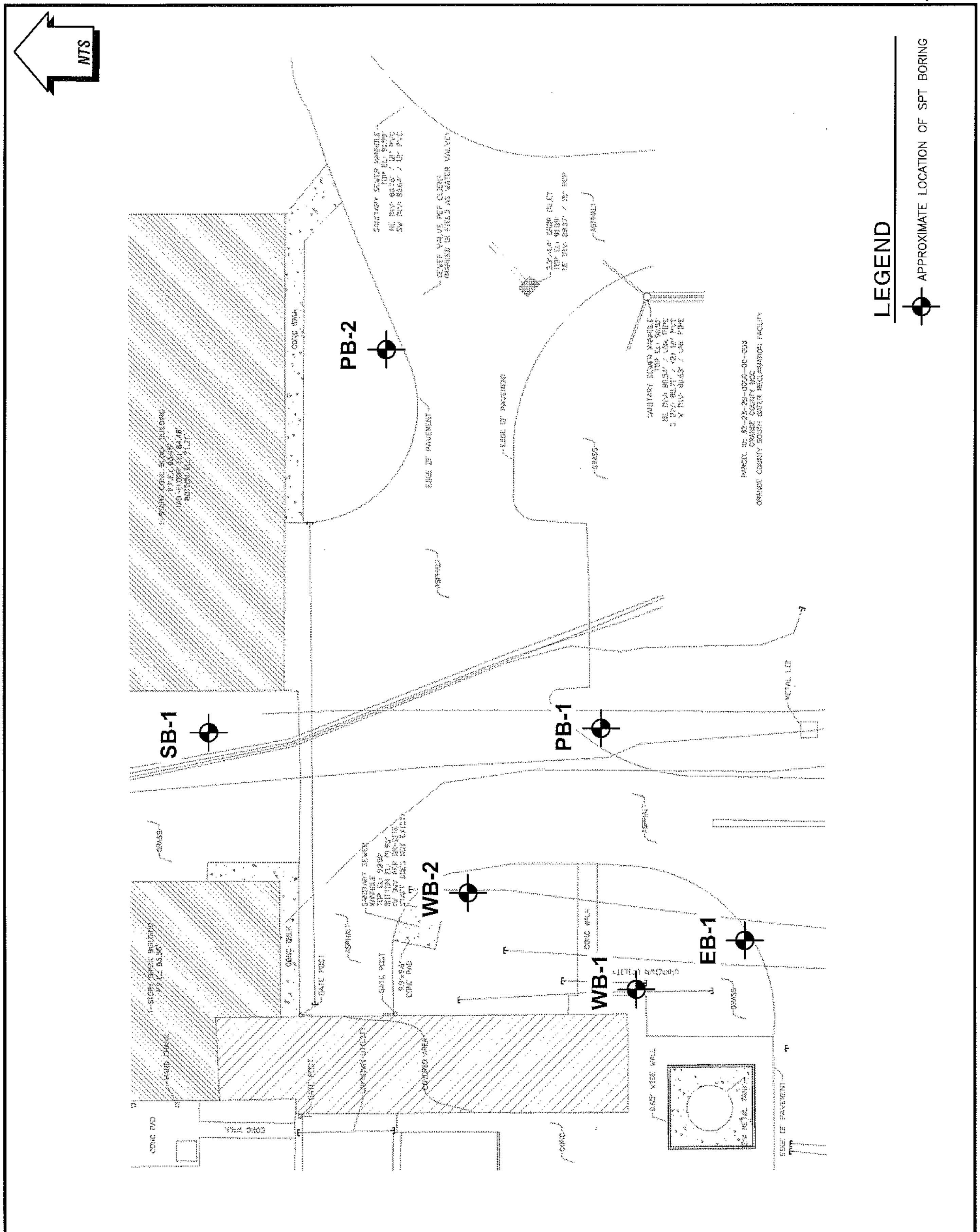


Figure developed from topographic survey provided by Client

BORING LOCATION PLAN		
201610	ORANGE COUNTY SOUTH WRF INFLUENT PUMP STATION	FIG. 2

APPENDIX A

ANTILLIAN ENGINEERING ASSOCIATES, INC.
3331 Bartlett Boulevard Orlando, Florida 32811
Tel (407) 422-1441 Fax (407) 422-2226

KEY TO BORING LOGS

SYMBOLS

Symbol	Description
10	SPT N-Value (number of blows a 140-lb weight falling 30 inches required to drive a Standard Split-Spoon sampler one foot into otherwise undisturbed soil)
WR	Penetration of sampler under weight of drill rods
WH	Penetration of sampler under weight of drill rods and hammer
SS	Split Spoon sample
ST	Undisturbed thin-walled Shelby Tube sample
	Observed change in soil type
	Unobserved change in soil type
▽	Estimated seasonal high groundwater level
▼	Encountered groundwater level

SOIL CONSISTENCY

(Based on empirical correlation with SPT N-Value)

GRANULAR SOILS

Very Loose - Less Than 4 blows/ft.
Loose - 4 to 10 blows/ft.
Medium Dense - 10 to 30 blows/ft.
Dense - 30 to 50 blows/ft.
Very Dense - More Than 50 blows/ft.

FINE-GRAINED SOILS

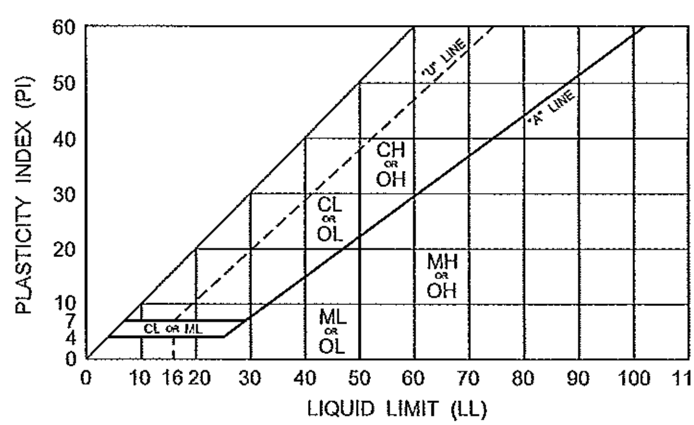
Very Soft - Less Than 2 blows/ft.
Soft - 2 to 4 blows/ft.
Firm - 4 to 8 blows/ft.
Stiff - 8 to 15 blows/ft.
Very Stiff - 15 to 30 blows/ft.
Hard - More Than 30 blows/ft.

UNIFIED SOILS CLASSIFICATION SYSTEM ASTM D 2487

(Based on material passing the 3-inch (75-mm) sieve)

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS More than 50% passing No. 200 sieve	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS			Pt	Peat, muck and other highly organic soils

PLASTICITY CHART



ANTILLIAN ENGINEERING ASSOCIATES, INC.

LOG OF BORING WB-1

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**5.5**
DATE:	**10/24/16**	COMPLETION DEPTH:	**50.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	- 200	MC %	LL	PI	OC %
0		HA	Gray to dark gray fine SAND with silt, occasionally cemented (SP-SM) - gray						
			Brown silty fine SAND, occasionally cemented (SM)						
			- very dark brown, more silty						
5					17				
			- dark brown, less silty (POSSIBLE BACKFILL)	▼					
	5	SS	Loose, dark grayish brown silty fine SAND (SM)	7.0					
	8	SS			22				
10									
	12	SS	- medium dense						
15									
	11	SS							
20									
	9	SS	- loose						
25									
	6	SS	- more silty		36				
30									

LOG OF BORING WB-1

ANTILLIAN ENGINEERING ASSOCIATES, INC.

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**5.5**
DATE:	**10/24/16**	COMPLETION DEPTH:	**50.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SAMPLES	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	OC %
35	■	16	SS	- medium dense							
40	■	6	SS	Firm, light greenish gray sandy CLAY (CL)	38.0		52	39	45	25	
45	■	5	SS								
50	■	6	SS	Firm, greenish gray CLAY (CH)	48.0		87	45	98	72	
					50.0						

LOG OF BORING WB-2

ANTILLIAN ENGINEERING ASSOCIATES, INC.

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**5.7**
DATE:	**4/6/17**	COMPLETION DEPTH:	**80.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	- 200	MC %	LL	PI	OC %
0		HA	Brown silty fine SAND (SM)						
			- dark brown, fine SAND with silt (SP-SM)						
	6	SS	- loose, mixed brown and dark brown		9				
5	17	SS	- medium dense, dark brown, occasionally cemented (POSSIBLE BACKFILL)	▼					
	13	SS	Medium dense, dark brown silty fine SAND (SM)	7.0	18				
	11	SS							
10									
	13	SS	- grayish brown						
15									
	15	SS			24				
20									
	8	SS	- loose						
25									
	11	SS	- medium dense, dark grayish brown, more silty						
30									

ANTILLIAN ENGINEERING ASSOCIATES, INC.

LOG OF BORING WB-2

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**5.7**
DATE:	**4/6/17**	COMPLETION DEPTH:	**80.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SAMPLES	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	OC %
35		12	SS	- less silty			23				
40		6	SS	Loose, light greenish gray clayey SAND (SC)	38.0						
45		6	SS				43				
50		8	SS	Firm, greenish gray CLAY (CH) Boring was originally drilled to 50 ft. on 10/24/16. Drilled deeper on 04/16/17 at Client's request to address change in project design.	48.0						
55		12	SS	- stiff				70	82	55	
60		14	SS	- olive gray, with shell fragments							

ANTILLIAN ENGINEERING ASSOCIATES, INC.

LOG OF BORING WB-2

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**5.7**
DATE:	**4/6/17**	COMPLETION DEPTH:	**80.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SAMPLES	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	OC %
					63.0						
65		35	SS	Dense, olive gray silty fine SAND with abundant shell fragments (SM)			19				
70		52	SS	- very dense, some shell fragments, occasionally weakly cemented							
75		49	SS	- dense, dark olive gray, abundant shell fragments							
80		58	SS	- very dense, some shell fragments							
					80.0						

ANTILLIAN ENGINEERING ASSOCIATES, INC.

LOG OF BORING EB-1

PROJECT NO: **201610**
PROJECT: **South WRF Influent Pump Station**
DATE: **10/25/16**
LOCATION: **See Figure 2**

SURFACE ELEVATION: **93 approx.**
GROUNDWATER DEPTH: **5.2**
COMPLETION DEPTH: **25.0**
DRILLING METHOD: **Mud Rotary**

DEPTH, ft.	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	- 200	MC %	LL	PI	OC %
0		HA	Gray fine SAND with limestone fragments (SP)						
			- brown						
			Dark grayish brown silty fine SAND (SM)						
	3	SS	- more silty						
5			(POSSIBLE BACKFILL)						
	11	SS	Medium dense, brown silty fine SAND (SM)	5.5					
	12	SS							
	16	SS	- grayish brown						
10									
	8	SS	- loose, light brownish gray		24				
15									
	9	SS							
20									
	9	SS							
25				25.0					

LOG OF BORING SB-1

ANTILLIAN ENGINEERING ASSOCIATES, INC.

PROJECT NO:	201610	SURFACE ELEVATION:	93 approx.
PROJECT:	South WRF Influent Pump Station	GROUNDWATER DEPTH:	8.0
DATE:	10/25/16	COMPLETION DEPTH:	40.0
LOCATION:	See Figure 2	DRILLING METHOD:	Mud Rotary

DEPTH, ft.	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	- 200	MC %	LL	PI	OC %
0		HA	Dark brown silty fine SAND, a few crushed limestone fragments (SP-SM)						
					18				
5	8	SS	- loose						
	12	SS	- medium dense						
	7	SS	- loose						
	8	SS	- grayish brown						
10			*Lost circulation while drilling between 10 ft. and 13 feet*						
			(POSSIBLE BACKFILL)	12.0					
15	10	SS	Loose, grayish brown silty fine SAND (SM)		22				
20	8	SS	- more silty, slightly plastic		25				
25	7	SS	- non-plastic						
30	12	SS	- medium dense, grayish brown, slightly plastic		23				

ANTILLIAN ENGINEERING ASSOCIATES, INC.	LOG OF BORING SB-1	SHEET 2 OF 2

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**8.0**
DATE:	**10/25/16**	COMPLETION DEPTH:	**40.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SAMPLES	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	OC %
	■	10	SS	- loose, light greenish gray, non-plastic							
35											
	■	8	SS	- more silty							
40					40.0						

LOG OF BORING PB-1

ANTILLIAN ENGINEERING ASSOCIATES, INC.

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**6.1**
DATE:	**10/25/16**	COMPLETION DEPTH:	**25.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	- 200	MC %	LL	PI	OC %
0		HA	Dark grayish brown silty fine SAND with a few crushed limestone fragments (SM)						
5	13	SS	- medium dense, more silty, no limestone fragments		15				
	16	SS	- brown, a few crushed limestone fragments	▼					
	13	SS	(POSSIBLE FILL)						
10	10	SS	Loose, brown silty fine SAND (SM)	8.5	14				
15	7	SS	- gray, more silty, slightly plastic		27				
20	8	SS							
25	8	SS		25.0					

LOG OF BORING PB-2

ANTILLIAN ENGINEERING ASSOCIATES, INC.

SHEET 1 OF 1

PROJECT NO:	**201610**	SURFACE ELEVATION:	**93 approx.**
PROJECT:	**South WRF Influent Pump Station**	GROUNDWATER DEPTH:	**9.0**
DATE:	**10/25/16**	COMPLETION DEPTH:	**25.0**
LOCATION:	**See Figure 2**	DRILLING METHOD:	**Mud Rotary**

DEPTH, ft.	SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	-200	MC %	LL	PI	OC %
0		HA	Dark grayish brown silty fine SAND with a few crushed limestone fragments (SM)						
4–6	20	SS	- medium dense, dark grayish brown, more silty						
6–7.5	29	SS	- dark brown with a few limestone fragments						
7.5–9	37	SS	Dense, brown silty fine SAND with nodules of gray clayey sand (SM)						
9–10	51	SS	- very dense, dark brown	▼ (9.0)					
13.0			(POSSIBLE FILL)	13.0					
13.5–15	9	SS	Loose, grayish brown silty fine SAND, slightly plastic (SM)						
18.5–20	6	SS							
23.5–25	7	SS	- brown, more plastic		27				
25.0				25.0					

Project: **South WRF Influent Pump Station** Job Number: **201610** **Sheet 1 of 2**

Manager:

Client:

Project Description:

Location: **See Figure 2**

Boring / Depth	Sample Description	#4	#10	#40	#60	#100	Fines #200	Water Content	LL	PI	Organic Content	k (ft/day)	Stratum Number	AASHTO	USCS
EB-1 15.0	Light brownish gray silty sand						24.2								SM
PB-1 5.5	Dark grayish brown silty sand						14.7								SM
PB-1 10.0	Brown silty sand						14.1								SM
PB-1 15.0	Gray silty sand						26.8								SM
PB-2 25.0	Brown silty sand						27.0								SM
SB-1 4.0	Dark brown silty sand						17.7								SM
SB-1 15.0	Grayish brown silty sand						22.0								SM
SB-1 20.0	Grayish brown silty sand						24.7								SM
SB-1 30.0	Grayish brown silty sand						23.0								SM
WB-1 5.5	Very dark brown silty sand						16.9								SM
WB-1 10.0	Dark grayish brown silty sand						22.2								SM
WB-1 30.0	Dark grayish brown silty sand						36.4								SM
WB-1 40.0	Light greenish gray sandy clay						52.3	39	45	25					CL
WB-1 50.0	Greenish gray clay						86.5	45	98	72					CH
WB-2 5.5	Brown sand with silt						9.4								SP-SM
WB-2 8.5	Dark brown silty sand						17.8								SM
WB-2 20.0	Grayish brown silty sand						24.0								SM
WB-2 35.0	Dark grayish brown silty sand						22.6								SM
WB-2 45.0	Greenish gray silty sand						43.4								SM

Summary Of Laboratory Test Results

ANTILLIAN ENGINEERING ASSOCIATES, INC.

Project: **South WRF Influent Pump Station** Job Number: **201610** **Sheet 2 of 2**

Manager:

Client:

Project Description:

Location: **See Figure 2**

Boring / Depth	Sample Description #4	#10	#40	#60	#100	Fines #200	Water Content	LL	PI	Organic Content	k (ft/day)	Stratum Number	AASHTO	USCS
WB-2 / **55.0**	**Greenish gray clay**						**70**	**82**	**55**					**CH**
WB-2 / **65.0**	**Greenish gray silty sand and shell**					**18.7**								**SM**

Summary Of Laboratory Test Results

ANTILLIAN ENGINEERING ASSOCIATES, INC.

APPENDIX B

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX C

ANTILLIAN ENGINEERING ASSOCIATES, INC.
CONSTRAINTS AND RESTRICTIONS

WARRANTY

Antillian Engineering Associates, Inc. has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Antillian Engineering Associates, Inc., as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Antillian Engineering Associates, Inc. of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Antillian Engineering Associates, Inc. to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Antillian Engineering Associates, Inc. is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Antillian Engineering Associates, Inc..

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Antillian Engineering Associates, Inc..

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Antillian Engineering Associates, Inc. cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

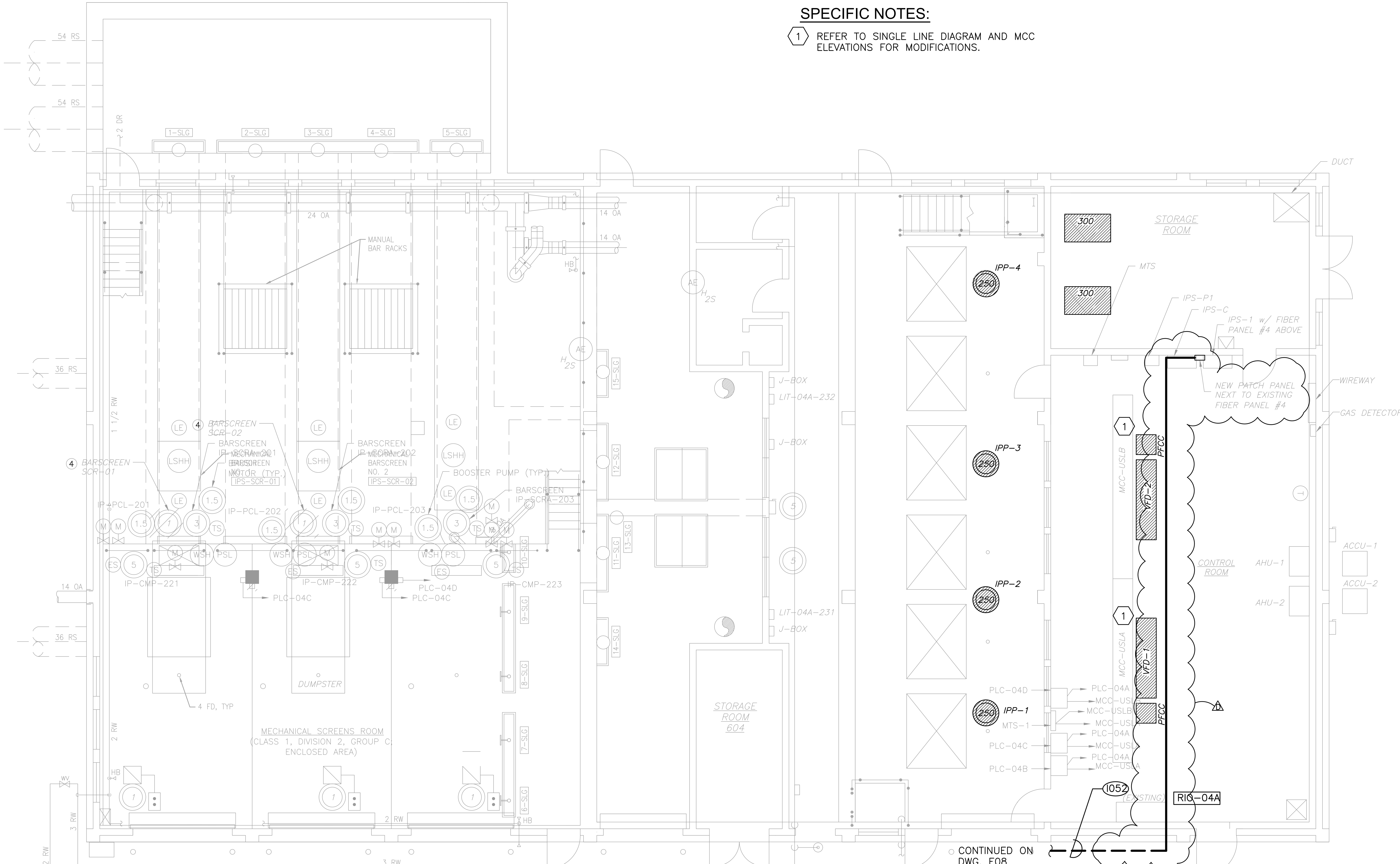
All users of this report are cautioned that there was no requirement for Antillian Engineering Associates, Inc. to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Antillian Engineering Associates, Inc. to locate any such buried objects. Antillian Engineering Associates, Inc. cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of investigation. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

SPECIFIC NOTES:

1. REFER TO SINGLE LINE DIAGRAM AND MCC ELEVATIONS FOR MODIFICATIONS.



EXISTING INFLUENT PUMP STATION – ELECTRICAL PLAN

SCALE: 3/16"=1'-0"

GENERAL NOTES:

1. DEMOLISH. REMOVE ASSOCIATED WIRING AND EXPOSED CONDUIT. ABANDON CONCEALED CONDUITS IN PLACE AND CAP. ALL OTHER EQUIPMENT SHALL REMAIN. SECURE DRIVE SHAFTS AS REQUIRED AFTER REMOVING MOTORS.

2. DEMOLITION OF EQUIPMENT SHALL NOT COMMENCE BEFORE NEW INFLUENT PUMP STATION HAS MET SUBSTANTIAL COMPLETION.

REV	DATE	DESCRIPTION
D	02/2018	ADDENDUM # 4
C	12/2017	ISSUED FOR BID
B	10/2017	100% FOR BID
A	02/2017	90% DRAWINGS

LINE IS 2 INCHES AT FULL SIZE (IF NOT SCALE ACCORDINGLY)

ORANGE COUNTY GOVERNMENT FLORIDA

ORANGE COUNTY UTILITIES DEPARTMENT ENGINEERING DIVISION
9150 CURRY FORD ROAD ORLANDO, FL. 32825

AECOM
AECOM TECHNICAL SERVICES INC. 150 N ORANGE AVENUE, SUITE 200 ORLANDO, FLORIDA 32801 PHONE 407.843.6552
CERTIFICATE OF AUTHORIZATION NO. 8115
PROJECT NO. 110031A

ORANGE COUNTY
SOUTH WATER RECLAMATION FACILITY INFLUENT PUMP STATION
ELECTRICAL
EXISING INFLUENT PUMP STATION ELECTRICAL PLAN

IRA BRANDELL, P.E.
PROFESSIONAL ENGINEER
FLORIDA LICENSE #65814

OCU FILE NO.: OCU #
DESIGNED BY: MAP
DRAWN BY: IPF
CHECKED BY: IB
CADD FILE: E04.DWG

SCALE: NOTED
DRAWING NO.: E04
SHEET: 93 OF 123

Rev/Plot by: RODRIGUEZ, MARCELINO on: 2/16/2018 8:57 AM Individual File Path: \\ORLANDO.NA.AECOMNET.COM\ORLANDO\DCS\PROJECTS\WTR\ORANGE COUNTY\SWRF\60515901_SWRF_IPS_FINAL\900-CAD_GIS\910 CAD\20-SHEETS\E\E04.DWG Parent Sheet Set: 110031A_OCIPS

CONDUIT SCHEDULE

CONDUIT NUMBER	CONDUIT SIZE	CONDUCTORS POWER, GROUND, & CONTROL	FROM	TO	REMARKS
I038	1"	C.O.	STUB UP @ FUTURE VFD-8	PMP-2 (FUTURE IP-8 START-	FUTURE CONDUCTORS
I039	1"	4#14, 1#14 G.	VFD-1	PMP-1 (IP-1 START-STOP)	
I040	1"	4#14, 1#14 G.	VFD-2	PMP-1 (IP-2 START-STOP)	
I041	1"	4#14, 1#14 G.	VFD-3	PMP-1 (IP-3 START-STOP)	
I042	1"	C.O.	STUB UP @ FUTURE VFD-4	PMP-1 (FUTURE IP-4 START-	FUTURE CONDUCTORS
I043	1"	(1) CAT 6 CABLE	PMP-1	PLC-04A	
I044	1"	(1) PROFINET CABLE	VFD-5	PLC-04A	
I045	1"	(1) PROFINET CABLE	VFD-6	PLC-04A	
I046	1"	(1) PROFINET CABLE	VFD-7	PLC-04A	
I047	1"	C.O.	STUB UP @ FUTURE VFD-8	STUB UP @ PLC-04A	FUTURE PROFINET CABLE
I048	1"	(1) PROFINET CABLE	VFD-1	PLC-04A	
I049	1"	(1) PROFINET CABLE	VFD-2	PLC-04A	
I050	1"	(1) PROFINET CABLE	VFD-3	PLC-04A	
I051	1"	C.O.	STUB UP @ FUTURE VFD-4	STUB UP @ PLC-04A	FUTURE PROFINET CABLE
I052	2"	FIBER OPTIC CABLE	NEW PATCH PANEL	PLC-04A	
I053	2"	(2) MFR PUMP CONTROL CABL	IP-1 (END CONDUIT @ WET	IP-1 CONTROL PULLBOX	PVC-COATED RGS; CONDUIT
I054	2"	(2) MFR PUMP CONTROL CABL	IP-2 (END CONDUIT @ WET	IP-2 CONTROL PULLBOX	PVC-COATED RGS; CONDUIT
I055	2"	(2) MFR PUMP CONTROL CABL	IP-3 (END CONDUIT @ WET	IP-3 CONTROL PULLBOX	PVC-COATED RGS; CONDUIT
I056	2"	C.O.	CAP @ WET WELL WALL (IP-	STUB UP @ FUT. IP-4 CTRL	PVC-COATED RGS; FUTURE
I057	2"	(2) MFR PUMP CONTROL CABL	IP-5 (END CONDUIT @ WET	IP-5 CONTROL PULLBOX	PVC-COATED RGS; CONDUIT
I058	2"	(2) MFR PUMP CONTROL CABL	IP-6 (END CONDUIT @ WET	IP-6 CONTROL PULLBOX	PVC-COATED RGS; CONDUIT
I059	2"	(2) MFR PUMP CONTROL CABL	IP-7 (END CONDUIT @ WET	IP-7 CONTROL PULLBOX	PVC-COATED RGS; CONDUIT
I060	2"	C.O.	CAP @ WET WELL WALL (IP-	STUB UP @ FUT. IP-8 CTRL	PVC-COATED RGS; FUTURE
I061	2"	(2) MFR PUMP CONTROL CABL	IP-1 CONTROL PULLBOX	PMP-1 (IP-1 SIGNALS)	CONT. IN C. I053
I062	2"	(2) MFR PUMP CONTROL CABL	IP-2 CONTROL PULLBOX	PMP-1 (IP-2 SIGNALS)	CONT. IN C. I054
I063	2"	(2) MFR PUMP CONTROL CABL	IP-3 CONTROL PULLBOX	PMP-1 (IP-3 SIGNALS)	CONT. IN C. I055
I064	2"	C.O.	STUB UP @ FUT. IP-4 CTRL	PMP-1 (FUTURE IP-4	CONT. IN C. I056; FUTURE
I065	2"	(2) MFR PUMP CONTROL CABL	IP-5 CONTROL PULLBOX	PMP-2 (IP-5 SIGNALS)	CONT. IN C. I057
I066	2"	(2) MFR PUMP CONTROL CABL	IP-6 CONTROL PULLBOX	PMP-2 (IP-6 SIGNALS)	CONT. IN C. I058
I067	2"	(2) MFR PUMP CONTROL CABL	IP-7 CONTROL PULLBOX	PMP-2 (IP-7 SIGNALS)	CONT. IN C. I059
I068	2"	C.O.	STUB UP @ FUT. IP-8 CTRL	PMP-2 (FUTURE IP-8	CONT. IN C. I060; FUTURE
I069	5"	3#500kcmil, 1#1/0 G. (15KV)	TX-NPG	TX-NPE	RUN ADDITIONAL 5" SPARE C.
I070	1"	2#12, 1#12 G.	LP-IPS	FACP	
I071	1"	4#14, 1#14 G.	FACP	PLC-04A	
I072	1"	4#14, 1#14 G.	PAC-1 DUCT SMOKE DETEC	FACP	
I073	1"	4#14, 1#14 G.	PAC-2 DUCT SMOKE DETEC	FACP	
I074	5"	3#500kcmil, 1#1/0 G. (15KV)	TX-NPH	TX-NPF	RUN ADDITIONAL 5" SPARE C.
I075	1"	4#14, 1#14 G.	ROOM HIGH TEMP. SWITCH	PLC-04A	
I076	1"	6#12, 1#12 G.	LP-IPS	IPS POLE LIGHTS, RECEPTS.	LIGHTS VIA CONTACTOR 'PC'
I077	1-1/4"	3#4, 1#6 G.	MCC-IPSA	PAC-1	
I078	1-1/4"	3#4, 1#6 G.	MCC-IPSB	PAC-2	
I079	1"	(1) CAT 6 CABLE	PMP-2	PLC-04A	
I080	1"	2#12, 1#12 G.	LP-IPS	PMP-1	
I081	(8) 4"	3#600kcmil, 1#600 N. EA.	TX-NPG	SWGR-IPSC	
I082	(8) 4"	3#600kcmil, 1#600 N. EA.	TX-NPH	SWGR-IPSD	
I083	3/4"	3#14, 1#14 G.	PHOTOCELL	CONTACTOR 'PC'	CONTINUED TO LP-IPS
I084	1"	4#12, 1#12 G.	PLC-04A	LIT-231	
I085	1"	2#12, 1#12 G.	LIT-231	LIT-232	CONT. IN C. I084
I086	1"	(2) 2/C #16TSP	LIT-231	PLC-04A	
I087	1"	(1) 2/C #16TSP	LIT-232	LIT-231	CONT. IN C. I086
I088	5"	3#500kcmil, 1#1/0 G. (15KV)	SWGR-A (POWER GEN. BLD	TX-NPG	RUN ADDITIONAL 5" SPARE C.
I089	5"	3#500kcmil, 1#1/0 G. (15KV)	SWGR-B (POWER GEN. BLD	TX-NPH	RUN ADDITIONAL 5" SPARE C.
I090	1"	C.O.	MCC-IPSA	PLC-04A	
I091	1"	C.O.	MCC-IPSB	PLC-04A	
I092	1-1/4"	(2) PROFINET CABLES	SWGR-IPSC/IPSD (METERS	PLC-04A	
I093	1-1/4"	(2) PROFINET CABLES	SWGR-IPSA/IPSB (METERS	PLC-04A	
I094	1"	2#12, 1#12 G.	LP-IPS	PLC-04A	
I095	1"	2#12, 1#12 G.	LP-IPS	PMP-2	
I096	1"	4#12, 1#12 G.	LP-IPS	BAS CONTROLLERS	
I097	1"	3#12, 1#12 G.	MCC-IPSA	SG-1	
I098	1"	3#12, 1#12 G.	MCC-IPSB	SG-2	
I099	2"	3#3/0, 1# 6 G.	MCC-IPSA	MCC-IPSB	
I100	(4) 4"	C.O.	SWGR-IPSA	STUB UP 3 FT. OUTSIDE	PORTABLE GENERATOR
I101	(4) 4"	C.O.	SWGR-IPSB	STUB UP 3 FT. OUTSIDE	PORTABLE GENERATOR
I102	(4) 4"	C.O.	SWGR-IPSC	STUB UP 3 FT. OUTSIDE	PORTABLE GENERATOR
I103	(4) 4"	C.O.	SWGR-IPSD	STUB UP 3 FT. OUTSIDE	PORTABLE GENERATOR

CONDUIT SCHEDULE

CONDUIT NUMBER	CONDUIT SIZE	CONDUCTORS POWER, GROUND, & CONTROL	FROM	TO	REMARKS
I104	1-1/2"	(4) FLOAT SW. CABLES	BACKUP PUMP CONTROL PANEL	PLC-04A	
I105	1"	3#12, 1#12 G.	MCC-IPSA	V-1	
I106	1"	(1) CABLE BY ACTUATOR MFR.	V-1 REMOTE CONTROL STATION	V-1	
I107	1"	(1) PROFINET CABLE	PLC-04A	V-1	
I108	2-1/2"	(7) FLOAT SW. CABLES	LS-2A/ LS-2H J. BOX	BACKUP PUMP CONTROL PANEL	(2) CABLES CONT. IN C. I104
I109	2-1/2"	(7) FLOAT SW. CABLES	LS-1A/ LS-1H J. BOX	BACKUP PUMP CONTROL PANEL	(2) CABLES CONT. IN C. I104
I110	1"	4#14, 1#14 G.	PSH-1	PLC-04A	
I111	1"	4#14, 1#14 G.	PSH-2	PLC-04A	
I112	1"	8#14, 1#14 G.	ZS-5, H/ O/ R SW-5	VFD-5	3#14 CONT. IN C. I160
I113	1"	8#14, 1#14 G.	ZS-6, H/ O/ R SW-6	VFD-6	3#14 CONT. IN C. I161
I114	1"	8#14, 1#14 G.	ZS-7, H/ O/ R SW-7	VFD-7	3#14 CONT. IN C. I162
I115	1"	C.O.	STUB UP @ FUTURE ZS-8	STUB UP @ FUTURE VFD-8	
I116	1"	8#14, 1#14 G.	ZS-1, H/ O/ R SW-1	VFD-1	3#14 CONT. IN C. I156
I117	1"	8#14, 1#14 G.	ZS-2, H/ O/ R SW-2	VFD-2	3#14 CONT. IN C. I157
I118	1"	8#14, 1#14 G.	ZS-3, H/ O/ R SW-3	VFD-3	3#14 CONT. IN C. I158
I119	1"	C.O.	STUB UP @ FUTURE ZS-4	STUB UP @ FUTURE VFD-4	
I120	1"	4#14, 1#14 G.	SMOKE DETECTORS	FACP	
I121	1"	2#12, 1#12 G.	PLC-04A	LIT-122	
I122	1"	(1) 2/ C #16TSP	LIT-122	PLC-04A	
I123	1-1/4"	4#8, 1#8 G.	LPM2A	PHH-6 SUMP PUMP	
I124	1-1/4"	2#8, 1#8 G.	PHH-6 SUMP PUMP	PHH-5 SUMP PUMP	CONT. IN C. I123
I125	1-1/4"	4#8, 1#8 G.	LP-IPS	PHH-3 SUMP PUMP	
I126	1-1/4"	2#8, 1#8 G.	PHH-3 SUMP PUMP	PHH-4 SUMP PUMP	CONT. IN C. I125
I127	1-1/4"	4#8, 1#8 G.	LP-IPS	PHH-2 SUMP PUMP	
I128	1-1/4"	2#8, 1#8 G.	PHH-2 SUMP PUMP	PHH-1 SUMP PUMP	CONT. IN C. I127
I129	5"	3#500kcmil, 1#1/0 G. (15KV)	EXIST. TX-NPC	EXIST. TX-NPA	VIA EXIST. MANHOLE P-6
I130	5"	3#500kcmil, 1#1/0 G. (15KV)	EXIST. TX-NPD	EXIST. TX-NPB	VIA EXIST. MANHOLE P-6
I131	1"	(1) CAT 6 CABLE	SWGR-IPSA	PLC-04A	
I132	1"	(1) CAT 6 CABLE	SWGR-IPSB	PLC-04A	
I133	1"	(1) CAT 6 CABLE	SWGR-IPSC	PLC-04A	
I134	1"	(1) CAT 6 CABLE	SWGR-IPSD	PLC-04A	
I135	1"	(1) CAT 6 CABLE	MCC-IPSA	PLC-04A	
I136	1"	(1) CAT 6 CABLE	MCC-IPSB	PLC-04A	
I137	1"	(1) PROFINET CABLE	ATS-IPS	PLC-04A	
I138	1"	2#12, 1#12 G.	LP-IPS	BACKUP PUMP CONTROL PANEL	
I139	1"	6#14, 1#14 G.	H/ O/ R SW-1	ZS-1	CONT. IN C. I116
I140	1"	6#14, 1#14 G.	H/ O/ R SW-2	ZS-2	CONT. IN C. I117
I141	1"	6#14, 1#14 G.	H/ O/ R SW-3	ZS-3	CONT. IN C. I118
I142	1"	C.O.	STUB UP @ FUTURE H/ O/ R SW-4	STUB UP @ FUTURE ZS-4	CONT. IN C. I119; FUTURE CONDUCTORS
I143	1"	6#14, 1#14 G.	H/ O/ R SW-5	ZS-5	CONT. IN C. I112
I144	1"	6#14, 1#14 G.	H/ O/ R SW-6	ZS-6	CONT. IN C. I113
I145	1"	6#14, 1#14 G.	H/ O/ R SW-7	ZS-7	CONT. IN C. I114
I146	1"	C.O.	STUB UP @ FUTURE H/ O/ R SW-8	STUB UP @ FUTURE ZS-8	CONT. IN C. I115; FUTURE CONDUCTORS
I147	1"	16#14, 1#14 G.	BACKUP PUMP CONTROL PANEL	PLC-04A	
I148	1"	4#14, 1#14 G.	BACKUP PUMP CONTROL PANEL	VFD-1	
I149	1"	4#14, 1#14 G.	BACKUP PUMP CONTROL PANEL	VFD-2	
I150	1"	4#14, 1#14 G.	BACKUP PUMP CONTROL PANEL	VFD-3	
I151	1"	C.O.	BACKUP PUMP CONTROL PANEL	STUB UP @ FUTURE VFD-4	FUTURE CONDUCTORS
I152	1"	4#14, 1#14 G.	BACKUP PUMP CONTROL PANEL	VFD-5	
I153	1"	4#14, 1#14 G.	BACKUP PUMP CONTROL PANEL	VFD-6	
I154	1"	4#14, 1#14 G.	BACKUP PUMP CONTROL PANEL	VFD-7	
I155	1"	C.O.	BACKUP PUMP CONTROL PANEL	STUB UP @ FUTURE VFD-8	FUTURE CONDUCTORS
I156	1"	3#14, 1#14 G.	VFD-1	PLC-04A	
I157	1"	3#14, 1#14 G.	VFD-2	PLC-04A	
I158	1"	3#14, 1#14 G.	VFD-3	PLC-04A	
I159	1"	C.O.	STUB UP @ FUTURE VFD-4	STUB UP @ PLC-04A	FUTURE CONDUCTORS
I160	1"	3#14, 1#14 G.	VFD-5	PLC-04A	
I161	1"	3#14, 1#14 G.	VFD-6	PLC-04A	
I162	1"	3#14, 1#14 G.	VFD-7	PLC-04A	
I163	1"	C.O.	STUB UP @ FUTURE VFD-8	STUB UP @ PLC-04A	FUTURE CONDUCTORS
I164	1"	(1) PROFIBUS CABLE	FI-190	PLC-04A	
I165	1"	2#12, 1#12 G.	PLC-04A	FI-190	
I166	1"	8#14, 1#14 G.	SG-1	PLC-04A	
I167	1"	4#14, 1#14 G.	SG-2	SG-1	CONT. IN C. I166

REV	DATE	DESCRIPTION
D	02/2018	ADDENDUM # 4
C	12/2017	ISSUED FOR BID
B	10/2017	100% FOR BID
A	02/2017	90% DRAWINGS

LINE IS 2 INCHES AT FULL SIZE (IF NOT SCALE ACCORDINGLY)

ORANGE COUNTY GOVERNMENT FLORIDA

ORANGE COUNTY UTILITIES DEPARTMENT ENGINEERING DIVISION

9150 CURRY FORD ROAD ORLANDO, FL. 32825

AECOM

AECOM TECHNICAL SERVICES INC. 150 N. ORANGE AVENUE, SUITE 200 ORLANDO, FLORIDA 32801 PHONE 407.843.6552

CERTIFICATE OF AUTHORIZATION NO. 8115

PROJECT NO. 110031A

ORANGE COUNTY
SOUTH WATER RECLAMATION FACILITY INFLUENT PUMP STATION
ELECTRICAL

CONDUIT SCHEDLUES

IRA BRANDELL, P.E.
PROFESSIONAL ENGINEER
FLORIDA LICENSE #65814

OCU FILE NO.: OCU #
DESIGNED BY: MAP
DRAWN BY: IPF
CHECKED BY: IB
CADD FILE: E18.DWG

SCALE: NOTED
DRAWING NO.: E18
SHEET: 107 OF 123

Parent Sheet Set:110031A_OCIPS Rev/Plot by:RODRIGUEZ, MARCELINO on: 2/14/2018 3:45 PM Individual File Path: \\ORLANDO.NA.AECOMNET.COM\ORLANDO\DCS\PROJECTS\WTR\ORANGE COUNTY\SWRF\60515901_SWRF_IPS_FINAL\900-CAD_GIS\910 CAD\20-SHEETS\E\E18.DWG