DOCUMENT 00 01 10

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SEALS

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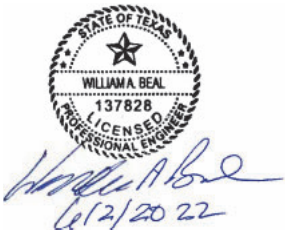

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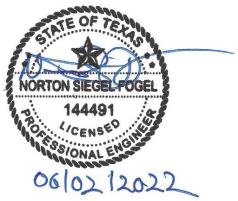

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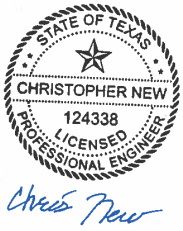

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END OF SEALS

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1. SUMMARY

Section Includes:

1. References.
2. Description of Project.
3. Location.
4. Access to the Site.
5. Scope of work.
6. Description of work.
7. Sequence of work.
8. Drawings.
9. CONTRACTOR use of the Site.
10. Work restrictions.

2. REFERENCES

1. Abbreviations and Acronyms:
    1. NAVD88 – North American Vertical Datum of 1988.
    2. USEPA -- United States Environmental Protection Agency.

3. DESCRIPTION OF PROJECT

1. The project is the Remedial Action for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site in Harris County, Texas (Remedial Action), as described in the approved Final 100% Remedial Design for the Southern Impoundment (Southern Impoundment RD). The Southern Impoundment and associated locations at which the project will take place are referred to in these Specifications as the “Site.”

4. ACCESS TO THE SITE

1. Access to Market Street leading to the Site is available from Highway I-10.
2. Make all necessary arrangements with the authorities having jurisdiction for the movement of CONTRACTOR material and equipment to and from the Site over public roadways.

5. SCOPE OF WORK

1. The Works to be performed consists of the Remedial Action, other than those elements of the Remedial Action that are expressly excluded.

6. DESCRIPTION OF WORK

1. The Works includes but is not limited to the following:
    1. Project startup.
    2. Development, implementation, and maintenance of required project plans, which may include plans included in the approved Southern Impoundment RD and/or the following:
    3. Temporary Traffic Control Plan.
    4. Site-specific Health and Safety Plan.
    5. Fall Protection and Prevention Plan.
    6. Contingency and Emergency Response Plans.
    7. Soil Erosion and Sediment Control Plan.
    8. Dust Control Plan.
    9. Storm Water Pollution Prevention Plan.
    10. Flood Contingency Plan.
    11. Hurricane and Severe Storm Plan.
    12. Water Quality Control Plan.
    13. Water Quality Monitoring Plan.
    14. Water Treatment Plan.
    15. Excavation Plan.
    16. Material Handling and On-Site Transportation Plan.
    17. Transportation Emergency Response Plan.

2. Mobilization to the Site.
3. Installation and maintenance of temporary facilities and controls, including:
    1. Temporary access roads.
    2. Soil erosion and sediment controls.
    3. Staging pads.
    4. Water Treatment System (WTS).
    5. Dewatering System, including pumps, piping, valves, flexible hosing, and accessories as required to transfer water from work areas to WTS.
    6. In river turbidity curtains related to installation of the bulkhead referenced below.

4. Site clearing, including removal, salvage, and storage of existing fence and demolition, removal of existing building (elevated frame structure), and removal of concrete slab.
5. Installation of steel sheet-pile bulkhead of approximately 260 linear feet along a portion of the southwest edge of the Site, directly adjacent to the San Jacinto River.
6. Excavation of clean overburden and temporary stockpiling (where needed) for reuse as backfill.
7. Excavation of impacted material and staging for waste characterization sampling prior to transporting to off-Site disposal facility.
8. Excavation, dewatering, and conveying contact water from excavation(s) to the WTS for treatment and discharge to the river.
9. Setup and operation of WTS.
10. Management of wet impacted material to remove free liquid (material must pass paint filter test prior to loading)
11. Loading impacted material that passes the paint filter test for transportation and off-Site disposal.
12. Management of stockpiled waste materials awaiting off-Site disposal.
13. Backfilling approved excavation areas to minimize time of open excavation and water generation.
14. Closeout including cleanup and demobilization; storage of materials; removal of equipment and material; and shutdown of WTS.

15. Restoration of work areas at the end of the Project.
16. Project closeout.

7. SEQUENCE OF WORK

1. Perform Works in an orderly and safe manner such that the movement and handling of materials, and potential exposure of personnel to Site-related contaminants and physical hazards are minimized.
2. Excavation and backfilling will be performed in a controlled manner to ensure proper segregation of non-impacted (clean overburden) soil and impacted (contaminated) soil. Separation of clean overburden soil into on-Site stockpiles and reuse of the stockpiled soil for backfilling of excavation areas will be performed according to a detailed backfilling plan to be provided by the ENGINEER prior to commencement of construction.
    1. As shown on the Drawings, there is generally non-impacted soil (designated as clean overburden) near the surface and impacted (contaminated) soil at deeper depths (to a maximum of 10 feet).
    2. Removal of clean overburden soil to the delineated depths indicated on the Drawings is to be placed in segregated on-Site stockpiles (up to ~500 cy in volume) for subsequent reuse as backfill after removal of impacted soil, as directed by ENGINEER.
    3. Removal of lower impacted soils to the delineated depths shown on the Drawings is to be staged in a separate area (dewatering pad) from the clean overburden for sampling and possible dewatering prior to loading for transport to the off-Site disposal facility.
    4. Excavation activities must be meticulously controlled such that clean overburden soil and impacted materials are not mixed.
    5. Placement of stockpiled clean overburden in the bottom portions of each excavation.
    6. Placement of a minimum of 2 feet of imported clean on top of the overburden in the excavations. Open excavation areas must be kept to a minimum each day such that the excavation area left open overnight does not exceed 25 feet by 25 feet, with the lower portion backfilled with replaced clean overburden to the extent practical.

8. DRAWINGS

1. Drawings issued with and forming part of the Contract Documents are provided under separate cover.

2. Perform the Works in accordance with the Drawings issued "Issued for Construction" (IFC) by ENGINEER. Such Drawings will be issued to CONTRACTOR with the notification from OWNER to CONTRACTOR to proceed with the Works (Notice to Proceed) and will consist of bid Drawings revised as required by ENGINEER and additional Drawings if required by ENGINEER.

3. Revised IFC Drawings may be issued from time to time by ENGINEER and such Drawings will supersede previous revisions.

9. CONTRACTOR USE OF THE SITE

1. Construction Operations: Limited to areas noted on the Drawings.

2. Hours of Operation: Limit on-site hours of operation to the hours of 7 a.m. to 7 p.m. or as otherwise permitted under applicable access agreement(s), unless otherwise approved by

the ENGINEER.

3. CONTRACTOR employees working on the Site may be required to have a Transportation Worker Identification Credential (TWIC) issued by the United States Government. Any fees associated with obtaining and maintaining either certification card shall be borne by CONTRACTOR and not due reimbursement by OWNER. TWIC requires renewal every five (5) years.

4. When unfavorable weather or other unsuitable construction conditions exist, continue operations which will not be adversely affected by such conditions. Do not construct or cause to be constructed any portion of the Works under conditions which would adversely affect the quality of the Works unless special means or precautions are taken to perform the Works in a proper and satisfactory manner.

10. WORK RESTRICTIONS

1. Monitor river levels daily. Work performed when the river stage is 10 feet or more above NAVD88 at the San Jacinto River Gauge in Sheldon, Texas must be performed in compliance with the Health and Safety Plan.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1. SUMMARY

Section Includes:

1. Mobilization and startup.
2. Coordination.
3. Pre-construction meeting.
4. Progress meetings.
5. Pre-installation meetings.

2. DEFINITIONS

1. OWNER is the entity(ies) implementing the Remedial Action.

2. ENGINEER is the representative of OWNER with responsibility to ensure that all remedial construction activities are completed in accordance with the design drawings and these Specifications and who will provide field management of all Construction Quality Control/Construction Quality Assurance (CQA/CQC) activities.

3. CONTRACTOR will carry out the remedial construction activities for the Remedial Action to the design drawings and these Specifications and implement the CQC requirements specified in the project specifications.

3. MOBILIZATION AND STARTUP

1. Do not mobilize to the Site without ENGINEER's prior written authorization.

2. Perform planning and scheduling activities as necessary for the performance of the Works.

3. Purchase materials and mobilize equipment, supplies, and incidentals to the Site.

4. Use the existing Site access roads to the designated work areas during mobilization. Complete improvements to roads as necessary for the performance of the Works.

5. Confine equipment, storage of materials and equipment, and the operations of workers to the Site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by laws and regulations, rights-of-way, permits, and easements. Do not

unreasonably encumber the Site with construction equipment or other materials or equipment.

4. COORDINATION

1. Do not deliver material or equipment of any kind to the Site until approval in writing has been applied for and obtained by CONTRACTOR from ENGINEER.

2. Coordinate delivery of material and equipment to the Site with work sequence; schedule deliveries to limit requirement for storage at the Site to the practical minimum; limit on-Site storage of materials to areas approved by ENGINEER.

5. PRE-CONSTRUCTION MEETING

1. ENGINEER will schedule and administer a pre-construction meeting at the Site after the date of the Notice to Proceed and prior to start of construction at the Site.

2. ENGINEER will make arrangements for meeting, prepare agenda with copies for participants, and preside at the meeting. Provide data required to ENGINEER and be prepared to discuss all items on the agenda.

3. Minimum Attendance Required: CONTRACTOR’s superintendent, CONTRACTOR's Health and Safety Officer, and major Subcontractors.

4. Agenda may include, but not necessarily be limited to, the following:
    1. Designation of responsible personnel.
    2. Lines of authority and communication.
    3. Health and safety.
    4. Use of the Site for storage, vehicle parking, access routes, and other Site requirements.
    5. OWNER's requirements.
    6. Coordination with Other Contractors and OWNER.
    7. Temporary facilities and controls provided by CONTRACTOR.
    8. Temporary utilities and services provided by OWNER.
    9. Field offices.
    10. Survey and Site layout.
    11. Security and housekeeping procedures.
    12. Procedures for processing field decisions, submittals, substitutions, applications for payments, proposal requests, Field Orders, Work Change Directives, Change Orders, and closeout procedures.
    13. Progress schedules.
    14. Procedures for testing and inspection.
    15. Procedures for maintaining Project record documents.

5. ENGINEER will record minutes and distribute copies to participants and those affected by decisions made.

6. PROGRESS MEETINGS

1. ENGINEER will schedule and administer progress meetings at the Site throughout the progress of the Works as required. It is anticipated that progress meetings will be held at a frequency of once per week.

2. ENGINEER will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings. Provide data required to ENGINEER and be prepared to discuss all items on the agenda.

3. Attendance Required: CONTRACTOR's Health and Safety Officer, CONTRACTOR's superintendent, major subcontractors, and suppliers, as appropriate to agenda topics for each meeting.

4. Agenda may include, but not necessarily be limited to, the following:
    1. Review of minutes of previous meetings.
    2. Review of work progress since last meeting.
    3. Field observations, problems, and decisions.
    4. Identification of problems which impede planned progress.
    5. Review of submittals schedule and status of submittals.
    6. Review of off-site material fabrication/processing and delivery schedules.
    7. Review of health and safety concerns and issues including air monitoring results.
    8. Maintenance of progress schedule.
    9. Corrective measures to regain projected schedules.
    10. Planned progress during succeeding work period.
    11. Coordination of projected progress.
    12. Maintenance of quality and work standards.
    13. Effect of proposed changes on progress schedule and coordination.
    14. Change Orders.
    15. Applications for Payment.
    16. Other business relating to the Works.

5. ENGINEER will record minutes and distribute copies to participants and those affected by decisions made. All communication to Subcontractors, Suppliers, or others that CONTRACTOR is responsible for will be made through CONTRACTOR.

7. PRE-INSTALLATION MEETINGS

1. When required in individual Sections, convene a pre-installation meeting at the Site prior to commencing work of the Section.

2. Require attendance of parties directly affecting, or affected by, work of the specific Section.

3. Prepare agenda and preside at meeting.

4. Review conditions of installation, preparation, and installation procedures.

5. Review coordination with related work.

6. ENGINEER will record minutes and distribute copies to participants and those affected by decisions made.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTAL

PROCEDURES

PART 1 GENERAL

1. SUMMARY

Section Includes:

1. Submittal procedures.
2. Progress schedules.
3. Monthly progress reports.
4. Construction quality control reports.
5. Proposed products list.
6. Shop Drawings.
7. Product data.
8. Samples.
9. Manufacturer installation instructions.
10. Manufacturer certificates.
11. Project organization.
12. Submittals for progress meetings.
13. Site layout.
14. Submittals schedule.

2. SUBMITTAL PROCEDURES

1. Unless directed otherwise, transmit submittals to ENGINEER.

2. Transmit each submittal with a letter of transmittal and the correct number of copies.

3. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

4. Identify the Project, CONTRACTOR, Subcontractor, or Supplier, pertinent Drawing and detail number and Section number, as appropriate.

5. Apply CONTRACTOR's approval stamp prior to initial submission to ENGINEER, signed and dated, certifying that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents including but not limited to review and approval, verification of products required, field dimensions, adjacent construction work, and coordination of information with respect to CONTRACTOR's review and approval of that submittal. Unstamped or unsigned submittals will be returned by ENGINEER without action.

6. Schedule submittals according to specified scheduling. Coordinate submission of related items.

7. Identify product or system limitations which may be detrimental to successful performance of the completed Works.

8. Provide space for ENGINEER review stamp and comments on submittals.

9. Make corrections to each submittal required by ENGINEER. Promptly revise and resubmit the required number of corrected copies of each submittal and submit new submittals required by such correction; identify changes made since previous submission and changes other than those requested by ENGINEER.

10. Promptly distribute copies of reviewed submittals to Subcontractors, Suppliers, and other concerned parties as appropriate. Instruct parties to promptly report any inability to comply with provisions.

11. Submittals not requested will not be recognized or processed. Submittals received directly from Subcontractors, Suppliers, vendors, or other Representatives or without CONTRACTOR stamp will be returned by ENGINEER without action.

12. It is the responsibility of CONTRACTOR to review submittals made by Suppliers and Subcontractors before transmitting them to ENGINEER to assure proper coordination of the Works and to determine that each submittal is according to CONTRACTOR's desires and that there is sufficient information about materials and equipment for ENGINEER to determine compliance with the Drawings and Specifications. Incomplete or inadequate submittals will be returned for revision without review.

13. Unless specified otherwise submit three copies of submittals.

14. Requirements of this article shall apply to all required submittals.

3. PROGRESS SCHEDULES

1. Prior to commencing work at the Site, submit initial detailed progress schedule in duplicate, and one electronic copy in Microsoft Project Gantt Chart format. Submit updated progress schedules at each progress meeting, identifying changes since previous version and estimated percentage of completion for each item of the Works. If a schedule remains unchanged from one period to the next, submit a written notice to that effect.

2. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, duration, and critical path tasks.

3. Provide sub-schedules to define critical activities which dictate the rate of progress.

4. Show accumulated percentage of completion of each item, and total percentage of the Works completed, as of the first day of each month.

5. Provide separate schedule of submittal dates for Shop Drawings, product data, Samples, factory and field testing dates, and product delivery dates, including those furnished by OWNER, and dates reviewed submittals will be required from ENGINEER. Indicate decision dates for selection of finishes.

6. If during performance of the Works CONTRACTOR believes it necessary or advantageous to change sequence of activities shown on CONTRACTOR's progress schedule, submit proposed revisions to ENGINEER for approval prior to changing the sequence of work. No change shall be made in the order in which work activities

are being performed until ENGINEER's written approval for the revised schedule has been obtained. The schedule will be acceptable to ENGINEER as providing an orderly progression of the Works to completion within any specified dates, but such acceptance will neither impose on ENGINEER responsibility for the sequencing, scheduling, or progress of the Works nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

7. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes. Provide narrative report to define problem areas causing delay, anticipated delays and length, and impact on schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of other contractors.

8. Distribute copies of reviewed schedules to Subcontractors, Suppliers, and other concerned parties. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

4. MONTHLY PROGRESS REPORTS

1. Submit monthly progress report in a form acceptable to ENGINEER indicating work accomplished, problems encountered, problems resolved, requests for changes to the Works, a comparison of the schedule submitted as part of the Contract Documents versus the current status, and work scheduled for the next month.

2. Submit progress schedule in the form of a Gantt chart with highlighted critical path tasks. The schedule shall show the original schedule and the actual schedule.

5. CONSTRUCTION QUALITY CONTROL REPORTS

1. Record daily Construction Quality Control activities in CONTRACTOR's Site log book.

2. Each work day submit a Construction Quality Control report for the previous work day.

6. PROPOSED PRODUCTS LIST

1. Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

2. For products specified only by reference standards or description, give name of manufacturer, trade name, model or catalog designation, and reference standards.

3. For products requiring special handling procedures, submit a Safety Data Sheet (SDS) prior to product's arrival on the Site.

7. SHOP DRAWINGS

1. When specified in individual Sections, prepare detailed drawings of material and structures to be supplied by CONTRACTOR from typical details shown on "Approved

for Construction" Drawings and/or from specified requirements.

2. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

3. Indicate materials, methods of construction, attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of the Works.

4. Where articles or equipment attach or connect to other articles or equipment, indicate that such work has been coordinated, regardless of the Section under which the adjacent items will be supplied and installed.

5. Confirm dimensions shown on CONTRACTOR's drawings with actual measurements of existing and/or completed associated structures and affected adjacent work at the Site.

6. Submit three hard copies and one digital copy of CONTRACTOR's drawings on USB memory stick or electronic file transfer or Compact Disc (CD) compatible for use with Windows 10 and AutoCad 2019.

7. After ENGINEER completes its review, Shop Drawings will be stamped with one of the following notations:
    1. Reviewed.
    2. Reviewed as Noted.
    3. Not Subject to Review.
    4. Revise and Resubmit.

8. If a Shop Drawing is acceptable, it will be marked “Reviewed" or "Reviewed as Noted". Two hard copies of the Shop Drawing will be returned to CONTRACTOR.

9. Upon return of a Shop Drawing marked "Reviewed" or "Reviewed as Noted", CONTRACTOR may order, ship, or fabricate the materials included on the Shop Drawing, provided it is according to the corrections indicated. Upon receipt of Shop Drawings stamped "Reviewed" or “Reviewed as Noted", produce copies and distribute according to PART 1, SUBMITTAL PROCEDURES and for Project record document purposes as described in Section 01 70 00.

10. If a Shop Drawing marked "Reviewed as Noted" has extensive corrections or corrections affecting other drawings or Works, ENGINEER may require that CONTRACTOR make the corrections indicated thereon and resubmit the Shop Drawings for Project record document purposes.

11. Shop Drawings that are for information only will be marked "Not Subject to Review" and one copy will be returned to CONTRACTOR.

12. If a Shop Drawing is unacceptable, two copies will be returned to CONTRACTOR marked "Revise and Resubmit".

13. Upon return of a Shop Drawing marked "Revise and Resubmit", CONTRACTOR shall make the corrections indicated and repeat the initial approval procedure.

14. Shop Drawings lacking adequate details or information to allow ENGINEER to determine whether or not the Shop Drawing meets the requirements of the Contract Documents will also be marked "Revise and Resubmit" and returned without further

comment.

15. Shop Drawings not bearing ENGINEER's "Approved" or "Approved as Noted" notation shall not be issued to Subcontractors nor utilized for construction purposes. No work requiring submission and approval of Shop Drawings shall be performed or equipment requiring submission and approval of Shop Drawings installed without Shop Drawings bearing one of these notations.

16. Submit Shop Drawings well in advance of the need for the material or equipment for construction and with ample allowance for time required to make delivery of material or equipment after data covering such is approved. CONTRACTOR shall assume the risk for all materials or equipment which are fabricated or delivered prior to the approval of Shop Drawings. No materials or equipment shall be incorporated into the Works nor included in progress payments until approval thereof has been obtained in the specified manner.

17. ENGINEER will review and process all Shop Drawings promptly, but a reasonable time should be allowed for this, for Shop Drawings being revised and resubmitted, and for time required to return the approved Shop Drawings to CONTRACTOR.

18. Approval of Shop Drawings shall not relieve CONTRACTOR from the responsibility of furnishing materials and equipment of proper dimension, size, quality, quantity, and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Approval shall not relieve CONTRACTOR from responsibility for errors of any sort on Shop Drawings. Approval is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. CONTRACTOR is responsible for information that pertains solely to the fabrication processes, to the technique of construction, and for the coordination of the work of all trades.

19. CONTRACTOR shall not be relieved of any part of its responsibilities for correctness of its drawings or adequacy of its design bearing ENGINEER's "Approved" or "Approved as Noted" notation. ENGINEER's approval is for the sole purpose of ascertaining conformance with general design concepts, and in no way constitutes approval of the detail design inherent in CONTRACTOR's drawings, responsibility for which remains solely with CONTRACTOR. Drawings prepared by CONTRACTOR's representatives including Subcontractors, Suppliers, vendors, or other Representatives shall be considered CONTRACTOR's drawings.

8. PRODUCT DATA

1. Submit the number of copies which CONTRACTOR requires, plus two copies which will be retained by ENGINEER.

2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to the Project.

3. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

4. After review, distribute according to PART 1, SUBMITTAL PROCEDURES and provide copies for Project record documents as described in Section 01 70 00.

9. MANUFACTURER INSTALLATION INSTRUCTIONS

1. When specified in individual Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to ENGINEER in quantities specified for product data in PART 1, PROPOSED PRODUCTS LIST.

2. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

3. Whenever the Specifications refer to manufacturer's instructions, such reference shall mean written instructions of the manufacturer.

10. MANUFACTURER CERTIFICATES

1. When specified in individual Sections, or when required by reference standards, submit certification and/or test results by manufacturer, in quantities specified for product data in PART 1, PROPOSED PRODUCTS LIST.

2. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications, as appropriate.

3. Certificates may be recent or previous test results on material or product but must be acceptable to ENGINEER.

11. PROJECT ORGANIZATION

1. Submit a Project organization chart identifying major positions and names of persons assigned to these positions, including project manager, superintendent, and site health and safety officer. Resumes of each person in these positions shall be submitted and approved by OWNER. A list of testing labs and Subcontractors shall also be submitted for review.

12. SUBMITTALS FOR PROGRESS MEETINGS

1. Prior to scheduled progress meetings submit the following:
    1. Updated progress schedule detailing all activities. Include review of progress with respect to previously established dates for starting and stopping the various stages of the Works, major problems and action taken, injury reports, equipment breakdown, and material removal.
    2. Copies of air sampling and analytical results conducted by CONTRACTOR.
    3. Copies of transport manifests, trip tickets, and disposal receipts for waste materials removed from the work area.
    4. Weekly copies of the Site entry and work area logbooks with information on worker and visitor access.
    5. Any other information required by ENGINEER or relevant to the agenda for the upcoming progress meeting.

13. SITE LAYOUT

1. Submit Site layout drawings showing existing conditions, facilities, proposed construction facilities, and temporary controls to be provided by CONTRACTOR which may include, but are not limited to, the following:
    1. Existing property lines, structures, roads, utilities, and other existing Site feature or facility.
    2. Temporary access roads and utilities to be constructed.
    3. Field offices and sheds.
    4. Equipment and personnel decontamination areas.
    5. The means of ingress and egress and temporary traffic control facilities.
    6. Proposed location of Site access.
    7. Equipment and material staging areas.
    8. Soil stockpile areas.
    9. Exclusion Zones, Contaminant Reduction Zones, and other zones specified in CONTRACTOR's Site-specific Health and Safety Plan.
    10. Grading, including contours, required to construct temporary construction facilities.
    11. Water storage areas.
    12. Any other data deemed pertinent by CONTRACTOR or required by ENGINEER.

14. SUBMITTALS SCHEDULE

1. The submittals schedule shall be in tabular form listing all submittals required by the Contract Documents and the date on which CONTRACTOR will make each submittal. As a minimum, the submittals schedule shall consist of the following columns:
    1. Submittal Number: Number consecutively.
    2. Section Number: Section number or description of location in the Contract Documents where submittal is requested.
    3. Page Number: Page number of the Section in the Contract Documents where submittals are requested.
    4. Item: Description of item or items to which submittals pertain.
    5. Submittal Type: A letter code indicating what type of submittal was requested. The type key shall be as follows:
        1. Test Results and/or Certificates
        2. Manufacturers' Literature or Data (Informative only)
        3. Shop Drawings
        4. Operation and Maintenance Instructions
        5. Samples
        6. Alternative Product Supporting Data
        7. Administrative such as schedules, etc.
    6. Deficiencies: Manner in which submittal or proposed alternative product does not meet the requirements of the Contract Documents.
    7. Anticipated Submittal Date: Date on which CONTRACTOR anticipates submittal to be delivered to ENGINEER.
    8. Response Required: Indicate "yes" if CONTRACTOR anticipates response from ENGINEER and "no" if no response is anticipated.

2. The submittals schedule will be reviewed by ENGINEER and ENGINEER will respond in writing listing deficiencies. Do not list submittals not called for in the Contract Documents. The schedule shall include all items for which CONTRACTOR proposes to use substitute or "or-equal" products. Correct deficiencies and resubmit the submittals schedule prior to beginning any work.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 35 00

TEMPORARY TRAFFIC

CONTROLS

PART 1 GENERAL

1. SUMMARY

1.0 Section Includes:
1. References.
2. Pre-Installation Meetings.
3. Submittals.
4. Information and Warning Devices.
5. Signs and Equipment.
6. Barricades and Lights.
7. Vehicular Traffic.
8. Control of Public Traffic.
9. Field Quality Control.

2.0 Related Requirements:
1. Section 01 50 00 – Temporary Facilities and Controls.
2. Section 02 61 14 – Material Handling and Transportation.

2. REFERENCES

1. US Department of Transportation Federal Highway Administration (FHWA).
2. Manual on Uniform Traffic Control Devices (MUTCD).
3. Texas Department of Transportation (TxDOT).

3. PRE-INSTALLATION MEETINGS

1. Meet with ENGINEER prior to the commencement of the Works in order to prepare a list of signs and other devices required for the project. If a condition on the Site changes, revise the list to the approval of ENGINEER.

4. SUBMITTALS

1. Submit Temporary Traffic Control Plan complying with MUTCD and TxDOT requirements.
2. Comply with all applicable local municipal and OWNER traffic regulations and by laws and requirements contained in applicable access agreement(s).
3. Develop and submit a detailed traffic control plan and coordinate a meeting with ENGINEER and OWNER in order to discuss the proposed traffic control plan, including any temporary traffic signals. Transportation and Off-Site Disposal Plan (TODP) has been prepared for the project. CONTRACTOR shall be responsible for developing and implementing the Temporary Traffic Control Plan consistent with the TODP.

4. Show sequences of construction affecting the use of roadways, temporary access roads, and board mats, the amount of time required for each phase of the Works, and phasing of operations to provide necessary access, and plans for signing, barricading, and striping in order to provide safe passages for pedestrians and vehicles.
5. All traffic control measures (signs, barriers, control devices, etc.) during construction, if subject to MUTCD, shall be in accordance with MUTCD.
6. Stabilized construction entrance and or temporary vehicle washing facility to prevent the release of miscellaneous debris onto Market Street.
7. Include copies of permits and approvals for construction as required by any applicable laws and regulations and governing agencies.

PART 2 PRODUCTS

1. INFORMATIONAL AND WARNING DEVICES

1. Provide and maintain signs, warning lights and other devices as may be required in order to provide adequate notification of construction activities or other temporary and unusual conditions resulting from the Works which may require road user response.

2. Supply and erect signs, delineators, barricades, and any miscellaneous warning devices as may be required by or specified in MUTCD and TxDOT.

3. Place signs and other devices as needed.

2. SIGNS AND EQUIPMENT

1. Conform to the requirements of MUTCD and TxDOT, if applicable.

2. Provide traffic controls to delineate traffic lanes and to guide and separate traffic movements.

3. Provide at obstructions, such as material piles and equipment.

4. Illuminate barricades and obstructions with warning lights from sunset to sunrise.

5. Use signs to alert the public of construction hazards, including if applicable any surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.

3. BARRICADES AND LIGHTS

1. Provide barricades and lights in accordance with the requirements of MUTCD and TxDOT, if applicable, in sufficient quantity to safeguard the public and the Works.

2. Provide barricades and lights to meet regulations and in sufficient quantity to safeguard the public and the Works.

PART 3 EXECUTION

1. VEHICULAR TRAFFIC

    1. Ingress and egress from the Site in accordance with the Drawings or as directed by ENGINEER.

    2. Comply with the Temporary Traffic Control Plan and the Transportation and Off-Site Disposal Plan.

    3. Confirm that designated route is available and adequate before coming to the Site.

    4. Confirm height restrictions on all access and haul routes.

    5. Confine construction traffic to haul routes approved by ENGINEER.

    6. Comply with applicable laws and regulations regarding closing or restricting the use of public streets or highways and provisions of applicable access agreement(s).

    7. Conduct the Works in a way that minimizes interference with public travel.

    8. When traffic control persons are required by regulation or when deemed necessary in order to ensure public safety, furnish them with approved apparel and other traffic control devices as required.

    9. Coordinate traffic routing with that of other contractors working in the same or in adjacent areas.

2. PROTECTION OF PUBLIC TRAFFIC

    1. Comply with the requirements of all applicable acts, regulations and by-laws in force for the regulation of traffic or the use of roadways upon or over which it is necessary to carry out the Works or haul materials or equipment.

    2. Do not close any lanes of road without the prior approval of TxDOT for any road under TxDOT jurisdiction. Before re-routing traffic, erect suitable signs and devices in accordance with MUTCD.

3. FIELD QUALITY CONTROL

    1. Continually maintain the traffic control devices in use by:
        1. Checking all signs daily for legibility, damage, suitability, and location. Clean, repair or replace the signs to maintain their clarity and reflectivity.
        2. Removing or covering signs which do not apply to existing conditions of that day.

END OF SECTION

SECTION 01 35 29

HEALTH AND SAFETY

PART 1 GENERAL

1. SUMMARY

A. Section Includes:
1. References.
2. General requirements.
3. Basis of program.
4. Site characterization.
5. Submittals.
6. Health and Safety Officer and Corporate Safety and Health Manager.
7. Personnel health, safety, and hygiene.
8. Air monitoring.
9. Contingency and Emergency Response Plans.
10. Site control.

2. REFERENCES

A. Abbreviations and Acronyms:
1. AIHA: American Industrial Hygiene Association.
2. CPR: Cardiopulmonary resuscitation.
3. FPAP Plan: Fall Protection and Prevention Plan.
4. HASP: Site-specific Health and Safety Plan.
5. HSO: Health and Safety Officer
6. JSA: Job Safety Analysis form.
7. NIOSH: National Institute for Occupational Safety and Health.
8. NRC: National Response Center.
9. OSHA: Occupational Safety and Health Administration.
10. PFD: Personal flotation device.
11. PID: Photoionization device.
12. PPE: Personal protective equipment.
13. SDS: Safety Data Sheet.
14. TCEQ: Texas Commission on Environmental Quality.
15. USACE: US Army Corps of Engineers.
16. USEPA: United States Environmental Protection Agency.
17. VOC: Volatile Organic Compound.

B. Reference Standards:
1. Section 01 40 00 - Quality Requirements: Requirements for references.
2. Occupational Safety and Health Administration, an agency of the United States Department of Labor, Occupational Safety and Health Standards and Safety and Health Regulations - Code of Federal Regulations:
   a. 29 CFR 1910 - Subpart I - Personal Protective Equipment.
   b. 29 CFR 1910.134 – Subpart I – Personal Protective Equipment - Respiratory Protection.
   c. 29 CFR 1910 - Subpart Z - Toxic and Hazardous Substances.
   d. 29 CFR 1910.120 – Subpart H Hazardous Materials - Hazardous Waste

Operations and Emergency Response.
e. 29 CFR 1910.146 – Subpart J – General Environmental Controls - Permit-required Confined Spaces.
f. 29 CFR 1910.147 – Subpart J – The Control of Hazardous Energy Sources.
g. 29 CFR 1910.1200 - Subpart Z - Toxic and Hazardous Substances - Hazard Communication.
h. 29 CFR 1926 - Subpart O - Motor Vehicles, Mechanized Equipment, and Marine Operations.
i. 29 CFR 1926 - Subpart P - Excavations.
j. 29 CFR 1926.65 - Subpart D – Occupational Health and Environmental Controls - Hazardous Waste Operations and Emergency Response.
k. 29 CFR 1926.502 - Subpart M - Fall Protection - Fall Protection Systems Criteria and Practices.
l. 49 CFR 171, Subpart B - Incident Reporting, Notification, BOE Approvals and Authorization.
m. 49 CFR 172, Subpart G - Emergency Response Information.
n. 49 CFR 390.15, Subpart E - Hazardous Materials Safety Permits.
o. US Army Corps of Engineers:
p. EM 385-1-1 - Safety and Health Requirements Manual.

3. GENERAL REQUIREMENTS

A. Develop a written HASP which complies with 29 CFR 1910.120 and 29 CFR 1926.65 prior to commencing mobilization to the Site and continue to implement, maintain, and enforce the HASP until final demobilization from the Site. The development, implementation, and maintenance of the HASP are CONTRACTOR's sole responsibility. The CONTRACTOR shall follow all requirements in the HASP and Emergency Response Plans that are provided with these Contract Documents and add any additional requirements to it that may be necessary and/or are specified in this Section.

B. The health and safety guidelines contained herein are minimal requirements intended to provide for a safe and minimal risk working environment for on-site personnel and to minimize the impact of activities involving contact with hazardous materials or hazardous wastes on the general public and the surrounding environment.

C. Should CONTRACTOR seek relief from, or substitution for, any portion or provision of the health and safety requirements specified herein, or the HASP reviewed by ENGINEER, such relief or substitution shall be requested from CONTRACTOR in writing, and if accepted by ENGINEER, will be authorized in writing.

D. Responsibility: Be responsible for the safety of persons and property on Site and for the protection of persons off Site and the environment to the extent that they may be affected by the performance of the Works. Comply with, and enforce compliance by employees of CONTRACTOR and Representatives, safety requirements of the Contract Documents, laws and regulations, and the HASP. CONTRACTOR acknowledges that safety and environment protection obligations are of paramount importance regarding all of the work to be performed under the Contract Documents.

E. Hazard Communication Requirements:
1. Comply with the requirements of 29 CFR 1910.1200. Obtain information on any hazardous chemical or harmful physical agent to which personnel of CONTRACTOR and Representatives and visitors have potential exposure while on Site.

2. Provide ENGINEER with SDS documentation on "hazardous" chemicals that CONTRACTOR or Representatives plan to bring onto the Site. In addition, CONTRACTOR shall be responsible for meeting container warning label requirements of 29 CFR 1910.1200.
3. Comply with OWNER's health and safety requirements.
4. In the event of conflicting or overlapping health and safety requirements, comply with the most stringent requirements.

F. Work Stoppage: Give precedence to the safety and health of the public, plant personnel, and on-Site personnel and the protection of the environment over cost and schedule considerations for all of the work to be performed under the Contract Documents. All CONTRACTOR personnel shall have the authority to stop Works should a health or safety concern arise. Any stop work action should be communicated to CONTRACTOR HSO immediately who will evaluate the situation and implement any necessary mitigation actions. The HSO, along with ENGINEER, will determine when it is safe to commence Works again. ENGINEER and OWNER will also have the right to stop the Works for health and safety considerations.

G. Unforeseen Hazards: Should any unforeseen or Site-peculiar safety-related factor, hazard, or condition become evident during performance of the Works, bring such to the attention of ENGINEER verbally and in writing as quickly as possible, for resolution. In the interim, take prudent action to establish and maintain safe working conditions and to safeguard employees of CONTRACTOR and Representatives, the public, OWNER, ENGINEER, and the environment.

4. BASIS OF PROGRAM

A. OSHA standards and regulations contained in 29 CFR 1910 and 1926 provide the basis for the Site health and safety program. The program also reflects the position of the USEPA and NIOSH regarding procedures recommended or required to ensure safe operations at sites containing hazardous or toxic materials.

5. SITE CHARACTERIZATION

A. Work at the Site may involve contact with soils, sediments, and water impacted by Site constituents including dioxins and furans. The constituents at the Site are discussed further in the design documents included with these Specifications.

6. SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
B. HASP:
   1. Prior to mobilization to the Site, submit a HASP which complies with 29 CFR 1910.120, and 29 CFR 1926.65. As a minimum, the HASP shall include the following:
      a. A safety and health risk or hazard analysis for each work task and operation.
      b. Personnel training assignments in accordance with 29 CFR 1910.120 (e) and 29 CFR 1926.65 (e).
      c. PPE to be used by personnel on Site for each work task and operation being conducted in accordance with 29 CFR 1910.120 (g) (5) and 29 CFR 1926.65 (g) (5) and Plant health and safety requirements.

d. US Coast Guard approved PFD to be used by personnel on Site for each work task and operation being conducted where drowning hazard exist as determined in accordance with USACE EM 385-1-1.
e. Medical surveillance requirements in accordance with 29 CFR 1910.120 (f), 29 CFR 1910.134, and 29 CFR 1926.65 (f).
f. Air monitoring program in accordance with 29 CFR 1920 (h) and 29 CFR 1926.65 (h), including frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.
g. Site control measures in accordance with 29 CFR 1910.120 (d) and 29 CFR 1926.65 (d).
h. Decontamination procedures in accordance with 29 CFR 1910.120 (k) and 29 CFR 1926.65 (k).
i. Contingency and Emergency Response Plans meeting the requirements of 29 CFR 1910.120 (l) and 29 CFR 1926.65 (l) for safe and effective responses to emergencies, including necessary PPE and other equipment. CONTRACTOR shall start with the Emergency Response Plan that has been provided with these Specifications and add any additional requirements that may be necessary as determined by CONTRACTOR.
j. Provisions for first aid and bloodborne pathogens.
k. Communication systems.
l. A detailed description of the planned movement of labor, equipment, and materials from and between work areas as work progresses, including measures to be employed to prevent recontamination of previously cleaned areas and impacts to areas that do not now contain hazardous materials.
m. A written respiratory protection program for work activities.
n. Dust Control Plan.
o. Procedures dealing with heat stress.
p. Confined space entry procedures.
q. Control of hazardous energy in accordance with 29 CFR 1910.147.
r. A spill containment program meeting the requirements of 29 CFR 1910.120 (j) and 29 CFR 1926.65 (j) if drummed waste material is generated, excavated, stored, or managed at the Site.
s. A detailed description of the personnel decontamination facilities to be employed including the planned phasing of decontamination facilities between work areas as work progresses and the methods to be used to collect, store, treat, and ultimately dispose of personnel decontamination waters and wastes.
t. A detailed description of the wash down area for decontamination of vehicles and equipment and the methods to be used to collect, store, treat, and ultimately dispose of wash down decontamination waters and sediments.

2. ENGINEER will review the HASP and provide comments. Revise the HASP as appropriate and resubmit the HASP to ENGINEER.

C. Proof of OSHA Training: Prior to mobilization to the Site, submit a list of all personnel who will be employed at the Site. For each of the listed personnel, provide proof of training as required under 29 CFR 1910.120 and 29 CFR 1926.65 (40-Hour Hazardous Waste Operations and Emergency Response training & 8-Hour HAZWOPER Refresher Training). Submit proof of training for any additional personnel as they are sent to the Site.

D. Medical Surveillance:
1. Prior to mobilization to the Site, submit certification of medical surveillance for all Site personnel.
2. Submit additional certification of medical surveillance as personnel are sent to the

Site.

E. Respirator Fit Test: Prior to mobilization to the Site, submit proof of respirator fit testing for on-Site personnel that potentially could wear a respirator on the project.

F. FPAP Plan:
   1. As applicable, a qualified person for fall protection shall prepare and sign the FPAP Plan which complies with 29 CFR 1926.502. The FPAP Plan shall be Site specific and address all fall hazards on Site and during different phases of the Works. The FPAP Plan shall address:
      a. How to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 4 feet (IP standard that is more stringent that OSHA).
      b. Fall protection and prevention systems, equipment and methods employed for every phase of the Works, responsibilities, assisted rescue, self-rescue, and evacuation procedures, training requirements, and monitoring methods.
   2. Revise the FPAP Plan, as needed, reflecting any changes during the performance of the Works due to changes in personnel, equipment, systems, or work habits. The accepted FPAP Plan shall be kept and maintained at the Site for the duration of the Works.

G. Air Monitoring Reporting: Submit real-time air monitoring results daily on a separate CONTRACTOR designated form.

H. Physical Hazard Control Records: Maintain records of the activities undertaken to control physical hazards on Site. This may include the following:
   1. Heart rate measurements and/or oral temperatures for heat stress monitoring.
   2. Results of heavy equipment inspections.
   3. Training and experience records of heavy equipment operators.
   4. Lockout/tagout records.
   5. Results of documented work area inspections.
   6. Results of documented excavation inspections.
   7. Activities on the equipment decontamination pad, dewatering and stabilization pad, and staging pads.

7. HEALTH AND SAFETY OFFICER AND CORPORATE SAFETY AND HEALTH MANAGER

A. Employ and assign to the Works a full-time competent and authorized representative, herein referred to as "Health and Safety Officer" (HSO). The HSO shall be dedicated to monitoring and administering the CONTRACTOR health and safety program at the Site and shall not split time/duties with other non-health and safety tasks.

B. Health and Safety Officer Qualifications:
   1. Minimum of 5 years Site related working experience as a HSO specific to remedial construction activities at hazardous waste sites.
   2. Basic working knowledge of state and federal occupational safety and health regulations.
   3. Formal education and/or training in occupational safety and health.
   4. OSHA 30-hour Construction Training
   5. OSHA Competent Person for Trenching and Excavation
   6. OSHA Competent Person for Fall Protection

C. Health and Safety Officer Responsibilities:

1. Obligated to stop or start the work when it is necessary or advisable for reasons of health or safety.
2. Conduct health and safety training sessions and ensuring that personnel not successfully completing the required training are not permitted to enter the Site to perform work in the Exclusion Zone or Contaminant Reduction Zone.
3. Implementation and daily enforcement and monitoring of the HASP.
4. Be on the Site during the execution of work at the Site and be under the direction of CONTRACTOR's Corporate Safety and Health Manager.
5. Verify that all on-Site personnel are made aware of the provisions of the HASP and have been informed of the nature of physical and/or chemical hazards associated with Site activities.
6. Ensure that JSA forms have been developed for all Project tasks and that Project personnel have been trained in all JSAs.
7. Maintain a daily log of all significant health and safety activities and incidents.
8. Verify that on-Site personnel and visitors have received the required training, including instructions for safety equipment and PPE use.
9. Suspend work if health and/or safety-related concerns arise.
10. Provide on-Site technical assistance.
11. Conduct the Site and personal air monitoring program, including all required real-time air monitoring and equipment maintenance and calibration. Submit collected samples to an AIHA accredited laboratory.
12. Issue/obtain required work permits.
13. Conduct Site safety orientation training and daily safety meetings.
14. Maintain the Exclusion Zones, Contaminant Reduction Zone, and Support Zones.
15. Coordinate emergency procedures.
16. Conduct on-Site personnel safety indoctrination sessions for potential hazards, personal hygiene principles, confined space entry procedures, all other standard operating procedures, safety equipment usage, emergency procedures, and location of first aid kits and identification of personnel trained in first aid and CPR.
17. Supervise and inspect equipment cleaning.
18. Maintain the on-Site Hazard Communication Program including copies of all SDS.
19. Verify that on-Site personnel have received the required physical examinations and medical certifications.
20. Review Site activities with respect to the adequacy of the HASP.
21. Maintain required health and safety documents and records on Site.

D. Employ and assign to the Works a competent and authorized representative, herein referred to as the "Corporate Safety and Health Manager".

E. Corporate Safety and Health Manager Responsibilities:
1. Oversee operations as necessary to ensure the Works is performed in accordance with the HASP.
2. Oversee and be present during health and safety training sessions and, as a minimum, complete qualitative respirator fit testing.
3. Oversee the HSO's activities on a part-time basis.
4. Be available on an as-needed basis for emergency situations.

8. PERSONNEL HEALTH, SAFETY, AND HYGIENE

A. Medical Surveillance: Conduct medical surveillance of personnel as required by 29 CFR 1910.120, 29 CFR 1926.65, and 29 CFR 1910.134.

B. Training: Furnish personnel assigned to or entering the Site who have successfully

completed training required by the applicable OSHA Standards in 29 CFR 1910 and 29 CFR 1926 and specifically with 29 CFR 1910.120 and 1926.65.

C. Levels of Protection: Establish actual levels of protection for each work area based on planned activity and location of activity. The anticipated levels of personal protection based on work activity are as follows:

Work Activity	*Anticipated Level of Personal Protection*
Mobilization and demobilization to and from the Site, including Site preparation/setup and Site restoration	Level D
Site clearing	Level D
Construction of access roads	Level D
Installation of temporary facilities and controls	Level D
Operation and Maintenance of Water Treatment Facility	Level D
Construction of Dewatering System	Level D, Modified Level D
Dewatering and water handling	Modified Level D
Excavation and stockpiling clean overburden	Level D and Modified Level D
Excavation and on-Site transportation of impacted soil	Level C and Modified Level D
Solidification of impacted soil	Level C, Modified Level D
Collection, storage, and disposal of water from excavations and the decontamination area	Level C, Modified Level D
Backfilling	Level D, Modified Level D
Equipment decontamination	Level C, Modified Level D
Restoration of work areas	Level D, Modified Level D

D. PPE:
1. Furnish on-Site CONTRACTOR personnel with appropriate PPE. Clean and maintain safety equipment and protective clothing. As a minimum, each worker on Site shall wear a hard hat, safety glasses with side shields, safety boots with steel toes and shank, and full-length pants.
2. Develop PPE usage procedures and enforce strict compliance with such procedures by on-Site personnel. Include the following procedures as a minimum:
3. Do not permit prescription eyeglasses to be worn that are not safety glasses. Do not permit contact lenses to be worn within the Exclusion Zone or Contaminant Reduction Zone.
4. Change respirator cartridges/filters daily during periods of respirator usage or prior to breakthrough, whichever occurs first.
5. Do not permit footwear to be worn that is not safety-toed shoes or boots.
6. Dispose of or decontaminate PPE worn on Site at break time and at the end of the work day.
7. Decontaminate reusable PPE before reissuing.
8. If air monitoring indicates respirator use is required, do not permit on-Site personnel who have not passed a respirator fit test to enter the Exclusion Zone or

Contaminant Reduction Zone. Do not permit personnel to wear a respirator if they have facial hair that interferes with a proper fit of the respirator.

E. Respiratory Protection:
1. Furnish on-Site personnel with extensive training in the usage and limitations of, and qualitative fit testing for, air purifying and supplied-air respirators in accordance with 29 CFR 1910.134 for confined space entry, or any work requiring Level C or higher protection.
2. Develop, implement, and maintain a written respiratory program in accordance with 29 CFR 1910.134.
3. Monitor, evaluate, and provide respiratory protection for on-Site personnel.
4. Immediately notify ENGINEER when level of respiratory protection required increases from Level D to Level C or from Level C to Level B.
5. Be responsible for appropriate respiratory protection during work activities. Do not allow persons to enter the Exclusion Zone or Contaminant Reduction Zone without appropriate respiratory protection.
6. Be responsible for assessing the ability for on-Site personnel to wear respiratory protection. Cardiopulmonary system examination and pulmonary function testing are minimum requirements for personnel wearing respiratory protection.
7. Do not permit on-Site personnel unable to pass a respirator fit test to wear respiratory protection and to enter the Exclusion Zone or Contaminant Reduction Zone.
8. The following respiratory action levels have been established to be measured within the breathing zone:

Action Level	*Action Taken*
No Visible Dust	Initiate/continue work
Visible Dust	Shutdown activities, move to a safe area, notify ENGINEER. Implement additional engineering controls
Lower Explosive Limit (LEL) ≥10 percent	Shutdown activities, move to a safe area, notify ENGINEER. Do not continue working until conditions are constantly below 10 percent LEL
<19.5 percent or >23.5 percent LEL	When oxygen levels are outside this range, percent LEL readings are not reliable. Shutdown activities, move to a safe area, notify ENGINEER. Do not continue working until oxygen levels are between 19.5 and 23.5 percent LEL

F. Heat Stress: Implement a heat stress monitoring program as applicable and include CONTRACTOR’s Site-specific program in the HASP.

G. Personnel Hygiene and Personnel Decontamination Procedures:
1. Provide, as a minimum, the following:
   a. Suitable disposable and reusable PPE on a daily basis for the use of CONTRACTOR's on-Site personnel.
   b. Suitable containers for storage and disposal of used disposable PPE.
   c. Potable water and a suitable sanitation facility.

H. Emergency and First aid Equipment:

1. Locate and maintain emergency and first aid equipment in appropriate on-Site location, including:
   a. First aid kit containing medications appropriate for the initial treatment of burns, abrasions, fractures, and ingestion or dermal contact with on-Site hazardous waste. Size first aid kit in accordance with the potential maximum number of on-Site personnel.
   b. Portable emergency eye wash and shower capable of providing adequate irrigation for 15 uninterrupted minutes.
   c. Two 20-pound ABC type dry chemical fire extinguishers.
   d. Blankets and towels.
   e. Stretcher.
   f. One hand-held emergency siren (air horn) for each work area.
   g. A windsock(s) visible from all work areas.
2. As a minimum, provide one certified first aid and CPR technician on Site at all times that on-Site work activities are in progress. This technician may perform other duties but shall be immediately available to render first aid when needed.

I. Site Communications:
   1. Post emergency numbers near Site telephones.
   2. Ensure that personnel work under the use of a "buddy" system and develop a hand signal system appropriate for Site activities.
   3. Provide an employee alarm system to notify employees of on-Site emergency situations or to stop work activities if necessary.
   4. Furnish selected personnel with two-way radios.

J. Site-specific Training: Prior to commencement of Works, conduct an initial training session for all personnel who will be employed at the Site. Provide instructions on topics that may include the following:
   1. Operational Discipline.
   2. Hazard Identification Tool usage.
   3. Stop Work Authority.
   4. Operational Excellence Processes.
   5. Personnel responsibilities.
   6. Content and implementation of the HASP.
   7. Site hazards and controls.
   8. Site-specific hazardous procedures.
   9. Training requirements.
   10. PPE requirements.
   11. Emergency information, including local emergency response team phone numbers, route to nearest hospital, incident reporting procedures, and emergency response procedures.
   12. Instruction in the completion of required inspections and forms.
   13. Location of safety equipment, such as portable eyewash, first aid kit, fire extinguishers.

K. Behavioral Based Safety (BBS) Training: Provide BBS training for each employee on their specific tasks or duties.

L. Tailgate Safety Meetings: Conduct mandatory daily tailgate safety meetings for on-Site personnel in the morning to discuss safety issues recapped from the day before, review of JSAs for the work activities for the current day as well as health and safety issues for the current day, to address questions that may have arisen in the workforce, and additionally as required by special or work-related conditions. Include refresher training for existing equipment and protocols, review ongoing safety issues and protocols, and examine new

Site conditions as they are encountered. Hold additional safety meetings on an as needed basis.

9. AIR MONITORING

A. Develop an air monitoring program meeting the requirements of 29 CFR 1910.120 (h) and 29 CFR 1926.65 (h). Implement all aspects of the air monitoring program that is presented in the HASP that has been provided.

B. Provide the required instruments for air monitoring including, as a minimum:
   1. PID equipped with a 10.6 eV lamp.
   2. MIE PDM DataRam, or equivalent.
   3. MiniRae capable of monitoring oxygen, combustible gas, and carbon monoxide.

C. Calibrate air monitoring equipment on a daily basis in accordance with manufacturer's guidelines. Record calibrations in the Site daily logbook.

D. Furnish a wind speed and direction indicator capable of providing a permanent record, placed at an unobstructed on-Site location above the elevation of the work area, clearly visible to affected workers.

E. Dust Suppression Program:
   1. Implement dust suppression program at the Site during ground invasive activities or during other activities which may potentially create an airborne hazard.
   2. If excessive dust is observed leaving the work area, as determined by ENGINEER, implement additional dust suppression techniques.

F. Reporting:
   1. Report the results of air monitoring programs to ENGINEER daily. Include the following information as applicable:
      a. Site location and date.
      b. Work process and operation name.
      c. Temperature, wind speed, and wind direction.
      d. Area sampling location diagram.
      e. Field notes, including the following:
         1. Description of operations and complaints and symptoms.
         2. Chemicals, materials, and equipment in use.
         3. Engineering and administration controls in effect.
         4. PPE in use.
         5. Sampling observations and comments.
   2. Record all daily air monitoring activities in a hard cover log book which shall be maintained on Site at all times by the HSO.
      a. ENGINEER to perform dust monitoring at perimeter of the work area.
      b. Perform work is a manner to not exceed the following action levels based on air monitoring by ENGINEER.

Perimeter Site Action Levels

Chemical of Interest	Work Area Location	Action Level[1]	Duration	Description of Action
Total Dust Concentrations	Perimeter of the Work Area	< 0.32 mg/m^3	1-Hour Average	No action required

Perimeter Site Action Levels

Chemical of Interest	Work Area Location	Action Level[1]	Duration	Description of Action
(Total Dust)		> 0.32 mg/m^3 <0.43 mg/m^3	1-Hour Average	Apply water or dust suppressant or adjust work activity to reduce dust concentrations below the action level.
		>0.43 mg/m3	1 Hour Average	Stop work and apply water or dust suppressant or adjust work activity to reduce dust concentrations below the action level before resuming activities.
Notes: [1]Action levels are based on real-time average concentrations of total dust				

10. CONTINGENCY AND EMERGENCY RESPONSE PLANS

A. A. Comply with 29 CFR 1910.120 (l) and 20 CFR 1926.65 (l).
B. Include and address the following emergency situations and responses, as a minimum:
    1. In the event of injury to on-Site personnel or contact with hazardous materials requiring immediate medical attention, implement the following protocol:
        a. Notify ENGINEER and the HSO.
        b. Phone the hospital previously identified to be closest to the Site and describe the injury.
        c. Decontaminate personnel and administer appropriate first aid.
        d. Transport personnel to the specified hospital along the most direct route which shall be predefined prior to commencing work on the Site.
    2. In the event that a release of a hazardous substance occurs on Site beyond the limit of working areas, implement the protocols presented in the HASP. As a minimum, the response action shall consist of:
        a. Notifying TCEQ and, if the release qualifies under 40 CFR Part 302 (Designation, Reportable Quantities and Notification), the NRC.
        b. Performing material containment actions.
        c. Performing air monitoring to determine if the released material migrated off Site.
        d. Performing required decontamination and/or disposal activities.
        e. Creating an Incident Report, which will, as a minimum, discuss the incident and the response actions taken, present the findings from the investigation of the incident, and present protocols to prevent a reoccurrence of the situation.
    3. In the event that excessive gases or vapors are detected at a work area, take the following actions:
        a. Evacuate workers to an area upwind of the affected area.
        b. Identify the contaminant and monitor contaminant concentrations to determine the type of respiratory protection and/or engineering controls required before workers

re-enter the area.

4. In the event of a fire at a work area, quickly use fire extinguishers and/or earth moving equipment to smother the fire if possible and, if the presence of noxious gases or degree of hazard prohibits this, employ proper evacuation procedures. Notify the appropriate public safety authorities, whose representatives will assume responsibility for coordinating with ENGINEER and the HSO for the proper emergency response strategy upon arrival.
5. In the highly unlikely event of a major leak of toxic gas, , evacuate on-site personnel to a safe distance, and notify the appropriate public safety authorities and local hospital if deemed necessary by ENGINEER and the HSO, and representatives of such public safety authorities will assume responsibility for coordinating with ENGINEER and the HSO for the proper emergency response strategy upon arrival.

C. Off-Site Contingency and Emergency Response Plan:
1. Prior to commencing work involving the off-site transportation of soils and waste materials, CONTRACTOR shall develop a written emergency response plan that identifies the emergency response actions that will be implemented involving a spill or release of waste material (i.e., vehicle rollover, equipment failure or leakage) from a truck that is in transit to a disposal facility. The Contractor's Emergency Response Plan will identify the designated truck routes that will be used for driving to the disposal facility, a requirement to communicate these designated truck routes to all drivers to ensure that they stay on the designated routes and will also identify the name of the firm(s) and phone number(s) who have been contracted with to provide emergency response services. CONTRACTOR shall have agreements in place with these firms that will require them to respond to the scene of any emergency within a 4-hour time frame.
2. The plan will address actions to be taken if a release of material from a transport vehicle occurs while in transit, which may include:
   a. Immediately notify CONTRACTOR, who will in turn notify ENGINEER and ENGINEER will notify applicable authorities.
   b. Take immediate measures within the capabilities of the transport driver to control the release, if necessary.
   c. Contain and eliminate the release, if possible.
   d. The driver must remain within a safe distance of the vehicle, and will keep unnecessary people away, isolate the area of the release, and deny entry to unauthorized personnel.
   e. Stay upwind, keeping out of low areas, and do not allow contact with the related material.
   f. Contact the appropriate local authorities (police, fire department, traffic control) and local hazardous materials response units.
   g. Other actions, as advised by the spill response team.
3. In the event of an accident involving transport vehicles, follow the procedures outlined in CONTRACTOR's Emergency Response Plan and comply with the requirements of 49 CFR 171 Subpart B, 49 CFR 172, Subpart G, and 49 CFR 390.15 Subpart E.

11. SITE CONTROL

A. Comply with 29 CFR 1910.120 (d) and 20 CFR 1926.65 (d).

B. Slip, Trip, and Fall Hazards: Maintain good housekeeping at the Site for the duration of the Works. Remove, mark, or guard trip hazards. Use extreme caution when working on or

around slippery surfaces. Take necessary precautions to protect personnel from injuries caused by slick surfaces.

C. Fall Protection: Using guard rail systems or personal fall arrest systems to protect walking or working horizontal and vertical surfaces at the Site with an unprotected side or edge that is 4 feet or more above a lower level such as found at the edge of excavations. Comply with 29 CFR 1926.502.

D. Confined Space Entry Program: Comply with 29 CFR 1910.146. Confined space workers and attendants shall wear and use fall arrest equipment according to manufacturer's instructions when there is a risk of falling:
   1. Four feet.
   2. Into operating machinery.
   3. Into water or another liquid.
   4. Onto a hazardous substance or object.
   5. Through an opening on a work surface.

E. Work Areas: Clearly layout and identify work areas in the field and limit equipment, operations, and personnel in the areas as defined below. Establish work areas as temporary or permanent, depending on the work activity and the sequence in which it is performed. These areas are:
   1. Exclusion Zone: Includes areas where hazardous or potentially impacted soils, debris, and other materials are being excavated contacted, disturbed, or handled (e.g., soil stabilization) and areas where contaminated equipment or personnel travel. Establish temporary Exclusion Zones around remote work areas beyond the limits of the Exclusion Zone; clearly delineate temporary Exclusion Zones with temporary fencing and warning signs.
   2. Contaminant Reduction Zone: Occurs at the interface of the Exclusion Zone and Clean Zone and provides for the prevailing upwind transfer of construction materials from clean to Site-dedicated equipment, the decontamination of equipment and vehicles prior to entering the Clean Zone from the Exclusion Zone, the decontamination of personnel and clothing prior to entering the Clean Zone from the Exclusion Zone, and the physical segregation of Clean and Exclusion Zones. An additional Contaminant Reduction Zone will be located on the decontamination wash pad.
   3. Clean Zone: Defined as a clearly delineated predominantly upwind area outside the Exclusion Zone(s) and Contaminant Reduction Zone(s), which functions include:
      a. An entry area for personnel, material, and equipment to the Contaminant Reduction Zone.
      b. An exit area for decontaminated personnel, material, and equipment from the Contaminant Reduction Zone.
      c. A storage area for clean safety and work equipment.

F. Particulate Emission Control Program: Prior to commencing the Works, submit a Particulate Emission Control Program for approval. During work activities, implement and enforce this program to minimize the generation and migration of dust, fly ash, cement kiln dust and/or lime on and off Site. The Particulate Emission Control Program is in addition to the Dust Suppression Program.

G.

H. Contaminant Migration Control: Take appropriate measures to prevent contaminant tracking on and off the Site. Decontaminate all vehicles including transport vehicles, equipment, and workers leaving areas of potential contamination prior to entry into Clean Zones. Locate decontamination facilities and sequence work activities to prevent contaminant tracking.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. References.
    2. Quality control.
    3. Tolerances.
    4. Requirements for references.
    5. Inspecting and testing services.
    6. Manufacturers' field services and reports.

2. REFERENCES

1. Reference Standards:
    1. Section 01 40 00 - Quality Requirements: Requirements for references.
    2. ASTM International:
        1. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
        2. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
        3. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

3. QUALITY CONTROL

1. Monitor quality control over Suppliers, products, services, Site conditions, and workmanship, to produce Works of specified quality.

2. Comply with manufacturers' instructions, including each step in sequence.

3. Should manufacturers' instructions conflict with the Contract Documents, request clarification from ENGINEER before proceeding.

4. Comply with specified standards as minimum quality for the Works except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

5. Perform work by persons qualified to produce workmanship of specified quality. Use persons licensed to perform the Works where required by these Specifications or laws and regulations.

6. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

7. Materials furnished and finished or intermediate stages of the Works shall be sampled, tested, and inspected as specified in individual Sections and as required by reference standards.

4. TOLERANCES

1. Monitor tolerance control of installed products to produce acceptable Works. Do not permit tolerances to accumulate.

2. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with the Contract Documents, request clarification from ENGINEER before proceeding.

3. Adjust products to appropriate dimensions; position before securing products in place.

5. REQUIREMENTS FOR REFERENCES

1. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified by an individual Section or are required by applicable laws and regulations.

2. Conform to reference standard by date of issue current as of bid closing date, except where a specific date is established by Laws or Regulations or by an individual Section.

3. Specific provisions of laws or regulations may be referenced in these Specifications to assist CONTRACTOR and identify options selected by ENGINEER. Such references do not relieve CONTRACTOR from compliance with other applicable provisions of Laws or Regulations not specifically referenced.

4. No inference or provision of any reference document including, but not limited to any standard specification, manual, or code shall be effective to change the relationships, duties, and responsibilities of PERFORMING PARTIES, CONTRACTOR, or ENGINEER from those set forth in the Contract Documents, nor shall it be effective to assign to PERFORMING PARTIES or ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Works or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract.

5. Publications referred to in these Specifications form part of the Specifications to the extent specified in individual Sections.

6. In case of conflict or discrepancy between a reference standard and the Project Specifications or with another reference standard, the more stringent requirements shall apply.

7. Should specified reference standards conflict with the Contract Documents, request clarification from ENGINEER before proceeding.

6. INSPECTING AND TESTING SERVICES

1. CONTRACTOR shall employ and pay for services of an independent testing laboratory to perform inspecting and testing services as specified in individual Sections.

2. Employment of testing laboratory and services performed by such testing laboratory in no way relieves CONTRACTOR of obligation to perform the Works in accordance with requirements of the Contract Documents.

3. Quality Assurance:
    1. Comply with requirements of the reference standards listed in PART 1, REFERENCES.
    2. Comply with agencies listed in individual Sections.
    3. Inspecting Company and Testing Laboratory: Authorized to operate in the state in which the Site is located.
    4. Inspecting Company and Testing Laboratory Staff: Maintain a full-time specialist on staff to review services.
    5. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either the National Institute of Standards or Technology or accepted values of natural physical constants.

4. CONTRACTOR Submittals:
    1. Prior to start of the Works, submit independent testing laboratory name(s), address, and telephone number, and names of full-time specialist and responsible officer at the laboratory.
    2. Submit copy of report of testing laboratory facilities inspection made by the Materials Reference Laboratory of the National Institute of Standards and Technology during most recent inspection, with memorandum of remedies of deficiencies reported by the inspection.

5. Testing Laboratory Responsibilities:
    1. Test samples of mixes and materials submitted by CONTRACTOR.
    2. Provide qualified personnel at the Site. Cooperate with ENGINEER and CONTRACTOR in performance of services.
    3. Perform specified inspecting, sampling, and testing of products and methods of construction in accordance with specified standards.
    4. Ascertain compliance of materials and mixes with requirements of the Contract Documents.
    5. Promptly notify ENGINEER and CONTRACTOR of observed irregularities, deficiencies, or non-conformance of products.
    6. Perform additional inspection and tests required by ENGINEER.
    7. Attend pre-construction meetings and progress meetings, as required.

6. Testing Laboratory Reports:
    1. After each inspection and test promptly submit two copies of reports to ENGINEER and CONTRACTOR. Submit draft on-Site inspection report prior to leaving the Site.
    2. As a minimum, reports shall include:
        1. Date issued.
        2. Project title and number.
        3. Name and address of testing laboratory.
        4. Name of inspector.
        5. Date and time of sampling or inspection.
        6. Identification of product and related specification Section.
        7. Location in the Project.
        8. Record of temperature and weather.
        9. Type of inspection or test.
        10. Date of test.
        11. Results of tests and observations.
        12. Conformance with the Contract Documents.
    3. When requested by ENGINEER, provide interpretation of test results.

7. Limits on Testing Laboratory Authority:
    1. Testing laboratory may not release, revoke, alter, or enlarge upon requirements of the Contract Documents.
    2. Testing laboratory may not approve or accept any portion of the Works.
    3. Testing laboratory may not assume or perform any duties of CONTRACTOR.
    4. Testing laboratory has no authority to stop the Works.

8. CONTRACTOR Responsibilities:
    1. Deliver to testing laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs for concrete, and other material mixes that require testing.
    2. Cooperate with personnel of independent testing laboratory and provide safe access to the Works and to manufacturer's operations.
    3. Provide incidental labor and facilities:
        1. To provide access to the Works to be tested.
        2. To obtain and handle samples at the Site or at source of products to be tested.
        3. To facilitate tests and inspections.
        4. For testing laboratory's exclusive use for storage and curing of test samples.
        5. Forms for preparing concrete test beams and cylinders.
    4. Notify ENGINEER and testing laboratory 24 hours prior to expected time for operations requiring inspecting and testing services to allow for assignment of personnel and scheduling of tests.
    5. Furnish copies of product test reports.
    6. Promptly notify ENGINEER of all observed irregularities or non-conformance of the Works.
    7. Retesting required because of CONTRACTOR negligence or non-conformance to specified requirements shall be performed by the same testing laboratory on instructions by ENGINEER at CONTRACTOR's expense and at no additional cost to PERFORMING PARTIES.
    8. If defects or deficiencies are revealed during testing or inspecting, correct such defects and deficiencies and retest affected portions of the Works.

7. MANUFACTURERS' FIELD SERVICES AND REPORTS

1. When specified in individual Sections, require Suppliers to provide qualified personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, and to initiate instructions when necessary.

2. Submit qualifications of observer to ENGINEER.

3. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

4. Submit report on same day as the Site visit to ENGINEER for information.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1. SUMMARY

    1. Section Includes:
        1. Temporary Utilities:
            1. Electricity.
            2. Water service.
            3. Telephone service.
            4. Internet service.
            5. Portable radios.
            6. Construction lighting.
            7. Temporary cooling.
            8. Fire protection.
        2. Construction Facilities:
            1. ENGINEER's field office.
            2. Agencies field office.
            3. CONTRACTOR's field office and sheds.
            4. Equipment Decontamination Facility.
            5. Personnel Hygiene/Decontamination Facility.
            6. Emergency First-aid Facility.
            7. Sanitary facilities.
            8. Storage/stockpiling facilities.
            9. Staging and stabilization pads.
            10. Water storage tanks.
        3. Vehicular Access and Parking:
            1. Access roads.
            2. Parking.
            3. Traffic regulation.
        4. Temporary Barriers and Enclosures:
            1. Barriers.
            2. Fencing.
            3. Security.
        5. Temporary Controls:
            1. Water control.
            2. Dewatering.
            3. Erosion and sediment control.
            4. Equipment decontamination.
        6. Project identification.
        7. Removal of temporary facilities and controls.

2. REFERENCES

    1. Reference Standards:
        1. Section 01 40 00 - Quality Requirements: Requirements for references.
        2. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

3. National Fire Protection Association:
   1. NFPA 10 - Standard for Portable Fire Extinguishers.
   2. NFPA 70 - National Electrical Code.
4. Occupational Safety and Health Administration, an agency of the United States Department of Labor, Occupational Safety and Health Standards and Safety and Health Regulations - Code of Federal Regulations:
   1. 29 CFR 1910.141 - Sanitation.
   2. 29 CFR 1910.157 - Portable Fire Extinguishers.
   3. 40 CFR 761.79 - Decontamination standards and procedures.

3. TEMPORARY UTILITIES

1. Electricity:
   1. Provide, maintain, and pay for power service required for performance of the Works.
   2. Provide power outlets for construction operations, with branch wiring and distribution boxes located as necessary. Provide flexible power cords as necessary.
   3. Provide main service disconnect and overcurrent protection at convenient locations.
   4. Route temporary utility lines along alignments approved by ENGINEER. Take necessary precautions to prevent service interruptions due to accidental breakage of utility lines. Coordinate installation with local utility company and comply with laws and regulations and NFPA 70.

2. Water Service:
   1. Provide, maintain, and pay for suitable quality water service required for performance of the Works.
   2. Extend branch piping with outlets located so that water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.
   3. Provide and maintain on Site a potable water storage tank(s) with a minimum live capacity of 5,000 gallons and all pipes, hoses, and fittings to adapt to the water supply and to transfer water to work locations. Protect equipment from freezing. Provide an operating flow control valve in-line near work locations to reduce waste of potable water.
   4. Do not use water storage tanks to store or haul potable water.
   5. Potable water tanks shall be clean and contaminant free inside and outside.

3. Telephone Service:
   1. Provide, maintain, and pay for telephone service and equipment including a minimum of one telephone unit to CONTRACTOR's field office at time of mobilization to the Site.
   2. Provide, maintain, and pay for separate telephone service and equipment including one telephone unit to agencies field office at time of mobilization to the Site. Agencies will pay for own long distance charges.
   3. Post emergency numbers including police, fire, ambulance, hospital, poison control center, and appropriate regulatory agencies in prominent location near each telephone.

4. High Speed Internet Service:
   1. Provide, maintain, and pay for high speed Internet service for ENGINEER's field office, agencies field office, and CONTRACTOR's field office.

5. Portable Radios:
   1. Provide and maintain for ENGINEER's exclusive use, three two-way portable radios for Site

communications, capable of clearly transmitting and receiving communications over a radius at time of mobilization to the Site.
2. Radio Frequencies: Same as those set for radios used by CONTRACTOR.
3. Equip at least the following key CONTRACTOR personnel with two-way portable radios:
    1. Superintendent.
    2. Health and Safety Officer.
    3. Security personnel.
    4. Each crew foreman.

6. Construction Lighting:
    1. Provide and maintain lighting for construction operations for any work done after daylight hours.
    2. Provide and maintain a minimum of 1 watt/sq ft lighting to exterior staging and storage areas exterior office area exterior decontamination areas after dark for security purposes.
    3. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as necessary.
    4. Maintain lighting and make routine repairs.

7. Fire Protection:
    1. Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with applicable laws and regulations and to the satisfaction of ENGINEER and insurance authorities.
    2. Bulk storage of flammable liquids and other hazardous materials is not allowed on Site. Handle flammable liquids in approved containers.
    3. Open burning of rubbish is not permitted on Site.
    4. Deliver, use, and dispose of flammable materials as required by authorities having jurisdiction.
    5. Designate an area on Site where smoking is permitted.
    6. Establish a fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain the fire watch before, during, and for 30 minutes after hazardous operations has ceased or until threat of fire does not exist, whichever is longer.
    7. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B; C UL rating.
    8. Provide a minimum of one fire extinguisher in every construction trailer and storage shed.
    9. Use fireproofed tarpaulins.
    10. Include on-Site fire protection specified in CONTRACTOR's Site-specific Health and Safety Plan.

4. CONSTRUCTION FACILITIES

1. ENGINEER's Field Office:
    1. Following issuance of the Notice to Proceed, provide structurally sound, completely weathertight and insulated office trailer acceptable to ENGINEER, which is specifically designed for this type of use and conforms to the requirements specified; minimum floor area 200 sq ft, minimum 10 feet wide, complete with minimum 50 percent opening windows with minimum total area of 10 percent floor area per room with operable sash and screen, interior lighting of 50-foot candles at desktop height and exterior light at entrances, electrical wall outlets that are accessible from 6 feet along any point, 1 lockable door with new lock and two keys and screens, heating and cooling equipment to maintain ambient temperature of 68 to 72 degrees F, new interior finish, resilient floor covering in first class condition, and exterior finish, all acceptable to ENGINEER. Provide 4 feet minimum width clean gravel or boardwalk landings and sidewalks for complete access to field office.
    2. Minimum Furnishings: five-drawer desk, shelf, three-drawer lockable filing cabinet, one coat rack, one swivel armchair, three side chairs, one waste basket, one tack board, two-door storage cabinet, one bookcase with shelving minimum 48 inches by 48 inches, drafting table

with built-in drawer, drafting stool and light, and minimum one 20-pound ABC type dry chemical fire extinguishers, one five-person first aid kit.
3. Provide and maintain suitable bottled chilled drinking water service.
4. Provide and maintain a photocopier. ENGINEER will supply own paper.
5. Provide and maintain telephone, and Internet service as specified in PART 1, TEMPORARY UTILITIES.
6. Provide and maintain private washroom facilities adjacent to the field office complete with flush or chemical type toilet, lavatory, and mirror.
7. Locate the field office where shown on the Drawings or as directed by ENGINEER.
8. Maintain the office and services continuously. Clean not less than once per week. Provide soap, paper towels, cleansers, and janitorial service and implements.
9. Repair immediately any damage, leaks, or defective service.
10. Exchange walk-off mats weekly at all entrances.

2. CONTRACTOR's Field Office and Sheds:
   1. Provide CONTRACTOR's field office with the minimum facilities specified. Provide all required storage and work sheds.
   2. Field Office and Furnishings:
      1. As required by CONTRACTOR and with sufficient room for Project meetings.
      2. Include conference table and chairs sufficient for 12 persons.
      3. Telephone service.
      4. Light and temperature as specified under ENGINEER's field office.
      5. Six hard hats for visitors' use.
      6. Exterior identifying sign.
      7. Other furnishings at CONTRACTOR's option.
   3. Remove field office and sheds upon completion unless otherwise approved by ENGINEER.

3. Equipment Decontamination Facility:
   1. Prior to commencing work involving equipment contact with potentially impacted materials, construct an equipment decontamination pad in accordance with the details shown on the Drawings.
   2. Provide, operate, and maintain suitable portable, high-pressure, low-volume decontamination wash unit(s) equipped with self-contained water storage tank and pressurizing system and capable of heating and maintaining wash waters to
   3. 180 degrees F and providing a nozzle pressure of 150 psi.
   4. Provide, operate, and maintain necessary equipment, pumps, and piping required to collect and contain equipment decontamination water and sediment and transfer same to approved storage facilities.

4. Emergency First-aid Facility: Comply with Section 01 35 29.

5. Sanitary Facilities:
   1. Provide and maintain required temporary sanitary facilities.
   2. Remove and dispose of sanitary wastes off Site on a periodic basis as required and in accordance with applicable laws and regulations.
   3. Provide portable toilets in compliance with 29 CFR 1926.51(c) at a minimum.

6. Storage/Stockpiling Facilities:
   1. Provide, maintain, and operate storage/stockpiling facilities to details shown on the Drawings.

7. Staging and Solidification Pads:
   1. Provide, maintain, and operate staging and solidification pads to details shown on the Drawings.

2. Provide and maintain facility approved by ENGINEER to store and protect solidification additives.
    1. Equip the facility with tarps capable of covering the stockpiled material before and after solidification
    2. Implement procedures to mitigate any hazards/risk of explosion from explosive dust.
    3. Do not deliver or store solidification additives without obtaining prior approval.

8. Drums:
    1. Storage of Liquid Waste: DOT-approved 55-gallon steel drums, closable lids, complete with labels for marking contents and date filled.
    2. Storage of Solid Waste: DOT-approved 55-gallon steel drums, closable lids, complete with labels for marking contents and date filled.

9. Temporary Water Treatment System: Comply with Section 46 07 01.

5. VEHICULAR ACCESS AND PARKING

1. Access Roads:
    1. Existing Roads: Reasonable use of existing on-Site roads for construction traffic is permitted subject to the following conditions:
        1. Improve existing roads as CONTRACTOR may require for performance of the Works.
        2. Comply with weight and load size restrictions where applicable and as shown on the Drawings.
        3. Tracked vehicles are not allowed on paved areas.
    2. Perimeter and interior roads shall be maintained to allow use by emergency vehicles in accordance with the Emergency Contingency Plan and as required by local, state, and federal emergency response officials.
    3. Temporary Roads:
        1. Obtain prior approval for location and extent of temporary roads.
        2. Construct temporary all-weather access roads from Site roadways to serve construction area of a width and load bearing capacity to provide unimpeded traffic for construction purposes as CONTRACTOR requires for performance of the Works.
        3. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
        4. Materials:
            1. Temporary Construction: CONTRACTOR's option.
        5. Preparation: Clear areas, provide surface and storm drainage of road and adjacent areas.
        6. Extend and relocate temporary roads as work progress requires. Provide detours as necessary for unimpeded traffic flow.
        7. Provide unimpeded access for emergency vehicles. Maintain sufficient width and turning space.
    4. Maintenance and Use:
        1. Maintain temporary access roads in a sound condition, properly graded, and free of ruts, washboard, potholes, ponding, ice, snow, mud, soft material, excavated material, construction equipment, and products. Maintain access roads throughout the construction period to ensure unimpeded access for passenger automobiles as well as construction vehicles.
        2. Remove mud from vehicle wheels before entering public roads.
        3. Prevent contamination of access roads. Immediately scrape up debris or material on access roads; transport and bring back to the Site. Clean access roads at least once per shift.
        4. ENGINEER may collect soil samples for chemical analyses from the traveling surfaces

of constructed and existing access routes prior to, during, and upon completion of the Works. Excavate and dispose of soil impacted by CONTRACTOR's activities, and supply and place clean replacement soil materials, all at no additional cost to OWNER.

5. Removal and Repair:
    1. Remove temporary materials and construction at Substantial Completion.
    2. Remove underground work and compacted materials to full depth and grade the Site as specified.
6. Parking:
    1. Construct temporary gravel surface parking areas to accommodate use of CONTRACTOR, OWNER, ENGINEER, Agencies, and visitors.
    2. When Site space is not adequate, provide additional off-Site parking.
    3. Locate parking areas as shown on the Drawings or as directed by ENGINEER.
    4. Do not allow tracked vehicles on pavement.
    5. Maintain separate parking area for construction equipment.

6. TEMPORARY BARRIERS AND ENCLOSURES

1. Barriers:
    1. Provide barriers to prevent unauthorized entry to construction, Site office, and on-Site parking areas, and to protect adjacent properties from damage from CONTRACTOR's operations.
    2. Provide protection for plant life and wetland areas designated to remain. Replace damaged plant life.
    3. Protect vehicular traffic, stored materials, the Site, and structures from damage.

2. Fencing:
    1. Temporary chain link fencing
        1. Construct temporary chain-link fence on western side or facility with temporary vehicle and pedestrian gates as shown on the Drawings.
        2. Install prior to any excavation activities
        3. Construct according to chain link fence specification (Section 32 31 13)
        4. Remove at the end of the project.
    2. Temporary Construction fencing
        1. Install temporary construction fencing as necessary to protect work areas and safety of personnel.
        2. Enforce and require that workers and visitors observe and respect the limits marked with temporary fencing.
3. Security:
    1. Initiate security program at time of mobilization to the Site.
    2. Maintain security program throughout the construction period until demobilization from the Site.
    3. Provide security and facilities to protect the Works and the Site from unauthorized entry, vandalism, and theft.
    4. Restrict entrance of persons and vehicles into the Site.
    5. Allow entrance only to authorized persons with proper identification.
    6. Maintain log of workers and visitors and make available to ENGINEER on request. Include date, name, address, company employed by, company/person visited, time in and time out for each person, and record of deliveries and security incidents.
    7. Do not allow cameras on the Site or photographs to be taken except by prior written approval of OWNER or ENGINEER.
    8. If unauthorized personnel are observed on the Site, notify ENGINEER or OWNER and, if so directed, call upon the appropriate law enforcement officials for proper legal actions.
    9. Require visitors to complete training in accordance with the Site-specific Health and Safety

Plan prior to gaining access to the secured areas.

10. Check that the perimeter fencing and warning signs are secure and intact on a daily basis; if deterioration of Site security fence is observed, or if warning signs are found to be removed, bring the situation to the attention of ENGINEER and immediately rectify.
11. Keep access gate to the Site closed except for passage of authorized personnel and vehicles.
12. Provide competent individuals to respond to an emergency on Site during non-working hours.

7. TEMPORARY CONTROLS

1. Water Control:
    1. Maintain excavations free of water as necessary to perform the Works.
    2. Protect the Site from puddling or running water. Grade the Site to drain by constructing shallow drainage swales in approved locations. Provide water barriers as necessary to protect the Site from soil erosion.
    3. Prevent surface water runoff from leaving work areas. Run-on from non-impacted areas shall be diverted around active work areas using berms and ditches.
    4. Do not discharge decontamination water, or surface water runoff, which may have come in contact with potentially impacted material off-Site.
    5. Prevent precipitation from infiltrating or from directly running off stockpiled waste materials. Cover stockpiled waste materials with an impermeable liner during periods of work stoppage including at the end of each working day and as directed by ENGINEER.
    6. Install and maintain appropriate BMPs around the stockpile(s) of excavated material.
    7. Direct surface waters that have not contacted potentially impacted materials to existing or new surface drainage systems.
    8. Provide, operate, and maintain necessary equipment appropriately sized to keep excavations, stockpile, staging pads, and other work areas free from water.
    9. Contain water from stockpiled waste materials. Transfer potentially impacted surface waters to water storage tanks.
    10. Have on hand sufficient pumping equipment, machinery, and tankage in good working condition for ordinary emergencies, including power outage, and competent workers for the operation of the pumping equipment.
    11. Contain and collect water and transfer such collected water to CONTRACTOR-supplied water storage tanks.
    12. Wash water containing oils, grease, or other hazardous materials resulting from wash down of equipment or working areas shall be contained for proper disposal, and shall not be discharged into the river or existing drainage features.
    13. Treat water in accordance with Section 46 07 01.

2. Dewatering:
    1. Dewater the various parts of the Works including, without limitation, open excavations and work areas.
    2. Employ construction methods, plant, procedures, and precautions that will ensure the Works, including excavations, are stable, free from disturbance, and dewatered to an extent to allow inspection and verification of excavation bottom.
    3. Dewatering Methods: Includes sheeting and shoring; water control systems; surface or free water control systems employing ditches, diversions, drains, pipes and/or pumps; and any other measures necessary to enable the whole of the Works to be carried out in the dry.
    4. Provide sufficient and appropriate labor, plant, and equipment necessary to keep the Works free of water including standby equipment necessary to ensure continuous operation of dewatering system.
    5. Take precautions necessary to prevent uplift of any structure and protect excavations from

flooding and damage due to surface runoff.
6. Comply with Section 31 23 19.

3. Erosion and Sediment Control:
   1. CONTRACTOR is responsible for taking the appropriate preventative erosion control measures to ensure compliance with the Project regulatory permits and approvals.
   2. Plan and execute construction by methods to control surface drainage from cuts and fills, from stockpiles, staging areas, and other work areas. Prevent erosion and sedimentation.
   3. Minimize the amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical. Strip vegetation, regrade, or otherwise develop in such a way as to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and water courses, and repair damage caused by soil erosion and sedimentation as directed by ENGINEER.
   4. Provide and maintain temporary measures which may include, but are not limited to, silt fences, ditches, geotextiles, drains, berms, terracing, riprap, vegetative cover, and any other construction required to prevent erosion and migration of silt, mud, sediment, and other debris off Site or to other areas of the Site where damage might result, or that might otherwise be required by applicable laws and regulations. Make sediment control measures available during construction. Place silt fences and/or hay or straw bales in ditches to prevent sediments from escaping from the ditch terminations.
   5. Plan construction procedures to avoid damage to, or work or equipment encroachment onto water bodies or drainage ditch banks. In the event of damage, promptly take action to mitigate the effects of such damage. Restore affected bank or water body to its existing condition.
   6. Construct fill areas by selective placement to avoid erosive surface silts or clays.
   7. Do not disturb existing embankments or embankment protection except as shown on the Drawings.
   8. Take all necessary measures to minimize the alteration or disturbance of existing vegetation outside defined work areas and access roads.
   9. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
   10. If soil and debris from the Site accumulate in low areas, roadways, ditches, or other areas where in ENGINEER's determination it is undesirable, remove the accumulation and restore the area to its original condition.
   11. Comply with Section 01 57 13.

4. Equipment Decontamination:
   1. Do not commence work involving equipment contact with potentially impacted material until the Equipment Decontamination Facility is operational.
   2. Decontaminate equipment after working in potentially impacted work areas and prior to subsequent work or travel on clean areas.
   3. Perform equipment decontamination on CONTRACTOR-constructed equipment decontamination pad.
   4. As a minimum, perform the following steps during equipment decontamination for equipment that is being moved from impacted work areas to clean areas:
      1. Mechanically remove packed dirt, grit, and debris by scraping and brushing without the use of steam or high-pressure water to reduce the amount of water needed and to reduce the amount of impacted rinsate generated.
      2. Use high-pressure, low-volume, supplemented by detergents as appropriate and as approved by ENGINEER.
      3. Pay particular attention to tire treads, equipment tracks, springs, joints, sprockets, and undercarriages.
      4. Scrub surfaces with long handle scrub brushes and a cleaning agent.
      5. Rinse off and collect cleaning agent.

6. Air dry equipment in the Clean Zone before removing from the Site or travel on clean areas.
7. Perform an assessment as directed by ENGINEER to determine the effectiveness of the decontamination.

5. Any excavation and waste handling equipment that has contacted impacted soils and leaves the Site will initially be cleaned on a decontamination pad by mechanical means (e.g., scraped, brushed, and/or wiped) to remove gross contamination (e.g., packed dirt, grit, and/or debris). All equipment will require to be inspected prior to leaving an exclusion zone or the Site.
6. Maintain an inspection record on the Site which includes:
    1. Equipment descriptions with identification numbers or license plates.
    2. Time and date entering the decontamination facility.
    3. Time and date exiting the decontamination facility.
    4. Name of the inspector with comment stating that decontamination was performed and completed.
7. Each piece of equipment will be inspected after decontamination and prior to removal from the Site and/or travel on clean areas. ENGINEER will have right to require additional decontamination to be completed if deemed necessary.
8. Take appropriate measures necessary to minimize the drift of mist and spray during decontamination including the provision of wind screens.
9. Collect decontamination water and sediments which accumulate on the equipment decontamination pad. Transfer water to designated water storage tank.
10. Transfer sediments to waste staging area or drums as appropriate.
11. Furnish and equip personnel engaged in equipment decontamination with protective equipment including suitable disposable clothing, respiratory protection, and face shields.
12. Have on hand sufficient pumping equipment, of adequate pumping capacity and associated machinery and piping in good working condition for ordinary emergencies, including power outage, and competent workers for the operation of the pumping equipment. Maintain piping and connections in good condition and leak-free.

8. PROJECT IDENTIFICATION

1. Provide and install a Project identification sign.
    1. Project name.
    2. CONTRACTOR.

2. No other signs are allowed without OWNER's prior written permission except those required by law.

9. REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

1. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.

2. Remove underground installations to full depth. Grade the Site as shown on the Drawings.

3. Clean and repair damage caused by installation or use of temporary work.

4. Restore existing facilities used during construction to original and functional condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 57 13

TEMPORARY SOIL EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1. SECTION INCLUDES

1. References.
2. Sequencing and scheduling.
3. Pre-installation meeting.
4. Coordination
5. Quality assurance.
6. Progress submittals.
7. Qualifications.
8. Delivery, storage, and handling.
9. Silt fence.
10. Temporary drainage swale.
11. Examination.
12. Preparation.
13. Installation, monitoring and maintenance.
14. Field quality control.
15. Cleaning.

2. REFERENCES

1. Section 01 40 00 - Quality Requirements: Requirements for references.
2. ASTM International (ASTM):
    1. D6461 - Standard Specification for Silt Fence Materials.
    2. D6462 - Standard Practice for Silt Fence Installation.
3. Texas Department of Transportation (TxDOT) Standard Specification for Construction and Maintenance of Highways, Streets, and Bridges: Item 506 – Temporary Erosion, Sedimentation, and Environmental Controls, including appropriate requirements of the Storm Water Pollution Prevention Plan (SWP3) and Texas Pollutant Discharge Elimination

System (TPDES) General Permit TXR150000.

3. SEQUENCING AND SCHEDULING

1. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.

2. Temporary erosion control measures as identified in the approved Soil Erosion and Sediment Control Plan shall be in place and functional prior to initiation of earth work activities.

4. PRE-INSTALLATION MEETING

1. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

2. Convene prior to commencing work of this Section.

5. COORDINATION

1. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

2. Maintain soil erosion and sediment control features during and after installation.

6. QUALITY ASSURANCE

1. Perform work of this Section in accordance with the Storm Water Pollution Prevention Plan (SWP3).

2. CONTRACTOR shall be responsible for the design of any temporary measures required to by-pass the water flow around the work area. CONTRACTOR shall assess the risks of any high water flow events (storms, floods) that may affect the Works and assume the appropriate level of risk. CONTRACTOR is responsible to prepare and implement a contingency plan should any surface water enter and overwhelm the work area. At a minimum, during high water events CONTRACTOR shall remove all equipment from the work area and temporarily protect all exposed soil areas.

7. PROGRESS SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Product Data: Submit product data for all manufactured products and materials.

3. Soil Erosion and Sediment Control Plan: Submit Soil Erosion and Sediment Control Plan indicating locations, design, and product names of design features.

8. QUALIFICATIONS

1. Manufacturer: Company specializing in manufacturing the products specified in this Section

with minimum 3 years documented experience.

9. DELIVERY, STORAGE, AND HANDLING

1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

2. Protect silt fence materials from chemicals, physical damage, direct sunlight, or other conditions or substances which may degrade the product.

3. Deliver, store, and handle in accordance with manufacturer's instructions.

PART 2 PRODUCTS

1. SILT FENCE

1. Geotextile: Uniform in texture and appearance with no defects, flaws, or tears that would affect its physical properties. Contain sufficient ultraviolet ray inhibitor and stabilizers to provide a minimum 2-year service life from outdoor exposure.

2. Net Backing: An industrial woven wire fence, gauge 14, with 6 inch by 6 inch openings attached to the fencepost. Width of netting: minimum of 3 feet.

3. Posts: Sharpened wood approximately 2 inches square and protrude below the bottom of geotextile to allow a minimum of 2 feet embedment. Post spacing: not to exceed 8 feet. Securely fasten each post to the geotextile and net backing by staples suitable for such purpose.

4. Comply with ASTM 6461.

2. TEMPORARY DRAINAGE SWALE

1. Temporary drainage channel to direct runoff water.

PART 3 EXECUTION

1. EXAMINATION

1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

2. Verify surface water drainage pattern to ensure proper locating of soil erosion and sediment control features.

3. Verify that surfaces and Site conditions are ready to receive work.

2. PREPARATION

1. Preserve salient natural features, keep cut and fill operations to a minimum, and ensure conformity with topography so as to create the least erosion and to adequately handle the volume and velocity of surface water runoff.

2. Whenever feasible, retain, protect, and supplement natural vegetation.

3. Do not damage, degrade, or in any way cause harm to existing above-ground structure or appurtenance, below ground utility, pipe, conduit, cable, conductor, or structure.

4. Performance of temporary erosion control work does not relieve CONTRACTOR of his responsibility for preventing or minimizing the potential for erosion or siltation.

5. Clear and grub areas where soil erosion and sediment control features are to be placed.

3. INSTALLATION, MONITORING AND MAINTENANCE

1. Construct temporary erosion control items in reasonably close conformity with the typical sections and elevation controls shown on the Drawings and in accordance with Soil Erosion and Sediment Control Plan. Actual alignment and/or location of the various items as directed by ENGINEER. Install silt fence in accordance with ASTM D6462.

2. Do not construct silt fence in flowing streams or in swales where there is the possibility of a washout.

3. Check erosion and sediment control measures at frequency defined in the SWPPP and at minimum daily and immediately after each rainfall.

4. Silt fence may be removed at the beginning of the work day, but replaced at the end of the work day.

5. Whenever sedimentation is caused by stripping vegetation, regrading, or other development, remove it from all adjoining surfaces, drainage systems, and watercourses, and repair damage as quickly as possible.

6. Prior to or during construction, ENGINEER may require the installation or construction of improvements to prevent or correct temporary conditions on-Site. Improvements may include berms, mulching, sediment traps, detention and retention basins, grading, planting, retaining walls, culverts, pipes guardrails, temporary roads, and other measures appropriate to the specific condition. All temporary improvements shall remain in place and in operation until otherwise directed by ENGINEER.

7. If fence fabric tears, starts to decompose, or in any way becomes ineffective, replace the affected portion immediately.

8. Unless otherwise shown on the Drawings, or directed by ENGINEER, remove all items upon completion of the Works once vegetation has stabilized. Spread accumulated sediments to form a suitable surface for seeding or dispose of, and shape the area to permit natural drainage; all to the satisfaction of ENGINEER. All materials once removed become the property of CONTRACTOR.

4. FIELD QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

2. ENGINEER will inspect all temporary erosion control items for proper placement and maintenance. All erosion control items shall be maintained in good working order. If any maintenance or repairs are to be made to any erosion control item, the work shall be initiated within 24 hours of inspection.

3. Inspect erosion control items as follows:
    1. Silt Fence: Depth of embedment, tears or holes, erosion around or under the fence, sagging or collapse.

5. CLEANING

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

2. Clean silt fences, bales, diversions, and check dams of excessive sediment accumulation if and when necessary.

3. Remove sediment deposits when the level of deposition reaches approximately one-half the height of the barrier.

END OF SECTION

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
   1. References.
   2. Submittals.
   3. Regulatory requirements.
   4. Temporary Controls:
      1. Water quality monitoring.
      2. Dust, particulate, and organic vapor control.
      3. Pollution control.
      4. Oil spill prevention and control.
   5. Construction equipment.
   6. Removal of temporary facilities and controls.

2. Related Requirements:
   1. Section 01 50 00 – Temporary Facilities and Controls.

2. REFERENCES

1. Abbreviations and Acronyms:
   1. BMPs: Best Management Practices.
   2. NOAA: National Oceanic and Atmospheric Administration.
   3. SDS: Safety Data Sheets.

2. Reference Standards:
   1. Section 01 40 00 - Quality Requirements: Requirements for references.
   2. EPA SWPPP Guide: Developing Your Stormwater Pollution Prevention Plan for Construction, EPA-833-R-06-004 May 2007.
   3. Texas Commission on Environmental Quality (TCEQ) Construction General Permit.

3. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Submit a Storm Water Pollution Prevention Plan in accordance with EPA-833-R-06-004 and TCEQ SWPPP requirements. The plan shall be approved by ENGINEER and implemented prior to commencement of the Works.

3. Submit a Flood Contingency Plan.
   1. Include all necessary data related to actions to be taken in case of river elevation equals or exceeds 10 feet above NAVD88 at the San Jacinto River Gauge in Sheldon, Texas and the proposed measures to protect active work areas, remove stockpiled material from the flood area or backfill to stabilize open excavations, remove equipment and personnel from the flood area.
   2. Identify material and equipment to be used to activate the plan.

3. Addresses emergency backfill capabilities such as availability of adequate fill material, type and availability of backfill equipment, and when emergency backfilling operations would be initiated during a high water period.

4. Submit a Hurricane and Severe Storm Plan. The Plan shall include, but not be limited to, the following:
    1. What type of actions will be taken before storm strikes at the Site.
    2. What weather conditions will require shutdown of the Works and removal of equipment and personnel.
    3. Notes from continuous monitoring of NOAA marine weather broadcasts and other local commercial weather forecasts.
    4. Equipment list with details on their ability to handle adverse weather conditions.
    5. Methods which will be used to secure equipment left onsite during adverse weather conditions.
    6. Evacuation or immediate reaction plans to be taken by personnel for sudden storm occurrences.
    7. Operations procedures which will be used to secure critical equipment during adverse weather conditions.
    8. Communications protocol with local law enforcement and fire and rescue agencies.

5. Submit a Water Quality Control Plan. At a minimum, the plan shall include the following information:
    1. Methods and procedures of excavation and fill placement.
    2. A description of contingency measures that will be implemented in the event water quality compliance criteria are exceeded during the performance of such activities.
    3. A description of BMPs that will be implemented during shoreline construction activities to prevent adverse effects to water quality and to satisfy permit requirements and meet the Project goals.
        1. BMPs shall include a Site-specific Spill Prevention and Counter Measure or Pollution Control Plan that provides a Site plan; a spill containment plan; and measures to contain hazardous and non-hazardous materials.
        2. The spill containment control plan shall include the following information: notification procedures, specific cleanup and disposal instruction for different products, quick response containment and cleanup measures, proposed methods of disposal of spilled materials and employee training on spill containment.
    4. The plan must be reviewed and approved by ENGINEER prior to the start of construction activity.

6. Submit a Water Quality Monitoring Plan in conformance with applicable requirements.

4. REGULATORY REQUIREMENTS

1. CONTRACTOR shall be fully familiar and comply with all applicable environmental acts, regulations and laws.

2. CONTRACTOR shall be responsible for water quality monitoring and environmental controls at the Site to ensure compliance with applicable Project requirements.

5. TEMPORARY CONTROLS

1. Water Quality Monitoring:
    1. CONTRACTOR is responsible for conducting water quality monitoring and for

achieving water quality criteria throughout all construction activities as defined in the Field Sampling Plan (FSP), and applicable local, state and federal standards.
2. If the results of the monitoring show that the water quality standards or Project performance standards are not being met, additional monitoring and mitigation action shall be taken.
3. Any changes to the monitoring requirements must be approved in writing by ENGINEER.
4. Violations of any water quality requirements listed in the FSP may result in work stoppage.
5. Excavation, stockpiling and filling activities shall be performed in a manner that does not adversely impact water quality.

2. Dust, Particulate, and Organic Vapor Control:
   1. Execute the Works by methods to minimize raising dust, odor, and organic vapor from construction operations.
   2. Implement and maintain dust, particulate, odor, and organic vapor control measures immediately during construction and in accordance with the State of Texas regulations and the action levels specified in the Air Monitoring Plan. Conduct and control activities to meet site dust, particulate, odor, and organic vapor control limits as specified in the Air Monitoring Plan.
   3. Provide positive means to prevent airborne dust from dispersing into atmosphere. Use water from a source approved by ENGINEER for a water misting system for dust and particulate control.
   4. Do not use chemical means for a water misting system for dust and particulate control without ENGINEER's prior written approval.
   5. Do not apply vapor suppressing foam for odor and/or organic vapor control without ENGINEER's prior approval.
   6. As a minimum, use appropriate covers on trucks hauling fine, dusty, or vaporous material and use watertight vehicles to haul wet materials.
   7. Prevent dust and odor from becoming a nuisance to adjacent property owners or occupants.
   8. ENGINEER may stop work at any time when CONTRACTOR's control of dusts, particulates, odors, and organic vapor is inadequate for the wind conditions present at the Site, or when the air quality monitoring indicates that the release of fugitive dusts, particulates, odors, or organic vapor into the atmosphere equals or exceeds the specified levels.
   9. In the event that CONTRACTOR's dust, particulate, odors, or organic vapor control is not sufficient for controlling dusts, particulates, odor, or organic vapor into the atmosphere, work shall be discontinued and a meeting held between ENGINEER and CONTRACTOR to discuss the procedures that CONTRACTOR proposes to resolve the problem. Make all necessary changes to operations prior to resuming any excavation, handling, processing, or any other work that may cause a release of dusts, particulates or organic vapors.
   10. Maintain and adjust odor and air emission control efforts as necessary to limit visible dust, dust above control limits of 5 mg/m3 in the work zone and 150 μg/m3 at the Site perimeter, complaints of odors, or as directed by ENGINEER.

3. Pollution Control:
   1. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of pollutants produced by construction operations.
   2. Be prepared to intercept, clean up, and dispose of spills or releases that may occur, whether on land or water. Maintain materials and equipment required for cleanup of spills or releases readily accessible on Site.
   3. Promptly report spills and releases to ENGINEER and OWNER. Examine SDS and

contact the manufacturer of the pollutant, if known, and ascertain the hazards involved, precautions required, and best measures to be used in any cleanup or mitigating action.

4. Take immediate action using available resources to contain and mitigate the effects on the environment and persons from any spill or release.

4. Oil Spill Prevention and Control:
    1. CONTRACTOR shall be responsible for prevention, containment, and cleanup of spilling of oil, fuel and other petroleum products used in CONTRACTOR's operations. All such prevention, containment and cleanup costs shall be borne by CONTRACTOR and shall be conducted in accordance with applicable regulations.
    2. CONTRACTOR is advised that discharge of oil from equipment or facilities is not permitted.
    3. CONTRACTOR shall, at a minimum, take the following measures regarding oil spill prevention, containment and cleanup:
        1. Fuel hoses, lubrication equipment, hydraulically operated equipment, oil drums, and other equipment and facilities shall be inspected regularly for drips, leaks, or signs of damage, and shall be maintained and stored properly to prevent spills. Proper security shall be maintained to discourage vandalism.
        2. Land-based oil and products storage tanks shall be diked or located so as to prevent spills from escaping. Diking and subsoils shall be lined with impervious material to prevent oil from seeping through the ground and dikes.
        3. Fuel storage tanks shall be engineered with anchoring to secure against flotation and lateral movement.
    4. Maintain on the Site the following materials, as a minimum:
        1. Oil-absorbent pads or bulk material.
        2. Oil-skimming system.
        3. Hay bales.
        4. Oil dri-all gloves and plastic bags.

6. CONSTRUCTION EQUIPMENT

1. When heavy equipment is used, the equipment selected shall have the least adverse effects on the environment, e.g., minimally sized, low ground pressure.

2. The equipment operating with hydraulic fluid shall use only those fluids certified as non-toxic to aquatic organisms.

3. The equipment shall be free of external petroleum-based products.

4. Accumulation of soils or debris shall be removed from the drive mechanisms (wheels, tires, tracks, etc.) and undercarriage of equipment prior to its use. Check the equipment daily for leaks and complete any necessary repairs prior to commencing work activities near the water.

5. All stationary power equipment such as generators, cranes, or other stationary equipment, operated within 150 feet of any waterbody shall be diapered to prevent leaks unless suitable containment is provided to prevent potential spills for entering the water.

6. Refueling areas shall employ standard mitigations (e.g., a gently sloping area with compacted soils and three- sided containment berm) operator training, emergency response planning and equipment maintenance.

7. A refueling station shall be set up within the designated area so that any accidental leaks of petroleum products during equipment fueling and maintenance will be contained and managed within the refueling area. This station should have a liner/spill containment control features (e.g., collection systems, berms) and fuel tanks shall be engineered with anchoring to secure against flotation and lateral movement.

7. REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

1. Comply with Section 01 50 00.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. Basic product requirements.
    2. Product options.
    3. Product substitutions.
    4. Product delivery and handling requirements.
    5. Product storage and handling requirements.

2. BASIC PRODUCT REQUIREMENTS

1. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

2. Provide interchangeable components of the same manufacturer for components being replaced.

3. PRODUCT OPTIONS

1. Products Specified by Reference Standards or by Description Only: Any approved product meeting those standards or descriptions.

2. Products Specified by Naming One or More Manufacturers With a Provision Not Prohibiting Substitutions: Products of manufacturers named and meeting specifications. Submit a request for substitution for any manufacturer not named in accordance with the following article.

3. Products Specified by Naming One or More Manufacturers With a Provision Prohibiting Substitutions: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

4. PRODUCT SUBSTITUTIONS

1. Document each request with complete data substantiating compliance of proposed substitution with the Contract Documents.

2. A request for substitution constitutes a representation that CONTRACTOR:
    1. Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product.
    2. Will provide the same warranty for the substitution as for the specified product.
    3. Will coordinate installation and make changes to other Works which may be required for the Works to be complete at CONTRACTOR's expense and at no additional cost to OWNER.
    4. Waives claims for additional costs or time extension which may subsequently become apparent.

3. Substitutions will not be considered when they are shown or implied on Shop Drawings or product data submittals without separate written request.

4. Substitution Submittal Procedure after the Notice to Proceed:
    1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
    2. Submit Shop Drawings, product data, and certified test results and other data as required by ENGINEER attesting to the proposed product equivalence. Burden of proof is on CONTRACTOR.
    3. ENGINEER will notify CONTRACTOR in writing of decision to accept or reject request.
    4. ENGINEER will be sole judge as to the acceptance or rejection of CONTRACTOR's request.
    5. In the event CONTRACTOR obtains ENGINEER's approval for the use of products other than that shown or specified, CONTRACTOR shall, at CONTRACTOR's own expense and using methods approved by ENGINEER, make all changes to the Works, including structures, piping, electrical, equipment, and controls, that may be necessary to accommodate this product.

5. PRODUCT DELIVERY AND HANDLING REQUIREMENTS

1. Make all arrangements for transportation, delivery, and handling of products required for prosecution and completion of the Works.

2. Arrange delivery of products to the Site in accordance with work sequence and in ample time to facilitate inspection prior to installation. Schedule deliveries to limit requirement for storage at the Site to the practical minimum.

3. Do not have products delivered to the Site until related Shop Drawings or Samples have been approved by ENGINEER.

4. Do not have products delivered to the Site until required storage facilities have been provided.

5. Transport and handle products in accordance with manufacturers' instructions.

6. Immediately on delivery, inspect shipments to ensure that products comply with requirements of the Contract Documents and reviewed submittals, quantities are correct, and products are undamaged.

7. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

6. PRODUCT STORAGE AND HANDLING REQUIREMENTS

1. Limit on-Site storage of products to areas shown on the Drawings or otherwise approved by ENGINEER.

2. Make all arrangements and provisions necessary for storage of materials and equipment.

3. Place all excavated materials, construction equipment, and materials and equipment to be incorporated into the Works so as not to injure any part of the Works or existing facilities and

so that free access can be had at all times to all parts of the Works and to all utility service company installations in the vicinity of the Works.

4. Store and protect products in accordance with manufacturers' recommendations and instructions and requirements of Specifications, with seals and labels intact and legible.

5. Store sensitive products in weathertight, climate-controlled enclosures. Protect products subject to ultraviolet degradation from direct exposure to sunlight.

6. For exterior storage of fabricated products, place on sloped supports, above ground.

7. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of product.

8. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

9. Furnish equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

10. Arrange storage of products to permit easy access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

11. Store materials and equipment neatly and compactly, and in locations that will cause a minimum of inconvenience to Other Contractors, public travel, adjoining owners, tenants, and occupants.

12. Protect delivered products from contamination or damage.

13. Do not use lawns, grass plots, or other private property for storage purposes without written permission of OWNER or other person in possession or control of such premises.

14. CONTRACTOR shall be fully responsible for loss or damage to stored products, materials, and equipment.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. Examination.
    2. Field surveying.
    3. Restoration.
    4. Progress cleaning.
    5. Final cleaning.
    6. Final decontamination.
    7. Removal and disposal.
    8. Protection.
    9. Closeout procedures.
    10. Project record documents.
    11. Warranties.

2. EXAMINATION

1. Prior to commencement of work at the Site, inspect the Site with ENGINEER to review and establish the condition of surface features including existing roads, parking areas, buildings, wells, trees, and other plants, grassed areas, fencing, service poles, wires, paving, and survey bench marks or monuments on or adjacent to the Site which may be affected by the Works. Photograph roads and immediate adjacent areas; submit copies to ENGINEER. This inventory shall be mutually agreed between ENGINEER and CONTRACTOR and shall not thereafter be subject to dispute. Such inventory as may be amended, from time to time, will be used by ENGINEER to check compliance by CONTRACTOR with the requirements of the Contract Documents.

2. Provide ongoing review, inspection, and attendance during performance of the Works to properly document conditions. Promptly inform ENGINEER of any existing condition at the Site affected by the Works which may require restoration, repair, or replacement. Do not cover up any of the Works without prior approval from ENGINEER.

3. Maintain and protect existing Site structures and facilities from damage which may be affected by the Works while work is in progress. Repair or replace damage resulting from the Works to ENGINEER's approval.

4. Examine and verify specific conditions described in individual Sections.

5. Verify that utility services are available, of the correct characteristics, and in the correct location.

3. FIELD SURVEYING

1. Quality Assurance:
    1. Employ a land surveyor registered in the State of Texas and acceptable to ENGINEER

to perform survey work of this Article. CONTRACTOR's registered land surveyor shall complete pre-construction, in-progress, final grade, and as-built topographic surveys, sheet pile monitoring survey, and other survey activities necessary for design verification, and quantity calculations. If initial and subsequent surveys are in whole or in part performed by means of GPS-equipped construction equipment, perform supplemental control surveys approved by ENGINEER.

2. Notify ENGINEER in advance of commencing work on any part of the construction to enable ENGINEER to establish benchmarks and base lines.
3. Unless otherwise specified, ENGINEER will establish and provide to CONTRACTOR reference benchmarks and base lines adjacent to the Works. CONTRACTOR shall be responsible for laying out the Works from established reference points.
4. ENGINEER may, at any time, check CONTRACTOR's survey and layout work but this shall not relieve CONTRACTOR of any of its responsibilities to carry out the Works to the lines and grades set out according to the Drawings and Project Specifications or as otherwise necessary for performance of the Works according to the Contract Documents.

2. Submittals:
   1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
   2. Submit paper and digital copies of registered Site drawing(s) and certificate signed by the land surveyor engaged by CONTRACTOR that the elevations and locations of the Works are in conformance with Project documents. Information shall include surface (XML) files, point files, CAD drawings and PDF figures. Provide digital copy, on USB memory stick or electronic file transfer or Compact Disc (CD) compatible for use with Windows 10, 64-bit and AutoCAD 3-D Civil (2019).
   3. On request, submit documentation verifying accuracy of survey work.

3. Survey Reference Points:
   1. Locate, preserve, and protect survey control and reference points.
   2. Control datum for survey is that shown on the Drawings.
   3. Promptly report to ENGINEER the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
   4. Make good any errors entering into the Works through CONTRACTOR failure to notify ENGINEER concerning lack of preservation of such survey reference points.
   5. Accurately replace or relocate disturbed reference or survey control points based on original survey control. Make no changes without prior written notice to and approval from ENGINEER.

4. Examination:
   1. Verify locations of survey control points prior to starting work.
   2. Verify set-backs, easements, and clearances, confirm Drawing dimensions and elevations.
   3. Promptly notify ENGINEER of any discrepancies discovered.

5. Survey Requirements:
   1. Utilize recognized engineering survey practices. Locate and lay out the Works using properly calibrated instrumentation.
   2. Establish elevations, lines, and levels and mark out work zone.
   3. Periodically verify layouts by same means and methods.
   4. Establish a minimum of four temporary bench marks on Site, referenced to established control points. Record locations, with horizontal and vertical data, on Project record documents.
   5. Provide reasonable and necessary opportunities and facilities for setting points and making measurements during construction.
   6. Confirm and document locations of all utilities.

7. Develop and make such additional detailed surveys as are needed for construction, such as bench marks, slope stakes, batterboards, stakes for establishing the design elevations of excavations and final grades, as-builts, and other working points, lines, and elevations. Maintain bench marks and base lines established by ENGINEER, existing property boundaries, lines and grade hubs, and other references and construction or survey points.
8. Record sheetpile locations.
9. Monitor sheetpile deflection at designated locations.

6. Record Documents:
   1. Maintain a complete and accurate log of control and survey work as it progresses.

4. RESTORATION

1. As a minimum, restoration shall mean replacement, repairs, or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Works.

2. Except where specifically required otherwise by other Sections, restore areas of the Works and areas affected by the performance of the Works to conditions that existed prior to commencement of the Works and to match condition of similar adjacent, undisturbed areas.

3. Ensure that restored areas match existing grade and surface drainage characteristics, except as otherwise specified, and ensure a smooth transition from restored surfaces to existing surfaces.

4. Do not alter original conditions without prior written approval from ENGINEER.

5. Without limiting the generality of the foregoing or other requirements of the Contract Documents, preserve and protect existing features encountered at the Site during performance of the Works including, but not limited to buildings, wells, structures, curbs and gutters, fences, pavement, manholes and catch basins, utilities, railroad sidings, roads, streets, walks, grassed areas, and other graded or improved areas.

6. Utilize construction methods and procedures during performance of the Works which keeps disturbance and damage of whatever nature to existing conditions to the practical minimum. Where work necessitates root or branch cutting, do not proceed without ENGINEER's prior approval.

7. Ensure that quality, grades, elevations, and the extent of bedding, cover, and other backfill materials including subgrades, finish grades, and thickness of pavements for roadways and parking areas are properly documented during their removal to ensure reconstruction to at least their original and functional condition.

8. Restoration Material: New, except as otherwise specified, not damaged or defective, and of the best quality for the purpose intended. Furnish evidence as to type, source, and quality of materials or products furnished when requested by ENGINEER or specified in other Sections.

9. Should any dispute arise as to the quality or fitness of materials, whether obtained on or off Site, whether previously inspected by ENGINEER prior to use or not, the decision to use any material or product in the finished Works will rest solely with ENGINEER.

10. Remove from the Site clean material not approved for reuse.

11. Handle and store products and materials in a manner to prevent damage, adulteration, deterioration, and soiling and according to manufacturers' instructions when applicable.

12. Prior to commencement of restoration work, inform ENGINEER of proposed material, methods, and procedures to repair, replace, or reconstruct disturbed, damaged, or suspected damage to the Works.

13. Perform cutting, fitting, remedial, and coordination work to make the several parts of the Works fit together.

14. Except as specified otherwise, dismantle and salvage materials for reuse where practicable. Exercise due care when removing material for salvage. Repair or replace materials damaged through improper handling or through loss after removal.

15. Store and protect removed material approved for reuse in approved locations. Beginning of restoration work means acceptance of existing conditions.

16. Unless otherwise specified, restore pavement by:
    1. Removing and replacing the entire portions between joints or scores and not merely refinishing or patching localized areas.
    2. Saw cutting surfaces, curbs and gutters, and similar structures or surfaces.
    3. Protecting adjacent joints and load transfer devices and underlying granular materials.

5. PROGRESS CLEANING

1. Execute cleaning during progress of the Works.

2. Requirements of Regulatory Agencies:
    1. In addition to the requirements herein, maintain the cleanliness of the Works and surrounding premises within the Works limits to comply with federal, state, and local fire and safety laws, ordinances, codes, and regulations.
    2. Comply with all federal, state, and local anti-pollution laws, ordinances, codes, and regulations when disposing of waste materials, debris, and rubbish.

3. Coordinate cleaning operations with disposal operations to prevent accumulation of dust, dirt, debris, rubbish, and waste materials on or within the Works or on the premises surrounding the Works.

6. FINAL CLEANING

1. Execute final cleaning prior to Substantial Completion of the Works.

2. Clean debris from drainage systems.

3. Clean the Site; sweep paved areas and rake clean landscaped surfaces.

4. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.

5. Maintain cleaning until acceptance by OWNER.

7. FINAL DECONTAMINATION

1. Perform final decontamination of construction facilities, equipment, and materials which may have come in contact with potentially impacted materials prior to removal from the Site.

2. Perform decontamination as specified in Section 01 50 00 to the satisfaction of ENGINEER. ENGINEER will have the right to direct CONTRACTOR to perform additional decontamination if required.

8. REMOVAL AND DISPOSAL

1. Remove surplus materials and temporary facilities and controls from the Site.

2. Dispose of all waste materials, litter, debris, and rubbish off Site.

3. Do not burn or bury rubbish and waste materials on Site.

4. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

5. Do not discharge wastes into streams or waterways.

6. Dispose of the following materials at an appropriate off Site facility approved by OWNER:
    1. Debris including excess construction material, litter, and rubbish.
    2. Spent Tyvek and other disposable personal protective equipment worn during final cleaning.
    3. Water removed from water storage tank, water generated from final decontamination operations including water storage tank cleaning.
    4. Lumber from the decontamination pads.

7. Dispose of materials according to Section 02 61 16.

9. PROTECTION

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protection of installed work.

2. Protect installed work and provide special protection where specified in individual Sections.

    1. Provide temporary and removable protection for installed products. Control activity in the immediate work area to prevent damage.

    2. Prohibit traffic on landscaped areas.

    3. Maintenance of Flow: Maintain the flow of water in existing sewers, drains, and watercourses. In the event that any emergency or situation should arise which requires interruption of normal operation of any existing systems, restore normal operation as soon as possible even though permission for such planned shutdown was obtained.

    4. Flotation: Take necessary precautions against the flotation of any structures during construction. Make good any damage caused by flotation.

10. CLOSEOUT PROCEDURES

    1. Submit written certification that the Contract Documents have been reviewed, the Works has been inspected, and that the Works is complete according to the Contract Documents and in compliance with applicable laws and regulations including, but not limited to, the provision of all applicable federal, state, and local health, safety, and environmental laws and regulations, including OSHA, and ready for ENGINEER's review.

    2. Complete and furnish submittals to ENGINEER that are required by the Contract Documents.

11. PROJECT RECORD DOCUMENTS

    1. Maintain one set of the following Project record documents on Site; record actual revisions to the Works to include:
        1. Drawings.
        2. Specifications.
        3. Reviewed Shop Drawings, product data, and Samples.
        4. Manufacturer's instruction for assembly, installation, and adjusting.
        5. Decontamination records.
        6. Erosion and Sediment Control inspections.
        7. Transportation and Disposal records.

    2. Ensure entries are complete and accurate, enabling future reference by OWNER.

    3. Store Project record documents separate from documents used for construction.

    4. Retain all documents relating to the Project on-Site including, but not limited to, emails, paper, sketches, testing results, and communications.

    5. Record information concurrent with construction progress.

    6. Specifications: Legibly mark and record, at each Section of the Specifications, a description of actual products installed.

    7. Project Record Documents and Drawings: Legibly mark each item to record actual construction including:
        1. Field changes of dimension and detail.
        2. Details not on original Drawings.
        3. Provide AutoCAD 3-D Civil (2019) files of as-built drawings on USB memory stick or electronic file transfer or Compact Disc (CD) compatible for use with Windows 10, 64 bit.

    8. Remove ENGINEER title block and seal from all documents generated by CONTRACTOR.

    9. Submit documents to ENGINEER.

    10. Site Records: CONTRACTOR shall keep a complete, current, and permanent record at the Site of all data required to be maintained by the Contract Documents, including, but not limited to, the dates of commencement and completion of all aspects of the Works, daily records of the number of workers, the number and type of equipment engaged on the Works

and on each division of the Works, survey information, and test results, and make such data available to ENGINEER upon request.

12. PRODUCT WARRANTIES

1. Obtain product warranties executed in duplicate by responsible Suppliers and manufacturers upon completion of the applicable item of the Works. Except for products put into use with OWNER's permission, leave date of beginning of time of warranty open until the date of Substantial Completion is determined.

2. Fill out original warranty forms in OWNER's name and register with manufacturers. Include coverage for specified performance requirements. Verify that documents are in proper form, contain full information, and are notarized.

3. Execute any special warranties and guarantees as required by the Contract Documents and laws or regulations.

4. Retain warranties until time specified for submittal.

5. Ensure that documentation regarding the terms of applicable warranties and all technical specifications, owners' manuals, operating instructions, or other information relating to materials or equipment that are covered by warranties are compiled.

6. For equipment or component parts of equipment put into service during construction with OWNER’s permission, submit documents after acceptance.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 91 00

WATER TREATMENT CONSUMABLES

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
   1. Water Treatment Chemical Requirements.
2. Related Requirements:
   1. Section 46 07 01 – Water Treatment System.

2. REFERENCES

1. Definitions:
   1. IBC Tote: Intermediate bulk container, a reusable container for transportation and storage of bulk liquid and granular materials.
   2. WTS: Water Treatment System.

3. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

4. SYSTEM DESCRIPTION AND OPERATION

1. Final treatment chemical selection and dosage shall be confirmed by CONTRACTOR during execution of jar testing on Site.

2. Maintain sufficient quantity of consumables to ensure uninterrupted excavation operation and operation of the WTS.

3. Water Treatment System:
   1. The WTS processes shall require the following (or equivalent chemicals) to facilitate successful water treatment:
   2. Coagulant (Polyaluminum Chloride or approved equal).
   3. Polymer for WTS.
   4. Polymer for sludge thickening (provisional)
   5. Acid or Caustic (provisional).
   6. Organosulfide
   7. Sand Filter Media.
   8. Anthracite Filter Media.
   9. Bag/Cartridge Filters
   10. Granular Activated Carbon Media.

4. Health and Safety:
   1. Provide SDSs for all chemical used on Site.
   2. Follow manufacturer's instructions for safe handling and use.

3. Document proper procedures for storing and handling all chemicals in the Project Health and Safety Plan (HASP).
4. Provide storage and secondary containment accessories/provisions per manufacturer recommendations.

PART 2 PRODUCTS

1. WATER TREATMENT SYSTEM CHEMICALS
    1. Consumable chemicals are estimated based on anticipated 3.0 and 5.0 million gallons of contact water in the first and second seasons of construction, respectively. This includes precipitation, water infiltration, and existing water in excavation cells.

    2. Coagulant:
        1. Service: Coagulation of suspended particles in the impacted water.
        2. Storage Container: IBC Tote or approved equal.
        3. Chemical Product: Polyaluminum Chloride or approved equal.
        4. Estimated Total Quantities: 2,500 lbs. (Season 1) and 4,200 lbs (Season 2)
        5. Other Requirements: Provide secondary containment for chemical as per supplier recommendations.

    3. Polymer for WTS:
        1. Service: Flocculation of Dredged Sediment/Sludge.
        2. Storage Container: Bulk or IBC tote or approved equal.
        3. Chemical Product: As recommended by manufacturer.
        4. Estimated Total Quantities: 630 lbs. (Season 1) and 1,050 lbs (Season 2)
        5. Other Requirements: Provide secondary containment for drums and provide all necessary equipment per supplier recommendations for preparation/activation and dosing of chemical. Polymer shall be activated/diluted prior to dosing into sediment/sludge.

    4. Polymer for sludge thickening (provisional):
        1. Service: Flocculation of sludge coming from the bottom of the clarifier.
        2. Storage Container: Bulk or IBC tote or approved equal.
        3. Chemical Product: As recommended by manufacturer.
        4. Estimated Total Quantities: 650 lbs (Season 1) and 1050 lbs (Season 2).
        5. Other Requirements: Provide secondary containment for drum and provide all necessary equipment per supplier recommendations for preparation/activation and dosing of chemical. Polymer shall be activated/diluted prior to dosing into sediment/sludge.

    5. Acid or Caustic (provisional):
        1. Service: pH adjustment of WTS.
        2. Storage Container: 55 gallons drum or IBC Tote or approved equal.

    6. Chemical Product: 93% sulfuric acid, 50% sodium hydroxide or approval equal.
        1. Estimated Total Quantities: TBD
        2. Other Requirements: Provide secondary containment for acid or caustic storage.

7. Organosulfide (provisional):
    1. Service: Metals precipitation in the impacted water. Organosulfide may be added depending on influent soluble metals concentrations.
    2. Storage Container: IBC Tote or approved equal.
    3. Estimated Total Quantities: 4590 lbs.
    4. Other Requirements: Provide secondary containment for chemical as per supplier recommendations.

8. Filter Media:
    1. Service: Removal of particulates following coagulation/flocculation.
    2. Storage Container: 23 kg bags or 500 kg super sacs or approved equal.
    3. Chemical Product: Liquid phase sand (0.45-0.55 UC)/anthracite (0.8 x 1.2 mm) filter media.
    4. Estimated Total Quantities: Assume one media filter change out per month of operation of the water treatment system per vessel. However, media change out will depend on quality of the effluent or differential pressure of each vessel.
    5. Other Requirements: CONTRACTOR shall be fully responsible for media filter vessel loading and removal/disposal of spent filter media.

9. Bag/Cartridge Filters:
    1. Service: removal of suspended particles larger than 1 micron. Bag or cartridge filters (10 micron and 1 micron, both with minimum 95% removal efficiency) will be configured downstream of the temporary treatment system multimedia filters. As the filters are fouled (with captured solids), they will need to be removed and replaced.
    2. Estimated Daily Quantities: Will depend on clarification efficiency. It is expected that filters will need to be replaced on a weekly basis.
    3. Other Requirements: CONTRACTOR shall be fully responsible for filter change out and removal/disposal of spent filters.

10. Granular Activated Carbon (GAC) Media:
    1. Service: Removal of remaining chemicals of concern.
    2. Storage Container: 20,000 lbs.
    3. Chemical Product: Virgin coconut shell GAC media, 8 x 30 mesh.
    4. Estimated Daily Quantities: CONTRACTOR should assume a minimum of one GAC media change outs every 2 months of operation of the water treatment system per vessel. However, media change out will depend on quality of the effluent or differential pressure of each vessel.
    5. Other Requirements: CONTRACTOR shall be fully responsible for GAC vessel loading and removal/disposal of spent GAC media.

11. Summary Table of estimated chemical quantities:

Chemicals	Unit	Estimate Dosage (mg/L)	Estimated Quantity (Season 1)	Estimated Quantity (Season 2)
Coagulant	Pounds	100	2,500	4,100
Polymer for WTS	Pounds	25	630	1,050
Organosulfide	Pounds	50	1,300	2,100
Polymer for sludge thickening	Pounds	500	650	1,050
Acid/Base	Pounds	TBD	TBD	
Note: Estimated quantities are based on an antipcated 3.0 and 5.0 million gallons of contact water from the first and second seasons of construction, respectively.				

1. PART 3 EXECUTION – Not Used

END OF SECTION

SECTION 01 91 20

FACILITY TESTING AND COMMISSIONING

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. References.
    2. Submittals.
    3. CONTRACTOR's testing and startup representative.
    4. Equipment testing.
    5. Facility startup and performance evaluation.

2. REFERENCES

1. Definitions
    1. Facility: The entire Works, or an agreed upon acceptable portion, including all of its unit processes.
    2. Field Quality Control: Term, as used in individual Specification Sections, which refers to the specified on Site functional and performance testing of equipment.
    3. Functional Test: Test or tests performed in the presence of ENGINEER and OWNER to demonstrate that the installed equipment meets the manufacturer's installation, calibration, and adjustment requirements and any other requirements as specified in the Contract Documents.
    4. Performance Test: A test performed in the presence of ENGINEER and after any required functional tests have been completed, to demonstrate and confirm that the individual equipment meets the performance requirements specified in the individual Specification Sections.
    5. Source Quality Control: Term, as used in individual Specification Sections, which refers to the specified testing performed on specified equipment at the manufacturer's facility prior to shipment.
    6. Unit Process: As used in this Section, a unit process is a portion of the facility that performs a specific process function.

3. SUBMITTALS

1. Section 01 30 00 - Administrative Requirements: Requirements for submittals.

2. Completed Manufacturer's Certificate of Proper Installation as required by any individual Specification Sections. Submit prior to beginning any facility startup procedures.

3. Equipment Test Report Form: Provide a written test report form for each item of equipment to be tested, to include the following information, at a minimum:
    1. Project Name.
    2. Equipment or item tested.
    3. Date and time of test.
    4. Type of test performed (functional or performance).

5. Test conditions.
6. Test results.
7. Signature space.

4. Testing Plan:
    1. Functional and performance test schedules, test plan, procedures, and log format.
    2. Facility Startup and Performance Evaluation Plan: Submit prior to the commencement of startup.

5. Certification of calibration for testing equipment.

4. CONTRACTOR'S TESTING AND STARTUP REPRESENTATIVE

1. Designate and provide one or more of CONTRACTOR's personnel to coordinate and expedite testing and facility startup. Such person or persons shall be present during all equipment testing and facility startup meetings and shall be available, at all times, during the testing and the facility startup and the performance evaluation period.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

1. EQUIPMENT TESTING

1. Preparation:
    1. General:
        1. Complete the installation of each unit and related processes before testing, including all related manufacturer's representative services.
        2. Provide qualified manufacturer's representatives, when required by individual Specification Sections, to assist in testing.
        3. Obtain, from the equipment manufacturer's representative, the manufacturer's certificate of proper installation, when required by individual Specification Sections.
        4. Schedule equipment testing and facility startup meetings to discuss the test schedule, plan of test, materials, chemicals and liquids required.
        5. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required in order to conduct testing.
        6. Unless otherwise indicated in the Contract Documents, provide water, power and chemicals as required for all testing and facility startup.
    2. Cleaning and Checking: Prior to beginning functional testing:
        1. Calibrate all testing equipment in accordance with the manufacturer's instructions.
        2. Inspect and clean all equipment, devices, connected piping, and structures to ensure that they are free of foreign material.
        3. Lubricate equipment in accordance with the manufacturer's instructions.
        4. Turn rotating equipment by hand when possible in order to confirm that the equipment is not bound.
        5. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
        6. Check the power supply to electric powered equipment for the correct voltage.

7. Adjust clearances and torque.
8. Test piping for leaks.

3. The “ready to test” determination will be made by ENGINEER based on completion of the following, at a minimum:
    1. Notification by CONTRACTOR of the equipment’s readiness for testing.
    2. Acceptable testing plan.
    3. Acceptable Operation and Maintenance Manuals.
    4. Receipt of the Manufacturer’s Certificate of Proper Installation, if so specified in the Contract Documents.
    5. Adequate completion of the Works adjacent to, or interfacing with, the equipment to be tested.
    6. Availability and acceptability of the manufacturer’s representative, when specified in the Contract Documents, to assist in testing of the respective equipment.
    7. Fulfillment of all other manufacturers’ responsibilities as specified in the Contract Documents to the satisfaction of ENGINEER.
    8. Completion of the equipment and electrical tagging.
    9. Delivery of all spare parts and special tools.

2. Functional Testing:
    1. Conduct as specified in individual Specification Sections.
    2. Notify ENGINEER and the manufacturer’s representative in writing prior to the scheduled date of testing.
    3. When, in ENGINEER’s opinion, the equipment meets the functional requirements specified in the Contract Documents, such equipment will be accepted for the purpose of advancing to the performance testing phase, if so required by individual Specification Sections.

3. Performance Testing:
    1. Conduct as specified in individual Specification Sections.
    2. Notify ENGINEER prior to the scheduled date of the test.
    3. Performance testing shall not commence until the equipment has been approved by ENGINEER as having satisfied the functional test requirements specified in the Contract Documents.
    4. Follow the testing plan approved by ENGINEER and detailed procedures specified in the Contract Documents.
    5. Unless otherwise indicated in the Contract Documents, furnish all labor, materials, and supplies required for conducting the test and taking all samples and performance measurements.
    6. Prepare a performance test report summarizing the test method and results.
    7. When, in ENGINEER’s opinion, the equipment meets the performance requirements specified in the Contract Documents, such equipment will be accepted as conforming to the Contract requirements. Such acceptance will be evidenced by ENGINEER’s signature on the Equipment Test Report.

2. FACILITY STARTUP AND PERFORMANCE EVALUATION

1. General:
    1. Equipment shall be accepted by ENGINEER as having met the requirements for functional testing as specified in the Contract Documents prior to facility startup.
    2. Sequence each unit process to the point that the complete facility is operational for the evaluation of unit process and facility performance.
    3. Demonstrate the proper operation of required interfaces within and between the

individual unit processes.
4. Provide the Subcontractors' and the equipment manufacturers' respective staff with adequate notice in order to prevent delays.
5. Schedule ongoing Works so as not to interfere with, or delay, the completion of facility startup.
6. After the facility is operating, complete the performance testing of those items of equipment which have not been previously tested.

2. Facility Startup and Performance Evaluation Plan:
    1. Develop a plan detailing step by step instructions for the startup of each unit process and the complete facility.
    2. Include a method of evaluation and an overall performance report for each unit process.
    3. The plan shall consist of bound copies of the Startup and Performance Evaluation Forms. Use one form for each unit process; use the sample form attached as a supplement to this Section, or one designed by CONTRACTOR which is acceptable to OWNER.
    4. The Startup and Performance Evaluation Form will include the following, at a minimum:
        1. Description of the unit process being started.
        2. All equipment and devices included in the unit process.
        3. Unit process startup procedures (including but not limited to, valves to be open/closed, order of equipment startup).
        4. Requirements for all water, power, and chemicals needed for startup.
        5. CONTRACTOR's certification that each unit process is capable of performing its intended function(s), including fully automatic operation.
        6. Space for evaluation comments.

3. ENGINEER's Responsibilities:
    1. Assist CONTRACTOR in developing a Facility Startup and Performance Evaluation Plan.
    2. Provide labor and materials as required for sampling and laboratory analyses.

4. Facility Startup Period:
    1. Startup sequencing of unit processes shall be as determined by CONTRACTOR.
    2. Make all adjustments, repairs, and corrections necessary to complete the facility startup.
    3. Startup of the entire facility or any portion thereof shall be considered complete when, in the opinion of ENGINEER, the facility or a designated portion of the facility has operated in the manner intended for 7 continuous days without significant interruption. This period is in addition to any training, functional, or performance test periods specified elsewhere in the Contract Documents.
    4. Significant Interruption: May include any of the following events:
        1. Failure of CONTRACTOR to provide and maintain qualified on Site startup personnel as scheduled.
        2. Failure to meet the specified performance for more than 2 consecutive hours.
        3. Failure of any critical equipment or unit process that is not satisfactorily corrected within 5 hours after the commencement of the failure.
        4. Failure of any noncritical equipment or unit process that is not satisfactorily corrected within 8 hours after the commencement of the failure.
        5. Any other event which ENGINEER, in its sole discretion, deems to be a significant interruption.

    5. A significant interruption will require that the startup in progress be stopped and restarted after all corrections are made.

5. Facility Performance Evaluation:
    1. During the facility startup period, CONTRACTOR shall conduct a performance evaluation for the purpose of evaluating the full capabilities of the facility.
    2. Certify, on the Facility Performance Evaluation Form, that each unit process is capable of performing its intended function(s), including fully automatic operation.

3. ATTACHMENTS

1. The attachment listed below forms part of this Section:
    1. Startup and Performance Evaluation Form.

END OF SECTION

STARTUP AND PERFORMANCE EVALUATION FORM

OWNER:_____ PROJECT:_____

Unit Process Description: (Include description and equipment number of all equipment and devices):

Startup Procedure (Describe procedure for sequential startup and evaluation, including valves to be opened/closed, order of equipment startup, etc.):

Startup Requirements (Water, power, chemicals, etc.):_____

Evaluation Comments:_____

CONTRACTOR Certification that Unit Process is capable of performing its intended function(s), including fully automatic operation:

Firm Name:_____

Startup Representative:_____ Date:_____, 20
(Authorized Signature)

SECTION 02 61 14

MATERIAL HANDLING AND TRANSPORTATION

PART 1 GENERAL

1. SECTION INCLUDES

1. Loading, handling, and transportation of materials excavated from work areas using CONTRACTOR-constructed access roads.

2. Loading and transportation of imported common fill, topsoil, and aggregate from off-site source(s).

2. REFERENCES

1. Section 01 40 00 - Quality Requirements: Requirements for references.

2. Environmental Protection Agency (EPA): SW-846 Method 9095B - Paint Filter Liquids Test.

3. SYSTEM DESCRIPTION

1. This Section applies to planning, and providing equipment and services necessary to load, transport, unload and stockpile (as necessary), and handle the following materials, and to decontaminate the equipment.
    1. Common fill.
    2. Topsoil.
    3. Aggregate.
    4. Liquids.
    5. Construction materials (impacted and non-impacted soils).

2. Refer to Section 02 61 16 for Off-Site Transportation and Disposal.

4. PROGRESS SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Material Handling and On-Site Transportation Plan:
    1. Before beginning any excavation, prepare a detailed Material Handling and Transportation Plan that describes how consolidated materials will be handled, staged, loaded, transported on Site and on public roads, and how equipment will be decontaminated, including list of type and size of transport vehicles. The Plan shall be designed so that handling and transportation measures prevent the spread of contamination and ensure compliance with local restrictions. The Plan shall be designed with traffic controls which comply with applicable traffic regulations with respect to public roads. As a minimum, the Plan shall consider including the use of flag persons and appropriate signage at all times when vehicles are utilizing entrances to public roads.

2. The Plan shall include local permits, if needed, to transport materials on public roads.

5. ENVIRONMENTAL REQUIREMENTS

1. Safeguards and Protective Barriers:
   1. Provide protective barriers to minimize the spread of contamination during handling. Items may include tarpaulin on a wooden frame to protect the side of the truck during loading, plastic sheeting on the ground during loading and unloading, and dump ramps during unloading to protect the undercarriage.
   2. Provide appropriate safeguards (e.g., bump guards, signs) as necessary.

PART 2 PRODUCTS

1. VEHICLES AND CONTAINERS

1. Motor Vehicles and containers designated for use only for specific materials in the Material Handling and Transportation Plan shall be so labeled or identified.

2. Motor Vehicles: Refer to Section 02 61 16.

3. Containers, Truck Beds and Roll on/Roll off Boxes:
   1. Free from drain holes, cracks, or other conditions that might allow leakage of liquids or solids.
   2. Free from conditions that might allow waste to accumulate.
   3. Fully lined to prevent leakage when transporting impacted soils off-site.
   4. Covers to prevent accumulation of rain water or release of dust.
   5. Refer to Section 01 50 00.

2. WATER STORAGE TANKS

1. Refer to Section 46 07 01.

PART 3 EXECUTION

1. EXAMINATION

1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

2. Verify that surfaces and the Site conditions are ready to receive work.

2. MATERIAL HANDLING AND TRANSPORTATION

1. General:
   1. Take necessary precautions for safe operation of the equipment and protection of the public, workers, and the environment from injury and damage from equipment.

Operators shall be properly licensed and insured.
2. Equipment and tools associated with impacted materials shall be used exclusively for that purpose until released. Items shall be decontaminated in accordance with Paragraph 5.1 and the Material Handling and Transportation Plan.
3. Keep a log in each truck recording the following information for each trip:
    1. Date and time of loading.
    2. Area within the Site from which the material was obtained.
    3. Destination.
    4. Quantity (e.g., approximate cubic yards, approximate weight, or specific number of containers).
    5. Date and time of unloading.
4. When not in use, secure vehicles in the secured excavation support areas, with keys removed and doors locked. Security shall be solely the responsibility of CONTRACTOR.

2. Loading:
    1. Inspect containers before loading of excavated material to be disposed of off-site at the excavation areas to verify that no water or liquid has been introduced and the vehicle/container has not been damaged. Test seals on watertight containers on a weekly basis to confirm seals are watertight. Maintain a log of seal testing.
    2. Use protective barriers around transport vehicles and take care to prevent spread of excavated materials to the ground surface beyond the excavation limits.
    3. Install and secure truck bed covers over non-containerized material. Secure tailgates during transit.
    4. Decontaminate vehicles before leaving the work area as required by the Material Handling and Transportation Plan. Collect and transport sediments removed from vehicles and equipment for off-site disposal in accordance with Section 02 61 16.

3. Transportation:
    1. Control free water from the soils and sediments. Do not track material onto clean areas or transportation routes.
    2. Collect, pump, and/or transport contact water to temporary Water Treatment Plant. This includes water from excavations, stockpile pads, and decontamination pad(s). Control water handling to prevent accidental spills in accordance with Section 01 50 00.
    3. Do not deviate from the on-Site transportation routes approved by ENGINEER without prior written approval from ENGINEER.
    4. In the event of accidents, spills, or releases, comply with Paragraph 2.6.

4. Dewatering of Soils and Sediments: Dewater soils/sediments that fail the Paint Filter Liquids Test by drainage, aeration, solidification, or other methods, including construction of dewatering pad at the CONTRACTOR's option. Transport collected water to temporary Water Treatment System.

5. Decontamination:
    1. Decontaminate equipment that has been in Impacted areas. Complete gross decontamination by removing soil and debris from the exterior, underbody, and between tires before leaving an impacted area. Remove soil and debris using scrapers, brushes, rags, or similar means.
    2. Collect and dispose of materials removed from vehicles/containers off-Site.
    3. Use decontamination areas only for light and final decontamination and not for gross decontamination (e.g., removal of bulk visible materials by scraper, brushes). Perform gross decontamination, if required, as part of earthwork at the area where trucks are loaded or unloaded. Repeat decontamination as needed.

4. Visually inspect decontaminated vehicles and maintain log of inspections at the Site. Provide decontamination inspection log to ENGINEER on a monthly basis.

6. Spills and Accidents: Perform spill control and cleanup in accordance with Section 02 61 16. Notify ENGINEER and implement the appropriate response immediately upon learning of an accident, spill, or release of impacted material.

3. TEMPORARY SOIL STOCKPILES

1. Temporary stockpiles for excavated soils will be allowed, however CONTRACTOR shall propose containment methods for both soil and surface water.

2. Obtain the Engineer's approval for locations of temporary stockpiles. Obtain the Engineer's approval prior to placing material in such stockpiles.

3. Construct stockpile sites so that they are level, well drained, free of foreign materials, and of adequate bearing capacity to support the weight of the materials to be placed thereon.

4. Provide and maintain access to stockpiles.

5. Separate differing materials with substantial dividers or stockpile apart to prevent mixing.

6. Prevent intermixing, contamination, or segregation of soil types.

7. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

8. Maintain temporary stockpile slopes not steeper than 2.5 horizontal to 1 vertical. In no instance shall stockpiles be greater than 12 feet in height above original surrounding grade, unless otherwise approved by ENGINEER. Place hay or straw bales or other soil erosion and sediment control fencing at the base of and around each temporary stockpile to contain soil that may be washed off the stockpile.

9. Maintain area surrounding stockpiles in neat and tidy condition.

END OF SECTION

SECTION 02 61 16

OFF-SITE TRANSPORTATION AND DISPOSAL

PART 1 GENERAL

1. SECTION INCLUDES

1. Supply, operation, and maintenance of transport vehicles/containers.
2. Preparing transport vehicles/containers for off-Site transportation.
3. Loading and securing materials in transport vehicles/containers.
4. Decontaminating vehicles/containers prior to leaving the Site.
5. Transporting materials from the Site to OWNER selected TSDF.
6. Preparation of shipping documents including manifests, and bills of lading.
7. Maintaining transportation records as required by regulatory agencies.
8. Obtaining documents from TSDF.
9. This Section includes a description of transportation and off-Site disposal activities by CONTRACTOR. OWNER may elect to contract with the disposal facilities directly, which will remove some of CONTRACTOR requirements described herein.

2. REFERENCES

1. Definitions:
    1. DOT: Department of Transportation.
    2. Non-Hazardous Materials: Materials not regulated by 40 CFR 261, 40 CFR 273, 40 CFR 279, and 49 CFR 761, or equivalent state regulation.
    3. TSDF: Treatment, storage, or disposal facility.
2. Reference Standards:
    1. Section 01 40 00 - Quality Requirements: Requirements for references.
    2. United States Federal Government - Code of Federal Regulations (CFR):
        1. 40 CFR 261 - Identification and Listing of Hazardous Waste.
        2. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste.
        3. 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste.
        4. 49 CFR 171 - General Information, Regulations, and Definitions.
        5. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
        6. 49 CFR 173 - Shippers - General Requirements for Shipments and Packaging.
        7. 49 CFR 177 - Carriage by Highway.
        8. 49 CFR 178 - Specifications for Packaging.
        9. 49 CFR 383 - Commercial Driver’s License Standards; Requirements and Penalties.

10. 49 CFR 385 - Safety and Fitness.
11. 49 CFR 387 - Minimum Levels of Financial Responsibility for Motor Carriers.
12. 49 CFR 390 - Federal Motor Carrier Safety Regulations.
13. 49 CFR 391 - Qualifications of Drivers.
14. 49 CFR 392 - Driving of Motor Vehicles.
15. 49 CFR 393 - Parts and Accessories Necessary for Safe Operation.
16. 49 CFR 395 - Hours of Service of Drivers.
17. 49 CFR 396 - Inspection, Repair, and Maintenance.
18. 49 CFR 397 - Transportation of Hazardous Materials; Driving and Parking Rules.

3. PROGRESS SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Transportation and Disposal Plan: Submit for review and approval a plan for transportation and disposal of materials prior to transportation and disposal of materials from the Site. Include relevant transporter and TSDF identification and regulatory classification and status, methods of transportation and disposal, contingency plans for spills during transportation, and schedule for transportation and disposal. Identify TSDF specific requirements for waste profiling sampling and analyses to determine acceptance.

3. Transportation Emergency Response Plan addressing:
    1. Instructions for compliance with 49 CFR 171.15 and 49 CFR 172, Subpart G.
    2. All aspects and considerations arising from transport incidents involving impacted materials.
    3. Procedures for incident response.
    4. Methods to contain and clean up releases in accordance with Section 01 35 29 – Health and Safety for Contaminated Sites.
    5. Details of manpower and equipment available.
    6. Coordination necessary to mobilize in an emergency.
    7. Traffic maintenance and warning procedures.
    8. List of emergency numbers for information and notification for each applicable state.
    9. List of name and telephone number of the contact at the pickup and destination facilities.
    10. Name and phone number of CONTRACTOR's Emergency Response Coordinator and the Transportation Representative.
    11. Accident/incident reporting requirements.
    12. A current copy of the Federal Motor Carrier Safety Rating assigned by the Federal Highway Administration (FHWA). CONTRACTOR receiving notification by the FHWA of a "conditional" or "unsatisfactory" rating will be ineligible to transport impacted materials.
    13. A copy of the TSDF permit, including both USEPA and state identification numbers.
    14. A copy of the certificate of insurance, location of the facility, process description, and impacted materials packaging requirements.
    15. Qualifications of motor vehicle operators:
        1. Statement that motor vehicle operators meet the requirements of 49 CFR 383, 49 CFR 391, 49 CFR 392, and 49 CFR 395.
    16. A listing of storage time limits for all material designated for off-Site transportation, and methods for ensuring compliance with these limits.

4. TSDF Requirements:
    1. For each TSDF accepted by OWNER, provide TSDF requirements to ENGINEER including:

1. Any TSDF-specific packaging requirements for shipments.
2. TSDF restrictions by wastestream which may cause rejection of transported materials.
3. Any wastestream-specific pre-approvals required by federal or state agencies prior to acceptance of wastestream by TSDF.
4. Restrictions on delivery schedules.
5. Type and frequency of routine additional sampling and analysis of materials by wastestream which are required during transport and disposal activities prior to delivery to TSDF.
6. Additional sampling and analysis of materials that will be conducted by TSDF during receipt of shipments to verify waste profiles.

2. Each TSDF shall disclose the name and telephone number of the contact at the lead agency responsible for TSDF primary permits who has knowledge of and can verify the existence of existing corrective action programs which may impact the ability of TSDF to accept materials from the Site.

5. Operating Licenses and Permits:
   1. Include letter from each proposed TSDF stating that it is in compliance with its federal, state, and local permits and that permits are current for the duration of the off-Site disposal activities from the Site.
   2. Include copies of valid operating licenses and permits from each transporter for each proposed transport vehicle/container.

6. Transportation Routes: Submit plans showing transportation routes or alternate routes which will be used to transport materials to OWNER selected TSDF prior to commencing transportation of materials from the Site. Comply with applicable federal, state, and local regulations.

7. Qualifications of Motor Vehicle Operators:
   1. Signed affidavit stating that all vehicle operators handling hazardous waste are HAZMAT trained in accordance with 49 CFR Part 172, Subpart H.
   2. Statement that motor vehicle operators meet the requirements of 49 CFR 383, 49 CFR 391, 49 CFR 392, 49 CFR 395, 49 CFR 397, 49 CFR 172 Subpart H, and 49 CFR 177.

8. Shipping and Disposal Documents:
   1. Include blank sample forms of proposed shipping and disposal documents.
   2. Include complete copies of waste profiles.
   3. Include completed copies of shipping and disposal documents including manifests and/or bills of lading on standard approved forms, including a copy of each form signed by the transporter prior to leaving the Site and a copy of each form signed by TSDF accepting the shipment.
   4. Use shipping and disposal documents of consignment state where so required. Obtain shipping documents from consignment state prior to shipment from the Site.

9. Supplemental Indemnifications: For each TSDF which provides a supplemental indemnification (e.g., Superfund Indemnification), obtain such indemnification for the benefit of OWNER.

10. Weigh Tickets: Submit weigh tickets generated at off-Site weigh scale in accordance with Article 3.10 of this Section.

11. Weigh Scale Calibration: Submit prior to commencing transport of materials off-Site, a calibration chart, completed within the previous 6 months, for the weigh scale. The weigh scale shall be calibrated by the State of Texas registered agency.

4. QUALITY ASSURANCE

1. ENGINEER will perform waste profiling analyses of Non-Hazardous Materials scheduled for off-Site disposal prior to the date of the Notice to Proceed. This information will be made available to the CONTRACTOR in coordination with transport of waste to TSDF.

5. QUALIFICATIONS

1. Motor Vehicle Operators:
    1. Before off-Site transportation services are rendered, motor vehicle operators (drivers) shall meet the requirements defined in the Transportation Emergency Response Plan.
    2. Have available the following information before any off-site transportation activity:
        1. A medical examiner's certificate, or a legible photographic copy of a certificate, or a statement attesting to a record on file with CONTRACTOR of a medical examiner's certificate on each motor vehicle operator's physical qualifications to operate a motor vehicle in accordance with 49 CFR 391.43 and 49 CFR 391.41.
        2. A statement certifying that CONTRACTOR, at least once every 12 months, reviews the driving record of each motor vehicle operator it employs, in accordance with 49 CFR 391.25. Include in this statement a list of any violations of motor vehicle traffic laws in accordance with 49 CFR 391.27.
        3. A valid commercial driver's license for each motor vehicle operator.

2. Replace any motor vehicle operator deemed unacceptable for transporting impacted materials.

6. ENVIRONMENTAL REQUIREMENTS

1. Do not spill, leak, or otherwise release materials from transport vehicles and containers during loading and unloading operations or while in transit from the Site to TSDF.

2. Do not generate dusting conditions when loading bulk solids.

3. Clean up any and all spills or leaks in transit.

PART 2 PRODUCTS

1. POLYETHYLENE SHEETING

1. Continuous sheeting, minimum 0.006 inch (6 mil) thick, fabricated from a single ply of construction-grade polyethylene plastic.

2. TUB LINER

1. Tub Liners for Bulk Solid Shipments: Pre-manufactured fitted polyethylene tub liner or continuous single sheet of polyethylene sheeting.

3. CONTAINERS, PACKING MATERIAL, AND LABELS

1. Comply with DOT, federal, state, and local regulations.

2. Transport vehicles (e.g., tractors and roll off containers) that meet the requirements of 49 CFR.

3. Securement systems, especially tiedown assemblies (e.g., chains, cables, steel straps, and fiber webbing); load binders and hardware (e.g., hooks, bolts, welds, or other connectors); and winches or other fastening devices that are without visual damage from wear or misuse and that meet the requirements of 49 CFR 393, Subpart I.

4. Weatherproof tarpaulins that are without visual damage from wear or misuse; are of a quality highly resistant to tears, rips, snags, punctures, abrasion, cracking, peeling, and weathering; and are suitable for use as an external cargo wrap.

5. Side boards that are suitable as a frame for use with tarpaulins to form a closed transport vehicle.

6. Motor vehicle operators who meet the requirements of 49 CFR 383, 49 CFR 391, 49 CFR 392, 49 CFR 395, 49 CFR 397, 49 CFR 172 Subpart H, and 49 CFR 177.

4. MOTOR VEHICLES

1. Provide equipment that is appropriate for accomplishing successful transportation of impacted materials from the Site to the TSDF. Maintain and operate motor vehicles in accordance with the manufacturer's recommendations; Occupational Safety and Health Administration requirements; federal regulations specified in 49 CFR 393 and 49 CFR 396; and applicable federal, state, and local regulations. Take all precautions necessary for safe operation of equipment and vehicles to safeguard the public and the environment from injury or accidental release of impacted materials.

2. Inspect all vehicles in accordance with 49 CFR 393, and comply with all applicable local, state, and federal requirements for registration, insurance, inspection, certification, and performance.

3. Motor vehicle inspections shall be performed by qualified inspectors, as required by 49 CFR 396.19. Have available a copy of the current certificate of commercial motor vehicle inspection before any transportation activities (or a statement certifying that all motor vehicles have been inspected in accordance with the requirements of 49 CFR 396.17, 49 CFR 396.19, and 49 CFR 396.23). Brake inspections shall be performed by a certified brake inspector for commercial motor vehicles, as described in 49 CFR 396.25.

4. The motor vehicle operator shall perform a safety inspection of each motor vehicle before it is used and at least once each day, in accordance with the requirements of 49 CFR 396.11 and 49 CFR 396.13.

5. Remove from the Site any motor vehicles determined to be potentially unsafe and/or unsuitable for their intended use. Reinspect repaired or replaced motor vehicles to determine whether they meet inspection standards.

PART 3 EXECUTION

1. EXAMINATION

    1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

    2. Notify ENGINEER sufficiently in advance of intention to commence activities at the Site that require attendance by ENGINEER as provided hereinafter.

    3. Activities requiring attendance by ENGINEER include:
        1. Final securement of loaded materials prior to transport from the Site.
        2. Decontamination of transport vehicles/containers prior to leaving the Site.

    4. Do not cover up loaded material prior to ENGINEER's inspection.

2. TSDF SELECTION

    1. OWNER may contract directly with the TSDF and ENGINEER will obtain the necessary approvals to dispose of Non-Hazardous Materials.

3. WASTE PROFILING

    1. ENGINEER will conduct waste profile sampling and analysis.

    2. ENGINEER will classify materials for off-Site disposal according to waste stream based on waste profile analytical results and other pertinent data/information.

    3. Select and submit proposals to ENGINEER for the appropriate disposition of all determined waste streams to be removed from the Site in accordance with applicable regulations for each wastestream. CONTRACTOR shall be responsible for disposition of materials to OWNER-selected TSDFs.

    4. Waste profile will be signed by OWNER or an authorized agent of OWNER except for materials brought on the Site by CONTRACTOR that are not incorporated in the Works or impacted by performance of the Works.

4. SEGREGATION OF MATERIALS

    1. Segregate and prepare materials for transportation and disposal in accordance with the delivery acceptance requirements of the transporter and TSDF and governing regulations, as appropriate based on waste characterization.

5. LOADING AND UNLOADING OPERATIONS

    1. The motor vehicle operators shall remain inside the tractor cab at all times during loading and unloading.

2. Provide motor vehicles that are non-contaminated and free of mud, dirt, grease, or other accumulations; motor vehicles shall arrive at the work area sufficiently clean to allow inspection.

3. Conduct loading and unloading operations in a highly controlled manner that prevents contamination of motor vehicles. Verify that CONTRACTOR motor vehicles are free of contamination before releasing them from the loading/unloading area.

4. Load for on-Site transportation in accordance with Section 02 61 14.

5. Load for off-Site transportation as follows:
    1. Decontaminate motor vehicles that become impacted during loading or unloading operations. After decontamination, check the motor vehicle again to verify that it is free of contamination before releasing it for transport.
    2. After loading and before leaving the Site or TSDF, the motor vehicle operator shall inspect and verify that the load is arranged and secured properly (based on experience and training, and in accordance with 49 CFR 392.9 and 49 CFR 393, Subpart I). Motor vehicle shall be weighed using built-in scales on the vehicle and the estimated weight of the vehicle will be recorded. Ensure compliance with applicable load restrictions.
    3. Upon acceptance of the load for transport, maintain the integrity of the load, the load arrangement, and any security seals. The motor vehicle operator shall examine and periodically reexamine the load and its load securing devices as necessary to maintain the integrity of the load and the load arrangement in accordance with
    4. 49 CFR 392.9. (Load inspections during transit do not apply to sealed trailers, only to the inspection of security seals.) Comply with the requirements of Article 3.13 upon discovery of any change in the load condition, load arrangement, or security seals (e.g., change caused by equipment/packaging failure, motor vehicle accident, adverse weather conditions, vandalism, or theft) that involves release of impacted materials.

6. PREPARATION AND SECUREMENT OF TRANSPORT VEHICLES/CONTAINERS

1. Do not load materials for transport for disposal without ENGINEER's approval.

2. Comply with applicable federal, state, and local regulations concerning shipping vehicles, containers, and materials.

3. Visibly display number for each transport vehicle/container.

4. Secure materials in transport vehicles/containers in accordance with regulations governing transportation of materials.

5. Bulk Solid Shipments:
    1. Clean the receiving box of the transport vehicle/container of loose debris or foreign material. Line the receiving box or container with a tub liner or polyethylene liner. Place the liner on the floor, run up the sides, and drape over the sideboards. Neatly push the liner into corners to prevent tearing during loading and transport.
    2. Load bulk materials into transport vehicles or containers in a manner which will not damage the placed tub liner. Limit the freefall of bulk materials being loaded. Place cushioning materials under and around each container for shipments of drummed/containerized materials.
    3. Replace damaged liner which is incapable of providing containment.
    4. Following loading, fold the liner over the loaded materials and place an overliner of

polyethylene sheeting over the materials prior to securing with an approved tarpaulin in a manner to prevent loss of materials or fugitive dust emissions.

6. Perform packaging, labeling, marking, and placarding in compliance with 49 CFR 173 and 49 CFR 178. The motor vehicle operator(s) shall perform an inspection to verify that packaging, labeling, marking, and placarding are in accordance with the requirements listed above and the accompanying shipping documents. Maintain the integrity of packaging, labeling, marking, placarding, and the accompanying shipping documents in compliance with 49 CFR 177.800, Subpart A.

7. DECONTAMINATION

1. Decontaminate transport vehicles and containers at on-Site equipment decontamination pad after loading and prior to leaving the Site. Remove material on the tires and axles of trucks and material on the vehicle resulting from loading operations. See Section 02 61 14 – Material Handling and Transportation: Decontamination.

8. DOCUMENTATION FOR THE TRANSPORTATION OF MATERIALS

1. Document the transport and disposal of materials to TSDFs on appropriate state and/or federal manifests or bills of lading, as prepared and provided by ENGINEER. Maintain shipping documents from the time the materials leave the Site to the time of release to TSDFs. Shipping documents for the transportation and disposal of materials will be signed by OWNER or an authorized agent of OWNER, except for materials brought on the Site by CONTRACTOR that are not incorporated in the Works or impacted by performance of the Works.

2. Inspect each truck before leaving the Site and maintain a log. Trucks shall not leave the Site until inspected.

9. NOTIFICATION

1. Notify applicable federal, state, and local representatives, or authorities having jurisdiction over the route and mode of transport, in advance of commencing transportation.

10. OFF-SITE IN-TRANSIT WEIGHING (BULK SHIPMENTS)

1. Weigh transport vehicles without loaded materials at certified off-Site weigh scale facility approved by ENGINEER prior to entry to the Site.

2. Submit copy of weigh ticket for loaded vehicle to ENGINEER within 48 hours of weighing. Ensure weigh scale receipts agree with the verbally reported weight.

11. TRANSPORTATION TO OFF-SITE TSDF

1. Comply with applicable requirements of regulations including, but not limited to 49 CFR 171, 49 CFR 172, 49 CFR 173, 49 CFR 177, 40 CFR 262, 40 CFR 263, and 40 CFR 761.

2. Transport material removed from the Site directly to TSDF approved by OWNER. Do not change either the route or mode of transport after commencing off-Site operations without ENGINEER's prior written approval.

3. Mark and placard shipments in accordance with federal, state, and local regulations as applicable.

4. Employ transport vehicle operators trained in conformance with federal, state, and local regulations for hazardous materials haulers.

5. Materials shall be transported using vehicles licensed for the waste stream being transported.

12. DISPOSAL

1. Make all arrangements with TSDFs for the receipt and acceptance of materials removed from the Site.

2. Ensure that materials removed from the Site are properly prepared and will be accepted by TSDF selected by OWNER.

3. Weigh transport vehicles/containers at receiving TSDF weigh scales both before and after discharging their contents.

4. Such measurements will be used by ENGINEER to verify proper delivery of materials which have been removed from the Site and for payment purposes.

5. Immediately return to the Site any transported material delivered to a TSDF which is rejected by the TSDF.

13. ACCIDENT INVOLVING TRANSPORT VEHICLES

1. In the event of an accident, follow the procedures outlined in CONTRACTOR's Emergency Response Plan and comply with the requirements of 49 CFR 390.15 Subpart E and 49 CFR 172, Subpart G.

2. In the event of an accident involving a release of materials being transported, promptly notify ENGINEER via telephone, and prepare a written report within 5 days. The report shall include but not be limited to:
    1. Location, date, and time of the accident.
    2. Resultant damage or injury.
    3. Person(s) involved.
    4. Condition of the load.
    5. Amount of materials released and amount recovered.
    6. Any other pertinent information.
    7. If applicable, weather conditions, distance to water sources, government agencies on the scene, and telephone number where communications can be maintained.
    8. Copies of any accident/incident reports required or prepared by state or other governmental entities.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cast-in-place concrete and materials for construction of concrete slab.

1.2 REFERENCES

A. Reference Standards:
1. Section 01 40 00 - Quality Requirements: Requirements for references.
2. American Concrete Institute:
a. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
b. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
c. ACI 301 - Specifications for Concrete Construction.
d. ACI 302.1R - Guide to Concrete Floor and Slab Construction.
e. ACI 305.1 - Specification for Hot Weather Concreting.
f. ACI 306.1 - Standard Specification for Cold Weather Concreting.
g. ACI 308.1 - Specification for Curing Concrete.
h. ACI 318 - Building Code Requirements for Structural Concrete.
i. ACI 347R – Guide to Formwork for Concrete.
j. ACI 350R – Code Requirements for Environmental Engineering Concrete Structures.
k. ACI SP-66 - ACI Detailing Manual.
3. ASTM International:
a. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
b. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
c. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
d. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
e. ASTM A1064/1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
f. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
g. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
h. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
i. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
j. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
k. ASTM C150/C150M - Standard Specification for Portland Cement.
l. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.

m. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
n. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
o. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
p. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
r. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
s. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

4. Concrete Reinforcing Steel Institute:
   a. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
   b. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications, and Nomenclature.
   c. CRSI Manual of Practice.
5. National Fire Protection Association: NFPA 70 – National Electrical Code.
6. National Ready Mixed Concrete Association (NRMCA).
7. American Association of State Highway and Transportation Officials – AASHTO – Design Specifications

1.3 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

C. Work shall comply with all requirements of the Occupational Safety and Health Act.

D. Locate all buried and overhead services prior to excavation. The contractor shall be responsible for all temporary bracing, shoring and dewatering necessary to undertake the work.

E. Drawings:
   1. Read concrete Drawings/Details in conjunction with all Drawings and contract documents.
   2. Do not scale Drawings.
   3. Do not exceed the indicated live loads during construction.
   4. Design loads indicated are unfactored unless noted otherwise.
   5. All dimensions on Drawings are in feet-inches unless noted otherwise.

F. Design conditions:
   1. Loads on slab: AASHTO Truck H25. Do not exceed this load.
   2. Exposure category of concrete is C-1.

G. “Approved” shall mean approved in writing by the engineer of record.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on joint devices, attachment accessories**,** and admixtures.

C. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs if admixtures are required for following:
      a. Hot and cold weather concrete work.
      b. Air entrained concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether chlorides were added during manufacture.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit installation procedures and interfacing required with adjacent Work.

F. Field Quality Control Submittals: Indicate results of CONTRACTOR-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout submittals.

B. Record Documents: Indicate actual locations of embedded utilities and components which are concealed from view.

1.6 QUALITY ASSURANCE

A. Perform concrete work in accordance with ACI 301 and ACI 350R.

B. Latest revision/version/edition, and current provisions of all applicable codes and reference standards shall be followed and apply to work. Work shall comply with local and state regulations.

C. Acquire cement and aggregate materials from same source for all work.

D. Conform to ACI 305.1 when concreting during hot weather.

E. Comply with ACI 306.1 when pouring concrete during cold weather.

F. Perform formwork in accordance with ACI 347R. Immediately remove from the Site the forms that cannot be properly cleaned or repaired.

G. Perform reinforcement work in accordance with CRSI 63, CRSI 65, and CRSI Manual of Practice.

H. Remove immediately from the Site reinforcement without rolled in grade marks or certified mill test reports.

1.7 QUALIFICATIONS

A. Supplier:
   1. Certified ready-mix supplier approved by ENGINEER.
   2. Plant certification complying with NRMCA.

B. Testing Agency: Independent testing laboratory complying with ASTM E329 and approved by ENGINEER, to carry out trial concrete mix investigations, and select materials and mix proportions in accordance with ACI 211.1.

C. Design formwork under direct supervision of a licensed professional engineer experienced in its design.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver, handle and store materials to avoid damage in any manner.

C. Store materials to prevent deterioration from moisture.

D. Store reinforcement in bundles with identifying tags or markings on racks or sills that will permit easy access for identification and handling, as well as prevent steel from becoming coated with any material that would adversely affect the bond.

E. Maintain individual bar identification after bundles are broken.

1.9 AMBIENT CONDITIONS

A. Hot Weather Requirements:
   1. Apply when the air temperature is above 78 degrees F.
   2. Submit to ENGINEER for review proposed equipment and methods before concreting in hot weather.

B. Concrete Temperature Upon Delivery to Site: Between 60 and 80 degrees F.

PART 2 PRODUCTS

2.1 FORM AND FORM ACCESSORIES

A. Form Materials: At the discretion of CONTRACTOR and conforming to APA PS9.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4-inch minimum.

C. Form Release Agent: Commercially formulated form release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Formulate form release agent with rust inhibitor for steel form facing materials.

D. Form Ties: Factory fabricated, removable or snap off metal or glass fiber reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water barrier plates to walls indicated to receive waterproofing.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet carbon steel bars; unfinished, galvanized in accordance with ASTM A767/A767M Class I/II, or epoxy coated in accordance with ASTM A775/A775M and ASTM D3963/D3963M.
   1. All reinforcing bars shall be supported in the forms and spaced with standard accessories.
   2. Reinforcement steel fabricator shall supply placing drawings and bar lists in accordance with the CRSI Manual of Practice for review by ENGINEER before fabrication of reinforcing.

B. Welded Steel Wire Fabric: ASTM A1064/A1064M, plain type in flat sheets; unfinished, galvanized in accordance with ASTM A767/A767M Class I/II, or epoxy coated in accordance with ASTM A884/A884M.

2.3 REINFORCEMENT ACCESSORIES

A. Tie Wire: 16 gauge black annealed type unless otherwise specified.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, including load bearing pad on bottom to prevent vapor barrier puncture. Do not use masonry block.

2.4 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M Type IIA, moderate sulfate resistance and heat of hydration and air entraining, gray color.

B. Fine and Coarse Aggregates: ASTM C33/C33M.

C. Water: Clean and not detrimental to concrete, free from injurious amounts of oil, acid, alkali, organic matter, sediment, or other deleterious substance.

2.5 ADMIXTURES

A. Air Entrainment: ASTM C260/C260M.

B. Chemical: ASTM C494/C494M, Type A water reducing, Type F water reducing and high range.

C. Provide admixtures from same source and manufacturer. Admixtures shall not contain calcium chloride-based compounds.

D. Fly Ash/Calcinated Pozzolan: ASTM C618 Class C or F.

E. Waterproofing Admixture: Crystalline type, 2% +/- by weight of cement for all concrete to come into contact with water during its service life.

2.6 JOINT DEVICES

A. Integral extruded plastic, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

2.7 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94/C94M Option C.

B. Select proportions for normal weight concrete in accordance with ACI 211.1.

C. Provide concrete to the following criteria:

Unit	*Measurement*
Compressive Strength (7-day)	3,000 psi
Compressive Strength (28-day)	4,500 psi
Water/Cement Ratio (maximum)	0.4 by weight (mass)
Aggregate Size (maximum)	3/4 inch
Air Entrained - Plus or minus 1 percent	5 percent
Admixture	water reducing type
Fly Ash and Pozzolan Content (maximum)	20 percent of cement content
Slump - Plus or minus 1 inch	3½ inches
Cement Content (minimum)	550 pounds per cubic yard

D. Use set retarding admixtures during hot weather only when approved by ENGINEER.

E. If required, add high range water reducing admixture (superplasticizer) to mix at the Site.

F. Do not use calcium chloride.

2.8 HYDROPHYLIC CAULK

A. One component type water swelling sealant, Leakmaster LV-1 or approved equal.

2.9 ACCESSORIES

A. Vapor Retarder: 10-mil thick fabric reinforced polyethylene film, type recommended for below grade application.

B. Waterproofing Sealant:
   1. Concrete surface waterproofing coating Raven Aquata Flex 506 epoxy/polyuria type or approved equal.
   2. Concrete surface waterproofing primer Raven 155 epoxy type or approved equal.

2.10 FABRICATION - REINFORCEMENT

A. Fabricate concrete reinforcing in accordance with CRSI 63, CRSI 65, and CRSI Manual of Practice.

B. Epoxy Coated Reinforcement: Clean surfaces, weld, and re-protect welded joint in accordance with manufacturer's instructions and/or CRSI Manual of Practice.

C. Locate reinforcing splices not shown on the Drawings, at point of minimum stress. Review location of splices with ENGINEER.

D. Lap splices in reinforcing bars shall be a minimum 38 times bar diameters but not less than 18 inches.

E. Concrete protection for reinforcing bars (unless otherwise noted):
   1. Exterior slabs on fill – 2-1/2 inch bottom, 2 inch forms/top.

2.11 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection, and analysis requirements.

B. ENGINEER may perform tests of cement, aggregates, water, and the mixture thereof at batch plant to ensure conformance with specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

B. Contractor shall check and verify all conditions and measurements at the Site and report to the engineer any discrepancies or unsatisfactory conditions which may adversely affect the proper completion of the job before proceeding with the work.
   1. Verify that compacted granular base is dry and ready to support imposed loads. Verify slopes and elevations of the base are correct.
   2. Verify lines, levels, openings, and centers before proceeding with formwork. Ensure that dimensions agree with the Drawings.
   3. Verify requirements for concrete cover over reinforcement.

4. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.
5. Verify that construction joints are located as shown on the Drawings.

3.2 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
   1. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal. Do not use rust-stained steel form facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike off templates or compacting type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete as indicated on the Drawings.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form release agent, according to manufacturer's written instructions, before placing reinforcement.

3.3 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast in place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form removal operations and provided curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by ENGINEER.

3.5 SHORES AND RESHORES

A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

B. Plan sequence of removal of shores and re-shore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 STEEL REINFORCEMENT

A. Install reinforcement as shown on Drawings and in accordance with reviewed Shop Drawings.

B. Comply with ACI SP-66 for reinforcement installation not shown on the Drawings.

C. Comply with ACI SP-66 and CRSI 65 for bar support systems and patterns.

D. Place, support, and secure reinforcement against displacement. Do not deviate from required position. Maintain required concrete cover around reinforcing.

E. Do not displace or damage vapor barrier. Accommodate placement of formed openings.

F. In the event inserts, sleeves, or other items interfere with reinforcement placing, immediately notify ENGINEER and obtain approval from ENGINEER for adjustments. Do not cut bars to clear obstructions without consulting ENGINEER.

G. Do not field bend reinforcement. When field bending is authorized by ENGINEER, bend without heat, applying a slow and steady pressure.

H. Replace bars which develop cracks or splits.

I. Bond and ground reinforcement in accordance with NFPA 70.

J. Notify ENGINEER at least 24 hours in advance of completion of reinforcement placing to permit time for inspection, final adjustment, and review by ENGINEER prior to placing concrete.

3.7 JOINTS

A. Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations shown on drawings or as accepted in writing by ENGINEER.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of slabs.
   2. Form from preformed galvanized steel, plastic keyway section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1 1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam girder intersection.
   4. Locate horizontal joints in walls and columns at underside of slabs, beams, and girders and at the top of footings or slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use an epoxy-modified cementitious bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs on Grade: Form weakened plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one fourth of concrete thickness, as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
   3. Joint spacing: More stringent of AASHTO Design specifications and ACI 360R

D. Isolation Joints in Slabs on Grade: After removing formwork, install joint filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
   2. Terminate full width joint filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section Joint Sealants, are indicated.
   3. Install joint filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated. Use dowel sleeves or lubricate or asphalt coat one half of dowel length to prevent concrete bonding to one side of joint.

3.8 PLACING CONCRETE

A. Place concrete in accordance with ACI 301, ACI 318 and ACI 350R.

B. Notify ENGINEER minimum 48 hours prior to commencement of concrete placing operations to allow ENGINEER opportunity to review methods of conveying, spreading, consolidating, finishing, curing, and protecting concrete.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Slab shall be sloped to edges in both directions with 0.5% slope and trowel finished to within 1/8 inch of elevations shown on drawings. following troweling, provide non-slip medium broom finish.

F. Place concrete continuously between predetermined or without control and construction joints.

G. Do not interrupt successive placement; do not permit cold joints to occur.

H. Place smooth dowels with lubrication at saw cut joint locations. Saw cut joints within 24 hours after placing. Use 3/16-inch thick blade (soft cut type), cut into 1/4 depth of slab thickness or as shown on the Drawings.

I. Apply sealants in joint devices.

3.9 FINISHING SLABS

A. Comply with recommendations in ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull floated or darbied. Use stiff brushes, brooms, or rakes. Apply scratch finish to surfaces indicated and to surfaces to receive concrete topping.

C. Float Finish: Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to slab surfaces to be covered with fluid applied or sheet waterproofing.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings.
   1. Apply a trowel finish to surfaces indicated and to slab surfaces exposed to view.
   2. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
      a. 3/16 inch for all concrete other than slabs-on-grade.
      b. 1/8 inch for all slabs-on-grade.

E. Trowel and Fine Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with OWNER before application.

3.10 CONCRETE PROTECTION AND CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 305.1 and ACI 306.1.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bullfloating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including slabs and other surfaces, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
      a. Water.
      b. Continuous water fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture Retaining Cover Curing: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than 7 days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   4. Curing and Sealing Compound: Apply uniformly to slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
   5. Cure concrete according to ACI 308.1.

E. No cutting or drilling in hardened concrete is permitted without written authorization from the ENGINEER.

3.11 LIQUID SLAB TREATMENTS

A. Penetrating Liquid Slab Treatment: Prepare, apply, and finish penetrating liquid slab treatment according to manufacturer's written instructions.
   1. Apply silane sealer to exterior concrete slabs and stairs in accordance with manufacturer’s specifications.

3.12 PATCHING

A. Allow ENGINEER to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.

C. Patch imperfections as directed by ENGINEER in accordance with ACI 301.

3.13 DEFECTIVE CONCRETE

A. Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.

B. Repair or replacement of defective concrete will be determined by ENGINEER.

C. Do not patch, fill, touch up, repair, or replace exposed concrete except upon express direction of ENGINEER for each individual area.

3.14 FORM REMOVAL

A. Give ENGINEER advance notice prior to form removal.

B. Do not remove forms or bracing until concrete has reached a strength of 3500 psi.

C. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

D. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3.15 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

B. Take three concrete test cylinders for every 75 cubic yard or less of concrete placed each day.

C. Take one slump test for each set of test cylinders taken.

D. Methods of Testing:
   1. Securing Composite Samples: ASTM C172/C172M.
   2. Molding and Securing Specimens from Each Sample: ASTM C31/C31M.

3. Compressive Strength: ASTM C39/C39M except specimens will be tested at 7 and 28 days.
4. Slump for Each Strength Test: ASTM C143/C143M.
5. Total Air Content for Each Strength Test: ASTM C231/C231M or ASTM C173/C173M, as determined by ENGINEER.
6. Temperature of concrete sample and mixing water for each strength test or as required.

E. Water test areas where unusual conditions exist for required slope and drainage. Repair areas where ponding is greater than 1/4-inch depth.

3.16 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean forms as erection proceeds, to remove foreign matter within forms.

C. Clean formed cavities of debris prior to placing concrete.

D. Flush with water or use compressed air to remove remaining foreign matter.

E. Ensure that no material, equipment, or debris is allowed to enter the watercourse.

END OF SECTION

SECTION 22 05 53

PIPE DATA SHEET - PVDF TUBING AND CARRIER

PIPING

PART 1 GENERAL

1. SECTION INCLUDES

    1. Polyvinylidene fluoride (PVDF) Tubing for chemical feed systems.

    2. Carrier pipe for PVDF tubing and chemical feed systems.

2. DELIVERY, STORAGE, AND HANDLING

    1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

    2. Product Requirements: Requirements for transporting, handling, storing, and protecting products.

    3. Inspect each shipment of tubing, pipe and fittings and make provisions for the timely replacement of damaged material. Unload by hand or use canvas slings to avoid scratching the pipe. Do not drop, slide, or drag pipe over an abrasive surface. Pipe with deep scratches and tubing with kinks and/or other signs of damage shall be removed from the Site and replaced with new stock.

    4. Stack pipe no higher than 5 feet and provide support for the pipe barrel to prevent bending of the pipe. Cover stockpiled pipe and tubing to protect it from sunlight.

3. CLOSEOUT SUBMITTALS

    1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout submittals.

    2. If specialized system or tools are used for installation, provide a complete set of required cutters, crimpers, etc., to allow for future maintenance or modification of the system to Owner.

PART 2 PRODUCTS

1. GENERAL

    1. All piping system components shall be products of the same manufacturer.

2. PVDF TUBING

    1. NSF 61 Certified, Polyvinylidene fluoride (PVDF) tubing.

    2. Opaque PVDF tube, nominal OD as required for service/selected by CONTRACTOR. Nominal working pressure of up to 150 psig.

    3. Temperature Range: Minus 5 degrees C to plus 65 degrees C.

    4. Fittings shall be compatible with tubing and with chemicals in use.

    5. No tubing fittings shall be hidden/concealed within carrier pipe.

3. CARRIER PIPE

    1. Carrier pipe shall be Schedule ~~40~~ 80 CPVC piping.

    2. Connections and fittings in the carrier pipe shall be long-radius bends and use wyes in place of tees to facilitate installation of PVDF tubing by pulling through assembled pipe.

    3. Carrier pipe shall not be buried

PART 3 EXECUTION

1. EXAMINATION

    1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

    2. Execution Requirements: Verification of existing conditions before starting work.

    3. All aboveground carrier pipe shall be installed and supported per manufacturer requirements with general slope towards open drainage points.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR PIPING AND EQUIPMENT

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. Nameplates.
    2. Plastic pipe markers.
    3. Plastic tape pipe markers.

2. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
2. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
3. Samples: Submit two labels.
4. Manufacturer's Instructions: Indicate special procedures and installation.

3. FIELD SAMPLES

1. Provide field Samples of labels.
2. Locate where directed by ENGINEER.
3. Accepted Sample may remain as part of the Work.

PART 2 PRODUCTS

1. EQUIPMENT NAMEPLATES

1. Provide name plates in accordance with the schedule at end of Section.
2. Manufacturers standard nameplate.
3. Minimum Tag Size: 1 ½-inch tall and 3-inch wide minimum with minimum 1-inch tall lettering.
4. Indicate at a minimum the following:
    1. Manufacturer name.
    2. Model number.
    3. Serial number.
    4. Equipment size/capacity.

2. PLASTIC PIPE MARKERS

    1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

3. PLASTIC TAPE PIPE MARKERS

    1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 EXECUTION

1. PREPARATION

    1. Degrease and clean surfaces to receive adhesive for identification materials.

2. INSTALLATION

    1. Plastic Markers:
        1. Install plastic pipe markers in accordance with manufacturer's instructions.
        2. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

3. APPLICATION

    1. Apply in accordance with manufacturer's instructions.

    2. Apply after painting.

4. CLEANING

    1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

    2. Clean excess paint and adhesive.

5. PROTECTION

    1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protection of installed work.

    2. Protect finished work using clear plastic and tape.

6. MECHANICAL SCHEDULE

Service	Marking Type	Letter/Symbol Color	Color	Background Location	Required Markings
Process Piping	Adhesive Tape	Black	Blue	Terminations and every 12 feet	Service, Flow Direction, as noted in Article 2.3
Chemical Piping	Adhesive Tape	Yellow	White	Terminations and every 12 feet	Service, Flow Direction, as noted in Article 2.3
Valves	Nameplate	Manufacturer Standard	Manufacturer Standard	Manufacturer Standard	As noted in Article 2.1
Equipment	Nameplate	Manufacturer Standard	Manufacturer Standard	Manufacturer Standard	As noted in Article 2.1
Pumps	Nameplate	Manufacturer Standard	Manufacturer Standard	Manufacturer Standard	As noted in Article 2.1

END OF SECTION

SECTION 31 10 10

SITE CLEARING

PART 1 GENERAL

1. SECTION INCLUDES

1. Removal and disposal of surface debris.
2. Clearing and grubbing, including tree removal.
3. Removal, salvage, and storage of existing fence.
4. Demolition and removal of existing building (elevated frame structure) and concrete slab.
5. Protection of existing drainage outlets.
6. Plugging and abandonment of existing monitoring well.

2. DEFINITIONS

1. Clearing: Felling, trimming, and cutting of trees into sections and the satisfactory disposal of trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.
2. Grubbing: Removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

3. ENVIRONMENTAL REQUIREMENTS

1. Control the amount of dust resulting from operations to avoid creation of a nuisance in the surrounding area.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

1. EXAMINATION

1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.
2. Verify that existing surface features designated to remain are tagged or identified.
3. Notify ENGINEER of intention to commence soil removal activities.

2. PREPARATION

1. Protect utilities and surface features designated to remain from damage resulting from construction operations by the erection of barriers or by such other means as circumstances require.

3. CLEARING AND GRUBBING

1. Clear areas required for access to the Site and execution of the Works.

2. Cut off trees, stumps, roots, brush, and other vegetation in areas to be cleared, flush with or below the original ground surface.

3. Remove debris, rock, and extracted plant life.

4. Dispose of trees, logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations off-Site.

4. REMOVALS

1. Remove existing fencing as required to access excavation areas.

2. Store salvaged fence and posts, so that they are protected from damage during Works. Replace materials damaged by CONTRACTOR at no additional cost to OWNER.

3. Dispose fence and posts not suitable for reuse off Site, as determined by ENGINEER.

4. Reinstall fence in accordance with Section 32 31 13.

5. Remove the existing frame structure on piles.
    1. Frame structure is about 1,300 square feet.
    2. Break into sizes suitable for transportation.
    3. Transport off-site for disposal.
    4. Approximately 115 square feet of asbestos-containing floor tile is present in the entryway, bathroom, and closets of the existing frame structure. Removal of the floor tile will need to be managed in accordance with the Texas Department of State Health Services (TDSHS) Texas Asbestos Health Protection Rules (TAHPR).
    5. Segregate all demolition materials for transportation and disposal to track quantities separately from impacted soil.
6. Remove the existing concrete slab.
    1. Slab is about is about 10,000 square feet and estimated to be 4 inches thick.
    2. Break into sizes suitable for transportation and disposal.
    3. Transport off-site for disposal.
    4. Provide for dust control during breaking and removal operations.
    5. Segregate all demolition materials for transportation and disposal to track quantities separately.
7. Continuously clean up and remove waste materials from the Site; do not allow waste materials to accumulate.

5. PROTECTION OF EXISTING DRAINAGE OUTLETS

    1. Locate, identify, and protect existing drainage outlets or other existing utilities designated to remain from physical damage or displacement during excavation activities.

    2. Minimize impact to adjacent areas by conducting only clearing and grubbing necessary to perform work of this Section. Ensure that no water from excavation activities is discharged to the existing drainage outlet but is completely captured for treatment as part of dewatering the excavation.

6. PLUGGING AND ABANDONMENT OF MONITORING WELL SJMW-004D

    1. Texas-Licensed driller will attempt removal of inner 2-inch diameter PVC riser and screen from the borehole in accordance with TAC §76.72 and §76.104 and all applicable technical guidance by Texas Department of Licensing and Regulation (TDLR) and Texas Commission on Environmental Quality (TCEQ).

    2. Driller to leave permanent 6-inch low carbon steel casing in place.

    3. Driller will pressure grout the borehole from total depth to approximately 10 feet below ground surface (bgs) so that the casing can be removed when excavation begins. Tremie pipe must be used to ensure even placement of cement-bentonite grout (typically 3-6% bentonite with balance Portland cement).

    4. Backfill remaining empty casing with sand or weld a steel cap in place over the casing.

    5. Driller to file a state plugging report with TDLR within 30 days of cementing activities.

    6. Once excavation begins, expose the steel casing for removal and cut to the base elevation of the excavation.

    7. If cement has settled, leaving open space in the casing, place a concrete plug to the top of the remaining casing that has been left in place.

END OF SECTION

SECTION 31 23 16

EXCAVATION

PART 1 GENERAL

1. SECTION INCLUDES

1. Excavating surface (upper) non-impacted soil and subsurface (lower) impacted soil.

2. REFERENCES

1. DEFINITIONS
    1. Excavation: Removal of materials of whatever nature encountered, whether wet, or otherwise, including dense tills, hardpan, cemented materials, concrete fragments, asphalt pavement, boulders or rock fragments, and weathered rock which can be removed by ripping or excavating with heavy duty mechanical construction equipment without drilling and blasting.
    2. Excavation Limits: Areal excavation limits shown on the Drawings to specified depth or as directed by ENGINEER.
    3. Additional Excavation: Excavation beyond initial excavation limits either laterally or in depth, as directed by ENGINEER.
    4. Rock: Material from solid masses of igneous, sedimentary, or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 cu yd.

2. Reference Standards:
    1. Section 01 40 00 - Quality Requirements: Requirements for references.
    2. ASTM International:
        1. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

3. PROGRESS SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Excavation Plan: Prior to mobilization to the Site, submit a detailed Excavation Plan demonstrating compliance with specified requirements and to permit ENGINEER to schedule testing and measurement activities. Include written procedures, schedules, and drawings as applicable and, at a minimum, address each of the following items:
    1. Methods and procedures which will be used to perform excavation.
    2. Sequencing and scheduling of excavation and backfilling in excavation areas.
    3. As shown on the Drawings, there is generally non-impacted soil (designated as clean overburden) near the surface and impacted (contaminated) soil at deeper depths (to a maximum of 10 feet).
    4. Removal of clean overburden soil to the delineated depths indicated on the Drawings is to be placed in segregated on-site stockpiles (up to ~500 cy in volume) for subsequent reuse as backfill after removal of impacted soil, as directed by ENGINEER.
    5. Removal of lower impacted soils to the delineated depths shown on the Drawings is to be staged in a separate area (dewatering pad) from the clean overburden for sampling

and possible dewatering prior to loading for transport to the off-site disposal facility.
6. Placement of imported clean common fill after placement of stockpiled clean overburden in the bottom portions of each excavation.
7. Minimize open excavations (overnight or during precipitation events) by completing clean backfill placement prior to commencing subsequent excavation.
8. Location of temporary decontamination facility.
9. Sequencing and layout of access routes to and from excavation areas.
10. Methods and procedures which will be used to perform additional excavation in open excavations, if required.
11. Anticipated crew sizes, man hours, types of equipment, and equipment hours on a weekly basis.
12. Utilities and structures which may be encountered and need to be rerouted or protected. Describe methods of rerouting and protecting.
13. Sloping of excavation faces and slope stability issues.
14. Shoring (sheet piling) drawings, where required. Drawings to be stamped by a Professional Engineer registered in the State of Texas.
15. Methods of monitoring movement of adjacent structures.

4. ENVIRONMENTAL REQUIREMENTS

1. Protect open excavations against damage due to surface water runoff and runon. Take necessary precautions to prevent erosion of excavated or disturbed surfaces.

2. Suspend operations whenever climatic conditions, as determined by ENGINEER, may detrimentally affect the quality of excavated material, and prevent their potential use as backfill.

3. After occurrence of heavy rains, take precaution or refrain from operating equipment on approved excavations until the material has dried sufficiently to prevent occurrence of excessive rutting.

4. Where excavations have been softened or eroded, remove soft and yielding material or otherwise objectionable or damaged areas and replace with clean fill as specified by ENGINEER, at no additional cost to OWNER.

5. Decontaminate equipment involved in excavation activities which may have come in contact with potentially impacted material before being removed from the Site or being relocated to clean areas of the Site.

5. SCHEDULING

1. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.

2. Sequence and schedule excavation activities with work of other Sections.

3. Coordinate and sequence excavation operations to minimize the area required for temporary stockpiling of excavated materials until required for backfilling. Keep the time during which excavations remain open to the practicable minimum.

4. Do not allow or cause any of work performed to be covered up or enclosed prior to required inspections, tests, or approvals.

PART 2 PRODUCTS

1. PLASTIC SHEETING

    1. ASTM D4397.

PART 3 EXECUTION

1. EXAMINATION

    1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

    2. Verify that survey bench marks and existing and intended elevations for the Works are as shown on the Drawings.

2. PREPARATION

    1. Identify required lines, levels, contours, and datum locations.

    2. Stake limits of excavation areas.

    3. Locate, identify, and protect utilities from damage. Confirm locations of buried utilities (e.g. CCTV line) and structures by careful test excavations or other suitable means (e.g., GPR or air knifing).

    4. Arrange for utility company to identify and relocate utilities, if necessary.

    5. Protect plant life, and other features remaining as a portion of final landscaping.

    6. Maintain and protect from damage utilities, surface features, and structures encountered, and not designated for demolition or removal. In the event of disturbance of or damage to any such well, utility, surface features, or structures, immediately notify ENGINEER. Repair or replace, as directed by ENGINEER.

    7. Protect existing mooring lines, facilities, surface features, and structures where temporary unbalanced earth pressures or uplift are liable to develop utilizing bracing, shoring, or other approved methods to counteract unbalance.

    8. Employ procedures for excavation such that uplift and displacement or disturbance of lines, utilities, surface features, and structures is avoided.

    9. Protect excavations from contamination.

    10. Obtain direction from ENGINEER before moving or otherwise disturbing monitoring wells, utilities, surface features, and structures.

3. SHORING AND BRACING

    1. Do not allow the sides of the excavation to become unsafe. Maintain sides and slopesof excavations in safe condition by appropriate methods as verified by CONTRACTOR’s registered engineer.

4. EXCAVATION

    1. Excavate to lines, grades, elevations, and dimensions shown on the Drawings or as directed by ENGINEER.

    2. Excavate at 2:1 side slopes, as shown on Drawings.

    3. Grade top perimeter of excavation or place earthen berms to prevent surface water from draining into excavation.

    4. Remove debris and other obstructions encountered.

    5. Notify ENGINEER of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

    6. Remove loose material and debris from excavations. Where natural or fill material at bottom of excavation is disturbed, compact disturbed soil using excavator to density at least equal to undisturbed soil (by visual means only) or remove disturbed soil and refill the open space as directed by ENGINEER.

    7. Open excavations shall be CONTRACTOR's sole responsibility.

5. OVER-EXCAVATING

    1. Should unauthorized excavation be carried below the lines and grades shown on the Drawings and in excess of specified limits and tolerance because of CONTRACTOR's operations including errors, methods of construction, or to suit his convenience, correct unauthorized excavation as follows:
        1. Fill unauthorized over-excavation areas by extending the indicated bottom elevation of the base of the material specified to be placed to the unauthorized excavation bottom without altering the required top elevation and compact in accordance with Section 31 23 23, unless otherwise directed by ENGINEER.

    2. Excavations beyond the lines and grades shown on the Drawings not authorized in writing by the ENGINEER or additional excavation to remove weakened or disturbed soil caused by CONTRACTOR's error, unsuitable construction methods or procedures, or to suit CONTRACTOR's convenience, subsequent additional backfill and compaction to correct deficiencies, and excess excavated material transportation and disposal costs shall be at no additional cost to OWNER.

6. PROTECTING CLEAN SOIL FROM CONTAMINATION

    1. Prevent contamination of clean soil adjacent to the excavation.

    2. Place plastic sheeting and/or plywood, as needed, under excavation equipment and

alongside the excavation to prevent impacted soil from being mixed with surrounding clean soil. Use other means of preventing contamination subject to approval by ENGINEER. Do not mix excavated soil with imported materials.

3. Where possible, load soil and materials directly into transport vehicles for on-Site staging for dewatering.

4. Decontaminate excavation equipment after handling excavated materials and prior to handling clean backfill materials or traveling on clean areas of the Site. ENGINEER will direct additional decontamination as necessary in the opinion of ENGINEER.

7. EXCAVATING OVERBURDEN AND IMPACTED MATERIALS

1. Identify excavated areas by survey stakes. Excavate each area (polygon) by first removing the overlying overburden (reusable as backfill) prior to removal of underlying materials.

2. Verify excavation depths of both overburden and underlying materials using Topcon 3DXi/GPS, indication system, or equivalent grade control system, for excavation control. Enter 3D topographic data into the machine's computer system prior to start of excavation activities. Ensure accuracy of GPS is within the machine's typical +/-0.10 inch range or equivalent.

3. No personnel shall enter the excavation, when possible.

4. Excavate soils to depths and dimensions as shown on the Drawings and as directed by ENGINEER. Use GPS based controls to remove materials in designated depth increments.

5. Perform excavation in such a manner that only the excavation bucket and boom contacts materials from depth intervals to be excavated.

6. Keep limits of excavation undisturbed and free of loose, soft, or organic matter.

7. Maintain excavation depth tolerances. Unless directed by ENGINEER, excavation in excess of specified limits shall be considered unauthorized over-excavation.

8. Should unauthorized excavation be carried below the lines and grades shown on the Drawings and in excess of specified limits and tolerance because of CONTRACTOR's operations including errors, methods of construction, or to suit his convenience, correct unauthorized excavation as described in Article 3.4 G.

9. Maintain the excavation free from water and adequately mark the open excavation with temporary fencing to restrict access until the excavation is properly backfilled.

10. Use methods and equipment that result in minimal disturbance to areas outside the excavation limits.

11. Upon completion of excavation, confirm removal of overburden and impacted soil at the required depth intervals for each delineated polygon, in accordance with the Drawings, by survey or grade control system data.

12. Keep excavations open until directed to be backfilled by ENGINEER pending receipt

and review of survey results from the excavated surface. Following receipt of survey results, ENGINEER may direct CONTRACTOR to horizontally extend the limits of the excavation, excavate an additional depth of soil, or commence backfilling. For the duration of an open excavation, maintain the excavation reasonably free from water and adequately mark the open excavation with temporary fencing to restrict access until the excavation is properly backfilled.

13. Schedule excavation activities in such a manner that access is available to any excavation area for additional excavation as directed by ENGINEER. When returning to an area for additional excavation, comply with previously specified access route restrictions.

14. Schedule individual excavation areas to be completely backfilled before commencing with subsequent excavation in order to reduce water handling and treatment costs

15. Decontaminate excavation equipment periodically and as directed by ENGINEER. Decontaminate equipment when visibly contaminated. ENGINEER will direct additional decontamination when required in the opinion of ENGINEER.

8. TOLERANCES

1. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

2. Within 2 inches greater or less than specified depth but not uniformly greater or less.

9. FIELD QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

2. Survey and provide grade control system data to confirm vertical and horizontal limits of excavation. Submit surveying data to ENGINEER immediately to confirm the limits of removal.

10. CLEANING

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

2. Clean and reinstate work areas and areas affected by equipment outside areas specified to be excavated, to specified restoration condition.

11. PROTECTION

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protection of installed work.

2. Protect bottom of excavations from disturbance, and recontamination by soils to be excavated and removed.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
   1. Design, installation, operation, and maintenance of a Dewatering System.

2. Related Requirements:
   1. Section 01 57 19 – Temporary Environmental Controls.

2. REFERENCES

1. Abbreviations:
   1. NPDES: National Pollution Discharge Elimination System.
   2. TSS: Total Suspended Solids.

2. Definitions:
   1. Dewatering System: A system to allow construction activities to be carried out in areas free of water, including but not limited to: surface water control, storm water, precipitation, and seepage control.
   2. Surface Water Control: Removal of surface water within open excavations.
   3. Seepage Control: Any water due to seepage, including seepage through any embankment and upward seepage from the bottom of excavations. Seepage control consists of the collection or control of all seepage, preventing or controlling it from entering the construction area and directing the seepage to an appropriate discharge point. This includes providing adequate measures to prevent leaks, or erosion of excavated slopes at the discharge point.

3. SYSTEM DESCRIPTION

1. Provide Dewatering System to maintain stability of the base of excavations, to keep them reasonably dry and free of standing water to allow excavation of impacted soil.

2. Provide Dewater Systems to keep all containment areas including truck wash, overburden stock pile, temporary dewatering facility, and Water Treatment System reasonably dry and free of standing water to allow water treatment and construction activities to proceed during and after a rain event.

3. Dewatering System shall consist of sumps, sump pumps, ditches, trenches, dikes, berms, cofferdams and combinations thereof and all necessary appurtenances. The system shall include construction methods that divert the

flow of water away from the construction area.

4. System capacity shall be continuously reviewed during operation and, if necessary, increased or otherwise modified to ensure that the installed capacity is adequate to provide the required level of control. Any required increases in system capacity shall be added at no additional cost to OWNER.

4. PRE-INSTALLATION MEETING

1. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

2. Convene minimum 1 week prior to commencing work of this Section.

5. COORDINATION

1. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

2. Coordinate work to permit construction to be completed on dry stable substrate.

6. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Storm Water Pollution Prevention Plan (SWPPP): The plan shall contain all supporting calculations and the following details:
   1. The planned location and layout, sizes, and capacities of the Dewatering System components.
   2. Proposed location to pump/divert incoming surface water.
   3. Proposed tankage to pump and contain excavation water.
   4. Provisions for disposal of water from the system and proposed facilities to prevent scour from system discharge.
   5. Plan of normal operation.
   6. Capacities of power-supply facilities, backup power, and description of standby components and spare parts.

3. Shop Drawings:
   1. Indicate Dewatering System layout, sump location and depth, bottom grade of excavation, pump location, discharge piping and hose pathway locations, and location of any vertical or horizontal intake screens to be used.
   2. Indicate equipment location and capacity.
   3. Indicate layout of discharge hoses or pipe, including road crossing details where required.
   4. Include detailed description of Dewatering System capacity, operating procedures and maintenance of equipment.
   5. Include description of emergency procedures to follow when problems arise.
   6. Details of screens and filter media, if any proposed.

4. Product Data: Submit data for each of the following:
   1. Dewatering Pumps: Indicate sizes, capacities, priming method,

motor characteristics.
2. Pumping equipment for control of surface water within excavation.

5. Design Data:
1. Indicate design values, analyses, and calculations to support design of equipment to be used.

7. QUALITY ASSURANCE

1. CONTRACTOR shall be responsible for meeting local, state and federal regulations regarding erosion control including the applicable provisions of NPDES.

2. CONTRACTOR shall be responsible for the design of any temporary measures required to by- pass the water flow around the excavation area. CONTRACTOR is responsible to prepare and implement a contingency plan should any surface water or seepage enter and overwhelm the work area.

PART 2 PRODUCTS

1. DESIGN REQUIREMENTS

1. Design Dewatering System to reduce groundwater pressure and lower groundwater levels for stable undisturbed and substantially dry subgrade.

2. Design Dewatering System so that settlement is not caused by extraction of fine particles from soil during dewatering. Demonstrate to acceptance of ENGINEER that wells meet TSS requirements 12 hours after commencement of pumping.

2. DEWATERING EQUIPMENT

1. Pumps: Suited for this application and actual field conditions. Pumping equipment for diversion of surface water from ditches that will be impacted by the excavation activities shall be properly sized and operated to pump/divert water to facilitate soil removal in dry conditions. Pumping equipment for dewatering of the excavations to facilitate soil removal shall be properly sized to maintain a dry excavation, depending on the size of each excavation.

2. Pipes:
1. Leak free with fittings of compatible materials and of corresponding weight and quality.
2. Size, length, and type as required to accommodate flow from the pumps.
3. Standpipe: Sufficient size to accommodate the flow.
4. Pipes shall be fusion welded HDPE SDR 11 unless otherwise specified in project specs and/or drawings.

3. Keep available sufficient standby equipment to ensure continuous operation of the Dewatering System. The number of standby components and spare parts shall be determined by CONTRACTOR in consideration of known reliability and availability unless otherwise specified in the project specs and/or drawings.

PART 3 EXECUTION

1. EXAMINATION

1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

2. Examine Site to establish locations for dewatering equipment and related piping.

2. PREPARATION

1. Protect existing adjacent structures and improvements from damage caused by dewatering operations.

2. Intercept surface water away from excavations and monitoring equipment by use of pipes, sumps, or other means to ENGINEER's acceptance.

3. INSTALLATION

1. Install Dewatering System in accordance with approved SWPPP, specifications, and drawings.

2. HDPE SDR 11 shall be installed per manufacturer's specification by qualified personnel.

3. During duration of operation, maintain Dewatering System safely in accordance with regulations and requirements of authorities having jurisdiction.

4. Clearly identify location of Dewatering System installations and install barricades and signs necessary to ensure safety to workers and to pose no hazard.

5. Prior to excavation for Dewatering System, locate existing underground utilities and make provisions in Dewatering System installation to accommodate such utilities.

6. All dewatering system pipelines shall be leaked test prior to being placed into service.

4. DEWATERING

1. Operate Dewatering System in accordance with approved SWPPP and other project requirements.

2. Provide and maintain pumps, sumps, suction mains and other Dewatering System components necessary to convey water away from excavations.

3. Keep precipitation and drainage water away and clear of the Works area. Keep excavation dry.

4. Maintain continuous and complete effectiveness of installation. Supply and install sufficient backup pumping and power equipment to maintain uninterrupted operation.

5. During backfilling maintain water level at such elevations to allow for adequate compaction of backfill.

6. Provide standby equipment to ensure continuity of dewatering operations.

7. Transport water removed by Dewatering System to on-Site Temporary Water Treatment System.

5. OPERATION AND MAINTENANCE OF DEWATERING SYSTEM

1. Inspect Dewatering System on a daily basis in the presence of ENGINEER.

2. Operate Dewatering System continuously until restorations are completed to above the water table or otherwise directed by ENGINEER.

3. Provide supervision of Dewatering System by personnel skilled in operation, maintenance, and replacement of system components.

4. Conduct periodic observation of Dewatering System. Make required repairs and perform scheduled maintenance.

5. Refill fuel tanks as needed in a safe and environmentally sound manner. When Dewatering System cannot control water within excavation, notify ENGINEER and stop excavation work.
    1. Supplement or modify Dewatering System and provide other remedial measures to control water within excavation.
    2. Demonstrate Dewatering System operation complies with performance requirements before resuming excavation operations.

6. Modify Dewatering System when operation causes or threatens existing facilities or stability of excavation or fill.

7. Do not discontinue dewatering operations without ENGINEER's approval.

8. Route discharge lines and provide vehicle crossing over pipes without damage.

9. Flows from the Dewatering System shall be discharged to the Water Treatment System, unless otherwise authorized by ENGINEER. If authorized by ENGINEER, discharge from the Dewatering System outside of the work areas and on the downstream side of each work area shall not erode, scour or otherwise damage the excavation or embankment slopes, completed Works, existing ditches, or adjacent soil.

6. REMOVAL OF DEWATERING SYSTEM

1. Remove Dewatering System after dewatering operations are discontinued at the conclusion of each construction season.

2. Repair damage caused by Dewatering System or resulting from failure of Dewatering System.

7. FIELD QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

2. Where critical structures or facilities existing immediately adjacent to areas of proposed dewatering, reference points shall be established and observed twice daily to detect any settlement which may develop.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1. SECTION INCLUDES

1. Stockpiled overburden removed from excavations.
2. Common fill for excavated areas.
3. Topsoil for site restoration.
4. Aggregate for temporary access roads and parking lot restoration.
5. Filling and grading prior to final restoration.

2. ON-SITE OVERBURDEN TO BE PLACED BACK IN EXCAVATION

1. General:
    1. Free of unsuitable materials including:
        1. Trees, stumps, branches, roots, or other wood or lumber which should not be placed back in the excavation as fill because it will not compact properly.
        2. Wire, steel, cast iron, cans, drums, or other foreign material.
    2. Any decisions made regarding excavated material that is not acceptable for re-use as backfill will be made jointly between CONTRACTOR and ENGINEER.

3. SUPPLIED MATERIALS FROM OFF-SITE SOURCES

1. General:
    1. From approved commercial source, as approved by ENGINEER.
    2. Free of unsuitable materials including:
        1. Trees, stumps, branches, roots, noxious weeds or other wood or lumber which cannot be dumped from the truck delivering the material.
        2. Rocks larger than 2 inches.
        3. Wire, steel, cast iron, cans, drums, or other foreign material.
2. Common Fill:
    1. Well graded.
    2. Free of rocks larger than 2 inches, loam, organic matter, very soft clays, swelling clays, or fine uniform sands that may be difficult to compact.
    3. A liquid limit of not more than 35 and plasticity index of not more than 12 in accordance with ASTM D4318.
    4. ASTM D2487 Group Symbol: Any except those described as poorly graded and except CH, MH, OL, and OH.

3. Topsoil:
    1. Friable loam neither of heavy clay nor of very light sandy nature.
    2. Reasonably free of roots, fragments larger than 3 inches in sizes, rocks or lumps larger than 1 inch in diameter, debris, weeds, plants or their roots, vegetation, seeds of noxious weeds, stolons, seeds; salts; soil sterilants; chemical contaminants; invasive species; or other materials detrimental to plant growth.
    3. Acidity Range (pH): 5.5 to 7.5, determined in accordance with ASTM D4972.
    4. Containing minimum 2 percent and maximum 10 percent organic matter determined in accordance with ASTM D2974.
    5. Containing salt less than 2.0 ms/cm (millisiemens/cm) total salts.
    6. Capable of supporting growth of grass.
    7. Coarse Aggregate as specified in Article 2.2.

4. REFERENCES

    1. Section 01 40 00 - Quality Requirements: Requirements for references.

    2. ASTM International (ASTM):
        1. C117 - Standard Test Method for Materials Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing.
        2. C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
        3. D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock
        4. D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
        5. D2974 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
        6. D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
        7. D4972 - Standard Test Method for pH of Soils.
        8. D6913/D6913M - Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
        9. D7928 - Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.
        10. E548 - Standard Guide for General Criteria Used for Evaluating Laboratory Competence.

    3. Texas Department of Transportation (TxDOT): Standard Specification for Construction and Maintenance of Highways, Streets, and Bridges.

    4. United States Environmental Protection Agency (USEPA): SW-846 - Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, Third Edition and Promulgated Updates I-III, November 1986.

5. PROGRESS SUBMITTALS

    1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

    2. Submit evidence for each imported material, in form of chemical analysis for parameters specified in Paragraph 3.5, that material is free of hazardous substances. If fill materials will be obtained from a state-certified quarry, chemical characterization specified in 2.3 E may

not be required.

3. Samples: Submit, in airtight bag or container, 5-pound sample of each type of imported fill to ENGINEER.

4. Independent Geotechnical Testing Firm: Submit the name and qualifications of the independent geotechnical testing firm proposed by CONTRACTOR to provide geotechnical testing services for work of this Section.

5. Independent Testing Laboratory: Submit the name and qualifications of the independent testing laboratory proposed by CONTRACTOR to provide chemical analysis for work of this Section.

6. Suppliers' Certificates: Submit certificate indicating that each type of imported fill meets or exceeds specified requirements.

7. Test Reports: Submit test reports certifying compliance with specified requirements prior to commencing transport to the Site.

8. Analytical Results: Submit chemical analytical results for each type of imported fill prior to commencing transport to the Site.

9. Geotechnical Data: Submit geotechnical data for aggregate materials prior to commencing transport to the Site. Submit grain size distribution curves, density, and moisture content for each type of aggregate material. Show average distribution and minimum and maximum variation in gradation for each grain size distribution curve.

10. Weigh Tickets: Submit at the start of the work day following delivery weigh tickets generated at Supplier's weigh scale of imported fill delivered to the Site.

11. Weigh Scale Calibration: Submit a calibration chart, completed within the previous 6 months, for weigh scale. Weigh scale shall be calibrated by State of Texas agency.

6. QUALIFICATIONS

1. Geotechnical Testing Firm: Company specializing in performing work of this Section and complying with ASTM D3740 to perform testing of fill materials including density, moisture content, permeability and particle size analysis for both soil and aggregate samples.

2. Independent Testing Laboratory: Company specializing in performing work of this Section and complying with ASTM E548 to perform chemical analysis of fill material samples for parameters specified in Paragraph 3.5.

7. QUALITY ASSURANCE

1. Perform work of this Section in accordance with TxDOT Standard Specification for Construction and Maintenance of Highways, Streets, and Bridges.

8. DELIVERY, STORAGE, AND HANDLING

1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling,

storing, and protecting products.

2. Deliver, handle, and transport fill materials at all times in a manner and with equipment that will prevent intermixing of aggregate types, segregation, or contamination.

3. Minimize stockpiling requirements. Transport material from source directly to final position where possible.

4. Stockpile fill materials on-Site in locations approved by ENGINEER.

9. ENVIRONMENTAL REQUIREMENTS

1. Suspend operations whenever climatic conditions, as determined by ENGINEER, are unsatisfactory for placing fill to the requirements of this Section.

2. After occurrence of heavy rains, do not operate equipment on previously placed material or on approved surfaces until the material has dried sufficiently to prevent occurrence of excessive rutting.

3. Where surfaces or previously placed material have been softened or eroded, remove soft and yielding material or otherwise objectionable or damaged areas and replace with compacted fill as specified by ENGINEER.

4. Decontaminate equipment involved in grading activities which may have come in contact with potentially impacted material before being removed from the Site or being relocated to clean areas of the Site.

10. SEQUENCING AND SCHEDULING

1. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.

2. Coordinate and sequence filling operations to minimize the need for double handling.

3. Coordinate and sequence filling operations to minimize open excavations at all times.

PART 2 PRODUCTS

1. GENERAL

1. Imported fill to be from an approved source.

2. Fill material to be free of unsuitable materials including:
    1. Trees, stumps, branches, roots, vegetation, or other wood or lumber.
    2. Wire, steel, cast iron, cans, drums, or other foreign material.
    3. Materials containing hazardous or toxic constituents at hazardous or toxic concentrations.

3. Compactable to specified density at specified moisture content.

2. COARSE AGGREGATE

   1. TxDOT Specification Sections 302, Coarse Dense Graded Aggregate.

3. SOURCE QUALITY CONTROL

   1. Section 01 40 00 - Quality Requirements: Testing, inspection, and analysis requirements.

   2. Testing and Analysis of Coarse Aggregate:
      1. Grain Size, ASTM C117, C136, and D6913/D6913M: 1 sample per 1,000 cu yd of aggregate required.
      2. Chemical Analysis: 1 sample per source. In accordance with Paragraph 3.5.

   3. Testing and Analysis of Common Fill:
      1. Particle Size, ASTM D6913/D6913M and D7928: One sample per 2,500 cu yd of material required.
      2. Soil Classification, ASTM D2487: One sample per 2,500 cu yd of material required.
      3. Chemical Analysis: 1 sample per source. In accordance with Paragraph 3.5.

   4. Testing and Analysis of Topsoil:
      1. Particle Size, ASTM D422: 1 sample per 2,500 cu yd, or portion thereof, of topsoil required.
      2. pH, ASTM D4972: 1 sample per 2,500 cu yd, or portion thereof, of topsoil required.
      3. Organic Matter, ASTM D2974: 1 sample per 2,500 cu yd or portion thereof, of topsoil required.
      4. Phosphorus, potassium, calcium, and magnesium, in accordance with
      5. state-accredited method: 1 sample per 2,500 cu yd, or portion thereof, of topsoil required.
      6. Chemical Analysis: 1 sample per source. In accordance with Paragraph 3.5.

   5. Chemical characterization in the laboratory in accordance with the following methods:

Analytical Parameters	*Analytical Methods*[1]
TAL[3] Metals	SW-846 6020A/7471A
Hexavalent Chromium	SW-846 7196A
Cyanide	SW-846 9010/9012
TCL[2] Volatiles	SW-846 8260B
TCL Semi-Volatiles	SW-846 8270D
TCL Pesticides	SW-846 8081B
Polychlorinated Biphenyls	SW-846 8082A
Herbicides	SW-846 8151A
Dioxin/Furans	SW-846 1613B
Total Petroleum Hydrocarbons	TX 1005/1006[4]
Notes: 1. EPA SW 846. 2. TCL: Target Compound List. 3. TAL: Target Analyte List. 4. Texas Commission on Environmental Quality Methods 1005 and 1006	

6. Test and analyze all imported material to demonstrate compliance with the EPA Regional Screening Levels (RSL) for resident soil (EPA RSL Table, November 2021) and the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) Tier 1 Residential Soil protective concentration levels (PCLs; for total petroleum hydrocarbons [TPH]).

7. If tests indicate materials do not meet specified requirements, change to appropriate material or change material source and retest.

8. Provide materials of each type from the same source throughout the Works.

9. In the event of changes to approved sources of materials during the performance of the Works, immediately advise ENGINEER of revised locations and obtain approval of such locations and materials prior to use in the Works.

PART 3 EXECUTION

1. EXAMINATION

1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

2. Do not allow or cause any of the work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, surveys, measurements, tests, or approvals.

3. Submit required survey data to ENGINEER and obtain approval from ENGINEER for completed subgrade and previously placed material prior to placement of successive lifts.

4. Obtain approval from ENGINEER prior to placing fill against structures or around exposed buried utilities.

5. Ensure areas to be backfilled are free from trash, debris, snow, ice, water, soft soils, organic materials, or frozen ground.

2. PREPARATION

1. Remove debris, water, soft soils, organic materials, or frozen ground from areas to be filled.

2. Where not filling on previously worked area, scarify subgrade surface to a depth of 6 inches.

3. Compact subgrade to requirements for subsequent fill material.

4. Cut out soft areas of subgrade not capable of compaction in place. Backfill with appropriate fill and re-compact to meet requirements for subsequent fill material.

3. STOCKPILING

1. If necessary, stockpile fill materials at temporary stockpile areas approved in the approved Material Handling and On-Site Transportation Plan and by ENGINEER.

2. Segregate temporary stockpiles by material type and analytical results.

3. Provide and maintain access to temporary stockpiles.

4. Prevent contamination of stockpiled fill.

5. Direct surface water away from stockpile locations to prevent erosion or deterioration of materials.

6. Maintain stockpile slopes not steeper than 2.5 horizontal to 1 vertical. In no instance shall stockpiles be greater than 12 feet in height above original surrounding grade. Place hay bales or other soil erosion and sediment control fencing at the base of and around each temporary stockpile to contain soil that may be washed off the stockpile.

7. Maintain area surrounding stockpiles in safe, neat, and tidy condition.

8. Cover stockpiled fill at the end of each day with robust tarpaulin, or similar measures, to withstand adverse weather, wind, and other detrimental forces. Provide total protection of stockpiled material from rain and other adverse weather effects.

4. FILLING

1. Load and transport fill from off-Site sources in accordance with the approved Material Handling and On-Site Transportation Plan.

2. Place and compact common fill material in equal continuous layers not exceeding 12 inches of uncompacted depth or 8 inches of machine-compacted depth.

3. Place topsoil over common fill (for restoration) to a minimum settled depth of 6 inches during dry conditions. Grade topsoil to eliminate rough, low, or soft areas and to ensure positive drainage, and rake smooth.

4. Employ a placement method that does not disturb or damage other work.

5. Slope grade away from structures minimum 2 percent to match existing grade.

6. Make gradual grade changes. Blend slope into level areas.

7. Do not operate heavy compaction equipment closer than 5 feet to structures, underground utilities, or monitoring wells.

5. PLACING TOPSOIL

1. Spread topsoil to a minimum settled depth of 6 inches over area to be seeded. Rake until smooth.

2. Place topsoil during dry weather and on dry subgrade.

3. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

4. Grade topsoil to eliminate rough, low, or soft areas, and to ensure positive drainage.

5. Tilt topsoil to incorporate materials to adjust soil pH. phosphorus fertilizers if recommended by soil test, and soil amendments to improve the soil structure.

6. Install edging at periphery of seeded areas in straight lines to consistent depth.

7. Obtain ENGINEER's approval of topsoil grade and depth before starting seeding.

6. PLACEMENT OF AGGREGATE

1. Verify subgrade has been inspected, gradients and elevations are correct, and is dry.

2. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.

3. Place aggregate in maximum 6-inch thick layers.

4. Level and contour surfaces to elevations and gradients to match existing adjacent areas.

5. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

6. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

7. COMPACTION

1. Common Fill: Compact using standard construction equipment (i.e., minimum three passes of a D6 dozer, vibratory roller or equivalent).

2. Coarse Aggregate: Compact to using standard construction equipment (i.e., minimum three passes of a D6 dozer, vibratory roller or equivalent).

3. Apply water from an approved source as necessary during compaction to obtain desired density. If material to be compacted is excessively moist, aerate with suitable equipment and methods until the moisture is corrected. In areas not accessible to rolling equipment, compact material to specified density with mechanical tampers.

4. Do not direct jets of water at fill with such force that finer materials will be washed out.

5. Compaction Equipment: The type, size, and efficiency of compaction equipment shall be capable of achieving desired degree of compaction. When operating equipment adjacent to and immediately above structures, exercise care so as not to cause damage or displacement of the structure.

8. TOLERANCES

1. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

2. Top Surface of Fill: Plus or minus 1 inch, but not uniformly high or low, from required elevations (i.e., match previous ground surface contours).

9. FIELD QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

2. Select samples of uncompacted fill intended for the Works and samples of compacted fill in the Works.

3. Test installed materials to confirm compliance with Specifications.

4. Submit copies of test reports to ENGINEER.

5. Verification Testing by ENGINEER:
    1. ENGINEER may select samples of uncompacted fill intended for the Works and samples of compacted fill in the Works.
    2. Testing by ENGINEER will in no way relieve CONTRACTOR of his responsibility to test all material prior to notifying ENGINEER of materials' suitability for the work involved.

6. Methods of Testing:
    1. Particle size analysis shall be performed in accordance with ASTM DD6913/D6913M and ASTM D7928 or ASTM C117 and ASTM C136, whichever is appropriate to material being tested.

7. Frequency of Testing:
    1. Common Fill and Aggregate:
        1. At least 1 grain size analysis per source.

8. The method used and the frequency of tests may be modified by ENGINEER.

9. Failure to Meet Specified Requirements: If tests indicate that material specifications have not been achieved or cannot be obtained with equipment in use, procedure being followed, or material being incorporated, remove and replace work and modify operations so that the equipment, procedures, and materials will produce the required results. Additional testing required by ENGINEER will be to CONTRACTOR's account.

10. ADJUSTING

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for adjusting.

2. Finish fill surfaces to within 1 inch of grades as shown on the Drawings but not uniformly high or low. Correct surface irregularities by loosening and adding or removing material until the surface is within specified grade.

3. Leave work areas in a properly graded condition sloped as required to permit proper drainage and free of depressions that will pond or collect water or debris that will restrict flow.

11. PROTECTION

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protection of installed work.

2. Reshape and recompact fills subjected to vehicular traffic or areas disturbed by other Works prior to installing finish topsoil layer.

END OF SECTION

SECTION 31 41 16

SHEET PILES

PART 1 GENERAL

1. SECTION INCLUDES

1. Steel sheet piling to create a retaining wall. Sheet piling to be removed upon completion of excavation activities.

2. REFERENCES

1. Section 01 40 00 - Quality Requirements: Requirements for references.

2. ASTM International:
   1. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
   2. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   3. ASTM A572/A572M - Standard Specification for High Strength Low Alloy Columbium Vanadium Structural Steel.
   4. ASTM A690/A690M – Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments.

3. American Welding Society:
   1. AWS D1.1/D1.1M - Structural Welding Code - Steel.

3. DEFINITIONS

1. Sheet Pile: Pile that is specially shaped to generally interlock with adjacent piles to form a reasonably tight wall with principal purpose of resisting lateral pressures, usually from soil or water with minimal water leakage.

4. SCHEDULING

1. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.

2. Schedule sheet piling submittals sufficiently in advance of pre-installation meeting to ensure ENGINEER's review is complete.

5. PROGRESS SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Product Data:
   1. Submit details of sheet piling.
   2. Storage and handling procedures.
   3. Interlock sealing material data and application procedures.

4. Details of templates or other temporary guide structures.

3. Shop Drawings:
   1. Indicate location and extent of sheet piling, details of top protection, tip reinforcement, tip protection, splices, fabricated additions to plain piles, cut off method, interlock sealing.
   2. Include complete dimensions and details of sheet piling sections and connectors.
   3. Include sequence of driving and detailed drawings of templates or other temporary guide structures.

4. Test Reports:
   1. Submit certified materials tests reports showing that sheet piling and appurtenant metal materials meet the specified requirements, for each shipment and identified with specific lots. Include in the identification data piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.
   2. Test reports shall meet ASTM A6/A6M requirements.

5. Pile Driving Equipment:
   1. Submit descriptions of pile driving equipment, including manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet, templates, and jetting equipment.

6. CLOSEOUT SUBMITTALS

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout submittals.

2. Record Documents:
   1. Record actual locations of sheet piling and top and bottom elevations.
   2. Submit driving records with hammer blows for final 12 inches of driving.
   3. Submit a complete and accurate record of each sheet pile within one day of completion of pile driving operation. The record shall indicate the pile location (as driven), data driven, size, driven length, embedded length, final elevations of tip and top, pile weight, and the total driving time. The record shall also include the type and size of the hammer used and the rate of operation. Any unusual conditions encountered during pile installation such as delays during driving, damage to pile resulting from driving, or heave in adjacent piles shall be recorded and immediately reported to ENGINEER.
   4. Submit records indicating piles pulled.

7. REGULATORY REQUIREMENTS

1. Conform to the Project regulatory permits and approvals.

8. QUALIFICATIONS

1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 5 years documented experience.
2. Installer: Company specializing in performing the work of this Section with minimum 15 years documented experience.

3. Design and select sheet pile components under direct supervision of professional

structural Engineer experienced in design of this work and licensed in State of Texas.

4. Welders and Welding Procedures: AWS D1.1 qualified within previous 12 months.

9. DELIVERY, STORAGE, AND HANDLING

1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

2. Deliver sheet piling with manufacturer's logo and mill identification mark on each sheet piling.

3. Store and handle sheet piling in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks.

4. Handle using handling holes or lifting devices.

5. Support on level blocks or racks spaced not more than 10 feet apart nor more than 2 feet from the ends. Arrange supports for multiple lifts aligned vertically.

6. Protect sheet piling with factory-installed joint sealant.

7. Storage of sheet piling should facilitate required inspection activities and prevent corrosion prior to installation.

10. PRE-INSTALLATION MEETING

1. Convene prior to commencing work of this Section.

PART 2 PRODUCTS

1. STEEL SHEET PILING

1. Sheet Piling: ASTM A690/A690M Grade 60.

2. Interlock Strength: 20 kips/inch for ASTM A690/A690M Grade 60 steel.

3. Interlock Swing Allowable: 5 degrees.

2. COMPONENTS

1. Splices and Other Fabrication Appurtenances Including Wales and Stiffener Plates: Structural Steel ASTM A572/A572M Grade 50.

2. Welding Materials: AWS D1.1; type required for materials being welded.

3. JOINT SEALANTS

    1. Pile interlock joint sealant, such as WADIT as manufactured Piledro Group or an approved equivalent.

4. SHOP FABRICATION

    1. Fabricate sheet piling and special fabricated sections to full length.

    2. Fabricate tees, wyes, corners and cross pieces to match sheet piling sections, with 1/2 inch minimum web thickness.

    3. Perform welding according to AWS D1.1.

    4. Fabricate sheet piling with standard pulling holes.

5. SOURCE QUALITY CONTROL

    1. Section 01 40 00 - Quality Requirements: Testing, inspection, and analysis requirements.

    2. Allow witnessing of factory inspections and test at manufacturer's test facility. Notify OWNER before inspections and tests are scheduled.

    3. Materials Tests:
        1. Sheet piling and appurtenant materials shall be tested and certified by the manufacturer to meet the specified chemical, mechanical and section property requirements prior to delivery to the Site.
        2. Testing of sheet piling for mechanical properties shall be performed after the completion of all rolling and forming operations.
        3. Testing of sheet piling shall meet ASTM A6/A6M requirements.

    4. Make completed sheet piling available for inspection at manufacturer's factory prior to packaging for shipment. Notify OWNER before inspection is allowed.

PART 3 EXECUTION

1. EXAMINATION

    1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

    2. Examine the Site, subsurface conditions, and become familiar with conditions that may affect work of this Section.

    3. In the presence of ENGINEER, conduct a condition survey of existing services, structures, and survey benchmarks and monuments, which may be affected by the Works. Document condition of adjacent structures prior to commencing the Works.

    4. Check and locate buried utilities, including piping in the work area. Record location and depth of all utilities and surface features encountered.

5. Protect buried utilities from damage during construction operations. Notify ENGINEER of conflicts with underground utilities before proceeding with the Works. Damage to utilities due to work of this Section shall be repaired at CONTRACTOR's expense and at no additional cost to OWNER.

6. Select methods of construction suitable for actual conditions encountered in the Works. CONTRACTOR is solely responsible for the safety and adequacy of the method employed.

7. Once the work has begun, interpret each of the previous piles for data to be employed on subsequent piles.

8. Should an obstruction be encountered during driving of sheet piles that prevents placing of the sheet pile within the specified tolerances to the required depths, as herein specified, clear the obstruction, if possible. If it is not possible to clear the obstruction, relocate the pile to a new position, under direction of ENGINEER.

2. TEMPLATES

1. Prior to driving, provide template or driving frame suitable for aligning, supporting, and maintaining sheet piling in correct position during setting and driving:
    1. Structural frame sufficiently rigid to resist lateral driving forces.
    2. Provide at least two levels of support at 1/3 points or not less than 20 feet apart.
    3. Provide wood blocking to bear against webs of alternate sheet piling.
    4. Provide outer restraints to prevent sheets from warping or wandering.
    5. Provide visible markings on templates to verify correct sheet piling location and direction.

3. PREPARATION

1. Retain a registered land surveyor to locate the position of each pile prior to construction, and to determine the top elevation of each pile after construction. Submit written, signed reports for each pile as an attachment to the daily record.

2. Use equipment approved by ENGINEER.

3. Use driving method that will not cause damage to nearby structures.

4. Protect structures including overhead and buried utilities near the Works, from damage.

4. PILING HAMMER

1. Use piling hammer approved by ENGINEER.

2. Keep hammer in good mechanical condition.

3. Operate hammer at speed and pressure recommended by manufacturer.

4. During piling driving operations, ENGINEER may make occasional measurements of velocity of hammer ram.

5. When energy per blow is less than 80 percent of rated energy per blow as specified by manufacturer of piling hammer, make necessary repairs to improve energy output to value of at least 80 percent of rated energy per blow, or replace piling hammer.

6. Use protective cap during driving to prevent damage to top of sheet piling.

5. EARTHWORK

1. Pre-excavation will not be permitted.

6. INSTALLATION

1. When driving is interrupted before refusal, drive additional 12 inches before resuming recording of performance data.

2. Placing: Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.
    1. Pilings shall be placed plumb with out of plumbness not exceeding 1/4 inch per foot of length and true to line. Place the pile so the face will not be more than 6 inches from vertical alignment at any point. Top of pile at elevation of cut off shall be within 1/2 inch horizontally and 2 inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Re-drive all heaved piles to the required tip elevation.
    2. Provide temporary wales, templates, or guide structures to ensure that the pilings are placed and driven to the correct alignment.

3. Driving:
    1. Drive pilings with the proper size hammer and by approved methods so as not to subject the pilings to damage and to ensure proper interlocking throughout their lengths.
    2. Maintain driving hammers in proper alignment during driving operations by use of leads or guides attached to the hammer. Caution shall be taken in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid interlock melt or damages. Discontinue the use of vibratory hammers and impact hammers employed when the penetration rate due to vibratory loading is one foot or less per minute.
    3. Employ a protecting cap in driving when using impact hammers to prevent damage to the tops of pilings. Use cast steel shoe to prevent damage to the tip of the sheet piling. Remove and replace pilings damaged during driving or driven out of interlock at no additional cost to OWNER.
    4. Drive pilings without the aid of a water jet unless otherwise authorized.
    5. Take adequate precautions to ensure that pilings are driven plumb. Where possible, drive Z pile with the ball end leading. If an open socket is leading, a bolt or similar object placed in the bottom of the interlock will minimize packing material into it and ease driving for the next sheet. If at any time the forward or leading edge of the piling wall is found to be out of plumb in the plane of the wall the piling being driven shall be driven to the required depth and tapered pilings shall be provided and driven to interlock with the out of plumb leading edge or other approved corrective measures shall be taken to insure the plumbness of succeeding pilings. The maximum permissible taper for any tapered piling shall be 1/8 inch per foot of length.

6. Pilings in each run or continuous length of piling wall shall be driven alternately in increments of depth to the required depth or elevation. No piling shall be driven to a lower elevation than those behind it in the same run except when the pilings behind it cannot be driven deeper. Incrementally sequence driving of individual piles such that the tip of any sheet pile shall not be more than 4 feet below that of any adjacent sheet pile. When the penetration resistance exceeds five blows per inch, the tip of any sheet pile shall not be more than 2 feet below any adjacent sheet pile. If the piling next to the one being driven tends to follow below final elevation it may be pinned to the next adjacent piling.
7. If obstructions restrict driving a piling to the specified penetration, the obstructions shall be removed or penetrated with a chisel beam. If CONTRACTOR demonstrates that removal or penetration is impractical, make changes in the design alignment of the piling structure as directed by ENGINEER to ensure the adequacy and stability of the structure. Pilings shall be driven to depths shown and shall extend up to the elevation indicated for the top of pilings.
8. Pre-augering or spudding of piles will not be permitted.

4. Cutting Off and Splicing: Pilings shall be driven to refusal or to the point of termination. Piles extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed by ENGINEER at no additional cost to OWNER. If directed by ENGINEER, pilings shall be spliced as required to drive them to depths greater than shown and extend them up to the required top elevation.
    1. Pilings adjoining spliced pilings shall be full length unless otherwise approved. Where spliced pilings adjoin the welded joints shall be staggered to ENGINEER's approval. Ends of pilings to be spliced shall be squared before splicing to eliminate dips or camber. Pilings shall be spliced together with concentric alignment of the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks. Spliced pilings shall be free sliding and able to obtain the maximum swing with contiguous pilings. The tops of pilings excessively battered during driving shall be trimmed when directed by ENGINEER, at no additional cost to OWNER. Piling cut offs shall become the property of CONTRACTOR and shall be removed from the Site.

5. Inspection of Driven Piling: Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of ENGINEER. Inspect the interlocked joints of driven pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at no additional cost to OWNER.

6. Sheet Piling to be removed upon completion of excavation activities.

7. INSTALLATION RECORDS

1. Maintain a pile driving record for each sheet pile driven.

8. WELDING AND SPLICING

1. Perform welding according to AWS D1.1 for shielded metal arc welding.

2. Splice sheet piling sections with one of the following:
   1. Complete penetration butt weld.
   2. Splicer sleeve with flanges welded with full penetration groove welds.

3. Use jig or alignment device during welding to maintain required shape and alignment.

4. Use only butt weld splices within 20 feet from sheet piling cut off elevation or design grade, whichever is lower.

5. Comply with the following for number, type and location of splices:
   1. No more than three splices for sheet piling over 100 feet long.
   2. No more than two splices for sheet piling up to 100 feet long.
   3. No splice closer than 25 feet from tip.

9. INTERLOCK SEALING

1. Clean off rust and debris from interlock section of piles and prepare interlocks in accordance with manufacturer's instructions.

2. Apply sealer to pile interlocks in horizontal configuration and tape ends in accordance with manufacturer's instructions.

3. Protect from moisture until ready to install piles.

4. After installation of piles, repair seal with cartridge application of sealer in accordance with manufacturer's instructions as required to provide fully sealed sheet pile wall.

10. TOLERANCES

1. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

2. Maximum Variation From Vertical for Plumb Sheet Piling: 1:48.

3. Maximum Variation From Sheet Piling Cut Off Elevation: 4 inches.

4. Maximum Out of Position: 2 inches.

11. FIELD QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

2. Inspect for imperfections in joint interlock capable of impeding installation.

3. Reject damaged sheet piling sections or repair as required prior to installing.

4. Unacceptable Piles: Piles that are placed out of position, are below cutoff elevations, not plumb, or are damaged.

5. Replace piles to conform to specified requirements.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. Removal and Replacement of existing fence fabric and slide gates.
    2. Removal of fence posts by cutting off at ground surface (with remainder of post being disposed of with excavated soils)
    3. Excavation for new post bases.
    4. Fence framework, fabric, and accessories, where existing materials are not reusable.
    5. Concrete foundation for posts and center drop for reinstallation of slide gates.
    6. Installation of temporary chain link fencing

2. REFERENCES

1. Reference Standards:
    1. Section 01 40 00 - Quality Requirements: Requirements for references.
    2. ASTM International:
        1. ASTM A121 - Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
        2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
        3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
        4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
        5. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
        6. A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
        7. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
        8. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
        9. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
        10. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
    3. Chain Link Fence Manufacturers Institute:
        1. CLFMI Product Manual.

3. SYSTEM DESCRIPTION

1. Fence Height: 6 feet nominal, with 12 inches barbed wire on top.

2. Line Post Spacing: At intervals not exceeding 10 feet.

3. Fence Post and Rail Strength: Conform to ASTM F1043, Light Industrial Fence quality.

4. Gates: Reinstallation of two existing slide gates and associated hardware.

5. Installation of temporary vehicle gates and a pedestrian gate

4. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Product Data: Submit data on fabric, posts, accessories, fittings, and hardware.

3. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

4. Manufacturer's Instructions: Submit installation requirements.

5. CLOSEOUT SUBMITTALS

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout submittals.

2. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.

6. QUALITY ASSURANCE

1. Supply material in accordance with CLFMI Product Manual.

2. Perform installation in accordance with ASTM F567.

3. Certifications: Provide certificate of compliance from authority having jurisdiction.

7. QUALIFICATIONS

1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

8. DELIVERY, STORAGE, AND HANDLING

1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

2. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

3. Identify each package with manufacturer's name.

4. Store fence fabric and accessories in secure and dry place.

PART 2 PRODUCTS

1. MATERIALS

1. Framing (Steel): ASTM F1083, Schedule 40; galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043, Type A on pipe exterior and interior.

2. Fabric Wire (Steel): ASTM A392, Class 1; zinc-coated steel wire.

3. Concrete: Normal Portland Cement, 3,000 psi strength at 28 days.

2. COMPONENTS

1. Line Posts: 2.38 inch diameter.

2. Corner and Terminal Posts: 2.88 inch.

3. Gate Posts: 4 inch diameter.

4. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

5. Gate Frame: 2 inch diameter for welded fabrication.

6. Fabric: 2-inch diamond mesh interwoven wire, 9 gauge, top salvage knuckle end closed, twisted tight, bottom selvage twisted tight, knuckle end closed.

7. Tension Wire: 7 gauge steel, single strand.

8. Tension Band: 0.188 inch steel.

9. Tension Strap: 0.188 inch steel.

10. Tie Wire: Aluminum alloy steel wire.

3. ACCESSORIES

1. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

2. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

4. FINISHES

1. Components and Fabric: Galvanized to ASTM A123/A123M for components; ASTM A153/A153M for hardware; ASTM A392 for fabric; 1.8 ounces per sq ft coating.

2. Hardware: Galvanized to ASTM A153/A153M, 1.8 ounces per sq ft coating.

3. Accessories: Same finish as fabric.

PART 3 EXECUTION

1. INSTALLATION

1. Permanent Fencing

1. Install framework, fabric, accessories, and gates in accordance with ASTM F567.

2. Set intermediate, terminal, gate, posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

3. Line Post Footing Depth Below Finish Grade: 3 feet.

4. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 3 feet.

5. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

6. Install top rail through line post tops and splice with 6-inch long rail sleeves.

7. Install center and bottom brace rail on corner gate leaves.

8. Place fabric on outside of posts and rails.

9. Do not stretch fabric until concrete foundation has cured 7 days.

10. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

11. Position bottom of fabric 2 inches above finished grade.

12. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches oc.

13. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

14. Install bottom tension wire stretched taut between terminal posts.

15. Support gates from gate posts.

16. Install gate with fabric to match fence. Install three hinges on each gate leaf, latch, catches, drop bolt.

17. Connect to existing fence at existing terminal post or existing line post converted to terminal post by installation of brace rails and brace rods.

18. Install posts with 6 inches maximum clear opening from end posts to fences and other

structures.

19. Excavate holes for posts to diameter and spacing shown on the Drawings without disturbing underlying materials.

20. Center and align posts. Place concrete around posts and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.

21. Extend concrete footings 1 inch above grade, and trowel, forming crown to shed water.

22. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

2. Temporary Fencing

1. Install framework, fabric, accessories, and gates in accordance with ASTM F567.

2. Set intermediate, terminal, gate, posts plumb, a minimum 3 feet into soils either by driving or digging a hole. Ensure soils are adequately compact around post and posts are secure. Mound top of soil for water runoff. Set in concrete if soils will not adequately support posts.

3. Line Post Depth Below Finish Grade: 3 feet.

4. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 3 feet.

5. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

6. Install top rail through line post tops and splice with 6-inch long rail sleeves.

7. Install center and bottom brace rail on corner gate leaves.

8. Place fabric on outside of posts and rails.

9. Ensure posts are secure before stretching fabric.

10. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

11. Position bottom of fabric 2 inches above finished grade.

12. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches oc.

13. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

14. Install bottom tension wire stretched taut between terminal posts.

15. Support gates from gate posts.

16. Install gate with fabric to match fence. Install three hinges on each gate leaf, latch, catches, drop bolt.

17. Connect to existing fence at existing terminal post or existing line post converted to terminal post by installation of brace rails and brace rods.

18. Install posts with 6 inches maximum clear opening from end posts to fences and other structures.

19. Drive or excavate holes for posts at and spacing shown on the Drawings without disturbing underlying materials.

20. Center and align posts. Compact material around posts as necessary to ensure they are secure. Set in concrete if soils will not adequately support posts Verify vertical and top alignment of posts and make necessary corrections.

21. Mound soil 1 inch above grade to shed water.

2. TOLERANCES

1. Section 01 40 00 - Quality Requirements: Tolerances.

2. Maximum Variation From Plumb: 1/4 inch.

3. Maximum Offset From Indicated Position: 1 inch.

4. Minimum Distance From Property Line: 6 inches.

3. FIELD QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Field inspection and testing.

2. Repair damaged galvanized surfaces in accordance with ASTM A780/A780M.

3. Apply field repair coating to damaged galvanized surfaces at dry film thickness at least equal to specified galvanized coating thicknesses

4. TEMPORARY FENCE REMOVAL

1. Remove all temporary fence material at the end of the project,

2. Dispose of materials in permitted landfill or retain for salvage.

3. Provide documentation of disposition of fence material to ENGINEER.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. Hydroseeding.
    2. Maintenance.

2. Related Requirements:
    1. Section 31 23 23 - Fill.

2. REFERENCES

1. Definitions:
    1. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.
    2. Noxious Weeds:
        1. Harmful, undesirable, hard to control. Including, but not limited to:
            1. Johnson Grass or Johnson Grass Crosses, Canadian Thistle, Quackgrass, Wild Garlic and Wild Onion, Bermuda Grass, Annual Blue Grass, Corn Cockle, Dodder, and Blindweed.

2. Reference Standards:
    1. Section 01 40 00 - Quality Requirements: Requirements for references.
    2. ASTM International:
        1. ASTM C602 - Standard Specification for Agricultural Liming Materials.
        2. ASTM D2974 - Standard Test Method for Moisture, Ash and Organic Matter of Peat and Other Organic Soils.
        3. ASTM D4972 - Standard Test Method for pH of Soils.
    3. Texas Department of Transportation (TxDOT):
        1. Standard Specifications Item 161 – Compost.
        2. Standard Specifications Item 164 – Seeding for Erosion Control.
        3. Standard Specifications Item 169 – Soil Retention Blanket.
    4. Texas Seed Law.

3. SCHEDULING

1. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.

2. Schedule topsoil placing to permit seeding operations under optimum conditions during normal planting seasons. The permanent seed mix shall be applied between January 15 and May 15, when possible.

3. Coordinate planting with specified maintenance periods to provide maintenance until acceptance by ENGINEER.

4. Seed areas within 10 days of completion of topsoiling. Use seed within 12 months from the date of analysis.

5. Apply fertilizer at least 1 week after application of lime.

4. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Seeding and Erosion Control Plan: Submit to ENGINEER for approval CONTRACTOR's Seeding and Erosion Control Plan including, but not limited to the following:
    1. Seed mixture(s) and fertilizers and application rates.
    2. Time of year for planting.
    3. Methods of preparing seedbed, seeding, rolling seeded areas, and irrigation.
    4. Methods to provide erosion control until seed is placed and grass is established (i.e., use of any or a combination of emulsifiers, tackifiers, mulches, adhesives, nurse crop seed).

3. Samples: Submit minimum 10- pound sample of topsoil proposed. Forward Sample to approved testing laboratory in sealed containers to prevent contamination.

4. Materials Sources: Submit name of proposed imported topsoil sources prior to commencing transport of topsoil to Site.

5. Seed Certificates: Submit certificates from seed vendors stating botanical and common name, percentage by weight and percentages of purity, germination, and weed seed for each species.

6. Fertilizer Certificate: Submit certificate confirming conformance with recommendations provided by laboratory based on topsoil analysis.

7. Test Results: Submit test results of manufactured topsoil. Indicate, by test results, information necessary to determine suitability, including, but not limited to, organic content, percent of sand w/grain size results, pH, phosphorus, potassium, calcium, and magnesium; and laboratory or supplier recommendation for fertilizer application rate for specified seed mixture.

5. CLOSEOUT SUBMITTALS

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout submittals.

2. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

6. QUALITY ASSURANCE

1. Perform work of this Section in accordance with Texas Seed Law and TxDOT Standard Specifications, Items 161 and 164.

2. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

3. Regulatory Requirements: Comply with regulatory agencies for fertilizer and herbicide composition.

4. Certifications: Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

7. QUALIFICATIONS

1. Seed Supplier: Established vendor capable of providing adequate seed quality and quantities.

2. Fertilizer Supplier: Established vendor capable of providing adequate fertilizer quality and quantities.

3. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

8. DELIVERY, STORAGE, AND HANDLING

1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

2. Deliver grass seed mixture in sealed containers bearing seed Supplier's label and certificate indicating the content of species, grade, and mass. Seed in damaged packaging is not acceptable. Label containers showing:
    1. Analysis of seed mixture.
    2. Percentage of pure seed.
    3. Percentage of weeds.
    4. Year of production.
    5. Net weight.
    6. Date when tagged and location.
    7. Percentage germination.
    8. Name and address of distributor.

3. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

4. Deliver mulch and erosion control agent in moisture-proof containers showing manufacturer, content, and net weight (air dry).

5. Store materials in accordance with manufacturer's instructions and in a manner to prevent damage or deterioration.

6. Remove from the Site seed which has become wet, moldy, or otherwise damaged in transit or storage.

7. Store seed in weatherproof enclosures.

9. AMBIENT CONDITIONS

1. Do not apply seed slurry when wind conditions are such that material would be carried beyond designated area or that materials would not be uniformly applied or when wind velocity exceeds 5 miles per hour.

2. Do not apply materials over snow, ice, frozen ground, or standing water.

PART 2 PRODUCTS

1. SEED MIXTURE

1. Grass Seed: Fresh, clean, new-crop seed harvested previous year meeting the requirements of the Texas Seed Law, including the testing and labeling for pure live seed (PLS = Purity x Germination).

2. Mixture of the following:

Districts	***Approximate Planting Dates***	***Plant Species***	***PLS Rate (lbs/acre)***
12 (Houston)*	January 15 to May 15	Green Sprangletop	0.3
		Bermudagrass	2.1
		Sideoats Grama (Haskell)	3.2
		Little Bluestem (Native)	1.4
		Illinois Bundleflower	1.0
12 (Houston) and 20 (Beaumont)	September 1 to November 30	Oats	72
All	May 1 to August 31	Foxtail Millet	34

2. SOIL AMENDMENTS

1. Soil amendments to be applied in accordance with soil test recommendations and ENGINEER's approval. Soil amendments shall be free from clay subsoil, sawdust, commercial wood products, stones, lumps, plants, sticks, weed stolons and seeds, chemical contaminants and other materials harmful to plant life.

2. Organic Components:
   1. Sphagnum peat moss shall be a horticultural grade. Peat moss suitable for horticultural purposes shall be medium to coarse shredded with a texture varying from porous to spongy fibrous and substantially homogeneous with a pH value between 3.4 and 5.5.

2. Commercially prepared compost shall be virtually free from all viable weed seeds or other plant reproductive parts, pathogens, chemicals or toxic contaminates. Physical contaminants such as rock, plastic, metal or glass shall be less than 0.5 percent. Total carbon to nitrogen ratio in the growing medium no to exceed 30:1.
3. Mushroom compost and/or animal manure and compost shall be leached with fresh water prior to installation (electrical conductivity not to exceed 2.0 mmhos/cm).

3. MULCHING MATERIAL

1. Free of weeds and other foreign materials, free of growth or germination inhibiting ingredients; manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material will become uniformly suspended to form a homogeneous slurry; dyed a suitable color to facilitate inspection of the placement of the material. When applied, capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil.

2. Straw Mulch: Oat or wheat, free from weeds, foreign matter detrimental to plant life, and dry; seasoned for spreading with mulch blower equipment. Hay or chopped cornstalks are not acceptable.

4. FERTILIZER

1. Granular form, dry, free flowing, and free from lumps.

2. Recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil.

5. WATER

1. Clean, fresh, and free of oil, salt, acid, alkali, sugar, vegetable matter, and any contaminants and substances or matter which could inhibit germination and vigorous growth of grass.

6. ACCESSORIES

1. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

2. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of grass.

7. SOURCE QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Testing, inspection, and analysis requirements.

2. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

3. Test in accordance with the following methodology:

Parameter	Test Method
Organic Content	ASTM D2974
Potassium, Phosphorus, Calcium, Magnesium	(1)
pH	ASTM D4972

Note:
(1) In accordance with state accredited method.

4. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

5. Chemical Characterization: One sample per source; in accordance with Section 31 23 22.

PART 3 EXECUTION

1. EXAMINATION

1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

2. Verify prepared soil base is ready to receive the work of this Section.

2. PREPARATION - SUBGRADE

1. Prepare subgrade to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.

2. Obtain ENGINEER's approval of subgrade before placing topsoil.

3. HYDROSEEDING

1. Seeding and mulching shall be a one-step process in which seed, fertilizer, hydraulic mulch, and mulch adhesive are applied simultaneously in a water slurry via hydraulic seeder/mulcher.

2. Apply seed mixture at a rate specified in PART 2, SEED MIXTURE in two intersecting directions.

3. Hydraulic Seeder/Mulcher: Apply seed, fertilizer, hydraulic mulch, and temporary cover adhesive using an acceptable hydraulic seeder/mulcher equipped with mechanical agitation equipment capable of mixing the materials into a homogeneous slurry and maintaining the slurry in a homogeneous state until it is applied. The discharge pumps and gun nozzles shall be capable of applying the materials uniformly.

4. Volume Certification: Hydraulic seeding/mulching equipment shall have the tank volume certified by a plate affixed by manufacturer and confirmed to ENGINEER by

means of measurements or tests prior to the commencement work. This plate shall be affixed in plain view on the hydraulic seeder/mulcher and shall not be removed or altered. The plate shall certify tank volume only, and shall imply equipment conformance to other requirements of this Section.

5. Application of Materials: Measure the quantity of each material to be charged into the hydraulic seeder/mulcher tank either by mass or by a system of mass-calibrated volume measurements acceptable to ENGINEER. Add the materials to the tank while it is being loaded with water. Thoroughly mix the materials into a homogeneous water slurry and distribute uniformly over the designated surface area via the hydraulic seeder/mulcher. Apply seed, fertilizer, and where applicable, hydraulic mulch adhesive within 2 hours of being charged into the hydraulic seeder/mulcher tank. During loading of the hydraulic seeder/mulcher tank, add materials in the following sequence:
    1. Seed, then fertilizer, then, where applicable, hydraulic mulch and adhesive.

6. Blend into existing adjacent grass areas to bond new growth to existing adjacent areas or to previous applications to form uniform surfaces.

7. Areas to be seeded with slopes steeper than 10H:1V shall also utilize a soil retention blanket as specified in TxDOT, Item 169.

4. OVERLAP

1. Hydroseeding and temporary cover shall overlap adjoining vegetation by 12 inches.

5. MAINTENANCE FOR VEGETATION ESTABLISHMENT

1. Start maintenance immediately after area seeded hydroseeded.

2. Maintain seeded area for not less than the period stated below and longer, as required to establish an acceptable stand, as determined by ENGINEER:
3. Not less than 180 days after last area hydroseeded.

4. Maintain vegetative cover by watering, fertilizing, weeding, mowing, trimming, overseeding, and other operations such as rolling, regrading, and replanting as required to establish a smooth, acceptable grassed surface, free of eroded or bare areas.

5. Cutting Height: Mow vegetative cover as soon as there is enough top growth to cut with mower set at the specified height for the principal species planted. Repeat mowing as required to maintain specified height. Do not remove more than a third of grass height. Do not mow when grass is wet. Time initial and subsequent mowings as required to maintain the following grass height:
    1. Mow grass at 4 to 5-inch height. Do not mow lower than 4 inches.

6. Provide and maintain temporary piping hoses and watering equipment as required to convey water from water sources and to keep grassed areas uniformly moist as required for proper growth.

7. Vegetative cover will be accepted by ENGINEER provided all requirements have been complied with, including completion of 60-day maintenance period, and the following:
    1. Vegetative cover is properly established.
    2. Turf is free of eroded, bare, or dead spots and 98 percent free of weeds.

3. No surface is visible when vegetative cover has been cut to a height of 4 to 5 inches.

6. CLEANING

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

2. Clean up immediately, soil, mulch, broken sod, or other debris spilled onto pavement and dispose of deleterious materials.

3. Take precautions and prevent contamination by seeding and mulching slurry of structures, signs, guardrails, fences, utilities, or other surfaces not specified to be landscaped.

4. Where contamination occurs, remove seeding slurry to satisfaction of, and by means approved by ENGINEER.

7. PROTECTION

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished work.

2. Protect landscaped areas from damage.

END OF SECTION

SECTION 35 49 25

TURBIDITY CURTAIN

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
   1. Turbidity curtain to be installed in the river during sheet piling, prior to excavation in areas directly adjacent to the river.

2. Related Requirements:
   2. Section 01 57 19 - Temporary Environmental Controls.

2. REFERENCES

1. Reference Standards:
   1. Section 01 40 00 - Quality Requirements: Requirements for references.
   2. ASTM International:
      a. ASTM D3786/D3786M - Standard Test Method for Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method.
      b. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
      c. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
      d. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
      e. ASTM D4632/D4632M- Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
      f. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
      g. ASTM D4833/D4833M - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.

3. PRE-INSTALLATION MEETING

1. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

2. Convene 1 week prior to commencing installation of curtain.

3. Mandatory attendance includes: ENGINEER, CONTRACTOR and Subcontractor.

4. Purpose of Meeting:
   1. Review the Site-specific quality assurance/quality control and monitoring procedures.
   2. Review time schedules.
   3. Review applicable personal protective equipment and regulations.
   4. Review safety plan and procedures.

4. SEQUENCING

1. Do not commence any work that could produce silts or sediments entering the river prior to curtain installation.

2. Curtain may be removed when Works that could cause silts and sediments to enter the river have been completed.

5. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Samples: Submit a sample of the curtain material prior to its incorporation into the work.

3. Test Reports: Include material properties sheets and manufacturer’s certified report of test.

4. Manufacturer’s Certificates: Certify that curtain meets or exceeds specified requirements prior to installation.

6. DELIVERY, STORAGE, AND HANDLING

1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

2. Package and label curtain bearing manufacturer's markings to clearly identify it with applicable test report submitted to ENGINEER.

3. When transported to the Site, handle curtain by appropriate means as recommended by manufacturer so that no damage is caused.

4. When not immediately incorporated into the Works, store curtain as recommended by manufacturer to prevent damage, degradation, and theft or vandalism.

5. Use appropriate handling equipment when moving curtain from one place to another.

6. Notify ENGINEER in advance of curtain delivery to the Site. Perform joint inspection with ENGINEER upon delivery. Defects or damage from shipping and handling will be grounds for rejection of a portion of, or the entire curtain at the discretion of ENGINEER. Remove curtain from the Site and replace with new material at no additional cost to OWNER.

7. AMBIENT CONDITIONS

1. Suspend installation operations whenever climatic or river conditions, or equipment proposed for placing the curtain, as determined by ENGINEER, are unsatisfactory for placing the curtain to the requirements of this Section.

2. Curtain placement shall take into account wave, wind, and other factors on the river at time proposed for placement.

3. Deployed curtain shall be adequately ballasted at all times to limit the risk of wind damage and/or displacement from curtain placed alignment due to wave action and/or water velocities at the Site.

8. WARRANTY

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

2. Provide 2 year manufacturer's warranty. Warranty shall not be pro-rated in a manner that would diminish coverage with increasing time from installation.

3. Warranty: Include coverage for:
   1. Full refund or replacement.
   2. Labor and equipment to repair or replace the curtain and consequential and incidental damage that occurs as a result of failure of the curtain.

4. Warranty coverage starts from the date of placement of the curtain in the river.

PART 2 PRODUCTS

1. TURBIDITY CURTAIN

1. Fabricated with upper and lower pockets to receive ballast and flotation billets. Double over and stitch ends for reinforcement with the addition of grommets for connecting additional sections of curtain.

2. Flotation: Consists of segmented closed cell polyethylene foam tubing enclosed in the upper pocket and machine stitched enclosed. Do not use polystyrene foam products for flotation.

3. Install a grommet between each billet pocket to allow the attachment of external flotation stabilizers.

4. Tubing: Minimum diameter of 4 inches.

5. Curtain Flotation Ratio: Not less than 5:1.

6. Ballast: Consists of either galvanized or bright steel chain of 5/16 inch diameter installed at the factory or on Site. Additional ballast may be required to secure curtain in place. Provide additional ballast, if required, at no additional cost to OWNER.

7. Provide a draw cord in units with chain not installed at the factory.

8. The curtain shall have the following properties:

Test	Unit	Test Method	Value	Direction
Tensile Strength	psi	ASTM D4632/D4632M	350 250	Wrap Fill
Elongation at Break	percent	ASTM	34	Wrap

		D4632/D4632M	34	Fill
Mullen Burst Strength	psi	ASTM D3786/D3786M	510	
Trapezoid Tear Strength	psi	ASTM D4533	65 65	Wrap Fill
Puncture Strength	pound	ASTM D4833/D4833M	140	
Permittivity	sec^{-1}	ASTM D4491	0.04	
Coefficient of Permeability	cm/s	ASTM D4491	0.01	
Water Flow Rate	$gal/min/ft^2$	ASTM D4491	5.0	
Apparent Opening Size (AOS)	sieve size	ASTM D4751	70	
Ultra Violet Resistance	percent retained/ number of hours	ASTM D4355	80/500	

PART 3 EXECUTION

1. EXAMINATION

    1. Section 01 70 00 - Execution Requirements: Verification of existing conditions before starting work.

    2. Verify depth of the river along specified alignment prior to ordering.

2. PREPARATION

    1. Placement shall not proceed until CONTRACTOR’s Site-specific Health and Safety Plan has been approved by ENGINEER.

    2. Obtain required permits for placement of curtain.

    3. Take appropriate health and safety precautions when working on the river.

3. PLACEMENT

    1. Place the curtain in accordance with manufacturer’s instructions.

    2. The curtain installation shall have the ability to perform 2 feet above high-water elevation.

    3. Install curtain and secure it prior to any work activity that could generate silt or sediment in the river.

    4. Replace any portion of the curtain that is damaged during its installation or during the Works at no additional cost to OWNER.

5. Attach adjacent sections of curtain by the use of grommet clips, lacing with rope though the end grommets, or as directed by ENGINEER.

6. Provide grommets in end sections at spacing of 12 inches on centers vertically at both ends of each unit.

7. Install a reinforcement belt of polyester webbing at the top of the curtain to provide additional tensile reinforcement and dimensional stability.

8. Use anchoring devices as required by river bottom conditions.

9. Mark curtain location with flags, buoys, or other devices as required by applicable regulations.

10. Remove curtain on completion of Site activities related to the installation of the sheet pile bulkhead.

4. FIELD QUALITY CONTROL

1. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

2. ENGINEER will inspect curtain for proper placement and maintenance and confirmation it is being maintained in good working order. If any maintenance or repairs are to be made to any part of the curtain, the work shall be initiated within 24 hours of inspection.

3. Inspect installed curtain for tears and gaps. Confirm top edge of curtain is above the water surface and bottom edge is in continuous contact with the watercourse bed.

4. If soil disturbance activities have been temporarily suspended (e.g., high river level) and temporary stabilization measures have been applied to all disturbed areas, the maintenance inspection activities will be temporarily stopped. Maintenance inspections will begin as soon as soil disturbance activities resume.

5. REMOVAL

1. Remove curtain on completion of Site activities related to the installation of the sheetpile bulkhead.

6. PROTECTION

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protection of installed work.

2. Protect curtain from damage. Utilize marking/warning devices required by permits and local regulations.

3. Check curtain for damage on a daily basis during sheet piling installation. Repair any damage and restore the curtain functionality to the satisfaction of ENGINEER.

END OF SECTION

SECTION 40 05 13

COMMON WORK RESULTS FOR PROCESS PIPING

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. General engineering requirements.
    2. General product requirements.
    3. General fabrication and testing requirements.
    4. General installation and commissioning requirements.

2. Related Requirements:
    1. Section 40 05 31.13 - Polyvinyl Chloride Process Pipe.
    2. Section 22 05 03 - Pipe Data Sheet- PVDF Tubing and Carrier Piping
    3. Section 40 05 33 - High-Density Polyethylene Process Pipe

2. REFERENCES

1. Definitions:
    1. The following are industry abbreviations for plastic materials:
        a. ABS: Acrylonitrile-butadiene-styrene plastic.
        b. CPVC: Chlorinated polyvinyl chloride plastic.
        c. HDPE: High-density polyethylene plastic
        d. PE: Polyethylene plastic.
        e. PVC: Polyvinyl chloride plastic.
    2. The following are industry abbreviations for metal materials:
        1. CLDI: Cement-lined ductile iron.
        2. CS: Carbon steel.
    3. The following are industry abbreviations for rubber materials:
        1. EPDM: Ethylene-propylene-dieneterpolymer rubber.
        2. NBR: Acrylonitrile-butadiene rubber.
    4. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
    5. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
    6. Exposed Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
    7. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
        1. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

2. Reference Standards:
    1. Section 01 40 00 - Quality Requirements: Requirements for references.
    2. American Society of Mechanical Engineers:
        1. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).

2. ASME B18.2.1 - Square and Hex Bolts and Screws - Inch Series.

3. ASTM International:
    1. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
    2. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
    3. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
    4. ASTM D2672 - Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.
    5. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
    6. ASTM D3138 - Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Non-Pressure Piping Components.
    7. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
    8. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
    9. ASTM D3350-96 – Standard Specification for High Density Polyethylene (HDPE) Pipe
    10. ASTM F402 - Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
    11. ASTM F656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
    12. American Water Works Association: AWWA C110 - Standard for Ductile-Iron and Gray Iron Fittings 76 mm Through 1219 mm.
    13. Underwriters Laboratories (UL).

3. SCHEDULING

1. Coordinate with work of other trades for piping fabrication, supporting, installation, insulation, connection to equipment and packages, and testing.

2. Coordinate installation of required in-line instrumentation and control valves.

3. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

4. Coordinate installation of required supporting devices and other structural components as they are constructed.

4. SUBMITTALS

1. Product Data: Submit detailed catalog information on selection, identification, shop and/or Site fabrication procedure, installation, and adjusting, for the following products, including components:
    1. Pipes.
    2. Flanges.
    3. Fittings.
    4. Expansion joints, flexible hoses, and hose adapters.
    5. Mechanical sleeve seals.

6. Supports, hangers, guides, and anchors.

2. Shop Drawings:
   1. Include descriptive information as required to fully describe the materials and procedures to be used in fabrication of the piping system. Submit all data as specified below. Partial submittals / submittals without all information as listed below in a single submittal will not be accepted by Engineer and will be returned Revise and Resubmit.
   2. Clearly specify pipe material and joint type selected for each pipeline, where alternatives are specified.
   3. Include Shop Drawings for fabricated components of pipe, fittings, anchors, and guides.
   4. Include a complete laying plan and section, detailing dimensions, location of each pipe section and each special length, special fittings, bends, coatings, and other pertinent information.
   5. Include double-lined to-scale drawings of each pipe support system to the scale shown on the Drawings.
   6. Locate each support and hanger, identify with type of catalog number or Shop Drawing detail number. Show anchor locations and identify them by Shop Drawing detail number.
   7. Include detailed installation drawings, catalog information, and complete component selection list for tie rods and thrust restraints systems.
   8. No change in material or joint selection will be permitted after submittal of Shop Drawings and their final review by ENGINEER.

3. Certificates and Reports:
   1. Certify that products meet or exceed specified requirements.
   2. Indicate results of field hydrostatic testing.

5. CLOSEOUT SUBMITTALS

1. Record Documents: Indicate location, size, and service of piping systems.

2. Warranties: Completed original warranty forms filled out in OWNER's name and registered with manufacturer.

6. QUALITY ASSURANCE

1. Fabrication of flanged, threaded, and grooved piping shall be in accordance with ASME and AWWA standards.

7. QUALIFICATIONS

1. Fabricator: Company specializing in the works of this Section, and supplementary individual piping specification sections, with minimum 3 years documented experience.

2. Installer: Company specializing in performing the work of this Section, and supplementary individual piping Sections, with minimum 3 years documented experience.

3. Independent Testing Firm: Company specializing in inspection of AWWA piping material, fabrication final pressure testing, with minimum 5 years documented experience.

8. DELIVERY, STORAGE, AND HANDLING

1. Handle piping items strictly in accordance with manufacturer instructions, during all stages of delivery and storage.

2. Ensure no damage is done to exterior, interior, shape of pipe during activities prior to fabrication and installation.

3. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

4. Protect the products from dirt, damage, deformation, non-compatible materials, heat, cold, sunlight exposure, rain, and moisture.

5. Receive the products in factory finish condition. Inspect for damage or deterioration of product quality. Replace damaged or deteriorated quality product as required and directed by ENGINEER.

9. WARRANTY

1. Not applicable

PART 2 PRODUCTS

1. DESIGN REQUIREMENTS

1. Design the system to ASME and AWWA standards.

2. Piping Sizes and Materials: TBD by CONTRACTOR.

2. JOINING MATERIALS

1. Refer to Section 40 05 31.13 for specific details on individual system joining methods and materials.

2. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents:
    1. ASME B16.21, nonmetallic, flat, asbestos-free, 3.2 mm maximum thickness unless thickness or specific material is indicated in piping data sheet.
    2. Full-face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    3. Narrow-face Type: For raised-face, Class 250, cast-iron and steel flanges.
    4. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

3. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

4. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

5. Solvent Cements for Joining Plastic Piping:
   1. PVC Piping: ASTM D2564. Include primer according to ASTM F656.

6. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

3. PIPE, FITTINGS, JOINTS, AND EXPANSION PROVISIONS FOR EXPOSED PIPING

1. Refer to the Drawings for location and overall arrangement of piping systems.

2. CONTRACTOR is required to install pipe anchors and flexible couplings to facilitate piping installation, provided that completed details describing location, pipe supports, and hydraulic thrust protection are submitted to ENGINEER for review.

3. Provide thrust ties for flexible couplings, transition couplings, and flanged coupling adapters on pressure piping as specified, including those shown on the Drawings. Thrust protection shall be adequate to sustain the force developed by 1 1/2 times the operating pressures and the test pressure specified.

4. Pipe or tube connections of dissimilar metals / materials shall be made as shown on Drawings. CONTRACTOR may use the following methods for joining pipes of different materials unless specifically stated on the Drawings. All pipe connections shall be rated to 150 psi at 120 degrees F:
   1. Stainless steel compression fittings for joining stainless steel pipe to HDPE pipe or tube. Compression fittings shall be axially restrained.
   2. Stainless steel threaded transition adapter nipple fitting with O-ring seals for joining HDPE pipe to stainless steel pipe by ISCO pipe or equal.
   3. Stainless steel reinforced PVC threaded adapter fittings for joining PVC to metal pipe by Spears or equal.

5. Quick disconnect fittings shall be stainless steel camlock couplers with rated pressure of 250 psi:
   1. Female coupler with hose shank shall be used with movable pipes.
   2. Male coupler shall be used on fixed pipes.
   3. Quick disconnect fittings shall be Dixon "Andrews" couplers or equal.
   4. Provide caps and plugs for all quick disconnect fittings.

5. PIPING SUPPORT AND RESTRAINING SYSTEMS

1. Support piping, in general, as described hereinafter and as shown on the Drawings.

2. Manufacturer's catalog figure numbers are typical of the types and quality of standard pipe supports and hangers to be employed. Special support and hanger details are shown to cover typical locations where standard catalogue supports are inapplicable.

3. Pipe supports shown on the Drawings are intended to present the general arrangement of pipe supports in the area, represented as typical of similar arrangements to be used. No attempt has been made to show all required pipe supports and restraints in all locations, either on the Drawings or in the details, standard or custom made.

CONTRACTOR shall be responsible for providing adequate number, size, and type of piping supports required.

4. Pipe support and restraining system components shall withstand the dead loads imposed by the weight of the pipes filled with water and shall have a minimum safety factor of 5, and live loads created by pumped fluid thrust and shall be adequately anchored to resist such forces without undue shock, vibration, or damage to the piping system or related equipment.

5. Support horizontal piping with adjustable swivel-ring, split-ring, or clevis type hangers as shown, Grinnel Figure 104 or 260, galvanized; or welded steel wall bracket, Grinnel Figure 199, galvanized, or approved equal; or approved alternative.

6. Support stacked horizontal runs of piping along walls by a metal framing system attached to concrete insert channels; Unistrut, or approved alternative. No pipe shall be supported from the pipe above or below itself.

7. Horizontal piping hanger support rods shall attach to steel beams with I-clamps, to concrete with inserts or flanges fastened with flush shells, to wood not less than 2 5/8 inch thick with lag screws and angle clips.

8. Vertical piping hangers and supports shall be Unistrut channel and pipe clamps, or approved alternative.

9. All hangers, rods, clamps, protective shields, metal framing support components, and hanger accessories shall be galvanized unless otherwise specified. Expansion anchors shall be Type 316 stainless steel. Submerged supports shall be Type 316 stainless steel and shall be electrically isolated from metal piping with a 1/4-inch by 3-inch neoprene rubber wrap.

10. Support Spacing: Maximum distance between pipe supports as set out below unless otherwise indicated on the Drawings:

	Maximum Distance Between Support Points		
Pipe Size	*CS*	*DIP, SST, STL*	*PVC/HDPE*
Up to 3/4 inch diameter	3' 3"	3' 3"	2' 0"
1 inch to 1 1/2 inch	6' 0"	6' 0"	3' 3"
2 inch to 3 inch	6' 0"	6' 0"	3' 3"
3 inch to 4 inch	6' 0"	8' 3"	3' 3"
5 inch to 8 inch	6' 0"	8' 3"	3' 3"
8 inch and over	6' 0"	8' 3"	3' 3"

* Spacing above are for specific gravity of 1.0, reduce spacings for greater specific gravities. Reduce spacings to 50 percent of above where valves occur in lines. Actual spacing will depend on pipe size and special loading conditions.

11. Hanger rod sizing for plastic pipe shall be the same as for steel pipe. Spacing of hangers shall be as recommended by the manufacturer for the flow temperature in the pipe.

12. Support piping in a manner that will prevent undue strain on any valve, fitting, or piece of equipment. In addition, provide pipe supports at changes in direction or elevation, adjacent to flexible couplings, and where otherwise shown. Do not install pipe supports and hangers in equipment access areas.

6. PIPING FABRICATION AND ERECTION

1. Join pipe and fittings according to the following requirements.

2. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

3. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before fabrication and assembly.

4. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

5. Do not use pipe sections that have cracked or open welds.

6. Piping fabrication, inspection and testing shall be in accordance with this specification, ASME and AWWA standards.

7. Erect piping with flanged and threaded connections as applicable in accordance with good engineering practice suitable for hydrocarbon processing industry. Use suitable lubricants on bolt threads.

8. The overall fabrication, supporting, and erection of piping shall be done in such a way as to impose minimum possible loading on connected equipment and valves. Wherever required, verify the alignment of the equipment and drive motor in pipe-connected and disconnected state, to verify that piping is not imposing undue load on the equipment.

PART 3 EXECUTION

1. EXAMINATION

1. Verify that surfaces and the Site conditions are ready to receive work.

2. INSTALLATION OF PIPING SYSTEMS - GENERAL REQUIREMENTS

1. Install piping as shown on the Drawings unless deviations to layout are approved by ENGINEER.

2. Mark each pipe and fitting on the outside to indicate the class of pipe and location number of the laying plan. Furnish and install piping in accordance with the reviewed Shop Drawings. All marking shall be coded to the Shop Drawings.

3. Provide allowance for piping to be modified around CONTRACTOR supplied equipment. Piping and piping systems may be modified up to 5 ft in any direction after receipt of equipment Shop Drawings to suit provided equipment. All Piping shown on drawings shall be confirmed in field prior to installation.

4. Specific flange joint requirements are shown on the Drawings. Provide other break flanges / unions in accordance with general industrial practice.

5. Install piping to maximum possible extent at right angles, and club together to manage in designated piping-ways. Diagonal runs are prohibited unless specifically indicated otherwise.

6. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

7. Install piping to permit valve servicing.

8. Install piping at indicated slopes.

9. Install piping free of sags and bends.

10. Install manufactured fittings for changes in direction and branch connections. Fabricated fittings shall not be accepted where standard manufactured fittings are available.

11. Install piping to allow application of insulation where indicated.

12. Select system components with pressure rating equal to or greater than system operating pressure.

13. Valves shall be accessible from relevant level flooring, and shall be installed in accordance with manufacturers instructions.

14. Support all piping connections to dynamic equipment suitably to prevent overstressing of equipment casing beyond limits specified by the equipment manufacturers. Provide spring supports wherever necessitated due to variable loads.

15. Hard-pipe and route overflow and drain lines to appropriate drain collection points.

16. Verify final equipment locations for roughing-in.

17. Refer to equipment specifications in other Sections of these specifications for roughing-in requirements.

18. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Coordinate sleeve sizes with the seal manufacturer for required annular space.
    1. Install steel pipe for sleeves smaller than 150 mm in diameter.
    2. Install cast-iron wall pipes for sleeves 150 mm and larger in diameter.
    3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

19. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3. PIPING JOINT CONSTRUCTION

1. Join pipe and fittings according to the following requirements and individual sections specifying piping systems.

2. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

3. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

4. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
    2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

5. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

6. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
    2. ABS Piping: Join according to ASTM D2235 and ASTM D2661 Appendixes.
    3. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.
    4. PVC Pressure Piping: Join schedule number ASTM D1785 PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
    5. PVC Non-pressure Piping: Join according to ASTM D2855.
    6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D3138 Appendix.

7. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.

8. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D3212.

4. ERECTION OF METAL SUPPORTS AND ANCHORAGES

1. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment as shown on the Drawings.

5. GROUTING

1. Mix and install grout for piping base plates, and anchors.

2. Clean surfaces that will come into contact with grout.

3. Provide forms as required for placement of grout.

4. Avoid air entrapment during placement of grout.

5. Place grout, completely filling equipment bases.

6. Place grout on concrete bases and provide smooth bearing surface for pipe supports.

7. Place grout around anchors.

8. Cure placed grout.

6. FIELD QUALITY CONTROL

1. Clean piping systems by flushing with water or blowing with air with valves wide open prior to testing and before installing any primary element instrumentation on the piping systems.

2. Provide temporary restraints or isolate expansion joints which cannot sustain the reactions due to test pressure.

3. Isolate from the piping, equipment that is not to be subjected to the test pressure.

4. Piping must pass field tests.

5. No leakage will be allowed.

6. Hydrostatically test piping using clean water at ambient temperature except where there is risk of damage due to freezing. Another fluid may be used if it is safe for workmen and compatible with the piping.

7. Apply the hydrostatic test pressure (1.5 times design pressure) for 4 hours.

8. If leaks are found, repair and retest until no leakage units found.

9. Drain piping and blow dry following successful completion of testing.

10. Prepare a report for each test. Include in the report the following:
    1. Location or section of piping.
    2. Time and duration of test.
    3. Test pressure at start and completion.
    4. Ambient and water temperatures.

7. CLEANING

1. Following assembly and testing, prior to disinfection of potable water lines, and following final acceptance, flush pipelines, except as stated below, with water at 160 gpm minimum flushing velocity until foreign matter is removed.

2. Remove accumulated debris through drains 2 inches and larger or by removing spools and valves from piping.

END OF SECTION

SECTION 40 05 33

HIGH DENSITY POLYETHYLENE PROCESS PIPE

PART 1 GENERAL

1. SECTION INCLUDES

A. This section defines the minimum requirements for supply and installation of High-Density Polyethylene (HDPE) pressure piping and associated appurtenances.
   1. All jointing and gasketing materials, harnessing, and other miscellaneous appurtenances and accessories shall be provided.

2. RELATED SECTIONS

A. Section 40 05 13 – Common Work Results for Process Piping

3. QUALITY ASSURANCE

A. Manufacturers Qualifications: Piping for each service or system specified herein shall be provided by a manufacturer who has thoroughly familiarized himself with the design intent of the system and will provide piping suitable for the service intended.

B. Source Quality Control: All pipe shall be marked with a class designation thereon. The name or trademark of the manufacturer shall also be marked on the pipe.

C. Each type of pipe shall be obtained from no more than one manufacturer.

D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

   1. ASTM D 2657, Standard Practice for Heat Joining Polyethylene Pipe and fittings.
   2. ASTM D 2683, Standard Specifications for socket type Polyethylene fittings for outside diameter controlled Polyethylene Pipe and Tubing.
   3. ASTM D 2837, Standard Testing Methods for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
   4. ASTM D 3261, Specifications for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Plastic Pipe and Tubing.
   5. ASTM D 3350, Standard Specifications for Polyethylene Plastic Pipe and Fitting Materials.
   6. PPI TR- 3, Policies and Procedures for Developing Recommended Hydrostatic Design Stress for Thermoplastic Pipe Materials.
   7. PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fitting Compounds.
   8. ANSI/NSF, Standard No. 61 for Drinking Water Systems Components- Health Effects.
   9. AWWA C901, Standards for Polyethylene (PE) Pressure Pipe and Tubing 1/2 inches through 3 inches for Water Service.
   10. AWWA C906, Standards for Polyethylene (PE) Pressure Pipe and Tubing 4 inches through 63 inches for Water Service.

E. Shop Tests:

1. Piping manufacturer shall maintain a continuous quality control program. All Polyethylene molding materials used to manufacture pipe and fittings under this Section shall be tested for conformance to the requirements of AWWA C901 or AWWA C906.

4. SUBMITTALS

A. Shop Drawings: CONTRACTOR shall submit for approval Shop Drawings showing the following:
1. Detailed procedures to be used in jointing and installing piping system including manufacturer's recommendations.
2. Interfacing of piping system to equipment, appurtenances, and other types of pipe.
3. Detail requirements for burial, supports, anchors, guides, expansion joints, and all accessories required for a satisfactory piping system.
4. Affidavit of Compliance in accordance with AWWA C901 or AWWA C906.

PART 2 PRODUCTS

1. MATERIALS

A. General

B. Polyethylene (HDPE) Pipe
1. Materials used in the manufacture of the polyethylene pipe shall be PE 4710, high density polyethylene meeting the requirements of ASTM D 3350, cell classification of 445474C.
2. The material shall have a minimum hydrostatic design basis of 320 psi at 73 degrees Fahrenheit when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe manufacturer in PPI TR-4.
3. Polyethylene pipe shall be manufactured in accordance with AWWA C901 for sizes 1/2 inches through 3 inches and in accordance with AWWA C906 for sizes 4 inches through 63 inches.
4. The pipe and fittings shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
5. All piping and tubing furnished for use on this project shall meet the following requirements, unless indicated otherwise on the Contract Drawings:
a. Iron Pipe Size (IPS) PE4710
b. Nominal 10-Inch HDPE (excluding creek crossing HDD installations): DR 21
c. Nominal 10-Inch HDPE for creek crossing HDD installations: DR 11
d. Nominal 8-Inch HDPE: DR 11
e. Nominal 3-Inch HDPE: DR 11
f. Nominal 2-Inch HDPE: DR 11
6. Restrained joints for polyethylene piping shall be accomplished by completion of butt fusion joints.
7. Restrained polyethylene pipe connections to stainless steel or carbon steel mechanical joint fittings shall be accomplished by use of a HDPE adapter piece which must be butt fused to the plain end of the HDPE piping. The adapter piece shall be PE 4710, with the same DR rating as the HDPE piping which it will be fused to.
8. When transitioning from one pipe material to HDPE pipe flex-restraints are required,

and an electrofusion flex restraint by Central Plastics shall be used with a concrete collar to prevent pull outs from expansion of HDPE pipe or approved equal.

9. Product and manufacturer: HDPE piping shall be manufactured by:
   a. Plexco
   b. ISCO Industries
   c. Or equal

C. Butt Fusion Fittings:
   1. Fittings shall be made of HDPE material with a minimum material designation of PE 4710 and with a minimum Cell Classification as noted in B.1. Fittings shall have a minimum pressure rating equal to or greater than the pipe to which they are joined unless otherwise specified on the plans or accepted by the OWNER/ENGINEER. All fittings shall meet the requirements of AWWA C901 or AWWA C906.
      1. Molded fittings shall comply with the requirements of ASTM D 32610
      2. All fabricated elbows, tees, reducing tees, and end caps shall be produced and meet the requirements of ASTM F 2206, holding an ISO 9001 quality system certificate. Each fitting will be marked per ASTM F 2206 Section 10 including nominal size and fitting EDR, which will meet or exceed the pipe DR identification for the project. Fabricated fittings shall be manufactured using a McElroy DataLogger to record fusion pressure and temperature and shall be stamped with unique joint number that corresponds to the joint report. A graphic representation of the temperature and pressure data for all fusion joints made producing fittings shall be maintained for a minimum of 5 years as part of the quality control and will be available upon request of OWNER/ENGINEER. Test results validate ASTM section 7.3 and 9 shall be provided to OWNER/ENGINEER upon request.
      3. Socket fittings shall meet ASTM D 2683.

D. Magnetic Tape Marker for Underground Pipe:
   1. All below ground Polyethylene (HDPE) pipe shall have a magnetic tape marker laid directly above the pipe for the full length of the pipe and approximately 18 inches below ground surface. At each concrete structure, cleanout, and/or valve box, the CONTRACTOR shall install the tape in such a manner where the tape runs up the exterior wall of the structure and is affixed at the top. The tape shall be affixed in such a fashion where the OWNER can attach his detection device to the tape to produce a stronger signal for pipeline detection.
   2. Tape shall be 3 inches wide consisting of two (2) exterior plies of polyethylene with an aluminum alloy foil core.
   3. Tape shall be manufactured by Paul Potter Warning Tape, Alarm Tape, or approved equal.
   4. Tape shall be green color and shall be labeled "Sewer" in black letters.
   5. Splices, where needed, shall be made in accordance with manufacturer's recommendations.
   6. At completion of the project, before final payment, the CONTRACTOR shall test the entire length of the pipe using pipe location equipment. Tests shall be made only in the presence of the Owner and ENGINEER. Any section of tape not continuous or that is undetectable shall be removed and relayed.

PART 3 EXECUTION

1. EXAMINATION

   i. Contractor shall inspect all piping prior to installation to assure that pipe is

free from defects in material and workmanship. The compatibility of all pipe and fittings shall be verified. Pipe fittings and accessories that are cracked, damaged, not identified, or in poor condition shall be rejected. Any pipe section or fitting containing significant scratches, dents, or marks shall be deemed unusable and rejected, or the suspect section removed from service. Any fitting or pipe section containing scratches, dents, or marks exceeding ten percent of the calculated wall thickness shall be rejected. Any substantial scratch in the opinion of the Engineer may be cause for rejection. Rejection will be at the sole discretion of the Engineer.

ii. The Inspector shall have free access to all joints and test joints for determining the suitability of the joining procedure. Where construction restrictions limit inspection of joints, the Engineer may have the person joining the pipe and/or fittings perform a test joint in the presence of the Engineer or have the joint in question tested. The Engineer shall determine the method of testing: either visual inspection, bent strap testing, or ultrasonic testing, per DOT CFR 49, Part 192.286 (b)(ii) or (b)(iii).

iii. During construction, the first fusion of the day shall be a trial fusion which shall be allowed to cool completely and destructively tested as directed by the Engineer. If the trial fusion fails, additional trial fusions shall be made and tested until successful fusions are completed. The procedure used to join the successful trial fusion shall be used for the balance of the day's work, provided the procedure is within the limitations recommended by the manufacturer. The Engineer shall have the authority to disallow any installer from completing heat fusion of HDPE pipe if that installer has consecutively failed trial joints. Any person deemed unqualified by the Engineer will require training as specified in 1403.0102 before being permitted to heat fuse HDPE pipe.

iv. During construction, the Contractor shall report any occurrence of potential soil contamination in the vicinity of the pipe trench to the Engineer immediately. Work shall be stopped until the contamination is remedied.

2. FIELD QUALITY CONTROL

1. Placing and Laying. All HDPE pipe shall be installed to minimize shear and tensile stresses. Pipe bedding and shading shall be sand. Pipe installation, bedding, and backfill shall be in accordance with Section 0209. The minimum radius of field bends shall be ten pipe diameters for pipe twenty-four inches and larger. Pipe bends shall be anchored by thrust blocks so that thermal unit changes will take place in the elasticity of the material. To prevent collapse of the pipe when vacuum and soil loads are applied, external pressure from depth of bury shall not exceed 41 psi.

2. Field Testing. The Contractor shall perform hydrostatic leakage tests on all HDPE pipe in accordance with the non-monitored makeup water test.

3. MONITORED MAKE-UP WATER TEST

1. The test procedure consists of initial expansion, and test phases. During the initial expansion phase, the test section is pressurized to the test pressure, and enough make-up liquid is added each hour for three (3) hours to return to test pressure.

2. The test phase follows immediately, and may be one (1), two (2), or three (3) hours. At the end of the test time, the test section is returned to test pressure by adding a measured amount of liquid. If the amount of make-up liquid added does not exceed Section 3.4 Table 1 values, leakage is not indicated.

3. For any test pressure from 1 to 1-1/2 times the system operating design pressure, the total test time including initial pressurization, initial expansion, and time at test pressure, must not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, then allow it to “relax” for at least eight (8) hours before bringing the test section up to test pressure again.

4. TEST PHASE MAKE-UP AMOUNT

TABLE 1

Nominal Pipe Size (in.)	Gallons/100 ft. of Pipe		
	1 Hour Test	2 Hour Test	3 Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.3	2.1
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.5
26	5.0	10.0	15.0
28	5.5	11.1	16.8
30	6.3	12.7	19.2
32	7.0	14.3	21.5
34	7.0	16.2	24.3
36	9.0	18.0	27.0

END OF SECTION

SECTION 40 05 51

COMMON REQUIREMENTS FOR PROCESS VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Gate Valves.
2. PVC Ball Valves.
3. Check Valves.
4. Butterfly Valves

1.2 REFERENCES

A. Reference Standards:
1. Section 01 40 00 - Quality Requirements: Requirements for references.
2. American National Standards Institute: ANSI B16.1 - Cast Iron Pipe Flanges and Flange Fittings Classes 25, 125, and 250.
3. American Petroleum Institute (API).
4. ASTM International:
    1. ASTM A126 – Standard Specification for Gray Iron Casings for Valves, Flanges and Pipe Fittings.
5. American Water Works Association:
    2. AWWA C509 - Standard for Resilient Seated Gate Valves for Water Supply Service.
    3. AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.
6. Manufacturers Standardization Society: MSS SP-110 – Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
7. Underwriters Laboratories Inc. (UL).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate dimensions, inlet and outlet size connections and connection ratings, materials of construction, CV/pressure loss curve, trim finish, coatings, mounting requirements and valve operators.

C. Product Data: Include vendor information.

D. Design Data: Indicate operating pressure data.

E. Manufacturer's Instructions: Indicate installation instructions.

F. Power and control wiring diagrams, including terminals and numbers.

G. Complete motor nameplate data.

H. Sizing calculations for open close/throttle and modulating.

1.4 CLOSEOUT SUBMITTALS

I. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout submittals.

J. Record Documents: Indicate location of valves and valve number, tests and inspection data.

K. Manufacturer's Certificate of Proper Installation.

L. Certificate of Compliance for:
1. API ANSI Classes 150 valves; full compliance with API standards.

M. Operation and Maintenance Data: Indicate instructions for operation, maintenance, and cleaning.

N. Warranties: Completed original warranty forms filled out in OWNER's name and registered with manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Blank off ends of valves with plywood or install plugs in valves for shipment to protect valve internals from debris during handling. Leave valves blanked off until installation.

C. Accept valves on the Site in original packaging. Inspect for damage.

D. Protect valves from damage.

PART 2 PRODUCTS

2.1 GENERAL

A. All valves shall include operator, actuator (as indicated on the Drawings) and accessories for a complete operation.

B. Valve shall be suitable for intended service.

C. Valve shall be same size as adjoining pipe.

D. Valve ends to suit adjacent piping.

E. Size operator to operate valve for the full range of pressures and velocities.

F. Valve shall open by turning counterclockwise.

G. Factory-mount operator, actuator, and accessories.

2.2 FACTORY FINISHING

A. Epoxy Lining and Coating:
   1. Use where specified for individual valves described herein.
   2. In accordance with AWWA C550 unless otherwise specified.
   3. Either two part liquid material or heat activated (fusion) material except only heat activated material if specified as "fusion" or "fusion bonded" epoxy.
   4. Minimum 1.5 mm dry film thickness except where limited by valve operating tolerances.

B. Exposed Valves: Safety isolation valves and lockout valves with handles, handwheels, or chain wheels "safety yellow".

2.3 BUTTERFLY VALVES

A. Butterfly valves shall be used for pipeline greater than 2.0 inches unless otherwise specified

B. Pressure ratings, 200 psi cold working pressure.

C. Operators: Provide valves six inches and less with handwheel operators. Provide valves over 6 inches with gear box and wheel operator unless otherwise specified.

D. Accessories: Provide chain wheel operator for valves mounted over six feet above floor level.

2.4 BALL VALVES

A. Ball Valve (2.0 inches and smaller)
   1. Ball valve shall be designed for two-way blocking capability. Valve shall provide bubble-tight shut-off.
   2. Ball valve shall be constructed of PVC Type 1, Grade 1. All elastomeric parts shall be made of Viton.
   3. Ball valve shall be of a True Union design with socket end connectors and be rated at 150 psi at 120 degrees F.
   4. As manufactured by Chemline, Type 21, Hayward Gordon or approved equal.

2.5 CHECK VALVES

A. PVC Check Valve (1.5 inches and smaller):
   1. PVC check valves shall be used for chemical service (includes methanol, ferric chloride, and phosphoric acid).
   2. Check valve shall be designed to be non-clog, fully automatic with internal ball as the only moving part. Valve shall provide a tight shut-off under pressure.
   3. Check valve body shall be constructed of PVC Type 1, Grade 1. Valve seat and O-rings shall be Viton.

4. Check valve shall be of a True Union design with socket end connectors and be rated at 150 psi at 120 degrees F.
5. As manufactured by Chemline, Hayward Gordon or approved equal.

B. Swing Check Valve (two inches and larger):

6. Swing check valve, cast iron body to ASTM A126 Class B, bolted bonnet, bronze disc under 6 inches, cast iron disc above 8 inches, bronze trim, stainless steel hinge pin, flanged ends to ANSI B16.1 Class 125, rated 150 psi, as manufactured by Crane, or approved equal.

2.6 VALVE OPERATORS

A. General: All valves shall be equipped with operators. The valve operator types, as specified herein, describe only the general characteristics of the operator. The operator shall be compatible with the valve with which it will be used and shall be of the same manufacturer, or a product that is recommended by the valve manufacturer. The operator shall be sized to operate the valve for the full range of pressures and velocities imposed by the service. All valve operators shall open by turning counterclockwise.

B. Manual Operators:

7. General:

a. Manual handwheel operators shall be provided unless otherwise shown or specified. Ferrous handwheels shall be galvanized and painted the same color as the valve and associated pipeline. Lever operators may be supplied on quarter-turn type valves 6 inches and smaller, if recommended by the manufacturer; however, operator force shall not exceed initial breakaway.
b. When the maximum force required to operate a valve under full operating head exceeds 40 pounds, gear reduction operations shall be provided. Gear operators shall be totally enclosed and lubricated.
c. On quarter-turn valves, the valve operators shall be of the self-locking type to prevent the disc or plug from creeping and shall be provided with position indicators to show the position of the valve disc or plug. Operators of the worm and gear type shall have self-locking worm gears, one-piece design, of bronze material, and accurately machine cut. The worm shall be hardened alloy steel, with thread ground and polished. Operators of the geared travelling nut type shall have threaded steel reach rods with an internally threaded bronze or ductile iron nut.

8. Exposed Operators:

d. Valves with operating nuts located more than 6 feet above finish floor elevation shall be fitted with chain wheels and guides, as manufactured by DeZurik Corporation, Series W or LWG, or equal. Chain wheels and guides shall be galvanized or cadmium plated. Chains shall be of the size recommended by the valve manufacturer and shall extend to within 4 feet of the operating floor. Where chains hang in normally travelled areas, appropriate "L" type tie-back anchors shall be provided and located as approved by ENGINEER.
e. Level type operators shall have some means of being fixed in any given position to prevent accidental movement; shall be of rugged, noncorrosive construction; and shall be fully compatible with the valve.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that installations of previous trades are complete and ready to receive work.

3.2 HANDLING OF VALVES

A. Chains, cables and ropes must not be placed through valve ports or attached to operating cylinders or handwheels. Slings must be used either around the valve body or with bolts or rods through the flange bolt holes.

3.3 STORAGE OF VALVES

A. Store valves in a cool location clear of moving vehicles or other objects. Prevent dirt and debris from entering the valve internals. On no account shall the valve seats on butterfly valves be painted. Valves must not be rested on handwheels or operating shafts.

B. Store butterfly valves with valves slightly off the closed position.

C. Cover the valves to shield them from dirt and to avoid exposing the seats to sunlight or mercury arc light.

3.4 INSTALLATION OF ACTUATORS

A. Install actuators where shown as per manufacturer's recommendations. Secure the base of actuator in place. Field support from building steel or concrete block structure, if valve body does not properly support actuator body. Do not install actuators in such a position that makes them inaccessible or with hard maintenance access. Maintain spacing and access. Position indicators shall be visible and legible from the floor level.

B. Supply testing equipment and manufacturer technical representatives at the site to verify actuator installation, adjustment of travel limits based on valve operation, torque and speed settings, and valve operational tests prior to the control system commissioning. Provide written report confirming proper installation.

C. Supply touch-up paint and touch up all exterior finish damage when installation is complete. Hand the remainder of touch-up paint in an identified container(s) to OWNER.

3.5 INSTALLATION OF VALVES

A. Install valves in accordance with manufacturer's instructions. Before installing valves, inspect the pipeline to ensure that no foreign debris or objects may work loose and prevent the valve from closing.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Provide clearance for installation of insulation and access to valves and fittings.

D. Provide access where valves and fittings are not exposed.

E. Provide support for valves where required for proper support and operation.

F. Install operator in position for convenient operation. Ensure space is available for operation of separators.

G. Install valves with stems upright or horizontal, not inverted. Ensure that each valve operates freely after installation into pipe.

H. Install unions downstream of valves.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting and testing.

B. Perform hydrostatic test with piping.

3.7 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean valves prior to painting.

3.8 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protection of installed work.

B. Keep valves in closed position following installation.

3.9 VALVE SCHEDULE

Service	**Valve Type**
Process Piping (Influent/Effluent)	Swing Check Valve (PVC)
	Gate Valve (PVC)
	Ball Valve (PVC)
	Butterfly Valve (PVC)
Solids Handling (Sludge)	Ball Valve (PVC)
	Swing Check Valve
Chemical Piping	PVDF Ball Valve

END OF SECTION

SECTION 40 70 00

INSTRUMENTATION FOR PROCESS SYSTEMS

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. Instrumentation for flow, turbidity, pH, and level measurement.

2. REFERENCES

1. Reference Standards:
    1. Section 01 40 00 - Quality Requirements: Requirements for references.
    2. National Fire Protection Association, Inc.:
        a. NFPA 70 - National Electrical Code.
    3. Underwriters Laboratories Inc. (UL).

3. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

2. Reference Data:
    1. Include process measurement device type, process tag, name, manufacturer's name, list of supplied items with complete model numbers and process measurement device calibrated range.
    2. Provide Supplier/distributor contact and location of manufacturer's closest service location.

3. Description and Engineering Data: Indicate minimum/maximum range, operating, and performance data, application conditions and limitations of use, layout drawings with overall dimensions, clearance requirements, size and location of connections, wiring diagrams, materials, process connection, mounting details, control schematics with signals identified, wiring connection details, and other technical specifications required to describe product.
    1. Provide detailed description of operation, when applicable.
    2. Provide detailed product data and operating manuals, sheets or manuals for review when required to evaluate submittal, or requested by ENGINEER.

4. Test Reports: Process measurement device calibration certificates including process measurement device reference data; identify testing/calibration equipment, date of original calibration, subsequent calibrations, calibration method, and test laboratory/location.

5. Manufacturer's Instructions: Provide installation details, manufacturer's instructions, and instructions for storage, handling, protection, examination, preparation, setup, and installation of product.

6. Manufacturer's Field Reports: Commissioning report on field tests, including all test forms and confirming proper installation prior to introduction to process media and energization.

4. CLOSEOUT SUBMITTALS

    1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout submittals.

    2. Record Documents:
        1. Indicate actual locations of instrumentation.
        2. Include actual setpoints and analog signal spans including any field modifications.

    3. Operation and Maintenance Data: Indicate and submit maintenance data for incorporation into Operations and Maintenance Manuals.
        1. Process measurement device reference data, and description and engineering data. As-built product data including any field modifications.
        2. Copies of factory test/manufacturer's calibration report, field report, and process measurement device setup/parameter configuration (including passwords) datasheets for each process measurement device. Include data communication registers layout.
        3. Provide detail installation drawings.
        4. Certificates or letters stating each piece of equipment has been installed to the satisfaction of the factory technical representative.
        5. Include operating manuals, manufacturer's setup, calibration instructions and control descriptions. Recommended renewal parts list and service/calibration schedules.
        6. Submit operation and maintenance data in printed and electronic Adobe Acrobat PDF format on electronic media. Upon approval, large manuals may be provided only in PDF format.
        7. Furnish special inspection certificates, when applicable.

5. QUALITY ASSURANCE

    1. Regulatory Requirements:
        1. Conform to NFPA 70.
        2. Electrical components must comply with requirements of current edition of applicable electrical safety regulations.
        3. Process measurement devices with electrical components to be UL certified. Manufacturers and approval marks must be accessible and legible after equipment is installed.
        4. Mechanical components must comply with of current edition of applicable standards and safety regulations.

6. QUALIFICATIONS

    1. Installer: Company specializing in performing work of this Section with minimum 5 years experience.

7. DELIVERY, STORAGE, AND HANDLING

    1. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

    2. Ship process measurement devices to the Site in factory containers. Store equipment

on Site in clean, dry, temporary storage containers for security purposes. Indicate any specific requirements for storage of process measurement devices during proposal stage.

3. Do not purchase sensors, probes, reagents, etc. or install sensors which have short storage/life time until they are ready to be put into continuous operation.

PART 2 PRODUCTS

1. INSTRUMENT LIST

1. Appended to this Section is Attachment 1, Instrument List, which tabulates the instruments that form part of the Works. Use this list in conjunction with Drawings.

2. ANALYTICAL INSTRUMENTATION-pH/ORP ANALYZER

1. Manufacturer List:
   1. Emerson Rosemount
   2. Endress + Hauser.
   3. Or Approved equal.
2. Differential electrode measurement pH/ORP analyzer with built in temperature compensation.
3. Output: 4-20 mA output signal proportional to range.
4. Operating Temperature Range: Minus 5 degrees C to 70 degrees C.
5. Materials: Wetted parts to be PEEK material or approved equal.
6. Mounting Assembly: Immersion in process tanks or in process piping. See P-02 drawing.
7. Sensor Cable: Integral, as long as needed
8. Controller:
   1. The controller shall be suitable to accept multiple different sensors and have a quick connect capability. Sensors to be connected via a termination box.
   2. Controller to provide 2 independent 4-20 mA outputs.
   3. Enclosure: Type 4.
   4. Compatible with sensors
9. Accessories: Sensor mounting hardware as required, junction box and 4-conductor extension cables with one shield and jacket. All in-line instrumentation shall be "hot tap" assemblies allowing instrumentation to be removed from piping while piping remains in service.
10. Ranges: Refer to table below.

Tag No.	Operating Range	Process Fluid	Location	Classification
TBD	1 to 14 pH Sensitivity of 0.01	Impacted water	Rapid Mix Tank	Unclassified

TBD	1 to 14 pH Sensitivity of 0.01	Final treated effluent	Final discharge pipe	Unclassified

3. FLOW INSTRUMENTATION– MAGNETIC FLOW METERS

1. Manufacturer List:
   1. Emerson Rosemount
   2. Endress + Hauser.
   3. Or Approved equal.

2. Description:
   1. Four-wire, microprocessor-based dc magnetic flowmeter transmitter with integral display of measured flow and flow totalizer values in engineering units HART protocol, sensor/electronics failure mode and annunciation, field programmable, menu driven limit and control settings (units, range, zero and span adjustment), non-volatile memory, local or remote mounted as indicated above.
   2. Flow Tube:
      1. Flanged style capable of monitoring liquids with conductivity greater than 5 µS/cm in vertical or horizontal position; with full tube.
      2. Housing: Steel.
      3. Metering Tube: Lined, Type 304 stainless steel.
      4. Electrodes: Hard rubber liner, Hastelloy C, rated and certified for use in potable water installation.
         a. Accuracy: Plus or minus 0.5 percent of calibrated span.
         b. Stability: Plus or minus 0.2 percent of calibrated span for 12 months.
   3. Power Supply: 120 VAC plus or minus 10 percent power, internal fusing.
   4. Outputs:
      1. 4-20 mA linear, analog current signal with superimposed digital HART protocol into load between 0 and 500 Ω minimum.
      2. Pulse, digital; totalizer signal for flow totalizing.
   5. Diameters: As required for design process flow.
   6. Enclosure:
      1. Transmitter: NEMA 4X.
      2. Flow Tube: Rated IP 68, suitable for occasional submergence.
      3. Permanently attached engraved tags associating each tube and flowmeter.
   7. Application: Unclassified area.
   8. Connections: Flanged to ASME B16.5 Class 150.
   9. Accessories:
      1. Type 316 stainless-steel ground ring.
      2. Stainless-steel protective inlet ring.
      3. Calibration certificate from factory.
      4. Tube to transmitter cable.
      5. Mounting Hardware: Where applicable for remote-mounted transmitter, provide mounting bracket as required to mount to pipe or wall.

   10. Schedule: Refer to Instrument Schedule and table below

Tag No.	**Flowrate**	**Pipe Size**	**Process Fluid**	**Service/Notes**
TBD	0-600 gpm	TBD by CONTRACTOR	Impacted water	Installed between Frac Tank(s) and water treatment system.

TBD	0-600 gpm	TBD by CONTRACTOR	Final treated effluent	Installed on discharge of the water treatment system

4. PRESSURE INSTRUMENTATION – GAUGES

1. Manufacturer List:
   1. Ashcroft.
   2. Dwyer.
   3. Endress+Hauser
   4. Winters.
   5. Or approved equal.

2. Description:
   1. Pressure gauges and accessories conforming to ANSI/ASME B40.1 and CRN approved.
      a. Accuracy: Plus or minus 0.5 percent of scale range, Grade 2A.
   2. Pressure Gauges: Steel case (black epoxy painted), 113 mm dial size, threaded ring, solid front with blow-out back, molded acrylic window, white painted aluminum face with dual black reading dials (PSIG and kPa), micrometer adjustable type black pointer. Stainless-steel rotary type movement with stainless-steel bushings, Type 316 stainless-steel Bourdon tube and socket suitable for potable water service, throttling device (screw, pressure snubber), standard 13 mm NPT bottom process connection. Liquid-fill capability.
   3. Range and scale sized according to process conditions.
      a. Accuracy: Plus or minus 2.5 percent of full scale.
   4. Gauges shall be calibrated. Submit a three-point factory calibration certificate for each gauge, or perform a three-point field calibration and submit results to ENGINEER. Gauges not having an accuracy of 5 percent within 30 to 100 percent span shall be replaced.
   5. Accessories:
      a. As required, such as isolation ball valves, nipples, reducers to match seal and process connection, mounting hardware.
      b. Identification tagging/engraving as indicated below.
   6. Provide pressure gauges (0-100 psig) at the discharge of all water treatment system pumps. Provide pressure gauges upstream and downstream of each of the multimedia filters, bag/cartridge filters, as well as upstream/downstream of each of the GAC vessels.

5. LEVEL INSTRUMENTATION – ULTRASONIC

1. Manufacturer List:
   1. Emerson Rosemount
   2. Endress + Hauser.
   3. Or Approved equal .

2. Description:
   1. Microprocessor based non-contact ultrasonic level transmitter.
   2. Four-wire electronic level transmitter with LCD display of measured level in engineering units, sensor/electronic failure mode and annunciation, fully field programmable (limit and control setting, range, zero and span adjustment), non-volatile memory, self-calibration, remote mounted.
   3. Ultrasonic sensor with built-in temperature compensation, rated NEMA 4X, corrosion

resistant to listed media, and rated for location when listed. The sensor will withstand accidental submersion and be mounted as approved by ENGINEER.
a. Beam Angle: Maximum 8 degrees.
b. Accuracy: Plus or minus 0.5 percent of calibrated span.
c. Stability: Plus or minus 0.5 percent of calibrated span for 12 months.

4. Power Supply: 120 VAC.
5. Output: 4-20 mA analog, linear isolated signal into load between 0 and 500 Ω minimum.
6. Enclosure: NEMA 4X.
7. Mountings: Stainless-steel sensor flange mounting hardware for connection to tank nozzles or open-top tanks.
8. Application: Unclassified areas; indoor applications.
9. Accessories: Sensor to transmitter cable, mounting brackets/hardware for sensor and, where remote transmitter is required, separate hardware for transmitter as indicated. Identification tagging/engraving as indicated in Instrument Schedule

6. TURBIDITY INSTRUMENTATION– TURBIDOMETER

1. Manufacturer List:

1. Emerson Rosemount
2. Endress + Hauser
3. Hach.
4. Or Approved equal.

2. Description:

1. Four-wire, microprocessor-based dc turbidity transmitter with integral display of measured turbidity value in NTU, HART protocol, sensor/electronics failure mode and annunciation, field programmable, menu driven limit and control settings (units, range, zero and span adjustment), non-volatile memory, local or remote mounted as indicated above.
2. Power Supply: 120 VAC plus or minus 10 percent power, internal fusing.
3. Outputs:
   a. 4-20 mA linear, analog current signal with superimposed digital HART protocol into load between 0 and 500 Ω minimum.
4. Diameters: As required for design process flow.
5. Application: Unclassified area.
6. Schedule: Refer to Instrument Schedule

7. DESIGN REQUIREMENTS

1. Furnish products listed and classified as suitable for purpose specified and indicated. Supplied process measurement devices must conform to the details specified. Except as specified elsewhere, equipment to be provided by acceptable manufacturers for each process measurement device or element as specified in equipment Sections.

2. Provide new devices unless otherwise specified. Provide process measurement devices of minimum specified design and quality, conforming to published ratings and for which replacement parts are readily available. Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified. Refurbished devices are not considered new.

3. Process measurement devices and components to be approved for the area classification and location in which it is being installed. Wetted parts of primary elements to be suited for process medium. External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, assembly.

4. Process measurement devices ranges indicated are for general guidance only and do not limit the device. Coordinate requirements based on actually installed equipment.

8. ACCESSORIES

1. Include mounting hardware, sampling lines, fittings, tubing, check valves, vacuum, and pressure relief valves, pressure and flow reducing control valves, selection and isolation valves, and other appurtenances necessary for process measurement devices operation.

PART 3 EXECUTION

1. EXAMINATION

1. Section 01 70 00 - Execution and Closeout Requirements: Verification of existing conditions before starting work.

2. Review, verify, and confirm compatibility and performance of the proposed instrument for treatment process and conditions.

3. Field verify process conditions and locations.

2. INSTALLATION

1. Install and assemble according to manufacturer's instructions. Exactly follow manufacturer's instructions and installation procedures for sensors directly interfacing process medium.

2. Install components of process measurement devices located as indicated. ENGINEER may change location of any process measurement device within process stream. Provide changes without extra cost if requested before installation.

3. Do not install process measurement devices at locations where other equipment is to be installed, obstruct walkway, or makes inaccessible or hard maintenance access. Maintain spacing and access.

4. Support process measurement devices, process connection lines, and sensors on pipe stands, plates, or channel brackets. Install and securely mount all devices in accessible locations with all gauges, dials, displays, or indicators visible and legible from floor level.

5. Provide electrical and control signals connections to all process measurement devices with manufacturer's instructions.
    1. Bond devices.
    2. Provide electrical identification.
    3. Wire process measurement device through junction box with terminal blocks if more than two wires have to be connected to a single terminal block inside process measurement device, or process measurement device terminal blocks require wire size

reduction. Wire size reduction by cutting the strings is not acceptable.

6. Configure, calibrate, and test all process measurement devices.

7. Provide digital network communication devices (HART handheld terminal, modem with PC software), obtain instrument current electronic data/configuration files, and configure digital communication, and device variables (registers).

8. Touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint. Clean and prime exposed non-galvanized hangers, racks, and fastenings to prevent rusting.

3. INTERFACE WITH OTHER PRODUCTS

1. Sequence, schedule, and coordinate work with other trades involved with process measurement device installation. Make arrangements for process measurement device process connection required to install electrical components.

2. Coordinate testing with SCADA integrator and verify data network communication, if applicable.

4. MANUFACTURER'S FIELD SERVICES

1. Where specified, provide manufacturer's representative to inspect after installation and submit report prior to startup, verifying installation and operation of process measurement devices is according to specifications and manufacturer's instructions.

5. SYSTEM STARTUP

1. Provide startup and commissioning support for all process measurement device testing and calibration.

2. Energize all process measurement devices and introduce to the process medium. Alternative procedures may be implemented for process measurement devices, which cannot be safely tested and energized.

3. Provide assistance during start up and rectify deficiencies, conduct troubleshooting and otherwise take corrective action of installed systems.

4. Perform operational tests using process media. Include operation of all process measurement devices by actuation of their controlling variable and monitoring of received signals. If the process media are not physically available or not available at required level (e.g., high pressure or temperature), provide testing means and media to simulate process conditions. Remove and reinstall sensors when required for testing.
    1. Provide digital meter, 4-20 mA signal readers and 24 VDC portable power supply for loop powered devices including accessories (alligator clips, metering leads, temporary wiring, etc.).
    2. Provide temporary tubing, fittings, and pressure regulators for testing.
    3. Provide testing solutions to verify operation of analytical process measurement devices.
    4. Provide movable targets to verify operation of level process measurement devices.
    5. Provide vacuum/pressure calibration pump complete with reference gauges to verify operation of pressure process measurement devices.

6. Provide ice and hot water in suitable containers complete with reference thermometers to verify operation of temperature process measurement devices.

5. Keep copy of manufacturer's instructions on Site available for review during startup.

6. ADJUSTING

1. Calibration of analysis process measurement devices, sensors, gauges, and meters must proceed on a system by system basis. No equipment or system performance acceptance tests to be performed until process measurement devices, gauges, and meters to be installed in that particular system have been calibrated, the calibration work has been witnessed by ENGINEER and reports have been submitted to ENGINEER.

2. Analytical process measurement devices and sensors used for performance testing to be subject to recalibration, if necessary, to confirm accuracy after completion, but prior to acceptance of each performance test. Recalibrate process measurement devices not meeting specifications or process conditions. Field change of process measurement device signal range, units, display configuration, etc. to suit process is considered a part of calibration work and it will not be considered as an extra to the Contract.

3. Provide calibration tags complete with technician name and date of calibration performed, next date of calibration to be performed and range.

4. Adjust process measurement device set points as listed on process measurement device list and as directed by ENGINEER.

5. Provide assistance during start up to rectify deficiencies, conduct troubleshooting, and otherwise take corrective action of installed systems.

7. CLEANING

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

2. Prior to energization of process measurement devices, clean inside of all enclosures such that it is free of any dust and debris, cause corrosion, or arc (wire strings).

3. Clean process lines prior to process measurement device installation. Clean process measurement devices process connection components, manifolds, fittings, etc. from construction debris and chemicals to avoid sensor damage or contamination.

8. DEMONSTRATION AND TRAINING

1. Section 01 80 00 - Facility Operation: Requirements for demonstration and training.

2. Demonstrate process measurement devices operation.

3. Provide training services for operator training on proper operating and maintenance procedures after satisfactory startup and commissioning.

9. PROTECTION

1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protection of installed work.

2. Protect all process measurement devices from moisture, dust, debris, and environmental, mechanical or electrical damage during construction. Allow for mechanical protection, removals and reinstallation where required for construction activities.

END OF SECTION

SECTION 46 07 01

WATER TREATMENT SYSTEM (WTS)

PART 1 GENERAL

1. SUMMARY

1. Section Includes:
    1. Design, construction, operation, and maintenance of temporary contact water treatment system capable of treating contact water generated during performance of Work. Sources are:
        a. Mounded Water: drains into excavation from excavation and surrounding soils.
        b. Persistent Infiltration: water that infiltrates through the soil from the river.
        c. Stormwater: accumulates in the excavation and containment area during a rain event.
        d. Equipment Decontamination Water: generated by the washing/rinsing of equipment (e.g., Truck Wash)
        e. Miscellaneous Contact Water: other water that comes into contact with waste material not associated with water types listed above.
    2. Treated water discharge criteria are presented in Table 1 of Section 2.1.

2. Related Requirements:
    3. Section 23 05 53- Identification for Piping and Equipment
    4. Section 40 05 13- Common Work Results for Process Piping
    5. Section 40 70 00- Instrumentation for Process Systems
    6. Section 40 05 51- Common Requirements for Process Valves
    7. Section 01 91 00 - Water Treatment Consumables

2. REFERENCES

1. Acronyms:
    1. ARARs: Applicable or Relevant and Appropriate Requirements
    2. FRP: Fiberglass Reinforced Plastic
    3. GAC: Granular Activated Carbon
    4. GPM: Gallons Per Minute
    5. HDPE: High-Density Poly Ethylene
    6. HMI: Human-machine Interface
    7. HRT: Hydraulic Retention Time
    8. ISO: International Organization for Standardization
    9. PLC: Process Logic Controller
    10. PID: Process and Instrumentation Diagram
    11. PFD: Process Flow Diagram
    12. SSPC: Steel Structures Painting Council
    13. TSS: Total Suspended Solids.
    14. TBD: To be Determined
    15. WTS: Water Treatment System

2. Definitions:
    1. Contact Water defined as:
        a. Mounded Water: drains into excavation from excavation and surrounding soils.

b. Persistent Infiltration: water that infiltrates through the soil from the river
c. Stormwater: accumulates in the excavation, and containment area during a rain event
d. Equipment Decontamination Water: generated by the washing/rinsing of equipment (e.g., Truck Wash)
e. Miscellaneous Contact Water: Other water that come into contact with waste material not associated with water types listed above

2. Hazardous Material: Solid or liquid materials regulated by federal or state regulations as hazardous materials.
3. Hazardous Waste: Listed in applicable regulations as a hazardous waste or exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
4. Non-hazardous Waste: Waste that in not classified as a Hazardous Waste.
5. Commissioning or Commission: the overall process of starting, testing, adjusting, and balancing the various components, equipment, and subsystems of a system or facility to place the system or facility into a fully operational condition.
6. Work: All activities related to excavation, material transportation, contact water collection and treatment which is include but not limited to mobilization, start up and commissioning, operation, decommissioning and demobilization.
7. WTS Effluent: all treated water discharged to the river.

3. Reference Standards:
1. American National Standards Institute (ANSI).
2. ASTM International (ASTM).
3. American Water Works Association (AWWA).
4. Institute of Electrical and Electronics Engineers (IEEE).
5. Insulated Power Cable Engineers Association (IPCEA).
6. National Electrical Manufacturer's Association (NEMA).

3. SYSTEM DESCRIPTION

1. WTS will be required to manage contact water for the Southern Impoundment RA. Design, obtain ENGINEER's approval, and implement water management program compatible with construction schedule and methodologies selected to perform the Works. WTS must be placed in a secondary containment area with available volume (i.e., area not occupied by other tanks) equal to or greater than the volume of the largest tank plus precipitation (if containment collects rainfall).

2. Contact water shall be directed from the excavation and all containment areas to the influent Holding Tank using transfer pump(s) at a rate to be determined by the CONTRACTOR to prevent delay of work.

3. Provide sufficient storage capacity for contact Water (including storm water falling into excavations) collected within the work area to prevent delay of Works.
1. Equalization storage capacity shall be provided upstream of the WTS. This capacity is currently estimated at 668,000 gallons (549,000 gallons working volume) which will hold the largest 24-hour rain event observed in Houston during the construction season (November to April) between 1930 and 2019.
2. Treated effluent shall only be discharge after receipt of sampling results indicating all contaminants are below ARARs.
3. Estimated contact water generation by area are provided in below:

Influent Sources	SW	SC	NC	NE	Notes
Maximum Predicted Persistent Infiltration (gpd)	13,600	212,700	29,200	116,200	Assumes excavation is 50' x 50'
Mounded Water (gpd)	25,000	70,000	65,000	25,000	Area to be remediated plus 50-ft buffer
Rain Collection - Excavation (gpd)	24,900	24,900	24,900	24,900	Assumes open excavation is 50' x 50' and collection area is 100' x 100' (i.e., 25' buffer)
Rain Collection - WTS Containment Area (gpd)	134,100	134,100	134,100	134,100	24-hr rain event, 53,800-ft^2
Rain Collection - Overburden/Dewatering Areas (gpd)	74,800	74,800	74,800	74,800	24-hr rain event, 30,000-ft^2 area
Rain Collection - Truck Wash Area (gpd)	5,700	5,700	5,700	5,700	24-hr rain event, 2,400-ft2 area
Rain Event (inch)	6.2	6.2	6.2	6.2	Maximum rain event (1930 to 2019) = 6.2" in 24 hours
Estimated 24-hour Collection with Rain (gpd)	**396,000**	**441,000**	**436,000**	**396,000**	Assumes excavation is filled before rain event (i.e., no persistent infiltration)

4. Take all necessary steps to protect WTS equipment and conveyance equipment (e.g., pumps, pipes, hoses) from extreme weather condition, including, but not limited to, storms, sunlight, extreme temperature.

5. WTS shall be installed at location shown on the attached drawings. CONTRACTOR may propose an alternate layout and location to be reviewed/approved by the OWNER/ENGINEER prior to implementation.

6. WTS shall be designed to treat contact water that will vary in quality/quantity. The overall treatment strategy shall conform to the details of this Section. Collected impacted water is expected to contain elevated levels of suspended solids (sediment), dioxins and furans, heavy metals, based on historical analytical data obtained during a recently executed treatability study. Applicable discharge criteria are provided in the next section.

7. Temporary WTS is not intended for management of domestic sanitary wastewater that will be generated on Site. This liquid waste stream is to be managed by other means.

8. Should WTS process adjustment/optimization of the proposed treatment equipment fail to meet the discharge criteria listed in Table 1 of Section 2.1, make modifications to treatment systems as necessary based on actual conditions observed during execution of Works. Modifications may include, but not be limited to bulk solids removal equipment (i.e., clarifier) changing treatment chemicals, reducing treatment flow rate, and/or installation of additional treatment equipment. Any modifications to the WTS equipment configuration will be reviewed/approved by the OWNER/ENGINEER prior to implementation. Modifications to the WTS must not delay the overall work schedule.

8. Sequence the Works, including temporary storage in active areas, to provide adequate water treatment to meet the project schedule.

4. SEQUENCING

1. CONTRACTOR shall be solely responsible for managing and coordinating related work that affects the quality and quantity of the contact water that is routed to the WTS for treatment and discharge.

2. Coordinate contact water treatment and discharge rates to maintain WTS capacity.

3. Minimize TSS transferred from the excavation to the WTS.

4. Sequence and coordinate work so that the WTS is operational prior to beginning operations that will generate contact water.

5. Continuously maintain the WTS and continue all contact water treatment efforts until all of the following conditions have been met:
   a. All of the on-site operations that could potentially generate contact water have been completed.
   b. All of the impacted materials have been transported off Site.

6. WTS shall be installed and tested by CONTRACTOR and inspected by ENGINEER prior to commencing work which may generate contact water.

7. Works included:

   a. Supply of specified treatment system equipment to meet the specified system requirements.
   b. Delivery of equipment to Site and field installation.
   c. Provision/construction of necessary foundations for WTS equipment.
   d. Calibration, certification, and commissioning of the supplied equipment.
   e. Provision of complete O&M manual for ENGINEER and OWNER reference.
   f. Perform pressure testing and provide pressure testing reports to ENGINEER.
   g. Supply, testing, and calibration of all process instrumentation associated with treatment equipment within the WTS.
   h. Provide load list and all electrical requirements for the treatment equipment.
   i. Electrical panel and process logic controller (PLC) and human-machine interface (HMI) for automated operation of the WTS.
   j. Provision of all required spare parts as to minimize system downtime during maintenance.
   k. Provide access hatches for system enclosures to allow for expendable media replacement and equipment clean-out/maintenance.
   l. Treatment equipment enclosures shall include ventilation systems to prevent internal temperatures in excess of 40° C. Provisions shall be made to maintain a minimum temperature within the containerized system of 10ºC.

5. SUBMITTALS

1. Contact Water Treatment Plan: Submit a Contact Water Treatment Plan, equipment selected (cutsheets), storage and pumping capacities, electrical load list and power distribution plan, effluent monitoring program, general arrangement of equipment within containers/enclosures, site layout of equipment and piping, and operating plan compatible with and demonstrating compliance with specified requirements. The WTS plan will include example operations log sheets identifying operational data that will be routinely collected by the WTS operators and/or WTS PLC. Example operations data is shown in the table below.

Operating Parameter	Value
Minimum Daily Flow	
Maximum Daily Flow	
Average Daily Flow	
Total Daily Flow	
Rapid Mix Tank pH Set Point (if applicable)	
Daily Coagulant Consumption	
Coagulant Dose Set Point	
Daily Polymer Consumption	
Polymer Dose Set Point	
Filters/GAC Pressure	
Effluent pH	
Backwash Event (vessel, flow, duration)	

2. Sequence of Construction: Submit sequence of construction of features and equipment associated with the WTS to include but not limited to containment base, influent and effluent tank erection, containment walls, other equipment and features.

3. Residuals, Solids, and Sediment Waste Management Plan: As part of the Contact Water Treatment Plan, submit a Residuals, Solids, and Sediment Waste Management Plan, including details for management of solids, soils, and sludge resulting from treatment activities as well as the management of expendables such as multimedia filter and GAC media. Such plans will detail testing of residuals to identify required disposal requirements per applicable local, state and federal laws and regulations.

4. WTS Staffing Plan

5. Shop Drawings:

    1. Product Data:
        a. Performance criteria, compliance with appropriate reference standard, characteristics, limitations, and trouble-shooting protocol.
        b. Product transportation, storage, handling, and installation requirements.
        c. Equipment information including: inlet pressure requirements, inlet/outlet diameters, included controls, included options, brochure cuts indicating dimensions and weights, surface loading rates, number of installations in North America, and location from where system services and technical support would be provided.
        d. A list of all supplied equipment including the length of supplied piping as part of the hookup requirements.

e. A system schematic and process control narrative.
2. Overall dimensions of equipment.
3. Final equipment layout.
4. Final arrangement and dimensions of accessories.
5. As-built Process and Instrumentation Drawings (P&IDs), if different from P&ID provided in drawing package
6. Dimension Drawing and required footprint for installation of WTS.
7. Process Control Narrative detailing the automatic water treatment operations associated with the WTS including proposed set points and alarms.
8. Site Acceptance Test (SAT) Plan: Contractor will provide and implement a Site acceptance test to demonstrate satisfactory automatic operation of the WTS. SAT will be executed as part of overall commissioning of the WTS.
9. Electrical load list and details of electrical distribution/control for powered equipment.

6. Design Data: Indicate tanks sizes, pump sizes, and treatment rates.

1. Test Reports/Commissioning Reports:
2. Provide records of commissioning performance and final set points, indicate on shop drawings all adjustments made during commissioning.
3. Submit commissioning procedure for ENGINEER for review a minimum 4 weeks prior to WTS commissioning. Commissioning report documentation (e.g., checklists) shall be provided for review. If intended commissioning documentation is deemed unsatisfactory by ENGINEER, ENGINEER provided commissioning documentation will be utilized by the CONTRACTOR.
4. Final effluent testing will be completed by an independent laboratory chosen by the OWNER/ENGINEER. OWNER/ENGINEER shall carry all costs for contact water sampling and analysis.
5. The system is to be fully commissioned using clean water (supplied by the CONTRACTOR).
6. Following clean water commissioning, CONTRACTOR shall store an initial volume of treated contact water until analytical results are received that document compliance with ARARs.

7. Operation, Maintenance and Equipment Data:
1. Operation and maintenance data: Indicate and submit maintenance data for incorporation into Operation and Maintenance Manuals.
2. Identification: Manufacturing name, type, year, serial number, number of units, capacity, and identification of related systems.
3. Data necessary for maintenance of equipment.
4. Manufacturer's recommended list of spare parts and associated costs.

6. CLOSEOUT SUBMITTALS

1. Facility Operation Report: Include all operational data from each operating day including flow rates, volumes, test results and effect on process, actual quantities of chemicals added, process modifications, etc.

7. QUALIFICATIONS

1. Manufacturer/Supplier of WTS equipment: Company specializing in supply and operations of containerized/skid mounted water treatment equipment for substantially similar applications,

with minimum 5 years documented product development, testing, and operations experience. Project references over the past five years shall be provided outlining application, treatment flow, and treatment technologies. Reference Project contact information may be required upon request of ENGINEER.

8. QUALITY ASSURANCE

1. Perform work of this Section in accordance with approved Contact Water Treatment Plan and ARARs.

9. DELIVERY, STORAGE, AND HANDLING

1. Protect equipment and supplies from precipitation by suitable covers or structures, if needed.

2. Protect supplies and consumables (e.g., treatment chemicals, filtration media, GAC) from precipitation by suitable covers or structures. Store products in a manner consistent with manufacturer recommendations

3. Maintain adequate supplies to maintain operations including all expendable materials and treatment chemicals. Store products in an appropriate manner with all health and safety/environmental requirements satisfied.

4. Maintain and service equipment to ensure they are in working order.

PART 2 PRODUCTS

1. DESIGN CRITERIA

1. WTS design criteria are provided in the attached drawings.

2. Influent water quality is based on sampling and pilot testing conducted during the Southern Impoundment RD. One borehole in the Southern Impoundment generated a sufficient volume of water to conduct limited baseline characterization. In addition, 20,000 gallons of representative contact water were generated from outside the Southern Impoundment (i.e., Northern Impoundment). In order to produce this volume, waste material was excavated from a 20-ft by 20-ft by 10-ft cell. The excavated material was stored in roll-off containers. Approximately 20,000 gallons of potable water was then transferred into the excavation and mixed with the excavated material using an excavator bucket to generate a worst case suspended solids mixture that may be encountered in stormwater during the Works. This simulated contact water was then pumped to two storage tanks and the contents of the two tanks were homogenized and subsequently sampled.

3. CONTRACTOR is fully responsible for the provision of temporary power to the WTS.

4. CONTRACTOR shall obtain all necessary permits and coordinate with local utility/authorities as required.

5. CONTRACTOR shall obtain all necessary permits associated with the provision of temporary power to the WTS as required.

6. The CONTRACTOR is responsible to make any necessary modifications to the WTS due to changing influent concentrations to continually optimize treatment to achieve target criteria. Any required changes shall be made in a timely manner as to not hinder Works. Changes to the WTS shall be reviewed and approved by the ENGINEER prior to implementation.

7. Table 1. Expected concentration of constituents of concern and their estimated discharge limits.

Component	**Units**	**Discharge criteria[1,2]**	**North Impoundment Pilot Contact Water**		**South Impoundment Borehole Water**
			Tank #1	**Tank #2**	
Dioxins/Furans					
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	100	590	370 J	22000
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	100	15000 J+	8800 J	310000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	50	880 J-	600 J	2800
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	50	840	540 J	43000
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	50	320	240 J	130
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	50	3100	2500 J-	260
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	50	11 U	4.9 U	69
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	50	790	650 J-	120
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	50	30 J	20 J-	920

Component	Units	Discharge criteria[1,2]	North Impoundment Pilot Contact Water		South Impoundment
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	50	53	40 J-	11 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	50	18 J-	8.5 J-	300
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	50	2100	1900	100
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	50	160	130	32 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	50	93	73 J-	38 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	50	1200	1100	73
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	10	50000	46000	3800
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	10	18000	15000	1000
Total heptachlorodibenzofuran (HpCDF)	pg/L	50	1600 J	1100 J	10000 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	50	2000 J	1300 J	88000 J
Total hexachlorodibenzofuran (HxCDF)	pg/L	50	4600 J	3800 J	2900 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	50	260 J	180 J	7400 J
Total pentachlorodibenzofuran (PeCDF)	pg/L	50	5000 J	4600 J	860 J

Component	Units	Discharge criteria[1,2]	North Impoundment Pilot Contact Water		South Impoundment
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	50	190 J	160 J	430 J
Total tetrachlorodibenzofuran (TCDF)	pg/L	10	100000 J	100000 J	6000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	10	20000 J	16000 J	1200 J
Dioxins/Furans (dissolved)					
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) (dissolved)	pg/L	100	170	11 U	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD) (dissolved)	pg/L	100	5400 J+	280 J+	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	50	240	12 J	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) (dissolved)	pg/L	50	250	27 J	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	50	88	4.9 U	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	750	31 J	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	50	4.6 U	3.1 U	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	190	9.8 J	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	50	6.7 J	2.1 J	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	14 J	4.8 U	--

Component	Units	Discharge criteria[1,2]	North Impoundment Pilot Contact Water		South Impoundment
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	50	5.7 J	1.7 U	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	50	450	20 J	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD) (dissolved)	pg/L	50	40 J	3.0 J	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	23 J	2.8 U	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	50	250	11 J	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF) (dissolved)	pg/L	10	11000	540 J	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (dissolved)	pg/L	10	3800	150 J	--
Total heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	50	430 J	20 J	--
Total heptachlorodibenzo-p-dioxin (HpCDD) (dissolved)	pg/L	50	630 J	51 J	--
Total hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	1100 J	48 J	--
Total hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	50	74 J	6.9 J	--
Total pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	50	1100 J	44 J	--
Total pentachlorodibenzo-p-dioxin (PeCDD) (dissolved)	pg/L	50	51 J	3.0 J	--

Component	Units	Discharge criteria[1,2]	North Impoundment Pilot Contact Water		South Impoundment
Total tetrachlorodibenzofuran (TCDF) (dissolved)	pg/L	10	21000 J	920 J	--
Total tetrachlorodibenzo-p-dioxin (TCDD) (dissolved)	pg/L	10	4000 J	170 J	--
Metals					
Antimony	mg/L	25.623	0.0039 U	0.0039 U	0.049 J
Arsenic	mg/L	0.164	0.026	0.023	0.16
Barium	mg/L	N/A	1.1	0.96	2.8
Cadmium	mg/L	0.0439	0.0028 J	0.0025 J	0.019
Chromium	mg/L	0.389	0.12	0.11	0.90 J
Copper	mg/L	0.0167	0.11	0.093	1.2
Lead	mg/L	0.107	0.12	0.098	3.4
Mercury	mg/L	0.000598	--	--	0.011
Mercury	ng/L	598	28 J	6.3 J	--
Mercury	ug/L		--	--	--
Nickel	mg/L	0.103	0.095	0.081	0.27 J
Selenium	mg/L	0.619	0.0029 U	0.0029 U	0.018 J
Silver	mg/L	0.00493	0.0013 U	0.0013 U	0.0046 J
Thallium	mg/L	0.5	0.0042 U	0.0042 U	0.0090 UJ
Zinc	mg/L	0.165	0.40	0.36	9.7
Metals (dissolved)					
Antimony (dissolved)	mg/L	25.623	0.0039 U	0.0039 U	0.015 J
Arsenic (dissolved)	mg/L	0.164	0.014	0.0041 J	0.012 U
Barium (dissolved)	mg/L	N/A	0.55	0.30	0.12
Cadmium (dissolved)	mg/L	0.0439	0.0013 J	0.00040 J	0.00050 U

Component	Units	Discharge criteria[1,2]	North Impoundment Pilot Contact Water		South Impoundment
Chromium (dissolved)	mg/L	0.389	0.048	0.0039 J	0.0012 U
Copper (dissolved)	mg/L	0.0167	0.036	0.0081 U	0.013
Lead (dissolved)	mg/L	0.107	0.037	0.0022 U	0.0047 J
Mercury (dissolved)	mg/L	0.000598	--	--	0.00010 U
Mercury (dissolved)	ng/L	598	--	22 J	--
Mercury (dissolved)	ug/L	0.598	--	--	--
Nickel (dissolved)	mg/L	0.103	0.033	0.0030 J	0.0062
Selenium (dissolved)	mg/L	0.619	0.0029 U	0.0029 U	0.013 UJ
Silver (dissolved)	mg/L	0.00493	0.0013 U	0.0013 U	0.00084 U
Thallium (dissolved)	mg/L	0.5	0.0042 U	0.0042 U	0.0090 U
Zinc (dissolved)	mg/L	0.165	0.15	0.026 J	0.14
pH	SU	6-9			
TSS	mg/L	30	3500	4600	--

Notes:

-- Data not available

[1]Per an EPA email dated February 18, 2020, compliance with the Texas Surface Water Quality Standards will be determined using the minimum level of the EPA approved method (1613B), cited in 40 CFR Part 136, in sampling of dioxin concentrations for surface water discharges during the Remedial Action.

[2]Estimated discharge criteria were calculated for all parameters except dioxins and furans utilizing the TCEQ model, TEXTOX MENU # 5 for bays or wide tidal rivers.

pg/L - picograms per Liter
mg/L - milligrams per Liter
ug/L - micrograms per Liter
s.u. - standard unit
U - Not detected at the associated reporting limit. J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.

2. LIST OF MAJOR EQUIPMENT

1. Water Treatment System shall include equalization, clarification and flocculation, filtration and GAC adsorption. Filtration step shall involve media filtration and bag/cartridge filtration. The WTS will initially use 10-micron, 95% efficient cartridge filter elements in the first bag filter

system and 1-micron, 95% efficient cartridge filter elements in the second filter system. The list of major equipment is provided in the attached table.

2. CONTRACTOR shall use equipment as listed in the Water Treatment System Equipment List included as the end of the specifications. Alternative equipment can be used if they are equal and approved by ENGINEER.

3. STORAGE TANKS

    1. Storage tank will hold contact water generated during construction activities.
    2. Operating Conditions:
        a. Fluid: Impacted contact water (sediment dewatering effluent, impacted precipitation, etc.).
        b. Size: See attached equipment list and drawings. Final selection approved by ENGINEER.
    3. Performance and Connection Requirements:
        a. Model: Lake Tank .
        b. Volume: ~668,000 Gallons.
        c. Quantity: 1
        d. Dimensions: 100 ft (dia).
    4. Material: See attached equipment list

4. RAPID MIXING TANK

    1. Operating Conditions:
        a. Fluid: Chemical dosed impacted water (sediment dewatering effluent, impacted precipitation, etc.).
    2. Type and Materials: See attached equipment list
    3. Performance Requirements: See attached equipment list
    4. Fabrication:
        a. All materials shall be suitable for continuous contact with contact water.
    5. Make and Model: See attached equipment list.

5. SLOW MIXING TANK

    1. Operating Conditions:
        a. Fluid: Chemical dosed impacted water (sediment dewatering effluent, impacted precipitation, etc.).
        b. Size: See attached equipment list. Final selection approved by ENGINEER.
    2. Type and Materials: See attached equipment list
    3. Performance Requirements: See attached equipment list
    4. Fabrication:
        a. All materials shall be suitable for continuous contact with contact water.
    5. Make and Model: See attached equipment list.

6. INCLINED PLATE CLARIFIER

    1. Operating Conditions:
        a. Fluid: Chemical dosed impacted water (sediment dewatering effluent, impacted precipitation, etc.).
        b. Size: See attached equipment list and drawings . Final selection approved by

ENGINEER.
2. Type and Materials: See attached equipment list
3. Performance Requirements: See attached equipment list
4. Fabrication:
   a. All materials shall be suitable for continuous contact with contact water.
5. Make and Model: See attached equipment list.

7. SLUDGE DEWATERING BOX

1. Operating Conditions:
   a. Fluid: Chemical dosed impacted water (sediment dewatering effluent, impacted precipitation, etc.).
   b. Size: See attached equipment list. Final selection approved by ENGINEER.
2. Type and Materials: See attached equipment list
3. Performance Requirements: See attached equipment list
4. Fabrication:
   a. All materials shall be suitable for continuous contact with contact water.
5. Make and Model: See attached equipment list.

8. FILTER FEED TANK

1. Operating Conditions:
   a. Fluid: Clarifier Effluent.
   b. Size: See attached equipment list. Final selection approved by ENGINEER.
2. Type and Materials: See attached equipment list
3. Performance Requirements: See attached equipment list
4. Fabrication:
   a. All materials shall be suitable for continuous contact with contact water.
5. Make and Model: See attached equipment list.

9. MULTIMEDIA FILTERS

1. Operating Conditions:
   a. Fluid: Clarifier Effluent.
   b. Operational Flow: Design Flow.
2. Type and Materials: See attached equipment list
3. Performance Requirements: See attached equipment list
4. Fabrication:
   a. All materials shall be suitable for continuous contact with contact water.
5. Make and Model: See attached equipment list.

10. CARTRIDGE/BAG FILTERS

1. Operating Conditions:
   a. Fluid: Clarifier Effluent.
   b. Size: See attached equipment list. Final selection approved by ENGINEER
2. Type and Materials: See attached equipment list
3. Performance Requirements: See attached equipment list
4. Fabrication:
   a. All materials shall be suitable for continuous contact with contact water.

5. Make and Model: See attached equipment list.

11. GAC VESSELS

    1. Operating Conditions:
        a. Fluid: bag/cartridge filter effluent.
        b. Size: See attached equipment list. Final selection approved by ENGINEER.
    2. Type and Materials: See attached equipment list
    3. Performance Requirements: See attached equipment list
    4. Fabrication:
        a. All materials shall be suitable for continuous contact with contact water.
    5. Make and Model: See attached equipment list.

12. EFFLUENT TANKS

    1. Operating Conditions:
        a. Fluid: GAC Filter Effluent.
        b. Location: In-line after GAC filter
        c. Size: See attached equipment list. Final selection approved by ENGINEER
    2. Performance and Connection Requirements:
        a. Model: Lake Tank .
        b. Volume: ~680,000 Gallons.
        c. Quantity: 3
        d. Dimensions: 100 ft (dia).
    3. Material: See equipment list

13. CHEMICAL DOSING EQUIPMENT

    1. Unit Description:
        a. Chemical metering pumps dose treatment chemicals to the WTS as it shown in attached drawings
        b. The metering pumps are controlled by the plant PLC in auto mode or locally in manual mode. Metering pumps shall modulate dosing flow to an adjustable dose setpoints (flow- paced model). The list of chemical dosing pumps in Equipment list
    2. Operating Conditions:
    3. Fluid: Various
    4. Location: See attached drawings
    5. Size: See attached equipment list. Final selection approved by ENGINEER
    6. Design Requirements:
        a. Type: Chemical metering pumps, sized by supplier, materials of construction to be suitable chemicals being pumped. Metering pump/accessories to be mounted on independent chemical pump panel.
        b. Provide polymer mixing, activation/maturation tank, and dilution equipment as required. Polymer shall be received as liquid emulsion (or powder) to be activated and diluted as a solution of 0.5-1.0 weight percent or less.
    7. Make and Model: See Equipment List

14. DISCHARGE DIFFUSERS

    1. Unit Description:
        a. Diffuser to disperse treated effluent from the WTS into the river
        b. Perforated Pipe: Dual Wall HDPE Perforated Pipe
        c. Pipe Perforation Pattern: AASHTO Class II perforations with a minimum inlet area of 1.5 in^2/ft
        d. Geotextile: 3 oz. Light weight non-woven geotextile
    2. See attached drawings for additional details
    3. Final design approved by ENGINEER
    4. Operating Conditions:
        a. Design flow – 5,600 GPM
        b. Pipe elevation to be minimum of 6” above average water surface elevation of river
        c. Assumed Head difference between maximum water level in tank and energy dissipator outlet elevation – 16.5 ft
        d. Assumed length of pipe leading to energy dissipator – 125 ft

15. WTS PROCESS PUMPS

    1. Unit Description:
        a. WTS process pumps convey untreated and treated contact water to WTS and through WTS.
        b. The process pumps are controlled as described in Control Narrative.
        c. Final pump sizing/selection is the responsibility of the Contractor based on identified service flows below. Operating pressure for pumps will be confirmed by Contractor based on the physical configuration of the WTS.
        d. All discharge piping from the WTS to discharge point is the responsibility of the Contractor. This includes piping associated with the discharge of treated water.
        e. Provide upstream/downstream isolation, discharge check valves, and pressure gauges for all process pumps.
    2. Operation conditions: See Equipment List
    3. Make and model: See Equipment List

16. WATER TREATMENT DESCRIPTION

    1. Treat collected contact water and release treated contact water meeting ARARs.

    2. Treated water shall only be discharge from the effluent water tanks after CONTRACTOR receives analysis of contents indicating all contaminants in the treated water are below ARARs and once approval of discharge by ENGINEER is received.

    3. Treated water shall be discharge by gravity at a rate not to exceed permit limit.

17. TREATMENT EQUIPMENT ENCLOSURES

    1. Equipment can be installed outside or within treatment equipment enclosures.

    2. General arrangement of equipment within containers shall be provided by supplier as well as arrangement of shipping containers on site plan.

3. The enclosures, if used, shall include at a minimum:
   a. Plywood floor.
   b. Barn style rear double doors.
   c. Ventilation fan/heater(s) with thermostat and hood. Ventilation system shall be sized to prevent enclosure temperature from exceeding 40 degrees C. Heating systems shall be provided to ensure temperature within temporary enclosures does not fall below 10 degrees C.
   d. Access hatches as required for removal of spent treatment media from the media filters, vessels, and GAC Contactors.
   e. Structural review of modified ISO container shall be completed and sealed by a professional engineer licensed in the state of Texas.
   f. Contractor shall provide appropriate foundations for treatment equipment enclosures to prevent shifting or settling.

18. CONTROL NARRATIVE

    1. See Attachment A at the end of this Section for a detailed control narrative.

19. ELECTRICAL CONTROL PANEL AND PLC SYSTEM

    1. Operating Conditions: Outdoors (NEMA 4).

    2. Panel Design:
       a. Enclosure: A PLC (Programmable Logic Controller) Panel must be provided based on treatment equipment supplier PLC IO list, which calls out specific PLC hardware.
       b. The electrical instrument design, specification portion of this Project shall conform to the latest editions of the NEMA, ANSI, IEEE, UL, the National Electrical Code, the Occupational Safety and Health Act, and any regulations or codes of any governmental jurisdictions, that may be more exacting than these references and related codes and standards as designated herein.
       c. All specifications, standards, codes, etc. referenced are to be the latest edition, and together with all addenda, revisions, and supplements shall be considered part of this Project.

    3. Hardware:
       a. Other Requirements: All automatic equipment and process set points shall be controlled through an HMI touch screen. All alarms generated by the process shall activate a written description of the alarm on the HMI touch screen.

    4. Programming: The design of the automation system is based upon the criteria listed below:
       a. All systems are operated at all times to meet required quality metric, and process data storage requirements along with client requirements, standards and objectives.
       b. All systems are designed for automatic, unattended operation. The status of operating equipment is continuously monitored to detect operational excursions, equipment failures, and automatic shutdowns.
       c. Manual control is provided for maintenance, startup and emergency shutdown where appropriate.

PART 3 EXECUTION

1. INSTALLATION

    1. Install Water Treatment Facility in location as shown in the Drawings or approved by ENGINEER.

    2. Installation: According to manufacturer's instructions and in accordance with state of Texas standards.

    3. Maintain working area free of standing water.

    4. Provide all necessary temporary piping/hose/etc. for interconnection of WTS tanks and treatment equipment.

2. FIELD QUALITY CONTROL

    1. Functional Test: Prior to facility startup, all equipment shall be inspected and verified for installation of equipment by others is satisfactory.

    2. Testing Equipment: Furnish all instruments and labor as required for this procedure.

    3. Provide continuous, inline, monitoring of turbidity at the clarifier overflow, filter effluent, and effluent.

    4. Provide inline monitoring of flow prior as shown in drawings.

    5. Provide online monitoring of pH as shown in drawings.

    6. Provide TSS analysis results per operation cycle or as requested by ENGINEER.

    7. Monitor lead GAC column for dioxins to ensure compliance with ARARs at effluent.

3. COMMISSIONING AND PERFORMANCE VERIFICATION

    1. Commissioning:
        1. Verify that equipment and systems are installed according to manufacturer's instructions, industry accepted minimum standards, and the Contract Documents.
        2. Verify that equipment and systems receive adequate operational checkout by CONTRACTOR.
        3. Verify and document proper performance of equipment and systems.
        4. Verify that complete operation and maintenance documentation is delivered to OWNER.
        5. Verify that operating personnel are adequately trained with documentation delivered to OWNER
        6. Commissioning does not relieve CONTRACTOR of responsibility to provide a finished and fully functioning Project.
        7. Site Acceptance Testing:
            1. Supplier shall test the system as a whole to bring the system online to treat the influent to the required effluent criteria.
            2. Chemicals and consumables required for the start-up and performance verification shall be provided by CONTRACTOR. CONTRACTOR shall provide additional

consumables as needed throughout project duration.

3. In general, equipment start-up and performance verification shall include:
   a. Bring temporary systems into operating condition.
   b. Ensure operation of equipment, devices, instrumentation, and alarms required for the proper operation of the temporary systems.
   c. Ensure operation of equipment, devices, instrumentation, and alarms required for the proper operation of the temporary systems.
   d. Operate WTS, perform multiple start and stop sequences and adjust settings as required. The number of operational treatment trains shall be dependent on the impacted water generation rates. During low flow periods, the WTS may need to operate in a batch mode.
   e. Simulate failures for WTS and shut down sequence. Adjust as required.
   f. Operation of the associated equipment.

8. Performance Verification:
   1. Performance verification shall happen after all equipment has completed start up testing and has been signed off by equipment supplier.
   2. Operate the system by bringing each system online as required to treat contact water.
   3. Fine tune dosing points of chemical coagulant and flocculent at clarifier to meet the performance requirements of the system. Record all adjustments made and record final set points.
   4. If a system must be removed from service to perform a cleaning cycle or other regular maintenance, the cleaning or maintenance activities shall be considered part of the WTS provided that the activities are not required to address failure of mechanical components or failure to meet operational standards.
   5. Malfunctions shall be defined as an event of 1) mechanical failure of a system or component, or 2) failure to meet the operational standards required for the system. In the event of a malfunction, the system shall be required to be retested to ensure system performance is met.

4. DEMONSTRATION

1. Supplier shall supervise CONTRACTOR's operating personnel during the startup period. Start-up operations shall be continuous until it is satisfactorily demonstrated that the equipment is suitable for continuous services.

5. OPERATION

1. Do not operate the WTS until ENGINEER has inspected facility and authorization for discharge has been received from ENGINEER.

2. Operate the WTS and do work necessary to treat collected contact water. Operation shall include treatment of contact water and discharge of treated water for duration of the Works.

3. Operate and maintain treatment units as required to meet ARARs.

4. Provide for removal and disposal of solids as approved by ENGINEER.

5. Provide for removal and disposal of media in approved CONTRACTOR-supplied

containers to an approved off-Site disposal facility.

6. Provide daily flow rate and turbidity data to OWNERS on a daily basis in a Log Sheet format acceptable to ENGINEER.

7. Operate treatment system in compliance with OWNER'S permit.

8. Provide daily flow rate data to the OWNER on a daily basis in a Log Sheet format acceptable to the OWNER. Daily log sheets shall also detail volume/mass of consumables utilized as well as any major upkeep/maintenance activities (e.g., GAC media replacement).

9. Start up and Shutdown Procedures – WTS:

    1. The WTS will need to operate intermittently and in a batch fashion. The Contractor shall provide one full time operator (minimum) to execute WTS operations. Before starting the WTS, the operators should prepare the chemical solutions. These solutions must be maintained over the course of the operating period.
    2. The operators shall make sure all monitoring and instrumentation devices are online and operational per manufacturer recommendations. All instrumentation should be cleaned and calibrated per manufacturer recommendations.

10. System Monitoring and Automatic Shutdown for Equipment – WTS (Refer to design drawings for instrumentation location)

    1. Control of the WTS shall be achieved through the use of programmable logic controller (PLC) and operator intervention.
    2. The Transfer Pumps shall shutdown on high-level in Influent Tank
    Treatment Feed Pump flowrate shall be flow controlled using an operator adjusted setpoint and the flow meter located at the feed line of the WTS treatment trains.
    3. Treatment Feed Pump shall shutdown if high-level is detected in Inclined Plate Clarifier or Filter Feed Tank
    4. Treatment Feed Pump shall shutdown if high turbidity (operator adjustable) is detected in effluent of Inclined Plate Clarifier
    5. Treatment Feed Pump shall shutdown if flowrate drops below operator setpoint TBD which indicates a potential break in the influent pipeline
    6. Chemical dosing systems shall be on a flow-paced mode to adjust the injection flow rate to achieve a desired dose.
    7. If needed, pH adjustment chemicals shall be added based on the pH in Rapid Mix Tank.
    8. Chemical dosing systems shall shutdown upon stopping of mixer in the Rapid Mix Tank or Flocculation Tank
    9. Chemical dosing systems shall shutdown if flowrate of the Influent Feed Pump drops below operator adjustable flowrate.
    10. Filter Feed Pump shall shutdown on high turbidity as measured by filter effluent
    11. Filtration Feed Pump shall shutdown on high-level in Treated Effluent Holding Tank(s).
    12. Settled sludge collected from the underflow of the Clarifier unit shall be conveyed by a sludge pump to the Sludge Dewatering Boxes.
    13. Sludge shall be discharged from Clarifier based on adjustable timer controls (e.g., frequency and duration of sludge transfer events) or by the operator at their discretion when the height of sludge reaches a certain level in the clarifier.
    14. Decanting Pump shall shutdown on high-level in Holding Tanks
    15. The output of the multimedia filter directly feeds the bag filters and GAC vessels.
    16. The output of the GAC filters shall be collected in effluent storage tank.
    17. The treated water shall be monitored for pH, turbidity, and flow before discharge to the

outfall.

6. MONITORING OF CONTACT WATER TREATMENT AND DISCHARGE

1. CONTRACTOR shall discharge treated contact water on a batch basis from the Effluent Tanks.

2. CONTRACTOR shall sample the treated water upon discharge from the last treatment unit (i.e., GAC vessels) and prior to discharge into the Effluent Tanks.

3. CONTRACTOR shall submit the sample to analytical laboratory for analysis of COCs as directed by OWNER or ENGINEER.

4. CONTRACTOR shall only discharge water from a treated effluent tank after analysis confirms that no COCs exceed limits as established in ARARs.

5. CONTRACTOR shall only discharge one effluent tank at a time.

6. CONTRACTOR may conduct additional testing of the water in support of operational or discharge decisions.

7. CONTRACTOR shall conduct water testing in accordance with approved Contact Water Treatment Plan – to be submitted by CONTRACTOR.

7. DISCHARGE LIMITS

1. Comply with ARARs and the discharge criteria shown in Table 1 of Section 2.1.

8. FAILURE TO MEET CRITERIA

1. Should analyses indicate that effluent has not met treatment criteria as provided in the Contact Water Treatment Plan, water in Effluent Tank shall be returned to Influent Tank for reprocessing.

2. Further action shall be performed in accordance with the Field Sampling Plan.

9. DECOMMISSIONING

1. Decontamination of all WTS equipment shall be completed by CONTRACTOR prior to removal from the Site.

2. All impacted material such as exhausted activated carbon, media filters, tank lines, etc. shall be disposed of by CONTRACTOR.

3. At the completion of the Works, WTS shall become property of CONTRACTOR and shall be removed from Site.

END OF SECTION

Attachment A – Process Control Narrative

1. P&ID P-002

1.1 Description

Several sources are pumped into the influent tank TK-2000 prior to subsequent treatment by the Water Treatment System (WTS):

– Contact water from excavation activities
– Contact water from excavation overburden stockpile area
– Contact water from excavation dewatering areas
– Contact water from equipment decontamination wash stations
– Water collected in sumps from inside the water treatment system (WTS) containment area
– Backwash from Multimedia Filters in the WTS
– Contact water from dewatering of solids generated by the WTS

Contact water is pumped to the WTS by the Treatment Feed Pump P-2001, which is equipped with a Variable Frequency Drive (VFD).

1.2 Controls

TK-2000 has a continuous level transmitter LIT-2000 to provide feedback for level control. Level in TK-2000 is controlled as follows:

1. Low level turns OFF P-2001 at operator adjusted setpoint and per tank supplier specifications.
2. High-high level alarm informs the WTS Operator to stop discharges into TK-2000 and to start feeding flow into the WTS, if not already started.

1.3 Operations

P-2001 operates to maintain constant flow to WTS and to keep TK-2002 as empty as possible to receive water sources for subsequent treatment by the WTS.

2. P&ID P-003

2.1 Description

Contact water from P-2001 is pumped into the Rapid Mix Tank TK-2100, which has a submersible mixer MX-2100 with VFD, operated at a high speed. Chemicals are fed into TK-2100 to facilitate chemical mixing:

– Coagulant is fed by Coagulant Feed Pumps (1 duty/1 spare) P-3501 and P-3502.
– Organosulfide (if needed) is fed by Organosulfide Feed Pumps (1 duty/1 spare) P-3101 and P-3102.
– Acid or Caustic (if needed) is fed by Acid/Caustic Feed Pumps (1 duty/1 spare) P-3201 and P-3202.

Contact water from TK-2100 flows by gravity to the Flocculation Tank TK-2200, which has a submersible mixer MX-2200 with a VFD. MX-2200 is operated a low speed to facilitate the formation of flocs. Polymer is added to TK-2100..

– Polymer is fed by Polymer Feed Pumps (1 duty/1 spare) P-3301 and P-3302.

Contact water from TK-2200 flows by gravity to the Inclined Plate Clarifier (IPC) CLR-2300, where flocs

settle to allow for liquid-solids separation. Solids from CLR-2300 are pumped via Sludge Transfer Pump P-2310 to be returned to TK-2100 or to Sludge Dewatering Boxes (TK-3600 and TK-3601) for dewatering, while clarified water flows by gravity to TK-2400 for further treatment by the WTS.

2.2 Controls

2.2.1 P-2001

P-2001 is controlled by on-off Flow Control Valve FCV-2002 and Flowmeter FE-2002. Flow from P-2001 is controlled as follows:

1. To send flow to the WTS, FCV-2002 to OPEN prior to turning ON P-2001. P-2001 VFD starts slowly and increases in speed until the flow measured by FE-2002 reaches an operator-adjustable setpoint (nominally 300 gpm).
2. To stop flow to the WTS, P-2001 VFD slowly decreases in speed until the flow measured by FE-2002 reaches 0 gpm and P-2001 turns OFF. FCV-2002 to CLOSE after turning OFF P-2001.
3. P-2001 VFD adjusts speed to maintain the operator-adjustable flow setpoint for the WTS.
4. P-2001 will shutdown is pump is running and 0 gpm is measured by FE-2002 for a period beyond WTS operator setpoint

2.2.2 TK-2100

TK-2100 has a high-level switch LSH-2100 to provide feedback for level control. Level in TK-2100 is controlled as follows:

1. High level sends an alarm to WTS Operator and turns OFF P-2001.

TK-2100 has a pH probe and transmitter AIT-2100 to monitor and control pH inside the tank. If used, acid and/or caustic controls the pH in TK-2100 as follows:

1. pH below an operator-adjustable setpoint adds Caustic to TK-2100 via pumps P-3201 or P3202.
2. pH above an operator-adjustable setpoint adds Acid to TK-2100 via pumps P-3201 or P3202.

The other chemicals are fed (as needed) manually by the WTS Operator into TK-2100, by manually setting the pumping rates and turning ON pumps P-3401/3402, P-3301/3302, and/or P-3101/3102 based on jar testing.
TK-2100 has a high-level switch LSH-2100 to provide feedback for level control. Level in TK-2100 is controlled as follows:

1. High level sends an alarm to WTS Operator.
2. High level stops P-2001

2.2.3 CLR-2300 and TK-2400

Discharge chamber of CLR-2300 and the Filter Feed Tank (TK-2400) are hydraulically connected. CLR-2300 receives flocculated contact water from TK-2200. The discharge from CLR-2300 has a turbidity meter (AIT-2301) to check the efficiency of the clarifiers for removal of TSS. A high turbidity indicates that operational changes to the chemical dosage rates may need to be made. CLR-2300 has two high level switches. LSH-2300 in the main chamber of the CLR-2300 and LSH-2301 in the discharge chamber. LSH-2300 is a redundant high-level switch to LSH-2100. LSH-2301 is a high-level switch for TK-2400.. CLR-2300 also has a turbidity analyzer and transmitter (AIT-2301) that continuously measures turbidity in the clarified water from the IPC.

1. The effluent of the CLR-2300 should have a TSS of less than 50 ppm to prevent excessive backwashing of the media filters.
2. During set-up, operator will calibrate the AIT-2301 to TSS.

3. High turbidity send alarm to operator indicating that chemical feed rates into TK-2100 and/or TK-220, and/or P-2310 sludge flowrate need to be adjusted to improve clarified water quality.
4. High turbidity sends an alarm to WTS Operator based on operator-adjusted setpoint.

Level in CLR-2300 is controlled as follows:

5. High level as measured by LSH-2300 sends an alarm to WTS Operator
6. High level as measured by LSH-2300 turns OFF P-2001.

2.2.4 P-2301

P-2310 is operated manually by the WTS Operator based on the sludge blanket depth in CLK-2300. Flowmeter FIT-2314 continuously measures sludge flow from P-2310 to TK-2100 (for return) and FIT-2314 continuously measures flow of sludge to sludge dewatering boxes. Isolation valves are provided to the return and disposal sludge lines, and the WTS Operator opens the respective valve for return or disposal as required. Flow information from FIT-2313 and FIT-2314 is provide operator information only, so that he can adjust P-2310 sludge flowrate as needed to adequately return/remove solids from CLR-2300 and measure volume of sludge recycled or discharged to sludge dewatering boxes.

2.3 Operations

P-2001 operates to maintain flow through the WTS at the operator-adjustable setpoint. LSH-2100, LSH-2300, and LSH-2301 prevent overflow of TK-2100, TK-2200, CLR-2300, and TK-2400 due to system malfunction such as pump failure, clogged pump, etc..

3. P&ID P-04

3.1 Description

Clarified water from CLR-2300 flows by gravity to the Filter Feed Tank TK-2400. Filtration Feed Pump P-2401, equipped with a VFD, sends water through the three (3) sets of filters, in order as follows:

– Four (4) Multimedia Filters (n+1) FLT-2500A, 2500B, 2500C and 2500D,
– Two (2) 10-micron Bag Filter Systems (1 duty/1 spare) FLT-2600A and 2600B,
– Two (2) 1-micron Bag Filters Systems (1 duty/1 spare) FLT-2700A and 2700B, and
– Two (2) Granular Activated Carbon (GAC) Adsorbers (lead/lag) GAC-2800 and 2800.

Flow from the GAC adsorbers is sent to Effluent Storage Tanks.

3.2 Controls

TK-2400 has a continuous level transmitter LIT-2400 to provide feedback for level control. TK-2400 has low- and high-level switch LSL-2400 to provide redundant control. Flow from P-2401 is controlled by level as follows:

1. LSL-2400 turns OFF P-2401
2. High-high level as measured by LIT-2400 or LSH-2301 sends alarm to WTS Operator and turns OFF P-2100 to reduce likelihood of overfilling TK-2400, and provides the following redundant control to LIT-2400
3. The VFD associated with P-2401 ramps up and down to maintain the operator adjustable setpoint for TK-2400 as measured by LIT-2400

P-2401 is controlled by on-off Flow Control Valve FCV-2401 and LIT-2400. LIT-2400 will have four (4) operating setpoints as described below

- Low-Low Level Setpoint (L-01)
  - Operator adjustable Level
  - Pump stops and FCV-2401 will close
  - Initially set at 1 ft of water about level at which LSL-01 activates

- Low Level Setpoint (L-02)
  - Operator adjustable level
  - FCV-2401 will open and pump will start at minimum speed.
    - Operator adjustable speed
    - Assume 35 Hz at start-up
  - Initially set at 2 ft of water
- Operating Setpoint (L-03)
  - Operator adjustable
  - Pump speeds up and slows down to maintain constant level in sump
  - Initially set at 4 ft of water
  - When the when the contact water enter TK-2400 is less than the P-2401 discharge rate at the minimum speed, the water level in the sump will decrease until the level reach L-01 and the pump shuts off and FCV-2401 will close
- High-Level Setpoint (L-04):
  - Operator adjustable
  - Initially set at 7 ft of water
  - Pump speed up to 60 Hz
  - Alarm sent to operator

:

1. To send flow to the filters, FCV-2401 to OPEN prior to turning ON P-2401. If contact water level in T-2400 is above.

Pressure indicators PI-2402, PI-2501, PI-2601, PI-2701 and PI-2802 monitor pressures upstream and downstream of FLT-2500A/B/C/D, FLT-2600A/B, FLT-2700A/B, and GAC-2800/2801.

1. PI-2402 and PI-2501 monitor the pressure across FLT-2500A/B/C/D. The WTS Operator visually monitors the differential pressure across the filters. Filter backwash will be automatic based on the differential pressure across each individual filter.
2. PI-2501 and PI-2601 monitor the pressure across FLT-2600A/B. The WTS Operator visually monitors the differential pressure across the operating filter. Once the differential pressure exceeds a prescribed setpoint, the Operator will manually send flow to the non-operating filter and isolate the previously operating filter for filter bag change-out.
3. PI-2601 and PI-2701 monitor the pressure across FLT-2700A/B. The WTS Operator visually monitors the differential pressure across the operating filter. Once the differential pressure exceeds a prescribed setpoint, the Operator will manually send flow to the non-operating filter and isolate the previously operating filter for filter change-out.
4. PI-2701 and PI-2802 monitor the pressure across GAC-2800/2801. The WTS Operator visually monitors the differential pressure across the GAC system.

The effluent line out of the FLT-2700A/B has a turbidity analyzer and transmitter AIT-2702 that continuously measures turbidity in the treated effluent from the 1-micron bag filters. High turbidity indicates a malfunction of the FLT-2700A/B (e.g., missing filter bag, ruptured filter bag).

1. High turbidity level sends an alarm to WTS Operator based on an operator-adjustable setpoint and turns OFF P-2401

The effluent line out of the GAC-2800/2801 has a turbidity analyzer and transmitter AIT-2803 that

continuously measures turbidity in the treated effluent. High turbidity indicates a potential problem with the GAC or the upstream treatment system.

1. High turbidity level sends an alarm to WTS Operator based on an operator-adjustable setpoint and turns OFF P-2401

3.3 Operations

P-2401 VFD adjusts speed to maintain the water level in TK-2400 at an operator-adjusted setpoint. Flow from P-2401 will increase and decrease based on the flowrate of P-2001. Turbidity of discharges from FLT-2700A/B and GAC-2800/2801 are continuously. Turbidity above operator setpoint indicate a malfunction in the system and will shutdown P-2401 and send WTS operator an alarm

4. P&ID P-005

4.1 Description

4.1.1 Effluent Tanks

Treated effluent from GAC-2800/2801 is stored in one of three (3) Effluent Tanks TK-2900, -2901, and -2902. Each tank has a manual inlet valve, and the WTS Operator selects which tank receives treated effluent by opening the tank's respective inlet valve.

4.1.2 Chemical Feed and Sludge Dewatering

P-2301 pumps sludge from CLR-2300 to one of two Dewatering Boxes TK-3600 and -3601. Contact water that drains out of TK-3600 and TK-3601 is collected in a sump and pumped to TK-2000.
The chemical storage and feed systems are provided as part of the WTS:

– Coagulant sent to TK-2100 is stored in TK-3500 and pumped (1 duty/1 spare) via P-3501 or P-3502.
– Polymer sent to TK-2200 is made down and stored in TK-3300 equipped with mixer MX-3300 and pumped (1 duty/1 spare) via P-3301 or P-3302.
– Polymer sent to TK-3600/3601 is made down and stored in TK-3400 equipped with mixer MX-3400 and pumped (1 duty/1 spare) via P-3401 or P-3402.
– Organosulfide (if used) sent to TK-2100 is stored in TK-3100 and pumped (1 duty/1 spare) via P-3101 or P-3102.
– Acid or caustic (if used) sent to TK-2100 is stored in TK-3200 and pumped (1 duty/1 spare) via P-3201 or P-3202.

4.2 Controls

4.2.1 Effluent Tanks

When ready to discharge from the Effluent Tanks, the WTS Operator will:

1. Manually OPEN FCV-2930, and
2. Monitor flowrate on FE-2930.

Each effluent tank is equipped with a level indicator/transmitter and low-level switch, LIT- and LSL-2900; LIT- and LSL-2901; LIT- and LSL-2902 for TK-2900, -2901, and -2902, respectively, to provide feedback for level control. Levels in TK-2900/2901/2902 are manually controlled as follows:

1. High level alarm informs the WTS Operator that the tank is FULL.
2. LSL-2900/2901/2902 informs the WTS Operator that the tank is EMPTY and to CLOSE FCV-2930.

The discharge from Effluent Tanks is monitored for flow (total and instantaneous) by FE-2930, pH by AIT-2932, and turbidity by AIT-2932. All measurements will be electronically recorded and stored at intervals established by ENGINEER. These data are provided for operator information only, and if needed, to stop discharge into the River.

4.2.2 Chemical Feed and Sludge Dewatering

Polymer for dewatering is fed manually by the WTS Operator into the sludge line feeding TK-3600/3601, by manually setting the pumping rates and turning ON P-3401/3402 based on jar testing.
The WTS Operator selects and monitor which of TK-3600 or -3601 will receive and store sludge for dewatering. When visually inspected to be full, the WTS Operator will arrange for the full dewatering box to be trucked off for disposal and manually begin filling the other empty dewatering box.
Level indicators/transmitters are installed in each chemical storage LIT--3100, -3200, -3300, -3400, and -3500 for TK-3100, -3200, -3300, -3400, and -3500, respectively, so that the WTS Operator can keep track of the chemical volumes available for the system.

4.3 Operations

4.3.1 Effluent Tanks

WTS Operator to open FCV-2930 to maximize discharge rate to empty the tanks as quickly as possible so that storage is available for treated effluent.

4.3.2 Sludge Dewatering

WTS Operator to dispose of full dewatering boxes (either of TK-3601 or -3601) as quickly as possible so that storage is available for sludge to be dewatered.

END OF PCN

CLIENT: San Jacinto River Waste Pits
PROJ. NAME: Southern Impoundment
PROJ. LOC: Harris County, TX

Doc Name: Water Treatment System Equipment List

Project No: 11215131
Rev No: 8
Issue: 100% Remedial Design Addendum
By: CMF
Checked: NSF
Rev Date: 27-May-2022

Rev No.	EQUIPMENT NUMBER (Tag Number)	EQUIPMENT NAME	Equipment Type	Status	P&ID No.	PFD No.	Potential make/model/supplier	Material of Construction	Control Panel?	Power Supply	CONNECTED LOAD, HP	OPERATING LOAD, HP	RPM	VFD Yes/No	Operating Mode	SIZE		CAPACITY					INSULATION		HEAT TRACED Y/N	Est Weight		Comment
																DIA/ Length (ID)	Height (Tan/Tan)	Flow / Total Volume		ΔPress or Head		Working Volume (Gal)	Y/N	Thick. (In.)		Liquid Full	Empty	
																		Rated	Units	Rated	Units					Lbs	Lbs	
8	TK-2000	Influent Tank	Lake Tank	Rental	P-02	P-01	Lake Tank B-16	Bolted steel with 40mil LLDPE	NO	NA	NA	NA	NA	NA	Continuous	100'	12'	688,000	GAL	NA	NA	560,000	N	NA	N	5,737,920	102,890	Size for 0.55 MG which will provide ~3 days HRT based on max daily flow of 190,000 gal for persistent infiltration and 100-year rain event
8	P-2001	Treatment Feed Pump	Centrifugal Pump with VFD\	Rental	P-02	P-01	NA	CI casing; SS impeller; steel shaft	YES	YES	TBD	TBD	TBD	NO	Continuous	TBD	TBED	280 - 1380	GPM	25 - 68	PSI	NA	N	NA	N	TBD	TBD	Size for treatment rate of 300 gpm
8	TK-2100	Rapid Mix Tank	Frac Tank with Integral Mixers	Rental	P-02	P-01	Frac Tank	CS tank with A36 frames	NO	NA	NA	NA	NA	NA	Continuous	24' x 8'-4"	6'-6"	7,070	GAL	NA	NA	2,000	N	NA	N	59,072	108	Working volume is minimum only
8	MX-2100	Rapid Mix Tank Mixer	Shaft-Mounted Top-Entry Vertical Submersible Mixer	Rental	P-02	P-01	TBD	See TK-2100	NO	Yes	TBD	TBD	TBD	YES	Continuous	5"	36"	NA	NA	NA	NA	NA	N	NA	N	TBd	63	Size for 2.5 hp/1,000 CF = 0.5hp (for 300 gal)
8	TK-2200	Flocculation Tank	Frac Tank with Integral Mixers	Rental	P-02	P-01	Frac Tank	CS tank with A36 frames	NO	NO	NO	NO	NA	NA	Continuous	24' x 8'-4"	6'-6"	7,070	GAL	NA	NA	2,000	N	NA	N	59,072	108	Working volume is minimum only
8	MX-2200	Flocculation Tank Mixer	Frac Tank with Integral Mixers	Rental	P-02	P-01	See TK-2200	See TK-2200	NO	460V/3ph/60Hz	TBD	TBD	TBD	YES	Continuous	See TK-2200	See TK-2200	NA	NA	NA	NA	NA	N	NA	NA	See TK-2200	See TK-2200	Size for 0.04 hp/1,000 gal = 0.5hp (for 8,000 gal)
8	CLR-2300	Inclined Plate Clarifier	Inclined Plate Clarifier	Rental	P-02	P-01	Monroe Environmental X-FLO Mobile Clarifier	CS tank with A36 frames	NO	NA	NA	NA	NA	NA	Continuous	45.5"L x 8.7'W	12'	400	GPM	NA	NA	NA	N	NA	NA	60,000	11,500	Assume only a few inches of head loss through unit
8	P-2310	Sludge Transfer Pump	Air-Operated Double Diaphragm Pump	Rental	P-02	P-01	United Rentals 5209040	CI	NO	NO	180 SCFM @ 180 psi (max)	180 SCFM @ 180 psi (max)	NA	NO	Continuous	20"L x 15"W	32"	150	GPM	180	PSI	NA	N	NA	N	~205	205	Size for max transfer rate of 150 gpm;
8	TK-2400	Filter Feed Tank	Frac Tank	Rental	P-02	P-01	Baker Corp EZ Clean Fixed Axle 480 BBL	CS tank with A36 frames	NO	See MX-2400	See MX-2400	TBD	See MX-2400	See MX-2400	Continuous	40'L x 8.5'W	15'	10,000	GAL	NA	NA	3,000	N	NA	N	56,670	31,650	Size for 10 min HRT at treatment rate of 300 gpm = 3,000 gal
8	P-2401	Filtration Feed Pump	Centrifugal Pump VFD	Rental	P-02	P-01	United Rentals 4NNT	CI casing; SS impeller; steel shaft	NO	YES	TBD	TBD	TBD	NO	Continuous	135"L x 67"W	78"	280 - 1380	GPM	25 - 68	PSI	NA	N	NA	N	3,593	2,990	Maximum treatment rate 400 gpm
8	FLT-2500A/B/C/D	Multimedia Filters (4 in parallel)	Automatic Backwash Sand/Gravel Filters	Rental	P-02	P-01	United Rentals 610-2454-01/ Yardney IL5424-AS3	304SS	YES	110V/1ph/60Hz	NA	NA	NA	NA	Continuous	20'Lx 5'W	8'	500 - 800	GPM	80	PSI	NA	N	NA	N	26900	19,400	Maximum treatment rate 400 gpm
8	FLT-2600A/B	10-um Bag Filtration System (2 in parallel)	Manually Operated Duplex Bag Filter	Rental	P-02	P-01	Rain for Rent BF400-1	CS	NO	NA	NA	NA	NA	NA	Continuous	62"L x 36"W	61"	400	GPM	150	PSI	NA	N	NA	N	800	800	1-micron bag or cartridge filters with minimum 95% removal efficiency (Rosedale Filter Cartridge Model PL-POMF-R1-1-P2 or equal), 25 gpm/cartridge elements with total system capacity of 400 gpm
8	FLT-2700A/B	1-um Bag Filtration (2 in parallel)	Manually Operated Duplex Bag Filter	Rental	P-02	P-01	Rain for Rent BF400-1	CS	NO	NA	NA	NA	NA	NA	Continuous	62"L x 36"W	61"	400	GPM	150	PSI	NA	N	NA	N	800	800	10-micron bag or cartridge filters with minimum 95% removal efficiency (Rosedale Filter Cartridge Model PL-POMF-R1-10-P2 or equal), 25 gpm/cartridge elements with total system capacity of 400 gpm
8	GAC-2800/ 2801	GAC Adsorbers (Lead/Lag)	Downflow Liquid Phase Adsorber Pressure Vessels	Rental	P-02	P-01	TIGG CP-20K-10	Epoxy-coated CS	NO	NA	NA	NA	NA	NA	Continuous	120" (each)	210" (each)	400	GPM	125	PSI	6,600 (est.)	N	NA	N	TBD	13,110 (each)	Size for hydraulic loading rate of 2 - 5 gpm/SF (5 gpm/SF) and minimum EBCT of 10 min at 300 gpm
8	TK-2900/ 2901/ 2902	Effluent Tanks (3)	Lake Tank	Rental	P-03	P-01	Lake Tank B-16	Bolted steel with 40mil LLDPE	NO	NA	NA	NA	NA	NA	Continuous	100'	12'	688,000	GAL	NA	NA	560,000	N	NA	N	8,340,000	102,890	Three tanks provided for batch operations
8	TK-3600/ 3601/ 3602	Sludge Gravity Thickener	Vacuum Dewatering Box	Rental	P-03	P-01	United Rentals 610-5170-01	Steel	NO	NA	NA	NA	NA	NA	Continuous	21'L x 8'W	7'	25	CY	7	FT	NA	N	NA	N	60,000	14,000	Size for hydraulic loading rate of 0.25 - 1.0 gpm/SF and solids loading rate of 16 lbs/SF day (54 gpm and 6,500 lb/d); need 405 SF min or 3 units
8	P-3101/3102	Organosulfide Feed Pumps (1 duty/1 spare)	Peristaltic Chemical Feed Pumps	Rental	P-03	P-01	Prominent DULCO flex Control DFYa	Options: NR,NBR, EPDM, NBR-A, Hypalon	YES	110V/1ph/60Hz	400W (max.)	400W (max.)	80 (max.)	NO	Continuous	1.9'L x 1.1'W	1.5'	1.8	GPM	116	PSI	NA	N	NA	N	~66	66	0.03 to 2.5 gpm
8	P-3201/3202	Acid/Caustic Feed Pumps (1 duty/1 spare)	Peristaltic Chemical Feed Pumps	Rental	P-03	P-01	Prominent DULCO flex Control DFYa	Options: NR,NBR, EPDM, NBR-A, Hypalon	YES	110V/1ph/60Hz	400W (max.)	400W (max.)	80 (max.)	NO	Continuous	1.9'L x 1.1'W	1.5'	1.8	GPM	116	PSI	NA	N	NA	N	~66	66	0.03 to 2.5 gpm
8	TK-3300	Polymer Activation Aging Tank 1	Open-Top Vertical Tank	Rental	P-03	P-01	USA Blue Book 41038/ Snyder 5750000N	HDLPE	NO	NA	NA	NA	NA	NA	Continuous	42"	62.5"	330	GAL	NA	NA	330	N	NA	N	3,135	108	For 1-day supply to clarifier at 0.2 gpm; 300 gal
8	MX-3300	Polymer Activation Aging Tank 1 Mixer	Shaft-Mounted Top-Entry Vertical Submersible Mixer	Rental	P-03	P-01	USA Blue Book 74961/ Grovhac 400-500-DD	316SS	NO	110V/1ph/60Hz	0.50	0.50	0 - 1725	NO	Continuous	5"	36"	NA	NA	NA	NA	NA	N	NA	N	63	63	Size for 2.5hp/1,000 CF; use 0.5hp
8	P-3301/3302	Polymer Feed Pumps 1 (1 duty/1 spare)	Peristaltic Chemical Feed Pumps	Rental	P-03	P-01	Prominent DULCO flex Control DFYa	Options: NR,NBR, EPDM, NBR-A, Hypalon	YES	110V/1ph/60Hz	400W (max.)	400W (max.)	80 (max.)	NO	Continuous	1.9'L x 1.1'W	1.5'	1.8	GPM	116	PSI	NA	N	NA	N	~66	66	0.03 to 2.5 gpm
8	TK-3400	Polymer Activation Aging Tank 2	Open-Top Vertical Tank	Rental	P-03	P-01	USA Blue Book 41033/ Snyder 5700000N	HDLPE	NO	NA	NA	NA	NA	NA	Continuous	30"	46.6"	120	GAL	NA	NA	120	N	NA	N	1,151	50	For 1-day supply to thickener at 0.059 gpm; 100 gal
8	MX-3400	Polymer Activation Aging Tank 2 Mixer	Shaft-Mounted Top-Entry Vertical Submersible Mixer	Rental	P-03	P-01	USA Blue Book 74961/ Grovhac 400-500-DD	316SS	NO	110V/1ph/60Hz	0.50	0.50	0 - 1725	NO	Continuous	5"	36"	NA	NA	NA	NA	NA	N	NA	N	63	63	Size for 2.5hp/1,000 CF; use 0.5hp
8	P-3401/3402	Polymer Feed Pumps 2 (1 duty/1 spare)	Peristaltic Chemical Feed Pumps	Rental	P-03	P-01	Prominent DULCO flex Control DFYa	Options: NR,NBR, EPDM, NBR-A, Hypalon	YES	110V/1ph/60Hz	400W (max.)	400W (max.)	80 (max.)	NO	Continuous	1.9'L x 1.1'W	1.5'	1.8	GPM	116	PSI	NA	N	NA	N	~66	66	0.03 to 2.5 gpm
8	TK-3500	Coagulant Tank	Open-Top Vertical Tank	Rental	P-03	P-01	USA Blue Book 41041/ Snyder 5780000N	HDLPE	NO	NA	NA	NA	NA	NA	Continuous	48	71.4"	500	GAL	NA	NA	500	N	NA	N	4,727	140	For 15-days supply to chem feed at 0.02 gpm; 500 gal
8	MX-3500	Coagulant Tank Mixer	Shaft-Mounted Top-Entry Vertical Submersible Mixer	Rental	P-03	P-01	USA Blue Book 74961/ Grovhac 400-500-DD	316SS	NO	110V/1ph/60Hz	0.50	0.50	0 - 1725	NO	Continuous	5"	36"	NA	NA	NA	NA	NA	N	NA	N	63	63	Size for 2.5hp/1,000 CF; use 0.5hp
8	P-3501/3502	Coagulant Feed Pumps (1 duty/1 spare)	Peristaltic Chemical Feed Pumps	Rental	P-03	P-01	Prominent DULCO flex Control DFYa	Options: NR,NBR, EPDM, NBR-A, Hypalon	YES	110V/1ph/60Hz	400W (max.)	400W (max.)	80 (max.)	NO	Continuous	1.9'L x 1.1'W	1.5'	1.8	GPM	116	PSI	NA	N	NA	N	~66	66	0.03 to 2.5 gpm

CLIENT: San Jacinto River Waste Pits
PROJ. NAME: Southern Impoundment Water Treatment System
PROJ. LOC: Harris County, TX Instrument List

Project No: 11215131
Rev No: 8
Issue: 100% Remedial Design Addendum
By: CMF
Checked: NSF
Rev Date: 27-May-2022

Rev No.	INSTRUMENT NUMBER (Tag Number)	INSTRUMENT NAME	Instrument Type	P&ID No.	Manufacturer Model Number[1]	Material of Construction[1]	SIZE		CAPACITY		Comment
							DIA/ Length (ID)	UNIT	Value / Units		
									Rated	Units	
8	LIT-2000	Influent Tank TK-2000 Level	Pressure Transmitter	P-02	TBD	TBD	NA	NA	0-12	FT	
8	FE-2002	WTS Influent Flowmeter	Magnetic Flowmeter	P-03	TBD	TBD	6	IN	100-500	GPM	
8	FCV-2001	WTS Influent Flow Control Valve	Manual Gear-Operated Plug Valve	P-03	TBD	TBD	6	IN	NA	NA	
8	LSH-2100	Rapid Mix Tank TK-2100 High Level Switch	Level Switch High	P-03	TBD	TBD	NA	NA	120	VAC	
8	AIT-2100	Rapid Mix Tank TK-2100 pH Analyzer	pH Transmitter	P-03	TBD	TBD	NA	NA	0-14	SUS	
8	LSH-2300	Inclined Plate Clarifier Tank CLR-2300 High Level Switch	Level Switch High	P-03	TBD	TBD	NA	NA	120	VAC	
8	LSH-2301	Inclined Plate Clarifier Tank CLR-2300 High Level Switch	Level Switch High	P-03	TBD	TBD	NA	NA	120	VAC	
8	AIT-2301	Inclined Plate Clarifier Tank CLR-2300 Overflow Turbidity Analyzer	Turbidity Transmitter	P-03	TBD	TBD	NA	NA	10-150	NTU	
8	FIT-2313	Settled Sludge Flowmeter-Discharge	Magnetic Flowmeter	P-03	TBD	TBD	3	IN	10-150	GPM	
8	FIT-2314	Settled Sludge Flowmeter-Return	Magnetic Flowmeter	P-03	TBD	TBD	3	IN	10-150	GPM	
8	FCV-2311	Sludge to Thickener Flow Control Valve	Manual Gear-Operated Plug Valve	P-03	TBD	TBD	3	IN	NA	NA	
8	FCV-2312	Sludge Recycle Flow Control Valve	Manual Gear-Operated Plug Valve	P-03	TBD	TBD	3	IN	NA	NA	
8	LIT-2400	Filter Feed Tank TK-2400 Level Transmitter	Pressure Transmitter	P-04	TBD	TBD	NA	NA	0-12	FT	
8	LSL-2400	Filter Feed Tank TK-2400 Low Level Switch	Level Switch Low	P-04	TBD	TBD	NA	NA	120	VAC	
8	PI-2402	Multimedia Filters (FLT-2500A/B/C/D) Influent Pressure	Pressure Transmitter	P-04	TBD	TBD	NA	NA	0-100	PSI	
8	PI-2501	10-micron Bag Filters (FLT-2600A/B) Influent Pressure	Pressure Transmitter	P-04	TBD	TBD	NA	NA	0-100	PSI	
8	PI-2601	1-micron Bag Filters (FLT-2700A/B) Influent Pressure	Pressure Transmitter	P-04	TBD	TBD	NA	NA	0-100	PSI	
8	AIT-2702	1-micron Bag Filter Turbidity Analyzer	Turbidity Transmitter	P-04	TBD	TBD	6	IN	0-500	NTU	
8	PI-2701	GAC Adsorbers (GAC-2800/2801) Influent Pressure	Pressure Transmitter	P-04	TBD	TBD	NA	NA	0-100	PSI	
8	PI-2802	GAC Adsorbers (GAC-2800/2801) Discharge Pressure	Pressure Transmitter	P-04	TBD	TBD	NA	NA	0-50	PSI	
8	FIT-2804	WTS Discharge Flowmeter	Magnetic Flowmeter	P-04	TBD	TBD	6	IN	100-500	GPM	
8	AIT-2803	GAC Adsorbers (GAC-2801/2801) Turbidity Analyzer	Turbidity Transmitter	P-04	TBD	TBD	6	IN	0-500	NTU	
8	LIT-2900	Effluent Tank TK-2900 Level	Pressure Transmitter	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	LSL-2900	Effluent Tank TK-2900 Low Level Switch	Level Switch Low	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	LIT-2901	Effluent Tank TK-2901 Level	Pressure Transmitter	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	LSL-2901	Storage Tank TK-2901 Low Level Switch	Level Switch Low	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	LIT-2902	Effluent Tank TK-2902 Level	Pressure Transmitter	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	LSL-2902	Effluent Tank TK-2902 Low Level Switch	Level Switch Low	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	FE-2930	Effluent Discharge Flowmeter	Magnetic Flowmeter	P-05	TBD	TBD	12	IN	TBD	TBD	
8	FCV-2930	Effluent Discharge Control Valve	Manual Gear-Operated Plug Valve	P-05	TBD	TBD	12	IN	NA	NA	
8	AIT-2931	Effluent Discharge Turbidity Analyzer	Turbidity Transmitter	P-05	TBD	TBD	6	IN	0-500	NTU	
8	AIT-2932	Effluent Discharge pH Analyzer	pH Transmitter	P-05	TBD	TBD	NA	NA	0-14	SUS	
8	LIT-3600	Organosulfide Tote (TK-3100)	Level	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	LIT-3601	Acid/Caustic Tote (TK-3200)	Level	P-05	TBD	TBD	NA	NA	TBD	TBD	
8	LIT-3602	Polymer Activation (TK-3300)	Level	P-05	TBD	TBD	NA	NA	TBD	TBD	