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SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

This Section provides a brief description of the major construction activities included under this contract. Individual activities are more thoroughly described in subsequent sections of the Specifications and on the Contract Drawings. The Contractor shall be responsible for ensuring that sufficient equipment, labor, supervision, and materials, including health and safety and quality control provisions, are supplied to execute all work activities for final acceptance by the Government. The Contractor shall perform all work required in accordance with the Contract Documents and subject to the terms and conditions of the Contract. This Section shall be used in conjunction with all other Sections to establish the total requirements of the Work.

1.01 GENERAL PROJECT INFORMATION

A. Site Location

The Site consists of the area within and around a groundwater plume identified during a series of site investigations and limited interim removal activities conducted between 1991 and 2001 at the former Grove Cleaners site. The Site is located in the Village of Hewlett (Town of Hempstead, Nassau County, New York) with Valley Stream and Lynbrook, located to the north; East Rockaway and Hewlett Harbor to the east; Woodsburgh and Hewlett Bay Park to the south; and Woodmere to the west. John F. Kennedy International Airport is located approximately three miles to the west of the Site. The area consists of commercial and residential properties, with most commercial properties located along Mill Road, Peninsula Boulevard, Broadway, and West Broadway. Woodmere Middle School is located along the western boundary of the Site. New York American Water Company (NYAW) operates its Plant #5 Well Field on a property located approximately 1,000 feet north of the Site. NYAW has been monitoring and treating groundwater pumped from this well field since 1991, and continues to maintain monitoring and treatment activities to address both iron fouling, a common and naturally-occurring problem for Long Island water suppliers, and volatile organic compound (VOC) contamination.

B. Project Background

During previous investigations, several former and existing area dry cleaners were identified as potential sources of PCE contamination in the Site area. The U.S. Environmental Protection Agency (EPA) Region 2 is the lead agency, and New York State Department of Environmental Conservation (NYSDEC) is the support agency for the Site. In September 2011, EPA published the OU-1 Record of Decision (ROD), which documented the selection of a remedy for groundwater contamination. It noted that a second remedial phase or operable unit, including a subsequent decision document, would address any sources of groundwater contamination. In November 2011, the U.S. Army Corps of Engineers (USACE) was tasked by EPA to perform the necessary pre-design and remedial design (RD) activities to develop the design components required to perform the remedial action (RA) and meet remedial action objectives (RAOs). The RD included in-situ treatability testing. The objectives of the treatability study were to evaluate the applicability of the in-situ chemical reduction (ISCR) strategy, and to provide data to aid in the design, installation, and operational parameters for the in-situ groundwater system. The study involved two major components: (1) installing an

ISCR barrier, and (2) employing biological amendments to reduce groundwater chlorinated volatile organic compounds (CVOCs) on a permanent basis.

C. RA Objectives

The RA objectives for addressing groundwater contamination at the Site include:

1. Restore the impacted aquifer to beneficial use as a source of drinking water by reducing contaminant levels to Federal and State Maximum Contaminant Levels (MCLs).
2. Reduce or eliminate the potential for migration of groundwater contaminants towards the NYAW well field.

With respect to in-situ treatment, the intent is to use treatment to target areas containing high concentrations of tetrachloroethene (PCE), as appropriate, in combination with groundwater extraction. In-situ treatment will reduce groundwater restoration time and costs of OU-1 remediation. As such, implementation of the in-situ treatment component will complement and improve the effectiveness of the groundwater extraction and treatment component.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

The RA for the targeted groundwater treatment area at the Peninsula Boulevard Groundwater Plume Superfund Site (the Site) includes the use of anaerobic reductive dechlorination (ARD) as an in-situ remedy.

A. In-situ Groundwater Remediation

The following is a brief summary of the components of the in-situ groundwater remediation:

1. Conduct bench-scale microcosm study to determine conditions for complete degradation of PCE and trichloroethene (TCE) within the targeted treatment area.
2. Install one new ISCR barrier across the plume axis at an approximately halfway between the two areas selected for injection of biological amendments. This is to be accomplished by injecting ISCR slurry into closely-spaced borings or injection points. The length of this barrier is to be approximately 154 feet, traverse at least one residential property, just downgradient of one of the two areas targeted for amendment injections, and will be perpendicular to the deep PCE plume.
3. Extend the existing ISCR barrier along Westervelt Place. The extension will extend approximately 30 feet west and approximately 120 feet northeast from the current barrier. The extended barrier will be approximately 220 feet long.
4. Install new, permanent remediation wells in two separate areas to help distribute biological amendments within the deep Upper Glacial Aquifer (UGA) plume. Wells are to be drilled to approximately 65 to 75 feet below ground surface (bgs).
5. Install new temporary PVC wells to monitor groundwater concentrations during in-situ treatment, and the progress of attaining the groundwater clean-up goals.
6. Perform baseline monitoring, sampling, and analysis. Obtain water-level

measurements and collect groundwater samples from new remediation wells, new temporary PVC wells, and existing wells.

7. Initially distribute biological amendments into two targeted areas across the CVOC plume through short-term recirculation. The targeted areas are within the current PCE contour at levels possibly exceeding 10,000 micrograms per liter (ug/L).
8. Conduct process and performance monitoring; evaluate monitoring results and clean-up progress; and perform additional short-term recirculation events as directed by the Government.

1.03 GENERAL REQUIREMENTS

A. Permitting

Contractor shall conduct all work in compliance with applicable Federal, State, and local rules and regulations. Other applicable regulations not explicitly included in these Specifications shall be adhered to in conducting the Work. The Contractor shall be responsible for contacting and informing the proper Federal, State, and local agencies of the nature and timing of Work on site, and for securing all necessary and applicable permits required to conduct the Work covered by the Contract.

1. The Contractor and its lower-tier subcontractor(s) shall be licensed to work in the State of New York.
2. The Contractor shall perform all work (e.g., well installation, ISCR barrier emplacement, bioremediation injections, management of investigation derived wastes [IDW]) in ways that minimize impacts to the environment.

B. Existing Features

The Contractor shall protect and maintain natural resources, monitoring wells, fences, roads, adjacent properties, and any other items as directed in the field by the Government's Representative against damage from equipment and vehicular traffic. Any damage shall be repaired by the Contractor at no expense to the Government.

C. Weather Delays

Contract times may be adjusted (e.g., extensions) due to adverse weather conditions. Actual adverse weather days must prevent Work for at least 4 hours, delay those activity(s) that are on the critical path, and be documented in the Contractor Quality Control Reports. The term "actual adverse weather days" shall apply to scheduled Work days only. The Government's Representative shall have the final decision as to the number of calendar days that Contract Work was limited because of adverse weather.

D. Mobilization

Provide all necessary labor, materials, and equipment to perform the Work, including temporary office and storage facilities in accordance with Section 01 71 13 - MOBILIZATION/DEMOBILIZATION.

E. Security

Provide all necessary labor, materials, and equipment necessary for restricting access to

all construction areas, and all excavated or trenched areas 24 hours a day, 7 days a week in accordance with Section 01 35 53 - SECURITY.

F. Maintenance and Protection of Traffic

Provide all necessary labor, materials, and equipment for the plan preparation and performance of traffic control in accordance with Section 01 50 00 - TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS. Obtain all necessary permits.

G. Site Preparation

Perform Site work according to the approved plans as required to provide for the installation of new wells, utilities, improvements, the ISCR barrier construction, substrate and biological amendments injection, and short-term groundwater recirculation.

H. Site Restoration

Repair any areas damaged by construction activities, including re-grading of affected areas, provision and placement of topsoil, seeding, provision and installation of landscaping materials, and anything else as directed by the Contracting Officer. In addition, restore any private or township roads or parking areas disturbed by construction activities to original or better conditions.

I. Demobilization

Furnish all necessary labor, materials, and equipment to perform the Work, including temporary office and storage facilities in accordance with Section 01 71 13 - MOBILIZATION/DEMobilIZATION. Decontaminate and clean all materials and equipment prior to removing them from the Site. Remove all temporary facilities and utilities.

J. Closeout Documents

Provide closeout documents, certifications, and as-built drawings to the Contracting Officer.

1.04 SUMMARY OF SEQUENCE OF WORK

A conceptualized sequence of Work is presented in the project schedule. However, the Contractor is responsible for preparing a final sequence of Work. The time to perform the required remediation activities is estimated to be approximately three years.

A. Sequence of Construction Activities

The generalized sequence of construction activities includes, but is not limited to, the following:

1. Hold Pre-Construction meetings with EPA, NYSDEC, USACE, and other stakeholders and inspect the Site prior to construction to verify existing conditions and underground utility locations.
2. Prepare Contract plans (e.g., Construction Work Plan, Construction Quality Control Plan, Site Safety and Health Plan, Accident Prevention Plan, Sampling and Analysis Plan, etc.).

3. Once plans are approved and Notice to Proceed is issued, mobilize and mark locations of all areas to be cleared or otherwise disturbed prior to actual Work. Establish any necessary temporary facilities (e.g., decontamination pads, staging area for materials).
4. Conduct bench-scale microcosm study. This study will involve the use of unpreserved site groundwater and various tests involving nutrients, electron donors, additives, and dechlorinating bacteria cultures.
5. Install one new ISCR barrier across and beneath a residential property roughly 154 feet in length. This ISCR barrier will consist of approximately 23 injection points spaced 7 feet apart to an estimated depth of 80 feet bgs. Extend the existing ISCR barrier along Westervelt Place. The extension will extend about 30 feet west and roughly 120 feet northeast from the current barrier. The extended barrier will be approximately 220 feet long. Mix and emplace an ISCR slurry consisting of dry powder (primarily carbon, iron, plant fiber, and guar) combined with site-related groundwater into the injection points.
6. Drill, install, and develop new wells within the targeted treatment area. Five new permanent wells will be installed along with two new temporary wells.
7. Perform one round of baseline groundwater sampling and analysis to determine current groundwater conditions.
8. Conduct start-up/prove-out of the equipment trailer or container.
9. Mix and distribute substrate (electron donor) and biological amendments through groundwater recirculation at two in-situ treatment areas using permanent extraction and injection wells. Prior to this work, install necessary piping, instrumentation, temporary power supply, valves, and other appurtenances that are housed in a single, portable equipment trailer or container to make it operational.
10. Initiate groundwater and system monitoring. Sample wells for specified analytical parameters per the approved Quality Assurance Project Plan and Sampling and Analysis Plan.
11. Remove all temporary facilities. Restore and revegetate disturbed areas as needed.
12. If directed by the Government, repeat the short-term groundwater recirculation events at the in-situ treatment areas.
13. Demobilize and submit In-situ Completion Reports, as-built drawings, and operation and maintenance (O&M) manual.

1.05 CONTRACTOR'S USE OF THE SITE

Designated areas may be changed at various times as activities change as approved by the Government's Representative. The Contractor shall allow full-access to the Government's Representative, and guests thereof. The Contractor shall assume full responsibility for the protection and safekeeping of its equipment and materials located on site.

The Contractor shall conduct all Site activities between the hours of 7:00 a.m. and 6:00 p.m. only, Monday through Friday only, and excluding Federal and State holidays, unless written

approval is given by the Government's Representative, as allowed by Federal, State, and local laws. The Contractor is responsible for maintenance and housekeeping in the equipment staging and laydown areas as well as within the project limits.

1.06 STANDARD SPECIFICATIONS AND REFERENCES

Any material specified by reference number, symbol, or title of a specific standard such as a Federal Specification, American Standard Specification, an ASTM Standard, or a Trade Standard, shall comply with the latest revision thereof and shall include any supplement thereto in effect on the date of the invitation to bid. The standard referred to shall be hereby incorporated into these Specifications by reference except as may be modified herein.

1.07 CONTRACTOR OBLIGATIONS

- A. The Contractor, and any of his subcontractors, shall cooperate with all other firms or persons authorized to perform any Work at or adjacent to the Site. The Contractor shall not unload or store materials in areas where these actions will interfere with the progress of the project or impede the Work on site.
- B. Modifications in the Work due to minor interferences and structural obstructions shall be accomplished as part of the Work. The Contractor shall not enter or occupy private land outside of easements, except by written permission of the land owner and the Government's Representative.
- C. The Contractor shall coordinate Work with all entities associated with the project to assure satisfactory, expeditious completion of the project within the Contract Schedule. The Contractor shall coordinate fully all subcontractors, manufacturers, fabricators, suppliers, distributors, installers, testing agencies, and all others whose services, materials or equipment are required to assure completion of the Work within the Contract Schedule.

1.08 LOCATION OF UNDERGROUND UTILITIES

The Contractor shall protect existing utility lines or appurtenances. It is the Contractor's responsibility to locate or verify existing utilities. Any damage to utilities shall be repaired by the Contractor at no expense to the Government. Contractor shall notify New York City/Long Island One-Call service a minimum of three days prior to performing any excavation or drilling activities.

1.09 PROTECTION OF WORK, PROPERTY, AND PERSON

- A. The Contractor shall be responsible for the protection of the work area and areas adjacent to the work area from damage and upon completion of the Work shall leave existing works in a condition equal to that which existed when the Work started. All work, storage of materials, and construction shall be kept within the limits of the areas assigned. Prior to construction operations, the Contractor shall confer with the Government's Representative to determine the proximity of any possible underground obstructions, pipe, or equipment that could be damaged as a result of operations. Existing utility lines shall be protected from damage, and if damaged, shall be repaired by the Contractor at no expense to the Government and to the Government's satisfaction.
- B. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. The Contractor will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury, or loss to all employees during the Work and other persons who

may be affected thereby; all work and all materials or equipment to be incorporated therein; whether in storage on or off the Site; and other property at the Site.

- C. Work shall proceed in such manner as to prevent undue emissions of odors, dust, mud, and flying particles. The Contractor shall take such additional measures as may be directed by the Government's Representative to prevent damage or injury to public and private property or personnel.
- D. In emergencies affecting the safety of persons or the Work or property at the Site or adjacent thereto, the Contractor, without special instruction or authorization from the Government's Representative, is obligated to act, at his discretion, to prevent threatened damage, injury, or loss. The Contractor shall give the Government's Representative a verbal notice (within 24 hours) and a written notice (within 2 working days) of any significant changes in the Work or deviations from the Contract Documents due to emergencies. Emergency actions not resulting from the Contractor's error or negligence shall be addressed as a modification to the Contract.
- E. It shall be the responsibility of the Contractor to provide and pay for all utilities that may be required during the duration of the Contract. The Contractor shall make its own investigations and determinations as to the availability and adequacy of utilities for his use for construction purposes.

1.10 MATERIAL AND EQUIPMENT DELIVERIES

A. Delivery Schedule

Notify the Contracting Officer in writing at least three calendar days in advance of the date on which the materials and equipment are required.

B. Delivery Location

All materials and equipment will be delivered to the Site.

1.11 SALVAGE MATERIAL AND EQUIPMENT

Items designated by the Contracting Officer to be salvaged remain the property of the Government. Segregate, itemize, deliver, and off-load the salvaged property at a location determined by the Contracting Officer. Maintain property control records for material or equipment designated as salvage. Be responsible for storage and protection of salvaged materials and equipment until disposition by the Contracting Officer.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Complete the entire Work specified in this Contract in accordance with the Terms and Conditions of this Contract.

3.01 CONTRACTOR REQUIREMENTS

A. Health and Safety

1. The Contractor is advised that some Work will be performed at a hazardous waste site. Meet all Health and Safety Requirements as listed in Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS.
2. Prepare a Site Specific Safety and Health Plan (SSHP) for all operations in accordance with Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS.
3. Implement the SSHP, taking precautions necessary to protect the public and work force personnel from potential hazards. Utilize personnel with approved hazardous waste training in areas designated for hazardous waste work. Refer to Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS for training requirements.
4. Keep all work areas free of trash and debris during the Work.

B. Protection Of Adjacent Structures

1. Use every precaution to protect adjacent properties, utility lines, trees, wells, survey monuments, and other structures from damage. Repair or replace any damage within 5 days as directed by the Contracting Officer at no cost to the Government.
2. Take all measures required to minimize adverse impacts from execution of the Work on residences adjacent to construction activities, and do not interfere with their operations.

3.02 CONTRACTOR QUALITY ASSURANCE/QUALITY CONTROL

- A. Quality workmanship and performance are essential in this Project. The Contractor shall be required to furnish documentation of materials supplied to the Project, calibration of measuring or testing equipment, as-built items, and similar equipment items.
- B. The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in accordance with the Contract Documents. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with Contract requirements and is consistent with EPA guidance and requirements. The system shall cover all construction operations, both on-site and off-site, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of Work on the job and is subject to removal by the Government for non compliance with quality requirements specified in the Contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.
- C. The Contractor quality control system shall demonstrate and document the extent of compliance of all Work with the standards and quality set forth by the Contract Documents through inspection, testing, equipment, and reporting. Inspection and test reports shall make reference to specific drawing and specification requirements.

3.03 EXECUTION OF WORK

- A. The Contractor shall complete all Work in accordance with Contract Drawings and Specifications, as well as Contractor-Prepared Plans approved by the Government.
- B. The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to Contract requirements. Testing includes operation and/or acceptance tests when specified. A list of tests which the Contractor understands he is to perform shall be furnished as a part of the Construction Quality Control (CQC) Plan.
- C. At the completion of all Work, the Contractor shall conduct a pre-final inspection of the Work, in conjunction with the Government's Representative, and develop a "punch list" of items that do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, and shall include the estimated date by which the deficiencies will be corrected. Once this is accomplished the Contractor shall notify the Government that the facility is complete and is ready for the Government's "Pre-final" inspection. The Contractor and Government's Representative will perform this inspection jointly to verify that the facility is complete, and a "Pre-final Punch List" will be developed as a result of this inspection. The Contractor shall document that all items on this list have been corrected and so notify the Government's Representative so that a "Final" inspection can be scheduled. Any items noted on the "Final" inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required will be accomplished within the time slated for completion of the entire Work.
- D. If any item(s) on the "Final" inspection are not corrected by the Contractor within the time slated for completion, the Contractor will be considered not fulfilling the Contract and Contract clauses will be executed by the Government to complete the Work.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS

PART 1 GENERAL

1.01 CONTRACTOR ACCESS AND USE OF PREMISES

A. Activity Regulations

Document that Contractor personnel employed on the Activity have become familiar with and obey Activity regulations including safety, fire, traffic, and security regulations. Keep within the limits of the Work and avenues of ingress and egress. Wear hard hats and other required personal protective equipment in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Mark Contractor equipment for identification.

1. No Smoking Policy

Smoking is prohibited within and outside of all buildings except in designated smoking areas. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer will identify designated smoking areas.

B. Working Hours

Regular working hours consist of an 11 hour period normally 7.00 a.m. and 6.00 p.m., Monday through Friday, excluding Government holidays.

C. Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract number and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the Work must be lighted in a manner approved by the Contracting Officer.

1.02 SECURITY REQUIREMENTS

A. Site Security

Protect work from theft, vandalism, and unauthorized entry. Initiate and maintain security program as required by Section 01 35 53 - SECURITY. Restrict entrance of persons and vehicles into project site. Allow entrance only to authorized persons with proper identification. Maintain log of workers and visitors; make available to Contracting Officer on request.

B. Photographs

Unofficial photography will not be allowed. Only photography required by the Contract is allowed.

1.03 PROHIBITED CONSTRUCTION PROCEDURES

Prohibited construction procedures include, but are not limited to, the following:

1. Dumping of spoil material into any stream corridor, any wetlands, any vernal habitats, any surface waters, any sites listed or eligible for listing on the New York or National Registers of Historic Places, or at unspecified locations;
2. Indiscriminate, arbitrary, or capricious operation of equipment in any stream corridors, wetlands, or surface waters;
3. Pumping of silt-laden water from trenches or other excavations into any surface waters, stream corridors, wetlands, or vernal habitats;
4. Damaging vegetation adjacent to or outside of the access road or the right-of-way;
5. Disposal of trees, brush, and other debris in any stream corridors, wetlands, vernal habitats, surface waters, or at unspecified locations;
6. Permanent or unspecified alteration of the flow line of any stream.
7. Use of calcium chloride, petroleum products, or other chemicals for dust control;
8. Use of asphaltic mulch binders; and
9. Any unpermitted discharge of sewage.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 20 00.00 20

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP-1110-1-8	(2009) Construction Equipment Ownership and Operating Expense Schedule
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1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Earned Value Report; G

1.03 EARNED VALUE REPORT

A. Data Required

Within 15 calendar days of notice of award, prepare and deliver to the Contracting Officer an Earned Value Report as directed by the Contracting Officer. Provide a detailed breakdown of the contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices. Summarize costs and provide totals for each construction category.

1.04 CONTRACT MODIFICATIONS

In conjunction with the Contract Clause "DFARS 252.236-7000, Modification Proposals-Price Breakdown," and where actual ownership and operating costs of construction equipment cannot be determined from Contractor accounting records, base equipment use rates upon the applicable provisions of the EP-1110-1-8.

1.05 CONTRACTOR'S INVOICE AND CONTRACT PERFORMANCE STATEMENT

A. Content of Invoice

Requests for payment will be processed in accordance with the Contract Clause FAR 52.232-27, Prompt Payment Construction Contracts and FAR 52.232-5, Payments Under Fixed-Price Construction Contracts. The requests for payment are to include the documents listed below.

1. The Contractor's invoice showing in summary form, the basis for arriving at the amount of the invoice.
2. The Earned Value Report from the cost-loaded NAS, showing in detail: the estimated cost, percentage of completion, and value of completed performance for each of the construction categories stated in this Contract.
3. Updated Project Schedule and reports required by the Contract.
4. Contractor Safety Self Evaluation Checklist.
5. Other supporting documents as requested.
6. Updated copy of submittal register.
7. Invoices not completed in accordance with contract requirements will be returned to the Contractor for correction of the deficiencies.

B. Final Invoice

1. A final invoice is to be accompanied by the Contractor's Final Release. If the Contractor is incorporated, the Final Release shall contain the corporate seal. An officer of the corporation shall sign and the corporate secretary shall certify the Final Release.
2. Final invoices not accompanied by the Contractor's Final Release will be considered incomplete and will be returned to the Contractor.

1.06 PAYMENTS TO THE CONTRACTOR

Payments will be made on submission of itemized requests by the Contractor which comply with the requirements of this Section, and will be subject to reduction for overpayments or increase for underpayments made on previous payments to the Contractor.

A. Obligation of Government Payments

The obligation of the Government to make payments required under the provisions of this Contract will, at the discretion of the Contracting Officer, be subject to reductions and/or suspensions permitted under the FAR and agency regulations including the following in accordance with "FAR 32.503-6:

1. Reasonable deductions due to defects in material or workmanship;
2. Claims which the Government may have against the Contractor under or in connection with this Contract;
3. Unless otherwise adjusted, repayment to the Government upon demand for overpayments made to the Contractor; and
4. Failure to provide up to date record drawings as stated in Contract Clause "FAC 5252.236-9310, Record Drawings."

B. Payment for Onsite and Offsite Materials

Progress payments may be made to the Contractor for materials delivered on the Site, for materials stored off construction sites, or materials that are in transit to the construction sites under the following conditions:

1. FAR 52.232-5(b) Payments Under Fixed Price Construction Contracts.
2. Materials delivered on the Site but not installed, including completed preparatory work, and off-site materials to be considered for progress payment are to be major high cost, long lead, special order, or specialty items, not susceptible to deterioration or physical damage in storage or in transit to the construction site. Examples of materials acceptable for payment consideration include, but are not limited to, structural steel, non-magnetic steel, non-magnetic aggregate, equipment, machinery, large pipe and fittings, precast/prestressed concrete products, plastic lumber (e.g., fender piles/curbs), and high-voltage electrical cable. Materials not acceptable for payment include consumable materials such as nails, fasteners, conduits, gypsum board, glass, insulation, and wall coverings.
3. Materials to be considered for progress payment prior to installation are to be specifically and separately identified in the Contractor's estimates of work submitted for the Contracting Officer's approval in accordance with Earned Value Report requirement of this Contract. Requests for progress payment consideration for such items are to be supported by documents establishing their value and that the title requirements of the clause at FAR 52.232-5 have been met.
4. Materials are adequately insured and protected from theft and exposure.
5. Provide a written consent from the surety company with each payment request for offsite materials.
6. Materials to be considered for progress payments prior to installation are to be stored in the Continental United States.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 22 00.00 10

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SUMMARY

This Section covers the methods and procedures which will be used to measure the Contractor's work and to provide payment to the Contractor for work performance. It is the responsibility of the bidder to make a thorough investigation of the Drawings, Specifications, permits, and the Site to determine the scope of work included in each bid item. All work not specifically set forth as a pay item in the listed bid items shall be considered a subsidiary obligation of the Contractor, and all costs in connection therewith shall be included in the lump sum and unit prices. The Contractor shall comply with changes in the scope of the work that the Government's Representative may make. Changes in price due to changes in quantities will be calculated using lump sum and unit rates provided by the Contractor. Changes that are required, but which have not been included in the scope of services, shall be verbally approved by the Government's Representative, and a letter stating the change and the unit price shall be submitted by the Contractor for approval by the Government's Representative.

Payments to the Contractor will be made for the actual quantities of the contract items performed and accepted in accordance with the Contract Documents. Upon completion of the Work, if the actual quantities show a decrease from the quantities given in the Bid, the Contract unit prices will prevail, except as provided hereinafter.

This method of payment will constitute complete compensation for all work shown on the Drawings, or provided in the Specifications, permit equivalencies, or other Contract Documents, and for all costs of accepting general risks and liabilities, and include, but not be limited to, compensation for overhead, profit, materials and services, and performing all work required to accomplish and complete the work specified under each item and all other work required.

Notwithstanding specification and/or drawing references provided within bid item descriptions in PART 3 of this specification, the Contractor is responsible for completion of all tasks in accordance with all requirements of the Contract Documents, including the specifications, drawings, permits, permit equivalencies, and any other documents provided by the Contracting Officer.

1.02 LUMP SUM PAYMENT ITEMS

Payment items for the work of this Contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.03 UNIT PRICE PAYMENT ITEMS

Payment items for the work of this Contract on which the contract unit price payments will be

made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 WORK ELEMENT 01 - WORK PLANS (BID ITEM 0001)

A. Prepare Work Plans (Bid Item 0001)

Measurement for this lump sum bid item includes all items described under this bid item in accordance with applicable specifications and drawings, and no separate quantity measurement will be made.

Payment for Preparing Work Plans will be made at the lump sum price bid, for which price and payment includes full compensation for all labor, equipment, material, and incidentals required for preparation of all project plans required under these Contract Documents. Project plans to be included in this bid item are those plans identified in Section 01 11 00 - SUMMARY OF WORK, Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS, and as otherwise required by the Contract Documents, including, but not limited to, Construction Work Plan, Quality Control Plan, Site-Specific Safety and Health Plan (SSHP), Sampling and Analysis Plan (SAP), Enhanced In-Situ Bioremediation Work Plan, and the Installation Work Plan in accordance with applicable specifications and drawings.

3.02 WORK ELEMENT 02 - GENERAL REQUIREMENTS (BID ITEMS 0002 THROUGH 0005)

A. General Conditions (Bid Item 0002)

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for General Conditions will be made at the lump sum price bid, for which price and payment includes full compensation for the expense of said conditions. General Conditions include all items required to complete the Work under these Contract Documents not specifically covered under other bid items, including but not limited to: the Contractor's cost for insurance, bonds, fees, permits, and other similar expenses directly related to and required by these Contract Documents; project-dedicated supervisory staff and equipment; compliance with specified regulatory requirements; pre-construction and construction period planning and scheduling; all submittals not specifically identified under a separate bid item; reporting, administration; contractor quality control; environmental protection and spill control; project photographs; and other requirements and related miscellaneous items.

B. Safety, Health, And Emergency Response (Bid Item 0003)

Measurement for this lump sum bid item includes all items described under this bid item,

and no separate quantity measurement will be made.

Payment for Safety, Health, and Emergency Response will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for providing safety, health, and emergency response equipment, facilities, personnel, and services detailed in Section 01 35 26 - GOVERNMENT SAFETY REQUIREMENTS, Section 01 35 40.00 20 - ENVIRONMENTAL MANAGEMENT, and as otherwise required by the Contract Documents. This bid item includes, but is not be limited to, costs to implement the occupational safety monitoring program, safety monitoring equipment, emergency response materials and supplies, and personnel protection equipment.

C. Security (Bid Item 0004)

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made. Progress will be paid monthly.

Payment for Security will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for providing security at the Site for the duration of the Contract in accordance with Section 01 35 53 - SECURITY and as otherwise required by the Contract Documents.

D. Decontamination (Bid Item 0005)

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for Decontamination will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required to furnish, install, operate, maintain, remove, and dispose of equipment washdown and decontamination facilities and materials in accordance with Section 01 11 00 - SUMMARY OF WORK, Section 01 71 13 - MOBILIZATION/DEMOBILIZATION, and as otherwise required by the Contract Documents.

3.03 WORK ELEMENT 03 - MOBILIZATION/DEMOBILIZATION (BID ITEMS 0006 AND 0007)

A. Perform Mobilization (Bid Item 0006)

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for Performing Mobilization will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for performing mobilization to the site for well drilling and installation, distribution of biological amendments, and installation of in-situ chemical reduction (ISCR) barriers in accordance with Section 01 71 13 - MOBILIZATION/DEMOBILIZATION and as otherwise required by the Contract Documents.

B. Perform Demobilization (Bid Item 0007)

Measurement for this lump sum bid item includes all items described under this bid item,

and no separate quantity measurement will be made.

Payment for Performing Demobilization will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for performing demobilization from the Site in accordance with Section 01 71 13 - MOBILIZATION/DEMOLITION and as otherwise required by the Contract Documents. This bid item includes removal of all Contractor-furnished equipment and materials from the Site in order to restore the Site to pre-construction conditions, but excludes those Site Restoration costs specifically included in Bid Items 0011 and 0012.

3.04 WORK ELEMENT 04 - BENCH-SCALE MICROCOSM STUDY (BID ITEM 0008)

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for bench-scale microcosm study will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for microcosm testing.

3.05 WORK ELEMENT 05 - INSTALLATION OF IN-SITU CHEMICAL REDUCTION BARRIER ACROSS PLUME AXIS (BID ITEMS 0009 AND 0010)

A. ISCR Barrier Installation (Bid Item 0009)

Measurement for this bid item will be based on per ISCR barrier injection point basis. The length of ISCR barrier "A" will be approximately 154 feet and will traverse at least one residential property and Hewlett Parkway. 23 injection points will be required for ISCR barrier "A". ISCR barrier "B" will extend from the existing 70-foot barrier along Westervelt Place and will be approximately 220 feet long. 22 injection points will be required for ISCR barrier "B". The unit price includes all equipment, labor, and supplies needed for installation of each ISCR barrier injection point.

The EHC slurry is to be prepared using a 2-bin mixing system. The EHC slurry will be continuously injected into ISCR barrier injection points. Once all intervals in an injection point have received the required volume of EHC slurry, the Contractor may need to install an appropriate seal (e.g., bentonite chips, granular bentonite) above the shallowest interval in that injection point. After the injections are completed, all injection points are to be resurfaced with an appropriate asphalt mix, or reseeded with top soil. The unit price includes all equipment, labor, and supplies needed for EHC slurry injection and site restoration, but excludes those costs specifically included in Bid Item 0010.

Payment will be based on the number of ISCR barrier injection points that are installed at the quoted unit rate.

B. EHC (Bid Item 0010)

Measurement for this bid item will be based on per pound of EHC injected. EHC consists of solid organic carbon, micro ZVI, plant fiber, and guar. The unit price includes all materials, labor, and shipping fees for delivery EHC to the Site.

Payment will be based on the pounds of EHC at the quoted unit rate.

3.06 WORK ELEMENT 06 - WELL INSTALLATION (BID ITEMS 0011 THROUGH 0013)

A. Extraction/Injection Well Installation (Bid Item 0011)

Measurement for this bid item will be based on per foot length of 8.25-inch hollow stem auger (HSA) drilling with 6-inch steel casing and screen installation. Five (5) 10-inch boreholes are to be drilled to an estimated average depth of 75 feet below ground surface just above the top of the Gardiners Clay formation. These boreholes will be used to install 6-inch inner diameter (ID) stainless steel casing and screen. These wells will be flush-mounted wells with approximately 25-foot screen lengths.

This bid item includes all labor, material, and equipment for borehole drilling using the HSA drilling technique. There will be full compensation for:

1. Drilling extraction well boreholes and installing stainless steel casing.
2. Completing the wells with flush mounts.
3. Well development.
4. Borehole geological logging.
5. Install 6-inch steel screened wells (total of 5) (assume 25-foot screen each).
6. Site restoration.

This item consists of the development of the wells with a submersible pump and if required a surge block or other methods as appropriate such as nitrogen air lift. The Contractor shall be prepared to supply all necessary equipment and materials (generator, hoses, clamps, etc.) necessary for the successful completion of this task.

Payment will be based upon the actual linear footage of extraction wells drilled, developed, logged, and installed at the quoted unit rate.

B. Temporary Monitoring Well Installation (Bid Item 0012)

Measurement for this bid item will be based on per foot length of 4.25-inch HSA drilling. Two (2) 6-inch boreholes will be drilled to an estimated average depth of 75 feet below ground surface just above the top of the Gardiners Clay formation. These boreholes will be used to install 2-inch ID PVC wells. These wells will be flush-mounted with approximately 25-foot screen lengths.

This bid item includes all labor, material, and equipment for borehole drilling using the HSA drilling technique. There will be full compensation for:

1. Drilling temporary monitoring well boreholes and installing PVC casing.
2. Completing the wells with standard flush mounts.
3. Well development.
4. Borehole geological logging.
5. Install 2-inch PVC screened wells (total of 2) (assume 25-foot screen each).
6. Site restoration.

This bid item consists of the development of the wells with a submersible pump and if required a surge block or other methods as appropriate such as nitrogen air lift. The Contractor shall be prepared to supply all necessary equipment and materials (generator, hoses, clamps, etc.) necessary for the successful completion of this task.

Payment will be based upon the actual linear footage of temporary monitoring well drilled, developed, logged, and installed at the quoted unit rate.

C. Survey Well Locations (Bid Item 0013)

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for the well survey will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for surveying locations and top of casing elevations of both the inner and outer casings for all wells and the locations of the ISCR barrier injection points installed under this Contract.

3.07 WORK ELEMENT 07 - BASELINE SAMPLING AND ANALYSIS (BID ITEMS 0014 AND 0015)**A. Baseline Sampling (Bid Item 0014)**

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for baseline sampling and analysis will be made at the lump sum bid price, for which price and payment will be full compensation for all labor, material, and equipment to acquire samples specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents. This bid item includes the associated reporting activities, but excludes those costs specifically included in Bid Item 0015. Sample acquisition and analysis shall be conducted in such a manner that avoid delays in construction. The Contractor shall prepare a written report regarding the baseline groundwater sample results. Analytical data shall be provided in an electronic format specified in the approved SAP.

B. Lab Analysis (Bid Item 0015)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for lab analysis will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for the lab analysis of the samples specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents.

3.08 WORK ELEMENT 08 - MANAGEMENT OF SOLID WASTE (BID ITEM 0016)

Measurement for this bid item shall be based on a per ton basis. This bid item consists of all costs, including materials and labor, associated with the collection, testing for disposal purposes, transportation, and disposal of drill cuttings. The unit price includes all equipment, labor, and supplies needed for collecting, containerizing, transporting, and disposal of drill cuttings. Bidder shall assume disposal at a non-hazardous waste landfill.

Payment will be based on the actual number of tons of solid waste that are collected, transported, and disposed of at the quoted unit rate.

3.09 WORK ELEMENT 09 - MANAGEMENT OF LIQUID WASTE (BID ITEM 0017)

Measurement for this bid item shall be based on per gallon basis. This line item consists of all costs, including materials and labor, associated with the collection, testing for disposal purposes, transportation, and disposal of liquid wastes generating during well installation and development activities. The unit price includes all equipment, labor, and supplies needed for collecting, containerizing, transporting, and disposal of liquid waste. Bidder shall assume the liquid waste is non-hazardous.

Payment will be based on the actual number of gallons of liquid waste that are collected, transported, and disposed of at the quoted unit rate.

3.10 WORK ELEMENT 10 - ENHANCED IN-SITU BIOREMEDIATION SYSTEM EQUIPMENT (BID ITEMS 0018 AND 0019)**A. Enhanced In-Situ Bioremediation System (Bid Item 0018)**

Measurement for this lump sum bid item includes all labor, materials, and equipment to procure, fabricate, assemble, install, and deliver the EISB remediation system equipment in a modified shipping container (e.g., 20 ft. x 8 ft.), and no separate quantity measurement will be made.

Payment for the equipment will be made at the lump sum price bid, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for the EISB system equipment. Details regarding the EISB system equipment are provided in the Contract Documents. This bid item includes all process equipment and accessories not specifically included in other bid items, including, but not limited to: two storage tanks, metering pumps, extraction/injection manifold, instrumentation, and bag filter. This equipment will be installed in the modified shipping container.

B. Initial Startup Testing (Bid Item 0019)

Measurement for this lump sum bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for Startup Testing will be made at the lump sum bid price, for which price and payment will be full compensation for all labor, equipment, material, and incidentals required for completion of startup and testing to ensure that the groundwater recirculation system and instrumentation are functioning properly as designed and installed. This bid item includes addressing any punch-list items identified during the initial testing of the EISB system as well as participating in pre-final and final inspections of the system.

3.11 WORK ELEMENT 11 - INSTALLATION OF ENHANCED IN-SITU BIOREMEDIATION SYSTEM (BID ITEM 0020)

Measurement for this bid item will be based on unit price per injection event for the successful installation of the EISB system in the field, and no separate quantity measurement will be made.

Payment for this bid item will be made at the actual number of injection events (each event includes installation of the EISB at two locations consecutively). This item includes full compensation for all labor, equipment, materials, and incidentals required for the installation of the EISB System in accordance with the Contract Documents. Temporary aboveground piping with appropriate protection from vandalism will be used. This bid item includes all costs

associated with installing the necessary piping, tubing, valves, and cables between injection wells, extraction wells, and the modified shipping container, but excludes those costs specifically included in Bid Item 0018. This bid item also includes testing to ensure that the EISB system has been properly installed and is functioning properly as designed prior to initiating any recirculation events.

3.12 WORK ELEMENT 12 - YEAR ONE O&M (BID ITEMS 0021 THROUGH 0027)

A. Biostimulation Injections

1. Biostimulation Event (Bid Item 0021)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for the biostimulation event will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for one injection event at each of the two locations with the groundwater recirculation system. This bid item includes work related to the injection event involving the recirculation of groundwater between extraction and injection wells using midstream addition of bioremediation amendments, but excludes those costs specifically included in Bid Item 0022.

2. Biostimulation Amendments (Bid Item 0022)

Measurement for this bid item will be based on per pound of amendments injected. Payment will be based on the pounds of amendments at the quoted unit rate. This bid item includes all costs associated with the purchase and delivery of the amendments to the Site.

B. Bioaugmentation Injections

1. Bioaugmentation Event (Bid Item 0023)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for the bioaugmentation event will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for one bioaugmentation event at each of the two locations with the groundwater recirculation system, but excludes those costs specifically included in Bid Item 0024. Bioaugmentation with *Dehalococcoides* will be conducted after anaerobic conditions are created.

2. *Dehalococcoides* Cultures (Bid Item 0024)

Measurement for this bid item will be based on per liter of *Dehalococcoides* cultures injected. Payment will be based on the pounds of *Dehalococcoides* cultures at the quoted unit rate. This bid item includes all costs associated with the purchase and delivery of the *Dehalococcoides* cultures to the Site.

C. Groundwater Monitoring**1. Performance Monitoring (Bid Item 0025)**

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for performance monitoring will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for the performance monitoring specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents. The frequency of performance monitoring will be quarterly during the first year of in-situ system operation. This bid item includes performance monitoring and associated reporting activities, but excludes those costs specifically included in Bid Item 0027.

2. Process Monitoring (Bid Item 0026)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for process monitoring will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for the process monitoring specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents. This bid item includes process monitoring and associated reporting activities, but excludes those costs specifically included in Bid Item 0027.

3. Lab Analysis (Bid Item 0027)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for lab analysis will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for the lab analysis of the samples specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents.

3.13 WORK ELEMENT 13 - YEARS TWO AND THREE O&M (BID ITEMS 0028 THROUGH 0034)**A. Biostimulation Injections****1. Biostimulation Event (Bid Item 0028)**

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for the biostimulation event will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for one injection event at each of the two locations with the

groundwater recirculation system. This bid item includes work related to the injection event involving the recirculation of groundwater between extraction and injection wells using midstream addition of bioremediation amendments, but excludes those costs specifically included in Bid Item 0029.

2. Biostimulation Amendments (Bid Item 0029)

Measurement for this bid item will be based on per pound of amendments injected. Payment will be based on the pounds of amendments at the quoted unit rate. This bid item includes all costs associated with the purchase and delivery of the amendments to the Site.

B. Bioaugmentation Injections

1. Bioaugmentation Event (Bid Item 0030)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for the bioaugmentation event will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for one bioaugmentation event at each of the two locations with the groundwater recirculation system, but excludes those costs specifically included in Bid Item 0031. Bioaugmentation with *Dehalococcoides* will be conducted after anaerobic conditions are created.

2. *Dehalococcoides* Cultures (Bid Item 0031)

Measurement for this bid item will be based on per liter of *Dehalococcoides* cultures injected. Payment will be based on the pounds of *Dehalococcoides* cultures at the quoted unit rate. This bid item includes all costs associated with the purchase and delivery of the *Dehalococcoides* cultures to the Site.

C. Groundwater Monitoring

1. Performance Monitoring (Bid Item 0032)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for performance monitoring will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for the performance monitoring specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents. The frequency of performance monitoring will be quarterly during the second year and semi-annually of the third year of in-situ system operation. This bid item includes performance monitoring and associated reporting activities, but excludes those costs specifically included in Bid Item 0034.

2. Process Monitoring (Bid Item 0033)

Measurement for this unit price bid item includes all items described under this

bid item, and no separate quantity measurement will be made.

Payment for process monitoring will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for the process monitoring specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents. This bid item includes process monitoring and associated reporting activities, but excludes those costs specifically included in Bid Item 0034.

3. Lab Analysis (Bid Item 0034)

Measurement for this unit price bid item includes all items described under this bid item, and no separate quantity measurement will be made.

Payment for lab analysis will be made at the unit bid price, for which price and payment will be full compensation for all labor, equipment, supplies, and materials required for the lab analysis of the samples specified in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION and performed in accordance with the approved SAP and other applicable requirements of the Contract Documents.

-- End of Section --

BIDDING SCHEDULE

Item	Description	Unit	Estimated Quantity	Unit Cost	Total
WORK ELEMENT 01 - WORK PLANS					
0001	Prepare Work Plans	LS	1		
SUBTOTAL OF WORK ELEMENT 01					
WORK ELEMENT 02 - GENERAL REQUIREMENTS					
0002	General Conditions	LS	1		
0003	Safety, Health, and Emergency Response	LS	1		
0004	Security	LS	1		
0005	Decontamination	LS	1		
SUBTOTAL OF WORK ELEMENT 02					
WORK ELEMENT 03 - MOBILIZATION/DEMOBILIZATION					
0006	Perform Mobilization	LS	1		
0007	Perform Demobilization	LS	1		
SUBTOTAL OF WORK ELEMENT 03					
WORK ELEMENT 04 - BENCH-SCALE MICROCOSM STUDY					
0008	Bench-scale Microcosm Study	LS	1		
SUBTOTAL OF WORK ELEMENT 04					
WORK ELEMENT 05 - INSTALLATION OF ISCR BARRIER ACROSS PLUME AXIS					
0009	ISCR Barrier Installation	EA	45		
0010	EHC	LB	25,150		
SUBTOTAL OF WORK ELEMENT 05					
WORK ELEMENT 06 - WELL INSTALLATION					
0011	Extraction/Injection Well Installation	FT	375		
0012	Temporary Monitoring Well Installation	FT	150		
0013	Survey Well Locations	LS	1		
SUBTOTAL OF WORK ELEMENT 06					

BIDDING SCHEDULE

Item	Description	Unit	Estimated Quantity	Unit Cost	Total
WORK ELEMENT 07 - BASELINE SAMPLING AND ANALYSIS					
0014	Baseline Sampling and Analysis	LS	1		
0015	Lab Analysis				
	Target Compound List (TCL) VOCs	EA	24		
	Total Organic Carbon	EA	10		
	Dissolved Gases	EA	10		
	Volatile fatty acids	EA	10		
	qPCR Census	EA	4		
SUBTOTAL OF WORK ELEMENT 07					
WORK ELEMENT 08 - MANAGEMENT OF SOLID WASTE					
0016	Management of Solid Waste	TON	15		
SUBTOTAL OF WORK ELEMENT 08					
WORK ELEMENT 09 - MANAGEMENT OF LIQUID WASTE					
0017	Management of Liquid Waste	GAL	10,000		
SUBTOTAL OF WORK ELEMENT 09					
WORK ELEMENT 10 - ENHANCED IN-SITU BIOREMEDIATION SYSTEM EQUIPMENT					
0018	Enhanced In-Situ Bioremediation System Equipment	LS	1		
0019	Initial Startup Testing	LS	1		
SUBTOTAL OF WORK ELEMENT 10					
WORK ELEMENT 11 - INSTALLATION OF ENHANCED IN-SITU BIOREMEDIATION SYSTEM					
0020	Installation of Enhanced In-Situ Bioremediation System	EA	6		
SUBTOTAL OF WORK ELEMENT 11					

BIDDING SCHEDULE

Item	Description	Unit	Estimated Quantity	Unit Cost	Total
WORK ELEMENT 12 - YEAR ONE O&M					
0021	Biostimulation Event	EA	2		
0022	Biostimulation Amendments	LB	45,000		
0023	Bioaugmentation Event	EA	1		
0024	Dehalococcoides Cultures	L	512		
0025	Performance Monitoring	EA	4		
0026	Process Monitoring	EA	4		
0027	Lab Analysis				
	Target Compound List (TCL) VOCs	EA	96		
	Total Organic Carbon	EA	40		
	Dissolved Gases	EA	40		
	Volatile fatty acids	EA	40		
	qPCR Census	EA	32		
SUBTOTAL OF WORK ELEMENT 12					
WORK ELEMENT 13 - YEARS TWO AND THREE O&M					
0028	Biostimulation Event	EA	4		
0029	Biostimulation Amendments	LB	9,000		
0030	Bioaugmentation Event	EA	4		
0031	Dehalococcoides Cultures	L	102		
0032	Performance Monitoring	EA	6		
0033	Process Monitoring	EA	8		
0034	Lab Analysis				
	Target Compound List (TCL) VOCs	EA	144		
	Total Organic Carbon	EA	60		
	Dissolved Gases	EA	60		
	Volatile fatty acids	EA	60		
	qPCR Census	EA	48		
SUBTOTAL OF WORK ELEMENT 13					
TOTAL COST					

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of Contact Personnel

1.02 MINIMUM INSURANCE REQUIREMENTS

Procure and maintain during the entire period of performance under this Contract the following minimum insurance coverage:

- A. Comprehensive general liability: \$500,000 per occurrence
- B. Automobile liability: \$200,000 per person, \$500,000 per occurrence for bodily injury, \$20,000 per occurrence for property damage
- C. Workmen's compensation as required by Federal and State workers' compensation and occupational disease laws.
- D. Employer's liability coverage of \$100,000, except in States where workers compensation may not be written by private carriers.
- E. Others as required by the State of New York.

1.03 CONTRACTOR PERSONNEL REQUIREMENTS

A. Subcontractors and Personnel

Furnish a list of contact personnel for the Contractor and subcontractor(s) including addresses and telephone numbers for use in the event of an emergency. As changes occur, update this list and distribute within one day.

B. Contractor Personnel Requirements

Failure of Contractor personnel to obtain entry approval will not affect the contract price or time of completion.

1.04 SUPERVISION

Have at least one qualified supervisor capable of reading, writing, and conversing fluently in the English language on the job site during working hours. In addition, if a Quality Control (QC) representative is required on the contract, then that individual must also have fluent English

communication skills.

1.05 AVAILABILITY OF CADD DRAWING FILES

After award and upon request, the electronic "Computer-Aided Drafting and Design (CADD)" drawing files will be made available to the Contractor for use in preparation of construction data related to the referenced contract subject to the following terms and conditions:

1. Data contained on these electronic files are not to be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Government. Make no claim and waive to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. To the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.
2. These electronic CADD drawing files are not construction documents. Differences may exist between the CADD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CADD files, nor does it make representation to the compatibility of these files with the Contractors hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished CADD files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these CADD files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project.
3. Remove all previous indicia of ownership (seals, logos, signatures, initials and dates) if these electronic CADD files are used, duplicated, and/or modified for use in producing construction drawings and data related to this contract.

1.06 ELECTRONIC MAIL (E-MAIL) ADDRESS

Establish and maintain electronic mail (e-mail) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats. Within 10 days after contract award, provide the Contracting Officer a single (only one) e-mail address for electronic communications from the Contracting Officer related to this contract including, but not limited to, Contract Documents, invoice information, request for proposals, and other correspondence. Multiple e-mail addresses will not be allowed.

Make timely distribution of all Contracting Officer initiated e-mail with its own organization including field office(s). Promptly notify the Contracting Officer, in writing, of any changes to this e-mail address.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 31 19.13

PRE-CONSTRUCTION MEETINGS

PART 1 GENERAL

1.01 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Conference Meeting Minutes; G
Submittal Register; G
Organization Chart
Mobilization Schedule; G
Accident Prevention Plan; G
Site Safety and Health Plan; G
Site Security Plan; G
Construction Work Plan; G
Environmental Protection Plan; G
Preconstruction Survey; G
Preparedness, Prevention, and Contingency Plan; G
Well Drilling/Development Material Handling Plan; G
List of Subcontractors; G
Contractor Quality Control Plan; G
Sampling and Analysis Plan; G

A. Conference Meeting Minutes

Record the minutes of the meetings including significant proceedings and decisions arising from the following conferences, and within seven calendar days after each meeting furnish 10 copies of the minutes to the Contracting Officer. After the Contracting Officer's review and approval, distribute copies to each participant in the meeting and to parties affected by decisions made at the meeting.

1. Pre-Mobilization Conference
2. Pre-Construction Conference
3. Pre-Construction Quality Control Conference
4. Pre-Construction Safety Conference

1.02 PRE-MOBILIZATION CONFERENCE

Prior to mobilization, a Pre-Mobilization Conference will be held between the Contractor and Contracting Officer.

A. Purpose

The purpose of this conference is to review submittals, safety, security, payrolls and labor relations, environmental protection, project schedules and payment, and procurement of materials.

B. Attendees

1. Contractor's superintendent
2. Contractor's quality control personnel
3. Contractor's safety personnel
4. Any major subcontractor's superintendents
5. Any other Contractor or subcontractor personnel as requested by the Contracting Officer

C. Submittals

Submit six copies of the following for review, at least 14 calendar days prior to the Pre-Mobilization Conference:

1. Submittal Register in accordance with
Section 01 33 00 - SUBMITTAL PROCEDURES.
2. Organization Chart
3. Mobilization Schedule
4. Accident Prevention Plan in accordance with
Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS
4. Site Safety and Health Plan in accordance with
Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS
5. Site Security Plan in accordance with Section 01 35 53 - SECURITY

1.03 PRE-CONSTRUCTION CONFERENCE

Prior to starting on-site construction a Pre-Construction Conference will be held between the Contractor and Contracting Officer.

A. Attendees

1. Contractor's superintendent
2. Contractor's quality control personnel
3. Contractor's safety personnel
4. Any major subcontractor's superintendents

5. Any other Contractor or subcontractor personnel as requested by the Contracting Officer

B. Submittals

Submit six copies of the following for review at least 14 calendar days prior to the Pre-Construction Conference:

1. Construction Work Plan in accordance with
Section 01 71 13 - MOBILIZATION/DEMobilIZATION
2. Environmental Protection Plan in accordance with
Section 01 35 40.00 20 - ENVIRONMENTAL MANAGEMENT
3. Preconstruction Survey
4. Preparedness, Prevention, and Contingency Plan in accordance with
Section 01 35 44 - SPILL CONTROL
5. Well Drilling/Development Material Handling Plan in accordance with
Section 33 24 00.0020 - EXTRACTION/INJECTION AND MONITORING
WELLS
6. List of subcontractors

C. Quality Assurance

1. Preconstruction Survey

Perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Discuss the results of the Preconstruction Survey at the Pre-Construction Conference.

2. Environmental Brief

Attend an environmental brief to be included in the Pre-Construction Conference. Provide the following information:

1. Types, quantities, and use of hazardous materials that will be brought onto the site
2. Types and quantities of wastes/wastewater that may be generated

1.04 PRE-CONSTRUCTION QUALITY CONTROL CONFERENCE

After the Pre-Mobilization Conference, before start of operation and any sampling or testing, a Pre-Construction Quality Control Conference will be held between the Contractor and Contracting Officer.

A. Purpose

The purpose of this conference is to discuss the quality control procedures to be used for all onsite and offsite work, and defining the interrelationship of the Contractor's

Management and the Contracting Officer's Quality Assurance. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work.

A list of definable features that involve chemical measurements are to be agreed upon. At a minimum, each matrix (soil, water, air, containerized wastes, instrumental chemical parameter measurement, etc.) are to be a definable work feature. Management of the chemical data quality system including project Data Quality Objectives, project submittals, chemical data documentation, chemical data assessment, required sampling and analysis protocols, and minimum data reporting requirements are to be agreed upon.

There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

B. Attendees

1. Contractor's superintendent
2. Contractor's quality control personnel
3. Contractor's safety personnel
4. Any major subcontractor's superintendents
5. Any other Contractor or subcontractor personnel as requested by the Contracting Officer

C. Submittals

Submit six copies of the following for review at least 14 calendar days prior to the Pre-Construction Quality Control Conference:

1. Contractor Quality Control Plan in accordance with Section 01 45 00.00 10 - QUALITY CONTROL.
2. Sampling and Analysis Plan in accordance with Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL.

1.05 PRE-CONSTRUCTION SAFETY CONFERENCE

After the submission of the Contractor's Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP), before start of operation, meet with the Contracting Officer for a Pre-Construction Safety Conference.

A. Purpose

The purpose of this conference is to discuss health and safety concerns related to the impending work including, but not limited to:

1. Project health and safety organization and expectations
2. Details of the submitted APP and SSHP including, but not limited to:

- a. Incorporated plans and programs
- b. Work procedures and safety considerations associated with those work procedures
- c. Heavy equipment to be used and training to operate equipment
- d. Safety requirements, such as training and safety equipment
- e. Listing of anticipated AHAs that will be developed and implemented during the performance of the contract in accordance with Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

3. Deficiencies in the submitted APP and SSHP

B. Attendees

Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference, including, but not limited to:

1. Contractor's superintendent
2. Contractor's quality control personnel
3. Contractor's safety personnel
4. Any major subcontractor's superintendents
5. Any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).
6. Any other Contractor or subcontractor personnel as requested by the Contracting Officer

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL

Schedule and administer the Pre-Mobilization Conference, Pre-Construction Conference, Pre-Construction Quality Control Conference, and Pre-Construction Safety Conference, as

specified in Paragraphs 1.02 through 1.05 of this section.

3.02 GENERAL CONFERENCE MEETING REQUIREMENTS

A. Conference Requirements

Administer the following general requirements for the conference meetings:

1. Prepare agenda for conferences
2. Make physical arrangements for conferences
3. Preside at conferences
4. Record the minutes including a detailed description of proceedings and decisions.

-- End of Section --

SECTION 01 31 19.23

PROGRESS MEETINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

This section describes the minimum requirements for conducting Project Progress Meetings during execution of the Work.

A. Project Progress Meetings

Schedule and administer Project Progress Meetings once a week and such additional meetings, when requested by the Contracting Officer during any stage of this project. Attend these meetings with all necessary personnel as determined by the Contracting Officer for the duration of this contract.

Meetings and conferences will take place at the project Site or some other location that is satisfactory to the Contracting Officer.

1.02 ATTENDANCE

A. Progress Meeting Attendees

The following persons must attend the Progress Meetings:

1. Contracting Officer or authorized representative
2. Contractor's Project Manager
3. Contractor's Quality Control Manager and/or Key Quality Control Staff
4. Contractor's Site Safety and Health Officer
5. Contractor's Environmental Manager
6. Subcontractors as appropriate to the agenda
7. Suppliers as appropriate to the agenda
8. Others as appropriate to the agenda

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

Project Progress Meeting Minutes; G

1.04 PROJECT PROGRESS MEETING MINUTES

Be responsible for recording the minutes of Project Progress Meetings including any significant proceedings and decisions arising from the meetings. Reproduce and submit three typed copies of the meeting minutes to the Contracting Officer within two calendar days after each meeting. After the Contracting Officer's review and approval, distribute copies to each participant in the meeting and to parties affected by decisions made at the meeting within two days.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL

Schedule and administer Project Progress Meetings at a minimum of once per week and any additional meetings.

3.02 GENERAL MEETING REQUIREMENTS

A. General Requirements for Progress Meetings

Administer the following general requirements for the progress meetings:

1. Prepare agenda for meetings
2. Make physical arrangements for meetings
3. Preside at meetings
4. Record the minutes including a detailed description of proceedings and decisions

3.03 SAMPLE AGENDA

A. Sample Agenda for Progress Meetings

The following is a sample agenda for Project Progress Meetings; modify this agenda in accordance with ongoing work.

1. Review of Health and Safety
2. Maintenance of quality and safety standards
3. Review of work progress
4. Field observations, problems, conflicts
5. Problems which impede the schedule, and proposed corrective actions
6. Review of offsite materials and equipment delivery schedules

7. Corrective measures and procedures to regain projected schedule
8. Revisions to project schedule
9. Review of planned progress during succeeding work period
10. Coordination of schedules
11. Review of submittal schedules
12. Discussion of pending changes and substitutions
13. Review of proposed changes for effect on completion date of the project
14. Discussion of other business, as appropriate

-- End of Section --

SECTION 01 32 01.00 10

SCHEDULE

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1-1-11

(1995) Administration -- Progress, Schedules, and
Network Analysis Systems

1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preliminary Project Schedule with Narrative Report ; G
Initial Project Schedule with Narrative Report ; G
Periodic Schedule Updates with Narrative Report; G.
Three Week Look Ahead Schedule; G
Equipment Delivery Schedule; G

1.03 SCHEDULE PREPARER

Designate an authorized representative to be responsible for the preparation of the schedule and all required updating (activity status) and preparation of reports. The authorized representative must be experienced in scheduling projects similar in nature and complexity to this project and experienced in the use of the scheduling software that meets the requirements of this specification.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

Prepare for approval a Project Schedule, as specified herein, pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS. Show in the schedule the sequence proposed to perform the work and dates for starting and completing all schedule activities. The scheduling of the entire project is required. Contractor management personnel must actively

participate in its development. Subcontractors and suppliers working on the project must also contribute in developing and maintaining an accurate Project Schedule. Provide a schedule that is a forward planning as well as a project monitoring tool.

A. Approved Project Schedule

Use the approved Project Schedule to measure the progress of the work and to aid in evaluating time extensions. Make the schedule cost loaded and activity coded. The schedule will provide the basis for all progress payments. Failure to submit any schedule within the time prescribed, may result in the Contracting Officer withholding approval of progress payments until the required schedule is submitted.

B. Schedule Status Reports

Provide a Schedule Status Report on at least a monthly basis. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, take steps necessary to improve its progress including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, and/or days of work, and to submit for approval any supplementary schedule or schedules as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

C. Default Terms

Failure to comply with the requirements of the Contracting Officer is grounds for a determination, by the Contracting Officer, that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

3.02 BASIS FOR PAYMENT AND COST LOADING

Use the schedule as the basis for determining contract earnings during each update period and therefore the amount of each progress payment. Lack of an approved schedule update, or qualified scheduling personnel, will result in the inability of the Contracting Officer to evaluate contract earned value for the purposes of payment. Failure to provide all required information will result in the disapproval of the preliminary, initial, and subsequent schedule updates. In the event schedule revisions are directed by the Contracting Officer and those revisions have not been included in subsequent revisions or updates, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until such revisions to the Project Schedule have been made. Document that activity cost loading is reasonable, as determined by the Contracting Officer. The aggregate value of all activities coded to a contract line item (CLIN) must equal the value of the CLIN on the Schedule.

3.03 PROJECT SCHEDULE DETAILED REQUIREMENTS

The computer software system utilized to produce and update the Project Schedule must be capable of meeting all requirements of this specification. Comply with PRIMAVERA P6 - USACE MANDATORY REQUIREMENTS. Failure to meet the requirements of this specification will result in the disapproval of the schedule.

A. Critical Path Method

Use the Critical Path Method (CPM) of network calculation to generate the Project Schedule. Prepare the Project Schedule using the Precedence Diagram Method (PDM).

B. Level of Detail Required

Develop the Project Schedule to an appropriate level of detail. Failure to develop the Project Schedule to an appropriate level of detail, as determined by the Contracting Officer, will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

1. Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities can have Original Durations (OD) greater than 20 work days or 30 calendar days. Procurement activities are defined herein.

2. Design and Permit Activities

Integrate into the schedule, the design and permitting activities, including necessary conferences and follow-up actions and design package submission dates.

3. Procurement Activities

The schedule must include activities associated with the submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies, and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days. A typical procurement sequence includes the string of activities: submit, approve, procure, fabricate, and deliver.

4. Mandatory Tasks

The following tasks must be included and properly scheduled:

- a. Submission, review, and acceptance of design packages.
- b. Submission of mechanical/electrical/information systems layout drawings.
- c. Submission and approval of O & M manuals.
- d. Submission and approval of as-built drawings.
- e. Submission and approval of fire protection specialist.
- f. Process system commissioning.
- g. Controls testing plan submission.
- h. Controls testing.

- i. Performance Verification testing.
- j. Other systems testing, if required.
- k. Contractor's pre-final inspection.
- l. Correction of punchlist from Contractor's pre-final inspection.
- m. Government's pre-final inspection.
- n. Correction of punch list from Government's pre-final inspection.
- o. Final inspection.

5. Government Activities

Show Government and other agency activities that could impact progress. These activities include, but are not limited to: approvals, inspections, utility tie-in, and Notice to Proceed (NTP) for phasing requirements.

6. Activity Responsibility Coding (RESP)

Assign Responsibility Code for all activities to the Prime Contractor, Subcontractor, or Government agency responsible for performing the activity. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, and Notice to Proceed (NTP) for phasing requirements. Code all activities not coded with a Government Responsibility Code to the Prime Contractor or Subcontractor responsible to perform the work. Activities cannot have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE). Unacceptable code values are abbreviations of the names of subcontractors.

7. Contract Changes/Requests for Equitable Adjustment (REA) Coding (MODF)

Assign Activity Code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by the Contracting Officer, with a Contract Changes/REA Code. Key all Code values to the Government's modification numbering system. Any activity or sequence of activities added to the schedule as a result of alleged constructive changes made by the Government may be added to a copy of the current schedule, subject to the approval of the Contracting Officer. Assign Activity Codes for these activities with a Contract Changes/REA Code. Key the code values to the Contractor's numbering system. Approval to add these activities does not necessarily mean the Government accepts responsibility and, therefore, liability for such activities and any associated impacts to the schedule, but rather the Government recognizes such activities are appropriately added to the schedule for the purposes of maintaining a realistic and meaningful schedule. Such activities cannot be Responsibility Coded to the Government unless approved. An activity cannot have more than one Contract Changes/REA Code.

8. Contract Line Item (CLIN) Coding (BIDI)

Code all activities to the CLIN on the Contract Line Item Schedule to which the activity belongs. An activity cannot contain more than one CLIN Item Code. CLIN Item code all activities, even when an activity is not cost loaded.

9. Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities based upon the phase of work in which the activity occurs. Code activities to a Construction Phase. Code fast track construction phases proposed by the Contractor to allow filtering and organizing the schedule by fast track design and construction packages. If the contract specifies construction phasing with separately defined performance periods, identify a Construction Phase Code to allow filtering and organizing the schedule accordingly. Each activity is identified with a single project phase and has only one Phase of Work code.

10. Category of Work Coding (CATW)

Assign Category of Work Code to all Activities based upon the category of work to which the activity belongs. Category of Work Code must include, but is not limited to: construction submittal approvals, Acceptance, Procurement, Fabrication, Delivery, Weather Sensitive Installation, Non-Weather Sensitive Installation, Start-Up, Test, and Turnover. Assign a Category of Work Code to each activity. Each activity can have only one Category of Work Code.

11. Definable Features of Work Coding (FOW1, FOW2, FOW3)

Assign a Definable Feature of Work Code to appropriate activities based on the definable feature of work to which the activity belongs. Definable Feature of Work is defined in Specification Section 01 45 00.00 10 - QUALITY CONTROL. An activity cannot have more than one Definable Feature of Work Code. Not all activities are required to be Definable Feature of Work Coded.

C. Scheduled Project Completion and Activity Calendars

The schedule interval extends from NTP date to the required contract completion date. The contract completion activity (End Project) is finished based on the required contract duration in the accepted contract proposal, as adjusted for any approved contract time extensions. The first scheduled work period will be the day after NTP is received by the Contractor. Schedule activities on a calendar to which the activity logically belongs. Activities may be assigned to a 7 day calendar when the contract assigns calendar day durations for the activity such as a Government Acceptance activity. If the Contractor intends to perform physical work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and holidays. Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive. Original durations must account for anticipated normal adverse weather. The Government will interpret all work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform work during those periods.

1. Project Start Date

The schedule starts no earlier than the date on which the NTP was acknowledged.

Include as the first activity in the project schedule an activity called "Start Project" (or NTP). The "Start Project" activity has an "ES" constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

2. Schedule Constraints and Open Ended Logic

Constrain completion of the last activity in the schedule by the contract completion date. Schedule calculations result in a negative float when the calculated early finish date of the last activity is later than the contract completion date. Include as the last activity in the project schedule an activity called "End Project." The "End Project" activity has an "LF" constraint date equal to the contract completion date for the project, and with a zero day duration or by using the "project must finish by" date in the scheduling software. The schedule has no constrained dates other than those specified in the contract. The use of artificial float constraints such as "zero free float" or "zero total float" are typically prohibited. There can only be 2 open ended activities: Start Project (or NTP) with no predecessor logic and End Project with no successor logic.

3. Early Project Completion

In the event the Preliminary or Initial project schedule calculates an early completion date of the last activity prior to the contract completion date, identify those activities that it intends to accelerate and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. The last activity has a late finish constraint equal to the contract completion date and the schedule will calculate positive float. The Government will not approve an early completion schedule with zero float on the longest path. The Government is under no obligation to accelerate activities for which it is responsible to support a proposed early contract completion.

D. Interim Completion Dates

Constrain contractually specified interim completion dates to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date.

1. Start Phase

Include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity has an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

2. End Phase

Include as the last activity for a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity has an "LF" constraint date equal to the specified completion date for that phase and a zero day duration.

3. Phase "X" Hammock

Include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" hammock activity is logically tied

to the earliest and latest activities in the phase.

E. Default Progress Data Disallowed

Do not automatically update Actual Start and Finish dates with default mechanisms that may be included in the scheduling software. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process will match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the AS and AF dates on the Daily Quality Control report for every in-progress or completed activity, and failure to document that the data contained on the Daily Quality Control reports is the sole basis for schedule updating will result in the disapproval of the Contractor's updated schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity are independent functions. Disable program features which calculate one of these parameters from the other.

F. Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule. Correct out of sequence progress that continues for more than two update cycles by logic revision, as approved by the Contracting Officer.

G. Negative Lags and Start to Finish Relationships

Lag durations contained in the project schedule will not have a negative value. Do not use Start to Finish (SF) relationships.

H. Calculation Mode

Retain the logic between predecessors and successors in schedule calculations even when the successor activity starts and the predecessor activity has not finished. Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") will not be allowed.

I. Milestones

The schedule must include milestone activities for each significant project event including but not limited to: milestone activities for each fast track design package released for construction; design complete; foundation/substructure construction complete; superstructure construction complete; building dry-in or enclosure complete to allow the initiation of finish activities; permanent power complete; and building systems commissioning complete.

3.04 PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data CD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

A. Preliminary Project Schedule Submission

Submit the Preliminary Project Schedule, defining the planned operations for the first 90 calendar days, for approval within 15 calendar days after the NTP is acknowledged. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Government acceptance of the associated design package(s) and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (FOW1, FOW2, FOW3).

B. Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after NTP. The schedule is to demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. The Initial Schedule is to be at a reasonable level of detail as determined by the Contracting Officer.

C. Periodic Schedule Updates

Update the Construction schedule and equipment delivery schedule at monthly intervals or when the schedule has been revised. Reflect any changes occurring since the last update. Submit copies of purchase orders and confirmation of delivery dates as directed. Based on the result of the meeting, specified in PERIODIC SCHEDULE UPDATE MEETINGS, submit periodic schedule updates. These submissions will enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor will be deemed not to have provided an estimate upon which progress payment may be made.

Contractor to provide monthly cost curve detailing projected and expended cost over time.

D. Three Week Look Ahead Schedule

Prepare and issue a 3-Week Look Ahead schedule to provide a more detailed day-to-day plan of upcoming work identified on the Construction Schedule. Updated each week to show the planned work for the current and following two-week period. Additionally, include upcoming outages, closures, preparatory meetings, and initial meetings. Identify critical path activities on the Three Week Look Ahead Schedule. The Three Week Look Ahead Schedule is to be bar chart type schedules, maintained separately from the Construction Schedule on an electronic spreadsheet program and printed on 8.5" by 11" sheets as directed by the Contracting Officer. Activities shall not exceed 5 working days in duration and shall have sufficient level of detail to assign crews, tools, and equipment

required to complete the work. Deliver three hard copies and one electronic file of the Three Week Look Ahead Schedule to the Contracting Officer no later than 8 a.m. each Monday.

E. Equipment Delivery Schedule

Within 30 calendar days after acceptance of the proposed construction schedule, submit for Contracting Officer acceptance a schedule showing procurement plans for materials and equipment. Submit in the format and content as prescribed by the Contracting Officer, and include as a minimum the following information:

1. Description.
2. Date of the purchase order.
3. Promised shipping date.
4. Name of the manufacturer or supplier.
5. Date delivery is expected.
6. Date the material or equipment is required, according to the current construction schedule.

F. Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used. A template SDEF compatible schedule backup file (sdef.prx) is available on the QCS website: <http://rms.usace.army.mil/>. The SDEF format is as follows:

SDEF Format			
Field	Activity Code	Length	Description
1	WRKP	3	Workers per Day
2	RESP	4	Responsible Party (e.g. GC, subcontractor, USACE)
3	AREA	4	Area of Work
4	MODF	6	Modification or REA number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of Work
7	CATW	1	Category of Work
8	FOW1	10	Feature of Work (used up to 10 characters in length)
9	FOW2	10	Feature of Work (used up to 20 characters in length)

SDEF Format			
Field	Activity Code	Length	Description
10	FOW3	10	Feature of Work (used up to 30 characters in length)

3.05 SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

A. Data CD's

Provide two sets of data CD's containing the project schedule in the backup Primavera P6 format. Each CD must also contain all previous update backup files. File medium must be CD. Label each CD indicating the type of schedule (Preliminary, Initial, Update), full contract number, data date, and file name. Each schedule will have a unique file name.

B. Narrative Report

Provide a Narrative Report with the Preliminary, Initial, and each Periodic Update of the project schedule, as the basis of the progress payment request. The Narrative Report is to include: a description of activities along the 2 most critical paths where the total float is less than or equal to 20 work days, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to communicate to the Government the thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through that analysis. Identify and explain any activities that, based on calculated late dates, should have either started or finished during the update period but did not.

C. Approved Changes Verification

Include only those project schedule changes in the schedule submission that have been previously approved by the Contracting Officer. The Narrative Report must specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

D. Schedule Reports

The format, filtering, organizing and sorting for each schedule report is as directed by the Contracting Officer. Typically reports contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. The following lists typical reports that will be requested. One or all of these reports may be requested for each schedule submission.

1. Activity Report

A list of all activities sorted according to activity number.

2. Logic Report

A list of detailed predecessor and successor activities for every activity in ascending order by activity number.

3. Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

4. Earnings Report by CLIN

A compilation of the Total Earnings on the project from the NTP to the data date. This report is to reflect the earnings of specific activities based on the agreements made in the schedule update meeting defined herein. Provided that the Government has been furnished a complete schedule update, this report will serve as the basis of determining progress payments. Group activities by CLIN item number and sort by activity number. This report will include: a sum of all activities coded to a particular CLIN and a CLIN item percent earned value; and a total project percent complete. The printed report contains, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

E. Network Diagram

The network diagram is required for the Preliminary, Initial, and Periodic Updates. The network diagram depicts and displays the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

1. Continuous Flow

Diagrams show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

2. Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3. Critical Path

Clearly show the critical path.

4. Banding

Organize activities as directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area, and/or responsibility.

5. S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.06 PERIODIC SCHEDULE UPDATE MEETINGS

Conduct monthly (at a minimum) schedule update meetings for the purposes of reviewing the proposed out of sequence corrections, determining causes for delay, correcting logic, maintaining schedule accuracy, and determining earned value. Meetings are to occur at least monthly within five days of the proposed schedule data date, and after updating the schedule with Government concurrence respecting actual start dates, actual finish dates, remaining durations and percent complete for each activity it intends to status. The meeting and resultant approvable schedule update are to be a condition precedent to a formal submission of the update as described in SUBMISSION REQUIREMENTS and to the submission of an invoice for payment. The meeting will be a working interactive exchange which will allow the Government the opportunity to review the updated schedule on a real time and interactive basis. The Contractor's authorized scheduling representative will organize, sort, filter and schedule the update as requested by the Government. Provide a rough draft of the proposed activity logic corrections and narrative report to the Government 48 hours in advance of the meeting. The Contractor's Project Manager and Authorized Scheduler must attend the meeting with the Authorized Representative of the Contracting Officer.

A. Update Submission Following Progress Meeting

Submit a complete update of the project schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 working days after the periodic schedule update meeting, reflecting only those changes made during the previous update meeting.

B. Status of Activities

Update information, including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD), and Percent Complete will be subject to the approval of the Government prior to the meeting. As a minimum, address the following items on an activity by activity basis during each progress meeting.

1. Start and Finish Dates

Accurately show the status of the AS and/or AF dates for each activity currently in-progress or completed since the last update. The Government may allow an AF date to be assigned with the percent complete less than 100 percent to account for the value of work remaining but not restraining successor activities. Only assign AS dates when actual progress occurs on an activity.

2. Remaining Duration

Update the estimated RD for all incomplete activities independent of Percent Complete. Remaining Durations may exceed the activity OD or may exceed the activity's prior update RD if the Government considers the current OD or RD to be understated based on current progress, insufficient work crews actually manning the job, unrealistic OD or deficiencies that must be corrected that restrain successor activities.

3. Percent Complete

Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be declared 100 percent complete. To allow for proper schedule management, cost load the correction of punch list from Government pre-final inspection activity(ies) not less than 1 percent of the total contract value, which activity(ies) may be declared 100 percent complete upon completion and correction of all punch list work identified during Government pre-final inspection(s).

4. Logic Changes

Specifically identify and discuss all logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, and other changes that have been made pursuant to contract provisions. The Government will only approve logic revisions for the purpose of keeping the schedule valid in terms of its usefulness in calculating a realistic completion date, correcting erroneous logic ties, and accurately sequencing the work.

5. Other Changes

Other changes required due to delays in completion of any activity or group of activities include:

- a. Delays beyond the Contractor's control, such as strikes and unusual weather.
- b. Delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary.
- c. Changes required to correct a schedule that does not represent the actual or planned prosecution and progress of the work.

3.07 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor believes it is entitled to an extension of the contract performance period, completion date, or any interim milestone date, furnish the following for a determination by the Contracting Officer: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of excusable delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is a condition precedent to any approvals by the Government. In response to each Request For Proposal issued by the Government, submit a schedule impact analysis demonstrating whether or not the change contemplated by the Government impacts the critical path.

A. Justification of Delay

Clearly display on the project schedule that all the float time available for the work involved with this request has been used, in full. The Contracting Officer's determination as to the number of allowable days of contract extension will be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, will not be a cause for an extension to the performance

period, completion date, or any interim milestone date.

B. Submission Requirements

Submit a justification for each request for a change in the contract completion date of less than 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request is to be in accordance with the requirements of other appropriate Contract Clauses and include, as a minimum:

1. A list of affected activities, with their associated project schedule activity number.
2. A brief explanation of the causes of the change.
3. An analysis of the overall impact of the changes proposed.
4. A sub-network of the affected area.

Identify activities impacted in each justification for change by a unique activity code contained in the required data file.

C. Additional Submission Requirements

The Contracting Officer may request an interim schedule update with revised activities for any requested time extension of over 2 weeks. Provide this within 4 days of the Contracting Officer's request.

3.08 DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The Contracting Officer will approve proposed revisions to the schedule prior to inclusion of those changes within the project schedule. If the the proposed revisions are not submitted, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. Include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the alternative revisions are not submitted within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.09 WEEKLY PROGRESS MEETINGS

1. Meet weekly with the Government (or as otherwise mutually agreed to) for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. The then current and approved schedule update is to be used for the purposes of this meeting and for the production and review of reports. The Contractor's Project Manager and the Authorized Representative of the Contracting Officer are to attend. The weekly progress meeting will address the status of RFI's, RFP's and Submittals.
2. Jointly review the reports with the Government. If it appears that activities on the longest

path(s) which are currently driving the calculated completion date (driving activities), are not progressing satisfactorily and therefore could jeopardize timely project completion, corrective action must be taken immediately. Corrective action includes but is not limited to: increasing the number of work crews; increasing the number of work shifts; increasing the number of hours worked per shift; and determining if Government responsibility coded activities require Government corrective action.

3.10 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, will not be considered for the exclusive use of either the Government or the Contractor.

3.11 TRANSFER OF SCHEDULE DATA INTO RMS/QCS

Download and upload the schedule data into the Resident Management System (RMS) prior to RMS databases being transferred to the Government. Provide additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 - Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 - Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and electronic export from QCS of the application for progress payment.

-- End of Section --

SECTION 01 32 23

SURVEYING

PART 1 GENERAL

1.01 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-05 Design Data

Surveys; G

1.02 SURVEYS

On request of the Contracting Officer, submit documentation to verify accuracy of field engineering work.

A. Survey Criteria

These drawings constitute the project record documents. Document that the survey meet the following criteria:

1. Submit surveys prepared, signed, and sealed by a New York Licensed Land Surveyor.
2. Develop all surveys in English unit systems and tie to the New York State Plane Coordinate System
3. Submit each survey on 24x36 inch print and on CD disk in AutoCAD Release 2013 format or newer.
4. All elevation information in the AutoCAD file must be at appropriate 3-D elevations, based on NAVD 1988. All horizontal data in the AutoCAD file shall be in 1983 NAD (NAD83) coordinates.
5. Place all entities on layer names, which adequately describe the entity being mapped.
6. 1 inch = 60 foot scale reproducible plot with 1-foot contour interval.
7. The Digital Terrain Models (DTM) must contain adequate 3-D points and 3-D breaklines required to accurately model the photographed surface to within above stated accuracy. The DTM must also provide a 2-D polyline defining the limits of the area surveyed. The DTM model AutoCAD file must be compatible for use with SoftDesk software or a license of another comparable software must be provided to the Contracting Officer for use in verifying quantities.

B. Surveys

Perform and submit to the Contracting Officer, the following surveys:

1. Certified survey of the surface and subsurface structures installed

After completion of the project, provide certified survey of the surface and subsurface structures installed including, but not limited to, the in-situ chemical reduction barrier injection locations, extraction/injection wells, and monitoring wells.

1.03 QUALIFICATIONS OF SURVEYOR

Registered Land surveyor with a minimum of five years in business, currently licensed in the State of New York.

1.04 SURVEY REFERENCE POINTS

Existing basic horizontal and vertical control points for the Project are those designated on Drawings. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.

A. Changes or Relocations

Make no changes or relocations without prior written notice to the Contracting Officer. Report to the Contracting Officer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations. Require surveyor to correctly replace project control points which may be lost or destroyed. Establish replacements based on original horizontal and vertical survey control.

1.05 PROJECT SURVEY REQUIREMENTS

Record locations, with horizontal and vertical data, on Project Record documents. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means.

1.06 RECORDS

Maintain a complete, accurate log of all control and survey work as it progresses. Survey logs are to be promptly produced to the Contracting Officer upon request. Update the Project Record Drawings on a monthly basis, or as directed by the Contracting Officer, based on the work performed during the month ending at the time of invoicing as a condition for approval of the invoice.

PART 2 PRODUCTS

Provide all materials, equipment, personal protective equipment, facilities, and personnel required to perform surveying activities on-site.

PART 3 EXECUTION

Throughout construction, perform all surveys required by the Contracting Officer to document site conditions.

-- End of Section --

SECTION 01 32 33

PHOTOGRAPHS

PART 1 GENERAL

1.01 SCOPE OF WORK

Furnish all labor, equipment, materials, and incidentals required to provide photographic documentation of construction activities.

1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

View Location Map
Project Photographs

1.03 VIEW LOCATION MAP

Submit to the Contracting Officer, prior to or with the first photograph submittals, a sketch or drawing indicating the required photographic locations. Update as required if the locations are moved.

PART 2 PRODUCTS

2.01 DIGITAL CAMERA

Use a digital camera to produce project photographs. The digital camera shall be capable of transferring digital photographs to a "JPEG" or "TIFF" electronic file format, with each photo date stamped.

2.02 PHOTOGRAPHIC LOGBOOK

Keep all written documentation concerning project photographs in a photographic logbook. Provide a logbook constructed of water resistant paper and bound along the left edge, or approved equal.

PART 3 EXECUTION

3.01 PROJECT PHOTOGRAPHS

Furnish digital photographs in an electronic file format approved by the Contracting Officer, taken with a digital camera by an experienced photographer using suitable equipment, to record the important features of the Site prior to the commencement of work, during construction, and after the work has been completed.

A. Pre-Construction Photographs

Before work begins, take a minimum of 25 digital photographs of the work areas. The locations will be designated by the Contracting Officer.

B. Progress Photographs

During construction, take and submit a minimum of 25 progress photographs per week throughout the duration of the project from a minimum of four different views. Provide each progress photograph as a separate electronic file and include coverage of, but not be limited to, the following::

1. Extraction/Injection Well Drilling/Installation
2. EISB System
3. Treatment Equipment
4. ISCR Barrier Installation
5. Piping Installation
6. Unanticipated events such as spills and the discovery of additional contaminated material
7. Contaminated material/water storage, handling, treatment, and transport
8. Site or task-specific employee respiratory and personal protection
9. Start Up Operations
10. Temporary Monitoring Well Installation
11. Site Restoration

In addition, at each successive period of photography, take at least one digital photograph from the same reference point.

C. Post-Construction Photographs

After completion of work, a minimum of 25 digital photographs including views will be taken. The Contracting Officer will determine if additional photographs are required. The locations will be designated by the Contracting Officer and will be similar to the photographs showing the Site condition prior to commencement of construction activities. Submit within one month of completion of work.

3.02 ELECTRONIC FILES FOR DIGITAL PHOTOGRAPHS

All digital photographs and related electronic files are U. S. Government property. Do not release to the public or news media.

A. Electronic file format

Download digital photographs from the digital camera to a personal computer daily during photographic sessions for transfer to an electronic file format. Provide the electronic file in either "JPEG" or "TIFF" format.

B. Electronic file name

Rename each downloaded electronic file at the time of download with a distinct filename that corresponds to the photographic logbook specified in Paragraph 3.03. The filename shall have the following format as defined below:

1. yyyy mm dd_hhnn_xxx
 - a. "yyyy" is the year the photograph was taken.
 - b. "mm" is the month the photograph was taken.
 - c. "dd" is the day the photograph was taken.
 - d. "hh" is the hour the photograph was taken using military time nomenclature.
 - e. "nn" is the minute the photograph was taken using military time nomenclature.
 - f. "xxx" is a three digit sequential number starting with 001 for each photograph taken during the preceding time period
2. An example of the above filename format is 2014 04 12_1845_002. This example photograph filename would have been the second photo taken at 6:45 p.m. on April 12, 2014.

C. Photographs

All photographs should be date stamped similar to how each file is named.

D. Compact Disc

Copy the electronic files to a compact disc after renaming. The compact disc shall be a "CD-R" or "CD-RW" format.

1. Complete copy process the same day the photographs are downloaded, except as approved by the Contracting Officer.
2. If the Contracting Officer allows the copy process to be delayed, backup the electronic files on at least one storage device other than the hard drive of the personal computer storing the electronic files until the copy process is completed.
3. Submit compact discs containing electronic files of digital photographs a minimum of once weekly during photographic sessions.

3.03 LOGBOOK DOCUMENTATION OF DIGITAL PHOTOGRAPHS

Record pertinent information concerning digital photographs in a photographic logbook as specified in Paragraph 2.02. Write in a waterproof ink.

A. Logbook Cover Information

Record the following information on the front cover of the logbook:

1. Project name
2. Contract number
3. Contractor name

B. Photographic Entry Information

Include the following information for each photographic entry, at a minimum:

1. Date
2. Time
3. Photograph filename
4. Location
5. Direction
6. Description

3.04 VIEWS REQUIRED

Consult with the Contracting Officer at each period of photography for recommendations concerning views required. The following should be photographed:

A. Site Progress

Illustrate condition and location of work and the state of progress.

B. Reference Points

At successive periods of photography, take at least one photograph from the same reference point as previously required.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's Quality Control (CQC) System Manager to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby.

1.02 DEFINITIONS

A. Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction or the start of the next major phase of the construction on a multi-phase contract, includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

Preconstruction submittals include, but are not limited to, the following:

- Certificates of insurance
- Surety bonds
- List of proposed Subcontractors
- List of proposed products
- Construction progress schedule
- Submittal register
- Schedule of prices
- Health and Safety Plan

Work Plan
Quality Control (QC) Plan
Environmental Protection Plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

All shop drawings shall be signed and sealed by a New York Licensed Professional Engineer.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

All equipment must conform with the Buy American Act of 1933 (41 U.S.C. § 10a–10d).

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

Design submittals, design substantiation submittals and extensions of design submittals.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Test Reports include, but are not limited to, the following:

- Investigation reports.
- Daily logs and checklists.
- Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Documentation required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Certificates include, but are not limited to, the following:

- Confined space entry permits.
- Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

Manufacturer's field reports include, but are not limited to, the following:

- Factory test reports.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

Interim "DD Form 1354" with cost breakout for all assets 30 days prior to facility turnover.

B. Approving Authority

Office or designated person authorized to approve submittal.

C. Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with this section.

SD-01 Preconstruction Submittals; G

Submittal Register; G

SD-02 Shop Drawings; G

SD-03 Product Data; G

SD-04 Samples; G

SD-05 Design Data; G

SD-06 Test Reports; G

SD-07 Certificates; G

SD-08 Manufacturer's Instructions; G

SD-09 Manufacturer's Field Reports; G

SD-10 Operation and Maintenance Data; G

SD-11 Closeout Submittals; G

1.04 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

A. Government Approved, "G"

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings."

B. Architect-Engineer Approved; "AE"

Architect-Engineer approval is required.

C. Information Only

Submittals not requiring Government and/or Architect-Engineer approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.05 PREPARATION

A. Transmittal Form

Use the transmittal form (ENG Form 4025) for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise special care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item.

1.06 QUANTITY OF SUBMITTALS

A. Number of Copies of SD-02 Shop Drawings

Submit six copies of submittals of shop drawings requiring review and approval only by QC organization and seven copies of shop drawings requiring review and approval by Contracting Officer.

B. Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

Submit in compliance with quantity requirements specified for shop drawings.

C. Number of Samples SD-04 Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to Contractor.
- b. Submit one sample panel or provide one sample installation where directed. Include components listed in technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of non-solid materials.

D. Number of Copies SD-05 Design Data and SD-07 Certificates

Submit in compliance with quantity requirements specified for shop drawings.

E. Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Submit in compliance with quantity and quality requirements specified for shop drawings other than field test results that will be submitted with QC reports.

F. Number of Copies of SD-10 Operation and Maintenance Data

Submit three copies of O&M Data to the Contracting Officer for review and approval.

G. Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

Unless otherwise specified, submit three sets of administrative submittals.

1.07 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.08 VARIATIONS

Variations from contract requirements require both Designer of Record (DOR) and Government approval pursuant to contract Clause FAR 52.236-21 and will be considered where advantageous to Government.

A. Considering Variations

Discussion with Contracting Officer prior to submission, after consulting with the DOR,

will help ensure functional and quality requirements are met and minimize rejections and re-submittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

B. Proposing Variations

When proposing variation, deliver written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government, including the DOR's written analysis and approval. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

Check the column "variation" of ENG Form 4025 for submittals which include proposed deviations requested by the Contractor. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

C. Warranting That Variations Are Compatible

When delivering a variation for approval, Contractor, including its Designer(s) of Record, warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work and there is no additional cost to any adjacent material, component, system, or assembly.

D. Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

1.09 SUBMITTAL REGISTER

Prepare and maintain submittal register, as the work progresses. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by Government; retain data which is output in columns (a), (g), (h), and (i) as approved. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required. Maintain a submittal register for the project. The Government will provide the initial submittal register in electronic format with the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the Government.

A. Use of Submittal Register

Submit submittal register. Submit with QC plan and project schedule. Verify that all submittals required for project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

B. Contractor Use of Submittal Register

Update the following fields in the Government-furnished submittal register program with each submittal throughout contract.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

C. Approving Authority Use of Submittal Register

Update the following fields in the Government-furnished submittal register program.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (l) List date of submittal receipt.

Column (m) through (p) List Date related to review actions.

Column (q) List date returned to Contractor.

D. Copies Delivered to the Government

Deliver one copy of submittal register updated by Contractor to Government with each invoice request.

1.10 SCHEDULING

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

- A. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.
- B. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A."
- C. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.
- D. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

1.11 GOVERNMENT APPROVING AUTHORITY

When approving authority is Contracting Officer, the Government will:

- A. Note date on which submittal was received.
- B. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- C. Identify returned submittals with one of the actions defined in paragraph entitled, "Review Notations," of this section and with markings appropriate for action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date approved submittals. Two copies of the approved submittal will be retained by the Contracting Officer and two copies of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

A. Review Notations

Contracting Officer review will be completed within 30 calendar days after date of submission. Submittals will be returned to the Contractor with the following notations:

- 1. Submittals marked "approved" or "accepted" authorize the Contractor to proceed with the work covered.
- 2. Submittals marked "approved as noted" "or approved except as noted, resubmittal not required," authorize the Contractor to proceed with the work covered provided

he takes no exception to the corrections.

3. Submittals marked "not approved" or "disapproved," or "revise and resubmit," indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.
4. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

1.12 DISAPPROVED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes," is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.13 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory.

Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.14 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Government reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor to replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer does not relieve the Contractor of his responsibilities under the contract.

1.15 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

1.16 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements is to be similar to the following:

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or
attached sheets(s)

SIGNATURE: _____

TITLE: _____

DATE: _____

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE For use of this form, see ER 415-1-10; the proponent agency is CECW-CE.					DATE		TRANSMITTAL NO.	
SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS <i>(This section will be initiated by the contractor)</i>								
TO:		FROM:		CONTRACT NO.			CHECK ONE: <input type="checkbox"/> THIS IS A NEW TRANSMITTAL <input type="checkbox"/> THIS IS A RESUBMITTAL OF TRANSMITTAL _____	
SPECIFICATION SEC. NO. <i>(Cover only one section with each transmittal)</i>			PROJECT TITLE AND LOCATION			THIS TRANSMITTAL IS FOR: <i>(Check one)</i> <input type="checkbox"/> FIO <input type="checkbox"/> GA <input type="checkbox"/> DA <input type="checkbox"/> CR <input type="checkbox"/> DA/CR <input type="checkbox"/> DA/GA		
ITEM NO. <small>(See Note 3)</small> a.	DESCRIPTION OF SUBMITTAL ITEM <small>(Type size, model number/etc.)</small> b.	SUBMITTAL TYPE CODE <small>(See Note 8)</small> c.	NO. OF COPIES d.	CONTRACT DOCUMENT REFERENCE		CONTRACTOR REVIEW CODE g.	VARIATION <small>Enter "Y" if requesting a variation (See Note 6)</small> h.	USACE ACTION CODE <small>(Note 9)</small> i.
				SPEC. PARA. NO. e.	DRAWING SHEET NO. f.			
REMARKS				I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.				
				NAME OF CONTRACTOR			SIGNATURE OF CONTRACTOR	
SECTION II - APPROVAL ACTION								
ENCLOSURES RETURNED <i>(List by item No.)</i>		NAME AND TITLE OF APPROVING AUTHORITY			SIGNATURE OF APPROVING AUTHORITY		DATE	

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.
2. Each Transmittal shall be numbered consecutively. The Transmittal Number typically includes two parts separated by a dash (-). The first part is the specification section number. The second part is a sequential number for the submittals under that spec section. If the Transmittal is a resubmittal, then add a decimal point to the end of the original Transmittal Number and begin numbering the resubmittal packages sequentially after the decimal.
3. The "Item No." for each entry on this form will be the same "Item No." as indicated on ENG FORM 4288-R.
4. Submittals requiring expeditious handling will be submitted on a separate ENG Form 4025-R.
5. Items transmitted on each transmittal form will be from the same specification section. Do not combine submittal information from different specification sections in a single transmittal.
6. If the data submitted are intentionally in variance with the contract requirements, indicate a variation in column h, and enter a statement in the Remarks block describing the detailed reason for the variation.
7. ENG Form 4025-R is self-transmitting - a letter of transmittal is not required.
8. When submittal items are transmitted, indicate the "Submittal Type" (*SD-01 through SD-11*) in column c of Section I.
Submittal types are the following:

SD-01 - Preconstruction	SD-02 - Shop Drawings	SD-03 - Product Data	SD-04 - Samples	SD-05 - Design Data	SD-06 - Test Reports
SD-07 - Certificates	SD-08 - Manufacturer's Instructions	SD-09 - Manufacturer's Field Reports	SD-10 - O&M Data	SD-11 - Closeout	
9. For each submittal item, the Contractor will assign Submittal Action Codes in column g of Section I. The U.S. Army Corps of Engineers approving authority will assign Submittal Action Codes in column i of Section I. The Submittal Action Codes are:

A -- Approved as submitted.	F -- Receipt acknowledged.
B -- Approved, except as noted on drawings. Resubmission not required.	X -- Receipt acknowledged, does not comply with contract requirements, as noted.
C -- Approved, except as noted on drawings. Refer to attached comments. Resubmission required.	G -- Other action required (<i>Specify</i>)
D -- Will be returned by separate correspondence.	K -- Government concurs with intermediate design. (<i>For D-B contracts</i>)
E -- Disapproved. Refer to attached comments.	R -- Design submittal is acceptable for release for construction. (<i>For D-B contracts</i>)
10. Approval of items does not relieve the contractor from complying with all the requirements of the contract.

SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.32	(2012) Fall Protection
ASSE/SAFE A10.34	(2001; R 2012) Protection of the Public on or Adjacent to Construction Sites
ASSE/SAFE Z359.1	(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z358.1	(2009) American National Standard for Emergency Eyewash and Shower Equipment
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1904	Recording and Reporting Occupational Injuries and Illnesses
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.16	Rules of Construction
29 CFR 1926.500	Fall Protection
29 CFR 1926.65	Hazardous Waste Operations and Emergency Response
CPL 2.100	(1995) Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 51B	(2014) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code
NFPA 70E	(2012; Errata 2012) Standard for Electrical Safety in the Workplace

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH 85-115	(1985) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities
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U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) Safety and Health Requirements Manual
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1.02 DESCRIPTION OF WORK

This section requires the Contractor to implement practices and procedures for working safely and in compliance with OSHA and USACE regulation while performing all work covered in the Contract Documents, including installing the in-situ chemical reduction (ISCR) barrier and employing biological amendments to reduce groundwater chlorinated volatile organic compounds (CVOCs).

A. Potential Hazards

There are potential hazards associated with the implementation of the Remedial Design at the Peninsula Boulevard Groundwater Plume Superfund Site. The Site has specific hazards associated with chlorinated solvents. There are also numerous physical hazards identified with the Site, including those associated with construction activities. There are also environmental hazards associated with the physical location of the Site (such as vehicular traffic) and weather conditions such as heat, noise, and flora and fauna contact.

1. Chemical Hazards

Contaminants at the site are those associated with chlorinated solvents. The main groundwater contaminants are cis-1,2-dichloroethene (cis-1,2-DCE), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride. Exposure to these compounds is primarily through inhalation and ingestion, although other routes of exposure exist. Chlorinated solvents typically affect the mucous membranes, and the nervous and respiratory systems. Symptoms of exposure include nausea, irritation, headaches, weakness and confusion.

2. Physical Hazards

There are numerous physical hazards associated with the project which, if not identified and addressed, may present accidents and personal injury to the workforce as well as operational problems. These include common hazards such

as slip, trips, and falls, back injuries from lifting, and being struck by moving or falling objects, to more serious construction related hazards.

These more serious hazards can include being struck by heavy equipment or vehicular traffic, threats posed by overhead or underground utilities, confined space entry during construction, work around or with energized systems, rigging and lifting heavy materials and equipment, and excavation and trenching.

3. Environmental Hazards

Environmental hazards will vary depending on the time of year during which the remedy is implemented. Weather and temperature stress may result from extremes of heat or cold, prolonged exposure outdoors (to the temperature or sun). Noise hazards may result from work construction work, particular jackhammers, drills, and heavy equipment. In and around heavy equipment operations, noise levels may exceed a time-weighted average (TWA) of 84 decibels, A scale (dBA).

Biological hazards may be encountered on site. Animal bites and insect stings can cause localized swelling, itching, and minor pain, however, effects can be more serious such as anaphylactic shock, which can lead to severe reactions in the circulatory, respiratory, and central nervous system and, in some cases, even death. Since the site is located in the northeast portion of the United States, the potential for coming into contact with deer ticks exists. Lyme disease is caused by an infection from the bite of a deer tick, which is about the size of the head of a pin. Lyme disease may cause a variety of medical conditions including arthritis. Early signs may include a flu-like illness, an expanding skin rash, and joint pain. A large expanding skin rash usually develops around the area of the bite.

Occasional extreme weather events, such as gale force winds or lightning may also pose hazards.

1.03 DEFINITIONS

A. High Visibility Accident

Any mishap which may generate publicity or high visibility.

B. Medical Treatment

Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.

C. Recordable Injuries or Illnesses

Any work-related injury or illness that results in:

1. Death, regardless of the time between the injury and death, or the length of the illness;
2. Days away from work (any time lost after day of injury/illness onset);
3. Restricted work;

4. Transfer to another job;
5. Medical treatment beyond first aid;
6. Loss of consciousness; or
7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

D. "USACE" property and equipment

"USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

E. Weight Handling Equipment (WHE) Accident

A WHE accident occurs when any one or more of the eight elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; or collision, including unplanned contact between the load, crane, or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.) Document any mishap meeting the criteria described above in the Contractor Significant Incident Report (CSIR) submitted within five days.

1.04 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan; G
Site Safety and Health Plan; G
Activity Hazard Analysis; G

Emergency Response Plan; G

SD-02 Shop Drawings

Work Zones; G
Decontamination Facilities; G

SD-03 Product Data

Exposure Monitoring/Air Sampling Program
Site Control Log

SD-06 Test Reports

Notifications and Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph, "Notifications and Reports."

Accident Reports

SD-07 Certificates

Competent Person

Confined Space Entry Permit

Hot work permit

Employee Certification

Certificate of Compliance

Submit one copy of each permit/certificate attached to each Contractor Quality Control Report.

SD-11 Closeout Submittals

Safety and Health Phase-Out Report

1.05 REGULATORY REQUIREMENTS

Comply with EM 385-1-1, OSHA requirements in 29 CFR 1910 and 29 CFR 1926 with work performed under this contract, especially OSHA's Standards 29 CFR 1926.65 and 29 CFR 1910.120 and state specific OSHA requirements where applicable. Submit to the Contracting Officer for resolution matters of interpretation of standards before starting work.

In addition to the detailed requirements included in the provisions of this Contract, comply with Federal, State, and local laws, ordinances, criteria, rules and regulations. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

1.06 STAFF ORGANIZATION, QUALIFICATION, AND RESPONSIBILITIES

A. Safety and Health Manager

1. Qualifications

Safety and Health Manager must be an Industrial Hygienist certified by the American Board of Industrial Hygiene. The Safety and Health Manager must have the following additional qualifications:

- a. A minimum of 5 years experience in developing and implementing safety and health programs at hazardous waste sites.
- b. Documented experience in supervising professional and technician level personnel.
- c. Documented experience in developing worker exposure assessment programs and air monitoring programs and techniques.

- d. Documented experience in managing personal protective equipment programs and conducting PPE hazard evaluations for the types of activities and hazards likely to be encountered on the project.
- e. Working knowledge of State and Federal occupational safety and health regulations.

2. Responsibilities and Duties

The Safety and Health Manager responsibilities include, but are not limited to, the following:

- a. Be responsible for the development, implementation, oversight, and enforcement of the APP and SSHP.
- b. Sign and date the APP and SSHP prior to submittal.
- c. Conduct initial site-specific training.
- d. Be available for consultation during the entire duration of remedial activities.
- e. Visit the site as needed and at least once per month for the duration of activities, to audit the effectiveness of the APP and SSHP.
- f. Be available for emergencies.
- g. Provide onsite consultation as needed to ensure the APP and SSHP are fully implemented.
- h. Coordinate any modifications to the APP and SSHP with the Site Superintendent, the SSHO, and the Contracting Officer.
- i. Provide continued support for upgrading/downgrading of the level of personal protection.
- j. Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.
- k. Review accident reports and results of daily inspections.
- l. Serve as a member of the Contractor's quality control staff.

B. Site Safety and Health Officer (SSHO)

1. Qualifications

The SSHO must meet the requirements of EM 385-1-1 section 1 and document that the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one (1) person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Designated Representative/alternate must be at the work site at all times to implement and administer the Contractor's safety program and government-accepted APP and SSHP. The SSHO's training, experience, and qualifications is as required by EM 385-1-1 paragraph 01.A.17, entitled SITE

SAFETY AND HEALTH OFFICER (SSHO), and all associated sub-paragraphs.

a. Additional Qualifications

The SSHO shall meet the following qualifications:

- (1) A minimum of 5 years experience in implementing safety and health programs at hazardous waste sites where Level C personal protective equipment was required.
- (2) Documented experience in construction techniques and construction safety procedures.
- (3) Working knowledge of Federal and State occupational safety and health regulations.
- (4) Specific training in personal and respiratory protective equipment, confined space entry and in the proper use of air monitoring instruments and air sampling methods.

2. Responsibilities and Duties

The SSHO responsibilities include, but are not limited to, the following:

- a. Be assigned to the site on a full time basis for the duration of field activities. The SSHO will have no duties other than Safety and Health related duties. If operations are performed during more than 1 work shift per day, a site Safety and Health Officer must be present for each shift.
- b. Have authority to ensure site compliance with specified safety and health requirements, Federal, State, and OSHA regulations and all aspects of the APP and SSHP including, but not limited to, activity hazard analyses, air monitoring, use of PPE, decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records by performing a daily safety and health inspection
- c. Conduct daily safety and health inspections, maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections, and document that results on the Daily Safety Inspection Log are in accordance with 29 CFR 1904. Attach Daily Safety Inspection Log to the Contractors' Quality Control Report which is detailed in Section 01 45 00.00 10 - QUALITY CONTROL.
- d. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. Post a list of unresolved safety and health deficiencies on the safety bulletin board.
- e. Have authority to stop work if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.

- f. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.
- g. Maintain applicable safety reference material on the job site.
- h. Attend the Pre-Construction Meetings and periodic progress meetings.
- i. Assist and represent the Safety and Health Manager in onsite training and the day to day onsite implementation and enforcement of the accepted APP and SSHP and AHAs.
- j. Consult with and coordinate any modifications to the APP and SSHP with the Safety and Health Manager, the Site Superintendent, and the Contracting Officer.
- k. Document sub-contractor compliance with safety and health requirements.
- l. Maintain a list of hazardous chemicals on site and their Material Safety Data Sheets.

Failure to perform the above duties will result in dismissal of the Superintendent, QC Manager, and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

C. Competent Person

Provide a Competent Person for all of the hazards identified in the Contractor's Safety and Health Program in accordance with the accepted APP and SSHP, and document that the Competent Person is on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. Submit the credentials of the Competent Persons(s) to the the Contracting Officer for acceptance in consultation with the Safety Office.

D. Occupational Physician

Utilize the services of a licensed physician, who is certified in occupational medicine by the American Board of Preventative Medicine, or who, by necessary training and experience is Board eligible. The physician must be familiar with this site's hazards and the scope of this project. Include the medical consultant's name, qualifications, and knowledge of the site's conditions and proposed activities in the APP and SSHP. The physician will be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1910.120, (f) and 29 CFR 1926.65, (f) and paragraph MEDICAL SURVEILLANCE.

E. Persons Certified in First Aid and CPR

At least two persons who are currently certified in first aid and CPR by the American Red Cross or other approved agency must be onsite at all times during site operations. They must be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030. These persons may perform other duties but will be immediately available to render first aid when needed.

F. Safety and Health Technicians

For each work crew in the exclusion zone, one person, designated as a Safety and Health technician, must perform activities such as air monitoring, decontamination, and safety oversight on behalf of the SSHO. They must have appropriate training equivalent to the SSHO in each specific area for which they have responsibility and report to and be under the supervision of the SSHO.

1.07 ACCIDENT PREVENTION PLAN AND SITE SAFETY AND HEALTH PLAN

Develop and implement a Site Safety and Health Plan (SSHP) and attach to the Accident Prevention Plan (APP) as an appendix. Address all occupational safety and health hazards (traditional construction as well as contaminant-related hazards) associated with cleanup operations within the APP and SSHP. Cover each SSHP element in section 28.A.01 of EM 385-1-1 and each APP element in Appendix A of EM 385-1-1. There are overlapping elements in Section 28.A.01 and Appendix A of EM 385-1-1. SSHP appendix elements that overlap with APP elements need not be duplicated provided each issue receives adequate attention and is documented in the APP and SSHP. The APP and SSHP are dynamic documents, subject to change as project operations/execution change. The APP and SSHP will require modification to address changing and previously unidentified health and safety conditions. It is the Contractor's responsibility to update the APP and SSHP accordingly. Submit amendments to the APP and SSHP to the Contracting Officer they are updated. The APP and SSHP must contain all updates.

A. Acceptance and Modifications

Prior to submittal, the APP and SSHP must be signed and dated in accordance with EM 385-1-1 Appendix A. Submit for review 14 days prior to the Pre-Construction Conference. Deficiencies in the APP and SSHP will be discussed at the Pre-Construction Safety Conference; revise the APP and SSHP to correct the deficiencies and resubmit for acceptance. Onsite work must not begin until the plan has been accepted. Maintain a copy of the written APP and SSHP onsite. Changes and modifications must be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. As soon as possible, the SSHO is to bring to the attention of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer, any unforeseen hazard that becomes evident during the performance of the work. In the interim, take necessary action to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34), and the environment. Disregard for the provisions of this specification or the accepted APP and SSHP will be cause for dismissal of the Superintendent, QC Manager, and/or SSHO, and a project work stoppage until the matter has been rectified.

B. Availability

Make available the APP and SSHP in accordance with 29 CFR 1910.120, (b)(1)(v) and 29 CFR 1926.65, (b)(1)(v). Copies of the accepted plan will be maintained at the Contracting Officer's office and at the job site.

C. EM 385-1-1 Contents

In addition to the requirements outlined in Appendix A of USACE EM 385-1-1, the following is required:

1. Confined Space Entry Plan

Develop a confined and/or enclosed space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, OSHA Directive CPL 2.100, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)

1.08 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

A. Project/Site Conditions

Refer to the following reports and information for the site description and contamination characterization.

1. CERCLA Documents

- a. Remedial Investigation
- b. Feasibility Study
- c. Record of Decision

1.09 ACTIVITY HAZARD ANALYSIS

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1, Section 1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHAs as amendments to the APP. The analysis should be used during daily inspections to document the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Develop the activity hazard analyses using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the Contracting Officer.

1.10 TRAINING

Meet the following requirements in the Contractor's training program for workers performing cleanup operations and who will be exposed to contaminants.

A. General Hazardous Waste Operations Training

All Personnel performing duties with potential for exposure to onsite contaminants must meet and maintain the following 29 CFR 1910.120/29 CFR 1926.65 (e) training requirements:

1. 40 hours of off site hazardous waste instruction.
2. 3 days actual field experience under the direct supervision of a trained, experienced supervisor.
3. 8 hours refresher training annually.

Onsite supervisors must have an additional 8 hours management and supervisor training specified in 29 CFR 1910.120/29 CFR 1926.65 (e) (4).

B. Pre-entry Briefing

Prior to commencement of onsite field activities, all site employees, including those assigned only to the Support Zone, must attend a site-specific safety and health training session. This session shall be conducted by the Safety and Health Manager and the Site Safety and Health Officer to document that all personnel are familiar with requirements and responsibilities for maintaining a safe and healthful work environment. Thoroughly discuss procedures and contents of the accepted APP and SSHP and Sections 01.B.02 and 28.D.03 of EM 385-1-1. Each employee must sign a training log to acknowledge attendance and understanding of the training. Notify the Contracting Officer at least 5 days prior to the initial site-specific training session so government personnel involved in the project may attend.

C. Periodic Sessions

Conduct periodic onsite training by the SSHO at least daily for personnel assigned to work at the site during the following day. Address safety and health procedures, work practices, any changes in the APP and SSHP, activity hazard analyses, work tasks, or schedule; results of previous week's air monitoring, review of safety discrepancies and accidents. Conduct a site-specific training session for new personnel, visitors, and suppliers by the SSHO using the training curriculum outlines developed by the Safety and Health Manager. Each employee must sign a training log to acknowledge attendance and understanding of the training.

1.11 DISPLAY OF SAFETY INFORMATION

Within one calendar day after commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, use an alternative, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, and deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, section 01.A.06. Additional items required to be posted include:

- A. Confined space entry permit
- B. Hot work permit

1.12 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.13 TASK SPECIFIC HAZARDS, INITIAL PPE, HAZWOPER MEDICAL SURVEILLANCE, AND TRAINING APPLICABILITY

Identify task specific occupational hazards, task specific HAZWOPER medical surveillance and training applicability and task specific initial PPE requirements for the project in the APP and SSHP. It is the Contractor's responsibility to reevaluate occupational safety and health hazards as the work progresses and to adjust the PPE and onsite operations, if necessary, so that the work is performed safely and in compliance with occupational safety and health regulations.

1.14 PERSONAL PROTECTIVE EQUIPMENT

A. Site Specific PPE Program

Provide onsite personnel exposed to contaminants with appropriate personal protective equipment. Components of levels of protection (B, C, D and modifications) must be relevant to site-specific conditions, including heat and cold stress potential and safety hazards. Use only respirators approved by NIOSH. Keep protective equipment and clothing clean and well maintained. Include site-specific procedures to determine PPE program effectiveness and for onsite fit-testing of respirators, cleaning, maintenance, inspection, and storage of PPE within the PPE section of the APP and SSHP.

Provide necessary PPE for all equipment, materials, and chemicals utilized during the Work.

B. Levels of Protection

The Safety and Health Manager must establish and evaluate as the work progresses the levels of protection for each work activity. Also establish action levels for upgrade or downgrade in levels of PPE. Describe in the SSHP the protocols and the communication network for changing the level of protection. Address air monitoring results, potential for exposure, changes in site conditions, work phases, job tasks, weather, temperature extremes, individual medical considerations, etc., within the PPE evaluation protocol.

C. PPE for Government Personnel

Three clean sets of personal protective equipment and clothing (excluding air-purifying negative-pressure respirators and safety shoes, which will be provided by individual visitors), as required for entry into the Exclusion Zone and/or Contamination Reduction Zone, must be available for use by the Contracting Officer or official visitors. The items must be cleaned and maintained by the Contractor and clearly marked: "FOR USE BY GOVERNMENT ONLY." Provide basic training in the use and limitations of the PPE provided.

1.15 SITE CONTROL MEASURES

A. Work Zones

Initial anticipated work zone boundaries (exclusion zone, contamination reduction zone, support zone, all access points and decontamination areas) are to be clearly delineated on the site drawings. Base delineation of work zone boundaries on the contamination characterization data and the hazard/risk analysis to be performed as described in paragraph: HAZARD/RISK ANALYSIS. As work progresses and field conditions are monitored, work zone boundaries may be modified (and site drawings modified) with approval of the Contracting Officer. Clearly identify work zones and mark in the field

(using fences, tape, signs, etc.). Submit and post a site map, showing work zone boundaries and locations of decontamination facilities in the onsite office. Work zones must consist of the following:

1. Exclusion Zone (EZ)

The exclusion zone is the area where hazardous contamination is either known or expected to occur and the greatest potential for exposure exists. Entry into this area and exit may only be made through the CRZ.

2. Contamination Reduction Zone (CRZ)

The CRZ is the transition area between the Exclusion Zone and the Support Zone. The personnel and equipment decontamination areas must be separate and unique areas located in the CRZ.

3. Support Zone (SZ)

The Support Zone is defined as areas of the site, other than exclusion zones and contamination reduction zones, where workers do not have the potential to be exposed to hazardous substances or dangerous conditions resulting from hazardous waste operations. Secure the Support Zone against active or passive contamination. Site offices, parking areas, and other support facilities must be located in the Support Zone.

B. Site Control Log

A log of personnel visiting, entering, or working on the site must be maintained. Include the following: date, name, agency or company, time entering and exiting site, time entering and exiting the exclusion zone (if applicable). Before visitors are allowed to enter the Contamination Reduction Zone or Exclusion Zone, they must show proof of current training, medical surveillance and respirator fit testing (if respirators are required for the tasks to be performed). Record this visitor information, including date, in the log.

C. Communication

Provide and install an employee alarm system that has adequate means of on and off site communication in accordance with 29 CFR 1910 Section .165. The means of communication must be able to be perceived above ambient noise or light levels by employees in the affected portions of the workplace. The signals must be distinctive and recognizable as messages to evacuate or to perform critical operations.

1.16 PERSONAL HYGIENE AND DECONTAMINATION

Personnel entering the Exclusion or Contamination Reduction Zones or otherwise exposed to hazardous chemical vapors, gases, liquids, or contaminated solids must decontaminate themselves and their equipment prior to exiting the contamination reduction zone (CRZ) and entering the support zone. Consult Chapter 10.0 of NIOSH 85-115 when preparing decontamination procedures. Submit a detailed discussion of personal hygiene and decontamination facilities and procedures to be followed by site workers as part of the APP and SSHP. Train employees in the procedures and enforce the procedures throughout site operations.

1.17 MEDICAL SURVEILLANCE PROGRAM

Meet 29 CFR 1910.120/29 CFR 1926.65 (f) and the following requirements for medical surveillance program for workers performing cleanup operations and who will be exposed to contaminants. Assure the Occupational Physician or the physician's designee performs the physical examinations and reviews examination results. Participation in the medical surveillance program will be without cost to the employee, without loss of pay and at a reasonable time and place.

A. Frequency of Examinations

Medical surveillance program participants must receive medical examinations and consultations on the following schedule:

1. Every 12 months
2. If and when the participant develops signs and symptoms indicating a possible overexposure due to an uncontrolled release of a hazardous substance on the project.
3. Upon termination or reassignment to a job where medical surveillance program participation is not required, unless his/her previous annual examination/consultation was less than 6 months prior to reassignment or termination.
4. On a schedule specified by the occupational physician.

B. Content of Physical Examinations/Consultation

1. Verify the following information about medical surveillance program participants:
 - a. Baseline health conditions and exposure history.
 - b. Allergies/sensitivity/susceptibility to hazardous substances exposure.
 - c. Ability to wear personal protective equipment inclusive of NIOSH certified respirators under extreme temperature conditions.
 - d. Fitness to perform assigned duties.
2. Provide the occupational physician with the following information for each medical surveillance program participant:
 - a. Information on the employee's anticipated or measured exposure.
 - b. A description of any PPE used or to be used.
 - c. A description of the employee's duties as they relate to the employee's exposures (including physical demands on the employee and heat/cold stress).
 - d. A copy of 29 CFR 1910.120, or 29 CFR 1926.65.
 - e. Information from previous examinations not readily available to the examining physician.

- f. A copy of Section 5.0 of NIOSH 85-115.
- g. Information required by 29 CFR 1910 Section .134.

C. Physician's Written Opinion

Obtain and furnish to the Safety and Health Manager; and the employee before work begins, a copy of the physician's written opinion for each employee, and addressing the employee's ability to perform hazardous waste site remediation work and containing the following:

1. The physician's verification of the employee's fitness to perform duties as well as recommended limitations upon the employee's assigned work and/or PPE usage.
2. The physician's opinion about increased risk to the employee's health resulting from work; and
3. A statement that the employee has been informed and advised about the results of the examination.

D. Employee Certification

Provide an employee certification for each worker performing cleanup operations with potential for contaminant-related occupational exposure signed by the safety and health manager and the occupational physician indicating the workers meet the training and medical surveillance requirements of this contract.

1.18 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Prepare and implement by the Safety and Health Manager an exposure monitoring/air sampling program to identify and quantify safety and health hazards and airborne levels of hazardous substances in order to assure proper selection of engineering controls, work practices, and personal protective equipment for affected site personnel. Include action levels for upgrading/downgrading PPE in the program. Submit personnel exposure monitoring/sampling results.

1.19 HEAT STRESS MONITORING AND MANAGEMENT

Document in the APP and SSHP and implement the procedures and practices in section 06.J. in EM 385-1-1 to monitor and manage heat stress.

1.20 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

A. Emergency Equipment And First Aid Requirements

Maintain, at a minimum, the following items onsite and available for immediate use:

1. First aid equipment and supplies approved by the consulting physician.
2. Emergency eyewashes and showers that comply with ANSI/ISEA Z358.1.

3. Fire extinguishers of sufficient size and type at site facilities and in all vehicles and at any other site locations where flammable or combustible materials present a fire risk.

1.21 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

A. Emergency Response Plan

An Emergency Response Plan, that meets the requirements of 29 CFR 1910.120 (l) and 29 CFR 1926.65 (l), must be developed and implemented as a section of the APP and SSHP. In the event of any emergency associated with remedial action, without delay, alert all onsite employees and, as necessary, offsite emergency responders that there is an emergency situation; take action to remove or otherwise minimize the cause of the emergency; alert the Contracting Officer; and institute measures necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency. Train employees that are required to respond to hazardous emergency situations to their level of responsibility according to 29 CFR 1910.120 (q) and 29 CFR 1926.65 (q) requirements. Rehearse the plan regularly as part of the overall training program for site operations. Review the plan periodically and revised as necessary to reflect new or changing site conditions or information. Provide copies of the Emergency Response Portion of the accepted APP and SSHP to the affected local emergency response agencies. Address, as a minimum, the following elements in the plan:

1. Pre-Emergency Planning

Coordinate with local emergency response providers during preparation of the Emergency Response Plan. At a minimum, coordinate with local fire, rescue, hazardous materials response teams, police and emergency medical providers to assure all organizations are capable and willing to respond to and provide services for on-site emergencies. Document that the Emergency Response Plan for the site is compatible and integrated with the local fire, rescue, medical and police security services available from local emergency response planning agencies.

2. Personnel roles, lines of authority, communications for emergencies.
3. Emergency recognition and prevention.
4. Site topography, layout, and prevailing weather conditions.
5. Criteria and procedures for site evacuation (emergency alerting procedures, employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).
6. Specific procedures for decontamination and medical treatment of injured personnel.
7. Route maps to nearest prenotified medical facility. Site-support vehicles must be equipped with maps. At the beginning of project operations, drivers of the support vehicles must become familiar with the emergency route and the travel time required.
8. Emergency alerting and response procedures including posted instructions and a list of names and telephone numbers of emergency contacts (physician, nearby medical facility, fire and police departments, ambulance service, Federal, State, and local

environmental agencies; as well as Safety and Health Manager, the Site Superintendent, the Contracting Officer and/or their alternates).

9. Criteria for initiating community alert program, contacts, and responsibilities.
10. Procedures for reporting incidents to appropriate government agencies. In the event that an incident such as an explosion or fire, or a spill or release of toxic materials occurs during the course of the project, the appropriate government agencies must be immediately notified. In addition, verbally notify the Contracting Officer and the local district safety office immediately and provide a written notification within 24 hours. Include within the report the following items:
 - a. Name, organization, telephone number, and location of the Contractor.
 - b. Name and title of the person(s) reporting.
 - c. Date and time of the incident.
 - d. Location of the incident, i.e., site location, facility name.
 - e. Brief summary of the incident giving pertinent details including type of operation ongoing at the time of the incident.
 - f. Cause of the incident, if known.
 - g. Casualties (fatalities, disabling injuries).
 - h. Details of any existing chemical hazard or contamination.
 - i. Estimated property damage, if applicable.
 - j. Nature of damage, effect on contract schedule.
 - k. Action taken to ensure safety and security.
 - l. Other damage or injuries sustained, public or private.
11. Procedures for critique of emergency responses and follow-up.

1.22 SEVERE STORM PLAN

The SSHO is to monitor weather conditions online through National Oceanic and Atmospheric Administration (NOAA) or other commercially available sources. In the event of a severe storm watch:

- A. Secure outside equipment and materials and place materials that could be damaged in protected areas.
- B. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.
- C. Document that temporary erosion controls are adequate.

1.23 INSPECTIONS

Attach to and submit the SSHO's Daily Inspection Logs with the Contractor Quality Control Reports which are detailed in Section 01 45 00.00 10 - QUALITY CONTROL. Include with each entry the following: date, work area checked, employees present in work area, PPE and work equipment being used in each area, special safety and health issues and notes, and signature of preparer.

1.24 NOTIFICATIONS and REPORTS

A. Accident Notification

Notify the Contracting Officer as soon as practical, but no more than four hours after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$2,000, or any weight handling equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted.

Any mishap occurring in any of the following high hazard areas are to be immediately reported to the Government Designated Authority (GDA). These mishaps are to be investigated in depth to identify all causes and to recommend hazard control measures. The GDA is to immediately notify the local Safety and Occupational Health Office when any one of these occurs and subsequently follow-up with official reports as prescribed by regulation. HQUSACE-SO must also be notified immediately (within 24 hours) and provided follow-up investigative findings within 10 days of occurrence.

1. Electrical - to include Arc Flash and Uncontrolled Release of Hazardous Energy;
2. Weight Handling Equipment or Rigging; and
3. Fall-from Height.

B. Accident Reports

1. Conduct an accident investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, property damage accidents resulting in at least \$20,000 in damages, and near misses as defined in EM 385-1-1, and other high hazards such as electrical to include arc flash and uncontrolled release of energy and fall-from height, to establish the root cause(s) of the accident. Complete the applicable USACE Accident Report Form 3394, and provide the report to the Contracting Officer within 5 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.
2. Conduct an accident investigation for any weight handling equipment accident (including rigging gear accidents) to establish the root cause(s) of the accident, complete the WHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Do not proceed with crane operations until cause is determined and corrective actions have been implemented to the satisfaction of the Contracting Officer. The

Contracting Officer will provide a blank copy of the accident report form.

C. Certificate of Compliance

Provide a Certificate of Compliance for each crane entering an activity under this contract (see Contracting Officer for a blank certificate). State within the certificate that the crane and rigging gear meet applicable OSHA regulations (with the Contractor citing which OSHA regulations are applicable, e.g., cranes used in construction, demolition, or maintenance) and comply with 29 CFR 1926 and USACE EM 385-1-1 Section 16 and Appendix I. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. Post certifications on the crane.

1.25 SPILL AND DISCHARGE CONTROL

Perform spill and discharge control in accordance with Section 01 35 44 - SPILL CONTROL.

1.26 HOT WORK PERMITTING PROGRAM

Implement a Hot Work Permitting Program and prepare a written permit prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices. An additional hot work permit may need to be obtained from local authorities. Detail the Hot Work Permitting Program in the APP and SSHP and include an example format for a hot work permit. Provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". Document that all extinguishers are current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. Document that the Fire Watch is trained in accordance with NFPA 51B and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the hot work permit. This person's sole responsibility is to monitor the hot work and have immediate access to the fire extinguisher located at each hot work site. A new permit must be obtained at the start of each work shift during which hot work will be conducted.

1.27 FACILITY OCCUPANCY CLOSURE

Do not close or obstruct streets, walks, and other facilities occupied and used by the Government without written permission from the Contracting Officer.

1.28 SAFETY AND HEALTH PHASE-OUT REPORT

Submit a Safety and Health Phase-Out Report in conjunction with the project close out report prior to final acceptance of the work. Include the following minimum information :

- A. Summary of the overall performance of safety and health (accidents or incidents including near misses, unusual events, lessons learned, etc.).
- B. Final decontamination documentation including procedures and techniques used to decontaminate equipment, vehicles, and on site facilities.
- C. Summary of exposure monitoring and air sampling accomplished during the project.
- D. Signatures of Safety and Health Manager and SSO.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 CONSTRUCTION AND OTHER WORK

A. Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials, or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval.

B. Unforeseen Hazardous Material

If material that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.02 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Document that each employee is familiar with and complies with these procedures and USACE EM 385-1-1, Section 12, Control of Hazardous Energy.

No person, regardless of position or authority, shall operate any switch, valve, or equipment that has an official lockout/tagout tag attached to it, nor removes such tag except as provided in this section. No person shall work on any energized equipment including, but not limited to activities such as erecting, installing, constructing, repairing, adjusting, inspecting, un-jamming, setting up, trouble shooting, testing, cleaning, dismantling, servicing and maintaining machines, equipment, or processes until an evaluation has been conducted identifying the energy source and the procedures which will be taken to ensure the safety of personnel.

Only qualified personnel shall perform work on electrical circuits.

A supervisor who is required to enter an area protected by a lockout/tagout tag will be considered a member of the protected group provided he notifies the holder of the tag stub each time he enters and departs from the protected area.

Do not rely on identification markings on building light and power distribution circuits for established safe work conditions.

Before clearance will be given on any equipment other than electrical (generally referred to as mechanical apparatus), secure the apparatus, valves, or systems in a passive condition with the appropriate vents, pins, and locks.

Vent pressurized or vacuum systems to relieve differential pressure completely.

Tag vent valves open during the course of the work.

Purge, ventilate, or otherwise make safe prior to entry, systems or areas where dangerous gas or fluid systems are involved, or in areas where the environment may be oxygen deficient.

A. Tag Placement

Complete lockout/tagout tags in accordance with the regulations printed on the back thereof and attached to any device which, if operated, could cause an unsafe condition to exist.

If more than one group is to work on any circuit or equipment, the employee in charge of each group shall have a separate set of lockout/tagout tags completed and properly attached.

When it is required that certain equipment be tagged, the Government will review the characteristics of the various systems involved that affect the safety of the operations and the work to be done; take the necessary actions, including voltage and pressure checks, grounding, and venting, to make the system and equipment safe to work on; and apply such lockout/tagout tags to those switches, valves, vents, or other mechanical devices needed to preserve the safety provided. This operation is referred to as "Providing Safety Clearance."

B. Tag Removal

When any individual or group has completed its part of the work and is clear of the circuits or equipment, the supervisor, project leader, or individual for whom the equipment was tagged, shall sign lockout/tagout tag stub. That group's or individual's lockout/tagout tags on equipment may then be removed.

3.03 FALL HAZARD PROTECTION AND PREVENTION PROGRAM

Establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures in accordance with ASSE/SAFE Z359.1.

A. Training

Institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, provide training for each employee who might be exposed to fall hazards. Provide training by a competent person for fall protection in accordance with USACE EM 385-1-1, Section 21.B.

B. Fall Protection Equipment and Systems

Enforce use of the fall protection equipment and systems designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Section 21. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, Paragraphs 21.N through 21.N.04. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems are required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with 29 CFR 1926.500, Subpart M, USACE EM 385-1-1 and ASSE/SAFE A10.32.

1. Personal Fall Arrest Equipment

Document that personal fall arrest equipment, systems, subsystems, and components comply with ASSE/SAFE Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Provide harnesses with a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Use only locking snap hooks and carabiners. Provide webbing, straps, and ropes made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 6 feet. Document that the total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall always is taken into consideration when attaching a person to a fall arrest system.

C. Existing Anchorage

Certify (or re-certify) by a qualified person fall protection anchorages, to be used for attachment of personal fall arrest equipment in accordance with ASSE/SAFE Z359.1. Existing horizontal lifeline anchorages must be certified (or re-certified) by a registered professional engineer with experience in designing horizontal lifeline systems.

D. Rescue and Evacuation Procedures

Personal fall arrest systems shall be designed to allow the mishap victim to self-rescue or be rescued promptly should a fall occur. Prepare a Rescue and Evacuation Plan and include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and Evacuation Plan within the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, the APP, and the SSHP.

3.04 EQUIPMENT

A. Material Handling Equipment

1. Do not modify material handling equipment, such as forklifts, with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.
2. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.
3. Document that operators of forklifts or power industrial trucks are licensed in accordance with OSHA.

3.05 EXCAVATIONS

Soil classification must be performed by a competent person in accordance with 29 CFR 1926 and EM 385-1-1.

A. Utility Locations

All underground utilities in the work area must be positively identified by a third party, independent, private utility locating company in addition to any station locating service and coordinated with the station utility department.

B. Utility Location Verification

Physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Use hand digging when within 2 feet of a known utility, do not perform digging by means of mechanical equipment. If construction is parallel to an existing utility, expose the utility by hand digging every 100 feet if parallel within 5 feet of the excavation.

C. Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces

Utilities located within and under concrete slabs or pier structures, bridges, parking areas, and the like, are extremely difficult to identify. Whenever contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with station utility departments in addition to location and depth verification by a third party, independent, private locating company. Document the third party, independent, private locating company locates utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

3.06 ELECTRICAL

A. Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to

performing each cut. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers will be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA.

B. Portable Extension Cords

Size portable extension cords in accordance with manufacturer ratings for the tool to be powered and protect from damage. Immediately remove from service all damaged extension cords. Document that portable extension cords meet the requirements of EM 385-1-1, NFPA 70E, and OSHA electrical standards.

3.07 WORK IN CONFINED SPACES

Comply with the requirements in Section 34 of USACE EM 385-1-1, OSHA 29 CFR 1910, OSHA 29 CFR 1910.146, OSHA Directive CPL 2.100 and OSHA 29 CFR 1926. Any potential for a hazard in the confined space requires a permit system to be used.

A. Entry Procedures

Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to document that the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 34 of USACE EM 385-1-1 for entry procedures.) Document that all hazards pertaining to the space were reviewed with each employee during review of the AHA.

Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its action level.

Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

-- End of Section --

SECTION 01 35 40.00 20

ENVIRONMENTAL MANAGEMENT

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z400.1/Z129.1	(2010) Hazardous Industrial Chemicals - Material Safety Data Sheets - Preparation
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ASTM INTERNATIONAL (ASTM)

ASTM D4840	(1999; R 2010) Sampling Chain-Of-Custody Procedures
ASTM E2114	(2008) Standard Terminology for Sustainability Relative to the Performance of Buildings

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004	(1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)
NPDES	(1972; R 2005) National Pollutant Discharge Elimination System

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 112.7	General Requirements for Spill Prevention, Control, and Countermeasure Plans
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste

40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 271	Requirements for Authorization of State Hazardous Waste Programs
40 CFR 272	Approved State Hazardous Waste Management Programs
40 CFR 273	Standards For Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 280	Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)
40 CFR 372-SUBPART D	Specific Toxic Chemical Listings
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.02 DEFINITIONS

Definitions pertaining to sustainable development are as defined in ASTM E2114 and as specified.

A. Chain-of-custody

Process whereby a product or material is maintained under the physical possession or control during its entire life cycle.

B. Chemical Wastes

This includes salts, acids, alkalizes, herbicides, pesticides, and organic chemicals.

C. Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

D. Hazardous Debris

As defined in Solid Waste paragraph, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) per 40 CFR 261; or debris that exhibits a characteristic of hazardous waste per 40 CFR 261.

E. Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172. Hazardous material is any material that:

1. Is regulated as a hazardous material per 49 CFR 173, or
2. Requires a Material Safety Data Sheet (MSDS) per 29 CFR 1910.120, or
3. During end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D.

Designation of a material by this definition, when separately regulated or controlled by other instructions or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this instruction for "control" purposes.

F. Hazardous Waste

Any discarded material, liquid, solid, or gas, which meets the definition of hazardous material or is designated hazardous waste by the Environmental Protection Agency or State Hazardous Control Authority as defined in 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 270, 40 CFR 271, 40 CFR 272, 40 CFR 273, 40 CFR 279, and 40 CFR 280.

G. Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act and includes the following chemicals:

chlorofluorocarbon-11 (CFC-11)

chlorofluorocarbon-12 (CFC-12)
chlorofluorocarbon-13 (CFC-13)
chlorofluorocarbon-111 (CFC-111)
chlorofluorocarbon-112 (CFC-112)
chlorofluorocarbon-113 (CFC-113)
chlorofluorocarbon-114 (CFC-114)
chlorofluorocarbon-115 (CFC-115)
chlorofluorocarbon-211 (CFC-211)
chlorofluorocarbon-212 (CFC-212)
chlorofluorocarbon-213 (CFC-213)
chlorofluorocarbon-214 (CFC-214)
chlorofluorocarbon-215 (CFC-215)
chlorofluorocarbon-216 (CFC-216)
chlorofluorocarbon-217 (CFC-217)
chlorofluorocarbon-500 (CFC-500)
chlorofluorocarbon-502 (CFC-502)
chlorofluorocarbon-503 (CFC-503)
halon-1211
halon-1301
halon-2402
carbon tetrachloride
methyl bromide
methyl chloroform

Class II ODS is defined in Section 602(s) of The Clean Air Act and includes the following chemicals:

hydrochlorofluorocarbon-21 (HCFC-21)
hydrochlorofluorocarbon-22 (HCFC-22)

hydrochlorofluorocarbon-31 (HCFC-31)
hydrochlorofluorocarbon-121 (HCFC-121)
hydrochlorofluorocarbon-122 (HCFC-122)
hydrochlorofluorocarbon-123 (HCFC-123)
hydrochlorofluorocarbon-124 (HCFC-124)
hydrochlorofluorocarbon-131 (HCFC-131)
hydrochlorofluorocarbon-132 (HCFC-132)
hydrochlorofluorocarbon-133 (HCFC-133)
hydrochlorofluorocarbon-141 (HCFC-141)
hydrochlorofluorocarbon-142 (HCFC-142)
hydrochlorofluorocarbon-221 (HCFC-221)
hydrochlorofluorocarbon-222 (HCFC-222)
hydrochlorofluorocarbon-223 (HCFC-223)
hydrochlorofluorocarbon-224 (HCFC-224)
hydrochlorofluorocarbon-225 (HCFC-225)
hydrochlorofluorocarbon-226 (HCFC-226)
hydrochlorofluorocarbon-231 (HCFC-231)
hydrochlorofluorocarbon-232 (HCFC-232)
hydrochlorofluorocarbon-233 (HCFC-233)
hydrochlorofluorocarbon-234 (HCFC-234)
hydrochlorofluorocarbon-235 (HCFC-235)
hydrochlorofluorocarbon-251 (HCFC-251)
hydrochlorofluorocarbon-252 (HCFC-252)
hydrochlorofluorocarbon-253 (HCFC-253)
hydrochlorofluorocarbon-261 (HCFC-261)
hydrochlorofluorocarbon-262 (HCFC-262)
hydrochlorofluorocarbon-271 (HCFC-271)

H. Oily Waste

Those materials which are, or were, mixed with used oil and have become separated from that used oil. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, used oil and may be appropriately tested and discarded in a manner which is in compliance with other State and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that:

1. It is not prohibited in other State regulations or local ordinances
2. The amount generated is "de minimus" (a small amount)
3. It is the result of minor leaks or spills resulting from normal process operations
4. All free-flowing oil has been removed to the practical extent possible

Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, a hazardous waste determination must be performed prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

I. Pollution and Environmental Damage

Caused by the presence of chemical, physical, or biological elements or agents. Human health or welfare is adversely affected; ecological balances are unfavorably altered; the utility of the environment for aesthetic, cultural, or historical purposes degrades.

J. Regulated Waste

Those solid wastes that have specific additional Federal, State, or local controls for handling, storage, or disposal.

K. Sediment

Soil and other debris that have eroded and have been transported by runoff water or wind.

L. Solid Waste

Garbage, refuse, debris, sludge, or other discharged material, including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations. Types of solid waste typically generated at construction sites may include:

1. Green Waste

The vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, shrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be

re-located, or be re-used are not included.

2. Surplus Soil

Existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included.

3. Debris

Non-hazardous solid material generated during the construction, demolition, or renovation of a structure which exceeds 2.5 inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (e.g., cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

4. Scrap Metal

Scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

5. Recyclables

Materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company. Paint cans may not be included as recyclable if sold to a scrap metal company.

6. Hazardous Waste

By definition, to be a hazardous waste, a material must first meet the definition of a solid waste. Hazardous waste and hazardous debris are special cases of solid waste. They have additional regulatory controls and must be handled separately. They are thus defined separately in this document.

Material not regulated as solid waste are: nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

M. Waste Hazardous Material (WHM)

Any waste material which because of its quantity, concentration, or physical, chemical, or infectious characteristics may pose a substantial hazard to human health or the environment and which has been so designated. Used oil not containing any hazardous

waste, as defined above, falls under this definition.

N. Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (e.g., thermostats) and lamps (e.g., fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G
Solid Waste Management Plan; G

SD-06 Test Reports

Laboratory Analysis
Environmental Field Quality Control Reports

SD-07 Certificates

Regulatory Notifications; G

SD-08 Manufacturer's Instructions

Material Safety Data Sheets

SD-11 Closeout Submittals

Contractor 40 CFR Employee Training Records
Waste Determination Documentation
Disposal Documentation for Hazardous and Regulated Waste; G
Contractor Hazardous Material Inventory Log; G
Hazardous Waste/Debris Management

1.04 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Promptly conduct tests and procedures for the purpose of assessing whether construction operations are in compliance with Applicable Environmental Laws. Analytical work will be done by qualified laboratories; and where required by law, the laboratories must be certified.

1.05 CONTRACTOR'S ENVIRONMENTAL MANAGER

Appoint, in writing, an Environmental Manager for the project site. The Environmental Manager is responsible for overseeing the environmental goals for the project and implementing procedures for environmental protection.

The Environmental Manager can also be the Site Superintendent, Site Safety and Health Officer, or Contractor Quality Control (CQC) System Manager.

A. Duties

The Environmental Manager must be at the work site at all times and responsibilities include, but are not limited to, the following:

1. Compliance with applicable Federal, State, and local environmental regulations, including maintaining required documentation
2. Document that all environmental permits are obtained, maintained, and closed out
3. Implementation of the Environmental Protection Plan
4. Document compliance with Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal)
5. Document compliance with Hazardous Materials (storage, handling, and reporting) requirements, including, but not limited to:
 - a. Document that waste segregation and storage compatibility requirements are met
 - b. Inspect and manage Satellite Accumulation areas
 - c. Provide a list of personnel authorized add wastes to containers
 - d. Document that all Contractor personnel are trained in 40 CFR requirements in accordance with their position requirements;
 - e. Coordinate removal of waste containers
6. Implementation of the Waste Management Plan
7. Implementation of the Preparedness, Prevention, and Contingency Plan in accordance with Section 01 35 44 - SPILL CONTROL

B. Qualifications

Minimum 5 years construction experience on projects of similar size and scope; minimum 2 years experience with environmental procedures similar to those of this project; familiarity with environmental regulations applicable to construction operations.

1.06 ENVIRONMENTAL REGULATORY REQUIREMENTS

Be responsible for knowing Federal, State, and local regulatory requirements pertaining to legal disposal of all construction and demolition waste materials. Comply with all applicable regulations and maintain records of permits, licenses, certificates, and other environmental regulatory requirement correspondences. For Government's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with environmental regulations bearing on performance of the work.

A. Regulatory Notifications

Be responsible for all regulatory notification requirements in accordance with Federal, State and local regulations. In cases where the Site must also provide public notification, coordinate with the Contracting Officer. Submit copies of all regulatory notifications to the Contracting Officer prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all inclusive): demolition, renovation, remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.07 ENVIRONMENTAL PROTECTION PLAN

Prepare an Environmental Protection Plan and submit to the Contracting Officer as scheduled in Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS. Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental laws and regulations. At a minimum, address the following elements in accordance with this section:

A. Description of the Environmental Protection Plan

1. General overview and purpose
 - a. A brief description of each specific plan required by environmental permits.
 - b. The duties and level of authority assigned to the person(s) on the job site that oversee environmental compliance, including the identification and contact information for the Environmental Manager.
 - c. A copy of any standard or project specific operating procedures that will be used to effectively manage and protect the environment on the project site.
 - d. Communication and training procedures that will be used to convey environmental management requirements to contractor employees and subcontractors.
 - e. Emergency contact information (office phone number, cell phone number, and e-mail address).
2. General site information, including preconstruction description and photographs.
3. A letter signed by an officer of the firm appointing the Environmental Manager that states that he/she is responsible for managing and implementing the Environmental Program. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

4. Monitoring and quality control procedures, including a template for the Environmental Field Quality Control Reports.
5. Regulatory Notification and Permits
 - a. List what notifications and permit applications must be made. Demonstrate that those permits have been obtained or applied for by including copies of all applicable, environmental permits. The Plan will not be approved until all permits have been obtained.

B. Management of Natural Resources

1. Procedures to address land resources
2. Tree protection
3. Replacement of damaged landscape features
4. Temporary construction

C. Protection of the Environment from Waste Derived from Contractor Operations

1. Control and disposal of solid and sanitary waste.
2. Control and disposal of hazardous waste (Hazardous Waste Management Section)

This item will consist of the management procedures for all hazardous waste to be generated. As a minimum, include the following:

- a. Procedures to be employed to ensure a written waste determination is made for appropriate wastes which are to be generated
- b. Attach the Sampling and Analysis Plan as detailed in Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL
- c. Methods of hazardous waste accumulation/storage (i.e., in tanks and/or containers);
- d. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)
- e. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)
- f. Pollution prevention/hazardous waste minimization procedures
- g. Plans for the disposal of hazardous waste by permitted facilities
- h. Procedures to be employed to ensure all required employee training records are maintained.

1.08 PROTECTION OF AIR RESOURCES

A. Dust Control

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

1.09 ENVIRONMENTAL DEMONSTRATION AND TRAINING

Provide environmental training for workers performing work on the project site.

A. Contractor 40 CFR Employee Training Records

Prepare and maintain employee training records meeting applicable 40 CFR requirements. Submit these training records to the Contracting Officer at the conclusion of the project, unless otherwise directed.

1.10 ENVIRONMENTAL REQUIREMENTS FOR PRODUCTS

A. Material Safety Data Sheets (MSDS)

Submit an MSDS for each product specified in other sections or required by OSHA to have an MSDS. Prepare MSDS within the previous five years. Include information for MSDS Sections 1 through 16 in accordance with ANSI Z400.1/Z129.1 and as follows:

1. Section 11: Include data used to determine the hazards cited in Section 3. Identify acute data, carcinogenicity, reproductive effects, and target organ effects. Provide written description of the process used in evaluating chemical hazards relative to preparation of the MSDS.
2. Section 12: Include data regarding environmental impacts during raw materials acquisition, manufacture, and use. Include data regarding environmental impacts in the event of an accidental release.
3. Section 13: Include data regarding the proper disposal of the chemical. Include information regarding recycling and reuse. Indicate whether or not the product is considered to be "hazardous waste" according to 40 CFR 261.
4. Section 14: Identify hazard class for shipping.
5. Section 15: Identify Federal, State, and local regulations applicable to the material.
6. Section 16: Include additional information relative to recycled content, biobased content, and other information regarding environmental and health impacts. Identify the date MSDS was prepared.

PART 2 PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

Consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and disposal of products, and provide products and materials with the least effect on the environment.

A. Prohibited Materials

The use of the following materials is prohibited:

1. Products containing asbestos.
2. Products containing urea formaldehyde.
3. Products containing polychlorinated biphenyls.
4. Products containing chlorinated fluorocarbons.
5. Solder or flux containing more than 0.2 percent lead and domestic water pipe or pipe fittings containing more than 8 percent lead.
6. Paint containing more than 0.06 percent lead.

B. Packaging

Where Contractor has the option to provide one of the listed products or equal, give preference to products with minimal packaging and easily recyclable packaging, and to manufacturers with policies that take back product packaging.

C. Substitutions

Notify the Contracting Officer of materials, equipment, or products that meet the aesthetic and programmatic intent of Contract Documents, but are more environmentally responsible than materials, equipment, or products specified or indicated in the Contract Documents. Submit the following for initial review by the Contracting Officer:

1. Product data including manufacturer's name, address, and phone number.
2. Description of environmental advantages of proposed substitution over specified product.

PART 3 EXECUTION

3.01 PROTECTION OF NATURAL RESOURCES

Comply with applicable regulations and these specifications. Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition as approved by the Contracting Officer upon completion of work. Confine construction activities to within the limits of the work indicated or specified. If the work is near streams, lakes, or other waterways, conform to the national permitting requirements of the Clean Water Act. Where violation of environmental procedures requirements

will irreversibly damage the site, documentation of progress at weekly intervals is required.

A. General Disturbance

Confine construction activities to work area limits indicated on the Drawings. Remove debris, rubbish, and other waste materials resulting from construction operations from site. Transport materials and dispose of them off site to areas that are approved for disposal by governing authorities having jurisdiction. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways. Remove spillage and sweep, wash, or otherwise clean project site, streets, or highways. Burning is prohibited.

B. Water Resources

Comply with requirements of the NPDES and the applicable State Pollutant Discharge Elimination System (SPDES). Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Store and service construction equipment at areas designated for collection of oil wastes. Prevent ponding of stagnant water conducive to mosquito breeding habitat. Prevent run-off from site during demolition and construction operations. Equipment will not be permitted to ford live streams.

C. Land Resources

Prior to construction, identify land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and landforms without permission from the Contracting Officer. Coordinate protection practices with work specified in Division 2 EXISTING CONDITIONS.

1. Erodible Soils

Plan and conduct earthwork to minimize the duration of exposure of unprotected soils, except where the constructed feature obscures borrow areas, quarries, and waste material areas. Clear areas in reasonably sized increments only as needed to use the areas developed. Immediately finish the earthwork brought to a final grade, as indicated or specified. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.

2. Tree and Plant Protection

Prior to start of construction, tag each tree and plant scheduled to remain. In the event of damage to tree or plant, the Government may, at the Contracting Officer's discretion, deduct the indicated value of the damaged tree or plant from the Contract Sum.

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor will be responsible for any resultant damage.

Protect existing trees which are to remain and which may be injured, bruised,

defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed. Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before replacement.

3.02 SOLID WASTE MANAGEMENT PLAN

Provide to the Contracting Officer written notification of the quantity of solid waste/debris that is anticipated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled.

A. Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers which are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Recycling is encouraged and can be coordinated with the Contracting Officer and the activity recycling coordinator. Remove all solid waste (including non-hazardous debris) and dispose off-site at an approved landfill. Solid waste disposal off-site must comply with most stringent Federal, State, and local requirements including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

Manage spent hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, as per environmental law.

1. Disposal Documentation for Hazardous and Regulated Waste

Manifest, pack, ship and dispose of hazardous or toxic waste and universal waste that is generated as a result of construction in accordance with the generating facilities generator status.

Submit a copy of the applicable EPA and or State permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifest must be reviewed, signed, and approved before the Contractor may ship waste.

3.03 WASTE DETERMINATION DOCUMENTATION

Complete a Waste Determination form (provided at the Pre-Construction Conference) for all contractor derived wastes to be generated. Base the waste determination upon either a constituent listing from the manufacturer used in conjunction with consideration of the process by which the waste was generated, EPA approved analytical data, or laboratory analysis (Material Safety Data Sheets (MSDS) by themselves are not adequate). Attach all support documentation to the Waste Determination form. As a minimum, a Waste Determination form must be provided for the following wastes (this listing is not all inclusive): oil and latex based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and all containers of the original materials.

3.04 POLLUTION PREVENTION/HAZARDOUS WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of hazardous waste. Include

procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the Environmental Protection Plan.

3.05 WHM/HW MATERIALS PROHIBITION

Do not dispose of waste hazardous material or hazardous waste on-site. Do not bring hazardous material onto the Site that does not directly relate to requirements for the performance of this contract. The government is not responsible for disposal of Contractor's waste material brought on the job site and not required in the performance of this contract. The intent of this provision is to dispose of that waste identified as waste hazardous material/hazardous waste as defined herein that was generated as part of this contract and existed within the boundary of the Contract limits and not brought in from offsite by the Contractor. Incidental materials used to support the contract including, but not limited to aerosol cans, waste paint, cleaning solvents, contaminated brushes, rags, clothing, etc. are the responsibility of the Contractor. The list is illustrative rather than inclusive. The Contractor is not authorized to discharge any materials to sanitary sewer, storm drain, or to the river or conduct waste treatment or disposal on-site without written approval of the Contracting Officer.

3.06 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the APP and SSHP. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Submit a MSDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on site. Typical materials requiring MSDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Hazardous materials shall be utilized in a manner that will minimize the amount of hazardous waste that is generated. Verify and document that all containers of hazardous materials have NFPA labels or their equivalent. Certify that all hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste per 40 CFR 261.

A. Contractor Hazardous Material Inventory Log

Submit the "Contractor Hazardous Material Inventory Log" (found at: http://www.wbdg.org/ccb/NAVGRAPH/hazardous_material_inventory_log.pdf), which provides information required by (EPCRA Sections 312 and 313) along with corresponding Material Safety Data Sheets (MSDS), to the Contracting Officer at the start and at the end of construction (30 days from final acceptance), and update no later than January 31 of each calendar year during the life of the contract. Keep copies of the MSDS for hazardous materials on site at all times. At the end of the project, provide the Contracting Officer with copies of all of these MSDS, and the maximum quantity of each material that was present at the site at any one time, the dates the material was present, the amount of each material that was used during the project, and how the material was used.

3.07 PETROLEUM PRODUCTS AND REFUELING

Conduct the fueling and lubricating of equipment and motor vehicles in a manner that protects against spills and evaporation. Manage all used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while on-site exhibits a characteristic of hazardous waste. Used oil containing 1000 parts per million of solvents will be considered a hazardous waste and disposed of at Contractor's expense. Used oil mixed with a hazardous waste will also be considered a hazardous waste.

A. Oily and Hazardous Substances

Prevent oil or hazardous substances from entering the ground, drainage areas, or navigable waters. In accordance with 40 CFR 112, surround all temporary fuel oil or petroleum storage tanks with a temporary berm or containment of sufficient size and strength to contain the contents of the tanks, plus 10 percent freeboard for precipitation. The berm will be impervious to oil for 72 hours and be constructed so that any discharge will not permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Provide general secondary containment for oil transfer operations as required by 40 CFR 112.7.

B. Inadvertent Discovery of Petroleum Contaminated Soil or Hazardous Wastes

Immediately notify the Contracting Officer if petroleum contaminated soil or suspected hazardous waste is found during construction that was not identified in the contract documents. Do not disturb this material until authorized by the Contracting Officer.

3.08 RELEASES/SPILLS OF OIL AND HAZARDOUS SUBSTANCES

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated by environmental law. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release in accordance with Section 01 35 44 - SPILL CONTROL.

3.09 CONTROL AND MANAGEMENT OF HAZARDOUS WASTES**A. Facility Hazardous Waste Generator Status**

Characterize wastes generated during construction of the Groundwater Treatment Plant to determine if wastes are hazardous. If hazardous wastes are generated, determine the appropriate generator status (e.g. Large Quantity Generator, Small Quantity Generator, Conditionally Exempt-Small Quantity Generator). All work conducted within the boundaries of this activity must meet the regulatory requirements of this generator designation. Comply with all provisions of Federal, State, and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of all construction derived wastes.

B. Hazardous Waste/Debris Management

Identify all construction activities which will generate hazardous waste/debris. Provide a documented waste determination for all resultant waste streams. Hazardous waste/debris will be identified, labeled, handled, stored, and disposed of in accordance with all Federal, State, and local regulations including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Hazardous waste will also be managed in accordance with the approved Hazardous Waste Management Section of the Environmental Protection Plan. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities will be identified as being generated by the Government.

Prior to removal of any hazardous waste from the Site, all hazardous waste manifests must be signed by the Contracting Officer. No hazardous waste must be brought onto the

Site. Provide to the Contracting Officer a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

1. Regulated Waste Storage/Satellite Accumulation/90 Day Storage Areas

If the work requires the temporary storage/collection of regulated or hazardous wastes, the Contractor will request the establishment of a Regulated Waste Storage Area, a Satellite Accumulation Area, or a 90 Day Storage Area at the point of generation. The Contractor must submit a request in writing to the Contracting Officer providing the following information:

<u>Contract Number:</u>	
<u>Contractor:</u>	
<u>Haz/Waste or Regulated Waste POC:</u>	
<u>Phone Number:</u>	
<u>Type of Waste:</u>	
<u>Source of Waste:</u>	
<u>Emergency POC:</u>	
<u>Phone Number:</u>	
<u>Location of the Site:</u>	

(Attach Site Plan to the Request)

Attach a waste determination form. Allow ten working days for processing this request. Barricade the designated area where waste is being stored and provide a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

2. Sampling and Analysis of HW

a. Waste Sampling

Sample waste in accordance with EPA 530/F-93/004. Each sampled drum or container will be clearly marked with the Contractor's identification number and cross referenced to the chemical analysis performed.

b. Laboratory Analysis

Follow the analytical procedure and methods in accordance with 40 CFR 261. Provide all analytical results and reports performed to the Contracting Officer

c. Analysis Type

Identify waste hazardous material/hazardous waste by analyzing for the following properties as a minimum: ignitability, corrosiveness, total chlorides, BTU value, PCBs, TCLP for heavy metals, and cyanide.

3. Hazardous Waste Disposal

Do not dispose or abandon hazardous, toxic, or universal waste or hazardous material on-site. Unless otherwise noted in this contract, the Government is not responsible for disposal of Contractor generated waste material. The disposal of incidental materials used to accomplish the work including, but not limited to aerosol cans, waste paint, cleaning solvents, contaminated brushes, rags, clothing, etc. are the responsibility of the Contractor. The list is illustrative rather than inclusive.

Do not discharge any materials to sanitary sewer, storm drain, or water way or conduct waste treatment or disposal on-site without written approval of the Contracting Officer.

Control of stored waste, packaging, sampling, analysis, and disposal will be determined by the details in the contract. The requirements for jobs in the following paragraphs will be used as the guidelines for disposal of any hazardous waste generated.

a. Responsibilities for Contractor's Disposal

Contractor responsibilities include any generation of WHM/HW requiring Contractor disposal of solid waste or liquid.

- (1) Provide all service necessary for the final treatment/disposal of the hazardous material/waste in accordance with all local, State and Federal laws and regulations, and the terms and conditions of the contract within sixty (60) days after the materials have been generated. These services will include all necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal, and/or transportation), including manifesting or completing waste profile sheets, equipment, and the compilation of all documentation.
- (2) Contain all waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 270, 40 CFR 272, 40 CFR 273, 40 CFR 279, 40 CFR 280, and 40 CFR 761.
- (3) Obtain a representative sample of the material generated for each job done to provide waste stream determination.
- (4) Analyze each sample taken and provide analytical results to the Contracting Officer. Provide two copies of the results.
- (5) Determine the DOT proper shipping names for all waste (each container requiring disposal) and will demonstrate how this determination is developed and supported by the sampling and analysis requirements contained herein to the Contracting Officer.
- (6) The Contractor must provide the emergency response person and

his/her telephone number manned 24 hours per day/7 days per week during the shipment period.

b. Contractor Disposal Turn-In Requirements

For any waste hazardous materials or hazardous waste generated which requires the Contractor to dispose of, the following conditions must be complied with in order to be acceptable for disposal:

- (1) Drums compatible with waste contents and drums meet DOT requirements for 49 CFR 173 for transportation of materials.
- (2) Drums banded to wooden pallets. No more than three (3) 55 gallon drums to a pallet, or two (2) 85 gallon over packs.
- (3) Band using 1-1/4 inch minimum band on upper third of drum.
- (4) Recovery materials label (provided by Code 106.321) located in middle of drum, filled out to indicate actual volume of material, name of material manufacturer, other vendor information as available.
- (5) Always have three (3) to five (5) inches of empty space above volume of material. This space is called 'outage'.

4. Universal Waste/e-Waste Management

Manage universal waste including but not limited to some mercury containing building products such as florescent lamps, mercury vapor lamps, high pressure sodium lamps, CRTs, batteries, aerosol paint containers, electrical equipment containing PCBs, and consumed electronic devices, in accordance with applicable environmental law and installation instructions.

C. Class I and II ODS Prohibition

Class I and II ODS in pure or blended form as defined and identified herein must not be used in the performance of this Contract, nor be provided as part of the equipment except for the use of servicing existing government owned equipment. This prohibition will be considered to prevail over any other provision, specification, drawing, or referenced documents.

1. Recycling Requirements

- a. Recycle used refrigerants and ozone depleting substances generated during the performance of this contract to the maximum extent practicable to minimize used refrigerant and ozone depleting substance disposal as HW.
- b. Test, collect, transfer, recycle, and/or arrange for shipping and proper disposal of used refrigerants and ozone depleting substances generated during the performance of work under this contract. The Contractor is responsible for all associated costs.
- c. Package and turn over to the Government for recycling upon the completion of the work covered by this contract, any and all Class I ODS and R-22 recovered by the Contractor as part of this contract. Arrange for recycling

of used refrigerants not turned over to the government, at a licensed refrigerant recycler approved by the Contracting Officer.

2. EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' place of business and carry as a wallet card by the technician, as provided by environmental law.

3. Accidental Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported to the Contracting Officer.

3.10 NOISE

Make the maximum use of low-noise emission products, as certified by the EPA. Confine well drilling and in-situ chemical reduction barrier installation

to the period between 8 a.m. and 5 p.m., Monday through Friday, exclusive of holidays, unless otherwise specified.

3.11 FIELD QUALITY CONTROL

Comply with requirements of agencies having jurisdiction and as specified herein. Provide field practices, shipping, and handling of samples in accordance with ASTM D4840. Provide Environmental Field Quality Control Reports in accordance with approved Environmental Protection Plan. Attach completed Environmental Field Quality Control Report to the associated date's Contractors' Quality Control Report which is detailed in Section 01 45 00.00 10 - QUALITY CONTROL.

-- End of Section --

SECTION 01 35 44

SPILL CONTROL

PART 1 GENERAL

1.01 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preparedness, Prevention, and Contingency Plan; G

1.02 PREPAREDNESS, PREVENTION, AND CONTINGENCY PLAN

Prepare a comprehensive Preparedness, Prevention, and Contingency Plan and submit to the Contracting Officer as scheduled in Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS. Include, at a minimum, the following information:

A. Spill Prevention

Provide procedures the Contractor and Subcontractors will follow to prevent the occurrence of spills to on-site or off-site media, roadways and/or property.

B. Training

Training that personnel will receive covering the approved Preparedness, Prevention and Contingency plan.

C. Spill Response

Procedures to follow in response to a spill, including at a minimum, the following:

1. Solid Spills

Immediately remove and place contaminated soils into staging piles and cover; identify the pile as contaminated; test the soil for disposal requirements; if appropriate, dispose of at an approved off-site treatment, storage and disposal facility as specified in Section 02 81 00 - TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

2. Liquid and/or Sludge Spills

Absorb with sand, fill, or other absorbent material and dispose of the absorbent/spill mixture in the manner specified in Part 1.02 C.1: Solid Spills.

3. Reporting Requirements

Follow all Federal, State, and local reporting procedures, in addition to the

immediate notification of the Contracting Officer and reporting under the applicable requirements of the Clean Air and Clean Water Acts:

a. Spill Directly Contaminates Surface Water, Sewers, or Drinking Water Supplies

Notify the Contracting Officer immediately and initiate cleanup measures where a spill directly contaminates surface water, sewers, or drinking water supplies.

b. All Other Spills

Spills which are not addressed above, must be cleaned in accordance with the procedures included in the Preparedness, Prevention and Contingency Plan. Notify the Contracting Officer.

4. Determination Of Spill Area In The Absence Of Visible Traces

Develop and use a statistically based sampling scheme approved by the Contracting Officer to determine the boundaries of the spill where there are insufficient visible traces, yet there is evidence of a leak or spill. The Contracting Officer must approve the final determination of the spill area.

5. Equipment Requirements

Provide the appropriate equipment and materials for any unexpected spill or discharges to be kept on-site at all times during Site work activities. Provide the location of where the spill control equipment and materials will be stored.

6. Discharges

Take the following actions if a discharge of material stored in an impoundment, tank, container or from a pipe break or leak occurs, to reduce potential migration to adjacent properties:

a. Notification

Immediately notify the Contracting Officer and other appropriate authorities.

b. Control Measures

Take immediate measures to control the discharge within the Site boundaries or beyond the Site boundaries, if necessary. This will include the following actions:

- a. Contain and eliminate the discharge, if possible
- b. Remove or retrieve any discharged liquids or sludges, if possible
- c. Isolate the hazardous area and deny entry to unnecessary personnel
- d. Do not allow anyone to touch the discharged materials

- e. Other actions, as needed

7. Decontamination Procedures

Decontamination procedures may be required after cleanup to eliminate traces of the substance spilled or reduce it to an acceptable level as determined by the Contracting Officer. Complete cleanup may require removal of contaminated soils. Personnel decontamination includes cleansing or disposing of clothing and equipment. All contaminated materials including solvents, cloth, soil, and wood that cannot be decontaminated must be properly containerized, labeled, and properly disposed.

D. Equipment

Equipment to be utilized in response to a spill, including identified equipment, materials, and personal protective equipment that will be maintained on-site for response to a spill or release.

E. Emergency Contacts

A listing of emergency contacts and telephone numbers for use in the event of a spill or release.

F. Spill Documentation

At the completion of spill or discharge cleanup, document the cleanup with records and certification of decontamination. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. The record and certification is to consist of the following:

1. Identification of the source of the spill
2. Estimated or actual date and time of the spill occurrence
3. Date and time cleanup was completed or terminated (if cleanup was delayed by emergency or adverse weather, the nature and duration of the delay)
4. A brief description of the spill location
5. Sampling data taken prior to the cleanup and a brief description of the sampling methodology used to establish the spill boundaries
6. A brief description of the solid surface cleaned and the wash/rinse method used
7. Approximate depth of soil excavation and the amount of soil removed
8. A signed certification statement stating that the cleanup requirements have been met and that the information contained in the record is true
9. Copies of the documents and certifications which were submitted to the Contracting Officer for review and acceptance.

PART 2 PRODUCTS

2.01 MATERIALS

Provide and maintain any and all materials required for spill control and/or spill cleanup for the duration of construction activities.

PART 3 EXECUTION

3.01 SPILL CONTROL

In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release in accordance with the Preparedness, Prevention, and Contingency Plan.

Contain and clean up these spills without cost to the Government. If Government assistance is requested or required, the Contractor will reimburse the Government for such assistance. Reimburse the government for all costs incurred including sample analysis materials, equipment, and labor if the government must initiate its own spill cleanup procedures, for Contractor responsible spills, when:

1. The Contractor has not begun spill cleanup procedure within one hour of spill discovery/occurrence, or
2. If, in the government's judgment, the Contractor's spill cleanup is not adequately abating life threatening situation and/or is a threat to any body of water or environmentally sensitive areas.

-- End of Section --

SECTION 01 35 45.00 10

CHEMICAL DATA QUALITY CONTROL

PART 1 GENERAL

1.01 SCOPE

This section covers requirements for the Contractor's Chemical Data Quality Control for long-term treatment and monitoring at the Peninsula Boulevard Groundwater Plume Superfund Site. This section is to be used in the preparation of a Sampling and Analysis Plan (SAP) including a Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), laboratory procurement, monitoring of laboratory performance, data validation, data reporting, and preparation of chemical-related reports, as defined in this section. The SAP is to contain the necessary technical detail and directions for all sampling and field measurements and to specify all quality assurance (QA) and quality control (QC) procedures required for planning, implementation and assessment.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NYSDEC DIVISION OF ENVIRONMENTAL REMEDIATION (DER)

NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 200-1-3 (2001) Engineering and Design -- Requirements for the Preparation of Sampling and Analysis Plans

EM 200-1-6 (1997) Environmental Quality -- Chemical Quality Assurance for HTRW Projects

ER 1110-1-263 (1998) Engineering and Design -- Chemical Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD Quality Systems Manual (QSM) for Environmental Laboratories. Version 5.0, July 2013

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Region 2 Policy for ICP-AES Data Validation, SOP HW-2a. Revision 15, December 2012.

EPA Region 2 Policy for ICP-MS Data Validation, SOP HW-2b. Revision 15, December 2012.

EPA Region 2 Policy for Mercury and Cyanide Data Validation, SOP HW-2c. Revision 15, December 2012.

EPA Region 2 Policy for Implementing the National Strategy for Procuring Analytical Services for all OSWER Programs, SOP HW-32. Revision 7, August 2009.

EPA Region 2 Policy for Contract Laboratory Program Statement of Work for Organic Analysis of Low/Medium Concentration of Volatile Organic Compounds SOM01.2 Data Validation, SOP HW-33. Revision 3, March 2013.

EPA Region 2 Policy for Contract Laboratory Program Statement of Work for Organic Analysis of Trace Concentration of Volatile Organic Compounds SOM01.2 Data Validation, SOP HW-34. Revision 3, February 2013.

EPA 240/B-06/001 Guidance on Systematic Planning using Data Quality Objectives Process (QA/G-4), February 2006.

EPA/240/R-02/009 EPA Guidance for Quality Assurance Project Plans. EPA QA/G5. December 2002.

EPA-240-B-01/003 EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. March 2001.

EPA SW-846 (Rev 6; updates I, II, IIA, IIB, IIIA, IIIB, IVA, and IVB) Test Methods for Evaluating Solid Waste (Vol. IA, IB, IC, and II), February 2007

EPA 505/B-04/900A Intergovernmental Data Quality Task Force (IDQTF), Uniform Federal Policy for Quality Assurance Project Plans (UFP QAPP) Part 1 - Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. March 2005

EPA 505/B-04/900B Intergovernmental Data Quality Task Force (IDQTF), Uniform Federal Policy for Quality Assurance Project Plans (UFP QAPP) Part 2B - Quality Assurance/Quality Control Compendium: minimum QA/QC Activities. March 2005

EPA 505/B-04/900C Intergovernmental Data Quality Task Force (IDQTF), Uniform Federal Policy for Quality Assurance Project Plans (UFP QAPP) Part 2A Workbook for UFP for UFP-QAPP. March 2005

EPA 540-P-87-001 A Compendium of Superfund Field Operations Methods. December 1987

EPA 540-R-10-011 EPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2010

EPA 540-R-08-01 EPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review, June 2008

EPA 540-R-09-03 Contract Laboratory Program Guidance for Field Samplers, January 2011

EPA 600/R-04/003 National Environmental Laboratory Accreditation Conference's (NELAC) Standards, Chapter 5 - Quality Systems, June 2003. Or the 2009 NELAC Institute standards if already implemented by the applicable state accrediting body.

EPA 600/4-79/020 Test Methods for Chemical Analysis of Water and Wastes, March 1983.

EPA 600/R-96-055 Guidance for the Data Quality Objectives Process, September 1994.

Directive 9240.0-2C Analytical Services Tracking System (ANSETS) for reporting non-CLP analytical services, November 2002.

Directive 9240.0-05A EPA Specifications and Guidance for Contaminant-Free Sample Containers. EPA 540/R-93/051. December 1992. Office of Solid Waste and Emergency Response.

EPA Directive 9200.1-103 Scribe as tracking software for use on CLP analytical services. November 2010. http://www.ertsupport.org/scribe_home.htm

USEPA Contract Laboratory Program Statement of Work of Inorganic Superfund Methods. Multi-Media, Multi-Concentration (ISM01.2). January 2010. Note: ISM01.3 includes ISM01.2 and modifications. A new SOW is not available but a summary of changes "Modifications Updating ISM01.2 to ISM01.3" and technical requirements document is available on the Superfund CLP website.

USEPA Contract Laboratory Program Statement of Work of Organics Analysis. Multi-Media, Multi-Concentration (SOM01.1). April 2007. Note: SOM01.2 includes SOM01.1 and modifications. A new SOW is not available but a modifications document is available on the Superfund CLP website.

EPA Region 2 Electronic Data Deliverable Comprehensive Specification Manual (current edition). <http://www.epa.gov/region2/superfund/medd.htm>.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 261

Identification and Listing of Hazardous Waste

1.03 ACRONYMS

Clearly define all acronyms that pertain to chemical data quality control for all contract related products and communications.

1.04 MEASUREMENT AND PAYMENT

Separate payment will not be made for providing and maintaining the chemical data quality requirements including chemical data quality management, chemical data validation, minimum chemical data reporting requirements, and chemical data quality submittal requirements; include these costs in the applicable unit prices or lump sum prices contained in the bidding schedule.

1.05 CHEMISTRY REQUIREMENTS

Chemical Data Quality Control (CDQC) is defined in ER 1110-1-263; this ER, which integrates USACE guidance on the subject, is supplemented by EM 200-1-6 for detail technical guidance on CDQC. Tables and charts defining Design Analysis (DA), ROD, and remedial technology specific chemistry will be according to or consistent with EM 200-1-3.

A. Data Quality Objectives (DQO)

Perform sample acquisition, chemical analysis, and chemical parameter measurements so that the resulting data meet and support data use requirements. Acquire, document, verify, and report the chemical data to ensure that the specified precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) requirements are achieved. The UFP-QAPP is to comply with the DQO process requirements as

specified in EPA 600/R-96/055.

B. Sampling Objectives

Acquire samples and perform chemical parameter measurements in such a manner that the resulting data meets and supports data use requirements. Both definitive and field screening data are anticipated for this project, as defined by the EPA Guidance for Systematic Planning (EPA 240/B-06/001). Field screening quality data are to be generated for health and safety purposes, but can be used to identify media or samples that may be subject to further analysis. Definitive level quality data are to be used to verify that the effluent samples meet the required discharge requirements, and to verify that the site cleanup criteria have been or will be met.

Definitive quality data are to be acquired, documented, verified and reported to ensure that the specified data quality indicators (DQIs) for PARCSS measurement performance requirements are achieved. Sampling objectives have been discussed in detail to ensure that the data obtained will be of sufficient quality and quantity to meet the DQOs. All required sampling and their respective frequency are shown in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION.

C. Real-Time Instrumental Measurement Samples

Real-time instrumental measurements are to be analyzed onsite for chemical parameters according to Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION.

1.06 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Analytical Service Request Form
Quality Control Plan Additional Requirements; G
Sampling and Analysis Plan; G

SD-06 Test Reports

ANSETS Data Requirement Form; G
Trip Report
Analytical Data
Chemical Data Report; G

1.07 QUALITY ASSURANCE ELEMENTS

Follow the QA/QC elements necessary to monitor and ensure the quality of chemical data produced.

A. Analytical Testing Laboratories

1. General

Comply with the Superfund Field and Analytical Services Teaming Advisory Committee (FASTAC) policy as detailed in SOP HW-32 in selecting and implementing analytical services for this project. This policy requires use of the tiered decision tree for procuring Superfund analytical services for all non-time critical data collection projects.

The decision tree is as follows:

Tier 1: EPA Region II Division of Environmental Science and Assessment (DESA) Laboratory including Environmental Services Assessment Team (ESAT) support

Tier 2: National Analytical Services Contract Laboratories Program (CLP)

Tier 3: Region Specific Analytical Services (SAS) Contract laboratories

Tier 4: Contractor, Interagency Agreement (IAGs) and Field Contractor Subcontract laboratories

Submit the analytical service request form to the EPA Regional Sample Control Center (RSCC) a minimum of two weeks prior to mobilization of the sampling event. Provide bottleware for any analysis performed by DESA/CLP.

Propose analytical subcontract laboratories in the UFP-QAPP for analytical services that cannot be accommodated through the DESA and/or CLP. The use of subcontract laboratories is to be approved by the EPA's Regional Project Manager (RPM) and RSCC. Provide justification for use of a subcontractor laboratory to the EPA RPM along with the analytical services request indicating the required analyses, turnaround-times, special requests, etc. Document that the subcontract laboratory meets the certification requirements listed in Paragraph SUBCONTRACT LABORATORY CERTIFICATION.

2. Subcontracted Laboratory Analytical Requirements

Provide chemical analyses for all parameters by methods specified in the project specification or UFP-QAPP to achieve the project DQOs.

3. Subcontract Laboratory Certification

Environmental laboratory services are to be provided only by laboratories compliant with the most recently published version of the Department of Defense (DoD) Quality Systems Manual (QSM) including the National Environmental Laboratory Accreditation Committee (NELAC) Standard Chapter 5 and Appendix requirements (EPA 600/R-04/003); holding a current National Environmental Laboratory Accreditation Program (NELAP) accreditation for all appropriate fields-of-testing; and certified by the State of New York. Before testing services can be performed by the laboratory, verify the candidate laboratory's acceptability by reviewing their certifications. NELAP accreditation information is to be provided annually.

All laboratories must demonstrate the ability to generate acceptable results from the analysis of proficiency-testing (PT) sample(s), subject to availability, using each applicable method in the specified matrix. Upon request, laboratories must make available to the Government, the results of all PT samples analyzed by the laboratory during the period of performance. All laboratory documentation shall be made available to the Government Chemist.

Notify the Government immediately of change in status of laboratory operations that may affect on-going compliance with these requirements. The USACE/EPA may, at any time, conduct audits (including requests for pertinent data or information) that support an environmental laboratory's self-declaration of compliance with this policy. If the USACE/EPA finds the laboratory is in non-compliance; the Contractor is to utilize alternate, compliant laboratory services until such time as compliance is again demonstrated. Before performing environmental testing, provide the laboratory access to the approved UFP-QAPP.

4. Subcontracted Laboratory Performance

Provide oversight to ensure continued acceptable analytical performance and establish a procedure to address data deficiencies noted by review and/or quality control sample results. Provide and implement a mechanism for providing analytical laboratories with the UFP-QAPP, for monitoring analytical performance and for ensuring corrective action procedures are implemented. Acquire analytical services with NELAP accredited and State of New York certified laboratories.

B. Contractor QC Sample Collection and Analysis

Collect and analyze quality control samples in accordance with EPA's Contract Laboratory Program Guidance for Field Samplers (EPA 540/R-07/06) and other guidance documents and the Contractor's approved UFP-QAPP. Quality control samples are to be collected as described in the approved UFP-QAPP. The following summarizes the minimum QC sampling requirements:

1. Collect field duplicates at a rate of at least one per every 20 samples to assess the overall precision of the field sampling technique.
2. Include one trip blank with each daily shipment that contains aqueous samples collected for volatile organic compound (VOC) analysis to verify the presence or absence of cross contamination in VOC samples during handling and shipment from the field to the laboratory.
3. Collect one field (or equipment/rinsate) blank at a frequency of one per decontamination event, not to exceed one per day, for each equipment type and for each sample matrix to assess the effectiveness of equipment decontamination if non-disposable or non-dedicated equipment is used.
4. Place one cooler temperature indicator or "temperature blank" in each cooler containing samples (solid and aqueous) for analysis to verify that samples have been maintained at 0-6 degrees C.
5. Collect one matrix spike/spike duplicate or matrix duplicate (MS/MSD or MD) at a rate of one per sample delivery group (SDG), as defined by EPA's Contract Laboratory Program Guidance for Field Samplers (Appendix F) to demonstrate the

accuracy of laboratory analysis. MS/MSDs are not required for VOC and semi-volatile organic compound (SVOC) analysis in EPA Region II.

C. Documentation of Sample Collection and Analysis

1. CLP Laboratory

Submit a trip report to the EPA RSCC within seven days of collection of the final sample in a CLP Case for samples analyzed by a CLP laboratory. The trip report includes sample locations, dates of collection and shipment, identification of QC samples, and names of laboratories to which samples were submitted. Submit the trip report via e-mail or hardcopy mail to the RSCC coordinator, Mr. Adly Michael (Michael.Adly@epamail.epa.gov) at the EPA Region 2 office, MS215, 2890 Woodbridge Avenue, Edison, New Jersey 08837.

2. Subcontract Laboratory

Submit an ANSETS Data Requirement Form documenting analytical services provided by any subcontracted laboratory. The form includes the laboratory name and location, number of samples, analytical methods, and costs. Submit the ANSETS Form to EPA RSCC at the end of each event, by the 5th of the next month following sample collection, via e-mail to Adly Michael (Michael.Adly@epamail.epa.gov), Jennifer Feranda (Feranda.Jennifer@epamail.epa.gov), and Robert Toth (Toth.Robert@epamail.epa.gov). Submit ANSETS Form to the Government Chemist for review prior to submission to EPA RSCC.

D. Data Validation

Samples analyzed by DESA/CLP will be validated by EPA or DESA and separate validation will not be required by the Contractor. Assess usability of DESA/CLP data as part of the Chemical Data Report.

Validate analytical data only for samples analyzed by the Contractor's subcontract laboratory. Evaluate the inorganic and organic data in accordance with EPA Data Validation SOPs (HW-2a, -2b, -2c, -33, and -34). If SOPs are unavailable please defer to the EPA Contract Laboratory Program National Functional Guidelines (Inorganic - EPA 540-R-10-011 and Organic - EPA 540-R-008-001) for data validation procedures. Assess items listed below as part of the data validation. The data validation criteria are to be consistent with project DQOs and discussed in the approved UFP-QAPP. Prepare a data validation report, which includes a summary of the independent data reviewer's findings. The summary consists of a table listing each QC result outside of established criteria, the established criteria, and the validation actions. Include comments on how these data affect the validity of analytical results of the samples including data qualifiers used. The data validation report includes, but is not limited to, the following parameters:

1. Data completeness
2. Method blank and field blanks
3. Holding time including sample integrity
4. Surrogate recovery
5. Instrument calibration
6. Matrix spike
7. Continuing calibration verification
8. Laboratory and field duplicate results

9. Laboratory control samples
10. Verification of sample results

Have the laboratory data validated by an organization independent of the organization generating the data.

Prepare a data validation report, which includes a summary of contract laboratory's QC analysis results. The summary consists of a table listing each QC result outside of established criteria. List the established criteria next to the result. QC results within criteria do not have to be listed. Include comments on how these data affect the validity of analytical results of the samples including data qualifiers used. Assess usability of the data as part of the Chemical Data Report.

1.08 ANALYTICAL DATA

A. Hard Copy

Re-produce and provide the chemistry data packages to the Contracting Officer no later than 4 weeks after receipt of the analytical data package from the subcontract laboratory. The chemistry data package is to contain information to demonstrate that the project's DQOs have been fulfilled. The hardcopy data package may be submitted as a portable document file (PDF).

B. Electronic Data Deliverable

Submit all laboratory data to EPA in the Staged Electronic Data Deliverable (SEDD) format. Details on the SEDD format are provided in the SEDD Version 5.0 (or most recent version) specification located at <http://www.epa.gov/fem/sedd.htm>.

Prepare and submit to EPA a final EDD for final samples and monitoring wells prepared in accordance with the procedures and requirements set forth in the Comprehensive Specification Manual (current edition) and as described at the following website: <http://www.epa.gov/region2/superfund/medd.htm>.

The EDD includes final sample information including sample locations (horizontal coordinates and surface elevation) and sample results. The EDD also includes an updated geo-referenced electronic base map in AutoCAD drawing exchange (DXF) format showing site features, monitoring well locations, and updated site grades (if applicable).

Provide the Government with a copy of the transmittal letter for all EDD submissions, identifying what data were provided in the EDD. Provide the Government with a copy of the notice from EPA that the EDD submittal was successfully uploaded.

1.09 QUALIFICATIONS

A. Chemical Quality Control Officer

As a minimum, the Contractor's Chemical Quality Control Officer is to have: a Bachelor of Science degree in Chemistry, and 10 years of experience related to investigations, studies, design and remedial actions at HTRW sites. The Chemical Quality Control Officer ensures that all chemistry related objectives including responsibilities for DQO definitions, sampling and analysis, project requirements for data documentation and validation, and final project reports are attained. The Chemical Quality Control officer

need not be present onsite during routine sampling, but is to be available for consultation with Government and Contractor personnel.

B. Project Chemist

As a minimum, the Contractor's Project Chemist is to have: a Bachelor of Science degree in Chemistry, and 5 years of experience related to investigations, studies, design and remedial actions at HTRW sites. The project chemist ensures that all chemistry related goals of the program are attained. The project chemist is to be onsite during all sampling events and also available for consultation with Government personnel.

C. Environmental Sampler

As a minimum, the Contractor's Environmental Sampler is to have: a Bachelor of Science degree in Chemistry, Environmental Science, Engineering, Geology, Hydrology, or a related field; 3 years of experience in and knowledge of EPA methods for collecting environmental and hazardous waste samples; 3 years of experience in operation of field screening equipment (e.g. PID, FID, infrared spectrometer, immunoassay, etc.); and 2 field seasons of experience with the particular field screening techniques for use on this project. The Environmental Sampler collects all onsite samples and perform all field screening tests. The Environmental Sampler reviews the sampling results, and provides recommendations for the Contractor's sampling program.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

Provide chemical sample acquisition, sample analysis, and instrumental measurements of chemical parameters for chemical data quality control. Establish an effective chemical data quality control system that meets the requirements for the chemical measurement DQOs applicable to the project. The chemical data QC system consists of a Chemical Quality Management staff responsible for the sampling and measurements plans, analytical procedures, minimum data reporting requirements, and the organization necessary to produce the required chemical data. The system is to cover chemical measurements pertaining to and required for Contractor and subcontractor produced chemical data. Control field screening, sampling, and testing in conjunction with remedial activities to meet all DQOs; minimize the amount of excavated material requiring temporary storage; prevent dilution of contaminated soils with clean soils; and ensure completion of work within the required time.

3.02 QUALITY CONTROL PLAN

A. Additional Requirements

In addition to the quality control requirements specified in Section 01 45 00.00 10 - QUALITY CONTROL, the Contractor Quality Control (CQC) Plan is to incorporate the qualifications, authority and responsibilities of all chemical quality management and support personnel. Chemical measurements including sampling and/or chemical parameter measurement will not be permitted to begin until after production and

acceptance of the CQC Plan and Government approval of the SAP.

B. Chemistry Elements of the CQC Plan

To cover contract-related chemical measurements by the Contractor and all subcontractors, the CQC Plan shall include the following as a minimum.

1. Qualifications

Names, education, experience qualifications, authorities, and decision-making responsibilities of all chemical quality management and support personnel. The CQC Plan shall contain a copy of a letter from the project Quality Control Manager designating and authorizing a Chemical Quality Control Officer and chemical quality control organization staff.

2. Authority and Responsibility

A diagram, flow chart, or figure clearly depicting the chemical data quality management and support staff and the authority and responsibility of each for chemical sampling and analysis, procedures for corrective actions, deliverables and submittals, deviations and changes, chemical quality documentation, data validation, minimum data reporting requirements, and DQOs for chemical parameter measurement by the Contractor and subcontractors. The contents of this section of the CQC Plan is to be included in the applicable "Project Organization" elements of the Field Sampling Plan (FSP) and the UFP-QAPP.

3.03 SAMPLING AND ANALYSIS PLAN

Prepare the SAP in accordance with CDQC requirements and EM 200-1-3. The SAP is a two-part document that contains two distinct elements: FSP and QAPP. Sections of the FSP and QAPP are to be cross referenced. The SAP confirms the Contractor's understanding of the contract requirements for chemical data quality control, and describes procedures for field sampling and sample submittal for analysis, field chemical parameter measurement, data documentation, data assessment, and data reporting requirements. The SAP is to delineate the methods the Contractor intends to use to accomplish the chemical quality control items to assure accurate, precise, representative, complete, legally defensible, and comparable data. The SAP is to describe all chemical parameter measurements for all matrices for all phases of the remediation contract. Provide the SAP to field and laboratory personnel as a single interrelated document.

Submit as scheduled in Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS.

A. Field Sampling Plan

The FSP is to contain necessary technical detail and direction for the field personnel to understand sampling and field measurement requirements. The FSP is to provide a comprehensive description and full detail for personnel to perform all onsite activities required to attain project DQOs, including, but not limited to, the following:

1. Locations of samples
2. Sampling procedures for onsite and offsite chemical analysis
3. Summaries of analyses to be performed on samples

4. Shipment of samples for offsite analyses
5. Performance of onsite and offsite instrumental parameter measurements
6. Data documentation and reporting requirements

B. Quality Assurance Project Plan

The Contractor's developed QAPP is to be in accordance with the UFP-QAPP Manuals referenced in Section 1.02. The UFP-QAPP describes procedures for field sampling and sample submittal for analysis, field chemical parameter measurement, data documentation, data assessment, and data reporting requirements. The UFP-QAPP delineates the methods the Contractor intends to use to accomplish the chemical quality control items to assure accurate, precise, representative, complete, legally defensible and comparable data. The UFP-QAPP is to describe all chemical parameter measurements for all matrices for all phases of the contract. The Contractor may propose original/innovative approaches to chemical parameter measurements for cost reduction and remediation efficiency by abbreviated sampling, contingency sampling and/or contingency analysis, indicator or tracer analysis, onsite analytical services, equivalency or screening methods. The UFP-QAPP is to clearly identify the Contractor obtained laboratories. Furnish copies of the Government approved UFP-QAPP to all laboratories and the Contractor's field sampling crew.

The UFP-QAPP covers, at minimum, the following topics and meet the requirements of the UFP-QAPP Manual:

1. Distribution List
2. Title and Approval Page
3. Project Description
4. Introduction including, Summary of Scope and Objectives, Site History and Contaminants
5. Existing Site Data Summary-Evaluation of Secondary Data and Use Limitations
6. Project Description/Problem Definition/ Site Specific Analysis Problems
7. Project Objectives/Systematic Planning Documentation/Data Quality Objectives
8. Sampling Design and Rationale
9. Scope and Objectives
10. Project Schedule and Timelines
11. Project Organization and Responsibility
12. Personnel Responsibilities, Qualifications and Special Training Requirements
13. Field Activities and Procedures (SOPs)
14. Field and Laboratory QC Samples
15. Sampling Procedures and Container/Preservation Requirements
16. Sample Custody, Chain-of-Custody/Sample Documentation
17. Sample Handling/ Identification
18. Field Logbooks and Contents; Documentation Procedures
19. Sample Packaging and Shipping
20. Equipment Decontamination
21. Contractor Quality Control
22. Daily Quality Control Reports
23. Field Quality Control and Corrective Actions
24. Sampling Apparatus and Field Instrumentation
25. Data Quality Objectives and Measurement Performance Criteria
26. Sample Custody and Holding Times

27. Analytical Procedures
28. Reference Limits and Evaluation of Quantitation Limit Goals
29. Laboratory Calibration Procedures and Frequency
30. Internal QC Checks
31. Calculation of Data Quality Indicators
32. Laboratory Corrective Actions
33. Data Reduction, Review, Validation and Reporting
34. Laboratory Reporting Requirements
35. Preventive Maintenance (Field and Laboratory)
36. Performance and System Audits
37. QC Reports to Management
38. Appendices

The UFP-QAPP is to include a table of contents; crosswalk showing that all UFP-QAPP elements have been addressed; definitions, acronyms, and references pertaining to the project; and other related chemical analysis documents such as the data validation SOP for parameters not included in the EPA Region 2 SOPs and/or National Functional Guidelines.

C. Level of Detail

The SAP is to contain necessary technical detail and direction such that field and laboratory personnel understand all sampling and field measurement requirements. The SAP is to document all aspects of the project, planning, implementation, assessment, corrective actions and reconciliation of completed tasks with documented planned objectives. The SAP includes all required sampling and their respective frequency and those are shown in Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION. The level of detail in the SAP is to be such that any technically-competent personnel unfamiliar with the Site can follow the plan and perform all required work. The SAP is to contain sufficient direction and detail that analytical laboratory personnel understand the analytical methods required and the project required reporting limits, project DQIs measurement performance criteria, project data validation, and reporting requirements.

D. Appendices

The Appendices section of the SAP contains all Contractor prepared forms, project figures and tables, SOPs, and all references pertaining to the project requirements included in the SAP relating to project DQOs, standard and non-standard measurement methods, equivalency data, and other contract related chemical analysis documents. Develop SOPs based on all applicable SOPs from EPA 540/P-87/001, Compendium of Superfund Field Operation Methods, or Contractor SOPs, where applicable.

E. Packing and Shipping

The following procedures are to be followed for sample packing and shipment:

Subcontract Laboratory - USACE Engineering Manual EM 200-1-3, Appendix F, February 2001

CLP/DESA Laboratory - Contract Laboratory Program Guidance for Field Samplers (EPA 540/R-09/03), January 2011

All Department of Transportation (DOT) regulations 40 CFR 261 and 40 CFR 106 to 40 CFR 179 are to be followed regarding shipment of the samples.

3.04 CONTROL OF CHEMICAL DATA QUALITY

Contractor chemical data quality control ensures that a quality control program is in place that assures sampling and analytical activities and the resulting chemical parameter measurement data comply with the DQO and the requirements of the SAP. Utilize the three-phase control system that includes a preparatory, initial, and follow-up phase for each definable feature of work. The Contractor's three-phase chemical data control process ensures that data reporting requirements are achieved and is to be implemented according to Section 01 45 00.00 10 - QUALITY CONTROL. Combine the three-phase chemical data control process with that under Section 01 45 00.00 10 - QUALITY CONTROL.

3.05 ANALYTICAL TESTING LABORATORIES

If DESA or CLP cannot accommodate the analyses, propose the analytical laboratories to be used for the primary sample analyses. Laboratory certification requirements are to be in accordance with Paragraph SUBCONTRACT LABORATORY CERTIFICATION. The Contractor may utilize its own laboratory or utilize subcontract laboratories to achieve the required sample analyses.

A. Laboratory Analytical Requirements

Provide chemical analyses specified in this Contract either by the Contractor's and/or by a subcontractor laboratory. Provide chemical analyses for all parameters by methods specified in the project specification or UFP-QAPP to achieve the project DQOs.

B. Laboratory Performance

Provide continued acceptable analytical performance and establish a procedure to address data deficiencies noted by review and/or quality assurance sample results. Provide and implement a mechanism for providing analytical labs with the SAP or QAPP portion of the SAP, for monitoring the lab's performance and for performing corrective action procedures. Acquire analytical services with NELAP accredited and State of New York certified laboratories.

3.06 CHEMICAL DATA REPORT

Produce a Chemical Data Report (CDR), including a summary of quality control practices employed and all chemical parameter measurement activities after each analytical sampling event. This includes, but is not limited to, all data analyzed by DESA, CLP and the Contractor's subcontract laboratories, and include all definitive data. As a minimum, the CDR is to contain the following:

- A. Summary of project scope and description.
- B. Summary of any deviations from the UFP-QAPP or specifications.
- C. Summary of chemical parameter measurements performed as contingent measurements.
- D. Summary discussion of resulting data including achieving data reporting requirements.
- E. Summary of DQO parameters including achieving project specific DQO.
- F. Presentation and evaluation of the data to include an overall assessment on the quality of the

data for each method and matrix.

- G. Internal QC data generated during the project, including tabular summaries correlating sample identifiers with all blank, matrix spikes, surrogates, duplicates, laboratory control samples, and batch identifiers.
- H. A list of the affected sample results for each analyte (indexed by method and matrix) including the appropriate data qualifier flag (J, B, R, etc.), where sample results are negatively impacted by adverse quality control criteria.
- I. Summary of field and laboratory oversight activities, providing a discussion of the reliability of the data, QC problems encountered, and a summary of the evaluation of data quality for each analysis and matrix as indicated by the laboratory QC data and any other relevant findings.
- J. Tables displaying groundwater level measurements and sample results.
- K. Conclusions and recommendations for any necessary adjustments to the in-situ remedy.
- L. Appendices containing chemistry data packages in EPA Region II EDD format, usability reports if DESA/CLP performs analysis, and data validation reports if a subcontract laboratory performs the analysis.

The following items will not be required for the CDR if DESA or CLP laboratory provides the data sets:

- A. Summary of DQO parameters including achieving project specific DQOs.
- B. Internal QC data generated during the project, including tabular summaries correlating sample identifiers with all blank, matrix spikes, surrogates, duplicates, laboratory control samples, and batch identifiers.
- C. Laboratory oversight activities.
- D. Summary of the evaluation of data quality for each analysis and matrix as indicated by the laboratory QC data.

3.07 NOTIFICATION OF NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. Take immediate corrective action after receipt of such notice.

-- End of Section --

SECTION 01 35 53

SECURITY

PART 1 GENERAL

1.01 SUMMARY

A. Site Security

Be responsible for securing all equipment and materials associated with this contract 24 hours a day, 7 days a week. Be responsible for restricting access to all construction areas, and all excavated or trenched areas 24 hours a day, 7 days a week. Vandalized, stolen, or damaged equipment and/or materials shall be replaced at no cost to the Government.

Provide security for all equipment and materials at the Site.

1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Site Security Plan; G

1.03 SITE SECURITY PLAN

Prepare and submit a Site Security Plan prior to mobilization at the Site as scheduled in Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS. Detail the measures that will be taken to prevent theft, tampering and/or damage to equipment and material at the Site; and to exclude residents and children from potentially dangerous portions of the Site, while the contract is in effect.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 LOG

Maintain a log of all security incidents. Provide this log to the Contracting Officer in accordance with Contract Specification Section 01 33 00 - SUBMITTAL PROCEDURES.

3.02 PERSONNEL IDENTIFICATION

Provide security identification, specific to the Site, for all on site personnel and Contractor

personnel entering secured areas of the Site.

3.03 ENTRANCE CONTROL

Provide control of all persons, equipment, and vehicles entering and leaving the secured areas of the Site. Maintain a Site Control Log in accordance with Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS.

A. Identification

Require each person to display proper identification.

B. Authorized Personnel

Maintain a list of persons authorized for entry into secured areas of the Site and submit a copy of the list to the Contracting Officer on request.

C. Hazardous Work Areas

Prevent site visitors from entering active hazardous work areas (Exclusion Zone and Contamination Reduction Zone), unless authorized by the Contracting Officer.

D. Vehicular Access

Restrict vehicular access to the secured areas of the Site to authorized vehicles only.

E. Personal Vehicles

Prohibit personal vehicles from entering the Exclusion Zone or Contamination Reduction Zone.

F. Visitors

Require a signature of visitors on a form relieving the U.S. Government, its officers, employees, and agents of the liability or consequences related to potential hazards associated with entry into secured areas of the Site.

G. Access Roads

Always use the roads and access routes approved by the Contracting Officer.

H. Hazardous Work Area Signage

Document that the exclusion zone and contamination reduction zone, identified as active hazardous work areas, are posted with signs on all sides of the zone declaring "WARNING, HAZARDOUS WORK AREA, DO NOT ENTER UNLESS AUTHORIZED." Document that the design of signs conforms with the U.S. Army Corps Engineers' Safety and Health Requirements Manual EM 385-1-1, latest revision.

I. Health and Safety

Be responsible for insuring that all personnel and visitors have complied with the requirements for personnel as defined in Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS, including training, employee/visitor register and medical

monitoring.

-- End of Section --

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 GENERAL

Use the most recent revision of all regulatory documents identified in the specifications in effect at the time of bid opening.

1.01 ONSITE WORK

Onsite waste handling regulations shall include, but not necessarily be limited to, the following:

U.S. Code (USC)

USC Title 42

The Public Health and Welfare

Federal Resource Conservation and Recovery Act (RCRA) as last amended (42 United States Code (USC) 6901, Subtitle C).

Superfund Amendments Reauthorization Act (SARA), PL-99-499, October 1986.

42 USC 4901 Noise Control Act of 1972.

Clean Air Act, Section 306 (42 USC 1857 (b)).

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1904

Recording and Reporting Occupational Injuries and Illnesses

29 CFR 1910

Occupational Safety and Health Standards

29 CFR 1910.120

Hazardous Waste Operations and Emergency Response

29 CFR 1910.134

Respiratory Protection

29 CFR 1910.146

Permit-required Confined Spaces

29 CFR 1926

Safety and Health Regulations for Construction

40 CFR 260

Hazardous Waste Management System: General

40 CFR 268

Land Disposal Restrictions

Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-4A "Superfund Remedial Design and Remedial Action Guidance".

Clean Water Act, Section 508 (33 USC 1368).

Administration of Clean Air Act and Federal Water Pollution Control Act with respect to Federal Contracts, Grants, and Loans (Executive Order 11738).

United States of Environmental Protection Agency (USEPA) National Contingency Plan as last amended.

USEPA QA/G-5, "Guidance for Quality Assurance Project Plans".

1.02 TRANSPORTATION

Waste material transportation regulations shall include, but not necessarily be limited to, the following:

U.S. Code (USC)

USC Title 42

The Public Health and Welfare

Federal Resource Conservation and Recovery Act (RCRA) as last amended (42 United States Code (USC) 6901, Subtitle C).

Superfund Amendments Reauthorization Act (SARA), PL-99-499, October 1986.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910

Occupational Safety and Health Standards

29 CFR 1926

Safety and Health Regulations for Construction

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 117

Determination of Reportable Quantities for Hazardous Substances

49 CFR 171

General Information, Regulations, and Definitions

49 CFR 172

Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

40 CFR 261

Identification and Listing of Hazardous Waste

40 CFR 262

Standards Applicable to Generators of Hazardous Waste

40 CFR 263

Standards Applicable to Transporters of Hazardous Waste

40 CFR 268

Land Disposal Restrictions

40 CFR 270

EPA Administered Permit Programs: The Hazardous Waste Permit Program

40 CFR 300

National Oil and Hazardous Substances Pollution Contingency Plan

40 CFR 302

Designation, Reportable Quantities, and Notification

Federal Highway Administration Regulation under 49 CFR 390.397.

Hazardous Materials Transportation Act (49 CFR 100-179).

Department of Transportation Regulations applicable to method of transport.

Posted weight limitations on roads and bridges.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.01 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g. ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.02 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1819 L Street, NW, 6th Floor

Washington, DC 20036

Ph: 202-293-8020

Fax: 202-293-9287

E-mail: info@ansi.orgInternet: <http://www.ansi.org/>

AMERICAN PETROLEUM INSTITUTE (API)

1220 L Street, NW

Washington, DC 20005-4070

Ph: 303-397-7993

Fax: 303-397-2740

E-mail: greg.kallio@ihs.comInternet: <http://www.api.org>

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

1800 East Oakton Street

Des Plaines, IL 60018-2187

Ph: 847-699-2929

Fax: 847-768-3434

E-mail: customerservice@asse.orgInternet: <http://www.asse.org>

AMERICAN WATER WORKS ASSOCIATION (AWWA)

6666 West Quincy Avenue

Denver, CO 80235

Ph: 800-926-7337

Fax: 303-347-0804

E-mail: smorrison@awwa.org

Internet: <http://www.awwa.org>

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-854-7179 or 800-843-2763
Fax: 212-591-7674
E-mail: infocentral@asme.org
Internet: <http://www.asme.org>

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
E-mail: service@astm.org
Internet: <http://www.astm.org>

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)
1901 North Moore Street
Arlington, VA 22209-1762
Ph: 703-525-1695
Fax: 703-528-2148
E-mail: isea@safetyequipment.org
Internet: <http://www.safetyequipment.org/>

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)
703 Waterford Way (NW 62nd Avenue), Suite 600
Miami, FL 33126
Ph: 305-264-7772
Fax: 305-264-8088
Internet: <http://www.iata.org>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Lane or 2001 L Street, NW. Suite 700
Piscataway, NJ 08855-1331 or Washington, DC 20036-4910 USA
Ph: 732-981-0060 or 800-701-4333
Fax: 732-562-6380
E-mail: onlinesupport@ieee.org or ieeusa@ieee.org
Internet: <http://www.ieee.org>

INTERNATIONAL CODE COUNCIL (ICC)
5360 Workman Mill Road
Whittier, CA 90601
Ph: 1-888-422-7233
Fax: 562-908-5524
E-mail: webmaster@iccsafe.org
Internet: www.iccsafe.org

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

3050 Centre Ave. Suite 102
Portage, MI 49024
Ph: 269-488-6382

Fax: 269-488-6383
E-mail: neta@netaworld.org
Internet: <http://www.netaworld.org>

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
3, rue de Varembe, P.O. Box 131
CH-1211 Geneva 20, Switzerland
Ph: 41-22-919-0211
Fax: 41-22-919-0300
E-mail: custserv@iec.ch
Internet: <http://www.iec.ch>

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND
FITTINGS INDUSTRY (MSS)
127 Park Street, NE
Vienna, VA 22180
Ph: 703-281-6613
Fax: 703-281-6671
E-mail: info@mss-hq.com
Internet: <http://www.mss-hq.com>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209
Ph: 703-841-3200
Fax: 703-841-5900
Internet: <http://www.nema.org/>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 617-770-3000 or 800-344-3555
Fax: 617-770-0700
E-mail: webmaster@nfpa.org
Internet: <http://www.nfpa.org>

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)
Mail Stop C-34
4676 Columbia Parkway
Cincinnati, OH 45226
Ph: 513-533-8611
Fax: 513-533-8285
E-mail: nioshdocket@cdc.gov
Internet: <http://www.cdc.gov/nchs/products.htm>

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
100 Bureau Drive
Stop 1070
Gaithersburg, MD 20899-1070
Ph: 301-975-NIST (6478)
E-mail: inquiries@nist.gov
Internet: <http://www.nist.gov>

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

2500 Wilson Blvd., Suite 300

Arlington, VA 22201

Ph: 703-907-7700

Fax: 703-907-7727

Internet: <http://www.tiaonline.org>

UNDERWRITERS LABORATORIES (UL)

2600 N.W. Lake Road

Camas, WA 98607-8542

Ph: 877-854-3577

Fax: 360-817-6278

E-mail: CEC.us@us.ul.com

Internet: <http://www.ul.com/>

UL Directories available through IHS at <http://www.ihs.com>

U.S. ARMY CORPS OF ENGINEERS (USACE)

Order CRD-C DOCUMENTS from:

U.S. Army Engineer Waterways Experiment Station

ATTN: Technical Report Distribution Section, Services

Branch, TIC

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Vicksburg, MS 39180-6199

E-mail: MTC-INFO@erdc.usace.army.mil

Internet: <http://gsl.erdc.usace.army.mil/SL/MTC/handbook/handbook.htm>

Order Other Documents from:

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Internet: <http://www.usace.army.mil/publications>

or <http://www.hnc.usace.army.mil/Missions/Engineering/TECHINFO.aspx>

U.S. Code (USC)

Office of the Law Revision Counsel

Internet: <http://uscode.house.gov/lawrevisioncounsel.shtml>

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

1200 New Jersey Ave. SE

Washington, DC 20590

Ph: 202-366-4000

Internet: <http://www.dot.gov>

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Ariel Rios Building

1200 Pennsylvania Avenue, N.W.

Washington, DC 20004

Ph: 202-272-0167

for Fax and E-mail see below

Internet: <http://www.epa.gov>

--- Some EPA documents are available only from:

National Technical Information Service (NTIS)
5301 Shawnee Road
Alexandria, VA 22312
Ph: 703-605-6050 or 1-688-584-8332
Fax: 703-605-6900
E-mail: info@ntis.gov
Internet: <http://www.ntis.gov>

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)
Order for sale documents from:
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732 North Capitol Street, NW
Washington, DC 20401
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Fax: 202-512-2104
E-mail: contactcenter@gpo.gov
Internet: <http://www.gpoaccess.gov>
Order free documents from:
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Department of Transportation
800 Independence Avenue, SW
Washington, DC 20591
Ph: 1-866-835-5322
Internet: <http://www.faa.gov>

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)
FHWA, Office of Safety
1200 New Jersey Ave., SE
Washington, DC 20590-
Ph: 202-366-0411
Fax: 202-366-2249
E-mail: contactcenter@gpo.gov
Internet: <http://www.safety.fhwa.dot.gov>
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E-mail: contactcenter@gpo.gov
Internet: <http://www.gpoaccess.gov>

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road
College Park, MD 20740-6001
Ph: 866-272-6272
Fax: 301-837-0483
E-mail: contactcenter@gpo.gov
Internet: <http://www.archives.gov>
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732 North Capitol Street, NW
Washington, DC 20401
Ph: 202-512-1800
Fax: 202-512-2104
E-mail: contactcenter@gpo.gov
Internet: <http://www.gpoaccess.gov>

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 45 00.00 10

QUALITY CONTROL

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D3740	(2012a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
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ASTM E329	(2013b) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
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INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code
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1.02 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all associated costs will be included in the applicable Bid Schedule unit or lump-sum prices.

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan; G

SD-06 Test Reports

Contractor Quality Control Report

Any other submittals, if needed, must comply with the requirements in Section 01 33 00 - SUBMITTAL PROCEDURES. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system in compliance with the Contract Clause titled "Inspection of Construction." QC consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. Cover all construction operations, both onsite and offsite, and be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work.

Non-compliance with the quality requirements specified in the contract will be cause for dismissal of the Superintendent and/or QC Manager. In this context, the highest level manager responsible for the overall construction activities at the site, including quality and production, is the project superintendent. The project superintendent must maintain a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.02 QUALITY CONTROL PLAN

Submit the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction" as scheduled in Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS. The Government will consider an interim plan for the first 30 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the accepted interim plan will not be permitted to begin until acceptance of a CQC Plan.

A. Content of the CQC Plan

Include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

1. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager who reports to the project superintendent.
2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
3. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Copies of these letters must be furnished to the Government.
4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures must be in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.

5. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer must be used.)
6. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
7. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
8. Reporting procedures, including proposed reporting formats.
9. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.
10. Additional requirements specified in Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL.
11. Any special inspection requirements as required in accordance with ICC IBC.

B. Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in the CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

C. Notification of Changes

After acceptance of the CQC Plan, notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.03 COORDINATION MEETING

Meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system in accordance with Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS.

3.04 QUALITY CONTROL ORGANIZATION

A. Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager must report directly to a senior project (or corporate) official

independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff must maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

B. CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who is responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager must be a construction person with a minimum of 10 years experience in related work. This CQC System Manager must be on the site at all times during construction and be employed by the prime Contractor. The CQC System Manager must be assigned no other duties. Identify in the plan an alternate to serve in the event of the CQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.

C. CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, mechanical, civil, structural, environmental. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan. A single person may cover more than one area provided that they are qualified to perform QC activities in each designated area and that workload allows.

Experience Matrix	
Area	Qualifications
Civil	Graduate Civil Engineer or Construction Manager with 2 years experience in the type of work being performed on this project or technician with 5 years related experience
Mechanical	Graduate Mechanical Engineer with 2 years experience or technician with 5 years of experience supervising mechanical features of work in the field with a construction company

Experience Matrix	
Area	Qualifications
Electrical	Graduate Electrical Engineer with 2 years related experience or technician with 5 years of experience supervising electrical features of work in the field with a construction company
Structural	Graduate Civil Engineer (with Structural Track or Focus) or Construction Manager with 2 years experience or technician with 5 years of experience supervising structural features of work in the field with a construction company
Environmental	Graduate Environmental Engineer with 3 years experience

D. Additional Requirements

The CQC System Manager cannot also be the Site Superintendent, Site Safety and Health Officer, or the Environmental Manager.

In addition to the above experience and/or education requirements, the CQC System Manager must have completed the course entitled "Construction Quality Management For Contractors".

E. Organizational Changes

Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.05 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control must be conducted by the CQC System Manager for each definable feature of the construction work as follows:

A. Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

1. A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.

2. Review of the contract drawings.
3. Check to assure that all materials and/or equipment have been tested, submitted, and approved.
4. Review of provisions that have been made to provide required control inspection and testing.
5. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
6. Examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
7. Review of the appropriate activity hazard analysis to assure safety requirements are met.
8. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
9. Document that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
10. Discussion of the initial control phase.
11. The Government must be notified at least 2 hours in advance of beginning the preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

B. Initial Phase

This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

1. All work shall be in full compliance with contract requirements. Review minutes of the preparatory meeting.
2. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards.
4. Resolve all differences.
5. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

6. The Government must be notified at least 2 hours in advance of beginning the initial phase. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for future reference and comparison with follow-up phases.
7. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

C. Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

D. Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if:

1. The quality of on-going work is unacceptable;
2. If there are changes in the applicable CQC staff, onsite production supervision or work crew;
3. If work on a definable feature is resumed after a substantial period of inactivity; or
4. If other problems develop.

3.06 TESTS

A. Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. Procure the services of a Corps of Engineers approved testing laboratory. Perform the following activities and record and provide the following data:

1. Verify that testing procedures comply with contract requirements.
2. Verify that facilities and testing equipment are available and comply with testing standards.
3. Check test instrument calibration data against certified standards.
4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
5. Record results of all tests taken, both passing and failing, on the CQC report for the date taken, specification paragraph reference, location where tests were taken, and

the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

B. Testing Laboratories

1. Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel must meet criteria detailed in ASTM D3740 and ASTM E329.

C. Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.07 COMPLETION INSPECTION

A. Punch-Out Inspection

Conduct an inspection of the work by the CQC Manager near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications, as required by paragraph DOCUMENTATION. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final inspection.

B. Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Document that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph must be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

C. Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative must be in attendance at the final acceptance inspection. Additional Government personnel may

also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notify the Contracting Officer at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.08 DOCUMENTATION

A. Contractor Quality Control Report

Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit one report for every 7 days of no work and on the last day of a no work period. All calendar days must be accounted for throughout the life of the contract. Reports must be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the CQC System Manager Report. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

1. Contractor/subcontractor and their area of responsibility.
2. Operating plant/equipment with hours worked, idle, or down for repair.
3. Work performed each day, giving location, description, and by whom. Indicate a description of trades working on the project and the number of personnel working.
4. Weather conditions encountered.
5. Any delays encountered.
6. Test and/or control activities performed with results and references to specifications/drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
7. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
8. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
9. Offsite surveillance activities, including actions taken.
10. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
11. Instructions given/received and conflicts in plans and/or specifications.

12. Contractor's verification statement.
 - a. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the contract.
13. Attach the Site Safety and Health Officer's Daily Inspection Logs in accordance with Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS.
14. Attach the Environmental Field Quality Control Reports in accordance with Section 01 35 40.00 20 - ENVIRONMENTAL MANAGEMENT.

3.09 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer 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 such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

Requirements of this Section apply to, and are a component of, each section of the specifications.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241	(2013) Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(2007; Rev K) Obstruction Marking and Lighting
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U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009) Manual on Uniform Traffic Control Devices
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1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan; G
Traffic Control Plan; G

1.04 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan including but not limited to:

1. Locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite))
2. Access and haul routes
3. Temporary utility plans

4. Identify any areas which may have to be graveled to prevent the tracking of mud
5. Indicate if the use of a supplemental or other staging area is desired
6. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

PART 2 PRODUCTS

2.01 TEMPORARY SIGNAGE

A. Bulletin Board

Immediately upon beginning of work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

B. Project and Safety Signs

The requirements for the signs, their content, and location are as shown on the drawings. Erect signs within 15 days after receipt of the notice to proceed. Correct the data required by the safety sign daily, with light colored metallic or non-metallic numerals.

2.02 TEMPORARY TRAFFIC CONTROL

A. Haul Roads

At contractors expense construct access and haul roads necessary for proper prosecution of the work under this contract. Construct with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic are to be avoided. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. Provide Dirt and Dust Control in accordance with Section 01 35 40.00 20 - ENVIRONMENTAL MANAGEMENT. Location, grade, width, and alignment of construction and hauling roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

B. Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic barricades will be required. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

C. Fencing

1. Provide fencing along the construction site at all open excavations to control access

by unauthorized people. Fencing must be installed to be able to restrain a force of at least 250 pounds against it.

2. Enclose the project work area and Contractor lay-down area with a 6 foot high chain link fence and gates. Remove the fence upon completion and acceptance of the work.

D. Temporary Wiring

Provide temporary wiring in accordance with NFPA 241 and NFPA 70. Include frequent inspection of all equipment and apparatus.

PART 3 EXECUTION

3.01 EMPLOYEE PARKING

Contractor employees will park privately owned vehicles in an area within the Site as designated by the Contractor and approved by the Contracting Officer.

3.02 AVAILABILITY AND USE OF UTILITY SERVICES

A. Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

B. Payment for Utility Services

It is the responsibility of the Contractor to provide utilities required for construction. The plan for temporary utilities must be detailed in the Construction Site Plan. This plan must include layouts and sources of the utilities.

C. Meters and Temporary Connections

At the Contractor's expense and in a manner satisfactory to the Contracting Officer, provide and maintain necessary temporary connections, distribution lines, and meters.

D. Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, Contractor is responsible for removal of all temporary utilities.

E. Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer and periodically empty wastes into a municipal, sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into any municipal sanitary sewer system. Any penalties and / or fines associated with improper discharge will be the responsibility of the Contractor. Maintain these conveniences at all times without nuisance. Include provisions for pest control and elimination of odors.

F. Telephone

Make arrangements and pay all costs for telephone facilities desired.

G. Obstruction Lighting of Cranes

Provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 100 feet above ground level. Light construction and installation must comply with FAA AC 70/7460-1. Lights must be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer.

H. Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials weekly to minimize potential hazards.

3.03 TRAFFIC PROVISIONS

A. Maintenance of Traffic

1. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.
2. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.
3. Provide, erect, and maintain, at Contractor's expense, lights, barriers, signals, passageways, detours, and other items, that are required.

B. Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

C. Dust Control

Provide Dirt and Dust Control in accordance with Section 01 35 40.00 20 -

ENVIRONMENTAL MANAGEMENT.

3.04 CONTRACTOR'S TEMPORARY FACILITIES

A. Safety

Protect the integrity of any installed safety systems or personnel safety devices. If entrance into systems serving safety devices is required, the Contractor must obtain prior approval from the Contracting Officer. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

B. Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site.

C. Project Construction and Storage Area Temporary Fencing

Construct a temporary 6 foot high chain link fence around trailers and materials. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not place or store trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on any given day. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

D. Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes must present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the Site.

E. Maintenance of Project Construction and Storage Area

Keep fencing in a state of good repair and proper alignment. Grassed or unpaved areas, which are not established roadways, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles; gravel gradation will be at the Contractor's discretion. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers will be edged or trimmed neatly as needed for performance of the work.

F. Security Provisions

Provide adequate outside security lighting at the Contractor's temporary facilities. The Contractor will be responsible for the security of its own equipment; in addition, the Contractor will notify the appropriate law enforcement agency requesting periodic

security checks of the temporary project field office.

G. Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work.

3.05 GOVERNMENT FIELD OFFICE

Provide all parking areas with adequate outdoor lighting as specified herein.

Provide structures and facilities that are designed for year-round operation.

A. Building and Trailer Requirements

1. Lighting

Provide electric lights of non-glare type luminaries with a minimum illumination level of 50 foot-candles at desk height level.

2. Heating and Cooling

Provide adequate equipment to maintain an ambient air temperature of 70 degrees Fahrenheit (F) + 3 degrees.

3. Fire Extinguisher

Provide non-toxic, dry chemical, fire extinguisher meeting Underwriters Laboratories, Inc., approval for Class A, Class B, and Class C fires with a minimum rating of 2A: 10B: 10C type as required for a trailer the same as office.

4. Janitorial Services

Provide janitorial services on a daily basis including but not limited to sweeping, emptying wastebaskets, servicing of toilets, weekly mopping of floors, sanitizing toilet seats, providing towels and soap to the lavatories and monthly washing of floors and windows (inside and out). Coordinate the time of the cleaning with the Contracting Officer.

5. Electrical Outlets

Provide a minimum of 6 duplex electrical receptacles.

B. USACE/USEPA Field Office

Furnish at the job site, prior to the start of work, an office, approximately 200 square feet in floor area. The exact location will be designated by the Contracting Officer. The USACE/USEPA Field Office is required from the start of work until after the first biostimulation event has been completed.

Make arrangements and pay connection fees and monthly usage for electrical and 4-line

telephone service, one dedicated to fax, one dedicated to modem and two dedicated to voice. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door. At completion of the project, the office will remain the property of the Contractor and be removed from the site. Utilities will be connected and disconnected in accordance with local codes and to the satisfaction of the Contracting Officer.

1. Field Office Furniture

Provide a building that is well constructed, properly ventilated, and containing a closet, door and windows capable of being locked, plumbed toilet facilities, and at a minimum the following:

- a. Three (3) desks
- b. Three (3) chairs having at minimum the following ergonomic features:
 - (1) Adjustable lumbar support
 - (2) Pneumatic seat height adjustment
 - (3) Adjustable arms
 - (4) Contoured front edge
- c. One (1) plan rack and drawing board
- d. Two (2) two-drawer filing cabinets
- e. One potable water cooler/heater. Replenish the supply of bottled water as required by the Contracting Officer
- f. One (1) 4 by 8 foot plan table
- g. Four (4) waste baskets

2. Copier

Provide a copier with plain-paper, desktop, autofeed, reduction, enlargement, sorting, stapling, monochrome, minimum 10 copies per minute. The copier shall be equipped with individual trays for 8.5" x 11", 8.5" x 14", and 11" x 17" paper. Replenish the supply of paper and toner as required by the Contracting Officer. Provide copier service as required.

3. Fax Machine

Provide a monochrome fax machine with a minimum feed three (3) - 8.5" x 11" pages per minute. The fax machine shall be capable of receiving on plain white bond paper.

4. Telephone

Provide four 2-line phones with conferencing and speaker phone capabilities compatible with phone service. Install telephones on each of the desks and the conference table.

5. Telephone Answering Machine

Provide standard telephone answering machine, compatible with standard telephone line and local service, with remote message retrieval ability.

6. First Aid Kit

Provide a first aid kit including, at a minimum, antiseptic kit, eyewash solution, bandages, insect sting medication, aspirin and acetaminophen, and coldpack.

7. Fire Extinguisher

Provide type as required for a trailer the same size as office.

8. Digital Camera

Provide a digital camera meeting the following minimum requirements:

- a. 12.0 megapixel (high Resolution) or better
- b. 48 Bit Color Depth
- c. 64 MB flash card or better
- d. 3x Optical Zoom
- e. 1.8" TFT LCD Monitor
- f. 3 Modes Built in Flash
- g. Wide aperture setting (f-stop)

9. Meeting Area

Provide one partitioned meeting area having a minimum of 160 square feet of floor area with toilet facilities, and containing the following equipment:

- a. Two (2) office conference tables, 3-1/2 feet by 8 feet with laminated top.
- b. Ten (10) straight backed office chairs.
- c. One (1) bulletin board, 4 feet by 6 feet.
- d. Four (4) waste baskets.
- e. One (1) vertical filing plan rack for twelve sets of 30 inch by 48 inch plans.
- f. One (1) electronic calculator with answer registered to at least eleven figures.
- g. One (1) telephone with extension and intercom connection to each of the two office areas described, with current local telephone directory.

- h. Five (5), four drawer, lockable filing cabinets, legal size.
- i. One (1) three-tier book case, 3 feet wide by 3 feet high by 12 inches deep.
- j. One (1) coat rack and 12 coat hangers.
- k. One (1) paper towel dispenser with towels.
- l. One (1) paper cup dispenser with cups.
- m. One (1) potable water cooler/heater. Replenish the supply of bottled water as required by the Contracting Officer.
- n. One (1) refrigerator.

C. Trailer-Type Mobile Office

The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above. Securely anchor the trailer to the ground at all four corners to guard against movement during high winds. At a minimum, a standard sized construction trailer with the facilities specified above must be provided.

3.06 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. The safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. Maintain the safety fencing during the life of the contract. Upon completion and acceptance of the work, fencing will become the property of the Contractor and be removed from the work site.

3.07 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store within the fenced area described above or at the supplemental storage area any materials resulting from demolition activities which are salvageable. Neatly stack stored materials not in trailers, whether new or salvaged.

3.08 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haulroads, and any other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence that will become the property of the Contractor. Restore to the original or better condition, areas used by the Contractor for the storage of equipment or material, or other use. Gravel used to traverse grassed areas must be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01 71 13

MOBILIZATION/DEMOBILIZATION

PART 1 GENERAL

1.01 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Work Plan; G

SD-11 Closeout Submittals

Evidence of Final Utility Payment

1.02 CONSTRUCTION WORK PLAN

Submit the following to the Contracting Officer as scheduled in Section 01 31 19.13 - PRE-CONSTRUCTION MEETINGS:

A. Construction Work Plan including:

1. Site Layout Plan

Prepare a Site Layout Plan, which will include, but not be limited to, the following:

a. Buildings/Trailers

Floor plans, fixtures, materials of construction and siting locations.

b. Temporary Electricity Supply and Lighting

Source point, layout locations, fixtures and materials. Sketch of the proposed temporary electrical system including metering.

c. Health and Safety

Areas designated for health and safety, decontamination zones, decontamination pad, parking, access roads, stockpiling, loading and unloading, and storage.

2. Construction Sequence

Provide a description of the proposed construction sequence for the performance of all major tasks of work, including support zones and access road construction (if necessary). Describe each major task in sufficient detail to demonstrate to the

Contracting Officer that the Contractor is familiar with the Site conditions and is prepared to implement and complete the work in an efficient and safe manner.

3. Construction Permits

Obtain and submit for review, copies of all issued State, County, Local, and Municipal construction permits to the Contracting Officer. Obtain all permits including the completion of applications and payment of and associated fees.

4. Construction Schedule

Present the proposed construction schedule for the overall project in accordance with Section 01 32 01.00 10 - SCHEDULE.

5. Decontamination Pad Details

Decontamination pad design calculations, plans, and specifications to demonstrate that the decontamination pad can support the intended loadings.

6. Enhanced In-Situ Bioremediation Work Plan

Attach the Enhanced In-Situ Bioremediation Work Plan in accordance with Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION.

7. Installation Work Plan

Attach the Installation Work Plan for the in-situ chemical reduction barriers in accordance with Section 02 70 00 - IN-SITU CHEMICAL REDUCTION BARRIER INSTALLATION.

B. Evidence of Final Utility Payment

Submit to the Contracting Officer, evidence of final payment of all utility services after all temporary utilities are disconnected and removed. In addition, notify New York City/Long Island One Call Center of the installation of permanent facilities and removal of temporary utilities.

PART 2 PRODUCTS

Fabricate, supply, provide, and maintain all materials, fabrication, installation, and delivery of services as specified in this section for complete and proper Site mobilization and demobilization.

PART 3 EXECUTION

3.01 GENERAL

Exercise the necessary precautions to minimize surface disturbances until the necessary support operations are in place and are operational.

3.02 MOBILIZATION

Perform all work by competent, trained personnel, skilled in the field to which they are

executing the work. Furnish, install, and maintain all necessary equipment to perform the Work. Prior to commencement of Work, the Contractor's plant equipment will be inspected and be subject to the Contracting Officer's approval.

3.03 DEMOBILIZATION

At the conclusion of the Work, restore the Site to its previous or an improved condition.

A. Temporary Facilities

Dismantle and properly dispose and/or remove from the Site all temporary and supporting facilities, including the decontamination pad, access roads and stabilized construction entrance unless otherwise directed by the Contracting Officer.

B. Decontamination

Decontaminate any contaminated equipment prior to demobilization. Decontaminated vehicles and equipment must be inspected and approved by the Contracting Officer prior to removal from the Site. Remove any soil or sediment attached to the equipment. Decontaminate the operations and decontamination pads prior to removal from the Site.

C. Temporary Utilities

Disconnect and remove all temporary utilities from offices and trailers installed by the Contactor or Subcontractor(s). Submit to the Contracting Officer evidence of final payment for all utility services.

D. Decontamination Pad

Investigate and repair any areas of distress in the decontamination pad or operation areas noted by the Contracting Officer, Contractor, or Subcontractor during inspections to the satisfaction of the Contracting Officer. Investigate and sample areas adjacent to the decontamination pad or operation pads which may have become contaminated due to overspray or spillage, along with materials below any apparent areas of cracking, separation, or deterioration in these areas, to the satisfaction of the Contracting Officer at no additional cost. Remove and dispose any and all contaminated soils encountered, at no additional cost, in accordance with these Specifications.

E. Debris

Clean debris from remediated areas, staging areas, support zones, and drainage systems, remove sediment from drainage systems, sweep paved areas and rake clean landscaped areas, and remove waste and surplus materials, rubbish and construction facilities from the Site.

F. Final Grading

Perform final grading and dressing of support areas to the extent required to assure proper and adequate drainage.

-- End of Section --

SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-03 Product Data

As-Built Record of Equipment and Materials
Cleanup
Spare Parts Data

SD-08 Manufacturer's Instructions

Preventative Maintenance
Condition Monitoring (Predictive Testing)
Inspection

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

In-Situ Bioremediation Completion Report; G
ISCR Barrier Completion Report; G
Record Drawings; G
Cost Report; G

1.02 PROJECT RECORD DOCUMENTS

A. In-Situ Completion Reports

1. In-Situ Bioremediation Completion Report

Prepare and submit the In-Situ Bioremediation Completion Report in accordance with Section 02 54 19.19 - ENHANCED IN-SITU BIOREMEDIATION.

2. ISCR Barrier Completion Report

Prepare and submit the ISCR Barrier Completion Report in accordance with Section 02 70 00 - IN-SITU CHEMICAL REDUCTION BARRIER INSTALLATION.

B. Record Drawings

Drawings showing final as-built conditions of the project. This paragraph covers record drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working record drawings," and "final record drawings" refer to contract drawings which are revised to be used for final record drawings showing as-built conditions. The final CAD record drawings must consist of one set of electronic CAD drawing files in the specified format and one set of the approved working Record drawings.

1. Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the Pre-Construction Conference for projects requiring CADD file record drawings.

2. Working Record and Final Record Drawings

Revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a (minimum) weekly basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final record drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the record drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. Show on the working and final record drawings, at minimum, the following information:

- a. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
- b. Changes or modifications which result from the final inspection.
- c. Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.
- d. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.
- e. Modifications (include within change order price the cost to change working and final record drawings to reflect modifications) and compliance with the

following procedures.

- (1) Follow directions in the modification for posting descriptive changes.
- (2) Place a Modification Delta at the location of each deletion.
- (3) For new details or sections which are added to a drawing, place a Modification Delta by the detail or section title.
- (4) For minor changes, place a Modification Delta by the area changed on the drawing (each location).
- (5) For major changes to a drawing, place a Modification Delta by the title of the affected plan, section, or detail at each location.
- (6) For changes to schedules or drawings, place a Modification Delta either by the schedule heading or by the change in the schedule.
- (7) The Modification Delta size is to be 1/2 inch unless the area where the delta is to be placed is crowded. Smaller delta circle is to be used for crowded areas.

3. Drawing Preparation

Modify the record drawings as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project and must be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Government.

4. Computer Aided Design and Drafting (CADD) Drawings

Only employ personnel proficient in the preparation of CADD drawings to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CADD files. The Contractor will be furnished "as-designed" drawings in AutoCad Release 2014 format compatible with a Windows 7 operating system. The electronic files will be supplied on optical disk. The Contracting Officer will review final record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

- a. Provide CADD "base" colors of red, green, and blue. Color code for changes as follows:

- (1) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.
 - (2) Additions (Green) - Added items, lettering in notes and leaders.
 - (3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.
- b. Rename the Contract Drawing files in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. Make all changes on the layer/level as the original item.
 - c. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Mark all other contract drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date original contract drawings in the revision block.
 - d. Within 20 days after Government approval of all of the working record drawings for a phase of work, prepare the final CADD record drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 30 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic files on optical disk and one set of the approved working record drawings. They must be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final record drawing files and marked prints as specified will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made to the Contractor.

5. Payment

No separate payment will be made for record drawings required under this contract, and all costs accrued in connection with such drawings are considered a subsidiary obligation of the Contractor.

C. As-Built Record of Equipment and Materials

Furnish 6 copies of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Submit 6 sets of final record of equipment and materials 10 days after final inspection. Key the designations to

the related area depicted on the contract drawings. List the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA				
Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used

D. Final Approved Shop Drawings

Furnish final approved project shop drawings 30 days after transfer of the completed facility.

1.03 SPARE PARTS DATA

Submit 6 copies of the Spare Parts Data list. Indicate manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

Recommend and supply spare parts inventory. Provision of spare parts does not relieve the Contractor of responsibilities listed under the contract guarantee provisions.

1.04 PREVENTATIVE MAINTENANCE

Submit Preventative Maintenance, Condition Monitoring (Predictive Testing) and Inspection schedules with instructions that state when systems should be retested.

Define the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure. Provide a signoff blank for the Contractor and Contracting Officer for each test feature; e.g., gpm, rpm, psi. Include a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventative maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair.

Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.05 OPERATION AND MAINTENANCE MANUALS

Submit 6 copies of the project operation and maintenance manuals 30 calendar days prior to testing the system involved. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

A. Configuration

Operation and Maintenance Manuals must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Bind information in manual format and grouped by technical sections. Test data must be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for

vendor data and manuals must have 0.3937-inch holes and be bound in 3-ring, loose-leaf binders. Organize data by separate index and tabbed sheets, in a loose-leaf binder. Binder must lie flat with printed sheets that are easy to read. Caution and warning indications must be clearly labeled.

B. Training and Instruction

Submit classroom and field instructions in the operation and maintenance of systems equipment where required by the technical provisions. These services must be directed by the Contractor, using the manufacturer's factory-trained personnel or qualified representatives. Contracting Officer will be given 7 calendar days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor, such as lists, static exhibits, and visual aids, must be made available to the Contracting Officer.

1.06 COST REPORT

Provide a detailed cost report for use in preparation of the Remedial Action Report for the project. Provide the cost report a minimum of 3 months prior to the end of the Contractor's one-year O&M period.

A. Detailed Cost Breakdowns

Provide detailed cost breakdowns of labor, equipment (breakdown for each piece of major equipment, piping, and instrumentation), materials, subcontractors (breakdown for each subcontractor), utilities, other direct costs (excluding utilities) and fee associated with, but not limited to, the following:

1. Construction of the enhanced in-situ bioremediation (EISB) system
2. Startup/shakedown of the EISB system
3. In-situ Chemical Reduction (ISCR) barrier installation
4. First six months of operation and maintenance of the EISB system after the startup/shakedown period

1.07 CLEANUP

Leave premises clean. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

Submit 6 copies of the listing of completed final clean-up items.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971

(2005; R 2011) Stewardship for the Cleaning of
Commercial and Institutional Buildings

1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

System O&M Manual; G

1.03 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit a System O&M Manual consisting of Operation and Maintenance (O&M) Data specifically applicable to this Contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors must compile and prepare data and deliver to the Contractor prior to the training of Government personnel. Compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal.

A. Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

B. Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections must use Data Package 3. Commissioned items with a Data Package 1 or 2 requirement must use instead Data Package 3.

C. Changes to Submittals

Manufacturer-originated changes or revisions to submitted data must be furnished if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

D. Review and Approval

The Contracting Officer must review the commissioned systems and equipment submittals for completeness and applicability. The Contracting Officer must verify that the systems and equipment provided meet the requirements of the Contract Documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. This work is in addition to the normal review procedures for O&M data.

E. O&M Database

Develop a database from the O&M manuals that contains the information required to start a preventative maintenance program.

1.04 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

A. Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1. Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

2. Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

3. Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

4. Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

5. Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further

damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

6. Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

7. Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the equipment should not be allowed to run.

B. Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1. Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications.
- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

2. Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

3. Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

C. Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting

problems and making repairs.

1. Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

2. Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams are point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

3. Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

4. Removal and Replacement Instructions

Include step-by-step procedures and a list of required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions include a combination of text and illustrations.

5. Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

D. Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer is to be identified and tabulated separately.

E. Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1. Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable

technical sections.

2. Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

3. O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

4. Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing are to show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings are to be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

5. Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or Contract Documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

6. Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

7. Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

8. Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

9. Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.05 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES

Include Data Package 5 and the following for control systems:

- A. Narrative description on how to perform and apply all functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- B. Full as-built sequence of operations.
- C. Copies of all checkout tests and calibrations performed by the Contractor (not Cx tests).
- D. Full print out of all schedules and set points after testing and acceptance of the system.
- E. Full as-built print out of software program.
- F. Electronic File:
 - 1. Assemble each manual into a composite electronically indexed file in PDF format. Provide HDD's, DVD's or CD's as appropriate, so that each one contains all maintenance and record files, and also the Project Record Documents and Training Videos, of the entire program for this facility.
 - 2. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - 3. Link the index to separate files within the composite of files. Book mark maintenance and record files, that have a Table of Contents, according to the Table of Contents
- G. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.06 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

- A. Data Package 1
 - 1. Safety precautions
 - 2. Cleaning recommendations

3. Maintenance and repair procedures
4. Warranty information
5. Contractor information
6. Spare parts and supply list

B. Data Package 2

1. Safety precautions
2. Normal operations
3. Environmental conditions
4. Lubrication data
5. Preventive maintenance plan and schedule
6. Cleaning recommendations
7. Maintenance and repair procedures
8. Removal and replacement instructions
9. Spare parts and supply list
10. Parts identification
11. Warranty information
12. Contractor information

C. Data Package 3

1. Safety precautions
2. Operator prestart
3. Startup, shutdown, and post-shutdown procedures
4. Normal operations
5. Emergency operations
6. Environmental conditions
7. Lubrication data
8. Preventive maintenance plan and schedule
9. Cleaning recommendations

10. Troubleshooting guides and diagnostic techniques
11. Wiring diagrams and control diagrams
12. Maintenance and repair procedures
13. Removal and replacement instructions
14. Spare parts and supply list
15. Product submittal data
16. O&M submittal data
17. Parts identification
18. Warranty information
19. Testing equipment and special tool information
20. Testing and performance data
21. Contractor information

D. Data Package 4

1. Safety precautions
2. Operator prestart
3. Startup, shutdown, and post-shutdown procedures
4. Normal operations
5. Emergency operations
6. Operator service requirements
7. Environmental conditions
8. Lubrication data
9. Preventive maintenance plan and schedule
10. Cleaning recommendations
11. Troubleshooting guides and diagnostic techniques
12. Wiring diagrams and control diagrams
13. Maintenance and repair procedures
14. Removal and replacement instructions

15. Spare parts and supply list
16. Corrective maintenance man-hours
17. Product submittal data
18. O&M submittal data
19. Parts identification
20. Warranty information
21. Personnel training requirements
22. Testing equipment and special tool information
23. Testing and performance data
24. Contractor information

E. Data Package 5

1. Safety precautions
2. Operator prestart
3. Start-up, shutdown, and post-shutdown procedures
4. Normal operations
5. Environmental conditions
6. Preventive maintenance plan and schedule
7. Troubleshooting guides and diagnostic techniques
8. Wiring and control diagrams
9. Maintenance and repair procedures
10. Removal and replacement instructions
11. Spare parts and supply list
12. Product submittal data
13. Manufacturer's instructions
14. O&M submittal data
15. Parts identification
16. Testing equipment and special tool information

17. Warranty information
18. Testing and performance data
19. Contractor information

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 USER TRAINING AND INSTRUCTION

The training is to consist of at least 16 hours of instruction including both onsite and classroom activities and include training in the startup, daily O&M, and troubleshooting of the EISB system. The training, as a minimum, is to include operator familiarity with the startup, operating, and shutdown procedures developed in accordance with this specification and review of all available equipment vendor data. Additional training requirements are included in the respective equipment specification sections.

3.02 TRAINING SCHEDULE

Provide formal training to the incoming EISB system operator's staff within the final 45 calendar days of the 365 day operational and functional (O&F) period. The training session are to be completed not less than 10 calendar days before the contract expires. Prepare an outline of the proposed training schedule for review by the Contracting Officer. Coordination with the Contracting Officer is to commence a minimum of 14 calendar days prior to commencement of the training. Revisions to the training schedule will be communicated to the Contracting Officer a minimum of 7 calendar days prior to the beginning of the training period.

-- End of Section --

SECTION 02 54 19.19

ENHANCED IN-SITU BIOREMEDIATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

The in-situ anaerobic bioremediation of groundwater focuses on addressing the high concentrations of VOCs in the source area. Substrate, as well as other biological amendments (e.g., dechlorinating cultures, nutrients, buffering chemicals), must be delivered, dispersed, and distributed throughout the formation in order for in-situ bioremediation to proceed. Amendments are to be distributed initially in two small areas (about 6,000 square feet each area) across the plume via a groundwater recirculation system to create an active treatment zone. These small areas will serve as sources for electron donor and PCE-degrading bacteria and will eventually be distributed across the rest of the high concentration PCE plume by groundwater flow.

1.02 GENERAL REQUIREMENTS

Amendment injection, including equipment, materials, installation, and performance, shall be in accordance with local, State, and Federal regulations. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" has been substituted for the word "should" wherever it appears.

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Enhanced In-Situ Bioremediation Work Plan; G

SD-03 Product Data

Electron Donor Substrate; G
Bioaugmentation Culture; G

SD-06 Test Reports

Microcosm Testing Report; G

SD-11 Closeout Submittals

In-Situ Bioremediation Completion Report; G

1.04 ENHANCED IN-SITU BIOREMEDIATION WORK PLAN

Meet with Government prior to beginning work to discuss in detail the Enhanced In-Situ Bioremediation Work Plan. Submit a detailed Enhanced In-Situ Bioremediation Work Plan as part of the Construction Work Plan in accordance with Section 01 71 13 -

MOBILIZATION/DEMOBILIZATION. The Enhanced In-Situ Bioremediation Work Plan prepared by the Contractor shall describe the proposed materials and equipment, sampling schedule and requirements, and schedules including, but not be limited to, the following:

A. Listing of Supervisory Personnel

Name and experience of the various persons, their role and primary responsibilities.

B. Incorporated Materials

Certificates of compliance, test reports, material safety data sheets (MSDS) provided by the manufacturers of each amendment, nutrient, and any other materials used during the recirculation and sampling events.

C. Amendments

Characteristics of all amendments and nutrients intended to be used in construction.

D. Quality Control

Provide a detailed quality control program covering all aspects of the In-situ Bioremediation.

E. Equipment

A list of major equipment by type and capacity including all equipment required by Section 46 07 53.16 - ENHANCED IN-SITU BIOREMEDIATION SYSTEM EQUIPMENT.

F. Schedule

Bar chart with starting and ending dates for major segments of the work, estimated production rates, days and hours of operation in accordance with Section 01 32 01.00 10 - SCHEDULE.

1.05 DESIGN REQUIREMENTS

Amendment distribution is to be performed by the Contractor in two phases: bio-stimulation (Phase I) and bio-augmentation (Phase II). During Phase I, substrate (such as LactOil or approved equal) with proper additives (nutrients, yeast, vitamin B12, etc.) are to be recirculated to stimulate biological activity and create strongly reducing groundwater conditions characterized by negative ORP measurements. However, based on treatability testing results, due to a lack of native PCE-degrading bacteria such as Dehalococcoides, it is not anticipated that bio-stimulation alone will be sufficient to degrade PCE to ethene. Therefore, Phase II is to include bio-augmentation with Dehalococcoides after anaerobic conditions are created. This is to be performed by the Contractor via a recirculation event similar to Phase I, but with Dehalococcoides cultures injected in midstream through the bioaugmentation port (after untreated extracted groundwater passes through the bag filter and before sodium bicarbonate is added to the flow to the injection wells).

The injection approach allows a significant degree of flexibility in selecting and modifying parameters such as amendment type, quantity, dilution ratio, injection rate, and recirculation event volume and duration.

A. Recirculation Event Duration

The initial amendments distribution zones A and B were selected to be placed across the 10,000 ug/L PCE contour. It is anticipated that the RA objectives for the in-situ groundwater remedy will be eventually achieved within 3 years of recirculation system start-up.

B. Substrate Selection and Dosage

Slow-release electron donor substrates include hydrogen-releasing compounds, vegetable oil, and chitin. These compounds gradually release fatty acids into the surrounding groundwater, which are subsequently metabolized and utilized by microbes. Emulsified vegetable oils (EVOs) are commercially available, and have been engineered to exhibit enhanced transport properties while slowly releasing carbon. LactOil is representative of this type of substrate.

The substrate quantity or electron donor demand necessary for degrading CVOCs depends on factors such as total contaminated pore volume, organic carbon fraction in soil and groundwater, concentrations of competing electron acceptors (e.g., sulfate, iron, etc.), DO, ORP, CVOC concentrations, substrate distribution effectiveness, and additional substrate parameters (i.e., solubility, mobility, matrix retention, etc.). Actual substrate quantities, as well as concentrations, will likely be adjusted based on physical observations and operating conditions during implementation of the RA.

C. pH Buffering

The majority of the groundwater has a near-neutral pH that is generally favorable for reductive dechlorination of PCE to ethane. Sodium bicarbonate (NaHCO_3) is to be used for pH adjustment, if necessary.

D. Bioaugmentation Culture

Treatability test results indicated a lack of native PCE-degrading bacteria, such as Dehalococcoides, at this Site. Several Dehalococcoides cultures are commercially available (e.g., KB-1, KB-1 Plus, and Bio-Dechlor INOCULUM Plus). It is anticipated that KB-1, or approved equal, is to be used. Based on the groundwater conditions following the first biostimulation injection, the Contractor shall provide a recommendation of the final specifications for the Dehalococcoides mixture for approval by the Government.

1.06 BENCH-SCALE MICROCOSM STUDY

The microcosm testing results will be used to refine any specific design parameters such as the selected electron donor, nutrients, additives, and dechlorinating bacteria cultures. The microcosm tests are to be conducted by the Contractor by setting up several bench studies using unpreserved Site groundwater collected from one or several locations. Several liters of groundwater will be required for the microcosm tests. The microcosm testing results will be used to optimize specific parameters such as the electron donor, nutrients, additives, and dechlorinating bacteria cultures. The sample is to be analyzed for CVOCs, competing electron acceptors (nitrate and sulfate), nutrients (ammonia and phosphate), dissolved gases, chloride, and organic acids.

The Contractor shall furnish mobile laboratory equipment, labor, all necessary tools, PPE, and any miscellaneous materials required to complete microcosm analyses. This includes all labor,

equipment, chemicals, reagent, and materials for microcosm laboratory analysis, to include standard laboratory control samples such as lab blanks, lab standards, etc. All handling of media samples for microcosm analysis shall be within an anaerobic glove box. The data generated by the laboratory shall be screening-quality data. Detection limits for chlorinated volatile organic compounds (CVOCs) shall be less than U.S. EPA National Primary Drinking Water Standards (MCLs).

The Contractor shall characterize groundwater samples by analyzing for CVOC concentrations, competing electron acceptors (nitrate and sulfate), nutrients (ammonia and phosphate), dissolved gases, chloride, and organic acids.

Analysis of these parameters is to be conducted during initiation of microcosm testing and in weekly increments for one month. The description below is included for illustration only. The actual number of microcosm tests may differ from this description for a typical set-up.

A. Microcosm Testing

The following three microcosm tests shall be conducted by the Contractor:

Test	Test Environment	Electron Donor	Mineral Supplement	Vitamin Addition	Bioaugmentation Cultures
1	Acid-killed (Control)	None	None	None	None
2	pH 7.0	Lactate	NH ₄ , PO ₄ , trace elements	B12	None, Native Population
3	pH 7.0	Lactate	NH ₄ , PO ₄ , trace elements	B12	Dechlorinating and sulfate reducing cultures

The second and third microcosms are supplemented with nutrients and vitamins and the pH shall be controlled to maintain a near neutral pH. Subsamples of microcosm headspace shall be removed from sealed microcosm bottles by syringe through septa, and analyzed by direct injection into a gas chromatograph for CVOCs as well as methane and ethene using EPA Method 5012A. Headspace samples shall also be analyzed for molecular hydrogen via a hydrogen gas analyzer. Electron donor utilization and sulfate reduction shall be analyzed by ion electrophoresis via EPA Method 6500. Additional donor shall be added as needed. pH shall be monitored by removing small samples and analyzing with microelectrode. pH shall be maintained near neutral by small injections of HCl or KOH. Analysis of chlorinated contaminants shall be conducted during initiation of microcosm testing and in weekly increments for 1 month.

B. Microcosm Testing Report

Submit a microcosm testing report containing microcosm methods, results, and conclusions. Laboratory analysis reports, trend graphs, analysis of degradation pathways, and recommendations shall be included in the report. As part of this report, include the final recommendation for the amendments to be used during the recirculation events.

1.07 BASELINE MONITORING, SAMPLING, AND ANALYSIS

Once all five permanent remediation wells and temporary PVC wells are installed, one round of groundwater samples is to be collected by the Contractor. One round of comprehensive water-levels is also to be obtained near the targeted treatment area, and the elevations are to be compared to previous water-level results.

Groundwater samples are to be collected in accordance with Table 02 54 19.19 - 1, the Contractor approved SAP, and Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL. Low-flow groundwater sampling procedures are to be employed with Grundfos Redi-Flo 2™ pumps (or approved equal) for wells of 2-inch or larger diameter. In PVC wells that are less than 2 inches in diameter, collect samples using either peristaltic pumps, micro-bladder pumps, or Waterra® inertial pumps.

The Contractor shall evaluate the results and recommend the subsequent frequency of bioremediation injections, and any necessary modifications to the dosage of the reagents for final approval by the Government.

1.08 GROUNDWATER MONITORING

Following the recirculation events, groundwater samples and water-level measurements from selected wells are to be obtained by the Contractor on a periodic basis. Samples shall be collected from the wells for both chemical and physical parameter analyses. Low-flow groundwater sampling procedures are to be employed with Grundfos Redi-Flo 2™ pumps (or approved equal) for wells of 2-inch or larger diameter. In PVC wells that are less than 2 inches in diameter, collect samples using either peristaltic pumps, micro-bladder pumps, or Waterra® inertial pumps. The monitoring program will help to determine the effectiveness and rate of bioremediation in the source area. Two types of groundwater monitoring is to be performed:

A. Performance Monitoring

The frequency of performance monitoring shall be quarterly during the first and second years and semi-annually during the third year of in-situ system operation. The schedule for performance monitoring events may need to be adjusted based on previous results. Samples shall be collected in accordance with Table 02 54 19.19 - 2, the Contractor approved SAP, and Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL.

The Contractor shall evaluate the monitoring data and recommend the subsequent frequency of recirculation events, modifications to the amendments dosages, injection volumes/durations, recirculation rates, and other operational parameters for final approval by the Government.

B. Process Monitoring

Process monitoring events involve the use of field instruments (for water quality parameters such as pH, DO, ORP, turbidity, conductivity, and temperature) and test kits (total alkalinity, total soluble sulfide, and ferrous iron) in accordance with Table 02 54 19.19 - 3, the Contractor approved SAP, and Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL. These results will be compared to pre-injection groundwater quality results.

Process monitoring events are to be conducted 1 and 2 months after any recirculation event. Process monitoring must be conducted after the initial biostimulation injection,

prior to the first bioaugmentation event to ensure anaerobic conditions have been achieved. Based on previous process monitoring results, the schedule may be adjusted and additional rounds may be needed. Payment for any additional rounds required by the Government will be made at the unit bid price.

PART 2 PRODUCTS

2.01 ELECTRON DONOR SUBSTRATE

Electron donor substrate shall be LactOil as manufactured by JRW Bioremediation, LLC, or approved equal. Submit the shipping documents and manufacturer's instructions.

The LactOil micro-emulsion is comprised of 35% ethyl lactate, 35% oleaginous material, 10% emulsifier, and 20% water by-weight.

2.02 BIOAUGMENTATION CULTURE

Bioaugmentation culture shall be KB-1 as manufactured by SiREM, Guelph, Ontario, Canada, N1G 5G3, or approved equal. Submit the shipping documents and manufacturer's instructions.

KB-1 is a naturally occurring, non-pathogenic microbial culture that contains Dehalococcoides (Dhc), the only group of microorganisms documented to promote the complete dechlorination of chlorinated ethenes to non-toxic ethene.

PART 3 EXECUTION

3.01 EXAMINATION

Operations are not to be started until the system has been tested by the Contractor and approved by the Government. Each component's start-up procedures, maintenance requirements and safety/operational warnings are to be reviewed.

3.02 GROUNDWATER RECIRCULATION

Groundwater recirculation will take the form of a closed loop configuration. Groundwater is to be pumped from extraction wells and returned to the subsurface via injection wells.

The recirculation system will be operated initially to attain steady-state water level conditions. The steady-state conditions are to be determined by routinely measuring the water levels until they have stabilized.

Each recirculation event is expected to take approximately 25 days. This duration includes installation and testing of the equipment at the two locations, operating the system to obtain steady state conditions, and the injection and recirculation of groundwater for 10 days at each location.

3.03 SUBSTRATE AND BIOAUGMENTATION CULTURE HANDLING

Procure, store, handle, prepare, and inject in accordance with manufacturer's instructions unless otherwise indicated.

3.04 BIOSTIMULATION INJECTION

Prior to initiating the addition of amendment or nutrient, the recirculation system is to be operated about 48 hours to attain steady-state conditions. Amendment and nutrient are to be injected using the mixing tanks and amendment feed pump and associated amendment feed pump manifold.

Biostimulation injections are to be conducted to create and maintain favorable reducing and anaerobic environmental conditions to support the in-situ bioremediation process. In order to deliver amendments (e.g., substrate, and sodium bicarbonate) to the groundwater recirculation cell, groundwater is to be pumped from extraction wells and the amended water is to be delivered to injection wells. The actual biostimulation injection strategies including donor substrate, dosage, injection rates and duration, injection locations may be adjusted based on physical observations and operating conditions during implementation of the RA.

Moderate pH buffering using sodium bicarbonate is recommended during the recirculation with the LactOil substrate. The NaHCO_3 buffering solution is to be prepared in the 300-gallon tank. 100 pounds of sodium bicarbonate is to be mixed into the water in 300-gallon tank, resulting in a 4% solution. The dosages, recirculation rates, and duration may be adjusted based on site conditions.

3.05 BIOAUGMENTATION INJECTION

If the bacterial population is not sufficiently large or of the right genetic composition for the process to efficiently achieve completion, bioaugmentation shall be performed to accelerate the current biodegradation process by introducing large volumes of Dhc and Dhb containing the required functional genes into the UGA's bacterial population. SiREM KB-1 dechlorinating culture, or approved equal, is to be used as the inoculating culture product.

The bioaugmentation culture is to be injected into the formation using the groundwater recirculation system. The actual quantity of KB-1 culture injected into the aquifer may change based on site information collected during post injection monitoring.

Prior to the injection of the KB-1 culture, the recirculation system is to be operated for several hours to bring formation groundwater into the system and to assure that the culture is injected into groundwater that has strongly reducing conditions and essentially no DO.

The injection of the KB-1 culture is to be initiated when the DO is essentially absent (<0.1 mg/liter) and the ORP is negative at -90 mV. Such parameters indicated that strongly reducing conditions are present at the point of injection. The KB-1 shall be injected into the recirculation system manifold. After all of the bacterial culture is added to the treatment system, the recirculation system is to be turned off, and the injected culture is to be left to acclimate under ambient conditions.

After 5 days, the recirculation system shall be turned on for an additional 5 days to assure that the acclimated injected culture is distributed throughout the recirculation cell.

3.06 IN-SITU BIOREMEDIATION COMPLETION REPORT

Provide completed operation records for groundwater in-situ bioremediation system including the detailed information about biostimulation injection events, bioaugmentation injection events, and post-injection monitoring.

Table 02 54 19.19 - 1:
BASELINE SAMPLING

Well Number	Target Compound List (TCL) VOCs	Total Organic Carbon	Dissolved Gases	Volatile Fatty Acids	qPCR Census (3)	Field Test Kits (4)	Synoptic Water Level Measurement
EW-N	X	-	-	-	-	-	X
IW-N1	X	X	X	X	X	X	X
IW-N2	X	X	X	X	X	X	X
IW-S1	X	X	X	X	X	X	X
IW-S2	X	X	X	X	X	X	X
IW-01D (EW-S)	X	-	-	-	-	-	X
IW-01S	X	-	-	-	-	-	X
MW-18D	X	-	-	-	-	-	X
MW-21D	X	-	-	-	-	-	X
MW-21S	X	-	-	-	-	-	X
MW-27D	X	X	X	X	-	X	X
MW-27S	X	-	-	-	-	-	X
PW-01S	X	-	-	-	-	-	X
TW-01D	X	X	X	X	-	X	X
TW-01S	X	-	-	-	-	-	X
TW-02D	X	X	X	X	-	X	X
TW-03D	X	-	-	-	-	-	X
TW-04D	X	-	-	-	-	-	X
TW-05D	X	-	-	-	-	-	X
TW-06D	X	X	X	X	-	X	X
TW-07D	X	-	-	-	-	-	X
TW-08D	X	X	X	X	-	X	X

Well Number	Target Compound List (TCL) VOCs	Total Organic Carbon	Dissolved Gases	Volatile Fatty Acids	qPCR Census (3)	Field Test Kits (4)	Synoptic Water Level Measurement
TW-10D	X	X	X	X	-	X	X
TW-11D	X	-	-	-	-	-	X
TOTALS	24	10	10	10	4	10	24

NOTES:

1. Obtain water quality parameters for DO, temperature, conductivity, pH, turbidity, and ORP at all sampled wells.
2. Analyze for VOCs using EPA SW-846 Method 8260B; for TOC using EPA Method 415.1 or Microseeps SOP WC21; for dissolved gases using EPA RSK SOPs 147/175 or Microseeps SOP. AM20-GAX; and for volatile fatty (metabolic) acids using Microseeps SOP AM23G.
3. Analyze for qPCR (dechlorinating bacteria), functional genes (TCE R-Dase, BAV1 Vinyl Chloride R-Dase, and Vinyl Chloride R-Dase), and Phylogenetic Groups (Eubacteria and Methanogens) using Microbial Insights SOP qPCR (CENSUS) and Bio-trap sample devices.
4. Use field test kits to measure total alkalinity (e.g., CHEMetrics K-9810), total soluble sulfide (e.g., CHEMetrics K-9510), and ferrous iron (e.g., CHEMetrics K-6210) levels.

Table 02 54 19.19 - 2:
PERFORMANCE MONITORING SAMPLING

Well Number	Target Compound List (TCL) VOCs	Total Organic Carbon	Dissolved Gases	Volatile Fatty Acids	qPCR Census (4)	Field Test Kits (5)	Synoptic Water Level Measurement
EW-N	X	-	-	-	-	-	X
IW-N1	X	X	X	X	X	X	X
IW-N2	X	X	X	X	X	X	X
IW-S1	X	X	X	X	X	X	X
IW-S2	X	X	X	X	X	X	X
IW-01D (EW-S)	X	-	-	-	-	-	X
IW-01S	X	-	-	-	-	-	X
MW-18D	X	-	-	-	-	-	X
MW-21D	X	-	-	-	-	-	X
MW-21S	X	-	-	-	-	-	X
MW-27D	X	X	X	X	-	X	X
MW-27S	X	-	-	-	-	-	X
PW-01S	X	-	-	-	-	-	X
TW-01D	X	X	X	X	-	X	X
TW-01S	X	-	-	-	-	-	X
TW-02D	X	X	X	X	-	X	X
TW-03D	X	-	-	-	-	-	X
TW-04D	X	-	-	-	-	-	X
TW-05D	X	-	-	-	-	-	X
TW-06D	X	X	X	X	-	X	X
TW-07D	X	-	-	-	-	-	X
TW-08D	X	X	X	X	-	X	X

Well Number	Target Compound List (TCL) VOCs	Total Organic Carbon	Dissolved Gases	Volatile Fatty Acids	qPCR Census (4)	Field Test Kits (5)	Synoptic Water Level Measurement
TW-10D	X	X	X	X	-	X	X
TW-11D	X	-	-	-	-	-	X
TOTALS	24	10	10	10	8	10	24

NOTES:

1. Performance monitoring is to occur quarterly for the first two years and semiannually for the third year of operation.
2. Obtain water quality parameters for DO, temperature, conductivity, pH, turbidity, and ORP at all sampled wells.
3. Analyze for VOCs using EPA SW-846 Method 8260B; for TOC using EPA Method 415.1 or Microseeps SOP WC21; for dissolved gases using EPA RSK SOPs 147/175 or Microseeps SOP. AM20-GAX; and for volatile fatty (metabolic) acids using Microseeps SOP AM23G.
4. Collect Bio-trap samples at intervals of 1 and 2 months after each recirculation event. Analyze for qPCR (dechlorinating bacteria), functional genes (TCE R-Dase, BAV1 Vinyl Chloride R-Dase, and Vinyl Chloride R-Dase), and Phylogenetic Groups (Eubacteria and Methanogens) using Microbial Insights SOP qPCR (CENSUS) and Bio-trap sample devices.
5. Use field test kits to measure total alkalinity (e.g., CHEMetrics K-9810), total soluble sulfide (e.g., CHEMetrics K-9510), and ferrous iron (e.g., CHEMetrics K-6210) levels.

Table 02 54 19.19 - 3:
PROCESS MONITORING SAMPLING

Well Number	Process Monitoring using Field Instruments (1,2)	Process Monitoring using Field Test Kits (1,3)
EW-N	X	-
IW-N1	X	X
IW-N2	X	X
IW-S1	X	X
IW-S2	X	X
IW-01D (EW-S)	X	-
MW-18D	X	-
MW-21D	X	-
MW-27D	X	X
PW-01D	X	-
TW-01D	X	X
TW-02D	X	X
TW-03D	X	-
TW-05D	X	-
TW-06D	X	X
TW-07D	X	-
TW-08D	X	X
TW-10D	X	X
TW-11D	X	-
TOTALS	19	10

NOTES:

1. Process monitoring is to occur one and two months after each recirculation event (both biostimulation and bioaugmentation events).
2. Obtain water quality parameters for DO, temperature, conductivity, pH, turbidity, and ORP at all wells.
3. Use field test kits to measure total alkalinity (e.g., CHEMetrics K-9810), total soluble sulfide (e.g., CHEMetrics K-9510), and ferrous iron (e.g., CHEMetrics K-6210) levels.

-- End of Section --

SECTION 02 70 00

IN-SITU CHEMICAL REDUCTION BARRIER INSTALLATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

The in-situ chemical reduction (ISCR) barriers will be established by injecting EHC slurry into closely-spaced injection points. The injection points are to be installed in a linear, barrier configuration. The EHC consists of organic carbon, micro Zero-Valent Iron (ZVI), plant fiber, guar, and water. The EHC slurry will reduce PCE and other VOC groundwater concentrations by creating low redox potential and producing hydrogen. Only the deep Upper Glacial Aquifer (UGA) will be targeted for the ISCR barrier. This section specifies requirements for ISCR barrier installation by EHC slurry injection.

1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Installation Work Plan; G

SD-02 Shop Drawings

Record Drawings; G

SD-03 Product Data

Manufacturer's catalog data

SD-08 Manufacturer's Instructions

Material Safety Data Sheets; G

SD-11 Closeout Submittals

ISCR Barrier Completion Report; G

1.03 INSTALLATION WORK PLAN

Meet with Government prior to beginning work to discuss in detail the Installation Work Plan. Submit a detailed Installation Work Plan as part of the Construction Work Plan in accordance with Section 01 71 13 - MOBILIZATION/DEMobilIZATION. The Installation Work Plan prepared by the Contractor shall describe the proposed construction methods, equipment, and schedules including, but not be limited to, the following:

A. Listing of Supervisory Personnel

Name and experience of the various persons, their role and primary responsibilities.

B. Construction Means and Methods

Construction steps, EHC slurry mixing and handling, injection equipment, EHC injection procedures, and site restoration. Include drawings depicting layout of major equipment items.

C. Incorporated Materials

Certificates of compliance, test reports, material safety data sheets (MSDS) provided by the manufacturers of each slurry ingredient and any other permanent materials that become a part of the final installation.

D. EHC Slurry

Characteristics of all chemicals in the EHC slurry intended to be used in construction. The submittal shall indicate whether the slurry is natural or synthetic and any residuals after degradation.

E. Quality Control

Provide a detailed quality control program covering all aspects of the ISCR barrier construction.

F. Equipment

A list of major equipment by type and capacity including DPT rig, slurry mixer, injection equipment, and transport equipment.

G. Schedule

Bar chart with starting and ending dates for major segments of the work, estimated production rates, days and hours of operation in accordance with Section 01 32 01.00 10 - SCHEDULE.

1.04 QUALITY ASSURANCE

A. Qualifications

The Contractor shall provide written evidence of a minimum of 5 years construction experience on in-situ chemical reduction barrier construction projects of similar size and scope. For each project, the following shall be provided: site name, location, the names of the Contractor's key personnel; key points of contact and phone numbers (including Government representatives, and other parties involved in the project); dates of mobilization/demobilization; contaminants of concern.

B. Regulatory Requirements

The Contractor shall obtain the permits, permit equivalents and certifications; and meet the substantive regulatory requirements necessary for the installation, operation, and closure of the project.

1.05 EXISTING CONDITIONS

Be familiar with the Site features, as well as surface, subsurface, and groundwater conditions at the Site. No Contract adjustment will be made because of the failure of the Contractor to review and understand all existing Site data.

PART 2 PRODUCTS

2.01 EHC SLURRY

The bioremediation product selected for the ISCR barriers shall be EHC as manufactured by PeroxyChem, Philadelphia, PA 19103, or approved equal. Submit all manufacturer's catalog data, material safety data sheets, and shipping documents.

A. Design Requirements

The EHC slurry consists of solid organic carbon, micro ZVI, plant fiber, guar, and water.

2.02 WATER FOR EHC SLURRY

The water used to make the EHC Slurry shall be suitable to provide slurry with adequate viscosity and useful life. Groundwater obtained by pumping from available nearby wells with trace to low levels of PCE (such as well MW-18D or PW-01D) is to be used to manufacture the EHC slurry. It is the responsibility of the Contractor that the EHC slurry resulting from the water shall always meet the standards of this Specification.

2.03 EQUIPMENT

A. Mixing Equipment

The EHC slurry is to be prepared using a 2-bin mixing system. Provide bins containing paddle-mixers for handling and mixing the EHC solid material with groundwater. After mixing, the slurry is to be transferred to the holding hopper, which is to be connected to the injection pump. The pump is to be connected to each injection point. Provide a mixing system featuring a pair of 70-gal mixing tanks, one 15-gal holding hopper, and an open throat progressive cavity grout pump. The double mix tank design permits continuous pumping as each mix tank alternates feeding the pump. Each mixer is to be equipped with baffles, bag breakers, and variable speed high-efficiency paddles to provide rapid mixing. The tank outlet valves are to be large slide gates that allow the thickest materials to fall easily into the pump hopper. Provide a holding hopper that has an auger in it to keep the material thoroughly mixed while supplying the grout pump with material for the continuous pumping operation.

B. Injection Equipment

The DPT (e.g., Geoprobe 7822 Model) is to be set up over each injection point. Follow the manufacturer's SOP for the direct push equipment and the SOP for the mechanical mixing equipment. Document that all probe holes remain vertical.

The selection of the most appropriate method for installing injection points will depend on site-specific conditions, including drilling costs, flow rate per injection point and interval, and volume of material that must be injected. The injection design shall be

optimized to provide the required injection flow rate while minimizing drilling costs and the time necessary to install the ISCR barrier.

Use minimum 1.5-inch O.D./0.625-inch I.D drive rods. The use of rods with larger diameters may also be practical given the materials that could be encountered in the deep UGA outwash.

Injections shall be bottom to top using a pressure activated tip that directs the slurry laterally into the subsurface. This will ensure accurate placement of the EHC slurry into the intended injection interval. A key feature of this probe is that it acts as a back-flow preventer, keeping injection material within the subsurface.

PART 3 EXECUTION

3.01 PREPARATION OF EHC SLURRY

The EHC slurry shall be prepared with a mechanical mixing system on site. It is recommend continuous mixing in smaller batches (<100 USG / 400 L) to avoid settling of solids at the bottom. For example Chem Grout's high pressure mixing and injection units are ideal for continuous preparation and injection of EHC. The amount of water to prepare the EHC slurry could be varied depending on the desired injection volume and slurry properties. 75 lbs of EHC powder is to be mixed with 28 gallons of water.

3.02 EHC SLURRY INJECTIONS

The injection points are to be spaced approximately 7 feet apart and generally lie in a straight line for the deep UGA. The exact spacing of points may vary depending on accessibility, subsurface features, and property owner considerations. The injections are to begin just above the Gardiners Clay and proceed bottom to top. Injections are to begin at approximately 80 feet bgs and advance up to the bottom of the "20-foot clay" layer (estimated at 50 feet bgs). Slurry is not to be introduced into the "20-foot clay" layer if it is present.

For each injection interval, the rods of the DPT equipment is to be advanced to the bottom of the targeted depth interval, and the selected slurry volume injected. The depth to groundwater within the shallow UGA ranges from 3 to 15 feet bgs; the depth to groundwater within the deep UGA varies from 6 to 17 feet bgs. A pressure activated tip with multiple openings directs the slurry horizontally. The injection intervals within a well are to be evenly spaced every 4 feet. The total number of intervals at an individual injection point will depend on the distance between the Gardiners Clay and the "20-foot" clay (if present) at the specific injection location. If necessary, additional DPT rods and injection tips are to be available to allow for the injection points to be capped at the end of each day to prevent overflow.

Each interval is to receive approximately 75 lbs of dry EHC powder (about 1.5 bags) blended with about 28 gallons of water. As some points are to be installed through existing roadways, after the injections are completed, the points are to be resurfaced with an appropriate asphalt mix; points in grass areas shall be reseeded with top soil.

3.03 INJECTION PROCEDURES

A pressure gauge is to be placed between the pump outlet and the delivery sub-assembly to monitor injection pump pressure and detect changes in aquifer backpressures during application. After the sub-assembly is connected to the drive, the Contractor is to check that all connections are secure. Once this check is completed, the EHC slurry is to be pumped through

the delivery system.

The drive rod assembly (including the pressure activated tip) is to be pushed to the deepest target depth for injecting the EHC slurry. The number of drive rods to reach the target depth is to be pre-counted prior to starting injection activities. Injections of EHC slurry are to begin at approximately 80 feet bgs and advance up to the bottom of the "20-foot clay" layer (estimated at 50 feet bgs).

For each injection point, the rods are to be advanced to the top of the targeted depth interval and a specified volume of slurry is injected before advancing up to the next depth. The injections are to be evenly distributed over the targeted depth interval, using spacing of about 4 ft. If necessary, inject a small volume of water (15 gals) to clear the injection tip.

Contractor field personnel shall record the time, injection pressure, volume injected into each interval and each injection point, and other relevant information. Often, some injection wells will accept flow more rapidly than others. When the flow totalizer indicates that an injection point interval has received the required slurry volume, the control valve is to be closed and the DPT drive rods are to be advanced up to a shallower depth interval.

Once the pressure activated tip is activated, the pre-determined volume of EHC slurry is to be pumped into the injection point across the desired treatment intervals. The Contractor is to monitor for indications of aquifer refusal. These indications may include a spike in pressure, or daylighting of injection materials around the injection rods or previously installed injection points. If backpressure is impeding the injection pump's delivery volume of EHC slurry, the pressure relief valve placed between the pump discharge and the delivery subassembly can be used to relieve or bypass the pressure build-up. In case of high back pressure, the Contractor is to allow sufficient time for the deep UGA to equilibrate prior to removing DPT drive rods.

The EHC slurry is to be applied at a rate and pressure that maximizes the radius of influence without causing preferential flow. This should be achieved by injecting at the minimum pressure necessary to overcome the pressures associated with the subsurface conditions.

Once all intervals in an injection point have received the required volume of EHC slurry, the Contractor shall install an appropriate seal (e.g., bentonite chips, granular bentonite) above the shallowest interval in that injection point. Quick-set concrete or asphalt can then be used to provide a good surface seal with minimal set up time. All drive rods are to be removed from the injection point and cleaned prior to being used again. Any residual EHC slurry from the rods is to be returned to the mechanical mixer.

3.04 QUALITY CONTROL PROCEDURES

The ISCR barriers will include both direct and indirect performance metrics. Direct performance metrics include adherence to design specifications, such as required quantities of ISCR material, mixing procedures, pounds of materials used, injection rate, depths, number of intervals, number of injection points, spacing, and injection pressure. The Contractor shall document that the injection equipment is capable of installing points in a vertically-aligned manner. After the first two adjacent injection points for ISCR barrier "A" are installed to depth using DPT equipment, the Contractor shall advance a test boring between these two points equidistant from each (e.g., 3.5 feet based on 7-foot spacing) to determine the overlap of ISCR slurry in the subsurface (i.e., radius of influence associated with each point).

The new boring shall have a sleeve to collect cores at 5-foot intervals. Each core shall be examined for the presence of ISCR slurry, which blends to a light tan color when using EHC. Cores shall be collected along the entire depth of the adjacent injection points (e.g., between 50

and 80 feet bgs). If necessary, field test kits shall be used to determine the presence of ferrous iron in the core sample if the presence of ISCR slurry cannot be adequately confirmed by visual observation alone. This process shall be performed for approximately 20% of the injection points associated with ISCR barrier "A" (roughly 5 points) and ISCR barrier "B" (roughly 4 points). The Contractor shall document the results of the borings and provide results within the ISCR Barrier Completion Report.

Based on the core sample results, injection point spacing for ISCR barrier "A" shall be decreased until it can be demonstrated there is adequate overlap between points and to minimize the potential for untreated zones. Differences in subsurface permeability may cause some portions of each ISCR barrier to be over treated, while some zones may be less treated. However, groundwater flow, dispersion, and dilution over time may increase the size of the treated zones. The same direct performance metrics shall apply to ISCR barrier "B".

Indirect metrics (i.e., process and performance monitoring) include post-injection monitoring to provide the framework for evaluating compliance with performance objectives, evaluating efficacy of the ISCR barrier, and optimizing any future ISCR barrier-related work. Process and performance monitoring are both done. Process monitoring provides information on the state of the remedial action after it is implemented, including (e.g., measure changes in physical parameters (e.g., pressure, flow rates, water elevations, etc.) and chemical changes (e.g., DO, ORP, pH, conductivity, TOC, etc.) in the subsurface. Performance monitoring includes sampling and analysis to evaluate the overall efficacy of the remedy. Process and performance monitoring requirements are described in Section 02 54 19.19.

3.05 ISCR BARRIER COMPLETION REPORT

Provide a completed injection records for ISCR barriers including the time, injection pressure, volume injected into each interval and each injection point, and other relevant information. Include documentation of the quality control testing performed and any field changes made as a result.

Submit record drawings that include a record of actual ISCR barrier injection locations, ISCR barrier depth (± 0.1 foot mean sea level), and top of EHC (± 0.1 foot mean sea level).

-- End of Section --

SECTION 02 81 00

TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

IATA DGR (2013) Dangerous Goods Regulations

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

DOT 4500.9R Defense Transportation Regulation, Part 2, Cargo Movement, Chapter 204, Hazardous Material

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 302	Designation, Reportable Quantities, and Notification
49 CFR 107	Hazardous Materials Program Procedures

49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.02 DEFINITIONS

A. Hazardous Material

A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated pursuant to the Hazardous Materials Transportation Act, 49 U.S.C. Appendix Section 1801 et seq. The term includes materials designated as hazardous materials under the provisions of 49 CFR 172, Sections 101 and 102 and materials which meet the defining criteria for hazard classes and divisions in 49 CFR 173. EPA designated hazardous wastes are also hazardous materials.

B. Hazardous Waste

A waste which meets criteria established in RCRA or specified by the EPA in 40 CFR 261 or which has been designated as hazardous by a RCRA authorized State program.

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Management Plan; G

SD-03 Product Data

Hazardous Waste Classification; G
Notices of Non-Compliance and Notices of Violation
Packaging Notifications

SD-06 Test Reports

Recordkeeping
Spill Response
Exception Report

SD-07 Certificates

Certification

Security Plan
Transportation and Disposal Coordinator
Training
EPA Offsite Policy
Certificates of Disposal
Shipping Documents and Packagings Certification
Waste Minimization

1.04 QUALITY ASSURANCE

A. Transportation and Disposal Coordinator

Designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for this contract. The TDC serves as the single point of contact for all environmental regulatory matters and has overall responsibility for total environmental compliance at the site including, but not limited to:

1. Accurate identification and classification of hazardous waste and hazardous materials;
2. Determination of proper shipping names;
3. Identification of marking, labeling, packaging and placarding requirements;
4. Completion of waste profiles, hazardous waste manifests, bill of ladings, exception and discrepancy reports;
5. All other environmental documentation

Document that the TDC has, at a minimum, one year of specialized experience in the management and transportation of hazardous waste and have been Department of Transportation certified under 49 CFR 172, Subpart H.

B. Training

Train, test, and certify the hazardous materials employees to safely and effectively carry out their assigned duties in accordance with State Regulations and Section 01 35 26- GOVERNMENT SAFETY REQUIREMENTS. Train, test, and certify employees transporting hazardous materials or preparing hazardous materials for transportation, including samples in accordance with 49 CFR 172, Subpart H, including security awareness and any applicable security plans. Where shipment of hazardous materials by air may be occurring, such as for sample shipments, train employees on IATA DGR. Train, test, and certify employees making determinations that shipments do not constitute DOT regulated hazardous materials in accordance with 49 CFR 172, Subpart H.

C. Certification

Document that the Contractor and/or Subcontractors transporting hazardous materials possess a current certificate of registration issued by the Research and Special Programs Administration (RSPA), U.S. Department of Transportation, when required by 49 CFR 107, Subpart G. Submit copies of the certificates or written statements certifying exemption from these requirements.

D. Laws and Regulations Requirements

Work shall meet or exceed the minimum requirements established by Federal, State, and local laws and regulations. These requirements are amended frequently and compliance with amendments is required as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the contract, notify the Contracting Officer immediately.

PART 2 PRODUCTS

2.01 MATERIALS

Provide all the materials required for the packaging, labeling, marking, placarding and transportation of hazardous wastes and hazardous materials in conformance with Department of Transportation standards and IATA DGR, if applicable. Details in this specification should not be construed as establishing the limits of the Contractor's responsibility.

A. Packagings

Provide bulk and non-bulk containers for packaging hazardous materials/wastes consistent with the authorizations referenced in the Hazardous Materials Table in 49 CFR 172, Section 101, Column 8. Bulk and non-bulk packaging shall meet the corresponding specifications in 49 CFR 173 referenced in the Hazardous Materials Table, 49 CFR 172, Section 101. Each packaging shall conform to the general packaging requirements of Subpart B of 49 CFR 173, to the requirements of 49 CFR 178 at the specified packing group performance level, to the requirements of special provisions of column 7 of the Hazardous Materials Table in 49 CFR 172, Section 101, and is compatible with the material to be packaged as required by 40 CFR 262. Also provide other packaging related materials such as materials used to cushion or fill voids in overpacked containers, etc. Document that sorbent materials are not capable of reacting dangerously with, being decomposed by, or being ignited by the hazardous materials being packaged. Additionally, sorbents used to treat free liquids to be disposed of in landfills shall be non-biodegradable as specified in 40 CFR 264, Section 314. Provide packaging notifications to the Government in accordance with 49 CFR 172, Section 178.2(c) regarding type and dimensions of closures, including gaskets, needed to satisfy performance test requirements.

B. Markings

Provide markings for each hazardous material/waste package, freight container, and transport vehicle consistent with the requirements of 49 CFR 172, Subpart D and Section 32 (for hazardous waste). Markings shall be capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during container storage and transportation.

C. Labeling

Provide primary and subsidiary labels for hazardous materials/wastes consistent with the requirements in the Hazardous Materials Table in 49 CFR 172, Section 101, Column 6. Labels shall meet design specifications required by 49 CFR 172, Subpart E including size, shape, color, printing, and symbol requirements. Labels shall be durable and weather resistant and capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during

container storage and transportation.

D. Placards

For each offsite shipment of hazardous material/waste, provide primary and subsidiary placards consistent with the requirements of 49 CFR 172, Subpart F. Provide placards for each side and each end of bulk packaging, freight containers, transport vehicles, and rail cars requiring such placarding. Placards may be plastic, metal, or other material capable of withstanding, without deterioration, a 30 day exposure to open weather conditions and meet design requirements specified in 49 CFR 172, Subpart F.

E. Spill Response Materials

Provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment in accordance with Section 01 35 44 - SPILL CONTROL. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Document that spill response materials are compatible with the type of material being handled.

2.02 EQUIPMENT AND TOOLS

Provide miscellaneous equipment and tools necessary to handle hazardous materials and hazardous wastes in a safe and environmentally sound manner.

PART 3 EXECUTION

3.01 ONSITE HAZARDOUS WASTE MANAGEMENT

These paragraphs apply to Government owned waste only. Contractors are prohibited by 10 U.S.C. 2692 from storing Contractor owned waste onsite for any length of time. The Contractor is responsible for ensuring compliance with all Federal, State, and local hazardous waste laws and regulations and verifying those requirements when preparing reports, waste shipment records, hazardous waste manifests, or other documents. Identify hazardous wastes using criteria set forth in 40 CFR 261 or all applicable State and local laws, regulations, and ordinances. When accumulating hazardous waste onsite, comply with generator requirements in 40 CFR 262 and any applicable State or local law or regulations. Document that onsite accumulation times are restricted to applicable time frames referenced in 40 CFR 262, Section 34 and any applicable State or local law or regulation. Accumulation start dates commence when waste is first generated (i.e., containerized or otherwise collected for discard). Only use containers in good condition and compatible with the waste to be stored. Containers shall be closed except when adding or removing waste, and immediately mark all hazardous waste containers with the words "hazardous waste" and other information required by 40 CFR 262, Section 32 and any applicable State or local law or regulation as soon as the waste is containerized. Place an additional marking on containers of "unknowns" designating the date sampled, and the suspected hazard. Inspect containers for signs of deterioration and for responding to any spills or leaks. Inspect all hazardous waste areas weekly and provide written documentation of the inspection. Include date and time of inspection, name of individual conducting the inspection, problems noted, and corrective actions taken on the inspection logs.

A. Hazardous Waste Classification

Identify, in consultation with the Contracting Officer, all waste codes applicable to each hazardous waste stream based on requirements in 40 CFR 261 or any applicable State or

local law or regulation. Also identify all applicable treatment standards in 40 CFR 268 and state land disposal restrictions and make a determination as to whether or not the waste meets or exceeds the standards. Submit waste profiles, analyses, classification, and treatment standards information to Contracting Officer for review and approval.

B. Waste Management Plan

Prepare a plan detailing the manner in which hazardous wastes will be managed and describing the types and volumes of hazardous wastes anticipated to be managed as well as the management practices to be utilized. The plan will include, but is not limited to, the following:

1. The method to be used to ensure accurate piece counts and/or weights of shipments
2. Waste minimization methods
3. Propose facilities to be utilized for treatment, storage, and/or disposal
4. Identify areas onsite where hazardous wastes are to be handled
5. Identify whether transfer facilities are to be utilized; and if so, how the wastes will be tracked to ultimate disposal.
6. EPA ID numbers, names, locations, and telephone numbers of Treatment, Storage, and/or Disposal (TSD) facilities and transporters.

Submit the plan prior to start of work. Submit written documentation of weekly hazardous waste inspections on a monthly basis.

3.02 OFFSITE HAZARDOUS WASTE MANAGEMENT

Use RCRA Subtitle C permitted facilities which meet the requirements of 40 CFR 264 or facilities operating under interim status which meet the requirements of 40 CFR 265. Do not use offsite treatment, storage, and/or disposal facilities with significant RCRA violations or compliance problems (such as facilities known to be releasing hazardous constituents into ground water, surface water, soil, or air). Submit Notices of Non-Compliance and Notices of Violation by a Federal, State, or local regulatory agency issued to the Contractor in relation to any work performed under this contract. Immediately provide copies of such notices to the Contracting Officer. Also furnish all relevant documents regarding the incident and any information requested by the Contracting Officer, and coordinate its response to the notice with the Contracting Officer or the designated representative prior to submission to the notifying authority. Also furnish a copy to the Contracting Officer of all documents submitted to the regulatory authority, including the final reply to the notice, and all other materials, until the matter is resolved.

A. Status of the Facility

Facilities receiving hazardous waste are permitted in accordance with 40 CFR 270 or operating under interim status in accordance with 40 CFR 265 requirements, or permitted by a State authorized by the Environmental Protection Agency to administer the RCRA permit program. Additionally, prior to using a TSD Facility, contact the EPA Regional Offsite Coordinator specified in 40 CFR 300, Section 440, to determine the facility's status, and document all information necessary to satisfy the requirements of the EPA Offsite policy and submit this information to the Contracting Officer.

B. Shipping Documents and Packagings Certification

Submit all transportation related shipping documents to the Contracting Officer, including but not limited to, draft hazardous waste manifests, draft land disposal restriction notifications, draft bill of lading for hazardous materials, lists of corresponding proposed labels, packages, marks, and placards to be used for shipment, waste profiles, and supporting waste analysis documents, for review a minimum of 14 days prior to anticipated pickup.

Provide written certification to the Contracting Officer that hazardous materials have been properly packaged, labeled, and marked in accordance with Department of Transportation and EPA requirements prior to the anticipated pickup. Furnish packaging assurances prior to transporting hazardous material.

Furnish "generator copies" of hazardous waste manifests, land disposal restriction notifications, used oil invoices/shipment records, bill of lading, and supporting waste analysis documents when shipments are originated.

Furnish "receipt copies" of hazardous waste manifests at the designated disposal facility not later than 35 days after acceptance of the shipment.

C. Transportation

Prior to conducting hazardous materials activities, either certify to the Government that a Security Plan is in place which meets the requirements of 49 CFR 172, Subpart I or in the event that the types or amounts of hazardous materials are excluded from the security planning requirements, a written statement to that effect detailing the basis for the exception. Use manifests for transporting hazardous wastes as required by 40 CFR 263 or any applicable State or local law or regulation. Transportation shall comply with all requirements in the Department of Transportation referenced regulations in the 49 CFR series. Prepare hazardous waste manifests for each shipment of hazardous waste shipped offsite. Complete manifests using instructions in 40 CFR 262, Subpart B and any applicable State or local law or regulation. Submit manifests and waste profiles to Contracting Officer for review and approval. Prepare land disposal restriction notifications as required by 40 CFR 268 or any applicable State or local law or regulation for each shipment of hazardous waste. Submit notifications with the manifest to the Contracting Officer for review and approval. In accordance with DOT 4500.9R, inspect motor vehicles used to transport hazardous materials in accordance the 49 CFR and DOT safety regulations and complete DDForm 626, Motor Vehicle Inspection.

D. Treatment and Disposal of Hazardous Wastes

Transport the hazardous waste to an approved hazardous waste treatment, storage, or disposal facility within 90 days of the accumulation start date on each container. Ship hazardous wastes only to facilities which are properly permitted to accept the hazardous waste or operating under interim status. Wastes shall be treated to meet land disposal treatment standards in 40 CFR 268 prior to land disposal. Propose TSD facilities via submission of the Solid Waste Management Plan, subject to the approval of the Contracting Officer. Submit copies of all Certificates of Disposal documenting the ultimate disposal, destruction or placement of hazardous wastes and CERCLA remediation waste within 180 days of initial shipment. Receipt of these certificates will be required for final payment.

3.03 HAZARDOUS MATERIALS MANAGEMENT

In consultation with the Contracting Officer, evaluate, prior to shipment of any material offsite, whether the material is regulated as a hazardous waste in addition to being regulated as a hazardous material; do this for the purpose of determining proper shipping descriptions, marking requirements, etc., as described below.

A. Identification of Proper Shipping Names

Use 49 CFR 172, Section 101 to identify proper shipping names for each hazardous material (including hazardous wastes) to be shipped offsite. Submit proper shipping names to the Contracting Officer in the form of draft shipping documents for review and approval.

B. Packaging, Labeling, and Marking

Package, label, and mark hazardous materials/wastes using the specified materials and in accordance with the referenced authorizations. Mark each container of hazardous waste of 110 gallons or less with the following:

"HAZARDOUS WASTE - Federal Law Prohibits Improper Disposal.

If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

Generator's name _____

Manifest Document Number _____"

C. Shipping Documents

Each shipment of hazardous material sent offsite shall be accompanied by properly completed shipping documents. This includes shipments of samples that may potentially meet the definition of a Department of Transportation regulated hazardous material.

1. Other Hazardous Material Shipment Documents

Prepare a bill of lading for each shipment of hazardous material which is not accompanied by a hazardous waste manifest. The bill of lading shall satisfy the requirements of 49 CFR 172, Subpart C, and 40 CFR 279 if shipping used oil and any applicable State or local law or regulation, and submit to the Contracting Officer for review and approval. For laboratory samples, prepare bills of lading and other documentation as necessary to satisfy conditions of the sample exclusions in 40 CFR 261, Section 4(d) and (e) and any applicable State or local law or regulation. Bill of lading requiring shipper's certifications will be signed by the Government.

3.04 OBTAINING EPA ID NUMBERS

Complete EPA Form 8700-12, Notification of Hazardous Waste Activity, and submit to the Contracting Officer for review and approval. Allow a minimum of 30 days for processing the application and assigning the EPA ID number. Do not make shipment earlier than one week after receipt of the EPA ID number.

3.05 WASTE MINIMIZATION

Minimize the generation of hazardous waste to the maximum extent practicable and take all

necessary precautions to avoid mixing clean and contaminated wastes. Identify and evaluate recycling and reclamation options as alternatives to land disposal. Requirements of 40 CFR 266 applies to: hazardous wastes recycled in a manner constituting disposal; hazardous waste burned for energy recovery; lead-acid battery recycling; and hazardous wastes with economically recoverable precious metals. Submit written certification that waste minimization efforts have been undertaken to reduce the volume and toxicity of waste to the degree economically practicable and that the method of treatment, storage, or disposal selected minimizes threats to human health and the environment.

3.06 RECORDKEEPING

The Contractor is responsible for maintaining adequate records to support information provided to the Contracting Officer regarding exception reports, annual reports, and biennial reports; maintaining asbestos waste shipment records for a minimum of 3 years from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract; and maintaining bill of lading for a minimum of 375 days from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract. Submit information necessary to file state annual or EPA biennial reports for all hazardous waste transported, treated, stored, or disposed of under this contract. Do not forward these data directly to the regulatory agency but to the Contracting Officer at the specified time. The submittal shall contain all the information necessary for filing of the formal reports in the form and format required by the governing Federal or state regulatory agency. A cover letter shall accompany the data to include the contract number, Contractor name, and project location. In the events that a manifest copy documenting receipt of hazardous waste at the treatment storage and disposal facility is not received within 35 days of shipment initiation, or that a manifest copy documenting receipt of PCB waste at the designated facility is not received within 35 days of shipment initiation, prepare and submit an exception report to the Contracting Officer within 37 days of shipment initiation.

3.07 SPILL RESPONSE

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), or pollutant or contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), notify the Contracting Officer immediately. Any direction from the Contracting Officer concerning a spill or release is not considered a change under the contract. If the spill exceeds a reporting threshold, follow the pre-established procedures for immediate reporting to the Contracting Officer in accordance with Section 01 35 44 - SPILL CONTROL. Comply with all applicable requirements of Federal, State, and local laws or regulations regarding any spill incident.

3.08 EMERGENCY CONTACTS

The Contractor is responsible for complying with the emergency contact provisions in 49 CFR 172, Section 604. Whenever the Contractor ships hazardous materials, provide a 24 hr emergency response contact and phone number of a person knowledgeable about the hazardous materials being shipped and who has comprehensive emergency response and incident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information. The phone shall be monitored on a 24 hour basis at all times when the hazardous materials are in transportation, including during storage incidental to transportation. Information regarding this emergency contact and phone number shall be placed on all hazardous material shipping documents. Designate an Emergency Coordinator and post the following information at areas in which hazardous wastes are managed:

- A. The name of the emergency coordinator.

- B. Phone number through which the Emergency Coordinator can be contacted on a 24 hour basis.
- C. The telephone number of the local fire department.
- D. The location of fire extinguishers and spill control materials.

Attachment A SAMPLE OFF-SITE POLICY CERTIFICATION MEMO	
Project/Contract #:	
Waste Stream:	
Primary TSD Facility, EPA ID # and Location:	
Alter. TSD Facility, EPA ID # and Location:	
EPA Region	Contact
I	(617) 918-1752
II	(212) 637-4130
III	(214) 814-5267
IV	(404) 562-8591
V	(312) 353-8207
VI	(214) 665-2282
VII	(913) 551-7154
VIII	(303) 312-6419
IX	(415) 972-3304
X	(206) 553-2859
EPA representative contacted:	
EPA representative phone number:	
Date contacted:	
Comment:	
The above EPA representative was contacted on _____. As of that date the above sites were considered acceptable in accordance with the Off-Site Policy in 40 CFR 300.440.	
Date:	Signature:
Phone number:	

-- End of Section --

SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL CODE COUNCIL (ICC)

ICC IFC (2012) International Fire Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1 (2012; TIA 11-1) Fire Code

NFPA 10 (2013) Standard for Portable Fire Extinguishers

NFPA 101 (2012; Amendment 1 2012) Life Safety Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.157 (2003) Portable Fire Extinguishers

UNDERWRITERS LABORATORIES (UL)

UL 154 (2005; Reprint Nov 2010) Carbon-Dioxide Fire Extinguishers

1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Manufacturer's Data

SD-02 Shop Drawings

Fire Extinguishers; G
Wall Brackets; G

SD-03 Product Data

Fire Extinguishers
Wall Brackets

SD-04 Samples

Fire Extinguisher; G
Wall Brackets; G

SD-07 Certificates

Fire Extinguishers
Manufacturer's Warranty with Inspection Tag

1.03 DELIVERABLES

A. Samples

Provide the following samples: One of each type of Fire Extinguisher being installed and three samples of wall brackets of each type being used. Approved samples may be used for installation, with proper identification and storage.

1.04 DELIVERY, HANDLING, AND STORAGE

Protect materials from weather, soil, and damage during delivery, storage, and construction. Deliver materials in their original packages, containers, or bundles bearing the brand name and the name and type of the material.

1.05 WARRANTY

Guarantee that Fire Extinguishers are free of defects in materials, fabrication, finish, and installation and that they will remain so for a period of not less than 5 years after completion.

PART 2 PRODUCTS

Submit fabrication drawings consisting of fabrication and assembly details performed in the factory and product data for the Fire Extinguishers and Wall Brackets.

2.01 TYPES

Submit certificates that show Fire Extinguishers comply with local codes and regulations.

Provide Fire Extinguisher conforming to NFPA 10. Provide quantity and placement in compliance with the applicable sections of ICC IFC, Section 1414 and Section 906, NFPA 1, NFPA 101, and 29 CFR 1910.157.

Provide carbon-dioxide type fire extinguisher compliant with UL 154.

Submit Manufacturer's Data for each type of Fire Extinguisher required, detailing all related Wall Mounting, and Accessories information, complete with Manufacturer's Warranty with Inspection Tag.

2.02 MATERIAL

Provide enameled steel extinguisher shell.

2.03 SIZE

Provide 20 pounds extinguisher.

2.04 WALL BRACKETS

Provide wall-hook fire extinguisher wall brackets as approved.

PART 3 EXECUTION

3.01 INSTALLATION

Install Fire Extinguishers near door of modified shipping container. Verify exact locations prior to installation.

Comply with the manufacturer's recommendations for all installations.

Provide extinguisher which is fully charged and ready for operation upon installation. Provide extinguisher complete with Manufacturer's Warranty with Inspection Tag attached.

-- End of Section --

SECTION 26 00 00.00 20

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

IEEE C2 (2012; Errata 2012; INT 1-4 2012; INT 5-6 2013)
National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code

1.02 RELATED REQUIREMENTS

This section applies to certain sections of Division 02 - EXISTING CONDITIONS. This section applies to all sections of Division 26 - ELECTRICAL of this project specification unless specified otherwise in the individual sections. This section has been incorporated into, and thus, does not apply to, and is not referenced in the following sections:

Section 26 20 00 - INTERIOR DISTRIBUTION SYSTEM

1.03 DEFINITIONS

- A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.
- B. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- C. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.04 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 240/120 V, single phase, three wire, 60 Hz, 100 ampere service to supply temporary power to the 20 foot by 8 foot modified shipping container.

1.05 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wiring Diagrams And Installation Details; G

SD-03 Product Data

Performance And Characteristic Curves

1.06 ADDITIONAL SUBMITTALS INFORMATION

Submittals required in other sections that refer to this section must conform to the following additional requirements as applicable.

A. Shop Drawings (SD-02)

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

B. Product Data (SD-03)

Submittal shall include performance and characteristic curves.

1.07 QUALITY ASSURANCE

A. Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

B. Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are

required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

1. Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

2. Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.08 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.09 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- A. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- B. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- C. Safety precautions.
- D. The procedure in the event of equipment failure.
- E. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.10 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.11 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.12 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B1	(2013) Standard Specification for Hard-Drawn Copper Wire
ASTM B8	(2011) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE 81	(2012) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-6 2013) National Electrical Safety Code

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2013) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1	(2005) American National Standard for Electrical Rigid Steel Conduit (ERSC)
ANSI C80.5	(2005) American National Standard for Electrical Rigid Aluminum Conduit
NEMA FU 1	(2012) Low Voltage Cartridge Fuses
NEMA ICS 1	(2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V

NEMA ICS 4	(2010) Terminal Blocks
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA KS 1	(2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)
NEMA MG 1	(2011; Errata 2012) Motors and Generators
NEMA MG 10	(2001; R 2007) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors
NEMA ST 20	(1992; R 1997) Standard for Dry-Type Transformers for General Applications
NEMA TC 2	(2013) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 3	(2013) Standard for Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing
NEMA TP 1	(2002) Guide for Determining Energy Efficiency for Distribution Transformers
NEMA WD 1	(1999; R 2005; R 2010) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2012) Wiring Devices Dimensions Specifications
NEMA Z535.4	(2011) American National Standard for Product Safety Signs and Labels

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code
NFPA 70E	(2012; Errata 2012) Standard for Electrical Safety in the Workplace
NFPA 780	(2014) Standard for the Installation of Lightning Protection Systems

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-607	(2011b) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
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UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Reprint Jul 2012) Standard for Flexible Metal Conduit
UL 1063	(2006; Reprint Jul 2012) Machine-Tool Wires and Cables
UL 1242	(2006; Reprint Jul 2012) Standard for Electrical Intermediate Metal Conduit -- Steel
UL 1699	(2006; Reprint Nov 2013) Arc-Fault Circuit-Interrupters
UL 198M	(2003; Reprint Feb 2013) Standard for Mine-Duty Fuses
UL 20	(2010; Reprint Feb 2012) General-Use Snap Switches
UL 360	(2013; Reprint May 2013) Liquid-Tight Flexible Steel Conduit
UL 4248-1	(2007; Reprint Oct 2013) UL Standard for Safety Fuseholders - Part 1: General Requirements
UL 4248-12	(2007; Reprint Dec 2012) UL Standard for Safety Fuseholders - Part 12: Class R
UL 44	(2010) Thermoset-Insulated Wires and Cables
UL 467	(2007) Grounding and Bonding Equipment
UL 486A-486B	(2013) Wire Connectors
UL 486C	(2013) Splicing Wire Connectors
UL 489	(2013) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 498	(2012; Reprint Aug 2013) Attachment Plugs and Receptacles
UL 5	(2011) Surface Metal Raceways and Fittings
UL 50	(2007; Reprint Apr 2012) Enclosures for Electrical Equipment, Non-environmental Considerations
UL 506	(2008; Reprint Oct 2013) Specialty Transformers
UL 508	(1999; Reprint Oct 2013) Industrial Control Equipment
UL 510	(2005; Reprint Jul 2013) Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514A	(2013) Metallic Outlet Boxes
UL 514B	(2012) Conduit, Tubing and Cable Fittings

UL 514C	(1996; Reprint Nov 2011) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 6	(2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel
UL 651	(2011; Reprint Mar 2012) Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
UL 67	(2009; Reprint Jan 2013) Standard for Panelboards
UL 6A	(2008; Reprint May 2013) Electrical Rigid Metal Conduit - Aluminum, Red Brass, and Stainless Steel
UL 83	(2008) Thermoplastic-Insulated Wires and Cables
UL 854	(2004; Reprint Sep 2011) Standard for Service-Entrance Cables
UL 869A	(2006) Reference Standard for Service Equipment
UL 870	(2008; Reprint Feb 2013) Standard for Wireways, Auxiliary Gutters, and Associated Fittings
UL 943	(2006; Reprint Jun 2012) Ground-Fault Circuit-Interrupters
UL 984	(1996; Reprint Sep 2005) Hermetic Refrigerant Motor-Compressors

1.02 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined in IEEE 100.

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Panelboards; G
Manual Motor Starters; G
Wireways; G
Marking Strips; G

SD-03 Product Data

Receptacles; G
Circuit breakers; G

Switches; G
Transformers; G
Motor controllers; G

SD-06 Test Reports

600-Volt Wiring Test; G
Transformer Tests
Ground-Fault Receptacle Test
Grounding System Test; G

SD-07 Certificates

Fuses; G

SD-10 Operation and Maintenance Data

Electrical Systems

1.04 QUALITY ASSURANCE

A. Fuses

Submit coordination data as specified in paragraph, FUSES of this section.

B. Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

C. Standard Products

1. Qualifications

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and:

- a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.
- b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.
- c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.05 MAINTENANCE

A. Electrical Systems

Submit operation and maintenance manuals for electrical systems that provide basic data relating to the design, operation, and maintenance of the electrical distribution system for the building. Include the following:

1. Single line diagram of the "as-built" building electrical system.
2. Schematic diagram of electrical control system (other than HVAC, covered elsewhere).
3. Manufacturers' operating and maintenance manuals on active electrical equipment.

1.06 WARRANTY

Provide equipment items supported by service organizations that are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

As a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70 for all materials, equipment, and devices.

2.02 CONDUIT AND FITTINGS

Conform to the following:

A. Rigid Metallic Conduit

1. Rigid, Threaded Zinc-Coated Steel Conduit

ANSI C80.1, UL 6.

2. Rigid Aluminum Conduit

ANSI C80.5, UL 6A.

B. Rigid Nonmetallic Conduit

PVC Type EPC-40 and EPC-80 in accordance with NEMA TC 2, UL 651.

C. Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

D. Flexible Metal Conduit

UL 1.

1. Liquid-Tight Flexible Metal Conduit, Steel

UL 360.

E. Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings: cadmium- or zinc-coated in accordance with UL 514B.

1. Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2. Fittings for EMT

Steel compression type.

F. Fittings for Rigid Nonmetallic Conduit

NEMA TC 3 for PVC and UL 514B.

2.03 SURFACE RACEWAY

A. Surface Metal Raceway

UL 5, two-piece painted steel, totally enclosed, snap-cover type.

2.04 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

A. Floor Outlet Boxes

Provide the following:

1. Boxes: Nonadjustable and concrete tight.
2. Each Outlet: Consisting of cast-metal body with threaded openings, or sheet-steel body with knockouts for conduits, adjustable brass flange ring, and cover plate with 3/4 inch threaded plug.
3. Telecommunications Outlets: Consisting of surface-mounted, horizontal, aluminum or stainless steel housing with a receptacle as specified and 3/4 inch top opening.
4. Receptacle Outlets: Consisting of surface-mounted, horizontal, aluminum or stainless steel housing with duplex-type receptacle as specified herein.
5. Gaskets: Provide gaskets where necessary to ensure watertight installation.

B. Outlet Boxes for Telecommunications System

Provide the following:

1. Standard Type 4 inches square by 2 1/8 inches deep
2. Outlet boxes for wall-mounted telecommunications outlets: 4 by 2 1/8 by 2 1/8 inches deep
3. Depth of boxes: Large enough to allow manufacturers' recommended conductor bend radii.

2.05 WIRES AND CABLES

Provide wires and cables in accordance applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Do not use wires and cables manufactured more than 12 months prior to date of delivery to site.

A. Conductors

Provide the following:

1. Conductor sizes and capacities shown are based on copper, unless indicated otherwise.
2. Conductors No. 8 AWG and larger diameter: stranded.
3. Conductors No. 10 AWG and smaller diameter: solid.
4. Conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3: stranded unless specifically indicated otherwise.
5. Minimum Conductor Sizes

Provide minimum conductor size in accordance with the following:

- a. Branch circuits: No. 12 AWG.
- b. Class 1 remote-control and signal circuits: No. 14 AWG.
- c. Class 2 low-energy, remote-control and signal circuits: No. 16 AWG.
- d. Class 3 low-energy, remote-control, alarm and signal circuits: No. 22 AWG.

B. Color Coding

Provide color coding for service, feeder, branch, control, and signaling circuit conductors.

1. Ground and Neutral Conductors

Provide color coding of ground and neutral conductors as follows:

- a. Grounding conductors: Green.

- b. Neutral conductors: White.
- c. Exception, where neutrals of more than one system are installed in same raceway or box, other neutrals color coding: white with a different colored (not green) stripe for each.

2. Ungrounded Conductors

Provide color coding of ungrounded conductors in different voltage systems as follows:

- a. 208/120 volt, three-phase
 - (1) Phase A - black
 - (2) Phase B - red
 - (3) Phase C - blue
- b. 480/277 volt, three-phase
 - (1) Phase A - brown
 - (2) Phase B - orange
 - (3) Phase C - yellow
- c. 120/240 volt, single phase: Black and red

C. Insulation

Unless specified or indicated otherwise or required by NFPA 70, provide power and lighting wires rated for 600-volts, Type THWN/THHN conforming to UL 83 or Type XHHW, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits: Type TW or TF, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

D. Bonding Conductors

ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

1. Bonding Conductor for Telecommunications

Provide a copper conductor Bonding Conductor for Telecommunications between the telecommunications main grounding busbar (TMGB) and the electrical service ground in accordance with TIA-607. Size the bonding conductor for telecommunications the same as the TBB.

E. Service Entrance Cables

Service Entrance (SE) and Underground Service Entrance (USE) Cables, UL 854.

2.06 SPLICES AND TERMINATION COMPONENTS

UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires: insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.07 DEVICE PLATES

Provide the following:

- A. UL listed, one-piece device plates for outlets to suit the devices installed.
- B. For metal outlet boxes, plates on unfinished walls: zinc-coated sheet steel or cast metal having round or beveled edges.
- C. For nonmetallic boxes and fittings, other suitable plates may be provided.
- D. Plates on finished walls: nylon or lexan, minimum 0.03 inch wall thickness and same color as receptacle or toggle switch with which they are mounted.
- E. Screws: machine-type with countersunk heads in color to match finish of plate.
- F. Sectional type device plates are not be permitted.
- G. Plates installed in wet locations: gasketed and UL listed for "wet locations."

2.08 SWITCHES

A. Toggle Switches

NEMA WD 1, UL 20, single pole, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw. Include the following:

- 1. Handles: white thermoplastic.
- 2. Wiring terminals: screw-type, side-wired.
- 3. Contacts: silver-cadmium and contact arm - one-piece copper alloy.
- 4. Switches: rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.

B. Switch with Red Pilot Handle

NEMA WD 1. Provide the following:

- 1. Pilot lights that are integrally constructed as a part of the switch's handle.
- 2. Pilot light color: red and illuminate whenever the switch is closed or "on".
- 3. Pilot lighted switch: rated 20 amps and 120 volts or 277 volts as indicated.

4. The circuit's neutral conductor to each switch with a pilot light.

C. Breakers Used as Switches

For 120- and 277-Volt fluorescent fixtures, mark breakers "SWD" in accordance with UL 489.

D. Disconnect Switches

NEMA KS 1. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Utilize Class R fuseholders and fuses for fused switches, unless indicated otherwise. Provide horsepower rated for switches serving as the motor-disconnect means. Provide switches in NEMA, as indicated, per NEMA ICS 6.

2.09 FUSES

NEMA FU 1. Provide complete set of fuses for each fusible switch. Coordinate time-current characteristics curves of fuses serving motors or connected in series with circuit breakers for proper operation. Provide fuses with a voltage rating not less than circuit voltage.

A. Fuseholders

Provide in accordance with UL 4248-1.

B. Cartridge Fuses, Current Limiting Type (Class R)

UL 198M, Class RK-1. Provide only Class R associated fuseholders in accordance with UL 4248-12.

2.10 RECEPTACLES

A. General Requirements

Provide the following:

1. UL 498, hard use (also designated heavy-duty), grounding-type.
2. Ratings and configurations: as indicated.
3. Bodies: brown as per NEMA WD 1.
4. Face and body: thermoplastic supported on a metal mounting strap.
5. Dimensional requirements: per NEMA WD 6.
6. Screw-type, side-wired wiring terminals or of the solderless pressure type having suitable conductor-release arrangement.
7. Grounding pole connected to mounting strap.
8. The receptacle: containing triple-wire power contacts and double or triple-wire ground contacts.

B. Switched Duplex Receptacles

Provide separate terminals for each ungrounded pole. Top receptacle: switched when installed.

C. Weatherproof Receptacles

Provide receptacles, UL listed for use in "wet locations". Include cast metal box with gasketed, hinged, lockable and weatherproof while-in-use, die-cast metal/aluminum cover plate.

D. Ground-Fault Circuit Interrupter Receptacles

UL 943, duplex type for mounting in standard outlet box. Provide device capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A ground-fault circuit interrupter devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

E. Plugs

Provide heavy-duty, rubber-covered three- or four-, wire cord of required size, install plugs thereon, and attach to equipment. Provide UL listed plugs with receptacles, complete with grounding blades. Where equipment is not available, turn over plugs and cord assemblies to the Government.

2.11 PANELBOARDS**A. General Requirements**

Provide panelboards in accordance with the following:

1. UL 67 and UL 50.
2. Panelboards for use as service disconnecting: additionally conform to UL 869A.
3. Panelboards: circuit breaker-equipped.
4. Designed such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL.
5. Where "space only" is indicated, make provisions for future installation of breaker sized as indicated.
6. Directories: indicate load served by each circuit of panelboard.
7. Directories: indicate source of service (upstream panel, switchboard, motor control center, etc.) to panelboard.
8. Type directories and mount in holder behind transparent protective covering.
9. Panelboard nameplates: provided in accordance with paragraph FIELD FABRICATED NAMEPLATES.

B. Enclosure

Provide panelboard enclosure in accordance with the following:

1. UL 50.
2. Cabinets mounted outdoors or flush-mounted: hot-dipped galvanized after fabrication.
3. Cabinets: painted in accordance with paragraph PAINTING.
4. Outdoor cabinets: NEMA 3R raintight with a removable steel plate 1/4 inch thick in the bottom for field drilling for conduit connections.
5. Front edges of cabinets: form-flanged or fitted with structural shapes welded or riveted to the sheet steel, for supporting the panelboard front.
6. All cabinets: fabricated such that no part of any surface on the finished cabinet deviates from a true plane by more than 1/8 inch.
7. Holes: provided in the back of indoor surface-mounted cabinets, with outside spacers and inside stiffeners, for mounting the cabinets with a 1/2 inch clear space between the back of the cabinet and the wall surface.
8. Flush doors: mounted on hinges that expose only the hinge roll to view when the door is closed.
9. Each door: fitted with a combined catch and lock, except that doors over 24 inches long provided with a three-point latch having a knob with a T-handle, and a cylinder lock.
10. Keys: two provided with each lock, with all locks keyed alike.
11. Finished-head cap screws: provided for mounting the panelboard fronts on the cabinets.

C. Panelboard Buses

Support bus bars on bases independent of circuit breakers. Design main buses and back pans so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

D. Circuit Breakers

UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker will be mounted. Breaker terminals: UL listed as suitable for type of conductor provided. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

1. Multiple Breakers

Provide common trip-type with single operating handle. Design breaker such that

overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2. Circuit Breaker With Ground-Fault Circuit Interrupter

UL 943 and NFPA 70. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements of UL 943 for Class A ground-fault circuit interrupter.

3. Circuit Breakers for HVAC Equipment

Provide circuit breakers for HVAC equipment having motors (group or individual) marked for use with HACR type and UL listed as HACR type.

4. Arc-Fault Circuit Interrupters

UL 489, UL 1699 and NFPA 70. Molded case circuit breakers: rated as indicated. Provide with "push-to-test" button.

2.12 TRANSFORMERS

A. General Requirements

Provide transformers in accordance with the following:

1. NEMA ST 20, general purpose, dry-type, self-cooled, ventilated.
2. Provide transformers in NEMA 1 enclosure.
3. Transformer insulation system:
 - a. 220 degrees C insulation system for transformers 15 kVA and greater, with temperature rise not exceeding degrees C under full-rated load in maximum ambient of 40 degrees C.
4. Transformer of 150 degrees C temperature rise: capable of carrying continuously 100 percent of nameplate kVA without exceeding insulation rating.

B. Specified Transformer Efficiency

Transformers, indicated and specified with: 480V primary, 80 degrees C or 115 degrees C temperature rise, kVA ratings of 37.5 to 100 for single phase or 30 to 500 for three phase, energy efficient type. Minimum efficiency, based on factory test results: not be less than NEMA Class 1 efficiency as defined by NEMA TP 1.

2.13 MOTORS

A. General Requirements

Provide motors in accordance with the following:

1. NEMA MG 1

2. Hermetic-type sealed motor compressors: Also comply with UL 984.
3. Provide the size in terms of HP, or kVA, or full-load current, or a combination of these characteristics, and other characteristics, of each motor as indicated or specified.
4. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters.
5. Rate motors for operation on 208-volt, 3-phase circuits with a terminal voltage rating of 200 volts, and those for operation on 480-volt, 3-phase circuits with a terminal voltage rating of 460 volts.
6. Use motors designed to operate at full capacity with voltage variation of plus or minus 10 percent of motor voltage rating.
7. Unless otherwise indicated, use continuous duty type motors if rated 1 HP and above.
8. Where fuse protection is specifically recommended by the equipment manufacturer, provide fused switches in lieu of non-fused switches indicated.

B. High Efficiency Single-Phase Motors

Single-phase fractional-horsepower alternating-current motors: high efficiency types corresponding to the applications listed in NEMA MG 11. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

C. Premium Efficiency Polyphase Motors

Select polyphase motors based on high efficiency characteristics relative to typical characteristics and applications as listed in NEMA MG 10. In addition, continuous rated, polyphase squirrel-cage medium induction motors must meet the requirements for premium efficiency electric motors in accordance with NEMA MG 1, including the NEMA full load efficiency ratings. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

D. Motor Sizes

Provide size for duty to be performed, not exceeding the full-load nameplate current rating when driven equipment is operated at specified capacity under most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, make adjustments to wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided. Provide controllers for motors rated 1-hp and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage.

E. Wiring and Conduit

Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment as specified

herein. Power wiring and conduit: conform to the requirements specified herein.
Control wiring: provided under, and conform to, the requirements of the section specifying the associated equipment.

2.14 MOTOR CONTROLLERS

A. General Requirements

Provide motor controllers in accordance with the following:

1. UL 508, NEMA ICS 1, and NEMA ICS 2.
2. Provide controllers with thermal overload protection in each phase, and one spare normally open auxiliary contact, and one spare normally closed auxiliary contact.
3. Provide controllers for motors rated 1-hp and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage.
4. When used with pressure, float, or similar automatic-type or maintained-contact switch, provide a hand/off/automatic selector switch with the controller.
5. Connections to selector switch: wired such that only normal automatic regulatory control devices are bypassed when switch is in "hand" position.
6. Safety control devices, such as low and high pressure cutouts, high temperature cutouts, and motor overload protective devices: connected in motor control circuit in "hand" and "automatic" positions.
7. Control circuit connections to hand/off/automatic selector switch or to more than one automatic regulatory control device: made in accordance with indicated or manufacturer's approved wiring diagram.
8. Provide a disconnecting means, capable of being locked in the open position, for the motor that is located in sight from the motor location and the driven machinery location. As an alternative, provide a motor controller disconnect, capable of being locked in the open position, to serve as the disconnecting means for the motor if it is in sight from the motor location and the driven machinery location.
9. Overload protective devices: provide adequate protection to motor windings; be thermal inverse-time-limit type; and include manual reset-type pushbutton on outside of motor controller case.
10. Cover of combination motor controller and manual switch or circuit breaker: interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in "off" position.
11. Minimum short circuit withstand rating of combination motor controller: 25,000 amperes rms symmetrical amperes.

B. Control Wiring

Provide control wiring in accordance with the following:

1. All control wire: stranded tinned copper switchboard wire with 600-volt

flame-retardant insulation Type SIS meeting UL 44, or Type MTW meeting UL 1063, and passing the VW-1 flame tests included in those standards.

2. Hinge wire: Class K stranding.
3. Current transformer secondary leads: not smaller than No. 10 AWG.
4. Control wire minimum size: No. 14 AWG.
5. Power wiring for 480-volt circuits and below: the same type as control wiring with No. 12 AWG minimum size.
6. Provide wiring and terminal arrangement on the terminal blocks to permit the individual conductors of each external cable to be terminated on adjacent terminal points.

C. Control Circuit Terminal Blocks

1. General

Provide control circuit terminal blocks in accordance with the following:

- a. NEMA ICS 4.
- b. Control circuit terminal blocks for control wiring: molded or fabricated type with barriers, rated not less than 600 volts.
- c. Provide terminals with removable binding, fillister or washer head screw type, or of the stud type with contact and locking nuts.
- d. Terminals: not less than No. 10 in size with sufficient length and space for connecting at least two indented terminals for 10 AWG conductors to each terminal.
- e. Terminal arrangement: subject to the approval of the Contracting Officer with not less than four (4) spare terminals or 10 percent, whichever is greater, provided on each block or group of blocks.
- f. Modular, pull apart, terminal blocks are acceptable provided they are of the channel or rail-mounted type.
- g. Submit data showing that any proposed alternate will accommodate the specified number of wires, are of adequate current-carrying capacity, and are constructed to assure positive contact between current-carrying parts.

2. Types of Terminal Blocks

- a. Short-Circuiting Type: Short-circuiting type terminal blocks: furnished for all current transformer secondary leads with provision for shorting together all leads from each current transformer without first opening any circuit. Terminal blocks: comply with the requirements of paragraph CONTROL CIRCUIT TERMINAL BLOCKS above.
- b. Load Type: Load terminal blocks rated not less than 600 volts and of

adequate capacity: provided for the conductors for NEMA Size 3 and smaller motor controllers and for other power circuits, except those for feeder tap units. Provide terminals of either the stud type with contact nuts and locking nuts or of the removable screw type, having length and space for at least two indented terminals of the size required on the conductors to be terminated. For conductors rated more than 50 amperes, provide screws with hexagonal heads. Conducting parts between connected terminals must have adequate contact surface and cross-section to operate without overheating. Provide each connected terminal with the circuit designation or wire number placed on or near the terminal in permanent contrasting color.

D. Control Circuits

Control circuits: maximum voltage of 120 volts derived from control transformer in same enclosure. Transformers: conform to UL 506, as applicable. Transformers, other than transformers in bridge circuits: provide primaries wound for voltage available and secondaries wound for correct control circuit voltage. Size transformers so that 80 percent of rated capacity equals connected load. Provide disconnect switch on primary side. Provide one fused secondary lead with the other lead grounded.

E. Enclosures for Motor Controllers

NEMA ICS 6.

F. Pushbutton Stations

Provide with "start/stop" momentary contacts having one normally open and one normally closed set of contacts, and red lights to indicate when motor is running. Stations: heavy duty, oil-tight design.

G. Pilot and Indicating Lights

Provide transformer, resistor, or diode type.

2.15 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single pole designed for surface mounting with overload protection and pilot lights.

A. Pilot Lights

Provide yoke-mounted, candelabra-base sockets rated 125 volts and fitted with glass or plastic jewels.

2.16 GROUNDING AND BONDING EQUIPMENT

A. Ground Rods

UL 467. Ground rods: copper-clad steel, with minimum diameter of 3/4 inch and minimum length 10 feet. Sectional ground rods are permitted.

B. Ground Bus

Copper ground bus: provided in the electrical equipment rooms as indicated.

2.17 WARNING SIGNS

Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. Provide marking that is clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.18 WIREWAYS

UL 870. Material: steel or galvanized 16 gauge for heights and depths up to 6 by 6 inches, and 14 gauge for heights and depths up to 12 by 12 inches. Provide in length required for the application with screw-cover NEMA 12 enclosure per NEMA ICS 6.

PART 3 EXECUTION

3.01 INSTALLATION

Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces: conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

A. Overhead Service

Overhead service conductors into buildings: terminate at service entrance fittings or weatherhead outside building.

B. Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures: labeled and identified as such.

1. Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, label each enclosure, new and existing, as one of several enclosures containing service entrance disconnect devices. Label, at minimum: indicate number of service disconnect devices housed by enclosure and indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to paragraph FIELD FABRICATED NAMEPLATES. Use lettering of at least 0.25 inch in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure: provided only as permitted by NFPA 70.

C. Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor: separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size: 1/2 inch in

diameter for low voltage lighting and power circuits.

1. Pull Wire

Install pull wires in empty conduits. Pull wire: plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

D. Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

1. Restrictions Applicable to Aluminum Conduit

- a. Do not install underground or encase in concrete or masonry.
- b. Do not use brass or bronze fittings.

2. Restrictions Applicable to EMT

- a. Do not install underground.
- b. Do not encase in concrete, mortar, grout, or other cementitious materials.
- c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.
- d. Do not use in hazardous areas.
- e. Do not use outdoors.
- f. Do not use in fire pump rooms.

3. Restrictions Applicable to Nonmetallic Conduit

- a. PVC Schedule 40 and PVC Schedule 80
 - (1) Do not use in areas where subject to severe physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, hospitals, power plants, missile magazines, and other such areas.
 - (2) Do not use in hazardous (classified) areas.
 - (3) Do not use in fire pump rooms.
 - (4) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

- (5) Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.

4. Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph FLEXIBLE CONNECTIONS. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

5. Underground Conduit

Plastic-coated rigid steel; PVC. Convert nonmetallic conduit, other than PVC Schedule 40 or 80, to plastic-coated rigid, or IMC, steel conduit before rising through floor slab. Plastic coating: extend minimum 6 inches above floor.

6. Conduit Support

Support conduit by pipe straps, wall brackets, threaded rod conduit hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Do not exceed one-fourth proof test load for load applied to fasteners. Provide vibration resistant and shock-resistant fasteners attached to concrete ceiling. Do not cut main reinforcing bars for any holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems: supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Do not share supporting means between electrical raceways and mechanical piping or ducts. Coordinate installation with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Where conduit crosses building expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

7. Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

8. Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings

cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Provide locknuts with sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

9. Flexible Connections

Provide flexible steel conduit between 3 and 6 feet in length for recessed and semirecessed lighting fixtures for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size: 1/2 inch diameter. Provide liquidtight flexible conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

E. Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways: cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, and when specifically indicated. Boxes in other locations: sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system. Provide each box with volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures: minimum 4 inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls: square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; provide readily removable fixtures for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

1. Boxes

Boxes for use with raceway systems: minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets: minimum 4 inches square, except that 4 by 2 inch boxes may be used where only one raceway enters outlet. Telecommunications outlets: a minimum of 4 inches square by 2 1/8 inches deep. Mount outlet boxes flush in finished walls.

2. Pull Boxes

Construct of at least minimum size required by NFPA 70 of code-gauge aluminum

or galvanized sheet steel, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

F. Mounting Heights

Mount panelboards, motor controller, and disconnecting switches so height of operating handle at its highest position is maximum 78 inches above floor. Mount lighting switches 48 inches above finished floor. Mount receptacles 18 inches above finished floor, unless otherwise indicated. Wall-mounted telecommunications outlets: mounted at height 60 inches above finished floor. Measure mounting heights of wiring devices and outlets in non-hazardous areas to center of device or outlet.

G. Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, provide color coding by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, provide color coding by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations in accordance with manufacturer's recommendations.

1. Marking Strips

Provide marking strips in accordance with the following:

- a. Provide white or other light-colored plastic marking strips, fastened by screws to each terminal block, for wire designations.
- b. Use permanent ink for the wire numbers
- c. Provide reversible marking strips to permit marking both sides, or provide two marking strips with each block.
- d. Size marking strips to accommodate the two sets of wire numbers.
- e. Assign a device designation in accordance with NEMA ICS 1 to each device to which a connection is made. Mark each device terminal to which a connection is made with a distinct terminal marking corresponding to the wire designation used on the Contractor's schematic and connection diagrams.
- f. The wire (terminal point) designations used on the Contractor's wiring diagrams and printed on terminal block marking strips may be according to the Contractor's standard practice.
- g. Prints of the marking strips drawings submitted for approval will be so marked and returned to the Contractor for addition of the designations to the terminal strips and tracings, along with any rearrangement of points required.

H. Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and

smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

I. Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

J. Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings.

K. Grounding and Bonding

Provide in accordance with NFPA 70 and NFPA 780. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds. Make ground connection to driven ground rods on exterior of building. Interconnect all grounding media in or on the structure to provide a common ground potential. This includes lightning protection, electrical service, telecommunications system grounds, as well as underground metallic piping systems. Make interconnection to the gas line on the customer's side of the meter. Use main size lightning conductors for interconnecting these grounding systems to the lightning protection system. In addition to the requirements specified herein, provide telecommunications grounding in accordance with TIA-607. Where ground fault protection is employed, document that connection of ground and neutral does not interfere with correct operation of fault protection.

1. Ground Rods

Provide cone pointed ground rods. Measure the resistance to ground using the fall-of-potential method described in IEEE 81. Do not exceed 25 ohms under normally dry conditions for the maximum resistance of a driven ground. If this resistance cannot be obtained with a single rod, additional rods, spaced on center, not less than twice the distance of the length of the rod. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, notify the Contracting Officer who will decide on the number of ground rods to add.

2. Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

- a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.
- b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Provide tools and dies as

recommended by the manufacturer. Use an embossing die code or other standard method to provide visible indication that a connector has been adequately compressed on the ground wire.

3. Resistance

Maximum resistance-to-ground of grounding system: do not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.02 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

3.03 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each test.

A. Devices Subject to Manual Operation

Operate each device subject to manual operation at least five times, demonstrating satisfactory operation each time.

B. 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance: 250,000 ohms.

C. Transformer Tests

Perform the standard, not optional, tests in accordance with the Inspection and Test Procedures for transformers, dry type, air-cooled, 600 volt and below; as specified in NETA ATS. Measure primary and secondary voltages for proper tap settings. Tests need not be performed by a recognized independent testing firm or independent electrical consulting firm.

D. Ground-Fault Receptacle Test

Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.

E. Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

-- End of Section --

SECTION 33 24 00.00 20

EXTRACTION/INJECTION AND MONITORING WELLS

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A312/A312M	(2013b) Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C117	(2013) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM D1586	(2011) Penetration Test and Split-Barrel Sampling of Soils
ASTM D1587	(2008; E 2012; R 2012) Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
ASTM D1785	(2012) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D2487	(2011) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2488	(2009a) Description and Identification of Soils (Visual-Manual Procedure)
ASTM D5088	(2002; R 2008) Decontamination of Field Equipment Used at Nonradioactive Waste Sites
ASTM D5092	(2004; E 2010; R 2010) Design and Installation of Ground Water Monitoring Wells in Aquifers
ASTM F480	(2012) Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80
ASTM F883	(2013) Padlocks

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) Safety and Health Requirements Manual
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EM 1110-1-4000

(1998) Monitoring Well Design, Installation, and Documentation at Hazardous Toxic, and Radioactive Waste Sites

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600-4-89-034

(1990) Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells

EPA 600/4-79/020

(1983) Methods for Chemical Analysis of Water and Wastes

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910

Occupational Safety and Health Standards

1.02 DESCRIPTION OF WORK

Provide one new extraction well, four injection wells, and two temporary monitoring wells complete and ready for operation including drilling, casing, well screen, gravel packing, grouting, development, monitoring device, and incidental related work.

1.03 GENERAL REQUIREMENTS

Each system, including equipment, materials, installation, and performance, shall be in accordance with local, State, and Federal regulations, ASTM D5092, EM 1110-1-4000, and EPA 600-4-89-034 except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" has been substituted for the word "should" wherever it appears. Reference to the "Project Representative" and the "Owner" shall be interpreted to mean the Contracting Officer. Additional requirements are included under Section 01 50 00 - TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS. Mark and secure monitoring wells to avoid unauthorized access and tampering.

1.04 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Well Drilling/Development Material Handling Plan; G
Accident Prevention Plan/Site Safety and Health Plan; G

SD-02 Shop Drawings

Well Construction; G

SD-03 Product Data

Well Casing; G
Well Screen; G

Filter Pack; G
Bentonite Seal; G
Bentonite/Cement Slurry; G

SD-06 Test Reports

Grain Size Distribution
Field Sampling and Laboratory Testing

SD-07 Certificates

Treatment, Storage, or Disposal Facility Permit
Well Development Report
Borehole Analysis Report
Installation Survey Report

SD-11 Closeout Submittals

Shipment Manifests
Delivery Certificates
Treatment and Disposal Certificates

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver materials in an undamaged condition. Unload and store with minimal handling. Store materials in on-site enclosures or under protective coverings. Store plastic piping and jointing materials, and rubber gaskets under cover, out of direct sunlight. Store materials off the ground. Keep insides of pipes and fittings free of dirt and debris. Replace defective or damaged materials with new materials at no cost to the Government.

1.06 QUALITY ASSURANCE

A. Required Drawings

Submit well construction drawings showing components and details of well casing, well screen, filter pack, annular seal, and associated items. Drawings shall be prepared by a State certified professional geologist or hydrogeologist, or by a State registered professional civil engineer, hereafter referred to as the Contractor's Professional Consultant (CPC).

B. Well Drilling/Development Material Handling Plan

Submit a Material Handling Plan 15 days prior to initiation of the work that describes phases of dealing with the potentially contaminated soil and groundwater, including the following:

1. Schedule to be employed in the well drilling and development stages
2. Sequence of operations
3. Method of drilling and development
4. Material hauling

5. Proposed equipment
6. Handling of the contaminated materials
7. Soil and water testing requirements
8. Safety precautions and requirements

C. Accident Prevention Plan/Site Safety and Health Plan

Safety precautions for each phase of the project as specifically related to handling of soil and water removed during well drilling and development operations shall be described in the Accident Prevention Plan and Site Safety and Health Plan specified in Section 01 35 26 - GOVERNMENTAL SAFETY REQUIREMENTS. Identify appropriate requirements of 29 CFR 1910 and EM 385-1-1.

D. Field Sampling and Laboratory Testing

Collect and test samples in accordance with Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL. Submit the sample reports to the Government's Representative that show sample identification for location, date, time, sample method, contamination level, name of individual sampler, identification of laboratory, and quality control procedures.

E. Treatment, Storage, or Disposal Facility Permit

Submit verification that the proposed facility is permitted to accept the contaminated materials specified, prior to the start of excavation.

F. Well Development Report

Provide report, containing the following data for each well:

1. Project name and location
2. Well designation
3. Date and time of well installation
4. Date and time of well development
5. Static water level from top of well casing before development and 24 hours after development
6. Field measurements of pH, temperature, specific conductivity, and turbidity
7. Depth of well from top of casing to bottom of well
8. Screen length
9. Description of development methodology size/capacity of pump or bailer
10. Pumping rate

11. Recharge rate.

G. Shipment Manifests

Submit copies of manifests and other documentation required for shipment of waste materials in accordance with Section 02 81 00 - TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

H. Delivery Certificates

Submit verification that the wastes were actually delivered to the approved treatment facility in accordance with Section 02 81 00 - TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

I. Treatment and Disposal Certificates

Submit verification that the wastes were successfully treated and remediated to the levels specified herein in accordance with Section 02 81 00 - TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

PART 2 PRODUCTS

2.01 WELL CASING

A. Stainless Steel Piping

ASTM A312/A312M, Type 304, Schedule 40S, with flush threaded joint end fittings. Wrap threaded joints with fluoropolymer tape, and provide with nitrile O-ring gaskets.

B. Carbon Steel Piping

ASTM A53/A53M with flush threaded joint end fittings. Wrap threaded joints with fluoropolymer tape, and provide with nitrile O-ring gaskets. Provide dielectric coupler if carbon steel piping is used with stainless steel screens.

C. PVC Piping

ASTM F480, Type 1, Grade 1, PVC 12454, National Sanitary Foundation (NSF)wc or NSF pw, Schedule 40, with flush threaded joint fittings. Threaded joints shall be wrapped with fluoropolymer tape, and provided with nitrile O-ring gaskets.

2.02 WELL SCREEN

Locate well screens as indicated. The length of each screen shall be as indicated. Slot size shall be 0.010 inch (No. 10) slot. Slotted openings shall be distributed uniformly around the circumference of the screen. Prior to installing each new well, collect and analyze one soil sample at the approximate screen depth for grain size distribution to determine the optimal screen slot size and filter pack. Submit recommendation for well screen slot size and filter pack for Government approval.

A. Stainless Steel Screens

ASTM A312/A312M, Type 304, Schedule 40S, continuous slot construction, wire

wound, with flush threaded joint ends. The stainless steel screens shall be 6-inch internal diameter (ID) for extraction/injection wells.

B. PVC Screens

ASTM D1785, PVC 1120, NSF wc or NSF pw, Schedule 40, screen, machine-slotted construction, flush threaded joint ends. The PVC screens shall be 2-inch ID for temporary monitoring wells. Slots shall be even in width, length, and separation.

2.03 PRIMARY FILTER PACK

Provide clean, durable, well-rounded, and washed quartz, with less than 5 percent non-siliceous material. Document that the filter pack does not contain organic matter or friable materials. Filter pack shall be in accordance with ASTM C117.

2.04 ANNULAR SEALANTS

A. Bentonite Seal

Provide powdered, granular, pelletized, or chipped montmorillonite in sealed containers from a commercial source, free of impurities. Document that diameter of pellets is less than one fifth the diameter of the borehole annular space to prevent bridging. Bentonite base grout shall be in accordance with ASTM D5092.

B. Bentonite/Cement Slurry

Provide bentonite/cement slurry consisting of approximately 5 pounds of bentonite and 7 gallons of potable water per bag (94 pounds) of Type I Portland cement. Only 100-percent pure, polymer-free bentonite is to be used. No other additives or materials will be added to the slurry.

2.05 BOTTOM PLUGS

Provide flush threaded solid plug at the bottom of the well. The plug shall be the same material as the well screen to which it is attached. Wrap joints with fluoropolymer tape and provide with nitrile O-ring gaskets.

2.06 LOCKING WELL CAP

Provide flush threaded, weatherproof, and non-removable locking well cap on the top of the well. Well cap shall be of the same material as the well casing to which it is attached. Well cap shall accommodate padlock. Provide a long shackled padlock in accordance with ASTM F883. Provide two keys for the padlock, and turn them over to the Contracting Officer. All locks at the Site shall be keyed alike.

2.07 WELL HEAD COMPLETIONS

Clearly mark and secure the well to avoid unauthorized access and tampering. Cast the words "EXTRACTION WELL", "INJECTION WELL", or "MONITORING WELL" on the well head cover. Provide a sign reading, "WELL IS NOT SAFE FOR DRINKING." Provide stamped metal identification tag as follows:

DO NOT DISTURB

ID #: Date:

Installed By:

Total Depth:

Screened Interval:

TOC Elevation:

Other:

For Information, Call:

A. At-Grade Completions

Provide cast iron vault box, 18 inch diameter for extraction/injection wells and 12 inch diameter for monitoring wells, with watertight frame and cover. Document that vault supports H-20 loading for traffic areas. Provide a frame that is a minimum 6 inches deep, and set in a concrete collar a minimum of 8 inches thick, and extending 4 inches beyond the edge of the frame in all directions. The frame and concrete collar shall be set flush with the level of the existing pavement. Provide locking well cap on top of the well casing, which will terminate inside the vault as indicated.

PART 3 EXECUTION**3.01 GENERAL**

Notify the Contracting Officer at least 15 days prior to commencement of work. The locations of wells shall be as indicated. Drilling, installation, and development of the extraction wells shall be supervised, directed, and monitored by the CPC. Decontaminate drilling, sampling, and well development equipment introduced to the well before and after each use in accordance with ASTM D5088.

3.02 DRILLING

Advance borehole using conventional 8.25 inch ID hollow-stem auger, rotosonic, and/or air rotary drilling methods for extraction/injection wells, and using 4.25 inch ID hollow-stem auger drilling for temporary monitoring wells. If it is the opinion of the CPC that an alternate drilling method is required, submit justification for a boring method change to the Contracting Officer, and approval for the change granted prior to drilling. Document that the drill crew is experienced and trained in drilling and safety requirements for contaminated sites.

A. Sampling

Obtain samples in accordance with ASTM D1586 or ASTM D1587 and in accordance with Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL. Perform standard penetration tests at the following depths: 0.0 to 1.5 feet; 1.5 to 3.0 feet; 3.0 to 4.5 feet; and 5 foot centers or at changes in soil formation thereafter. Screen each soil sample in the field with an organic vapor analyzer/flame ionization device (OVA/FID) capable of detecting vapors to a minimum of one ppm. Log boring in accordance with ASTM D2487 and ASTM D2488. Indicate groundwater elevation.

B. Analysis

The CPC shall review the log data from each borehole and compare the data with the well design requirements. The CPC shall verify the adequacy of the well design, or offer a proposed modification to the design based on the geologic and hydrogeologic data obtained from the borehole. Conduct this review and analysis for each borehole. Submit the borehole boring logs, the analysis of the well design, and any proposed design modifications to the Contracting Officer in a Borehole Analysis Report. Any modifications to the well design approved by the Contracting Officer are considered a change to the contract documents and must be negotiated in accordance with the "CHANGES" clause.

C. Alignment

Verify that the injection and extraction wells are straight by lowering a 10 foot section of 6 inch diameter steel pipe in to the well. Verify that the monitoring wells are straight by lowering a 10 foot section of 2 inch diameter steel pipe in to the well. The 10 foot pipe should pass down to the bottom of the well and be removed without difficulty.

3.03 SOLID WASTE COLLECTION AND DISPOSAL

A. Solid Waste Collection

Place solid waste (primarily drill cuttings) in roll-off containers with liner and cover for storage and transportation. The transport containers are to be sealed or covered so that no material vibrates or falls out during transport. Fully loaded transport containers and vehicles are not to exceed weight limits for the local roads or bridges, and are not to violate any applicable traffic safety regulations.

B. Testing Requirements for Solid Waste

1. Sampling

a. Bulk Containers

Develop and analyze a minimum of one composite sample for each required test for every 100 cubic yards or fraction thereof from a composite of the soil removed from all well sites. To develop a composite sample of the size necessary to run the required tests, take several samples from different areas along the surface and in the center of the stockpile. Combine and thoroughly mix these samples to develop the composite sample.

b. Drums

Develop and analyze a minimum of one composite sample for each required test for every drum with soil removed from all well sites. To develop a composite sample of the size necessary to run the required tests, take several samples from different areas within the drum including in the center. Combine and thoroughly mix these samples to develop the composite sample.

2. Testing and Disposal

Perform testing and disposal according to Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL, and Section 02 81 00 - TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS, and as otherwise required by the Contract Documents. Any additional analyses to meet the requirements of the approved disposal facility are also required.

3. Disposal of Solid Waste

- a. Soils exhibiting TPH less than 100 ppm, BTEX less than 10 ppm, TOX less than 100 ppm, passing TCLP tests, and testing negative for PCB's is considered clean. Dispose of as directed by the Contracting Officer.
- b. Manage soils failing the TCLP test or exhibiting TOX greater than 100 ppm in accordance with applicable State and local regulations. Payment for disposal of materials failing the TCLP metals test or TOX test must be made in accordance with the "CHANGES" clause of the General Conditions.

3.04 WELL INSTALLATION

Well installation shall be in accordance with ASTM D5092 and EPA 600-4-89-034, and as indicated on the well construction drawings submitted by the CPC and approved by the Contracting Officer. Document that the borehole is stable and verified straight before beginning installation.

A. Casings and Screens

Decontaminate well casings, screens, plugs, and caps prior to delivery by the manufacturer and be certified clean. Deliver, store, and handle materials in such manner as to prevent that grease, oil, or other contaminants do not contact any portion of the well screen and casing assembly prior to installation. If directed by the Contracting Officer, clean the well screen and casing assembly with high pressure water prior to installation. Personnel shall wear clean cotton or surgical gloves while handling the assembly. Use centralizers to ensure that the well screen and casing assembly is installed concentrically in the borehole. When the assembly has been installed at the appropriate elevation, adequately secure it to preclude movement during placement of the filter packs and annular seals. Cap the top of the well casing during filter pack placement.

B. Primary Filter Packs

Place primary filter packs as indicated on the approved well construction drawings to fill the entire annular space between the screen and casing assembly and the outside wall of the borehole. Place both the primary filters with a tremie pipe in accordance with EPA 600-4-89-034 and ASTM D5092. Placement of the primary filters by gravity or free fall methods is not allowed. Control speed of filter placement to prevent bridging and to allow for settlement. Prior to commencement of work, equipment and methods required to place filters must be approved by the Contracting Officer.

C. Bentonite Seal

Place a three to five foot thick bentonite seal using bentonite as powder, granular, pelletized, or chipped montmorillonite through a tremie pipe. Control speed of bentonite placement to prevent bridging. Add additional water to the annular space as directed by

the CPC to ensure complete hydration of the bentonite. Document that the bentonite is completely hydrated and expanded before the placement of bentonite/cement slurry.

D. Bentonite/Cement Slurry

Fill the remaining annular space above the bentonite seal to 3 feet from the ground surface with the bentonite/cement slurry using a tremie pipe. Document that the bentonite cured a minimum of 24 hours before the placement of cement grout to ensure complete hydration and expansion of the bentonite.

E. Well Head Completions

Well head completions shall be as indicated and as specified herein.

3.05 WELL DEVELOPMENT

Well development shall be in accordance with EPA 600-4-89-034 and ASTM D5092 except as modified herein. Bailing, surging, and pumping/overpumping/backwashing are acceptable development methods. Air surging and jetting are prohibited. Method of development must be chosen by the CPC and approved by the Contracting Officer. Do not begin well development until the well installation is complete and accepted by the Contracting Officer. Conduct well development operations continuously for a minimum of two hours, removing at least 3 to 5 well volumes, and until development water flows clear and free of drilling fluids, cuttings, or other materials. Test representative water samples for pH, temperature, specific conductivity, and turbidity in accordance with EPA 600/4-79/020. Collect samples every 15 minutes. When stabilized readings of these parameters, as accepted by the Contracting Officer, have been achieved for three consecutive readings, cease well development operations. If after 4 hours the water quality readings have not stabilized, development may be considered complete at the discretion of the Contracting Officer.

3.06 WATER FROM WELL DEVELOPMENT OPERATIONS

Containerize water from the well development operations in accordance with State and local regulations.

A. Sampling

1. Bulk Containers

Collect and analyze one sample for each required test for every 1000 gallons of stored water from well development operations.

2. Drums

Collect and analyze one sample for each required test for every drum of stored water from well development operations.

B. Testing and Disposal

Perform testing and disposal according to Section 01 35 45.00 10 - CHEMICAL DATA QUALITY CONTROL, Section 02 81 00 - TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS, and as otherwise required by the Contract Documents. Any additional analyses to meet the requirements of the approved disposal facility are also required.

3.07 TRANSPORTATION OF CONTAMINATED SOIL AND WATER

Comply with Federal, State, and local requirements for transporting contaminated materials through the applicable jurisdictions and bear responsibility and cost for any noncompliance. In addition to those requirements, do the following:

- A. Inspect and document vehicles and containers for proper operation and covering.
- B. Inspect vehicles and containers for proper markings, manifest documents, and other requirements for waste shipment.
- C. Perform and document decontamination procedures prior to leaving the worksite and again before leaving the disposal site.

3.08 DISPOSAL OF CONTAMINATED SOIL AND WATER

Dispose of contaminated materials removed from the site at a treatment/disposal facility permitted to accept such materials in accordance with Section 02 81 00 - TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

3.09 INSTALLATION SURVEY

Upon completion of well installation and development and acceptance by the Contracting Officer, the vertical and horizontal position of each well shall be determined by a registered land surveyor licensed in the State of New York. The survey shall document the vertical elevations of the top of the casing pipe and the ground surface elevation adjacent to each well. The survey shall also determine the horizontal location of each well based on the New York State Plane coordinate system. The survey shall be accurate to the nearest 0.01 foot for the vertical direction and 0.1 foot for the horizontal direction. Submit this data with a well location map as the Installation Survey Report.

3.10 CLEANUP

Upon completion of the well construction, remove debris and surplus materials from the jobsite.

-- End of Section --

SECTION 40 95 00

PROCESS CONTROL

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.90 (2005) Standard for Relays and Relay Systems Associated With Electric Power Apparatus

IEEE Stds Dictionary (2009) IEEE Standards Dictionary: Glossary of Terms & Definitions

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 61131-3 (2013) Programmable Controllers - Part 3: Programming Languages

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C12.1 (2008) Electric Meters Code for Electricity Metering

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA ICS 1 (2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements

NEMA ICS 2 (2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V

NEMA ICS 3 (2005; R 2010) Medium-Voltage Controllers Rated 2001 to 7200 V AC

NEMA ICS 4 (2010) Terminal Blocks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013) National Electrical Code

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST SP 250 (1991) Calibration Services Users Guide

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15

Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 1059

(2001; Reprint Oct 2011) Standard for Terminal Blocks

UL 508

(1999; Reprint Oct 2013) Industrial Control Equipment

1.02 DEFINITIONS

Definitions, Symbols, and engineering unit abbreviations shall conform to IEEE Stds Dictionary, as applicable.

1.03 SYSTEM DESCRIPTION

The process control system shall be used to monitor and control the operation of process equipment as specified and in accordance with the sequence of control as defined in Section 1.04 - LOGIC and control schematics shown on Drawing M-1. The control system shall provide for operator interaction, overall control system supervision, and process equipment control and monitoring. Provide hardware configured and sized to support expansion as specified and shown on the drawings.

A. General Requirements

The control system shall consist of a Programmable Logic Controller (PLC) based controller with touch screen panel for programming.

B. Operation

The control system provided under this specification shall operate using direct digital control (DDC) algorithms or ladder logic type and supervisory control to provide the required sequences of operation. Input data to the controller shall be obtained by using instruments and controls interfaced to mechanical, electrical, utility and other systems as shown and specified. All required setpoints, settings, alarm limits, and sequences of operation shall be as identified sequences of operation shown on the drawings. The number and location of control panels shown on drawings shall be provided as a minimum.

C. Points

Inputs to and outputs from the control system shall be in accordance with the Input/Output (I/O) Summary Table shown below.

Input/Output Summary Table

I/O POINT	TYPE	REMARK
SPT-1	AI	Well Level Transmitter
PT-1	AI	High Inlet Pressure Transmitter
PT-2	AI	High Injection Pressure Transmitter
FMT-1	AI	Inlet Flow Transmitter
LSLL-1	DI	Substrate Low Level Switch
LSLL-2	DI	NaHCO ₃ Low Level Switch
POALR-1	DI	Well Pump DP-1 Signal Off
RW-1	DO	Shutdown Well Pump DP-1
MP-1	DO	Shutdown Pump MP-1
MP-2	DO	Shutdown Pump MP-2

D. Operation and Maintenance Data Requirements

Outline the step-by-step procedures required for system startup, operation and shutdown. Include in the instructions layout, wiring and control diagrams of the system as installed, the manufacturer's name, model number, service manual, parts list and a brief description of all equipment and their basic operating features.

List routine maintenance procedures, possible breakdowns and repairs and trouble shooting guides.

1.04 LOGIC

A. Extraction Well

The ground water extraction system consists of one (1) well located under Container. Well has submersible pump DP-1. Ground water from extraction well will be pumped to the Bag Filter 'BF-1'.

Pressure (level) transducer in well will monitor water level and send 4-20 mA signal (AI) to the PLC, level will be displayed at the PLC screen.

Well pump will have MAN-OFF-AUTO switch on starter.

Man position - Pump will run, normal start-stop interlocks are by-passed.

Off position - Pump will stop.

Auto position - Pump will start and will automatically shutdown on any of the following conditions.

1. High Inlet pressure (HPALR-1), signal from PT-1.
2. High Injection pressure (HPALR-2), signal from PT-2.

Well pump motor starter will receive shutdown signal (DO) from the PLC and will send off signal (DI) to the PLC for shutdown indication.

Magnetic flow totalizer meter FMT will monitor total influent water flow from well to the filter. It will send 4-20 mA signal (AI) to the PLC totalized and record the flow rate as system's INFLUENT FLOW RATE.

Pressure transmitter PT-1 will monitor inlet pressure and send 4-20 Ma signal (AI) to the PLC. One soft switch HPALR-1 will be generated in PLC for alarm and shutdown.

B. Bag Filter

The water from the bag filter will be passed through inline mixer SM-1 before injection into the two Injection wells.

Local pressure transmitter PT-2 will monitor Injection pressure and send 4-20 Ma signal (AI) to the PLC. One soft switch HPALR-2 will be generated in PLC for alarm and shutdown.

C. Injection Wells

The water from the bag filter will be injected into two injection wells.

Each injection well will have local pressure gauge for pressure indication and mechanical flow meter with totalizer to record total flow.

D. Chemical Feed System

Substrate feed system 'MP-1'

Substrate feed system will consist of a 265 gallon storage tank T-1 and one feed metering pump MP-1.

Substrate feed pump MP-1 will be controlled manually from pump controller. Pump power plug will be plugged into the switched receptacle.

Level switch LSLL-1 will monitor the substrate level in the tank; on low level, it will send signal (DI) to the PLC for alarm LLALR-1 and shutdown substrate feed pump MP-1 (DO).

Pump MP-1 will have M-O-A switch located near pump.

Man position - Pump will run, interlocks are by-passed.

Off position - Pump will stop.

Auto position - Pump will start only if extraction well pump DP-1 is running and will automatically shutdown on any of the following conditions.

1. Low level in tank T-1 (LLALR-1).
2. High Inlet pressure (HPALR-1).

3. High Injection pressure (HPALR-2).

NaHCO₃ feed system 'MP-2'.

NaHCO₃ feed system will consist of a 300 gallon storage tank T-2 and one feed pump MP-2.

NaHCO₃ feed pump MP-2 will be controlled manually from pump controller. Pump power plug will be plugged in to the switched receptacle.

Level switch LSLL-2 will monitor the NaHCO₃ level in the tank; on low level, it will send signal (DI) to the PLC for alarm LLALR-2 and shutdown NaHCO₃ feed pump MP-2 (DO).

Pump MP-2 will have M-O-A switch located near pump.

Man position - Pump will run, interlocks are by-passed.

Off position - Pump will stop.

Auto position - Pump will start only if extraction well pump DP-1 is running and will automatically shutdown on any of the following conditions:

1. Low level in tank T-2 (LLALR-2).
2. High Inlet pressure (HPALR-1).
3. High Injection pressure (HPALR-2).

1.05 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

SD-03 Product Data

Control Drawings; G
Performance Verification Test (PVT); G
Endurance Test; G

SD-06 Test Reports

Testing, Adjusting and Commissioning

SD-10 Operation and Maintenance Data

Training Manual
Control System

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Standard Products

Materials and equipment shall be standard unmodified products of a manufacturer regularly engaged in the manufacturing of such products. Units of the same type of equipment shall be products of a single manufacturer. Items of the same type and purpose shall be identical and supplied by the same manufacturer, unless replaced by a new version approved by the Government.

2.02 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. PLC General Requirements

PLCs shall be micro-processor based, capable of receiving discrete and analog inputs and, through programming, shall be able to control discrete and analog output functions, perform data handling operations and communicate with external devices. PLCs shall meet the requirements of Class A computing devices, and shall be labeled as set forth in 47 CFR 15 and shall be able to withstand conducted susceptibility test as outlined in NEMA ICS 1, NEMA ICS 2, and NEMA ICS 3. PLCs shall function properly at temperatures between 32 and 122 degrees F at 5 to 95 percent relative humidity non-condensing and shall tolerate storage temperatures between minus 40 and plus 140 degrees F at 5 to 95 percent relative humidity non-condensing.

B. Modular PLC

PLCs shall be based on a modular, field expandable design allowing the system to be tailored to the process control application. The system shall be expandable through the use of additional hardware and/or user software. As a minimum, the PLC shall include a mounting backplane, power supply module, central processing unit (CPU) module, communications module, and input/output (I/O) module. The modules shall be grouped together in a mounting rack or cabinet. The mounting rack backplane shall provide the communications mechanism to fully integrate the individual modules located within the rack. Modules shall plug directly into the backplane. The use of wire connectors between modules will not be allowed. The rack size shall be as needed to hold the equipment necessary while performing the required control functions. The system configuration shall allow for the removal and/or installation of modules under power.

1. Central Processing Unit (CPU) Module

The CPU module shall be a self contained, microprocessor based unit that provides time of day, scanning, application (ladder rung logic) program execution, storage of application programs, storage of numerical values related to the application process and logic, I/O bus traffic control, peripheral and external device communications and self diagnostics.

2. Communications Module

The communications module shall allow peer-to-peer communication with other PLCs and shall allow the PLC to communicate with the central station, or workstation. The communication module shall utilize the manufacturer's standard communication architecture and protocol, ethernet architecture and protocol or a

combination of these. The communication module shall allow programming of the PLC to be done locally through the use of a laptop computer or touch screen panel mounted on the control panel.

3. Power Supply Module

One or more power supply modules shall be provided as necessary to power other modules installed in the same cabinet. Power supply modules shall plug directly into the backplane. Auxiliary power supplies may be used to supply power to remote cabinets or modules.

- a. Power supply modules shall use AC power with a nominal voltage of 120 vAc plus or minus 5 percent. The power supply module shall monitor the incoming line voltage level and shall provide over current and over voltage protection. If the voltage level is detected as being out of range the power supply module shall continue to provide power for an adequate amount of time to allow for a safe and orderly shutdown. Power supply modules shall be capable of withstanding a power loss for a minimum of 20 milliseconds while still remaining in operation and providing adequate power to all connected modules.
- b. Each power supply module shall be provided with an on-off switch integral to the module. If the manufacturer's standard power supply module is not provided with an on-off switch, a miniature toggle type switch shall be installed near the PLC and shall be clearly labeled as to its function.
- c. Power supply modules shall be provided with an indicating light which shall be lit when the module is operating properly.

4. Input/Output (I/O) Modules

Modules shall be self contained, microprocessor based units that provide an interface to field devices. The module shall be located in the same mounting rack as the other PLC components. The unit shall plug directly into the backplane of the mounting rack. Each module shall contain visual indication to display the on-off status of individual inputs or outputs.

C. Program Storage/Memory Requirements

The CPU shall utilize the manufacturer's standard non-volatile memory for the operating system. The controller shall have electronically erasable, programmable, read only memory (EEPROM) for storage of user programs and battery backed RAM for application memory. The EEPROM shall be loaded through the controller keypad, central station or through the use of a laptop computer. The CPU memory capacity shall be based on the system's control requirements. The memory capacity shall be sized such that, when the system is completely programmed and functional, no more than 50 percent of the memory allocated for these purposes is used.

D. Input/Output Characteristics

Each controller shall allow for analog input, analog output, discrete input and discrete output. The number and type of inputs and outputs for the system shall be as shown on the drawings and shall comply with the sequence of control. The system capacity shall include a minimum of 20 percent spare input and output points (no less than two points)

for each point type provided. During normal operation, a malfunction in any input/output channel shall affect the operation of that channel only and shall not affect the operation of the CPU or any other channel. Analog input circuits shall be available in 4-20 mA. Discrete input circuits shall be available in 79-132 vAc. All input circuits shall have a minimum optical isolation of 1500 VRMS and shall be filtered to guard against high voltage transients from the externally connected devices. Analog output circuits shall be available in 4-20 mA. Discrete output circuits shall be available in 79-132 vAc. All output circuits shall have a minimum optical isolation of 1500 VRMS and shall be filtered to guard against high voltage transients from the externally connected devices.

E. Wiring Connections

Wiring connections shall be heavy duty, self lifting, pressure type screw terminals to provide easy wire insertion and secure connections. The terminals shall accept two #14 AWG wires. A hinged protective cover shall be provided over the wiring connections. The cover shall have write-on areas for identification of the external circuits.

F. Diagnostics

Each PLC shall have diagnostic routines implemented in firmware. The CPU shall continuously perform self-diagnostic routines that will provide information on the configuration and status of the CPU, memory, communications and input/output. The diagnostic routines shall be regularly performed during normal system operation. A portion of the scan time of the controller shall be dedicated to performing these housekeeping functions. In addition, a more extensive diagnostic routine shall be performed at power up and during normal system shutdown. The CPU shall log input/output and system faults in fault tables which shall be accessible for display. When a fault affects input/output or communications modules the CPU shall shut down only the hardware affected and continue operation by utilizing the healthy system components. All faults shall be annunciated at the PLC. Diagnostic software shall be useable in conjunction with the portable tester.

G. Accuracy

Controllers shall have an accuracy of plus or minus 0.25 percent of input span.

2.03 PLC SOFTWARE

All PLC software described in this specification shall be furnished as part of the complete control system.

A. Operating System

Each PLC shall be provided with the manufacturer's standard operating system software package. The PLC shall maintain a point database in its memory that includes all parameters, constraints and the latest value or status of all points connected to the PLC. Execution of the PLC application programs shall use the data in memory resident files. The operating system shall support a full compliment of process control functions. It shall be possible to define these functions using a mix of function blocks, ladder logic diagrams, sequential function charts and text programming. Programming methods and interactions shall be based on IEC 61131-3. A combination of the programming methods shall be possible within a single controller. The operating system shall allow loading of software locally or from the central station and data files from the portable tester. It shall

also support data entry and diagnostics using an operator interface panel attached directly to the PLC. Each PLC shall be capable of operating in stand alone mode.

1. Startup

The PLC shall have startup software that causes automatic commencement of operation without human intervention, including startup of all connected I/O functions. A PLC restart program based on detection of power failure at the PLC shall be included in the PLC software. The restart program shall include start time delays between successive commands to prevent demand surges or overload trips.

2. Failure Mode

Upon failure for any reason, each PLC shall perform an orderly shutdown and force all PLC outputs to a predetermined (failure mode) state, consistent with the failure modes shown and the associated control device.

B. Functions

The controller operating system shall be able to scan inputs, control outputs, and read and write to its internal memory in order to perform the required control as indicated in the sequence of control on the drawings. The controller shall periodically perform self diagnostics to verify that it is functioning properly.

1. Analog Monitoring

The system shall measure and transmit all analog values including calculated analog points.

2. Logic (Virtual)

Logic (virtual) points shall be software points entered in the point database which are not directly associated with a physical I/O function. Logic (virtual) points shall be analog or digital points created by calculation from any combination of digital and analog points, or other data having all the properties of real points, including alarms, without the associated hardware. Logic (virtual) points shall be defined or calculated and entered into the database. The calculated analog point shall have point identification in the same format as any other analog point.

3. State Variables

If an analog point represents more than two (up to 8) specific states, each state shall be nameable. For example, a level sensor shall be displayed at its measured engineering units plus a state variable with named states usable in programs or for display such as low alarm/low/normal/high/high alarm.

4. Analog Totalization

Any analog point shall be operator assignable to the totalization program. Up to eight analog values shall be totalized within a selectable time period.

5. Trending

Any analog or calculated point shall be operator assignable to the trend program.

Up to eight points shall be sampled at individually assigned intervals, selectable between 1 minute and 2 hours. A minimum of the most recent 128 samples of each trended point shall be stored. The sample intervals shall be able to be defined, modified, or deleted online.

C. Alarm Processing

Each PLC shall have alarm processing software for AI, DI, and PA alarms for all real and virtual points connected to that PLC.

1. Digital Alarms

Digital alarms are those abnormal conditions indicated by DIs as specified and shown. The system shall automatically suppress analog alarm reporting associated with a digital point when that point is turned off.

2. Analog Alarms

Analog alarms are those conditions higher or lower than a defined value, as measured by an AI. Analog readings shall be compared to predefined high and low limits, and alarmed each time a value enters or returns from a limit condition. Unique high and low limits shall be assigned to each analog point in the system. In control point adjustment (CPA) applications, key the limit to a finite deviation traveling with the setpoint. The system shall automatically suppress analog alarm reporting associated with an analog point when that analog point is turned off.

3. Pulse Accumulator (PA) Alarms

Pulse accumulator alarms are those conditions calculated from totalized values of accumulator inputs or PA input rates that are outside defined limits as specified and shown. PA totalized values shall be compared to predefined limits and alarmed each time a value enters a limit condition. Unique limits shall be assigned to each PA point in the system.

D. Constraints

1. Equipment Constraints Definitions

Each control point in the database shall have PLC resident constraints defined and entered by the Contractor, including as applicable: maximum starts (cycles) per hour; minimum off time; minimum on time; high limit (value in engineering units); and low limit (value in engineering units).

2. Constraints Checks

All control devices connected to the system shall have the PLC constraints checked and passed before each command is issued. Each command point shall have unique constraints assigned. High and low "reasonableness" values or one differential "rate-of-change" value shall be assigned to each AI. Each individual point shall be capable of being selectively disabled by the operator from the central station.

E. Control Sequences and Control Loops

Specific functions to be implemented are defined in individual system control sequences and database tables shown on the drawings, and shall include, as applicable, the following functions: PI control shall provide proportional control and proportional plus integral control; two position control shall provide control for a two state device by comparing a set point against a process variable and an established dead band; floating point control shall exercise control when an error signal exceeds a selected dead band, and shall maintain control until the error is within the dead band limits; signal selection shall allow the selection of the highest or lowest analog value from a group of analog values as the basis of control and shall include the ability to cascade analog values so that large numbers of inputs can be reduced to one or two outputs; signal averaging shall allow the mathematical calculation of the average analog value from a group of analog values as the basis of control and shall include the ability to "weight" the individual analog values so that the function output can be biased as necessary to achieve proper control; reset function shall develop an AO based on up to two AIs and one operator specified reset schedule.

F. Command Priorities

A scheme of priority levels shall be provided to prevent interaction of a command of low priority with a command of higher priority. Override commands entered by the operator shall have higher priority than those emanating from applications programs.

G. Resident Application Software

Provide resident applications programs developed in accordance with paragraph Graphical Object Oriented Programming to achieve the sequences of operation, parameters, constraints, and interlocks necessary to provide control of the process systems connected to the control system. All application programs shall be resident in the PLC and shall execute in the PLC, and shall coordinate with each other, to insure that no conflicts or contentions remain unresolved.

1. Program Inputs and Outputs

Use program inputs listed for each application program to calculate the required program outputs. Where specific program inputs are not available, a "default" value or virtual point appropriate for the equipment being controlled and the proposed sequence of operation shall be provided to replace the missing input, thus allowing the application program to operate.

2. Failure Mode

In the event of a PLC failure, the controlled equipment shall continue to function in the failure mode shown on the drawings.

2.04 CONTROL PANELS

A. Components

1. Enclosures

The enclosure for each control panel shall conform to the requirements of NEMA 250 for the types specified. Finish color shall be the manufacturer's

standard, unless otherwise indicated. Damaged surfaces shall be repaired and refinished using original type finish. Enclosures shall be NEMA Type 12; Enclosure shall be provided with a single, continuously hinged exterior door with print pocket, 3-point latching mechanism and key lock and a single, continuously hinged interior door.

2. Controllers

Controllers shall be in accordance with paragraph Programmable Logic Controller (PLC).

3. Standard Indicator Light

Indicator lights shall comply with NEMA ICS 1, NEMA ICS 2 and UL 508. Lights shall be heavy duty, round and shall mount in a 0.875 inch mounting hole. Indicator lights shall be LED type and shall operate at 120 vAc or 24 vDc. Long life bulbs shall be used. Indicator light shall be provided with a legend plate labeled as shown on the drawings. Lens color shall be as indicated on the drawings. Lights shall be push to test (lamp) type.

4. Selector Switches

Selector switches shall comply with NEMA ICS 1, NEMA ICS 2 and UL 508. Selector switches shall be heavy duty, round and shall mount in a 0.875 inch mounting hole. The number of positions shall be as indicated on the drawings. Switches shall be non-illuminated. Switches shall be rated for 600 volts, 10 amperes continuous. Selector switches shall be provided with a legend plate labeled as shown on the drawings. Where indicated or required, dual auxiliary contacts shall be provided for the automatic position to provide position sensing at the central station or workstation. Auxiliary contacts shall be rated for 120 vAc, 1A as a minimum. Where indicated on the drawings, switches shall be key operated. All keys shall be identical.

5. Push Buttons

Push buttons shall comply with NEMA ICS 1, NEMA ICS 2 and UL 508. Push buttons shall be heavy duty, round and shall mount in a 0.875 inch mounting hole. The number and type of contacts shall be as indicated on the drawings or required by the Sequence of Control. Push buttons shall be rated for 600 volts, 10 amperes continuous. Push buttons shall be provided with a legend plate labeled as shown on the drawings.

6. Relays

Relays shall comply with IEEE C37.90 and derated for altitude above 1,500 m. Relays shall be as required by the Sequence of Control; relay coil shall be 120 vAc and shall be provided with matching mounting socket. Power consumption shall not be greater than 3 watts.

7. Terminal Blocks

Terminal blocks shall comply with NEMA ICS 4 and UL 1059. Terminal blocks for conductors exiting control panels shall be two-way type with double terminals, one for internal wiring connections and the other for external wiring

connections. Terminal blocks shall be made of bakelite or other suitable insulating material with full deep barriers between each pair of terminals. A terminal identification strip shall form part of the terminal block and each terminal shall be identified by a number in accordance with the numbering scheme on the approved wiring diagrams.

8. Alarm Horns

Alarm horns shall be provided where indicated on the drawings. Horns shall be vibrating type and shall comply with UL 508. Horns shall provide 100 dB at 10 feet. Exterior mounted horns shall be weather proof by design or shall be mounted in a weather proof enclosure that does not reduce the effectiveness of the horn.

B. Panel Assembly

Control panels shall be factory assembled and shipped to the jobsite as a single unit. Panels shall be fabricated as indicated and devices shall be mounted as shown or required. Each panel shall be fabricated as a bottom-entry connection point for control system electrical power and control system wiring. Panel shall have power on-off switch, common alarm light, and emergency stop push button mounted on door. For layout see Drawing M-4.

C. Electrical Requirements

Each panel shall be powered by a dedicated 120 volts ac circuit, with a fuse, 10 amp, and a disconnect switch located inside the panel. Wiring shall terminate inside the panel on terminal blocks. Electrical work shall be as specified in Section 26 20 00 - INTERIOR DISTRIBUTION SYSTEM and as shown on the drawings.

D. Grounding

Control panel enclosures shall be equipped with a solid copper ground bus or equivalent. The ground bus shall be securely anchored to the enclosure so as to effectively ground the entire structure. Clamp-type terminals sized large enough to carry the maximum expected current shall be provided on the ground bus for grounding cables. Where a definite circuit ground is required, a single wire not less than #10 AWG shall run independently to the panel ground bus and shall be fastened to the ground bus with a bolted terminal lug. Cases of instruments, relays and other devices shall be effectively grounded through the enclosures steel structure unless otherwise indicated. Insulated wiring having a continuous rated current of not less than the circuit fuse rating shall be used for grounding. Grounding terminals of power receptacles shall be solidly grounded to the panel enclosure.

2.05 FACTORY TEST

The control system shall be tested at the factory prior to shipment. Written notification of planned testing shall be given to the Government at least 21 days prior to testing, and in no case shall notice be given until after the Contractor has received written Government approval of the test procedures.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION REQUIREMENTS

A. Installation

Install system components and appurtenances in accordance with the manufacturer's instructions and provide necessary interconnections, services, and adjustments required for a complete and operable system. Adjust or replace devices not conforming to the required accuracies.

3.02 INSTALLATION OF EQUIPMENT

Install equipment as specified, as shown and as required in the manufacturer's instructions for a complete and fully operational control system.

A. Control Panels

Control panels shall be located as indicated on the drawings. Devices located in the control panels shall be as shown on the drawings or as needed to provide the indicated control sequences.

3.03 WIRE, CABLE AND CONNECTING HARDWARE

A. Metering and Sensor Wiring

Metering and sensor wiring shall be installed in accordance with the requirements of ANSI C12.1, NFPA 70, and Section 26 20 00 - INTERIOR DISTRIBUTION SYSTEM.

3.04 SOFTWARE INSTALLATION

Load software required for an operational control system, including databases, operational parameters, and system, command, and application programs. Adjust, tune, debug, and commission all software and parameters for controlled systems to assure proper operation in accordance with the sequences of operation and database tables.

3.05 CONTROL DRAWINGS

Control drawings, reproducible, with corresponding CADD files shall be provided for equipment furnished and for interfaces to equipment at each respective equipment location. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation and procedures for safely starting and stopping the system manually shall be prepared in typed form.

Submit in booklet form, indexed to the unique identifiers, consisting of data sheets that document compliance with the specification. Where multiple components are shown on a catalog cut, mark the application specific component.

3.06 FIELD TESTING AND ADJUSTING EQUIPMENT

Provide personnel, equipment, instrumentation, and supplies necessary to perform site testing. The Government will witness the PVT, and written permission shall be obtained from the Government before proceeding with the testing. Original copies of data produced, including results of each test procedure, during PVT shall be turned over to the Government at the

conclusion of each phase of testing prior to Government approval of the test. The test procedures shall cover actual equipment and functions specified for the project.

A. Testing, Adjusting and Commissioning

After successful completion of the factory test as specified, the Contractor will be authorized to proceed with the installation of the system equipment, hardware, and software. Once the installation has been completed, test, adjust, and commission each control loop and system in accordance with NIST SP 250 and shall verify proper operation of each item in the sequences of operation, including hardware and software. Calibrate field equipment, including control devices, adjust control parameters and logic (virtual) points including control loop setpoints, gain constants, constraints, and verify data communications before the system is placed online.

B. Performance Verification Test (PVT)

Submit test procedures for the PVT. The test procedure shall describe all tests to be performed and other pertinent information such as specialized test equipment required and the length of the PVT. The test procedures shall explain, in detail, step-by-step actions and the expected results, to demonstrate compliance with all the requirements of the drawings and this specification. The test procedure shall be site specific and based on the inputs and outputs, required calculated points and the sequence of control. Refer to the actions and expected results to demonstrate that the control system performs in accordance with the sequence of control. Include a list of the equipment to be used during the testing plus manufacturer's name, model number, equipment function, the date of the latest calibration and the results of the latest calibration.

Demonstrate that the completed Control system complies with the contract requirements. All physical and functional requirements of the project including communication requirements shall be demonstrated and shown. Demonstrate that each system operates as required in the sequence of operation. The PVT as specified shall not be started until after receipt of written permission by the Government, based on the written report including certification of successful completion of testing, adjusting and commissioning as specified, and upon successful completion of training as specified. Upon successful completion of the PVT, furnish test reports and other documentation.

C. Endurance Test

1. Phase I (Testing)

The test shall be conducted 24 hours per day for 3 consecutive calendar days, including holidays, and the system shall operate as specified. Make no repairs during this phase of testing unless authorized by the Government in writing.

2. Phase II (Assessment)

After the conclusion of Phase I, identify failures, determine causes of failures, repair failures, and deliver a written report to the Government. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which testing should be resumed. After delivering the written report, convene a test review meeting at the job site to present the results and recommendations to the Government. The meeting shall not be scheduled earlier than 5 business days after receipt of the report by the Government. As a part of this test review meeting, demonstrate that failures have

been corrected by performing appropriate portions of the performance verification test. Based on the Contractor's report and the test review meeting, the Government will determine if retesting is necessary and the restart point. The Government reserves the right to require that the Phase I test be totally or partially rerun. Do not commence any required retesting until after receipt of written notification by the Government. After the conclusion of any retesting which the Government may require, the Phase II assessment shall be repeated as if Phase I had just been completed.

3. Exclusions

The Contractor will not be held responsible for failures resulting from the following: Outage of the main power supply in excess of the capability of any backup power source, provided that the automatic initiation of all backup sources was accomplished and that automatic shutdown and restart of the control system performed as specified. Failure of a Government furnished communications link, provided that the PLC automatically and correctly operates in the stand-alone mode as specified, and that the failure was not due to Contractor furnished equipment, installation, or software. Failure of existing Government owned equipment, provided that the failure was not due to Contractor furnished equipment, installation, or software.

3.07 MANUFACTURERS' FIELD SERVICES

Obtain the services of a manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installing, adjusting, and testing of the equipment.

3.08 FIELD TRAINING

Field training oriented to the specific system shall be provided for designated personnel. Furnish a copy of the training manual for each trainee plus two additional copies. Manuals shall include an agenda, the defined objectives for each lesson, and a detailed description of the subject matter for each lesson. Furnish audiovisual equipment and other training supplies and materials. Copies of the audiovisuals shall be delivered with the printed training manuals. The Government reserves the right to videotape training sessions for later use. A training day is defined as 8 hours of classroom instruction, excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility. Submit the training manual and schedule to receive approval from the Government at least 30 days before the training.

A. Preliminary Operator Training

Prior to the start of field testing, preliminary operator training shall be taught at the project site for one training day. Upon completion of this course, each student, using appropriate documentation, should be able to perform elementary operations with guidance and describe the general hardware architecture and functionality of the system. This course shall include: general system architecture; functional operation of the system, including workstations; operator commands; application programs, control sequences, and control loops; database entry and modification; reports generation; alarm reporting; diagnostics; and historical files.

-- End of Section --

SECTION 43 21 13.10

SUBMERSIBLE PUMPS

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2011; Errata 2012) Motors and Generators
NEMA WC 70	(2009) Standard for Non-Shielded Power Cable 2000 V or Less for the Distribution of Electrical Energy
NEMA WC 72	(1999; R 2004) Standard for Continuity of Coating Testing for Electrical Conductors

1.02 SYSTEM DESCRIPTION

Provide one submersible well pump designed for continuous submerged operation that include start/stop operation for pumping of contaminated groundwater.

1.03 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Materials and Equipment; G

Spare Parts

Installation Instruction Manual; G

SD-10 Operation and Maintenance Data

Operating and Maintenance Manual; G

1.04 DETAIL DRAWINGS

Submit drawings of sufficient size to be easily read, within 90 days of Notice of Award. Submit shop drawings for pump including, dimensions, materials of construction, motor data,

performance curves, and pump installation arrangement.

1.05 DELIVERY, STORAGE, AND HANDLING

The pump will be inspected for damage or other distress when received at the project site. Store the pump and associated equipment indoors as recommended by the pump manufacturer, protected from construction or weather hazards at the project site. The pump and equipment shall have adequate short-term storage in a covered, dry, and ventilated location prior to installation. The manufacturer's instructions shall be followed for extended storage. Proper equipment for handling the pump shall be supplied and shall be considered as special tools if not completely standard. Follow the manufacturers recommendations for handling of the pump.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Provide materials and equipment which are as specified below, as shown, and are suitable for the service intended. Provide materials and equipment which are new and unused, except for tests. Where two or more pieces of equipment performing the same function are required, they shall be duplicate products of the same manufacturer.

Within 60 days of Notice of Award, submit a list designating materials and equipment to be used for each pump part along with the submittal of the drawings. If deviation from specified materials is desired, submit complete specifications for the proposed deviating materials after award of the Contract.

A. Description

The pump shall be submersible well pump of the types indicated and specified to extract groundwater from extraction wells and transfer water to the groundwater recirculation system. The single driving units for the pump shall be electric motors as indicated and specified.

B. Nameplates

Pumps and motors shall have a standard nameplate securely affixed in a conspicuous place showing the manufacturer's name, address, type or style, model, serial number, and catalog number. Nameplate for each electric motor shall show at least the minimum information required by 10.38 NEMA MG 1. Such other information as the manufacturer may consider necessary to complete identification shall be shown on the nameplate.

2.02 SUBMERSIBLE PUMP

The pump shall be submersible well pump of the types indicated and specified to extract groundwater from extraction wells and transfer water to the groundwater recirculation system. The pump shall have a capacity of 25 gallons per minute when operating against a total dynamic head of 200 feet of water. All wetted components of the pump, including but not limited to, the impeller, diffuser vanes, shaft, couplings, and check valve shall be constructed of stainless steel for resistance to wear, corrosion and abrasion. The pump shall be electrically driven, water lubricated, submersible type. The pump shall meet the performance requirement provided in the design data. The pump shall be manufactured by "GRUNDFOS" with specific model numbers provided in the pumps schedule, or approved equal. The pump shall be constructed in

accordance with the minimum requirements below.

A. Pump and Motor Bearing Arrangement

The pump and motor bearings shall be the standard design of the manufacturer for the pump supplied under this specification. The type and number shall be of proven design as used in previous operating units supplied by the manufacturer. The bearings shall be of the grease lubricated and sealed type. Each bearing shall be of the correct design to resist the radial and thrust loads applied. Enough bearings shall be provided to ensure the pump rotating elements are supported so that the possibility of excessive vibration is eliminated.

B. Impeller

The impeller design and manufacture shall be the manufacturer's standard. The impeller surface shall be smooth, without holes and fabrication offsets. The attachments to shaft shall be with keys or other fasteners which are to be made of stainless steel. The attachment should be of sturdy construction designed to not loosen, but be easily removed for maintenance. The impeller construction shall be stainless steel for resistance to wear, corrosion, and abrasion.

C. Shaft

The shaft shall be one piece integral with the motor of stainless steel with a factor of safety of five measured against the ultimate strength. The shaft shall be designed for all torque conditions during normal operation and for runaway speed during reverse flow.

D. Bowl Assembly

The bowl assembly shall be construction of stainless steel. The hydraulic design shall be the manufacturer's standard design as used in previous operating installations. The general manufacture quality relating to flange design, drilling, bolts, alignments, etc., shall be in accordance with industry standard practice.

E. Pump Lifting Handle and Lifting Lugs

The lifting handle shall be designed to bear the entire weight of the pumping unit at a conservative factor of safety. Lifting lugs shall be provided where the weight of the separate part requires a lug.

2.03 MOTOR

All motors shall be supplied with their driven pumps. The submersible pump electric motor shall be completely submersible, self cooling, and capable of resisting the surrounding environment including sand and possible contaminants. Motor bearings shall be constructed so as to exclude dirt and water and prevent lubricant from reaching windings. Thrust bearings shall be of sufficient design to handle the design pressure loads and forces. The motors shall be "GRUNDFOS" environmental type motors or approved equal. The motors shall be constructed in accordance with the minimum requirements below.

A. Design Requirements

The motors shall be 2 horsepower, single phase, 60-Hz, 230 volts, alternating current power and shall conform to the requirements of NEMA MG 1. The stator windings and

stator leads shall be insulated with a moisture-resistant Class F insulation with temperature resistance of 311 degrees F. The service factor shall be 1.0. The temperature rise above ambient for continuous full load rated conditions and for the class of insulation used shall not exceed the values in NEMA MG 1. The motor shall be rated for continuous duty when submerged and shall also be capable of operation in the dry for short periods of time for testing and maintenance purposes. Motor shall be supplied with a control box.

B. Support

Thrust bearing support shall have sufficient strength and rigidity to support the weight of the entire rotating element of the motor, pump impeller and shaft, and the hydraulic thrust.

2.04 CABLE

- A. Power and instrumentation cable shall be specifically designed for use with a submersible pump application and shall conform to the requirements of NEMA WC 70 and NEMA WC 72. Submersible cable shall be suitable for continuous immersion in water at the maximum depth encountered. Cable shall have an ampacity of not less than 125 percent of the motor full load current. The cable length shall be determined by the pump manufacturer for the installation shown.
- B. Power and instrumentation cables shall enter the motor through a sealing system that prevents water entry into the unit and provides strain relief. The cable entry may be comprised of rubber bushings, flanked by stainless steel washers, having a close tolerance fit against the cable outside diameter and the entry inside diameter for sealing by compression of the bushing, or the entry may be sealed by other gland compression methods.

2.05 Spare Parts

Submit six Copies of manufacturers complete parts list showing all parts, spare parts, and bulletins for pump. Clearly show all details, parts, and adequately describe parts or have proper identification marks. The parts lists shall be printed on good quality 8-1/2 by 11 inch paper, bound separately of the Operation and maintenance manual with a flexible, durable cover. Drawings incorporated in the parts lists may be reduced to page size provided they are clear and legible, or they may be folded into the bound lists to page size. Photographs or catalog cuts of components may be included for identification.

PART 3 EXECUTION

3.01 INSTALLATION

Perform correct installation and assembly of the pumping unit in accordance with the drawings and with the manufacturer's installation instruction manual. Furnish all bolts, shims, tools, and other devices necessary for installing the pumping units.

A. Installation Instruction Manual

No later than 30 days prior to time of pump delivery, submit three copies of a typed and bound manual describing procedures to be followed by the installation engineer in assembling, installing, and dry- and/or wet-testing the pump. Coordinate and consolidate

the description of the pump with similar descriptions for other specified pump parts. The description shall be of such a nature that it may be comprehended by an engineer or mechanic without extensive experience in erecting or installing pumps of this type. The description shall be a step-by-step explanation of operations required, and shall include, where applicable, such things as alignment procedures, bolt torque values, recommended instrument setups, recommended gauges and instruments, and similar details.

3.02 FIELD PUMP TESTS

Field testing shall be conducted by an experienced field test engineer and will be witnessed by the Contracting Officer. Before initially energizing the pump/motors, document that all pumping plant control, monitoring, and protective circuits have been successfully tested. This thorough electrical checkout procedure shall have followed a detailed step-by-step approved test plan. The motor and other pumping unit elements undergoing tests should also be checked at this time.

A. Wet Test

Each unit shall be given an operating test under load for a period of at least 2 hr or as directed by the Contracting Officer. Conduct the tests to be witnessed by the Government. During the tests, the operation of the pumping units shall be observed and measurement of noise, motor-bearing temperatures, voltage, and current shall be recorded for each pump. Measured parameters shall be within the pump manufacturers published limits. Without additional cost to the Government, the Contractor shall make all changes and correct any errors for which the Contractor is responsible.

3.03 OPERATING AND MAINTENANCE MANUAL

Submit six copies of the manual containing complete information on operation, lubrication, adjustment, routine and special maintenance disassembly, repair, reassembly, and trouble diagnostics of pump and auxiliary equipment. The operation and maintenance manual shall be printed on good quality 8-1/2 by 11 inch paper, bound separately from the parts list, and bound between a flexible, durable cover. Drawings incorporated in manual may be reduced to page size provided they are clear and legible, or they may be folded into the manual to page size. Photographs or catalog cuts of components may be included for identification.

-- End of Section --

SECTION 43 43 00.01

PARTICULATE FILTRATION SYSTEM

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASME INTERNATIONAL (ASME)

ASME B1.1 (2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

SD-03 Product Data

Spare Parts List
Framed Instructions; G
Materials and Equipment; G

SD-07 Certificates

Manufacturer's Representative Qualifications

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

1.03 ADDITIONAL SUBMITTAL REQUIREMENTS

A. Shop Drawings

Submit shop drawings consisting of a complete list of equipment and materials, including manufacturer's descriptive and technical literature; performance charts and curves; catalog cuts; and installation instructions. Also submit shop drawings containing complete wiring and schematic diagrams; equipment layout and anchorage; and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

B. Materials and Equipment

Submit catalog cuts and other pertinent information on filters, pumps, tanks, mixers, piping, and flow elements.

1.04 DELIVERY, STORAGE, AND HANDLING

In order to prevent damage during shipment, carefully pack and brace all material either within shipping containers or on the carrier. Provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. Handle materials by methods to prevent bending or overstressing during fabrication and delivery. Protect material and equipment delivered and placed in storage from the weather, excessive humidity and excessive temperature variation, dirt, dust, or other contaminants.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Provide materials and equipment which are as specified below, as shown, and are suitable for the service intended. Provide materials and equipment which are new and unused, except for tests. Provide duplicate products of the same manufacturer, where two or more pieces of equipment performing the same function are required.

A. Description

Provide one bag filtration system as shown in the Contract Drawings for the continuous operation/filtration of contaminated groundwater. Fabricate the filter cartridge housing, support legs and eyebolts for cover closure of Type 304 stainless steel. After fabrication, the vessel shall be glass bead blast finished. Cover closure shall use swing bolts with eye nuts or other appropriate closure for service conditions. Housing shall be of height (length) sufficient to contain the filter bags as specified in the "Equipment Capacity." Housing shall have one bottom threaded drain connection and two threaded connections for pressure gauge attachment. Manufacturers shall be Eaton, Rosedale, Filtra Systems or approved equal. Valves on the influent and effluent connections adequate to allow the unit to be taken out of service to change out the filter material in the unit. Supply auxiliary systems and equipment required to maintain complete and workable filter systems including, but not limited to, required piping between units and auxiliary equipment for plumbing.

B. Nameplates

Provide each major item of equipment with the manufacturer's name, address, type of

style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.02 BAG FILTER

A. Equipment Capacity

1. Particulate Filtration Unit BFR-1

Provide one bag filter for operation. Unit must be capable of treating the entire stream. Provide unit which meets the following requirements:

1. Operational Flowrates:
 - a. Design: 25 gpm
 - b. Maximum: 50 gpm
2. Water Temperature:
 - a. Design: 55 degrees F
3. Design Pressure: 150 psi

B. Filter Material

Provide filter material constructed of polypropylene.

C. Gasket Material

Provide a single gasket cover seal for each bag element with material of construction being Viton or Teflon.

D. Pore Size/Rating

Provide a bag pore size of 10 microns.

E. Filter Bags

Filter Bags shall be #4 size. Provide a bag filter size of approximately 4 inches in diameter and approximately 14 inches in height. Filter bags with metal ring fabricated from Type 304 stainless steel shall be used.

F. Bag Support/Strainer Basket

Provide a support/basket material constructed of carbon steel.

2.03 FILTER HOUSING

A. Material Construction

Construct the filter housing head, shell, and associated internal and external connections and internal and external hardware of carbon steel. Prefabricate the housing and deliver the housing to the site in such a condition that the unit can be fastened in the location

designated on the Contract Drawings.

B. Shell O-Ring Material

Provide filter housing shell O-rings constructed of Viton or Teflon, or approved equal.

C. Pipe and Fittings

Provide pipe hangers and supports in accordance with Section 46 07 53.16 - ENHANCED IN-SITU BIOREMEDIATION SYSTEM EQUIPMENT. Provide pipe, valves and fittings for liquids in accordance with Section 46 07 53.16 - ENHANCED IN-SITU BIOREMEDIATION SYSTEM EQUIPMENT.

D. Bolts, Nuts, and Fasteners

With the equipment, unless otherwise indicated, furnish galvanized bolts, anchor bolts, nuts, washers, plates, bolt sleeves, and all other types of supports necessary for the installation of the equipment. Where indicated, specified, or required, provide anchor bolts with square plates at least 4 by 4 by 3/8 inch thick or with square heads and washers. Provide expansion bolts with malleable-iron and lead composition elements. Unless otherwise specified, provide refined bar iron stud, tap, and machine bolts. All threads shall conform to ASME B1.1. Bolts, anchor bolts, nuts, and washers specified to be galvanized, are to be zinc coated, after being threaded, by the hot-dip process in conformity with ASTM A 123/A 123M or ASTM A 153/A 153M. Bolts, anchor bolts, nuts, and washers indicated to be stainless steel are to be Type 316 stainless steel.

E. Lids

Furnish standard built-in davit arm mechanisms to lift filtration housing lids.

F. Connections

For the filtration unit, provide a 1-inch NPT drain centered at the bottom, and two 1/4-inch NPT gauge ports located on the unit at the influent and effluent levels. Provide 150 pound flanged connections at the influent and effluent piping.

2.04 SPARE PARTS

Provide a spare parts list for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one (1) year of service.

A set of manufacturer recommended spare parts and supplies for one (1) year of service is to be included as part of the equipment provided under this Section. Also to be provided are any unusual parts or tools that are necessary for maintenance and repair of the system.

PART 3 EXECUTION

3.01 EXAMINATION

Verify all dimensions in the field and advise the Contracting Officer of any discrepancy before performing the work.

3.02 EQUIPMENT INSTALLATION

Provide filter unit. Set filter in place, plumb, level, and securely anchored. Provide reducers as necessary. Do not install filter bags until housing has been thoroughly cleaned and connecting pipelines have been thoroughly flushed. Flush the filter bags a minimum of three times before placing the units in service.

3.03 PIPE, VALVES, FITTINGS, AND APPURTENANCES

Install piping including cleaning, cutting, threading and jointing, in accordance with Section 46 07 53.16 - ENHANCED IN-SITU BIOREMEDIATION SYSTEM EQUIPMENT or as appropriate to the application. Provide differing metals with isolation devices.

3.04 TESTS

Carefully inspect all products for defects in workmanship and material; clean debris and foreign matter out of valve openings and seats; operate all operating mechanisms to check their proper functioning; and check all nuts and bolts for tightness. Repair or replace valves and other equipment which do not operate easily or are otherwise defective at no additional cost to the Government. Give each system component requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet requirements of the specification and its intended use. Operate the filters under design conditions for 2 hours. Correct any deviations from normal operation such as excessive vibration, noise or other abnormal operation. Verify that the pressure and flow rate are within 5% of the values shown on the certified rating.

A. Hydrostatic Tests

At the factory and again after installation, test all units for water tightness. Test pressures shall be 150 psi. Isolate piping systems from the tanks for pressure testing at the specific test pressures.

3.05 MANUFACTURER'S SERVICE

Prior to startup, document that the equipment was inspected for alignment and connections by a manufacturer's representative. Service by the manufacturer's representative includes inspection of final installation, adjustment and testing of the equipment, and demonstration that the system meets the performance requirements.

A. Manufacturer's Representative Qualifications

Provide the services of a manufacturer's field representative who is experienced in the installation, adjustment, and operation of the equipment furnished and who has complete knowledge of the proper operation and maintenance of the system. Submit names and qualifications of each manufacturer's field representative and training engineer with written certification from the manufacturer that each representative and trainer is technically qualified.

3.06 FRAMED INSTRUCTIONS

Where directed, post framed instructions containing wiring and control diagrams, under glass or in laminated plastic. Prepare, in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams, the condensed operating instructions. Submit posted diagrams, instructions, and other sheets prior to posting.

3.07 MAINTENANCE

The following information can either be included in the manual or manufacturer literature that contains the information and is furnished with the Operation and Maintenance Manuals. Equip each manual with an index listing the contents. Bind manuals in sturdy three-ring, loose-leaf binders.

- A. Submit six complete copies of operating instructions outlining the step-by-step procedures required for system startup, normal operation, short- and long-term deactivation, and shutdown. In the beginning of the instructions, include an introduction and overall equipment description, purpose, functions, and simplified theory of operation. Include the manufacturer's name, model number, service manual, parts list and brief description of each piece of equipment and its basic theory and operating features in the instructions. Include piping and component layouts and wiring and control diagrams for the systems as installed in the instructions. Provide operating instructions reflective of all performance test data.
- B. Submit six complete copies of maintenance instructions listing routine maintenance procedures, calibration procedures, possible breakdowns and repairs and trouble shooting guides. Include procedures for cleaning and removal of scale.

3.08 FIELD TRAINING

Conduct a training course of operating staff as designated by the Contracting Officer. Start the training period, for a total of 4 hours of normal working time, after the system is functionally complete but prior to final acceptance tests. Cover the topics included in the Operating and Maintenance Manuals in the field instructions. Also provide 16 hours of training, as directed by the Contracting Officer, following completion of the one year operating period for the follow-in Contractor.

3.09 WARRANTY

Warrant the equipment and materials of construction for one (1) year after the end of the construction phase. Warrant the equipment and materials of construction for more than one (1) year when such equipment or materials' respective warranties extend longer than one (1) year. Approve of all installations by others; installations of work by others does not diminish the warranty to the Contracting Officer. Include all extended warranties in the Operation and Maintenance Manual.

-- End of Section --

SECTION 46 07 53.16

ENHANCED IN-SITU BIOREMEDIATION SYSTEM EQUIPMENT

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 6D (2008; Errata 1 2008; Errata 2 2008; Errata 3 2009; Addendum 1 2009; Errata 4 2010; Errata 5 2010; Errata 6 2011; Addendum 2 2011; Addendum 3 2012)
Specification for Pipeline Valves

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C200 (2012) Steel Water Pipe - 6 In. (150 mm) and Larger
AWWA C206 (2011) Field Welding of Steel Water Pipe
AWWA C207 (2013) Standard for Steel Pipe Flanges for Waterworks Service-Sizes 100 mm through 3600 mm 4 in. through 144 in.
AWWA C208 (2012) Standard for Dimensions for Fabricated Steel Water Pipe Fittings

ASME INTERNATIONAL (ASME)

ASME B1.20.1 (2013) Pipe Threads, General Purpose (Inch)
ASME B16.3 (2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.5 (2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2012) Standard Specification for Carbon Structural Steel
ASTM A53/A53M (2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A307 (2012) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM D1785 (2012) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120

ASTM D2241	(2009) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2564	(2012) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D3139	(1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3308	(2012) PTFE Resin Skived Tape
ASTM F477	(2010) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND
FITTINGS INDUSTRY (MSS)

MSS SP-58	(2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
MSS SP-70	(2011) Gray Iron Gate Valves, Flanged and Threaded Ends
MSS SP-78	(2011) Cast Iron Plug Valves, Flanged and Threaded Ends
MSS SP-80	(2013) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
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1.02 SUBMITTALS

Government approval is required for submittals with a "G" designation; Architect-Engineer approval is required for submittals with an "AE" designation; submittals not having a "G" or "AE" designation are for information only. Submit the following in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Equipment Installation; G

SD-03 Product Data

Modified Shipping Container; G
Spare Parts
Manufacturer's Written Instructions

SD-07 Certificates

Virgin Polyethylene Resin

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

1.03 QUALIFICATIONS

Procedures and welders shall be qualified in accordance with the code under which the welding is specified to be accomplished.

1.04 DELIVERY, STORAGE, AND HANDLING

Protect all equipment delivered and place in storage from the weather, excessive humidity, excessive temperature variation, and dirt, dust, or other contaminants.

1.05 EXTRA MATERIALS

Submit spare parts data for each different item of equipment and material specified, after approval of the related submittals. Include with the data a complete list of parts and supplies, with current unit prices and source of supply.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

Substrate, as well as other biological amendments (e.g., dechlorinating cultures, nutrients, buffering chemicals), must be delivered, dispersed, and distributed throughout the formation in order for in-situ bioremediation to proceed. Amendments are to be distributed via a short-term groundwater recirculation system. Recirculation system equipment is to include two storage tanks, metering pumps, extraction/injection manifold, instrumentation, and bag filter. This equipment is to be housed in a modified shipping container. Temporary aboveground piping with appropriate protection from vandalism is to be used. The total estimated length of these temporary lines in each area is 150 feet.

2.02 EQUIPMENT ENCLOSURE

A modified shipping container is to be used as equipment enclosure for EISB system. Front gate door and personnel entrance door for the container are to be installed. Equipment enclosure shall be constructed as described in the Contract Documents.

External dimensions of the modified shipping container:
20 feet Length X 8 feet Width x 8 feet Height.

2.03 STORAGE TANKS

The tanks are designed for above-ground, vertical installation and are capable of containing chemicals at atmospheric pressure. One 300-gallon tank shall be provided as a storage for sodium carbonate solution. One 265-gallon tank shall be provided as a storage for substrate solution. Provide an approximately 18-inch covered opening at the top of each mix tank that is used to add the amendment materials and formation water. Provide tanks containing a bottom discharge valve (normally plugged) used only for cleaning and draining, and fitted with a

recirculation pump for mixing the amendment material into a dilute solution with formation water for injection.

A. Manufacturers

Poly processing Company, Snyder-Crown Industries, Inc., or approved equal.

B. Materials

The material used shall be virgin polyethylene resin as compounded and certified by the manufacturer. Submit certification upon delivery. Tanks shall be made from crosslinked polyethylene resin as manufactured by ExxonMobil Chemical, or resin of equal physical and chemical properties. All polyethylene resin material shall contain a minimum of a U.V. 8 stabilizer as compounded by the resin manufacturer. Pigments may be added at the purchaser's request, but shall not exceed 0.25% (dry blended) of the total weight.

C. Design Requirements

The minimum required wall thickness of the cylindrical shell at any fluid level shall be determined by the following equation, but shall not be less than 0.187 in. thick.

$$T = P \times O.D./2 SD = 0.433 \times S.G. \times H \times O.D./2 SD$$

T = wall thickness

SD = hydrostatic design stress, PSI

P = pressure (.433 x S.G. x H), PSI

H = fluid head, ft.

S.G. = specific gravity, g/cm³

O.D. = outside diameter, in.

The hydrostatic design stress shall be determined by multiplying the hydrostatic design basis, determined by ASTM D2837 using rotationally molded samples, with a service factor selected for the application. The hydrostatic design stress is 600 PSI at 73 degrees Fahrenheit for Type I and Type II materials. In accordance with the formula, the tank shall have a stratiform (tapered wall thickness) wall. The hydrostatic design stress shall be derated for service above 100 degrees Fahrenheit and for mechanical loading of the tank. The standard design specific gravity shall be 1.5 or 1.9.

The minimum required wall thickness for the cylinder straight shell must be sufficient to support its own weight in an upright position without any external support. Flat areas shall be provided to allow locating large fittings on the cylinder straight shell. The top head must be integrally molded with the cylinder shell. The minimum thickness of the top head shall be equal to the top of the straight wall. The tank shall be designed to provide a minimum of 4 tie-down lugs integrally molded into the top head.

D. Tank Fittings

Fittings - Threaded Bulkhead. Threaded bulkhead fittings can be used for below-liquid installation. Fittings must be placed away from tank knuckle radius and flange lines. The maximum allowable size for bulkhead fittings placed on a curved sidewall section of tanks 48 in. to 142 in. in diameter is 2 inch size. Tank wall thickness must be considered for bulkhead fitting placement.

The bulkhead fittings shall be constructed of PVC, PP, or other specified material. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton, or other specified material.

E. Mixer

For the 300-gallon tank provided as storage for sodium carbonate solution, provide a manually activated submersible mixing pump with side outlet or a manually activated submersible mixer providing a water to "pumping" rate of six (6) tank volumes per minute without splashing with a 1.5 HP, 110 V, single phase motor. The mixing pump/mixer shall be manufactured by Flygt, Lightnin, or approved equal. Wetted parts shall be fabricated of 304 or 316 stainless steel.

F. Capacitance Type Level Sensor

Liquid level sensor shall produce a signal that is proportional to the measured level. Sensor shall be capacitance type. The transmitter shall have non-interacting zero and span adjustments, and shall have an accuracy of plus or minus 0.1 percent of calibrated span. Assemblies shall include mounting flange, weighted flexible probe, stainless steel bolts, and corrosion resistant housing. Sensor shall be provided with a minimum 25 feet of sensor cable.

G. Displacement Type Level Switch

Liquid level switch shall be displacement type, with a Buna-N float independently activating a set of Form C contacts. The switch shall have a narrow differential band. The mounting connections shall be threaded, flanged, or surface mounted to suit the application. All surfaces in contact with the tank contents shall be stainless steel. The switch enclosure shall be complete with a sealed water tight junction box, terminal block, and mounting plate. Each set of contacts shall be snap action, dry contact type with one normally open and one normally closed, contact rated in accordance with NEMA ICS 1. The switch shall be actuated by a magnetically equipped stainless steel displacer. Repetitive accuracy shall be plus or minus 1/4 inch of actual displacer setting. Level switch shall be manufactured by Genus, or approved equal.

2.04 MATERIALS AND EQUIPMENT REQUIREMENTS

A. Standard Products

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of such products and which essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

B. Nameplates

Each major item of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

C. Special Tools

One set of special tools, calibration devices, and instruments required for operation, calibration, and maintenance of the equipment shall be provided.

2.05 MATERIALS

Materials shall conform to the following requirements:

A. Steel Plates, Shapes, and Bars

Steel plates, shapes, and bars shall conform to ASTM A36/A36M.

B. Steel Pipe

Steel pipe shall conform to AWWA C200.

1. Flanged Joints

Flanged joints shall conform to AWWA C207, Class B Ring Type.

2. Slip Joints

Slip joints shall conform to AWWA C200.

3. Mechanical Joints

Mechanical joints shall conform to AWWA C200.

4. Welded Joints

Welded joints shall conform to AWWA C206.

5. Fittings for Steel Pipe

Fittings shall conform to AWWA C200 and be fabricated in compliance with AWWA C208.

C. Galvanized Steel Pipe and Fittings

Pipe shall conform to ASTM A53/A53M, standard weight, galvanized. Pipe smaller than 4-inch diameter shall have screwed joints in accordance with ASME B1.20.1. Fittings shall be galvanized malleable iron in accordance with ASME B16.3.

D. Polyvinyl Chloride (PVC) Pipe and Fittings

PVC pipe and fittings less than 4-inch diameter shall be in accordance with ASTM D1785 or ASTM D2241.

1. Push-On Joints

Push-on joints shall conform to ASTM D3139 or ASTM F477.

2. Solvent Cement

Solvent cement shall conform to ASTM D2564.

E. Pipe Hangers and Supports

Pipe hangers and supports shall conform to MSS SP-58 and MSS SP-69.

F. Valves

1. Angle, Check, and Globe Valves

Angle, check and globe valves shall conform to MSS SP-80, Type 3 Globe and Angle, Types 3 and 4 Check.

2. Gate Valves

Gate valves shall conform to MSS SP-80, Type 1, Class 150 or MSS SP-70, Type I, Class 125 Bronze Trim.

3. Plug Valves

Bronze plug valves shall conform to MSS SP-78. Iron plug valves shall conform to API Spec 6D.

G. Joint Compound

Joint compound for screwed joints shall be a stiff mixture of graphite and oil, inert filler and oil, or a graphite compound.

H. Joint Tape

Joint tape for screw joints shall conform to ASTM D3308.

I. Bolts and Nuts

Bolts and nuts shall conform to ASTM A307, Grade B.

2.06 CHEMICAL FEED PUMPS

Chemical metering pumps shall be positive displacement, Liquifram type pumps that are UL and CUL approved. Output volume shall be adjustable while pumps are in operation from zero to maximum capacity of 2.5 GPH (9.5 liters per hour). The power supply shall be 115VAC, 60Hz, single phase. Chemical metering pumps shall be capable, without a hydraulically backed diaphragm, of injecting solutions against pressures up to 100 psig (6.9 bar). Metering pumps shall have a clear liquid crystal display. Control shall be selectable between internal and external pulsing by means of a tactile keypad. Internal stroke frequency shall be adjustable from 1 stroke per hour to 100 strokes per minute. Pressure capacity shall be keypad adjustable to reduce noise, vibration, and wear.

The pump drive shall be totally enclosed with no exposed moving parts. Solid state electronic pulser shall be fully encapsulated and supplied with quick connect terminals at least 3/16 inches (4.75 mm) wide. Electronics shall be housed in chemical resistant enclosure at the rear of the pump for maximum protection against chemical spillage. Electrical power consumption shall not exceed 29 watts per hour under full speed and maximum pressure conditions. Pump weight shall not exceed 15 pounds (6.9 kg). To eliminate need for pressure relief valve, the pump shall automatically stop pulsating when discharge pressure exceeds pump pressure rating by not more than 35%. Chemical metering pump housing shall be of chemically resistant PVC. Chemical metering pump check valves shall be ball type, with ceramic balls. Valve seat and seal ring shall be renewable by replacing the combination seat-seal ring or cartridge valve assembly. Pump head shall be of PVC material capable of resisting the pumped chemical. Fittings and

connections at pump head shall be PVC.

A. Manufacturers

LMI Pumps, Inc. or approved equal.

Pump model shall be the same for all applications: LMI Pumps, B12-1-498SI.
Alternative model can only be used if approved by Government representative. Spare parts for liquid end shall be provided (2 replacement kits).

B. Control

Stroke length control shall be manually adjusted between 0% and 100% with a stroke adjustment knob on the pump face control. The LCD shall digitally display stroke length setting in 1% increments in the full range between 0% and 100%. Stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the LCD. The metering pump shall be capable of receiving a pulse input via optional external control cable such that 1 pulse gives 1 pump stroke rate. The pump shall be capable of remote ON-OFF operation through a control cable.

C. Installation

Install in accordance with manufacturer's instructions and recommendations in the locations shown on the Drawings.

D. Maintenance

The manufacturer shall provide a minimum 1 year warranty from time of shipment against defects in materials and workmanship on all mechanical components of the pump. Pumps shall be as similar as practical with respect to spare parts to minimize spare parts inventory. Each pump shall include Operating and Maintenance manual.

E. Field Quality Control

After the pumps have been completely installed, conduct such tests as are necessary to indicate that pump efficiency and discharge conform to the Contract Documents. Field tests shall be performed on all pumps furnished under this Section. Supply all electric power, labor, water, and auxiliary equipment required to complete the field tests. If the pump performance does not meet the Contract Documents, corrective measures shall be taken, or pumps shall be removed and replaced with pumps which satisfy the conditions specified at no cost to the Government. Any component parts which are damaged as a result of testing or which fail to meet the requirements of the Contract Documents shall be replaced, reinstalled and retested at the Contractor's expense.

2.07 FLOW METERS

Provide means for flow metering.

A. Electronic Flow Meters

1. Manufacturers

Georg Fisher Signet LLC or approved equal.

2. Operating Parameters

Flow Rate: 50 gpm (maximum rating); 25 gpm (average);
Influent Pressure: 150 psig (maximum rating);
Temperature Range: 33 degrees F to 85 degrees F.

3. Quality Assurance

The water meters covered by this Section are intended to be standard equipment, as modified by this Section, of proven ability, as manufactured by a single manufacturer, having long experience in the production of such electronic flow meters. The electronic flow meters furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Drawings and specified herein.

In the event that equipment which differs from this Section be offered and determined to be equal to that specified, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no cost to the Owner and be as approved by the Performing Contractor.

4. Transmitters

Transmitters shall be able to convert the signal from frequency and digital (S3L) flow sensors into a 4 to 20 mA signal for long distance transmission. Transmitters shall be compatible with Signet flow sensors with frequency outputs. Transmitters shall have one input, 2 or 4 wire, 4 to 20 mA and open collector for Hi, Lo, Pulse, and Frequency configuration.

Transmitters power supply shall be 12 to 24 VDC, regulated. Transmitters shall have alphanumeric LCD display with sealed 4-key silicon rubber. Transmitters enclosure shall be NEMA 4X/IP65 classification. Transmitter enclosure shall be manufactured of PBT resin and be capable of a field mount.

5. Construction

Sensor shall be capable of sensing flow in either direction (bi-directional). The paddlewheel insertion flow sensor shall generate an electrical signal proportional to flow velocity from a range of 0.3-20 feet per second. The sensor shall be inserted at the correct depth and there shall be a fully developed flow profile. Linearity of the output signal shall be within 0.5% of full range, with a repeatability within 0.5% of full range. The sensor shall not create a pressure drop of >1 psi at any flow rate. Two optional sensor lengths shall allow the flow sensor to install into a flow installation fitting. Optional sensor lengths will allow insertion in pipes from 0.5 to 8 inches.

Installation fitting specifically designed for the flow sensor shall be used. Installation fitting shall be tee-type manufactured from PVC SCH 80. The installation fittings shall have threaded union ends with solvent cement socket connections.

Install the electronic flow meters in accordance with manufacturer's instructions and recommendations in the locations shown on the Drawings. Install the

electronic flow meters in a horizontal orientation.

6. Maintenance

Electronic flow meters shall be as similar as practical with respect to spare parts to minimize spare parts inventory. All work under this specification shall be the responsibility of the Contractor. Each meter shall include an Operating and Maintenance manual.

7. Warranty

Electronic flow meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from the date of installation.

Electronic flow meters shall be manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management. Meters shall meet or exceed AWWA Standards C708.

B. Mechanical Flow Meters

Meters furnished shall be new and complete units conforming in all details to AWWA Standard C708 for Cold Water Multi-Jet Type Meters and current amendments thereto, subject to the following supplementary requirements except where in conflict with these specifications. These meters shall be installed at the water inlet and on each branch of the injection manifold as indicated on Technical Drawings.

1. Operating Parameters

Flow Rate: 50 gpm (maximum rating); 25 gpm (average);
Influent Pressure: 150 psig (maximum rating);
Temperature Range: 33 degrees F to 85 degrees F.

2. Manufacturers

Dwyer Instruments, Badger Inc., Siemens Inc., or approved equal.

3. Construction

Register shall be magnetically driven, permanently rolled sealed type and mechanically disconnected from the measuring components. (The term "sealed" shall mean moisture and dust-proof.) All gearing shall be enclosed in the sealed register unit. Register shall be standard straight reading (Odometer Type). All same size meters furnished under this and future contracts shall have identical change registers. All registers of like-size meters shall be interchangeable with each other without loss of accuracy. Registers shall be furnished with either internal or external tamper-proof protection locking devices. Register lid may be manufactured of brass or high density plastic.

Meter housings including the register box shall be made of a copper alloy containing not less than 85% copper and be Certified by NSF to NSF/ANSI Standard 61. Housing connection shall be spuds having external straight threads conforming to ANSI 82.1. Meters shall be shipped with plastic end caps over meter threads. The manufacturer's meter/serial number shall be stamped on the outer main case. The first two numbers in the serial number shall identify the year

the meter was manufactured. The remaining numbers shall identify the unique number for a particular meter. No meter shall have the same number as another meter manufactured by the same manufacturer.

Measuring chambers shall be separate units of copper alloy, containing not less than 85% copper but no lead, or shall be separate units of approved suitable synthetic polymer material, inert in potable water. Meters shall have a strainer with an effective straining area of at least double that of the main housing inlet.

4. Installation

Install the water meters in accordance with manufacturer's instructions and recommendations in the locations shown on the Drawings. Install the water meters in a horizontal orientation with the face clearly visible.

5. Maintenance

Meters shall be as similar as practical with respect to spare parts to minimize spare parts inventory. Each meter shall include an Operating and Maintenance manual.

6. Warranty

Meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from the date of installation. Meters shall meet or exceed AWWA Standards C708. Visual read registers shall be warranted to remain functional and watertight for a minimum period of ten (10) years. Contractor may submit additional information on third party testing that substantiates claims for meter durability beyond the formal warranty periods.

2.08 PRESSURE INSTRUMENTATION

A. Pressure Gauges

Local pressure gauges and indicators shall be direct reading gauges (0 - 125 psig), 4-1/2 inch face diameter with a low internal volume 3/16 inch brass bourden tube and shall be Glycerin filled. Gauges shall be tapered 1/2 inch national pipe thread (NPT) to bottom connection and shall be provided with PVC diaphragm type chemical seal tapped 1/2 inch by 1/2 inch. Gauge case shall be PET resin with 316SS tube and socket. Gauges shall conform to ANSI B40.1 and manufactured by Ashcroft, or approved equal.

B. Differential Pressure Transmitter

Each transmitter shall include a local analog indicating gauge. Each switch shall be adjustable diaphragm, or bellows operated device, with taps for sensing lines for connection of pressure fittings designed to sense fluid pressure. The taps shall incorporate snubbers. The adjustable differential range shall be a maximum of 0.15 inches water at the low end to a minimum of 0.35 inches of water at the high end. Transmitter shall be capable of an isolated, standard 4-20 MA signal with 1% accuracy.

2.09 STATIC MIXER

The inline static mixer shall be designed to disperse the design flow and added chemicals in a process flow stream with flows ranging from 18 to 32 gpm. The diameter of the mixer housing shall be sized identical to the process piping. The length shall be in accordance with the number

of mixing elements required. Housing materials shall be chlorinated polyvinyl chloride (CPVC), providing chemical resistance to both the chemical additives and process stream. End configurations shall be flanged faced, drilled to ASME B16.5 Class 150, and shall be compatible with piping system. Injection ports shall be of the same materials as the mixer housing in the number shown on drawings, with female ASME B1.20.1 threaded connections compatible with the chemical feed piping system. Each housing shall be supplied with a name plate which at a minimum provides the manufacturer's name and address, part model number, and direction of flow. Mixing elements shall be constructed of TP316 stainless steel providing resistance to both the chemical additives and the process stream.

PART 3 EXECUTION

3.01 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.02 RECIRCULATION SYSTEM CONSTRUCTION

The groundwater recirculation system shall be designed and constructed for transportation, installation, and operation without detrimental buckling, distortion, or other defects. Tanks shall not leak when filled with water.

A. Pipe and Valve Installation

Piping shall be installed in a neat manner with all joints tight and with no undue marring of finishes. Installed piping, valves, and fittings shall be free from strain and excessive stresses caused by weight or misalignment.

1. Flanged Joints

Bolts shall be tightened uniformly to prevent overstressing flanges and misalignment.

2. Screw Joints

Screw joints shall be made tight with joint compound, applied to the male threads only, or joint tape.

3. Push-On Joints for PVC Pipe

Pipe ends shall be beveled to facilitate assembly. Pipe shall be marked to indicate when the pipe is fully seated. Lubricate gasket to prevent displacement. Exercise care to ensure that the gasket remains in proper position in the bell or coupling while making joint.

4. Solvent-Weld Joints for PVC Pipe

Joints shall be made in accordance with the manufacturer's written instructions.

5. Valves

Valves shall be installed with the stem vertical and located for easy access for

operation.

B. Equipment Installation

Equipment shall be installed in compliance with the manufacturer's written instructions. Submit drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and is to properly function as a unit. Show on the Drawings proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

C. Electrical Work

Electrical work shall be in accordance with the applicable requirements of Section 26 00 00.00 20 - BASIC ELECTRICAL MATERIALS AND METHODS.

D. Final Cleaning

1. Interim Cleaning

Prevent the accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, and other foreign material within piping sections during fabrication. Examine the piping to assure removal of these and other foreign objects prior to assembly and installation.

2. Flushing

Following assembly and testing, and prior to final acceptance, flush the piping systems with water to remove accumulated construction debris and other foreign matter. Flush the piping until all foreign matter is removed from the pipeline. Provide all hoses, temporary pipes, ditches, and other items as required to properly dispose of flushing water without damage to adjacent properties. The minimum flushing velocity is to be 2.5 fps.

3.03 MANUFACTURER'S SERVICES

Services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment in accordance with the manufacturer's written instructions.

3.04 CLOSEOUT ACTIVITIES

A. Operation and Maintenance Manuals

Submit copies of operation and copies of maintenance manuals for the EISB system equipment furnished. One complete set prior to performance testing and the remainder upon acceptance. Operation manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operation manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed. Manuals shall be approved prior to the field training

course.

B. Field Training

A field training course shall be provided for designated operating and maintenance staff members. Training shall be provided for a total period of 8 hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the operating and maintenance manuals.

-- End of Section --