Bidding and Contract Documents
For
County of Lycoming

LEVEE CERTIFICATION DESIGN PROJECT BID PACKAGE
ISSUED FOR CONSTRUCTION

October 6, 2020

Prepared for:

The County of Lycoming
48 West Third Street
Williamsport, PA 17701

On behalf of:
City of Williamsport
Borough of South Williamsport

By:

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Project No.7777182005
Project Name: Relief Well Rehabilitation and Replacement
Levee District: USACE Baltimore District
County: Lycoming County, Pennsylvania

SECTION 01 11 30

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCES

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

Occupational Safety & Health Administration - CONSTRUCTION (OSHA)

Part 1926	(Latest Edition) SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

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

40 CFR 261	Identification and Listing of Hazardous Waste

1.2 DEFINITIONS

Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavorably alter ecological balances of plant or animal communities; or degrade the environment from an aesthetic, cultural or historic perspective. Environmental protection is the prevention/control of pollution and habitat disruption that may occur during construction. The control of environmental pollution and damage requires consideration of air, water, land, biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive materials; and other pollutants.

1.3 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; E DA

Submit plan detailing Contractor's procedures for complying with all applicable environmental protection regulations and the special requirements of this contract.

Commercial Borrow; E DA

The contractor shall submit requirements as stated in paragaph Commercial Borrow.

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

The Contractor shall comply with all applicable Federal, State, and local laws and regulations. The Contractor shall provide environmental protective measures and procedures to prevent and control pollution, limit habitat disruption, and correct environmental damage that occurs during construction.

1.4.1 Protection of Features

This section supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. The Contractor shall prepare a list of features requiring protection under the provisions of the contract clause, which are not specially identified on the drawings as environmental features requiring protection. The Contractor shall protect those environmental features shown specially on the drawings, even if such preservation interferes with the Contractor's work under this contract.

1.4.2 Permits

This section supplements the Contractor's responsibility under the contract clause PERMITS AND RESPONSIBILITIES to the extent that the OWNER has already obtained environmental permits. The Contractor shall comply with the terms, and conditions of these permits which will be provided to the Contractor after award of the contract.

1.4.2.1 Special Environmental Requirements

The Contractor shall comply with any special environmental requirements, a copy of which, if applicable, is included at the end of this section. These special environmental requirements are an outgrowth of environmental commitments made by the OWNER during the project development.

1.4.3 Environmental Assessment of Contract Deviations

The Contract specifications have been prepared to comply with the special conditions and mitigation measures of an environmental nature which were established during the planning and development of this project. The Contractor is advised that deviations from the drawings or specifications (e.g., disposal areas, staging areas, alternate access routes, etc.) could result in the requirement for the OWNER to reanalyze the project from an environmental and cultural resources standpoint. The Contractor must obtain, at his expense, all necessary permits to use alternate sites including, but not limited to, Section 401 and Section 404 of the Clean Water Act, and coordination with the State Historic Preservation Officer regarding Section 106 of the National Historic Preservation Act. Deviations from the construction methods and procedures indicated by the plans and specifications which may have an environmental impact will require a extended review, processing, and approval time by the OWNER. The Quality Assurance Representative (QAR) reserves the right to disapprove alternate methods, even if they are more cost effective, if the QAR determines that the proposed alternate method will have an adverse environmental impact.

1.5 ENVIRONMENTAL PROTECTION PLAN

Within 15 calendar days of Notice of Award, the Contractor shall submit an Environmental Protection Plan for review and acceptance by the Contracting

Officer. The Quality Assurance Representative will consider an interim plan for the first 30 days of operations. However, the Contractor shall furnish an acceptable final plan not later than 30 calendar days after receipt of the Notice to Proceed. The Contractor shall meet with representatives of the Quality Assurance Representative to develop a mutual understanding relative to compliance with this section and administration of the environmental pollution control program. Acceptance is conditional and is predicated upon satisfactory performance during construction. The Quality Assurance Representative reserves the right to require the Contractor to make changes in the Environmental Protection Plan or operations if the Quality Assurance Representative determines that environmental protection requirements are not being met. The plan shall detail the actions that the Contractor shall take to comply with all applicable Federal, State, and local laws and regulations concerning environmental protection and pollution control and abatement, as well as the additional specific requirements of this contract. No physical work at the site shall begin prior to acceptance of the Contractor's plan or an interim plan covering the work to be performed. The environmental protection plan shall include, but not be limited to, the following:

1.5.1 List of State and Local Laws and Regulations

The Contractor shall provide as part of the Environmental Protection Plan a list of all State and local environmental laws and regulations, which apply to the construction operations under the Contract.

1.5.2 Spill Control Plan

The Contractor shall include as part of the environmental protection plan, a Spill Control Plan. The plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by the Emergency Response and Community Right to Know Act or regulated under State or local laws or regulations. The Spill Control Plan supplements the requirements of Part 1926. This plan shall include as a minimum:

a. The name of the individual who will be responsible for implementing and supervising the containment and cleanup.

b. Training requirements for Contractor's personnel and methods of accomplishing the training.

c. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

d. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material placement equipment available in case of an unforeseen spill emergency.

e. The methods and procedures to be used for expeditious contaminant cleanup.

f. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Quality Assurance Representative in addition to the legally required Federal, State, and local reporting channels (including the National Response

Center 1 801 424 8802) if a reportable quantity spill occurs. The plan shall contain a list of the required reporting channels and telephone numbers.

1.5.3 Contaminant Prevention Plan

As a part of the Environmental Protection Plan, the Contractor shall prepare a contaminant prevention statement identifying potentially hazardous substances to be used on the job site and intended actions to prevent accidental or intentional introduction of such materials into the air, water, or ground. The Contractor shall detail provisions to be taken to meet Federal, State, and local laws and regulations regarding the storage and handling of these materials.

1.5.4 Storm Water Pollution Prevention Plan (SWPPP)

As a part of the Environmental Protection Plan, the Contractor shall prepare a Storm Water Pollution Protection Plan to ensure the design, implementation, management, and maintenance of Best Management Practices (BMP) in order to reduce the amount of sediment and other pollutants in storm water discharges associated with the land disturbance activities; comply with the Water Quality Standards of the state in which the construction activities take place. The SWPPP also ensures compliance with the terms and conditions of the Land Disturbance Permit.

1.5.5 Environmental Monitoring

The Contractor shall include in the plan the details of environmental monitoring requirements under the laws and regulations and a description of how this monitoring will be accomplished.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 SPECIAL ENVIRONMENTAL PROTECTION REQUIREMENTS

3.1.1 Tree Protection

No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized by the Quality Assurance Representative. Where such special use is permitted, the Contractor shall provide effective protection to prevent damage to the trees and other land and vegetative resources. Unless specifically authorized by the Quality Assurance Representative, no construction equipment or materials shall be placed or used within the dripline of trees shown on the drawings to be saved. No excavation or fill shall be permitted within the dripline of trees to be saved except as shown on the drawings.

3.1.2 U.S. Department of Agriculture (USDA) Quarantined Considerations

The Contractor shall thoroughly clean all construction equipment at the prior job site in a manner that ensures all residual soil is removed and that egg deposits from plant pests are not present. The Contractor shall

consult with the USDA Plant Protection and Quarantine (USDA PPQ) jurisdictional office for additional cleaning requirements that may be necessary.

3.1.3 Commercial Borrow

Prior to bringing commercially obtained borrow material onsite, theContractor shall submit to the Contracting Officer for approval, thefollowing information:

a. Written evidence of property rights - Signed Agreement.

b. Soil tests from a Corps validated laboratory.

c. State Department of Natural Resources land disturbance permits and any other required state or local approvals.

d. Clean Water Act 401 and 404 permits, if applicable.

e. USDA Farmland Protection and Farmland Conversion Impact.

f. Cultural Resource Assessment done by professional, qualified archeologist; Section 106 Review and comments by state DNR.

g. Endangered species report by independent Professional Biologist submitted to and commented on by both US Fish and Wildlife Service and USACE.

h. Types and estimated quantities of materials to be obtained from each source.

3.1.4 Disposal of Solid Wastes

Solid waste is rubbish, debris, waste materials, garbage, and other discarded solid materials (excluding clearing debris and hazardous waste as defined in following paragraphs). Solid waste collection can be portable tank, drums, totes, etc. and shall be disposed of on a regular schedule. All handling and disposal shall be conducted in such a way as to prevent spillage and contamination. The Contractor shall transport all solid waste off site and dispose of it in compliance with Federal, State, and local requirements. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of the landfill area. All solid waste located over the plume as shown in publicly available EPA data are to be sampled for disposal. Portions of the wells are located over a trichloroethylene (TCE) plume but all waste is expected to be non-hazardous.

3.1.5 Debris

Debris is defined as trees, tree stumps, tree trimmings, shrubs, leaves, vegetative matter, excavated natural materials (e.g., dirt, sand, and rock), and demolition products (e.g., brick, concrete, glass, and metals).

a. The Contractor shall collect trees, tree stumps, tree trimmings, shrubs, leaves, and other vegetative matter and transport off site for proper disposal in compliance with Federal, State, and local requirements unless otherwise specified herein. The Contractor shall segregate the matter where appropriate for proper disposal. Untreated and unpainted scrap lumber may be disposed of with this debris where

appropriate.

b. Excavated natural materials shall be transported from the project site for proper disposal in compliance with Federal, State, and local requirements unless otherwise specified herein.

c. Demolition products shall be transported from the project site for proper disposal in compliance with Federal, State, and local requirements unless otherwise specified herein.

3.1.6 Disposal of Contractor Generated Hazardous Wastes

Hazardous wastes are hazardous substances as defined in 40 CFR 261, or as defined by applicable State and local regulations. Hazardous waste generated by construction activities shall be removed from the work area and be disposed of in compliance with Federal, State, and local requirements. The Contractor shall segregate hazardous waste from other materials and wastes, and shall protect it from the weather by placing it in a safe covered location; precautionary measures against accidental spillage such as berming or other appropriate measures shall be taken. Hazardous waste shall be removed from the project site within 60 days. Hazardous waste shall not be dumped onto the ground, into storm sewers or open water courses, or into the sanitary sewer system.

3.1.7 Fuels and Lubricants

Fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants and waste oil to be discarded shall be stored in marked corrosion resistant containers and recycled or disposed of in accordance with Federal, State, and local laws and regulations.

3.1.8 Nuclear Density Meters

The Contractor shall adhere to the requirements of Part 1926 when in possession of nuclear density meters.

3.2 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

3.2.1 Discovered Historic, Archaeological, and Cultural Resources

If during construction activities, items are observed that may have historic or archaeological value (e.g., Native American human remains or associated objects are discovered), such observations shall be reported immediately to the Quality Assurance Representative so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall prevent its employees from trespassing on, removing, or otherwise disturbing such resources.

3.3 PROTECTION OF WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters.

3.3.1 Wastewater

Wastewater directly derived from concrete construction activities shall not be discharged before being treated to remove pollutants.Wastewater collection can be portable tank, drums, totes, etc. and shall be disposed of on a regular schedule. All wastewater located over the plume as shown in publicly available EPA data are to be sampled for disposal. Portions of the wells are located over a trichloroethylene (TCE) plume but all waste is expected to be non-hazardous.

3.4 PROTECTION OF FISH AND WILDLIFE RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to, and damage of, fish and wildlife.

3.5 PROTECTION OF AIR RESOURCES

Special management techniques as set out below shall be implemented to control air pollution by the construction activities. These techniques supplement the requirements of Federal, State, and local laws and regulations; and the safety requirements under this Contract. If any of the following techniques conflict with the requirements of Federal, State, or local laws or regulations, or safety requirements under this contract, then those requirements shall be followed in lieu of the following.

3.5.1 Particulates

Airborne particulates, including dust particles, from construction activities and processing and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, disposal sites, and all other work areas free from airborne dust which would cause a hazard or nuisance.

3.5.2 Other Air Pollutants

3.5.2.1 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

3.5.2.2 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

3.6 INSPECTION

If the Quality Assurance Representative notifies the Contractor in writing of any observed noncompliance with contract requirements or Federal, State, or local laws, regulations, or permits, the Contractor shall inform the Quality Assurance Representative of proposed corrective action and take such action to correct the noncompliance. If the Contractor fails to comply promptly, the Quality Assurance Representative may issue an order stopping all or part of the work until satisfactory corrective action is taken. No time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

3.7 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed pollution control facilities and portable pollution control devices for the duration of the Contract or for the length of time construction activities create the particular pollutant.

3.8 TRAINING OF CONTRACTOR PERSONNEL

Contractor personnel shall be trained in environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel monthly. The training and meeting agenda shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, installation and care of facilities (vegetative covers, etc.), and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control. Anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants, shall also be discussed. Other items to be discussed shall include recognition and protection of archaeologic sites and artifacts.

3.9 EROSION CONTROL

3.9.1 Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in cases where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be totally cleared. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by the Quality Assurance Representative.

3.9.2 Disturbed Areas

The Contractor shall effectively prevent erosion and control sedimentation through approved methods including, but not limited to, the following:

a. Retardation and Control of Runoff.
Runoff from the construction site or from storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, berms, and by any measures required by area wide plans under the Clean Water Act.

b. Erosion and Sedimentation Control Devices.
The Contractor shall construct or install temporary and permanent erosion and sedimentation control features as indicated in the Contractor Environmental Protection Plan or as indicated on the drawings. Berms, dikes, drains, grassing, and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.

-- End of Section --

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SECTION 01 13 12

QUALITY CONTROL SYSTEM (QCS)
03/11

PART 1 GENERAL

1.1 CONTRACT ADMINISTRATION

The Quality Assurance Represenative (QAR) will set up and maintain a Project Sharepoint site to assist in thier monitoring and administration of this contract. The Contractor must use the Quality Assurance Representative-Furnished PROJECT SHAREPOINT SITE, referred to as QCS, to record, maintain, and submit various information throughout the contract period. This joint Quality Assurance Representative-Contractor use of QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Quality Assurance Representative in the following areas:

Administration
Quality Control
Submittal Monitoring
Scheduling
Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both the Quality Assurance Representative and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record will also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.2 QCS INTERFACE

QCS is an internet based program that can be run on a stand-alone personal computer with an internet connection or on a network. The Quality Assurance Representative will allow access to the QCS interface to the Contractor after award of the construction contract.

1.3 SYSTEM REQUIREMENTS

The following is the minimum system configuration that the Contractor must have to run QCS:

Hardware

Apple or IBM-compatible PC with 1000 MHz Pentium or higher processor

256+ MB RAM for workstation / 512+ MB RAM for server

SVGA or higher resolution monitor (1024x768, 256 colors)

Mouse or other pointing device

Apple or Windows compatible printer. (Laser printer must have 4 MB+ of RAM)

Connection to the Internet, minimum 56k BPS

Software

Latest version of: Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher

Electronic mail (E-mail) MAPI compatible

Virus protection software that is regularly upgraded with all issued manufacturer's updates

Adobe Acrabat Standard or other software to create and modify .pdf files.

1.4 RELATED INFORMATION

1.5 DATABASE MAINTENANCE

Establish, maintain, and update data in the QCS database throughout the duration of the contract at the Contractor's site office. Submit data updates to the Quality Assurance Representative (e.g., daily reports, submittals, RFI's, schedule updates, payment requests, etc.) using the Quality Assurance Representative's SFTP repository built into QCS export function. If permitted by the Quality Assurance Representative, e-mail or CD/DVD may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA CD/DVD). The QCS database typically includes current data on the following items:

1.5.1 Administration

1.5.1.1 Contractor Information

Contain within the database the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS access from the Quality Assurance Representative, deliver Contractor administrative data in electronic format.

1.5.1.2 Subcontractor Information

Contain within the database the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Within 14 calendar days of receipt of QCS access from the Quality Assurance Representative, deliver subcontractor administrative data in electronic format.

1.5.1.3 Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request

worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.5.1.4 Request For Information (RFI)

Exchange all Requests For Information (RFI) using the Built-in RFI generator and tracker in QCS.

1.5.2 Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other Contractor QC requirements. Maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. Provide the Quality Assurance Representative a Contractor Quality Control (CQC) Plan within the time required in SECTION 01 14 40 - CONTRACTOR QUALITY CONTROL. Within seven calendar days of Quality Assurance Representative acceptance, submit a QCS update reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.5.2.1 Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS must be the Contractor's official report. Summarize data from any supplemental reports by the Contractor and consolidate onto the QCS-generated Daily CQC Report. Submit daily CQC Reports as required by SECTION 01 14 40 - CONTRACTOR QUALITY CONTROL. Electronically submit reports to the Quality Assurance Representative within 24 hours after the date covered by the report. Also provide the Quality Assurance Representative a signed, printed copy of the daily CQC report.

1.5.2.2 Deficiency Tracking

Use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. Maintain a current log of its QC punch list items in the QCS database. The Quality Assurance Representative will log the deficiencies it has identified using its QA punch list items. The Quality Assurance Representative's QA punch list items will be included in its export file to the Contractor. Regularly update the correction status of both QC and QA punch list items.

1.5.2.3 QC Requirements

Develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in QCS. Update all data on these QC requirements as work progresses, and promptly provide this information to the Quality Assurance Representative via QCS.

1.5.2.4 Three-Phase Control Meetings

Maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.5.2.5 Labor and Equipment Hours

Log labor and equipment exposure hours on a daily basis. This data will be rolled up into a monthly exposure report.

1.5.2.6 Accident/Safety Reporting

The Quality Assurance Representative will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Quality Assurance Representative's safety comments will be included in its export file to the Contractor. Regularly update the correction status of the safety comments. In addition, utilize QCS to advise the Quality Assurance Representative of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 300.

1.5.2.7 Features of Work

Include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.5.2.8 Hazard Analysis

Use QCS to develop a hazard analysis for each feature of work included in the CQC Plan. Address any hazards, or potential hazards, that may be associated with the work.

1.5.3 Submittal Management

The Quality Assurance Representative will provide the initial submittal register in electronic format. Thereafter, maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Quality Assurance Representative will be included in its export file to the Contractor. Use QCS to track and transmit all submittals. ENG Form 4025R, submittal transmittal form, and the submittal register update must be produced using QCS. QCS and RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.5.4 Import/Export of Data

QCS includes the ability to export Contractor data to the Quality Assurance Representative and to import submittal register and other Quality Assurance Representative-provided data from RMS, and schedule data using SDEF.

1.6 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. Ensure that sufficient resources are available to maintain its QCS database, and to provide the Quality Assurance Representative with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.7 DATA SUBMISSION VIA CD/DVD

The Quality Assurance Representative-preferred method for Contractor's submission of QCS data is by using the Quality Assurance Representative's SFTP repository built into QCS export function. Other data should be submitted using E-mail with file attachment(s). For locations where this is not feasible, the Quality Assurance Representative may permit use of CD/DVD for data transfer. Export data onto CDs using the QCS built-in export function. If used, submit CD/DVDs in accordance with the following:

1.7.1 File Medium

Submit, in English, required data on CD/DVD conforming to industry standards used in the United States.

1.7.2 CD/DVD Labels

Affix a permanent exterior label to each CD/DVD submitted. Indicate on the label, in English: the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

1.7.3 File Names

The files will be automatically named by the QCS software. The naming convention established by the QCS software must not be altered.

1.8 MONTHLY SCHEDULE UPDATE

Update the QCS database each workday. At least monthly, generate and submit an export file to the Quality Assurance Representative with schedule update and progress payment request. As required in Contract Clause entitled, "Payments", at least one week prior to submittal, meet with the Quality Assurance Representative representative to review the planned progress payment data submission for errors and omissions.

Make all required corrections prior to Quality Assurance Representative acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Quality Assurance Representative will not process progress payments until an acceptable QCS export file is received.

1.9 NOTIFICATION OF NONCOMPLIANCE

The Quality Assurance Representative will notify the Contractor of any detected noncompliance with the requirements of this specification. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, will be deemed sufficient for the purpose of notification.

PART 2 PRODUCTS (Not applicable.)

PART 3 EXECUTION (Not applicable.)

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS
05/11

PART 1 GENERAL

1.1 Submittals

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Emergency Action Plan

1.2 SPECIAL SCHEDULING REQUIREMENTS

a. All contractors shall be ready for operation as approved by the Quality Assurance Representative.

b. Have materials, equipment, and personnel required to perform the work at the site prior to the commencement of the work.

c. The levee roads will remain in operation during the entire construction period. The Contractor shall conduct his operations so as to cause the least possible interference with normal operations of the activity. If operations require the closure of part of a levee road, the Contractor shall ensure that alternate levee road access is available.

d. Permission to interrupt any roads, railroads, and/or utility service shall be requested, in writing, a minimum of 48 hours prior to the desired date of interruption.

1.3 CONTRACTOR ACCESS AND USE OF PREMISES

1.3.1 Activity Regulations

Ensure that Contractor personnel employed on the construction become familiar with and obey the construction regulations including safety, fire and traffic regulations. Wear proper Personal Protection Equipment (PPE)in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. The Contractor's equipment shall be conspicuously marked for identification.

1.3.1.1 Subcontractors and Personnel Contacts

Furnish a list of contact personnel of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.3.2 Working Hours

Working hours shall conform to the requirements of Section 00 510 -

Project Labor Agreement.

1.3.3 Work Outside Regular Hours

Work outside regular working hours shall conform to the requirements of Section 00 510 - Project Labor Agreement.

1.3.4 Utility Cutovers and Interruptions

a. Notify the Quality Assurance Representative at least 48 hours prior to starting excavation work. Contractor is responsible for marking and verifying all utilities not marked.

b. The Contractor shall verify the elevations of existing piping, utilities, and any type of underground obstruction not indicated or specified to be removed. The Contractor shall verify the elevations of existing piping, utilities, and any type of underground obstruction indicated or specified to be removed (as shown on the construction plans). Contractor shall verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made.

c. Work shall be scheduled to hold outages to a minimum. Requests for utility outages and connections shall be coordinated with the Quality Assurance Representative at least 7 calendar days in advance of the time required. Each request shall clearly define the system involved, area involved, approximate duration of outage, and the nature of work involved. The contractor shall not be entitled to additional payment for utility outages and connections required to be performed outside of regular work hours.

1.3.5 Susquehanna River Stage Limitations

Construction operations may be prevented due to high Susquhanna River stages.

Work Restrictions based on River Stage (Excavation Adjacent to Toe of Levee)			
Cutoff Wall Site	Station	Plan Sheet No.	River Stage (Elev) (Mel Price L&D TW Gage)
~~Upper~~Lower Wood River	~~20+00 TO 38+00~~ 152+00 TO 170+00	~~CA-W100 TO CA-W105~~C-101 TO C-107	~~29.5 (424.98)~~21.52 (417.0)

The Contractor shall examine the National Weather Service 3-day forecast for the Williamsport Levee Systems and Dam Gage daily to be alerted to possible high river stages and to prepare for preventing damage to already completed work. Construction operations shall cease when the Williamsport Levee Systems Gage rises to a stage higher than shown above. At any river stage above the stages shown above, the Contractor may be directed by the

Quality Assurance Representative to perform emergency actions to prevent uncontrolled seepage from occurring or to prevent uncontrolled surface water from entering the work area. The Quality Assurance Representative will determine the extent of the delay to the work due to high Mississippi River stages, and the time fixed for completion of the contract will be extended for the period of the time delay.

The contractor shall prepare an Emergency Action Plan for the working area 14 calendar days prior to starting work to be reviewed and accepted by both the Quality Assurance Representative and the U.S. Army Corps of Engineers - Baltimore District. As part of the Emergency Action Plan the contractor shall include, but is not limited to, the following actions. No excavation or drilling shall be allowed once the Susquehanna River exceeds 21.52 (elevation 417.0) on the Mel Price L&D TW Gage Station. The contractor is required to notify the quality assurance representative when the Susquehanna River is forecast to exceed 22.52 (elevation 418.0) on the Mel Price L&D TW Gage Station. **If the 72 hour forecast is forecast to exceed 24.52 (elevation 420.0) on the Williamsport Levee Systems TW Gage Station the contractor shall begin actions to protect the excavation.** These actions shall include, but are not limited to protecting stripped or excavated riverside levee face with 10 mm plastic sheeting, and other actions necessary to protect the construction site during a flood event. The Emergency Action Plan shall be fully implemented prior to the Susquehanna River reaching 27.52 (elevation 423.0) on the Mel Price L&D TW Gage Station. See specifications section 32 20 20 for river level and ground water level restrictions specific to the cement-bentonite slurry trench cutoff wall excavation and placement.

The contractor shall notify the Quality Assurance Representative within 24 hours of construction completion to allow the owner to notify the US Army Corps of Engineers within 48 hours of construction completion.

1.4 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

a. This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the Contract Clause entitled, "Default (Fixed-Price Construction)". In order for the Quality Assurance Representative to award a time extension under this clause, the following conditions must be satisfied:

   (1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

   (2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(5)	(6)	(7)	(7)	(7)	(8)	(8)	(9)	(6)	(6)	(7)	(7)

c. Upon acknowledgement of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor shall record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph b, above, the Quality Assurance Representative will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the Contract Clause entitled "Default (Fixed Price Construction)".

PART 2 PANDEMIC SAFETY PLAN

Guidance for Businesses in the Construction Industry Permitted to Operate During the COVID-19 Disaster Emergency

2.1 Intent

The virus that causes Coronavirus 2019 Disease (“COVID-19”) is easily transmitted, especially in group settings, and it is essential that the spread of the virus be slowed to safeguard public health and safety. Previously, the Governor and Secretary of Health ordered most construction projects to cease unless they were supporting life-sustaining businesses or activities. Recognizing that the construction industry is vital to Pennsylvania’s economy, construction activities may resume in accordance with this guidance.

Businesses in the Commonwealth that have been permitted to maintain in-person operations during the disaster emergency, other than health care providers, must take several precautions to protect their employees, their employees’ families, and members of their communities. Businesses that are permitted to maintain in-person operations are those authorized under the Governor’s and Secretary’s Non-Life Sustaining Business Closure Orders, an exemption from those orders, or subsequent applicable order from the Governor and Secretary. All businesses (especially those that were originally closed and later permitted to re-open a portion of their operations) must review these guidelines and commit to ensuring the health and safety of their employees and the public, including construction businesses currently conducting in-person operations and those now able to resume activities.

2.2 Businesses Subject to This Guidance

Beginning May 1, 2020, all businesses in the construction industry in the

Commonwealth, including those in new construction, renovation, and repair, as well as land subdivision and design-related field activities, are permitted to maintain in-person operations pursuant to the Governor’s and Secretary of Health’s April 20, 2020 amendments to the Business Closure Orders so long as their activities strictly adhere to this guidance. Construction projects previously granted an exemption to continue in-person operations may continue operations but must adhere to this guidance.

2.3 Policy

It is the policy of the Administration to ensure that all businesses in the construction industry subject to this guidance conduct operations in the manner best designed to prevent or mitigate the spread of COVID-19 and ensure the safety of the employers, employees and the public as a whole.

All construction businesses authorized to conduct in-person operations in the Commonwealth must adhere to requirements of this guidance, as well as all applicable business and building safety orders issued by the Secretary of Health.

Local political units may elect to impose more stringent requirements than those contained in this guidance. In such instances, businesses must adhere to the more stringent requirements.

2.4 All Construction Activities

All businesses and employees in the construction industry must do the following:

Follow all applicable provisions of the Order of the Secretary of Health providing for business safety measures, issued April 15, 2020, including but not limited to provisions requiring that every person present at a work site wear masks/face coverings, and provisions requiring the establishment of protocols for execution upon discovery that the business has been exposed to a person who is a probable or confirmed case of COVID-19.

Follow all applicable provisions of the Order of the Secretary of Health providing for building safety measures, issued April 5, 2020.

Follow other applicable Department of Health (DOH) and Centers for Disease Control and Prevention (CDC) guidance.
Require social distancing (6-feet minimum distance between workers) unless the safety of the public or workers require deviation (e.g. drywalling, team lifting).

Provide hand wash stations at appropriate locations on the site such as building entrances, break areas, food truck areas, offices, trailers, and job site egress areas.

Implement cleaning or sanitizing protocols at all construction sites and projects. Identify and regularly clean and disinfect areas that are at high risk for transmission (requirements to clean common areas and regularly trafficked spaces periodically).

Ensure all gatherings are limited to no more than 10 people in counties in the red phase of reopening, 25 people in counties in the yellow phase of reopening, and 250 people (outdoors) and 25 people (indoors) in counties

in the green phase of reopening, maintaining 6-foot social distancing, when required to meet, even when conducted outside.

Use virtual meetings, and disseminate information electronically to the extent feasible.

Stagger shifts, breaks, work areas and/or stacking of trades where feasible to minimize workers on site.

Limit tool sharing and sanitize tools if they must be shared.

Employ jobsite screening based on CDC guidance to determine if employees should work. Prohibit from working any employees with any symptoms of COVID-19. Encourage sick employees to stay home.

Prohibit unnecessary visitors to any project or work site, and limit supplier deliveries.

Limit access to enclosed spaces to the extent feasible.

Ensure workers are traveling to and from the job site separately. Wherever possible employees should not share a vehicle. For counties in the green phase, workers may share a vehicle to travel to the job site, as long as the vehicle’s occupancy is no more than 50% its occupancy load and face masks are worn by the vehicle’s occupants.

Identify a “Pandemic Safety Officer” for each project or work site, or, if a large-scale construction project, then for each contractor at the site. The primary responsibility of the Pandemic Safety Officer will be to convey, implement, and enforce the social distancing and other requirements of this guidance for the protection of employees, suppliers, and other personnel at the site.

2.5 Public Construction

Elected political subdivisions (or “local political units” as described in the Governor’s guidance), and other public entities should continue to use best judgment in exercising their authority to conduct critical construction projects. All construction decisions should appropriately balance public health and safety while ensuring the continued safety of critical infrastructure. When possible, local political units and public entities should postpone non-essential projects and only proceed with essential projects when they can implement appropriate social distancing and cleaning/disinfecting protocols, and should adhere to this guidance on all construction projects.

Local political units and public entities should officially communicate to contractors whether their specific project will be resumed. Notwithstanding any general authorization to resume construction activities, contractors should not resume work on public construction projects until directed to do so by the applicable governmental unit.

Certain commonwealth agencies and independent commissions have already issued guidance for critical or essential projects that are continuing. Those specific agency or commission directives should be followed unless there is a direct conflict with these guidelines, in which case these guidelines control. Contractors working on public construction projects must follow construction restart or resumption plans established by that agency or commission.

2.6 Guidance

Businesses in the construction industry may wish to refer to PennDOT’s COVID-19 Guidance for Restarting Construction Projects which provided a process for restarting construction projects that were suspended in response to COVID-19 mitigation.

2.7 Enforcement

Enforcement actions against violators of the Governor’s and Secretary of Health’s Orders Closing Businesses That Are Not Life Sustaining commenced on March 23, 2020, and is ongoing.

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 14 40

CONTRACTOR QUALITY CONTROL
06/03

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D 3740	(2010) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(2000; Rev. A) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump sum prices contained in the Bidding Schedule.

1.3 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

CONTRACTOR QUALITY CONTROL PLAN; E DA

The project Quality Control Plan shall be submitted to the Quality Assurance Representative (QAR) within 10 days of Notice to Proceed. The plan shall contain sufficient detail to show how the Contractor will control and document the work quality and comply to the requirements specified in this section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "ARTICLE 13 - Tests and inspections; Correction,

Removal or Acceptance of Defective Work." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The system shall cover all construction operations, both on-site and off-site, and shall be keyed to the proposed construction sequence.

3.2 CONTRACTOR QUALITY CONTROL PLAN (CQC)

The Quality Assurance Representative will consider an interim plan for the first 60 days of operation to be submitted no later than 15 days after receipt of Notice of Award. Subsequent to submittal of an interim plan, the Contractor shall furnish for acceptance by the Quality Assurance Representative, not later than 35 days after receipt of Notice of Award, the original and one copy of the total Contractor Quality Control (CQC) Plan proposed for use in implementing the requirements of the Contract Clause entitled "QUALITY CONTROL". If an interim plan is not submitted, the Contractor shall submit for approval within 15 days after receipt of Notice of Award, the total Quality Control Plan specified above. The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. Construction will be permitted to begin only after acceptance of the CQC Plan.

3.2.1 Content of the CQC Plan

The CQC plan shall include, as a minimum, the following to cover all construction operations, both on-site and off-site, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC system manager who shall report to the project manager or someone higher in the Contractor's organization. Project Manager in this context shall mean the individual with responsibility for the overall management of the project including quality and production.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. The name and address of the Corps of Engineers validated commercial testing laboratory to be used for quality control testing; a letter of validation from the Material Testing Center (MTC); a list of applicable ASTM procedures that the laboratory is validated to perform; and the qualifications of the field technician(s) identified for the project.

d. A copy of the letter to the CQC System Manager signed by an authorized official of the firm, which describes the responsibilities and delegates the authorities of the CQC System Manager.

e. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with SECTION 01 33 00 - SUBMITTAL PROCEDURES.

f. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph

requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Quality Assurance Representative.)

g. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

h. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

i. Reporting procedures, including proposed reporting formats.

j. A list of the definable features of work. A definable feature of work is a task that is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list shall be agreed upon during the coordination meeting.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Quality Assurance Representative reserves the right to require the Contractor to make changes in the CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the QC plan, the Contractor shall notify the Quality Assurance Representative in writing a minimum of seven calendar days prior to any proposed change. Proposed changes are subject to acceptance by the Quality Assurance Representative.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Quality Assurance Representative of the Quality Control Plan, the Contractor shall meet with the Quality Assurance Representative or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's Management and control with the OWNER's Quality Assurance. Minutes of the meeting shall be prepared by the Quality Assurance Representative and signed by both the Contractor and the Quality Assurance Representative. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.3.1 Weekly Coordination Meeting

Once construction begins the Contractor shall conduct weekly onsite coordination meetings with the OWNER and Quality Assurance Representative at a mutually agreed upon time. The meeting may be conducted at a lesser interval if mutually agreed upon by the OWNER and Quality Assurance Representative and Contractor. The Contractor shall prepare minutes for each meeting and provide a copy to the Quality Assurance Representative prior to the next meeting for review and concurrence. The minimum outline of items to be addressed at the coordination meetings shall include an update and a review of progress since last week, project schedule, work schedule for the week ahead, submittals, modifications and potential modifications, QC/QA issues, RFI's, environmental protection, safety, and any other issues determined appropriate.

3.4 QUALITY CONTROL ORGANIZATION

The Contractor shall identify an individual within its organization at the worksite who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be on the site at all times during construction and shall be employed by the Contractor. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. Period of absence may not exceed one (1) week at any one time, and not more than ten (10) workdays during a calendar year. The requirements for the alternate will be the same as for the designated CQC Manager.

3.4.1 CQC Organizational Staffing

The Contractor shall provide a CQC staff, which shall be at the worksite at all times during progress, with complete authority to take any action necessary to ensure compliance with the contract.

3.4.1.1 CQC Staff

Following are the minimum requirements for the CQC staff. These minimum requirements will not necessarily assure an adequate staff to meet the CQC requirements at all times during construction. The actual strength of the CQC staff may vary during any specific work period to cover the needs of the work period. When necessary for a proper CQC organization, the Contractor shall add additional staff at no cost to the OWNER. This listing of minimum staff in no way relieves the Contractor of meeting the basic requirements of quality construction in accordance with contract requirements. All CQC staff members shall be certified in accordance with paragraph QUALITY CONTROL ORGANIZATION, and shall be subject to acceptance by the Quality Assurance Representative.

3.4.1.2 CQC System Manager

The CQC System Manager and staff shall be assigned no scheduling or other duties.

3.4.1.3 Assistant CQC System Manager

The assistant CQC System Manager shall hold the same qualifications as the CQC System Manager and shall be on site at all times.

3.4.2 Organizational Changes

The Contractor shall obtain Quality Assurance Representative's acceptance before replacing any member of the CQC staff. Requests shall include the names, qualifications, duties, and responsibilities of each proposed replacement.

3.5 SUBMITTALS

Submittals shall be made as specified in SECTION 01 33 00 - SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

The controls shall include at least three phases of control to be conducted by the CQC System Manager for all definable features of work, as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

a. A review of each paragraph of applicable specifications.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. A check to assure that provisions have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for constructing the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that phase of work.

i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Quality Assurance Representative.

j. The Quality Assurance Representative shall be notified at least 24 hours in advance of beginning any of the required action of the preparatory phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager

and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of preliminary work to ensure that it is in compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verification of full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Comparison with sample panels is appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Quality Assurance Representative shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work on-site, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

As determined by the Quality Assurance Representative, additional preparatory and initial phases may be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, on-site production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Materials Testing and Inspection

Testing shall be the responsibility of the Contractor and shall be

performed at no additional cost to the OWNER. All testing shall be performed by a Corps of Engineers validated commercial testing laboratory. Both the field and permanent laboratory shall be validated. A list of current validated testing laboratories can be viewed at www.wes.army.mil/SL/MTC/mtc.htm or you may contact Mr. Steve O'Connor, St. Louis District, Geotechnical Branch, at Telephone 314-331-8445 for laboratory verifications. If the Contractor elects to establish testing facilities, work requiring testing will not be permitted until the Contractor's facilities have been validated by the Materials Testing Center. The Contractor shall ensure that the Materials Testing Center is reimbursed for all costs regarding validation of testing laboratories pertaining to this contract.

3.7.2 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product that conforms to contract requirements. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a testing laboratory on or off site that is validated by the Material Testing Center (MTC) for the Corps of Engineers. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Quality Assurance Representative, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility shall be provided directly to the Quality Assurance Representative. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.3 Testing Laboratories

3.7.3.1 Capability Check

The Quality Assurance Representative reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329, and shall be validated by the Corps of Engineers MTC.

3.7.3.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed any charges incurred to reimburse the OWNER for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.4 On-Site Laboratory

If an onsite CQC laboratory is established, the Contractor shall submit the request for validation to the District POC in a timely manner and emphasize the critical need. After the request to the MTC is submitted, the Contractor should anticipate a six-week turn around and reflect the turn-around time in its scheduling. The Quality Assurance Representative reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the OWNER.

3.7.5 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Quality Assurance Representative shall be delivered to a laboratory to be selected by the Engineer and identified to the Contractor prior to the start of construction.

Coordination for each specific test, exact delivery location, and dates shall be made through the Laboratory and copied to the Quality Assurance Representative.

3.8 COMPLETION INSPECTION

At the completion of all work or any increment thereof established by a completion time stated in the Contract Clause entitled "ARTICLE 14 - Payment to Contractor and Completion" or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Quality Assurance Representative. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be submitted to the Project Sharepoint Site, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals reviewed, with contract reference, by whom, and action taken.

g. Off-site surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Quality Assurance Representative daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Quality Assurance Representative will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the worksite, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Quality Assurance Representative may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

3.11 PROJECT SHAREPOINT SITE) FOR CONTRACTOR QUALITY CONTROL OF CONTRACT.

3.11.1 General

The Quality Assurance Representative will use set up a PROJECT SHAREPOINT SITE to assist in its monitoring and administration of this contract. The Contractor shall utilize this Sharepoint site to make submittals, upload daily reports, request information (RFI's) and to submit other documentation as required by the contract during construction period of the project. This joint Sharepoint site facilitate electronic exchange of information and overall management of the contract. The Sharepoint site will provide the Contractor with a means to input, track, and electronically share information with the Quality Assurance Representative and OWNER in administration, Quality Control, submittal monitoring, scheduling, and import/export of data.

3.11.2 Quality Assurance Comments

During the course of the contract, the Contractor will receive various Quality Assurance comments from the Quality Assurance Representative that will reflect corrections needed to Contractor activities or reflect outstanding or future items needing the attention of the Contractor. The Contractor shall acknowledge receipt of these comments by specific number reference on its Daily CQC Report, and shall also reflect on its Daily CQC Report when these items are specifically completed or corrected to permit Quality Assurance Representative verification.

3.11.3 Contractor's Scheduling System

The Contractor's schedule system shall include, as specific and separate activities, all Preparatory Phase Meetings (inspections), all O&M Manuals and all Test Plans of Electrical and Mechanical Equipment or Systems that require validation testing or instructions to the Quality Assurance Representative.

-- End of Section --

SECTION 01 15 00

TEMPORARY CONSTRUCTION FACILITIES
06/03

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall provide the temporary facilities specified herein. The temporary facilities shall be maintained by the Contractor during the life of the contract and upon completion and acceptance of the work shall be removed from the site of the work.

1.1.1 No Separate Payment

Payment for materials and equipment furnished under this section will not be paid for separately, and all costs in connection therewith shall be included in other items for which payment is provided.

1.2 APPLICABLE PUBLICATIONS

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

Occupational Safety & Health Administration - CONSTRUCTION (OSHA)

Part 1926	(Latest Edition) SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

1.3 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Access/Haul Road Plan; E DA

Within 15 days after receipt of Notice of Award of the contract, the Contractor shall submit requirements as stated in paragraph 3.1.

1.4 Temporary Construction Office

Provide the Resident Engineer with an office, approximately 200 square feet in floor area, located where directed and providing space heat, electric light and power, and toilet facilities. Include a 4 by 8 foot plan table, a standard size office desk and chair. At completion of the

project, the office will remain the property of the Contractor and be removed from the site. Utilities will be paid by the contractor for the entire contract period and will be connected and disconnected in accordance with local codes and to the satisfaction of the Resident Engineer.

PART 2 PRODUCTS

2.1 TEMPORARY PROJECT SAFETY FENCING

The Contractor shall furnish and erect temporary project safety fencing as required by the OSHA Regulations - Part 1926. The safety fencing shall be a high visibility orange color, HDPE open-weave pattern, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location.

2.2 TEMPORARY PUBLIC ACCESS BARRIERS

The Contractor shall furnish and erect access gates and barriers as necessary to control public access at all times during construction to and through the construction site. Gate locations shall be determined by Quality Assurance Representative.

PART 3 EXECUTION

3.1 HAUL ROADS

When haul roads are required, the Contractor shall construct them in accordance with the requirements of the OSHA Regulations - Part 1926. Prior to construction, the Contractor shall submit an Access/Haul Road Plan for approval to the Quality Assurance Representative.

3.2 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away as directed by the Quality Assurance Representative or designated OWNER Representative(s).

3.3 RESTORATION OF SITE

Upon completion of the project, areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition at no additional cost to the OWNER. This includes, but is not limited to, areas used for haul roads and site access, temporary construction storage, and other areas within the construction limits.

-- End of Section --

SECTION 01 22 00

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 PAYMENT ITEMS

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

1.1.1 Mobilization and Demobilization

The contract lump sum price for this item shall constitute full compensation for furnishing all materials, permits, labor, equipment and tools for all required mobilization and demobilization of staff and equipment, and any other costs associated with complying with the contract administrative requirements and commencing work at the project site. This item also includes all work and materials necessary to complete the work as described in the plans and specifications. Payment for this item shall be lump sum and shall not be requested until at least thirty days from the notice to proceed has elapsed. The total for this item shall not exceed 5% of the total sum bid for the base bid. Partial payment shall be made not to exceed 30% of the total lump sum bid amount on the first pay request submitted by the contractor. The next 45% payment will be made on subsequent partial payment request after the Contractor has completely mobilized. The final 25% will be made on subsequent partial payment request after the Contractor has completely demobilized.

1.1.2 Bonds and Insurance

Payment for all costs associated with bonding will be made at the contract lump sum price for "ARTICLE 5 - Bonds and Insurance", as defined in the Contract Clauses, SECTION 00 700.

1.1.3 Stripping

Payment for all work associated with stripping will be made at the contract lump sum price for "Stripping", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to perform work as specified in SECTION 31 21 10.

1.1.4 Establishment of Turf

Payment for all work associated with establishment of turf will be made at the contract lump sum price for "Establishment of Turf", which price and payment shall constitute full compensation for the costs of all labor,

equipment, and materials required to perform work as specified in SECTION 32 29 35.

1.1.5 Material Disposal

Payment for all work associated with removals and disposal will be made at the contract lump sum price for "Material Disposal", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to perform work as specified in SECTION 32 20 20.

1.1.6 Cement-Bentonite (CB) Slurry Trench Cutoff Wall (0-80) ft

1.1.6.1 Measurement

Measurement for cement-bentonite cutoff wall shall be based on the face area in square feet of completed cut-off wall measured in a vertical plane through the centerline of the cutoff wall, from the final/complete as-built top elevation as shown on the drawings down to a distance 80 feet below the final/complete as-built top elevation within the station limits where the cement-bentonite cut-off wall is required, as so indicated on the drawings. For the purposes of this measurement item, the final/complete as-built top elevation is defined as one foot below the surface of the working platform, as shown on the drawings. Any overlap between adjacent cutoff wall panels shall be considered incidental to the cutoff wall construction. Any variations from the amounts derived using this definition are considered incidental to the work. Measurements for purposes of as-built plans and/or quality assurance shall be based on surveys and soundings taken at the site as directed and approved by the Quality Assurance Representative and as outlined in the as-builts and the panel closure reports. Soundings shall be conducted in the presence of the Quality Assurance Representative. Such measurements shall not take precedence over the definition of this paragraph.

1.1.6.2 Payment

Payment for cement-bentonite cutoff wall will be made at the contract unit price per square foot of final, in-place face area. Such price will include costs incurred for the construction and completion of the cutoff wall, the care of water plan as specified in SECTION 31 21 40, and the test section. No separate payment will be made for material, equipment, handling and cleaning the slurry, quality control testing, removing and/or rebuilding any portion of the wall within the test section or project limits that fails to meet specifications as stated in SECTION 32 20 20, record keeping, and/or site preparation, including construction and removal of the temporary working platforms. No separate payment will be made for cobbles, rock, or other difficult materials or conditions encountered during installation of the cutoff wall. No separate payment will be made for overlap between adjacent cutoff wall panels. No separate payment will be made for portions of cutoff wall required to be removed prior to completion of the project; all cutoff wall face area required to be installed and removed between the working platform and the final, in-place cutoff wall shall be considered incidental to the cutoff wall installation.

1.1.7 Cement-Bentonite Slurry Trench Cutoff Wall (80+) ft

1.1.7.1 Measurement

Measurement for cement-bentonite cutoff wall shall be based on the face area in square feet of completed cutoff wall measured in a vertical plane through the centerline of the cutoff wall, from 80 feet below the final/complete as-built top elevation as defined in Paragraph 1.1.6.2 of this section to the bottom of the excavated panels not including into competent rock within the station limits where the cement-bentonite cutoff wall is required, as so indicated on the drawings. Any overlap between adjacent cutoff wall panels shall be considered incidental to the cutoff wall construction. Measurement shall be based on surveys and soundings taken at the site as directed and approved by the Quality Assurance Representative and as outlined in the as-builts and the panel closure reports. Soundings shall be conducted in the presence of the Quality Assurance Representative.

1.1.7.2 Payment

Payment for cement-bentonite cutoff wall will be made at the contract unit price per square foot of face area. Such price will include costs incurred for the construction and completion of the cutoff wall and the test section. No separate payment will be made for material, equipment, handling and cleaning the slurry, quality control testing, removing and/or rebuilding any portion of the wall within the test section or project limits that fails to meet specfications as stated in SECTION 32 20 20, record keeping, and/or site preparation, including construction and removal of the temporary working platforms. No separate payment will be made for cobbles, rock, or other difficult materials or conditions encountered during installation of the cutoff wall. No separate payment will be made for overlap between adjacent cutoff wall panels.

1.1.8 Cement-Bentonite Slurry Trench Cutoff Wall (ROCK)

1.1.8.1 Measurement

Measurement for cement-bentonite cutoff wall shall be based on the face area in square feet of completed cutoff measured in a vertical plane through the centerline of the cutoff wall that is installed into competent rock within the station limits where the cement-bentonite cutoff wall is required, as so indicated on the drawings. Any overlap between adjacent cutoff wall panels shall be considered incidental to the cutoff wall construction. Measurement shall be based on surveys and soundings taken at the site as directed and approved by the Quality Assurance Representative and as outlined in the as-builts and the panel closure reports. Soundings shall be conducted in the presence of the Quality Assurance Representative. Installation of the cutoff wall into rock, including weathered rock, other than competent rock, as defined in SECTION 32 20 20, shall be considered incidental to the cutoff wall construction and measured and paid according to sub part 1.1.6 or 1.1.7 of this section, depending on the depth at which the rock was encountered.

1.1.8.2 Payment

Payment for cement-bentonite cutoff wall will be made at the contract unit price per square foot of face area. Such price will include costs incurred for the construction and completion of the cutoff wall and the test section. No separate payment will be made for material, equipment,

handling and cleaning the slurry, quality control testing, removing and/or rebuilding any portion of the wall within the test section or project limits that fails to meet specifications as stated in SECTION 32 20 20, record keeping, and/or site preparation, including construction and removal of the temporary working platforms. No separate payment will be made for overlap between adjacent cutoff wall panels.

1.1.9 Geotechnical Instrumentation Installation

Payment for the following items will be made at the contract lump sum price for "Geotechnical Instrumentation Installation". Price and payment shall constitute full compensation for furnishing and installing instruments including all materials in place, all cable, labor, tools, and equipment, instruction manuals, drilling, sampling, pre-installation acceptance testing, installation, post-installation acceptance testing, installation of surface and other protection, obtaining formal initial readings, performing instrumentation monitoring, determination of as-built locations and providing data and reports to the Quality Assurance Representative:

(1) Open system piezometers (13 total required).

(2) Automated piezometers, data retrieving devices, direct read cables, cap assemblies, venting systems, conduit, enclosures (up to 13 total required).

(3) Inclinometer installations (15 total required).

(4) Inclinometer probe, cable, readout unit, riser and pulley assembly, accessories.

(5) In-place biaxial inclinometer sensors, gauge tubes, data-loggers, accessories (up to 4 complete systems required).

(6) Inclinometer software.

(7) Water level indicator.

1.1.10 Impervious Fill

1.1.10.1 Measurement

Impervious Fill will be measured for payment by the cubic yard with quantities determined by creating a TIN volume surface in Autodesk AutoCAD Civil 3D 2013 using the CONTRACTOR's Excising Grade Survey and the CONTRACTOR's Clay Cap Survey as required in Section 01 480. No separate measurement will be made for benching the clay cap into the existing levee, as benching is considered incidental to the Impervious Fill work. Top soil shall be considered incidental to this work, and will not be paid for separately.

1.1.10.2 Payment

Payment for fill will be made at the applicable contract unit price per cubic yard for "Impervious Fill". These prices and payments shall constitute full compensation for furnishing all plant, labor, equipment and material and performing all operations necessary to complete the work as specified in SECTION 31 22 00- IMPERVIOUS FILL and as shown on the drawings.Furnishing, stockpiling and placing of topsoil shall be

incidental to the unit price of the Impervious Fill Material. All Impervious Fill material required for benching the clay cap shall be considered incidental to the placement of impervious fill.

1.1.11 Waterline Removal and Replacement

Payment for all work associated with waterline (36 inch Olin Water Intake Pipe) removal and replacement will be made at the contract lump sum price for "Waterline Removal and Replacement", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to perform work as shown on the drawings and as specified herein.

1.1.12 Temporary Electrical Line

Payment for all work associated with the temporary electrical line (Olin Overhead Electric Line) removal will be made at the contract lump sum price for "Temporary Electrical Line", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to remove the electrical lines and reinstall them as shown on the drawings and as specified herein.

1.1.13 Environmental Protection

Payment for all work associated with environmental protection including but not limited to berms, fencings, and all other remedial measures as to protect wetlands and project features will be made at the contract lump sum price for "Environmental Protection", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to perform work as specified herein.

1.1.14 Slurry Wall Panel Coring

Payment for the slurry wall panel coring will be made at the contract unit price per linear feet for "Slurry Wall Panel Coring", which price and payment shall constitute full compensation for all costs of plant, labor, materials and equipment associated with the coring work, as specified in SECTION 32 20 20.

1.1.15 Clearing and Grubbing

Payment for all work associated with stripping will be made at the contract unit price per acre for "clearing and grubbing", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to perform work as specified in SECTION 31 11 00.

1.1.16 Dewatering

The contract lump sum price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the dewatering of the work area. This work shall be performed in conjunction with Section 31 22 00 - EARTHWORK.

1.1.17 Construction Staking

The contract lump sum price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the construction staking of all piping, relief wells, and all other

related items. This item also includes all work and materials necessary to complete the work as described in the plans and specifications. Payment of this item shall be lump sum.

1.1.18 Pilot Holes

The contract price for the drilling of pilot holes for relief wells per vertical foot of depth shall constitute full compensation for furnishing all materials, labor, equipment and tools in conjunction with Section 33 26 00.00 10 - RELIEF WELLS.

1.1.19 Relief Wells

The contract price for the construction of relief wells per vertical foot of depth (from well outlet elevation to bottom of well plug as shown on Detail Sheets C-503 and C-504 and relief well tables of work on sheet G-005) shall constitute full compensation for furnishing all materials, labor, equipment and tools, including all items and in conjunction with Section 33 26 00.00 10 - RELIEF WELLS. No separate payment will be made for the sump (2-foot overdrill) beneath the well plug; the sump (2-foot overdrill shall be considered incidental to the construction of the relief well.

1.1.20 Site Demolition and Restoration

Payment for all work associated with material disposal will be made at the contract lump sum price for "Site Demolition and Restoration", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to perform work as specified in SECTION 02 41 00.

Subpart	Estimated Quantity
Asphalt Road Demolition	15,906 SF
Access Gate Demolition	1 EA
Access Gate Gravel Entrance Demolition	1,900 SF

1.1.21 Drilling Obstructions

The contract price, per vertical foot of depth, shall constitute full compensation for furnishing all materials, labor, equipment and tools for drilling using bucket augers or other equipment capable of drilling through or removing obstructions during relief well construction, including pilot hole drilling, as required by Section 33 26 00.00 10 - RELIEF WELLS. No separate payment or adjustment in unit price per vertical foot of depth shall be made due to an increase or decrease in quantity of Drilling Obstructions.

1.1.22 Olin Utility Protection

Payment for all work associated with protection of the Olin industrial wastewater effluent pipeline will be made at the contract lump sum price for "Olin Utility Protection", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials. Payment for "Olin Utility Protection" shall include, but is not limited to, all work associated with locating, air excavating, completing loading calculations, and developing, constructing, and removing (if necessary) a method of ensuring that the installation of the cutoff wall does not interfere with Olin Corporation's ability to repair any utility within 24-36 hours of a break, failure, or malfunction of any type and does not

allow the migration of pipe bedding/foundation material of nearby utilities into the cutoff wall slurry trench as shown on the drawings and specified herein. No separate payment will be made for damage, repair, or any other costs associated with damage to existing utilities resulting from Contractor's negligence.

1.1.23 Bicycle Trail Relocation

Payment for all work associated with the Madison County Transit (MCT) bicycle trail relocation pavement section, random fill, removal and replacement of signage, bollards, and striping will be made at the contract lump sum price for "Bicycle Trail Relocation", which price and payment shall constitute full compensation for the costs of all labor, equipment, and materials required to construct the improvements as shown on the drawings and as specified herein.

Subpart	Estimated Quantity
IDOT HMA Surface Course, Mix C (3" Thickness)	1,168 SY
IDOT Aggregage Base Course, Type A (6" Thickness)	1,401 SY
Random Fill	5,325 CY
Striping	1,060 LF

1.1.24 Cost to Execute Olin's Temporary License

Payment for all costs associated with the execution of Olin's Temporary License and Request for Access Form (ATTACHMENT 300-E) (excluding only "Cost to Obtain Insurance Required by Olin" which are addressed in 1.1.25 below and "Olin Utility Protection" which are addressed in 1.1.22 above) will be made at the contract lump sum price for "Cost to Execute Olin's Temporary License", which price and payment shall constitute full compensation for all direct and indirect costs required to comply with Olin's Temporary License and Request for Access Form during construction the improvements as shown on the drawings and as specified herein.

1.1.25 Cost to Obtain Insurance Required by Olin

Payment for all costs associated with obtaining and maintaining the insurance required by Olin will be made at the contract lump sum price for "Cost to Obtain Insurance Required by Olin", which price and payment shall constitute full compensation for the cost of all insurance policies required to construct the improvements as shown on the drawings and as specified herein.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 22 00.00 10

PRICE AND PAYMENT PROCEDURES
08/15

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A615/A615M	(2016) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.][information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Weight Certificates

1.3 SINGLE JOB PAYMENT ITEMS

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

1.3.1 Mobilization and Demobilization

1.3.1.1 Payment

Payment will be made for costs associated with mobilization and demobilization, as defined in Special Contract [Clause] [Requirement] PAYMENT FOR MOBILIZATION AND DEMOBILIZATION.

1.3.1.2 Unit of Measure

Unit of measure: job.

1.3.2 Structure No. 1

1.3.2.1 Payment

Payment will be made for costs associated with operations necessary for construction of the structure at Station XX+XX.

1.3.2.2 Unit of Measure

Unit of measure: job.

1.3.3 Structure No. 2

1.3.3.1 Payment

Payment will be made for costs associated with operations necessary for construction of the structure at Station YY+YY.

1.3.3.2 Unit of Measure

Unit of measure: job.

1.4 UNIT PRICE PAYMENT ITEMS

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the [BIDDING] [PRICING]PROPOSAL SCHEDULE and described below. The unit price and payment made for each item listed constitutes full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

1.4.1 Excavation

1.4.1.1 Payment

Payment will be made for costs associated with excavation [for the channel][and][for the structure], which includes performing required excavation and other operations incidental thereto, Contractor-furnished disposal area(s) and disposition of excess excavated material and unsuitable and frozen materials.

1.4.1.2 Measurement

The total quantity of excavated material for which payment will be made will be the theoretical quantity between the ground surface as determined by a survey and the grade and slope of the theoretical cross sections indicated. No allowance will be made for overdepth excavation or for the removal of any material outside the required slope lines unless authorized.

1.4.1.3 Unit of Measure

Unit of measure: cubic yard.

1.4.2 Riprap

1.4.2.1 Payment

Payment will be made for costs associated with furnishing, transporting, stockpiling (if applicable), placing, and constructing the stone protection as specified.

1.4.2.2 Measurement

Measure riprap for payment by the ton (2,000 pounds) by weighing each truckload to the nearest 0.1 ton, and the final quantity of [each truckload] [the whole sum] is rounded to the nearest whole ton. Weigh the riprap for payment on approved scales before being placed in the work. Quarry weights will not be accepted. Use scales of sufficient length to permit simultaneous weighing all axle loads. Scales must be inspected, tested and sealed as directed to assure accuracy with 0.5 percent throughout the range of the scales. Certify scales located at the site of the work as to accuracy by an acceptable scales company representative prior to weighing any riprap. Scales will be checked and certified before riprap hauling and rechecked and recertified whenever a variance is suspected. Furnish the scales. If commercial scales are readily available in close proximity, 10 miles of site of work, the Contracting Officer may approve the use of the scales. Weigh riprap in the presence of the Government representative. The Contracting Officer may elect to accept certified weight certificates furnished by a public weighmaster in lieu of scale weights at the jobsite.

1.4.2.3 Unit of Measure

Unit of measure: ton (2,000 pounds).

1.4.3 Deformed Steel Bars for Concrete Reinforcement

1.4.3.1 Payment

Payment will be made for costs associated with furnishing, transporting, delivering, and placing deformed steel bars for concrete reinforcement, which includes steel in laps as indicated or as required. No payment will be made for the additional steel in laps which are authorized for the convenience of the Contractor. No separate payment will be made for accessories; include payment in the contract unit price for the items of work to which the accessories are incidental.

1.4.3.2 Measurement

The measured lengths of deformed steel bars for concrete reinforcement will be converted to weights for the size of bars listed by the use of the nominal weights per lineal foot specified in ASTM A615/A615M.

1.4.3.3 Unit of Measure

Unit of measure: per pound in place.

[1.5 CONTAMINATED SOIL REMOVAL

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the [PRICING] [BIDDING]PROPOSAL SCHEDULE and described below. The unit price and payment made for each

item listed must constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, [tests and reports,] and for performing all work required for each of the unit price items.

1.5.1 Unit of Measure

Unit of measure: cubic yard.

][1.6 DREDGING

Payment will be made at the contract lump sum job price and must constitute full compensation for performing all dredging, disposal, [and ice and snow removal], stockpiling, and replacement. Payment will be in accordance with above paragraph, SINGLE JOB PAYMENT ITEMS. In no case will payment be made for material removed from below the maximum pay-line or outside the dredging prism as indicated.

]PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

[Not Used][3.1 CONTRACT COST BREAKDOWN

The Contractor must furnish within 30 days after the date of Notice to Proceed, and prior to the submission of its first partial payment estimate, a breakdown of its single job pay item or items which will be reviewed by the Contracting Officer as to propriety of distribution of the total cost to the various accounts. Any unbalanced items as between early and late payment items or other discrepancies will be revised by the Contracting Officer to agree with a reasonable cost of the work included in the various items. This contract cost breakdown will then be utilized as the basis for progress payments to the Contractor.

] -- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES
11/12

PART 1 GENERAL

1.1 SUMMARY

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

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

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

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

Submittals requiring ENGINEER's approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.2 DEFINITIONS

1.2.1 Submittal Descriptions (SD)

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

SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction (work) or the start of the next major phase of the construction on a multi-phase contract. For example, schedules, work plans, lists of data, or lists including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work are considered preconstruction submittals.

Certificates of insurance

Surety bonds

List of proposed Subcontractors

List of proposed products

Construction Progress Schedule

Submittal register

Schedule of prices

Health and safety plan

Work plan

Quality Control(QC) plan

Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work; diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project; and drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

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

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product; color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work. Any design or analysis by the Contractor shall be sealed by an appropriate professional (e.g., Professional Engineer or Professional Geologist) who is licensed in the state and local jurisdiction to perform such work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accordance with specified requirements; report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site; and report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation, including investigation reports, daily logs and

checklists, final acceptance test and operation test procedures reports.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements; document required of Contractor, or of a manufacturer, supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism; special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1 Engineer\Designer of Record Approved (E DA)

Engineer approval is required for extensions of design, critical materials, any deviations from the solicitation, the accepted proposal, or the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Engineer. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings." Contractor to provide the Quality Assurance Representative with the number of copies designated hereinafter of all Engineer/Designer of Record approved submittals.

1.3.2 For Information Only

All submittals not requiring Engineer\Designer of Record Approved (E DA) approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above. These submittals shall be filed and maintained in the Contractor's field office subject to ENGINEER or Quality Assurance Representative spot check and be located on the PROJECT SHAREPOINT SITE.

1.4 APPROVED SUBMITTALS

The Engineer\Designer of Record Approved or RESIDENT ENGINEER's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials,

detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error that may exist, as the Contractor under the CQC requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After the ENGINEER OF RECORD or RESIDENT ENGINEER has approved submittals, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.5 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Quality Assurance Representative and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be furnished promptly to the Quality Assurance Representative.

1.6 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained. In addition; the OWNER will withhold 2% of the total bid price of the applicable item for which FIO technical submittals are not being maintained and on file at the Contractor's Field Office.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Quality Assurance Representative may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to the submission of submittals, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring ENGINEER OF RECORD (E DA) approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER

Attached to the end of this section is the SUBMITTAL REGISTER listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Construction Safety Program (01 460), Statement of Required Insurance (00 800), Environmental Protection Plan (01 11 30), Progress Schedule, and Quality Control Plan (01 14 40), shall be submitted as set forth in each applicable specification paragraph and should not be included as part of the Submittal Register ENG Form 4288-R. The Quality Assurance Representative has completed columns "d" through "r"; the Contractor shall complete columns "a" through "c" and "s" through "u" and submit the forms to the Quality Assurance Representative for approval within 10 calendar days after Notice to Proceed. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated. The time for submission, procurement, lag/lead and delivery shall be entered into the SHAREPOINT SYSTEM.. A

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. It is the Contractor's responsibility to provide the Quality Assurance Representative with timely, accurate, and complete submittal packages. The Quality Assurance Representative, in turn, will process, review, and provide official responses to the Contractor within 30 calendar days after physical receipt of the submittal, unless otherwise noted in the Technical Provisions. The Contractor shall incorporate the stated Quality Assurance Representative review time in the submittal register. No delay damages or time extensions will be allowed for time lost in late submittals. The Contractor's Quality Control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective system. Copies of updated or corrected listing shall be submitted to the Quality Assurance Representative at least every 30 days in the quantity specified.

3.4 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.4.1 Procedures

The Contractor shall submit to the Quality Assurance Representative for approval six copies of all shop drawings as called for under the various headings of these specifications.

3.4.2 Identifying Submittals

When submittals are provided by a subcontractor, the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Quality Assurance Representative approval.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate

component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction contract number.

c. Date of the drawings and revisions.

d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.

e. Section number of the specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, 18A would become 18B, to indicate resubmission.

h. Product identification and location in project.

3.4.3 Deviations

For submittals, which include proposed deviations requested by the Contractor, the column "variation" of the SUBMITTAL REGISTER shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Quality Assurance Representative reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.5 CONTROL OF SUBMITTALS

The Contractor shall carefully control its procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.6 ENGINEER OF RECORD APPROVED SUBMITTALS

Upon completion of review of submittals requiring ENGINEER OF RECORD approval, the submittals will be identified as having received approval by being so stamped and dated. The Quality Assurance Representative will retain five copies of the submittal and one copy of the submittal will be returned to the Contractor.

3.7 INFORMATION ONLY SUBMITTALS

Approval of the Quality Assurance Representative is not required on information only submittals. The Contractor shall maintain in his field office all current FIO submittals for use by CQC Manager during the course of the contract. The OWNER will periodically spot-check the Contractor's compliance with maintaining current and correct FIO submittals for CQC purposes. Any incorrect submittals found during the OWNER spot check will be immediately corrected by the CQC Manager. If the Contractor fails to keep the FIO submittals current and correct, 2% of the total bid price against the applicable bid item will be withheld. At the completion of the contract, the Contractor will submit the entire file of FIO submittals to the OWNER.

3.8 STAMPS

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

CONTRACTOR (Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s).
SIGNATURE: _____
TITLE: _____
DATE: _____

-- End of Section --

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SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
08/10

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

ALUMINUM ASSOCIATION (AA)
National Headquarters
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209
Ph: 703-358-2960
Fax: 703-358-2961
Internet: http://www.aluminum.org

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
E-mail: service@astm.org
Internet: http://www.astm.org

Occupational Safety & Health Administration - CONSTRUCTION (OSHA)
200 Constituion Ave, NW
Washington, DC 20210
Ph: 800-321-OSHA (6742)

U.S. ARMY CORPS OF ENGINEERS (USACE)
Order CRD-C DOCUMENTS from:
Headquarters Points of contact
441 G Street NW
Washington, DC 20314-1000

Ph: 202-761-0011
E-mail: hq-publicaffairs@.usace.army.mil
Internet: http://www.wes.army.mil/SL/MTC/handbook.htm
Order Other Documents from:
USACE Publications Depot
Attn: CEHEC-IM-PD
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081
Fax: 301-394-0084
E-mail: pubs-army@usace.army.mil
Internet: http://www.usace.army.mil/publications
or http://www.hnd.usace.army.mil/techinfo/engpubs.htmU.S.
ENVIRONMENTAL PROTECTION AGENCY (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20004
Ph: 202-272-0167
for Fax and E-mail see below
Internet: http://www.epa.gov
--- Some EPA documents are available only from:
National Technical Information Service (NTIS)
5301 Shawnee Road
Alexandria, VA 22312
Ph: 703-605-6050 or 1-688-584-8332
Fax: 703-605-6900
E-mail: info@ntis.gov
Internet: http://www.ntis.gov

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road
College Park, MD 20740-6001
Ph: 866-272-6272
Fax: 301-837-0483
E-mail: contactcenter@gpo.gov
Internet: http://www.archives.gov
Order documents from:
Superintendent of Documents
U.S.Government Printing Office (GPO)
732 North Capitol Street, NW
Washington, DC 20401
Ph: 202-512-1800
Fax: 202-512-2104
E-mail: contactcenter@gpo.gov
Internet: http://www.gpoaccess.gov

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not used

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SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS
05/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511	(2017) Reduced-Pressure Principle Backflow Prevention Assembly

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
FCCCHR Manual	(10th Edition) Manual of Cross-Connection Control

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241	(2013; Errata 2015) Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14) National Electrical Code

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(2015; Rev L) Obstruction Marking and Lighting

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2015) Manual on Uniform Traffic Control Devices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for [Contractor Quality Control approval.][information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan; G[, [_____]]

Traffic Control Plan; G[, [_____]]

Haul Road Plan; G[, [_____]]

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certification

Backflow Preventers Certificate of Full Approval

1.3 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

1.4 BACKFLOW PREVENTERS CERTIFICATE

Certificate of Full Approval from FCCCHR List, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

1.4.1 Backflow Tester Certificate

Prior to testing, submit to the Contracting Officer certification issued by the State or local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with any company participating in any other phase of this Contract.

1.4.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that

states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

1.5 DOD CONDITION OF READINESS (COR)

DOD will set the Condition of Readiness (COR) based on the weather forecast for sustained winds 50 knots (60mph or 95 km/hr) or greater. Contact the Contracting Officer for the current COR setting.

Monitor weather conditions a minimum of twice a day and take appropriate actions according to the aproved Emergency Plan in the accepted Accident Prevention Plan, EM-385-1-1 Section 01 Emergency Planning and the instructions below.

Unless otherwise directed by the Contracting Officer, comply with:

a. Condition FOUR (Sustained winds of 50 knots or greater expected within 72 hours): Normal daily jobsite cleanup and good housekeeping practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Maintain the construction site including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all debris, trash, or objects that could become missile hazards.

b. Condition THREE (Sustained winds of 50 knots or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness.

c. Condition TWO (Sustained winds of 50 knots or greater expected within 24 hours): Curtail or cease routine activities until securing operation is complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment, materials, or remove from the jobsite. Expend every effort to clear all missile hazards and loose equipment from general base areas.

d. Condition ONE. (Sustained winds of 50 knots or greater expected within 12 hours): Secure the jobsite, and leave Government premises.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Within [one] [_____] calendar day[s] of mobilization on site and prior to the commencement of work activities, provide a clear weatherproof covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, Safety and Health Information as required by EM 385-1-1 Section 01 and other information approved by the Contracting Officer. Coordinate requirements herein with 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS.

2.1.2 Project Identification Signs

The requirements for the signs, their content, and location are [as indicated][and][as specified in Section 01 58 00 PROJECT IDENTIFICATION]. Erect signs within 15 days after receipt of the notice to proceed. Correct the data required by the safety sign daily, with light colored metallic or non-metallic numerals.

2.1.3 Warning Signs

Post temporary signs, tags, and labels to give workers and the public adequate warning and caution of construction hazards according to the EM 385-1-1 Section 04. Attach signs to the perimeter fencing every 150 feet warning the public of the presence of contruction hazards. Signs must require unauthorized persons to keep out of the construction site. Correct the data required by safety signs daily.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Haul Roads

Construct access and haul roads necessary for proper prosecution of the work under this contract in accordance with EM 385-1-1 Section 04. Construct with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic are be avoided. Submit haul road plan for approval. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic barricades will be required. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.3 FENCING

Provide fencing along the construction site and at all open excavations and tunnels to control access by unauthorized personnel. Safety fencing must be highly visible to be seen by pedestrians and vehicular traffic. Specific fencing requirements are as described herein. All fencing will meet the requirements of EM 385-1-1.

2.3.1 Polyethylene Mesh Safety Fencing

Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid, a minimum of 48 inches high and maximum mesh size of 2 inches. Fencing must extend from the grade to a minimum of 48 inches above the grade and be tightly secured to T-posts spaced as necessary t maintain a rigid and taut fence. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any

direction with less than 4 inches of deflection.

2.3.2 Chain Link Panel Fencing

Temporary panel fencing must be galvanized steel chain link panels [6] [8] feet high. Multiple fencing panels may be linked together at the bases toform long spens as needed. Each panel base must be weighted down using sand bags or other suitable materials in order ofr the fencing to withstand anticipated winds while remaining upright. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.3 Post-Driven Chain Link Fencing

Temporary post-driven fencing must be galvanized chain link fencing [6] [8] feet high supported by an tightly secured to galvanized steel posts driven below grade. Fence posts must be located on minimum 10 foot centers. Posts may be set in various sufaces such as sand, soil, ashpalt or concrete as necessary. Chain link fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection. Fencing and posts must be completely removed at the completion of construction and any surfaces disturbed or damaged must be restored to its original condition. Underground utilities must be located and identified prior to setting fence posts. Fence must be equipped with a lockable gate. Gate must remain locked when construction personnel are not present.

2.4 TEMPORARY WIRING

Provide temporary wiring in accordance with EM 385-1-1 Section 11, NFPA 241 and NFPA 70. Include monthly inspection and testing of all equipment and apparatus.

2.5 BACKFLOW PREVENTERS

Reduced pressure principle type conforming to the applicable requirements AWWA C511. Provide backflow preventers complete with [150 pound] [_____] flanged [cast iron], [bronze][brass] mounted gate valve [and strainer], [304][_____] stainless steel or bronze, internal parts. [The particular make, model/design, and size of backflow preventers to be installed must be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the FCCCHR List and be accompanied by a Certificate of Full Approval from FCCCHR List.] [After installation conduct Backflow Preventer Tests and provide test reports verifying that the installation meets the FCCCHR Manual Standards.]

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Construction contract employees will park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Employee parking must not interfere with existing and established parking requirements of the government installation.

3.2 TEMPORARY BULLETIN BOARD

Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

3.3 AVAILABILITY AND USE OF UTILITY SERVICES

3.3.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.3.2 Payment for Utility Services

a. The Government will make all reasonably required utilities available from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed will be charged to or paid at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. Carefully conserve any utilities furnished without charge.

b. Reasonable amounts of the following utilities will be made available [without charge.] [at the prevailing rates.] [at the following rates:]

Utility Services		
	Cost ($) per	Unit
Electricity		
Potable Water		
Salt Water		
Compressed Air		
Steam		
Natural Gas		
Sanitary Sewer		

c. The point at which the Government will deliver such utilities or services and the quantity available is as indicated. Pay all costs incurred in connecting, converting, and transferring the utilities to the work. Make connections, including [providing backflow-preventing devices on connections to domestic water lines;] [providing meters;] and providing transformers; and make disconnections.

3.3.3 Meters and Temporary Connections

Provide and maintain necessary temporary connections, distribution lines, and meter bases (Government will provide meters) required to measure the amount of each utility used for the purpose of determining charges. Notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot

connection after inspection and approval of the Contractor's temporary wiring installation. Do not make the final electrical connection.

3.3.4 Advance Deposit

An advance deposit for utilities consisting of an estimated month's usage or a minimum of $50.00 will be required. The last monthly bills for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed prior to the end of the current fiscal year.

3.3.5 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. Then remove all the temporary distribution lines, meter bases, and associated paraphernalia. Pay all outstanding utility bills before final acceptance of the work by the Government.

3.3.6 Sanitation

[a. Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into any municipal, district, or commercial sanitary sewer system. Any penalties or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.]

3.3.7 Telephone

Make arrangements and pay all costs for telephone facilities desired.

3.3.8 Obstruction Lighting of Cranes

Provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 100 feet above ground level. Light construction and installation must comply with FAA AC 70/7460-1. Lights must be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer.

3.3.9 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials [daily][weekly][monthly] to minimize potential hazards.

3.4 TRAFFIC PROVISIONS

3.4.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. [Make all notifications and obtain any permits required for modification to traffic movements outside Station's jurisdiction.]. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.

c. Provide, erect, and maintain, at contractors expense, lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage, overhead protection authority having jurisdiction.

3.4.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

3.4.3 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations for [_____] without notification to and approval by the Contracting Officer.

3.4.4 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Coordinate dust control methods with 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

3.5 CONTRACTOR'S TEMPORARY FACILITIES

Contractor-owned or -leased trailers must be identified by Government assigned numbers. Size and location of the number will comply with [_____]. Apply the number to the trailer within [14][_____] calendar days of notification, or sooner, if directed by the Government. Temporary

facilities will meet requirements as identified in EM 385-1-1 Section 04.

[3.5.1 Quality Control Manager Records and Field Office

Provide on the jobsite an office with approximately [100][200][_____] square feet of useful floor area for the exclusive use of the QC Manager. Provide a weathertight structure with adequate [heating and cooling,] toilet facilities, lighting, ventilation, a 4 by 8 foot plan table, a standard size office desk and chair, computer station, and working communications facilities. [Provide either a 1,500 watt radiant heater and a window-mounted air conditioner rated at 9,000 Btus minimum or a window-mounted heat pump of the same minimum heating and cooling ratings.] Provide a door with a cylinder lock and windows with locking hardware. Make utility connections. Locate [as directed][where indicated]. File quality control records in the office and make available at all times to the Government. After completion of the work, remove the entire structure from the site.

]3.5.2 Safety Systems

Protect the integrity of any installed safety systems or personnel safety devices. Obtain prior approval from Contracting Officer if entrance into systems serving safety devices is required. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

3.5.3 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will [not] be available to the Contractor's personnel.

3.5.4 Storage Area

Construct a temporary 6 foot high chain link fence around trailers and materials. Include plastic strip inserts, colored [green][brown], so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not place or store trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on any given day. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

3.5.5 Supplemental Storage Area

Upon request, and pending availability, the Contracting Officer will designate another or supplemental area for the use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. The area will be maintained in an clean and orderly fashion and secured if needed to protect supplies and equipment. Utilities will

not be provided to this area by the Government.

3.5.6 Appearance of Trailers

a. Trailers which are rusted, have peeling paint or are otherwise in need of repair will not be allowed on Installation property. Trailers must present a clean and neat exterior appearance and be in a state of good repair.

b. and maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal.

3.5.7 Maintenance of Storage Area

a. Keep fencing in a state of good repair and proper alignment. Grassed or unpaved areas, which are not established roadways, and will be traversed with construction equipment or other vehicles, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers will be edged or trimmed neatly.

3.5.8 New Building

In the event a new building is constructed for the temporary project field office, it will be a minimum 12 feet in width, 16 feet in length and have a minimum of 7 feet headroom. Equip the building with approved electrical wiring, at least one double convenience outlet and the required switches and fuses to provide 110-120 volt power. Provide a work table with stool, desk with chair, two additional chairs, and one legal size file cabinet that can be locked. The building must be waterproof, supplied with a heater, have a minimum of two doors, electric lights, a telephone, a battery operated smoke detector alarm, a sufficient number of adjustable windows for adequate light and ventilation, and a supply of approved drinking water. Approved sanitary facilities must be furnished. Screen the windows and doors and provide the doors with dead bolt type locking devices or a padlock and heavy duty hasp bolted to the door. Door hinge pins will be non-removable. Arrange the windows to open and to be securely fastened from the inside. Protect glass panels in windows by bars or heavy mesh screens to prevent easy access. In warm weather, furnish air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 20 degrees F below the outside temperature when the outside temperature is 95 degrees F. Any new building erected for a temporary field office must be maintained during the life of the contract. Unless otherwise directed by the Contracting Officer, remove the building from the site upon completion and acceptance of the work.

3.5.9 Security Provisions

Provide adequate outside security lighting at the temporary facilities. The Contractor will be responsible for the security of its own equipment.

3.5.10 Weather Protection of Temporary Facilities and Stored Materials

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

3.5.10.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

3.6 GOVERNMENT FIELD OFFICE

3.6.1 Resident Engineer's Office

Provide the [Government Resident Engineer] [Government Engineer] with an office, approximately 200 square feet in floor area, located where directed and providing space heat, [air conditioning unit,] electric light and power, and toilet facilities consisting of one lavatory and one water closet complete with connections to water and sewer mains. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door. Include a 4 by 8 foot plan table,[computer work space] a standard size office desk and chair, and telephone. At completion of the project, the office will remain the property of the Contractor and be removed from the site. Utilities will be connected and disconnected in accordance with local codes and to the satisfaction of the Contracting Officer. Compliance with safety and appearance requirements for temporary facilities stated in previous paragraphs is required.

3.6.2 Trailer-Type Mobile Office

The option is available to, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer to meet the requirements of the minimum facilities specified above. Securely anchor the trailer to the ground at all four corners to guard against movement during high winds. Coordinate requirements for proper anchoring with EM 383-1-1 Section 04.

3.7 PLANT COMMUNICATIONS

Whenever the individual elements of the plant are located so that operation by normal voice between these elements is not satisfactory, install a satisfactory means of communication, such as telephone or other suitable devices and make available for use by Government personnel.

3.8 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. Maintain the safety fencing during the life of the contract and, upon completion and acceptance of the work,

removefrom the work site.

3.9 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store any salvageable materials resulting from demolition activities within the fenced area described above or at the supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

3.10 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and any other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence. Restore areas used during the performance of the contract to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 02 41 00

SITE DEMOLITION AND RESTORATION
11/12

PART 1 GENERAL

1.1 SCOPE

The work includes demolition, salvage of identified items and materials, removal of resulting rubbish and debris, and site restoration. Rubbish and debris shall be removed from the property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Quality Assurance Representative. In the interest of occupational safety and health, the work shall be performed in accordance withthe latest version of the Occupational Safety and Health Administration (OSHA) Manual. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be disposed of as specified herein.

1.2 REFERENCES

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

Occupational Safety & Health Administration (OSHA)

1926 Subpart T	(75 FR 48135, Aug. 9, 2010; 77 FR 49730, Aug. 17, 2012; 78 FR 23843, April 23, 2013) Demolition

1.3 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan; E DA

This work plan shall include the procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, and coordination with other work in progress. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with OHSA 1926 Subpart T.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site

and to avoid creation of a nuisance in the surrounding area. Use of water shall not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding, or pollution.

1.5 PROTECTION

1.5.1 Protection of Personnel

During the demolition work, the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.2 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Quality Assurance Representative showing the condition of structures and other facilities adjacent to areas of alteration or removal. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the OWNER or Levee District; any damaged items shall be repaired or replaced as approved by the Quality Assurance Representative at no additional cost to the OWNER. Unless otherwise noted on the drawings, all existing property shall be restored to its original pre-construction condition, following the completion of the project. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required.

1.5.3 Protection From the Weather

Any salvageable materials and equipment shall be protected from the weather at all times.

1.5.4 Protection of Trees

Trees within the project site which might be damaged during demolition and which are not indicated for removal shall be protected by a 6 foot high webbed construction fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Quality Assurance Representative.

1.5.5 Environmental Protection

The work shall comply with the requirements of SECTION 01 11 30 ENVIRONMENTAL PROTECTION.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 DEMOLITION PLAN

The Contractor shall submit for approval, a demolition plan, which at a minimum includes the following: procedures proposed for the accomplishment of the work; safety concerns and procedures; procedures and methods to provide necessary supports, lateral bracing and shoring when required; plan for removal and disposition of materials specified to be salvaged; coordination with other work in progress; a detailed description of the methods and equipment to be used for each operation; and the sequence of removal and demolition operations.

3.2 EXISTING STRUCTURES

3.2.1 Salvageable Items

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible. Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

3.2.2 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units. Cut chain link fabric to 25 foot lengths and store in rolls off the ground.

3.3 EXISTING UTILITIES

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing and after approved in the demolition plan by the Quality Assurance Representative. Remove and relocate/replace existing utilities as indicated by the drawings and terminate when necessary in a manner conforming to the nationally recognized code covering the specific utility and approved by the Quality Assurance Representative. When utility lines are encountered but are not indicated on the drawings, notify the Quality Assurance Representative prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Quality Assurance Representative.

3.4 REPAIR AND/OR REPLACEMENT ITEMS

3.4.1 Paving and Slabs

Remove sawcut concrete and asphaltic concrete paving and slabs, including aggregate base, as indicated on the drawings to a depth necessary to complete the construction of the project. Provide neat sawcuts at limits of pavement removal as required. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Quality Assurance Representative. Pavement and slabs not to be used in this project shall be removed from the site at the

Contractor's expense. Remove and replace curbs and gutters as indicated. Materials used to replace paving and slabs shall be in accordance with IDOT Standard Specifications.

3.4.2 Gravel Roads

Materials used to repair or replace gravel roads shall be in accordance with IDOT Standard Specifications.

3.4.3 Waterline

Contractor shall remove portion(s) of the existing 36-inch waterline, as shown on the construction drawings, for the construction of the Cut Off Wall. Contractor shall replace removed sections with new, same material, thickness, and class as the existing pipe. Contractor shall conform to all AWWA and ASTM standards pertaining to the pipe material for construction and installation.

3.5 DISPOSITION OF MATERIAL AND CLEAN UP

The removed materials shall become the property of the Contractor. Removals, debris and rubbish shall be removed from the project site. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

-- End of Section --

SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE (CIP) CONCRETE
04/08

PART 1 GENERAL

1.1 SUMMARY

This work shall consist of the furnishing of all labor, materials and equipment necessary for the construction of the proposed CIP Concrete in accordance with the Contract Drawings and Specifications. Contractor shall pay for all permits required under this Specification.

1.2 UNIT PRICES

Miscellaneous CIP concrete will be included in the lump-sum contract price, and will not be measured or paid on a unit cost basis. Payment will constitute full compensation for furnishing all materials, equipment, plant, and tools; and for all labor and other incidentals necessary to complete work required by this section of the specification.

1.3 REFERENCES

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

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT)

Standard Specifications	(2012) Standard Specifications for Road and Bridge Construction

1.4 STANDARD SPECIFICATIONS

All work, installation, procedures, materials, etc. shall be in conformance with Construction Publication 408/PUB 408 , adopted April 3,2000 by the Pennsylvania Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification.

1.5 RELATED SECTIONS

Miscellaneous CIP concrete shall use Section 33 26 00.00 10 - RELIEF WELLS in addition to this section.

1.6 SYSTEM DESCRIPTION

Perform the work consisting of installing formwork, providing material, placing, finishing, removing formwork for miscellaneous CIP concrete composed of portland cement concrete with or without reinforcement, constructed at or below grade. Typical installation of miscellaneous CIP concrete includes concrete collars on storm pipe. Miscellaneous CIP concrete designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections shown on the drawings. Miscellaneous CIP concrete shall meet the requirements of Section 503 - "Concrete Structures", Section 1006 -

"Metals", and Section 1020 - "Portland Cement Concrete" of the Standard Specifications, except as noted herein.

1.7 SUBMITTALS

Engineer/Designer of record approval is required for submittals with an "E DA" designation. All submittals are to be reviewed by the submitting contractor's quality control personnel, prior to submission to the Quality Assurance Representative, to ensure conformance to the design. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; E DA

SD-03 Product Data

Conveying and Placing Concrete; E DA
Ready-Mix Concrete; E DA

SD-06 Test Reports

Compressive Strength Testing; E DA
Slump; E DA
Delivery ticket specifying concrete mix; E DA

PART 2 PRODUCTS

2.1 Concrete

Provide portland cement concrete in accordance with Section 1020 - "Portland Cement Concrete" of the Standard Specifications, based on the following criteria and requirements:

Class of Concrete:	SI	1020.04
Portland Cement Type:	Type I Cement	1001.01
Compressive Strength:	4,000 psi (at 28 days)	1020.04
Fine Aggregate Gradation:	FA 1 or FA 2	1003.01
Fine Aggregate Quality:	Class A	1003.01
Coarse Aggregate Gradation:	CA 11	1004.01
Coarse Aggregate Quality:	Class A	1004.01

2.2 REINFORCEMENT BARS

Provide reinforcement bars in accordance with Section 1006 - "Metals" of the Standard Specifications, based on the following criteria and requirements:

Deformed Bars (uncoated):	Grade 60	1006.10

PART 3 EXECUTION

3.1 EQUIPMENT

Equipment used in the production, placement, and finishing of the miscellaneous CIP concrete shall meet the requirements of Section 503.03 and Section 1020.03 of the Standard Specifications.

3.2 CONSTRUCTION

Construction methods shall meet the requirements of Sections 503.04 through 503.19 of the Standard Specifications.

3.3 PREPARATION OF THE CONCRETE MIXTURE

Portland cement concrete ready mix material shall be produced in accordance with Section 1020 of the Standard Specifications, by a plant certified by IDOT for the production of PCC products.

3.4 TRANSPORTATION

Transportation of the ready mix concrete to the job site shall be in accordance Section 1020.11 of the Standard Specifications.

3.5 CONTRACTOR QUALITY CONTROL / QUALITY ASSURANCE (QA/QC)

The contractor shall complete QA/QC in accordance with Section 503 - "Concrete Structures" and Section 1020 - "Portland Cement Concrete" of the Standard Specifications, including sampling, testing and reporting.

3.6 ANTICIPATED CONTRACTOR QUALITY CONTROL

Installation Drawings

Conveying and Placing Concrete
Ready-Mix Concrete
Compressive Strength Testing
Slump
Delivery ticket specifying concrete mix

-- End of Section --

SECTION 13 50 00

GEOTECHNICAL INSTRUMENTATION
02/02

PART 1 GENERAL

1.1 Scope

The Contractor shall furnish, install, collect and interpret data, and maintain geotechnical instrumentation; protect instrumentation from damage.

1.2 References

ASTM INTERNATIONAL (ASTM)

ASTM A 865/A 865M	(2006) Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 778	(2006) Standard Specification for Standard Sand
ASTM D 5092	(2004; R 2010e1) Design and Installation of Ground Water Monitoring Wells in Aquifers

1.3 Qualifications of Contractor's Instrumentation Personnel

Geotechnical instrumentation work involves highly specialized tasks. The Contractor's instrumentation personnel who are responsible for furnishing and installing all geotechnical instrumentation and maintaining instrumentation, as required, shall have the qualifications specified herein, and shall provide resumes for instrumentation personnel demonstrating the required qualifications. These personnel may be on the staff of the Contractor or may be on the staff of a specialist instrumentation subcontractor.

(a) The Contractor's instrumentation personnel shall include a qualified Geotechnical Instrumentation Engineer who is a registered Professional Engineer in any State, who has a minimum of a Bachelor of Science degree in civil engineering, and who has at least 4 years of experience in installation of the types of instruments specified herein. The Geotechnical Instrumentation Engineer shall:

(1) Prepare detailed step-by-step Contractor Installation Plan describing the installation procedures to be used for all instruments specified herein.

(2) Be on site and supervise at least the first two installations of each type of instrument.

(3) Conduct the pre-installation and post-installation acceptance

tests for at least the first two of each type of instrument specified herein.

(4) Be on-site until the completion and acceptance tests for at least the first two of each type of instrument specified herein.

(5) Prepare a detailed Monitoring Plan and perform all instrumentation monitoring included in the approved plan.

(6) Perform instrumentation monitoring during and after the installation of the slurry trench. Provide daily monitoring reports and a final instrumentation monitoring report.

(b) The Contractor's instrumentation personnel shall include a Superintendent who will be in responsible charge full-time on site during the geotechnical instrumentation program. The Superintendent shall have at least 4 years of direct field experience in installation of the types of instrumentation specified herein, and shall have supervised instrumentation programs of similar magnitude in similar subsurface conditions. The Superintendent shall be on-site and supervise all instrument installations, pre-installation, and post-installation acceptance tests, after the Geotechnical Instrumentation Engineer has performed these three tasks for the first two of each instrument type.

(c) The Contractor's instrumentation personnel resumes including the Geotechnical Instrumentation Engineer, and the Superintendent, shall be submitted to the Quality Assurance Representative and GEOTECHNICAL ENGINEER for approval. If requested by the Quality Assurance Representative, the Contractor shall replace any person in the position of Geotechnical Instrumentation Engineer or Instrumentation Superintendent who fails to properly perform their required tasks as defined herein.

1.4 Purpose of Geotechnical Instrumentation Program

Purposes of the Geotechnical Instrumentation Program include, but are not limited to:

(a) Providing pre-construction baseline data for comparison with construction and post-construction data.

(b) Monitoring of ground movement and pore-pressure during and after construction. Monitoring to be performed by the Contractor's instrumentation personnel.

(c) Providing a warning of unforeseen conditions that may require remedial or precautionary measures.

1.5 Responsibilities of Contractor

(a) Furnish all components of geotechnical instrumentation required by the Contract.

(b) Install instruments specified in the Contract.

(c) Protect from damage and maintain instruments installed by the Contractor. Repair or replace damaged or inoperative instruments throughout the duration of the Contract.

(d) Provide data collection (monitoring) and inspection of the

instrumentation.

(e) Prepare daily monitoring reports and a final instrumentation monitoring report.

1.6 Submittals

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Personnel Resumes; E DA

Within 10 calendar days after Notice to Proceed, submit to the Quality Assurance Representative (OWNER's Geotechnical designers) for review:

(a) Resumes of Geotechnical Instrumentation Engineer and Superintendent sufficient to define details of relevant site experience.

(b) Resumes of other field and office geotechnical instrumentation personnel to be assigned to the project, other than clerical staff.

(c) Proposed equipment and products for all instrumentation. Name, make, product name and details of installation.

SD-03 Product Data

Factory/Manufacturer Information; E DA

Within 7 calendar days of receipt of each instrument at the site, submit to the GEOTECHNICAL ENGINEER a copy of factory calibration, manufacturer's calibration and test equipment certification, completed copy of quality assurance checklist, and warranty for each portable readout unit.

SD-05 Design Data

Contractor Installation Plan; E DA

At least 15 calendar days prior to commencing installation of the first of each type of instrument, submit to the GEOTECHNICAL ENGINEER for review the following items pertaining to that instrument type:

(a) Detailed step-by-step procedure for installation, together with a sample installation record sheet. The procedures shall be bound and indexed. The installation procedures shall include:

(1) The method to be used for cleaning the inside of casing or augers.

(2) Specifications for proposed grout mixes, including

commercial names, proportions of admixtures and water, mixing sequence, mixing methods and duration, pumping methods and tremie pipe type, size and quantity.

(3) Drill casing or auger type and size.

(4) Depth increments for backfilling boreholes with sand and granular bentonite.

(5) Method for overcoming buoyancy of instrumentation components during grouting.

(6) Method of sealing joints in pipes and inclinometer casing to prevent ingress of grout.

(7) Method of conducting pre-installation and post-installation acceptance test.

(8) Method for protecting instruments from damage.

(9) Methods to allow for compression of instruments due to consolidation of the foundation without damaging the instrument.

(b) A chart indicating the proposed time sequence of instrument installation.

(c) Sample of the quality assurance checklist, pre-installation acceptance test record, and installation record for each instrument type to be used to check instruments on receipt from the manufacturer.

(d) A plan of action that outlines the most appropriate remedial measure to mitigate excess movement within the excavated panel.

SD-06 Test Reports

Instrumentation Testing; E DA

Within 7 calendar days of receipt of each instrument at the site, submit to the Quality Assurance Representative completed pre-installation acceptance test record form for that instrument.

Within 5 calendar days prior to installing each instrument, submit to the Quality Assurance Representative the installation record sheet for that instrument, including as-built instrument location as specified.

Within 5 calendar days prior to installation, submit to the Quality Assurance Representative the filter sand gradation to be utilized in the placement of the instrumentation.

Monitoring Plan; E DA

The Contractor's instrumentation personnel shall submit to the OWNER's Geotechnical designers a detailed monitoring plan and perform all instrumentation monitoring included in the approved monitoring plan.

Daily Monitoring Reports; E DA

The Contractor's instrumentation personnel shall provide to the OWNER's Geotechnical designers daily monitoring reports once a day throughout the slurry trench construction period. The daily reports shall be submitted to the Quality Assurance Representative the day of receiving the instrumentation data needed to complete each report. The daily monitoring reports shall include pertinent groundwater information and inclinometer readings performed during installation of the slurry trench. Inclinometer readings need only be taken during construction when the panel and adjacent panel corresponding to the specific instrument is being installed. All piezometer readings shall always be taken.

The daily reports shall be presented in a recognized fashion. Groundwater levels shall be plotted with water elevation (using the contract datum) vs. time. Inclinometer readings shall also be plotted cumulatively so as to show the movement with time. Both tabular and graphical data should be included within each report.

Final Instrumentation Monitoring Report; E DA

At the end of the slurry trench construction period the Contractor's instrumentation personnel shall submit a concise, comprehensive Final Instrumentation Report that documents field results. Within this report the instrumentation personnel shall present all results in an organized fashion documenting the changes in groundwater elevation throughout the installation of the project and the movement incurred by the inclinometers during installation of the panels. The report shall document, at a minimum, anomalies observed, issues with the instrumentation readings, and any decisions undertaken due to instrument response.

SD-07 Certificates

Instrumentation Calibration; E DA

A factory calibration shall be conducted on all instruments prior to shipment to the Site. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the National Institute of Standards and Technology. Additional factory calibrations shall be required on the schedule as recommended by the manufacturer, whenever equipment is suspected to have suffered damage, or where anomalies are considered by the QA officer to potentially be the result of mis-calibration.

SD-11 Closeout Submittals

As-Built Plans; E DA

The Contractor shall submit to the Quality Assurance Representative updated as-built instrument location plans within one week of the completion of installation of each instrument. Panel construction may not commence until the As-Built plans have been accepted by the Quality Assurance Representative. As-built plans shall be provided electronically and in hard copy format and shall consist, at a minimum, of 11 by 17 sheets of paper in plan view documenting

locations of installed instruments. It shall also include other pertinent information such as contract alignment of the wall with proposed panel locations, levee center line, utilities and other features of the work site. Additionally, it shall include profile sheets of the as installed instruments detailing vertical locations of all the elements of the instruments (i.e. well screens, casing depths, bentonite plugs, etc.) as well as installed depths and elevations for each instrument installed.

1.7 Scheduling Work

Install instruments and agree on formal initial readings and the following schedule:

(a) Piezometers shall be installed and formal initial readings recorded.

(b) In-Place Inclinometers and manual inclinometers shall be installed and formal duplicate initial readings recorded one week after installation.

(c) Variations in this schedule require the prior review and acceptance by the Quality Assurance Representative.

1.8 Shipment and Storage

All instrumentation materials, after receipt at the site and prior to installation, shall be stored in an indoor, clean, dry, and secure storage space. Instruments shall not be exposed to temperatures outside the manufacturer's stated working temperature range, nor should they be allowed to freeze.

1.9 Contractor Installation Plan

The Contractor shall prepare and submit a detailed step-by-step Contractor Installation Plan for each instrument to be installed.

1.10 As-Built Plans

The Contractor shall submit updated as-built plans in accordance with paragraph entitled "Installation - General".

PART 2 PRODUCTS

2.1 Materials

(a) All materials shall be new.

(b) Whenever any product is specified by brand name and model number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the product desired. The term "acceptable equivalent" shall be understood to indicate that the "acceptable equivalent" product is the same or better than the product named in the specifications in function, performance, reliability, quality, and general configuration. This procedure is not to be construed as eliminating from competition other suitable products of equal quality by other manufacturers. The Contractor may, in such cases, submit complete

comparative data to the Quality Assurance Representative for consideration of another product. Substitute products shall not be ordered, delivered to the site, or used in the Work unless accepted by the Quality Assurance Representative in writing. The Quality Assurance Representative will be the sole judge of the suitability and equivalency of the proposed substitution. The Contractor shall submit Factory/Manufacturer Information for each instrument he proposes to use on the project.

(c) Any request from the Contractor for consideration of a substitution shall clearly state the proposed alternative, the nature of the deviation from the product specified and the reason for the deviation requested. The Contractor will also provide documentation supporting the claim of "acceptable equivalence".

(d) The Contractor shall have specified readout units, together with associated calibration devices and software, for making pre-installation and post-installation acceptance tests, for taking any required readings during installation, and for taking required readings during the course of the work. Such readout units shall be identical to the specified readout units.

(e) The Contractor shall furnish all installation tools, materials, and miscellaneous instrumentation components necessary to install the required instrumentation in a fully functional state.

(f) The Contractor shall provide surface protection to each instrument to protect the instrument from damage by the elements, vandals and the Work activities. The Contractor shall submit proposed protection methods and measures to be used for review and acceptance by the Quality Assurance Representative at least 10 calendar days prior to the start of installation. The Contractor shall maintain and repair all surface protection measures for the duration of the Contract.

(g) All measurements, dimensions and units shall be in U.S. Customary Units, for example, feet, inches, or pounds.

(h) The Contractor shall construct each piezometer to allow for the accurate measurement of ground water depths relative to the top of the well riser, by use of electrical, wetted tape, or acoustical methods. The screened interval is that portion of a piezometer which is directly open to the host aquifer by way of openings in the well screen and indirectly open to the aquifer by way of the filter pack (or other permeable material) extending continuously below and/or above the screen. The piezometer details are shown on the drawings.

2.2 Inclinometers

(a) Inclinometer casing shall be 3.34-inch O.D. ABS or acceptable equivalent with broached internal keyways, and twist tolerance better than one degree per 10-foot length.

(b) Cement grout shall be Type III Portland cement and water. Special grout, Type B shall include cement, bentonite, and water, and shall have approximately the same shear strength and compressibility as the surrounding ground. The cement-bentonite grout mix shall consist of one 94-lb bag of Portland cement, Type III, mixed with 25 to 35 gallons of water. Powdered bentonite at 20 to 40 lbs will be added to cement-water

mix to produce a pumpable grout of thick creamy consistency.

(c) In areas where construction activities will not interfere with the inclinometer casing, installations shall continue to ground elevation. Proper seal of casing is required as to not allow any backfill material to enter the inclinometer casing.

(d) Surface protection shall be 6-inch diameter steel casing with locking cap. This will allow attachment of cable support assembly, or shall allow for an inclinometer casing extension while readings are being taken. The length of the inclinometer cable shall not vary by more than 0.05 inches between depths of readings.

(e) In areas where construction activities will interfere with construction installation inclinometer casing shall be placed inside a protective manhole or structure. The manhole shall be flush with the ground surface and extend 3 feet below the ground surface. The manhole or structure shall be able to withstand the loading induced from the work platform and construction equipment and not damage or affect the integrity of the monitoring system. Proper seal of casing and manhole or structure is required as to not allow any backfill material to enter the inclinometer casing.

2.3 Manual Inclinometers

(a)Provide inclinometer casing, probe, heavy-duty control cable, readout unit, and accessories, as manufactured by Slope Indicator Co., Seattle WA or acceptable equivalent.

(b) Inclinometer probe shall be an English-unit probe with a 2 ft spacing on the wheel base.

(c) Control cable shall be longer than the deepest inclinometer installation to accommodate full measurement range and have depth marks every 1 foot.

(d) Readout unit shall be a Digitilt Datamate II as manufactured by Slope Indicator Co. or acceptable equivalent that includes accessories such as hand switch, battery charger, and USB cable to hook to PC for data download and viewing. A pulley assembly shall be used to provide consistent depth readings.

2.4 In-Place Inclinometers

(a) Provide inclinometer casing, sensors, gauge tubes, dataloggers, and other pertinent accessories, as manufactured by Slope Indicator Co., Seattle, WA or acceptable equivalent.

(b) Inclinometer casing shall be 3.34-inch O.D. ABS or acceptable equivalent with broached internal keyways, and twist tolerance better than one degree per 10-foot length.

(c) Sensors shall be a serial biaxial model 57804622L as manufactured by Slope Indicator Co., or acceptable equivalent capable of being placed in series with other sensors in one installation to monitor zones of interest.

(d) Gauge tube lengths shall be such that serial sensors are placed approximately 5 feet apart and 10 feet apart based on location in

inclinometer casing.

(e) Dataloggers shall be an M-logger as manufactured by Slope Indicator Co, or acceptable equivalent that is specifically designed to read MEMS sensors. Each Datalogger shall be housed in an enclosure with a power supply to record sensor readings.

(f) Provide accessories, consisting of suspension kits, plugs, and jumper cables for taking readings a distance away from the inclinometer installations.

(g) Provide means of connecting to the dataloggers to set up sensors, retrieve readings, and reduce data to monitor displacement.

2.5 Open System Piezometer

(a) WELL CASING: Provide new piezometer well riser, as shown on the plans. Piezometer risers to be set in sands shall be 2 inch diameter galvanized steel pipe meeting the standards of ASTM A 865/A 865M for threaded couplings, steel, black or Zinc-coated (galvanized) welded or seamless, for use in steel pipe joints. Provide 2 inch galvanized steel pipe cap with 1/8 inch diameter hole in top.

(b) CENTRALIZERS: Attach stainless steel or PVC, as appropriate centralizers to the well casing when piezometers are over 20 feet in length. Centralizers are not required if the piezometers are installed through hollow-stem augers.

(c) WELL SCREEN: Provide piezometer well screens, designed and constructed in accordance with paragraph MATERIALS and as shown on the plans. Well screens to be set in sand shall be 2-inch I.D. stainless steel with No. 10 slots. The coupler shall be placed as shown on the plans.

(d) Filter sand shall conform to ASTM C 778 or 20-40 sand.

(e) Granular bentonite shall be Enviroplug Medium, as manufactured by Wyo-Ben, Inc., Billings, MT, or Holeplug, as manufactured by Baroid Division, Petroleum Services, Inc., Houston, TX, or acceptable equivalent.

(f) Special grout Type A shall consist of uniform sized fine ground or powdered non-drilling mud grade bentonite, for use in sealing and grouting well casings. A polymer-based thixotropic additive may also be added to the mix if recommended by the manufacturer. Special grout Type A shall have a mixed specific gravity, prior to placement within the instrument borehole, of between 1.03 and 1.20. The cement-bentonite grout mix shall consist of one 94-lb bag of Portland cement, Type III, mixed with 25 to 35 gallons of water. Powdered bentonite at 20 to 40 lbs will be added to cement-water mix to produce a pumpable grout of thick creamy consistency.

(g) Cylindrical sounding hammer shall be a steel cylinder with outside diameter 0.3 to 0.5 inch less than the inside diameter of the casing or augers, an inside diameter 0.15 to 0.25 inch larger than the outside diameter of the cable, a length of not less than 2 feet, and a weight of 10 to 20 pounds.

(h) Surface protection for the piezometer(s) shall be an 8-inch

diameter, schedule 40, standard weight carbon steel pipe conforming to ASTM A53/A53M pipe collar back filled with concrete in accordance to SECTION 03 30 53 and installed 3-foot below ground surface to 3-foot above ground surface. In addition, each piezometer shall have three (3) bollards; offset 120 degrees around the circumference of the piezometers, installed for the protection of the piezometers since they will be a permanent structure. Bollards shall be 6-inch diameter, schedule 40, standard weight carbon steel pipe conforming to ASTM A53/A53M. Bollards shall be filled with concrete in accordance to SECTION 03 30 53 and installed 3-foot below ground surface to 3-foot above ground surface. Weld four(4) 6-inch long galvanized stud bolts as shown on the plans to bollard pipes. All pipes shall be hot-dipped galvanized and painted or sleeved in safety yellow.

2.6 Automated Piezometer

(a) Provide a self contained, automatic level and temperature recording device as manufactured by Solinst model 3001 Levelogger or acceptable equivalent.

(b) Provide model 3001 Levelogger Edge LT M20 F65, Model 3001 Barologger Edge M1.5 F5, USB package (c/w Optical Reader, PC Interface Cable, CD w/manual and software), 3001 Leveloader Gold (c/w cables (RS232/USB)), direct read cable connect assembly and appropriate direct read cable lengths, 3001 locking well cap assembly (2-inch) for the Levelogger, or acceptable equivalent for all items listed herein.

(c) Provide water tight caps for piezometers that will be potentially inundated. Proper venting system raised above maximum water elevation will be required.

(d) Provide a water tight locking sealed enclosure to run direct read cables underground to a location that can be read at all times including high water events. Provide trenching materials needed to perform burial of cable. Radio communication shall be used for LWR-PZ-7 to retrieve data instead of trenching cable a significant distance. RRL Gold Radio compatible with Solinst transducers or acceptable equivalent shall be used as the radio communication device.

2.7 Instrumentation Calibration

(a) A factory instrumentation calibration shall be conducted on all instruments at the place of manufacture prior to shipment. Each factory calibration shall include a calibration curve with data points clearly indicated, and a tabulation of the data. Each instrument shall be marked with a unique identification number. Quality assurance as factory calibration shall be performed as specified herein previously. The instrumentation calibration shall be submitted to the Quality Assurance Representative.

(b) Upon completion of the drilling and installation of the piezometer piping, and prior to concrete finishing, a falling head test shall be performed to ensure the functionality of the piezometer. The Contractor shall use form WES 798, following this specification, for recording the installation and falling head test. The Falling Head Test Report shall be submitted to the Contracting Officer for approval. The piezometer shall be filled to the top with clear water, and the rate at which the water falls in the riser pipe observed and recorded. The depth to the water shall be recorded every minute for

the first five minutes, and at five-minute intervals thereafter, for a maximum of 30 additional minutes, and a final reading, approximately 24 hours following the start of the falling head test. If the piezometer has been properly installed, the time required for the water in the riser pipe to fall 50 percent of the total fall to the groundwater table should not be appreciably greater, if any, than that listed below:

Type of Material Piezometer Screen Set In
Period of Observation
Approx Time for 50% fall
Silty Sand 10 minutes to 5 minutes.

(c)Factory calibrations of inclinometers shall include comprehensive calibrations of the force balance accelerometers prior to assembly in the probe. A final calibration shall include measurements made at 10 degrees intervals from -30 degrees to +30 degrees with respect to vertical, and a comprehensive repeatability check over +1-5 degrees of vertical.

PART 3 EXECUTION

3.1 Instrumentation Testing

3.1.1 Preinstallation Acceptance Tests

(a) When instruments are received at the site, the Contractor's instrumentation personnel shall perform instrumentation testing to ensure that the instruments and readout units are functioning correctly prior to installation. Pre-installation acceptance tests shall include relevant items from the following list:

(1) Examine factory calibration curve and tabulated data, to verify completeness.

(2) Examine manufacturer's final quality assurance inspection check list, to verify completeness.

(3) Check cable length.

(4) Check tag numbers on instrument and cable.

(5) Check, by comparing with procurement document, that model, dimensions, and materials are correct.

(6) Bend cable back and forth, at point of connection to instrument, while reading the instrument, to verify connection integrity.

(7) Verify that all components fit together in the correct configuration.

(8) Check all components for signs of damage in transit.

(9) Check that quantities received correspond to quantities ordered.

(b) During pre-installation acceptance testing of each instrument, the Contractor's instrumentation personnel shall complete a

pre-installation acceptance test record form.

(c) An instrument that fails the specified pre-installation acceptance test shall be repaired such that it passes a subsequent pre-installation acceptance test, or shall be replaced by an identical instrument at no additional cost to the OWNER.

3.2 Installation - General

(a) The Contractor shall provide Contractor's personnel resumes for instrumentation personnel who shall install instruments in accordance with the Contractor's detailed step-by-step procedures that were submitted as the Contractor Installation Plan and reviewed by the Quality Assurance Representative.

(b) Clearing, grubbing and access roadway improvements will be allowed before instrumentation is installed. Construction of the test section work platform is allowed once the test area inclinometers and the landside piezometers are installed per the approved instrumentation plan and assuming the installed instruments are adequately protected during construction of the platform; alternatively, the inclinometers which penetrate through the test section work platform can be installed after the test section platform is completed and before any trench excavation is initiated. Otherwise, all inclinometers and landside and crown piezometers shall be installed before any excavation and grading begins within the project limits. The riverside piezometers shall be installed after all work is complete.

(c) The Contractor shall submit a Contractor Installation Plan for each instrument to be installed. Installation procedures for instruments in boreholes shall be such that all steps in the procedure can be verified. Granular bentonite shall be placed in depth increments not exceeding 2 feet. Volumes of each increment of backfilling with sand shall be small enough that no bridging of bentonite occurs. The depth to the top of each instrument of sand or granular bentonite shall be checked after placement.

(d) Grout shall be placed using a tremie method with side discharge ports on the tremie pipe.

(e) Prior to installing any instrument through drill casing or augers, all material adhering to the inside of the casing or augers, and all cuttings, shall be removed thoroughly.

(f) Whenever withdrawing drill casing or augers during instrument installation in a borehole, care shall be taken to minimize the length of unsupported borehole and the rate of casing or auger withdrawal. Collapse of the borehole shall not be allowed to occur. Backfill material shall not be allowed to build up inside the casing or auger such that the instrument is lifted as the casing or auger is withdrawn. The casing or auger shall be withdrawn without rotation. The casing or auger may be omitted, if allowed by the Quality Assurance Representative, only where it can be shown that instrument installation without the casing or auger will not cause collapse of the borehole or in any way adversely affect instrument installation. If casing or augers are omitted, or the Quality Assurance Representative allows withdrawal of casing or augers prior to instrument installation, the following requirements shall apply. The instrument shall be installed in the borehole in a continuous

operation, starting when instrumentation materials are first placed in the borehole, and shall not be interrupted prior to complete backfilling of the borehole to the ground surface. Partially completed instrument installations shall not be left in unsupported boreholes overnight or longer without the prior written concurrence of the Quality Assurance Representative.

(g) The Contractor shall notify the Quality Assurance Representative at least 24 hours prior to installing each instrument.

(h) The Contractor shall install instrumentation, in addition to that specified herein, that the Contractor deems necessary to ensure the safety of personnel and the work, at no additional cost to the OWNER. The Contractor shall notify the Quality Assurance Representative at least 24 hours prior to installing any such additional instrumentation. Data resulting from such instrumentation are referred to herein as Contractor's data. Such Contractor's data will be accepted by the Quality Assurance Representative only if the data are obtained from instrumentation furnished, calibrated, tested, installed, and maintained as specified herein, if the data are collected and plotted as specified herein, and if submitted to the Quality Assurance Representative within one month of data collection.

(i) The Contractor shall extend installed instrumentation and reinstall protection measures as necessary as grade changes occur, and revise instrument reference elevations as necessary.

(j) As each instrument is installed, an installation record sheet shall be prepared, including appropriate items from the following list:

(1) Project name.

(2) Contract name and number.

(3) Instrument type and number, including readout unit.

(4) Planned location in horizontal position and elevation.

(5) Planned orientation.

(6) Planned lengths and volumes of backfill.

(7) Personnel responsible for installation.

(8) Plant and equipment used, including diameter and depth of any drill casing or augers used.

(9) Date and time of start and completion.

(10) Spaces on record sheet for necessary measurements or readings required at hold points during installation to ensure that all previous steps have been followed correctly, including instrument readings made during installation.

(11) A log of subsurface data indicating the elevations of strata changes encountered in the borehole. Strata soil nomenclature shall be based on profiles and boring logs contained in the Geotechnical Data Report.

(12) Type of backfill used.

(13) As-built plans with location in horizontal position and elevation including:

(a) Elevation referenced to the Project Elevation Datum, together with the location of the point used for the elevation measurement.

(b) Horizontal position referenced both to Pennsylvania State Plane Grid Coordinates, as referenced to the North American Datum of 1983 (NAD 83), and to project Baseline Station and Offset, together with the location of the point used for horizontal position measurement.

(c) A location sketch showing the instrument number, taped horizontal ±1 foot from permanent physical features in the field. A sufficient number of taped measurements shall be included on the sketch to establish a unique horizontal position for the instrument. If such features are removed, the Contractor shall provide a new sketch, prior to removal, with taped measurements to other features.

(14) As-built orientation.

(15) As-built lengths and volumes of backfill.

(16) Result of post-installation acceptance test.

(17) Weather conditions at the time of installation.

(18) A space on record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on instrument behavior.

(k) An instrument that fails the specified post-installation acceptance test shall be replaced by an identical instrument at no additional cost to the OWNER.

(l) The Contractor shall submit updated as-built plans showing instrument location plans to the Quality Assurance Representative within 5 calendar days of completion of the instrumentation installations. The location plans shall be reproducible composite plans of all installed instruments plotted on 11 inch by 17 inch or 24 inch by 36 inch sheets at a scale of 1 inch = 100 feet. The first plans shall be submitted within one month after completion of the first instrument installation, regardless of instrument type. Updated plans shall be submitted every subsequent 4 weeks. Updated plans need not be submitted for periods during which no instruments have been installed.

3.3 Installation of Inclinometers

(a) Inclinometer casings shall be installed at the locations and depths shown on the Plans or as specified herein or as directed by the Quality Assurance Representative. The inclinometer casing shall be installed so that it is at the middle of the proposed panel layout at that location. After installation, the casing groove spiral shall not

exceed one degree per 10 feet of length, the orientation of the grooves at the top of the casing shall be within 10 degrees of the planned orientation, and no part of the casing shall deviate from vertical by more than 4 percent of the depth to that part. The bottom of the casing shall be a minimum of 15 feet below the top of the selected rock layer. In areas where construction activities will not interfere with the inclinometer casing, installations shall continue to ground elevation. Surface protection shall be 6-inch diameter steel casing with locking cap. In areas where construction activities will interfere with construction installation inclinometer casing shall be placed inside a protective manhole or structure. The manhole shall be flush with the ground surface and extend 3 feet below the ground surface. The manhole or structure shall be able to withstand the loading induced from the work platform and construction equipment and not damage or affect the integrity of the monitoring system. Proper seal of casing and manhole or structure is required as to not allow any backfill material to enter the inclinometer casing.

(b) Bottom of inclinometers shall be set to an elevation of 10 feet into sound rock at each location.

(c) The Contractor shall sample through the clays with 5-inch Shelby tubes with a piston sampler for each inclinometer installed. The Shelby tubes will be extruded on site and a drilling log prepared by a registered geologist or registered professional engineer shall be submitted to the Quality Assurance Representative within 24 hours.

(d) Correct casing groove orientation shall be maintained throughout installation. Once installed the casing cannot be rotated to align the grooves.

(e) Standard couplings shall be installed.

(f) An anchoring system with bottom cap shall be installed to fix the casing to competent bedrock.

(g) After completion of installation, a post-installation acceptance test shall be performed to verify that there is no grout in the inclinometer casing, that groove orientation and verticality are correct, and that the inclinometer probe tracks correctly in all four orientations.

(h) After completion of installation, the as-built location in horizontal position shall be determined to an accuracy of ± 0.03 foot, and the elevation of the top of the inclinometer casing to an accuracy of ± 0.01 foot. The point selected to determine horizontal position shall be marked on the casing and indicated on the installation record sheet.

3.4 Installation of In-Place Inclinometers

(a) In-Place Inclinometers shall be installed at the locations and depths shown on the Plans or as directed by the Quality Assurance Representative.

(b) The contractor shall install serial sensors such that the first sensor is located as close to the top of the casing as allowed by the manufacturer. The next 4 serial sensors shall be spaced 5 feet apart. After the 4 sensors have been installed on 5 feet intervals the serial

sensors shall be placed on 10 foot intervals until bedrock has been encountered with a maximum allowable numbers of sensors 16 in the casing. If 16 sensors are utilized prior to reaching bedrock the contractor shall not place any additional sensors in the casing.

(c) The contractor shall obtain and install all products located in paragraph 2.4 according to the manufacturer's instructions.

3.5 Installation of Piezometers

(a) Piezometers shall be installed at the locations and depths shown on the Plans or as directed by the Quality Assurance Representative.

(b) Maintain an open hole with casing. Bentonitic drilling mud shall not be used.

(c) The Contractor shall sample through the clays with 5-inch Shelby tubes with a piston sampler for each piezometer installed. The Shelby tubes will be extruded on site and a drilling log prepared by a registered geologist or registered professional engineer shall be submitted to the Quality Assurance Representative within 24 hours. The log will be utilized to verify and confirm the locations of the piezometers tip.

(d) Provide sufficient diameter in borings for piezometers installation to permit at least 2 inches of annular space between the boring wall and all sides of the centered riser pipe and screen. Determine depths of individual borings as indicated on the drawings.

(e) Provide the piezometer well screen in length as shown on the drawings and set to the appropriate depth.

(f) Place the bottom of the well screen no more than 2.0 feet above the bottom of the drilled borehole.

(g) Provide watertight flush threaded joints and fastenings; solvent glue or set screws are not permitted.

(h) Make the piezometers centered and plumb by the use of a minimum of 1centralizer, spaced 120 degrees apart at intervals not exceeding 20 feet along the length of the casing. Do not place centralizers on the screened interval or within the bentonite seal. Verify the alignment of the well by passing a 5 foot long section of rigid pipe 1/4 inch smaller in diameter than the inside diameter of the casing through the entire well. If the pipe does not pass freely, the well will not be accepted. Thoroughly clean the pipe section prior to each test. Use temporary casing, hollow stem augers or other measures, as necessary, to prevent collapse of the boring against the well screen and well casing/riser pipe prior to placement of the filter pack and sealing materials. Install a vented cap on the top of the riser pipe constructed to preclude binding to the well casing caused by tightness of fit, unclean surfaces, or weather conditions. Make cap secure enough to preclude the introduction of foreign material into the well, yet allow pressure equalization between the well and the atmosphere.

(i) After the screen and well casing have been concentrically placed in the hole, construct the approved filter pack around the screen by filling the entire space between the screen and the wall of the hole over the selected screened interval. Place the lowermost 1 foot of

filter pack in the boring prior to installation of the well screen, serving as a base on which to place the screen. Lower a tremie pipe having an inside nominal diameter of not less than 1 inch, to the bottom of the annulus between the hole and well. Clean the tremie pipe prior to each use. Arrange the tremie pipe so that water and filter pack material fed at uniform rates are discharged as the filter pack material fills the hole from the bottom up. Raise the tremie pipe at a rate that will keep the bottom of the pipe no more than 5 feet above the top of the surface of the filter pack level, and no more than 2 feet below the surface of the filter pack level at all times. Dumping filter pack material from the surface of the ground and agitating the well in an effort to settle the filter material is not allowed. Install the filter pack continuously and without interruption until the filter pack has been placed to a minimum of 3 feet above the top of the screen in the well. Directly measure the depth to the top of the filter pack and record.

(j) Place a minimum 5 foot thick hydrated bentonite seal on top of the filter pack in a manner which prevents bridging of the bentonite in the annulus, such that the bottom of the bentonite seal is a minimum of 5 feet above the top of the filter pack. Directly measure the depth to the top of the bentonite seal and record immediately after placement, without allowance for swelling. If the bentonite seal is located above any borehole fluid levels, place a 1 foot layer of fine sand at the top of the bentonite seal.

(k) Mechanically mix a non-shrinking cement grout, in accordance with paragraph OPEN SYSTEM PIEZOMETERS, and place in one continuous operation into the annulus above the bentonite seal to the depth shown on the drawing. Make grout injection in accordance with ASTM D 5092. Thoroughly clean the tremie pipe before use in each well. Construct the bottom of the tremie pipe to direct the discharge to the sides rather than downward, keeping the discharge end of the tremie pipe submerged at all times. Add additional grout from the surface to maintain the level of the grout at the land surface as settlement occurs. Work is not permitted in the well within 24 hours after cement grouting.

(l) After insertion of the piezometer a check shall be made to ensure that the piezometer reading agrees with the water head, and the elevation of the diaphragm shall be recorded.

(m) Depth to the top of each increment of granular bentonite shall be checked using a cylindrical sounding hammer. The granular bentonite shall not be tamped.

(n) After completion of installation a post-installation acceptance test shall be performed to verify that the piezometer functions correctly.

(o) After completion of installation, the as-built location in the horizontal position shall be determined to an accuracy of ± 0.1 foot, and the elevation of the top of the work platform to an accuracy of ± 0.01 foot. The elevation of the piezometer diaphragm shall also be determined, to an accuracy of ± 0.1 foot.

3.6 Automated piezometers

(a) Automated piezometers shall be installed at the locations and

depths shown on the Plans or as directed by the Quality Assurance Representative.

(b) The contractor shall obtain and install Solinst dataloggers or acceptable equivalent as indicated herein. The datalogger materials, piezometer well cap assembly, pressure transducers and associated direct read cabling shall be installed according to the manufacturer's instructions.

(c) The contractor shall install the datalogger at elevation 380 ft.

(d) For the landside and riverside piezometers the contractor shall run direct read cables in buried flexible conduit that can house all the required materials to a sealed enclosure at a location as directed by the contracting officer representative that can be read at all times including during high water events. This distance shall be as close to the instrument as feasibly possible. Install radio communication at LWR-PZ-7 to retrieve data instead of trenching cable a significant distance.

(e) For the piezometers being placed on the levee crown the contractor shall run direct read cables from the transducer to the top of the riser pipe in the well cap assembly.

3.7 Instrumentation Tolerances

During construction if the Contractor discovers inclinometer readings differing 0.5 inches from the baseline readings the Contractor shall immediately notify the Quality Assurance Representative so that he or she is aware of potential problems. If the Contractor discovers inclinometer readings differing 2.0 inches from the baseline readings or any other sign of potential problems including surface cracking that would indicate a slope failure the Contractor shall cease work immediately and notify the Quality Assurance Representative and implement the remedial action as submitted in the approved plan of action at the discretion of the Quality Assurance Representative.

3.8 Field Calibration and Maintenance

The Contractor's instrumentation personnel shall conduct regular maintenance of field terminals and accessible instrument components.

3.9 Damage to Instrumentation

(a) The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations, weather, traffic, use, and vandalism.

(b) If an instrument is damaged or inoperative, the Contractor's instrumentation personnel shall repair or replace the damaged or inoperative instrument within 72 hours at no additional cost to the OWNER. It is the responsibility of the Contractor to properly design, construct, install, develop, and test all inclinometers and piezometers according to the requirements of this specification so that they are suitable for the intended purpose. If the Contractor installs inclinometers or piezometers that are not functional or not in accordance with these specifications, the Quality Assurance Representative will disapprove the inclinometer(s) or piezometer(s)

and direct the Contractor to repair or replace it, and to abandon the disapproved item in accordance with this specification. The Contractor shall notify the Quality Assurance Representative at least 24 hours prior to repairing or replacing a damaged or inoperative instrument. The Quality Assurance Representative will be the sole judge of whether repair or replacement is required.

3.10 Disclosure of Data

The Contractor shall not disclose any instrumentation data to third parties and shall not publish data without prior written consent of the OWNER.

3.11 Monitoring Plan

3.11.1 Purpose

Because of the critical nature of this project and the complexity of the design considerations and assumptions rigorous monitoring must be performed. The instrumentation plan as a whole will monitor lateral movement and pore-water pressures. These two measurements will allow design assumptions to be adjusted based on real-time data gathered from the field and to help monitor and potentially mitigate excessive movements.

3.11.1.1 Monitoring and Reporting of Data

The data shall be gathered by the Contractor's instrumentation personnel and the information and data shall be provided to the Quality Assurance Representative (OWNER's Geotechnical designers). The Quality Assurance Representative will make the necessary decisions and adjustments as it pertains to the readings of the instruments and the effects the excavation is having on the integrity of the levee based on instrument readings. The Quality Assurance Representative will be the sole judge of whether adjustments are required.

3.11.1.2 Monitoring Frequencies

Once the piezometers are installed and base readings have been taken the Contractor shall read the piezometers once per week and then once daily or once per shift whichever is greater once excavation starts until the project is complete.

Once the inclinometers are installed and duplicate base readings have been taken the Contractor shall read the inclinometers once per week and then hourly once excavation starts and shall continue reading the inclinometers hourly until the panel and adjacent panel has reached an unconfined compression strength of 15 psi. The Contractor shall analyze the inclinometer data continuously throughout the monitoring period so that if any deviations from the baseline readings are encountered the contractor will be aware of these findings almost instantly which will ensure the instrumentation tolerances listed herein are not exceeded.

3.11.1.3 Instrumentation Monitoring

The Contractor's instrumentation personnel shall submit a detailed monitoring plan and perform all instrumentation monitoring included in the approved monitoring plan.

3.11.1.4 Daily Monitoring Reports

The Contractor's instrumentation personnel shall provide Daily Monitoring Reports once a day throughout the slurry trench construction period that include, at a minimum, instrument data and any warning of unforeseen conditions that may require remedial or precautionary measures. If any unforeseen conditions that may require remedial or precautionary measures are discovered the Contractor's instrumentation personnel shall immediately notify the contracting officer representative and all construction operations shall cease until a remedial or precautionary measure has been taken. The daily reports shall be submitted to the Quality Assurance Representative the day of receiving the instrumentation data needed to complete each daily report.

3.11.1.5 Final Instrumentation Monitoring Report

At the end of the construction period, as determined by the Quality Assurance Representative, the Contractor's instrumentation personnel shall submit a concise, comprehensive Final Instrumentation Monitoring Report that documents field results.

3.11.1.6 Removal of Instrumentation

Inclinometers installed by the Contractor's instrumentation personnel within close proximity of the slurry trench construction shall be removed at the end of the construction period. The Quality Assurance Representative will determine the end of the construction period and will direct the Contractor when to remove instrumentation.

After all slurry trench construction is finished and backfilled, the inclinometers and all component parts shall be dismantled, and removed from the project, and shall become the property of the Contractor. The Contractor shall seal in place all the inclinometers that are below the original ground surface elevation. The inclinometers shall be sealed in place from the bottom up with neat cement grout and all materials associated with the inclinometers in the ground shall be removed within 3 feet of the original ground surface. The soils that are disturbed shall be restored to their original condition.

-- End of Section --

SECTION 31 11 00

CLEARING AND GRUBBING
08/08

PART 1 GENERAL

1.1 SUMMARY

The contractor shall furnish all labor, materials, equipment and means to clear and grub the project site as shown on Contract Drawings or required to permit the installation of the facilities, and dispose of the materials. Contractor shall pay for all permits required under this Specification.

1.2 REFERENCES

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

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT)

Standard Specifications (2000) Publication 408/PUB 408

1.3 STANDARD SPECIFICATIONS

All work, installation, procedures, materials, etc. shall conform to the Publication 408/PUB 408, adopted April 3, 2000 by the Pennsylvania Department of Transportation (herein referred to as the Standard Specifications), except as modified by this Specification.

1.4 RELATED SECTIONS

For work related to this specification section refer to Section 31 22 00 - EARTHWORK and Section 201 - "Clearing, Tree Removal and Protection, Care and Repair of Existing Plant Material" of the Standard Specifications.

1.5 CONTRACTORS ORGANIZATION

Contractor shall have a competent supervisor onsite during the process of the work who shall act for the contractor in all matters concerning the work. He shall have the authority to receive and to act upon directions from the owner.

1.6 MATERIAL OWNERSHIP

Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.7 UNDERGROUND FACILITIES

The information and data shown or indicated in the Construction Drawings with respect to existing Underground Facilities at or contiguous to the site are based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others. The OWNER or

ENGINEER shall not be responsible for the accuracy or completeness of any such information or data. The cost of all of the following will be included in the Contract Price and contractor shall have full responsibility for: (i) reviewing and checking all such information and data, (ii) locating all Underground Facilities shown or indicated in the Contract Documents, (iii) coordinating the Work with the owners of such Underground Facilities during construction, and (iv) maintaining the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the work.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver materials to store at the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Trees, Shrubs, and Existing Facilities

Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Engineer immediately of damage to or an encounter with an unknown existing utility line. The Contractor is responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, notify the Engineer in ample time to minimize interruption of the service.

3.2 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Trees within the clearing area shall be felled in such a manner as to avoid damage to

trees to be left standing and trees outside the clearing area, and with due regard for the safety of employees and others.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material (i.e., soil that is similar to the native soil) and compacted to make the surface conform with the original adjacent surface of the ground.

All holes caused by grubbing operations, except areas of excavation, shall be backfilled with earth fill material as defined in Section 31 22 00 - EARTHWORK, placed in 8-inch layers to an elevation of the adjacent ground surface, and each layer compacted to a density equivalent to that of the surrounding materials.

3.5 DISPOSAL OF MATERIALS

All timber on the project site noted for clearing and grubbing shall become the property of the Contractor, and shall be removed from the project site and disposed of off-site.

-- End of Section --

SECTION 31 21 10

STRIPPING
11/12

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor and equipment, and performing all operations necessary for stripping of the areas specified herein or indicated on the drawings and for stockpiling all stripped materials.

1.2 QUALITY CONTROL

Quality control shall be established and maintained for stripping operations to assure compliance with requirements specified herein, and maintaining records of the quality control for all operations including but not limited to the following:

(1) Stripping. Station to station limits, transverse stripping limits from the surveyed baseline; depth of stripping; percentage of area complete; type of material.

(2) Stockpiling of Stripped Materials. Location of stockpile.

(3) A copy of these records of inspections, as well as the records of corrective action taken, shall be furnished to the Quality Assurance Represenative daily.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 STRIPPING

The area to be stripped shall be the complete footprint of the required construction features. In general, stripping shall be minimized wherever possible. Stripping shall consist of the removal of materials down to bare earth without removing more than 6-inches. If any organic material remains after the required stripping has been accomplished, the Contracting Officer shall be notified to determine whether additional stripping will be required. Stripped material shall be stockpiled in the location as shown on the drawings or as designated by the Quality Assurance Represenative. If usable, the stockpiled material shall be utilized as top dressing. The Quality Assurance Represenative will determine the usability of this material.

-- End of Section --

SECTION 31 21 40

CARE OF WATER
10/12

PART 1 GENERAL

1.1 SCOPE

All construction activities shall be carried on in areas free of water. The work provided for herein consists of furnishing all design, plant, labor, material, and equipment and performing all operations required for designing, furnishing, installing, testing, operating, maintaining and removing a care of water system to control surface water in all work areas during construction operations.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for excavation operations to assure compliance with contract requirements, and maintain records of its quality control for all construction operations including but not limited to the following:

(1) Design, plan submittal, installation, adequacy, operation, maintenance and removal of care of water control systems.

(2) Fabrication and workmanship.

(3) Installation, testing, operation, and removal.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Quality Assurance Representative daily.

1.3 DEFINITIONS

The care of water system shall be designed and installed to allow all construction activities to be carried on in areas free of water, including but not limited to: surface water and precipitation. The care of water system shall have the capabilities defined in paragraph 2.2. Surface water is defined as follows:

(1) Surface Water Control. Surface water control consists of the collection, control, removal and disposal of all surface water within the excavation and working areas regardless of source. Surface water control includes providing adequate measures to divert surface water from entering the excavation, removing surface water from all excavations, preventing erosion of the foundation and excavated slopes, and preventing erosion from lateral seepage from the adjacent ditch.

1.4 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Care of Water System Plan; E DA

Within 15 days after receipt of the Notice to Proceed, the Contractor shall submit the proposed care of water plan to the government. The plan shall contain all supporting calculations and rationale and the following details:

(1) The planned location and layout, sizes, and capacities of all system components including, but not limited to: ditches, berms, trenches, collectors, sumps, pumps, and well points.

(2) Provisions for disposal of water from the system and proposed facilities to prevent scour from system discharge.

(3) Plan of normal operation.

(4) Capacities of power supply facilities, backup power, and description of standby components and spare parts.

(5) Plan for abandonment of care of water system.

PART 2 PRODUCTS

2.1 DESIGN

The care of water system shall be designed by the Contractor, using accepted professional methods of engineering design consistent with the best current practice, to meet all the system requirements herein. The Contractor shall design, furnish, install, operate, and maintain the system to pump standing water out of the required areas and to provide for adequate care of water control while the work is ongoing in any work area. The Contractor shall be responsible for all damage to any and all work both permanent and temporary caused by failure to construct, operate and maintain the system as specified.

2.2 CARE OF WATER SYSTEM REQUIREMENTS

The care of water control system shall consist of sumps, sump pumps, mechanical plugs/packers, bulkheads, ditches, trenches, dikes, berms, well points, and combinations thereof and all necessary appurtenances. The system may also include construction methods that divert the flow of water away from the construction area. They must be designed, installed and operated as necessary to accomplish all specified requirements for a rainfall intensity of 2-inches per hour.

System capacity shall be continuously reviewed during operation and, if necessary, increased or otherwise modified to insure 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 expense to the OWNER.

2.2.1 Discharge

Flows from the care of water system shall be discharged outside of the levee repairs work area, on the downstream side of each work area, unless otherwise authorized by the Quality Assurance Representative. Discharge from the care of water system shall not erode, scour or otherwise damage

the levee slope, levee foreshore, completed works, existing ditches, adjacent soil or adjacent properties.

2.2.2 Standby Capacity

The system shall be provided with sufficient standby components and spare parts to assure required operation of the care of water system. The number of standby components and spare parts shall be determined by the Contractor in consideration of known reliability and availability to ensure continuous operation.

PART 3 EXECUTION

3.1 OPERATION

The Contractor shall be required to perform care of water control, as long as necessary to construct all work under this contract in areas free of water. Care of water control systems shall be operated to insure that construction operations may be performed without interruption due to wet conditions. Soil at the base of the excavations which becomes unworkable as a result of improper drainage shall be removed and replaced with impervious material at the Contractor's own expense to maintain a firm dry excavation bottom and base.

3.2 MAINTENANCE AND SERVICING

The Contractor shall be responsible for the maintenance, servicing, and repairs of the entire care of water control system and appurtenances, during the life of the contract. Maintenance, servicing, and repair operations are not cause for relaxation of the specified requirements, and the system shall be designed to provide the specified conditions during maintenance, servicing and repair.

3.3 DISMANTLING AND DISPOSAL

After the care of water operations are completed, the system and all component parts shall be dismantled, and removed from the project, and shall become the property of the Contractor.

3.4 FLOODING

If climatic conditions threaten to flood the construction area, the Quality Assurance Representative may direct the contractor to temporarily cease operations and demobilize his equipment to higher ground.

-- End of Section --

SECTION 31 22 00

EARTHWORK
10/12

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment, materials and testing; performing all operations necessary for completing the excavations, protection of existing piezometers and relief wells, foundation preparation, fills associated with the installation of a slurry cutoff trench, clay caps, random fill, and final grading as specified herein and as shown on the drawings. All costs for obtaining materials from an off-site borrow area, a site for disposing waste materials, the hauling of materials to and from these areas, and erosion control shall be the CONTRACTOR'S responsibility. The CONTRACTOR shall pay for all permits required under this Specification.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D2487	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D5084	(2010) Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

From hereon, referred to as the "Standard Specification"

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846	(Third Edition; Update IV) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.3 DEFINITIONS

1.3.1 Impervious Materials

Impervious materials shall consist of materials classified in accordance with ASTM D 2487 as lean clay (CL) and fat clay (CH), which are free from roots and other organic matter, trash, debris, and frozen materials.

Impervious materials shall be fine grained materials of low permeability consisting of clays. The particle size of impervious material shall be

such that a minimum of 50.0% of the soil particles shall pass a U.S. Standard No. 200 sieve, and that classify as CL and CH in accordance with ASTM D2487 and that have permeability equal to or less than 1 x 10-6 centimeters per second (cm/s).

1.3.2 Unsatisfactory Materials

Unsatisfactory material includes all material that is not defined as impervious material or random fill. Unsatisfactory materials also include all material that contains debris, refuse, roots, organic matter, frozen material, asphalt, contamination from hazardous, toxic or radiological substances, stones greater than 1 inch in any dimension and other materials that are determined by the Quality Assurance Representative.

1.3.3 Topsoil

Topsoil includes selectively excavated material that is representative of local soils that produce crops, grass, or other vegetation, and is free from litter, wood, limbs, brush, matted roots, toxic substances, or any material harmful to plant growth or which would hinder grading, planting or maintenance operations. Topsoil shall not contain more than 1 percent by weight of stones or other such objects larger than 1 inch in any dimension.

1.3.4 Unsuitable Foundation

Unsuitable foundations consist of one or a combination of the following: standing water on the foundation materials, unsatisfactory materials as defined in DEFINITIONS, and soft and yielding foundation materials as determined by the Quality Assurance Representative.

1.3.5 Impervious Clay Fill (fill)

Impervious clay fill that meets the requirements of an impervious material shall be used as the material needed for the placement and compaction of the impervious clay cap. Materials that classify as CH shall only be used at depths greater than two feet below the final finished surface grade of the Clay Cap.

1.3.6 Work Platform

The work platform shall be comprised of an impervious material as defined in Paragraph 1.3.1 and compacted as outlined in Paragraph 3.5.2

1.3.7 Spoil Material

Spoil material shall consist of the material excavated from the slurry trench not classifying as impervious clay fill and be free of debris, organic matter, and deleterious materials and shall be placed on the landside berm. Spoil material not suitable for use as random fill on this project and that is in excess of that volume capable of being disposed of on the landside (disposal) berm as shown on the drawings shall be disposed of off-site by the Contractor.

1.3.8 Borrow Material

For Contractor-Furnished Borrow Area(s), The CONTRACTOR shall submit a written certification that the proposed borrow material contains no hazardous and/or toxic substances. The CONTRACTOR shall also submit

written certification that the proposed borrow area(s) will not significantly impact the environment and wetlands. The CONTRACTOR shall also submit written certification of historic and cultural resource clearance(s) that shall consist of a signed letter of concurrence from the appropriate State Historic Preservation Officer (SHPO). SHPO clearance will require one of the following: 1) evidence that the area includes no significant historic resources and that the existing ground surface within the proposed site has been previously disturbed to the extent that archaeological features would have been destroyed; or 2) evidence that a professional archaeological assessment of the area demonstrates that the location contains no significant archaeological remains. The CONTRACTOR shall submit written evidence to Wood that the CONTRACTOR has obtained property rights and access to the approved borrow area(s). The written evidence shall consist of an authenticated copy of the conveyance under which the CONTRACTOR acquired the property rights and access thereto, prepared and executed in accordance with the laws of the State of Pennsylvania. Wood reserves the right to approve or disapprove the use of Contractor-furnished borrow areas. No borrow pits shall be allowed within 1,000 linear feet landside (dry side) or 2,000 linear feet riverside (wet side) of the levee centerline without prior approval by the GEOTECHNICAL ENGINEER.

1.3.9 Relief Wells

Relief wells, for under-levee seepage control, are permanently installed 8-inch diameter wells that are protected at the top by well guard housings. The wells extend down into the aquifer for total depths ranging between 30 and 50 feet. Relief wells are to be protected throughout all construction activities. The Contractor is not allowed to use the existing relief wells constructed of wooden stave well screens and riser pipes.

1.3.10 Random Fill

Random fill materials shall consist of materials classified as clay, sand, gravel, or a combination thereof (CL, SC, SM, SP, SW) in accordance with ASTM D2487, which can be compacted to form stable embankments. Random fill shall not contain Fat Clay (CH) material in accordanace with ASTM D2487. Random fill shall be free from trash, vegetation, organic matter, and stones or clods greater than six (6) inches in diameter. Random fill areas shall be overlaid with 6" of topsoil.

1.4 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Excavation Plan; E DA

The Contractor shall submit a written excavation plan 30 days prior to the beginning of any excavation. Approval of the detailed plan shall be obtained from the Quality Assurance Representative prior to starting the work. If necessary, the plan shall be modified as required to meet field conditions, and the modifications shall be approved prior to use. The plan shall contain, as a minimum but not limited to, the following:

(a) Proposed methods of preventing interference with, or damage to, existing underground or overhead utility lines, piezometers, relief wells, and other manmade facilities or natural features designated to remain within or adjacent to the construction right-of-way.

(b) Provision for coordinating the work with other Contractors working in the construction right-of-way or on facilities crossing or adjacent to this work.

(c) The proposed methods for draining and keeping excavated areas dry under this contract.

(d) Stockpiling plan showing locations of stockpiled embankment materials before they are transported and placed as fill, material classification testing, stockpile heights, slopes, limits, erosion control, silt filter fencing and drainage around the stockpile areas.

(e) A complete listing of equipment to be used for excavation and to transport the excavated material.

(f) The Contractor's proposed sequence of work for excavating adjacent to the levee embankment shall be shown in the plan. The plan shall include but not limited to cross sectional views showing starting and final work locations and clearing, grubbing and stripping limits.

(g) The Contractor's proposed road pattern plan and plan for how dust control measures will be implemented.

(h) The Contractor's proposed methods for draining excavated area excavated under this contract which may be flooded by high river stages.

(i) The Contractor's proposed methods for making optimum use of available excavated materials.

(j) The Contractor's proposed methods for providing drainage of the foundations prior to, during, and after excavating the foundation materials.

(k) References to the Emergency Action Plan shall be included per Section 01 14 00.

Plan for Fill Operations; E DA

The Contractor shall submit for review and approval by the Quality Assurance Representative, 30 days prior to placing fill, the plan of operations for accomplishing all fill specified herein. The plan shall contain, as a minimum but not limited to, the following:

(a) The Contractor's proposed sequence of construction for placement of fill.

(b) The Contractor's proposed list of equipment types and quantities of each equipment type to be utilized for all fill operations.

(c) The Contractor's proposed methods for transporting, placing, and compacting the fills.

(d) The Contractor's proposed methods for providing drainage prior to, during, and after placement of partially and completed fills, and for the surface sealing of the fill to minimize precipitation infiltration prior to periods of inactivity such as the end of each work day and rain stoppages.

(e) The Contractor's plan shall include the names and addresses of the commercial testing labs or engineering firms which will perform the soil testing and inspection and describe how all required soils testing will be performed.

(f) The Contractor's plan shall include the emergency flooding plan for the slurry trench installation.

(g) Proposed methods of preventing interference with, or damage to, existing underground or overhead utility lines, piezometers, relief wells, and other manmade facilities or natural features designated to remain within or adjacent to the construction right-of-way.

Survey Records; E DA

A copy of the records of each compliance survey shall be provided the Quality Assurance Representative the next work day following the survey.

Plan for Installation of the Turfing Erosion Control Mat; E DA

Method of Installation. Submit the method of installation, equipment to be used, and the manufacturer's recommendation of placement and securing the turfing erosion control mat.

SD-06 Test Reports

Soil Classification Tests; E DA

Submit the results of initial soil classification tests at least 30 days prior to delivery of any such material to the work site, and thereafter submit results within 24 hours of completion of tests.

Moisture-Density Relationships; E DA Tests

Submit the results of initial moisture density relationships tests at least 30 days prior to delivery of any such material to the work site, and thereafter submit results within 24 hours of completion of tests.

In-Place Density Tests; E DA

Submit the results of these tests within 24 hours of completion of tests.

Water (Moisture) Content Tests; E DA

Submit the results of these tests within 24 hours of completion of tests.

Borrow Site Conformance Testing; E DA

Submit the results of these tests within 24 hours of completion of tests.

Additional Tests; E DA (If Required)

Submit the results of these tests within 24 hours of completion of tests.

SD-07 Certificates

Contractor-furnished Rights-of-way; E DA

If the Contractor proposes to use private property for drainage, stockpiles, and haul roads, the Contractor shall submit written evidence to the Quality Assurance Representative that the right has been obtained from the property owner. The written evidence shall consist of an authenticated copy of the conveyance under which the Contractor acquired the property rights and access thereto, prepared and executed in accordance with applicable state and local laws and regulations.

Commercial-furnished Materials; E DA

The Contractor shall submit commercial certificates showing evidence of compliance to the contract specifications.

Turfing Erosion Control Mat; E DA

The Contractor shall submit commercial certificates showing evidence of compliance to the contract specifications. The certificates shall be dated not less than six months from date of submittal.

Borrow Material Free of Hazardous and/or Toxic Substances; E DA

Borrow Site Impact on Environment and Wetlands; E DA

1.5 QUALITY CONTROL

The Contractor shall establish and maintain quality control for all excavation, fill operations to assure compliance with contract requirements, and maintain records of the quality control for all construction operations including but not limited to the following:

(a) Grade and Cross Section. Lines, grades, and tolerances shall conform to those shown on the drawings.

(b) Segregation of Satisfactory Materials. Monitor excavations to achieve segregation of different satisfactory materials.

(c) Disposition of Satisfactory Materials. Transporting and/or stockpiling of satisfactory materials into the appropriate fill and stockpile.

(d) Disposal of Unsatisfactory Materials. Properly dispose unsatisfactory and excess materials off site.

(e) Earthwork Equipment. Earthwork equipment shall be identified by type, model, size, number of units, and suitability for construction of the prescribed work.

(f) Foundation Preparation. Foundation preparation shall be performed by the Contractor by scarifying the surface in advance of fill construction and provide drainage of the foundation and partially completed fills.

(g) Materials. Use of satisfactory materials of each material type

specified for the fill is based on material testing.

(h) Fill Placement. Layout, providing drainage for partially completed and completed fills, moisture control, thickness of layers, scarifying the previous layer as necessary, spreading, and compaction for the fill. At the end of each workday and prior to anticipated precipitation, all fills shall be graded smooth and sealed to quickly shed precipitation runoff.

(i) Records. A copy of the records of inspections and tests, as well as the records of corrective actions taken, shall be furnished to the OWNER within 24 hours.

(j) Submittals. The Contractor shall submit survey records, Contractor-furnished rights-of-way, Plan for Installation of the turfing erosion control mat and commercial-furnished materials.

(k) Inspect the turfing erosion control mat before installation and monitor during the installation.

1.6 PERMITS

The Contractor shall obtain all necessary permits required for disposal, hauling, erosion control, and pay all fees associated with permitting and compliance. In addition, the Contractor shall obtain permits for storm water discharge (NPDES). These permits are contained in SECTION 01 11 30 - ENVIRONMENTAL PROTECTION. The Contractor shall comply with the terms of these permits and with the requirements of SECTION 01 11 30 and this section.

1.7 PROTECTION OF CULTURAL AND NATURAL RESOURCES

All work and Contractor operations shall comply with the requirements of SECTION 01 11 30 and with the requirements of this section.

1.8 PROTECTION OF EXISTING MANMADE FACILITIES AND NATURAL FEATURES

Excavation shall be conducted in such a manner as to avoid damage to trees left standing and trees outside the clearing and excavation area, existing buildings, manmade facilities and natural features, and with due regard to the safety of employees and others. Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained shall be protected from damage during excavation. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the applicable utilities in sufficient time for measures to be taken to prevent interruption of the services. Existing relief wells and piezometers shall be protected against any damages since they are essential components to the flood protection and underseepage control system.

1.9 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations. Groundwater levels indicated in the soil boring logs were at the time of exploration. The groundwater table may vary significantly depending on time of year and river stage level. Soil borings logs of those borings located outside

this contract's construction limits are available to be reviewed at the Wood Blue Bell Office:

Wood Environment and Infrastructure, Inc.
751 Arbor Way, Suite 180
Blue Bell, PA 19422

1.10 SHIPMENT AND STORAGE

The turfing erosion control mat shall be furnished in a protective wrapping which shall protect the turfing erosion control mat from direct sunlight, ultra-violet rays, temperatures greater than 140 degree Fahrenheit, mud, dirt, dust and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy duty protective covering.

PART 2 PRODUCTS

2.1 SATISFACTORY MATERIALS

2.1.1 General

All fill shall be constructed of impervious materials, random fill, or spoil material as defined in paragraph DEFINITIONS and specified herein and obtained from the required excavations and commercial sources. Fill materials shall be free from unsatisfactory materials and topsoil as defined in paragraphs UNSATISFACTORY MATERIALS and TOPSOIL, respectively.

2.1.2 Impervious (Clay) Materials

Impervious material, shall consist of materails as defined in paragraph 1.3.1 Impervious Materials. Materials that classify as CH shall only be used at depths greater than two feet six inches below the final finished grade of the clay cap and topsoil and shall not be used within two feet from the bottom of the aggregate base course material under the bike trail pavement section.

2.1.3 Commercially Furnished Impervious Material

The Contractor shall supply commercially furnished impervious materials as specified in paragraph Impervious Materials for the project's impervious clay fill and at the direction of the Quality Assurance Representative when satisfactory impervious materials are unavailable from on site excavations. If commercially furnished impervious material is used at the Contractor's convenience, the OWNER will not pay any additional costs for its use.

2.1.4 Flowable Backfill

Flowable backfill used in the installation of sliplined pipe or as shown on the drawings shall be furnished and constructed in conformance with IDOT SECTION 593, CONTROLLED LOW-STRENGTH MATERIAL, BACKFILL and SECTION 1019, CONTROLLED LOW-STRENGTH MATERIAL (CLSM).

2.1.5 Requirements for Off Site Barrow Materials

Backfill material shall be obtained from offsite sources approved by Wood. Prior to delivery of any material to the site that is to be used, the Contractor shall advise Wood of the material source, shall test

samples, and shall receive Wood's approval before using the materials from that source. Backfill shall be free from roots and other organic matter, trash, debris, snow, ice or frozen materials. Test offsite soils, brought in for use as backfill, for total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals (Ag, As, Ba, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Ag, Tl, Zn), and pesticides. Wood reserves the right to request additional testing or to reduce the testing requirements. The reporting limits must be approved by Wood prior to conducting the tests. Analyses should be by EPA SW-846 methods or appropriate equivalents. Backfill shall not contain more than 100 parts per million (ppm) of total petroleum hydrocarbons (TPH). Results above Tier 1 soil remediation objectives should be reported to Wood immediately for review. The approval of any source of supply by Wood will not imply that all material from that source will be accepted. Should material from an approved source fail to maintain a quality meeting the requirements of the specifications, that material will be rejected for use at the site. Select granular material obtained from a quarry and approved by Wood will be exempt from these testing requirements, however, Wood reserves the right to request such testing.

Provide Borrow Site Conformance Testing for the parameters listed above by obtaining a representative composite sample of material from the borrow site, with at least one composite sample test per 5,000 cubic yards from each borrow site. Wood reserves the right to reduce or increase these testing requirements based on borrow site-specific conditions or information. Within 24 hours of conclusion of physical tests, submit test results, including calibration curves and results of calibration tests. Do not bring material onsite until tests have been approved by Wood.

2.2 UNSATISFACTORY MATERIALS

2.2.1 Unsatisfactory Materials

Materials unsatisfactory for fill are defined in paragraph UNSATISFACTORY MATERIALS and masses of organic matter, sticks, branches, roots, discarded lumber and timbers, railroad ties, and other debris. Crushed stone, gravel encountered in the excavations, sandbags, and excavated limestone screenings are unsatisfactory materials. All unsatisfactory material shall be disposed of off-site by the Contractor.

2.2.2 Frozen Materials

Under no circumstances shall frozen fill, snow, or ice be placed in a fill nor be placed on frozen earth, snow or ice.

2.3 EARTHWORK EQUIPMENT

2.3.1 General

The Contractor shall use the approved rollers and compactors to compact impervious fills and random fills. All rollers and compactors shall be field checked under the direction and supervision of the Quality Assurance Representative prior to their use on the fill to assure that the required results can be obtained. Any equipment that does not produce the required results will not be allowed on the fill.

2.3.2 Power Tamping Rammers

Power tamping rammers shall be used to compact fill consisting of impervious material and random fill. Power tamping rammers shall have a minimum impact force of 2,500 pounds per blow. The tamping (shoe) surface area shall be between 140 and 160 square inches. Impact blows per minute shall be between 600 and 800.

2.3.3 Pneumatic fill Tampers

Pneumatic fill tampers shall used to compact impervious fills under pipes. The pneumatic fill tamper shall have impact rates between 600 and 800 blows per minute (bpm). The pneumatic fill tamper shall have a cylinder stroke distance between 5.0 and 8.5 inches and shall be fitted with a tamper impact surface diameter between 5.0 and 6.5 inches.

2.3.4 Vibratory Rollers

Vibratory rollers shall be used to compact pervious materials. The vibratory rollers shall be equipped with a smooth steel compaction drum or steel drum with pads. Vibratory roller operating weights shall not exceed 3,500 pounds so as to not induce high lateral loads on the structures. The level of amplitude and vibration frequency during compaction shall be maintained uniform throughout the fill zone within which it is operating. Vibratory rollers shall be operated at a frequency of vibration during compaction operations between 1,500 and 2,000 vibrations per minute (vpm). The vibratory rollers shall have a minimum centrifugal force of 13,000 pounds. Rollers shall be operated at speeds not to exceed 1.5 miles per hour.

2.3.5 Vibratory Plate Compactors

Vibratory plate compactors for compacting pervious materials shall be equipped with a smooth steel plate. The level of amplitude and vibration frequency during compaction shall be maintained uniform throughout the fill zone within which it is operating. Vibratory plate compactors shall be operated at a frequency of vibration during compaction operations between 5,000 and 8,000 vibrations per minute (vpm). Vibratory plate compactors shall have a minimum centrifugal force of 3,500 pounds. The vibratory plate (shoe) surface area shall be between 400 and 525 square inches.

2.3.6 Spreading Equipment

Spreading equipment shall be capable of spreading and blending materials in horizontal layer thickness between 4.0 and 12.0 inches.

2.3.7 Sprinkling Equipment

Sprinkling equipment shall be designed to apply water uniformly and in controlled quantities to variable widths of surface. The water tank truck shall have a minimum capacity of 2000 gallons.

2.3.8 Miscellaneous Equipment

Scarifiers, disks, spring tooth or spike tooth harrows, spreaders, and other equipment shall be suitable for the type of construction required and acceptable to the Quality Assurance Representative.

2.3.9 Tracked-Dozer

The tracked-dozer shall weigh at least 20,000 pounds and shall exert a unit tread pressure of not less than 6 pounds per square inch. The dozer shall not be operated at speeds that exceed 3.5 miles per hour. The equipment shall be used to compact the spoil material placed on the levee berms.

2.3.10 Deep Compaction Vibratory Roller

Deep compaction vibratory rollers shall be equipped with smooth steel compaction drums and shall be operated at frequencies of vibration during compaction operations between 1,200 and 1,800 vpm. Deep compaction vibratory rollers may be either towed or self-propelled. The vibratory roller shall have a minimum centrifugal force of 40,000 pounds when operating at a minimum of 1,250 vpm. The level of amplitude and vibration frequency during compaction shall be maintained uniform through the deep compaction foundation area. The maximum operating speed is 1.5 miles per hour during the deep compaction operation.

2.3.11 Sheepsfoot Rollers

Sheepsfoot rollers shall consist of one or more units. Each unit shall consist of a cylindrical drum not less than 60 inches in length and not less than 60 inches in diameter. The drums shall be filled with ballast. Ballast may consist of water, sand, or other approved ballast. Each drum shall have staggered feet uniformly spaced over the cylindrical surfaces to provide approximately 3 feet for each two square feet of drum surface. The feet shall be 7 to 9 inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than 5 nor more than 10 square inches. The weight of the roller when fully loaded shall not be less than 4000 pounds per linear foot of drum length and when empty shall not be less than 2500 pounds per linear foot of drum length. The Contractor shall be required to vary the amount of ballast in the drums to obtain optimum compactive effort for the material being compacted. The rolling units shall be equipped with a suitable device for cleaning the feet. The rolling units of multiple-type sheepsfoot rollers shall be pivoted on the main frame in a manner which will permit the units to adapt themselves to uneven ground surfaces and to rotate independently. The roller shall not exceed 3.5 miles per hour.

2.4 Turfing Erosion Control Mat

TURFING EROSION CONTROL MAT. The turfing erosion control mat shall be a punched and drawn geogrid consisting of polypropylene formed into a biaxial geogrid. The turfing erosion control mat shall be resistant to ultraviolet degradation and biological and chemical environments. The opening dimensions in any one direction shall be at least 1.0-inch but not more than 1.5-inch with a ratio of the two sides of at least 1.0 but not more than 2.0. The minimum roll width shall be 10.0 feet. The turfing erosion control mat shall conform to the following property requirements specified below:

Index Property	Test Procedure	Acceptable Values*
Tensile Strength @ 5% Strain	ASTM D 6637	Minimum 700 lb/ft
Ultimate Tensile Strength	ASTM D 6637	Minimum 1350 lb/ft
Resistance to UV Degradation (500 hours)	ASTM D 4355	Minimum 100%
*Unless stated otherwise all numerical values represent average roll values (i.e. any roll in a lot should meet or exceed the minimum value but not exceed the maximum value listed in the table).		

2.4.1 TURFING EROSION CONTROL MAT ANCHOR

The anchoring system for the turfing erosion control mat shall be manufacturer's recommendation except that no wooden and/or plastic stakes shall be used.

PART 3 EXECUTION

3.1 EXCAVATIONS

3.1.1 General

The Contractor shall submit the excavation plan as specified. Excavation of every description, and of whatever substance encountered, shall be performed to the lines, grades, and extent indicated on the drawings. Temporary excavated earth slopes shall not be steeper than 1 vertical on 3 horizontal or flatter as the soils will require to maintain stability, unless the excavation is shored. All excavations shall be performed when no standing water is present. Disposition of excavated materials shall be as specified in paragraph 3.1.2.

3.1.2 Disposition of Materials

3.1.2.1 Satisfactory Excavated Materials

Excavated materials which are free of debris, organic matter, and deleterious materials, and which are satisfactory for use as impervious fill as defined in paragraph IMPERVIOUS MATERIALS or random fill as defined in paragraph RANDOM FILL shall be placed and stockpiled for use as impervious fill or random fill, respectively. Stockpiled materials shall placed within the lines and grades shown in the drawings and in accordance with paragraph Stockpiles.

3.1.2.2 Unsatisfactory Materials

All unsatisfactory materials as defined in paragraph UNSATISFACTORY MATERIALS, asphalt, crushed stone, limestone screenings, sandbags excavated from the required excavations, and excess materials shall be hauled off-site by the Contractor in accordance with all Federal, state, and local laws and regulations.

3.1.2.3 Spoil Materials

Excavated materials which are free of debris, organic matter, and

deleterious materials, and which are satisfactory for use as spoil material as defined in paragraph DEFINITIONS shall be stockpiled for use as spoil material, and ultimately disposed of in the landside berm or off-site. Stockpiled materials shall placed within the construction limits as shown in the drawings and in accordance with paragraph Stockpiles. The landside berm volume as designed can accept approximately 19,800 cubic yards of spoil material. Spoil in excess of that volume capable of being disposed on the landside berm as shown on the drawings shall be disposed of off-site by the Contractor in accordance with all Federal, state, and local laws and regulations. If less spoil material volume is required than that shown on the drawings, the contractor shall build the landside berm to a lower overall height.

3.1.3 Stockpiles

The Contractor shall stockpile satisfactory excavated materials in accordance with applicable requirements of these specifications and within the construction limits shown on the drawings. Stockpiles shall not exceed 15 feet in height and slopes shall not be steeper than 1 vertical on 2 horizontal. The toe of the stockpiled material shall be at least 50 feet from top of any excavation slope or the natural bank of any ditch or stream. Transporting materials which includes but not limited to labor, equipment, haul roads, temporary channel crossings, and temporary bridges shall be at no additional cost to the OWNER.

3.1.4 Protection of Relief Wells and Piezometers

The Contractor shall take precautions for the protection of the existing relief wells and piezometers located within the construction area.

3.2 FOUNDATION PREPARATIONS

3.2.1 General.

The foundation receiving fill shall be kept thoroughly drained. Drainage to areas outside the construction limits will be allowed only after the Contractor has submitted to the Quality Assurance Representative a copy of the conveyance that permission from the appropriate landowner(s) for such drainage has been obtained. The Contractor shall be solely responsible for any and all damages, claims for damages, and liability of any nature whatsoever arising from drainage to areas outside the construction limits. No fill shall be placed upon frozen ground.

3.2.2 Impervious Material Foundations

After inspection of the excavated area, the entire earth surface, where fill materials will have contact with the existing material, shall be thoroughly scarified to a depth of 6.0 inches. Scarified impervious foundation soils shall conform to the moisture control requirements specified in paragraph FILL AND COMPACTION. The scarified foundation shall then be compacted as specified in paragraph FILL AND COMPACTION. Impervious fill shall then be placed and compacted as specified in paragraph FILL AND COMPACTION. If for any reason, the scarified surface becomes compacted in such a manner that, in the opinion of the Quality Assurance Representative, a plane of seepage or weakness might result, the surface shall again be thoroughly scarified before depositing material upon it.

3.3 MATERIALS TESTING

3.3.1 General

Material testing shall be performed by a USACE-validated commercial testing laboratory or engineering firm, which performs soil and material testing and inspection. All testing of fill and clay stockpile materials shall meet the minimum requirements specified herein. If the Quality Assurance Representative suspects that the materials may have changed or when conditions exist as defined in paragraph Additional Testing, the Quality Assurance Representative may require more frequent testing intervals than that specified below at no additional cost to the OWNER.

3.3.2 Soil Classification Tests and Soil Permeability Tests

Soil classification, Atterberg Limits, and grain size shall be performed in accordance with ASTM D 2487. The Contractor shall perform one (1) classification test from each source and for every 1,000 cubic yards of fill materials placed or at least once per day. At least one classification test shall be required for each material type the Contractor intends to use as fill. The Contractor shall submit the results of these tests within 24 hours after in-place testing of impervious fill. A permeability test in accordance with ASTM D5084 shall be required for every five sets of classification tests, which is a minimum of one test every 5,000 cubic yards of fill materaial. Additional tests supplementing those specified herein may be required by the Quality Assurance Representative if noticeable changes in the material occur or when conditions exist as defined in paragraph Additional Testing.

3.3.3 Moisture-Density Relationships

The moisture density relationships of the impervious materials and random fill materials shall be determined in accordance with ASTM D 698, Method A. The Contractor shall submit the results at least 5 days prior to placing the fill. Additional tests may be required by the Quality Assurance Representative if noticeable changes in the material occur or when conditions exist as defined in paragraph Additional Testing.

3.3.4 Water (Moisture) Content Tests

Determination of in-place water content shall be performed in accordance with ASTM D 2216 and shall be performed on all in-place density tests. Drying back the soil tests with a microwave oven shall be prohibited for the quality control record water content tests. The Contractor shall submit the test results to the Quality Assurance Representative test within 48 hours after in-place testing of impervious fill. Additional tests may be required by the Quality Assurance Representative if noticeable changes in the material occur or when conditions exist as defined in paragraph Additional Testing. Fill materials not meeting the required specifications for water content shall require a retest after corrective measures have been applied.

3.3.5 In-Place Density Testing For Impervious and Random Fill Materials

The in-place density tests shall be performed on impervious and random fill materials. In-place density shall be determined in accordance with ASTM D 2937 and/or ASTM D 1556. At least one in-place density test per lift per 500 linear feet or per working day, whichever is greater, shall be performed. The in-place soil density shall be compared to the

requirements of paragraph Compaction of fill. Fill materials not meeting the required specifications for in-place density shall require a retest after corrective measures and additional compaction have been completed.

3.3.6 Additional Testing

The Quality Assurance Representative may request additional tests at no additional cost to the OWNER if:

(a) There is reason to doubt the adequacy of the compaction;

(b) Special compaction procedures are being used;

(c) There is a noticeable change in the materials

(d) The Quality Assurance Representative determines that the Contractor's testing is inadequate; or.

(e) The Contractor is concentrating fill operations in a relatively small area.

3.4 FILL AND COMPACTION

3.4.1 General

The location and extent of the compacted fill is shown on the drawings. Fill material shall consist of impervious material, random fill, or spoil material as specified in paragraph DEFINITIONS. The fill material shall be placed or spread in layers as specified or as shown on the drawings prior to compaction. The Contractor shall properly drain and seal the fill surface at the end of each work day. Materials that classify as CH shall only be used at depths greater than two feet six inches below the final finished grade of the Clay Cap.

3.4.2 Moisture Control for Impervious Materials

The Contractor shall control the moisture content of the compacted fill material. No material shall be compacted with an in-place moisture content more than 3.0 percent above nor less than 0 percent below optimum moisture content determined by testing as specified in paragraph Moisture-Density Relationships. The moisture content of the fill material shall be determined by performing moisture control in accordance with ASTM D 2216 and specified in paragraph Water (Moisture) Content Tests. The Contractor shall perform the necessary work in moisture control to bring the fill materials within the moisture content range specified above. If the fill materials are too wet, it shall be spread out and disked to hasten drying to within the specified water content limits. If the borrow material is too dry, it shall either be pre-wet in the borrow area and stockpile, or sufficient moisture shall be uniformly distributed and blended into each layer of placed soils prior to compaction. No additional payment will be made for any moisture control modification.

3.4.3 Compaction of Fill

3.4.3.1 Compaction of Impervious fill and Random Fill

When the water (moisture) content and conditions of the spread layers are satisfactory, each layer shall be compacted to a minimum of 98 percent of the maximum dry density as determined by the moisture-density relationship

determined in paragraph Moisture Density Relationships. Determination of in-place density shall be in accordance with ASTM D 1556 or ASTM D 2937 and specified in paragraph In-Place Density Testing For Impervious and Random Fill Materials. The fill material shall be placed and spread in layers, the first layer not more than 6.0 inches loose thickness and the succeeding layers not more than 8.0 inches loose thickness. Portions of the fills where the compacting equipment cannot reach for any reason shall be compacted to required density with pneumatic fill tampers and power tamping rammers. Layer thickness shall not exceed 4.0 inches prior to compaction when pneumatic fill tampers and power tamping rammers are used for compaction.

3.4.3.2 Placement of Unstable Materials

Unstable material removed from the bottom of any excavation shall be replaced with compacted impervious material meeting the requirements of SECTION 31 22 00 - EARTHWORK.

3.4.3.3 Scarifying

Scarifying of the fill material shall take place 5.0 feet and beyond from any concrete, pipe, or structure. Where hand compactions efforts are applied scarifying will not be needed.

3.4.3.4 Benching

When impervious, spoil, or random fill material is to be placed against an existing embankment, the Contractor shall bench into the slope of the existing embankment as shown in the drawings in order to place and compact the new material in horizontal layers. Benching shall be incorporated in all work associated with the levee and all other earthwork tasks. The vertical face of the existing embankment resulting from the benching operation shall be a minimum of one foot in height but shall not exceed two feet in height.

3.5 Compaction of Spoil Materials

3.5.1 Lift Thickness

When the water (moisture) content and conditions of the spoil material to be placed on the landside berm are satisfactory, the spoil material shall be placed and spread in 6.0 inch layers in thickness prior to compaction. Layers shall be started full out to the slope stakes and shall be carried substantially horizontal and parallel to the levee alignment centerline with sufficient slope to provide positive drainage during construction. The Contractor shall properly drain and seal the spoil material surface at the end of each work day.

3.5.2 Compaction

The Contractor shall be allowed to use a compaction device that is deemed adequate as stated in section 31 22 00 Paragraph 2.3 to achieve compaction. The Contractor shall fully compact each layer by completing a minimum of least 6.0 full passes over the entire layer.

3.6 FLOWABLE BACKFILL

Flowable backfill shall be placed under and around the sides of the waterline that intersects the cement-bentonite cutoff wall in accordance

with the details shown on the drawings and in accordance with IDOT SECTION 593, CONTROLLED LOW-STRENGTH MATERIAL BACKFILL. Flowable backfill shall be placed in 2 lifts; each lift shall be roughened to a 0.25 amplitude and distributed evenly on each side of the pipe to prevent the pipe from displacing from the alignment and grades shown on the contract drawings. The flowable backfill shall be placed to at least a minimum of 12.0 inches and maximum of 18.0 inches below the top of the pipe. Before backfill operations are started the flowable fill shall meet the requirements as stated in IDOT 593.03.

3.7 Roadway Embankments

Maintenance road embankments shall consist of satisfactory impervious materials conforming to the requirements specified in paragraph IMPERVIOUS MATERIALS. The impervious materials shall be placed and compacted as specified in paragraph IMPERVIOUS MATERIALS.

3.8 Slides

In the event of sliding of any part of an excavation or fill during its construction, or after its completion but prior to its acceptance, the Contractor shall, upon written order of the Quality Assurance Representative, cut out and remove the slide and then restore that portion of the excavation or fill. If the slide is caused through the fault of the Contractor, the foregoing operations and construction shall be performed at no additional cost to the OWNER. If the slide is not the Contractor's fault, an equitable adjustment will be made to the contract price

3.9 Finished Grades and Tolerances

3.9.1 Roadway Embankments

The finished surfaces shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade grader or scraper operations. The finished surface shall be not more than 0.2 foot above and no tolerance below the established grade or approved cross section.

3.9.2 Topsoil

The Contractor shall place commercially furnished topsoil no less than six inches above the clay cap/impervious clay fill, random fill, and spoil material in on the landside (disposal) berm, to an elevation not less than that shown on the drawings. All clay cap/impervious clay fill cross sections depict a five foot thick clay cap and six inches of topsoil. Topsoil shall be placed to the final finished grade limits, or to the existing grade elevations, when applicable, where the established vegetation has been disturbed or removed as directed by the contracting officer representative. Topsoil will only be placed to existing grade elevations where the Contractor has disturbed the existing grade and placed no additional fill such as impervious clay fill, random fill, or other proposed fill materail. Topsoil shall be placed not less than six inches thick atop all all fill associated with relocation of the Madison County Transit bicycle trail relocation, to not less than those elevations depicted on the drawings.

3.9.3 Finished Grade

The finished surfaces shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade grader or scraper operations. The finished surface shall be not more than 0.5 foot above and no tolerance below the established grade or approved cross section.

3.10 TURFING EROSION CONTROL MAT INSTALLATION AND PROTECTION

Prior to the installation of the turfing erosion control mat the Contractor shall seed the area. The turfing erosion control mat shall be installed and anchored in accordance with the manufacturer's recommendation on the areas as shown on the drawings. The turfing erosion control mat shall be installed perpendicular to the centerline of the levee embankment and shall be continuous with no seams along the length of mat section installed. As the installation of the mat proceeds in the upstream direction, the upstream section shall overlap the downstream section a minimum of 12 inches wide or the manufacturer's recommendation whichever is wider and anchors installed at a maximum 2.0 feet spacing along the overlapped area. The spacing for the remaining anchoring system shall be in accordance with manufacturer's recommendations. The turfing erosion control mat shall be installed at the top elevation shown on the drawings and the bottom elevation being 10 feet beyond the riverside toe. The Contractor shall have a manufacturer's representative on the job site for the first three days of installation and then once for every 10 working days to verify the installation procedure The turfing erosion control mat shall be protected at all times during construction from contamination by surface run-off and any turfing erosion control mat so contaminated shall be removed and replaced with uncontaminated erosion control mat. The Contractor at no cost to the OWNER shall replace any damage to the turfing erosion control mat during its installation.

-- End of Section --

SECTION 32 11 13

SUBGRADE SOIL MODIFICATION
03/15

PART 1 GENERAL

1.1 SUMMARY

A. This Section addresses site requirements for subgrade soil modification by chemical means. The method of Subgrade modification (i.e. lime) will be determined by the geotechnical engineer based on soils testing of onsite and proposed borrow materials. In the event it is determined by the geotechnical engineer that the material proposed for lime modification is not suitable for the procedure, then cement shall be substituted. The percentage of lime by weight of dry soil material shall be approximately 5 - 7 percent. The actual percentage required for the mixture will be determined by the geotechnical engineer prior to construction. Subgrade soil modification shall include but not be limited to the following items of work:

(1) Construct a 12 inch deep modified subgrade under the bicycle trail granular subbase.

(2) Grade and compact the modified soil mixture to meet site contours allowing for depth of a subbase pavement.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D698	(2012) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

Pennsylvania Department of Transportation (PENNDOT)

STANDARD SPECIFICATIONS	(2000) Publication 408 / PIUB 408

1.3 SITE TESTING

A. The Contractor shall use an independent testing agency to provide testing and inspection of the subgrade soil modification work. Testing of materials to be used in soils modification and compaction of the modified-soil mixture shall be performed by the independent testing agency's laboratory. Testing shall be performed in manner to least encumber performance of work.

B. When work or portions of work, are completed, notify the independent testing agency to perform density tests. Do not proceed with additional portions of work until satisfactory results have been verified in writing.

C. When, during progress of work, tests indicate that compacted materials do not meet specifications, remove defective work, replace and retest, as directed in writing by Quality Assurance Representative.

1.4 QUALITY ASSURANCE

A. Density Test for In Place Soil Materials: The testing agency shall provide for a minimum of one (1) Nuclear Density test performed in accordance with ASTM D6938 for each 2,500 square feet of prepared modified subgrade.

1.5 GENERAL REQUIREMENTS

The subgrade soil shall be scarified and mixed uniformly with lime and water or cement and water, pulverized, shaped, compacted and cured in accordance with these specifications and in conformity to the lines, grades and dimensions as shown on the engineering plans.

A. Lime Requirement: The percent of hydrated or non hydrated by-product lime (Code L), by weight of dry soil material shall be approximately 5 – 7 percent, based upon test results as subsequently outlined. In the event it is determined by the soils engineer that the material proposed for lime modification is not suitable for the procedure, then cement shall be substituted. The percentage required for the mixture will be determined by the soils engineer prior to construction.

1.6 SUBMITTALS

Engineer/Designer of record approval is required for submittals with an "E DA" designation. All submittals are to be reviewed by the submitting contractor's quality control personnel, prior to submission to Wood, to ensure conformance to the design. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

A. Samples: A sample of lime, or lime by-product to be used on the job is to be submitted to the testing laboratory for approval at least seven days prior to the start of the subgrade soil modification work. Samples shall be submitted in moisture-proof, air-tight containers.

B. Certified Test Reports

(1) Maximum Density and Optimum Moisture inaccordance with ASTM D698, and ASTM D6938 with and without recommended lime dosage; E DA

(2) Final Compaction Test Reports; E DA

C. Manufacturer's Certificate of Conformance:

(1) Lime or Portland cement including purity certification; E DA

(2) Material Safety Data Sheet.

1.7 DELIVERY AND STORAGE

Deliver lime or cement in containers showing or including designated trade name, product identification, specification number, manufacturer's name, and source. Store in a manner that will prevent moisture damage, overexposure and contamination.

1.8 WEATHER LIMITATION

Do not construct subgrade when weather conditions detrimentally affect the quality of the materials. Do not apply lime unless the air temperature is at least 40 degrres F (5 degrees C) in the shade and rising. Do not apply lime or cement to soils that are frozen or contain frost. If the air temperature falls below 35 degrees F (3 degrees C) in the shade, protect completed treated areas by approved methods against the detrimental effects of freezing. Remove and replace or recompact any damaged portion of the completed soil-lime treated areas, at no additional costs to the owner.

PART 2 PRODUCTS

2.1 LIME

Lime shall conform to section 1012 of the STANDARD SPECIFICATIONS.

2.2 SOIL

Soil shall consist of the natural materials in the area to be stabilized (unless otherwise indicated). Remove stones retained on a three-inch sieve and deleterious substances such as sticks, debris, and vegetable matter.

2.3 WATER

Potable or subject to approval by the Quality Assurance Representative. Water high in Sulphates is not suitable for use.

2.4 CURING

A. Water Curing: The Contractor shall cure the compacted modified soil layer by keeping the surface continuously moist until subsequent layers are applied.

B. Bituminous Curing Compound: In lieu of water curing, the modified soil layer shall be cured by application of a bituminous emulsion meeting the requirements of ASTM D9773 or other approved curing/sealing membrane.

PART 3 EXECUTION

3.1 SITE PREPARATION

Clean debris from the area to be modified. Perform clearing and grubbing (to a specified depth) and recompact as required. Inspect the original ground for adequacy for the forthcoming compactive effort of lime treatment work. Rough grade and shape the area to be modified to conform to the lines, grades, and cross sections indicated. (Prior to subgrade soil modification comply with subgrade requirements of the applicable specifications).

A. Grade Control: When the modified course is to be constructed to meet with fixed grade, provide adequate line and grade stakes for control. Finished and completed areas shall conform to the lines, grades, cross section and dimensions indicated. Locate grade stakes in lanes parallel to the center line of areas under construction, and suitably placed for string lining. Maintain the line and grade until further construction prohibits. Contractor should be aware that lime modification generally lowers soil density and increases soil thickness and this “fluffing effect” needs to be considered by the Contractor to achieve specified final grade sections.

3.2 LIME MODIFICATON

A. General Requirements of Execution: After site preparation, scarify the subgrade and spread lime as specified hereinafter. Blend lime into the subgrade to the required depth as indicated. Apply lime and water to the soil only to those areas where mixing operations can be completed during the same working day. No traffic shall be allowed to pass over the spread lime until after completion of mixing. Pulverize, mix, compact, and cure as specified herein. If double application of lime is required because of heavy plasticity of the soil, the percentage of lime for the initial application shall be approximately one-half the total specified lime.

B. Scarification: After obtaining required line and grade, scarify and partially pulverize the subgrade. Remove unified organic materials such as stumps and roots. Remove rocks larger than 2 inches.

C. Application of Lime: The specified quantity of lime shall be applied uniformly in a manner that minimizes dust and is satisfactory to the engineer.

D. Mixing, Uniformity Testing, and Compaction: distribute the lime uniformly in the soil by mixing and pulverizing the subgrade, the rate of spread per lineal foot (meter) shall not vary over ten percent from the designated rate. During the mixing process, add water to the subgrade to provide a moisture content of four to five percent above the optimum moisture content and to insure chemical reaction of the lime and subgrade materials. The mixer shall continue making passes until it has produced a homogeneous, uniform mixture of lime, soil and water. After mixing, all the soil particles shall pass a 25.4-mm (one-inch) sieve with at least 60 percent passing the No. 4 sieve. Additionally, the soil-lime mixture shall be free of streaks or pockets of lime and pass the uniformity and gradation test Compact the lime-treated material immediately after final mixing and testing. Aerate or sprinkle water as necessary to provide adequate moisture conditioning during compaction. Compact the lime-treated material in specified lifts to 95 percent of maximum density at 2 to 3 percent above optimum moisture content in accordance with ASTM D698. Field density tests shall be based on moisture-density relations of a representative lime-treated sample obtained from the site. As compaction progresses, maintain the shape of the lifts by blading. The surface upon completion shall be smooth and conform to the indicated section and established lines and grades. Perform initial compaction with sheepsfoot or pneumatic rollers. Areas inaccessible to rollers shall be compacted by other means satisfactory to the Quality Assurance Representative. The entire mixing compaction operation shall be completed within 120 hours of the initial lime spreading, unless otherwise permitted by the Quality Assurance Representative.

E. Finishing: The surface of the finished lime-modified soil after compaction shall be the grading plane established, and at any point the surface shall not vary more than 0.05 feet (15.21 mm) above or below the established grade. Any excess lime-treated soil is to be removed.

3.3 CURING

A. Finished portions of modified subgrade that are traveled on by equipment used in constructing an adjoining section shall be protected in such a manner as to prevent equipment from marring or damaging completed work.

B. After completion of final finishing, the surface of the modified subgrade shall be cured by being kept continuously moist for a period of 7 days with a fog-type water spray that will not erode the surface or by application of a bituminous or other approved sealing membrane. If curing membrane material is used, it shall be applied as soon as possible, but not later than 24 hours after completing finishing operations. The surface shall be kept continuously moist prior to application of curing material.

C. For bituminous curing material, the surface of the modified subgrade shall be dense, free of all loose and extraneous materials, and shall contain sufficient moisture to prevent excessive penetration of the bituminous material. The bituminous material shall be uniformly applied to the surface of the completed soil-lime without undue runoff.

D. Should it be necessary for construction equipment or other traffic to use the bituminous-covered surface before the bituminous material has dried sufficiently to prevent pickup, sufficient sand blotter cover shall be applied before such use. Sufficient protection from freezing shall be given the soil-lime for at least 7 days after its construction or as approved by the Quality Assurance Representative.

3.4 TRAFFIC CONTROL, MAINTENANCE, AND DRAINAGE PROTECTION

A. Provide sufficient warning signs and barricades so that traffic shall not be permitted on the modified soils until stability of the subgrade is assured. Maintain the finished surface until all work has been completed. Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the area which has been modified.

3.5 GENERAL

A. All sampling and tests shall be performed by an approved testing laboratory at the Contractor's expense.

B. Frequency of sampling and testing of materials for conformance and quality control shall be as specified herein and shall be performed at such other times as necessary to document contract compliance. All test reports and results shall be certified by appropriate test methods.

3.6 SURPLUS MATERIAL

A. Remove surplus materials from site.

-- End of Section --

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SECTION 32 11 16

GRANULAR SUBBASE
03/15

PART 1 GENERAL

1.1 SUMMARY

A. This Section addresses the requirements for subbase granular material for use with concrete pavements including but not limited to the following items of work:

(1) Prepare subgrade.

(2) Place and level sub-base granular material under concrete pavements.

(3) Compact as specified for IDOT Subbase Granular Material, Type A/

1.2 REFERENCES

ASTM INTERNATIONAL (ASTM)

ASTM C136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D698	(2012; E 2014) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
ASTM D422	(2007) Standard Test Method for Particle-Size Analysis of Soils
ASTM D4318	(2010; E 2014) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 TESTING & INSPECTION

A. Gradation of stone materials will be performed in accordance with ASTM C136

B. Tests for Proposed Materials: All granular materials proposed for use in the work shall be tested by the Contractor's independent soil testing service and test result reports promptly submitted to the Quality Assurance Representative.

(1) One optimum moisture-maximum density curve will be provided for each type of granular material proposed for use. Maximum density will be determined in accordance with ASTM D698, as applicable.

(2) Mechanical analysis in accordance with ASTM D422 and plasticity index in accordance with ASTM D4318 will be performed for each granular material proposed for use.

B. When the granular subbase, or portion thereof, has been placed and compacted in accord with specifications, notify testing laboratory to perform density tests.

1.4 QUALITY ASSURANCE

A. The Contractor shall use an independent testing agency to provide testing and inspection of the granular subbase work. Testing and inspection shall be performed in manner to minimize disruption to the work.

B. Density Test for In Place Materials: The testing laboratory will perform one series of compaction tests in accordance with ASTM D6938 for each 2,500 square feet of prepared Granular Subbase. Contractor shall pay all costs of additional testing due to unsatisfactory test results.

1.5 SUBMITTALS

A. Submit 10 lb. sample of subbase granular material to testing laboratory, in airtight containers.

B. Test Reports: Copies of the following reports will be submitted to the Quality Assurance Representative from the testing laboratory with copy to Contractor:

(1) Test reports on subbase granular materials.

(2) One optimum moisture-maximum density curve for each type of granular material to be used as subbase or backfill.

(3) Other tests and material certificates, as required.

C. Submit verification that supplier is an approved PENNDOT quarry by written certification.

PART 2 PRODUCTS

2.1 MATERIALS

A. Subbase Granular Material, Type A – Crushed Angular Limestone Aggregate: free of shale, clay, friable materials and debris; graded in accordance with ASTM C136 within the following limits as required for coarse aggregate meeting the requirements of PENNDOT, Type CA-6.

Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90 - 100
1/2 inch	60 - 90
No. 4	30 - 56
No. 16	10 - 40
No. 200	4 - 12

PART 3 EXECUTION

3.1 PREPARATION AND INSTALLATION

A. Verify stabilized subgrade is clean of all debris, dry and ready to receive granular subbase material.

B. Verify gradients and elevations of subgrade are correct.

C. Preparation of Mixture: The exact proportions of aggregate and water shall be regulated so as to produce a uniform satisfactory mixture. The order of sequence in which the aggregate and water shall be drawn or weighted may vary under different conditions. The percentage of water in the mixture may vary with moisture conditions and sources of aggregate, but in no case shall the percentage of water by more than 12 percent by weight, of the total mixture. The finished mixture shall have a moisture content necessary to obtain the maximum density required to comply with the standard compaction test herein specified. In general, the proper moisture content can be judged by the appearance of free water on the surface of the particles. Excess moisture resulting in run-off shall be avoided.

3.2 CONSTRUCTION OF GRANULAR SUBBASE

A. In no case will the Contractor be permitted to place the mixture or manipulate it on muddy or frozen subgrade. Also, no frost or frozen particles shall be placed on the subgrade or compacted.

B. After the stabilized subgrade has been properly prepared, the granular subbase mixture shall be uniformly deposited with a mechanical spreader, spreader box or other approved equipment, in lifts not more than 4” when compacted. The Contractor may construct the granular subbase base in any number of layers which he may find convenient to facilitate compacting, except that, in no case, shall any individual layer have a compacted thickness of more than 4". Each layer shall be compacted immediately after placing, as hereinafter specified, before any succeeding layer is placed.

C. If the mixture becomes too dry to permit compaction, water shall be added during the compacting operations in such an amount as to insure proper compaction. If for any reason, the mixture is too wet for proper compaction it shall be allowed to dry until the proper moisture content is obtained.

D. The mixture shall be handled in such manner as to avoid undue segregation. If segregation occurs or if the mixture becomes contaminated, such segregated or contaminated materials shall be replaced with materials of suitable quality and gradation, except that areas of surface segregation may be corrected by spreading a quantity of stone screening sufficient to close the voids and bind the loose material firmly in place. The screening shall be wet and rolled so as to create a dense and uniform surface. Segregated or contaminated materials shall be removed and replaced with suitable material at the sole expense of the Contractor.

E. The mixture shall be handled in such manner as to avoid undue segregation. If segregation occurs or if the mixture becomes contaminated, such segregated or contaminated materials shall be replaced with materials of suitable quality and gradation, except that

areas of surface segregation may be corrected by spreading a quantity of stone screening sufficient to close the voids and bind the loose material firmly in place. The screening shall be wet and rolled so as to create a dense and uniform surface. Segregated or contaminated materials shall be removed and replaced with suitable material at the sole expense of the Contractor.

F. The Contractor shall restrict hauling over the completed or partially completed work after inclement weather or at any time when subgrade material is soft and there is tendency for the subgrade material to work into the granular material. If any earth is worked into the granular material during placement or compaction operations, all granular material within the affected area shall be removed and replaced with new granular materials.

G. Shaping and compaction shall be carried on until a true, even, uniform granular subbase of the proper grade, cross section and density is obtained. Proper moisture content shall be maintained by wetting the surface as required during shaping and compacting operations. The use of excess water, resulting in run-off or in the formation of a slurry on the surface, shall be avoided.

H. Final rolling on the top course of multiple course construction or the top of single course construction shall be accomplished by a self-propelled pneumatic-tired three wheel or tandem roller weighing not less than six (6) tons, nor more than ten (10) tons.

I. Each layer of granular material shall be compacted to a minimum 95% of the maximum dry density in accordance with ASTM D698.

3.3 FIELD QUALITY CONTROL

A. General: Test in-place subbase granular material for compliance with density requirements in accordance with Paragraph QUALITY ASSURANCE. Requirements for thickness and surface smoothness shall be made at such points as the Quality Assurance Representative selects. Repair or remove and replace unacceptable paving as directed by Quality Assurance Representative.

B. The in-place compacted thickness of the subbase granular material will not be acceptable if it deviates 1/2 inch plus or minus from the required plan thickness.

C. The finished surface of the subbase shall not deviate from plan elevation by more than 1/4 inch minus.

-- End of Section --

SECTION 32 20 20

CEMENT-BENTONITE (CB) CUTOFF WALL
09/13

PART 1 GENERAL

1.1 SCOPE OF WORK AND DESCRIPTION

The Contractor shall furnish all labor, supervision, tools, equipment, and materials for constructing the cutoff wall in panels using the slurry trench method of construction in accordance with these specifications. The cutoff shall be constructed to the alignment, grade, depth, and cross-sections as defined in these Specifications and as shown on the Plans. The Contractor is responsible for the continuity, width, depth, adequacy of the key, trench stability, and permeability of the completed cutoff wall. The completed cutoff wall will consist of a mixture of bentonite-water slurry, cement, and suspended in-situ sand materials from the trench that become mixed during the excavation process. The work shall include:

1. Layout of the work, including surveying and location and elevation control.

2. Providing bentonite-water-cement slurry, including mixing, storage, pumping, testing and maintenance of required physical properties.

3. Excavating slurry trench in panels, maintaining trench stability and slurry levels as specified.

4. Cleaning the site including disposal of excavation spoil, soil and rock, and excess slurry.

5. Quality control testing associated with slurry trench excavation, backfill, and materials.

6. Providing quality as-builts and all raw data used to create them such that the final product can be shown to meet design criteria as specified herein.

7. Maintaining a relatively clean and safe site during construction.

1.2 INTENT

The intent of this Section is to provide specifications for constructing a permanent, continuous, homogeneous, minimum 2-foot-wide CB cutoff wall with a hydraulic conductivity of equal to or less than 1 x 10-6 centimeters per second (cm/s) and a depth up to approximately 140 feet below grade, keying a minimum depth of 5 feet into the till that overlays the bedrock surface or as shown on the drawings, or a minimum of 2 feet into competent rock. The panel final depth shall be determined and field verified for each panel by the Slurry Trench Specialist (STS) and in the presence of the Quality Assurance Representative authorized by the Geotechnical Engineer of Record.

1.3 SEQUENCE OF EXCAVATION IN PANELS

This specification requires a sequence of excavation in primary and secondary panels using a cement-bentonite (CB) slurry for trench stability, which will then harden with time to form the finished cutoff wall. Each panel, be it primary or secondary, shall be a maximum of 40 ft long along the alignment of the wall from stationing 164+00 to 170+00. Each panel, be it primary or secondary, shall be a maximum of 23 ft long along the alignment of the wall from stationing 152+00 to 164+00.

1.4 ASSUMPTIONS

A. This Section has been written assuming that the cement-bentonite slurry panel method will be used to construct the cutoff wall.

B. No panel excavating work shall be performed when the groundwater elevation in the project piezometers is above elevation 417 feet, or when the lower tailwater gage of the Williamsport Levee Systems is projected to rise above stage 21.5 feet within one week.

See http://www2.mvr.usace.army.mil/watercontrol/stationinfo2.cfm?sid=CE2256B4&fid=ALNI
All elevations in this document are in feet and refer to the North American Vertical Datum of 1988 (NAVD88). Gage zero elevation at the Mel Price (Lower) gage is 395.48 ft, National Geodetic Vertical Datum of 1929, (NGVD 29), which is equal to 395.63 ft, NAVD88.

C. The Contractor shall anticipate that obstructions including cobbles up to 1 foot diameter, boulders larger than 1 foot in diameter and sound buried logs exceeding 8 inches in diameter will be encountered in the overburden soils along the CB wall alignment. No extra time or compensation will be granted to Contractor for the removal of such obstructions. Contractor shall submit appropriate means and methods to deal with such obstructions.

D. The Contractor shall anticipate encountering a hard TILL layer around or below elevation 330 ft from stations 152+00 to 164+00. Undrained Shear strengths between 2600 psf and 8000 psf have been measured during excavation as well as blow counts over 50. There is no specific rock strength testing in the immediate vicinity of the wall but with samples taken close by the contractor shall anticipate encountering a hard limestone layer, sandstone, siltstone, and/or shale layer around or below elevation 300 ft from stations 164+00 to 170+00. Unconfined compressive strengths of 17,000 psi in this limestone layer and 4,700 psi in this sandstone layer have been measured during testing at these nearby locations.

1.5 REFERENCES

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

AMERICAN PETROLEUM INSTITUTE (API)

API RP 13B-1	(2009; 4th Ed) Recommended Practice for Field Testing Water-Based Drilling Fluids
API Spec 13A	(2010) Specification for Drilling-Fluid

Materials

ASTM INTERNATIONAL (ASTM)

ASTM C 150	(2009) Standard Specification for Portland Cement
ASTM C 989	(2009a) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D 671	(1993) STANDARD TEST METHOD FOR FLEXURAL FATIGUE OF PLASTICS
ASTM D 792	(2008) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 882	(2012) Tensile Properties of Thin Plastic Sheeting
ASTM D 2103	(2010) Standard Specification for Polyethylene Film and Sheeting
ASTM D 2578	(2008) STANDARD TEST METHOD FOR WETTING TENSION OF POLYETHYLENE AND POLYPROPYLENE FILMS
ASTM D 4832	(2010) Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
ASTM D 5084	(2010) Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes

1.6 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Company Qualifications and Contractors Personnel and Resumes Qualifications and Experience; E DA

Within 10 calendar days after Notice to Proceed, submit to the Quality Assurance Representative and GEOTECHNICAL ENGINEER for review:

(a) The Contractor shall submit brief 2 page descriptions and results of at least 4 similar projects that have been successfully completed by the Contractor. Similar projects shall be those that

used panel construction (hydromill/hydrofraise/clamshell) to depths greater than or equal to 100 ft, utilized Cement-Bentonite backfill, were installed in similar geology and required a maximum hydraulic conductivity of 1.00 X 10-6 cm/s. The brief descriptions shall include but not be limited to method utilized, equipment utilized, depths reached, quality control methods for verticality, and depth measurements and final product results.

(b) Resume and qualifications of the Slurry Trench Specialist (STS). The STS shall have an engineering or geologic/earth science degree with at least 10 years of experience in the successful installation, construction and supervision experience in all aspects of slurry cutoff wall construction, which includes but is not limited to: (1) controlling composition, mixing, placing, testing, cleaning, and maintaining slurry;(2) supervision of alignment, verticality and depth of slurry trenches; and(3) a thorough knowledge of cutoff wall trench construction equipment and material testing. The slurry cutoff wall specialist shall have cutoff wall experience for at least three completed slurry cutoff wall construction projects, at least one of which shall be a panel-type wall at least 140 feet deep and at least 1000 feet in length. Multiple headings in a single contract shall be considered as one construction project. The following information is to be submitted to the Quality Assurance Representative for the proposed project's Slurry Trench Specialist.

1. Contract number, contract amount, date of award, date of completion of at least three previous projects within the last five years, and owners contact information.

2. Description of length, depth, key material and the type of cutoff wall backfill material. A complete description shall be provided of the equipment used, including excavating equipment and the equipment used for sampling and measuring verticality.

The Quality Assurance Representative reserves the right to remove the Slurry Trench Specialist from the job site if he/she or his/her representatives feel that the job is not being adequately performed. The Slurry Trench Specialist shall be the on-site representative of the Quality Control Office for the Contractor.

(c) Resume and qualifications of the Professional Land Surveyor (PLS). The Contractor shall submit the resume of a PLS, licensed in the state of Pennsylvannia, with at least 10 years of experience in the Surveying field. The PLS shall be responsible for assuring the alignment of the wall meets the contract plans and specifications and will also be responsible for providing survey information for the creation of as built. The PLS shall also be responsible for assuring the correct position of any panel surveying equipment the Contractor proposes to use (i.e. plum bob, KODEN, etc..).

(d) Resume and qualifications of the Project Field Superintendent (PFS) The project on-site supervisor shall have at least 10 years of supervisory experience in cutoff wall construction using the panel method. The supervisor shall be on-site at all times during CB cutoff wall construction and have authority for all work on behalf of the Contractor. Once approved, the supervisor shall not be removed from the project without the

Quality Assurance Representative's approval.

(e) Resume and qualifications of CADD technicians. The Contractor shall submit the resume of CADD technicians with at least 5 years of experience that will be creating and updating as built information. The CADD technicians shall be responsible for generating the drawings required for panel completion reports and for as built drawings as provided by the PLS for the project.

Pre-construction Mix Design; E DA

(a) Before construction starts on the cut-off wall, the Contractor shall submit for the GEOTECHNICAL ENGINEER's Approval, an acceptable mix design that utilizes the materials from the same source and in the same proportions that will be used during construction to confirm the designed CB mix meets the design requirements for permeability and strength. The Contractor is responsible for utilizing equipment that is compatible with the proposed mix design. The mix design testing shall be conducted by an independent validated laboratory as listed in the MTC website and the laboratory shall also be validated for the methods being used to determine the strength and permeability of the mix.

(b) A number of borings and explorations have been performed around the site and locations are included in the plan set. The test results from these borings can be obtained from:

Wood Environment & Infrastructure, Inc
850 Vandalia St. Suite 230
Collinsville, IL 62234
(618) 346-9120

Local variations may exist within the subsurface and the interpretations and deductions made from these logs and test results are the sole responsibility of the Contractor. Local variations, if encountered, will not be considered as being materially different within the purview of this contract. Soil samples from the exploration will be made available to the Contractor for use in their mix design phase.

(c) The Contractor shall submit a mix design report no more than 60-days after NTP that shall include at a minimum, batching procedures for the design mixes, and testing procedures utilized to verify the mix design properties. Mix design proportions, properties and test results shall be presented in the report. These results shall include density of freshly batched slurry, density of cured slurry at 28 days, 7, 14 and 28 day compressive strength and 7, 14 and 28 day permeability. The report shall also include the Contractors selected mix design. This report shall be submitted for the GEOTECHNICAL ENGINEER's approval.

Equipment, Methods and Procedures for CB Slurry Preparation, Treatment and Disposal; E DA

(a) The Contractor shall provide a list of equipment and materials utilized for the preparation, treatment and disposal of the CB slurry. The submittal shall include descriptions of procedures and methods that will be utilized to prepare the slurry, treat and dispose of it as well.

(b) The Contractor shall submit a list of equipment, methods and procedures utilized to monitor the compositions of the slurry right after batching, during in-trench excavation and prior to completion of panel.

Equipment, Methods and Procedures for Panel Installation and Backfill; E DA

(a) The Contractor shall submit a list of equipment and describe the procedures and methods utilized to excavate each panel of the cut-off wall and how stability in each panel will be maintained and slurry level verified.

(b) The Contractor shall submit a list of equipment and describe the methods and procedures utilized to verify the cleanliness of the bottom of the trench and methods utilized to clean the bottom of the trench if necessary.

(c) The Contractor shall submit the layout of the cut-off wall, in plan view, along the alignment provided by the GEOTECHNICAL ENGINEER. In this plan view the Contractor shall present and numerically identify each panel with its planned/theoretical location. Both planned secondary and primary panels shall be identified such that they are able to be differentiated from one another. Panels shall also be identified in reference to the levee stationing as well as numerically and in sequence. This should be presented in a detailed format to include all the pertinent site information and should include but not be limited to levee locations, work surface locations and construction limits. The Contractor shall also present assumed theoretical depths of each panel, in profile view, based on the criteria presented herein and on his interpretation of the sub-surface data. Ultimately the final depth shall be verified in the field. This location will be used as the baseline to generate the as-builts once the panels are installed.

(d) The Contractor shall submit the equipment methods and procedures he plans on utilizing to measure and verify trench width and panel depth. He/She shall submit and utilize at least two (2) independent methods to verify panel verticality and to generate as-built information.

(e) The Contractor shall submit equipment, methods and procedures for mitigating sudden slurry loss resulting in compromised trench stability. The Contractor shall submit in detail how he plans to protect the levee and the excavation in the event of rapid or sudden slurry loss above what is typically expected during the excavation process and based on the geologic conditions of the site.

(f) The Contractor shall submit equipment, methods and procedures for sampling that will be utilized to confirm the depth of the panel has reached the minimum penetration into the key material, whether it be till or bedrock as shown on the plans. This confirmation shall be performed in the presence of the Quality Assurance Representative, GEOTECHNICAL ENGINEER or GEOTECHNICAL ENGINEER's Representative as well as the STS.

(g) The Contractor shall submit equipment, methods and procedures utilized for the permeability and compressive strength testing of the CB mix design as well as of the in place (bulk) samples taken during installation.

(h) The Contractor shall submit equipment, methods and procedures for the sampling method of in place CB slurry for testing purposes and verification of design parameters as outlined herein.

(i) The Contractor shall submit a coring plan to core at least 5% of the installed panels not including the test section panels and one full depth core shall be completed within the test section. Coring shall be conducted within 21 to 35 days of panel installation, and not before the in-place panel has reached a strength of at least 20 psi. The coring plan shall include information including but not limited to equipment, methods and procedures utilized to core the wall with minimum disturbance, retrieve samples with a recovery of at least 95%, test the samples for strength and permeability, and backfill the cored panels. The coring shall be at least 2 ft into rock between stations 162+00 to 170+00. Between stations 152+00 to 162+00 the coring shall be taken to the bottom of the wall/till interface. The Contractor shall submit proposed panels to be cored with the original work plan but the GEOTECHNICAL ENGINEER shall choose the final location along the alignment of the wall. The GEOTECHNICAL ENGINEER reserves the right to request additional coring based on ongoing progress and results of panel closure tests at no additional cost to the OWNER.

(j) The Contractor shall submit procedures to confirm that the cutoff wall has been tied into competent bedrock or till.

(k) The Contractor shall submit example formats of test reports, QC checklists, data sheets and sample data reduction from QC testing to include but no be limited to verticality plots, compressive strength, permeability, and in trench slurry properties.

(l) The Contractor shall submit equipment, methods and procedures for disposing and treatment of excess soil and slurry (Spoils produced from the excavation of the cut-off walls.

(m) The Contractor shall submit equipment, methods and procedures for removing the portion of the cutoff wall that will be replaced with a clay cap.

(n) Emergency Action Plan. The Contractor shall submit an emergency action plan that details the steps the Contractor will take in order to close the trench with partially complete panels, suspend excavation activities, and move the equipment to safer areas if the Mississippi River is predicated to rise above 21.5 ft at the Mel Price Lock and Dam Tailwater gage.

(o) Contractor shall provide loading calculations for all utility crossings prepared by and signed and sealed by a Professional Engineer registered in the State of Pennsylvania not less than fourteen (14) days prior to construction of the work platform.

Instrumentation Plan for Test Section; E DA

(a) The Contractor shall submit for GEOTECHNICAL ENGINEER approval a detailed instrumentation plan that includes the location of the proposed test section , location of instruments that will be utilized to monitor stability of the panels, qualifications of the personnel that will be utilized to install and subsequently monitor the instruments. The installation shall at a minimum be supervised by a Licensed PE in the state of Pennsylvannia with at least 5 years of experience in the installation and monitoring of the instrumentation utilized. The reading of the instruments shall be performed by a technician with at least 5 years of experience with the instrumentation to be utilized and supervised by the Instrumentation Engineer.

(b) The instruments consist of at least 6 inclinometers installed 10 feet into competent bedrock from the original ground surface (not including the work platform). The inclinometers shall be utilized to monitor movement of the side walls of the panel excavation. A pair of inclinometers as shown in the drawings shall be placed on a primary and a secondary panel that are adjacent to each other. The instruments shall also include piezometers as shown on the drawings tipped in the sandy aquifer in order to monitor groundwater levels during installation of the cut-off wall.

SD-02 Shop Drawings

Raw Panel Data and As-builts; E DA

(a) The Contractor shall submit as-built drawings of the completed cut-off wall. The drawings shall include a plan view of the installed alignment of the wall. It shall also include a profile view of the as-installed wall with the accurate field measured and approved depth of each panel along the wall alignment. Each panel should be identified and shown as a discrete element. Any obstructions or other anomalies and/or utilities encountered during excavation shall be noted and actions taken to remove or work around such obstructions should be noted as well. The as-builts shall also include detailed verticality analysis of each panel closure. One panel closure will be defined as 2 primary panels connected by 1 secondary panel. The detailed verticality analysis should be composed of discrete transverse cuts of the closures performed shown at 10-foot intervals along the full depth of each closure (2 primaries, 1 secondary). The transverse sections at those intervals shall show each panel and how it deviates from the theoretical panel. Dimensions such as minimum effective thickness of the wall and length of the panels shall be noted on these sections as well as any other dimension that describes the panels and the closure. This shall be presented for every closure that forms the finished cut-off wall. The Contractor shall submit one hard copy and one electronic copy of the as-built to the GEOTECHNICAL ENGINEER for approval. The as-built submittal shall also include all the pertinent raw data that was used to generate them.

SD-03 Product Data

Fill For Working Platform; E DA

Source of temporary fill for working platforms

Admixtures; E DA

Information on any admixtures proposed for the slurry

SD-04 Samples

Bentonite

Samples of Key Materials

Bulk Samples and Test Specimens

SD-06 Test Reports

Panel Construction Records; E DA

(a) After installation of each panel. The Contractor shall submit for approval a detailed installation report of the panel. The report format shall be identified using the panel number and cut-off wall station. The panel report shall include verticality plots from the 2 independents methods, final installation depth of the panel, notes of any obstructions or slurry losses, results of in place slurry testing during installation and as-built verticality as compared to theoretical verticality. Each panel report shall be submitted no more than 3 days after installation of the panel.

Permeability Tests Results; E DA

(a) Once the 7, 14 and 28 day results for the UCS and Permeability test results are available they shall be submitted to the Engineer for approval. The results shall be submitted in an organized manner and each result set shall be clearly identified by panel number and cut-off wall station. The test results shall be considered supplemental to the Panel Construction Report and shall be submitted as an amendment to each panel construction report.

Bentonite

Test reports from the bentonite manufacturer with each load of bentonite shipped to the site.

Test Section Completion Report; E DA

(a) The Contractor shall submit a Test Section Completion (TSC) Report once the Test Section is completed as specified herein. The purpose of the test section will be for the Contractor to prove to the GEOTECHNICAL ENGINEER that his selected equipment, methods, and procedures can install the proposed cut-off wall to the specified design criteria and without damaging or compromising the integrity and stability of the excavation and the existing Wood River levee.

(b) The TSC Report shall include all the reports and information required for the production panels installed subsequently as specified herein. These include but are not limited to Panel Construction Reports, UCS and Permeability test results, Instrumentation results and Panel Closure Reports and As-builts). The test section shall be composed of 2 full closures or a minimum of 84 linear feet of cutoff wall incorporating 20 feet panels or a maximum of 184 linear feet of cutoff wall incorporating 40 feet panels. The test section will be installed within the proposed alignment of the final wall between stationing 164+00 to 168+00 so that it will be part of the completed cut-off wall. The length of primary and secondary panels chosen within the test section shall be the length of panels utilized between stations 164+00 to 170+00.

(c) The test section shall be instrumented as specified in the Instrumentation Plan and results from the instrument reading during and subsequent to the installation of the test section shall be submitted in an organized fashion along with the TSC Report and the as-builts for the test section.

(d) The Contractor shall not commence installation of panels outside of the test section until the complete TSC Report has been reviewed and approved by the GEOTECHNICAL ENGINEER. The GEOTECHNICAL ENGINEER will have up to 21 days to review the TSC Report.

SD-07 Certificates

Certificate of Compliance; E DA

Certificate of compliance and statement from the supplier that the cement complies with ASTM C 150.

DETECTABLE MARKING TAPE (DMT); E DA ASTM Certification

Certificate of compliance and statement from the supplier that the cement complies with ASTM D 2103, ASTM D 882, ASTM D 2578, ASTM D 792, and ASTM D 671

Slag; E DA

Statement from the supplier that the slag is ASTM C989 minimum grade 120 or better

1.7 DEFINITIONS

A. Cement-Bentonite Slurry Trench Cutoff: A cement-bentonite slurry trench cutoff is a 2 ft minimum width trench excavated below the prepared working platform into existing soil materials that terminates as shown on the drawings or at least 5 feet into till, or 2 feet into competent bedrock, by the slurry method of excavation. The excavating slurry is left in the trench to cure in place, resulting in a barrier with a permeability equal to or less than 1 x 10-6 cm/sec; referred to herein as the CB cutoff wall.

B. Slurry Panel Method of Excavation: The slurry method of excavation for this project consists of excavating a vertical wall trench in overlapping primary and secondary panels through fill and natural soils while at the same time keeping the trench filled with a

cement-bentonite-water slurry. The initial purpose of the slurry is to provide support for the walls of the trench and prevent movement of groundwater. A primary panel is a panel that is excavated before the adjacent secondary panel or panels. A secondary panel is a panel that is excavated adjacent to and overlaps a primary panel that has hardened to a minimum specified strength.

C. Till: Till shall constitute an impervious material as defined in SECTION 31 22 00

D. Competent rock: Competent bedrock shall be determined in the field by the Owner's Engineer after continuous excavation for 60 minutes with a hydromill or chisel yields less than one foot of advancement, and in conjunction with consideration by the Owner's Engineer of other pertinent information. Such information to consider in determining competent rock will be at the discretion of the Owner's Engineer and will include examining the cuttings at the desander (hydromill) or at the trench (clamshell or chisel), viewing the performance/torque of the hydromill, comparing the depth of competent rock for adjacent panels, the type of cutting wheels, type of cutting teeth, the angles of cutting teeth, the rpm's and torque of the cutting wheels, and the amount of weight on the cutting head. Chisel advancement rates also depend on the type of chisel such as square, star, or cross, the weight of the chisel, the free-fall distance while chiseling. Each of these factors must be considered by the contractor when selecting equipment appropriate for the geologic conditions.

E. Cement-bentonite (CB) Panel: A CB panel, either primary or secondary depending on the sequence of excavation, is a segment of the cutoff wall with a maximum length of 23 (stationing 152+00 to 164+00) to 40 feet (Sta. 164+00 to 170+00) depending on the location of construction that is excavated in multiple bites with tools having a bite length of less than the maximum specified length. The overlap between adjoining primary and secondary panels shall be at least 20 inches, and greater if necessary to maintain the specified minimum effective wall thickness of 2 feet given the CONTRACTOR'S equipment and methods.

F. CB subpanel: A CB subpanel is a segment (bite) of a CB panel excavated with tools having a bite length less than the maximum specified length of a CB panel.

G. Bentonite Slurry: Bentonite slurry is a colloidal mixture of bentonite (fully hydrated) and water or other suitable admixtures approved by the GEOTECHNICAL ENGINEER.

H. Bentonite: Bentonite is an ultra-fine natural clay whose principal mineral constituent is sodium cation montmorillonite.

I. Cement Bentonite Slurry: Cement bentonite slurry is a colloidal mixture of prehydrated bentonite slurry, Portland cement Type I/II (per ASTM C 150), slag (ASTM C 989 minimum grade 120 or better), and water, along with other suitable mixtures approved by the GEOTECHNICAL ENGINEER. For the purposes of this specification, any reference to cement is a reference to cement, slag, and/or a mixture of cement and slag. The liquid slurry will be used to support the sidewalls of the trench during construction. After a period of time the slurry will harden in the trench and become the backfill for the cutoff wall.

J. Surface Water: Surface water is used to denote all waters that enter the Work area above the existing ground from either natural or artificial sources.

K. Ground Water: Ground water denotes all water below the existing ground surface within the Work area. The ground water levels shown on the boring logs are those measured at the time of the exploration. The ground water level can vary depending on rainfall, season, and the stage of the adjacent Susquehanna River and Lycoming Creek. Groundwater levels during CB cutoff wall construction shall be assumed to be the same as the Susquehanna River elevation at the lower gage of the Williamsport Levee System.

L. Working Platform: The working Platform is the surface on which the equipment operates to construct the cutoff wall. The liquid slurry level in the trench shall never be more than two feet below the elevation of the working platform. The groundwater encountered beneath the working platform shall be equal or less than elevation 417 during all slurry trench construction work and shall be assumed to be the same as the river elevation at the locks and dam lower gage adjacent to the trench.

M. Backfill: A homogeneous mixture of bentonite, cement, water, and other admixtures approved by the Quality Assurance Representative that is used to construct the slurry cutoff wall.

N. Admixtures: Any additive used to modify the properties of the bentonite and/or the cement bentonite slurry as approved by the Quality Assurance Representative.

O. The hydrofraise-type cutter or hydromill, used in the slurry panel method, consists of hydraulically operated, horizontal shaft, cutter drums, mounted in a vertical frame with a high capacity reverse circulation pump to remove cuttings from the trench. A desanding plant shall be provided to remove cuttings from the slurry prior to recirculation to the trench. The cutter shall be steerable and contain monitoring equipment to provide real-time information on its precise location. The hydrofraise-type cutter shall have either hydraulic jacks or an articulating cutter with the capability of correcting and maintaining required verticality tolerance. The cutters shall be capable of excavating into adjacent partially hardened CB cutoff panels to form a clean, serrated joint between panels that shall be capable of transferring shear between the panels and shall prevent piping of materials through the completed CB cutoff wall. The joint between the adjacent panels shall be accomplished by excavating a minimum of 20 inches into the previously completed primary panels.

P. The grab clamshell shall be capable of excavating panels, which require continued, simultaneous excavation. The grab clamshell shall be capable of correcting and maintaining required verticality tolerance. The joint between the adjacent panels shall be accomplished by excavating a minimum of 20 inches into the previously completed primary panels.

1.8 MIX DESIGN

A. Before construction starts, the Contractor shall complete a CB mix design using the materials from the same source and in the same proportions as will be used during construction to confirm the

designed CB mix meets the design requirements for permeability and strength. The CB mix design testing shall be conducted by an approved independent laboratory and include at a minimum permeability and strength testing. The laboratory shall have current Corps of Engineers validation (including for the tests being performed during mix design testing) and its supervisory personnel shall have completed at least three CB mix designs similar to that specified in this section.

B. The Contractor shall begin the trial mix designs within 7 calendar days from the Notice to Proceed. The Contractor shall develop a laboratory testing program to demonstrate the adequacy of the proposed backfill mix design. Trial mix designs shall cover a range of percentages of bentonite, cement, and admixtures. Any combination of water, bentonite, cement, and admixtures can be used by the Contractor. The Contractor shall fabricate a sufficient number of samples and mix designs to support the basis for the proposed mix design. The minimum number of trial mix designs shall be four. The materials used to fabricate the test specimens shall be those proposed for use in construction including bentonite, cement, water, admixtures, and any other materials. The performance criteria shall include hydraulic conductivity (ASTM D 5084) (permeability), compressive strength (ASTM D 4832), and viscosity (API RP 13B-1) in accordance with the parameters and methods described herein. The CB slurry mix selected for production work shall undergo a second series of tests in which at least four different percentages of sand, representative of the naturally occurring sand collected from the project site, are intermixed within the slurry. A minimum of 10 percent of sand will be used. One sand content will be 15 percent, one will be 25 and another will represent the saturated state in which sand is mixed into the fresh slurry until the sand begins to fall out of suspension. The CB slurry selected for production work shall have additives mixed with the fresh slurry such that the slurry will set in less than 24 hours and not less than 4 hours after the expected completion time for a specific panel.

C. The Contractor shall submit a mix design report including the mix design test results and a complete description of test methods and procedures to the GEOTECHNICAL ENGINEER for review and approval. The Contractor's test results, including density, mix proportions, 7, 14, and 28-day permeability and 7, 14, and 28-day compressive strength shall be submitted to the GEOTECHNICAL ENGINEER within 60 calendar days from the Notice to Proceed date.

1.9 QUALITY CONTROL

A. Perform quality control field and laboratory tests as required to manage operations, produce consistent materials, and meet the requirements of this section.

B. Any quality assurance work and testing performed by the Quality Assurance Representative, OWNER's 3rd Party Quality Assurance Contractor, or GEOTECHNICAL ENGINEER does not relieve the Contractor from his obligation to perform such quality control work, unless so approved by the GEOTECHNICAL ENGINEER.

1.10 QUALITY ASSURANCE

A. The GEOTECHNICAL ENGINEER's Representative and OWNER's 3rd Party Quality Assurance Contractor will perform field and laboratory quality

assurance tests to confirm that CB slurry and CB backfill meets the requirements of the specifications. OWNER's 3rd Party Quality Assurance Contractor quality assurance testing is described in Paragraph 3.10.

B. Final acceptance of all materials and placement methods will be based on a review of quality control tests and measurements made by Contractor, quality assurance tests performed by the OWNER's 3rd Party Quality Assurance Contractor and GEOTECHNICAL ENGINEER's Representative, and on visual observations made by the Government during construction. See Paragraph 3.10

C. If a test fails to meet the specified criteria, another test shall be performed after the Contractor has completed the necessary corrective work. The Contractor shall bear the expense of all the necessary corrective action and re-tests performed.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Bentonite

The bentonite shall be a sodium cation base montmorillonite powder (Premium Grade Wyoming-type bentonite) that conforms to the standards set forth in API Spec 13A, Section 10, unless the Contractor believes the use of treated bentonite is justified, in which case he should seek Engineer's approval to comply with Section 9 instead of Section 10, and provide reasons for the change. The Contractor shall furnish to the GEOTECHNICAL ENGINEER a certificate of compliance and a copy of the test reports from the bentonite manufacturer for each lot of bentonite shipped to the site stating that the bentonite complies with all applicable standards. All bentonite will be subject to inspection, sampling, and verification of quality by Contractor Quality Control testing and OWNER's 3rd Party Quality Assurance Contractor Quality Assurance testing. No bentonite from the bentonite manufacturer shall be used prior to acceptance by the GEOTECHNICAL ENGINEER. Bentonite not meeting the specifications shall be promptly removed from the site and replaced with bentonite conforming to specification requirements at the Contractor's expense. Bentonite shall be protected from moisture during transit and storage.

2.1.2 Water

Water shall be supplied by Contractor. The water used in production and mix design shall be the same source and shall be in the specified ranges, and the mix design report shall document the water source and the source test results. The water shall be clean and free from deleterious amounts of oil, salts, and organic matter. Water shall meet the following criteria:

A. pH 6 to 8.5 (API RP 13B-1)

B. Hardness 150 to 250 ppm (API RP 13B-1)

C. Total Dissolved Solids < 500 ppm (EPA 600/4-79/020, Method 160.01)

2.1.3 Cement

The cement used in preparation of the slurry shall conform to ASTM C 150,

"Requirements of Portland Type I-II Cement" and/or slag (ASTM C 989 minimum grade 120 or better). The cement shall be adequately protected from moisture and contamination while in transit to and in storage at the job site. Reclaimed cement or cement containing lumps or deleterious materials shall not be used.

2.1.4 Bentonite Slurry

A. The bentonite slurry for mixing in the cement bentonite slurry shall consist of the specified bentonite in water. It is the responsibility of the Contractor that the slurry meets the necessary properties. Slurry shall consist of a fully hydrated stable colloidal suspension of powdered, premium grade bentonite in water and shall be controlled in accordance with the most current API RP 13B-1 and shall conform to the requirements specified herein.

B. Do not mix slurry by hand or in the trench. Mix bentonite and water using approved mixing equipment until the bentonite slurry is homogeneous and allow to hydrate at least 24 hours unless otherwise approved by the Quality Assurance Representative. Mix the slurry periodically and recirculate the slurry to keep it homogenous.

C. In the event the Contractor uses any additional admixture, it shall be subject to approval of the GEOTECHNICAL ENGINEER and the Contractor shall have on file a written statement from the manufacturer as to the use of any such admixture, its effect on the slurry, its long-term performance and stability, and its effect on the environment. Admixtures of the type used in the control of oil field drilling mud such as thinners, dispersants, and flocculants may be used to control standard properties of the slurry such as apparent viscosity and filtration characteristics subject to the approval of the GEOTECHNICAL ENGINEER. Peptizing or bulking agents shall not be mixed with the slurry. Submit detailed information on the additives required to control the set time of the CB slurry.

2.1.5 Cement Bentonite Slurry

A. The initial design mix for the CB slurry cutoff wall backfill shall be developed by the Contractor and approved by the GEOTECHNICAL ENGINEER based upon specification requirements and advance testing as specified herein. Modifications to the initial design mix shall be made only with the approval of the Quality Assurance Representative. Adjustments to the slurry mixture shall be made by the Contractor to ensure a stable excavation at all times. Any CB slurry not used within the acceptable pot-time shall be discarded and disposed of at the Contractor's expense.

B. The cement bentonite water slurry shall be mixed in a mixer that can completely disperse the particles and produce a stable colloidal suspension before introduction into the trench.

C. The Contractor shall maintain the properties of the slurry in the trench by approved additives, recirculation, or replacement.

2.2 EQUIPMENT

A. The Contractor's slurry plant shall include a suitable mixer capable of producing a colloidal suspension of bentonite and water, an agitating sump, pumps, and necessary valves, hoses, supply lines and

small tools to provide an adequate supply of slurry to the cutoff trench excavation. The Contractor shall use an approved water source for slurry mixing; to this end, the Contractor shall obtain the necessary valves, hoses, and other necessary items to bring water from the approved source to the mixing area. The mixer used in preparing the slurry may be a high-speed colloidal-type mixer, or other approved type, capable of achieving complete dispersion of bentonite and additives, and capable of continually mixing to provide a uniform and thoroughly blended slurry. Mixing equipment shall have a controlled weighing system for assuring that that the dry and wet constituents of the slurry are properly proportioned.

B. Storage of the bentonite slurry shall be in above-ground tanks or ponds. The storage facilities shall be of sufficient size to accommodate the trench excavation rate and to allow complete hydration of the bentonite before mixing with cement/slag and additives. The storage facilities shall be equipped with a circulation system for agitation of the slurry and shall have adequate capacity to provide fully hydrated slurry where substantial slurry loss from the trench occurs through pervious zones.

C. The equipment shall permit addition of the cement to the hydrated bentonite-water slurry just prior to introduction of the slurry into the trench. The equipment shall provide for a thoroughly blended slurry with the cement particles fully dispersed in the bentonite-water slurry. The cement-bentonite-water slurry shall be in constant circulation until it is introduced in the trench. Transport the bentonite slurry by means of temporary pipeline or other methods approved by GEOTECHNICAL ENGINEER.

D. Calibrate slurry mixing plants prior to construction.

E. Excavation Equipment

(1) The excavation equipment shall be selected by the Contractor and approved by the GEOTECHNICAL ENGINEER as specified herein. Every piece of equipment utilized to excavate any portion of the cut-off wall shall already have been submitted and approved by the government. Any additional equipment that the Contractor chooses to utilize shall only be utilized after approval from the GEOTECHNICAL ENGINEER in writing. All the equipment utilized for the excavation shall be capable of meeting the verticality requirements as specified herein.

(2) The Contractor is allowed to utilize traditional excavating equipment for the panel construction as long as panel lengths are kept within the limits specified herein.

F. The equipment shall be arranged to permit free vertical passage of CB slurry within the trench and prevent the development of suction pressures within the trench. The equipment shall be such that raveling of the sides of the trench is minimized and the width of the trench is maintained. The equipment shall be capable of excavating the cutoff wall trench to the minimum required thickness of the wall with one pass of the excavating tool. The trenching equipment shall be placed on crane mats with a minimum dimension of 24 feet long by 22 feet wide so that the loads from the equipment are evenly distributed into the soil.

G. Use equipment accepted by the Quality Assurance Representative for final cleaning of the bottom of the trench as submitted to the GEOTECHNICAL ENGINEER.

H. Use devices accepted by the Quality Assurance Representative to demonstrate that the trench is excavated to the required depth, width, and vertical tolerance shown on the Drawings. Verticality shall be checked throughout the excavation process using at least 2 of the following methods: the internal inclinometers, Koden sonic imaging, pendulum measurement or an alternate accepted method of measuring verticality compatible with the Contractor's equipment. The method of measuring verticality shall be presented in the Contractor's submittals. A minimum of 2 approved independent methods shall be utilized at all times.

2.3 FIELD LABORATORY

A. The field laboratory for Contractor's Quality Control Testing shall contain as a minimum the following working equipment:

1. 2 Marsh funnel sets.
2. 1 Standard filter press.
3. 2 Mud balances (direct reading of density).
4. 2 Slurry sampler.
5. 2 Number 200 sieves.
6. 1 Set of standard sieves and sieve shaker.
7. 1 Oven for moisture content.
8. 2 Scale.
9. 2 pH meter.
10. 2 Sand content sets.
11. 4 3 by 6 inch cylindrical molds.
12. Thermometers.

B. The equipment shall be made available for GEOTECHNICAL ENGINEER's Representative testing at any time.

C. The field laboratory shall be located on site and shall be an enclosed and climate controlled area such that QC and QA personnel can adequately perform the required test for verification of slurry quality.

2.4 DETECTABLE MARKING TAPE (DMT)

Underground marking tape shall be a 12" width, detectable marking tape, with a minimum 5.0 mil overall thickness. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core, and then laminated to a 3.75 mil clear virgin polyethylene film. Tape shall be printed using a blue diagonally striped design for maximum visablity.

Detectable marking tape shall meet or exceed the following ASTM Standards:

ASTM D 2103: STANDARD SPECIFICATION FOR POLYETHYLENE FILMS AND SHEETING.

ASTM D 882: STANDARD TEST METHOD FOR TENSILE PROPERTIES AND ELONGATION OF THIN PLASTIC SHEETING.

ASTM D 2578: STANDARD TEST METHOD FOR WETTING TENSION

OF POLYETHYLENE AND POLYPROPYLENE FILMS.

ASTM D 792: STANDARD TEST METHODS FOR DENSITY OF PLASTICS BY DISPLACEMENT.

ASTM D 671: STANDARD TEST METHOD FOR FLEXURAL FATIGUE OF PLASTICS.

Custom Print Legend Shall Be 3 Lines of text

Line 1: "CAUTION BURIED LEVEE FLOOD WALL"
Line 2: "CONTACT WOOD RIVER"
Line 3: "DRAINAGE AND LEVEE DISTRICT"

Detectable marking tape shall be Pro-Line Safety Products or approved equal.

Text shall be on a 28-inch repeat pattern on 24-inch plate

All unused tape shall become the property of Wood River Drainage and Levee District and shall be delivered to their office after the completion of the construction

Contractor shall consider cost of DMT incidental to Cutoff Wall construction. Cost of DMT shall be included in the SF cost for cutoff wall.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Construct the CB cutoff wall at the locations shown on the drawings after constructing the work platform and preparation of necessary construction staging and work areas.

B. The intent is to construct a CB cutoff wall in primary and secondary panels that is at least 2 feet thick, has an unconfined compressive strength between 50 and 180 psi, a hydraulic conductivity of 1 x 10-6 cm/s or less, and penetrates at minimum 5 feet into till or as shown on the drawings, or a minimum of 2 feet into competent bedrock as indicated on the drawings or as determined by the Quality Assurance Representative. The nominal thickness of the cutoff wall shall be based on the dimensions of the tools used to excavate the cutoff wall panels; the effective thickness will be the in-place, constructed thickness of the wall, which shall be a minimum of 2 feet. The length of primary and secondary panels shall be at maximum 23 ft between stations 152+00 to 164+00. The length of primary and secondary panels shall be at maximum 40 ft between stations 164+00 to 170+00.

C. Before performing any work covered by this Section, the Contractor shall become thoroughly familiar with the site, site conditions, site utilities (above and below ground), subsurface conditions, lines and limits of site disturbance, and all other portions of the Work. The Contractor shall submit, for approval by the GEOTECHNICAL ENGINEER, instrumentation plan for test section, sources for platform fill, detailed plans for protecting or bypassing the existing Olin water line and force main if applicable, details for excavating in the vicinity where these two lines cross the cutoff wall alignment, and details for placement of CB slurry around the two pipelines.

D. Maintain the stability of the excavated trench.

E. Dispose of excess bentonite slurry and CB backfill at locations approved by the GEOTECHNICAL ENGINEER.

F. Provide and maintain personnel with sufficient qualifications, equipment, and materials on site to raise the slurry level in the cutoff wall trench when necessary. Have personnel on call at all times, including weekends and holidays. During excavation, maintain sufficient capacity and adequate quantities of lost circulation materials to stop slurry loss and to immediately raise the slurry level in case of sudden loss of CB slurry from the cutoff wall trench.

G. Employ construction methods that prevent leakage or spillage of excavated soils, bentonite slurry, or CB slurry into streams, the Susquehanna River, Lycoming Creek or drainage ditches, onto adjacent areas, property, or other areas outside of the limits of site disturbance.

H. Perform and submit stability analysis if there are any revisions or variations/deviations from the cross sections shown on the plans. Variations/deviations include but are not limited to changes in the levee cross-section, alterations from the platform surface elevation shown on the drawings, changes in alignment and location of the cut-off wall and changes in the maximum length of panels. Stability analysis shall meet Factors of Safety of at least 1.2 using a 3D finite difference analysis. If a 3D finite difference analyses program other than FLAC3D is used, a calibration analysis shall be performed using the input parameters from the Wood analysis, and shall be submitted for review along with the report. The slurry shall be assumed to have no shear strength and no more than 72 pcf unit weight unless it can be justified with mix design results. A report of the analyses shall be prepared and submitted to the Owner's Engineer in accordance with Section 01 33 00 Par 1.2.1, along with (if requested by the QAR) electronic input and output files from the program used to make the analyses.

I. Before the Contractor proceeds to the installation of the production panels of the cut-off wall but after the Contractor's methods and procedures have been approved, the Contractor shall have an approved TSC Report as specified herein.

3.2 SITE PREPARATION

A. Prepare necessary construction staging and work areas, working platforms, bentonite slurry preparation areas, and CB preparation areas as required to construct the cutoff wall. Work platforms designed by Contractor shall be verified by the Contractor's stability analyses
considering the actual equipment and work platform geometry to be used. The design of work platforms shall be performed and sealed by a geotechnical engineer licensed in the State of Pennsylvania.

B. Control surface water drainage into the slurry trench excavation through the use of ditches and/or diversion berms constructed by mounding soil adjacent to the slurry trench to prevent water from entering the trench and diluting the slurry. The quality of runoff leaving the construction site shall be controlled by installing silt

fences, earth berms or concrete platforms and gutters to prevent the release of bentonite slurry, CB slurry or suspended solids into any drainage ditches, water bodies, or offsite areas.

3.3 WORKING PLATFORMS

A. Construct and remove required working platforms suitable for excavating and constructing the CB cutoff wall.

B. The working platform shall be constructed at a minimum to the dimensions shown on the plans and shall consist of impervious clay fill placed in accordance with Section 31 22 00 EARTHWORK.

C. During the course of construction, the Contractor shall maintain the working platform in such a condition so as not to risk the safety of the employees and persons on site and as to not impair the construction operations, including excavation of the slurry trench, quality of the cement-bentonite-water slurry/backfill, access to the trench for observations and measurements, containment of excavating fluids, and trafficability of vehicles associated with the work. Any deterioration of the working platform shall be promptly repaired by the Contractor so as not to delay the work.

3.4 EXCAVATION

A. Excavation of the cutoff wall trench includes, but is not limited to, excavating in primary and secondary panels from the prepared surface of the working platform, through overburden soils, and (a) excavating to the depth shown on the drawings and at least keying 5 feet into till or (b) 2 feet into competent rock. Competent rock is defined in 1.7.D.

B. Excavation shall extend vertically from the prepared surface of the working platform to the depths shown on the Drawings, or as required by the Quality Assurance Representative. The total depth of the cutoff wall trench may be modified by the Quality Assurance Representative. The effective width of the excavation shall be at least 2 feet wide. Should the Contractor elect, for his own convenience, to construct a wider cutoff, the additional width and materials will be at no additional cost to the OWNER.

C. The CB slurry in a primary panel shall have an unconfined compressive strength of at least 20 psi before an adjacent secondary panel is excavated.

D. Alignment: The cutoff shall be constructed along the horizontal alignment shown on Contract Drawings. Deviation of more than 6 inches from the alignment as shown on the contract drawings shall not be made without prior written approval of the Quality Assurance Representative. The difference between the centerline axes at the top of any two adjoining subpanels at the joint between them shall be 1 inch or less. The Contractor shall assure that each panel is properly surveyed in place to the locations as specified herein.

E. The verticality of the cutoff shall be within 0.5 percent of its full depth measured in directions transverse to the plane of the cutoff. The in-plane verticality of panels and subpanels shall also be within 0.5 percent of its full depth.

F. The excavation shall begin at the location specified in the approved work plan. Excavation of the trench shall be accomplished by approved grab clamshells, hydromills, and heavy rock chisels or similar tools or other equipment approved by the GEOTECHNICAL ENGINEER. The approved equipment shall excavate alternating primary and secondary panels along the alignment of the trench in a sequence submitted for approval to the GEOTECHNICAL ENGINEER. Pre-augering, chiseling, or other suitable and approved methods shall be used when necessary to remove in situ materials. Use of such methods shall be with the approval of the GEOTECHNICAL ENGINEER and shall be included in the contract unit prices and in the approved work plan.

G. Before excavation commences the Contractor shall survey in the theoretical location of the panel in the field to assure that the baseline or theoretical panel is as shown on the work plan. Coordinates in the horizontal plane and elevations shall be recorded for each panel in order to determine excavation depths and actual top of wall. All subsequent panels shall be surveyed in place before excavation of said panel takes place. This will serve to verify each panel commences at the proposed location.

H. Cement-bentonite-water slurry shall be introduced into the trench at the beginning of excavation and shall be maintained at a level no more than 2 feet below the top of the working platform. The Contractor shall maintain the stability of the excavated trench at all times for its full depth. To this end, the Contractor shall have personnel, equipment and materials available to raise the slurry level at all times including weekends and holidays.

I. The soil excavated from the trench shall be loaded in trucks and hauled to disposal areas approved by the GEOTECHNICAL ENGINEER. Soil shall not be temporarily placed in the vicinity of any open panel.

J. The Contractor shall allow time during the excavation cycle for quality assurance testing and observations of the work by the Quality Assurance Representative, GEOTECHNICAL ENGINEER, GEOTECHNICAL ENGINEER's Representative, and OWNER's 3rd Party Quality Assurance Representative. The Contractor shall provide:

1. Suitable means to access to the trench for observation and QA depth measurements.

2. Labor to assist the GEOTECHNICAL ENGINEER and OWNER's 3rd Party Quality Assurance Contractor in measuring the depth of the trench and verifying the key into till or competent bedrock.

3. A suitable depth-measuring device with prominent markers at half-foot intervals.

J. Should the properties of the cement-bentonite-water slurry in the trench be altered during excavation for any reason, such as the beginning of the set of the slurry, fresh cement-bentonite-water slurry with appropriate approved additives shall be added to the trench to re-establish the desired properties. No water shall be added to the slurry in the trench.

K. Upon completion of excavation, and before initial set of the cement-bentonite-water slurry, loose material shall be removed from the bottom of the trench with excavation tools, airlifting or other

approved means. The final depth of the cutoff wall shall be measured by the Contractor and verified by the Quality Assurance Representative.

L. Continuation of trench excavation after the slurry in a completed subpanel has taken initial set shall include re-excavation of a minimum of 20 inches into the previously placed subpanel.

M. Maintain the stability of the excavated cutoff wall trench at all times for its full depth. Excavate in a manner that does not cause movement or loss of ground. The following conditions shall be met:

1. Excavation of each subpanel shall be continuous and shall be to the full required depth of each subpanel. During excavation, soundings shall be obtained to determine the elevations of the top of the key layer, the bottom of the excavation, and the bottom of the subpanel. The bottom of each subpanel shall be cleaned utilizing the reverse circulation pump in the excavation equipment or by an airlift consisting of a 10 inch diameter pipe and a compressor capable of airlifting from depths of around 140 ft or by another method approved by the government. Cleaning shall be continued until not greater than 3 inches loose soil, debris, broken rock, cobbles and contaminated slurry pockets remain. Bottom conditions shall be checked by probing with a weighted tape measure, steel bar, pipe or other approved means. Where competent rock underlies the cutoff and the surface is either sloping or irregular, airlifting shall be performed until probing indicates that all soil has been removed. Liquid CB slurry from airlifting may be returned to the trench after settle-able debris has been removed. As may be required based on sounding data, trench cleaning/re-mixing is required at the end of the shift and as frequently as necessary prior to slurry hardening to ensure full-depth construction of a homogenous CB cutoff wall free of defects and/or inclusions of non-CB materials.

2. Subpanels of the CB cutoff wall shall be constructed essentially without interruption until complete. If the various sections of the CB cutoff wall are constructed separately or in more than one straight line segment, re-excavation of a section of the previously constructed and set CB material will be required at points of intersection. Re-excavation shall consist of removal of a 1.0-foot thickness of CB backfill for the full depth of the previously constructed section of the cutoff.

N. Show to the satisfaction of Quality Assurance Representative, that the required bottom depth of the cutoff wall trench has been obtained and that the bottom of the trench has been cleaned of sand, gravel, cobbles, boulders, broken rock or other material that may have fallen or settled to the bottom. Obtain a representative sample of key material at 10-foot intervals or in each subpanel along the trench bottom using a sampling tool or from the excavating tools. Obtain additional bottom samples as requested by the GEOTECHNICAL ENGINEER at intermediate locations.

O. Properly dispose of all excess cement, bentonite and cement-bentonite materials.

3.5 METHOD OF MIXING AND STORAGE

A. The bentonite-water slurry shall be prepared by mixing bentonite

with water in an approved mixer that achieves complete dispersion and hydration of the bentonite particles.

B. The bentonite-water slurry shall be allowed to hydrate completely before mixing with cement and/or additives. This may be accomplished by maintaining high-speed circulation until hydration is complete, or by storing the slurry in a tank or pit with a circulation system. Complete hydration is defined as the stabilization of the slurry viscosity and fluid loss properties. The bentonite-water slurry shall be stored under essentially constant circulation until used to prepare cement-bentonite water slurry. Circulation may cease for short periods when construction activities are not in progress.

C. Cement shall be added to the bentonite-water slurry just prior to introduction into the trench. The cement shall be thoroughly blended into the slurry until the mix is homogeneous and the cement particles are fully dispersed in the bentonite-water slurry. The cement-bentonite slurry shall be kept in constant circulation until introduced into the trench.

3.6 TOP OF CUTOFF WALL

The top elevation of the cutoff wall differs throughout the alignment of the wall. The final top elevation shall not be less than 1 foot below the work platform elevation as shown on the drawings. During panel excavation, the liquid CB slurry shall be maintained no more than 2 feet below the top of the working platform. If, during the course of construction, the level of the hardened CB slurry settles below the top elevation as shown on the drawings, any free water shall be pumped off and the Contractor shall place additional CB slurry to meet the requirements of the plans.

3.7 WALL CAP

A. To prevent surface drying and cracking, the top of the CB wall will be protected with a temporary cap consisting of one foot of uncompacted clay soil cover placed within one day of the initial set for each completed wall section.

B. The temporary cover shall be removed after the CB cutoff wall has achieved a minimum of 20 psi compressive strength and replaced with a 5-foot thick compacted clay cap as shown on the drawings

C. The clay cap material shall be compacted in six inch lifts. Compaction for impervious clay fill shall be in accordance with SECTION 31 22 00 EARTHWORK.

D. The wall shall be removed at the locations and elevations as shown on the plans. The removal of the wall shall be conducted by excavating down along the side of the wall and then saw-cutting through the cross section of the wall for removal. Alternative methods and procedures for removing the wall shall be submitted for the government's approval. The appropriate method chosen to remove the wall shall be a method that prevents any potential damage or cracking to the wall. Detailed and careful excavation shall be made as to not harm or crack the wall below the line of excavation.

3.8 QUALITY ASSURANCE

A. Quality control of the CB cutoff wall is the responsibility of

the Contractor. Quality Assurance is the responsibility of the Quality Assurance Representative, GEOTECHNICAL ENGINEER, GEOTECHNICAL ENGINEER's Representative, and OWNER's 3rd Party Quality Assurance Representative. The Quality Assurance Representative reserves the right to conduct check tests as he deems necessary. The Contractor will provide equipment and full cooperation and assistance during conduct of a check test or in obtaining samples for a check test.

B. The Contractor shall provide the GEOTECHNICAL ENGINEER and OWNER's 3rd Party Quality Assurance Representative with the labor required to assist in determining the elevation of the working platform, to measure the depth and/or calculate the elevation of the trench bottom, and to probe the bottom of the trench under the observation of the Quality Assurance Representative, GEOTECHNICAL ENGINEER, GEOTECHNICAL ENGINEER's Representative, and/or OWNER's 3rd Party Quality Assurance Representative. The Quality Assurance Representative and to assist the GEOTECHNICAL ENGINEER in QA sampling and documentation of construction activities.

3.9 CONTRACTOR QUALITY CONTROL TESTS AND MEASUREMENTS

A. Every quality control test or sample shall be referenced to the cutoff station at which the test was conducted or the sample was obtained and shall be referenced to the panel that is being excavated as stated in the work plan. Minimum tests and testing frequency are provided below. The Contractor shall notify the Quality Assurance Representative prior to conducting tests.

B. Subpanel Excavation: The Contractor shall allow sufficient time during the excavation cycle for the observation and sampling of the soil and key material as it is removed from the trench. Elevations of the bottom of the finished trench and backfill shall be measured to within 0.1 feet by soundings and recorded on 10-foot intervals along the alignment (or in each subpanel at a minimum) from the point of excavation to the point of backfill which has already set.

C. Subpanel Construction Records: The depth of each subpanel including the actual depth of excavation into the key material shall be checked and recorded (and approved by the GEOTECHNICAL ENGINEER). If the subpanel extends through weathered rock to competent rock, the variations in depth (to the nearest 0.1 foot) to competent bedrock across the subpanel shall be measured and recorded by cutoff wall station (to nearest 0.1 foot) for each point measured.

The following shall be performed by the Contractor with concurrent verification by the Quality Assurance Representative, GEOTECHNICAL ENGINEER, GEOTECHNICAL ENGINEER's Representative, and/or OWNER's 3rd Party Quality Assurance Representative:

1. Monitoring and logging of materials encountered during excavation. The depth of the excavation shall be sounded prior to each verticality control check, at the top of till and the bottom of the CB cutoff wall, and at the beginning and end of each shift.

2. Monitoring of slurry consumption and exceptional slurry loss.

3. Monitoring and recording of all chiseling time.

4. Subpanel verticality and horizontal alignment checks

throughout the excavation sequence. More frequent measurements shall be made if necessary or if requested by the GEOTECHNICAL ENGINEER.

D. Cutoff Documentation: The Contractor is responsible for observing, calculating and documenting the verticality and continuity of the cutoff.

E. Other Measurements: The GEOTECHNICAL ENGINEER reserves the right to make any measurement he deems necessary to inspect and evaluate the as-built condition of the cutoff wall. The Contractor shall cooperate with the Quality Assurance Representative, GEOTECHNICAL ENGINEER, GEOTECHNICAL ENGINEER's Representative, and/or OWNER's 3rd Party Quality Assurance Representative and provide assistance in these measurements, without right to claim for delays. These measurements may include sampling of the completed trench or the as-mixed slurry for hydraulic conductivity testing.

F. Required Slurry Properties and test methods are listed in Table 1:

Table 1 Slurry Properties			
Slurry Test	**Frequency (Minimum)**	**Property Requirement**	**Test Method**
Initial Bentonite Slurry			
a. Viscosity	2x/shift	>40 marsh-seconds	API RP 13B-1
b. Density	2x/shift	>64 pcf	API RP 13B-1
c. Filtrate Loss	2x/shift	<20 cubic cm	API RP 13B-1
d. pH	2x/shift	7 to 10	API RP 13B-1
Initial Cement Bentonite Slurry			
a. Density	3x/shift	Meeting approved mix design density	API RP 13B-1
b. pH	3x/shift	7 to 10	API RP 13B-1
c. Viscosity	3x/shift	>40 marsh-seconds	API RP 13B-1
In-Trench Cement Bentonite Slurry			
a. Density	2x/shift	Meeting approved mix design density; 72 lb/cu ft minimum	API RP 13B-1
b. Filtrate Loss	2x/shift	For Information Only	API RP 13B-1
c. pH	2x/shift	7 to 10	API RP 13B-1
d. Sand Content	2x/shift	Maximum allowed based on approved mix design	API RP 13B-1

G. Bentonite Slurry: All slurry tests specified in this Section shall be conducted in accordance with API RP 13B-1 and the requirements of Table 1. If more than one batching plant is being used, these frequencies shall apply to each batching plant separately.

1. The bentonite slurry shall be tested prior to placing the slurry in the cement bentonite mixer a minimum of two times each working shift. The following tests shall be performed: viscosity, filtration, density, and pH. Tests shall conform to the requirements of API RP 13B-1 and Initial Bentonite Slurry parameters in Table 1. Report results of all tests in the shift quality control report.

2. The bentonite slurry shall be tested for density prior to placing the slurry in the trench at a minimum of three times each working shift. Samples shall be taken at the location of slurry discharge into the trench. Tests shall conform to the requirements of API RP 13B-1 and Initial Cement Bentonite Slurry parameters in Table 1.

3. The sampling devices used to collect samples shall be as approved by the GEOTECHNICAL ENGINEER in the Contractors work plan. The Contractor shall be required to obtain additional samples for the GEOTECHNICAL ENGINEER at any time or location requested. Personnel shall be provided by the Contractor for conducting the tests and they shall have a working knowledge of test procedures for drilling fluids in accordance with applicable API standard procedures. Equipment for slurry testing shall be furnished and maintained by the Contractor.

H. Water Tests - Measure the dissolved solids, hardness, and pH of

the water before starting and at least once per week on samples of the water being used for the preparation of bentonite slurry.

I. Key Material: Samples of key material from the initial key material contact elevation in the trench shall be obtained for the Quality Assurance Representative, GEOTECHNICAL ENGINEER, GEOTECHNICAL ENGINEER's Representative, and/or OWNER's 3rd Party Quality Assurance Representative inspection at 10-foot intervals or in each subpanel along the trench alignment. Each sample shall be labeled with depth, elevation and station and stored at the site after the Quality Assurance Representative has inspected them. The samples shall be considered OWNERS property.

J. Backfill Sampling and Testing:

1. Bulk Samples and Test Specimens:

a. Two bulk (wet grab) samples of the CB slurry cutoff wall backfill shall be taken for every shift of work at each excavating location. Each sample shall be taken randomly from different batches (morning, afternoon, evening, etc.). The bulk samples shall be collected before pumping into trench and used to cast specimens for permeability and strength testing. This is to make sure backfill going in the trench meets mix design criteria as specified and approved.

b. Two additional bulk (wet grab) samples of CB slurry collected from within ten feet of the bottom of the trench shall be taken not less than 5 hours after placement in the trench for every panel. Two additional bulk samples of CB slurry from depths ranging between 40 and 80 ft shall be taken not less than 5 hours after placement in the trench for every panel. Two additional bulk samples of CB slurry from depths ranging between 0 and 40 ft shall be taken not less than 5 hours after placement in the trench for every panel.

c. From each bulk sample, the Contractor shall cast 8 test specimens for Quality Control purposes, 4 test specimens for the GEOTECHNICAL ENGINEER to be tested by the GEOTECHNICAL ENGINEER's Representative, and 4 test specimens for the OWNER's 3rd Party Quality Assurance Representative to be tested by the OWNER's 3rd Party Quality Assurance Representative. Cylindrical plastic molds used to cast the test specimens shall be 3 inches in diameter and 6 inches long. Any materials coarser than a 1/4-inch screen shall be removed and discarded. The wet slurry shall be poured into the molds and rodded or vibrated to remove trapped air pockets and the specimens shall be sealed with plastic caps, taped and clearly labeled. Each label shall include, at a minimum, date made, batch identification and time, specific location sampled to include panel number, station, and depth, and the technician's name. The specimens shall be stored in a constant-temperature, damp environment until tested or until otherwise directed by the Quality Assurance Representative. The handling and storage of the samples shall be in accordance with ASTM D 4832 if such requirements are more stringent than described above.

2. For each shift per excavating location in which CB slurry is placed, one of the test specimens cast from a bulk sample representing a single batch collected prior to pumping into the

trench (paragraph J.1.a above) shall be tested for hydraulic conductivity (permeability) and at least three shall be tested for unconfined compressive strength. For (paragraph J.1.a) bulk samples from primary panels, two specimens shall be tested for compressive strength before excavating an adjacent secondary panel to demonstrate that the primary panel has attained the specified minimum strength of 20 psi. Remaining specimens from the same bulk sample and the 12 (untested) specimens from the second (paragraph J.1.a) bulk sample shall be retained and properly stored for possible testing by the GEOTECHNICAL ENGINEER or OWNER's 3rd Party Quality Assurance Representative. The Contractor shall store the GEOTECHNICAL ENGINEER and OWNER's 3rd Party Quality Assurance Representative specimens until they are transported by the GEOTECHNICAL ENGINEER and OWNER's 3rd Party Quality Assurance Representative's Quality Assurance independent laboratories. In the event that the Contractor forms additional specimens beyond the minimum specified number, the Contractor shall also form a duplicate set of specimens for the GEOTECHNICAL ENGINEER and OWNER's 3rd Party Quality Assurance Representative and store the specimens as previously described.

3. Unconfined Compression Strength Tests and Testing Schedule

a. Three of the test specimens obtained from the randomly chosen wet grab bulk sample obtained before pumping into the trench per paragraph J.1.a of this section shall be tested in unconfined compression per ASTM D 4832 as follows: one after curing for 7 days, one after curing for 14 days and two after curing for 28 days. Two specimens from samples from primary panels shall be tested for compressive strength to demonstrate that the minimum specified CB backfill strength (20 psi) has been attained before adjacent secondary panels are excavated. Testing of additional specimens may be performed by the GEOTECHNICAL ENGINEER or OWNER's 3rd Party Quality Assurance Representative. The need for such additional testing will be determined based, at least in part, on the results of the bulk sample testing. It is the intent of these tests to relate unconfined compression strength to permeability; therefore tests shall be performed on specimens from the same bulk sample.

b. Three of the test specimens obtained at each depth interval from the wet grab bulk sample obtained from within the trench per paragraph J.1.b of this section shall be tested in unconfined compression per ASTM D 4832 as follows: one after curing for 7 days, one after curing for 14 days and two after curing for 28 days. Testing of additional specimens may be required, as directed by the Quality Assurance Representative.

4. Permeability Tests and Testing Schedule

a. Three test specimen from the randomly chosen bulk sample obtained before pumping into the trench per paragraph J.1.a of this section shall be subjected to permeability testing in a triaxial type permeability cell. The samples will be tested at 7 days, 14 days and 28 days of curing respectively in order to document the change in permeability throughout the curing process. Additional testing may be required, as directed by the GEOTECHNICAL ENGINEER. The need for such additional testing will be determined based, at least in part, on the results of the bulk

sample testing.

b. One sample test specimen from each depth interval from the wet grab bulk sample obtained from within the trench at the three designated depths per paragraph J.1.b of this section shall be subjected to permeability testing in a triaxial type permeability cell at 28 days of curing.

5. The permeability test parameters are as follows:

a. Average Effective Confining Stress: 50 psi

b. Hydraulic Gradient: 15

c. Fluid: Groundwater from the construction site may be obtained from piezometers or relief wells constructed only of PVC or steel.

d. Backpressure: Sufficient to ensure a Skempton's pore pressure "B" parameter greater than or equal to 0.95 determined in accordance with ASTM D 5084.

6. The permeability tests shall be performed in accordance with ASTM D 5084 and shall be continued until inflow-outflow measurements or flow rates demonstrate that steady state seepage conditions are evident. The permeameter cell shall be sized to accommodate the full height of the sample (6 inches). Sample trimming shall be limited in order to maximize the original 6-inch height of the sample. The independent Quality Control testing laboratory selected by the Contractor shall submit a detailed permeability testing plan including detailed information and data on the equipment used for testing.

K. Once the panels have been cored along the alignment of the wall the retrieved cores shall be required to undergo permeability and shear strength testing within 7 days after the core has been completed. The results of these tests shall meet the permeability and strengths testing requirements of this project as stated herein. These tests shall be performed at elevations of 427, 407, 373, 343, and 315 for Sta. 170+00 to 161+50 and at elevations of 420, 413, 406, 382, 345, and 315 for Sta. 161+50 to 152+00.

L. Documentation of tests: All test results performed in accordance with the requirements of these specifications including measured dimensions of all specimens shall be recorded on data forms acceptable to the GEOTECHNICAL ENGINEER and available for Quality Assurance Representative, GEOTECHNICAL ENGINEER, or GEOTECHNICAL ENGINEER's Representative inspection at all times. They shall be submitted weekly to the Quality Assurance Representative and as prescribed in paragraph SUBMITTALS. The Quality Assurance Representative or GEOTECHNICAL ENGINEER reserves the right to request that the Contractor alter his/her documentation practices in order to improve the quality of data recording for future documentation. All the data and test results shall be supplemental to the Panel Completion reports as specified herein and shall be submitted as amendments to the PCR submittals.

M. Closure Acceptance Criteria: A CB panel will be considered acceptable when all tests on a wet grab sample of the cement-bentonite slurry obtained from within the trench satisfy the criteria below. CB panels not satisfying these criteria shall be considered unacceptable.

Only samples obtained from within the trench will be used to determine acceptance.

1. The average unconfined compressive strength of the three test specimens from wet grab bulk sample obtained in the lower 10 feet of the CB panel, the middle and top of the panel shall be 50 to 180 psi at 28 days. No individual specimen strength shall be less than 30 psi or greater than 200 psi. The panel shall meet this criteria along its entire depth. In the event that any of the test specimens tested from the first bulk sample did not satisfy the acceptance criteria, four additional untested spare specimens from the second bulk sample obtained at the non-compliant depth interval from within the trench shall be tested at 28 +/- 3 days after curing. If the four additional test specimens meet the acceptance criteria, the panel will be considered acceptable, otherwise the panel will be considered unacceptable and the Contractor shall reconstruct the panel.

2. The permeability of the test specimens from the wet grab bulk sample obtained from within the lower 10 feet of the CB panel shall be equal to or less than 1.0 x 10-6 cm/sec at 28 days. This shall also apply to the samples obtained at the middle and top of the panel. In the event any specimen does not meet the acceptance criteria, three spare specimens selected from the other wet grab bulk sample obtained at the non-compliant depth interval from within the trench shall be tested at 28 +/ 3 days of curing for permeability. If results from the three additional tests meet the acceptance criteria, the panel will be considered acceptable, otherwise the panel will be considered unacceptable and the Contractor shall reconstruct the panel.

3. The panels shall have been keyed into the till as specified herein, or extended into competent rock and verified by sounding following 60 minutes of chiseling. The panel shall have at least the minimum top elevation and maximum bottom elevation shown on the drawings, unless another elevation has been authorized by the Quality Assurance Representative and GEOTECHNICAL ENGINEER.

4. The geometric tolerances (wall alignment, centerline tolerance between subpanels, transverse cutoff width, maximum panel length, verticality, and adjacent panel overlap) shall have been verified.

5. Five Percent (5%) of the installed panels shall have been cored to verify permeability and strength requirements. The Contractor shall inform the Quality Assurance Representative and GEOTECHNICAL ENGINEER which panels will be cored at least 7 days before coring operations begins. The Contractor shall submit a coring plan as prescribed in the paragraph SUBMITTALS. The Contractor shall test coring samples for strength and permeability. These shall also meet the requirements stated herein.

N. Remedial Measures: Panels not meeting acceptance criteria described in Paragraph M above shall be replaced and re-tested in accordance with this section.

3.10 PLACEMENT OF DETECTABLE MARKING TAPE (DMT)

The contractor shall install the detectable marking tape centered on the

top of the slurry cut-off wall, 12-inches above the wall as shown in the construction drawings.

3.11 OWNER QUALITY ASSURANCE TESTING

Quality assurance tests, including compressive strength and hydraulic conductivity of cement-bentonite backfill, will be conducted by the Quality Assurance Representative at his discretion.

3.12 SITE CLEANUP

Contractor shall clean up the site and install all barricades as needed at the end of each work shift as required to maintain the site in a clean and safe condition.

Upon completion of the work, the Contractor shall remove and dispose of all trash, debris, bentonite slurry, CB slurry, excess soil, etc., resulting from operations and excavations during construction of the cutoff wall.

Remaining excess soil, CB slurry, and bentonite slurry shall be removed and disposed of offsite as approved by the Quality Assurance Representative. Soil surfaces disturbed by the cutoff wall installation shall be cleaned of bentonite slurry and/or cement-bentonite backfill and refilled and /or regraded to their existing condition as directed by the Quality Assurance Representative. All slurry ponds shall be pumped dry and backfilled. All trash and debris shall be removed from the site by the Contractor.

-- End of Section --

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SECTION 32 29 35

ESTABLISHMENT OF TURF
11/12

PART 1 GENERAL

1.1 SCOPE

The work covered by this section of the specifications consists of furnishing all materials, equipment, plant and labor, and performing all work required for seeding, mulching, liming, and fertilizing in accordance with the requirements of this section of the specifications. Turf shall be established on all newly constructed areas and as shown on the drawings. All other areas disturbed by the Contractor's operations shall be seeded or turfed at no additional cost to the OWNER.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control to assure compliance with the contract specifications and shall maintain records of quality control for all construction operations.

(1) Dressing.

(2) Fertilizing.

(3) Liming.

(4) Mulching.

(5) Seeding.

(6) Sodding.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished to the Quality Assurance Representative daily.

1.3 SUBMITTALS

ENGINEER/DESIGNER OF RECORD approval is required for submittals with a "E DA" designation; submittals not having a "E DA" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Soil Test Results; E DA

1.4 COMMENCEMENT, PROSECUTION, AND COMPLETION

Seeding operations shall be performed between 01 March and 01 June or between 01 August and 15 November. All embankment which is completed prior to, or after expiration of the seeding seasons, shall be protected from eroding, as approved by the Quality Assurance Representative, until the next seeding season occurs. Seed, fertilizer, limestone and mulch shall be applied as herein specified and in accordance with standard

horticultural practices for establishing new turf.

Seeding may be performed outside these dates provided the Contractor guarantees a minimum of 75 percent uniform growth over the entire seeded area(s) after a period of establishment. Inspection dates for the period of establishment will be as follows: Seeding conducted in between June 2 and July 31 will be inspected after April 15 and seeding conducted between November 16 and February 28 will be inspected after September 15. The guarantee shall be submitted to the Engineer in writing prior to performing the work. After the period of establishment, areas not exhibiting 75 percent uniform growth shall be interseeded or reseeded, as determined by the Engineer, at no additional cost to the OWNER.

1.4.1 Time Extension

When all work under this contract is completed except work required under this section, and such work is not performed because of seasonal limitations stated in paragraph COMMENCEMENT, PROSECUTION, AND COMPLETION, or because of conditions occurring within the specified seeding seasons which, in the opinion of the Quality Assurance Representative, are unfavorable for such work, the time for completion will be extended by the number of days that this work is thereby delayed.

1.5 SAMPLING AND TESTING

Following completion of all earthwork, soil tests from the area to be seeded shall be performed by a recognized commercial testing laboratory to determine pH Level of soil and recommend application rates of nitrogen, phosphorous, potash and limestone. Testing shall be the responsibility of the Contractor and shall be accomplished at no additional cost to the OWNER. At least one soil sample and test shall be taken every two acres, and one composite report shall be made by the testing agency. The test results and application rates for nitrogen, phosphorous, potash and limestone indicated by the soil test results for preplanting fertilization shall be furnished to the Quality Assurance Representative for review and approval prior to the Contractor ordering the soil nutrients.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Fertilizer

Fertilizer shall be uniform in composition and free flowing. The fertilizer may be delivered to the site in bags or other convenient containers or delivered in bulk. If delivered in bags or containers, the fertilizer shall be fully labeled in accordance with the applicable fertilizer laws of the State and shall bear the name, tradename or trademark, and warranty of the producer. The fertilizer shall meet the requirements of the State for commercial fertilizer. Should the commercial fertilizer be furnished in bulk, the Contractor shall furnish certified weight tickets and a certified quantitative analysis report, in triplicate, from a recognized testing laboratory certifying the nutrient ratio of the materials. In the event the commercial mixture is delivered to the job site in the original containers, unopened, the analysis report will not be required. Quantity of fertilizer required per acre shall be determined by certified soil tests as specified in Paragraph SAMPLING AND TESTING.

2.1.2 Limestone

Limestone shall be approved agricultural grade limestone containing not less than 85 percent total carbonates. Limestone shall be ground to such fineness that 25 percent will pass a 100 mesh sieve and 100 percent will pass an 8 mesh sieve. Quantity of lime required per acre shall be determined by certified soil tests as specified in Paragraph SAMPLING AND TESTING.

2.1.3 Seed

Seed labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act, as reprinted with amendments August 1963, shall be furnished by the Contractor. Seed shall be fresh, new crop, furnished in sealed, standard containers unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable. The seed mixes, rates of application, minimum percent purity and germination, and maximum percent weed control shall be as shown in the following table:

Kinds of Seed	Pounds Per Acre	Minimum Purity	Minimum Germination	Maximum Weed Content
Common Perennial Rye Grass Lolium perenne	50	98	85	0.8
Kentucky 31 Tall Fescue Festuca Arundinacea	50	98	85	0.8

2.1.4 Mulch

Threshed straw from a cereal grain such as oats, wheat, barley, or grass hay shall be provided. Materials that contain noxious grass or weed seeds will not be acceptable. Mulch shall be uniformly applied at the rate of 2 tons per acre.

2.1.5 Mulch Stabilizers

The Contractor shall embed or anchor the mulch into the soil by using an approved disk type roller having flat serrated disks spaced not more than 10 inches apart and equipped with cleaning scrapers.

PART 3 EXECUTION

3.1 ESTABLISHMENT

The Contractor shall assume responsibility for proper care of seeded areas while grass is becoming established for 3 months after completion of turfing, or returfing if any, on the entire project, unless the desired cover is established in a shorter period of time and the Quality Assurance Representative shortens the responsibility period. The contractor shall be

allowed to assume responsibility for proper care of the seeded area while grass is becoming established after June 05, 2015. The owner reserves the right to withhold final payment of Site Demolition and Restoration until turn has been established.

3.1.1 Refertilizing

The Quality Assurance Representative will designate areas needing refertilization at least 15 days before reapplication is required. Fertilizer shall be distributed on designated areas during the period when grass is dry. Fertilizer shall be applied uniformly at the rate determined as specified in paragraph SAMPLING AND TESTING. Fertilizer conforming to physical condition, packaging, and marking as specified hereinbefore shall be provided. All costs associated with refertilizing will be borne by the Contractor.

3.1.2 Reseeding

The Quality Assurance Representative will designate areas requiring reseeding at least 15 days before the period specified for reseeding. Seed as specified shall be distributed at the rate specified in paragraph Seed of each ingredient per acre in a manner that will cause minimum disturbance to the existing stand of grass. All costs associated with reseeding will be borne by the Contractor.

3.2 REPAIR

When the surface to be turfed becomes gullied or otherwise damaged or when previously placed turfing is damaged, the affected area shall be repaired to re-establish the condition prior to injury, as directed. Repair work required because of faulty operations or negligence on the part of the Contractor shall be performed without additional cost to the OWNER.

3.3 INSPECTION AND ACCEPTANCE

Final acceptance will be made on completion of the contract. Acceptance of the established turf will be determined by visual inspection. Existence of erosion problems or dead and dying turf will not be acceptable.

-- End of Section --

SECTION 33 26 00.00 10

RELIEF WELLS
09/30

PART 1 GENERAL

1.1 Scope

This section, in conjunction with the contract drawings and relief well designs, covers rehabilitating and replacing relief wells in their entirety including permits, well drilling, well screen,bentonite seals, concrete seals, riser pipe, filter pack, well development, and pumping tests and outlet works.Since there is no historical testing record for these wells, the criteria used for evaluation is specific capacity at 24 hours less than 25% of the average, and yield less than 5 gallons per minute (gpm). Wells with specific capacity at 24 hours less than 25% of the average, are recommended for rehabilitation below. Wells with yield less than 5 gallons per minute (gpm) are recommended for replacement. The effort should be performed in two stages so that after rehabilitation, wells that are still less than 25% of the average specific capacity at 24 hours are recommended for replacement. All work shall conform to the requirements of the Pennsylvania Department of Conservation and Natural Resources (DCNR) Well Construction Recommendations. All variances, permitting, licensing, and submittal requirements required by this work are the responsibility of the Contractor. Assigning laboratory tests and final design of relief wells will be by Wood.

1.2 UNIT PRICES

1.2.1 Relief Wells

1.2.1.1 Payment

Payment will be made for costs associated with relief wells, which price shall constitute full compensation fordrilling, assembling, and installing relief wells. Payment will be made for costs associated with relief wells, which price shall constitute full compensation for drilling, assembling, and installing relief wells. No payment will be made for placement or replacement of temporary casings or repair of damage resulting from Contractor operations. No separate payment will be made for permits, screen, riser, check valves, filter pack, development, backfill, concrete/bentonite seals and slabs, or metal well guard. Separate payment will be made for Type "T" relief well manholes and discharge piping per the bid schedule.

Bore holes ordered abandoned prior to installation of well screen and riser due to no fault of the Contractor will be paid for at the contract unit price, per linear foot, for Bore Hole Abandonment. There will be no separate payment for setup, drilling, downtime, etc. for bore holes ordered abandoned.

1.2.1.2 Measurement

Relief wells will be measured for payment by the linear foot of completed well from the relief well outlet elevation to the bottom of the well plug.

The sump (2-foot overdrill) beneath the well plug shall be considered incidental to the work. For Type "T" relief wells, the depth from ground surface to the outlet elevation will also be considered incidental to the work. Completed wells ordered abandoned due to no fault of the Contractor, will be measured for full payment.

1.2.1.3 Unit of measure

Unit of measure: linear foot to the nearest 0.1 foot.

1.2.2 Pump Tests

1.2.2.1 Payment

Payment will be made for costs associated with pump test, which price shall constitute full compensation to perform a satisfactory pump test as specified. No payment will be made for pump test not successfully completed.

1.2.2.2 Measurement

Pump tests will be measured for payment for each pump test successfully performed as specified, and otherwise directed.

1.2.2.3 Unit of measure

Unit of measure: Each (EA).

1.2.3 Pump Installation/Removal

1.2.3.1 Payment

Payment will be made for costs associated with installation and removal of the pumps used in pay item "Pump Tests". No payment will be made for pump installation removal where pump test was not successfully completed.

1.2.3.2 Measurement

Pump installation/removal for pump test will be measured for payment on the base of the applicable contract unit price per relief well pump tested.

1.2.3.3 Unit of measure

Unit of measure: each.

1.2.4 Abandonment of Existing Relief Wells

1.2.4.1 Payment

Payment will be made for all costs associated with abandonment (plugging) of existing relief wells, which price shall constitute full compensation for abandonment of designated existing relief wells, partial removal of the relief well riser, and backfill of the excavation. No separate payment will be made for over-excavation, backfill, or excess grout/concrete placed outside of the neat volume of the cylinder.

1.2.4.2 Measurement

Measurement for payment will be per each completed relief well abandonment.

1.2.4.3 Unit of Measure

Unit of Measure: Each (EA)

1.2.5 Drilling Through Obstructions

1.2.5.1 Payment

Payment will be made for costs associated with drilling through obstructions as defined in Part 3 of this specification section. This price will constitute full compensation for drilling advancement through obstructions via alternative drilling methods or tooling, or simply the reduced production rate of a normal drilling operation. This unit price is above and beyond the base unit price for drilling and installing Type "D" or Type "T" relief wells.

1.2.5.2 Measurement

Drilling through obstructions will be measured for payment by the linear foot of completed borehole through an obstruction. If borehole advancement is lost due to cave-off or settlement, the contractor will be compensated for the initial linear foot of advancement. Any secondary or tertiary attempts by the contractor will not be measured for payment.

1.2.5.3 Unit of Measure

Unit of measure: linear foot to the nearest 0.1 foot.

1.3 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA SAS-30	Specifications for Aluminum Structures

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 198	(2010) Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

ASTM INTERNATIONAL (ASTM)

ASTM A312/A312M	(2013a) Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A48/A48M	(2003; R 2012) Standard Specification for Gray Iron Castings
ASTM A536	(1984; R 2009) Standard Specification for Ductile Iron Castings

ASTM B98/B98M	(2008) Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes
ASTM C478	(2013) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C990	(2009) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D1586	(2011) Penetration Test and Split-Barrel Sampling of Soils
ASTM F480	(2012) Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT)

Standard Specifications	(2012) Standard Specifications for Road and Bridge Construction

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

1.4 STANDARD SPECIFICATIONS

All work, installation, procedures, materials, etc. shall be in conformance with the Standard Specifications for Road and Bridge Construction, provided in Publication 408/PUB 408 effective April 1, 2016 by the Pennsylvania Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification.

1.5 SUBMITTALS

Engineer/Designer of record approval is required for submittals with an "E DA" designation. All submittals are to be reviewed by the submitting contractor's quality control personnel, prior to submission to Wood, to ensure conformance to the design. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Shop Drawings; E DA
Relief Well Drilling; E DA
Relief Well Details; E DA

SD-03 Product Data

Well Screen; E DA
Well Screen Bottom Plug; E DA
Riser Pipe; E DA
Couplings; E DA
Filter Pack; E DA
Cement Grout Mixture Proportion; E DA

Check Valve; E DA
Well Guard; E DA
Cover Plate; E DA
Bentonite; E DA
Concrete Seal Mix Design; E DA

SD-06 Test Reports

Daily Logs of Work; E DA

Relief Well Boring Logs; E DA
Relief Well Developement Report; E DA
Relief Well Pumping Test Report; E DA
Sanding Reports; E DA
Standard Penetration Test; E DA

SD-07 Certificates

Drillers and Loggers and Crew Qualifications and References; E DA
Proposed Substitutes and Alternates; E DA
Well Drilling Specialist; E DA
Stainless Steel Welding Certification; E DA

1.6 SHOP DRAWINGS

The Contractor shall construct the relief wells as described herein and as shown on the plans. All shop drawings shall be properly labeled with the relief well name, coordinates, stationing, and offset. Show details of the proposed methods for drilling, coupling well screen and riser sections together, placement of centralizers, installing the well screen and riser, developing, pump testing, and limit(s) of backfilling. Drilling, construction, and development data shall be recorded and logs prepared including GPS coordinates in feet, referencing the Pennsylvania North State Plane Coordinate System (NAD83).Show on the shop drawings the type of screen and size; slot size, shape and pattern; bottom plug material; and installation detail. The Relief Well Details (riser pipe, check valve(s), housing, and well discharge details) shall also be shown on the shop drawings. Any Contractor proposed substitutes or alternates in material construction details or methods shall be indicated on the submittal and detailed on the shop drawings. No phase of the work shall be initiated until all shop drawings concerning that activity have been approved.

1.7 WELL DRILLING SPECIALIST

The Contractor shall submit to Wood, for review and approval within 10 days of Notice to Proceed, summaries of qualifications and references for the Well Drilling Specialist. The Contractor shall designate a separate well drilling specialist for each work shift and/or crew. The well drilling specialist shall have a minimum of ten years experience in the water well industry, and shall be familiar with the operation of all equipment and machinery required to install high capacity water wells within river alluvium in the MidAtlantic Region. The Contractor shall submit summaries of qualifications and references for any and all well drilling specialists to Wood for review and approval within 10 days of Notice to Proceed. Well drilling shall not proceed until the well drilling plan has been approved by the Army Corps of Engineers, Baltimore District. The well drilling specialist shall be at the field site at all times during drilling and installation of well materials, as well as during

development and pump testing of installed wells.

1.8 REGULATORY REQUIREMENTS FOR DRILLING AND WELL INSTALLATION

Drilling, backfilling and relief well installation shall be performed in accordance with Pennsylvania state statutory and regulatory requirements. Permits, variances, and/or waivers shall be obtained as required to install and abandonthe wells as detailed on the drawings and as described in this specification.

1.9 LOCATION

Relief well locations shall be field located by the Contractor. The final relief well locations may be adjusted, at no additional cost, to within 5-feet of the original well location .

1.10 NEW RELIEF WELL DESIGN

The well numbers, locations, diameter and lengths of well screen and riser pipe, and the gradation of the material for the filter pack that is to be installed around the well screen will be determined by Wood . Final design lengths for the well construction will be determined in the field by Wood.

1.11 DISPOSAL OF DEBRIS

The Contractor shall dispose of all debris resulting from relief well construction operations off-site. Disposal activities shall be in compliance with SECTION 01 11 30 - ENVIRONMENTAL PROTECTION.

1.12 PROJECT/SITE CONDITIONS

1.12.1 Location

The exact location of each relief well, with respect to station and distance from structure centerline, will be determined in the field by Wood. The total number of wells and spacings may be modified by Wood as the work proceeds.

1.12.2 Obstructions Encountered

If obstructions are encountered in the foundation which, in the opinion of Wood, render it impracticable to complete the well to the directed depth, Wood may adjust the depth. Alternatively, Wood may direct the Contractor to abandon the well, plug the hole by backfilling with approved material by an approved procedure, and construct another well at an adjacent site, or to continue drilling using bucket augers or other equipment capable of drilling through and/or removing the obstruction.

PART 2 PRODUCTS

2.1 WELL SCREEN

2.1.1 General

Well screen, screen interval, filter pack and riser length are provided on the contractor drawings. Materials for relief wells shall be of the type specified below, and shall be of the dimensions specified by Wood. Screen openings shall be uniform in size and pattern, and shall be spaced

approximately equally around the circumference of the pipe. Before installation, all well screens shall be approved by Wood.

2.1.2 Stainless Steel Well Screen

2.1.2.1 General

The well screen shall be of the continuous slot, wire-wound design. It shall be fabricated by circumferentially wrapping a triangularly shaped wire around a circular array of internal rods. The wire configuration shall produce inlet slots with sharp outer edges, widening inwardly to minimize clogging. Each juncture between the horizontal wire and the vertical rods shall be fusion welded under water by the electrical resistance method. End fittings shall be welded to the screen body.

2.1.2.2 Materials

All pipes, rods, bars, wire, and fittings shall be stainless steel conforming to ASTM A312/A312M, Grade TP 304.

2.1.2.3 Well Screen

The slot size and screen length have been provided to the Contractor. Collapse, column, and tensile strengths of the well screens shall be adequate to allow safe installation and development of the wells. In addition, contractor shall have available two (5) five-foot sections of screen to allow for field changes during installation, if necessary. Additionally, the contractor shall also be able to field modify the bottom section of screen by cutting and welding a plug on a shorter section of screen to maximize aquifer penetration in the event the well requires adjustment due to obstructions. The contractor shall submit the certification of the individual(s) so certified to perform welding of stainless steel.

2.1.2.4 Well Screen Couplings

End fittings for the stainless steel well screens shall be furnished with Schedule 40 flush threads compatible with ASTM F480 requirements, and of the same alloy as the well screen and riser pipe. Flush joint fittings which join well screen to riser pipe shall adequately provide for the transition from well screen to riser pipe. Joints shall be designed and constructed to support the weight of the screen and/or pipe as it is lowered into the hole. All fittings shall contain a Viton O ring on the male end.

2.2 PVC RISER PIPE

The new relief well riser pipe and fittings shall be manufactured from PVC Pipe conforming to ASTM D1784/D1785/D2466/D2467. The pipe roundness, wall thickness, and straightness shall meet the ASTM specifications. The riser pipe shall be Schedule 40 wall thickness with a minimum inside diameter 10 inches. Riser discharge shall conform to the details shown on the contract drawings. Couplings for new relief wells between the riser pipe and the well screen and between adjacent pieces of riser pipe sections shall be as specified for well screen pipes.All joints in the PVC shall include couplings and shall be glued with a solvent cement conforming to ASTM D2564.

2.3 WELL SCREEN BOTTOM PLUG

The bottom plug for each well screen shall be made of the same material and at least the same minimum thickness as the screen. Plugs shall be the same diameter as the outside of the screen and fastened to the bottom screen portion in an approved manner.

2.4 Relief Well Concrete

All concrete for seals, slabs or washes shall conform to Section 03 30 53 MISCELLANEOUS CAST-IN PLACE (CIP) CONCRETE or as shown on the drawings.

2.5 RELIEF WELL TYPES

2.5.1 "D"-Type Wells

The outlet works shall consist of a well guard with check valve, cover plate, concrete pad, numbering/welding and other appurtenant items.

2.5.1.1 Well Guard

The well guard shall consist of a section of 20-inch diameter, stainless steel Type 304, continuous slot well screen. It shall be fabricated by circumferentially wrapping a triangularly shaped wire around a circular array of internal rods. The wire configuration shall produce inlet slots with sharp outer edges, widening inwardly to minimize clogging. Each juncture between the horizontal wire and the vertical rods shall be fusion welded under water by the electrical resistance method. End fittings shall be welded to the screen body. The width of the clear space between the wire wrappings shall be 0.250 inches. The wire wrappings shall be composed of "130" wire. Welding rings shall be furnished on both ends of the screen and stainless steel 3x3 angles (4) welded to the weld rings. The guard screen shall be attached to the concrete pad by bolting of well guard by the angles to the embedded bolts of the concrete pad as shown on the drawings.

2.5.1.2 Concrete Pad

Dimensions and details of the concrete are shown in the drawings. Requirements for the concrete are contained in 03 30 53 - MISCELLANEOUS CAST-IN-PLACE (CIP) CONCRETE.

2.5.1.3 Check Valve

The check valves shall be fabricated in accordance with details shown on the drawings and as specified herein. The aluminum parts, at the Contractor's option, may be any one or a combination of aluminum alloys 3005 H14, 6061 T 4, or T6. The 3/8 inch diameter aluminum guide rods shall be carefully bent to avoid flattening at the bends. The seat for the check valve shall be constructed of two 1/4-inch aluminum plates and a neoprene gasket, all bolted together as indicated on the drawings. The bolt holes shall be formed by drilling or punching the aluminum plates and neoprene gasket. The neoprene gasket shall have a thickness of 1/2-inch and shall be fabricated from neoprene gasket material. The aluminum guide rods and aluminum lifting ring shall be connected to the plates by welding conforming to the applicable provisions of AA SAS-30. The check valve shall be temporarily installed on top of the riser pipe immediately after completion of the development pumping, and thereafter shall be kept in place on the pipe at all times, except during pumping, cleaning

operations, and actual addition of riser pipe during installation until the total length of the riser pipe is installed. Immediately after the riser pipe is installed to final height, the top of the riser pipe shall be modified for proper fitting of the check valve.

2.5.1.4 Cover Plate

The top of the well guard shall be fitted with a detachable Type 304 stainless steel cover plate as shown on the drawings. The plate shall be 1/4-inch in thickness and shall have a diameter of 21 inches. The cover plate shall be attached to the well guard using brass 5/8-inch bolts, and stainless steel washers and nuts. The nuts shall be tackwelded onto the underside of the angles attached to the weld ring of the outlet works.

2.5.1.5 Well Numbering

On all new Type "D" well guards installed for surface draining wells, the well numbers shall be cut out of 1/4-inch thick Type 304 stainless steel and then tack-welded to the cover plate, facing the levee crown. Numerals shall be 5-inches tall.

2.5.2 "T"- Type Wells

The outlet works shall consist of precast concrete manholes, lateral pipes and flap gates, check valve, embedded bronze survey markers, drive point drains and other appurtenant items. Requirements for the precast concrete are contained in 03 30 53 - MISCELLANEOUS CAST-IN-PLACE(CIP) CONCRETE.

2.5.2.1 Well Guard

The well guard shall consist of a section of 48-inch diameter manhole extending from the concrete well pad to existing ground elevation. The well guard pipe shall be provided with access ladder rungs, which shall support the weight of a 250 lb. person, shall meet the safety requirements of EM 385-1-1, and that do not restrict access to the top of the 10 -inch riser pipe and check valve movement.

2.5.2.2 Check Valve

The check valves shall be fabricated in accordance with details shown on the drawings and as specified herein. The aluminum parts, at the Contractor's option, may be any one or a combination of aluminum alloys 3005 H14, 6061 T 4, or T6. The 3/8 inch diameter aluminum guide rods shall be carefully bent to avoid flattening at the bends. The seat for the check valve shall be constructed of two 1/4-inch aluminum plates and a neoprene gasket, all bolted together as indicated on the drawings. The bolt holes shall be formed by drilling or punching the aluminum plates and neoprene gasket. The neoprene gasket shall have a thickness of 3/8-inch and shall be fabricated from neoprene gasket material. The aluminum guide rods and aluminum lifting ring shall be connected to the plates by welding conforming to the applicable provisions of AA SAS-30. The check valve shall be temporarily installed on top of the riser pipe immediately after completion of the development pumping, and thereafter shall be kept in place on the pipe at all times, except during pumping, cleaning operations, and actual addition of riser pipe during installation until the total length of the riser pipe is installed. Immediately after the riser pipe is installed to final height, the top of the riser pipe shall be modified for proper fitting of the check valve.

2.5.2.3 Bronze Survey Markers

The bronze survey markers shall be made from silicon bronze bar, orbitally formed, and conforms to ASTM B98/B98M. The survey marker shall have a 4-inch diameter domed cap, "C" style (U.S. Army Corps of Engineers Type 1 Disc) with a minimum 0.75-inch diameter, 3-inch long split-style tapered stem. One survey marker shall be installed in the top slab of each "T" type well.

2.5.2.4 Backfill

The backfill for the 'T' type relief wells shall conform to the requirements as specified in the drawings. The final backfill surface including the topsoil shall be flush with the surrounding ground surface. The channel slope protection shall be replaced with like materials. All disturbed areas shall be dressed smooth and rolled with a smooth drum roller for the establishment of turf.

2.6 MANHOLES

2.6.1 Relief Well Manholes

The relief well manholes shall conform to the lines, grades, and dimensions as shown on the drawings. The top elevation of the manhole cover shall be flush with the surrounding ground surface. The manhole sections shall be 48-inch interior diameter (ID) precast reinforced concrete manhole sections. The precast concrete manhole sections shall conform to ASTM C478 and Section 1042 - "Precast Concrete Products" of the Standard Specifications. The finish floor of the manholes shall be constructed of concrete conforming to Section 03 30 53 - MISCELLANEOUS CAST-IN-PLACE (CIP) CONCRETE or as shown on the drawings. Manhole sections shall be complete with risers, adapter rings, precast concrete manhole covers and shall be designed and manufactured in accordance with ASTM C478. The manhole cover opening frame and bronze survey marker shall be cast into each manhole cover at the time of manufacture. Manhole steps shall be embedded into the wall a minimum of 3.0 inches but shall not be extended on the outside of the structure. Manhole steps shall be cast into the reinforced concrete manhole wall at locations as shown on the drawings. Flexible watertight preformed butyl mastic joint sealants shall be used conforming to ASTM C990. Prior to placing the butyl mastic joint sealants, the concrete joint surfaces shall be clean and dry. Double rings, coils, or ropes of butyl mastic joint sealants shall be applied to each concrete joint per the manufacturer's product instructions.

2.6.2 Relief Well Manhole Frames and Lids

The Contractor shall place a manhole frame and lid on top of each relief well manhole. Locations for flat top relief well manholes and eccentric cone relief well manholes shall be as designated in the plans.

Flat top manhole frames and hinged lids shall be heavy duty, constructed of cast gray iron conforming to ASTM A48/A48M, Class 35B, and shall have a minimum tensile strength of 35,000 pounds per square inch. The frames and hinged lids shall be designed for AASHTO H-20 loadings. The relief well manhole frames shall have clear square openings of 29 inches X 29 inches with hinged lids. The lids shall be constructed with stainless steel butt hinges and waterproof lift handles. The frames shall be embedded into the precast manhole covers in accordance with manufacturer's recommendations.

The lids shall be bolted to the frame with tamper-proof bolts. See Neenah Foundry R-6665 or approved equal.

2.6.3 Manhole Steps

The manhole steps shall be constructed of cast gray iron, copolymer polypropylene plastic coated 1/2-inch, grade 60 steel reinforcement step, or ductile iron castings. The step materials shall have a minimum tensile strength of 35,000 pounds per square inch. The gray iron castings shall conform to ASTM A48/A48M, Class 35B. The ductile iron castings shall conform to ASTM A536, Grade 80-56-06.

2.7 FLEXIBLE WATERTIGHT PREFORMED BUTYL MASTIC JOINT SEALANTS

The flexible watertight preformed butyl mastic joint sealants shall conform to ASTM C990 or AASHTO M 198 Type B. The sealants shall consist of high quality butyl rubber with at least 98% solids to minimize hardening, shrinkage, and oxidation. The joint sealants shall be at least ½-inch, preformed coils or ropes and supplied in ready-to-apply forms. The preformed joint sealant coil or rope shall be applied so the ends meet and do not overlap.

2.8 Resilient Connectors

Flexible, watertight connectors used for connecting all pipe to manholes and inlets shall conform to ASTM C923. The connector shall be the A-LOK Premium Connector as manufactured by A-LOK Products, Inc., Tullytown, PA or approved equal.

a. Connect the pipe to the structure wall by casting the connector integrally with the structure wall during the manufacturing process in a manner that it will not pull out during pipe coupling. The connector shall also be capable of being cast into a round structure by curving the connector in a manner that allows it to remain centrally located within the structure wall and perpendicular to the pipe. This configuration will result in no loss of seal or deflection of pipe entering a concrete structure.

b. The seal between the connector and the pipe shall be made by the compression of the connector between the outside circumference of the pipe and the interior hole opening of the structure. The connector shall be the only component to affect the seal between the pipe and structure.

c. The connector shall be sized specifically for the type of pipe being used and shall be installed in accordance with the recommendations of the manufacturer.

PART 3 EXECUTION

3.1 RELIEF WELL REHABILITATION

3.1.1 General

Rehabilitation shall be in accordance with U.S. Army Corps of Engineers (USACE) EM 1110-2-1914 and specifically consist of brushing, swabbing, and swab/airlifting or swab/pumping to loosen and remove fines.

3.1.2 Inspection

The wells shall be video inspected prior to rehabilitation activities with a downhole color camera (400 lines/inch minimum resolution) equipped with dive lights and down- and side-view capability. The video shall be run from top to bottom with a down-view without stopping, then from bottom to top at a maximum rate of 10 ft/min with a side-view image rotating such that the entire well structure is recorded. The depth in feet below the measuring point (preferably the ground surface) shall be shown at all times in the video, and the depth of the measuring point at the beginning and end of each video shall match within 0.5 feet or the video will be re-run at the Contractor's expense. An electronic still image and a descriptive caption shall be provided at the depth of any well damage or anomaly at a resolution that will allow enlargement up to 8 in x 10 in without loss of detail. 7 dated, marked copies of video records (DVD) form and 4 in x 6 in color prints of each still image discussed in the USACE rehabilitation documentation shall be provided.

3.1.3 Developement

Following well rehabilitation, fines production shall be measured once per 20 minutes during the swab/airlifting or swab/pumping phase by filling a graduated container with pumped water, waiting five minutes, and measuring fines in the sample as a percent of volume. Completion of rehabilitation is based on two samples taken 10 minutes apart with less than 10% improvement in fines production and nephelometric turbidity units (NTU) less than 50. If more than 6 in of fill has accumulated in the well after rehabilitation, this shall be removed by bailer. Fluids may be discharged to grass areas. Wells with specific capacity less than 25% of the average as specified at 24 hours after rehabilitation are recommended for replacement.

3.2 RELIEF WELL REPLACEMENT

3.2.1 RELIEF WELL DRILLING

3.2.1.1 General

Wells shall be drilled by the reverse rotary methodwith a submitted and reviewed drilling program plan (DPP) in accordance with EM 1110-1-1807, in such a manner to ensure proper placement and plumbness and alignment of the well screen, riser pipe and filter pack.No drilling shall be conducted without a DPP approved by USACE. Drilling and installation of well screen and filter pack shall be completed for each well without interruption. Drill cutting material may be spread on site but not clog any ditch or swale or be placed on any filter surface.Before the drilling operation begins on each well, the Contractor shall demonstrate that all material, equipment, and experienced personnel are mobilized and that all equipment necessary for the job is adequate for an efficient operation and is operating in a satisfactory manner. Loss of a hole or well because of lack of material, inadequate or faulty equipment, not meeting plumbness and alignment requirements or careless operating procedures will be considered cause for an abandoned well due to fault of the Contractor. The digging of mud pits or similar excavations will not be allowed.

3.2.1.2 Reverse Rotary Method

The diameter of the hole shall be such that will permit the placement of

the thickness of filter pack as shown on the drawings. The use of a bentonite drilling fluid is prohibited. If the walls of the hole above the top of the filter pack require support during development operations, a temporary casing shall be placed so as to extend from the ground surface to at least one foot below the planned top of the filter material. The Contractor shall be responsible for establishing and maintaining a minimum 7-foot head differential in the drill hole above the piezometric level in the sand aquifer.

3.2.1.3 Temporary Casing

A new or used temporary well casing of either iron or steel may be used to support the sides of the entire hole during drilling and placement of screen, riser pipe, and filter pack and to support the sides of the unbackfilled portion of the hole during development of the well. Any temporary casing shall have an inside diameter large enough to provide the minimum filter thickness, entirely around the well screen or riser pipe and shall have sufficient thickness to retain its shape and maintain a true section throughout its depth and may be in sections of any convenient length. The temporary casing shall be securely anchored to the drill rig or ground surface at all times until removed. The temporary casing shall be such as to permit its removal without interfering with the filter or riser pipe. Methods of installation that will create a cavity outside the temporary casing are prohibited. In the event the temporary casing should become unduly distorted or bent it shall be discarded and a suitable casing shall be used.

3.2.1.4 Obstructions Encountered

The Contractor shall provide and use drills and equipment that are capable of drilling through in-situ logs within the alluvium and capable of removing cobbles up to 5 1/2 inches in diameter. The presence of cobbles up to 5 1/2 inches in diameter or in-situ wood which may be encountered during drilling, shall not be considered as obstructions or sufficient reason for abandonment of a well.Standard drilling methods and tooling shall be utilized until it is demonstrated to Wood that further efforts to advance the bore hole are impracticable. Such demonstration shall include, but not be limited to, continuing drilling operations when no gain in depth is being made for a minimum of 30 minutes."No gain in depth" is defined as 0.00 feet of advancement in a period of 30 minutes.

When it is agreed that 0.00' of advancement has been made for a period of 30 minutes, the contractor shall be prepared to utilize alternative drilling methods or tooling to advance through the larger obstructions. All alternative methods and tooling shall be approved by Wood prior to utilization in the field

If obstructions are encountered in the foundation which, in the opinion of Wood, render it impracticable to complete the well to the directed depth, Wood may adjust the depth to conform to that of the obstruction. Alternatively, Wood may direct the Contractor to abandon the well and construct another well at an adjacent site, or to continue drilling using bucket augers or other equipment capable of drilling through and/or removing the obstruction.

3.2.1.5 Temporary Drilling Pads

The Contractor shall construct any required drilling pads to the minimum dimensions needed to perform the work in a safe manner or maintain the

minimum head differential in the drill hole above the piezometric level in the sand aquifer. Material used in the construction of the pads shall consist of crushed stone, earth, crane mats, or other materials approved by Wood. Construction of temporary drilling pads shall be incidental to the work to be performed for this project.

3.2.1.6 Sampling Procedure

Samples shall be obtained by Standard Penetration Test Method - SPT (ASTM D1586). The soil shall be sampled in accordance with ASTM D1586 by standard (SPT) 2-inch o.d. splitspoon sampler. Generally the SPT's will be performed at an interval of 2.5 feet in the upper 20 feet of each boring, then on 5 feet intervals to approximately 60 feet, then 10 feet intervals thereafter until the scheduled depth is reached, or glacial till or refusal is encountered, or the hole is terminated by AMEC. When a change of material is detected during the process of drilling, at the discretion of AMEC the drilling shall be stopped, the depth determined, and a sample taken immediately. The number of blows required to effect each 6 inches of penetration shall be recorded on the drilling log. Refusal is defined as penetration of less than 12 inches for 100 blows. For some depths where samples are not obtained a second attempt using a 3-inch splitspoon may be required.

3.2.2 INSTALLATION OF RISER PIPE AND SCREEN

3.2.2.1 Assembly

All riser pipe and screen shall be in good condition before installation and all couplings and other accessory parts shall be securely fastened in place. The successive lengths of pipe shall be arranged to provide accurate placement of the screen sections in the bore hole. Centralizers shall be attached to the assembled riser pipe and screen in such numbers and of a type that they will satisfactorily center the riser pipe and screen in the well and will hold it securely in position while the filter pack material is being placed.

3.2.2.2 Joints

Sections of relief well pipe shall be joined together as specified . Joints shall be designed and constructed to have sufficient strength to support the weight of the relief well string as it is being lowered into place in the well.

3.2.2.3 Installation

The assembled 12-inch or 8-inch internal diameter PVC riser pipe shall be placed in the bore hole and instaled from ground surface,with the remainig depth consisting of 0.050" slot stainless steel wire over plastic or V-wire screen with centralizers at the top and bottom of screen. The screen shall be suspended in the hole and shall not rest on the bottom of the hole. After the screen and riser pipe have been placed, a filter pack shall be constructed around the screen section as specified. The top of the riser pipe shall be held at the designated elevation during placement of the filter pack.

3.2.2.4 Plumbness and Alignment

3.2.2.4.1 Alignment

Each well shall be installed and maintained straight and plumb during placement of filter and development. Immediately before placing the filter pack and with the top of the well fastened securely in a vertical and horizontal position, the Contractor shall perform an alignment test. This test shall consist of lowering a pipe 20 feet in length with an outside diameter 1/2 inch smaller than the inside diameter of the well to the full depth of the well and withdrawing it without binding against the sides of the well screen or riser pipe. Furnish the pipe and perform the alignment check and plumbness check in the presence of Wood. If the well fails to conform to the standard described above, the alignment of the well shall be corrected by the Contractor at no additional expense to the OWNER.

3.2.2.4.2 Plumbness Test

After completion of the alignment test the Contractor shall perform a plumbness test before placement of the filter pack. This test will consist of a plumb line run from the top of the well to the bottom of the well. A variation of 6 inches per 100 feet will be permitted in the combined length of screen and riser pipe of the well. If the well fails to conform to the standard described above, the plumbness of the well shall be corrected by the Contractor at no additional expense to the OWNER.

In addition, at least one plumbness check and alignment check shall be performed on each well after placement of the filter pack and backfill. Additional tests may be made during the performance of the work at the option of the Contractor. If the well fails to conform to the standards described above, the well will be abandoned due to the fault of the Contractor and a new well installed at no additional expense to the OWNER.

3.2.3 FILTER PACK PLACEMENT

3.2.3.1 General

After the screen and riser pipe have been placed and alignment surveys and plumbness surveys are conducted, the check valve shall be placed on the top of the well riser to prevent any material from entering the interior of the well. The Contractor shall place the filter pack using the tremie method or an approved alternative that prevents segregation. The filter pack shall be disinfected during placement by the addition of 70% hypochlorite to the pack in the proportion of 2 lbs. per ton.

3.2.3.2 Tremie

3.2.3.2.1 Tremie Hopper

The filter pack shall be placed in a tremie hopper so constructed and balanced that filter material will feed freely and equally to two tremie pipes located at 180 degrees on each side of the screen. Connections between the tremie pipe and the hopper shall be designed for quick connection or disconnection for adding or removing tremie pipe with least possible delay.

3.2.3.2.2 Tremie Pipes

Tremie pipe shall consist of two rigid 4 inch inside diameter tremies with

no obstructions. The tremie pipes shall consist of equal 5 foot lengths of 4-inch iron pipe size (IPS) steel pipe with 1/16-inch wide equally spaced slotted openings. Tremie pipe shall be free of dents, flat spots, damaged threads, and holes, and shall be reamed and/or deburred to full inside diameter of the pipe. The tremie guide shall consist of a metal ring or rings of sufficient diameter to slip freely over riser pipe and screen with 4 inch collars welded to the guide at 180 degrees to securely hold the tremie pipe in place.

3.2.3.3 Procedure

3.2.3.3.1 Filter Material

The Contractor shall be equipped to quickly and efficiently add filter material to the hopper in any position from the ground surface to the maximum height of the hopper. A #2 gravel pack (nominal gradation of 8 x 16 mesh ASTM E-11) shall be installed. No filter pack material shall be allowed to enter the well except through the tremie pipes. At no time shall tremie guide or pipes be raised, lowered or supported by only one pipe. Ten feet of tremie pipe shall be installed below the lower tremie guide. The filter pack material shall be placed using clean water introduced at bottom of hopper and without significant segregation.

3.2.3.3.2 Filter Pack

The filter pack shall have a thickness of 8 inches between the outside of the well screen and the outside of the filter pack and shall be installed from the total depth up to 2 feet above top of screen, in an annular space of at least 1.8 inches but no more than 3.8 inches. A fine sand transition shall be placed from 2 feet above the screen to 3 feet. At the commencement of the placing operation, the tremie shall rest at the bottom of the hole and shall be filled with filter pack material. The tremie shall then be raised in increments approximately equal to the increments of the filter pack placed. At all times during the placing of the filter pack, the tremie shall be kept filled to within five feet of its top.

3.2.3.3.3 Temporary Casing

If temporary casing is used, the filter pack shall be placed in increments not to exceed 2 feet; the tremie and temporary casing shall be raised in small increments approximately equal to the increments of the filter pack placed, except that at no time prior to the completion of placement of the filter pack shall the bottom of the casing be less than 1 foot below the top of the filter pack in the hole. The Contractor shall provide a means of measuring the filter pack depth in the hole. The alternate placing of filter pack material and withdrawing of the tremie and temporary casing shall be continued until the filter pack has been placed to the level shown on the drawings.

3.2.3.3.4 Prior to Development

During development of the well, the top of the filter pack material shall be maintained at the level specified. Prior to and during placement of the filter pack, the top of the temporary casing or hole shall be covered or otherwise shielded to prevent the filter pack from entering the space around the well except through the tremie pipe. Material that may have entered the well screen and riser pipe shall be removed before development of the well is commenced. Construction of the relief well outlet works shall not commence until the development of the well is completed and the

filter pack has been placed to the elevation specified.

3.2.4 DEVELOPMENT

3.2.4.1 General

Following placement of filter pack materials the Contractor shall develop the relief well by high velocity jetting and simultaneous airlift pumping. At the time of development, the well shall be free of drawdown or surging effects due to pump testing, developing or drilling at another location. The Contractor shall be responsible for maintaining the needed access and work areas at the relief well and the necessary clearance in the relief well to accomplish development. The Contractor shall furnish, install or construct the necessary discharge line and troughs to conduct and dispose of the discharge a sufficient distance from the work areas to prevent damage and contamination of any relief wells. This may require running the discharge lines over the levee and discharging on splash protection at the toe of the levee on the riverside. Discharge configuration must be discussed with USACE Baltimore District by the City of Williamsport. Development shall be conducted to achieve a stable well of maximum efficiency and shall be continued until little or no material from the foundation or filter pack can be pulled into the well by pumping. As development proceeds, filter pack material shall be added to the annular space around the screen to maintain the top elevation of the filter pack at the specified elevation. The Contractor shall provide a bubbler tube or other approved means for accurately determining the water level in the well under all conditions. If at any time during the development process it becomes apparent, in the opinion of Wood, that the well may be damaged, operations shall be immediately stopped. Wood may require a change in method if the Contractor's method does not accomplish the desired results.Development shall consist of swab/airlifting or swab/pumping to loosen and remove fines. Fines production shall be measured once per 20 minutes during the swab/airlifting or swab/pumping phase by filling a graduated container with pumped water, waiting five minutes, and measuring fines in the sample as a percent of volume. Completion of development is based on two samples taken 10 minutes apart with less than a 10% improvement in fines production, and NTU less than 50.

If after initial development and 6 hours of additional development, a well continues to produce excessive sand, Wood may order the Contractor to abandon the wellIf more than six inches of fill has accumulated in the well after development, it shall be removed by bailer. Fluids may be discharged to grass areas. All materials pulled into the well by the development process shall be removed prior to performing the pumping test. Development shall be performed before interconnection to the collector system.

3.2.4.2 Jetting and Air-Lift Pumping

The well development shall be accomplished by high-velocity, horizontal jetting and simultaneous airlift pumping. The outside diameter of the jetting tool shall be 1/2 to 1 inch smaller than the inside diameter of the screen. The exit velocity of the jetting fluid shall be between 150 and 300 fps and have a pressure at the nozzle of approximately 200 psi. Circulation of the jetting water will not be allowed. The jetting shall proceed from the bottom of the screen to the top. The tool shall be rotated at a speed of 1 rpm. It shall be positioned at one level for not less than 2 minutes and shall then be raised to the next level. Individual jetting levels shall be spaced no more than 6 inches vertically apart. Sizing of the eductor pipe, air line, and air compressor shall be

adequate to efficiently pump the well at a rate from 10 to 20 percent more than the volume of water introduced through the jetting tool. The eductor pipe shall be placed no more than 5 feet above the top of the jetting tool during development. At the start of the airlift pumping the quantity of air injected shall be limited to that required to initiate flow through the screen.

3.2.5 PUMPING TEST

3.2.5.1 General

The Contractor shall perform pumping tests to determine whether the new wells have been adequately developed. Prior to the pump test the Contractor shall determine that ground water levels are sufficient to cover the well screen. In the event that ground water levels are low enough to expose the well screen when the well is pumped at 1,000 gpm, no pump test shall be performed. Development shall continue until the sand content of the discharge from the well averages no more than 5 parts per million (ppm) by volume of sand in the discharge water for a complete pumping cycle of 2 hours duration when pumping at a constant rate of 1,000 gpm. Sand content measurements shall be taken at equal 15-minute intervals to permit plotting sand content as a function of time and discharge and determination of average sand content for each cycle. Contractor shall calculate sand content in accordance with instructions provided by the manufacturer of the sand sampler. The flow through the sand sampler shall be measured for every pumping test, in addition to sand volumes accumulating in the graduated tube. After completion of the test, the depth of the well shall be measured, by means of an approved method, under the direction of Wood.

3.2.5.2 Equipment

3.2.5.2.1 Pump

The Contractor shall provide a deep-well submersible pump capable of producing the specified discharge over a period sufficient to satisfactorily perform the pumping test specified. The Contractor shall provide, without additional cost to Wood, the electrical power, control box and the necessary wiring which shall be removed at the completion of the pumping test.

3.2.5.2.2 Water Level

The Contractor shall accurately measure the water level in the well to within 0.01 foot before and during the pumping test.

3.2.5.2.3 Flow Meter

The Contractor shall furnish and install a calibrated flow meter of standard design for measuring the discharge from the well during the pumping test. The calibration of the flow meter shall be checked at regular intervals. The meter shall be installed in strict accordance with the manufacturer's recommendations. The meter shall be accurate to within 1% of the measured flow.

3.2.5.2.4 Rossum Sand Sampler

The Contractor shall furnish an approved Rossum centrifugal sand sampler and appurtenant piping and valving for accurate determination of the

discharge sand content. Contractor shall measure the flow through the sampler for every sand content test.

3.2.5.3 Data

The following test data shall be obtained and recorded by the Contractor on WES Form 796 "Relief Well Pumping Test Report", a copy of which is attached at the end of this section. The form shall be completely filled out to include the well number and station and offset.

a. Time of water level measurement.

b. Depth of water in well before, during, and after pumping. The time intervals for measuring the water levels shall be every one minute for the first ten minutes, then 20 minute intervals thereafter for the duration of the pumping test.

c. Flow in gpm.

d. Elevation of water in well before and after pumping (to 0.01 ft.).

e. Elevation of water in the four closest adjacent wells or piezometers before and during pumping (to 0.01 ft.).

f. The depth of sand in well before, during, and after pumping.

g. Sand content of discharge in ppm and time of measurement/pumping. Each sand content shall be calculated based on two sand volume measurements. The flow through the tester shall be measured and reported for every sand test.

The Contractor shall furnish the field WES form and digital (excel format) Relief Well Pumping Test Report with Sanding Reports (form to be provided to the Contractor) within 2 working days (M-F, except holidays) from completion of the test.

3.2.5.4 Procedure

3.2.5.4.1 Pump Testing

The pumping and sand infiltration tests for the rehabilitated and replaced wells shall be conducted under the direction of Wood. The Contractor shall test each well by pumping continuously over a period of two hoursper well using a 5, 10, or 15 gpm flow restrictor/regulator depending on the assessed yield after development. A submersible pump capable of 5 to 15 gpm shall be utilized. A data logging pressure transducer may be used to collect water level data. No test pumping of a well will be permitted concurrently with drilling or pumping of any other well within a radius of 500 feet. In the event that the test is interrupted, other than by order of Wood, prior to the completion of the specified period of continuous operations, the water level in the well shall be allowed to recover to the original static level and the test shall be re run at no additional expense to the OWNER.

3.2.5.4.2 Discharge

The Contractor shall furnish, install or construct the necessary discharge line to conduct the discharge to grass areas. The discharge line shall be turned upward in a saxophone-like outlet to dissipate the energy/pressure

through free fall. Plastic sheeting, 6 mil minimum, shall be placed under the discharge line outlet and in the vicinity of the discharge, so the flow does not damage the grass areas. Any damage shall be repaired by the Contractor at no additional cost to Wood. The Contractor shall make provisions to keep the plastic in place even on windy days. The Contractor shall place the discharge line so that it does not disrupt local traffic.

3.2.5.4.3 Additional Testing

In addition to the test described above, Wood may direct the Contractor to perform additional testing. Such additional testing shall conform in general to the requirements specified above with the exception that the duration of the tests and the approximate drawdown will be determined by Wood. The test, to be successful, shall be continuous throughout the specified period.

3.2.5.4.4 Material Infiltration

In the event that sand or other material infiltrates into the well as a result of the pumping test, the following procedure shall be followed: If the rate of sand infiltration during the latter part of the two hour pumping test has not been reduced to 5 ppm or less, the well shall be resurged by manipulation of the test pump for 20 minutes after which the test pumping shall be resumed and shall be continued at the constant rate specified above until the sand infiltration rate is reduced to 5 ppm, but not for more than a total of eight hours. A 50-gram representative sample of the sand shall be collected and furnished to Wood for grain size testing by Wood.

3.2.5.4.5 Abandonment

If, at the end of eight hours of pumping, the rate of infiltration of sand is more than 5 ppm, the well shall be abandoned, except that the Contractor may elect to continue the test pumping and perform such other approved remedial work considered desirable, all at the Contractor's own expense. If, after such additional test pumping and other remedial measures, the sand infiltration rate of a well is reduced to 5 ppm, the well will be accepted. Unacceptable wells shall be abandoned and a new well installed nearby at a location directed by Wood at no additional cost, unless analysis of the grain size of the sand by Wood indicates that the filter gradation is incompatible with the sand formation.

3.2.5.4.6 Completion

Upon completion of the pumping test, any sand or filter material in the bottom of the well shall be removed by pumping or by other approved methods, after which the Contractor shall remove all equipment, discharge lines, etc., and restore the site to its original condition.

3.2.5.5 Additional Pumping Test Measurements

In addition to the measurements and record-keeping required of the Contractor, Wood may require access to the well to perform additional water level measurements in the pumped well and nearby relief wells.

3.2.5.6 Records

The Contractor shall obtain and furnish to Wood for record purposes the elevation of the water in each well to the nearest 0.01 ft. before and

after the development pumping, the flow in gpm during the pump test and the time of observation. The water surface elevation shall be obtained immediately before starting the pump and the water surface elevation and flow shall be obtained at each required time interval and just before stopping the pump upon completion of the development pumping. These data shall be recorded on WES Form 797, a copy of which is attached at the end of this section. The Contractor shall furnish the field WES form and digital (excel format) Relief Well Pumping Test Report (form to be provided to the Contractor) within 2 working days (M-F, except holidays) from completion of the test.A 24-hour projected specific capacity shall be calculated from the water level (drawdown) data plotted on a semi-log chart and the pumping rate.

3.2.6 BACKFILLING

After each new well has been developed the annular space above the filter pack shall be backfilled by extending the filter pack a minimum of 5 feet above the top of the screen and sealing the remainder of the space up to the required elevation (finished ground surface or well pit or base of the pre-cast manhole elevation) with concrete. The temporary casing, if used, shall be withdrawn in increments as the backfill is placed.

3.2.7 PLUGGING OF ABANDONED WELLS

The Contractor shall seal the bore hole with cement grout starting from the bottom of the hole to within 3 feet of ground surface by means of a tremie pipe inserted to the bottom of the well. The tremie pipe may be withdrawn but the end of the tremie pipe must remain at least 2 feet below the surface of the concrete. The cement grout shall be placed through the pipe and forced upwards towards the surface. Cement grout shall be placed to within 3 feet of ground surface. After the grout has setup the riser pipe shall be cutoff 3 feet below ground. Then the hole shall be backfilled with concrete and or backfill as directed by Wood. The cement grout mixture proportion to be used shall be submitted for approval.The surface completion will be removed and wellhead area re-seeded with a drought tolerant tall fescue seeding/mulching mix (like Scott's Turfbuilder EZseed), covered with straw, and watered. Alternatively, if desired by the City of Williamsport, wells that perform poorly may be kept in place upon consultation with USACE Baltimore District.

3.2.8 REPLACING OUTLET WORKS OF EXISTING TYPE "T" RELIEF WELLS

Four existing Type "T" relief wells are designated to have the existing corrugated metal housing and outlet piping replaced with precast concrete structures and reinforced concrete pipe. The corrugated metal housing and existing concrete slab shall be removed in their entirety. Care should be taken during demolition to not damage the stainless steel riser pipe. Once removed, a new cast-in-place concrete slab and precast concrete manhole structure shall be set atop a stable aggregate base as specified. Alternatively, a precast concrete section with a hole in the base slab can be set as one piece over the stainless steel riser pipe.

3.2.9 TESTS

Submit Relief Well Boring Logs for each relief well. Register each well with the state as required by the state in which the well is installed.

3.2.10 INSTALLATION TOLERANCES

New relief wells shall be installed to the elevations shown in the contract drawings. As the discharge elevation of the relief well is of utmost importance, the well shall be installed so that it is no more than 0.04-feet higher nor more than 0.25-feet lower than the specified elevation.

3.2.11 ORDER OF OPERATIONS

In order to maintain the integrity of underseepage controls during construction, new relief wells must be complete and operational prior to abandoning any of the existing relief wells. Care should be taken to protect the existing wells designated for abandonment during installation of new wells.

3.2.12 REPORTS

Include in the reports for each relief well, an executive summary of work completed,video inspection of existing wells to remain and post video inspection of new wells, rehabilitation records, log of the boring, log of construction, filter pack gradation, quantity of filter pack added during development, pump test, sand test, and report of backfilling. The elevation of changes between materials on these logs shall be to the nearest 0.1 foot. The log of backfill material shall include the filter pack particle size distribution test data, and notes concerning installation and development of the relief well. The pump test log shall include the duration of the test and rate of flow in gpm, the draw-down response data with time in the pumped well, in adjacent wells, and in nearby piezometers, and the plot with calculation of projected 24-hour specific capacity. The log of construction shall include elevations of the well screen, top of riser pipe, and top and bottom of well. The field relief well log and the field digital pump test logs shall be submitted to Wood within 2 working days of the completion of the well. Also submit a report of the well installation to the appropriate public agency and in the form required by state statutory and/or regulatory requirements specified; a copy of well report and any correspondence to/from the state/regulatory agency shall be provide to Wood.

-- End of Section --