TECHNICAL SPECIFICATIONS

FOR PHASE 1 CORRECTIVE MEASURE DESIGN IMPLEMENTATION ACTIVITIES ASSOCIATED WITH

NORTHSIDE GENERATING STATION

4377 Heckscher Drive, Jacksonville, FL

PREPARED FOR:

PREPARED BY:

Geosyntec Consultants
1200 Riverplace Blvd., Ste. 710
Jacksonville, FL 32207

CDM Smith
8381 Dix Ellie Trail, Ste. 400
Jacksonville, FL 32256

January 2018

DIVISION 01 – GENERAL REQUIREMENTS

01 11 00 Summary of Work

Part 1 General

1.01 Scope of Work

A. This section provides a summary of the work covered by the Contract Documents. The CONTRACTOR shall furnish, unless otherwise stated, all permits, labor, materials, and equipment to complete the following scope of work within the specified schedule:

1. **5 Vertical Extraction Wells.** CONTRACTOR shall install each vertical extraction well using rotary sonic drilling methods to depths specified on the Construction Drawings. CONTRACTOR shall install submersible pumps, water alarm sensors and associated fittings, wiring, support cables, etc. within the extraction wells per the Construction Drawings. CONTRACTOR shall install the above ground extraction well enclosure and all associated hosing, piping, valves, gauges, etc. within the extraction well enclosure. CONTRACTOR shall construct a square concrete extraction well pad and pedestal and install bollards to prevent vehicular damage.

2. **5 Piezometers and 3 Monitoring Wells.** CONTRACTOR shall install each piezometer and monitoring well using rotary sonic drilling methods to depths specified on the Construction Drawings. CONTRACTOR shall complete filter packs, seals, and surface completions per the Construction Drawings and manage waste generated during well installation and development activities in accordance with the Technical Specifications.

3. **Transmission Pipe and Conduit.** CONTRACTOR shall complete the construction of all transmission piping and conduit between the extraction wells, hydraulic control system, pump station, and the tie-in to the existing forcemain. CONTRACTOR shall utilize a combination of conventional trenching and horizontal directional drilling to convey the hydraulic transmission pipes and the electrical transmission conduits from each extraction well to the hydraulic control system. From the hydraulic control system to the existing force main, CONTRACTOR shall utilize conventional trenching only to house the hydraulic transmission discharge pipe. CONTRACTOR shall excavate, characterize, transport, and dispose of contaminated materials indicated by the JEA ENGINEER and Technical Specifications. CONTRACTOR shall install all transmission piping and conduit per the Technical Specifications, Construction Drawings and Manufacturer's Recommendations.

4. **Hydraulic Control System Shed, Pumps, Instrumentation, Controls, and Equalization Tank.** CONTRACTOR shall procure and install a fully plumbed, fully wired, operational hydraulic control system manufactured by Seneca Companies (Model Number

HCS765W) which includes all pumps, wiring, instrumentation, and controls and an above ground equalization tank. Hydraulic control system shed shall house all electrical and mechanical equipment necessary to operate the submersible pumps and water alarm sensors. CONTRACTOR shall connect hydraulic control system shed to the equalization tank, hydraulic transmission piping and electrical conduits in trenches per the Technical Specifications, Construction Drawings, and Manufacturer's Recommendations.

5. **Pump Station.** CONTRACTOR shall procure and construct a fully plumbed, fully wired, operational pump station which includes all pumps, wiring, equalization tanks, instrumentation, and controls. CONTRACTOR shall connect pump system shed to hydraulic transmission piping and electrical conduits in trenches per the Technical Specifications, Construction Drawings, and Manufacturer's Recommendations.

6. **Concrete Pad.** CONTRACTOR shall construct a concrete pad for the placement of the hydraulic control system and pump station. The concrete pad shall be constructed per the Technical Specifications and Construction Drawings.

7. **Electrical Connection.** CONTRACTOR shall complete all electrical connections for the hydraulic control system shed and pump station to the CWTS MCC per the Technical Specifications and Construction Drawings. CONTRACTOR shall install buried conduit from MCC to power distribution panel. CONTRACTOR shall be responsible for integrating the connection with JEA to minimize disruptions in electrical service.

8. **Earthwork.** CONTRACTOR shall complete all earthwork associated with the construction of a 1-ft clean soil cap and the backfill required to achieve final elevations for the hydraulic control system and pump station concrete pad. Earthwork activities also include the restoration of the access road and site restoration activities. All earthwork activities shall be per the Technical Specifications and Construction Drawings.

9. **Warranty.** CONTRACTOR shall provide a three-year warranty for all labor and major equipment associated with the Hydraulic Control System and the Pump Station (pumps, building, equalization tank, metering pump, totalizers, control panel, telemetry, etc).

B. Work shall conform to the following Construction Drawings, which form part of the Contract Documents. The coordinate system used in the Construction Drawings is the Florida State Plane Coordinate System East Zone NAD83; the vertical datum is based on the North American Vertical Datum of 1988 (NAVD88).

SHEET NUMBER	TITLE
--	Title Page
G-100	Cover Sheet
G-101	Drawing Index
G-102	Overall Site Layout and Sheet Reference Map
G-103	Existing Property Conditions
G-104	Existing Property Topographic Map
C-100	Civil Legend
C-101	Subgrade Grading Plan
C-102	Final Grading Plan
C-103	Yard Piping (Sheet 1 of 2)
C-104	Yard Piping (Sheet 2 of 2)
C-105	Hydraulic Control System and Pump Station Layout
C-106	Hydraulic Control System Borehole and Trench Details
C-107	Extraction Well Details
C-108	Soil Cover and Access Road Sections and Details
C-109	Miscellaneous Civil Details
C-110	Concrete Pad Earthwork
C-111	Proposed Extraction Well, Monitoring Well, and Piezometer Location Plan
C-112	Proposed Piezometer and Monitoring Well Construction Details
M-100	Standard Mechanical Legend
M-101	Hydraulic Control System and Pump Station Plan and Section (Sheet 1 of 2)
M-102	Hydraulic Control System and Pump Station Plan and Section (Sheet 2 of 2)
M-103	Miscellaneous Mechanical Details
I-100	Instrumentation Legend
I-101	Hydraulic Control System and Pump Station Process and Instrumentation Diagram (Sheet 1 of 2)
I-102	Hydraulic Control System and Pump Station Process and Instrumentation Diagram (Sheet 2 of 2)
I-103	Instrument Installation Details
E-100	Electrical Legend
E-101	One Line Diagram Modifications
E-102	Hydraulic Control System and Pump Station Electrical Plan
E-103	Electrical Details
S-101	Concrete Pad Plan and Sections

Part 2 Products - None

Part 3 Execution

3.01 Preparation

A. The CONTRACTOR shall coordinate all work activities with JEA ENGINEER.

B. The CONTRACTOR shall be responsible for all aspects of the installation of the hydraulic control system including but not limited to procuring qualified subcontractors, preparing and obtaining all permits unless otherwise indicated by JEA ENGINEER.

C. The CONTRACTOR shall not be responsible for removing, relocating, nor storing any existing product owned by JEA (equipment, parts, etc.) or JEA subcontractor unless otherwise noted in the Contract Documents.

D. The CONTRACTOR shall conduct all work in accordance with the applicable rules and regulations of specified governing agencies, and in accordance with the laws, rules, and/or regulations of all other authorities having jurisdiction over the required construction work. Any required permits shall be obtained and paid for by the CONTRACTOR (including all city permit fees and charges).

E. The CONTRACTOR shall determine the exact location of existing structures, underground piping, or conduit which would be in the vicinity or possibly affected by the CONTRACTOR's operation.

F. The CONTRACTOR shall relocate existing items or mark these existing items if removal is not required, and shall protect any underground facility.

G. The CONTRACTOR shall schedule and coordinate all construction activities and shall cooperate with the JEA and JEA ENGINEER operating personnel to provide a minimum of interruptions to the operations of other present facilities.

END OF SECTION

01 14 00 Work Restrictions

01 14 13 Access to Site

Part 1 General

1.01 Scope of Work

A. This section provides a description of how the CONTRACTOR shall coordinate construction activities with JEA ENGINEER and/or JEA.

1.02 Referenced Sections

1. All Technical Specifications are referenced. Refer to Technical Specification Index.

1.03 Cited Standards - None

1.04 Noted Restrictions

A. The CONTRACTOR work hours shall be Monday through Friday from 7:00 am to 6:00 pm. Weekend and night work will not be allowed (unless approved by the JEA ENGINEER and JEA).

1.05 Safety - None

1.06 Quality Control - None

1.07 Submittals

A. The CONTRACTOR shall provide JEA and the JEA ENGINEER a list of personnel who will require access to the site at least one week prior to access.

B. The CONTRACTOR shall provide JEA and the JEA ENGINEER a plan to minimize the effect of construction activities on the normal flow of vehicular and pedestrian traffic within the areas affected by this project.

Part 2 Products - None

Part 3 Execution

3.01 Preparation

A. Site access is restricted through two main entrances with security guards. The CONTRACTOR shall utilize the entrance located off William Ostner Road to complete the scope of work. One form of photographic identification is required at the guarded entrance to confirm identity.

B. Site access is further restricted to SWMU 18 by a keyed lock and the CWTS by an electronic badge. The CONTRACTOR shall coordinate with JEA the application and issuance of a temporary badge which will allow access to the CWTS area. Upon issuance of the temporary badge, the CONTRACTOR shall be responsible for escorting personnel in and out of the CWTS area.

The JEA ENGINEER will assist with access until the temporary badge is issued.

C. Site access is further restricted at the tie-in location of the 10-inch force main within the CSX property. The CONTRACTOR shall remove existing fencing and install a temporary double swing gate during construction activities as shown on the Construction Drawings. The temporary gate shall be accessed under the following conditions:

1. The CONTRACTOR shall secure gate with a security padlock provided by JEA.

2. The CONTRACTOR shall secure gate at all times when the CONTRACTOR is not on-site during construction activities.

3. The CONTRACTOR shall check in/out the security padlock key from the JEA security guard at the entrance located off William Ostner Road. The CONTRACTOR shall provide names of all individuals that will need authorization to utilize the key.

4. Following construction completion, the CONTRACTOR shall remove temporary gate and replace with fencing to match existing.

D. The CONTRACTOR shall develop, discuss, and implement a plan to minimize the effect of construction activities on the normal flow of vehicular and pedestrian traffic within the areas affected by this project.

E. The CONTRACTOR shall use the parking lot available near the William Ostner Road off for employee parking and staging of trucks, vehicles, etc. At no time shall vehicles be staged, parked, left idle along roadways within the NGS

F. The CONTRACTOR shall make every effort to minimize the disruption of any potential JEA or neighboring property activities, including keeping neat work areas, protecting CONTRACTOR's and JEA's work at all times, identify potential conflicts, and working with JEA and the JEA ENGINEER to meet the project goals.

3.02 Installation - None

3.03 Testing - None

END OF SECTION

01 22 00 Measurement and Payment

Part 1 General

1.01 Scope

A. This section includes specifications for measurement and payment as they apply to the work, and includes provisions applicable to lump sum prices.

1.02 Referenced Sections

A. Related Sections are shown below.

1. All Technical Specifications are referenced. Refer to Technical Specification Index.

1.03 Measurement and Payment

A. Scope

1. The prices stated in the Bid include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the Work. The CONTRACTOR's attention is again called to the fact that the quotations for the various items of Work are intended to establish a total price for completing the Work in its entirety. Should the CONTRACTOR feel that the cost for any item of the Work has not been established by the Bid Form or Basis of Payment, CONTRACTOR shall include the cost for that work in some other applicable bid item, so that his proposal for the project does reflect his total price for completing the Work in its entirety.

2. The CONTRACTOR shall construct the work under a single lump sum fixed price contract. Lump-sum measurements will be for the entire item, unit of work, structure, or any combination of these described, as specified and as indicated in the Bid Schedule of the Bid Form.

3. Excavation quantities are listed as bank cubic yards, i.e., undisturbed in-place soil volumes. The CONTRACTOR shall be responsible for final measurement of cut volumes with a professional licensed surveyor per Section 01 32 23.

B. Bid Item 001 - Mobilization and Demobilization

1. Payment

a. Lump Sum payments will be made to compensate CONTRACTOR in full to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. This item should also include attendance at the pre-construction meeting; site security; the preparation and correction (if necessary) of all

submittals; and the removal (demobilization) of the job site materials, resources, equipment, and temporary support facilities. One-half of the lump sum payment will be paid upon completion of mobilization and required submittals and the other one-half of the lump sum amount will be paid upon the completion of demobilization activities and satisfaction of all punch list items. The total of the mobilization and demobilization shall not exceed 15 percent of the total bid estimate.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

C. Bid Item 002 – Private Utility Locate

1. Payment

a. Lump Sum payments will be made to compensate CONTRACTOR in full subcontract with a third party to locate utilities onsite within the limits of work, including but not limited to above and below ground Water, Electric, Communication, Gas, Sanitary, and Storm Sewer. CONTRACTOR shall coordinate utility locate with JEA NGS personnel. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

D. Bid Item 003 – Installation of Temporary Erosion Controls

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

E. Bid Item 004a – Installation of Cap: Clearing and Grubbing

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work, including the proper disposal of vegetative material. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

F. Bid Item 004b – Installation of Cap: Grading Subbase

1. Payment

a. The Unit Rate Price for this item shall be paid in equal installments based on the CONTRACTOR's progress schedule and JEA ENGINEER approval.

2. Unit of Measure

a. The Work required for this item will be measured based on bank cubic yards of cut/filled material as demonstrated by PLS survey.

G. Bid Item 004c – Installation of Cap: Subgrade and Final Fill (Protective Cover Soil)

1. Payment

a. The Unit Rate Price for this item shall be paid in equal installments based on the CONTRACTOR's progress schedule of installed materials meeting all the project requirements and JEA ENGINEER approval.

2. Unit of Measure

a. The Work required for this item will be measured based on bank cubic yards of placed protective cover fill material as demonstrated by PLS survey.

H. Bid Item 004d – Installation of Cap: Final Grade Fill (Top Soil)

1. Payment

a. The Unit Rate Price for this item shall be paid in equal installments based on the CONTRACTOR's progress schedule of installed materials meeting all the project requirements and JEA ENGINEER approval.

2. Unit of Measure

a. The Work required for this item will be measured based on bank cubic yards of graded top soil cover fill material as demonstrated by PLS survey.

I. Bid Item 004e – Installation of Cap – Erosion Control Mat and Seeding

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will be measured based on the completion of satisfactory conditions (cover of living plants, after true leaves are formed, of the required seed species designated for use, in which gaps larger than 3 square feet do not occur) of vegetation following the 60 day warranty period.

J. Bid Item 004f – Installation of General Fill

1. Payment

a. The Unit Rate Price for this item shall be paid in equal installments based on the CONTRACTOR's progress schedule of installed materials meeting all the project requirements and JEA ENGINEER approval.

2. Unit of Measure

a. The Work required for this item will be measured based on bank cubic yards of placed and compacted general fill as demonstrated by PLS survey.

K. Bid Item 004g – Sodding

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will be measured based on the completion of satisfactory conditions (cover of living plants, after true leaves are formed, of the required species designated for use, in which gaps larger than 3 square feet do not occur) of vegetation following the 60 day warranty period.

L. Bid Item 005 – Installation of Access Road

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work including but

not limited to the geotextile and #57 stone. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

M. Bid Item 006 – Installation of System Power

1. Payment

a. Lump Sum payments will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work, including but not limited to procuring necessary permits, installing electrical and appurtenances, coordinating with JEA and scheduling all inspections, and installing underground - conduit from the CWTS MCC to the pump station and hydraulic control system location. Payment will be paid upon completion of complete System (Hydraulic Control System and Pump Station) startup and approval of all permits and inspections.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

N. Bid Item 007a – Installation of Extraction Wells and Above Ground Enclosures

1. Payment

a. Lump Sum payments will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

O. Bid Item 007b – Installation of Monitoring Wells and Piezometers

1. Payment

a. Lump Sum payments will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

P. Bid Item 008 – Installation of Conveyance Conduit (Hydraulic and Electrical), Yard Piping and Force Main Tie-in

1. Payment

a. One Lump Sum payment will be made upon completion to compensate CONTRACTOR in full for costs associated with all equipment, labor, materials, and procuring permits related to the excavation and installation of all electrical and hydraulic transmission piping from the extraction wells to the hydraulic control system and the yard piping from the pump station to the existing force main including the tie-in connection. Work includes transport and placement of bedding sand from an off-site source obtained by the CONTRACTOR as shown on the Construction Drawings. The off-site fill source and material must be approved by the JEA and the JEA ENGINEER prior to its use on-site.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

Q. Bid Item 009 – Disposal of Contaminated Materials

1. Payment

a. Payments will be made on a unit price basis to compensate CONTRACTOR in full for costs associated with all equipment, labor, and materials related to the sampling, characterizing, transportation, and disposal of all non-hazardous contaminated materials. The off-site disposal facility must be approved by JEA and the JEA ENGINEER prior to its use.

2. Unit of Measure

a. The Work for this bid item will be made on a unit price basis based on truck tickets and waste manifests provided by CONTRACTOR.

R. Bid Item 010 – Installation of Hydraulic Control System and Pump Station Concrete Pad

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

S. Bid Item 011 – Installation of Hydraulic Control System Shed, Pumps, Wiring, Instrumentation, and Controls

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities, including installation of building anchors required to perform the Work as specified in Division 50. Payment will be paid upon completion of startup activities as specified in Division 50.

2. Unit of Measure

a. The Work required for this item will be measured on the basis of satisfactory evidence of system delivery and system inspection and startup testing demonstrated when all system components have operated continuously for one week (24 hours per day, 7 days a week) without malfunction or alarms. If the system shuts down or fails to operate during the startup period, the startup period shall restart. This procedure shall be repeated until a successful 7 days of operation is achieved. Half of the Lump Sum payment will be paid when the hydraulic control system (and associated components) are delivered and half of the Lump Sum payment will be paid upon satisfactory startup testing.

T. Bid Item 012 – Hydraulic Control System Startup Testing

1. Payment

a. One Lump Sum payment will be made to provide a representative from equipment manufacturer to assist with three days of startup testing. Payment will be paid upon completion of startup activities as specified in Division 50.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

U. Bid Item 013 – Installation of Pump Station

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, equipment, and temporary support facilities required to perform the Work. Payment will be paid on the basis of satisfactory evidence of system delivery and system inspection and startup testing demonstrated when all system components have operated continuously for one week (24 hours per day, 7 days a week) without malfunction or alarms.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

V. Bid Item 014 – Installation of Equalization Tank

1. Payment

a. One Lump Sum payment will be made to furnish, deliver, and install an equalization tank. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

W. Bid Item 015 – Installation of Chain Link Fencing

1. Payment

a. One Lump Sum payment will be made to furnish and deliver to the job site materials, resources, and equipment, required to construct 10 linear feet of fencing around the hydraulic control system concrete pad. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this bid item will not be measured.

X. Bid Item 016 – Site Restoration

1. Payment

a. One Lump Sum payment will be made to complete all site restoration activities. Payment will be paid upon completion.

2. Unit of Measure

a. The Work required for this item will be measured on the basis of satisfactory evidence of the CONTRACTOR completing all final punch list items and restoring the site back to original condition.

Y. Bid Item 017 – Close Out Documentation.

1. Payment

a. The Unit Rate Price for this item shall be paid based on the CONTRACTOR'S progress and completion of the Work to the satisfaction of the JEA ENGINEER.

2. Measurement

a. The Work required for this item will be measured on the basis of satisfactory evidence of the CONTRACTOR completing all final punch list items and final submittal of all documentation and sampling results.

1.04 Cited Standards - Not Used

1.05 Noted Restrictions - Not Used

1.06 Safety - Not Used

1.07 Quality Control - Not Used

1.08 Submittals

A. Submittal of invoices shall comply with JEA Contract Documents.

Part 2 Products – not used

Part 3 Execution – not used

END OF SECTION

01 31 29 Project Meetings

Part 1 General

1.01 Scope of Work

A. The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.02 Referenced Sections

A. Related Sections are shown below.

1. All Technical Specifications are referenced. Refer to Technical Specification Index.

1.03 Cited Standards - not used

1.04 Noted Restrictions - not used

1.05 Safety – not used

1.06 Quality Control – not used

1.07 Submittals

A. A Project Submittal Schedule shall be submitted in accordance with paragraph entitled, "Project Meetings," of this section.

B. The CONTRACTOR shall submit a letter report bi-weekly, documenting activities, problems, progress, and activities planned for the next week via electronic mail.

1.08 Pre-Construction Conference

A. The CONTRACTOR shall attend a preconstruction conference scheduled by the JEA ENGINEER. Work shall not commence prior to the conference. One representative from each of the CONTRACTOR's first teir Subcontractor(s) representatives shall attend. The meeting will be located at the NGS, include a site walk and last approximately 4 hours.

B. The CONTRACTOR shall address project orientation, personnel contact, safety issues, permits, deficiencies, traffic routes, preliminary project schedule, and the location of the CONTRACTOR'S office (if applicable).

C. The preconstruction submittals identified in Section 01 33 00 SUBMITTAL PROCEDURES shall be submitted prior to start of work.

1.09 Project Meetings

A. The CONTRACTOR shall attend weekly project meetings scheduled by the JEA ENGINEER. The CONTRACTOR'S Superintendent shall attend scheduled project meetings. Subcontractor(s) representatives shall attend, as

required by the JEA ENGINEER. At each meeting, the CONTRACTOR shall be prepared to discuss progress schedule, and shall address potential factors of delay, deficiencies, material delivery schedules, submittals, and safety issues. At each meeting, the CONTRACTOR shall submit an updated Project Progress Schedule.

B. Meeting minutes will be completed by the JEA ENGINEER and submitted draft to the CONTRACTOR for review and comment be finalization.

Part 2 Products - None

Part 3 Execution - None

END OF SECTION

01 32 16 Construction Progress Schedule

Part 1 General

1.01 Scope of Work

A. The CONTRACTOR shall be responsible for developing and maintaining construction schedules and related requirements as specified herein.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 01 33 00 - Submittals

1.03 Cited Standards - None

1.04 Submittals

A. The CONTRACTOR shall submit a draft final/baseline construction schedule to the JEA ENGINEER at least seven (7) calendar days prior to the Preconstruction Conference for discussion and review at the Preconstruction Conference.

B. The CONTRACTOR shall submit a revised final/baseline construction schedule to the JEA ENGINEER within seven (7) calendar days after the Preconstruction Conference.

C. The CONTRACTOR shall revise and submit construction progress schedules weekly, or within 24 hours of any known schedule delay, or as directed by the JEA ENGINEER, during the course of the Work. Construction progress schedules shall be submitted to the JEA ENGINEER at the Weekly Construction Meeting.

D. The CONTRACTOR shall not start activities at the site until the final/baseline schedule has been reviewed and approved by the JEA ENGINEER. Approval of the schedule by the JEA ENGINEER does not relieve the CONTRACTOR of its contractual obligations or responsibility for errors and omissions within the schedule.

1.05 Schedule Format

A. Construction schedules shall be developed in the form of Critical Path Method (CPM) charts using MS Project scheduling software with the characteristics listed below.

1. Each major task shall be represented. Significant subtasks shall be broken out from each major work element.

2. The time scale shall indicate the first work day of each week.

3. The diagram shall allow space for notations.

4. The minimum diagram size shall be 11 inches by 17 inches.

5. Tasks shall be listed in essentially chronological order, with the activities that are to occur first given at the top of the schedule.

6. The critical path shall be clearly indicated.

1.06 Schedule Content

A. Each construction schedule shall indicate:

1. the complete sequence of work by activity;

2. the dates for the beginning and completion of each major task and the sequence of significant subtasks;

3. clearly delineated anticipated delays;

4. the estimated percent completion for each item, as of the first day of each month; and

5. interim milestone dates.

B. At a minimum, the CONTRACTOR shall include the following tasks:

1) Submission and approval project plans

2) Submission and approval of submittal and shop drawings

3) Permitting milestones

4) Site clearing and backfilling activities

5) Well installation

6) Conveyance piping activities (directional and conventional trenching)

7) Force main connection

8) Delivery of the hydraulic control system and other major components including the equalization tank

9) Delivery of the major component of the pump station

10) Seeding and sodding

11) System startup

12) Sequence of closure construction

13) Project close-out

1.07 Progress Revisions

A. Revisions to construction schedules shall include:

1. the progress of each activity to date of submission;

2. changes occurring since the previous schedule submission including:

   a. major changes in scope;

   b. activities modified since previous submission;

   c. revised projections of progress and completion;

   d. number of consumed anticipated delay days;

   e. other identifiable changes; and

   f. force majeure occurrences.

3. a narrative report as needed to define:

   a. problem areas, anticipated delays, and impacts on the construction schedule;

   b. reformatory action recommended and its effect; and

   c. effect of changes on schedules of other contractors.

4. a recovery schedule if the critical path is affected.

Part 2 Products - None

Part 3 Execution - None

END OF SECTION

01 32 23 Survey

Part 1 General

1.01 Scope of Work

A. This section covers procedures that the CONTRACTOR shall use in conducting record and construction surveys. Surveys shall be performed by the CONTRACTOR at the beginning and completion of the construction activities and at intermediate points as necessary to determine pay quantities, to locate and stake contaminated areas, and to record as-built information for final record drawings. The CONTRACTOR shall adhere to survey requirements listed within this section.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 01 33 00 - Submittals
2. Section 01 39 25.13 - Health, Safety, and Emergency Response Requirements for Contaminated Sites
3. Section 01 51 00 - Temporary Utilities
4. Division 02 - Existing Conditions
5. Division 03 - Concrete
6. Division 31 - Earthwork
7. Division 33 - Utilities
8. Division 40 - Process Piping, Hosing, and Appurtenances
9. Division 50 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

1.03 Cited Standards

A. National Geodetic Survey Standards

B. All survey work shall comply with Chapter 61G17, Florida Administrative Code (FAC), regarding minimum technical standards for land surveying in the State of Florida.

1.04 Submittals

A. Submittals shall be made in accordance with requirements set forth in Section 01 33 00 of the Technical Specifications unless stated otherwise. Submittals of drawings shall include three sets. Submittals under this section include, but are not limited to:

1. At a minimum, the following three record surveys:

a. existing conditions record survey drawing showing existing grades within the limit of disturbance, existing structures and existing utilities (if any, as determined by the utility locate);

b. subgrade record survey showing the final grades of the subgrade; and

c. final record drawings.

2. As requested by the JEA ENGINEER

a. copies of the surveyor's notes; and

b. calibration documentation for surveying equipment.

B. Record survey, stamped and signed, by a State of Florida Licensed/Registered Land Surveyor or Professional Engineer, shall be submitted immediately following the completion of any applicable construction element. Complete as-built surveys shall be submitted upon substantial completion of each phase of construction and are a prerequisite for payment and contract closeout.

Part 2 Products

2.01 Materials and Survey Equipment

A. Provide materials and survey equipment as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts, and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required.

B. The survey instruments used for this work shall be precise and accurate to meet the needs of the work described. All survey instruments should be capable of reading to a precision of 0.001 ft and with a setting accuracy of ± 0.8 seconds.

2.02 Survey Control

A. The CONTRACTOR shall establish the same survey control that was used to prepare the Construction Drawings.

B. The CONTRACTOR shall survey and establish additional survey control that may be required for performance of the work, conduct measurements, and check dimensions necessary for proper execution of the work. The CONTRACTOR shall be responsible for re-establishing existing survey control lost during the course of the construction activities. Project survey control shall be tied into the existing survey control.

1. Survey control shall be set and measurements obtained using standard accepted surveying methods and equipment.

2. Surveyors utilized by the CONTRACTOR shall be professional land surveyors registered in the State of Florida. Surveyor's field notes shall be included with project record documents for submission to the

JEA ENGINEER. The registered surveyor's signatures shall be included on all field notes and survey record documents. CONTRACTOR may utilize the surveyor who provided the existing site survey if approved by the JEA ENGINEER.

3. Surveying instruments shall be calibrated prior to the start of the survey work. Documentation attesting to instrument calibration shall be submitted to the JEA ENGINEER prior to performing survey work.

2.03 Record Survey Drawings

A. Survey record drawings shall be tied to the existing survey control and shall generally conform to industry standards as to quality and information shown. Other requirements for survey record drawings are set forth below. Survey record drawings shall be labeled with the name of the project, the name of the surveyor, the date of the survey, and the survey location and purpose.

1. Existing Conditions Record Survey and Drawing. The Existing Conditions Record Survey shall verify the topographic conditions shown on the Construction Drawings and shall show all the existing site features up to and including the limit of work for each work area and the limits of the soil exceeding Ecological Risk Assessment criteria. If any discrepancies between the Existing Conditions Record Survey completed by the Contractor and the Construction Drawings it must be brought to the attend of the JEA Engineer prior to the start of work otherwise it shall be assumed that there are no material discrepancies. The Existing Conditions Record Survey will be used as the basis of all subsequent surveys and will be used for calculating volumes of materials for payment.

   The Existing Conditions Record Drawing and all subsequent drawings, contour interval shall be 0.5 ft and the scale shall be the same scale as the Construction Drawings and compatible with existing Construction Drawings.

2. Soil Cap Subgrade Record Drawings. The Soil Cap Subgrade Record Drawings shall show: (1) the elevation of the subgrade prior to the placement of the backfill material (subgrade preparation); and (2) the elevation of the subgrade following the placement of backfill material to establish the final subgrade and the following points shall be staked and noted as applicable:

   a. Grade breaks and ridge line;

   b. Mid-point of slopes less than 50 ft;

   c. Points of horizontal curvature and tangency; and

   d. Points of stationing equation.

   The subgrade elevation prior to backfill record drawing is necessary to document the soil regrading volumes. The subgrade elevation to establish final subgrades is necessary to document the volume of

backfill required to achieve final subgrade elevations noted on the Construction Drawings. The record drawings shall show the horizontal and vertical limits of the area and provide sufficient information to clearly locate the area and perform calculations to record final quantities (in place bank cubic yards). The record drawing shall include a quantity for cut and fill (in bank cubic yards) for the regraded soil and for the backfill to achieve the subgrade. Spot elevations shall be accurate to the nearest hundredth of a foot. Record survey drawings shall include, but are not limited to, elevation and extent of regraded area, and the elevation of the backfilled final subgrade.

Final Record Survey Drawings. Final record survey drawings shall document the final condition of the site after completion of the construction activities. The final record survey drawings shall be at the same scale and of the same area as the existing conditions and soil cap subgrade record survey drawings, and shall be compatible with the existing drawing in the level of detail shown and in the manner of presentation, so that the drawings can be easily compared. Significant features of the project, including but not limited to soil regrading extents and grades, soil cover grades (subgrade and final cover), installed extraction wells and process piping, hydraulic control system, extent of concrete pad, access road, all underground piping, force main tie-in location, and utilities remaining on-site shall be shown on the final record survey drawings. The final record drawing shall show the horizontal and vertical limits of the area and provide sufficient information to clearly locate the area and perform calculations to record final quantities (in place bank cubic yards) of the final backfill volume. Spot elevations shall be accurate to the nearest hundredth of a foot. The record drawing shall include a quantity for (in bank cubic yards): (1) the regraded soil; (2) the backfill to achieve the subgrade; and (3) the final soil cover.

2.04 Professional Stamp

A. Record survey drawings shall bear the stamp and signature of the professional surveyor registered in the State of Florida and responsible for the survey work.

Part 3 Execution

3.01 CONTRACTOR Measurements

A. The CONTRACTOR shall conduct survey measurements and check dimensions necessary for the proper execution of the work called for by the Construction Drawings and the Technical Specifications.

B. Where the dimensions and locations of existing structures or utilities are of critical importance to the installation or connection of new work, the CONTRACTOR shall verify such dimensions and locations in the field before conducting the work.

C. The CONTRACTOR shall establish the horizontal and vertical control benchmarks from the existing survey control.

3.02 Initial Record Survey

A. Prior to performing construction activities at the site, the CONTRACTOR shall conduct a survey of the site within the project boundaries, up to and including the limit of work. The survey shall document the condition of the site at the initiation of the project. The survey shall include locating the alignment of overhead and subsurface utilities; and locating utility poles, water supply lines, and connections. The survey will provide the metes and bounds of the boundary of the site. The survey data will provide the geographic coordinates for each point identified in the metes and bounds description of the site, as follows:

1. horizontal coordinates as state plane coordinates, east zone, North American Datum of 1983, 2011 adjustment; and

2. elevations as North American vertical datum of 1988 (NAVD 88).

B. An AutoCAD file generated in Civil 3D of the survey shall also be provided.

3.03 Field Survey

A. Earthwork Staking: Staking for cut and fill limits shall establish the exterior limits of excavations and embankments. <u>The maximum staking interval shall be 50 feet. Stakes shall be prominently noted with description of point, vertical distance to design elevation of: (i) the final waste grade; (ii) the final grade of the subgrade; and (iii) offset distances as applicable.</u>

B. The CONTRACTOR shall perform surveys as needed throughout the progress of the construction activities to determine pay quantities and document work that has been performed. Surveys to be performed shall include, but shall not be limited to:

1. the limits and final elevations of the subgrade prior to backfilling (applies to soil cap area) (at 25-ft intervals along the crest and toe of perimeter slopes or shear faces, at corners and changes of direction, at 25-ft intervals along the centerline of cut and filled areas less than 50 feet wide, and at 25-ft grid nodes in cut and filled areas larger than 50 ft wide);

2. the limits and final elevations of the placed protective cover fill material (as part of the subgrade and final cover) (applies to soil cap area) (at 25-ft intervals along the crest and toe of perimeter slopes or shear faces, at corners and changes of direction, at 25-ft intervals along the centerline of backfilled areas less than 50 feet wide, and at 25-ft grid nodes in backfilled areas larger than 50 ft wide);

3. the limits and final elevations of the final cover soil layer (following placement of top soil fill material) (applies to soil cap area) (at 50-ft grid nodes, identical to the top of graded excavated soil to create

"stacked" points, intended to show the required thickness of the cover soil layer, and at the perimeter boundary, break lines, crest, and toe);

4. the limits and final elevations of the general fill (applies to area backfilled for the hydraulic control system concrete pad) (at 50-ft grid nodes, identical to the top of graded excavated soil to create "stacked" points, intended to show the required thickness of the cover soil layer, and at the perimeter boundary, break lines, crest, and toe);

5. the limits of the geotextile; and

6. the locations, elevation of adjacent ground surface, and top of casing elevations of extraction wells.

C. Surveys to determine pay quantities and document work shall be submitted in an AutoCAD file generated in Civil 3D.

3.04 Final Record Survey

A. At the conclusion of the Work, the CONTRACTOR shall perform a survey of the site within the project boundaries, up to and including the limit of Work. The survey shall accurately locate features that are to be shown on the final record survey drawing. The final record survey shall include as-built sections defining cut and fill limits (soil regrading, subbase backfill, and final cover backfill) and as-built records of the actual soil cover system, as well as final restoration grades of other disturbed areas. The surveyor shall also produce one final drawing for the installed soil cover. This drawing shall show the "as constructed" top of topsoil grades. In addition, the final record survey drawings shall show the thickness certification points for the various layers in the soil cover. The final record survey shall provide a table on the drawings listing northing, easting, bottom and top elevations of cover soil layer and topsoil, and the thickness of each layer at the certification locations.

B. An AutoCAD file generated in Civil 3D of the survey shall also be provided.

3.05 Tolerances

A. Acceptable tolerances upon completion of each layer, within the project areas, shall be 0 to - 0.1 ft (30 mm) on excavated soil elevations, and 0 to + 0.1 ft on final soil cover layers. Surveying tolerances may need to be more stringent in the certain areas (i.e., trench inverts and pipe alignments) to confirm accurate construction.

3.06 Documentation

A. Original field survey notes shall be retained by the senior surveyor. The surveyor shall produce record survey drawings for the JEA ENGINEER as the job progresses. The results from the field surveys will be documented on a set of record plans. At a minimum, these plans shall show the final elevations of the surfaces listed in Section 3.04 at a scale of 1-inch equal 40 ft with contour intervals no greater than 0.5 ft.

END OF SECTION

01 33 00 Submittal Procedures

Part 1 General

1.01 Scope of Work

A. This Section includes the requirements for compiling, processing and transmitting submittals required for execution of the project.

B. Submittals are categorized into two types: Action Submittals and Informational Submittals, as follows:

1. Action Submittal: Written and graphic information submitted by the CONTRACTOR that requires the JEA ENGINEER's approval. The following are examples of action submittals:

   a. Shop drawings (including working drawings, valve schedule, and product data);

   b. Soil testing data;

   c. Samples;

   d. Operation & maintenance manuals;

   e. Site Usage Plan (CONTRACTOR's staging - including material laydown area);

   f. Schedule of values; and

   g. Payment application format.

2. Informational Submittal: Information submitted by the CONTRACTOR that requiresrequires the JEA ENGINEER's approval. The following are examples of informational submittals:

   a. Shop Drawing Schedule;

   b. Construction Schedule;

   c. Statements of Qualifications;

   d. Health and Safety Plans;

   e. Construction Photography and Videography;

   f. Outage Requests;

   g. Proposed Testing Procedures;

   h. Test Records and Start-up Reports;

   i. Certifications;

j. Record Shop Drawings;

k. Submittals required by laws, regulations and governing agencies;

l. Warranties and Bonds; and

m. Contract Close-Out Documents.

1.02 Related Work

A. Additional requirements may be specified in the General Conditions for the Contract.

B. Additional submittal requirements may be specified in the respective technical Specification Sections.

C. Operation and Maintenance manuals are included in Section 01 78 23.

1.03 CONTRACTOR's Responsibilities

A. All submittals shall be clearly identified as follows:

1. Date of Submission.

2. Project Number.

3. Project Name.

4. CONTRACTOR Identification.

a. CONTRACTOR.

b. Supplier.

c. Manufacturer.

d. Manufacturer or supplier representative.

5. Identification of the Product.

6. Reference to Contract Drawing.

7. Reference to specification section number, page and paragraph(s).

8. Reference to applicable standards, such as ASTM or Federal Standards numbers.

9. Indication of CONTRACTOR's approval.

10. CONTRACTOR's Certification statement.

11. Identification of deviations from the Contract Documents, if any.

12. Reference to previous submittal (for resubmittals).

13. Made in America (when required by the Contract).

B. Submittals shall be clear and legible, and of sufficient size for legibility and clarity of the presented data.

C. Submittal Log. Maintain a log of all submittals. The submittal log shall be kept accurate and up to date. This log should include the following items (as applicable):

1. Description.

2. Submittal Number.

3. Date transmitted to the JEA ENGINEER.

4. Date returned to CONTRACTOR (from JEA ENGINEER).

5. Status of Submittal (Approved/Not Approved/etc.).

6. Date of Resubmittal to JEA ENGINEER and Return from JEA ENGINEER (if applicable and repeat as necessary).

7. Date material released for fabrication.

8. Projected (or actual) delivery date.

D. Variances

1. Notify the JEA ENGINEER in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

2. Notify the JEA ENGINEER in writing, at the time of re-submittal (resubmission), of all deviations from previous submissions of that particular shop drawing, except those deviations which are the specific result of prior comments from the JEA ENGINEER.

E. Action Submittals

1. Shop Drawings, Working Drawings, Product Data and Samples.

a. Shop Drawings.

I. Shop drawings as defined in the General Conditions, and as specified in individual Sections may include, but are not necessarily limited to, custom prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, valve schedules, wiring diagrams, coordination drawings, equipment

inspection and test reports, and performance curves and certifications, as applicable to the work.

II. CONTRACTOR shall verify all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and coordinate each item with other related shop drawings and the Contract requirements.

III. All details on shop drawings shall clearly show the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

IV. All shop drawings submitted by subcontractors and vendors shall be reviewed by the CONTRACTOR. CONTRACTOR shall confirm, materials, dimensions, catalog numbers, technical data and performance criteria; and shall coordinate with other related shop drawings and the Contract requirements. In addition, CONTRACTOR shall confirm existing field conditions and dimensions and assure that the submittal is coordinated and compatible with existing conditions. Submittals directly from subcontractors or vendors will not be accepted by the JEA ENGINEER.

V. The CONTRACTOR shall be responsible the accuracy of the subcontractor's or vendor's submittal; and, for their submission in a timely manner to support the requirements of the CONTRACTOR’s construction schedule. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractor or vendor to correct, before submission to the JEA ENGINEER. All shop Drawings shall be approved by the CONTRACTOR.

VI. Delays to construction due to the untimely submission of submittals will constitute inexcusable delays, for which CONTRACTOR shall not be eligible for additional cost nor additional contract time. Inexcusable delays consist of any delay within the CONTRACTOR's control.

VII. Submittals for equipment specified under Divisions 11, 13, 14, 21, 22, 23, 31, 33, 35, 40 through 46 shall include a listing of installations where identical or similar equipment manufactured by that manufacturer has been installed and in operation for a period of at least five years.

b. Working Drawings

I. Detailed installation drawings (sewers, equipment, piping, electrical conduits and controls, HVAC work, and plumbing, etc.) shall be prepared and submitted for review and approval by the JEA ENGINEER prior to installing such work. Installation drawings shall be to-scale and shall be fully dimensioned.

II. Piping working drawings shall show the laying dimensions of all pipes, fittings, valves, as well as the equipment to which it is being connected. In addition, all pipe supports shall be shown.

III. Equipment working drawings shall show all equipment dimensions, anchor bolts, support pads, piping connections and electrical connections. In addition, show clearances required around such equipment for maintenance of the equipment.

IV. Electrical working drawings shall show conduits, junction boxes, disconnects, control devices, lighting fixtures, support details, control panels, lighting and power panels, and Motor Control Centers. Coordinate all locations with the Contract Documents and the CONTRACTOR's other working drawings.

c. Product Data

I. Product data, as specified in individual Specification Sections, include, but are not limited to, the manufacturer's standard prepared data for manufactured products (catalog data), such as the product specifications, installation instructions, availability of colors and patterns, rough-in diagrams and templates, product photographs (or diagrams), wiring diagrams, performance curves, quality control inspection and reports, certifications of compliance (as specified or otherwise required), mill reports, product operating and maintenance instructions, recommended spare parts and product warranties, as applicable.

d. Samples

I. Furnish, samples required by the Contract Documents for the JEA ENGINEER's approval. Samples shall be delivered to the JEA ENGINEER as specified or directed. Unless specified otherwise, provide at least two samples of each required item. Materials or equipment for which samples are required shall not be used in the work unless and until approved by the JEA

ENGINEER.

II. Samples specified in individual Specification Sections, include, but are not limited to: physical examples of the work (such as sections of manufactured or fabricated work), small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and other specified units of work.

III. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify and Contract Requirements.

IV. Approved samples not destroyed in testing shall be sent to the JEA ENGINEER or stored at the site of the work. Approved samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the approved samples. Samples which fail testing or are not approved will be returned to the CONTRACTOR at his expense, if so requested at time of submission.

e. Professional Engineer (P.E.) Certification Form

I. If specifically required in any of the technical Specification Sections, submit a Professional Engineer (P.E.) Certification for each item required, using the form appended to this Section.

2. CONTRACTOR's Certification

a. Each shop drawing, working drawings, product data, and sample shall have affixed to it the following Certification Statement:

I. "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."

b. Shop drawings, working drawings, and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The transmittal cover sheet for each identified shop drawing shall fully describe the packaged data and

include a listing of all items within the package.

3. The review and approval of shop drawings, working drawings, product data, or samples by the JEA ENGINEER shall not relieve the CONTRACTOR from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the CONTRACTOR and the JEA ENGINEER will have no responsibility therefor.

4. Project work, materials, fabrication, and installation shall conform to approved shop drawings (including working drawings and product data) and applicable samples.

5. No portion of the work requiring a shop drawing (including working drawings and product data) or sample shall be started, nor shall any materials be fabricated or installed before approval of such item. Procurement, fabrication, delivery or installation or products or materials that do not conform to approved shop drawings shall be at the CONTRACTOR's risk. Furthermore, such products or materials delivered or installed without approved shop drawings, or in non-conformance with the approved shop drawings will not be eligible for progress payment until such time as the product or material is approved or brought into compliance with approved shop drawings. Neither the JEA nor JEA ENGINEER will be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

6. Operation and Maintenance Data

   a. Operation and maintenance data shall be submitted in assembled manuals as specified. Such manuals shall include detailed instructions for JEA personnel on safe operation procedures, controls, start-up, shut-down, emergency procedures, storage, protection, lubrication, testing, trouble-shooting, adjustments, repair procedures, and other maintenance requirements.

7. Schedule of Values

   a. On projects consisting of lump sums (in whole or in part) submit a proposed schedule of values providing a breakdown of lump sum items in to reasonably small components – generally disaggregated by building, area, and/or discipline. The purpose of the schedule of values is for processing partial payment applications. If requested by the JEA ENGINEER, provide sufficient substantiation for all or some items as necessary to determine the proposed schedule of values is a reasonable representation of the true cost breakdown of the Work. The schedule of values shall not be unbalanced to achieve early payment or over-payment in excess of the value of work or any other mis-distribution of the costs. If, in the opinion of the JEA ENGINEER, the schedule

of values is unbalanced, CONTRACTOR shall reallocate components to achieve a balanced schedule acceptable to JEA ENGINEER.

8. Payment Application Format

a. If an application form is included in the Contract Documents, use that form unless otherwise approved by the JEA ENGINEER and JEA. If an application form is not included in the Contract Documents, CONTRACTOR may propose a form for approval.

9. Site Usage

a. Submit a proposed site staging plan, including but not limited to the location of office trailers, storage trailers and material laydown. Such plan shall be a graphic presentation (drawing) of the proposed locations; and, shall include on-site traffic modifications, and temporary utilities, as may be applicable.

F. Informational Submittals

1. Shop Drawing Schedule

a. Prepare and submit a schedule indicating when shop drawings are required to be submitted to support the as-planned construction schedule. The submittal schedule shall allow sufficient time for preparation and submittal, review and approval, and fabrication and delivery to support the construction schedule.

2. Construction Schedule

a. Prepare and submit construction schedules and monthly status reports as specified.

3. Statements of Qualifications

a. Provide evidence of qualification, certification, or registration, as required in the Contract Documents, to verify qualifications of licensed land surveyor, professional engineer, materials testing laboratory, specialty subcontractor, technical specialist, consultant, specialty installer, and other professionals.

b. Health and Safety Plans

I. When specified, prepare and submit a general company Health and Safety Plan (HSP), modified or supplemented to include job-specific considerations.

4. Construction Photography and Videography

a. Provide periodic construction photographs and videography as specified – including but not limited to preconstruction photographs and/or video, monthly progress photos and/or video and post-construction photographs and/or video.

5. Work Plans

a. Prepare and submit copies of all work plans needed to demonstrate to the JEA ENGINEER that CONTRACTOR has adequately thought-out the means and methods of construction and their interface with existing facilities.

6. Outage Requests

a. Provide sufficient notification of any outages required (electrical, flow processes, etc.) as may be required to tie-in new work into existing facilities. Unless specified otherwise elsewhere, a minimum of seven calendar days' notice shall be provided.

7. Proposed Testing Procedures

a. Prepare and submit testing procedures it proposes to use to perform testing required by the various technical specifications.

8. Test Records and Reports

a. Provide copies of all test records and reports as specified in the various technical specifications.

9. Vendor Training Outlines/Plans

a. At least two weeks before scheduled training of JEA's personnel, provide lesson plans for vendor training in accordance with the specification for O&M manuals.

10. Test and Start-up Reports

a. Manufacture shall perform all pre-start-up installation inspection, calibrations, alignments, and performance testing as specified in the respective Specification Section. Provide copies of all such test and start-up reports.

11. Certifications

a. Provide various certifications as required by the technical specifications. Such certifications shall be signed by an officer (of the firm) or other individual authorized to sign documents on behalf of that entity.

b. Certifications may include, but are not limited to:

I. Welding certifications and welders' qualifications

II. Certifications of Installation, Testing and Training for all equipment

III. Material Testing reports furnished by an independent testing firm

IV. Certifications from manufacturer(s) for specified factory testing

V. Certifications required to indicate compliance with any sustainability or LEEDS accreditation requirements indicated in the Contract Documents

12. Record Drawings

a. No later than Substantial Completion, submit a record of all changes during construction not already incorporated into drawings – in accordance with specification on Project Record Documents.

13. Record Shop Drawings

a. Before final payment is made, furnish one set of record shop drawings to the JEA ENGINEER. These record shop drawings shall be in conformance with the approved documents and should show any field conditions which may affect their accuracy.

b. Submittals required by laws, regulations and governing agencies

I. Prepare and submit all documentation required by state or local law, regulation or government agency directly to the applicable agency. This includes, but is not limited to, notifications, reports, certifications, certified payroll (for projects subject to wage requirements) and other documentation required to satisfy all requirements. Provide to JEA ENGINEER one copy of each submittal made in accordance with this paragraph.

c. Submittals required by funding agencies

I. Prepare and submit all documentation required by funding agencies. This includes, but is not limited to segregated pay applications and change orders when required to properly allocate funds to different funding sources; and certified payrolls for projects subject to wage requirements. Provide one copy of each submittal made in accordance with this paragraph to

the JEA ENGINEER.

14. Other requirements of the technical Specification Sections

    a. Comply with all other requirements of the technical specifications.

15. Warranties and Bonds

    a. Assemble a booklet or binder of all warranties and bonds as specified in the various technical specifications and in accordance with the specification on Warranties and Bonds; and provide two originals to the JEA ENGINEER.

16. Waste Manifests

    a. Ten (10) days after completion of drilling activities, the CONTRACTOR shall provide copies of manifests and other documentation required for shipment of waste materials from the site to an approved treatment location. Manifests shall be signed by and approved by JEA.

17. Record and As-Built Surveys

    a. Engage the services of a licensed land surveyor in accordance with the Surveying specification. Prior to Final Completion, provide an as-built survey of the constructed facility, as specified.

18. Contract Close-Out Documents

G. Submit Contract documentation as indicated in the specification for Contract Close-out.

Part 2 Products – Not Used

Part 3 Execution

3.01 Submittal Schedule

A. Provide an initial submittal schedule at the pre-construction meeting for review by JEA and JEA ENGINEER. Incorporate comments from JEA or JEA ENGINEER into a revised submittal schedule.

B. Maintain the submittal schedule and provide sufficient copies for review by JEA and JEA ENGINEER. An up-to-date submittal schedule shall be provided at each project progress meeting.

3.02 Transmittals

A. Prepare separate transmittal sheets for each submittal. Each transmittal sheet shall include at least the following: the CONTRACTOR's name and address, JEA's name, project name, project number, submittal number, description of

submittal and number of copies submitted.

B. Submittals shall be transmitted or delivered directly to the office of the JEA ENGINEER, as indicated in the Contract Documents or as otherwise directed by the JEA ENGINEER.

C. Provide copies of transmittals forms or cover letters (without attachments) directly to the Resident Project Representative.

3.03 Procedures

A. Action Submittals

1. CONTRACTOR's Responsibilities

a. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required). Coordinate with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. Extensions to the Contract Time will not be approved for the CONTRACTOR's failure to transmit submittals sufficiently in advance of the Work.

b. The submittals of all shop drawings (including working drawings and product data) shall be sufficiently in advance of construction requirements to allow for possible need of re-submittals, including the specified review time for the JEA ENGINEER.

c. No less than 30 calendar days will be required for JEA ENGINEER's review time for shop drawings and O&M manuals involving only one engineering discipline. No less than 45 calendar days will be required for JEA ENGINEER's review time for shop drawings and O&M manuals that require review by more than one engineering discipline. Resubmittals will be subject to the same review time.

d. Submittals of operation and maintenance data shall be provided within 30 days of approval of the related shop drawing(s).

e. Before submission to the JEA ENGINEER, review shop drawings as follows:

I. make corrections and add field measurements, as required

II. use any color for its notations except red (reserved for the JEA ENGINEER's notations) and black (to be able to distinguish notations on black and white documents)

III. identify and describe each and every deviation or variation from Contract documents or from previous submissions, except those specifically resulting from a comment from the JEA ENGINEER on a previous submission

IV. include the required CONTRACTOR's Certification statement

V. provide field measurements (as needed)

VI. coordinate with other submittals

VII. indicate relationships to other features of the Work

VIII. highlight information applicable to the Work and/or delete information not applicable to the Work

f. Submit the following number of copies:

I. Shop drawings (including working drawings and product data) – Submit no fewer than six, and no more than nine; five of which will be retained by the JEA ENGINEER.

II. Samples – three

III. Site Usage Plan – three copies

IV. Schedule of values – four copies

V. Payment application format – four copies

g. If CONTRACTOR considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, provide written notice thereof to the JEA ENGINEER immediately; and do not release for manufacture before such notice has been received by the JEA ENGINEER.

h. When the shop drawings have been completed to the satisfaction of the JEA ENGINEER, carry out the construction in accordance therewith; and make no further changes therein except upon written instructions from the JEA ENGINEER.

2. JEA ENGINEER’s Responsibilities

a. JEA ENGINEER will not review shop drawings (including working drawings and product data) that do not include the CONTRACTOR's approval stamp and required certification statement. Such submittals will be returned to the CONTRACTOR, without action, for correction.

b. Partial shop drawings (including working drawings and product data) will not be reviewed. If, in the opinion of the JEA ENGINEER, a submittal is incomplete, that submittal will be returned to the CONTRACTOR for completion. Such submittals may be returned with comments from JEA ENGINEER indicating the deficiencies requiring correction.

c. If shop drawings (including working drawings and product data) meet the submittal requirements, JEA ENGINEER will forward copies to appropriate reviewer(s). Otherwise, noncompliant submittals will be returned to the CONTRACTOR without action - with the JEA ENGINEER retaining one copy.

d. Submittals which are transmitted in accordance with the specified requirements will be reviewed by the JEA ENGINEER within the time specified herein. The time for review will commence upon receipt of submittal by JEA ENGINEER.

3. Review of Shop Drawings (Including Working Drawings and Product Data) and Samples

a. The review of shop drawings, working drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:

I. as permitting any departure from the Contract requirements

II. as relieving the CONTRACTOR of responsibility for any errors, including details, dimensions, and materials

III. as approving departures from details furnished by the JEA ENGINEER, except as otherwise provided herein

b. The CONTRACTOR remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

c. If the shop drawings (including working drawings and product data) or samples as submitted describe variations and indicate a deviation from the Contract requirements that, in the opinion of the JEA ENGINEER are in the interest of the JEA and are so minor as not to involve a change in Contract Price or Contract Time, the JEA ENGINEER may return the reviewed drawings without noting an exception.

d. Only the JEA ENGINEER will utilize the color "RED" in marking submittals.

e. Shop drawings will be returned to the CONTRACTOR with one of the following codes.

I. "APPROVED" - This code is assigned when there are no notations or comments on the submittal. When returned under this code the CONTRACTOR may release the equipment and/or material for manufacture.

II. "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the CONTRACTOR. The CONTRACTOR may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

III. "APPROVED AS NOTED/CONFIRM" - This combination of codes is assigned when a confirmation of the notations and comments is required by the CONTRACTOR. The CONTRACTOR may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the JEA ENGINEER within 15 calendar days of the date of the JEA ENGINEER's transmittal requiring the confirmation.

IV. "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the entire package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the JEA ENGINEER within 30 calendar days of the date of the JEA ENGINEER's transmittal requiring the resubmittal.

V. "NOT APPROVED" - This code is assigned when the submittal does not meet the intent of the contract documents. The CONTRACTOR must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the contract documents.

VI. "COMMENTS ATTACHED" - This code is assigned where there are comments attached to the returned

submittal, which provide additional data to aid the CONTRACTOR.

VII. "RECEIPT ACKNOWLEDGED (Not subject to JEA ENGINEER's Review or Approval)" - This code is assigned to acknowledge receipt of a submittal that is not subject to the JEA ENGINEER's review and approval, and is being filed for informational purposes only. This code is generally used in acknowledging receipt of means and methods of construction work plans, field conformance test reports, and health and safety plans.

f. Repetitive Reviews: Shop drawings, O&M manuals and other submittals will be reviewed no more than twice at the JEA's expense. All subsequent reviews will be performed at the CONTRACTOR's expense. Reimburse the JEA for all costs invoiced by JEA ENGINEER for the third and subsequent reviews.

4. Electronic Transmission

a. Action Submittals may be transmitted by electronic means provided the following conditions are met:

I. The above-specified transmittal form is included.

II. All other requirements specified above have been met including, but not limited to, coordination by the CONTRACTOR, review and approval by the CONTRACTOR, and the CONTRACTOR's Certification.

III. The submittal contains no pages or sheets large than 11 x 17 inches.

IV. With the exception of the transmittal sheet, the entire submittal is included in a single file.

V. The electronic files are PDF format (with printing enabled).

VI. In addition, transmit three hard-copy (paper) originals to the JEA ENGINEER.

VII. The JEA ENGINEER's review time will commence upon receipt of the hard copies of the submittal.

VIII. For Submittals that require certification, corporate seal, or professional embossment (i.e., P.E.s, Surveyors, etc.) transmit at least two hard-copy originals to the JEA ENGINEER. In addition, provide additional

photocopied or scanned copies, as specified above, showing the required certification, corporate seal, or professional seal.

B. Informational Submittals

1. CONTRACTOR's Responsibilities

a. Number of copies: Submit three copies, unless otherwise indicated in individual Specification sections

b. Refer to individual technical Specification Sections for specific submittal requirements.

2. JEA ENGINEER's Responsibilities

a. The JEA ENGINEER will review each informational submittal within 15 days. If the informational submittal complies with the Contract requirements, JEA ENGINEER will file for the project record and transmit a copy to the JEA. JEA ENGINEER may elect not to respond to CONTRACTOR regarding informational submittals meeting the Contract requirements.

b. If an informational submittal does not comply with the Contract requirements, JEA ENGINEER will respond accordingly to the CONTRACTOR within 15 days. Thereafter, the CONTRACTOR shall perform the required corrective action, including retesting, if needed, until the submittal, in the opinion of the JEA ENGINEER, is in conformance with the Contract Documents.

3. Electronic Transmission

a. Informational submittals may be transmitted by electronic means providing all of the following conditions are met:

I. The above-specified transmittal form is included.

II. The submittal contains no pages or sheets large than 11 x 17 inches.

III. With the exception of the transmittal sheet, the entire submittal is included in a single file.

IV. The electronic files are PDF format (with printing enabled).

V. For Submittals that require certification, corporate seal, or professional embossment (i.e., P.E.s, Surveyors, etc.)) transmit two hard-copy originals to the JEA ENGINEER.

END OF SECTION

01 35 29.13 Health, Safety, and Emergency Response Requirements for Contaminated Sites

Part 1 General

1.01 Scope of Work

A. CONTRACTOR is solely responsible for the health and safety of its employees and shall place the highest priority thereon. Additionally the CONTRACTOR shall be JEA Safety Certified and shall meet the requirements specified in JEA's Health and Safety requirements (http://www.jea.com/business/services/contractor/safety.asp), including NCCER 8-hour CONTRACTOR Safety Orientation, the OSHA 10-hour Outreach Program, and the on-site supervisor will be required to participate in the 8-hour safety leadership program developed by JEA (as required based on bid proposal) prior to conducting any work. CONTRACTOR shall comply with the Florida Trench Safety Act.

B. CONTRACTOR shall be familiar with, and shall at all times conform to, the regulations of the Contract Documents, "OSHA General Industry Occupational Safety and Health Standards," "OSHA Safety and Health Regulations for Construction," and other applicable state and municipal standards and regulations.

C. CONTRACTOR shall maintain a safe working environment during performance of the Work. CONTRACTOR shall ensure its employees comply with all applicable health, safety and security laws and regulations, including, without limitation, federal, state and local laws and regulations, any JEA ENGINEER and JEA health and safety plans and JEA's site rules and regulations. Compliance with such requirements shall represent the minimum standard. CONTRACTOR shall be responsible for examining all requirements and determining whether additional or more stringent health, safety and security provisions are required for the Work and implementing them accordingly. CONTRACTOR shall immediately notify the JEA ENGINEER of any unanticipated hazard or potential hazard which it encounters in connection with the Work.

D. CONTRACTOR shall, at a minimum, furnish necessary personal protective equipment and other safety devices ("Health and Safety Equipment"), as required by applicable laws, regulations, and health and safety plans, and to ensure that it is properly used and maintained.

E. CONTRACTOR shall, at its sole expense, comply with employee training and medical monitoring requirements as required by applicable laws, regulations, and health and safety plans. CONTRACTOR shall warrant that all personnel assigned to carry out the Work shall be fit and qualified.

F. The minimum personal protection required for the work to be performed is anticipated to be level "D". The CONTRACTOR shall be responsible for determining the level of protection for its staff and for providing all required personal protective equipment. The CONTRACTOR is responsible for implementing a Health and Safety Plan in accordance with 29 CFR Part 1910.120. Previous environmental assessments and geophysical surveys

indicate that the soils and groundwater may be impacted with arsenic, nickel, and vanadium and the CONTRACTOR should be prepared for these conditions. Copies of 40-hour HAZWOPER and current certification documenting compliance with training and health monitoring shall be provided by the CONTRACTOR for all on-site personnel prior to commencing field activities. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings during drilling activities.

G. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings.

1.02 Referenced Sections

A. Related Sections are shown below.

1. All Technical Specifications are referenced. Refer to Technical Specification Index.

1.03 Cited Standards - None

1.04 Submittals

A. The CONTRACTOR shall provide copies of 40-hour, HAZWOPER certificates and current certification documenting compliance with training and health monitoring for all on-site personnel two weeks prior to commencing field activities to the JEA ENGINEER.

1. Delivery drivers of materials (backfill, equipment, materials) that will not exit their vehicle do not need HAZWOPER training.

B. CONTRACTOR shall provide a copy of their Health and Safety Plan to the JEA ENGINEER two weeks prior to the commencement of work.

Part 2 Products - None

Part 3 Execution

3.01 General

A. CONTRACTOR will be provided a copy of the JEA ENGINEER's HASP prior to commencing work. A summary of the soil and groundwater contaminants of concern in soil and groundwater are provided. The groundwater and surface water concentrations are based upon laboratory analytical results from the November 2016 sampling event as documented in the interim Groundwater and Surface Water Monitoring Report dated February 2017. The soil concentrations are based upon laboratory analytical results from the March 2012 sampling event as documented in the Soil Data Summary Report dated August 2012. Copies of the Corrective Measures Study and Corrective Measures Design reports will also be available to the CONTRACTOR

	Soil (mg/kg)	Groundwater (µg/L)	Surface Water (µg/L)
Arsenic	N/A	8.35	N/A
Nickel	510	224.22	120
Vanadium	1300	6741.9	2015.7

B. CONTRACTOR shall coordinate utility location with Sunshine State One-Call of Florida, Inc. Once the locate service has field marked all utilities, the CONTRACTOR shall verify each utility (including any service laterals, i.e. water, wastewater, cable, gas, electric, phone, etc.). Verification may be performed utilizing Ground Penetrating Radar, hand dig, or vacuum excavation. Prior to initiating drilling, the CONTRACTOR shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The CONTRACTOR shall utilize the Ground Penetrating Radar over the projected bore path whether utilities are located in the horizontal drill pathway or not, in order to reduce the opportunity of conflicting with any unforeseen obstructions.

END OF SECTION

01 35 43 Environmental Protection Procedures

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.

C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to construction activity in that area.

D. Specific requirements for the proper handling and disposal of dewatering and drainage are specified in Section 31 25 00.

E. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the CONTRACTOR's responsibility to determine the specific construction techniques to meet these guidelines.

F. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Florida Department of Environmental Protection. Prepare sedimentation and erosion control drawings meeting the requirements for approval by that agency. Upon approval, furnish two copies of the approved Drawing to the JEA ENGINEER.

1.02 Applicable Regulations

A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.03 Notifications

A. The JEA ENGINEER will notify the CONTRACTOR in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies

responsible for verification of certain aspects of the environmental protection requirements shall notify the CONTRACTOR in writing, through the ENGINEER, of any non-compliance with State or local requirements. After receipt of such notice from the JEA ENGINEER or from the regulatory agency through the JEA ENGINEER, immediately take corrective action. Such notice, when delivered to the CONTRACTOR or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the CONTRACTOR fails or refuses to comply promptly, the JEA may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the CONTRACTOR unless it is later determined that the CONTRACTOR was in compliance.

1.04 Implementation

A. Prior to commencement of the work, meet with the JEA ENGINEER to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.

B. Remove temporary environmental control features, when approved by the ENGINEER and incorporate permanent control features into the project at the earliest practicable time.

Part 2 Products - Not Used

Part 3 Execution

3.01 Erosion Control

A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

3.02 Protection of Streams and Surface Waters

A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.

B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins,

or other approved method to reduce the amount of sediment contained in the water to allowable levels.

C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the Florida Department of Environmental Protection. Submit two copies of approved contingency plans to the ENGINEER.

D. Water being flushed from structures or pipelines after disinfection, with a Cl2 residue of 4 mg/L or greater shall be treated with a dechlorination solution, in a method approved by the ENGINEER, prior to discharge.

3.03 Protection of Land Resources

A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.

B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the ENGINEER. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The CONTRACTOR shall in any event be responsible for any damage resulting from such use.

C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.

D. Trees or other landscape features scarred or damaged by the CONTRACTOR's equipment or operations shall be restored as nearly as possible to their original condition. The ENGINEER will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

4. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the CONTRACTOR and are beyond saving in the opinion of the ENGINEER, shall be immediately

removed and replaced.

E. The locations of the CONTRACTOR's storage and other construction buildings required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the ENGINEER and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the ENGINEER.

F. If the CONTRACTOR proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.

1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.

2. Details of temporary road construction.

3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.

4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the CONTRACTOR's approved drawings shall be made only with the written approval of the ENGINEER. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the ENGINEER.

H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 Protection of Air Quality

A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the ENGINEER.

D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the CONTRACTOR shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the ENGINEER.

3.05 Noise Control

A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 Maintenance of Pollution Control Facilities During Construction

A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

01 40 00 Quality Requirements

Part 1 General

1.01 Scope of Work

A. This section includes a brief description of general quality control, workmanship in relation to industry standards, and compliance with manufacturer's instructions.

1.02 Referenced Sections

A. Related Sections are shown below.

1. All Technical Specifications are referenced. Refer to Technical Specification Index.

1.03 Cited Standards - None

1.04 Noted Restrictions - None

1.05 Safety - None

1.06 Quality Control

A. Verification of Dimensions

1. The CONTRACTOR shall lay out all work and shall be responsible for all lines, levels, grades, elevations and measurements of structures, and other work required under this contract.

2. The CONTRACTOR shall verify all site dimensions, project layout dimensions, setbacks, etc., shown on the Construction Drawings before laying out the work.

3. The CONTRACTOR shall notify the JEA ENGINEER in writing of any error or discrepancy found and shall not proceed until the error or discrepancy is resolved.

4. The CONTRACTOR shall be responsible for correction of any work, which is done in error because of failure to verify dimensions.

B. Tests

1. The CONTRACTOR shall comply with any tests required by law, ordinance, rule, regulation, or order of any public authority having jurisdiction.

2. Special tests may be ordered by the JEA ENGINEER in accordance with the contract documents or as agreed between the JEA ENGINEER and CONTRACTOR in writing.

3. If the Technical Specifications require testing by an independent testing laboratory, the CONTRACTOR shall select the testing laboratory and receive approval from the JEA ENGINEER. After approval, the CONTRACTOR shall schedule all tests and shall deliver all test reports to the JEA ENGINEER. JEA ENGINEER shall be notified within 24 hours of all testing or as specified within the project document.

4. The CONTRACTOR is responsible for all costs involving testing with the exception of the following:

   a. Special tests required by the JEA ENGINEER. Special tests are to be paid for as stipulated in the Contract Documents or as otherwise agreed between the JEA ENGINEER and CONTRACTOR in writing.

5. In order to produce work of the specified quality, the CONTRACTOR shall maintain quality control over products, services, site conditions, and workmanship.

C. Workmanship

1. The CONTRACTOR and his/her workers shall comply with the highest prevailing industry standards in regard to work and safety.

2. The CONTRACTOR shall provide workers who are qualified to perform all work to the specified quality.

3. The CONTRACTOR shall provide a minimum of three years warranty on all workmanship, materials, and equipment.

4. Manufacturer's Instructions

   a. The CONTRACTOR shall comply with the manufacturer's instructions in full detail, including each step in sequence. If the manufacturer's instructions conflict with the Contract Documents, the CONTRACTOR shall request clarification from the JEA ENGINEER before proceeding.

1.07 Submittals - None

Part 2 Products - None

Part 3 Execution - None

END OF SECTION

01 45 28 Pipeline Testing and Cleaning

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required and test and clean all new pipelines installed under this Contract as specified herein.

1.02 Related Work

A. Buried pipelines are included in Division 31 and in JEA's Water and Wastewater Standards Manual (January 2017 or latest).

B. Above grade and exposed pipelines are included in Division 40 and in JEA's Water and Wastewater Standards Manual (January 2017 or latest).

Part 2 Products - Not Used

Part 3 Execution

3.01 General

A. Furnish all necessary equipment and labor for cleaning and testing the pipelines. The procedures and methods shall be approved by the ENGINEER.

B. Make any taps and furnish all necessary caps, plugs, etc., as required in conjunction with testing pipelines. Furnish a test pump, gauges and any other equipment required in conjunction with carrying out the hydrostatic tests.

3.02 Cleaning Pipelines

A. As pipe laying progresses and at the conclusion of the work thoroughly clean all new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

3.03 Testing Pressure Pipelines

A. All pressure pipelines shall be pressure and leakage tested. Pipelines shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure and this pressure maintained for at least 10 minutes. The leakage test shall be conducted at the maximum operating pressure as determined by the JEA ENGINEER, and this pressure shall be maintained for at least two hours. The test pump and water supply shall be arranged to allow accurate measurement of the water required to maintain the test pressure. Where applicable, hydrant branch gate valves shall remain open during this test. The amount of leakage which will be permitted shall be in accordance with AWWA C600.

END OF SECTION

01 51 00 Temporary Utilities

Part 1 General

1.01 Scope of Work

A. This section includes details pertaining to temporary utilities such as onsite water and electricity.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Division 02 – Existing Conditions
2. Division 31 - Earth Work
3. Division 40 – Process Piping, Hosing, and Appurtenances
4. Division 50 - Hydraulic Control System

1.03 Cited Standards - not used

1.04 Noted Restrictions - not used

1.05 Safety – not used

1.06 Quality Control – not used

1.07 Submittals – not used

Part 2 Products – not used

Part 3 Execution

3.01 Preparation

A. Temporary Electrical Facilities

1. The CONTRACTOR shall assume that no power is available onsite for CONTRACTOR use.

B. Temporary Water

1. The CONTRACTOR shall assume that no water is available onsite for CONTRACTOR use.

C. Temporary Sanitary Facilities

1. CONTRACTOR shall be responsible for staging temporary sanitary facilities and removal at the completion of construction activities.

3.02 Installation – not used

A. Testing – not used

END OF SECTION

01 60 00 Product Requirements

Part 1 General

1.01 Scope

A. This section includes details pertaining to products, the quality of materials to be used, and appurtenances and accessories.

Part 2 Products

2.01 Material

A. Materials, equipment, appliances, fixtures, and fabricated assemblies to be incorporated in the work shall be new unless indicated or specified otherwise in the Contract Documents.

B. All products including but not limited to material, equipment, and systems, shall comply with the specifications and referenced standards as minimum requirements.

C. Ten (10) days after the date established in notice to proceed, the CONTRACTOR shall submit a complete list of major products proposed for use including the name of the manufacturer and model number of each product.

D. Product Substitutions

1. The CONTRACTOR may submit a request for substitution for any products specified by only one manufacturer. Products specified by naming several manufacturers shall have NO substitutions allowed.

2. The JEA shall only consider requests from the CONTRACTOR for substitution if the request is made within ten (10) days after the date established in notice to proceed. Prior to requesting a product substitution, the CONTRACTOR shall do the following:

a. Investigate the proposed product and determine that it meets or exceeds the specified product in all respects.

b. Make sure that the proposed product will provide the same warranty as the specified product.

c. Coordinate installation and make sure that changes do not require substantial additions to the work to be performed.

d. Waive claims for additional costs, which may subsequently become apparent.

E. Product substitutions will not be considered when they are indicated or implied on Construction Drawings or product data submittals without a separate written request, or when acceptance requires substantial revision of the Contract Documents.

F. The JEA will determine acceptability of a proposed substitution, and will notify the CONTRACTOR of acceptance or rejection in writing within a reasonable time. JEA may require reimbursement of the cost associated with the evaluation of substitution.

G. The CONTRACTOR shall make only one request for substitution for each product and if the proposed substitution is rejected, the CONTRACTOR shall provide the specified product.

H. Appurtenances and Accessories

1. Products to be incorporated in the Work shall be furnished as complete assemblies or systems with all appurtenances and installation anchors, fasteners, and accessories as required providing a complete and finished product installation.

2. Installed products with moving parts shall be fully operable at proper settings and levels in accordance with the respective manufacturers' instructions and recommendations.

END OF SECTION

01 66 00 Product Storage and Handling Requirements

Part 1 General

1.01 Scope

A. This section includes details pertaining to packaging and handling, transportation and delivery, and storage and protection of the products to be used at the site.

B. Specific requirements, if any, are specified with the related item.

Part 2 Products – Not Used

Part 3 Execution

3.01 Packaging and Handling

A. The CONTRACTOR shall avoid bending, scraping, or overstressing materials and equipment. Projecting parts shall be protected by blocking with wood, by providing bracing, or by other methods approved by the JEA ENGINEER.

B. Materials and equipment shall be protected from soiling and moisture by wrapping or by other methods approved by the JEA ENGINEER.

C. Small parts shall be packaged in containers such as boxes, crates, or barrels to avoid dispersal and loss. The CONTRACTOR shall firmly secure an itemized list and description of contents to such a container.

3.02 Transportation and Delivery

A. Transportation and handling shall be in accordance with manufacturer's instructions.

B. Arrange deliveries of materials and equipment in accordance with the project schedule to reduce long term on-site storage prior to installation and/or operation. Coordinate to avoid conflict with work and conditions at the site.

C. Deliver materials in undamaged condition, in manufacturers' unopened containers or packaging (where applicable), dry, with identifying labels intact and legible.

D. The CONTRACTOR shall provide the equipment and personnel to handle products by methods to prevent soiling or damage.

E. Deliver cement, prepared dry mortar mixes, grouting material, plaster, and coloring material in original, unopened and sealed containers, bearing the brand and manufacturer's name.

F. Refer also to the individual Specifications Sections for detailed requirements as applicable.

G. Promptly inspect shipment to assure that products comply with requirements,

quantities are correct and items are undamaged. For items furnished by others (i.e. JEA, other contractors), perform inspection in the presence of the JEA. Notify ENGINEER verbally, and in writing of any problems.

H. If any item has been damaged, such damage shall be repaired at no additional cost to the JEA.

3.03 Storage and Protection

A. The receiving, storage, quality, and inventory control of equipment and materials required for the work of this Contract shall be the sole responsibility of the CONTRACTOR. Storage shall be arranged to provide easy access for inspection and identification of each shipment.

B. Materials shall be stored in such a manner as to ensure the preservation of their quality and fitness for the work and to facilitate inspection.

C. Arrange storage to permit for inspection.

D. Sheltered, weathertight, or heated weathertight storage shall be provided as required to protect materials and equipment from weather damage and corrosion.

E. The CONTRACTOR shall store manufactured materials in accordance with the various manufacturers' instructions with seals and labels intact and legible. Storage instruction shall be studied by the CONTRACTOR and reviewed with the JEA. The temperature and humidity shall be maintained within the ranges required by the various manufacturers' instructions.

F. Blocking, platforms, pallets, or skids shall be provided for materials and equipment subject to damage by contact with earth or pavement. Clearances shall be provided from adjacent surfaces for stored materials requiring natural ventilation.

G. Packaged materials shall be stored in their original unbroken packages or containers.

H. Protect materials and equipment from damage and corrosion during warehousing operations.

I. For exterior storage of fabricated products, the products shall be placed on sloped supports above ground. Products subject to deteriorations shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.

J. Loose granular materials shall be stored on solid surfaces in a well-drained area to prevent mixing with foreign matter.

K. Perform periodic inspections of stored materials to assure that materials are maintained under specified conditions, and are free from damage or deterioration.

L. Continue protection of materials and equipment from damage and corrosion

after installation until final acceptance of the work.

M. CONTRACTOR shall be responsible for security with respect to damage or theft of construction supplies, materials, and equipment.

N. Refer also to the individual Specifications Sections for detailed requirements, as applicable.

END OF SECTION

01 77 00 Closeout Procedures

Part 1 General

1.01 Scope of Work

A. This section includes requirements for closeout procedures, final cleaning, property restoration, and project record documents.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 02 61 00 - Removal and Disposal of Contaminated Materials
3. Section 02 61 10 - Removal and Staging Contaminated Materials
4. Section 02 61 20 - Transporting and Disposing of Contaminated Materials
5. Section 03 05 00 - Concrete
6. Section 31 05 00 - Earthwork
7. Section 31 23 00 - Excavation and Backfill
8. Section 31 23 16 - Excavation
9. Section 31 23 23 - Backfill
10. Section 33 23 00 - Extraction Wells
11. Section 50 00 00 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls
12. Section 50 20 00 - Startup

1.03 Cited Standards - None

1.04 Noted Restrictions - None

1.05 Safety - None

1.06 Quality Control - None

1.07 Submittals - None

Part 2 Products - None

Part 3 Execution

3.01 Closeout Procedures

A. When the CONTRACTOR considers his/her work has reached final completion, the CONTRACTOR shall submit a certification that states that the Contract Documents have been reviewed, work has been inspected, and that the work is complete in accordance with the Contract Documents and is ready for the JEA's inspection. The inspection shall include start-up and testing data of all installed equipment in accordance with manufacturer's recommendation.

3.02 Final Cleaning

A. Cleanup and restoration operations must be completed within a reasonable time following installation of any particular section of work.

B. Final cleaning shall be executed prior to the final inspection.

C. Immediately after all construction operations have been completed, the CONTRACTOR shall thoroughly clean the area of all excess materials, debris, plant and equipment for which he or she is responsible. The CONTRACTOR shall also restore grounds, lawns, driveways, streets, roadways, pipes, drain lines, banks, ditches, and all other areas to their original condition and to the satisfaction of the JEA ENGINEER and shall leave the premises in a neat and operable condition.

3.03 Property Restoration

A. The CONTRACTOR shall assume all responsibility and liability for property damages, bodily injury, or financial losses and interruptions of service that may result from his/her construction activities which affect structures, facilities, water lines, gas lines, power lines, electric conduits, sewer lines, telephone lines, cable TV lines, and all service facilities connected thereto.

B. The CONTRACTOR shall be responsible for the relocation, repair, reconstruction, and re-installation of damaged or disturbed items due to his/her construction activities.

C. Damaged or disturbed items shall be re-installed or restored to their original condition as soon as possible and prior to completion of work. Restoration shall be approved by the authority having jurisdiction over the disturbed items. There shall be no extra cost to the JEA.

D. Items not specifically stated in the Technical Specifications that are removed, damaged, destroyed, or defaced due to neglect or carelessness on the part of the CONTRACTOR shall be repaired or replaced by the CONTRACTOR if determined so by the JEA ENGINEER.

E. The CONTRACTOR will be responsible for protection and preservation of existing improvements including necessary removal and storage of such improvements and subsequent replacement to obtain to the fullest extent possible, the undisturbed condition.

F. Where material or debris has washed or flowed into or been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as a result of the CONTRACTOR's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the process of the work, and the ditches, channels, drains, etc. kept in a clean and neat condition.

G. The CONTRACTOR shall restore or replace, when and as directed, any public or private property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of its operations. Suitable materials, equipment and methods shall be used in such restoration.

H. CONTRACTOR shall notify JEA and the JEA ENGINEER five (5) business days in advance of construction completion for a Professional Engineer inspection.

3.04 As-Built Drawings

A. Upon completion of the work and prior to final completion and final payment under the Contract with JEA, the CONTRACTOR shall furnish to JEA as-built drawings which have been revised to scale to indicate final as-built data in accordance with all addenda, field changes, and requests for information.

B. As-built drawings shall be prepared in accordance with requirements of Section 01 32 23.

END OF SECTION

01 78 23 Operation and Maintenance Data

Part 1 General

1.01 Scope of Work

A. This Section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

1.02 Related Work

A. Submittals are included in Section 01 33 00.

1.03 Operating Manuals

A. Provide specific operation and maintenance instructions for all electrical, mechanical, and instrumentation and controls equipment furnished under various technical specification sections.

B. Separate manuals shall be provided for each type of equipment, or each section number. Each manual shall contain the following:

1. Format and Materials

a. Binders:

I. Commercial quality three ring binders with durable and cleanable plastic covers

II. Maximum ring width capacity: 3 inches

III. When multiple binders are used, correlate the data into related consistent groupings/volumes.

b. Identification: Identify each volume on the cover and spine with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". Include the following:

I. Title of Project.

II. Identify the general subject matter covered in the manual.

III. Identify structure(s) and/or location(s), of the equipment provided.

IV. Specification Section number.

c. 20 lb loose leaf paper, with hole reinforcement

d. Page size: 8-1/2 inch by 11 inch

e. Provide heavy-duty fly leafs (section separators), matching the table of contents, for each separate product, each piece of operating equipment, and organizational sections of the manual.

f. Provide reinforced punched binder tab; bind in with text.

g. Reduce larger drawings and fold to the size of text pages - but not larger than 11 inches x 17 inches - or provide a suitable clear plastic pocket (with drawing identification) for such folded drawings/diagrams.

2. Contents:

a. A table of contents/Index, divided into section reflective of the major components provided.

b. Specific description of each system and components

c. Name, address, telephone number(s) and e-mail address(es) of vendor(s) and local service representative(s)

d. Specific on-site operating instructions (including starting and stopping procedures)

e. Safety considerations

f. Project specific operational procedures and recommended log sheet(s).

g. Project specific maintenance procedures

h. Manufacturer's operating and maintenance instructions – specific to the project

i. Copy of each wiring diagram

j. Copy of approved shop drawing(s) and CONTRACTOR's coordination/layout drawing(s)

k. List of spare parts and recommended quantities

l. Product Data: Mark each sheet to clearly identify specific products and component parts and data applicable to installation. Delete inapplicable information.

m. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams

n. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified.

o. Warranties and Bonds, as specified in the General Conditions

3. Transmittals

a. Prepare separate transmittal sheets for each manual. Each transmittal sheet shall include at least the following: the CONTRACTOR's name and address, JEA's name, project name, project number, submittal number, description of submittal and number of copies submitted.

b. Submittals shall be transmitted or delivered directly to the office of the JEA ENGINEER, as indicated in the Contract Documents or as otherwise directed by the JEA ENGINEER.

c. Provide copies of transmittals (only, i.e., without copies of the respective submittal) directly to the Resident Project Representative.

C. Manuals for Equipment and Systems - In addition to the requirements listed above, for each System, provide the following:

1. Overview of system and description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include legible performance curves, with engineering data and tests and complete nomenclature and commercial number of replaceable parts.

2. Panelboard circuit directories including electrical service characteristics, controls and communications and color-coded wiring diagrams as installed.

3. Operating procedures: include start-up, break-in and routine normal operating instructions and sequences; regulation, control, stopping, shut-down and emergency instructions; and summer, winter and any special operating instructions.

4. Maintenance Requirements

a. Procedures and guides for trouble-shooting; disassembly, repair, and reassembly instructions

b. Alignment, adjusting, balancing and checking instructions

c. Servicing and lubrication schedule and list of recommended lubricants

d. Manufacturer's printed operation and maintenance instructions

e. Sequence of operation by instrumentation and controls manufacturer

f. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance

5. Control diagrams by controls manufacturer as installed (as-built)

6. CONTRACTOR's coordination drawings, with color coded piping diagrams, as installed (as-built)

7. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams. Include equipment and instrument tag numbers on diagrams.

8. List of original manufacturer's spare parts and recommended quantities to be maintained in storage

9. Test and balancing reports, as required

10. Additional Requirements as specified in individual product specification

11. Design data for systems engineered by the CONTRACTOR or its Suppliers

D. Electronic Transmission of O&M Manuals

1. Unless otherwise approved by the JEA ENGINEER, O&M manuals may not be transmitted by electronic means other than by CD-ROM or USB flash drive. Electronic O&M manuals shall meet the following conditions:

a. The above-specified transmittal form is included.

b. All other requirements specified above have been met, including, but not limited to, coordination by the CONTRACTOR, review and approval by the Contactor.

c. The submittal contains no pages or sheets large than 11 x 17 inches.

d. With the exception of the transmittal sheet, the entire submittal is included in a single file.

e. Files are Portable Document Format (PDF) – with the printing function enabled.

f. All scanned manufacturer's O&M manuals must be quality checked after scanning to ensure the page are not crooked and all information is legible.

2. When electronic copies are provided, transmit two hard copy (paper) originals to the JEA ENGINEER with an electronic copy on CD-ROM.

3. The electronic copy of the O&M manual shall be identical in organization, format and content to the hard copies of the manual.

4. The electronic O&M Manual shall be bookmarked identically to the paper manual table of contents to allow quick access to information. Electronic submittals that require extensive scrolling will not be accepted. The document shall be indexed and searchable.

Part 2 Products - Not Used

Part 3 Execution

3.01 Submittal Schedule

A. Operation and maintenance manuals shall be delivered directly to the office of the JEA ENGINEER, as follows:

1. Provide preliminary copies of each manual to the office of the JEA ENGINEER, no later than 30 days following approval of the respective shop drawings.

2. Provide final copies of each completed manual prior to testing.

3. Provide a letter that grants the JEA ENGINEER and JEA to the limited right to use and reproduce each manual (in it its entirety or any portion thereof) from the respective equipment manufacturer(s). Such limited right shall allow the JEA ENGINEER and JEA to use each manual or and portion thereof for:

a. The potential assembly of a comprehensive facility operation and maintenance manual for the sole benefit of the JEA; and,

b. Supplemental training of the JEA's personnel and operators, over and above the required vendor's training, regarding operation of the facility as a system.

B. The JEA ENGINEER will review Operation and Maintenance manuals submittals for operating equipment for conformance with the requirements of the applicable specification Section. The review will generally be based on the O&M Manual Review Checklist appended to this Section.

C. If during test and start-up of equipment, any changes were made to the equipment, provide two hard copies of as-built drawings or any other amendments for insertion, by the CONTRACTOR, in the previously transmitted final manuals. In addition, provide one revised electronic version including the as-built drawings and any other amendments. The manuals shall be completed, including updates, if any, within 30 days of start-up and testing of the facility.

3.02 Vendor Training/Instructions (To JEA’s Personnel)

A. Before final initiation of operation, CONTRACTOR's vendors shall train/instruct JEA's designated personnel in the operation, adjustment, and

maintenance of products, equipment and systems at times convenient to the JEA.

B. Unless specified otherwise under the respective equipment specification section, vendor training/instruction shall consist of eight hours of training for each type of equipment. Such training/instruction shall be scheduled and held at times to accommodate the work schedules of JEA's personnel, including splitting the required training/instruction time into separate sessions and/or presented at reasonable times other than the CONTRACTOR's "normal working hours" or the JEA's normal day shift.

C. Use operation and maintenance manuals as basis for instruction. Train/instruct the JEA's personnel, in detail, based on the contents of manual explaining all aspects of operation and maintenance of the equipment. If the respective equipment is inter-related to the operation of other equipment, all interlock, constraints, and permissives shall be explained.

D. At least two weeks prior to the schedule for vendor training, a detailed lesson plan, representative of the material to be covered during instruction, shall be submitted to the JEA ENGINEER for approval. Lesson plans shall consist of in-depth outlines of the training material, including a table of contents, resume of the instructor, materials to be covered, start-up procedures, maintenance requirements, safety considerations, and shut-down procedures.

E. Prepare and insert additional data in each Operation and Maintenance Manual when the need for such data becomes apparent during training/instruction.

F. Vendor's training/instruction will be considered acceptable based on the completed JEA's Acknowledgement of Manufacturer's Instruction as indicated on the Equipment Manufacturer's Certification of Installation, Testing, and Instruction appended to this Section.

3.03 Videography of Vendor Training/Instruction

A. Audio/video (A/V) record (in DVD format) training/instructions as they are being provided to the JEA's personnel. Such recording shall include the entire training/instruction session(s) as well as all questions and answers. A/V recording shall be performed by a professional organization experienced in the production of such recordings. Self-recording by the CONTRACTOR may be considered, provided that CONTRACTOR can demonstrate, in advance, proficient examples of such recordings.

B. To avoid audio problems, training/instruction shall be held in a location sufficiently removed from construction activity, insulated from the noise of construction activity, or during a time when construction activity is not occurring in the vicinity.

C. The audio portion of the A/V recording should be done with a microphone (wired or wireless) attached to the trainer/instructor to maximize the quality of speech.

D. Each A/V recording should have "chapters" to segregate the distinct portions

of the training/instruction, or have visual cues at the start of a change in subject.

E. Two copies of the A/V recordings shall be submitted to the JEA ENGINEER on DVD disk(s). The DVDs will become the property of the JEA.

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

02 05 00 Maintenance of Existing Conditions

Part 1 General

1.01 Scope of Work

A. The Construction Drawings and these Specifications are complementary to each other; what is called for by one shall be as binding as if called for by both. If there is any conflict between what is shown on the Construction Drawings and what is written in the Technical Specifications, the more restrictive shall take precedence and the CONTRACTOR shall communicate the conflicts to the JEA ENGINEER prior to constructing the work.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 61 00 – Removal and Disposal of Contaminated Materials
2. Section 02 61 10 – Removal and Staging Contaminated Materials
3. Concrete work is provided in Division 03.
4. Section 31 23 16 – Excavation
5. Section 31 23 19 – Dewatering and Drainage
6. Section 31 23 23 - Backfill
7. Section 33 23 00 - Extraction Wells
8. Section 33 24 00 – Piezometers and Monitoring Wells

B. Cited Standards - None

1.03 Noted Restrictions

A. The CONTRACTOR will not be permitted to use existing sewer systems (if any) as drain lines for the construction work. The CONTRACTOR shall be responsible for all surface water runoff and/or groundwater tributary to the pipeline and/or trenches constructed and shall supply the necessary dewatering and pumping equipment and storage facilities for handling those flows during construction.

1.04 Safety

A. The CONTRACTOR shall be familiar with, and shall at all times conform to, the regulations of the *"OSHA General Industry Occupational Safety and Health Standards," "OSHA Safety and Health Regulations for Construction,"* and other applicable state and municipal standards and regulations.

B. All of the CONTRACTOR's working personnel shall be 40-hour HAZWOPER

trained with current and up-to-date certification.

C. All of the CONTRACTOR's working personnel shall have completed the required JEA safety training.

D. The minimum personal protection required for the work to be performed is anticipated to be level "D". The CONTRACTOR shall be responsible for determining the level of protection for its staff and for providing all required personal protective equipment. The CONTRACTOR is responsible for implementing a Health and Safety Plan in accordance with 29 CFR Part 1910.120. Previous environmental assessments indicate that the soils and groundwater may be impacted with arsenic, nickel and vanadium. CONTRACTOR shall be responsible for reviewing and understanding the available environmental data for the site.

E. At a minimum, CONTRACTOR shall provide copies of 40-hour HAZWOPER and current certification documenting compliance with training and health monitoring for all on-site personnel that may come into contact with contaminated materials prior to commencing field activities. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings.

1.05 Quality Control

A. The CONTRACTOR shall conduct all work in accordance with the applicable rules and regulations of specified governing agencies, and in accordance with the laws, rules, and/or regulations of all other authorities having jurisdiction over the required construction work. Any required permits shall be obtained and paid for by the CONTRACTOR (including all City permit fees and charges).

B. The CONTRACTOR shall determine the exact location of existing structures, underground piping, or conduit which would be in the vicinity or possibly affected by the CONTRACTOR's operation.

C. The CONTRACTOR shall relocate existing items or mark these existing items if removal is not required, and shall protect any underground facility.

D. The CONTRACTOR shall schedule and coordinate all construction activities and shall cooperate with the JEA and the JEA ENGINEER to provide a minimum of interruptions to the operations of other present facilities.

1.06 Submittals

A. Record Drawings

1. The CONTRACTOR shall keep one up-to-date copy of all drawings for all deviations or modifications to utilities shown on the Construction Drawings.

Part 2 Products

2.01 Existing Materials for Utilities

A. Except as indicated on the Construction Drawings or as specifically authorized by the utility owner, the CONTRACTOR shall reconstruct utilities with new material of the same size, type, and original quality as that removed or damaged (replacement in kind).

Part 3 Execution

3.01 Locating Existing Utilities

A. Prior to beginning any subsurface work, CONTRACTOR shall meet onsite with JEA and JEA ENGINEER to locate JEA utilities.

B. The CONTRACTOR shall also subcontract with third party subsurface utility locate company, to locate all underground utilities within the limits of work.

C. The CONTRACTOR is responsible for locating any possible existing underground and aboveground utilities in order to properly complete site work.

D. The CONTRACTOR shall contact the JEA or JEA ENGINEER immediately upon discovery of additional utilities in the area prior to starting and during the performance of the work. Any cables exposed during construction, whether energized or not, must be handled and protected as if they are energized.

E. Water, sewer, gas, power and telephone service to site and surrounding properties shall be maintained with a minimum of interruption throughout the construction of the contract work. No such service shall be intentionally interrupted without the approval of the respective utility company concerned, and without first giving due warning to the occupants of said dwelling or business establishment.

F. The CONTRACTOR shall at all times conduct the work in a manner that interferes as little as possible with the existing utilities.

G. The CONTRACTOR shall avoid disturbance and/or displacement of existing utilities and shall provide all temporary and permanent supports and other required protection.

H. The CONTRACTOR shall maintain a minimum 20-ft horizontal clearance from overhead power lines with equipment that has a vertical clearance of 20-ft or higher.

I. The CONTRACTOR shall also operate all machinery and conduct all other construction activities in a manner, which will assure protection of all construction personnel and other persons against the described hazard.

J. The CONTRACTOR shall avoid disturbance and/or displacement of existing stormwater culverts unless otherwise noted on the Construction Drawings.

K. The CONTRACTOR shall not operate existing system valves, hydrants or other appurtenances at any time. If the existing items described are required to accommodate construction, the CONTRACTOR shall provide the JEA with an advance notice and shall receive approval from the JEA before use of the existing appurtenances.

L. In the event the CONTRACTOR damages an existing utility, the CONTRACTOR shall immediately notify JEA, the owner of the damaged utility and the JEA ENGINEER. Should the damage cause an interruption of service, the CONTRACTOR shall be responsible for restoring service as soon as possible; however, the CONTRACTOR shall not make repairs, other than any required to restore safe conditions, without the approval of the property owner, or the owner of the damaged utility. The CONTRACTOR shall be responsible for coordinating any repair effort, and any associated costs should the utility owner or a licensed repair contractor be required to make the repair. JEA reserves the right to deduct any unsettled claim amount from CONTRACTOR's invoices until such time as the claim is satisfactorily resolved.

M. Whenever possible, piping (hydraulic and electrical) should be laid at least 10 feet, horizontally, from any existing utilities. If local conditions prevent a lateral separation of 10 feet, piping may be laid closer than 10 feet to existing utilities as long as one of the following are performed:

1. it is laid in a separate trench;

2. it is laid in the same trench with the utility located at one side of a bench of undisturbed earth; and

3. in either case (1 or 2) the elevation of the top (crown) of the pipe line is at least 18 inches below the bottom (invert) of the utility.

N. Whenever the piping must cross under existing utilities, piping shall be laid at such an elevation that the top of the utility is at least 36 inches below the bottom of the utility.

O. Where significant utility conflicts are to be encountered, the JEA ENGINNER shall be notified and each trench shall be backfilled with cement slurry at all such locations at the direction of JEA and/or the JEA ENGINEER.

3.02 Abandoned Utilities (Cut and Plug Ends)

A. The CONTRACTOR, with the approval of the OWNER'S REPRESENTATIVE, shall cut abandoned utility lines (conduits) and plug the ends with brick and mortar or a concrete plug. Plug utility lines with a wall of brick and mortar or a concrete plug from the cut end of the pipe. Remove and dispose of abandoned utilities within the trench excavation.

3.03 Temporary Relocations

A. The CONTRACTOR, with the approval of the OWNER'S REPRESENTATIVE, shall remove items, which would interfere with the pipe installation operations, and shall re-install these items after construction is complete.

B. The CONTRACTOR shall disassemble the items carefully and store them in a safe location, and in a manner to prevent damage. Any damage to the items, as a result of the CONTRACTOR's neglect during removal, disassembly, storage, and/or reinstallation shall be replaced or repaired to the satisfaction of the OWNER'S REPRESENTATIVE at the CONTRACTOR's expense.

3.04 Testing - None

3.05 Cleanup

A. Immediately after all construction operations have been completed, the CONTRACTOR shall thoroughly clean the area of all excess materials, debris, plant and equipment for which he or she is responsible. The CONTRACTOR shall also restore grounds, driveways, streets, roadways, banks, ditches, and all other areas to their original condition, to the satisfaction of the OWNER and OWNER'S REPRESENTATIVE, and shall leave the premises in a neat and operable condition.

B. Cleanup and restoration operations must be completed within a reasonable time following completion of the work.

END OF SECTION

02 61 00 Removal and Disposal of Contaminated Materials

02 61 10 Removal and Staging Contaminated Materials

Part 1 General

1.01 Scope of Work

A. Under this section, the CONTRACTOR shall furnish all materials, labor, and equipment necessary to perform work related to the staging and handling of contaminated materials, as shown on the Construction Drawings or specified herein. CONTRACTOR shall prevent contaminated materials from coming into contact with other non-contaminated material (soil, surface water, concrete, asphalt, etc.). Any non-contaminated material which comes into contact with contaminated material shall be decontaminated or treated as contaminated material as directed by the JEA ENGINEER at the CONTRACTOR's expense.

B. CONTRACTOR shall assume that soils exceeding the Ecological Risk Assessment (ERA) within SWMU 18 are contaminated material. The location of soils exceeding the ERA are illustrated on the Construction Drawings. The CONTRACTOR is responsible to staking the area in accordance with the surveying specification.

C. CONTRACTOR shall assume that all groundwater and soil beneath the water table is contaminated material.

D. CONTRACTOR shall assume that all sediment within the existing drainage ditch is contaminated material.

E. CONTRACTOR shall assume that the contaminated materials are non-hazardous and shall be managed, handled, transported and disposed as such.

F. CONTRACTOR shall decontaminate all equipment in contact with contaminated material with a high pressure stream cleaner or broom sweep to the satisfaction of the JEA ENGINEER.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 01 35 29.13 - Safety
2. Section 31 23 16 - Excavation
3. Section 31 23 19 - Dewatering and Drainage
4. Section 31 23 23 - Backfill
5. Section 31 25 00 - Erosion and Sedimentation Control
6. Section 33 23 00 - Extraction Wells

7. Section 33 24 00 – Piezometers and Monitoring Wells

1.03 Cited Standards - None

1.04 Noted Restrictions

A. On-site soils may not be used for berms of any kind.

B. Existing soils within the SWMU 18 that exceed the ERA may be used to construct the subgrade of the soil cover; however, all regraded material must stay within the area identified on the Construction Drawing and be capped with a minimum of 1-ft of soil.

1.05 Quality Control - None

1.06 Submittals

A. Materials and Waste Handling Work Plan. The Contractor shall prepare a draft Materials and Waste Handling Work Plan and submit within 14 calendar days of the final notice to proceed and the Materials and Waste Handling Work Plan within five calendar days after receipt of comments describing in detail site activities involving the handling of materials from the time they arrive on site to the time that they are incorporated into the work. Also included shall be the handling of onsite materials through the ultimate disposition of these materials on or offsite. In general, this plan shall supplement the project schedule by providing a detailed description of the various work activities for the project. The CONTRACTOR shall specifically include excavation, handling, transportation, and placement procedures for contaminated materials and non-contaminated materials.

1. Information presented shall include, but not be limited to:

a. storage locations, details, and protection requirements for materials and equipment to be incorporated into the work, including temporary soil stockpile areas requiring re-grading of areas, storage of remediation equipment;

b. excavation methods, equipment and personnel, proposed for contaminated materials and non-contaminated materials movement;

c. access routes to and within the work area;

d. dependence on other tasks, particularly preceding activities;

e. site drawings showing details of facilities locations and placement of temporary utilities parking areas, access road, and staging areas;

f. a traffic control plan for all hauling of materials from and to the proposed work areas;

g. detail regarding the equipment and methods to be used for decontamination of equipment and personnel, locations of decontamination facilities, storage of contaminated fluids and solids, proposed disposal methods and facility locations, and other items pertinent to the topic; and

h. proposed equipment and methods to be used to control dust.

Part 2 Products

2.01 Materials

A. Liner – Linear low density polyethylene (LLDPE) geomembrane with a minimum thickness of 10 mils or approved equivalent.

Part 3 Execution

3.01 Preparation

A. CONTRACTOR may elect to place contaminated soil either directly into roll-off containers or placed in a temporary stockpile area. Liquids shall be placed into drums.

1. Roll-off Containers:

a. All roll-off containers shall be sealed during storage/staging.

b. All roll-off containers shall be staged within the limits of work.

c. All roll-off containers shall be covered with a tarpaulin and be water-tight.

2. Drums:

a. CONTRACTOR may elect to store contaminated groundwater and decontamination water in new 55-gallon United States Department of Transportation (DOT) approved drums or approved containers by the JEA ENGINEER. All containers shall be stored within the limits of work or as directed by the JEA ENGINEER.

3. Temporary Stockpile Areas

a. CONTRACTOR shall construct temporary staging areas adjacent to the excavation areas to handle the contaminated material.

b. All temporary stockpiles shall be constructed in areas within the limits of work, as directed by JEA ENGINEER.

c. CONTRACTOR shall place a 10-mil thick liner beneath all stockpiles and construct a soil berm around the toe of the

stockpile. No contaminated material shall be placed directly on the existing soil, asphalt, or concrete without a liner.

d. CONTRACTOR shall segregate contaminated soils from other non-impacted non-contaminated material.

e. Stockpiles shall be contained within the temporary staging area(s) and shall have a maximum side slopes of 2 horizontal to 1 vertical (2H:1V) and a maximum height of 20 ft. The CONTRACTOR shall maintain the stockpiles at the end of each working day by dressing the surface as directed by JEA ENGINEER. Stockpile dressing shall be accomplished by using the trackhoe bucket to knock down and smooth uneven areas. The CONTRACTOR shall cover the stockpile at night, when unattended, during times of precipitation, or as directed by JEA ENGINEER to minimize erosion with plastic sheeting and weight down the liner using sand bags or equivalent. CONTRACTOR shall be responsible for all erosion control measures.

f. All contaminated stockpiled material shall be covered with a liner during rain events and at the end of the day to minimize runoff onto the site.

B. CONTRACTOR shall containerize any storm water than comes into contact with contaminated soil and it is the CONTRACTOR's responsibility to characterize and dispose of any storm water that comes into contact with contaminated soil during construction at the CONTRACTOR'S expense.

C. CONTRACTOR shall decontaminate equipment utilized in excavation of contaminated material. All decontaminated liquid shall be containerized, characterized, and disposed by CONTRACTOR.

3.02 Installation - None

3.03 Testing - None

END OF SECTION

02 61 20 Transporting and Disposing of Contaminated Materials

Part 1 General

1.01 Scope of Work

A. The CONTRACTOR shall provide the necessary materials, labor, and equipment necessary to characterize and transport contaminated material to an approved waste disposal facility.

B. The CONTRACTOR shall assume that JEA will sign and approve all manifests unless JEA provides a letter to the CONTRACTOR authorizing the CONTRACTOR to sign non-hazardous waste manifests on behalf of JEA.

C. CONTRACTOR shall include, at a minimum, the following information on all non-hazardous manifests:

1. Contact: Jaclyn Taricska, P.E., JEA Environmental
2. Contact Address: 21 West Church Street, Jacksonville, FL 32202
3. Contact Telephone Number: (904) 655-4253
4. Project Name: JEA Northside Generating Station – Phase 1 Corrective Measure Design Implementation
5. Project Site Address: 4377 Heckscher Drive, Jacksonville, FL
6. Generator's EPA Identification Number: FLD000735860

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 31 23 16 - Excavation
2. Section 31 23 19 - Dewatering and Drainage
3. Section 31 23 23 - Backfill
4. Section 31 25 00 - Erosion and Sedimentation Control
5. Section 33 23 00 - Extraction Wells
6. Section 33 24 00 – Piezometers and Monitoring Wells

1.03 Cited Standards - None

1.04 Noted Restrictions

A. CONTRACTOR shall be responsible for characterizing and obtaining all required Federal, State and local permits and licenses for the safe and proper handling, transporting and storage of any contaminated and/or non-contaminated materials encountered at the site. All materials shall be

transported to a disposal facility that complies with Federal, State and local department(s) of transportation regulations pertaining to licenses, permits and appropriate signage.

1. Should the CONTRACTOR elect to utilize the services of SUB-CONTRACTOR for hauling and transportation, it is the CONTRACTOR's responsibility to provide the JEA ENGINEER with the subcontracted hauler's name, licensure and permits two (2) weeks prior to initiating excavation activities.

1.05 Safety

A. The CONTRACTOR shall be familiar with, and shall at all times conform to, the regulations identified in the Contract Documents, "OSHA General Industry Occupational Safety and Health Standards," "OSHA Safety and Health Regulations for Construction," and other applicable state and municipal standards and regulations.

B. The minimum personal protection required for the work to be performed is anticipated to be level "D". The CONTRACTOR shall be responsible for determining the level of protection for its staff and for providing all required personal protective equipment. The CONTRACTOR is responsible for implementing a Health and Safety Plan in accordance with 29 CFR Part 1910.120. Previous environmental assessments and geophysical surveys indicate that the soils and groundwater may be impacted with arsenic, vanadium and nickel and the CONTRACTOR should be prepared for these conditions. Copies of 40-hour HAZWOPER and current certification documenting compliance with training and health monitoring shall be provided by the CONTRACTOR for all on-site personnel who may come into contact with contaminated materials prior to commencing field activities. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings for all Work on-site.

1.06 Quality Control - None

1.07 Submittals

A. The CONTRACTOR shall provide all pertinent information relating to the permitted disposal facility for all media to the JEA ENGINEER prior to the removal from site for approval. The information shall include the following:

1. Facility Information

a. General Information

1) Facility Name

2) Facility Address

3) Contact Person

4) Title of Contact Person

5) Telephone Number of Contact Person

6) Permit Number

b. The facility shall provide written confirmation that they are permitted to accept and will accept material of the general quality and quantity described by these Technical Specifications.

c. The facility shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of materials specified in this Contract.

d. Submit a complete list of the disposal facility's permitted allowable contaminant levels and physicals characteristic requirements for contaminated material, and list any required regulatory approvals for individual waste streams.

B. The CONTRACTOR shall provide the JEA ENGINEER copies of all waste characterization data for all contaminated and non-contaminated material and waste profiles within fifteen (15) days prior to removal from site. Analytical data shall be kept confidential. JEA ENGINEER's review of the data will be completed within two (2) days of receipt of waste characterization data.

C. The CONTRACTOR shall provide the JEA with all waste manifests (hazardous and non-hazardous) and the JEA ENGINEER copies of all waste manifests (hazardous and non-hazardous) seven (7) days prior to transportation off-site for review and signature.

D. The CONTRACTOR shall provide JEA and the JEA ENGINEER copies of all facility-signed original waste manifests (hazardous and non-hazardous) and weight tickets for all contaminated and non-contaminated material within fifteen (15) days after removal from site.

E. The CONTRACTOR shall provide JEA and the JEA ENGINEER copies of all final waste certifications from the disposal facilities.

F. The CONTRACTOR shall submit all pertinent information relating to the transportation of materials specified herein. The information shall include the following:

1. Transporter Information:

a. Name and address of common carrier transporters to be used on the project.

b. Name and address of licensed waste transporters to be used on the project. Provide current licenses and permits to operate in all states affected by transport. Provide current EPA transporter license.

Part 2 Products - None

Part 3 Execution

3.01 Preparation

A. JEA will provide CONTRACTOR with all known environmental data on contaminated materials prior to disposal.

B. CONTRACTOR shall be responsible for providing and completing all waste manifests (e.g., EPA Form 8700-22 (Rev. 3-05)).

3.02 Installation - None

3.03 Testing

A. The CONTRACTOR shall be responsible for characterizing the soil and liquids for purposes of obtaining approvals for final disposal of contaminated, surplus, and unsuitable soil. The CONTRACTOR shall collect soil and liquid samples to perform testing required by the disposal facility.

3.04 Disposal and Transportation

A. The CONTRACTOR shall not be permitted to transport materials off-site until all disposal facility documentation has been received, reviewed, and accepted by JEA ENGINEER.

B. Transport and dispose in accordance with all United States Department of Transportation (DOT), Florida Department of Transportation (FDOT), United States Environmental Protection Agency (EPA), and Florida Department of Environmental Protection (FDEP) regulations, and other regulations of all affected states.

END OF SECTION

DIVISION 03 - CONCRETE

03 05 00 Concrete

Part 1 General

1.01 General Conditions

A. The General Conditions apply to all work on this specification, which shall be done as shown on the Construction Drawings, and as specified, and shall be properly coordinated with work in other Technical Specifications.

B. The Construction Drawings and these Technical Specifications are complementary to each other; what is called for by one shall be as binding as if called for by both. If there is any conflict between what is shown on the Construction Drawings and what is written in the Technical Specifications, the more restrictive shall take precedence and the CONTRACTOR shall communicate the conflicts to the JEA ENGINEER prior to constructing the work.

C. Safety: refer to Section 01 35 29.13 Health, Safety, and Emergency Response Requirements for Contaminated Sites

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 03 30 53 - Miscellaneous Cast-in Place Concrete
2. Section 03 35 00 - Concrete Finishing
3. Section 03 39 00 - Concrete Curing
4. Section 33 23 00 - Extraction Wells
5. Section 33 24 00 - Piezometers and Monitoring Wells

1.03 Cited Standards - None

1.04 Noted Restrictions - None

1.05 Quality Control

A. The CONTRACTOR shall furnish all material, equipment, labor, services, etc., to complete and install all concrete work as specified on the Construction Drawings.

B. Special Inspection of the Work items covered by this Section is required to be performed by a Registered Design Professional in Responsible Charge (JEA ENGINEER), appointed by the JEA, in accordance with the Florida Building Code.

1.06 Submittals

A. For all concrete work, the CONTRACTOR shall submit (at a minimum) cast-in-place concrete mix designs to the JEA ENGINEER.

1.07 Delivery, Storage, and Handling

A. All concrete related materials shall be delivered, stored, and handled as to prevent damage to the materials and the inclusion of foreign substances. Packaged materials shall be delivered and stored in original containers until ready for use. Material containers or materials showing evidence of water or other damage will not be accepted.

Part 2 Products

2.01 Concrete (General)

A. All concrete used for work shall be composed of Portland cement, fine aggregate, coarse aggregate, and water so proportioned and mixed as to produce a plastic, workable mixture in accordance with the applicable specifications and suitable to the specific conditions of placement.

Part 3 Execution

3.01 Preparation - None

3.02 Installation

A. Concrete work throughout its entirety shall be constructed as a monolith as feasible. Every part of the work involving concrete and grout of homogeneous structure, when hardened, shall have the required strength and resistance to weathering.

END OF SECTION

03 30 00 - Cast-in-Place Concrete

03 30 53 Miscellaneous Cast-in-Place Concrete

Part 1 General

1.01 Scope of Work

A. The CONTRACTOR shall furnish all material, equipment, labor, services, etc., to complete and install all cast-in-place concrete work as specified in this section and as shown on the Construction Drawings.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 03 35 00 - Concrete Finishing
2. Section 03 39 00 - Concrete Curing
3. Section 33 23 00 - Extraction Wells
4. Section 33 24 00 - Piezometers and Monitoring Wells

1.03 Cited Standards

A. All cast-in-place concrete shall conform to the requirements of the following standard specifications, of the latest revisions, as applicable:

1. AASHTO M 182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats
2. ACI 301 - Specifications for Structural Concrete
3. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete
4. ACI 305 - Guide to Hot Weather Concreting
5. ACI 318 - Building Code Requirements for Structural Concrete
6. ASTM C33 / C33M - 16e1, Standard Specification for Concrete Aggregates
7. ASTM C94 / C94M - 17, Standard Specification for Ready-Mixed Concrete
8. ASTM C150 / C150M - 17, Standard Specification for Portland Cement
9. ASTM C171 - 16, Standard Specification for Sheet Materials for Curing Concrete

10. ASTM C260 / C260M - 10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete

11. ASTM C309 - 11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

12. ASTM C494 / C494M - 16, Standard Specification for Chemical Admixtures for Concrete

13. ASTM C618 - 15, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

14. ASTM C881 / C881M - 15, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

15. ASTM C1017 / C1017M - 13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

1.04 Noted Restrictions - None

1.05 Quality Control

A. The concrete to be used in this project shall be ready-mixed concrete in conformity with ASTM C94 except as revised or amended hereinafter or with approval of the JEA ENGINEER.

B. Production Facility Requirements

1. Where the concrete production facility can establish the uniformity of its production for concrete of similar strength and materials based on recent test data, the average strength used as a basis for determining mix design proportions shall exceed the specified design strength by the requirements of ACI 318, Section 4.3 or ACI 301, Section 3.9.

2. When a concrete production facility does not have field test records for calculation of standard deviation, the required average strength shall be at least 1200 psi greater than the specified design strength.

1.06 Submittals

A. The following shall by submitted to the JEA ENGINEER and include:

1. Provide certificate that cement used complies with ASTM C150 and these Technical Specifications.

2. Provide certificates that aggregates comply with required ASTM standards. Submit gradation analysis with concrete mix designs.

3. Provide certificate of compliance with these Technical Specifications from the manufacturer of the concrete admixtures.

4. For each formulation of concrete proposed, provide concrete mix designs and laboratory 7-day and 28-day compressive tests, or submit test results of 7- and 28-day compressive tests of the mix where the same mix has been used on two previous projects in the past twelve months.

5. As a minimum each concrete mix design submittal shall include, but is not limited to containing the following information:

   a. 7-day and 28-day compression test results. Include standard deviation for test results on each 7 or 28-day group.

   b. Shrinkage test results.

   c. Constituent quantities per cubic yard.

   d. Water cementitious materials ratio.

   e. Concrete slump.

   f. Air content.

   g. Water soluble chloride ion content of any individual components of the proposed mix.

   h. Type of concrete mix.

   i. Manufacturer of cementitious products.

   j. Sources of cement, pozzolan, and aggregates.

   k. Letter certifying that the admixtures used in the same concrete mix are compatible with each other, as well as the aggregates.

6. Proposed special procedures for protection of concrete under wet weather placement conditions.

7. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

B. Test and Evaluation Reports shall be submitted to the JEA ENGINEER and include:

   1. Results of drying shrinkage tests from trial concrete mixes by the CONTRACTOR's testing laboratory firm.

   2. Results of the slump tests.

C. Manufacturers' Instructions:

1. Provide epoxy bonding compound manufacturer's specific instructions for use. Provide manufacturer's data sheets as to suitability of product to meet job requirements with regard to surface, pot life, set time, vertical or horizontal application, and forming restrictions.

D. Field Quality Control Submittals:

1. Provide delivery tickets for ready-mix concrete or weigh master's certificate per ASTM C94, including weights of cement and each size of aggregate and amount of water added at the plant and record of pours. Record the amount of water added on the job on the delivery ticket. Water added at the plant shall account for moisture in both coarse and fine aggregates.

1.07 Storage of Materials

A. Cement and aggregates shall be stored in such a manner as to prevent deterioration of or contamination with foreign matter.

B. Fine and coarse aggregates shall be stored separately and in such a manner as to avoid segregation. Cement, which has become caked, partially set, or otherwise deteriorated, or any material, which has become damaged or contaminated, shall be rejected for use.

Part 2 Products

2.01 Concrete

A. Portland cement shall conform to ASTM C150, Type II. All cement shall be obtained from one source. Different brands of cement shall not be permitted, except as previously specified.

B. All cement shall be stored in a suitable way to protect the cement from dampness in a way to be easily inspected and to permit easy identification of each shipment. Facilities shall be provided for inspection and sampling of stored cement being used. The cement shall be rejected if it fails to meet any of the requirements of these Technical Specifications.

C. Fly ash (alternate, if used)

1. Fly ash may be used in the mix design. When fly ash is used as a partial replacement for cement, the minimum cement content shall be met by considering Portland cement plus fly ash as the total cementitious material. The replacement rate shall be determined from laboratory trial mixes, but shall not exceed 20 percent by weight of the total cementitious material.

2. Fly ash shall meet the requirements of ASTM C618, Class C, F or N with the exception of loss of ignition, where the maximum shall be less than 6 percent for Class F or N.

2.02 Fine Aggregates

A. Fine aggregate shall conform to ASTM C33.

B. For fine aggregates, only clean, natural sand shall be used. Artificial or manufactured sand will not be acceptable. The grading of the fine aggregate shall be per ASTM C33.:

2.03 Coarse Aggregate

A. Course aggregate shall conform to ASTM C33.

B. Coarse aggregate shall consist of crushed stone or crushed gravel conforming to the following limits:

1. Sodium sulfate test - 10% max loss

2. L. A. abrasion test - 35% max loss

3. Crushed particles (gravel) - 45% min loss

C. The sizes of coarse aggregate for the type of concrete being used in this work shall be Class B, ASTM Size 67.

D. The gradations required for the coarse aggregate are 8 to 18 percent for the top size aggregates and 8 to 22 percent for smaller top size aggregates retained on each sieve.

2.04 Water

A. Water used in mixing and curing concrete shall be from a public water system and shall be clean and free from injurious amounts of sewage, oil, acid, alkali, organic matter or other deleterious substances.

2.05 Admixtures

A. All admixtures shall be approved by the JEA ENGINEER and shall be added to the concrete in strict accordance with the recommendation of the manufacturer.

B. The admixture shall conform to ASTM C494, Type A, and not contain more chloride ions than are present in municipal drinking water.

C. Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are <u>not</u> permitted. Written conformance to the above-mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the JEA or the JEA ENGINEER.

D. Do not use any admixture that contains chlorides or other corrosive elements in any concrete. Admixtures shall be nontoxic after 30 days.

E. Use admixtures in compliance with the manufacturer's printed instructions. The manufacturer shall certify the compatibility of multiple admixtures used in the same mix.

F. Do not use admixtures in greater dosages than recommended by manufacturer.

G. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

H. Air Entrainment:

1. Air-entraining admixtures shall conform to ASTM C260.

2. Products:

a. BASF Corporation; MB-AE 90.

b. Sika Corporation, AER.

c. Or accepted equivalent product.

3. Adjust the admixture content to accommodate fly ash or pozzolan requirements, and other admixtures when used, in order to obtain the specified air content.

I. Water-Reducing:

1. For Class A concrete a water-reducing admixture conforming to ASTM C494, Type A and compatible with the air-entraining admixtures shall be used. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.

2. Products:

a. BASF Corporation; Polyheed Series.

b. Sika Corporation, Plastocrete 161.

c. Euclid Chemical Company; EUCON NW.

d. Or accepted equivalent product.

J. Water-Reducing and Retarding:

1. Water-reducing and retarding admixture shall conform to ASTM C494, Type D and be compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.

2. Products:

a. BASF Corporation; Pozzolith Series.

b. Sika Corporation; Plastiment.

c. Euclid Chemical Company; EUCON WR-91.

d. Or accepted equivalent product.

K. High-Range Water-Reducing Admixture (Superplasticizer):

1. For Class A concrete a high-range water-reducing admixture conforming to ASTM C494, Type F or ASTM C1017, Type I.

2. Products:

a. BASF Corporation; Glenium Series.

b. WR Grace & Co.; Daracem 100.

c. Euclid Chemical Company; EUCON SPC.

d. Or accepted equivalent product.

L. Shrinkage-Reducing Admixture:

1. A shrinkage-reducing admixture is permitted to be used in the mix to meet shrinkage limitations provided that specified strength is met and there is no reduction in sulfate resistance and no increase in permeability. Quantity of shrinkage-reducing admixture used in the mix shall be added to the quantity of water for purposes of determining the water/cementitious materials ratio.

2. Products:

a. BASF Corporation; Tetraguard AS20.

b. WR Grace & Co.; Eclipse.

c. Euclid Chemical company; EUCON SRA.

d. Or accepted equivalent product.

A. Epoxy Bonding Agent

1. Epoxy bonding agent shall conform to ASTM C881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives. The class of epoxy bonding agent shall be suitable for ambient and substrate temperatures.

2. Products:

a. Sika Corp.; Sikadur 32.

b. Euclid Chemical Company; Duralcrete.

c. BASF Corporation, Concresive Liquid LPL.

d. Or accepted equivalent product.

B. Curing Compound

1. Use Type I, Class A or B, having 18 percent minimum solids conforming to ASTM C309. Liquid form shall exposed to fresh concrete by means of spray gun.

2. Products:

a. BASF Building Systems; Kure 1315.

b. Euclid Chemical Company; Super Diamond Clear VOX.

c. W. R. Meadows, Inc.; VOCOMP-30.

d. Dayton Superior Corp; Safe Cure and Seal 30 percent.

C. Burlap Mats

1. Conform to AASHTO M182.

D. Sisal-Kraft Paper and Polyethylene Sheets for Curing

1. Conform to ASTM C171.

Part 3 Execution

3.01 Preparation

A. The CONTRACTOR shall submit the ready-mix design from the batch plant used accompanied by complete standard deviation analysis or trial mixture test data.

B. All mixes shall be approved by the JEA ENGINEER prior to use on the job. No deviations from the approved mixes shall be permitted without approval from the JEA ENGINEER.

C. Structural concrete shall have a minimum compressive strength of 4000 psi, minimum cementitious material content of 600 lbs/yd^3 and a maximum water cement ratio of 0.45, for slabs and well pads (including those for extraction wells, monitoring wells, and piezometers).

D. All concrete shall contain a minimum of 6 percent (+/- 1 percent) entrained air, as measured at the point of placement (end of pump truck hose or truck chute if no pump is used).

E. The concrete shall arrive at the job site at a slump of 4 inches. The CONTRACTOR shall perform slump test to be witnessed by the JEA or JEA ENGINEER for verification. All concrete shall have a maximum slump of 3 inches for slabs or 4 inches for other applications.

F. Mixes containing water reducers shall have a maximum slump of 6 inches after the addition of a mid-range water reducer and maximum slump of 8 inches after the addition of a high-range water reducer.

G. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the site of the work shall not exceed 30 minutes if concrete is hauled in non-agitating trucks, nor shall it exceed 60 minutes when hauled in transit-mix trucks or truck agitators.

H. The addition of water after the completion of the initial mixing operation will not be permitted, except when concrete is delivered in transit mix trucks. In this case water may be added to the batch materials and additional mixing (at minimum 20 rpm) may be performed to modify the consistency to meet specified requirements, provided that all of these operations are performed within 45 minutes after the initial mixing operation and the mixing speed of 20 rpm is not exceeded. Concrete that is not within specified consistency limits at the time of placement shall not be used.

3.02 Mixing Concrete

A. The concrete shall be mixed in a batch mixer until there is a uniform distribution of the materials, and shall be discharged completely before the mixer is recharged. For job-mixed concrete, the mixer shall be rotated at the speed recommended by the manufacturer and mixing shall be continued as follows for various sizes of mixers:

1. ½ yd^3 mixer or smaller at 1-¼ minutes.

2. ¾ to 1-¼ yd^3 mixer at 1-½ minutes.

3. Larger than 1-¼ yd^3 mixer at 2 minutes.

4. For each additional yd^3 over 2yd^3 add ¼ minute.

B. The ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C94. During a continuous pour, the interval between loads shall not be greater than 20 minutes, or in any case be so great as to allow the concrete in place to become partially hardened. Water used to flush the mixer or agitator between loads shall not be allowed to become a part of any concrete in the work.

C. When the temperature is below 40°F, adequate equipment shall be provided for heating the component materials of the concrete so that the concrete being deposited can be maintained at a temperature of 50°F (minimum) to 90°F (maximum). When the air temperature is above 90°F, the temperature of the concrete being deposited shall not exceed 90°F, and adequate means of cooling the concrete mix shall be provided.

D. Truck mixers shall be revolving-drum type and shall be equipped with a mixing water tank capable of introducing the appropriate amount mixing water for the work.

E. Delivery tickets shall be prepared for each load of ready-mixed concrete delivered. In the event a laboratory representative is designated to inspect the batching operation, he shall prepare the ticket. In the event no laboratory representative is required for the project, the batch plant operator shall prepare the ticket. The drivers of the trucks shall deliver the tickets to the JEA ENGINEER at the site at the time of delivery. The tickets shall contain the following information:

1. Number of cubic yards of concrete delivered on this truck.
2. Quantities of materials in the batch.
3. The time at which the truck left the batching plant.
4. The time at which the cement was added.
5. The outdoor temperature in the shade.
6. The numerical sequence of the delivery.
7. The date.

3.03 Placing Concrete

A. Placing of the concrete shall be done in accordance with ACI 304.

B. Before depositing concrete, all debris shall be removed from the space to be occupied by the concrete. Forms, if constructed of lumber, shall be thoroughly wetted. Reinforcement, pipe sleeves and other materials to be embedded in the concrete shall be thoroughly secured in position. Water shall be removed from the space to be occupied by the concrete before concrete is deposited.

C. Concrete shall be handled from the transporting vehicle in a manner to prevent the separation or loss of the ingredients. Under no circumstances shall concrete that has partially hardened be deposited in the work. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling. It shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal.

D. Where concrete is conveyed to chutes, the equipment shall be of such size and design as to insure a continuous flow in the chute. The chutes shall be of metal, or metal-lined, and if two or more lengths are used, they shall have approximately the same slope. The slope shall not be less than 2H:1V and shall be such as to prevent the segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate to prevent segregation. If the distance of the discharge end of the chute above the surface of the concrete is more than 3 times the thickness of the layer being deposited, or more than 4 ft above the surface of the concrete, a spout or "elephant trunk" shall be used and the lower end maintained as near to the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run and the debris from any water used shall be discharged outside the forms.

E. Before depositing new concrete on or against concrete which has hardened and to which it is to bond, the forms shall be re-tightened. The surface of the hardened concrete shall be roughened in a manner not to leave loosened particles of aggregate or damaged concrete at the surface. It shall be thoroughly cleaned of foreign matter and laitance, and saturated with water. If there is a cold joint within the concrete slab, contact JEA ENGINNER, and their representative, for connection detailing.

F. Concrete during and immediately after depositing shall be thoroughly compacted by means of vibration. The number of vibrators used shall be subject to the approval of the JEA ENGINEER, or their representative. The concrete shall be thoroughly worked around the reinforcement and around embedded fixtures and into the corners of the forms. Note that manhole bottoms, pipe cradle and encasement, and similar concrete work are also required to be thoroughly vibrated.

G. The accumulation of water on the surface of the concrete due to water gain, segregation, or other causes, during placement and compacting, shall be prevented as far as possible by adjustments in the mixture. Provision shall be made for the removal of such accumulated water so that under no circumstance will concrete be placed in such accumulation.

H. To minimize the formation of laitance, great care shall be exercised to disturb the concrete as little as possible while it is being deposited. Upon completion of a section of concrete, all laitance shall be entirely removed before work is resumed.

3.04 Placing Concrete in Hot Weather

A. Concrete shall be placed in hot weather in accordance with ACI 305.

B. If after stripping of forms any concrete is found to be not formed as shown on the Construction Drawings, out of alignment or not level, or shows a defective surface, it shall be removed and replaced by the CONTRACTOR at his expense unless granted permission by the JEA ENGINEER to patch the defective area, in which case patching shall be done as hereinafter described.

C. Defects that require replacement or repair are those that consist of honeycomb, damage due to stripping forms, loose pieces of concrete, surface holes caused by bolts and ties, excessive ridges at form joints and bulges due to movement of the forms. Ridges and bulges shall be removed by chipping, tooling or grinding finished surfaces. Honeycomb and other defective concrete shall be chipped out, and the chipped openings having sharp edges shaped so that the mortar filling will be keyed in place. All holes shall be kept thoroughly moistened for several hours before mortar filling is placed. The area to be patched shall be filled with the specified repair material after application of an epoxy bonding agent.

D. Imperfections, bolt and tie-rod holes, and chipped-out honeycomb areas to be repaired shall be filled with dry-patching mortar composed of 1 part of Portland cement to 2 parts of regular concrete sand (volume measurement)

and just enough water so that after the ingredients are mixed thoroughly the mortar will stick together on being molded into a ball by slight pressure of the hands, and will not exude free water. Mortar repairs shall be placed in thin layers and thoroughly compacted by suitable tools.

E. The CONTRACTOR shall take care in filling rod and bolt-holes so that the entire depth of the hole is completely filled with compacted mortar. "EMBECO", Five Star, or equal, shall be added to all patching mortar in an amount as recommended by the manufacturer for the mix to be used except for unpainted, exposed surfaces, or surfaces which are specified to be waterproofed or damp-proofed with a chemical-type protective coating. For surfaces on which the chemical-type protective coatings are specified, only materials recommended by the coating manufacturer shall be used for repairs.

F. Materials for exposed surfaces not requiring painting or waterproofing shall not cause discoloration of the proposed patch or the surrounding concrete surfaces. All honeycomb areas, bolt-holes and other imperfections shall be repaired with Master Builders, Cleveland, OH, "Set 45" or U.S. Grout Corporation, Old Greenwich, CT, Five Star structural concrete, or an approved equal which shall be installed according to the manufacturer's recommendations.

3.05 Curing and Protection

A. Refer to Technical Specification 03 39 00 Concrete Curing for requirements.

END OF SECTION

03 35 00 Concrete Finishing

Part 1 General

1.01 Scope of Work

A. This section shall describe how the CONTRACTOR shall perform work in regard to concrete finishing.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 03 30 53 - Miscellaneous Cast-in-Place Concrete
2. Section 03 39 00 - Concrete Curing
3. Section 33 23 00 - Extraction Wells
4. Section 33 24 00 - Piezometers and Monitoring Wells

1.03 Noted Restrictions - None

1.04 Quality Control

A. All concrete surfaces shall be finished by experienced finishers, as specified, as soon after placing the concrete as conditions will permit. The placing of concrete and the removal of forms shall be scheduled so that finishing the surfaces can be completed before the concrete reaches a final hard set. No cement plaster or cement brush-coats will be acceptable.

Part 2 Products

2.01 Sealer (where necessary)

A. Where specified, the sealer shall be Conspec #1, Thomson's Water Seal 201, applied at a rate of 300 sq ft. per gallon for each coat.

Part 3 Execution

3.01 Preparation - None

3.02 Installation

A. Concrete surfaces which are specified or indicated to be painted, and all concrete surfaces, interior or exterior, exposed to view shall have fins removed and joints ground smooth, and shall be "sacked" with cement mortar so that all pits and holes are filled. All form ties shall be removed from all surfaces, and holes shall be filled after being cleaned and roughened by heavy sandblasting.

B. Slab Finishes

1. General: Slab finishes shall be as follows, unless otherwise noted on the Construction Drawings.

   a. Broom finish - for floors intended as walking surfaces.

2. Finish Guidelines: The following are presented as general guidelines to obtain the surface finish of slabs. It is recognized adjustments to these guidelines may be necessary as job conditions vary. It is CONTRACTOR's responsibility to achieve a quality finish, free from surface defects and in accordance with the tolerances stated above.

   a. Floated finish: After the concrete has been placed, consolidated as necessary, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, the surface plane shall be checked with a 10-foot straightedge applied at no less than two different angles. All high spots shall be cut down and all low spots filled to meet the surface flatness tolerance. The slab shall then be refloated immediately to a uniform sandy texture.

   b. Steel trowel finish: After floating as specified above, provide an initial steel trowel finish, using either power trowels or hand trowels, to produce a smooth surface free of defects other than minor trowel marks. Final troweling shall be by hand and leave the surface free of any trowel marks and uniform in texture and appearance.

END OF SECTION

03 39 00 Concrete Curing

Part 1 General

1.01 Scope of Work

A. This section shall describe how the CONTRACTOR shall perform work in regard to concrete curing.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 03 30 53 - Miscellaneous Cast-in-Place Concrete
2. Section 03 35 00 - Concrete Finishing
3. Section 33 23 00 - Extraction Wells
4. Section 33 24 00 - Piezometers and Monitoring Wells

1.03 Cited Standards

A. All concrete curing shall conform to the requirements of the following standard specifications, of the latest revisions, as applicable:

1. ASTM C171 - 16, Standard Specification for Sheet Materials for Curing Concrete
2. ASTM C309 - 11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

1.04 Noted Restrictions - None

1.05 Quality Control

A. The CONTRACTOR shall protect against loss of moisture from the surface of the concrete by performing the following:

1. Keeping the surface cured for a minimum period of 7 days.
2. Keeping the surface in contact with the form.
3. Covering with burlap or cotton mats kept continuously wet and covered with polyethylene plastic.
4. Continuously sprinkling the exposed surfaces.
5. Applying a curing and sealing compound as specified herein.

Part 2 Products

2.01 Curing and Sealing Compound

A. Compound shall be "Super Aqua Cure VOX" by The Euclid Chemical Co. or an equal approved by the JEA ENGINEER.

B. Clear Curing and Sealing Compound (VOC compliant) shall comply with ASTM C309, Type 1D and shall have 30 percent solids content minimum.

C. No curing compounds shall be used on any surfaces to which pneumatic mortar is to be applied, or on which any other type of concrete mortar or chemical waterproofing coating is to be used. They may be used in other places, however, upon the approval of the compound and its location by the JEA.

Part 3 Execution

3.01 Preparation - None

3.02 Curing and Placing

A. Curing shall be by application of the specified curing and sealing compound, or by application of water proof sheet materials conforming to ASTM C 171. Liquid membrane forming curing and sealing compounds shall be applied in accordance with the manufacturer's recommendations. The curing process must begin immediately after final finishing.

B. When concrete slab placements are subject to high temperatures, wind and/or low humidity, the JEA ENGINEER may require the use of the evaporation retarder to minimize plastic cracking. The compound may be required to be applied one or more times during the finishing operation.

C. At air temperatures of 90°F or above, concrete shall be kept below 90°F during placing and curing. Concrete surfaces shall be kept continuously moist by wet-curing for at least 24 hours after the concrete has been placed, and water shall be applied to formed surfaces while forms are still in place.

D. After the period of wet-curing, a suitable heat-reflecting plastic membrane or white-pigmented curing compound or immediate membrane curing shall be used.

3.03 Testing - None

END OF SECTION

DIVISION 26 – ELECTRICAL

26 00 00 Electrical

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials and equipment required to install complete and make operational, electrical and process instrumentation systems as specified, as shown on the Construction Drawings.

B. The work shall include furnishing and installing the following:

1. Conduit, wire and field connections for all motors, motor controllers, control devices, terminal boxes, control panels and electrical equipment furnished herein and under other Divisions of these Specifications.

2. Conduit, wiring, terminations, mounting equipment, hardware, and labor for installation of all field mounted instruments specified herein and under other Divisions of these Specifications. This includes process instrumentation primary elements, transmitters, local indicators, control panels, and lightning and surge protection equipment wiring at process instrumentation transmitters. Install vendor furnished cables specified under other Divisions of these Specifications.

3. Furnish and install pull boxes, manholes, and handholes.

4. Grounding System

5. Underground System

C. The CONTRACTOR shall maintain the existing plant in operation at all times. Temporary power, control, and instrumentation connections as required shall be provided by the CONTRACTOR at no additional expense to JEA. All temporary wiring shall be in accordance with the NEC. Any 480V temporary equipment feeders shall be installed in conduit. The CONTRACTOR shall provide to the JEA ENGINEER details, methods, materials etc. prior to making temporary connections. Furnish and install all equipment and materials including control equipment, motor starters, branch and feeder circuit breakers, panelboards, transformers, etc., for temporary power.

D. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing buildings and structures in which work under this bid is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that they have visited the site, buildings and structures and noted the locations and conditions under which the work will be performed and that they take full responsibility for a complete knowledge of all factors governing his/her work.

E. Provide all electrical demolition work associated with the removal of equipment from the existing facilities, including disconnecting and removing all electrical wiring and conduit to equipment being removed under other sections. Survey the existing electrical systems with representatives from other trades prior to performing any demolition work. Identify all conduit and equipment to be removed with tags or paint.

F. Provide all electrical relocation work associated with the relocation of equipment for the existing and new facilities, including disconnecting all existing wiring and conduits and providing new wiring and conduit to the relocated equipment.

1. During demolition and construction of the wet well slab, the CONTRACTOR shall temporarily relocate any control panels, equipment, conduit, wire, and additional hardware as necessary. Once construction is complete, all equipment, control panels, conduit, wiring, terminations, hardware, etc. shall be installed back into permanent service.

G. All power interruptions to electrical equipment shall be at JEA's convenience with 72 hours (minimum) notice. Each interruption shall have prior approval.

H. The work shall include complete testing of all equipment and wiring at the completion of work and making any minor correction changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.

I. A single manufacturer shall provide disconnect switches, transformers, transformer panel assemblies, panelboards, etc.

1.02 Related Work

A. Excavation and backfilling, including gravel or sand bedding for underground electrical work is included in Division 31.

B. Cast in place concrete work, including concrete encasements for electrical duct banks, equipment pads, light pole bases and reinforcing steel, is included in Division 03.

C. Refer to Process Mechanical Drawings for the exact location of mechanical, instrumentation and process equipment.

1.03 Submittals

A. Submit, in accordance with Section 01 30 00, shop drawings for equipment, materials and other items furnished under Division 26.

B. Check shop drawings for accuracy and contract requirements prior to submittal. Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to Specifications and Construction Drawings. This statement shall also list all exceptions to the Specifications and

Construction Drawings. Shop drawings not so checked and noted shall be returned.

C. The JEA ENGINEER's check shall be for conformance with the design concept of the project and compliance with the Specifications and Construction Drawings. Errors and omissions on approved shop drawings shall not relieve the CONTRACTOR from the responsibility of providing materials and workmanship required by the Specifications and Construction Drawings.

D. All dimensions shall be field verified at the job site and coordinated with the work of all other trades.

E. Material shall not be ordered or shipped until the shop drawings have been approved. No material shall be ordered or shop work started if shop drawings are marked "APPROVED AS NOTED - CONFIRM," "APPROVED AS NOTED - RESUBMIT" or "NOT APPROVED."

F. Operation and Maintenance Data

1. Submit operations and maintenance data for equipment furnished under this Division, in accordance with Section 01 78 23. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc., to instruct operating and maintenance personnel unfamiliar with such equipment.

1.04 Contract Performance Requirements

A. Electric equipment, materials and installation shall comply with the latest edition of the National Electrical Code (NEC) and with the latest edition of the following codes and standards:

1. National Electrical Safety Code (NESC)

2. Occupational Safety and Health Administration (OSHA)

3. National Fire Protection Association (NFPA)

4. National Electrical Manufacturers Association (NEMA)

5. American National Standards Institute (ANSI)

6. Insulated Cable Engineers Association (ICEA)

7. Instrument Society of America (ISA)

8. Underwriters Laboratories (UL)

9. Factory Mutual (FM)

10. National Electrical Testing Association (NETA)

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 Priority of The Contract Documents

A. If, during the performance of the work, the CONTRACTOR finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Construction Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.

B. In all cases, figured dimensions shall govern over scaled dimensions, but work not dimensioned shall be as directed by the JEA ENGINEER and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.

C. Detailed Construction Drawings shall govern over general drawings, larger scale Construction Drawings take precedence over smaller scale Construction Drawings, Change Order Drawings shall govern over Contract Drawings and Contract Drawings shall govern over Shop Drawings.

D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the CONTRACTOR, unless otherwise directed by the JEA ENGINEER.

E. In accordance with the intent of the Contract Documents, the CONTRACTOR accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the CONTRACTOR's responsibility to comply with all Laws and Regulations at all times.

1.06 Enclosure Types

A. Unless otherwise specified electrical enclosures shall have the following ratings:

1. NEMA 1 for dry, non-process indoor above grade locations.

2. NEMA 4X 316 stainless steel for all other areas.

3. NEMA 7 for areas shall be rated "Class I Div. 1 Group D."

1.07 Hazardous Areas

A. Equipment, materials and installation in areas designated as hazardous shall comply with National Electrical Code Articles 500, 501, 502 and 503.

B. Equipment and materials installed in hazardous areas shall be UL listed for the appropriate hazardous area classification.

1.08 Codes, Inspection and Fees

A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction.

B. Obtain all necessary permits and pay all fees required for permits and inspections.

1.09 Tests and Settings

A. Test systems and equipment furnished under Division 26 and repair or replace all defective work and equipment. Refer to the individual equipment sections for additional specific testing requirements.

B. Make adjustments to the systems and instruct JEA's personnel in the proper operation of the systems.

C. In addition to the specific testing requirements listed in the individual sections, the following minimum tests and settings shall be performed.

1. Mechanical inspection, testing and settings of circuit breakers, disconnect switches, protection relays, motor starters, overload relays, control circuits and equipment for proper operation.

2. Check the full load current draw of each motor.

3. Check power and control power fuse ratings. Replace fuses if they are found to be of the incorrect size.

4. Check settings of the motor circuit protectors. Adjust settings to lowest setting that will allow the motor to be started when under load conditions.

5. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.

6. Check rotation of motors prior to testing the driven load. Disconnect the driven equipment if damage could occur due to wrong rotation. If the rotation is for the driven equipment is not correct, disconnect the motor lead connections at the motor terminal box and reconnect for proper rotation.

7. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.

8. Inspect each piece of equipment in areas designated as HAZARDOUS to ensure that equipment of proper rating is installed.

9. Verify all terminations at transformers, equipment, panels and enclosures by producing a 1, 2, 3 rotation on a phase sequenced motor when connected to "A," "B" and "C" phases.

10. Test the grounding system using the three-point fall in potential method.

11. Test all 600 Volt wire insulation with a meg-ohm meter after installation. Make tests at not less than 500V. Submit a written test report of the results to the JEA ENGINEER.

D. Testing shall be scheduled and coordinated with the JEA ENGINEER at least two weeks in advance. Provide qualified test personnel, instruments and test equipment.

1.10 Size of Equipment

A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure that the tilting does not impair the functional integrity of the equipment.

1.11 Record Drawings

A. As the work progresses, legibly record all field changes on a set of project contract drawings, hereinafter called the "record drawings."

B. Record drawings shall accurately show the installed condition of the following items:

1. One-line Diagram(s).

2. Raceways and pullboxes.

3. Conductor sizes and conduit fills.

4. Panel Schedule(s).

5. Control Wiring Diagram(s).

6. Underground raceway and duct bank routing.

7. Plan view, sizes and locations of panelboards.

C. Submit a schedule of control wiring raceways and wire numbers, including the following information:

1. Circuit origin, destination and wire numbers.

2. Field wiring terminal strip names and numbers.

D. As an alternate, point-to-point connection diagrams showing the same information may be submitted in place of the schedule of control wiring raceways and wire numbers.

E. Submit the record drawings and the schedule of control wiring raceways and wire numbers (or the point-to-point connection diagram) to the JEA ENGINEER.

1.12 Equipment Interconnections

A. Review shop drawings of equipment furnished under other Divisions of this Specification and prepare coordinated wiring interconnection diagrams or wiring tables. Submit copies of wiring diagrams or tables with Record Drawings.

B. Furnish and install all equipment interconnections.

1.13 Materials and Equipment

A. Materials and equipment shall be new.

B. Material and equipment of the same type shall be the product of one manufacturer and shall be UL listed.

C. Provide Quality Control in accordance with Section 01 45 00.

D. Warrant all equipment furnished under Division 26 in accordance with Section 01 40 1.06. Refer to individual equipment sections for additional warranty items.

1.14 Equipment Identification

A. Identify equipment (disconnect switches, separately mounted motor starters, control stations, etc) furnished under Division 26 with the name of the equipment it serves. Control panels, junction or terminal boxes, transfer switches, etc, shall have nameplate designations as shown on the Construction Drawings.

B. Nameplates shall be engraved, laminated plastic, not less than 1/16-inch thick by 3/4-inch by 2-1/2-inch with 3/16-inch high white letters on a black background.

C. Nameplates shall be bonded to all enclosure types using an epoxy or similar permanent waterproof adhesive. Two-sided foam adhesive tape is not

acceptable. Where the equipment size does not have space for mounting a nameplate the nameplate shall be permanently fastened to the adjacent mounting surface.

1.15 Interpretation of Construction Drawings

A. Unless specifically stated to the contrary, the Construction Drawings are not intended to show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.

B. Install each 3-phase circuit in a separate conduit unless otherwise shown on the Construction Drawings.

C. Unless otherwise approved by the JEA ENGINEER, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.

D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation. Where home-runs indicate conduit is to be installed concealed or exposed the entire branch circuit shall be installed in the same manner. Unless otherwise indicated install branch circuit conduits exposed in process/industrial type spaces and concealed in finished spaces.

E. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

F. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the Construction Drawings are approximate only. Exact locations shall be determined by the CONTRACTOR and approved by the JEA ENGINEER during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the JEA ENGINEER and furnish all labor and materials necessary to complete the work in an approved manner.

G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown.

H. Redesign of electrical or mechanical work, which is required due to the CONTRACTOR's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the CONTRACTOR at his/her own expense. Redesign and detailed plans shall be submitted to the JEA ENGINEER for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.

I. It is the intent of these Specifications that the Electrical Systems shall be suitable in every way for the service required. All materials and all work that may be implied as being incidental to the work of this Section shall be furnished at no additional cost to JEA.

Part 2 Products

2.01 Conduits and Fitting

A. Rigid Aluminum Conduit

1. Rigid aluminum conduit shall be 6063 alloy and shall be as manufactured by New Jersey Aluminum Corp.; AFC Co.; VAW of America, Inc. or equal.

2. PVC conduit used in underground concrete encased duct banks shall be rigid polyvinyl chloride Type DB as manufactured by Carlon; An Indian Head Co.; Cantex; Queen City Plastics or equal.

B. Rigid Nonmetallic Conduit

1. PVC conduit shall be rigid polyvinyl chloride schedule 80 as manufactured by Carlon; An Indian Head Co.; Kraloy Products Co., Inc.; Highland Plastics Inc. or equal.

C. Liquidtight Flexible Metal Conduit, Couplings and Fittings

1. Liquidtight flexible metal conduit shall be Sealtite, Type UA, manufactured by the Anaconda Metal Hose Div.; Anaconda American Brass Co.; American Flexible Conduit Co., Inc.; Universal Metal Hose Co. or equal.

2. Fittings used with liquidtight flexible metal conduit shall be of the 3-piece screw-in type malleable iron as manufactured by the O.Z. Gedney Co. or equal.

3. Liquidtight flexible metal conduit shall be for use under the provisions of NEC Article 351.

D. Flexible Couplings

1. Flexible couplings shall be type ECGJH as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; Killark Electric Manufacturing Co. or equal.

E. Boxes and Fittings

1. NEMA 4X stainless steel, junction boxes and pull boxes shall be 316 stainless steel with 316 stainless steel hardware and gasketed covers. Boxes shall have continuously welded seams and welds shall be ground smooth. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel screws. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets (refer to Section 26 19 00 3 for additional requirements.) Boxes shall be as

manufactured by Hoffman Engineering Co.; Lee Products Co.; ASCO Electrical Products Co., Inc., or equal.

2. Explosion-proof boxes shall be designed for Class 1, Group D, Division 1 hazardous locations. They shall be cast aluminum, with stainless steel hinged covers and stainless steel hardware and bolts; Type EJB-N4 as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; Adalet-PLM or equal.

3. Cast aluminum boxes and fittings shall be copper free aluminum with cast aluminum covers and stainless steel screws as manufactured by the Killark Electric Co..; Crouse-Hinds Co.; Appleton Electric Co.; or equal.

4. Cast aluminum device boxes shall be Type FD. All cast aluminum boxes and fittings shall be copper-free aluminum with cast aluminum covers and stainless steel screws as manufactured by the Killark Electric Co.; Crouse-Hinds Co.; L. E. Mason Co. or equal.

5. Cast aluminum fittings (C's, T's, LB's, etc.) shall be of the mogul design (with rollers) as manufactured by Appleton Electric Co.

6. Conduit hubs shall be of the grounding type as manufactured by Myers Electric Products, Inc. or equal.

7. Conduit wall seals for new concrete walls below grade shall be O.Z./Gedney Co., Type WSK; Spring City Electrical Manufacturing Co., Type WDP or equal.

8. Conduit wall seals for cored holes shall be Type CSML as manufactured by the O.Z./Gedney Co. or equal.

9. Conduit wall and floor seals for sleeved openings shall be Type CSMI as manufactured by the O.Z./Gedney Co. or equal.

10. Combination expansion-deflection fittings embedded in concrete shall be Type XD as manufactured by the Crouse-Hinds Co.; O.Z./Gedney Co.; Spring City Electrical Mfg. Co. or equal.

11. Combination expansion-deflection fittings installed exposed shall be Type XJ as manufactured by Crouse-Hinds Co.; O.Z. Gedney Co.; Spring City Electrical Mfg. Co. or equal.

12. Explosion proof fittings shall be as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; O.Z./Gedney Co. or equal.

13. Conduit sealing bushings shall be O.Z./Gedney, Type CSB or equal.

14. Elbows and couplings shall be aluminum.

F. Conduit Mounting Equipment

1. 316 Stainless steel channel with 316 stainless steel hardware (hangers, rods, backplates, beam clamps, fasteners, anchors, nuts, washers, etc.) shall be used in process areas, as shown on the Construction Drawings, in areas designated "WET", "DAMP" and "CORROSIVE" on the Construction Drawings and in outdoor locations. All channel and hardware shall be resistant to the chemicals present in the area in which it is used.

2. Expansion anchors (minimum 3/8-inch diameter) shall be equal to Kwik-Bolt as manufactured by the McCullock Industries, Minneapolis, MI; Wej-it by Wej-it Expansion Products, Inc., Bloomfield, CO; or Kwik-Bolt II as manufactured by the Hilti Fastening Systems, Inc, Tulsa, OK. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the steel reinforcement. Apply anti-seize compound to all nuts and bolts. Supports installed without the approved compound shall be dismantled and correctly installed, at no cost to JEA.

G. Wall and Floor Slab Opening Seals

1. Wall and floor slab openings shall be sealed with "FLAME-SAFE" as manufactured by the Thomas & Betts Corp.; Pro Set Systems; Neer Mfg. Co.; Specified Technologies, Inc. or equal.

2.02 Wire, Cable And Accessories

A. Wires and cables shall be of annealed, 98 percent conductivity, soft drawn copper.

B. All conductors shall be stranded, except that lighting and receptacle wiring may be solid.

C. Except for control, signal and instrumentation circuits, wire smaller than No. 12 AWG shall not be used.

D. Wire for lighting, receptacles and other circuits not exceeding 150 Volts to ground shall be NEC Type THHN/THWN as manufactured by Okonite Co.; Southwire Co.; Pirelli Corp., or equal.

E. Wire for circuits over 150 Volts to ground shall be NEC type XHHW for sizes up to No. 4/0 AWG and Type RHW for sizes greater than No. 4/0 AWG as manufactured by Okonite Co.; Southwire Co., or equal.

F. Wire for control, status and alarm circuits shall be No.14 AWG NEC type XHHW, 600 V, stranded as manufactured by Okonite Co.; Southwire Co., or equal.

G. Process instrumentation wire shall be twisted pair, 600 V, cross linked polyethylene insulated, aluminum tape shielded, polyvinyl chloride jacketed type "XLP" as manufactured by the Rockbestos Co., or equal.

H. Cable for 4-20 mA instrumentation, potentiometer, RTD and similar analog circuits shall be multi-conductor twisted and shielded.

1. Single pair cable:
   a. Conductors: 2 No. 16 AWG stranded and twisted
   b. Insulation: XLP
   c. Shield: 100 percent tape with drain wire
   d. Jacket: PVC with UL and manufacturers identification

2. Three conductor (triad) cable:
   a. Conductors: 3 No. 16 AWG stranded and twisted
   b. Insulation: XLP
   c. Shield: 100 percent tape with drain wire
   d. Jacket: PVC with UL and manufacturers identification

3. Multiple pair cables (where shown on the Construction Drawings):
   a. Conductor: Multiple 2 No. 16 AWG stranded and twisted
   b. Insulation: XLP
   c. Shield: Individual pairs and overall shielded with 100 percent tape and drain wire
   d. Jacket: PVC with UL manufacturers identification

I. Splices for power wiring shall be compression type connectors insulated with a heat shrink boot or outer covering and epoxy filling. Splice kits shall be as manufactured by Raychem; Ideal Industries; 3M Co. or equal.

J. Motor connections shall be ring type mechanical compression terminations installed on the branch circuit wires and the motor leads and secured with bolt, nut and springwasher. Connections shall be insulated with a Raychem Type RVC, roll-on stub insulator or equal.

K. Termination connectors for control wiring shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

L. Splices for control wiring shall be insulated compression type connectors of the expanded vinyl insulated parallel or pigtail type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

M. Termination connectors for shielded instrumentation wiring shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

N. Wire markers shall be "Omni-Grip" as manufactured by the W.H. Brady Co.; Thomas & Betts Co.; 3M Co. or equal.

O. Wire and cables with diameters exceeding the capacity of the "Omni-Grip" shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by the W.H. Brady Co.; Panduit Corp. or equal.

2.03 Miscellaneous Equipment

A. Disconnect Switches

1. Disconnect switches shall be heavy-duty, quick-make, quick-break, visible blades, 600 Volt, 3 Pole with full cover interlock, interlock defeat and flange mounted operating handle.

2. NEMA 4X enclosures shall be 316 stainless steel.

3. NEMA 7 enclosures shall be cast aluminum.

4. Switches shall be as manufactured by the Square D Co.; Cutler Hammer Co.; General Electric Company; Siemens Company or equal.

B. Fused Disconnect Switches:

1. Fused disconnect switches shall be heavy-duty, quick-make, quick-break, visible blades, 600 Volt, 3 Pole with full cover interlock, interlock defeat and flange mounted operating handle.

2. Fuses shall be rejection type, 600 Volt, 200,000 A.I.C., dual element, time delay, Bussman Fusetron, Class RK-5; Gould Shawmut Inc.; Littelfuse Power Fuse Division, or equal.

3. NEMA 4X enclosures shall be 316 stainless steel

4. NEMA 7 enclosures shall be cast aluminum.

5. Switches shall be as manufactured by the Square D Co.; Cutler Hammer Co.; General Electric Company; Siemens Company, or equal.

C. Combination Magnetic Motor Starters:

1. Motor starters shall be a combination motor circuit protector and contactor, 2 or 3 Pole, single or 3 phase as required, 60 Hz, 600 Volt, magnetically operated, full voltage non-reversing unless otherwise shown on the Construction Drawings. NEMA sizes shall be as required for the horse-powers shown on the Construction Drawings. Motor circuit protectors shall be molded case with adjustable magnetic trip only. They shall be specifically designed for use with magnetic motor starters. Motor circuit protectors shall be current limiting type, with additional current limiters if required. Combination motor starters shall be fully rated for 22,000amps RMS symmetrical.

2. Two speed starters shall be for single or two winding motors as shown on the Construction Drawings.

3. Each motor starter shall have a 120 Volt operating coil and control power transformer. Three phase starters shall have three overload relays. One normally open and one normally closed auxiliary contact shall be

provided as spares in addition to contacts shown on the Construction Drawings.

4. Overload relays shall be adjustable, ambient compensated and manually reset.

5. Furnish built-in control stations and indicating lights where shown on the Construction Drawings.

6. NEMA 4X enclosures shall be 316 stainless steel.

7. NEMA 7 enclosures shall be cast aluminum.

8. Combination magnetic motor starters shall be as manufactured by the Square D Co.; Cutler Hammer Co.; General Electric Company; Siemens Company, or equal.

D. Circuit Breakers:

1. Provide thermal magnetic circuit breaker in NEMA Type 4X 316 stainless steel enclosure with externally operated handle. Circuit breakers shall be fully rated for interrupting capacity as shown on the Construction Drawings.

2. Circuit breakers shall be manufactured by Cutler Hammer Co.; General Electric Company; Siemens Company, or equal.

E. Control Stations

1. Control stations shall be heavy-duty type, with full size operators. Momentary contact stop buttons shall have a lockout latch that can be padlocked in the open position.

2. NEMA 4X enclosures shall be 316 stainless steel.

3. Control stations shall be Square D Class 9001; Cutler Hammer Co.; General Electric Company; Allen Bradley Company or equal.

F. Surge Protective Devices (SPD)

1. SPDs shall be UL 1449, 3rd Edition listed.

2. Each protection device shall have a capacitive filtering system connected in each Line to Neutral (L-N)(Wye) mode or Line to Line (L-L)(Delta) mode to provide EMI/RFI noise attenuation.

3. Protection modes: The SPD shall provide Line to Neutral (L-N)(Wye), Line to Ground (L-G)(Wye or Delta), Line to Line (L-L)(Delta) and Neutral to Ground (N-G)(Wye) protection.

4. SPD shall contain a technology that utilizes multiple thermally protected metal oxide varistors (MOV) per mode.

5. All primary transient paths shall utilize copper wire, aluminum bus bar and lugs of equivalent capacity to provide equal impedance interconnection between phases. No plug-in module or components shall be used in surge carrying paths.

G. Panelboard SPDs shall be:

1. SPD shall be a multi-stage non-parallel protector. Please see one-line diagram and panelboard schedule to confirm voltages. SPD's minimum surge current capacity shall be 80 kA per phase (L-N plus L-) and 40 kA per mode (L-N, L-G, L-L and N-G).

2. SPD shall provide the following monitoring features: dry contacts and audible alarm.

3. SPD shall be integral to the panelboard enclosure.

4. SPDs shall be as manufactured by LEA International Inc – SP Series, Current Technology – CGP Series, Liebert ACV-III Series, or approved equal.

H. Control Relays

1. Control relays shall be heavy duty machine tool type, with 10 Amps, 300 Volt convertible contacts. Number of contacts and coil voltage shall be as shown on the Construction Drawings. General use relays shall be General Electric Co., Catalog No. CR120B or equal by Square D Co. or Allen-Bradley Co. Latching relays shall be General Electric Co., CR120BL, equal by Square D Co. or Allen-Bradley Co.

2. Time delay relays shall be pneumatic, 600 Volt, 20 Amp contacts, with calibrated knob operated adjustment. On delay and off delay types and timing ranges shall be as shown on the Construction Drawings. Relays shall be Agastat, Model 7012 or 7022 or equal.

I. Polyethylene Warning Tape

1. Warning tape shall be red polyethylene film, 6-inch minimum width.

2. Warning tape shall be W.H. Brady Co., Catalog No. 91296 or equal.

J. Heat Tracing

1. Heat trace tape shall be temperature self-limiting type rated 5 watts per foot at 50 degrees F, 120 Volt, 60 Hz and shall be Chemelex, Catalog No. 5BTV1 with stainless steel overbraid and fluoropolymer outer jacket or equal.

2. Ambient air temperature sensing thermostat shall be adjustable from 15 to 150 degrees F, mounted in NEMA 4X enclosure, and shall be Chemelex, Catalog No. AMC-1A, or equal.

3. Aluminum heat transfer tape shall be 2 mil thickness, 2-1/2-inch wide and shall be Chemelex, Catalog No. AT-150 or equal.

K. On-Delay, Off-Delay Timers (Solid State)

1. On and off delay timers shall be microprocessor based, solid state type.

2. Timers shall have the following features:
   a. Adjustable timing ranges from 0.1 seconds to 99 hours, 59 minutes minimum.
   b. Setpoints entered by pressing membrane covered keyboard on unit.
   c. LCD readout of timing progress and setpoint.
   d. Adjustable for on-delay or off-delay modes.
   e. Standard sized plug-in case.
   f. Totally sealed face plate.
   g. Sealed battery backup power to retain memory for up to 30 days.
   h. Accuracy plus or minus 0.01 second.
   i. DPDT isolated instantaneous and timed output contacts rated 6 amps minimum at 120 Volt.

3. Timers shall be Bulletin 651 Multirange, solid state as manufactured by Tenor Co., Inc.; Eagle Signal CS-300 Series or equal.

L. Equipment Mounting Stands

1. The transfer switches, field mounted instruments, disconnects, pushbutton control stations, etc, shall be mounted on 316 stainless steel stands as specified herein or as shown on the Construction Drawings.

2. Where clearance requirements for stands may not be maintained, the JEA ENGINEER may direct equipment to be wall-mounted adjacent to the motor or device, but in no case shall the distance from the motor or device to the control station exceed 3-ft.

M. Transformer-Panel Assembly:

1. Manufacturers:
   a. Cutler-Hammer, Mini-Power Center.
   b. Square D, Mini-Power Zone.
   c. General Electric, Servicenter.

2. Ratings:
   a. kVA and voltage ratings shall be as shown on the Construction Drawings.

b. Units shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.

c. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings.

3. Construction:

a. Each TPA shall include a main primary breaker, an encapsulated dry-type transformer, and a secondary panelboard with main breaker.

b. Main primary, secondary, and feeder breakers shall be enclosed with a padlockable hinged door.

4. Bus:

a. Panelboard bus shall be copper sized to NEMA 65 degrees C rise.

5. Wiring/Terminations:

a. All interconnecting wiring between the primary breaker and transformer, secondary main breaker and transformer, and distribution section shall be factory installed.

b. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring.

6. Main Devices:

a. Each TPA shall include a main primary breaker with an interrupting rating of 22 kA at 480 Volts; and a secondary panelboard with main breaker rated 10 kA interrupting rating at 240 Volts.

7. Feeder Devices:

a. The secondary distribution section shall accommodate one inch, plug-in breakers with 10 kA interrupting capacity.

8. Enclosure:

a. The enclosure shall be made of heavy-gauge steel and the maximum temperature of the enclosure shall not exceed 90 degrees C.

b. The enclosure shall be totally enclosed, non-ventilated, NEMA Type 3R, with lifting eyes.

2.04 Panelboards

A. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

C. 120/240 Volt, single phase, 3 Wire and 120/208 Volt, 3 Phase, 4 Wire panelboards shall be Type AQ as manufactured by the General Electric Company; Type NQOD as manufactured by Square D Co.; Type Pow-R-Line C as manufactured by Cutler-Hammer, or equal.

D. 277/480 Volt, 3 Phase, 4 Wire panelboards shall be type AE as manufactured by the General Electric Company; Type NEHB as manufactured by Square D Co.; Type Pow-R-Line C as manufactured by Cutler-Hammer, or equal.

E. 480 Volt, 3 Phase, 3 Wire panelboards shall be type CCB as manufactured by the General Electric Company; I-Line series as manufactured by Square D Co.; Type Pow-R-Line C as manufactured by Cutler-Hammer, or equal.

F. Enclosures

1. NEMA 1 for dry, non-process indoor above grade locations.

2. NEMA 4X 316 stainless steel for all other areas.

G. Rating:

1. All panelboards shall be rated for the intended voltage.

2. Circuit breaker panelboards shall be fully rated for the specified circuit breaker fault current interrupting capacity. Series connected short circuit ratings will not be acceptable.

H. Buses:

1. Bus bars for the mains shall be of copper. Full size neutral bars shall be included. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

2. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

3. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.

4. Equipment ground bars shall be furnished.

I. Circuit Breakers:

1. Panelboards shall be equipped with circuit breakers.

2. Circuit breakers shall be molded case, bolt-in type.

3. Each circuit breaker used in 120/240 Volt and 120/208 Volt panelboards shall have an interrupting capacity as shown on the Construction Drawings.

4. Each circuit breaker used in 277/480 Volt and 480 Volt panelboards shall have an interrupting capacity as shown on the Construction Drawings.

5. GFCI (ground fault circuit interrupter) shall be provided for circuits where shown on the Construction Drawings. GFCI units shall be 1 Pole, 120 Volt molded case, bolt-on breakers, incorporating a solid state ground fault interrupter circuit insulated and isolated from the breaker mechanism. The unit shall be UL listed Class A Group I device (5 milliamp sensitivity, 25 millisecond trip time) and an interrupting capacity of 10,000 Amps RMS.

6. Circuit breakers shall be as manufactured by the panelboard manufacturer.

2.05 Underground System

A. All concrete and reinforcing steel shall be as specified in Division 03, but the responsibility of furnishing and installing the material shall be that of this Section.

B. All trenching and surface restoration shall be as specified in Division 31, but the responsibility of furnishing and installing the material shall be that of this Section.

C. Raceways shall be polyvinyl chloride conduit encased in concrete except that rigid aluminum conduit shall be used for 600 Volt shielded wire and data highway wiring.

D. Handholes shall be precast concrete, heavy-duty type, designed for a Class H-20 wheel load and conform to ASTM C478. Precast units shall be as manufactured by Chase Precast Corp.; American Precast Co. or equal and constructed to dimensions as shown on the Construction Drawings.

E. Handhole frames and covers shall be cast iron, heavy duty type for Class H-20 wheel loading.

2.06 Grounding

A. Ground rods shall be 3/4-inch by 10-foot copper clad steel and constructed in accordance with UL 467. The minimum copper thickness shall be 0.25 mm. Ground rods shall be Copperweld or equal.

B. Grounding conduit hubs shall be malleable iron type similar to Thomas & Betts Co.; Cat No. 3940 (3/4-inch conduit size) by Burndy; O.Z./Gedney Co. or equal, and of the correct size for the conduit.

C. Waterpipe ground clamps shall be cast bronze saddle type, similar to Thomas & Betts Co. Cat. No. 2 (1/2-inch, 3/4-inch, or 1-inch size) or equal by Burndy; O.Z./Gedney Co. or equal, and of the correct size for the pipe.

D. Buried grounding connections shall be by Cadweld process, or equal exothermic welding system.

Part 3 Execution

3.01 Sleeves And Forms For Openings

A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.

C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the JEA ENGINEER may allow the installations of such conduit to be exposed. Requests for this deviation must be submitted in writing. No additional compensation for such change will be allowed.

D. Seal all openings, sleeves, penetration and slots.

3.02 Cutting And Patching

A. Cutting and patching shall be done in a thoroughly workmanlike manner and be in compliance with modifications and repair to concrete as specified in Section 03 01 31. Sawcut concrete and masonry prior to breaking out sections.

B. Core drill holes in concrete floors and walls as required.

C. Install work at such time as to require the minimum amount of cutting and patching.

D. Do not cut joists, beams, girders, columns or any other structural members.

E. Cut opening only large enough to allow easy installation of the conduit.

F. Patching to be of the same kind and quality of material as was removed.

G. The completed patching work shall restore the surface to its original appearance or better.

H. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed.

I. Remove rubble and excess patching materials from the premises.

J. When existing conduits are cut at the floor line of wall line, they shall be filled with grout of suitable patching material.

3.03 Installation

A. Any work not installed according to the Specifications shall be subject to change as directed by the JEA ENGINEER. No extra compensation will be allowed for making these changes.

B. Electrical equipment shall be protected at all times against mechanical injury or damage by water. Electrical equipment shall not be stored outdoors. Electrical equipment shall be stored in dry permanent shelters. Do not install electrical equipment in its permanent location until structures are weather-tight. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and tested as directed by the JEA ENGINEER, or shall be replaced at no additional cost at the JEA ENGINEER's discretion.

C. Equipment that has been damaged shall be replaced or repaired by the equipment manufacturer, at the JEA ENGINEER's discretion.

D. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted per the field painting specifications in Section 09 91 00, at no additional cost to JEA.

E. Coordinate the conduit installation with other trades and the actual supplied equipment.

F. Install each 3 phase circuit in separate conduit.

G. Unless otherwise approved by the JEA ENGINEER, conduit installed interior to the building shall be installed exposed; conduit installed exterior to the building shall be concealed.

H. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

I. Exact locations of electrical equipment shall be determined by the CONTRACTOR and approved by the JEA ENGINEER during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the JEA ENGINEER and furnish all labor and materials necessary to complete the work in an approved manner.

3.04 Raceways, Boxes and Fittings

A. Unless otherwise specified herein or shown on the Construction Drawings, all boxes shall be metal.

B. Exposed switch, receptacle and lighting outlet boxes and conduit fittings shall be cast aluminum.

C. Concealed switch, receptacle and lighting outlet boxes shall be pressed steel. Welded seamed boxes will not be permitted.

D. Terminal boxes, junction boxes and pull boxes shall have NEMA ratings suitable for the location in which they are installed, as specified in Section 26 00 00.

E. Combination expansion-deflection fittings shall be used where conduits cross structure expansion joints. Refer to Structural Drawings for expansion joint locations. Provide bonding jumpers around fittings.

F. Conduit wall seals shall be used where underground conduits penetrate walls or at other locations shown on the Construction Drawings.

G. Conduit sealing bushings shall be used to seal conduit ends exposed to the weather and at other locations shown on the Construction Drawings.

H. No conduit smaller than ¾-inch electrical trade size shall be used, nor shall any have more than the equivalent of three 90-degree bends in any one run. Pull boxes shall be provided as required or directed.

I. No wire shall be pulled until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the conduit system has been completed in every detail.

J. The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.

K. Conduit supports, other than for underground raceways, shall be spaced at intervals of 8-feet or less, as required to obtain rigid construction.

L. Single conduits shall be supported by means of aluminum one-hole pipe clamps in combination with aluminum one-screw back plates, to raise conduits from the surface. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8-inch diameter. Surface mounted panel boxes, junction boxes, conduit, etc, shall be supported by spacers to provide a minimum of 1/2-inch clearance between wall and equipment.

M. Conduit hangers shall be attached to structural steel by means of beam or channel clamps. Where attached to concrete surfaces, concrete expansion anchors shall be provided.

N. All conduits on exposed work, within partitions and above suspended ceilings, shall be run at right angles to and parallel with the surrounding wall and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run perfectly straight and true.

O. Conduit terminating in pressed steel boxes shall have double locknuts (aluminum) and insulated grounding bushings.

P. Conduit terminating in gasketed enclosures shall be terminated with grounding type conduit hubs.

Q. Conduits containing equipment grounding conductors and terminating in sheet steel boxes shall have insulated throat grounding bushings with lay-in type lugs.

R. Conduits shall be installed using threaded fittings unless otherwise specified herein.

S. Liquidtight flexible metal conduit shall be used for all motor terminations, the primary and secondary of transformers, and other equipment where vibration is present.

T. Flexible couplings shall be used in hazardous locations for all motor terminations and other equipment where vibration is present.

U. Aluminum fittings and boxes shall be used with aluminum conduit. Aluminum conduit shall not be imbedded in concrete containing chlorides, unwashed beach sand, sea water, or coral bearing aggregates. Aluminum conduit shall be isolated from other metals with heat shrink tubing (Raychem or equal) or plastic-coated hangers. Strap wrenches shall be used for tightening aluminum conduit. Pipe wrenches, channel locks, chain wrenches, pliers, etc. shall not be used.

V. All threads on aluminum conduit and fittings shall be cleaned and coated with No-Oxide compound before installing.

W. Aluminum conduit installed in concrete or below grade shall be completely covered with two (2) coats of bitumastic paint or with heat shrink tubing (Raychem or equal).

X. Where conduits pass through openings in walls or floor slabs, the remaining openings shall be sealed against the passage of flame and smoke.

Y. PVC conduit to non-metallic and metallic box connections shall be made with sealing rings, with a stainless steel retainer as manufactured by Thomas & Betts Co.

Z. Conduit ends exposed to the weather shall be sealed with conduit sealing bushings.

AA. Expansion fittings shall be used on exposed runs of PVC conduit where required for thermal expansion. Installation and number of fittings shall be as provided per the NEC and approved by the PVC conduit manufacturer.

BB. All conduit entering or leaving a motor control center, switchboard or other multiple compartment enclosure shall be stubbed up into the bottom horizontal wireway or other manufacturer designated area, directly below the vertical section in which the conductors are to be terminated.

CC. Conduit sealing and drain fittings shall be installed in areas designated as NEMA 7.

DD. Spare conduits and conduit stubouts for future construction shall be provided with threaded PVC end caps at each end.

EE. No unbroken run shall exceed 300 feet in length. This length shall be reduced by 75 feet for each 90-degree elbow.

FF. Aluminum conduit entering manholes and below grade pull boxes shall be terminated with grounding type bushings and connected to a 5/8-inch x 10-foot rod with a #6 bare copper wire.

GG. Underground circuits shall be installed directly to the respective motor control centers, lighting panels, etc., except stainless steel pull boxes shall be wall mounted on structures to eliminate excessive bends. With prior written approval, below grade pull boxes may be used. Splices shall not be made in above or below grade pull boxes unless otherwise indicated on the plans and approved in writing by the JEA ENGINEER.

HH. All conduits shall have a 4-inch concrete housekeeping pad at all slab and grade penetrations. The housekeeping pad shall have 45-degree, 3/4-inch chamfer at all exposed edges.

II. All risers from underground, concrete pads, floors, etc. shall be provided with heat shrink tubing (Raychem Co. or equal) from a point 1 foot-0-inch below bottom of slab or grade to a point not less than 6 inches above grade or surface of slab.

JJ. Existing conduits are to be reused only where specifically noted on the Construction Drawings. Mandrels shall be pulled through all existing conduits which will be reused and through all new conduits 2-inch in diameter and larger prior to installing conductors.

KK. 3/16-inch polypropylene pull lines shall be installed in all new conduits noted as spares or designated for future equipment.

LL. Where no size is indicated for junction boxes, pull boxes or terminal cabinets, they shall be sized in accordance with the requirements of NEC Article 314.

MM. Conduits shall not cross pipe shafts, access hatches or vent duct openings. They shall be routed to avoid such present or future openings in floor or ceiling construction.

NN. The use of running threads is prohibited. Where such threads are necessary, a 3-piece cast aluminum union shall be used.

OO. Conduits passing from heated to unheated spaces, exterior spaces, refrigerated spaces, cold air plenums, etc, shall be sealed with "Duxseal" as manufactured by Manville or seal fitting to prevent the accumulation of condensation.

PP. All field cut ends of hot dipped galvanized mounting channel shall be cleaned and painted with cold galvanizing compound before installation.

QQ. All underground control and instrumentation conduits shall be separated from power conduits by a minimum of 12 inches unless specifically noted otherwise. Crossing of control and instrumentation conduits with power conduits shall be

kept to a minimum and where they must cross they shall cross at 90-degree angles.

3.05 Wire, Cable And Accessories

A. Uniquely identify all wires, cables and each conductor of multi- conductor cables (except lighting and receptacle wiring) at each end with wire and cable markers.

B. Use lubrications to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

C. All wire shall be color coded or coded using electrical tape in sizes where colored insulation is not available. Where tape is used as the identification system, it shall be applied in all junction boxes, and other accessible intermediate locations as well as at each termination.

D. The following coding shall be used:

System	Wire	Color
240/120 Volts 1-Phase, 3-Wire	Neutral Line 1 Line 2	White Black Red
208Y/120, Volts 3-Phase, 4-Wire	Neutral Phase A Phase B Phase C	White Black Red Blue
240/120 Volts 3-Phase, 4-Wire delta, center tap ground on phase coil A-C	Neutral Phase A Phase B (High) Phase C	White Black Orange Blue
480Y/277 Volts 3-Phase, 4-Wire	Neutral Phase A Phase B Phase C	White Brown Orange Yellow

E. Power conductors: Terminations shall be die type or set screw type pressure connectors as specified. Splices (where allowed) shall be die type compression connector and waterproof with heat shrink boot or epoxy filling. Aluminum conductors (where specified) shall employ terminations and splices specifically designed for aluminum conductors.

F. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of two conductors. Termination on screw type terminals shall be

made with a maximum of two spade connectors. Splices (where allowed) shall be made with insulated compression type connectors.

G. Instrumentation Signal Conductors (including graphic panel, alarm, low and high level signals): terminations same as for control conductors. Splices allowed at instrumentation terminal boxes only.

H. Except where permitted by the JEA ENGINEER no splices will be allowed in manholes, handholes or other below grade located boxes.

I. Splices shall not be made in push button control stations, control devices (i.e., pressure switches, flow switches, etc), conduit bodies, etc.

J. Instrumentation cables shall be installed in rigid aluminum raceways as specified. All circuits shall be installed as twisted pairs or triads. In no case shall a circuit be made up using conductors from different pairs or triads. Triads shall be used wherever three wire circuits are required.

K. Terminal blocks shall be provided at all instrument cable junction and all circuits shall be identified at such junctions.

L. Shielded instrumentation wire, shall be run without splices between instruments, terminal boxes, or panels.

M. Shields shall be grounded as recommended by the instrument manufacturer and isolated at all other locations. Terminal blocks shall be provided for inter-connecting shield drain wires at all junction boxes. Where individual circuit shielding is required, each shield circuit shall be provided with its own block.

3.06 Panelboards

A. Mount boxes for surface mounted panelboards so there is at least 1/2-inch air space between the box and the wall.

B. Connect panelboard branch circuit loads so that the load is distributed as equally as possible between the phase busses.

C. Type circuit directories giving location and nature of load served. Install circuit directories in each panelboard.

D. Install markers on the front cover of all panelboards which identify the voltage rating. Markers shall be made of self-sticking B-500 vinyl cloth printed with black characters on an Alert Orange background, 2-1/4-inch high by 9-inch wide, Style A as manufactured by W.H. Brady Co., or equal.

E. Install a 1-inch by 3-inch laminated plastic nameplate with 1/4-inch white letters on a black background on each panelboard. Nameplate lettering shall be as shown on the Construction Drawings. Nameplates shall be stainless steel screw mounted.

3.07 Underground System

A. Install raceways to drain away from buildings.

B. Reinforce raceway banks when conduits pass over newly excavated pipes.

C. The minimum cover for raceway banks shall be 24-inch unless otherwise permitted by the JEA ENGINEER.

D. Swab all raceways clean before installing cable.

E. Plug spare raceways and seal them watertight at all manholes, buildings and structures.

F. Seal the ends of raceways and make watertight at all handholes, buildings and structures.

3.08 Grounding

A. The service entrance equipment ground bus shall be grounded to a ¾-inch cold water pipe and to the ground as indicated on the Construction Drawings. Run grounding electrode conductors in Schedule 80 PVC conduits and seal conduits watertight. Do not allow water pipe connections to be painted. If the connections are painted, disassemble them and re-make them with new fittings.

B. Install equipment grounding conductors with all feeders and branch circuits.

C. Bond all steel building columns in new structures together with ground wire in rigid conduit and connect to the distribution equipment ground bus.

D. Ground wire connections to structural steel columns shall be made with long barrel type one-hole heavy duty copper compression lugs, bolted through 1/2-inch maximum diameter holes drilled in the column web, with stainless steel hex head cap screws and nuts.

E. Metal conduits stubbed into a motor control center shall be terminated with insulated grounding bushings and connect to the motor control center ground bus. Bond boxes mounted below motor control centers to the motor control center ground bus. Size the grounding wire in accordance with NEC Table 250-95, except that a minimum No. 12 AWG shall be used.

F. Liquid tight flexible metal conduit in sizes 1-1/2-inch and larger shall have bonding jumpers. Bonding jumpers shall be external, run parallel (not spiraled) and fastened with plastic tie wraps.

G. Ground transformer neutrals to the nearest available grounding electrode with a conductor sized in accordance with NEC Article 250.94.

H. Seal exposed connections between different metals with No-Oxide Paint Grade A or equal.

I. Lay all underground grounding conductors slack and, where exposed to mechanical injury, protect by pipes or other substantial guards. If guards are iron pipe, or other magnetic material, electrically connect conductors to both ends of the guard. Make connections as specified herein.

J. Care shall be taken to ensure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

K. All grounding type receptacles shall be grounded to the outlet boxes with a No. 12 THW green conductor connected to the ground terminal of the receptacle and fastened to the outlet box by means of a grounding screw.

L. Test the grounding system. Resistance to ground testing shall be performed during dry season. Submit test results in the form of a graph showing the number of points measured (12 minimum) and the numerical resistance to ground.

M. Testing shall be performed before energizing the distribution system.

N. Notify the JEA ENGINEER immediately if the resistance to ground for any building or system is greater than five ohms.

END OF SECTION

DIVISION 26 – ELECTRICAL

26 00 01 Electrical Systems Analysis

Part 1 General

1.01 Scope of Work

A. Provide both a preliminary and a final short circuit, selective coordination and arc flash study of the complete electrical distribution system as specified herein and as shown on the Construction Drawings. The study should include the equipment associated with this project as well as CWTS MCC and the Utility Transformer and protective devices.

B. The selective coordination study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and including the largest feeder circuit breaker and motor starter in the all low voltage motor control centers and power distribution panelboards. The study shall also include, Uninterruptible Power Supplies (UPS), power factor correction equipment, transformers and protective devices associated with emergency and standby generators. The arc flash study shall begin with the utility company's feeder protective device and include all of the electrical distribution equipment down to and including low voltage motor control centers and power distribution panelboards and lighting panels. All information required to perform the study shall be obtained by the contractor.

C. Submit the preliminary short circuit, selective coordination and motor starting/running study prior to submittal of motor control centers, and 480 Volt panelboards shop drawings. The aforementioned shop drawings will not be reviewed until the preliminary power system study is approved by the JEA ENGINEER. No exceptions will be allowed. The preliminary study shall include but not limited to:

1. Short circuit, and protective device coordination and motor starting studies shall be performed on nationally recognized computer software such as SKM System Analysis, EDSA, ETAP, or approved equal.

2. Obtain and verify with the utility company all information needed to conduct the study. Obtain and verify with JEA ratings of existing electrical equipment that shall be included in the study.

3. The preliminary study shall verify equipment is being applied within their design ratings and electrical protective devices will coordinate.

4. Recommend changes and/or additions to equipment as required providing adequate protection and coordination based on the actual equipment supplied and the results of the short circuit and protective device selective coordination studies. Submit any such changes and additions as a part of the study. Field settings of devices, adjustments, and minor modifications to equipment that are required to accomplish conformance with the approved short circuit and protective device

selective coordination studies shall be carried out by the CONSTRUCTION CONTRACTOR at no additional cost to JEA.

D. After release of electrical equipment by the manufacturer, but prior to energizing the electrical equipment, submit the final short circuit and selective coordination study including all calculations, tabulations, protective devices coordination graphs, etc. as specified herein.

1. Provide a complete short circuit study and protective device selective coordination study for both the utility power distribution system and the emergency/standby power distribution system under the scope of this study. The study shall include but shall not be limited to:

a. Full compliance with applicable ANSI and IEEE Standards.

b. Preformed on nationally recognized computer software such as EDSA, SKM System Analysis, ETAP, or equal.

2. Provide a report summarizing the selective coordination and motor starting/running study including: one-line diagram of the system, relay and breaker setting tabulation, coordination curves, relay curves, circuit breaker curves, motor starting/running curves, protective device coordination and short circuit calculation, all prepared by the specialty firm.

3. Recommend changes and/or additions to equipment as required providing adequate protection and coordination based on the actual equipment supplied and the results of the short circuit and protective device selective coordination studies. Submit any such changes and additions as a part of the study. Field settings of devices, adjustments and minor modifications to equipment that are required to accomplish conformance with the approved short circuit and protective device selective coordination studies shall be carried out by the CONSTRUCTION CONTRACTOR at no additional cost to JEA.

1.02 Related Work – Not Used

E. Submittals are included in Section 01 30 00.

1.03 Submittals

F. Preliminary Short Circuit and Coordination Study Report shall include but not limited to:

1. The coordination study report shall be bound in a standard 8-1/2-in by 11-in size report.

2. Electrical distribution system one-line diagram. One-line diagrams shall be legible on printed paper and shall not exceed 11-in x 17-in in size unless required to clearly illustrate the system and related data.

3. Provide detailed “Input Data” report that identifies all input parameters associated with the equipment depicted on the system one-line diagrams

including but not limited to Utility data, conductor sizes and lengths, protective device sizes and rating, transformer sizes and ratings, motor types and sizes, etc.

4. Tabulation of each protective device, its short circuit rating, the available fault current available at the device and an indication whether or not the device is adequately rated for the available fault current and voltage at which it is applied.

5. Preliminary graphic time-current curves showing how the protective devices proposed by the equipment suppliers will coordinate as being applied. TCC's shall be produced and printed in color to assist the reviewing engineer in the graphical analysis of the protective device coordination. Each device on a TCC shall be a different color and where devices are shown on multiple TCCs the color for the device shall be constant on each TCC that the devices are shown on.

G. Final Short Circuit and Selective Coordination Study Report shall include but not limited to:

1. The coordination study report shall be bound in a standard 8-1/2-in by 11-in size report. The selection of all protective relays types, current transformers, fuse types and ratings shall be the responsibility of the manufacturer and shall be based on the preliminary coordination study, which shall be submitted prior to the equipment shop drawings in accordance with Section 01 30 00. The complete study shall be approved by the JEA ENGINEER before any equipment is shipped. The report shall include the following sections and information:

2. An executive summary outlining the distribution system, the information received from the power company, assumptions made to complete the report, statement of the adequacy of the distribution equipment to safely clear any fault currents, the adequacy of the distribution equipment to close in on a fault, identify any problem areas with recommendations for resolving the problem.

3. Electrical distribution system one-line diagram. One-line diagrams shall be legible on printed paper and shall not exceed 11-in x 17-in in size unless required to clearly illustrate the system and related data.

4. Provide detailed "Input Data" report that identifies all input parameters associated with the equipment depicted on the system one-line diagrams including but not limited to Utility data, conductor sizes and lengths, protective device sizes and rating, transformer sizes and ratings, motor types and sizes, etc.

5. Tabulation of all protective devices, circuit breakers, fuses, current transformers, etc. The tabulation shall indicate the device, manufacturer, catalog number, recommended setting, etc.

6. Industry standard graphic time current, protective relay and protective device curves, showing equipment and material damage curves, relay,

circuit breaker, fuse curves, available fault currents at the equipment, transformer inrush currents, etc., for each piece of equipment. TCC's shall be produced and printed in color to assist the reviewing engineer in the graphical analysis of the protective device coordination. Each device on a TCC shall be a different color and where devices are shown on multiple TCCs the color for the device shall be constant on each TCC that the devices are shown on.

7. Tabulation of each protective device, its short circuit rating the available fault current available at the device and an indication whether or not the device is adequately rated for the available fault current and voltage at which it is applied.

8. Calculations and required documentation including copies of correspondence with involved entities such as utility fault contribution coordination.

H. Preliminary Arc Flash Study Report shall include but not limited to:

1. The Arc Flash study report shall be bound in a standard 8-1/2-in by 11-in size report.

2. An executive summary outlining the distribution system, the information received from the power company, assumptions made to complete the report and recommendations to reduce the arc flash values.

3. Recommendations to reduce the arc flash incident energy levels.

I. The Final Arc Flash Study report shall be bound in a standard 8-1/2-in by 11-in size report. The report shall include the following sections and information:

1. An executive summary outlining the distribution system, the information received from the power company, assumptions made to complete the report and recommendations to reduce the arc flash values.

2. Provide a detailed bus label for each fault location. Each label shall include a listing of the protective device settings and incident energy at several different working distances.

3. Provide a NFPA 70 E work permit form for each fault location.

4. Provide labels for each fault location.

a. Labels shall be indoor/outdoor rated weather resistant vinyl or polyester with a UV resistant overlaminate. The label shall have a minimum thickness of 5 mil. Labels shall be backed with pressure sensitive permanent cold temperature adhesive rated for a minimum 5-year life in the environment in which they are installed.

b. The label shall match any pre-existing facility or JEA specified formatting. The CONTRACTOR shall be responsible for

obtaining this formatting information prior to submitting label templates.

c. A single label for equipment is acceptable where equipment is continuous. In the event of split busses or equipment not arranged in a continuous fashion, multiple labels shall be provided.

d. Line side labels for equipment main breakers shall be included in addition to load side labels.

e. Labels shall be DANGER/WARNING type conforming to the NFPA 70E and ANSI Z534.4 standards. Labels are required to have the minimum information specified by these standards printed on them. Labels shall be legible and standard throughout the plant.

f. Labels templates shall be provided to the JEA ENGINEER and JEA for final approval and shall be printed and affixed by the CONTRACTOR. CONTRACTOR shall be responsible for all work required to print and affix the labels to the equipment. Labels shall be affixed in accordance with the direction of JEA.

5. PPE Table – Provide a PPE table that defines the Personnel Protective Equipment classes and clothing descriptions identified in the reports and labels.

J. Submittal of Digital Data and System Model

1. Following final approval of any of the above-mentioned studies, the CONTRACTOR shall provide a digital copy of all reports submitted as part of the project. Reports shall not be password protected and shall be free manipulated by the JEA ENGINEER or JEA.

2. Following final approval of any of the above studies, the CONTRACTOR shall provide the complete digital system model and system library used to build the model and complete the studies. All files needed to accurately recreate the study completed by the CONTRACTOR must be furnished and a backup of the system library used to define all system components must be provided.

1.04 Referenced Standards

K. Institute of Electrical and Electronic Engineers, Inc. (IEEE):

1. Plants

2. Standard 241, Recommended Practice for Electrical Power Systems in Commercial Buildings

3. Standard 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Systems

4. Standard 399, Recommended Practice for Industrial and Commercial Power System Analysis

5. IEEE Std. 519- Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems, 1992

6. IEEE Std. 1584- IEEE Guide for Arc Flash Hazard Calculations, 2002

7. NFPA 70E 2012

8. IEEE Std. 242-2001

L. American National Standards Institute (ANSI):

1. Standard C37.90, IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

2. Standard C37.91, IEEE Guide for Protective Relay Applications to Power Transformers

3. Standard C37.95, IEEE Guide for Protective Relaying of Utility-Consumer Interconnections

4. Standard C37.96, IEEE Guide for AC Motor Protection

5. Standard C57.12.59, IEEE Guide for Dry-Type Transformer Through-Fault Current Duration

6. Standard C57.13, IEEE Standard Requirements for Instrumentation Transformers

7. Standard C57.109, IEEE Guide for Liquid-Immersed Transformer Through-Fault-Current Duration

1.03 Short Circuit Study

M. Perform a short circuit study in accordance with ANSI Standards C37.010 and C37.13 to check the adequacy and to verify the correct application of circuit protective devices and other system components within the construction package. The study shall address the case when the system is being powered from the utility source as well as from the on-site generating facilities, normal and alternate (bus tie closed) modes of operation. Minimum and maximum possible fault conditions shall be covered in the study. It shall be the responsibility of the CONTRACTOR performing the study to determine the operating parameters of the system and to derive the worst-case fault conditions. Assumptions of plant operation shall not be allowed.

N. Consider the fault contribution of all motors operating during the maximum demand condition of the motors.

O. Calculate short-circuit momentary duties and interrupting duties on the basis of an assumed bolted 3 phase short circuit at each high and medium voltage switchgear bus and controller, low voltage switchgear bus, switchboard, motor

control center, distribution panelboard, pertinent branch circuit panelboard and other significant locations throughout the systems. The short circuit tabulations shall include X/R ratios, asymmetry factors, KVA and symmetrical fault-current. Provide a ground fault current study for the same system areas. Include in tabulations fault impedance, X/R ratios, asymmetry factors, motor contribution, short circuit KVA, and symmetrical and asymmetrical fault-currents.

P. The studies shall include representation of the site power system, the base quantities selected, impedance source data, calculation methods and tabulations, one-line diagrams, conclusions and recommendations.

Q. Provide the following:

1. The available fault current at each bus within the limits of the study shall be identified and listed.

2. The momentary and interrupting rating of all elements of the distribution system shall be listed. The maximum available fault current available at each element shall be calculated.

3. Determine the adequacy of the electrical protective devices to withstand the maximum available fault at the terminals of the equipment. Provide an equipment list, the equipment rating (both momentary and withstand), the maximum available fault rating and the adequacy of the equipment to withstand the fault. The results shall be tabulated in the form of a PASS/FAIL device evaluation table Equipment that does not have adequate ratings shall be identified immediately and brought to the attention of the JEA ENGINEER.

4. The short circuit portion of the report shall include:

   a. Executive summary describing the distribution system, the procedures used to develop the study, utility related information furnished by the utility company including the name and telephone number of the individual supplying the information, identify all assumptions made in the preparation of the study, identify any problem areas and provide a definitive statement concerning the adequacy of the distribution system to interrupt and withstand the maximum possible fault current.

   b. Computer printout of the input data.

   c. Computer printouts for the three phase and ground fault studies. Printouts shall indicate the fault current available at each major equipment, distribution bus within the high, medium and low voltage distribution systems.

   d. Table listing all the electrical distribution and utilization equipment (including VFDs), the equipment interrupting and withstand ratings, the available fault current at the terminals of the equipment and the ability of the equipment to interrupt and/or withstand the fault.

e. The short circuit study shall be prepared using approved computer software and must include complete fault calculations as specified herein for each proposed and ultimate source combination. Source combinations may include present and future Power Company supply circuits, large motors, or generators.

R. Automatic Load Transfer

1. Provide a detailed study demonstrating the interrupting capacity of automatic transfer bus ties and switches, as well as the fault withstand capabilities. The following shall be considered:

a. X/R ratio fault-current of circuit at point of transfer.

b. X/R ratio and fault-current rating of the transfer device.

c. Length of time fault may persist prior to protective device opening.

d. Magnetic stress withstand rating.

e. I2t withstand rating.

f. Transfer device maximum interrupting duty compared to load interrupting duty.

1.06 Protective Device Coordination

S. Provide a protective device time-current coordination study in accordance with ANSI/IEEE Std. 242, with coordination plots of protective devices plus tabulated data, including ratings and settings selected. In the study, balance shall be achieved between the competing objectives of protection and continuity of service for the system specified, taking into account the basic factors of sensitivity, selectivity and speed.

T. Provide separate plots for each mode of operation: (1) "double-ended mode" (double-ended substation with bus tie open); (2) "singled ended mode" (single incoming utility feeder energized all switchgears single ended with bus ties closed); (3) "stand-by mode" (on-site generation solely providing power to the system; (4) "peak shaving modes" (a.) (double-ended substation with bus tie open with on-site generation paralleled) and (b) (single-ended with bus ties closed with on-site generation paralleled). Show maximum and minimum fault values in each case. Multiple power sources shown in one plot is not acceptable.

U. Each primary protective device required for a delta-to-wye-connected transformer shall be selected so the characteristic or operating band is within the transformer parameters, which, where feasible, shall include a parameter equivalent to 58 percent of the ANSI C37.91 withstand curve to afford protection for secondary line-to-ground faults. Separate low voltage power circuit breakers from each other and the associated primary protective device, by a 16 percent current margin for coordination and protection in the event of line-to-line faults. Separate the protective relays by a 0.3-second time margin for the maximum 3 phase fault

conditions to assure proper selectivity. The protective device characteristics or operating bands shall be terminated to reflect the actual symmetrical and asymmetrical fault-currents sensed by the device. Provide the coordination plots for 3 phase and phase-to-ground faults on a system basis. Include at least all devices down to largest branch circuit and largest feeder circuit breaker in-each motor control center and/or power distribution panelboard. Include all adjustable setting ground fault protective devices.

V. Select relay types (i.e., inverse, very inverse, extremely inverse, over current with or without voltage restraint, timers, etc.), current transformer ratings and types, fuse, residually or zero sequence connected ground faults protection, etc., that will allow the system to be protected to within the equipment fault ratings and provide the maximum possible coordination between the protective devices.

W. Multifunction Solid State Relays

1. Where multifunction solid state relays are already installed, it shall be the responsibility of the CONTRACTOR to obtain the current and complete list of software setpoints programmed into the device. These setpoints shall be evaluated for potential impacts on the protective device coordination.

2. Where multifunction solid state relays are being install, it shall be the responsibility of the CONTRACTOR to provide all setpoints needed for the specified operation of the relay. These settings include but are not limited to:

   a. The complete pickup settings of all protective elements specified by the designer and shall not be limited to only the overcurrent pickup settings. Settings for protective elements such as reverse power, synchronization, frequency and voltage control, etc. shall be provided in full.

   b. Differential pickup and zone settings necessary for the relay to operate as specified and designed and to protect the zone it is intended for. Zone of protection calculations and balance equations shall be completed entirely by the CONTRACTOR based on the equipment as furnished and designed.

   c. The complete protective relay logic map and logic equations. The relay logic is responsible for translating the pickups of the protective elements into relay output events and device trips. All logic necessary to create the specified output of the relay based on the specified protective elements shall be furnished with the protective device coordination report.

   d. Any and all miscellaneous settings necessary for the relay to communicate with the installation systems and the mirroring of data to other installation systems as specified or designed.

3. CONTRACTOR shall be responsible for the programming of relays prior to the field testing and start up requirements of this contract.

CONTRACTOR shall be responsible for all time needed to complete the relay settings in order to furnish a completely functional system as specified and required by the approved protection device settings.

X. Arc Flash Mitigation and Reduction Modes

1. Where devices are furnished with alternative trip settings intended to mitigate arc flash hazards, the CONTRACTOR shall coordinate these alternative pickup settings and provide representation of their tripping characteristics via TCC's. The alternative pickup settings shall be coordinate with the associated load and shall be set to provide the fastest device response time while avoiding nuisance trips during normal plant operation.

Y. Generator Protective Devices

1. The study shall address all of the protective devices provided for generator protection.

2. Protective relays requiring settings shall be included.

3. The Electrical Contractor shall obtain all necessary generator information to perform this study.

Z. Motor Protection and Coordination

1. Provide a complete and independent set of current-time characteristic curves for all motors 50 HP and above indicating coordination between the protective relays and the thermal and starting characteristics of the motor.

2. The CONTRACTOR shall obtain from the motor supplier the necessary information to perform the study. Certified curves for "Safe Time vs. Current at 100% Voltage" and "Accelerating Time vs. Current at 100% Voltage" are necessary and shall become part of the final report.

AA. Call discrepancies to the attention of the JEA ENGINEER in the conclusions and recommendations of the report.

BB. The Time current Characteristic Curves shall include:

1. The coordination plots shall graphically indicate the coordination proposed for the several systems centered on full-scale log forms. The coordination plots shall include complete titles, representative one-line diagrams and legends, associated upstream power system relays, fuse or system characteristics, significant motor starting characteristics, significant generator characteristics, complete parameters for power, and substation transformers, complete operating bands for low voltage circuit breaker trip devices, fuses, and the associated system load protective devices. The coordination plots shall define the types of protective devices selected, together with the proposed coil taps, time-dial settings and pick-up settings required. The short-time region shall indicate the relay instantaneous elements, the magnetizing inrush, and

ANSI transformer damage curves, the low voltage circuit breaker and instantaneous trip devices, fuse manufacturing tolerance bands, and significant symmetrical and asymmetrical fault-currents.

2. No more than six devices shall be shown on one coordination plot. Of these six curves, two (the largest upstream device and the smallest downstream device) shall repeat curves shown on other coordination plots in order to provide cross-reference. Give each curve in the study a study-unique number or letter identifier to permit cross-reference between plots.

3. The coordinating time interval between primary and back-up protective devices shall be as per Table 15-3, Section 15.6, IEEE Std. 242-2001.

4. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings. A tabulation shall include settings for every overcurrent protective device, timer, power system relays (e.g., ANSI 25, 27, 32, 67, 87, etc.), circuit breaker, recommended fuse and current transformer ratings, etc. Include C.T. ratio, burden and all other calculations required for the determination of settings. Provide recommended settings for all protective devices furnished under Division 26 and furnished with those furnished with Variable Frequency Drives and associated transformers, generators and associated paralleling and distribution switchgear.

1.07 Arc Flash

CC. Provide an arc flash study that utilizes the fault current values calculated in the short circuit study and the minimum clear times of the upstream protective device selected in the coordination study to calculate the incident energy at each fault location.

DD. The Arc Flash study shall be in accordance with the procedure outlined in NFPA 70E.

EE. Calculate the incident energy levels at each faulted bus for each mode of operation: (1) "double-ended mode" (double-ended substation with bus tie open); (2) "singled ended mode" (single incoming utility feeder energized all switchgears single ended with bus ties closed); (3) "stand-by mode" (on-site generation solely providing power to the system; (4) "peak shaving modes" (a.) (double-ended substation with bus tie open with on-site generation paralleled) and (b) (single-ended with bus ties closed with on-site generation paralleled). Determine arc flash incident energy values for both maximum and minimum fault values in each case.

FF. Extent of Study

1. The arc flash study shall include analysis for all equipment that would normally be serviced while energized and cannot be easily shut down during maintenance periods. The CONTRACTOR shall coordinate with JEA to ensure that all equipment that is expected to be analyzed is

included in the study. The extent of the analysis includes but is not limited to:

a. Switchgear, MCC's and distribution equipment.

b. Low voltage lighting panels, even those covered by certain calculation exceptions must be modeled and provided with a unique device label.

c. Low voltage control equipment such as 120-600V control panels.

GG. Arc Flash Labels

1. The arc flash study shall produce a single set of label templates that shall not be printed until the final arc flash study has been approved.

2. A single set of labels shall be printed and affixed to the equipment analyzed if the equipment is continuous. Double ended equipment shall have individual labels for each side of the gear. Equipment that is not continuous shall have a single label placed on each piece of continuous gear.

3. Where applicable, LINE and LOAD labels shall be produced for equipment. Examples of equipment that require these labels include the main breakers of switchgear and MCC's. In these cases, the LINE side breakers shall be affixed to indicate the hazard associated with the line side of the equipment and the LOAD label shall be affixed to indicate the hazard associated with the rest of the gear.

4. Labels shall be affixed where they are clearly identifiable with the equipment they depict. Labels shall not obscure any other signage on the equipment unless they are used to completely cover a previous arc flash label.

5. Labels shall meet the following requirements:

a. Labels shall be indoor/outdoor rated weather resistant vinyl or polyester with a UV resistant overlaminate. The label shall have a minimum thickness of 5 mil. Labels shall be backed with pressure sensitive permanent cold temperature adhesive rated for a minimum 5-year life in the environment in which they are installed.

b. All lettering shall be black and printed via thermal transfer. Backgrounds shall be orange for hazard risk categories 1-4 and red for "Dangerous" areas.

c. Where subjected to degrading or corrosive environments, the labels shall be provided with a tinted fiber glass cover.

d. The label shall match any pre-existing facility or JEA specified formatting. The CONTRACTOR shall be responsible for

obtaining this formatting information prior to submitting label templates.

e. A single label for equipment is acceptable where equipment is continuous. In the event of split busses or equipment not arranged in a continuous fashion, multiple labels shall be provided.

f. Line side labels for equipment main breakers shall be included in addition to load side labels.

g. Labels shall be DANGER/WARNING type conforming to the NFPA 70E and ANSI Z534.4 standards. Labels are required to have the minimum information specified by these standards printed on them. Labels shall be legible and standard throughout the plant.

h. Labels templates shall be provided to the JEA ENGINEER and JEA for final approval and shall be printed and affixed by the CONTRACTOR. CONTRACTOR shall be responsible for all work required to print and affix the labels to the equipment. Labels shall be affixed in accordance with the direction of JEA.

6. CONTRACTOR shall produce all arc flash labels and coordinate affixing them onto all equipment.

HH. Arc Flash Mitigation and Reduction Devices

1. Where devices are furnished with alternative trip settings intended to mitigate arc flash hazards, the CONTRACTOR shall provide an alternative arc flash lookup table associated with these alternative settings.

2. Labels shall have only the worst-case hazard risk category (without the arc flash reduction settings) depicted. Multiple labels for different device settings shall not be accepted.

3. Devices such as differential protection relays which limit incident energy by limiting the magnitude of the available fault and/or minimizing the fault clearing time may be used to calculate hazard risk categories. The use of these devices in the calculations shall only be permitted where permitted by the standards and code guidelines used to complete the arc flash analysis. If not explicitly stated by the standard as an acceptable method for calculating arc flash hazard, it shall not be permitted.

II. Arc Flash Hazard Mitigation

1. Acceptable hazard risk categories shall be coordinated by the CONTRACTOR between JEA and JEA ENGINEER. Where there are no guidelines determining acceptable arc flash levels, the CONTRACTOR shall actively attempt to reduce all hazard risk categories greater than 2. CONTRACTOR shall list all areas greater that category 2 in the

conclusion of the report and shall give reasons for the high incident energy.

2. The CONTRACTOR shall be responsible for proposing and evaluating arc flash mitigation measure including but not limited to:

   a. Adjustment of protective devices in an attempt to better balance the system coordination and the incident energy available to an arcing fault.

   b. Equipment that could be used to physically remove the operator from the arc flash hazard boundary (mimic panels, remote switching/racking).

   c. Equipment that could be used to limit the amount of incident energy or reduce the protective device pickup time (maintenance mode bypass, differential relaying).

3. Proposing an evaluating these arc flash mitigation measures shall include evaluating the cost and implementation of the options as well as reevaluating and reporting the hazard risk category associated with their installation.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Quality Assurance

JJ. Adjust relay and protective device settings according to values established by coordination study.

KK. Make minor modifications to equipment as required to accomplish conformance with the short circuit and protective device coordination studies.

LL. Notify JEA ENGINEER in writing of any required major equipment modifications.

END OF SECTION

DIVISION 31 – EARTH WORK

31 05 00 Earthwork

Part 1 General

1.01 Scope of Work

A. Under this section, the CONTRACTOR shall furnish all materials, labor, and equipment necessary to perform work related to all excavation, trenching, and backfill, as shown on the Construction Drawings or specified herein.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 01 35 29.13 – Health, Safety, and Emergency Response Requirements for Contaminated Sites
2. Section 02 05 00 - Maintenance of Existing Conditions
3. Section 02 61 00 - Removal and Disposal of Contaminated Materials
4. Section 02 61 10 - Removal and Staging Contaminated Materials
5. Section 02 61 20 - Transporting and Disposing of Contaminated Materials
6. Section 31 20 00 – Clearing and Grubbing
7. Section 31 23 00 – Excavation and Backfill
8. Section 31 25 00 - Erosion and Sedimentation Control

1.03 Cited Standards – None

1.04 Noted Restrictions

A. Under this section, the CONTRACTOR shall furnish all materials, labor, and equipment necessary to perform work related to the staging and handling of contaminated materials, as shown on the Construction Drawings or specified herein. CONTRACTOR shall prevent contaminated materials from coming into contact with other non-contaminated material (soil, surface water, concrete, asphalt, etc.). Any non-contaminated material which comes into contact with contaminated material shall be decontaminated or treated as contaminated material as directed by the JEA ENGINEER at the CONTRACTOR'S expense.

1.05 Safety

A. All excavation work shall be in accordance with OSHA safety standards, including OSHA Excavation Standards (29 CFR Subpart P 1926.650) and the Florida Statutes, Chapter 553, Part III, Trench Safety Act.

B. The minimum personal protection required for the work to be performed is anticipated to be level "D". The CONTRACTOR shall be responsible for determining the level of protection for its staff and for providing all required personal protective equipment. The CONTRACTOR is responsible for implementing a Health and Safety Plan in accordance with 29 CFR Part 1910.120. Previous environmental assessments and geophysical surveys indicate that the soils and groundwater may be impacted with arsenic, vanadium and nickel and the CONTRACTOR should be prepared for these conditions. Copies of 40-hour HAZWOPER and current certification documenting compliance with training and health monitoring shall be provided by the CONTRACTOR for all on-site personnel prior to commencing field activities. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings during drilling activities.

1.06 Quality Control

A. The CONTRACTOR shall make all excavations for piping and appurtenant structures in any material encountered to the depth and grades indicated on the Construction Drawings, shall backfill such excavations and dispose of excess or unsuitable materials from such excavations, and shall provide and place necessary borrow material to properly backfill excavations, all as indicated on the Construction Drawings, specified herein or as directed by the JEA ENGINEER.

B. Limits of Work

1. The CONTRACTOR shall confine his operations to designated areas of the site as shown on the Construction Drawings and as directed by the JEA ENGINEER.

2. The CONTRACTOR shall occupy and cross only those portions of the site on which the actual work is located.

C. Antipollution Measures

1. The CONTRACTOR shall conduct his activities and shall program his excavation, trenching, and restoration operations in such a manner as to minimize pollution from erosion of the freshly excavated or backfilled material during periods of excavation.

2. The CONTRACTOR shall reduce the area and duration of exposure of all erodible soils by the greatest extent practicable. At a minimum, the CONTRACTOR shall install silt fencing along the perimeter of the work area as specified on the Construction Drawings. Where the JEA ENGINEER so directs in the field, sediment traps and other means to retard runoff rates shall be installed. Discretion shall be exercised in selecting the number and location of encroachments during construction both in and along watercourses such that a minimum of disturbance and erosion pollution result.

3. The CONTRACTOR shall be responsible for all surface water runoff and/or groundwater tributary to the trenches constructed and shall

supply the necessary dewatering and pumping equipment for handling those flows during construction.

4. During all construction activities, the CONTRACTOR shall also, wherever possible, make every effort to minimize noises caused by his activities, especially in populated residential areas. Equipment shall be equipped with mufflers or silencers designed to operate with the least possible noise levels.

5. During all construction activities, the CONTRACTOR shall also, wherever possible, make every effort to minimize fugitive dust. As required or directed by the JEA ENGINEER, CONTRACTOR shall use water trucks to wet soils.

6. The CONTRACTOR shall not use any vacant lot, or private land as a plant site, depository for materials, or spill site, or for any other purpose without the written authorization of the JEA (or an authorized agent of the land), a copy of which authorization shall be filed with JEA and the JEA ENGINEER.

Part 2 Products - None

Part 3 Execution

3.01 Preparation

A. The aerial extent and depth of excavations and trenches shall comply with the line and grades as shown on the Construction Drawings, or with the line and grades established by the JEA ENGINEER in the field.

B. The CONTRACTOR shall provide adequate and suitable means of support to prevent failure of any excavation wall and to protect his personnel working in the excavation. The system of support shall be in accordance with current OSHA regulations.

3.02 Installation

A. All open excavations or trenches in the construction area shall be adequately barricaded and posted with battery operated warning lights, signs, etc., as required by any local, State, or Federal regulations, or by any published policy by JEA, or in the absence of any such regulation, to the satisfaction of the JEA ENGINEER.

B. Excavated non-contaminated material used for backfill shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated non-contaminated material is required, the CONTRACTOR shall be responsible for obtaining the sites to be used and shall so maintain the operations as to provide for natural drainage and not present an unsightly appearance. No excavated non-contaminated material shall be placed on private property without the written consent of the property owner.

C. As required, to maintain traffic and/or provide access to the property, all open

excavations or trenches in the construction area logistically able to be covered by typical construction-type steel plate(s) shall be covered with the referenced plating by the CONTRACTOR while these openings exist and shall be done to the satisfaction of the JEA ENGINEER.

D. Should the CONTRACTOR's operations encounter foundations of new or existing structures, the CONTRACTOR shall perform excavation and backfill in such a manner as not to undermine any new or existing structure. CONTRACTOR shall be solely responsible for maintaining stability of all new and existing structures.

E. The CONTRACTOR shall prevent surface water and subsurface or groundwater from flowing into excavations and from flooding the project site. The CONTRACTOR shall not allow water to accumulate in trenching.

F. CONTRACTOR shall excavate, segregate, and dispose of contaminated materials per Section 02 61 10 and Section 02 61 20.

END OF SECTION

31 05 19 Geosynthetics

31 05 19.13 Geotextiles for Earthwork

Part 1 General

1.01 Scope of Work

A. This section includes the requirements for geotextile products and their installation.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Common Work Results for Existing Conditions

2. Section 31 05 00 - Common Work Results for Earthwork

1.03 Cited Standards

A. Latest version of ASTM International (ASTM) standards:

1. ASTM D 4355. Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

2. ASTM D 4491. Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

3. ASTM D 4533. Standard Test Method for Trapezoidal Tearing Strength of Geotextiles.

4. ASTM D 4632. Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

5. ASTM D 4751. Standard Test Methods for Determining Apparent Opening Size of a Geotextile.

6. ASTM D 4833. Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.

7. ASTM D 4873. Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.

8. ASTM D 5261. Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.

9. ASTM D 5493. Standard Test Method for Permittivity of Geotextiles Under Load.

10. ASTM D 6241. Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

1.04 Submittals

A. Submit the following to the JEA ENGINEER not less than 30 calendar days prior to use for review:

1. proposed geotextile;

2. manufacturer's product information and the recommended methods of installation; and

3. certification of minimum average roll values and the corresponding test procedures for all geotextile properties listed in Table 310519-1.

Part 2 Products

2.01 Materials

A. Furnish geotextile products with minimum average roll values (95 percent lower confidence limit) meeting or exceeding the required property values in Table 310519-1.

B. Geotextile shall be a 8 ounce per square yard non-woven geotextile consisting of long-chain polymeric filaments or yarns. Material composition and properties shall conform to those specified in Table 310519-1.

C. Furnish geotextiles that are manufactured from first quality polymers, with no more than 20 percent reclaimed polymer used in production.

D. Furnish polymeric threads for stitching that are ultra-violet (UV) light stabilized to at least the same requirements as the geotextile to be sewn.

2.02 Manufacturing Quality Control

A. Sample and test the geotextile to demonstrate that the material conforms to the requirements of this section.

B. Perform manufacturing quality control tests to demonstrate that the geotextile's properties conform to the values specified in Table 310519-1. Perform as a minimum, the following manufacturing quality control tests at a minimum frequency of once per 50,000 square feet with minimum of 1 test per resin lot.

Test	Procedure
Mass per unit area	ASTM D 5261
Grab strength	ASTM D 4632
Tear strength	ASTM D 4533
Puncture strength	ASTM D 4833
Static Puncture strength	ASTM D 6241

C. Perform additional manufacturing quality control tests on the geotextile filter at

a minimum frequency of once per 100,000 square feet with minimum of 1 test per resin lot, to demonstrate that the apparent opening size (ASTM D 4751) and permittivity (ASTM D 4491) of the geotextile conform to the values specified in Table 310519-1.

D. Submit quality control certificates signed by the geotextile manufacturer quality control manager. The certificates shall state that the geotextiles are continuously inspected and are needle-free. The quality control certificates shall also include: lot, batch, and roll number and identification; and results of manufacturing quality control tests including description of test methods used.

E. Do not supply any geotextile roll that does not comply with the manufacturing quality control requirements.

F. If a geotextile sample fails to meet the quality control requirements of this section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

2.03 Packaging and Labeling

A. Supply geotextiles in rolls wrapped in relatively impermeable and opaque protective wrapping. Wrapping which becomes torn or damaged shall be repaired with similar materials.

B. Mark or tag geotextile rolls in accordance with ASTM D 4873 with the following information:

1. manufacturer's name;
2. product identification;
3. lot or batch number;
4. roll number; and
5. roll dimensions.

C. Geotextile rolls not labeled in accordance with this section or on which labels are illegible upon delivery to the site shall be rejected and replaced at no expense to the JEA.

2.04 Transportation

A. Deliver geotextiles to the site at least 14 calendar days prior to the planned deployment date to allow the JEA ENGINEER adequate time to perform conformance testing on the geotextile samples if necessary.

2.05 Handling and Storage

A. Protect geotextiles from sunlight, moisture, excessive heat or cold, puncture, mud, dirt, and dust or other damaging or deleterious conditions. Follow all geotextile manufacturer recommendations for handling and storage. Geotextile

rolls shall be covered with additional tarp cover (in addition to the roll cover) to prevent damage to the rolls.

B. Store geotextile rolls on pallets or other elevated structures. Do not store geotextile rolls directly on the ground.

C. Outdoor storage of geotextile rolls shall not exceed the manufacturer's recommendation or longer than 6 months, whichever is less.

Part 3 Execution

3.01 Installation

A. After unwrapping the geotextiles from its opaque cover, do not leave them exposed for a period in excess of 30 calendar days.

B. Placement of geotextile shall be on smooth, compacted soil which is free of rocks, holes, depressions, projections, muddy conditions, and standing or flowing water. Notify the JEA ENGINEER 24 hours prior to the installation of geotextile.

C. Geotextile shall be joined by overlapping a minimum of 18” (unless otherwise specified) and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacture, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation and placement of aggregate materials for the gravel road. Pins shall be steel or fiberglass formed as a U, L, or T shape.

D. The securing pins shall be installed along a line about 2 inches in from the edge of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified.

E. Any geotextile that is damaged (torn or punctured) shall be removed and replaced.

3.02 Construction Quality Assurance

A. The installation of geotextiles will be monitored by the JEA ENGINEER as specified in this section.

B. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the JEA ENGINEER at no additional cost to the JEA.

Table 310519-1

REQUIRED PROPERTY VALUES FOR GEOTEXTILE SEPARATOR

PROPERTIES (6)	QUALIFIER	UNITS (5)	SPECIFIED VALUES (1)	TEST METHOD
Product Requirements				
Type	--	--	Woven	--
Polymer composition	Minimum	%	95 polypropylene or polyester by wt	--
Mass per unit area	Minimum	oz/yd^2	10	ASTM D 5261
Filter Requirements				
Apparent opening size	Maximum	mm	$O_{95} \leq 0.21$	ASTM D 4751
Permittivity	Minimum	sec^{-1}	0.5	ASTM D 4491
Mechanical Requirements				
Grab strength	Minimum	lb	200	ASTM D 4632 (2)
Tear strength	Minimum	lb	75	ASTM D 4533 (3)
Puncture strength	Minimum	lb	90	ASTM D 4833 (4)
Static puncture strength	Minimum	psi	500	ASTM D 6241
Durability Requirements				
Ultraviolet Resistance	Minimum	%	70	ASTM D 4355

Notes:

(1) All values represent minimum average roll values.
(2) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
(3) Minimum value measured in machine and cross machine direction.
(4) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
(5) mm = millimeter; % = percent; oz/yd^2 = ounce per square yard; sec = second; lb = pound; psi = pound per square inch
(6) See Paragraph 2.02 for required MQC test frequencies.

END OF SECTION

31 20 00 Clearing and Grubbing

Part 1 General

1.01 Scope of Work

A. This section describes the requirements for clearing, grubbing, and/or stripping activities. Clearing, grubbing, and/or stripping activities will be required to perform the earthwork and perform other work, as needed, to complete various construction activities.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 31 23 00 – Excavation and Backfill
3. Section 31 25 00 - Erosion and Sedimentation Control

1.03 Cited Standards - None

1.04 Noted Restrictions - None

1.05 Definitions

A. Clearing consists of the removal of trees, bushes, vegetation, and other surface debris that are 18 inches or greater above the ground surface.

B. Grubbing consists of the removal of stumps, roots, and vegetation to a depth of 3 feet below the existing ground surface or subgrade elevation, whichever is lower.

C. Stripping consists of the removal of minimum 6 inches topsoil layer including roots and organic matter, grass, and other material unsuitable for use as subgrade or compacted fill.

Part 2 Products - None

Part 3 Execution

3.01 Preparation

A. Furnish equipment to perform the clearing, grubbing, and stripping specified in this Section.

B. Prior to implementing any work described in this section, the CONTRACTOR shall install all erosion and sediment controls in the relevant area(s) of construction.

C. CONTRACTOR is solely responsible for selecting, implementing, and maintaining proper and fully adequate erosion and sediment controls at all times during construction.

3.02 Completion

A. Perform clearing and grubbing in soil cover area and other areas as shown on the Construction Drawings unless otherwise directed by the JEA ENGINEER.

B. Perform clearing and grubbing as separate activities.

C. In those areas where only clearing is required, perform clearing in a manner that minimizes disturbance to the existing ground surface.

D. Stockpile cleared and grubbed materials separately as directed by the JEA ENGINEER.

END OF SECTION

31 23 00 Excavation and Backfill

31 23 16 Excavation

Part 1 General

1.01 Scope of Work

A. Under this section, the CONTRACTOR shall furnish all materials, labor, and equipment necessary to perform work related to all excavation, trenching, and backfill, as shown on the Construction Drawings or specified herein.

B. CONTRACTOR shall decontaminate all equipment in contact with contaminated soils with a high pressure stream cleaner or broom sweep to the satisfaction of the JEA ENGINEER. All decontamination fluids shall be properly containerized and disposed of by CONTRACTOR.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 02 61 00 - Removal and Disposal of Contaminated Materials
3. Section 02 61 10 - Removal and Staging Contaminated Materials
4. Section 02 61 20 - Transporting and Disposing of Contaminated Materials

1.03 Cited Standards - None

1.04 Noted Restrictions

A. Under this section, the CONTRACTOR shall furnish all materials, labor, and equipment necessary to perform work related to the staging and handling of contaminated materials, as shown on the Construction Drawings or specified herein. CONTRACTOR shall prevent contaminated materials from coming into contact with other non-contaminated material (soil, surface water, concrete, asphalt, etc.). Any non-contaminated material which comes into contact with contaminated material shall be decontaminated or treated as contaminated material as directed by the JEA ENGINEER at the CONTRACTOR'S expense.

B. CONTRACTOR shall assume that soils exceeding the Ecological Risk Assessment (ERA) within SWMU 18 are contaminated material. The location of soils exceeding the ERA are illustrated on the Construction Drawings. The CONTRACTOR is responsible to staking the area in accordance with the surveying specification.

C. CONTRACTOR shall assume that all groundwater and soil beneath the water table is contaminated material and will need to be properly disposed of.

D. CONTRACTOR shall assume that all sediment within the existing drainage ditch is contaminated material.

E. CONTRACTOR shall assume that the soils are non-hazardous and shall be managed, handled, transported and disposed as such.

1.05 Safety

A. All excavation work shall be in accordance with OSHA safety standards, including OSHA Excavation Standards (29 CFR Subpart P 1926.650) and the Florida Statutes, Chapter 553, Part III, Trench Safety Act.

B. The minimum personal protection required for the work to be performed is anticipated to be level "D". The CONTRACTOR shall be responsible for determining the level of protection for its staff and for providing all required personal protective equipment. The CONTRACTOR is responsible for implementing a Health and Safety Plan in accordance with 29 CFR Part 1910.120. Previous environmental assessments and geophysical surveys indicate that the soils and groundwater may be impacted with arsenic, vanadium and nickel and the CONTRACTOR should be prepared for these conditions. Copies of 40-hour HAZWOPER and current certification documenting compliance with training and health monitoring shall be provided by the CONTRACTOR for all on-site personnel prior to commencing field activities. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings during drilling activities.

1.06 Quality Control

A. The CONTRACTOR shall make all excavations for piping and appurtenant structures in any material encountered to the depth and grades indicated on the Construction Drawings, dispose of excess or unsuitable materials from such excavations, and shall provide and place necessary borrow material to properly backfill excavations, all as indicated on the Construction Drawings, specified herein or as directed by the JEA ENGINEER.

Part 2 Products - None

Part 3 Execution

3.01 Preparation

A. The aerial extent and depth of site grading, excavations and trenches shall comply with the line and grades as shown on the Construction Drawings, or with the line and grades established by the JEA ENGINEER in the field.

B. The CONTRACTOR shall provide adequate and suitable means of support to prevent failure of any excavation wall and to protect his personnel working in the excavation. The system of support shall be in accordance with current OSHA regulations.

3.02 Installation

A. All open excavations or trenches in the construction area shall be adequately

barricaded and posted with battery operated warning lights, signs, etc., as required by any local, State, or Federal regulations, or by any published policy by JEA, or in the absence of any such regulation, to the satisfaction of the JEA ENGINEER.

B. Excavated non-contaminated material used for backfill shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated non-contaminated material is required, the CONTRACTOR shall be responsible for obtaining the sites to be used and shall so maintain the operations as to provide for natural drainage and not present an unsightly appearance. No excavated non-contaminated material shall be placed on private property without the written consent of the property owner.

C. As required, to maintain traffic and/or provide access to the property, all open excavations or trenches in the construction area logistically able to be covered by typical construction-type steel plate(s) shall be covered with the referenced plating by the CONTRACTOR while these openings exist and shall be done to the satisfaction of the JEA ENGINEER.

D. Should the CONTRACTOR's operations encounter foundations of new or existing structures, the CONTRACTOR shall perform excavation and backfill in such a manner as not to undermine any new or existing structure. CONTRACTOR shall be solely responsible for maintaining stability of all new and existing structures.

E. The CONTRACTOR shall prevent surface water and subsurface or groundwater from flowing into excavations and from flooding the project site. The CONTRACTOR shall not allow water to accumulate in trenching.

F. CONTRACTOR shall excavate, segregate, and dispose of contaminated materials per Section 02 61 10 and Section 02 61 20.

END OF SECTION

31 23 19 Dewatering and Drainage

Part 1 General

1.01 Scope of Work

A. Design, furnish, install, operate, monitor, maintain and remove a temporary dewatering system as required to lower and control water levels at least 2 feet below subgrades of excavations and to permit construction to proceed in-the-dry.

B. Furnish, maintain and remove temporary surface water control measures adequate to drain and remove surface water entering excavations.

C. Retain the services of a professional engineer registered in the State in which the work will occur to prepare dewatering and drainage system designs and submittals described herein.

D. Work shall include the design, equipment, materials, installation, protection, and monitoring of geotechnical instrumentation required to monitor the performance of the dewatering and drainage system as required herein.

E. Collect and properly dispose of all discharge water from the dewatering and drainage systems with the provisions of Section 01 35 43. Under no circumstances shall water from dewatering systems be discharged into the existing or new sanitary sewer systems.

F. Obtain and pay for all permits required for dewatering and drainage systems.

G. Repair damage caused by dewatering and drainage system operations.

1.02 Referenced Sections

A. Section 31 05 00 - Earthwork

B. Section 31 23 00 - Excavation and Backfill

C. Section 31 23 16 - Excavation

D. Section 31 23 23 - Backfilling and Compaction

E. Section 31 23 33 - Trenching

F. Section 31 25 00 - Erosion and Sedimentation Control

1.03 Submittals

A. Dewatering and drainage system designs shall be prepared by a licensed professional engineer retained by the CONTRACTOR. The CONTRACTOR shall submit an original and three copies of the licensed professional engineer's certification on the PE form specified in Section 01 33 00. The CONTRACTOR shall also submit qualifications as required herein.

B. The CONTRACTOR shall submit a dewatering and drainage system design plan. The plan shall include a description of the proposed dewatering system and include the proposed installation methods to be used for dewatering and drainage system elements and for observation wells. The plan shall include equipment, drilling methods, holes sizes, filter sand placement techniques, sealing materials, development techniques, the number and location of dewatering points and observations wells, etc. Include the dewatering system design calculations in the plan.

C. The plan shall identify the anticipated area influenced by the dewatering system and address impacts to adjacent existing and proposed structures.

D. Coordinate dewatering and drainage submittals with the excavation and support of excavation submittals. The submittal shall show the areas and depths of excavation to be dewatered.

E. Do not proceed with any excavation or dewatering activities until the dewatering submittals has been accepted by the JEA ENGINEER.

1.04 Quality Assurance

A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.

B. The CONTRACTOR shall have at least 5 years of experience with work compatible to the work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of work.

C. The CONTRACTOR's design engineer shall be registered in the State in which the work is located and have a minimum of 5 years of professional experience in the design and construction of dewatering and drainage systems and shall have completed not less than 5 successful dewatering and drainage projects of equal type, size, and complexity to that require for the work.

1.05 Design Requirements

A. The CONTRACTOR is responsible for the proper design and implementation of methods for controlling surface water and groundwater.

B. The primary purpose of the groundwater control system is to preserve the natural undisturbed condition of the subgrade soils in the areas of the proposed excavations. Prior to excavation, the CONTRACTOR shall lower the groundwater to at least 2 ft below the lowest excavation subgrade elevation. Additional groundwater lowering may be necessary beyond the 2-ft requirement, depending on construction methods and equipment used and the prevailing groundwater and soil conditions. The CONTRACTOR is responsible for lowering the groundwater as necessary to complete construction in accordance with the plans and specifications at no additional cost to the JEA.

C. Design deep wells, well points and sumps, and all other groundwater control system components to prevent loss of fines from surrounding soils. Sand

filters shall be used with all dewatering installations unless screens are properly sized by the CONTRACTOR's design engineer to prevent passage of fines from surrounding soils.

D. The CONTRACTOR shall be responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements and work that may result from dewatering or surface water control operations.

E. Design review and field monitoring activities by the JEA or by the JEA ENGINEER shall not relieve the CONTRACTOR of his/her responsibilities for the work.

1.06 Definitions

A. Where the phrase "in-the-dry" is used in this section, it shall be defined as an excavation subgrade where the groundwater level has been lowered to at least 2 ft below the lowest level of the excavation, is stable with no ponded water, mud, or muck, is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material, pipe or concrete foundations.

Part 2 Products

2.01 Materials

A. Piping, pumping equipment and all other materials required to provide control of surface water and groundwater in excavations shall be suitable for the intended purpose.

B. Standby pumping systems and a source of standby power shall be maintained at all sites.

Part 3 Execution

3.01 General

A. Control surface water and groundwater such that excavation to final grade is made in-the-dry, the natural undisturbed condition of the subgrade soils are maintained, and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.

B. Methods of groundwater control may include but are not limited to perimeter trenches and sump pumping, perimeter groundwater cutoff, well points, ejectors, deep wells and combinations thereof.

C. Where groundwater levels are above the proposed bottom of excavation level, a pumped dewatering system will be required for pre-drainage of the soils prior to excavation, and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged.

D. It is expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location.

E. All work included in this section shall be done in a manner which will protect adjacent structures and utilities and shall not cause loss of ground or disturbance to the pipe bearing soils or to soils which support overlying or adjacent structures.

F. Install, monitor and report data from observation wells. Evaluate the collected data relative to groundwater control system performance and modify systems as necessary to dewater the site in accordance with the Contract requirements.

G. Locate groundwater control system components where they will not interfere with construction activities adjacent to the work area or interfere with the installation and monitoring of geotechnical instrumentation including observation wells. Excavations for sumps or drainage ditches shall not be made within or below 1H:1V slopes extending downward and out from the edges of existing or proposed foundation elements or from the downward vertical footprint of the pipe.

3.02 Surface Water Control

A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations and to allow construction to proceed without delay.

3.03 Excavation Dewatering

A. At all times during construction, provide and maintain proper equipment and facilities to promptly remove and properly dispose of all water entering excavations. Excavations shall be maintained in-the-dry. Groundwater levels shall be kept at least 2 feet below the lowest excavation level.

B. Excavation dewatering shall maintain the subgrade in a natural undisturbed condition and until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

C. Pipe, masonry, and concrete shall not be placed in water or be submerged within 24 hours after being installed. Water shall not flow over new masonry or concrete within four days after placement.

D. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent flotation of the pipe by promptly placing backfill.

E. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed condition of the subgrade soils at the proposed bottom of excavation.

F. If the subgrade of the trench or excavation bottom becomes disturbed due to

inadequate dewatering or drainage, excavate below normal grade as directed by the JEA ENGINEER and refill with structural fill, screened gravel or other material as approved by the JEA ENGINEER at the CONTRACTOR's expense.

G. It is expected that the initial dewatering plan may have to be modified to suit the variable soil/water conditions to be encountered during construction. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.

H. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.

I. Water entering the excavation from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to a sump and pumped from the excavation to maintain a bottom free from standing water.

J. Drainage and dewatering fluids (free of sediment and solids) shall be disposed of in the CWTS ponds under JEA and JEA ENGINEER's direction. Existing or new sanitary sewers shall not be used to dispose of drainage.

3.04 Removal of Systems

A. At the completion of the excavation and backfilling work, and when approved by the JEA ENGINEER, all pipe, deep wells, wellpoints, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems shall be removed from the site. All materials and equipment shall become the property of the CONTRACTOR. All areas disturbed by the installation and removal of groundwater control systems and observation wells shall be restored to their original condition.

B. Leave in place any casings for deep wells, wellpoints or observation wells located within the plan limits of structures or pipelines or within the zone below 1H:1V planes extending downward and out from the edges of foundation elements or from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or existing structures.

C. Where casings are pulled, holes shall be filled with sand. Where left in place, casings should be filled with cement grout and cut off a minimum of 3 ft below finished ground level or 1 ft below foundation level so as not to interfere with finished structures or pipelines.

D. When directed by the JEA ENGINEER, observation wells should be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes shall be suitable for the traffic and for any other conditions to which the observation wells will be exposed.

END OF SECTION

31 23 23 Backfilling and Compaction

Part 1 General

1.01 Scope of Work

A. The CONTRACTOR shall utilized backfill as per the specifications contained herein.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 02 61 00 - Removal and Disposal of Contaminated Materials
3. Section 02 61 10 - Removal and Staging Contaminated Materials
4. Section 02 61 20 - Transporting and Disposing of Contaminated Materials
5. Section 31 23 00 - Earthwork and Backfill
6. Section 31 23 33 - Trenching, Backfilling, and Compaction
7. Section 31 25 00 - Erosion and Sedimentation Control

1.03 Cited Standards

A. Florida Department of Environmental Protection Standard Operating Procedures

B. All compaction shall conform to the requirements of the following standard specifications, of the latest revisions, as applicable:

1. ASTM D422-63(2007)e2 Standard Test Method for Particle-Size Analysis of Soils
2. ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))
3. ASTM D2487-11 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
4. ASTM D2974-14 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
5. ASTM D6938-17 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

6. All analytical soil testing shall be done by a NELAC-certified laboratory and shall conform to the following analytical methods:

   a. Environmental Protection Agency Method for Volatile Organic Compounds by Gas Chromatography Mass/Spectrometry (GC/MS) (EPA Method 8260)

   b. Environmental Protection Agency Method for Semi-Volatile Organic Compounds by Gas Chromatography Mass/Spectrometry (GC/MS) (EPA Method 8270)

   c. Environmental Protection Agency Method for RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) (EPA Method 6010 and EPA Method 7471)

   d. Environmental Protection Agency Method for nickel and vanadium (EPA Method 6010)

   e. Florida Petroleum Range Organics (FL-PRO)

   f. Environmental Protection Agency Method for Pesticides (EPA Method 8081 and EPA Method 8141)

1.04 Noted Restrictions

A. Under this section, the CONTRACTOR shall furnish all materials, labor, and equipment necessary to perform work related to the staging and handling of contaminated materials, as shown on the Construction Drawings or specified herein. CONTRACTOR shall prevent contaminated materials from coming into contact with other non-contaminated material (soil, surface water, concrete, asphalt, etc.).

B. Any non-contaminated material which comes into contact with contaminated material shall be decontaminated or treated as contaminated material as directed by the JEA ENGINEER at the CONTRACTOR'S expense.

1.05 Quality Control

A. The CONTRACTOR shall include all costs required for Proctor compaction testing, including delivery of said certified results to the JEA ENGINEER, in the total price bid for this Contract.

   1. Proctor compaction tests shall be in accordance with ASTM D1557.

B. Subject to unsatisfactory test results, the JEA ENGINEER reserves the right to order additional tests at no additional cost to the JEA or JEA ENGINEER until satisfactory test results are reached in the affected areas.

C. Analytical Testing

   1. CONTRACTOR shall collect a grab sample from each proposed backfill source (general fill, protective cover soil, and top soil) at a

frequency of one sample per 2,000 tons delivered to the site. Soil samples will be analyzed by the CONTRACTOR for the following. Analytical results must meet the most stringent Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs) for all constituents to be acceptable for backfill. Any soil that does not meet the SCTLs will be rejected by the JEA ENGINEER and resampling will be at no cost to JEA:

a. Environmental Protection Agency Method for Volatile Organic Compounds by Gas Chromatography Mass/Spectrometry (GC/MS) (EPA Method 8260);

b. Environmental Protection Agency Method for Semi-Volatile Organic Compounds by GC/MS (EPA Method 8270);

c. Environmental Protection Agency Method for RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) (EPA Method 6010 and EPA Method 7471);

d. Environmental Protection Agency Method for nickel and vanadium (EPA Method 6010);

e. Florida Petroleum Range Organics (FL-PRO); and

f. Environmental Protection Agency Method for Pesticides (EPA Method 8081 and EPA Method 8141).

2. CONTRACTOR shall collect up to four 6-point composite samples from stockpiled areas (at the direction of the JEA ENGINEER) containing material excavated during trenching activities (6-inch force main and to EW004S). Soil samples will be analyzed by the CONTRACTOR for the following contaminants. Analytical results must meet the most stringent Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs) for all constituents to be acceptable for backfill. Any soil that does not meet the SCTLs will be rejected by the JEA ENGINEER and will require off-site disposal:

a. Environmental Protection Agency Method for RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) (EPA Method 6010 and EPA Method 7471);

b. Environmental Protection Agency Method for nickel and vanadium (EPA Method 6010); and

c. Toxicity characteristic leaching procedure (**TCLP**) for RCRA 8 Metals.

D. The earthwork will be monitored by the JEA ENGINEER. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the JEA ENGINEER at no additional cost.

E. The CONTRACTOR shall perform soil conformance testing on general fill associated with backfill near the concrete pad area to establish compliance with this section. The CONTRACTOR shall provide equipment and labor to obtain conformance samples from excavations and stockpiles.

1. Conformance testing shall include, at a minimum, 1 test per 2,000 CY for grain size distribution and 1 test per 5,000 CY for standard Proctor.

F. The CONTRACTOR shall perform soil performance testing on the general fill lifts (associated with the hydraulic control system shed area) to evaluate compliance with this section. The JEA ENGINEER will indicate any portion of the earthwork that does not meet the requirements of this section and will delineate the extent of the nonconforming area.

1. Performance testing shall include, at a minimum, 5 tests per acre per lift or 2 tests per lift per 1,000 ft.

G. The CONTRACTOR shall be aware of the activities required of the JEA ENGINEER and shall account for these activities in the construction schedule.

1.06 Submittals

A. Analytical report(s) associated with the stockpiled material generated during trenching shall be submitted to the JEA ENGINEER within 2 weeks of sample collection; native stockpiled material, will not be accepted for placement within the trench if it does not meet the criteria stated above.

B. For each source of backfill material, submit the following to the JEA ENGINEER for review within 30 calendar days from Notice to Proceed:

1. the source of the material and analytical testing results;

2. certification and test results from the supplier that the backfill material meets the requirements of this section; certification shall also include that tests were performed in accordance with ASTM D422, ASTM D1557, and ASTM D2487;

3. certification and test results from the supplier that the vegetative fill material meets the requirements of this section; certification shall also include that tests were performed in accordance with ASTM D422, ASTM D1557, ASTM D2487, and ASTM D2974; and

4. 50 pound representative sample of the general and vegetative fill material from each source for visual examination, and testing, if necessary.

C. Soil will not be accepted unless it meets the criteria stated herein.

Part 2 Products

2.01 Materials

A. Pipe Bedding Sand

1. Pipe bedding sand shall be suitable Class A-3, clean, non-plastic bedding sand, free from perishable and objectionable objects and containing no stones or clods larger than 0.5-inch diameter.

2. Excavated native earth (non-contaminated material) shall be free from perishable and objectionable objects and containing no stones or clods larger than 2 inches in diameter and not comprised fully granular material (unless authorized by the JEA ENGINEER). Any excess material shall be spread evenly across the trenched area as long as the material is not considered contaminated.

3. Unsuitable material shall include pile foundations, concrete, railroad tracks, debris, muck, clay, large clods, stones, wood, stumps, roots or other deleterious material, etc. All unsuitable materials must be verified by the JEA ENGINEER prior to removal and replacement.

B. General Fill

1. Obtain materials for general fill from off-site borrow sources approved by the JEA ENGINEER.

2. General Fill material shall be free of debris, foreign objects, large rock fragments, organics, and other deleterious materials. General fill material shall consist of clean, granular soils, which classify as SW, SP, SW-SM, SW-SC, SP-SM, or SP-SC according to the Unified Soil Classification System (per ASTM D2487) and shall be meet the specifications of hydrologic soil group A or FDOT 902-4. Soils having other classifications may be acceptable as general fill, if approved by the JEA ENGINEER.

3. Protective Cover Soil material shall be relatively homogeneous natural soils. No rock fragments larger than 2 inches shall be allowed unless approved by the JEA ENGINEER.

C. Protective Cover Soil

1. Obtain materials for protective cover soil from off-site borrow sources approved by the JEA ENGINEER.

2. Protective Cover Soil material shall be free of debris, foreign objects, large rock fragments, organics, and other deleterious materials. Protective Cover soil material shall consist of clean, granular soils, which classify as SW, SP, SW-SM, SW-SC, SP-SM, or SP-SC according to the Unified Soil Classification System (per ASTM D2487) and shall be meet the specifications of hydrologic soil group A or FDOT 902-4. Soils having other classifications may be acceptable as protective soil cover, if approved by the JEA ENGINEER.

3. Protective Cover Soil material shall be relatively homogeneous natural soils. No rock fragments larger than 2 inches shall be allowed unless approved by the JEA ENGINEER.

D. Topsoil

1. Material shall consist of sandy and silty soils with a maximum particle size of 1 inch.

2. Material shall be from a natural borrow source and free of debris, foreign objects, large rock fragments, organics, and other deleterious materials.

3. Top soil layer shall contain between 4 and 10 percent organics as determined by loss on drying and loss on ignition of samples to constant weight (per ASTM D 2974, Method A loss on drying for moisture content determination and Method C loss on ignition for ash content determination). The top soil layer may be amended as approved in writing by the JEA ENGINEER if the organic content is less than 4 percent or greater than 10 percent.

4. The pH of the vegetative soil layer material shall not be less than 5.5 and not more than 7.0.

E. #57 Stone

1. Shall average in size from 0.5 to 1.5 inches.

2. Shall be free of trash and debris.

3. Shall generally meet the gradation requirements of Table 1, Section 901-1.4 of Florida Department of Transportation's Standard Specifications.

Part 3 Execution

3.01 Backfill Around Piping

A. The CONTRACTOR shall have the trench inspected by the JEA ENGINEER prior to backfilling.

B. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be prosecuted expeditiously.

C. The CONTRACTOR shall install bedding sand per the Construction Drawings. The bedding sand shall be graded to provide an even cover along the entire length of the pipe.

D. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel has been placed and compacted to a level 1-ft over the pipe.

E. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 95 percent compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.

F. Water jetting or puddling may be used unless the refill contains too great a

proportion of clay or loam to permit satisfactory drying. Water jetting shall consist of using a suitable length of pipe at least 1-1/4-in in diameter fitted with quick acting valve and sufficient hose to connect to hydrant or pump having adequate pressure and capacity. The full depth of backfill shall be thoroughly inundated by thrusting the pipe into the fill at frequent intervals with the valve open until all slumping ceases. Where backfill is compacted by puddling, it shall be done by depositing in water. Water for jetting or puddling may be obtained from OWNER hydrants wherever possible. Water may be furnished by the OWNER from these hydrants if reasonable care is exercised in its use and when approved by the Water Department.

G. If water restrictions are in force, obtain water elsewhere, or compact the backfill by other approved methods at no additional cost to this Contract.

H. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material being spread and compacted in layers not over 6-in thick. If necessary, sprinkling shall be employed in conjunction with rolling or ramming.

I. Backfill around structures shall be selected common fill material, may be compacted by puddling where approved by the and supports and shall remove from the excavation all materials which the JEA ENGINEER. All backfill shall be compacted, especially under and over pipes connected to the structures.

J. Subject to the approval of the and supports and shall remove from the excavation all materials which the JEA ENGINEER, fragments of ledge and boulders smaller than 6-in may be used in trench backfill providing that the quantity in the opinion of the and supports and shall remove from the excavation all materials which the JEA ENGINEER is not excessive. Rock fragments shall not be placed until the pipe has at least 2-ft of earth cover. Small stones and rocks shall be placed in thin layers alternating with earth to ensure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.

3.02 General Fill Backfilling

A. Place the general fill material to the limits and grades shown on the Construction Drawings. To facilitate proper bonding with the existing slope, excavation of shallow horizontal benches shall be performed as shown on the Construction Drawings.

B. Place general fill material on surfaces that are free of debris, branches, vegetation, mud, ice, or other deleterious materials. Place fill material in loose lifts with a thickness of 12 inches. Each lift shall be compacted by rolling with a tamping roller, heavy rubber tire roller, steel wheel (sheep-foot) power roller, or other suitable compaction equipment approved by the JEA ENGINEER. In areas where compaction is to be performed using hand-operated equipment, place the fill material in loose lifts with a thickness of 6 inches.

C. Remove visible rock particles with a maximum dimension larger than 2 inches.

D. Prior to placing a succeeding lift of general fill material over a previously

compacted lift, thoroughly scarify the previous lift to a depth of 2 inches by discing, raking, or tracking with a dozer. Moisture condition the preceding lift in accordance with this section if the moisture content of the surface of the preceding lift is not within the range of acceptable moisture contents specified in this section.

E. The traversing of scarified surfaces by trucks or other equipment, except compaction equipment, is not permitted.

F. The as-placed moisture content of the general fill shall be within 3 percentage points of optimum moisture content as determined by ASTM D1557, or as approved by the JEA ENGINEER. Compact general fill material in each lift to at least 95 percent of its modified Proctor maximum dry unit weight as determined by ASTM D1557.

G. Moisture condition the fill material to achieve the compaction requirements of this section. Use a water spraying system for wetting. During wetting or drying, regularly disc, rake, or otherwise mix the material to thoroughly blend the moisture throughout the lift. Use discing, raking, or other appropriate methods to dry the material as required.

H. Do not place fill during periods of precipitation. Placement may occur during periods of misting or drizzle, but only if authorized by the JEA ENGINEER.

I. Rework compacted fill that does not meet the required compaction.

J. Dust shall be controlled by the application of water to the general fill surfaces.

3.03 Protective Cover Backfilling

A. Use protective cover soil that meets the requirements of this section. Place protective cover soil to the limits and grades shown on the Construction Drawings.

B. Protective cover soil shall be placed in loose lifts of 4 inches minimum.

C. Do not place protective cover soil cover soil during periods of heavy precipitation. Placement may occur during periods of misting or drizzle, but only as authorized by the JEA ENGINEER.

D. Dust shall be controlled by the application of water to the top soil surfaces.

3.04 Top Soil Backfilling

A. Use top soil that meets the requirements of this section. Place top soil to the limits and grades shown on the Construction Drawings.

B. Top soil shall be placed in loose lifts of 4 inches minimum.

C. Prior to placing a succeeding top soil over a previously loosely compacted protective cover soil layer, thoroughly scarify the loosely compacted protective cover soil layer to a depth of 2 inches by discing, raking, or tracking with a dozer. Moisture condition the compacted protective cover soil layer if not

within the acceptable moisture range.

D. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment, is not permitted.

E. Do not place top soil cover soil during periods of heavy precipitation. Placement may occur during periods of misting or drizzle, but only as authorized by the JEA ENGINEER.

F. Dust shall be controlled by the application of water to the top soil surfaces.

3.05 #57 Stone Backfilling

A. Place non-woven geotextile on subgrade to cover the area prior to placement of #57 stone.

B. Geotextile and liner shall be overlapped a minimum of 18 inches.

C. Place #57 stone to the thickness and locations indicated on the Construction Drawings.

D. CONTRACTOR shall not place stone in a manner that causes damage to an underlying geotextile or liner. Repair damaged geotextile and liner as directed by the JEA ENGINEER.

3.06 Restoring Surfaces

A. Ground surface shall be restored to the elevation shown on the Construction Drawings and restored to match pre-construction conditions.

B. If settlement takes place, immediately deposit additional backfill to restore the level of the ground.

END OF SECTION

31 23 33 Trenching

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required and perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall provide suitable room for installing pipe, structures, and appurtenances.

C. Furnish and place all sheeting, bracing and supports and shall remove from the excavation all materials which the JEA ENGINEER may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry and in all respects, acceptable. If conditions warrant, deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related closely to the rate of pipe laying. All excavation shall be made in open trenches.

D. All excavation, trenching and related sheeting, bracing, etc., shall conform to the requirements of the Florida "State Safety Act" (CS/SB 2626) which incorporates, by reference, OSHA's excavation safety standards, 29 CFR 1926.650 Subpart P.

E. Wherever the requirement for 95 percent compaction is referred to herein it shall mean "at least 95 percent of maximum density as determined by ASTM D1557".

F. Prior to the start of work submit the proposed method of backfilling and compaction to the and supports and shall remove from the excavation all materials which the JEA ENGINEER for review.

1.02 Related Work

A. Section 31 23 19 - Dewatering

B. Section 31 23 23 - Backfill

1.03 Noted Restrictions

A. CONTRACTOR shall prevent contaminated materials from coming into contact with other non-contaminated material (soil, surface water, concrete, asphalt, etc.).

B. Any non-contaminated material which comes into contact with contaminated material shall be decontaminated or treated as contaminated material as directed by the JEA ENGINEER at the CONTRACTOR'S expense.

1.04 Quality Control

A. Subject to unsatisfactory test results, the JEA ENGINEER reserves the right to order additional tests at no additional cost to the JEA or JEA ENGINEER until satisfactory test results are reached in the affected areas.

B. The work will be monitored by the JEA ENGINEER. The CONTRACTOR shall correct all deficiencies and non-conformances identified by the JEA ENGINEER at no additional cost.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Trench Excavation

A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

B. Strip and stockpile topsoil from grassed areas crossed by trenches. At the CONTRACTOR's option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.

C. While excavating and backfilling is in progress, all utilities and other property shall be protected.

D. Trenches shall be excavated to the depth indicated on the Construction Drawings and in widths sufficient for laying the pipe, bracing and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the JEA ENGINEER. Trench width shall be practical minimum.

E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by screened gravel fill as required.

F. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth-edge bucket to excavate the last 1-ft of depth.

G. Where pipe is to be laid in screened gravel bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required.

3.02 Disposal of Materials

A. Excavated material shall be stacked without excessive surcharge on the trench bank. Excavated material shall be segregated for use in backfilling as specified below.

B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the and supports and shall remove from the excavation all materials which the JEA ENGINEER. When removal of surplus materials has been approved by the and supports and shall remove from the excavation all materials which the JEA ENGINEER, dispose of such surplus material in approved designated areas.

C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided. When required, it shall be re-handled and used in backfilling the trench.

3.03 Test Pits

A. Excavation of test pits may be required for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.

B. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

3.04 Excavation Below Grade and Refill

A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.

B. If the CONTRACTOR excavates below grade through error or for the CONTRACTOR's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the JEA ENGINEER to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his own expense.

C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine peastone, as approved by the and supports and shall remove from the excavation all materials which the JEA ENGINEER, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the and supports and shall remove from the excavation all materials which the JEA ENGINEER prior to placement. Screened gravel shall then be placed in 6-in layers thoroughly compacted up to the normal grade of the pipe. If directed by the and supports and shall remove from the excavation all materials which the JEA ENGINEER, bank-run gravel shall be used for refill of

excavation below grade.

END OF SECTION

31 25 00 Erosion and Sedimentation Control

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required to perform all installation, maintenance, removal and area cleanup related to erosion and sedimentation control work as shown on the Construction Drawings and as specified herein. The work shall include, but not necessarily be limited to: installation of temporary access ways and staging areas; silt fences; sediment removal and disposal; device maintenance; removal of temporary devices; temporary mulching; matting installation; and final cleanup.

1.02 Submittals

A. Submit within 10 days after award of Contract, technical product literature for all commercial products, including straw mulch tackifier, to be used for erosion and sedimentation control.

1.03 Quality Assurance

A. Be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off-site areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Construction Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the CONTRACTOR. No additional charges to the JEA will be considered.

B. Sedimentation and erosion control measures shall conform to the requirements of all permits and Regulatory Agencies, and to requirements outlined in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual, latest edition, Florida Department of Transportation Design Standards, latest edition, and Storm Water Pollution Prevention Plan.

Part 2 Products

2.01 Materials

A. Crushed stone for sediment filtration devices, access ways and staging areas shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

B. Silt Fence

1. Silt fence shall be a FDOT Type IV prefabricated commercial product made of a woven, polypropylene, ultraviolet resistant material such as "Envirofence" by Mirafi Inc., Charlotte, NC or equal.

C. 1/4-inch woven wire mesh for filter boxes shall be galvanized steel or hardware cloth.

D. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10 inches or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

E. Latex acrylic copolymer or organic tackifier shall be a commercial product specifically manufactured for use as straw mulch tackifier.

F. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the JEA ENGINEER.

G. Erosion control mat shall be installed in all seeded areas as shown on the Construction Drawings or as directed by the JEA ENGINEER. Erosion control mat shall be 100 percent agricultural straw matrix stitch bonded with degradable thread between two photodegradable polypropylene nettings, such as Model S150 Double Net Short-Term Blanket (10 months) by North American Green, Evansville, IN or approved equal.

Part 3 Execution

3.01 Installation

A. Silt Fence Installation

1. Silt fences shall be positioned as indicated on the Construction Drawings and as necessary to prevent off site movement of sediment produced by construction activities as directed by the JEA ENGINEER.

2. Dig trench approximately 6 inches wide and 6 inches deep along proposed fence lines.

3. Drive stakes, 8-ft on center (maximum) at back edge of trenches. Stakes shall be driven 2 ft (minimum) into ground.

4. Hang filter fabric on posts carrying to bottom of trench with about 4 inches of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and maintain secure both ways.

5. Backfill trench with excavated material and tamp.

6. Install pre-fabricated silt fence according to manufacturer's instructions.

B. Staging areas and access ways shall be surfaced with a minimum depth of 4 inches of crushed stone.

3.02 Maintenance and Inspections

A. Inspections

1. Make a visual inspection of all erosion and sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to off-site areas, promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

B. Device Maintenance

1. Slit Fences

a. Remove accumulated sediment once it builds up to 1/2 of the height of the fabric.

b. Replace damaged fabric, or patch with a 2-ft minimum overlap.

c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

2. Add crushed stone to access ways and staging area as necessary to maintain a firm surface free of ruts and mudholes.

3.03 Temporary Mulching

A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 days of the completion of rough grading.

B. Straw mulch shall be applied at rate of 100 lbs per 1000 sq ft and tackified with latex acrylic copolymer at a rate and diluted in a ratio per manufacturer's instructions.

3.04 Erosion Control Mats

A. Erosion control mats shall be installed in all seeded areas as shown on the Construction Drawings (specifically on the and as directed by the JEA ENGINEER in accordance with manufacturer's instructions. The area to be covered shall be properly prepared, fertilized and seeded with permanent vegetation before the mat is applied. When the mat is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. The mats shall be applied in the direction of water flow and stapled. Mats shall be stapled together in accordance with manufacturer's instructions. Side overlaps shall be 4 inches minimum. The staples shall be made of wire, 0.091-inch diameter or greater, "U" shaped with legs 10-inch long and a 1-1/2-inch crown. Commercial biodegradable stakes may also be used with prior approval by the JEA ENGINEER. The staples shall be driven vertically into the ground, spaced approximately two linear feet apart, on each side, and one row in the center alternately spaced between each side. Upper and lower ends of the matting shall be buried to a depth of 4 inches in a trench. Erosion stops shall be created every 25 ft by making a fold in the fabric and carrying the fold into a silt trench across the full width of the mat. The bottom of the fold shall be 4 inches below the ground surface. Staple on both sides of fold.

Where the matting must be cut or more than one roll length is required in the swale, turn down upper end of downstream roll into a slit trench to a depth of 4 inches. Overlap lower end of upstream roll 4 inches past edge of downstream roll and staple.

1. To ensure full contact with soil surface, roll matting with a roller weighing 100 lbs/ft of width perpendicular to flow direction after seeding, placing matting and stapling. Thoroughly inspect channel after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below.

3.05 Removal and Final Cleanup

A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Construction Drawings.

END OF SECTION

31 31 00 Vegetation Control

Part 1 General

1.01 Scope

A. This section includes the requirements for sodding, seeding, fertilizing, and maintaining vegetation until established and accepted. Areas to be vegetated include areas noted on the Construction Drawings. All areas outside the soil cap and any other areas as directed by the JEA ENGINEER shall be restored with sod. Only the area within the soil cap shall be seeded.

1.02 Referenced Sections

A. Related Sections and Plans

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 31 23 00 - Earthwork and Backfill
3. Section 31 25 00 - Erosion and Sedimentation Control

1.03 Cited Standards

A. Standard Specifications for Road and Bridge Construction (SSRBC), Florida Department of Transportation, latest edition.

1.04 Submittals

A. Submit the following to the JEA ENGINEER not less than 30 calendar days prior to use for review:

1. proposed type and source of seed; and
2. manufacturer's product data for commercial fertilizer and lime and the recommended methods of application.

B. Submit a plan for handling and storage of materials to prevent damage by moisture, heat, or exposure. Include all recommendations of manufacturers and suppliers.

Part 2 Products

2.01 Materials

A. Seeds

1. Seeds shall be live seed and meet the requirements of Florida Department of Agriculture and Consumer Services.
2. The seeds should have been harvested from the previous year’s crop.

3. All seed bags shall have a label attached stating the date of harvest, LOT number, percent purity, percent germination, noxious weed certification, and date of test.

4. Use fertilizer that is dry or liquid commercial grade fertilizer uniform in composition that meets the requirements of all State and Federal regulations and standards of the Association of Agricultural Chemists. Deliver fertilizer to the site in original, properly labeled, unopened, clean, containers each showing the manufacturer's guaranteed analysis conforming to applicable fertilizer regulations and standards. Use fertilizer that is 16-4-8 or as modified by the JEA ENGINEER based on testing of the topsoil by the CONTRACTOR.

5. Use lime that is agricultural ground limestone with a minimum total neutralizing power of 90 percent. The lime shall have a gradation of at least 40 percent passing the U.S. Standard Number 100 sieve, and at 95 percent passing the U.S. Standard Number 8 sieve.

B. Sod

1. Permanent grass and sod shall be in accordance with JEA's Water and Wastewater Standards Section 441 – Grassing.

Part 3 Execution

3.01 Planting and Application of Fertilizer

A. Do not commence vegetation until the JEA ENGINEER reviews the results of soil analyses.

B. Notify the JEA ENGINEER 24 hours prior to laying sod, seeding or fertilizing.

C. The seed and fertilizer shall be placed by hydro seeding, or other method approved by the JEA ENGINEER.

D. The surface area to be sodded shall be loosened to a depth of not less than 3-inches with a rake or other device and shall be sprinkled until saturated at least 1-inch in depth and kept moist until the sod is placed thereon.

E. The underlying soil layer should be graded to the lines and limits as indicated on the Construction Drawings. The soil layer surface shall be scarified and damp immediately prior to seed placement.

F. Repair all gullies, washes, or disturbed areas that develop subsequent to final dressing of the prepared surface.

G. Seeded areas shall be watered after germination as necessary until the vegetation is well established.

H. Sod on slopes steeper than 3 to 1 shall be held in place by wooden pins about 1-inch square and 6-inches long, driven through the sod into the soil until they are flush with the top of the sod.

I. Apply fertilizer and lime to all vegetated areas unless otherwise indicated by the JEA ENGINEER.

J. Apply fertilizer and lime at the specified rates. If not applied hydraulically, thoroughly rake the fertilizer and lime into the prepared surface to a minimum depth of 2 inches.

K. Application rates:

1. Application rates for seeding shall be according to manufacturer/supplier recommendations.

2. Application rates for fertilizer and lime in this section may be adjusted after the results of the site soil testing performed by the CONTRACTOR are available.

3. Base contract price on application rates for fertilizer and lime specified in this section. Contract price will be adjusted for any variations either decreasing or increasing the application rates.

L. For areas to be covered with seed:

1. Apply fertilizer at a uniform rate of 1,200 pounds per acre or as otherwise directed by the JEA ENGINEER.

2. Apply agricultural lime at a rate of two tons per acre or as otherwise directed by the JEA ENGINEER.

3.02 Maintenance

A. Maintain sodded and seeded areas immediately after placement until vegetation is well established and exhibits a vigorous growing condition.

B. The CONTRACTOR shall supply and apply supplemental irrigation for the maintenance period following the placement of the sod and seed. All sodded and seeded areas should receive a minimum of 1½ in. of water per week either by precipitation or supplemental irrigation.

C. Maintain the sodded and seeded areas in satisfactory condition. Maintenance of the sodded and seeded areas includes repairing eroded areas, revegetating, watering, and mowing (if applicable). A satisfactory condition of a sodded and seeded area is defined as cover of living plants, after true leaves are formed, of the required species designated for use in which gaps larger than 3 square feet do not occur.

D. The inspection will be performed by the JEA ENGINEER, who will determine whether repair of sodded and seeded areas or revegetation is required. The CONTRACTOR shall make the repair or revegetation at the CONTRACTOR's expense.

3.03 Acceptance

A. The vegetated areas shall be accepted at the end of the warranty period if a

satisfactory condition as defined in this section exists or if accepted by the JEA ENGINEER.

3.04 Warranty Period

A. Vegetated areas shall be subject to a warranty period of not less than 60 days from the issuance of the JEA ENGINEER's final completion notice to the CONTRACTOR for the Contract over 100 percent of the areas sodded and seeded.

B. At the end of the warranty period, the JEA ENGINEER will perform an inspection upon written request by the CONTRACTOR. Vegetated areas not demonstrating satisfactory condition of vegetation as outlined above, shall be repaired, reseeded, and maintained to meet all requirements as specified herein at the CONTRACTOR's expense. All unaccepted areas requiring repair and/or resodding or reseeding shall be subject to a 60 day warranty period commencing at the completion of the rework.

C. After all necessary corrective work has been completed, the JEA ENGINEER will certify in writing the final acceptance of the vegetated areas.

END OF SECTION

DIVISION 33 - UTILITIES

33 23 00 Extraction Wells

Part 1 General

1.01 Scope of Work

A. The CONTRACTOR shall provide all permitting (City of Jacksonville, Environmental Quality Division, and St. Johns Water Management District), equipment, personnel, and materials necessary to perform the scope of work including: advancing soil borings; installing and developing extraction wells; and containerizing, managing and disposing of investigation derived waste (soil and groundwater).

B. The CONTRACTOR shall install the extraction wells including drilling, casing, screening, packing, grouting, monitoring equipment, and any additional related work as specified herein and as shown on the Construction Drawings.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 02 61 10 - Removal and Staging Contaminated Materials
3. Section 02 61 20 - Transporting and Disposing of Contaminated Materials
4. Division 03 - Concrete

1.03 Cited Standards

A. ASTM C150 - Standard Specification for Portland Cement

B. ASTM D5092 - Standard Practice for Design and Installation of Groundwater Monitoring Wells

1.04 Noted Restrictions - None

1.05 Safety

A. The minimum personal protection required for the work to be performed is anticipated to be level “D”. The CONTRACTOR shall be responsible for determining the level of protection for its staff and for providing all required personal protective equipment. The CONTRACTOR is responsible for implementing a Health and Safety Plan in accordance with 29 CFR Part 1910.120. Previous environmental assessments and geophysical surveys indicate that the soils and groundwater may be impacted with arsenic, vanadium and nickel and the CONTRACTOR should be prepared for these conditions. Copies of 40-hour HAZWOPER and current certification documenting compliance with training and health monitoring shall be provided

by the CONTRACTOR for all on-site personnel prior to commencing field activities. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings during drilling activities.

1.06 Quality Control

A. All drilling activities shall be conducted in the presence of the JEA ENGINEER, who shall be responsible for final determination of the total depth and screen interval of each extraction well.

B. Delivery, Storage, and Handling Equipment

1. All products to be delivered shall be in an undamaged condition. Unloading and storage of the products shall be performed carefully and with minimal handling.

2. All products including casing and screens shall arrive at the site in their original shipping containers (pre-wrapped).

3. The CONTRACTOR shall store materials in on-site enclosures or under protective coverings. Materials shall not be stored on the ground unless specified otherwise by JEA or JEA ENGINEER.

4. Plastic piping, jointing materials, and rubber gaskets shall be stored under covering and out of direct sunlight. The insides of the pipes and fittings shall be free of dirt and debris.

5. Defective or damaged materials shall not be accepted and shall be replaced at the CONTRACTOR's expense.

1.07 Submittals

A. Ten (10) days prior to commencement of drilling activities, the CONTRACTOR shall submit product information to JEA or JEA ENGINEER. The product list shall include, but is not limited to, the following:

1. Well screen

2. Filter pack

3. Neat cement grout

4. Bentonite seal

5. Installation Survey Report

6. Well Construction Permits

7. Shipment and handling details

B. Ten (10) days prior to commencement of drilling activities, the CONTRACTOR shall submit the drillers contact information, professional licenses, and proof of insurance.

C. The CONTRACTOR shall provide copies of manifests and other documentation required for shipment of waste materials from the site to an approved treatment location. JEA reserves the right for first right of refusal for the proposed disposal facility.

D. Manifests shall be approved and signed by JEA.

E. The CONTRACTOR shall provide the JEA ENGINEER a copy of all well completion reports a minimum of fifteen (15) days after installation of well permits.

Part 2 Products

2.01 Well Casing

A. Extraction well casings shall be constructed of 5-inch diameter Schedule 80 PVC. The casing to be used within each individual well shall be as specified in the Construction Drawings.

2.02 Well Screens

A. Extraction well screens shall be of the length shown on the Construction Drawings and shall cover the depths as indicated in the Construction Drawings.

B. The extraction well screens shall be constructed of 5-inch diameter stainless steel and wire wrapped.

C. The screens shall be flush threaded joint ends for connection to the well casing.

D. The width of the slotted openings shall be 0.010-inch.

2.03 Filter Packs

A. The CONTRACTOR shall install a primary filter pack of 6/20 silica sand.

B. The primary filter pack shall extend no more than 1 foot below and at least 2 feet above the top of the well screen.

C. The CONTRACTOR shall select a fine sand seal of 30/65 silica sand.

D. The fine sand seal shall be a minimum of one foot (300 mm) thick.

E. Both sands shall contain clean, durable, well-rounded, and washed quartz or granite, with less than 5 percent non-siliceous material.

F. The filter packs shall not contain organic matter or friable materials, shall allow free flow of water in the well, and shall prevent the infiltration of aquifer materials.

2.04 Annular Sealants

A. A neat type II cement/bentonite (95/5 percent by weight) grout shall be placed above the fine sand seal and approximately 3 feet above the highest well

screen.

B. The neat cement grout shall be provided in accordance with ASTM D5092.

C. Quick setting admixtures shall not be permitted and drilling mud or cuttings shall not be used as a sealing material.

D. A ¾-inch grout opening shall be constructed around the perimeter of the well casing at land surface using non-shrink grout.

2.05 Silt Traps

A. The CONTRACTOR shall provide flush threaded 1-ft long silt trap at the bottom of each extraction well. The silt trap shall be of the same material as the well screen.

2.06 Well Head Completions

A. The CONTRACTOR shall clearly mark and secure all extraction wells to avoid unauthorized access and tampering.

B. Each extraction well shall be contained within a well head that extends approximately 3 feet above land surface.

C. Each extraction well shall be capped with a 5-inch well seal with ½-inch, ¾-inch, and 1.5-inch access ports to prevent debris, water, and other material from entering the well while allowing the installation of necessary pipes and wiring.

D. The stamped metal identification tab on each extraction well concrete pad shall include the following:

1. DO NOT DISTURB
2. ID #:
3. Date:
4. Installed By:
5. Total Depth:
6. Screened Interval:
7. TOC Elevation:

2.07 Other Aboveground Completions

A. Bollards

1. For each extraction well, the CONTRACTOR shall provide and install four (4) traffic bollards.

2. Bollard shall be constructed using 4-inch diameter galvanized steel pipe filled with Type II concrete and painted yellow.

3. Bollards, 6 ft in length, shall be installed 2 ft below grade with the center of the bollard 2 ft from the corner of the concrete well pad.

B. NEMA Enclosures

1. Installed adjacent to each extraction well shall be a 4-ft high by 3-ft wide by 1-ft deep aluminum NEMA enclosure.

2. Each NEMA enclosure will house piping and electrical components as specified on the Construction Drawings.

3. All enclosure seams and junctions with piping and electrical components shall be water-tight.

Part 3 Execution

3.01 Preparation

A. General

1. Drilling, installation, and development of the extraction wells shall be supervised, directed, and monitored by the JEA ENGINEER. Refer to Section 02 61 00 Removal and Disposal of Contaminated Materials.

2. Drilling and well development equipment introduced to the well shall be decontaminated before and after each using a high pressure wash to the satisfaction of the JEA ENGINEER.

3. Contain development water. Refer to management and disposal of contaminated media.

4. Prior to commencing subsurface work, a hand auger or posthole digger shall be advanced at each of the proposed extraction well locations to 5 ft below land surface by the CONTRACTOR, to check for buried utilities that may exist in the area.

B. Drilling

1. Each borehole shall be 8 inches in diameter at minimum and drilled using rotary sonic technology.

2. If the CONTRACTOR suggests a drilling method other than the rotary sonic technology, justification for a boring method change shall be submitted to the JEA ENGINEER for approval for the change prior to drilling.

3. The drilling crew shall be licensed, experienced, and trained in drilling and safety requirements for contaminated sites.

C. Sampling

1. Soil cores shall be taken over the proposed screened interval for each well and inspected by the JEA ENGINEER to ensure installation of the well components at proper depths.

D. Removal of Soil from the Boreholes

1. All soil removed from each borehole shall be placed and handled in accordance with Section 02 61 10 and Section 02 61 20.

3.02 Extraction Well Installation

A. Well installations shall be performed in accordance with ASTM D5092 and as directed by the JEA ENGINEER.

B. The boreholes shall be stable and shall be verified straight prior to installation.

C. The depth of the borehole shall be “tagged” using a weighted tape measure and shall be verified by the JEA ENGINEER prior to installing the well casing and screen.

D. Casings and Screens

1. Well casings, screens, plugs, and caps shall be decontaminated prior to delivery by the manufacturer. The materials shall be delivered, stored, and handled in such manner as to ensure that grease, oil, or other contaminants do not contact any portion of the well screen and casing assembly prior to installation.

2. If directed by JEA or JEA ENGINEER, the CONTRACTOR shall clean the well screen and casing assembly with high pressure water prior to installation.

3. The CONTRACTOR personnel shall wear clean cotton or surgical gloves while handling the assembly, and centralizers shall be used every 5 feet to ensure that the well screen and casing assembly is installed concentrically in the borehole.

4. When the assembly has been installed at the appropriate elevation, it shall be adequately secured to preclude movement during placement of the filter packs and annular seals.

5. The top of the well casing shall be capped during filter pack placement.

E. Filter Pack and Fine Sand Seal

1. The filter pack and fine sand seal shall be placed with a tremie pipe as indicated on the Construction Drawings to fill the entire annular space between the screen and casing assembly and the outside wall of the borehole.

2. Placement of the filter pack and fine sand seal by gravity or free fall methods is not allowed.

3. The CONTRACTOR shall control speed of placement to prevent bridging and to allow for settlement.

4. Top of the filter pack and fine sand seal shall be “tagged” using a weighted tape measure and shall be verified by the JEA ENGINEER.

5. Prior to commencement of work, the equipment and methods required to place filters shall be approved by JEA or JEA ENGINEER.

F. Neat Cement Grout

1. Cement grout shall be placed in the annular space above the fine sand seal as indicated on the Construction Drawings.

2. Cement grout shall be placed as a slurry through a tremie pipe, and injected under pressure to reduce chance of voids.

3. Grout shall be injected in one continuous operation until full strength grout flows out at the ground surface without evidence of drilling cuttings or fluid.

4. Cement grout shall cure a minimum of 48 hours before beginning well development operations.

3.03 Well Development

1. The method of development shall be chosen by the CONTRACTOR and approved by the JEA ENGINEER.

2. Well development shall not begin until 48 hours after the installation of the grout and bentonite and approved by the JEA ENGINEER.

3. Well development operations shall be conducted continuously until 1.5 times the quantity of water added to the extraction well during installation is removed and development water flows clear and free of drilling fluids, cuttings, or other materials and is to the satisfaction of the JEA ENGINEER.

4. All well development fluids (extraction wells) shall be characterized and containerized in accordance with Section 02 61 10 and Section 02 61 20.

3.04 Concrete Pads

A. EW003S and EW003D are located within the extents of the ERA soil impacts. Any material excavated within this area shall be handled in accordance with Section 02 61 10 and Section 02 61 20 and/or relocated within the soil cover area and covered with a minimum 1-ft thick layer of soil.

B. CONTRACTOR shall install a 6-inch thick compacted subbase below each

concrete well pad.

C. CONTRACTOR shall construct an 8-inch thick concrete perimeter around the extraction well and NEMA enclosure. The dimensions of the concrete pad shall be 8 ft by 8 ft at land surface and 4 ft x 4 ft at the top of the pad. The concrete around the perimeter of the extraction well shall be constructed and cured to promote drainage away from the extraction and HCS components.

1. Portland cement shall conform to ASTM C150, Type I. All cement shall be obtained from one source. Different brands of cement shall not be permitted, except as previously specified. All concrete shall be a minimum of 4,000 pounds per square inch, Type I, entrained with FIBERMESH® 150 SYNTHETIC FIBER, or approved equivalent.

2. All concrete, grout, and all ingredients including water shall be as approved by the JEA ENGINEER.

3. The CONTRACTOR shall make provisions for the installation and casting into the concrete of all pipe sleeves, anchor bolts, equipment supports, hatchway frames, conduits, drains or other appurtenances indicated on the Construction Drawings or described herein.

D. The exposed casing above grade shall be encased within 4-inch thick concrete.

3.05 Bollard Installation

A. EW003S and EW003D are located within the extents of the ERA soil impacts. Any material excavated within this area shall be handled in accordance with Section 02 61 10 and Section 02 61 20 and/or relocated within the soil cover area and covered with a minimum 1-ft thick layer of soil.

B. The bollard shall be installed in the middle of the hole so that equal amounts of concrete surround the bollard in all directions (minimum 1-ft diameter).

C. The bollard shall be installed 2 ft bls with at least 4 ft of bollard above ground and with the center of the bollard 2 ft from the corner of the concrete pad as shown on the Construction Drawings.

D. CONTRACTOR shall construct bollard with 6-inches of concrete below base of bollard.

E. At a minimum 3 cubic feet of concrete with a minimum diameter of 1 foot shall be used to secure the bollard.

3.06 NEMA Enclosure

A. Each NEMA enclosure shall be mounted on a 3-ft high by 4-ft wide by 2-ft deep concrete base as illustrated in the Construction Drawings.

B. Each NEMA enclosure shall be bolted to the concrete base using 4 minimum ½-inch diameter by 3-inch long stainless steel concrete anchors.

C. All penetrations to the enclosure shall be watertight.

3.07 Closeout Procedures

A. Installation Survey

1. Following extraction well installation, the horizontal and vertical position of each top of casing shall be determined by a registered land surveyor licensed in the State of Florida.

2. Surveys for each well shall be accurate to the nearest 0.01 ft (3 mm). This data shall be submitted with a well location map as the As-Built.

END OF SECTION

33 24 00 Piezometers and Monitoring Wells

Part 1 General

1.01 Scope of Work

A. The CONTRACTOR shall provide all permitting (City of Jacksonville, Environmental Quality Division, and St. Johns Water Management District), equipment, personnel, and materials necessary to perform the scope of work including: advancing soil borings; installing and developing piezometers and monitoring wells; and containerizing, managing and disposing of investigation derived waste (soil and groundwater).

B. The CONTRACTOR shall install the piezometers and monitoring wells including drilling, casing, screening, packing, grouting, and any additional related work as specified herein and as shown on the Construction Drawings.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 02 61 10 - Removal and Staging Contaminated Materials
3. Section 02 61 20 - Transporting and Disposing of Contaminated Materials
4. Division 03 - Concrete

1.03 Cited Standards

A. ASTM C150 - Standard Specification for Portland Cement

B. ASTM D5092 - Standard Practice for Design and Installation of Groundwater Monitoring Wells

1.04 Noted Restrictions - None

1.05 Safety

A. The minimum personal protection required for the work to be performed is anticipated to be level “D”. The CONTRACTOR shall be responsible for determining the level of protection for its staff and for providing all required personal protective equipment. The CONTRACTOR is responsible for implementing a Health and Safety Plan in accordance with 29 CFR Part 1910.120. Previous environmental assessments and geophysical surveys indicate that the soils and groundwater may be impacted with arsenic, vanadium and nickel and the CONTRACTOR should be prepared for these conditions. Copies of 40-hour HAZWOPER and current certification documenting compliance with training and health monitoring shall be provided by the CONTRACTOR for all on-site personnel prior to commencing field

activities. The CONTRACTOR shall be responsible for holding daily tailgate safety meetings during drilling activities.

1.06 Quality Control

A. All drilling activities shall be conducted in the presence of the JEA ENGINEER, who shall be responsible for final determination of the total depth and screen interval of each piezometer and monitoring well.

B. Delivery, Storage, and Handling Equipment

1. All products to be delivered shall be in an undamaged condition. Unloading and storage of the products shall be performed carefully and with minimal handling.

2. All products including casing and screens shall arrive at the site in their original shipping containers (pre-wrapped).

3. The CONTRACTOR shall store materials in on-site enclosures or under protective coverings. Materials shall not be stored on the ground unless specified otherwise by JEA or JEA ENGINEER.

4. Defective or damaged materials shall not be accepted and shall be replaced at the CONTRACTOR's expense.

1.07 Submittals

A. Ten (10) days prior to commencement of drilling activities, the CONTRACTOR shall submit product information to JEA or JEA ENGINEER. The product list shall include, but is not limited to, the following:

1. Well screen

2. Filter pack

3. Neat cement grout

4. Fine sand seal

5. Installation Survey Report

6. Well Construction Permits

7. Shipment and handling details

B. Ten (10) days prior to commencement of drilling activities, the CONTRACTOR shall submit the drillers contact information, professional licenses, and proof of insurance.

C. The CONTRACTOR shall provide copies of manifests and other documentation required for shipment of waste materials from the site to an

approved treatment location. JEA reserves the right for first right of refusal for the proposed disposal facility.

D. Manifests shall be approved and signed by JEA.

E. The CONTRACTOR shall provide the JEA ENGINEER a copy of all well completion reports a minimum of fifteen (15) days after installation of well permits.

Part 2 Products

2.01 Well Casing

A. Piezometer and monitoring well casings shall be constructed of 2-inch diameter Schedule 40 PVC. The casing length to be used within each individual well shall be as specified in the Construction Drawings.

2.02 Well Screens

A. Piezometer and monitoring well screens shall be of the length shown on the Construction Drawings and shall cover the depths as indicated in the Construction Drawings.

B. The piezometer and monitoring well screens shall be constructed of 2-inch diameter Schedule 40 PVC.

C. The screens shall be flush threaded joint ends for connection to the well casing.

D. The width of the slotted openings shall be 0.010-inch.

2.03 Filter Packs

A. The CONTRACTOR shall install a primary filter pack of 20/30 silica sand.

B. The primary filter pack shall extend at least 1 foot above the top of the well screen.

C. The CONTRACTOR shall select a fine sand seal of 30/65 silica sand.

D. The fine sand seal shall be a minimum of two feet (600 mm) thick.

E. Both sands shall contain clean, durable, well-rounded, and washed quartz or granite, with less than 5 percent non-siliceous material.

F. The filter packs shall not contain organic matter or friable materials, shall allow free flow of water in the well, and shall prevent the infiltration of aquifer materials.

2.04 Annular Sealants

A. A neat type II cement/bentonite (95/5 percent by weight) grout shall be placed above the fine sand seal.

B. The neat cement grout shall be provided in accordance with ASTM D5092.

C. Quick setting admixtures shall not be permitted and drilling mud or cuttings shall not be used as a sealing material.

D. A ¾-inch grout opening shall be constructed around the perimeter of the well casing at land surface using non-shrink grout.

2.05 Well Head Completions

A. The CONTRACTOR shall clearly mark and secure all piezometers and monitoring wells to avoid unauthorized access and tampering.

B. Each piezometer and monitoring well shall be contained within a 4-inch square aluminum casing that extends approximately 3 feet above land surface and set in a 2-foot by 2-foot by 4-inch thick concrete pad.

C. The stamped metal identification tab on each piezometer and monitoring well concrete pad shall include the following:

1. DO NOT DISTURB
2. ID #:
3. Date:
4. Installed By:
5. Total Depth:
6. Screened Interval:
7. TOC Elevation:

Part 3 Execution

3.01 Preparation

A. General

1. Drilling, installation, and development of the piezometers and monitoring wells shall be supervised, directed, and monitored by the JEA ENGINEER. Refer to Section 02 61 00 Removal and Disposal of Contaminated Materials.

2. Drilling and well development equipment introduced to the well shall be decontaminated before and after each using a high pressure wash to the satisfaction of the JEA ENGINEER.

3. Contain development water. Refer to management and disposal of contaminated media.

4. Prior to commencing subsurface work, a hand auger or posthole digger shall be advanced at each of the monitoring well and

piezometer locations to 5 ft below land surface by the CONTRACTOR, to check for buried utilities that may exist in the area.

B. Drilling

1. Each borehole shall be 6.25 inches in diameter at minimum and drilled using rotary sonic technology.

2. If the CONTRACTOR suggests a drilling method other than the rotary sonic technology, justification for a boring method change shall be submitted to the JEA ENGINEER for approval for the change prior to drilling.

3. The drilling crew shall be licensed, experienced, and trained in drilling and safety requirements for contaminated sites.

C. Sampling

1. Soil cores shall be taken over the proposed screened interval for each well and inspected by the JEA ENGINEER to ensure installation of the well components at proper depths.

D. Removal of Soil from the Boreholes

1. All soil removed from each borehole shall be placed and handled in accordance with Section 02 61 10 and Section 02 61 20.

3.02 Monitoring Well and Piezometer Installation

A. Well installations shall be performed in accordance with ASTM D5092 and as directed by the JEA ENGINEER.

B. The boreholes shall be stable and shall be verified straight prior to installation.

C. The depth of the borehole shall be “tagged” using a weighted tape measure and shall be verified by the JEA ENGINEER prior to installing the well casing and screen.

D. Casings and Screens

1. Well casings, screens, plugs, and caps shall be decontaminated prior to delivery by the manufacturer. The materials shall be delivered, stored, and handled in such manner as to ensure that grease, oil, or other contaminants do not contact any portion of the well screen and casing assembly prior to installation.

2. When the assembly has been installed at the appropriate elevation, it shall be adequately secured to preclude movement during placement of the filter packs and annular seals.

3. The top of the well casing shall be capped during filter pack placement.

E. Filter Pack and Fine Sand Seal

1. The filter pack and fine sand seal shall be placed with a tremie pipe as indicated on the Construction Drawings to fill the entire annular space between the screen and casing assembly and the outside wall of the borehole.

2. Placement of the filter pack and fine sand seal by gravity or free fall methods is not allowed.

3. The CONTRACTOR shall control speed of placement to prevent bridging and to allow for settlement.

4. Top of the filter pack and fine sand seal shall be “tagged” using a weighted tape measure and shall be verified by the JEA ENGINEER.

5. Prior to commencement of work, the equipment and methods required to place filters shall be approved by JEA or JEA ENGINEER.

F. Neat Cement Grout

1. Cement grout shall be placed in the annular space above the fine sand seal as indicated on the Construction Drawings.

2. Cement grout shall be placed as a slurry through a tremie pipe, and injected under pressure to reduce chance of voids.

3. Grout shall be injected in one continuous operation until full strength grout flows out at the ground surface without evidence of drilling cuttings or fluid.

4. Cement grout shall cure a minimum of 48 hours before beginning well development operations.

3.03 Well Development

A. The method of development shall be chosen by the CONTRACTOR and approved by the JEA ENGINEER.

B. Well development shall not begin until 24 hours after the installation of the grout and approved by the JEA ENGINEER.

C. Well development operations shall be conducted continuously until 1.5 times the quantity of water added to the piezometer or monitoring well during installation is removed and development water flows clear and free of drilling fluids, cuttings, or other materials and is to the satisfaction of the JEA ENGINEER.

D. All well development fluids shall be characterized and containerized in accordance with Section 02 61 10 and Section 02 61 20.

3.04 Closeout Procedures

A. Installation Survey

1. Following piezometer and monitoring well installation, the horizontal and vertical position of each top of casing shall be determined by a registered land surveyor licensed in the State of Florida.

2. Surveys for each well shall be accurate to the nearest 0.01 ft (3 mm). This data shall be submitted with a well location map as the As-Built.

END OF SECTION

33 29 00 Well Abandonment

Part 1 General

1.01 Section Includes

A. This section includes the CONTRACTOR's responsibilities in order to abandon extraction well PMW-1.

B. The CONTRACTOR is responsible for all the permit and application fees.

1.02 Referenced Sections - none

1.03 Cited Standards

A. 02 61 10 Removal and Staging Contaminated Materials

B. 02 61 20 Transporting and Disposing of Contaminated Materials

C. 31 05 00 Earthwork

1.04 Noted Restrictions

A. The abandonment of the extraction well PMW-1 shall be completed by a well driller licensed in the State of Florida.

1.05 Quality Control

A. Abandonment procedures shall be designed to permanently close boring/wells. This shall include demolition of the above ground casing, concrete pad, and backfilling of the well with a cement bentonite grout in order to preclude current or subsequent fluid media from entering or migrating within the subsurface environment along the borehole vertical axis.

B. This work shall be performed by the CONTRACTOR in such a manner that boreholes are completely sealed and cannot act as conduits for migration of contaminants from the ground surface to the water table or between aquifers.

1.06 Submittals

A. The CONTRACTOR/DRILLER shall be responsible for the completion and the filing of the application for permits required by St Johns Water Management District shall be submitted on State of Florida Permit Application to Construct, Repair, Modify, or Abandon a Well, DEP Form 62-532.900(1) within 30 days of completion of drilling the well or borehole. The CONTRACTOR/DRILLER shall provide a copy of each form to the JEA ENGINEER within 5 days of filing of the form with the State.

B. The CONTRACTOR/DRILLER shall be responsible for the completion and the filing of the application for permits required by the City of Jacksonville Environmental Quality Division and submitting the Application for Permit to Construct, Repair, Modify, or Abandon a Well

Part 2 Products - none

Part 3 Execution

3.01 Abandonment of Well

A. Wells shall be abandoned by completely removing the above ground casing, concrete pad, bollards, and backfilling with grout.

B. Backfilling with grout shall be done by placing a tremie pipe to the bottom for the boring (i.e., to the maximum depth drilled) and pumping grout through the pipe until undiluted grout flows from the boring at ground surface. The ground sealant must consist 95% Cement to 5% Bentonite Grout (grout); a mixture of 6.5 gallons of water per 94-pound bag of Portland Type I/II cement and 4 pounds of bentonite powder. Neither additives nor borehole cuttings should be mixed with the grout. No borehole shall be backfilled with cuttings.

C. After 24 hours, the CONTRACTOR shall check the abandoned site for grout settlement. Any settlement depression should be immediately filled even with the ground surface and rechecked 24 hours later. Additional grout shall be added using a tremie pipe inserted to the top of the firm grout, unless the depth of the unfilled portion of the hole is less than 5 feet and that portion is dry.

D. This process shall be repeated until firm grout remains at the ground surface. It may be necessary to grout the boring to a depth of 2 feet below grade and complete the backfill with lean concrete or asphalt, depending upon the composition of the original surface.

END OF SECTION

33 29 01 Well Protection and Extension

Part 1 General

1.01 Section Includes

A. This section includes the CONTRACTOR's responsibilities to protect the existing monitoring wells and piezometers in place.

B. The CONTRACTOR is responsible for protecting all the existing monitoring wells and piezometers in place. Existing wells and/or piezometers damaged by the CONTRACTOR shall be properly abandoned and replaced by a well driller licensed in the State of Florida at the CONTRACTOR's expense.

C. Piezometers OBW-1S and OBW-1D shall be protected in place during the construction of the slope and extended to match the final grade.

1.02 Referenced Sections - none

1.03 Cited Standards

A. 02 61 10 Removal and Staging Contaminated Materials

B. 02 61 20 Transporting and Disposing of Contaminated Materials

C. 31 05 00 Earthwork

1.04 Noted Restrictions - none

1.05 Quality Control

A. The CONTRACTOR shall prevent media from entering or migrating into Piezometers OBW-1S and OBW-1D.

B. This work shall be performed by the CONTRACTOR in such a manner that boreholes are completely sealed and cannot act as conduits for migration of contaminants from the ground surface to the water table or between aquifers.

1.06 Submittals - none

Part 2 Products

A. Piping - shall be constructed with 2-inch schedule 40 PVC riser pipes. Total length will be determined based location within the final slope.

Part 3 Execution

3.01 Extension of Well/Piezometer

A. The existing concrete pad, manhole/casing, and bollards for Piezometers OBW-1S and OBW-1D shall be demolished and disposed of off-site. The bollards may be reused if they are kept in good condition as approved by the JEA ENGINEER.

B. The well casing shall be extended to a sufficient height such that when complete it is a minimum of 3-ft above the final finished grade.

3.02 New Concrete Pads

A. CONTRACTOR shall install a new aluminum 4-inch by 4-inch above ground casing to protect the well casing.

B. CONTRACTOR shall install a new 2-ft by 2-ft and 4-inch thick concrete well pad.

C. The concrete pad shall be sloped to match the final grade.

3.03 Closeout Procedures

A. Installation Survey

1. Following well installation, the position of each well and the top of casing shall be determined by a registered land surveyor licensed in the State of Florida.

2. Surveys for each well shall be accurate to the nearest 0.01 foot. This data shall be submitted with a monitoring well location map as the record drawing.

END OF SECTION

33 35 00 Directional Utility Borings

Part 1 General

1.01 Scope of Work

A. The CONTRACTOR shall provide all permitting and fees (equipment, personnel, and materials necessary to perform the scope of work including: advancing directionally drilled utility borings; installing bundles of high density polyethylene (HDPE) piping within the borings for conveyance of extracted groundwater and electrical wiring to submersible pumps and level transmitters; testing HDPE piping for leaks; containerizing, managing and disposing of investigation derived waste (a slurry of drilling mud, soil, and groundwater); site restoration; and any additional related work as specified herein and as shown on the Construction Drawings.

1.02 Site Geology

A. The materials encountered from the surface to 45 to 60 feet below land surface generally include the following progression: grass, topsoil, and intermixed layers of very fine sand and silty sand. The sandy layer is generally composed of poorly graded, loose, fine-grained, subangular to rounded, brown to dark brown to tan sand.

1.03 Referenced Sections

A. Related Sections are shown below.

1. Section 02 05 00 - Maintenance of Existing Conditions
2. Section 02 61 00 - Removal and Disposal of Contaminated Materials
3. Section 02 61 10 - Removal and Staging Contaminated Materials
4. Section 02 61 20 - Transporting and Disposing of Contaminated Materials
5. Section 40 05 70 - Piping Specialties
6. Section 40 23 00 - Water Process Piping
7. Section 40 23 19.2 - HDPE Hydraulic Transmission Piping

1.04 Cited Standards

A. JEA Water and Wastewater Standards

1. Horizontal directional drilling for small diameter pipe (12 inches or less) is included in JEA's Water and Wastewater Standards Manual Chapter VI. 2. - Section 750 (January 2016 or latest).

B. All HDPE piping shall conform to the requirements of the following standard specifications, of the latest revisions, as applicable:

1. ASTM D638 - Standard Test Method for Tensile Properties of Plastics

2. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

3. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

4. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

5. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique

6. ASTM D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics

7. ASTM D2122 - Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings

8. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

9. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

10. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

11. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

1.01.1.1ASME B31.3 - Process Piping

1.05 Noted Restrictions

A. Hot gas welding shall not be allowed for wetted components.

B. All drilling mud will be considered contaminated material.

1.06 Quality Control

A. All drilling activities shall be conducted in the presence of the JEA ENGINEER.

B. HDPE Pipe System

1. The Supplier shall submit, in writing, that the pipe furnished under this specification is in conformance with the material and mechanical requirements specified.

2. All material and fittings furnished under this Technical Specification shall be from a manufacturer who has been regularly engaged in the design and manufacture of HDPE piping for at least 5 years.

3. The HDPE piping system, including fittings and custom fabrications, shall be supplied by a single JEA-approved manufacturer.

4. Pipe that has been tested by the manufacturer and falls outside the appropriate limits set forth in these specifications shall be rejected for use on this project.

5. The HDPE pipe manufacturer shall submit Quality Assurance / Quality Control (QA/QC) records to the JEA ENGINEER and maintain these records for a minimum of 3 years from the date of production.

C. Delivery, Storage, and Handling Equipment

1. All products to be delivered shall be in an undamaged condition. Unloading and storage of the products shall be performed carefully and with minimal handling. Defective or damaged materials shall not be accepted and shall be replaced at the CONTRACTOR's expense.

2. All products including HDPE piping shall arrive at the site in their original shipping containers (wrapped rolls).

3. The CONTRACTOR shall store materials in on-site enclosures or under protective coverings. Materials shall not be stored on the ground unless specified otherwise by the JEA ENGINEER.

4. Plastic piping, jointing materials, and rubber gaskets shall be stored under covering and out of direct sunlight. The insides of the pipes and fittings shall be free of dirt and debris.

D. Fusing and Leak Testing

1. Fusion machine heater plate surface temperatures and hydraulic cylinder interface pressures shall be recorded during the butt fusion joining operations. Measurements shall be permanently recorded utilizing a McElroy Datalogger or other JEA-approved equal.

2. The CONTRACTOR shall ensure that the persons joining the HDPE have been trained in the pipe manufacturer's recommended procedures.

3. It is the sole responsibility of the CONTRACTOR to construct conveyance piping capable of passing the leak tests. Failure of a piping segment to pass leak testing shall be repaired at no cost to JEA.

1.07 Submittals

A. Work Plan: Ten (10) days prior to commencement of drilling activities, the CONTRACTOR shall provide a detailed and comprehensive Work Plan

describing the project organization, project schedule, roles/responsibilities, site lay out, drilling methods and equipment, fusion and leak testing procedures, spill control and cleanup procedures, waste management procedures and equipment, and change management procedures. The Work Plan shall include:

1. Driller's Information: contact information, professional licenses, and proof of insurance.

2. Product Information: including but not limited to HDPE piping and fittings; Drill rig and associated equipment; Pull rope/pull tape; Bentonite drill mud; and Shipment and handling details.

3. Fusion Joint Technician Certification: written certification that the fusion technician is employed by the pipe fusion equipment supplier and/or has received training in the proper use of the fusion equipment and manufacturer's recommended procedures, and that the proposed pipe fusion method(s) and equipment are appropriate for use on the project and on the supplied HDPE pipe.

4. Leak Testing Procedure: including but not limited to the methodology, the equipment, a sequence of all testing and disposal activities; the location of source water to be used for testing; the method and location for legal disposal of water used for testing; and the location and size of container required for disposal of water used for flushing.

B. Daily Reports: The CONTRACTOR shall maintain daily activity reports during operations and submit to the JEA ENGINEER within 24 hours of completion. Daily reports shall include the tools and equipment in use, description of conditions encountered, description of drilling fluid, fluid pumping rate, maximum and minimum pumping pressures, drill head location, drill stem torque, and details of any unusual conditions, problems, or delays.

C. Fusion Records: Two (2) days following the completion of any joint, the CONTRACTOR shall submit fusion bonding machine recorded parameters to JEA. Failure to submit this information may result in the joint being rejected and replaced.

1.08 Protection of Work Area

A. The CONTRACTOR shall be familiar with possible/potential utilities that may impact construction work, and plan work accordingly.

B. Prior to commencing subsurface work, a hand auger or posthole digger shall be advanced at each of the proposed locations to 5 ft below land surface by the CONTRACTOR, to check for buried utilities that may exist in the area.

C. The CONTRACTOR shall protect existing site improvements from damage during construction of underground pipeline.

1.09 Warranty

A. The pipe manufacturer shall provide a warranty against manufacturing defects

of material and workmanship for a period of ten years after the final acceptance of the project by JEA. The manufacturer shall replace, at no additional cost to JEA, any defective pipe material within the warranty period.

Part 2 Products

2.01 HDPE

A. Groundwater extraction piping shall consist of 1.5" nominal diameter HDPE (SDR 13.5) and electrical conduit piping shall consist of 1.0" nominal diameter HDPE (SDR 13.5).

2.02 Pull Rope/Pull Tape

A. Continuous running pull rope or pull tape shall be provided in all 1.0" nominal diameter electrical conduits.

2.03 Locating Wire

A. As specified in the Construction Drawings.

2.04 Bentonite Drill Mud

A. The CONTRACTOR shall provide a bentonite drill mud for borehole integrity. Drilling fluids shall be recycled to minimize generation of contaminated waste.

B. Mud that is utilized will be considered contaminated at the termination of the work.

2.05 Utility Completions

A. The CONTRACTOR shall clearly label all daylighted conduits on both ends with the designated identification on the Construction Drawings.

B. The CONTRACTOR shall cap all daylighted conduits on both ends and complete as stub-ups approximately 1 feet above grade.

Part 3 Execution

3.01 Preparation

A. General

1. Drilling and installation of the utility borings shall be supervised, directed, and monitored by the JEA ENGINEER.

2. Drilling equipment introduced to the site shall be decontaminated prior to beginning work and after completion of work using a high pressure wash to the satisfaction of the JEA ENGINEER.

3. Contain drilling mud, including any filtered solids. Refer to 3.02.F and Section 02 61 00 Removal and Disposal of Contaminated Materials.

4. Boreholes shall be advanced using double-ended (entry-exit) methods. The CONTRACTOR shall establish the entry point in the vicinity of EW001S, and establishing two separate exit points in the vicinity of EW002S and EW003S. The staging area near EW002S shall be dedicated to this well's components, while the staging area near EW003S will accommodate a borehole of sufficient diameter for EW003S, EW003D, and EW004S. Conventional trenching shall be used to complete the run from EW003S/3D to EW004S.

5. The CONTRACTOR is responsible for determining any site preparation that may be needed at each staging area, for example, from soft earth conditions that may arise from wet conditions.

6. The CONTRACTOR shall lay down containment (e.g., plastic sheeting) beneath their equipment to prevent leaks of hydraulic fluid or any other liquid waste to the ground.

7. The CONTRACTOR shall provide a drill rig of sufficient size, rotary torque, and push/pull-back force to advance through the formation.

3.02 Execution

A. Drilling

1. Boreholes shall be of sufficient diameter to allow for construction and installation of the bundled conduits to the EW002S staging location and the EW003S staging location. It is anticipated that a minimum borehole diameter of 4 or 6 inches, respectively, will be required as shown in the Construction Drawings.

2. Drill pressure must be monitored continuously to avoid inadvertent return (frac-out) of drill mud, particularly under the drainage swale southeast of EW001S. A minimum depth of 15 feet below land surface shall be maintained when passing underneath this swale. CONTRACTOR shall select a staging area in the EW001S location with sufficient setback to accommodate this minimum depth.

3. The drilling crew shall be licensed, experienced, and trained in drilling and safety requirements for contaminated sites.

B. Navigation

1. It is assumed that tracking and steering the drill head will be accomplished by detecting and interpreting a signal transmitted from the drill head during advancement of the borehole.

2. CONTRACTOR must achieve a navigational accuracy of +/- 1 foot vertically and +/- 3 feet horizontally and must demonstrate this accuracy is being met at all times to the JEA engineer.

C. Pipe Joining Methods

1. Lengths of pipe shall be assembled into suitable installation lengths by the butt-fusion process. Thermal fusion shall be conducted only by persons who have received training and are certified in the use of the fusion equipment that is intended for use on this project. The selected fusion equipment shall conform to the equipment recommended by the pipe manufacturer.

D. Conduit Installation

1. Bundling of the well components will be allowed. The CONTRACTOR shall, at all times, handle the pipe in a manner that does not over stress the pipe. If the pipe is cracked or otherwise damaged, the damaged section shall be removed and replaced by the CONTRACTOR at their expense. The CONTRACTOR shall take appropriate steps during installation to ensure that the pipe will be installed without damage.

E. Testing

1. Furnish all necessary equipment and labor for cleaning and testing the pipelines. The procedures and methods shall be approved by the JEA ENGINEER.

2. Make any taps and furnish all necessary caps, plugs, etc., as required in conjunction with testing pipelines. Furnish a test pump, gauges and any other equipment required in conjunction with carrying out the pneumatic and hydrostatic tests.

3. Pneumatic testing: Prior to installation in the borehole, all HDPE piping (including extraction well and electrical conduit and all spares) shall be air pressure tested above ground @ 5 psig for a period of 15 minutes. The pneumatic testing will be approved upon demonstration of 0% pressure loss.

4. Hydrostatic testing: After installation in the borehole, extraction well HDPE pipe (including spares) shall be pressure and leakage tested with 150 psig of clean water for at least 2 hours. The test pump and water supply shall be arranged to allow accurate measurement of the water required to maintain the test pressure. The hydraulic testing will be approved upon demonstration of 0% pressure loss and if no make-up water is used.

5. Test gauges shall be calibrated within one year of date of testing.

6. Testing shall be conducted in accordance with manufacturer's recommendations and JEA Water and Wastewater Standards, Chapter VI.2. - Section 750.

F. Removal of Drill Mud from the Boreholes

1. All mud removed from each borehole shall be placed and handled in accordance with Section 02 61 10 and Section 02 61 20.

2. The CONTRACTOR shall provide lined roll-off boxes (filter boxes) and a bulk storage tank (mini-frac tank or approved equal) in secondary containment for IDW solids and liquids. Every effort should be made to minimize waste, particularly solid waste. The CONTRACTOR will be responsible for providing the materials and equipment necessary to circulate drilling fluids and to transfer drilling wastes (solids and liquids) to appropriate containers.

G. Site Restoration

1. Entry pits will be backfilled with native material to grade. The CONTRACTOR may use sand or certified clean backfill if additional material is needed. The CONTRACTOR will level the surface above the cleanout so that it matches the existing grade.

END OF SECTION

33 36 00 Poly Tank

Part 1 General

1.01 Scope

A. This section covers furnishing, installing, and testing the poly tank.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 50 00 00 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

2. Section 50 20 00 - Startup

1.03 Cited Standards - None

1.04 Noted Restrictions - None

1.05 Safety - None

1.06 Quality Control - None

1.07 Submittals

A. The submittals required in this section include data and cut sheets of the poly tank and shall be provided, for approval, to the JEA ENGINEER thirty (30) days prior to installation.

Part 2 Products

2.01 Poly Tank:

A. Shall have a capacity of 3,000 gallons with a diameter of 95 inches and a height of 109 inches.

B. Made from polyethylene plastic.

C. Equipped with:

1.01.1.216-inch vented manway on the top of the tank;

1. two 3-inch diameter female NPT threaded bulkhead fittings at the base of the tank;

2. one 3-inch diameter female NPT threaded bulkhead fitting at the top of the tank opposite the manway; and

3. two 6-inch diameter female NPT threaded bulkhead fittings for the water level sensors and level transmitter.

Part 3 Execution

3.01 Installation

A. All bulkhead fittings shall be watertight.

B. Poly tank shall be delivered and installed on a level surface.

C. Poly tank shall be strapped to the concrete foundation in accordance with local and state building codes.

END OF SECTION

DIVISION 40 - Process Piping, Hosing, and Appurtenances

40 05 00 Process Piping, Hosing, and Appurtenances

40 05 14 Stainless Steel Pipe and Fittings

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required to install, complete test, and make ready for operation all stainless steel pipe as shown on the Construction Drawings and as specified herein.

B. Where the word "pipe" is used it shall refer to pipe, fittings, hangers, supports and appurtenances unless otherwise noted.

C. The work includes, but is not necessarily limited to:

1. Furnishing and installing interior, above grade, stainless steel pipe, fittings and specials with screwed, butt welded, or flanged and plain ends.

1.02 Referenced Sections

A. Division 03 - Concrete

B. Division 40 (13) - Instrumentation and Controls

C. Section 40 05 50 - Valves

D. Section 40 05 70 - Piping Specialties

1.03 Submittals

A. Submit the following:

1. Within 30 calendar days following effective date of the Agreement submit the name of the pipe, fitting and appurtenances manufacturers and a list of the material to be furnished by each manufacturer. Also include information on local representative for each manufacturer, if product is sold through a distributor.

2. Shop drawings including piping layouts and schedules, including dimensioning, fittings, expansion joints, locations of valves and appurtenances, joint details, wall penetration details, methods and locations of supports and all other pertinent technical specifications for all piping to be furnished. Shop drawings shall include all data and information required for the complete piping systems. All dimensions shall be based on the actual equipment to be furnished. Types and locations of pipe hangers and/or supports shall be shown on the piping layouts for each pipe submittal. Not all dimensions will be checked by the JEA ENGINEER, nor will detailed review be

performed. CONTRACTOR shall be responsible for accurate dimensioning of piping systems.

3. Proposed cleaning method, including pre-cleaning, descaling, chemicals to be used, or mechanical descaling method and final cleaning/passivation.

4. Certifications that welders are qualified, in accordance with ASME B31.1, Paragraph 127.5 for shop and project site welding of pipe work.

1.04 Cited Standards

A. ASTM International

1. ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

2. ASTM A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.

3. ASTM A530 - Standard Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe.

4. ASTM A778 - Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.

B. American National Standards Institute (ANSI)

1. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings for Classes 25, 125 and 250.

2. ANSI B16.9 - Factory-Made Wrought Steel Butt-welding Fittings.

3. ANSI B36.19 - Stainless Steel Pipe.

C. American Water Works Association (AWWA)

1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

D. American Society of Mechanical Engineers (ASME)

1. ASME B31.1 - Power Piping.

2. ASME Section IX - Welding.

E. American Welding Society (AWS)

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 Quality Assurance

A. Stainless steel pipe and fittings shall be furnished by a single manufacturer who is fully experienced, reputable, qualified and regularly engaged for the last 5 years in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with this section.

1.06 System Description

A. Piping shall be installed in those locations as shown on the Construction Drawings.

B. The equipment and materials specified herein are intended to be standard types of stainless steel pipe and fittings for use in transporting wastewater.

C. Stainless steel piping for the system listed below shall be designed for the following conditions:

1. System: Pump Station Building – Above and Below Grade Piping

a. Material: Type 316L, Schedule 10

b. Operating Pressure: 58 psi

c. Test Pressure: 150 psi

d. Temperature: 68 – 80 °F

1.07 Delivery, Storage and Handling

A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe and fittings. Pipe and fittings shall not be dropped. Pipe and fittings shall be examined before installation and no piece shall be installed which is found to be defective.

B. In handling the pipe, wide cushioned slings or other devices and methods acceptable to the JEA ENGINEER shall be used. No uncushioned ropes, chairs, wedges or levers shall be used in handling the pipe, fittings and couplings.

C. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe by the CONTRACTOR, at the CONTRACTOR's own expense. All pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until they are put into service.

Part 2 Products

2.01 Materials

A. All stainless steel pipe and fittings shall be fabricated from stainless steel sheet and conform to ASTM A778 Type 316L. Carbon content of Type 316L

material shall be 0.03 percent maximum. Finish shall be No. 1 or No. 2B.

B. Pipe shall be die-formed or rolled true to dimension and round. Tolerances for length, inside and outside diameter and straightness shall conform to ASTM A530. The two edges of sheet shall be brought to line so as not to leave a shoulder on the inside of the pipe. Ends of pipe and fittings shall be perpendicular to the longitudinal axis. Longitudinal seams on pipe and fittings shall be welded by either the tungsten gas or the metallic-gas method. The interior welds shall be smooth, even, and shall not have an internal bead higher than 1/16-inch. All pieces shall be marked with gauge and type of stainless steel and with the initials of the inspector marked on the inside of each piece, at each end.

1. All stainless steel piping shall be Schedule 10 or of sufficient thickness for a working pressure of 150 psi at 120 degrees F.

C. Fittings shall be smooth curve type up to 18-inch diameter and mitered type 20-inch diameter and greater. Fittings shall conform to ANSI B16.9.

D. Flanges for pipe 4-inch and smaller shall be of the type of stainless steel as the pipeline, and shall be welded directly to the pipe end, and shall be drilled to the 125 lb ANSI B16.1 standard. Flanges for pipe larger than 4-inch shall have stub ends or rolled angle rings of the type of stainless steel as the pipeline welded to the pipe end, with suitable gaskets between the mating surfaces and joined through the use of 125 lb rated back-up flanges, drilled to ANSI B16.1, and made of Type 316 stainless steel. Where the pipe stub is to pass through a sleeve during installation, a split-type back up flange shall be used. Bolts, washers, nuts, and other hardware for flange bolting shall be Type 316 stainless steel.

E. Gaskets for flanged connections shall be a minimum of 1/8-inch thick and shall be hypalon, teflon, BUNA-N, SBR, NBR or viton.

F. All stainless steel pipe and fittings shall be pickled at the point of manufacture, scrubbed and washed until all discoloration is removed in accordance with ASTM A380.

G. Pipe ends shall be prepared for couplings or other type ends where required by transport and handling limitations, where required by the support layout requirements, and where noted on the Construction Drawings. Plain end pipe may be coupled with "Pressfit"-style connectors, for pipe/tubing sizes 1½-inch diameter and smaller, manufactured by the Victaulic Co. or by the use of grooved end couplings. Grooving (or built-up ends for Schedule 5s or 10s pipe) shall be of the coupling manufacturers standard type. CONTRACTOR is responsible for ensuring rigidity of joints where required. All normal pipe joints at valves, bends, etc., shall be flanged, drilling per ANSI B16.1, Class 125.

H. Shop welding of fabrications shall be done according to the procedures and by welders certified per ASME Section IX. Welds shall be by an inert gas shielding process using only extra low carbon filler metals. Welds shall have a bead height of no more than 1/16-inch. Butt welds shall have 100 percent penetration to the interior or backside of the weld joint. Cross-sectional

thickness of welds shall be equal or greater than that of the parent metal.

I. Where shown on the Construction Drawings or where approved by the JEA ENGINEER, harnessed flange adapter couplings (HFAC) shall be used to connect plain end pipe to equipment, fittings and valves.

Part 3 Execution

3.01 Installation

A. All pipe and fittings shall be installed true to grade and alignment and pipe anchorage and/or restraint shall be provided where required. Manufacturer's instructions shall be strictly followed.

B. All pipe and fittings shall be protected from dirt, dust, oil, grease, and other foreign matter during installation to prevent damage to pipe and to assure no foreign matter is left in the piping.

C. To assemble the joints in the field, thoroughly clean all joint surfaces and gaskets, if any, with soapy water before assembly. Bolts shall be tightened alternately, evenly to the manufacturer's specified torques. Under no condition shall extension wrenches or pipe-over-handle ratchet wrenches be used to secure greater leverage. All electrical bonding or insulation shall be installed as joints are made up.

D. Fittings, in addition to those shown on the Construction Drawings, shall be provided if required. Due consideration shall be given to thermal expansion/contraction over a temperature range of 200 degrees F.

E. When cutting of pipe is required, the cutting shall be done by machine neatly, without damage to the pipe. Cut ends shall be smooth and at right angles to the axis of the pipe.

F. After installation, stainless steel pipe lines shall be washed clean with steam or hot water to remove any foreign material picked up during transport.

3.02 Joining Flanged Joints

A. Flanged joints shall be made with gasket, bolts, and nut bolts stud with a nut on each end, or studs with nuts where the pipe is tapped. The number and size of bolts shall conform to the same standard requirements as the flange.

3.03 Field Welding

A. Welding in the field shall be done only if approved by the JEA ENGINEER. Field welds shall be made by welders certified under ASME Section IX and be equal in all respects to shop welds. After field welding has been done, all joints shall be thoroughly cleaned and buffed using deburring and finishing wheels.

3.04 Field Painting

A. Final field painting is required for all piping except that for all stainless steel

pipe, only bands, labels, and arrows rather than full pipe painting will be required.

3.05 Disinfection and Cleanup

A. After installation, completed lines shall be cleaned with Oakite deoxidizer or similar deoxidizer as recommended by the manufacturer to remove all foreign matter, construction stains or shop markings. Cleaned lines shall be rinsed clear with steam or hot water.

3.06 Field Testing

A. Field testing of the pipe shall be as specified in JEA Water and Wastewater Standards (2016 Edition or most recent).

END OF SECTION

40 05 24 Process Gauges

Part 1 General

1.01 Scope

A. This section covers furnishing, installing, and testing (where required), of all gauges which would be furnished by the manufacturer(s).

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 40 05 70 - Piping Specialties
2. Section 40 23 00 - Water Process Piping
3. Division 40 (13) - Instrumentation and Controls
4. Division 50 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

1.03 Cited Standards - None

1.04 Noted Restrictions

A. No asbestos shall be used in the manufacture of any gauge component.

1.05 Safety - None

1.06 Quality - None

1.07 Submittals

A. The submittals required in this section include data sheets and operation manuals (where applicable) of all gauges and shall be provided to the JEA ENGINEER fifteen (15) days prior to installation.

Part 2 Products

2.01 Equipment

A. Pressure Gauge

1. CONTRACTOR shall utilize glycerin-filled pressure gauges with stainless steel wetted parts and 2½-inch dial sizes, by Wika Instrument, or approved equivalent.
2. Pressure gauges shall have a measuring range of 0 - 100 psi.
3. Pressure gauges shall have a lower mount configuration with a ¼-inch MNPT connection.

Part 3 Execution

3.01 Installation

A. Avoid installing pressure gauges at high points in the pipeline. Gauges shall be connected to the process piping through ¼-inch isolation ball valves.

B. The placement of gauges, instruments, and other components shall be located such that they can be easily serviced and seen.

C. All gauges shall be installed per manufacturer's recommendations and user manuals.

END OF SECTION

40 05 25 Process Totalizing Water Flow Meter

Part 1 General

1.01 Scope

A. This section covers furnishing, installing, and testing (where required), of all flow meters (flow totalizers) which would be furnished by the manufacturer(s).

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 40 05 70 - Piping Specialties
2. Section 40 23 00 - Water Process Piping
3. Division 40 (13) - Instrumentation and Controls
4. Division 50 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

1.03 Cited Standards - None

1.04 Noted Restrictions

A. No asbestos shall be used in the manufacture of any flow meter component.

1.05 Safety - None

1.06 Quality Control - None

1.07 Submittals

A. The submittals required in this section include data sheets and operation manuals (where applicable) of all meters and shall be provided to the JEA ENGINEER fifteen (15) days prior to installation.

Part 2 Products

2.01 Equipment

A. Flow Indicating and Totalizing Transmitter

1. CONTRACTOR shall utilize 1½-inch totalizing flowmeter capable of reading 0 to 50 gallons per minute and registering up to 1,000,000 gallons on each extraction well leg.
2. Flowmeters shall provide a local display as well as a 4-20mA output signal.
3. The CONTRACTOR shall provide all flow meters as specified herein and/or as shown on the Construction Drawings. The CONTRACTOR shall submit for approval by the JEA ENGINEER a schedule of all flow

meters indicating the service, size, connections, make, model number and any special features.

4. All packing, gaskets, etc., shall conform to recommendations of the flow meter manufacturer for the intended service.

Part 3 Execution

3.01 Installation

A. The placement of flow meters, instruments and other components shall be located such that they can be easily serviced.

B. Install flowmeters per manufacturer's recommendations. CONTRACTOR shall ensure that flowmeters are properly flooded and installed with appropriate lengths of straight pipe runs upstream and downstream.

END OF SECTION

40 05 50 Valves

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation and test all non-buried valves as shown on the Construction Drawings and as specified herein.

B. The equipment shall include, but not be limited to, the following; however not all items specified herein may be included in this project.

1. General Requirements.
2. Valve Actuators - Manual.
3. Check Valves.
4. Ball Valves.
5. Pressure Regulating Valves.
6. Air Release Valves.

1.02 Referenced Sections

A. Division 26 - Electrical

B. Section 40 05 70 - Piping Specialties

C. Section 40 23 00 - Water Process Piping

D. Division 40 (13) - Instrumentation and Controls

E. Division 50 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

F. Certain items similar to those specified in this Section may be specified to be furnished and installed with individual equipment or systems. In case of a conflict, those individual equipment or system requirements shall govern.

G. Electric valve operators of all types, rate of flow controllers (including modulating valves and operators) and other types of valves which are part of the automated instrumentation (such as some solenoid valves) if not included herein are included in Division 40. Valve operators shall, however, be mounted at factory on valves as specified herein, as part of the work of this Section.

1.03 Submittals

A. Submit to JEA ENGINEER, in accordance with Section 01 33 00, materials required to establish compliance with this Section. First submittal shall be valve schedule described in Paragraph 1.09. Approval of valve schedule submittal is required prior to CONTRACTOR submitting any of equipment in

this specification. Subsequent Equipment Submittals shall include at least the following:

1. Valve tag number.

2. Manufacturer and supplier.

3. Address at which equipment will be fabricated or assembled.

4. Drawings showing assembly details, materials of construction and dimensions.

5. Descriptive literature, bulletins and/or catalogs of the equipment.

6. Total weight of each item.

7. A complete bill of materials.

8. Additional submittal data, where noted with individual pieces of equipment.

9. Individual electrical control schematics and wiring diagrams for each valve operator with external interfaces, identified exactly as detailed on Electrical and Instrumentation Drawings. Standard catalogue cut sheets that show typical wiring diagrams only are not acceptable. Valve actuators shall be coordinated with electrical requirements shown on Construction Drawings and valves as specified herein.

B. Certificates:

1. For each valve specified to be manufactured, tested and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with appropriate standards, including certified results of required tests and certification of proper installation.

C. Manufacturer's Installation and Application Data.

D. Operating and Maintenance Data.

1. Operating and maintenance instructions shall be furnished to JEA ENGINEER as provided in Section 01 78 23. Instructions shall be prepared specifically for this installation and shall include required cuts, drawings, equipment lists, descriptions and other information required to instruct operating and maintenance personnel unfamiliar with such equipment.

1.04 Cited Standards

A. ASTM International:

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

3. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.

4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

5. ASTM A436 - Standard Specification for Austenitic Gray Iron Castings.

6. ASTM A536 - Standard Specification for Ductile Iron Castings.

7. ASTM B30 - Standard Specification for Copper-Base Alloys in Ingot Form.

8. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

B. American Water Works Association (AWWA):

1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

2. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-in (50mm through 24-in (600mm) NPS.

3. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.

4. AWWA C800 - Underground Service Line Valves and Fittings.

C. American National Standards Institute (ANSI):

1. ANSI B1.20.1 - Specifications, Dimensions, Gauging for Taper and Straight Pipe Threads (except dry seals).

2. ANSI B16.10 - Face-to-Face and End-to-End Dimensions of Valves.

D. American Iron and Steel Institute (AISI).

E. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS):

1. MSS-SP-61 - Pressure Testing of Steel Valves.

2. MSS-SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Services.

3. MSS-SP-82 - Valve Pressure Testing Methods.

4. MSS-SP-98 - Protective Coatings for the Interior of Valves, Hydrants and Fittings.

F. National Electrical Manufacturers Association (NEMA).

G. Underwriters Laboratories (UL).

H. Factory Mutual (FM).

I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 Noted Restrictions

A. No asbestos shall be used in the manufacture of any valve component.

1.06 Quality Assurance

A. Qualifications:

1. Valves and appurtenances shall be products of well-established firms who are fully experienced, minimum ten years, reputable and qualified in manufacture of particular equipment to be furnished.

2. Equipment shall be designed, constructed and installed in accordance with best practices and methods and shall comply with this Section as applicable.

3. Units of the same type shall be the product of one manufacturer.

B. Certifications:

1. Manufacturers shall furnish an affidavit of compliance with Standards referred to herein as specified in Paragraph 1.03C above. Refer to Part 3 for testing required for certain items in addition to that required by referenced standards.

C. Inspection of units may also be made by JEA ENGINEER or other representative of JEA after delivery. Equipment shall be subject to rejection at any time due to failure to meet any of specified requirements, even though submittal data may have been accepted previously. Equipment rejected after delivery shall be marked for identification and shall be removed from job site at once.

D. The placement of valves, instruments and other components shall be located such that they can be easily serviced.

E. All packing, gaskets, discs, seats, diaphragms, lubricants, etc., shall conform to recommendations of the valve manufacturer for the intended service.

F. Valves shall be installed with the stems positioned in the horizontal or above the centerline of the pipe. Valves shall be arranged to open by hand wheel or lever operation unless otherwise indicated in these Technical Specifications.

G. Each valve selected shall be suitable for site-specific conditions based on manufacturer's recommendation, specifications, and operation manuals.

H. Flange end valves shall have connecting end flanges in accordance with American National Standards Institute (ANSI) standard B16.5.

I. Unless otherwise stated in the specifications, the valve operating mechanisms shall be supplied by the valve manufacturer. This shall include hand wheels, levers, gear boxes, or pneumatic and electric operators and positioners.

1.07 System Description

A. Equipment and materials specified herein are intended to be standard for use in controlling flow of contaminated ground water and air as noted on Construction Drawings.

B. Valves, appurtenances and miscellaneous items shall be installed as shown on Construction Drawings and as specified, so as to form complete workable systems.

1.08 Delivery, Storage and Handling

A. Reference is made to Section 01 66 00 for additional information.

B. Packing and Shipping:

1. Care shall be taken in loading, transporting and unloading to prevent injury to the valves, appurtenances, or coatings. Equipment shall not be dropped. Valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Damage to the coatings shall be repaired as acceptable to JEA ENGINEER.

2. Prior to shipping, ends of valves shall be acceptably covered to prevent entry of foreign material. Covers shall remain in place until after installation and connecting piping is completed.

a. Valves 3-in and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.

b. Valves smaller than 3-in shall be shipped and stored as above except that heavy cardboard covers may be used on the openings.

c. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until the valve is installed and put into use.

d. Corrosion in evidence at the time of acceptance by the JEA shall be removed, or the valve shall be removed and replaced.

C. Storage and Protection:

1. Special care shall be taken to prevent plastic and similar brittle items from being directly exposed to the sun, or exposed to extremes in temperature, to prevent deformation. See the individual piping sections and manufacturer's information for further requirements.

1.09 Maintenance

A. Special tools and the manufacturer's standard spare parts, if required for normal operation and maintenance, shall be supplied with the equipment in accordance with Section 01 78 23 and where noted, as specified herein. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.

B. Provide one operations and maintenance manual for each type of valve and operator supplied under this specification in accordance with Section 01 78 23.

C. Included within operations and maintenance manuals, provide a list of all spare and replacement parts with individual prices and location where they are available.

1.010 Valve Designations and Schedule

A. Valves shall be identified by a unique valve tag as identified in valve schedule prepared by CONTRACTOR. Specific type of valve to be used will be identified by symbol and/or call out on Construction Drawings. CONTRACTOR shall identify each valve by its assigned tag number on shop drawings and equipment submittals.

B. CONTRACTOR shall refer to the P&IDs and mechanical plans for type of each valve called out by abbreviation or drawing symbol. Prior to first valve submittal, CONTRACTOR shall submit a detailed valve schedule listing process valves to be furnished along with Contract Drawing P&IDs edited electronically which shall include valve tag numbers prepared by CONTRACTOR identifying each valve. Valve schedule shall include: valve tag number; valve designation; valve size; end connections and operator type. Valve tag convention shall be four digits long, numbering shall be linked to the P&ID Sheet on which it is shown. Identical valves in same position in parallel processes (EX. Pump inlet/outlet isolation valves where there are three parallel pumps of same type) shall have same tag number followed by a hyphen and quantifier -1, 2, 3 etc. Where electric, hydraulic or pneumatic actuators are supplied their type shall be so noted with an E, H or P. Modulating duty actuators shall be noted with an M following the actuator type notation. An excerpt of an EXAMPLE schedule is as follows:

Valve Tag.	Designation	Size	Ends	Operator	Notes
1000-1	BFV1	8-in	Flanged	Gear/Handwheel	Extra description as necessary
1000-2	BFV1	8-in	Flanged	Gear/Handwheel	

1005	PV1	6-in	Flanged	EM	

Part 2 Products

2.01 Materials and Equipment - General

A. Reference is made to Division 01 for additional requirements, including nameplates, provisions for temporary pressure gauges, protection against electrolysis and anchor bolts.

B. Use of a manufacturer's name and/or model or catalog number is for purpose of establishing standard of quality and general configuration desired.

C. Valves and appurtenances shall be of size shown on the Construction Drawings or as noted and as far as possible equipment of same type shall be identical and from one manufacturer.

D. Valves and appurtenances shall have name of maker, nominal size, flow directional arrows, working pressure for which they are designed and standard referenced, cast in raised letters or via riveted stainless steel nameplate upon some appropriate part of the body.

E. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of same working pressure as pipe they connect to, whichever is higher and suitable for pressures noted where they are installed.

F. Joints, size and material - unless otherwise noted or required by JEA ENGINEER:

1. Except where noted, joints referred to herein shall be of same type, nominal diameter, material and with a minimum rating equal to pipe or fittings they are connected to.

2. Valves and appurtenances shall be of same nominal diameter as pipe or fittings they are connected to.

3. Valves exposed to view, or in vaults:

a. Plastic valves in chemical service - solvent cement, or flanged ends.

b. 3-in and smaller - threaded ends- unless noted otherwise herein or on Construction Drawings.

c. 4-in and larger - flanged ends.

G. Provide special adaptors as required to ensure compatibility between valves, appurtenances, and adjacent pipe.

H. No alternative materials will be considered for approval unless complete documentation is provided regarding their satisfactory long-term use in similar conditions; in addition, the consideration of any substitution will be considered

only if superiority of proposed materials is the intent of substitution, and only if sufficient evidence is provided to document that superiority.

2.02 Valve Actuators - General/Manual

A. Geared actuators shall be suitable for all weather service, with mechanical shaft seals, shall be permanently greased, or shall have provisions for greasing. Actuators for submerged duty shall be so rated, with certification by manufacturer for submerged service.

B. Valve manufacturer shall supply, mount, and test all actuators on valves at factory. Valves and their individual actuators shall be shipped as a unit.

C. Unless otherwise noted on Construction Drawings, valves shall be manually actuated; non-buried valves shall have an operating wheel, handle or lever mounted on operator; those with operating nuts shall have a non-rising stem with an AWWA 2-in nut; At least two tee handles shall be provided for operating nuts. Unless otherwise noted, operation for valves shall be CCW open.

D. Actuators shall be capable of moving valve from full open to full close position and in reverse and holding valve at any position part way between full open or closed.

E. Each operating device shall have cast on it the word "OPEN" and an arrow indicating direction of operation.

F. Floor boxes for operating nuts recessed in concrete shall be standard cast iron type, cast-in-place, with fastening top, and Type 316 stainless steel hardware.

G. Stem guides shall be of the adjustable wall bracket type, bronze bushed, with maximum spacing of 10-ft as manufactured by Clow; Rodney Hunt or equal. Extended operating nuts and/or stems shall have universal joints and pin couplings, if longer than 10-ft and a rating of at least five times the maximum operating torque. Stem adaptors shall be provided.

H. Where required by installation, or as specified, provide the following: extended stem; floor stand and handwheel; position indicator and etched or cast arrow to show direction of rotation to open the valve; resilient, moisture-resistant seal around stem penetration of slab.

I. Gear Actuators:

1. Unless otherwise noted, gear actuators shall be provided for the following: plug and ball valves larger than 3-in diameter; where specified and/or indicated on Construction Drawings; where manual operator effort is greater than 40 lbs rim pull.

2. Actuators shall be capable of being removed from valve without dismantling the valve or removing valve from the line.

3. Gear actuators for quarter turn valves shall be of worm or helical worm gear type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on output shaft. Where shown on Construction Drawings, a two-inch cast iron operating nut shall be provided. Actuators shall conform to AWWA C504 except where more stringent requirements are provided hereinafter. Gearing shall be machine cut steel designed for smooth operation. Bearings shall be permanently lubricated, with bronze bearing bushings provided to take thrusts and mechanical shaft seals to contain lubricants. Housings shall be sealed to exclude moisture and dirt, allow reduction mechanisms to operate in lubricant and be constructed of cast iron, ASTM A 126, Grade B, or of ductile iron, ASTM A 536. Gear housing bodies for thermoplastic valves may be cast aluminum or fabricated steel to reduce weight. Gear actuators shall indicate valve position and have adjustable stops.

4. Manual Input torque to produce required valve operating torque for worm and travelling nut gear operators shall not exceed 80 ft-lbs. In addition, hand wheel rim pull shall not exceed 20 lbs for valve sizes up to 12 inches, 40 lbs for valve size between 14 and 20 inches, 60 lbs for valve size 24 and greater. Minimum hand wheel size shall be 8 inches for up to 12-inch valve size, 12 inches for up to 16-inch valve size, 18 inches for up to 20-inch size.

5. Gear actuators for multi turn valves shall be of bevel or spiral bevel type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on output shaft. Gearing shall be machine cut steel designed for smooth operation. Bearings shall be permanently grease lubricated, with dual anti-friction ball bearings on output shaft and mechanical shaft seals to contain lubricants. Output flange of primary gear reducer shall be designed to meet an appropriate MSS or ISO standard to allow mounting to secondary gear reducer. Ring gear shall ride on ball bearings. Stem nut shall be bronze alloy, shouldered, and ride on needle bearings. Housing components shall be O-ring sealed to exclude moisture and dirt, constructed of cast iron, ASTM A 126, Grade B, or of ductile iron, ASTM A 536. Gear housing bodies for thermoplastic valves may be cast aluminum or fabricated steel to reduce weight. Manual operator input effort to the hand wheel shall be a maximum of 30 lbs for operating the valve from full open to full close, under any conditions. Maximum hand wheel size shall be 24-in diameter.

J. Additional valve actuator requirements are included with the individual valve types and as noted in Paragraph 1.02 above.

K. Position indication and direction of opening arrows shall be embossed, stamped, engraved, etched, or raised castings. Decals or painted indications shall not be allowed.

L. Unless otherwise noted, valves larger than 3-in nominal diameter shall be provided with position indicators at the point of operation.

2.03 Gate Valves

A. All gate valves shall comply with requirements included in JEA's Water and Sewer Standards Manual, Section 351 – Water Valves & Appurtenances.

B. Gate valves shall be rated for 200 psi or greater.

2.04 Check Valves

A. Rubber Flapper Check Valves: Tag Type RFCV.

B. The Rubber Flapper Swing Check Valve shall have a heavily constructed ductile iron or ductile iron body and cover. The body shall be long pattern design (not wafer) with integrally cast-on end flanges. The flapper shall be Buna-N having an "O" ring seating edge and be internally reinforced with steel.

C. Flapper to be captured between the body and the body cover in a manner to permit the flapper to flex from closed to full open position during flow through the valve. Flapper shall be easily removed without need to remove valve from line. Check Valves to have full pipe size flow area. Seating surface to be on a 45 degree angle requiring the flapper to travel only 35 degrees from closed to full open position, for minimum head loss and non-slam closure.

D. Buna-N Flapper (hi-strength coated fabric – coated both sides with 70 Duro) which creates an elastic spring effect, molded internally, to assist the flapper to close against a slight head to prevent slamming.

E. Valve designed for 250 psi working pressure for raw water.

F. A top or side mounted valve position limit switch shall be provided to provide disc position indication. The indicator shall have continuous contact with the disc under all operating conditions to assure accurate disc position indication. The limit switch shall be Honeywell model no. 914CE20-3

G. The Valve Manufacturer shall have been regularly engaged in the design and manufacture of Rubber Flapper Swing Check Valves for at least five years and shall submit a list of at least five separate installations in service for a minimum of five years for JEA ENGINEER approval prior to release to manufacture.

H. Materials of construction shall be certified in writing to conform to ASTM specifications as follows:

Body & Cover	ASTM A536 Grade 65-45-12 Ductile Iron
Rubber Flapper	Buna-N

I. Valve to be APCO Series 100 Rubber Flapper Swing Check Valve, as manufactured by Valve & Primer Corporation, Schaumburg, Illinois, U.S.A.; Val-Matic 500 Series; Crispin RF Series or approved equal.

2.05 Ball Valves: Tag Type Noted Below

A. General Service Ball Valves: Tag Type BV1.

1. Ball valves shall be full port and shall conform to the requirements of the JEA Water and Wastewater Standards (January 2016 or latest Edition) – Section 430 Wastewater Valves and Appurtenances.

B. Sample ports shall consist of ¼-inch ball valves.

1. Body: brass or steel, compatible with site-specific groundwater

2. Seats: EPDM, PTFE, or other compatible materials

3. Seals: EPDM, PTFE, or other compatible materials

4. Ball: brass or steel, compatible with site-specific groundwater

2.06 Pressure Regulating Valves: Tag Type PCV

A. Valve will be designed to act as a normally closed back pressure sustaining and check valve. It will have a normally closed pressure sustaining pilot designed to open on an increase in upstream pressure and close on a decrease. The valve will be designed to open slowly to feed water downstream the well as long as inlet pressure is at 47 psi or higher. It will stay open as long as pressure is above this setting to protect the upstream pump, keeping it on its curve. If inlet pressure drops below outlet pressure the valve will check shut preventing reversal of flow. The sustaining valve will have 0-75 psi adjustable back pressure adjustment ranges.

B. The main valve will be a 3-inch 100-46 with all 316 stainless steel main valves. It will have a two-piece slip on flanged, diaphragm actuated main valve. The main valve will be all 316SS with 316SS trim and pilot system. It will have a one-piece stainless steel seat. The cover will have a locating lip. The main body will be supplied with a 150 ANSI flanged ends rated to 285 psi working pressures. The CRL60 sustaining pilot will have a 0-75 psi spring range. There shall be pilot isolation valves installed (B). There shall be a 0-100 psi gauge mounted on the main valve inlet (P) and outlet. The pilot system will have a “Y” strainer (Y). There shall be an X101 valve position indicator (V) to give a visual indication of valve position. The rubber parts will be EPDM. The check feature is denoted by (D).

C. The manufacturer shall provide a direct factory employee for startup and training.

D. The manufacturer shall warranty the valve for 3 years from date of shipment.

E. The valve shall be a model 3-inch 550G-90BDPSVY TT SSB as manufactured by Cla-Val Co. Newport Beach, CA.

2.07 Air Release Valves: Tag Type ARV

A. All reclaimed and raw water lines shall have combination air release valves installed as they are indicated on the plans. The body/base of these valves shall be made from high strength lightweight non-corroding fiberglass reinforced nylon, with total weight of no more than 3 pounds, and all operating parts are to be made of engineered corrosion resistance plastic materials. The

rolling resilient seal shall provide smooth positive opening, closing, and leak-free sealing over the fluctuation of pressure differentials. The valve shall be designed to allow larger-than-normal automatic orifice providing efficient air release and minimize potential debris build up and clogging. The working pressure shall be 200 psi and shall have a 1-inch threaded connection. All combination air release valves shall be model ARI D-021P. The connection to the system shall be a direct threaded connection on the top of the pipe with a saddle, with an isolation valve. The height of valve shall not be more than 14-inches. If room does not allow for a direct connection, the use of a 90-deg. bend can be used to offset the connection to the side. This connection must have a grade that increases as it leaves the connection at the pipe.

2.08 Surface Preparation and Shop Coatings

A. Notwithstanding any of these specified requirements, coatings and lubricants in contact with potable water shall be certified as acceptable for use with that fluid.

B. If manufacturer's requirement is not to require finished coating on interior surfaces, then manufacturer shall so state and no interior finish coating will be required, if acceptable to JEA ENGINEER.

C. Exterior surface of various parts of valves, operators, floor-stands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease or other foreign matter and thereafter one shop coat of an approved rust-inhibitive primer such as Inertol Primer No. 621 shall be applied in accordance with instructions of paint manufacturer or other primer compatible with finish coat provided.

D. Unless otherwise noted, interior ferrous surfaces of valves shall be given a shop finish of an asphalt varnish conforming to AWWA C509, (except mounting faces/surfaces) or epoxy conforming to AWWA C550 with a minimum thickness of 6 mils.

E. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating. Mounting surfaces shall be especially coated with a rust preventative.

F. Special care shall be taken to protect uncoated items and plastic items, especially from environmental damage.

2.09 Factory Inspection and Testing

A. Factory inspection, testing and correction of deficiencies shall be done in accordance with the referenced standards and as noted herein.

B. See Division 01 for additional requirements. Also refer to Part 1, especially for required submission of test data to JEA ENGINEER.

C. In addition to tests required by referenced standards, the following shall also be factory tested:

1. Pressure regulating valves shall be factory tested at specified pressures and flows.

Part 3 Execution

3.01 Installation - General

A. Valves and appurtenances shall be installed per manufacturer's instructions in locations shown, true to alignment and rigidly supported. Damage to above items shall be repaired to satisfaction of JEA ENGINEER before they are installed.

B. Install brackets, extension rods, guides, various types of operators and appurtenances as shown on Construction Drawings, or otherwise required. Before setting these items, check Construction Drawings and figures which have a direct bearing on their location. CONTRACTOR shall be responsible for proper location of valves and appurtenances during construction of the work.

C. Materials shall be carefully inspected for defects in construction and materials. Debris and foreign material shall be cleaned out of openings, etc. Valve flange covers shall remain in place until connected piping is in place. Operating mechanisms shall be operated to check their proper functioning and nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to JEA.

D. Where installation is covered by a referenced standard, installation shall be in accordance with that standard, except as herein modified, and CONTRACTOR shall certify such. Also note additional requirements in other parts of this Section.

E. Unless otherwise noted, joints for valves and appurtenances shall be made up utilizing same procedures as specified under applicable type connecting pipe joint and valves and other items shall be installed in proper position as recommended by manufacturer. CONTRACTOR shall be responsible for verifying manufacturers' torqueing requirements for all valves.

3.02 Installation of Manual Operational Devices

A. Unless otherwise noted, operational devices shall be installed with units of factory, as shown on Construction Drawings or as acceptable to JEA ENGINEER to allow accessibility to operate and maintain item and to prevent interference with other piping, valves, and appurtenances.

B. For manually operated valves 3-in in diameter and smaller, valve operators and indicators shall be rotated to display toward normal operation locations.

C. Floor boxes, valve boxes, extension stems and low floor stands shall be installed vertically centered over operating nut, with couplings as required and elevation of box top shall be adjusted to conform to elevation of finished floor surface or grade at completion of Contract. Boxes and stem guides shall be adequately supported during concrete placement to maintain vertical

alignment.

3.03 Inspection, Testing and Correction of Deficiencies

A. See also Division 01. Take care not to over pressure valves or appurtenances during pipe testing. If unit proves to be defective, it shall be replaced or repaired to satisfaction of JEA ENGINEER.

B. Functional Test: Prior to plant startup, items shall be inspected for proper alignment, quiet operation, proper connection and satisfactory performance. After installation, manual valves shall be opened and closed in presence of JEA ENGINEER to show valve operates smoothly from full open to full close and without leakage. Valves equipped with electric, pneumatic or hydraulic actuators shall by cycled five times from full open to full closed in presence of JEA ENGINEER without vibration, jamming, leakage, or overheating. Pressure control and pressure relief valves shall be operated in presence of JEA ENGINEER to show they perform their specified function at some time prior to placing piping system in operation and as agreed during construction coordination meetings

C. Various pipe lines in which valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed, and replaced, or otherwise made acceptable to JEA ENGINEER.

D. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with specified operational capabilities and deficiencies shall be corrected or device replaced or otherwise made acceptable to JEA ENGINEER.

3.04 Cleaning

A. Items including valve interiors shall be inspected before line closure, for presence of debris. At option of JEA ENGINEER, internal inspection of valve and appurtenances may be required any time that likelihood of debris is a possibility. Pipes and valves shall be cleaned prior to installation, testing disinfection and final acceptance.

3.05 Disinfection

A. Disinfection of valves and appurtenances on potable water lines and where otherwise noted, shall be as noted in Paragraph 1.02B above.

END OF SECTION

40 05 70 Piping Specialties

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required to install, complete test, and make ready for operation all piping specialties required by the work of this Contract. Specific piping materials, systems and related installation and testing requirements shall be coordinated with the related sections in Division 31 and Division 40. The items shall include the following:

1. Flanged Joints;
2. Plugs and Caps;
3. Miscellaneous Adaptors;
4. Service Clamps;
5. Flexible Connectors; and
6. Harnessed Flange Adapter Couplings.

1.02 Related Work

A. Division 33 - Utilities

B. Division 40 - Process Piping, Hosing, and Appurtenances

C. Section 40 05 50 - Valves

1.03 Submittals

A. Submit general submittals for piping, piping systems, and pipeline appurtenances as listed below. It is not intended that all submittals listed below be provided for all piping materials and systems.

B. Shop Drawings and Product Data:

1. Piping layouts with specialties;
2. Location of pipe hangers and supports;
3. Location and type of backup block or device to prevent joint separation;
4. Large scale details of wall penetrations and fabricated fittings;
5. Catalog cuts of specialties, joints, couplings, harnesses, expansion joints, gaskets, fasteners and other accessories;
6. Catalog cuts of all pipeline appurtenances specified herein; and

7. Brochures and technical data on coatings and linings and proposed method for application and repair.

C. Samples.

D. Design Data.

E. Certificates:

1. Copies of certification for all welders performing work in accordance with ANSI B31.1.

F. Manufacturer's Installation (or application) instructions.

G. Statement of Qualifications.

H. Manufacturers Field Report.

I. Project Record Document.

J. Operation and Maintenance Data.

K. Warranties.

1.04 Reference Standards

A. ASTM International (ASTM):

1. ASTM A36 - Standard Specification for Carbon Structural Steel.

2. ASTM A126 - Standard Specification for Gray Iron Casting for Valves, Flanges, and Pipe Fittings.

3. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts.

4. ASTM A278 - Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 Degrees F.

5. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

6. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.

7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

8. ASTM A536 - Standard Specification for Ductile Iron Castings.

9. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

10. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

B. American National Standards Institute (ANSI):

1. ANSI A13.1 - Scheme for the Identification of Piping Systems.
2. ANSI B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
3. ANSI B18.2 - Square and Hexagon Bolts and Nuts
4. ANSI B31 - Pressure Piping.
5. ANSI B31.1 - Power Piping.

C. American Society of Mechanical Engineers (ASME):

1. ASME B2.1 - Pipe Threads (Except Dryseal).
2. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
3. ASME B16.5 - Pipe Flanges and Flange Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

D. American Welding Society (AWS):

1. AWS B3.0 - Welding Procedure and Performance Qualifications.

E. American Water Works Association (AWWA):

1. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
2. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C219 - Bolted, Sleeve-Type Couplings for Plain-End Pipe.
4. AWWA C606 - AWWA Standard for Grooved and Shouldered Joints.
5. AWWA Manual M11 Steel Pipe - A Guide for Design and Installation.

F. Plumbing and Drainage Institute (PDI):

1. WH 201 - Water Hammer Arresters Standard.

G. Underwriters Laboratories (UL).

H. Factory Mutual (FM).

I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 Quality Assurance

A. Materials shall be new and unused.

B. Install piping to meet requirements of local codes.

C. Provide manufacturer's certification that materials meet or exceed minimum requirements as specified.

D. Coordinate dimensions and drilling of flanges with flanges for valves, pumps, and other equipment to be installed in piping systems. Bolt holes in flanges to straddle vertical centerline.

E. Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, and acid solder.

F. Pipe-joint compound, for pipe carrying flammable or toxic gas, must bear approval of UL or FM.

G. Unless otherwise specified, pressures referred to in Construction Drawings are expressed in pounds per square inch, gauge above atmospheric pressure, psig and all temperature are expressed in degrees Fahrenheit (F).

1.06 Delivery, Storage and Handling

A. During loading, transportation, and unloading, take care to prevent damage to pipes and coating. Carefully load and unload each pipe under control at all times. Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation to ensure no injury to pipe and lining. Cover or cap all pipe ends while pipe is in storage, until it is made a part of the work.

Part 2 Products

2.01 Materials and Equipment

A. Specific piping materials and appurtenances are specified in the Construction Drawings. The use of a manufacturer's name and/or model number is for the purpose of establishing the standard of quality and general configuration desired.

B. Equipment shall be of the size shown on the Construction Drawings or as noted and as much as possible equipment of the same type shall be identical and from one manufacturer.

C. Equipment shall have the name of the maker, nominal size, flow directional arrows (if applicable), working pressure for which they are designed and standard referenced specifications cast in raised letters or indelibly marked upon some appropriate part of the body.

D. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of the same working pressure as the pipe they connect to, whichever is higher and suitable for the pressures noted where they are installed.

2.02 Flanged Joints

A. Flanged Joints: Bolt and nuts, Type 316 stainless steel, bolt number and size same as flange standard; studs - same quality as machine bolts; 1/8-inch thick rubber gaskets with cloth insertions; rust-resistant coatings.

2.03 Plugs and Caps

A. Provide standard plug or cap as required for testing; plugs, caps suitable for permanent service.

B. Plug or cap or otherwise cover all piping work in progress.

2.04 Miscellaneous Adapters

A. Between different types of pipe and/or fittings special adapters may be required to provide proper connection. Some of these may be indicated on the Construction Drawings or specified with individual types of pipe or equipment. However, it is the CONTRACTOR's responsibility to ensure proper connection between various types of pipe, to structures and between pipe and valves, gates, fittings and other appurtenances. Provide all adapters as required, whether specifically noted or not.

B. As required, these adapters shall be suitable for direct bury.

2.05 Service Clamps

A. Service clamps for outlet sizes up to 2-inch shall have malleable or ductile iron bodies which extend at least 160 degrees around the circumference of the pipe and shall have neoprene gaskets cemented to the saddle body. Bodies shall be tapped for IPS. Clamps shall be of the double strap design. Service clamps shall be Style 91 by Dresser Industries, Inc.; Smith Blair; Mueller; or approved equal.

B. Service clamps for outlet sizes 4-inch through 12-inch where the outlet size is not greater than half the size of the main pipe shall have ductile iron bodies and a neoprene circular cross section O-ring gasket confined within the body. Outlet shall be AWWA C110 flange or AWWA C111 mechanical joint as required for the application. Straps shall be alloy steel, minimum 1/4-inch by 1½-inch in cross section and fabricated with 3/4-inch threaded ends. Service clamps shall be Fig. A-10920 or A-30920 by American Cast Iron Pipe Company, or approved equal.

2.06 Flexible Connectors

A. Provide one flanged rubber flexible connector at the connection of the proposed poly tank to the new piping. Connectors shall be Ultraspool by Flexicraft or approved equal.

2.07 Appurtenances and Miscellaneous Items

A. Gaskets, glands, bolts, nuts, and other required hardware shall be provided for connection of piping and appurtenances. Bolts and nuts shall be high

strength, Type 316 stainless steel if submerged, buried, or subject to splashing. All other hardware shall be of the size, type and number as required and recommended by the piping or appurtenance manufacturer and as specified herein.

B. Plugs, caps, and similar accessories shall be of the same material as the pipe and of the locking type, unless otherwise noted.

2.08 Harnessed Flange and Adapter Couplings (HFAC)

A. Provide HFACs meeting the requirements of AWWA C219 as applicable and with tie rods. Provide dismantling joints as shown on the Construction Drawings and called out as HFAC. All connecting hardware shall be Type 316 stainless steel. The spigots and flange adapters shall be ductile iron or steel meeting ASTM A283 Grade C, and shall be provided with a shop-coat primer compatible with the field applied coating. The HFAC shall be a complete assembly consisting of a spigot piece, flange adapter, tie rods, and gaskets. The tie rod restraint system shall be capable of withstanding the full pressure thrust that the pipe system can develop at no more than 50 percent of the yield strength of the tie rod material. The design pressure rating of the HFACs shall be a minimum of 150 psig. HFACs shall be type DJ 400 Dismantling Joints by Romac Industries, Dismantling Joints by Viking Johnson, Style 131 Dismantling Joints by Dresser Industries, or approved equal.

2.09 Color Coding and Labeling

A. General:

1. Provide a complete color coding system consisting of preprinted labels and banding by Brady; Seton or approved equal.

2. Piping system identification shall comply with the requirements of ANSI A13.1.

3. Colors listed are general. Actual colors will be selected based on a comparison to the existing plant color codes, except as otherwise indicated; samples shall be furnished for all pipe paint colors; with chips from existing piping where new service lines are connecting.

4. Banding:

a. Unless special spacing is listed in schedule, apply banding to pipe at connections to equipment, valves, branch fittings, at wall, floor, or ceiling boundaries and at intervals not greater than 36 ft.

5. Labels and Directional Arrows:

a. Apply labels with directional arrows at connections to equipment, valves, branch fittings, at least one wall, floor, or ceiling boundary within a room and at intervals not greater than 36 ft.

b. At each label, arrows indicating direction of flow shall point away from label. If flow may be in both directions, use double headed arrows.

c. Lettering shall bear the full pipe system name as scheduled.

d. Lettering height shall be as follows:

Outside Pipe Diameter	Minimum Letter Height
3/4-inch to 1¼-inch	1/2-inch
1½-inch to 2-inch	3/4-inch
2½-inch to 6-inch	1¼-inch
8-inch to 10-inch	2½-inch
Over 10-inch	3½-inch

Part 3 Execution

3.01 General

A. Dirt, scale, weld splatter, water and other foreign matter shall be removed from the inside and outside of all pipe and sub-assemblies prior to installing.

B. Pipe joints and connections to equipment shall be made in such a manner as to produce a minimum strain at the joint.

C. Test Connections:

1. Provide 1/2-inch female NPT test connection equipped with 1/2-inch brass plug on all pump suction and discharge lines. Where indicated on the Construction Drawings, test connections should be equipped with bar stock valve and gauge. Provide test connections at all steam traps. The connection shall be located on the discharge side of the trap between the trap and the first valve. It shall consist of a 1/2-inch branch connection terminated with a gate valve.

D. Installation of Expansion Joints and Flexible Connectors:

1. Piping systems shall be aligned prior to installation of expansion fittings. Alignment shall be provided by fitting a rigid pipe spool in place of the expansion joint. Prior to testing of the piping system, the pipe spool shall be replaced with the specified expansion or flexible fitting.

2. In addition to the locations noted on the Construction Drawings and in Part 2 of this Technical Specifications, expansion fittings and anchors shall be located and spaced as specified by the Expansion Joint Manufacturer's Association. The expansion joints/flexible connectors shall not be installed during times of temperature extreme or in a fully compressed or fully expanded condition.

E. Welding:

1. Welding shall be in accordance with ANSI B31 and AWS B3.0.

2. Install welding fittings on all welded lines. Make changes in direction and intersection of lines with welding fittings. Do not miter pipes to form elbows or notch straight runs to form tees, or any similar construction. Do not employ welder who has not been fully qualified in above specified procedure and so certified by approved welding bureau or similar locally recognized testing authority.

F. Installation of Flanged Joints:

1. Make flanged joints with bolts; bolt studs with nut on each end; or studs with nuts where one flange is tapped. Use number and size of bolts conforming to same ANSI Standard as flanges. Before flange pieces are assembled, remove rust resistant coating from machined surfaces, clean gaskets and smooth all burrs and other defects. Make up flanged joints tight, care being taken to prevent undue strain upon valves or other pieces of equipment.

3.02 Testing

A. Test all pipelines for water/gas tightness as specified in the Construction Drawings. Furnish all labor, testing plugs or caps, pressure pumps, pipe connections, gauges and all other equipment required. Testing shall be performed in accordance with one or more of the testing procedures appended to this section as specified in each Construction Drawings. All testing shall be performed in the presence of the JEA ENGINEER.

B. Repair faulty joints or remove defective pipe and fittings and replace as approved by the JEA ENGINEER. Retest.

END OF SECTION

40 23 00 Water Process Piping

40 23 19 Process Plant Water Piping

40 23 19.1 Plastic Process Piping

Part 1 General

1.01 Scope

A. This specification outlines minimum manufacturing requirements for Polyvinyl Chloride (PVC) Schedule 80 pipe.

B. CONTRACTOR shall utilize Schedule 80 PVC inside well vaults and within the hydraulic control system shed.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 50 00 00 - Hydraulic Control System

2. Section 50 20 00 - Startup

1.03 Cited Standards

A. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

B. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

C. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

D. ASTM D2672 - Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement

E. NSF International Standard NSF 14 - Plastics Piping System Components and Related Materials

1.04 Noted Restrictions - None

1.05 Safety - None

1.06 Quality Control

A. This pipe is intended for use in applications where the fluid conveyed does not exceed 140°F. This pipe shall meet or exceed the industry standards and requirements as set forth by the ASTM International (ASTM D1785 and ASTM D2665) and the NSF International (Standard NSF 14).

1.07 Submittals - None

Part 2 Products

2.01 Materials

A. The material used in the manufacture of the pipe shall be domestically produced rigid PVC compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784, trade name designation H707 PVC.

B. This compound shall be gray in color.

C. Dimensions:

1. All sizes of PVC Schedule 80 pipe shall be manufactured in strict accordance to the requirements of ASTM D1785 for physical dimensions and tolerances.

2. PVC Schedule 80 pipe sizes 1½-inch through 2-inch diameters shall also meet the requirements of ASTM D2665.

3. Each production run of pipe manufactured in compliance to the standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785 and ASTM D2665, as applicable.

4. All belled-end pipe shall have tapered sockets to create an interference-type fit, which meets the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672.

5. CONTRACTOR shall solvent weld all Schedule 80 PVC pipes 3-inch or smaller in diameter.

D. Marking

1. Product marking shall meet the requirements of ASTM D1785 and ASTM D2665 as applicable and shall include: the manufacturer's name (or the manufacturer's trademark when privately labeled); the nominal pipe size; the material designation code; the pipe schedule and pressure rating in psi for water @ 73°F; the ASTM D1785 designation; and the ASTM D2665 designation (when dual marked).

Part 3 Execution - None

END OF SECTION

40 23 19.2 High Density Polyethylene Pipe and Fittings (Pressure Pipe)

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required and install high density polyethylene (HDPE) pipe and fittings complete as shown on the Construction Drawings and as specified herein.

1.02 Referenced Sections

A. Division 31 - Earthwork

B. Section 31 23 33 - Trenching

C. Section 33 35 00 - Directional Utility Borings

D. Division 40 - Instrumentation and Controls

E. Section 40 23 00 - Water Process Piping

F. Section 40 05 70 - Piping Specialties

G. Division 50 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

1.03 Cited Standards

A. JEA Water and Wastewater Standards

1. Buried pipelines are included in Division 02 and in JEA's Water and Wastewater Standards (January 2016 or latest).

B. ASTM International

1. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

2. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.

3. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.

4. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

5. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

C. American National Standards Institute (ANSI)

1. ANSI B16.1 - Cast Iron Flanges and Flanged Fittings.

2. ANSI B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.

D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 Noted Restrictions

A. Hot gas welding shall not be allowed for wetted components.

1.05 Submittals

A. Submit, in accordance with Section 01 33 00, completely detailed working drawings and schedules of all high density polyethylene (HDPE) pipe and fittings required.

B. Submit the name and address of pipe manufacturer.

C. Submit type, grade, and thickness of HDPE pipe, joint detail, details of flanges, dished heads, and outlets, and pipe closure pieces and jumper pipe assemblies.

D. Submit complete description of method of pipe installation.

E. Submit description of the method of testing the pipe and fittings including a complete drawing of mandrel with dimensions for each pipe size.

F. Submit the manufacturer's recommendations for handling, storing and installing the pipe and fittings.

G. Submit certification that the stress regression testing has been performed on the specific polyethylene resin being utilized in the manufacturing of the pipe for this contract in accordance with ASTM D2837.

H. Prior to each shipment, submit certified test reports that the pipe and fittings for this contract were manufactured and tested in accordance with the ASTM Standards specified herein.

I. Submit the name and qualifications of the technician proposed to perform the heat fusion of the pipe joints.

J. The CONTRACTOR shall notify JEA ENGINEER a minimum of 7 working days in advance of intention to perform the work of this section.

K. Fusion Joint Technician Certification

1. The CONTRACTOR shall submit a written certification to JEA ENGINEER a minimum of 7 working days prior to construction from the HDPE pipe fusion equipment supplier and the HDPE pipe supplier that the fusion technician is employed by the pipe fusion equipment supplier and/or has received training in the proper use of the fusion equipment and manufacturer’s recommended procedures.

2. The CONTRACTOR shall submit a written certification to JEA ENGINEER from the HDPE pipe suppliers that the proposed pipe fusion method(s) and equipment are appropriate for use on the project and on the supplied HDPE pipe.

L. Fusion bonding machine recorded parameters shall be submitted to JEA within 2 days following the completion of any joint. Failure to submit this information may result in the joint being rejected and replaced.

M. Fifteen (15) calendar days before the start of HDPE pipe installation at the project site, the CONTRACTOR shall submit for JEA ENGINEER review and approval, a comprehensive project work plan and schedule.

1.06 Delivery, Storage, and Handling

A. The delivery, storage and handling of the pipe and fittings shall be done in accordance with the manufacturer's recommendations.

B. The CONTRACTOR shall exercise care when transporting, handling, and placing HDPE pipe and fittings. CONTRACTOR shall use fabric or nylon slings and straps when handling HDPE pipe. Do not position slings, straps, etc., at butt-fusion or electrofusion joints or fittings.

C. The handling of the pipe shall be done in a manner to avoid dragging the pipe over any hard or sharp objects to avoid cutting of the pipe's exterior. Any cut or gouge deeper than 5 percent of the pipe's wall thickness shall be removed from the site.

D. Handling of the pipe shall be done in a manner to avoid all undue stress in the pipe caused by bending of the pipe.

E. The interior of the pipe shall be free of cuts, gouges and scratches.

1.07 Protection of Work Area

A. The CONTRACTOR shall be familiar with possible/potential utilities that may impact construction work, and plan work accordingly.

B. The CONTRACTOR shall verify the possible locations for all underground utilities before beginning excavation work for pipe installation.

C. The CONTRACTOR shall protect existing site improvements from damage during construction of underground pipeline.

1.08 Quality Assurance

A. All HDPE pipe and fittings shall be manufactured in strict accordance with ASTM F714, and shall be from a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the polyethylene pipe and fittings to be furnished. All HDPE pipe and fittings shall be supplied by a single distributor who is fully experienced, reputable, and qualified with the distribution of the pipe and fittings to be furnished. The pipe shall be designed, constructed, and installed in accordance with the best practices and

methods and shall comply with these specifications.

B. All pipes under this contract shall be manufactured from a polyethylene resin that has been specifically stress regression tested to provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1600 psi, as determined in accordance with ASTM D2837.

C. All HDPE pipe to be installed under this Contract may be inspected at the factory for compliance with this Section by an independent testing laboratory provided by the JEA. The manufacturer's cooperation shall be required in these inspections. The cost of these plant inspections of all pipe approved for this Contract will be borne by the JEA.

D. Inspection of the pipe may also be made by the JEA ENGINEER or other representatives of the JEA after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specified requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

E. The CONTRACTOR shall ensure that the persons joining the HDPE have been trained in the pipe manufacturer’s recommended procedures.

F. It is the sole responsibility of the CONTRACTOR to construct a pipeline capable of passing the leak tests. Failure of a pipeline segment to pass leak testing shall be repaired at no cost to JEA.

1.09 Warranty

A. The pipe manufacturer shall provide a warranty against manufacturing defects of material and workmanship for a period of ten years after the final acceptance of the project by the JEA. The manufacturer shall replace, at no additional cost to the JEA, any defective pipe material within the warranty period.

Part 2 Products

2.01 Materials

A. General

1. HDPE pipe is a flexible conduit and shall be designed to transfer imposed loads to the surrounding embedment medium. The pipe and fittings shall be free from all defects including indentations, delaminations, cracks, bubbles and pinholes, which due to their nature, degree, or extent, detrimentally affect the strength and serviceability of the pipe. Any pipe or fittings with such defects which, in the judgement of the JEA ENGINEER, will affect the strength and serviceability shall be repaired or rejected.

2. HDPE pipe resins shall be high molecular weight, high density polyethylene with a cell classification number of 345464C (or E) or higher cell classification in accordance with ASTM D3350.

B. Pipe and Fittings

1. The pipes shall have the nominal dimensions shown on the Construction Drawings, and shall conform to the dimension requirements of the IPS Sizing System (ANSI B36.10). Pipe shall meet the requirements of Dimension Ratio (DR) as shown on the Construction Drawings.

2. Pipe shall be furnished in standard laying lengths not exceeding 50 ft.

3. HDPE pipes shall not contain cuts, cracks, holes, blisters, voids, foreign inclusions, or other defects that are visible to the naked eye and that may affect the wall integrity. Damaged sections of piping shall not be repaired. Damaged sections of piping shall be cut out and replaced.

4. Pipe shall be uniform in color, opacity, density, and other physical properties, and free from tacky or sticky material.

5. HDPE pipes shall be manufactured in accordance with the requirements of ASTM F714.

6. Joining system: The pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the manufacturer's recommendations and ASTM 2657.

7. HDPE fittings shall be fully pressure rated to match the pipe DR pressure rating. All fittings shall be molded or fabricated by the same manufacturer as the pipe. HDPE fittings shall be joined using butt, heat fusion and/or electrofusion to the same outside diameter or externally reinforced wall thickness, tolerances, and the internal pressure service equivalent to match the full service pressure as the mating pipe. Adhesives and solvent cements shall not be permitted. Pressure de-rated fabricated fittings shall not be permitted.

2.02 Pipe Identification

A. At 5-ft intervals along the pipe, the pipe shall be marked with the name of the manufacturer, size and class (pressure and DR), and manufacturing reference to ASTM F714.

B. A color coded strip(s) shall be marked along the entire length of the pipe.

Part 3 Execution

3.01 Installation

A. All pipe and fittings shall be installed in accordance with the manufacturer's instructions.

B. Pipe and accessories shall be assembled to avoid twisting or damage to the pipe. Under no circumstances shall any of the materials be dropped or dumped.

C. The CONTRACTOR performing the joining shall be a distributor of the pipe material supplied. All fusion joints shall be done by a factory qualified technician as designated by the manufacturer with a minimum of five years' experience with the fusion equipment to be used.

D. Joining of the pipe by heat fusion shall be done in accordance with ASTM D2657. Prior to the start of pipe installation, one test joint shall be made and tested. Test shall be done in accordance with CPChem Co. Bulletin No. 106. No joints shall be made until a successful test joint has been made.

E. When cutting pipe is required, the cutting shall be done by machine specifically designed for the cutting of HDPE pipe. The cut shall leave a smooth cut at right angles to the axis of the pipe.

F. Fittings shall be connected to HDPE pipe in accordance with manufacturer's recommendations.

G. Flanged and mechanical connections shall consist of the following:

1. A high density polyethylene flange adapter, made by the manufacturer from the same resin as the pipe, and fully pressure rated to match the pipe DR pressure rating, thermally butt-fused to the stub end of the pipe.

2. A ductile iron or steel back-up ring conforming to ANSI B16.1 fitted to the polyethylene flange adapter and shaped as necessary to suit the outside dimension of the pipe.

3. A full face neoprene gasket, conforming to ANSI B16.21.

4. Corrosion resistant bolts and nuts of Type 316 stainless steel as specified in ASTM A276 and ASTM A307. Bolts shall be tightened alternatively and evenly to the manufacturer's specified torques. After installation, a bitumastic coating shall be applied to bolts and nuts.

H. Locating Wire shall be installed per the Construction Drawings.

1. Locating wire shall be 12 AWG copper-clad carbon steel with 30 mils (min) insulation. For open-cut projects, the locating wire construction and testing shall meet the locating wire requirements, as specified in JEA Water and Wastewater Standards, Chapter III.1. - Section 350 [10 gauge, single strand, UF rated, copper wire with 30 mil (minimum) insulation]. The external color shall be either white or yellow. Locating wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations". There is no maximum length or interval between locating wire stations. The testing and reporting requirements within Chapter III.1. - Section 350 shall be required except as modified herein.

3.02 Cleaning, Testing, and Disinfection

A. As pipe laying progresses and at the conclusion of the work thoroughly clean all new pipelines by flushing with water or other means to remove all dirt,

stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

B. All pressure pipelines shall be pressure and leakage tested. Pipelines shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure and this pressure maintained for at least 10 minutes. The leakage test shall be conducted at the maximum operating pressure as determined by the JEA ENGINEER, and this pressure shall be maintained for at least two hours. The test pump and water supply shall be arranged to allow accurate measurement of the water required to maintain the test pressure.

C. Cleaning, testing and disinfection of the pipe shall be in accordance with Section 01 45 28.

END OF SECTION

40 23 19.3 Reinforced PVC Hosing

Part 1 General

1.01 Scope

A. This section includes a description of how the CONTRACTOR shall address the construction practices that relate to reinforced PVC hosing.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 50 00 00 - Hydraulic Control System

1.03 Cited Standards - None

1.04 Noted Restrictions - None

1.05 Safety - None

1.06 Quality Control - None

1.07 Submittals

A. CONTRACTOR shall submit, to JEA ENGINEER for approval, product information for all hosing to be used during construction fifteen (15) days prior to installation.

Part 2 Products

2.01 Materials

A. Hosing

1. The flexible PVC hosing shall be Braid Reinforced green PVC Hose manufactured by Nylobrade® with an internal diameter of 1-1/2 inches or approved equivalent.

2. The flexible PVC hosing shall have a minimum working pressure of 150 psi at 70°F.

3. All hosing components (i.e., fittings, reducers, connections, etc.) shall be per the manufacturer's recommendations.

4. Flexible PVC hosing shall be cut to size in the field as shown on the Construction Drawings.

5. Flexible PVC hosing shall not be used to hang submersible pump.

6. The flexible PVC hose and fittings shall be homogeneous throughout and free from visible cuts, cracks, holes, blisters, voids, foreign inclusions, or other defects that are visible to the naked eye and that

may affect the hose integrity. Damaged sections of hose shall not be repaired. If the hose is damaged, it shall be completely replaced.

B. Hose Fittings

1. Flexible PVC hosing fittings shall be cam and groove fittings made of polypropylene with stainless steel hardware.

2. Flexible PVC hosing fittings shall be rated for a minimum pressure the same as that of the hose itself.

3. Fitting shall be provided and installed per manufacturer's recommendations.

4. Barbed fittings shall be equipped with the appropriate stainless steel clamps to properly secure the connection even when hose is pressurized.

2.02 Equipment - None

Part 3 Execution

3.01 Preparation

A. The CONTRACTOR shall provide proper handling and storage of the flexible PVC hose, fittings, and appurtenances.

B. The CONTRACTOR shall exercise care when transporting, handling, and installing the flexible PVC hose and fittings.

C. The CONTRACTOR shall carefully inspect the installed work of all other sections and verify that all work is complete to the point where the work of this section may properly commence without adverse impact.

D. If the CONTRACTOR has any concerns regarding the installed work in other sections, the JEA ENGINEER shall immediately be notified in writing prior to the start of work of this section.

3.02 Installation

A. PVC hoses shall be used in accordance with manufacturer recommendations. Cam locks shall be installed on the PVC hoses to prevent leaks in accordance with manufacturer's recommendations.

3.03 Testing

A. The PVC hosing shall be checked for leaks during startup. Any leaks noted shall be repaired by the CONTRACTOR at no additional cost to the JEA.

END OF SECTION

DIVISION 40 (13) – INSTRUMENTATION AND CONTROLS

40 90 00 General Provisions

Part 1 GENERAL

1.01 Scope of Work

A. The CONTRACTOR shall procure the services of a single Instrumentation System Supplier (ISS) to furnish and install all materials, equipment, labor and services, except for those services and materials specifically noted, required to achieve a fully integrated and operational system as specified herein and in other Specification Sections listed below.

B. The work shall include furnishing, installing and testing the equipment and materials detailed in the following Sections:

Section No.	Title
40 90 00	Instrumentation and Controls (I&C) – General Provisions
40 91 40	I&C – Field Instruments
40 95 13	I&C – Control Panels and Panel Mounted Equipment

Requirements specified in this Section apply to all equipment specified in the above sections, unless otherwise specified.

C. The responsibilities of the ISS shall be generally as follows:

1. Furnish and install all field instrumentation as shown in the Construction Drawings and listed in Section 40 91 40.

2. Provide the Pump Station Local Control Panel as shown in the Construction Drawings and listed in Section 40 95 13. Additional control panel components are described in Section 40 90 00.

D. Auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators, software, and drivers to interface with existing equipment or equipment provided by others under other Sections of these specifications, shall be included whether they are shown on the Construction Drawings or not.

E. Substitutions on functions or type of equipment specified shall not be acceptable unless specifically noted. In order to confirm compatibility between all equipment, coordinate all interface requirements with mechanical and electrical systems and furnish any signal isolation devices that might be required.

F. Equipment shall be fabricated, assembled, installed and placed in operating condition in full conformity with the project Specifications, Construction Drawings, Engineering data, instructions, and recommendations of the equipment manufacturer as approved by the JEA ENGINEER.

G. To facilitate JEA's future operation and maintenance, similar products shall be supplied from the same manufacturer.

H. All equipment and installations shall satisfy applicable Federal, State and local codes.

I. Use the equipment, instrument, and loop numbering scheme that has been developed and shown on the Construction Drawings and specifications in the development of the submittals. Do not deviate from or modify said numbering scheme without the JEA ENGINEER'S approval.

1.02 Referenced Sections

A. Process & Instrumentation Diagrams (P&ID) are included in the Construction Drawings

B. Control System Architecture Block Diagram is included in the Construction Drawings

C. Process and mechanical equipment is specified in Divisions 40 and 43

D. Division 26 - Electrical

1.03 Submittals

A. General submittal requirements include:

1. Refer to Division 01 for general submittal requirements.

2. Additional submittal requirements are contained in related Instrumentation Sections in Division 40.

3. Shop drawings shall demonstrate that the equipment and services to be furnished comply with the provisions of these specifications and shall provide a complete record of the equipment as manufactured and delivered. Submittals shall be complete; giving equipment specifications, details of connections, wiring, ranges, installation requirements, and specific dimensions. Submittals consisting of only general sales literature shall not be acceptable.

4. Submittals shall be bound in separate three-ring binders, with an index and sectional dividers, with all drawings reduced to a maximum size of 11-inch by 17-inch, then folded to 8.5-inch by 11-inch for inclusion within the binder. Maximum binder size shall be 3 inches.

5. The submittal drawings' title block shall include, as a minimum, the ISS's registered business name and address, JEA and project name, drawing name, revision level, and personnel responsible for the content of the drawing.

6. Incomplete or partial submittals not complying with the submittal arrangements outlined in this Section may be returned without review.

B. Field Instruments Submittal

1. Submit complete documentation of all field instruments using ISA-TR20.00.01-2007 data sheet formats. Submit a complete Bill of Materials (BOM) or Index that lists all instrumentation equipment. The list shall be sorted by Loop Number.

2. Submit separate data sheets for each instrument including:

   a. ISA tag number.

   b. Product (item) name used herein and on the Construction Drawings.

   c. Manufacturer's complete model and/or part number(s).

   d. Location of the device.

   e. Input - output characteristics.

   f. Range, size, and graduations in engineering units.

   g. Physical size with dimensions, enclosure NEMA classification and mounting details in sufficient detail to determine compliance with requirements.

   h. Materials of construction for enclosure and wetted parts.

   i. Instrument or control device sizing calculations where applicable.

   j. Certified calibration data for all flow metering devices.

   k. Two-wire or four-wire device type as applicable.

3. Submit manufacturer’s catalog cuts for all instruments. Submit descriptive literature for each component that fully describes the component being provided.

4. Submit proposed mounting details of all instruments.

C. Control Panel Submittal

1. Submit a bill of materials that lists, at a minimum, product name, manufacturer, model number, and location, for each hardware component.

2. Catalog cuts for pump controller and all other control panel components.

3. Panel Layout Drawings: Drawings shall be furnished for all panels, consoles, and equipment enclosures specified. Panel assembly and elevation drawings shall be drawn to scale and detail all equipment in

or on the panel. Panel drawings shall be 11-inch by 17-inch in size. The panel drawings shall include the following:

a. Interior and exterior panel elevation drawings to scale.

b. Nameplate schedule.

c. Conduit access locations.

d. Panel construction details.

e. Cabinet assembly and layout drawings to scale. The assembly drawing shall include a bill of material on the drawing with each panel component clearly defined. The bill of material shall be cross-referenced to the assembly drawing so that a non-technical person can readily identify any component of the assembly by manufacturer and model number.

f. Fabrication and painting specifications including color (or color samples).

g. Submit construction details, NEMA ratings, intrinsically safe barrier information, gas sealing recommendations, purging system details, etc. for panels located in hazardous locations or interfacing to equipment located in hazardous areas.

h. Submit evidence that all control panels shall be constructed in conformance with UL 508 and bear the UL seal confirming the construction. Specify if UL compliance and seal application shall be accomplished at the fabrication location or by field inspection by UL inspectors. All costs associated with obtaining the UL seal and any inspections shall be borne by the ISS and included in the Project Bid Price.

4. Panel Wiring Diagrams: Panel wiring diagrams depicting wiring within and on the panel as well as connections to external devices. Panel wiring diagrams shall include power and signal connections, and normal power sources, all panel ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering. Field device wiring shall include the device ISA-tag and a unique numeric identifier. The diagrams shall identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the ISS. Wiring labeling used on the drawings shall match that shown on the Contract Documents or as developed by the ISS and approved by the JEA ENGINEER. I/O wiring shall be numbered with rack number, slot number, and point number. Two-wire and four-wire equipment shall be clearly identified and power sources noted. Submit final wire numbering scheme. Panel drawings shall be 11-inch by 17-inch in size.

D. Spares and Expendables Equipment Lists Submittal

1. This submittal shall include for each Subsystem:

a. A list of, and descriptive literature for, spares and expendables equipment as specified in Divisions 40 and 43.

b. Unit and total costs for the additional spare items specified or recommended for each subsystem.

E. Final System Documentation (O&M)

1. Submit in accordance with Division 01.

2. The Final System Documentation shall consist of operations and maintenance manuals as specified herein. The manuals shall be bound in three-ring binders, maximum size of three inches, with Construction Drawings reduced to 11-inch by 17-inch, then folded to 8.5-inch by 11-inch for inclusion. Each section shall have a uniquely numbered tab divider, and each component within each section shall have a separate binder tab divider.

3. The operations and maintenance manuals shall, at a minimum, contain the following information:

a. Table of Contents

I. A Table of Contents shall be provided for the entire manual with the specific contents of each volume clearly listed. The complete Table of Contents shall appear in each volume.

b. Instrument and Equipment Lists

I. The following lists shall be developed in Excel and provided as hardcopy and electronically.

II. An instrument list for all devices supplied including tag number, description, specification section and paragraph number, manufacturer, model number, serial number, range, span, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.

III. An equipment list for all non-instrument devices supplied listing description, specification section and paragraph number, manufacturer, model number, serial number, location, manufacturer phone number, local supplier name, local

supplier phone number, completion year replacement cost, and any other pertinent data.

c. Data Sheets with Vendor Operations and Maintenance Information

I. ISA S20 data sheets shall be provided for all field instruments.

II. Cover page for each device, piece of equipment, and OEM software that lists, at a minimum, date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA S20, general data sheet; however, other formats will be acceptable provided they contain all required information.

III. Final vendor O&M documentation for each device, piece of equipment, or OEM software shall be either new documentation written specifically for this project, or modified standard vendor documentation. All standard vendor documentation furnished shall have all portions that apply clearly indicated with arrows or circles. All portions that do not apply shall be neatly lined out or crossed out. Groups of pages that do not apply at all to the specific model supplied shall be removed.

IV. For any component requiring dip switch settings or custom software configuration, that information shall be included along with the corresponding data sheets and O&M information.

d. As-Built Drawings

I. Complete as-built drawings, including all drawings and diagram specified in this section under the "Submittals" section. These drawings shall include all termination points on all equipment the system in connected to, including terminal points of equipment not supplied by the ISS.

II. As-built documentation shall include information from submittals, as described in this Specification, updated to reflect the as-built system.

e. Electronic O&M Information

I. In addition to the hard copy of O&M data, provide an electronic version of all equipment manuals on CD-R or DVD-R. Electronic documents shall be supplied in PDF format.

II. Provide electronic files for all custom-developed manuals. Text shall be supplied in both Microsoft Office format and PDF format.

III. Provide electronic files for all drawings produced. Drawings shall be in AutoCAD ".dwg" format and in Adobe Acrobat format. Drawings shall be provided using the AutoCAD eTransmit feature to bind external references, pen/line styles, and fonts into individual zip files along with the drawing file.

4. The cover and edge of each volume shall contain the following information:

Project Name (refer to Contract Documents)
Contract Number (refer to Contract Documents)

Instrumentation and Control System
Hardware [or Applications Engineering] Operations and Maintenance Manual
Specification Sections _____, _____, _____

Subcontractor Name
Date
Volume X of Y
(Where X is the volume number and Y is the number of volumes)

5. Provide as-built panel drawings, for both new and modified control panels, to be stored within that panel.

a. Provide one complete set of drawings that shall be stored in the print pocket: 11-inch by 17-inch size; laser printed, not inkjet; in full color where appropriate.

b. An additional copy of all key electrical drawings, such as power distribution, networking and I/O, shall be laminated and affixed to the inside of the door. 8.5-inch by 11-inch size may be used if there is not enough room for 11-inch by 17-inch size.

1.04 Cited Standards

A. Publications are referred to in the text by basic designation only. Where a

date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition in effect at the time of bid opening shall apply.

B. International Society of Automation (ISA)

1. ISA S5.2, Binary Logic Diagrams for Process Operations

2. ISA S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic and Computer Systems.

3. ISA S5.4, Instrument Loop Diagrams.

4. ISA S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.

5. ISA RP60.3, Human Engineering for Control Centers

6. ISA RP60.6, Nameplates, Labels, and Tags for Control Centers

C. National Electrical Manufacturers Association (NEMA)

D. National Fire Protection Agency (NFPA)

1. NFPA 70, National Electrical Code (NEC).

E. Underwriters Laboratories, Inc. (UL)

1. UL 508 - Industrial Control Equipment - for custom fabricated equipment

2. UL 508A – Industrial Control Panels

3. A nationally recognized testing laboratory, as approved by the Authority having jurisdiction, may substitute for UL listing on commercial off the shelf products.

1.05 Quality Assurance

A. The Instrumentation System Supplier (ISS) shall be a "systems integrator" regularly engaged in the design and the installation of instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For the purposes of this Specification Section, a "systems integrator" shall be interpreted to mean an organization that complies with all of the following criteria:

1. Employs personnel on this project who have successfully completed ISA or manufacturers training courses on general process instrumentation and configuration and implementation of the specific equipment proposed for this project. Key personnel shall hold ISA CCST Level 1 certification or have a minimum of 10 years of verifiable plant startup experience. Key personnel shall include, as a minimum, the lead field technician.

2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five years. Successful completion shall be defined as a finished project completed on time, without any outstanding claims or litigation involving the ISS. Potential references shall be for projects where the contract was of similar size to this project.

3. Has been actively engaged in the type of work specified in this Specification Section for a minimum of five years.

B. The ISS shall maintain a permanent, fully staffed and equipped service facility within 200 miles of the project site with full time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. At a minimum, the ISS shall be capable of responding to on-site problems within 12 hours of notice. Provide an on-site response within 4 hours of notification starting at two months before scheduled startup to two months after startup completion.

C. Actual installation of the instrumentation system need not be performed by the ISS's employees; however, the ISS as a minimum shall be responsible for the technical supervision of the installation by providing on site supervision to the installers of the various components.

D. The ISS shall be one of the following:

1. Control Instruments Inc. (C2i)
   5253 Oakdale Road
   Smyrna, GA 30082
   TEL: (404) 351-1085
   ATTN: Frank Gonzalez

2. EG Controls
   11790 Philips Hwy
   Jacksonville, FL 32256
   TEL: (904) 292-0110
   ATTN: Sonia McKenzie

3. Infamation Technologies Group (ITG)
   11235 St. John's Industrial Parkway North, Unit #2
   Jacksonville, FL 32246
   TEL: (904) 425-4760
   ATTN: Dale Young

1.06 Delivery, Storage, and Handling

A. Delivery, storage, and handling shall be in accordance with Section 01 66 10.

B. Shipping Precautions

1. After completion of shop assembly and approval of all equipment, cabinets, panels and consoles shall be packed in protective crates and enclosed in heavy duty (5 mil) polyethylene envelopes or secured

sheeting to provide protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.

2. Manufacturer's special instructions for field handling, storage and installation required for protection, shall be securely attached to the packaging for each piece of equipment prior to shipment. The instructions shall be stored in resealable plastic bags or other means of protection.

3. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the JEA.

1.07 Warranty

A. Provide warranty per Division 01, Warranties and Bonds, and as specified herein.

B. The ISS shall provide a three (3) year unconditional warranty beginning at Final Completion of all work furnished by them under this Contract. The warranty shall include materials, installation, and applications; and shall constitute complete replacement and delivery to the site of materials, installation and applications to replace defective material or defective workmanship with new materials/workmanship conforming to the Contract Drawings and Specifications. The ISS shall also ensure that the warranties of supplied components are honored by their respective manufacturers.

C. The ISS shall provide telephone technical support within 4 hours of warranty claim. If failure cannot be resolved by telephone, ISS shall provide onsite technical support within 24 hours of warranty claim.

1.08 Site Requirements

A. Elevation: Equipment shall be designed to operate at the project ground elevation.

B. Temperature:

1. Outdoor areas' equipment shall operate between -10 and 50 °C ambient.

2. Equipment located in indoor locations shall operate between 0 and 40 °C ambient.

3. Storage temperatures shall range from 0 to 50 °C ambient.

4. Additional cooling or heating shall be furnished if required by the equipment as specified herein.

C. Relative Humidity. Air conditioned area equipment shall operate between 20 to 95%relative, non-condensing humidity. All other equipment shall operate between 0 to 100% relative, condensing humidity.

Part 2 PRODUCTS

2.01 General

A. All instrumentation and electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and epoxy or equal coating to prevent contamination by dust, moisture and fungus. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions.

B. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks unless otherwise noted. Fasteners for securing control panels and enclosures to walls and floors shall be either hot-dipped steel galvanized after fabrication, or stainless steel. Only stainless steel fasteners will be acceptable in corrosive areas rated NEMA 4X on the Construction Drawings or as defined under Section 26 00 00. Provide and size anchors in accordance with Divisions 01 and 05 as required per the seismic calculations. Provide minimum size anchor of 3/8-inch.

C. All indicators shall be linear in process units, unless otherwise noted. All transmitters shall be provided with indicators in process units, accurate to two percent or better.

D. All equipment, cabinets and devices furnished shall be heavy-duty type, designed for continuous industrial service. The system shall contain similar products of a single manufacturer, and shall consist of equipment models, which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.

E. All electronic/digital equipment shall be provided with radio frequency interference protection.

F. Electrical

1. Equipment shall operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

2. With the exception for field device network connected devices, all electronic instrumentation shall utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet may be 1-5 VDC (volts direct current).

3. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed.

4. Discrete signals shall be nominal 120VAC, 60 Hz.

5. All switches shall have double-pole double-throw contacts rated at a minimum of 600 VA, unless noted otherwise.

6. Switches and/or signals indicating an alarm, failure or upset condition shall be wired fail-safe to the SCADA system. A fail-safe condition is an open circuit when in an alarm state.

7. Materials and equipment shall be UL approved. Where components are not available with UL approval, integrate the device with ground fault protective devices, isolation transformers, fuses, or other protective equipment necessary to achieve compliance with UL 508 requirements.

8. All equipment furnished shall be designed and constructed so that in the event of power interruption, the systems specified herein shall go through an orderly shutdown with no loss of memory, and shall resume normal operation without manual resetting when power is restored, unless otherwise noted.

9. All transmitter output signals shall include signal and power source isolation.

2.02 Electrical Surge Protection

A. General - Surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines from lightning, utility, or the plant electrical system. The protection systems shall be such that the protective level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level. Protection shall be maintenance free and self-restoring. Devices shall have a response time of less than 50 nanoseconds and be capable of handling a discharge surge current (at an 8x20µs impulse waveform) of at least 8 kA. Ground wires for all instrumentation device surge protectors shall be connected to a low resistance ground in accordance with Section 33 79 00.

B. Provide protection of all analog and serial signal circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit.

C. Provide the following surge protection devices:

1. 230VAC power feeds (single phase): Citel DS42S-230

2. 120VAC power feeds: Citel DS41S-120

3. 24VDC power feeds: Citel DS220S-24DC

4. 24VDC/4-20mA analog signals (within panel): Citel DLAW-24D3

2.03 Tubing and Fittings

A. Instrument tubing shall be fully annealed ASTM A269 Seamless Type 316 stainless steel, ½-inch O.D. by 0.035 wall thickness, free of OD scratches.

B. All instrument shut-off valves and associated fittings shall be supplied in accordance with the piping specifications and all instrument installation details. The materials for fittings and valves shall be compatible with process fluids. Where metallic fittings and valves are compatible, wetted materials shall be Type 316 stainless steel. Connections shall be threaded type.

2.04 Spare Parts

A. All spare parts shall be wrapped in bubble wrap, sealed in a polyethylene bag complete with dehumidifier, then packed in cartons and labeled with indelible markings. Complete ordering information including manufacturer's contact information (address and phone number), part name, part number, part ordering information, and equipment name and number(s) for which the part is to be used shall be supplied with the required spare parts. The spare parts shall be delivered and stored in a location directed by JEA or JEA ENGINEER.

B. Furnish one of each type of surge protection devices used (see paragraph 2.02.C).

C. Other spare parts are specified in each Instrumentation Specification Section (see paragraph 1.01.B).

Part 3 EXECUTION

3.01 General Installation

A. Instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions. The locations of equipment, transmitters, alarms and similar devices indicated on Construction Drawings are approximate only. Exact locations of all devices shall be as approved by the JEA ENGINEER during construction. Obtain in the field, all information relevant to the placing of process control equipment and in case of any interference with other work, proceed as directed by the CONTRACTOR and furnish all labor and materials necessary to complete the work in an approved manner at no additional cost to JEA.

B. The P&IDs and Construction Drawings indicate the intent and not the precise nature of the interconnection between the individual instruments. Where indicated on the P&IDs or Construction Drawings as not requiring installation, provide the instruments suitably packaged for storage.

C. All equipment used in areas designated as hazardous shall be designed for the Class, Group and Division as required for the locations as shown on the Construction Drawings and specified in Division 26. All work shall be in strict accordance with codes and local rulings.

D. All instrumentation connections shall be provided with shutoff and drain valves.

E. All piping and tubing to and from field instrumentation shall be provided with necessary unions, calibrations and test tees, couplings, adaptors, and shut-off valves. Process tubing shall be installed to slope from the instrument toward process for gas measurement service and from the process toward the instrument for liquid measurement service. Provide drain/vent valves or fittings at any process tubing points where the required slopes cannot be maintained.

F. Brackets and hangers required for mounting of equipment shall be provided. They shall be installed as shown and not interfere with any other equipment.

G. The shield on each process instrumentation cable shall be continuous from source (Control Panel) to destination and be grounded at only one point for each shield on the PLC side.

H. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, ship material in sections sized to permit passing through restricted areas in the building. Provide on-site service to oversee the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the JEA ENGINEER'S approval. Certify that field wiring associated with his/her equipment is installed in accordance with best industry practice. Schedule and coordinate work under this section with that of the electrical work specified under applicable Sections of Division 26.

I. Provide sunshades for equipment mounted outdoors in direct sunlight. Sunshades shall include standoffs to allow air circulation around the cabinet. Orient equipment outdoors to face to the North or as required to minimize the impact of glare on LED, LCD, or other digital readouts.

END OF SECTION

40 91 40 Field Instruments

Part 1 GENERAL

1.01 Scope of Work

A. This section covers the furnishing, installation, and services for instruments.

B. Refer to Section 40 90 00.

1.02 Submittals

A. Refer to Section 40 90 00.

1.03 Delivery, Storage, and Handling

A. Refer to Section 40 90 00.

1.04 Nomenclature and Identification

A. Field Instrument Tags

1. A stainless steel or other non-corrosive metal tag firmly attached and permanently and indelibly inscribed with the instrument tag number, as indicated in the Construction Drawings, shall be provided on each piece of equipment supplied under this Section. Equipment shall be tagged before shipping to the site.

2. Provide 1/8-inch by 3/8-inch, Type 316 stainless steel button head machine screws.

3. All supplied field instrument transmitters and field instrument transmitter elements shall have a stainless steel identification tag attached to each transmitter and element prior to shipment. Tag shall be attached via stainless steel chain or stainless steel wire (24-gauge min) to a non-removable part of the device. The tag size shall be a minimum of 1.5 square inches. Tag shall include the ISA alphanumeric instrument number as indicated in the P&ID, loop, and detail drawings. The alphanumeric instrument number shall be stamped into the tag and shall have a minimum of 3/16-inch high alphanumeric characters.

Part 2 PRODUCTS

2.01 Magnetic Flowmeter

A. Flow Element

1. Type

a. Pulsed DC type

2. Function/Performance

a. Operating Temperature: Process liquid temperatures of 0 to 140 degrees F or greater dependent upon liner and an ambient of minus 30 to 150 degrees F

b. Radio Frequency Interference (RFI) protection: RFI protection shall be provided as recommended by the manufacturer.

c. Pressure rating: Equal to piping system where meter is installed.

d. Additional: Meter shall be capable of running empty indefinitely without damage to any component.

3. Physical

a. Metering Tube: 304 stainless steel or equivalent

b. Flanges: ANSI 150 lb. or DIN PN 16 stainless steel flanges shall be used on all SS process pipes.

c. Liner: PTFE (Teflon).

d. Electrodes: 316 stainless steel.

e. Housing: For meters with remote mounted transmitters, meters below grade shall be suitable for submergence for up to 48 hours to a depth of 30 ft (9m). Meters above grade shall be NEMA 4X (IP65). Where hazardous areas are indicated on the Construction Drawings, the equipment shall be rated for that area.

f. Finish: All external surfaces shall have a chemical and corrosion resistant finish.

4. Accessories/Documentation Required

a. Factory calibration: All meters shall be factory calibrated. A copy of the calibration report shall be included in the O&M manual.

b. Grounding: Meter shall be grounded in accordance with the manufacturer's recommendation. Provide ground ring, ground wires, gaskets, etc., as required. All materials shall be suitable for the liquid being measured and must be compatible with process fluid and with the process pipe.

c. For meters with remote mounted transmitters, signal cable for installation between the flowtube and the transmitter. Length shall be as required by installation as indicated on the Construction Drawings.

B. Flow Converter/Transmitter

1. Type

   a. Microprocessor based, intelligent transmitter compatible with flowtube provided.

   b. Integral mount or mounted remote from the flowtube as shown on the Construction Drawings or as required by the physical location.

2. Functional/Performance

   a. Accuracy (including flowtube): Plus/minus 0.5 percent of flowrate or better

   b. Operating Temperature: –20 to 140 degrees F

   c. Output: Isolated 4-20 mA with HART protocol. Current output adjustable over the full range of the instrument.

   d. Diagnostics: Self diagnostics with on screen display of faults.

   e. Display: Digital indicator displaying flow in engineering units indicated in the Instrument Device Schedule.

   f. Totalizer: A fully configurable totalizer and data logger shall be provided as an integral function of the transmitter. The totalized flow shall be displayed on the transmitter display.

   g. Empty Tube Zero: The transmitter shall include a feature that will lock the output at zero when no flow is detected. The empty tube zero feature shall be enabled automatically when the transmitter detects no flow or manually through a contact input.

3. Physical

   a. Transmitter shall be suitable for surface or pipe stand mounting.

   b. Enclosure shall be NEMA 4X (IP65).

4. Power Requirements

   a. The transmitter shall be 120 VAC powered instrument.

5. Accessories/ Required

   a. Keypad where required for transmitter configuration.

   b. Sunshade as described in Section 40 90 00.

C. Manufacturer

1. Endress+Hauser.

2. Siemens.

3. Or equal.

D. Units to be Furnished by ISS:

1. FITQ/FE-620: Pump Station Flow

a. Range: 0-170 GPM

2.02 FLOAT SWITCHES

A. Type

1. Mercury free ball float switch.

B. Function/Performance

1. Differential: Less than 8-inch.

2. Switch Rating: 1 amp at 120 VAC or 100 VA @ 120 VAC

3. Provide NO or NC type contact as indicated herein.

C. Physical

1. Float: 316 stainless steel, Teflon or non-stick coating, 5-inch diameter.

2. Totally encapsulated switch.

3. Cable shall be heavy-duty, PVC or equivalent jacketed integral to float.

D. Options/Accessories Required

1. Provide stainless steel hardware.

2. Provide anchor weight mounting.

3. Lead wire shall be a waterproof cable of sufficient length so that no splice or junction box is required in the vault.

4. Provide cast-aluminum weatherproof junction box outside the sump pit with terminals for all floats and tapped as required for conduit connections.

E. Manufacturer(s)

1. Contegra FS 90

2. Siemens Water Technologies Model 9G-EF.

3. Anchor Scientific SST-NM

4. Or equal.

F. Units to be Furnished by ISS:

1. LSL-600: Above Ground Tank Pumps Off Level

a. Normally open; elevation: 18.80’

2. LS-600-A: Above Ground Tank Lead Pump On Level

a. Normally open; elevation: 20.80’

3. LS-600-B: Above Ground Tank Lag Pump On Level

a. Normally open; elevation: 21.80’

4. LSH-600: Above Ground Tank High Level

a. Normally open; elevation: 22.80’

2.03 Diaphragm Seal - Threaded

A. Type:

1. Thread attached.

2. Welded Metal Diaphragm.

B. Function/Performance:

1. Maximum Pressure: Two times the maximum process pressure.

2. Operating Temperature: -40 to 100 degrees C.

C. Physical:

1. All Type 316L stainless steel construction.

2. Teflon gaskets and O rings on process connection.

3. Bleeding connection provided. NOTE: filling screw not recommended since it provides poor quality measurement if done incorrectly in the field.

D. Accessories Required:

1. Stainless steel armored capillary tubing as required for the installation. Refer to Section 40 90 00.

E. Manufacturer(s):

1. Rosemount.

2. Ashcroft.

3. Ronningen-Petter Company.

4. Siemens 7MF4861.

5. Or equal.

2.04 Pressure Gauge

A. Type:

1. Bourdon tube actuated dial face pressure gauge.

B. Function/Performance:

1. Accuracy: ±1.0% of span.

C. Physical:

1. Case: Phenolic shock resistant or type 316 stainless steel for surface/stem mounting with a pressure relieving back. The case shall be vented for temperature/atmospheric compensation. Gauge shall be callable of being liquid filled in the field or at the factory.

2. Window: Clear acrylic or shatter proof glass.

3. Bourdon tube: Stainless steel.

4. Connection: ½-inch NPT.

5. Gauge size: Minimum 4-inch viewable.

6. Pointer travel: Not less than 200 degrees not more than 270-degree arc.

D. Accessories/Options Required:

1. Shutoff valve: Each gauge shall have a process shutoff valve that can also be used as an adjustable pressure snubber.

2. Gauges shall be liquid filled from the factory for the purpose of reducing needle vibration. Liquid shall be glycerin or other clear, inert fluid, appropriate for the temperature conditions where installed.

3. Tubing shall conform to the requirements of Section 40 90 00.

E. Manufacturer(s):

1. Ashcroft.

2. Ametek/US Gauge.

3. Or equal.

F. Units to be Furnished by ISS:

1. PG-610-1: Pump Station Pump No. 1 Discharge Pressure

   a. Range: 0-100 psig

2. PG-610-2: Pump Station Pump No. 2 Discharge Pressure

   a. Range: 0-100 psig

2.05 Pressure Switch

A. Type:

1. Diaphragm actuated.

B. Function/Performance:

1. Repeatability: Better than 1 percent of full scale.
2. Setpoint: Field adjustable and set between 30 and 70 percent of the adjustable range.
3. Dead Band: Fixed unless adjustable dead band requirement is noted in the Instrument Device Schedule.
4. Reset: Unit shall be of the automatic reset type unless noted otherwise in the Instrument Device Schedule.
5. Over Range Protection: Over range protection to 150 percent of the maximum process line pressure.
6. Output: Single pole double throw (SPDT) unless requirement for double pole double throw (DPDT) switch is shown on the instrument device schedule. Switch rating shall be 10 A at 230 VAC.

C. Physical:

1. Housing: NEMA 4X (IP65) for non-hazardous areas. For installation in hazardous areas, housing shall be explosion proof approved for Class 1, Division 1, Groups C and D (EEx d IIB).
2. Switch Assemblies: Hermetically sealed switches.
3. Wetted Parts: Type 316L stainless steel diaphragm, viton seals, Type 316 stainless steel connection port.

D. Accessories/Options Required:

1. Shutoff Valve: Provide a Type 316 stainless steel shutoff valve. Valve shall be by D/A Manufacturing, Anderson Greenwood, or Equal.
2. Tubing shall conform to the requirements of Section 40 90 00.

E. Manufacturer(s):

1. Static-O-Ring (SOR).
2. Ashcroft.
3. Mercoid.
4. Or equal.

F. Units to be Furnished by ISS:

1. PSH-610-1: Pump Station Pump No. 1 Discharge Pressure High
   a. Range: 0-100 psig
2. PSH-610-2: Pump Station Pump No. 2 Discharge Pressure High
   a. Range: 0-100 psig

2.06 Spare Parts

A. Furnish the following field instrument related spare parts:

1. One complete pressure switch/gauge/diaphragm assembly.

Part 3 EXECUTION

A. Furnish all mounting hardware required for pipe stand, surface, or other mounting.

B. Furnish surge protection as required in Section 40 90 00.

END OF SECTION

40 95 13 Control Panels and Panel Mounted Equipment

Part 1 General

1.01 Scope of Work

A. Refer to Section 40 90 00.

B. Furnish and install new control panels and panel mounted equipment as specified herein and shown on the Construction Drawings.

C. Additions and modifications to existing panels shall conform to the standards and requirements of this Section wherever applicable.

D. All new panels and panel components shall match existing equipment makes and models wherever possible, so that system additions can be most easily integrated with respect to operation and maintenance training, spare parts inventory, and service contracts. Even when exact matches are not possible, equipment furnished must be fully compatible with the existing system. Color, size, and material of new panels should conform to that of existing panels.

E. The following new control panels shall be provided under this Section:

1. Pump Station Local Control Panel. NEMA 4X 316 stainless steel construction, free-standing with 12-inch stands. Maximum size: 60”H x 36”W x 18”D.

Part 2 PRODUCTS

2.01 Lighting/Surge Protection

A. Refer to Section 40 90 00.

2.02 Control Panel General Requirements

A. The dimensions within this Section and on the Construction Drawings are for general reference only. Ensure that final enclosure sizing and panel arrangements accommodate all required equipment for a fully integrated and operational system as specified herein and in the Contract Documents.

B. Each control panel and terminal cabinet shall bear the UL label. The UL label shall apply to the enclosure, the specific equipment supplied with the enclosure, and the installation and wiring of the equipment within and on the enclosure. If required for UL labeling, provide ground fault protective devices, isolation transformers, fuses and any other equipment necessary to achieve compliance with UL 508A requirement. The Construction Drawings do not detail all UL 508A requirements.

C. All panel doors shall have a lock installed in the door handle, or a hasp and staple for padlocking. Locks for all panels provided under this Contract shall be keyed alike.

D. The devices designated for rear-of-panel mounting shall be arranged within the panel according to respective panel drawings and in a manner to allow for ease of maintenance and adjustment. Heat generating devices such as power supplies shall be located at or near the top of the panel.

E. All components shall be mounted in a manner that shall permit servicing, adjustment, testing, and removal without disconnecting, moving, or removing any other component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Component mounting shall be oriented in accordance with manufacturer's recommendations. The internal components shall be identified with suitable plastic or metal engraved nametags mounted adjacent to (not on) each component identifying the component in accordance with the drawing, specifications, and ISS's data.

F. All hardware and fasteners shall be 316 stainless steel. All mounting screws shall be drilled and tapped; self-tapping screws are not permitted.

G. All exterior panel mounted equipment shall be installed with suitable gaskets, faceplates, etc. required to maintain the NEMA rating of the panel.

H. Nameplates

1. All panels and panel devices shall be supplied with suitable nameplates, which identify the panel and individual devices as required. Unless otherwise indicated, each device nameplate shall include up to three lines with the first line containing the device tag number as shown on the drawings, the second line containing a functional description (e.g., Recirculation Pump No. 1), and the third line containing a functional control description (e.g., Start).

2. Nameplates shall be 3/32-inch thick, plastic laminate with engraved inscriptions. The letters shall be White against a Black background unless otherwise noted. Edges of the nameplates shall be beveled and smooth. Nameplates with chipped or rough edges will not be acceptable.

3. Nameplate fasteners and mounting shall be epoxy adhesive or stainless steel screws.

4. For every panel, provide a main panel nameplate with a minimum of 1-inch high letters. Provide legend plates or 1-inch by 3-inch engraved nameplates with 1/4-inch lettering for identification of door mounted control devices, pilot lights, and meters.

5. Single lamicoid nameplates with multiple legends shall be used for grouping of devices such as selector switches and pilot lights that relate to one function.

I. Mounting Elevations

1. ISA Recommended Practice RP60.3 shall be used as a guide in layout and arrangement of panels and panel mounted components. Dimensions shall account for all housekeeping pads that panels will sit on once they are installed.

2. Centerline of indicators and controllers shall be located no lower than 48-inches or higher than 66-inches above the floor on a panel face.

3. Centerline of lights, selector switches, and pushbuttons shall be located no lower than 32-inches or higher than 70-inches above the floor on a panel face.

4. Tops of annunciators shall be located no higher than 86-inches above the floor on a panel face.

5. Installation of panel components shall conform to component manufacturers' guidelines.

2.03 Panel Materials and Construction

A. Structure and Enclosure

1. All panels in outdoor, wet, or chemically corrosive environments shall be NEMA 4X and of stainless steel construction. All panels located in a hazardous location shall be rated for the type of hazard (e.g., NEMA 7 for Class 1, Division 1).

2. Provide angle stiffeners as required on the back of the panel face to prevent panel deflection under instrument loading or operation. Internally the panels shall be supplied with a structural framework for instrument support purposes and panel bracing. The internal framework shall permit panel lifting without racking or distortion. Provide removable lifting rings designed to facilitate simple, safe rigging, and lifting of the control panels during installation.

3. Each panel shall be provided with full height, fully gasketed access doors. Doors shall be provided with a three-point stainless steel latch and heavy duty stainless steel locking handle. Panel access doors shall be provided with full length, continuous, piano type stainless steel hinges with stainless steel pins. Front access doors with mounted instruments or control devices shall be of sufficient width to permit door opening without interference from flush mounted instruments. Clamp-type door latches are not permitted.

4. The panels, including component parts, shall be free from sharp edges and welding flaws. Wiring shall be free from kinks and sharp bends and shall be routed for easy access to other components for maintenance and inspection purposes.

5. The panel shall be suitable for top and bottom conduit entry as required by the Electrical Drawings. For top mounted conduit entry, the panel top shall be provided with nominal one-foot square removable access plates, which may be drilled to accommodate

conduit and cable penetrations. All conduit and cable penetrations shall be provided with ground bushings, hubs, gasketed locknuts, and other accessories as required to maintain the NEMA rating of the panel and electrical rating of the conduit system.

B. Wall and Unistrut Mounted Panels. All wall and Unistrut mounted panels shall meet the NEMA classification as shown on the drawings or specified herein. The panels shall be constructed of not less than USS 14-gauge steel, suitably braced internally for structural rigidity and strength. All wall mounted panels shall be constructed of 316 stainless steel.

C. Instrument Racks

1. Instrument racks shall be sized and configured to support all indicated instruments and accessories, such that they are easily accessible to operators. Mounting elevation requirements provided herein shall apply. Elements to be mounted on an instrument rack may include transmitters and controllers; sensor assemblies; sample and drain pipes, tubes, valves and manifolds; sample pumps or compressors; power supplies, surge suppressors and disconnects.

2. Instrument rack plates shall be fabricated from .125 Marine Grade Aluminum, powder-coated white on all surfaces. Depending on overall size, racks may be fabricated in single or multiple segments for attachment to the support framing, to preserve rigidity. All exposed corners, edges, and other projections shall be smooth rounded or chamfered to prevent injury.

3. Each instrument rack shall be securely attached by stainless steel hardware to two or more steel support struts. Struts shall be steel, no less than 1-inch square, permanently installed in concrete, coated in bitumastic paint up to 18 inches above the concrete for protection against moisture. All exposed corners, edges and protruding bolts shall be smooth rounded or capped to prevent injury.

4. Instrument racks located outdoors shall be fully covered by sun shields as described herein.

D. Finish Requirements (except for NEMA 7 rated enclosures)

1. All sections shall be descaled, degreased, filled and ground, phosphate cleaned, and finished.

2. Enclosure finish shall be polyester powder-coated. NEMA 12 indoor enclosure exterior shall be ANSI 61 gray. The exterior of outdoor panels and NEMA 4X panels shall be white. All instrument rack panels and sun shield panels shall be white. All enclosure interiors shall be white.

E. Print storage pockets shall be provided on the inside of each panel. The storage pockets shall be constructed of compatible material with the panel door, welded onto the door, and finished to match the interior panel color. The

storage pocket shall be sufficient to hold all of the prints required to service the equipment, and to accommodate 8.5-inch by 11-inch documents without folding.

2.04 Environmental Control

A. Provide custom fabricated sun shields for all outdoor panels and instrument racks in accordance with the following requirements:

1. Sun shields shall be fabricated from .125 Marine Grade Aluminum, powder-coated white on all surfaces. Units shall be designed, fabricated, installed, and supported to fully cover and shade the top, sides and back of the enclosure, and to partially shade the front panel of the enclosure, from direct exposure to sunlight from sunrise to sunset.

2. Depending on overall size, sun shields may be fabricated in single or multiple segments for attachment to the enclosure support framing or to separate free standing framing around the enclosure, to preserve rigidity.

3. Sun shields shall not be attached directly to the enclosure by drilling holes through, or welding studs to, the enclosure surfaces, and shall be designed and mounted to provide a minimum 3-inch air gap all around the enclosure for air circulation and heat dissipation.

4. The top section of all sun shields shall be sloped at a minimum angle of 5 degrees from horizontal. For wall mounted enclosures, the top section shall slope downward away from the wall and towards the front of the enclosure. For free standing, floor mounted and frame mounted enclosures the top section shall slope downward towards the back side of the enclosure.

5. The front edge of the top section of all sun shields shall incorporate a narrow and more steeply sloped drip shield segment which sheds water away from the front of the enclosure and prevents it from dripping or running directly onto the front panel of the enclosure.

6. All seam welds used in sun shield fabrication shall be continuous and shall be ground smooth.

7. All exposed corners, edges and projections shall be smooth rounded or chamfered to prevent injury.

B. Under no circumstances shall temperature control methods compromise the NEMA rating of the panel. Air conditioners are not allowed.

C. All control panels that are located outdoors or in unconditioned indoor process areas shall be provided with an integral heater, fan, and adjustable thermostat to reduce condensation and maintain the minimum internal panel temperature. Mount the unit near the bottom of the enclosure with discharge away from heat-sensitive equipment. Heater shall be Hoffman DAH or equal.

2.05 Corrosion Control

A. Panels shall be protected from internal corrosion by the use of corrosion-inhibiting vapor capsules as manufactured by Northern Technologies International Corporation, Model Zerust VC; Hoffman Model AHCI; or equal.

2.06 Control Panel – Internal Construction

A. Internal Electrical Wiring

1. Wire type 12 AWG and smaller shall be Hook-Up/Lead tinned copper, minimum 18 AWG stranded, Belden 35612 Hook-Up Lead-UL AWM Style 3173-XL-DUR or equal.

2. Wiring for systems operating at voltages in excess of 120 VAC shall be segregated from other panel wiring either in a separate section of a multi-section panel or behind a removable Plexiglas or similar dielectric barrier. Panel layout shall be developed such that technicians shall have complete access to 120 VAC and lower voltage wiring systems without direct exposure to higher voltages.

3. Power and low voltage DC wiring systems shall be routed in separate wireways. Crossing of different system wires shall be at right angles. Different system wires routed parallel to each other shall be separated by at least 6 inches. Different wiring systems shall terminate on separate terminal blocks.

4. Wiring troughs shall be wide slot, hinged cover type. Trough edges may be located no less than 1.5 inches from the nearest terminal block or component or subpanel edge. Troughs shall not be filled to more than 40 percent visible fill.

5. Power distribution wiring on the line side of fuses or breakers shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 18 AWG minimum. Electronic analog circuits shall utilize 20 AWG minimum, foil and braided shielded twisted pair, cable insulated for not less than 600 volts. Insulation is to be stripped back 6-inch from the terminal connection to allow clamp on measurement of a 4-20ma loop.

6. All control wires are to have Insulated Ferrules mounted on all the ends. This includes the ends of all field wires. Proper manufacturer recommendations are to be followed when installing each ferrule.

7. Terminations

a. All wiring shall terminate onto single tier terminal blocks, where each terminal is uniquely and sequentially numbered. Direct wiring between field equipment and panel components is not acceptable.

b. Terminal blocks shall be arranged in vertical rows and separated into groups (power, AC control, DC signal). Each group of terminal blocks shall have a minimum of 25 percent spares. Terminal blocks shall be by Weidmuller.

c. Discrete terminal blocks shall be double deck. Analog terminal blocks are to be triple deck. Terminal block colors shall match UL508A voltage code.

d. Terminal blocks shall be the compression type, fused, unfused, or switched as shown on the Construction Drawings or specified elsewhere in Division 40.

e. Wire and tube markers shall be the tube type with heat impressed letters and numbers.

f. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal or within 8-inches of the bottom of free standing panels, or within 3-inches of stanchion mounted panels, or 3-inches of adjacent wireway.

8. All wiring to hand switches and other devices, which are live circuits independent of the panel's normal circuit breaker protection, shall be clearly identified as such.

9. All wiring shall be clearly tagged and color coded. All tag numbers and color coding shall correspond to the panel wiring diagrams and loop drawings. All power wiring, control wiring, grounding, and DC wiring shall utilize different color insulation for each wiring system used. The color coding scheme shall be in accordance with UL 508a.

10. Provide surge protectors on all incoming power supply lines at each panel per the requirements of Section 40 90 00.

11. Mount all terminal blocks, fuse blocks, and other devices wherever feasible, on extended DIN rail, attached to the subpanel by stainless steel screws.

12. Wiring trough for supporting internal wiring shall be wide width, plastic type, with snap-on covers. The side walls shall be open top type to permit wire changing without disconnecting. Trough shall be supported to the subpanel by stainless steel screws. Trough shall not be bonded to the panel with glue or adhesives.

13. Each panel shall have a work light fixture, LED type, mounted internally to the ceiling of the panel, with manual switch.

14. Each panel shall have a specification grade duplex convenience receptacle with ground fault interrupter, mounted internally. The convenience receptacle shall be powered from the UPS, shall be

protected by a dedicated fuse or circuit breaker, and shall be clearly labeled “Computer Use Only – 3 Amp Maximum”.

15. Each panel shall be provided with an isolated copper grounding bus for all signal and shield ground connections. Shield grounding shall be in accordance with the instrumentation manufacturer's recommendations.

16. Each panel shall be provided with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.

17. Each panel shall have control, signal, and communication line surge suppression in accordance with Section 40 90 00.

18. Where 24VDC power is required, provide separate power supplies for internal control devices, and for field devices such as 4-20mA loops.

19. Each panel shall be provided with a circuit breaker to interrupt incoming power.

20. Additional electrical components including transformers, motor starters, switches, circuit breakers, etc. shall be in compliance with the requirements of Division 26.

B. Relays not provided under Division 26 and required for properly completing the control function specified in Division 40, Division 26, or shown on the Construction Drawings shall be provided under this Section.

2.07 Electrical Components

A. Main circuit breaker shall be a thermal-magnetic molded case breaker, by Square D Company, or equal. Provide a flange mounted main power disconnect operating handle with mechanical interlock having a bypass that will allow the panel door to open only when the switch is in the OFF position.

B. A mechanical disconnect mechanism, with bypass, shall be installed on each motor circuit protector, capable of being locked in the "OFF" position to provide a means of disconnecting power to the motor.

C. Auxiliary contacts shall be provided for remote run indication and indication of each status and alarm condition. Additional controls shall be provided as specified herein and as required by the detailed mechanical equipment requirements, the P&IDs (Division 40, the Control Wiring Diagrams (Division 26) and as shown on the Construction Drawings.

D. Operating control devices and instruments shall be securely mounted on the exterior door. Controls shall be clearly labeled to indicate function and shall be in accordance with the electrical area classification indicated on the Electrical Drawings.

E. A six digit, non-resettable quartz time base elapsed time meter shall be connected to each motor starter. Meter shall be Hobbs 98000 Series,

Redington Model 722, Cramer Model ETI-635 G, or equal.

F. Control panel shall be provided with a lightning and surge protection unit on the line side of the main circuit breaker. Unit shall be 600 Volt, 3 Phase, General Electric "Tranquell" Series, or equal.

G. Where required by Specifications, an alternator shall be provided to sequence motors. Alternator shall be Catalog No. 008-120-13SP or 009-120-23AP by Stacon; Square D, Class 9039, Type HG-21 or equal.

H. Panel mounted timers shall be flush mounted, plug-in type, Eagle Signal Bulletin 125 cycle-flex, Idec SR6P-MO8G or equal, with ranges as shown on the Construction Drawings, or as required by the detailed mechanical equipment specifications.

I. Specific control devices, control descriptions and other data are specified under the detailed specification for the mechanical equipment with which the control panel is supplied.

2.08 General Purpose Relays and Time Delays

A. Type:

1. General purpose plug-in type.

B. Functional:

1. Contact arrangement/function shall be as required to meet the specified control function; Mechanical life expectancy shall be in excess of 10 million.

2. Duty cycle shall be rated for continuous operation; Units shall be provided with integral indicating light to indicate if relay is energized.

3. Solid state time delays shall be provided with polarity protection (DC units) and transient protection.

4. Time delay units shall be adjustable and available in ranges from .1 second to 4.5 hours.

C. Physical:

1. For 120 VAC service provide contacts rated 10 amps at 120 VAC, for 24 VDC service provide contacts rated 5 amps at 28 VDC, for electronic (milliamp/millivolt) switching applicator provide gold plated contacts rated for electronic service; relays shall be provided with dust and moisture resistant covers.

D. Options/Accessories Required:

1. Provide mounting sockets with pressure type terminal blocks rated 300 volt and 10 amps.

2. Provide mounting rails/holders as required.

E. Manufacturer(s):

1. IDEC.

2.09 Emergency Alarm Beacon and Audible Horn

A. Beacon alarm light:

1. Type:

a. Beacon alarm light.

2. Physical:

a. Beacon alarm light for building exterior mounting shall be 120 VAC, flush mounted, weatherproof construction.

b. A 750,000-candle power xenon strobe tube and red polycarbonate lens.

3. Manufacturer(s):

a. Federal Signal.

b. Edwards.

c. Wheelock.

d. Or equal.

B. Alarm Horn:

1. Type:

a. Alarm horn shall be vibrating type for 120 Volts, 60 Hz.

2. Manufacturer(s):

a. Federal Signal Corp.

b. Edwards Co.

c. Benjamin.

d. Or equal.

2.010 Selector Switches and Pushbuttons

A. Type:

1. Control devices shall be heavy-duty oil tight type with stackable contact blocks.

B. Functional:

1. Provide contact arrangement and switching action as required for the control system specified.

C. Physical:

1. For 120 VAC service provide contacts rated 10 amps at 120 VAC, for 24 VDC service provide silver sliding contacts rated 5 amps at 125 VDC, for electronic (millivolt/ milliamp) switching provide contacts rated lamp at 28 VDC.

2. Pushbuttons shall have flush type operators.

3. Selector switches shall have knob or wing lever operators; NEMA rating - 4X; Provide legend plates denoting switch/pushbutton position/ function.

D. Manufacturer(s):

1. Cutler-Hammer.

2. Allen Bradley.

3. General Electric.

4. Square D.

5. Crouse Hinds (NEMA 7).

6. Or equal.

2.011 Pilot Type Indicating Lights

A. Type: Energy efficient Solid State LED Lamps.

B. Functional:

1. Units shall be provided with low voltage LED lamps suitable for the voltage supplied.

2. Lights supplied with 120V AC power shall have integral reduced voltage transformers.

3. Lamps shall be replaceable from the front of the unit.

C. Physical:

1. Lens color:

a. Running, on, open - Red.

b. Stopped, off, closed - Green.

c. Alarm - Amber.

d. White - Power on.

e. Blue - All other status indications not covered by the above.

f. Lens caps shall be approximately 0.46-inch diameter. Provide legend faceplates engraved to indicate the required function of each device; NEMA rating - 4X.

D. Manufacturer(s):

1. Cutler-Hammer.

2. Allen Bradley.

3. General Electric.

4. Square D.

5. Crouse Hinds (NEMA 7).

6. Or equal.

2.012 Digital Panel Meter

A. Type:

1. Electronic, 3.5 digit, 0.56-inch high efficiency LED display.

B. Operation:

1. To accept 4-20 mA DC input signal and provide indication in Engineering Units of measured variable.

C. Functional:

1. Power supply: 115 VAC, plus or minus 10 percent, 50/60 Hz, 10 VA.

2. Input: 4-20 mA DC into 100 ohms.

3. Indication: 0.56-inch LED display.

D. Physical:

1. Case size nominal 2.5-inch high by 5-inch wide by 6-inch deep.

2. Case type: watertight and dust-tight (NEMA 4X).

3. Mounting: flush panel suitable for high density mounting arrangements.

E. Performance: Linear input accuracy plus or minus 0.05 percent of calibrated span, plus or minus 1 count.

F. Manufacturer(s): Precision Digital, Red Lion, or equal.

2.013 Intrinsic Safety Barriers (for 2-wire transmitter systems)

A. Intrinsic safety barriers shall be passive devices requiring no external voltage supply and supplied with series resistors, series fuse and shunt zener diodes to limit the transfer of energy to levels required by intrinsically safe protection between safe and hazardous locations.

B. Unit shall be Factory Mutual approved and certified for use in accordance with National Fire Protection Association (NFPA 493).

C. Manufacturer(s):

1. P&F.

2. Gems.

3. Unitech.

4. Or equal.

2.014 24 VDC Power Supply

A. Provide one or more 24VDC power supplies as required. Each 24 VDC power supply shall meet the following requirements:

1. Input power: 115 VAC, plus or minus 10 percent, 60 Hz.

2. Output voltage: 24 VDC.

3. Output voltage adjustment: 5 percent.

4. Line regulation: 0.05 percent for 10 volt line change.

5. Load regulation: 0.15 percent no load to full load.

6. Ripple: 3 mV RMS.

7. Operating temperature: 32 to 140 degrees Fahrenheit.

B. Equip each power supply with a power on/off circuit breaker. Furnish separate power supplies for internal panel devices and for loop-powered instruments outside the panel. For the internal panel devices, furnish a redundant pair of power supplies with automatic failover unit.

C. Size each 24 VDC power supply to accommodate its design load plus a minimum 25 percent spare capacity.

D. Provide output overvoltage and overcurrent protective devices with the power supply to protect instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.

E. Mount the 24 VDC power supply such that dissipated heat does not adversely

affect other panel components.

F. Manufacturer: PULS.

2.015 Spare Parts

A. The following control panel spare parts shall be furnished:

1. Relays and sockets - Two of each type installed.

2. Fuses and circuit breakers - 10% (minimum of 10 fuses and 2 circuit breakers) of each type and size installed.

3. Power supplies - one of each type installed.

4. Light bulbs - 10% (minimum of 10) of each type installed. For LED type lights, 5% (minimum of 3) of each color installed.

5. Selector switches/pushbuttons - Two of each type installed including contact blocks.

Part 3 EXECUTION

3.01 Installation

A. Refer to Section 40 90 00.

END OF SECTION

DIVISION 43 - PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

43 21 02 ANSI Standard Horizontal, End Suction Centrifugal Pumps

Part 1 General

1.01 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required and completely install, put in operation and field test two horizontal, end suction, constant speed, centrifugal pumps complete with drivers, mounting arrangement and controls as shown on the Construction Drawings and as specified herein.

B. The pump manufacturer shall supply all materials, equipment, and incidentals required and install, complete and ready for operation of the two (2) pumping units including pump control panel, motors, and instrumentation as shown on the Construction Drawings, and as specified herein.

C. All necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in this Section or not shall be furnished and installed as required for an installation incorporating the highest standards for this type of service. Also included shall be supervisory services during installation and field testing of each unit and instructing the regular operating personnel in the proper care, operation and maintenance of the equipment.

1.02 Related Work

A. Concrete work and the installation of anchor bolts are included in Division 03; however, anchor bolts for these units shall be furnished under this Section.

B. Valves, mechanical piping and appurtenances and pipe hangers, supports and thermal insulation are included in Division 40.

C. Control Panels and Instruments are included in Division 40.

D. Motors and other Electrical work, except as hereinafter specified, is included in Division 26.

1.03 Submittals

A. The documentation as stated under Appendix A of the ANSI Standards ASME B73.1M-1991 and/or ASME B73.2M-1991 shall be supplied to provide clear communication between the pump user and pump manufacturer and to facilitate the safe design, installation and operation of the pump.

B. Test Reports

1. Each pump shall be Hydrostatically Tested with certified copies of the test results submitted to the JEA ENGINEER.

2. Performance curves shall be submitted based on tests conducted in accordance with the Hydraulic Institute Standards.

C. Submit dimensional drawings for approval showing weights and materials of construction by ASTM reference and grade. Show any linings and coatings. Show seal water requirements.

D. Submit expected pump performance curves for approval on which the specified operating points are shown. Include pump head, efficiency, brake horsepower and NPSH required at full speed. Show the impeller diameter and pump sphere size capability.

E. Submit motor data for approval by the JEA ENGINEER including manufacturer, model or type, and dimensional drawing. Show horsepower, service factor, full load speed, NEMA design, frame size, weight, enclosure, winding insulation class and treatment, rated ambient temperature, voltage, phase, frequency, full load current and locked rotor current. Also show the guaranteed efficiency and power factor at full, ¾, and ½ loads.

F. Submit Operation and Maintenance manuals for approval. These manuals shall include all of the approved and corrected submittal data, installation, operation and maintenance requirements, and test data on all equipment furnished by the pump supplier. This manual shall be marked to show exactly what will be furnished and all other options and accessories shall be deleted or crossed out. If test data has not been completed at the time these manuals are prepared, this test data may be furnished later, however, the index shall reference, the page this future additional data.

1.04 Quality Assurance

A. The equipment covered by this Section is intended to be standard pumping equipment of proven ability as manufactured by companies having extensive experience in the production of such equipment. Units specified herein shall be furnished by a single manufacturer. The equipment furnished shall be designed, constructed and installed to operate satisfactorily when installed as shown on the Construction Drawings.

B. The pump manufacturer shall be fully responsible for the design, arrangement and operation of all connected rotating components of the assembled mounted pumping unit and to ensure that neither harmful nor damaging vibrations occur at any speed within the specified operating range.

C. Vibration, when measured in the direction of maximum amplitude on either the pump and motor bearing housings or at the top motor bearing housing, shall not exceed the specified displacement and velocity limit at any speed within the operating speed range.

D. Pumps shall be in accordance with ANSI B73.1 and Hydraulic Institute Standards.

E. Motors shall be in accordance with NEMA Standards.

1.05 System Description

A. The pumps shall be designed for the conditions of service tabulate:

Service	Contaminated Groundwater
Driver	Constant Speed Electric Motor
Quantity	Two
Specific Gravity	1.0
<u>Design Point:</u>	
Capacity	105 GPM
TDH	116 ft.
Efficiency	56%
<u>Secondary Point:</u>	
Minimum Capacity	80 GPM
TDH	123 ft.
<u>Runout Point:</u>	
Minimum Capacity	156 GPM
TDH	75 ft.
Max NPSH Req.	17 ft.
Max. Motor Speed	3500 RPM
Minimum Motor Size	7.5 hp
Minimum Shut-Off Head	134.9 ft.
Min. Suction	3 in.
Min. Discharge	1.5 in.
Basis of Design:	ITT Goulds Model 3196

1.06 Delivery, Storage, and Handling

A. All parts shall be properly protected so that no damage or deterioration will

occur during a prolonged delay from the time of shipment until installation is completed and the unit and equipment are ready for operation.

B. All equipment and parts must be properly protected against any damage during a prolonged period at the site. Store all equipment in accordance with the manufacturer's instructions.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the JEA ENGINEER.

D. The finished surfaces of all exposed flanges shall be protected by wooden or equivalent blank flanges, strongly built and securely bolted thereto.

E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. No shipment shall be made until approved by the JEA ENGINEER in writing.

G. For protection of bearings during shipment and installation, the bearing shall be properly processed. Anti-friction bearings, if pre-lubricated, shall be protected in accordance with the bearing manufacturer's recommendations against formation of rust during a long period of storage while awaiting completion of installation and start-up of the machine in which they are used. Anti-friction bearings which are not pre-lubricated shall be properly treated in accordance with the bearing manufacturer's recommendation against formation of rust during a long period of storage, while waiting completion of installation and start-up, by the application of Exxon, Rust-Ban No. 392 or equal treatment.

1.07 Maintenance

A. Furnish all special tools and test equipment required to properly startup, test, and operate the pumps. All such tools and test equipment shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

B. All spare parts shall be properly protected for long periods of storage and packed in containers that are clearly identified with indelible markings as to contents.

C. Furnish the following spare parts for each pump model.

1. One Type 316 stainless steel casing wearing ring.

2. One wear plate for open impeller design.

3. Mechanical seals.

4. Two anti-friction radial thrust bearing assemblies.

5. Two anti-friction radial and axial thrust bearing assemblies.

1.08 Warranty

A. The equipment shall be warranted for a period of 1 year from date of Substantial Completion, defined as the point at which the construction has been accepted by JEA and the JEA ENGINEER and the CONTRACTOR has demobilized from the Site, to be free from defects in workmanship, design or material. If the equipment should fail during the warranty period due to a defective part(s), it shall be replaced in the machine and the unit(s) restored to service at no additional cost to the JEA.

Part 2 Products

2.01 GENERAL

A. The pumping units shall all be supplied by pump supplier and shall be complete including pumps, motors, steel mounting arrangement, controls and appurtenances such as, but not limited to, couplings, guards and gauges.

B. The pumps, motors, and drives (if required) shall be rated for continuous duty and shall be capable of pumping the specified flow range without cavitation or excess vibration. The pumps and drives shall not infringe upon the motor service factor at any point on the pump full speed curve.

C. The amplitude of vibration shall not exceed the limits set forth in the latest edition of the Hydraulic Institute Standards.

D. Corrosion resistant nameplates with the name of the manufacturer, the rated capacity, head, speed, serial number, model number and all other pertinent data shall be attached to each pump.

E. Corrosion resistant nameplates with the name of the manufacturer, serial number, model number, horsepower, speed, voltage, amperes, and all other pertinent data shall be attached to each motor.

F. The pumping equipment shall be as manufactured by ITT Goulds Pumps and distributed by Hudson Pump and Equipment, or approved equal.

G. All necessary foundation bolts, nuts, and washers shall be furnished and shall be Type 316 stainless steel.

2.02 CONDITIONS OF SERVICE

A. The pumps shall be Model 3196 STi 1x3-8 by Goulds Pumps, or approved equal.

B. The pumps shall be designed for the conditions of service as tabulated in paragraph 1.05.

C. Pump Materials:

	Part	Material	Designation
1.	Casing	Ductile Iron	ASTM A395 Gr 60-40-18
2.	Impeller	316SS	ASTM A744 CF-8M

3.	Stuffing Box	Ductile Iron	ASTM A395 Gr 60-40-18
4.	Frame Adapter	Ductile Iron	ASTM A536 Gr 80-60-13
5.	Bearing Housing	Cast Iron	ASTM A48 Cl 20
6.	Shaft	316SS	ASTM A276 Type 316
7.	Base	Steel	Carbon Steel

2.03 Pump Construction

A. The pumps shall be constructed according to ASME B73.1M for horizontal, end suction centrifugal pumps.

B. The pump casing shall be of sufficient strength, weight and metal thickness to insure long life, accurate alignment and reliable operation. The volute shall have smooth fluid passages large enough at all points to pass any size solid which can pass through the impeller and provide smooth, unobstructed flow. The casing shall be suitable for working pressures up to 250 psi and shall be of the vertically split design with top centerline discharge. The casing shall be of the back pullout design so that the impeller may be removed without disturbing either the suction or discharge piping. The suction and discharge shall have 150 lb. flanges with drilled and tapped holes for gauge connections. The casing shall also have a drilled and tapped drain hole.

C. The impeller shall be of the fully open type with contoured vanes curving into the suction. It shall be threaded onto the shaft and sealed with a Teflon O-ring. Clearances in all leakage paths shall be renewable through an axial adjustment of the impeller and shaft assembly. The pump impeller shall be balanced to ISO Level G6.3 and a certificate shall be furnished.

D. The stuffing box shall be cast integrally with the stuffing box head, readily accessible and its construction shall permit the use of either a mechanical seal or packing rings without special machining. A renewable throat bushing shall be installed in the bottom of the stuffing box to minimize the amount of clean water injected into the box.

1. Each pump shall be equipped with a John Crane 5610Q XF(55)1XO(58)H (carbon vs Silicon Carbide with Viton) single cartridge type, or approved equal.

2. The seal shall be hydraulically balanced, O-ring design to reduce heat generation, face wear and minimize horsepower consumption.

3. The seal shall be mechanically loaded with multiple external springs. The springs shall be isolated from the pumped product to eliminate corrosion or clogging problems.

4. Two connection ports with standard NPT tapped connections shall be provided in the gland.

5. The bushing design shall be capable of positioning particulate matter/contaminants for removal by conveying them from the bore to the shaft by means of an integral helical groove machined into the internal diameter of the sealing arrangement stationary bushing component. The particulate matter/ contaminants shall be ejected from the seal chamber back to the impeller for expulsion. Bushing shall be capable of excluding particulate matter, with no flush required, in waste streams, with up to 25% solids. Bushing as manufactured by John Crane or approved equivalent.

6. To minimize on-going maintenance costs, mechanical seal must be field repairable, utilizing a spare parts kit of wearable elements only, no housing required. Spare parts kit shall include split rotary and stationary faces, springs, elastomers, gaskets and fasteners. Include 1 Spare Parts Kit per seal. Split seal to be field-installed, by a seal manufacturer representative, at the end-user location.

7. Materials of construction:

   a. Casing: Ductile iron

   b. St. Box Cover: Ductile iron

   c. Impeller: 316SS

   d. Casing Gaskets: Aramid Fiber with EPDM and Silicate Filler

   e. Impeller O-ring: Teflon

   f. Shaft Material: 316SS

   g. Gland: 316SS

   h. Bearings: 6207 (Inboard) 5306 (Outboard)

   i. Coupling: Rexnord – Omega Rex Elastomer – ES-4 (standard orange element) S.F. 1.00, or approved equal

   j. Coupling Guard: Carbon steel

   k. Baseplate: Carbon steel

E. The pump bearing frame shall be a one-piece rigid frame with a cast iron bearing housing mounted at the outboard end and a ductile iron frame adapter mounted at the inboard end. The bottom of the frame shall be fitted with a magnetic drain plug to capture any ferrous contaminants. Both ends of the frame shall be provided with INPRO VBXX-D labyrinth type deflectors constructed of bronze stators and stainless steel rotors to prevent the entrance of contaminants. Lip seals are not acceptable.

F. Bearings shall be oil lubricated and designed for an L10 life of two years. The bearing frame shall be furnished with a 1-inch diameter sight glass to enable monitoring of the actual oil level. Provisions to mount the sight glass on either

side of the frame for installation and monitoring flexibility shall be included.

G. The pump shall be fully and accurately machined and of sufficient size to transmit the full driver output. Shaft deflection shall not exceed the limits of ANSI B73.1M.

H. The pump shall utilize the manufacturer's standard flexible coupling. Coupling halves shall be secured to the driver and driven shafts by a set screw located over the key. Coupling guards shall meet OSHA standards.

I. All machine bolts, nuts and capscrews shall be of the hex head type. Hardware or parts requiring special tools shall not be used.

J. A common fabricated steel base under the pump and motor shall be provided.

2.04 Motors

A. Pump motors shall be 3 phase, 60 hertz and 230/460 volts and shall be sized so that the service factor is not infringed upon throughout the full speed performance curve of the pumps. Motors shall have Class F insulation and a 1.15 service factor. Motors shall be TEFC-Premium Efficient and shall have grease or oil lube bearings.

B. Control Panel is furnished by ISS and is included in Division 40.

2.05 Pump Control Panel

A. The control panel shall be mounted as shown on the Construction Drawings. The control panel shall have NEMA 4X 316 stainless steel enclosure and all comply with Division 40 as modified herein.

B. Pump Control is intended to be controlled via either local (hand) or automatic (via float switch) operation. Refer to paragraph 2.06. No provisions for remote monitoring to DCS are required, only local alarm with horn.

C. Each pump motor shall be controlled via H.O.A. switch, with red indicator light for motor running, amber light for motor alarm, and elapsed time meter.

D. Short circuit rating of panel shall be 42,000 AIC minimum.

E. Provide the additional control panel mounted indicating lights and nameplates:

1. High Level - Amber indicator light

2.06 Controls

A. Sealed tilt type switches shall be supplied to control sump level and alarm signal. The mercury switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket. A weight shall be attached to each cord above the float to hold each switch in place in the sump. The weight shall be placed above or inside the float to effectively prevent sharp bends in the cord when the float operates. The float switches shall hang in the sump supported only by the

cord. Four float switches shall be used to control and signal level; one for high-high level (HHL), one for pump turn-on at high level (HL), one for pump turn-off at low level (LL) and one for low-level alarm.

B. Level settings shall be as shown on the Construction Drawings.

C. On sump level rise, the "pump off" level mercury switch shall be energized. When the level reaches the "pump on" level switch it shall be energized and send a signal to the control panel and automatically turn on a pump. One pump shall operate until the "pump off" switch automatically turns the pump off. Under normal operation, the duty and standby pumps shall alternate service after each pump cycle is complete and the in-service pump called to stop.

1. If sump level rises to the HHL water level, the standby pump shall be started. Both pumps will be operated in this condition. If the HHL level switch does not disable within two minutes, an alarm light shall be turn on in panel, denoting both pumps are running. Once level drops and reaches the “pump-off” switch, both pumps will be disabled and the normal alternating cycle resume.

2. Should the duty pump fail to start, the standby pump shall be automatically started after a one-minute time delay, the failed duty pump shall be locked out, an alarm transmitted and the standby pump shall continue to operate through every cycle. Each pump shall be capable of being operated manually from the control panel. All level switches shall be adjusted for level setting from the surface.

D. Floats and instruments are furnished by ISS and are included in Division 40.

E. Each float switch shall be supplied with a sufficient length of cord such that the switches can be connected to junction boxes inside the station.

F. Refer to Section 40 91 40 for float switches, diaphragm seals, and pressure gauges.

2.07 Shop Testing

A. Certified copies of both hydrostatic and performance tests are required for each pump and in accordance with both the referenced ANSI and Hydraulic Institute Standards.

B. Each motor shall be given a non-witnessed short commercial test to determine that the motor is free from electrical and mechanical defects and to provide assurance that it meets the specifications. Testing shall be in accordance with NEMA standards and shall consist of no load current, locked rotor current, winding resistance, high potential and bearing inspection.

2.08 Shop Painting

A. All surfaces shall be prepared and shop primed, as part of the work under this Section.

Part 3 Execution

3.01 Preparation

A. Coordinate with other trades, equipment and systems to the fullest extent possible.

B. Take all necessary measurements in the field to determine the exact dimensions for all work and the required sizes of all equipment under this contract. All pertinent data and dimensions shall be verified.

3.02 Installation

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Construction Drawings. Anchor bolts shall be set in accordance with the manufacturer's recommendations and setting plans.

B. Set base mounted pumps on the steel base and check for alignment in accordance with the standards of the Hydraulic Institute and then grout base. Unless inertia block is specified on the Construction Drawings, base mounted pumps shall be installed and grouted on a pad. In line and suspended pumps shall be properly supported by the suspension clips as recommended by the manufacturer to prevent any strain on the connecting piping.

C. All piping connections to the pump shall be done without bending and/or twisting the piping to mate with the pump flange connections.

D. A certificate from each equipment manufacturer shall be submitted stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3.03 Field Tests

A. Furnish the services of a factory representative to inspect the final installation, supervise a test run of the equipment and provide operator training.

B. The CONTRACTOR shall check all motors for correct clearances and alignment, and for correct lubrication in accordance with the manufacturer's instructions. The CONTRACTOR shall check the direction of rotation of all motors and reverse if necessary.

C. After installation and as soon as conditions permit full speed operation, and in the presence of the JEA ENGINEER, have the vibration tests performed on each of the units to (a) prove compliance with specified limitations, and (b) prove that there are no field installed resonant conditions due to misalignment, the foundation, or the connecting piping and its supports, when operating at any speed within the specified operating range.

D. If required, take corrective action and the units shall be retested to ensure full compliance with this Section. All costs associated with the field tests or any required corrective action shall be borne by the CONTRACTOR.

END OF SECTION

DIVISION 50 - HYDRAULIC CONTROL SYSTEM SHED, PUMPS, INSTRUMENTATION, AND CONTROLS

50 00 00 Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

Part 1 General

1.01 Scope

A. This section includes a description of how the CONTRACTOR shall construct and provide the Hydraulic Control System Shed, Pumps, Instrumentation, and Controls (Seneca Companies model HCS765W). The CONTRACTOR shall construct the system to be suitable for use with facility electricity, which will furnish 480V, 3-phase power.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 33 23 00 - Extraction Wells
2. Section 33 36 00 - Poly Tank
3. Section 40 05 00 - Process Piping, Hosing, and Appurtenances
4. Section 40 05 23 - Process Valves
5. Section 40 05 24 - Process Gauges
6. Section 40 05 25 - Process Totalizing Water Flow Meter
7. Section 40 05 70 - Piping Specialties
8. Division 40 (13) - Instrumentation and Controls
9. Section 50 20 00 - Start up

1.03 Cited Standards

A. National Electric Code (NEC) - NEC General Purpose standards

B. MET Laboratories US Certified

C. American Institute of Constructors (AIC)

D. National Electrical Manufacturers Association (NEMA)

E. 2017 Florida Building Code (enforced by the City of Jacksonville)

1.04 Noted Restrictions - None

1.05 Safety - None

1.06 Quality Control - None

1.07 Submittal

A. CONTRACTOR shall provide specifications, shop drawings, hurricane strapping calculations and details, equipment and piping layout, instrumentation diagram, control panel electrical diagrams, etc. pertaining to the final construction of the hydraulic control system (including both internal and external features, equipment, and connections) to the JEA ENGINEER.

B. The CONTRACTOR shall provide an electrical line diagram prepared by a licensed electrical contractor or a registered electrical engineer to the JEA ENGINEER.

C. The CONTRACTOR must provide hurricane strapping calculations and details sealed by a Florida licensed engineer, and any other submittals required to meet the 2017 Florida Building Code.

Part 2 Products

2.01 Equipment

A. CONTRACTOR shall furnish and install Seneca Companies model HCS765W per the following specifications:

1. Three-year **all-inclusive warranty** against defective workmanship, equipment, electrical, building, material, etc.

2. System Building

a. Shall be built to NEC General Purpose standards

b. Shall be MET Laboratories US certified

c. Shall be a 10 ft by 16 ft by 8 ft interior height wood frame building and shall include:

1) White vinyl siding;

2) Forklift pockets;

3) Bolt down tabs on lower corners for installation of soil anchors in accordance with Florida Building Code wind load requirements;

4) Steel non-skid floor;

5) Interior painted plywood;

6) 3-ft wide double doors with combination padlock; and

7) Rain shields over the double doors (shipped loose if necessary).

d. Interior of shed shall include:

1) Control panel;

2) Groundwater extraction manifold;

3) 10 ft of shelving for light storage (less than 50 lbs);

4) Duplex 15 Amp GFI receptacle;

5) Adequate lighting with light switch located near doors;

6) Thermostat controlled ventilation fan with hood;

7) Passive vent louvers with hood;

8) Fire extinguisher (10-pound ABC Dry Chemical);

9) Wall-mounted OSHA first-aid kit; and

10) All influent, effluent, and drain lines plumbed to outside of building.

3. Groundwater Extraction Manifold

a. Constructed of five 1.5-inch diameter Schedule 80 PVC influent legs and one 3-inch diameter Schedule 80 PVC effluent leg. The five influent legs shall terminate outside of the hydraulic control system (penetrations through the wall) and connect above ground to the influent hydraulic conveyance piping using cam lock and 1.5-inch diameter wire wrapped rubber hydraulic hose rated for 200 psi. The one effluent leg shall terminate outside the hydraulic control system and connect above ground to the effluent piping using 3-inch diameter Schedule 80 PVC.

b. The one effluent leg shall include:

1) APCO ½-inch model 55 air release valve with stainless steel or plastic wetted parts, to be located at the highest point on the piping;

2) and

3) 3/8-inch sample port.

c. The five influent legs shall include:

1) Union on each end of the appurtenances;

2) ball valve;

3) pressure gage (liquid filled, stainless steel case);

4) ¼-inch sample port;

5) Check valve (true union ball check valve);

6) 1½-inch Yokogawa AXF Magnetic totalizing flow indicating transmitter capable of reading an approximate range of 2.5 to 160 gallons per minute and registering up to 100,000,000 gallons; and

7) Metal identification tags on all process elements corresponding to P&ID designation.

d. All valves and appurtenances must be installed between 3 and 6 feet above the floor to facilitate operating and monitoring of the system.

e. All piping shall include pipe flow labels.

f. Transmitter signal wiring shall be conveyed to the control panel in wire racks near the ceiling, or approved equivalent method.

4. Control Panel

a. The interior of the control panel shall include a PLC-based control panel with the following standard features:

1) UL certification;

2) AIC rating of 5000;

3) NEMA 2 lockable panel enclosure;

4) Primary circuit protection using fused main disconnect;

5) Surge and lightning protection for control system;

6) Main power block;

7) Branch circuit protection with circuit breakers for motors;

8) Motor starters with overload protection;

9) Branch circuit protection with circuit breakers for powered devices;

10) Allen Bradley Compact Logix Series PLC;

11) 24 VDC power supply;

12) Duplex 15 Amp GFI receptacle;

13) Uninterruptible Power Supply (UPS) capable of providing 30 minutes of backup power to provide alarms in the event of a power outage;

14) Wired and installed;

15) Spare I/O capacity (25%) for instrumentation in the event of system expansion or for integration of data into another system; and

16) Factory tested prior to shipping.

b. The outside of the control panel shall include:

1) Allen Bradley HMI:

a) P&ID screen with water level elevation in each extraction well and equalization tank;

b) Hour meters for each extraction well and metering pump;

c) VFD parameters for each extraction well including speed, current, temperature;

d) HOA switches with green run lights for each pump (including metering pump);

e) Red alarm indicator screen (such that the operator can readily see what the alarm is for troubleshooting); and

f) Instantaneous flow rates (individual and total) and total effluent flow meter (installed outside the system).

2) Power on light;

3) Alarm reset button; and

4) Emergency stop button.

5. Variable frequency drives (VFDs)

a. Allen-Bradley PowerFlex VFDs for each well pump (5), or approved equal, installed along the wall adjacent to the control panel.

6. Controls

a. The operating principle for the hydraulic control system is to maintain a constant target flow rate in the submersible well pumps. The CONTRACTOR shall program the PLC to control

the well pump VFD speed via feedback loop programming from the flow meter transmitters in the influent manifold legs.

b. As a secondary option, the CONTRACTOR shall also program the PLC to control well pump VFD speed to target a groundwater level in the extraction wells via feedback loop programming from the submersible well transducers.

c. CONTRACTOR to program PLC for alarms and interlock conditions as shown in the Construction Drawings. A system alarm and interlock schedule is also provided in Table 1.

7. Telemetry Module:

a. Wireless remote access to view system status and download data (remote control of system is prohibited), including:

1) P&ID user interface which will display status of all inputs, outputs and alarms, accessible from any PC with access to the Internet;

2) Standard 20 digital inputs/16 digital outputs, expandable with digital/analog inputs and outputs with 25% spare capacity; and

3) Datalogging capabilities:

a) Alarm history including data and time for each event;

b) Motor run times;

c) Daily totalized extraction quantities for individual extraction wells and a combined total effluent (total extracted quantity signal will be relayed from transmitting totalizers on each individual extraction well specified in this specification and the total extracted quantity signal will be a calculated value from the individual extraction well totalizers);

d) Daily totalized discharged quantities into force main (total effluent signal will be relayed from a transmitting totalizer not specified in this specification and associated with the pump station); and

e) Time trends of instantaneous pump flow rates and total effluent flow rate.

8. Hurricane Strapping

a. Straps and anchors. Hurricane anchors and straps shall be provided within building. Eye bolts shall be provided for securing straps, if necessary. Hurricane straps and anchors shall be installed by CONTRACTOR and shall meet local and state building codes. Hurricane submittal must be sealed by a Florida licensed engineer.

9. O&M Manual shall include the following at a minimum:

a. Operating instructions for all treatment system components;

b. Three-year system warranty;

c. Copy of operating manual for each piece of equipment;

d. Summary of system components;

e. Summary of system operation principles;

f. Summary of operation controls and failsafes; and

g. Summary of maintenance requirements for each piece of equipment.

10. Level Transducers

a. For each extraction well, a KPSI 320 (stainless steel, polyurethane cable) level transducer shall be installed within ¾-inch slotted Schedule 80 PVC casing to the bottom of the well. Details on the depth of installation for each extraction well are provided in Table 2. The ¾-inch slotted casing should penetrate the well seal and be secured to the side of the extraction well casing.

b. Two spare level transducers with approximately 60-ft of conduit shall be provided with the system.

11. The water level sensor for the exterior equalization tank shall be manufactured by Global Water Instrumentation, Inc., model WL400, or approved equal.

a. Water level sensors shall be installed per manufacturer's recommendation. CONTRACTOR shall provide and install all electrical and hydraulic conduit to ensure a fully plumbed and operational system.

b. Water level sensors shall be a two-wire sensor that is approximately 1 inch in diameter.

c. Water level sensors operating temperature shall be -30º to +85º C.

d. One spare level sensor shall be provided.

12. Submersible Pumps

    a. Submersible pumps shall be Grundfos SP25S15-9 for shallow wells (4 total) and SP5S05-9 for the deep well (1 total), or approved equal. Details on the depth of installation for each extraction well are provided in Table 2.

    b. Submersible pumps shall be installed per manufacturer's recommendation. CONTRACTOR shall provide and install all electrical and hydraulic conduit to ensure a fully plumbed and operational system.

    c. One spare Grundfos SP25S15-9 submersible pump shall be provided.

    d. Submersible pumps shall have a shroud/sleeve over the pump intake.

    e. Submersible pump shall be of stainless steel construction suitable for environmental (groundwater) applications.

    f. Submersible pumps shall be installed in a 4-inch diameter well and suitable for continuous and intermittent operation. Pumps shall provide continuous variable speed control within 30 to 100 percent of the pumps' performance curves. Pumps in shallow wells shall operate between 5 - 25 gpm, while the pump in the deep well shall operate between 1 - 5 gpm.

    g. The pump shall be located at minimum 1 foot above the top of the silt trap.

13. Field Wiring

    a. CONTRACTOR shall furnish with the HCS system (shipped loose or drop-shipped to site) field wiring for the 480V, 3-phase pump power leads, and for the 4-20 mA signal wiring for the submersible transducers. Details on the field wiring are provided in Table 3.

14. Metering Pump

    a. Metering pump shall be LMI Milton Roy Roytronic excel series AD with adjustable stroke speed and length.

    b. Equipped with anti-siphoning package and self-priming capabilities.

    c. Space near the metering pump shall be provided in the HCS building to accommodate a 55-gallon drum of bleach or other amendment, if JEA deems it necessary in the future.

    d. Metering pump shall be compatible with bleach.

Part 3 Execution

3.01 Preparation

A. The hydraulic control system shall be fully assembled, plumbed, wired, and operational prior to delivery.

3.02 Installation

A. All electrical work shall be completed by an electrician licensed in the State of Florida.

B. CONTRACTOR shall unload and level the Hydraulic Control System building on the concrete foundation. CONTRACTOR shall be solely responsible to repair or replace any equipment damaged during shipping at their expense.

C. The system building shall be secured with straps and anchors in accordance with state and local building codes.

D. CONTRACTOR shall connect the Hydraulic Control System to the hydraulic transmission piping and electrical conduit per the Construction Drawings and Technical Specifications.

E. CONTRACTOR shall install all process piping, valves, and appurtenances per the Construction Drawings and manufacturer's recommendations, or approved equal.

F. CONTRACTOR shall be responsible for installing all hydraulic and electrical conduits and wiring to ensure a fully operational Hydraulic Control System building.

3.03 Testing

A. CONTRACTOR shall follow procedures under Section 50 20 00 for start-up testing procedures. JEA ENGINEER to determine if system is fully operational based on startup testing procedures.

Table 2 – Pumping Well Details

Well Component	Pump Intake Depth (ft bls)	Pump Selection	Pump Power (hp / Amp)	Design Pumping Rate (gpm)
EW-001S	20	Grundfos SP25S15-9	1.5 / 3.0	20
EW-002S	35	Grundfos SP25S15-9	1.5 / 3.0	16
EW-003S	20	Grundfos SP25S15-9	1.5 / 3.0	19
EW-003D	40	Grundfos SP5S05-9	0.5 / 1.1	3
EW-004S	20	Grundfos SP25S15-9	1.5 / 3.0	18

Table 3 – Field Wiring Details

Well Component	Distance from System to Well (ft)	Pump Lead Sizing	Transducer Signal Wire Sizing
EW-001S	70	#12 AWG, 3-conductor wire plus ground, jacketed cable	#18 AWG, 2-wire plus ground, shielded and jacketed cable
EW-002S*	440	#12 AWG, 3-conductor wire plus ground, jacketed cable	#18 AWG, 2-wire plus ground, shielded and jacketed cable
EW-003S*	660	#12 AWG, 3-conductor wire plus ground, jacketed cable	#18 AWG, 2-wire plus ground, shielded and jacketed cable
EW-003D*	680	#12 AWG, 3-conductor wire plus ground, jacketed cable	#18 AWG, 2-wire plus ground, shielded and jacketed cable
EW-004S*	1,030	#10 AWG, 3-conductor wire plus ground, jacketed cable	#18 AWG, 2-wire plus ground, shielded and jacketed cable

*Note that a portion of the span from the HCS to these wells is via directional utility borings. Refer to Construction Drawings.

END OF SECTION

50 20 00 Start up

Part 1 General

1.01 Scope

A. This section includes a description of how the CONTRACTOR and manufacturer of the hydraulic control system shall perform startup activities for the hydraulic control system.

1.02 Referenced Sections

A. Related Sections are shown below.

1. Section 50 00 00 - Hydraulic Control System Shed, Pumps, Instrumentation, and Controls

1.03 Cited Standards - None

1.04 Noted Restrictions

A. CONTRACTOR shall ensure that all building inspections and permits are in place prior to initiating startup procedures.

B. CONTRACTOR's electrician and hydraulic control manufacturer shall verify all connection prior to initiating startup procedures.

C. CONTRACTOR shall not start up system without JEA ENGINEER on site.

1.05 Safety - None

1.06 Quality Control

A. JEA ENGINEER will perform quality assurance of the hydraulic control system to ensure the correct operation, such as verifying flow rates, operation of all gauges, valves, and flowmeters, checking proper operation of all alarms and remote telemetry unit.

1.07 Submittals

A. CONTRACTOR shall notify JEA ENGINEER within ten (10) business days of hydraulic control system startup.

Part 2 Products - None

Part 3 Execution

3.01 Installation

A. CONTRACTOR shall install hydraulic control system shed, pumps, controls, and instrumentation per manufacturer's recommendations.

3.02 Testing

A. CONTRACTOR shall provide two, ten-hour days of startup activities with the CONTRACTOR, hydraulic control system manufacturer, and the JEA ENGINEER. Startup procedures will not be complete until all the components have been verified to be operational by the JEA ENGINEER and the system (includes all submersible pumps, VFDs, water level sensors, telemetry, gauges, valves, sample ports, etc.) has operated for an uninterrupted period of 48 hours without malfunction.

B. JEA and JEA ENGINEER are not responsible for any delay in startup due to malfunction of equipment, and improper installation or connection of equipment.

C. JEA ENGINEER will verify the following during the two days of startup activities:

1. operation of all submersible pumps within the pumps' specified range(s) under the following conditions:

   a. single pump running;

   b. successive startup of each pump until all five pumps are running;

   c. all five pumps running simultaneously; and

   d. all five pumps operating individually and/or simultaneously controlled by either water level or flow rate set points input at the human machine interface (HMI) screen on the control panel inside the shed.

2. flow rates from all submersible pumps;

3. operation of gauges, valves, and flow meters;

4. operation of all VFDs; and

5. operation of all water level sensors and remote telemetry unit.

D. CONTRACTOR is fully responsible for any repairs, modifications, etc. required after start up testing to ensure all equipment as specified is fully operational and free of leaks.

E. The cost of the training program shall be included in the Contract price. The training and instruction shall be directly related to the system being supplied. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance of the system.

F. All training schedules shall be coordinated with and at the convenience of JEA.

G. Provide detailed training manuals to supplement the training courses. The

manuals shall include specific details of equipment supplied and operations specific to the project. The manuals shall be provided for each participant.

H. For equipment items not manufactured by the system supplier, on-site training shall be provided by an authorized representative of the equipment manufacturer. The manufacturer's representative shall be fully knowledgeable in the operation and maintenance of the equipment.

I. Training Summary:

1. system overview;
2. system components and specific equipment arrangements and configuration;
3. test, adjustment, and calibration procedures;
4. periodic maintenance;
5. troubleshooting and diagnosis; and
6. communications and operation.

END OF SECTION

APPENDIX B MINIMUM QUALIFICATIONS FORM

078-18 – NORTHSIDE GENERATING STATION – PHASE 1 CORRECTIVE ACTION IMPLEMENTATION

GENERAL

THE MINIMUM QUALIFICATIONS SHALL BE SUBMITTED ON THIS FORM. IN ORDER TO BE CONSIDERED A QUALIFIED BIDDER BY JEA YOU MUST MEET THE MINIMUM QUALIFICATIONS LISTED BELOW, AND BE ABLE TO PROVIDE ALL THE SERVICES LISTED IN THIS SOLICITATION.

THE BIDDER MUST COMPLETE THE BIDDER INFORMATION SECTION BELOW AND PROVIDE ANY OTHER INFORMATION OR REFERENCE REQUESTED. THE BIDDER MUST ALSO PROVIDE ANY ATTACHMENTS REQUESTED WITH THIS MINIMUM QUALIFICATIONS FORM.

PLEASE SUBMIT THIS COPY OF THIS FORM AND ANY REQUESTED ADDITIONAL DOCUMENTATION WITH THE BID SUBMISSION TO: PLEALL@JEA.COM

BIDDER INFORMATION

COMPANY NAME:_____

BUSINESS ADDRESS:_____

CITY, STATE, ZIP CODE:_____

TELEPHONE:_____

FAX:_____

E-MAIL:_____

PRINT NAME OF AUTHORIZED REPRESENTATIVE:_____

SIGNATURE OF AUTHORIZED REPRESENTATIVE:_____

NAME AND TITLE OF AUTHORIZED REPRESENTATIVE:_____

MINIMUM QUALIFICATIONS

Respondent shall meet the following Minimum Qualifications to be considered eligible to submit a Response to this ITN. A Respondent not meeting all of the following criteria will have their Response rejected:

- Respondents must have performed two (2) similar projects ($500,000 minimum each project) in the last five (5) years, ending March 30, 2018.
- A similar project is defined as 1) construction of a pump and treat or hydraulic control system and/or 2) construction of a pump station with associated force main tie-ins

APPENDIX B MINIMUM QUALIFICATIONS FORM

078-18 – NORTHSIDE GENERATING STATION – PHASE 1 CORRECTIVE ACTION IMPLEMENTATION

REFERENCE 1

Customer Name _____

Customer Address _____

Reference Name_____

Reference Phone Number_____

Reference E-Mail Address_____

Contract Year/Amount _____

Desription of Service Contract_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX B MINIMUM QUALIFICATIONS FORM

078-18 – NORTHSIDE GENERATING STATION – PHASE 1 CORRECTIVE ACTION IMPLEMENTATION

REFERENCE 2

Customer Name _____

Customer Addrerss _____

Reference Name_____

Reference Phone Number_____

Reference E-Mail Address_____

Contract Year/Amount _____

Description of Service Contract _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX B - Bid Form
Northside Generating Station – Phase 1 Corrective Measures Implementation

Submit a scanned signed copy of this document to pleall@jea.com

Company Name: _____

Company's Address_____

Phone Number:_____FAX No: _____ Email Address: _____

BID SECURITY REQUIREMENTS	**TERM OF CONTRACT**
☐ None required ☒ Certified Check or Bond (Five Percent (5%)	☐ One Time Purchase ☐ Annual Requirements ☒ Other, Specify- Project Completion

SAMPLE REQUIREMENTS	**SECTION 255.05, FLORIDA STATUTES CONTRACT BOND**
☒ None required ☐ Samples required prior to Bid Opening ☐ Samples may be required subsequent to Bid Opening	☐ None required ☒ Bond required 100% of Bid Award

QUANTITIES	**INSURANCE REQUIREMENTS**
☐ Quantities indicated are exacting ☒ Quantities indicated reflect the approximate quantities to be purchased Throughout the Contract period and are subject to fluctuation in accordance with actual requirements.	**Insurance required**

PAYMENT DISCOUNTS	**SUNSHINE LAW ACKNOWLEDGEMENT**
☐ 1% 20, net 30 ☐ 2% 10, net 30 ☐ Other _____ ☐ None Offered	**_____(Initials) I have read and understood the Sunshine Law/Public Records clauses contained within this solicitation. I understand that in the absence of a redacted copy my bid will be disclosed to the public "as-is".**

Line	**ENTER YOUR BID FOR 078-18**	**TOTAL BID PRICE**
1	**Lump Sum Bid Price (transfer from Bid Workbook)**	**$**

BIDDER'S CERTIFICATION

By submitting this Bid, the Bidder certifies that it has read and reviewed all of the documents pertaining to this Solicitation, that the person signing below is an authorized representative of the Bidder's Company, that the Company is legally authorized to do business in the State of Florida, and that the Company maintains in active status an appropriate contractor's license for the work (if applicable). The Bidder also certifies that it complies with all sections (including but not limited to Conflict Of Interest and Ethics) of this Solicitation, and that the Bidder is an authorized distributor or manufacturer of the equipment that meets the Technical Specifications stated herein.

We have received addenda

_____ through _____

_____ _____
Handwritten Signature of Authorized Officer of Company or Agent Date

_____
Printed Name and Title