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REAL ESTATE

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-- End of Section Table of Contents --
PART 1  GENERAL

1.1  SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Additional Property Agreements; G-RED.

Copies of any agreements for Contractor-acquired real estate rights for this project shall be furnished before entering thereon.

Certified Survey Results

Furnish a copy of certified results of surveys which verify areas and limits of Contractor-acquired real estate rights.

1.2  REGULATORY REQUIREMENTS

1.2.1  Real Estate Rights

Rights for the use of the work and storage areas have been obtained and the general limits of the areas are shown on the drawings. Copies of instruments conveying rights for use of the work and storage areas shown on the drawings and specified herein are available for inspection in the Engineering, Design, & Construction Office, U.S. Army Corps of Engineers, Detroit District, 477 Michigan Avenue, McNamara Building, Detroit, Michigan. Conformance to all applicable requirements of the instruments conveying rights is required. Two (2) copies of each instrument will be furnished to the Contractor. No other real estate rights have been obtained by the Government for this project.

1.2.2  Additional Real Estate Rights

Any additional property agreements and/or real estate rights desired by the Contractor shall be obtained by the Contractor at its own expense. Such agreements shall clearly relieve the Government of any responsibility for damages or liability resulting from the Contractor's use of such grounds.
1.3 PROJECT/SITE CONDITIONS

1.3.1 Location and Verification

It shall be the Contractor's responsibility to accurately locate the limits of all lands utilized under the contract. The corner and angle points of each area for which rights have been obtained shall be marked with semipermanent markers except where there is an approved existing property marker. Temporary markers shall be placed at points on alignment. The points on alignment shall be marked at stations so that intervals between points do not exceed 200 feet.

1.3.2 Survey Markers

All markers shall be installed in an area prior to its use and they shall be available for reference during and upon completion of use of the area. Where approved existing property markers are found, a witness stake, as specified in Subparagraph, "Semipermanent Markers" below, shall be provided. If the types of markers specified hereinafter cannot be used, other types, as approved by the Contracting Officer, shall be provided.

1.3.2.1 Semipermanent Markers

The markers shall be a steel rod one-half inch in diameter and four (4) feet long. The steel rod shall be driven vertically into the ground so that the top is flush with the finished ground surface. Each marker shall be witnessed by a 2" x 2" yellow stake extending two (2) feet above the ground surface and driven into the ground until stable, with not less than one (1) foot penetration.

1.3.2.2 Temporary Markers

Markers shall be 2" x 2", red-colored, wood hub stakes driven into the ground until stable (not less than one (1) foot penetration) with two (2) feet projecting above the ground surface. If the period in which temporary markers are to be in place exceeds one (1) construction season, a more permanent type of marker, as approved, shall be provided.
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3.3 CONTRACTOR'S USE OF PREMISES

ATTACHMENTS:

Emergency Action Plan for Sabin Dam
Sabin Dam Safety Inspection Report

-- End of Section Table of Contents --
PART 1   GENERAL

1.1    RELATED DOCUMENTS

A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section, including but not limited to Division 1, General Requirements.

B. Definition: COR - Contracting Officer's Representative.

1.2    PROJECT DESCRIPTION

A. SECTION INTENT: This section is intended to provide a summary of the project and the various elements of work associated with it. This summary should be used in conjunction with other Specification sections and the construction Drawings. This section does not provide the technical detail for particular Work Items, but describes the work as a whole, providing an overall perspective to the separate tasks and their interrelationships.

B. GENERAL: The work to be completed consists of two major components, and includes installation and maintenance of erosion and sedimentation control measures for each:

1. The breaching, demolition, and removal of the Sabin Dam Powerhouse, spillway, and appurtenances. Latest dam safety inspection report is attached at the end of this section and is also available on theboardman.org website.

2. Restoration of the Boardman River for approximately 4,000 linear feet from the Beaver Pond area just north and east of Cass Road, through the extents of the former Sabin impoundment, and approximately 500 feet downstream of the existing Sabin Dam.

C. BREACHING, DEMOLITION, AND DAM REMOVAL SUMMARY:

1. Breaching, Demolition, and Dam Removal generally consists of:

   a. Site clearing and installation of construction access drives.

   b. Coordination with the Contracting Officer's Representative for removal of powerhouse equipment and intake gate equipment.

   c. Demolition of concrete spillway to elevation 609.

   d. Incremental demolition of the concrete spillway to reach a maximum dewatering rate of 1 foot per day.

   e. Construct sediment trap upstream of the spillway inlet and maintain throughout the dewatering operation.

   f. Once impoundment is drawn down below powerhouse inlet elevation, install stop logs in powerhouse intake to limit flow to the spillway.

   g. Construct downstream flow diversion berm between spillway outlet and powerhouse outlet channel.

   h. Begin fill and construction of the proposed river channel directly downstream of the Powerhouse and west of the flow diversion berm.

   i. Once spillway is demolished to elevation 598.5, stop demolition and install bulk bag cofferdam upstream of the existing powerhouse to
j. Demolition and removal of powerhouse, substructure, spillway, and retaining walls.
k. Construct proposed river channel through the Powerhouse into the Sabin impoundment.
l. Once proposed river channel is fully constructed through the powerhouse, finish dewatering by incrementally lowering the bulk bag cofferdam.
m. Finish construction of proposed river channel through cofferdam area connecting the river channel within the impoundment to the river channel constructed through the powerhouse.
n. Finish grading and seeding and restoration of dam breaching area.
o. After the river has been routed through the restored river channel and the spillway is no longer in use, inert materials from demolition activities may be disposed of onsite, in former spillway channel, according to NREPA Part 115 Section 324.11504 and Section 324.11507. Disposal site shall be capped with 3 feet of fill, topsoil and seed.
p. Sampling of wiring and roofing materials for asbestos, lead based paint survey and an inventory of building components that may contain PCBs, mercury, chlorofluorocarbons, refrigerants, and other potentially hazardous materials.
q. All hazardous material shall be disposed of according to local, state and federal regulations.
r. Coordination with utility companies for removal power service and work around utilities.

D. SEDIMENT MANAGEMENT AND RIVER RESTORATION SUMMARY:
1. A large deposit of sediment has accumulated in the Sabin Pond (Impoundment), as noted on the Drawings. The intent is to excavate a corridor through this sediment, wasting material in adjacent disposal areas as noted, to expose the pre-dam Boardman River channel. The average channel dimensions are indicated on the Drawings. Dimensions will vary from this average to re-construct natural pools and riffles. Channel bank cut slopes are 2H:1V (horizontal to vertical) and spoil placement areas are 3H:1V (horizontal to vertical) unless steeper native slopes are encountered. Cut slopes from floodplain extents to existing grade are 3H:1V (horizontal to vertical unless steeper natives slopes are encountered.
2. The sediment accumulation in the impoundment is primarily sand. Some finer material between approximately Station 123+00 to 121+00 (the dam embankment) is expected to include more fine material and will be revealed during drawdown of the pond.
3. As finished grades are reached, indicators such as the gravel bed of the pre-dam channel and stumps of trees along the pre-dam banks will help guide fine grading as the old river channel is exposed. Additional restoration includes the enhancement of pool and riffle features and the addition of large wood habitat.
4. Sediment removal may occur under the most efficient means possible, including mechanical, hydraulic, or otherwise. The contractor will provide a detailed submittal of the means and methods for excavation and sequencing. The approach utilized must minimize the transport of sediment downstream of the dam to the extent feasible. Sediment traps will be used to collect material that will mobilize through the work area as an additional control to minimize sediment transport. Controlled drawdown of the headpond will also be used to minimize sediment transport. Some sediment is expected to mobilize and be transported within the work area and downstream of the dam as part of the project.
1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The following permits have been applied for:
   1. Joint Permit Application from the Michigan Department of Environmental Quality.
   2. Natural Rivers Permit from the Michigan Department of Natural Resources

B. The required Work for this contract includes:
   1. Obtain permits as follows:
      a. Demolition permit from the Grand Traverse County Construction Codes Department, and submit a notification (Notice of Intent to Renovate/Demolish) to MDEQ at least 10 working days prior to the demolition date. Prior to application for the demolition permit a NESHAP (40CFR Part 61, Subpart M) must be completed.
      b. Soil and Sedimentation Control Permit (Part 91) from the Grand Traverse County Drain Commissioner.
      b. Any other permits that may be required.
   2. At existing impoundment elevation (approximately 609.0) set up all controls onsite, including erosion and sedimentation controls.
   3. Sampling and analysis of powerhouse wiring and roofing materials for existence of asbestos containing material (ACM). Identify other potential hazardous material for abatement. Previously identified items include; potential lead based paints, fluorescent light tubes potentially containing mercury, and potential PCB containing material including caulking, oil, and electrical equipment.
   4. Incrementally demolish existing spillway as indicated on the Drawings and dewater impoundment at a rate of no greater than 1 foot per day or as dictated in the approved Joint Permit Application (JPA).
   5. Complete preliminary grading and sediment traps as shown on the Drawings.
   6. Install downstream flow diversion berm and upstream bulk bag cofferdam structures as indicated in the Drawings.
   7. Dewater impoundment utilizing the existing concrete spillway as indicated in the Drawings. Construct bulk bag cofferdam upstream of the powerhouse.
   8. Any work referred to as "proposed' within the specifications package or Drawings shall be considered required under this contract.

C. The work of any one trade, Contractor or Subcontractor shall not be limited to the work listed in a Section under "Project Description". Such listings are intended as general guides to the contents of a Section, and not as a scope of the work. Unless otherwise indicated, provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, test equipment, testing and other facilities and services necessary for the proper execution and completion of the work, whether temporary or permanent, and whether or not incorporated or to be incorporated in the work.

1.4 WORK

A. SEQUENCE
   General
   1. The work shall be planned, scheduled, and performed in stages in order to complete the Work within the requirements of the Specifications and Drawings and the requirements of appropriate regulatory agencies and permits.
   2. The sequence shall be in the general sequence described by Drawing B-2.1.
1.5 OTHER GENERAL REQUIREMENTS

A. Comply with all project permits and apply/obtain all Contractor responsible permits prior to the commencement of work.

B. Make arrangements for temporary storage of materials and supplies and for timely delivery to the project site.

C. Assist the Contracting Officer's Representative as required in the review of construction.

D. Maintain up-to-date records on-site.

E. Maintain the Limits of Work in a neat condition.

1.6 SUBMITTALS

A. The Contractor shall submit schedules of work, safety plans, drawings and sequencing details, test reports, lab data, and others to the Contracting Officer's Representative in accordance with Section 01 33 00. The Submittal Register at the end of Section 01 33 00 lists the specific submittals required.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 HEALTH AND SAFETY

A. The contractor is responsible for understanding and being prepared to follow and fully implement the "USACE Manual No. 385-1-1 dated 30 November 2014". In addition, it will be required that any full-time superintendent maintain a copy of this plan at all times on site, and perform at least one (1) emergency response drill in cooperation with the County Emergency Management Coordinator during the first week of construction.

B. The contractor is responsible for understanding and being prepared to follow and fully implement the "Emergency Action Plan for Sabin Dam" dated November 2015 as included in these specifications. In addition, it will be required that any full-time superintendent maintain a copy of this plan at all times on site, and perform at least one (1) emergency response drill in cooperation with the County Emergency Management Coordinator during the first week of construction. During construction, the contractor must maintain an adequate level of preparedness, as determined by the County Emergency Management Coordinator, for an unexpected dam breach.

3.2 PROTECTION OF PROPERTY AND OPERATIONS

A. The project will occur within the County Natural Education Reserve property. Residences are in close proximity along the east edge of the impoundment. Impacts to adjacent property owners shall be minimized. The Boardman River is a heavily utilized recreational river with watercraft and fisherman moving through the river. Signage will be in-place notifying users of the project, but the Contractor is notified of the potential for the general public to enter the work area through the river corridor.

B. The Contractor shall utilize every precaution to protect the property
from damage during execution of the Work. Any damage that the Contractor may inflict shall be repaired or replaced in a prompt manner as directed by the Contracting Officer's Representative (COR) at no additional cost to the USACE.

C. The Contractor shall utilize every precaution to protect the remaining dam equipment from damage during demolition of the dam structure. Any damage that the Contractor may inflict shall be the responsibility of the contractor, repaired or replaced in a prompt manner as directed by the Contracting Officer's Representative at no additional cost to the USACE.

D. The Contractor shall take all measures required to minimize adverse impacts from execution of the work on property abutters and shall not interfere with their operations.

E. The Contractor shall coordinate site restrictions and vehicular/pedestrian traffic control plans as appropriate.

3.3 CONTRACTOR'S USE OF PREMISES

A. Confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and do not unreasonably encumber the Site with any materials or equipment. The Contractor shall use only those designated areas of the Site for staging and storage. Staging and storage areas are to be agreed upon and accepted by the Contracting Officer's Representative.

B. The Contractor shall assume full responsibility for the protection and safe keeping of products and equipment under this Contract that are stored on-site during the project construction.

C. At all times, provide the Contracting Officer's Representative easy and safe access to the work wherever it is in preparation and progress. Provide such access so COR may perform his functions.

Attachments:
Emergency Action Plan for Sabin Dam
Sabin Dam Safety Inspection Report

-- End of Section --
EMERGENCY ACTION PLAN

SABIN DAM

National Inventory of Dams No. MI00513
Boardman River
Grand Traverse County, Michigan

Owner:
Grand Traverse County
400 Boardman Ave. Traverse City, MI 49684

November 2015
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EMERGENCY ACTION PLAN
SABIN DAM PROJECT

I. NOTIFICATION FLOWCHARTS

The purpose of this Plan is to give specific guidelines to be followed by Grand Traverse County personnel and emergency warning agencies in the event of a failure of a dam structure or earthen dike that would cause an uncontrolled release of flow and could result in property damage and/or loss of life. Specific chains of command and sequences of notification are given for the following two possible failure situations.

Condition A. Failure has occurred or is imminent

1. General Definition: Once a determination has been made that there is no longer any time available to attempt corrective measures to prevent failure, the “failure is imminent or has occurred” warning should be issued. “Failure is imminent” and “failure has occurred” should conservatively be interpreted as essentially the same condition for evacuation purposes.

Condition B. Potentially Hazardous Situation is Developing

1. General Definition: Some amount of time is still available to take action during certain events (such as major floods) that may prevent failure

The Notification Flowcharts appear on pages 4 and 5 of this Emergency Action Plan.

Notification Flowcharts shall be prominently posted at the Central Dispatch Office, the Emergency Management’s office, the Department of Public Works office, and at the powerhouses at the Boardman and Sabin Dams.

LISTING OF DOWNSTREAM RESIDENTS

A listing showing the name, address and telephone numbers of potential residents located downstream is provided on Appendix C to this plan. In the event of a potential failure there may not be time to call the entire list. The County does not have personnel available to telephone the entire list. The county’s CodeRED notification system and early warning siren would be the fastest means of notification.
CONDITION A:
Failure has occurred or is imminent

911

Traverse City Fire
Radio TC FIRE

Grand Traverse County Sheriff
Radio A-3

Traverse City Police
Radio A-1

State Police
Radio A-3

Grand Traverse Metro/Rural Fire
Radio A-6

County Roads
Radio

Emergency Management Coordinator
Office 231-995-6059
Cell 231-590-2373

County Administration
231-922-4780

County DPW
Sam Tyson, 231-590-2658

State Emergency Management
State DEQ
CONDITION B: Potentially Hazardous Situation is Developing

911

Emergency Management Coordinator
Office 231-995-6059
Cell 231-590-2373

County Administration
Office 231-922-4780

County DPW
Sam Tyson 231-590-2658
Office 231-995-6039

State Emergency Management
State DEQ

Notify City, Metro and Rural
Fire by phone

Notify City Police and County
Sheriff shift commanders
II. STATEMENT OF PURPOSE

This plan defines responsibilities and provides procedures designed to identify unusual and unlikely conditions which may endanger Sabin Dam in time to take preventive action and to notify the appropriate emergency management officials of possible, impending, or actual failure of the Dam. The plan may also be used to provide notification when flood releases will create major flooding.
III. PROJECT DESCRIPTION

The Sabin Dam is located on the Boardman River in Grand Traverse County, approximately 3 miles upstream of Traverse City, Michigan.

All elevations are given in feet and are referenced to National Geodetic Vertical Datum (NGVD). The normal headwater elevation at the Sabin Dam is 609.0 feet. The drainage area of the Boardman River at the Sabin Dam is 239 square miles.

Project structures are referred to in this report as left and right looking downstream. The Sabin Dam spans a stretch of the Boardman River valley that is approximately 200 feet wide. The project structures consist of a 60 foot long earth embankment, a 64 foot wide powerhouse, a 52 foot long earth embankment, a spillway section, and a 330 foot long earth embankment. Part of the right earth embankment is built around the piers of the original spillway structure, which was built in 1906.

A. Dam. The earth embankments are constructed of sand fill. The right embankment is approximately 330 feet long with a maximum height of 20 feet. The embankments were constructed using ordinary fill and compaction methods. Between 1985 and 1988 the crest elevation of the earth embankments was raised one foot to an elevation of 618.5.

B. Spillway. There are three low flow outlets with wood lift gates in the stoplog section that are no longer in use. The tainter gate section contains one 18 foot wide by 5.5 foot high steel tainter gate. The gate is operated with a fixed electric cable hoist.

C. Powerhouse. The reinforced concrete powerhouse contains one inactive vertical shaft turbine generator unit.

D. Intake and Outlet Works. The turbine intake is integral to the powerhouse. Water passes through the inactive vertical shaft turbine and discharges directly into the Boardman River just down stream of the powerhouse.

Map of Vicinity

A vicinity map is shown on the following page(s).

Facility Drawing

A facility drawing is shown on the following page(s).
Associated Dams

Boardman Dam, also owned by Grand Traverse County, is located .7 miles upstream of Sabin Dam. Union Street Dam, owned by the City of Traverse City, is located 4.0 miles downstream of Sabin Dam. Sabin Dam impounds Sabin Pond, and Union Street Dam impounds Boardman Lake in Traverse City.

Site Specific Concerns

When personnel are dispatched to the site under adverse conditions, the employees should be equipped with portable lighting and a two-way portable radio whenever possible. See Appendix C for additional information.
IV. EMERGENCY DETECTION, EVALUATION, AND CLASSIFICATION

Detection:
Headwater and tailwater monitoring of this facility is conducted at a minimum of five days a week, additional monitoring during inclement weather. Grand Traverse County Department of Public Works currently monitors headwater and tailwater levels on a daily basis.

A phone call may be received from an observer or reliable source indicating that an abnormal, hazardous, or emergency situation exists.

The Department of Public Works Manager may also dispatch personnel to the site to observe, monitor, and report on conditions. Daily on-site inspection of the facilities and dam are conducted by Grand Traverse County Department of Public Works employees.

Conditions or events that may cause an abnormal, hazardous, or emergency situation include spillway gate failure, structural failure, dike failure, heavy continuous rainfall, earthquake, terrorism, etc.

Evaluation:

Information and data received needs to be evaluated so as to assess the severity and magnitude of the situation.

The rate of change (sudden change vs gradual change) of headwater and tailwater levels and weather condition (sunny day vs heavy rain) are two important factors to consider. In the case of an on-site observation, either by a reliable observer or employee, an immediate decision can reliably be made as to the severity and magnitude. The Public Works Manager may also dispatch personnel to the site to monitor and report on conditions when circumstances (such as continuous heavy rainfall) would indicate that a potential for a hazardous situation to develop are present. The Public Works Manager has the ability to monitor weather conditions via Internet web sites.

Classification:
Two emergency classifications have been developed which are:
   Condition A - Failure has occurred or is imminent
   Condition B - Potentially hazardous situation developing
Once Detection and Evaluation phases are completed, a determination as to whether Condition A or Condition B exists shall be made. General definitions of these conditions are provided in Section I. Responsibilities regarding each condition are provided in Section V. “Declaration of an emergency can be a very controversial decision. The issue should not be debated too long. An early decision and declaration is critical to maximize available response time”, per Federal EAP Guideline
V. GENERAL RESPONSIBILITIES UNDER THE EMERGENCY ACTION PLAN
The purpose of this plan is to give specific guidelines to be followed by Grand Traverse County personnel and emergency warning agencies in the event of a failure of a dam structure or earthen dike at the Sabin Dam located on the Boardman River in Grand Traverse County, Michigan.

A. Owner’s Responsibilities
Regular physical inspections are used for continuous headwater and tailwater monitoring of the facility by Department of Public Works personnel each working day throughout the week. Additional inspections are conducted during inclement weather events.

Upon becoming aware that an abnormal headwater or tailwater condition exists, the Grand Traverse County Department of Public Works Manager, in conjunction with the Emergency Management Coordinator, will make a determination with regard to the severity of the problem and initiate the "Condition A" or "Condition B" response procedure, if appropriate. Both response procedures include prompt contact of Grand Traverse County personnel and Central Dispatch (911). Central Dispatch will contact the Emergency Management Coordinator and Grand Traverse County Sheriff’s Office, City and State Police, and City and County Fire Departments. Central Dispatch will also activate the CodeRED emergency notification system and the Early Warning Siren located approximately a mile downstream in the Logan’s Landing area on South Airport Rd. Adjustment of spillway gates and adjustment of water intakes will be done as deemed appropriate.

The Public Works Manager will take appropriate action to determine the nature of the failure or dangerous situation. If notification has been received from an observer, the Manager will obtain the name, address and telephone number of the caller, the information about the type and time of failure. If necessary, the Manager will dispatch personnel, equipped with a two-way portable radio, to inspect the dam. He will then advise the Emergency Management Coordinator, request emergency repairs, and continue to monitor the situation closely. The Public Works Manager will also contact Central Dispatch, who will contact local agencies and keep them informed of the situation.

B. Responsibility for Notification
CONDITION A - Failure has occurred or is imminent
A Notification Flowchart delineating the contacting responsibilities for the various individuals or agencies involved in a rapidly developing or instantaneous failure at the Sabin Dam is presented in Section I of this plan. The dam shall be considered about to fail if a serious structural deficiency or an uncontrolled flow of water that cannot be corrected or contained develops, making failure imminent, or if the structural deficiency or uncontrolled flow has the likely potential of increasing to
catastrophic proportions, causing failure of part of the dam. The most likely mode of failure at Sabin Dam is overtopping of the dam embankment. Overtopping can occur because of flooding and/or incorrect operation the dam.

Upon becoming aware that a condition exists that is likely to cause imminent failure, Central Dispatch will initiate the Condition A” warning procedure as follows:

1. **Central Dispatch**
   a. **Activate Early Warning Siren and utilize CodeRED Notification System**
      to notify the following that a dam failure has occurred or is imminent:
   b. **Contact the Emergency Management Coordinator**
      - Business: (231) 995-6059
      - Cell: (231) 590-2373

   The Emergency Management Coordinator will be responsible for organizing and coordinating warning and evacuation procedures with appropriate agencies using the inundation maps included in Section VII of this Emergency Action Plan. If the Emergency Management Coordinator is not available, the Chief of the Grand Traverse County Metro Emergency Services Authority will implement the Grand Traverse County Warning and Evacuation Procedures.

c. **Notify Grand Traverse County Sheriff’s Office via Radio**
d. **Notify Grand Traverse Metro/Rural Fire via Radio**
e. **Notify Traverse City Fire via Radio**
f. **Notify Traverse City Police via Radio**
g. **Notify State Police Post via Radio**
h. In the event of an imminent or actual failure, potentially affected property owners between the Sabin Dam and the Traverse City limits can be contacted by telephone using the listing that appears in Appendix C of this Emergency Action Plan. Affected residents within city limits will be identified using the inundation map located in Section VII of this Emergency Action Plan and notified by CodeRED emergency notification system.

2. **Other Actions**
   a. After completion of the warning procedures, the Director of Grand Traverse County Department of Public Works will assess the damage to the dam and formulate a plan for emergency repairs.
CONDITION  B - Warning Procedure if Potentially Dangerous Situation is Developing

Section I of this plan includes a flowchart summarizing the sequence of notification if a potentially hazardous situation is developing.

Upon becoming aware that an unknown condition exists that may affect the dams normal operations, Central Dispatch will initiate the Condition B” warning procedure as follows:

The notification procedures are as follows:

1. Central Dispatch
   a. Notify County DPW of situation
   b. Contact the Emergency Management Coordinator
      Business: (231) 995-6059
      Cell (231) 590-2373

If needed the Emergency Management Coordinator will be responsible for organizing and coordinating warning and evacuation procedures with appropriate agencies using the inundation maps included in Section VII of this Emergency Action Plan. If the Emergency Management Coordinator is not available, the Chief of the Grand Traverse County Metro Emergency Services Authority will implement the Grand Traverse County Warning and Evacuation Procedures.

2. Other Actions
   a. After completion of the notification procedures, the Director of Grand Traverse County Department of Public Works will assess the situation of the dam and formulate a plan for emergency repairs.

If a potentially dangerous situation is developing at Sabin Dam, the failure of Union Street Dam downstream may be caused. Inundation maps for the potential areas subject to flooding are shown in Section VII of this Emergency Action Plan. In the event of an imminent or actual failure, potentially affected property owners between the Boardman Dam and the Traverse City limits can be contacted with the CodeRED Emergency Notification System or in person using the listing that appears in Appendix C of this Emergency Action Plan. Affected residents within city limits will be identified using the inundation map located in Section VII and notified by the CodeRED Emergency Notification System.
C. Responsibility of Evacuation

Central Dispatch is responsible for notifying the appropriate emergency management officials when major flooding is anticipated, a dam failure is imminent or has occurred, or a potentially hazardous situation is developing.

It is the responsibilities of other local authorities who have the statutory obligation for evacuation of people. However, there may be situations in which routine notification and evacuation will not suffice, as in the case of a resident located just downstream of the dam. In these situations, Grand Traverse County may arrange to notify these residences directly. When possible, these activities should be coordinated with the appropriate public agencies.

D. Responsibility for Termination and Follow-Up

The Grand Traverse Department of Public Works director shall ensure that Public Works personnel are monitoring the situation at the dam and keeping Emergency Management informed of developing conditions at the dam from the time that an emergency starts until the emergency has been terminated. The Emergency Management Coordinator will also contact Central Dispatch and local agencies and keep them informed of the situation.

The Emergency Management Coordinator is responsible for declaring that the emergency at the dam is terminated and for termination of the disaster response activities.

Provisions for security measures may include use of local law enforcement, fire departments, or any authorized personnel.

Within 60 days after the emergency has been terminated, the Emergency Management Coordinator shall conduct a follow-up evaluation, including input from other outside participants. The evaluation shall be documented on a written report.

E. Emergency Management Coordinator Responsibilities

Duties of the Emergency Management Coordinator include the following:
1. Conduct necessary training, prepare revisions to the Emergency Action Plan, and provide documentation thereof to the Michigan Department of Environmental Quality.

2. Conduct annual plan review as described in Appendix B of this Emergency Action Plan and preparing revisions as required.

3. Conduct an annual test of state of readiness as described in Appendix B of this Emergency Action Plan.

4. Coordinating Emergency Action Plan related activities, and serving as the Emergency Action Plan contact should any questions arise.

VI. PREPAREDNESS

B. Surveillance

The Grand Traverse County Department of Public Works monitors the dams on the Boardman River on a continuing basis. General on-site inspections of each dam is done daily, at a minimum, by Grand Traverse County Department of Public Works personnel.

The Sabin Dam contains two separate draft tubes. During periods of actual or forecasted high flows or signs of serious structural distress a Grand Traverse County employee equipped with a two-way portable radio may be stationed at the dam. There may be emergency situations in which routine notification and evacuation will not suffice, as in the case of a resident located just downstream of the dam. In these situations, Grand Traverse County may arrange to notify those residents directly.

C. Response During Periods of Darkness

Lighting would have to be provided by vehicles or portable means. The Notification Flowcharts include 24-hour telephone numbers which can be used day or night.

D. Access To Site

A rapidly developing dam failure could inundate some downstream roads and therefore require preplanned transportation routes. Sabin Dam should be approached from the west side because the powerhouse and spillway are west of the earth embankment which is approximately 1.7 feet below the spillway walkway. Hence, overtopping the embankment will occur prior to overtopping at the spillway.
E. **Response During Weekends and Holidays**

For response during weekends and holidays, Grand Traverse County Central Dispatch (9-1-1) shall call-out personnel as per procedure.

F. **Response During Periods of Adverse Weather**

During periods of actual or forecasted high flows, a Grand Traverse County Department of Public Works employee with a two-way radio may be stationed at the dam 24 hours a day. In the event of a failure, the Public Works Manager can contact Central Dispatch (communications/warnings offices) by telephone or by radio. Access to site includes use of Grand Traverse County snow removal equipment.

Presently there is no lighting available for illumination of the spillway or operating deck at the dam. Response time to the site is expected to be less than thirty minutes by Grand Traverse County personnel.

F. **Alternate Systems of Communication**

The principal means of communication would be the commercial telephone system. In the event of an emergency, the emergency operations center will be the communications control point. The emergency operations center is equipped with one radio console and ten outgoing phone lines. Seventeen radio frequencies are available for radio communication with Sheriff, Fire Departments, Police, Public Works, Light and Power personnel, and County Road Commission. The Emergency Operations Center can be linked to the Gaylord NWS office by phone, cellular phone, and 800 MHz radio.

G. **Emergency Supplies and Information**

1. **Stockpiling of Materials**

   Sandbags are available locally from:

   Grand Traverse County Facilities Management  
   231-995-4401 or 9-1-1

   Grand Traverse County Road Commission  
   231-922-4848 or 9-1-1

   McGough’s (231) 947-5900
   After hours: (231) 933-1172 Tim Lampton (Home)  
   Cell (231) 499-3686

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Sand is available locally from:

Elmer’s Concrete  (231) 943-3443
(231) 933-4449 Home (Troy Broad)
(231) 218-4967 Mobile
(231) 946-4572 Home (Todd)
(231) 218-4968 Mobile

Information regarding available materials, their location, equipment and operating personnel are currently on file with the Emergency Management Coordinator as part of the City of Traverse City and Grand Traverse County Emergency Operations Plan. Both office and home phone numbers are included in the listings.

2. **Alternate Sources of Power and Equipment**

The spillway gate at Sabin Dam is normally operated electrically but can be operated by hand crank. Use of a backup generator or overhead crane may also be an option. Other alternate equipment sources include vehicles which are owned, operated, and maintained by Grand Traverse County.

3. **Coordination of Weather Information and Flows**

There are no sources on the Boardman River which relay river stage information; however, up-to-date and advanced precipitation and river stage forecasts can be obtained from the National Weather Service (NWS). The Emergency Operations Center can be linked to the Gaylord NWS office by both phone and radio. The Public Works Manager also has access to weather information via Internet web sites.

4. **Flow Control Procedure**

If a large breach has developed, no action should be taken to lower the reservoir water surface more rapidly. However, if a small breach exists, or no breach at all, the reservoir water surface should be lowered to prevent a rapidly developing dam failure from occurring. Inflow to the reservoir cannot be controlled.

5. **Other Available Resources/Contacts**

Wade-Trim Inc.  Brian Sousa  800-968-6660 or 231-878-0144

Gosling Czubak, Inc.
Charles Brumbaugh, PE., Manager  Michael Schaeffer, PE
Work: (231) 933-5110  Work: (231) 933-5124
Cell: (231) 342-0901  Home: (231) 947-9379
Home: (231) 947-1448
VII. Inundation Maps

The Emergency Action Plan Inundation Maps show the areas potentially inundated due to two failure scenarios: a normal flow failure and a failure during the flood condition. The flood condition failure used in this analysis is the Probable Maximum Flood for the Sabin Dam.

The area inundated during the normal flow failure is outlined by a dashed line and colored in yellow. The additional area inundated by the flood condition failure is outlined by a solid line and colored in orange. The downstream boundary of each inundation zone is the point where the failure of the dam would cause an incremental rise of less than 2 feet.

The inundation areas, river levels, and travel times shown on the map reflect the specific failure assumptions discussed in Section VIII, Appendix A of this Emergency Action Plan. These assumptions are selective and meant to represent a worst-case scenario of downstream flooding. An actual failure of the dam could result in somewhat different downstream flooding, depending on the type and timing of the failure and antecedent river flows. Therefore, the map should serve as a guide for warning and evacuation, but does not replace the judgment and local experience of emergency government officials.

The travel times shown on the inundation map are the time for the front of the flood wave to reach that location on the downstream channel and the time for the peak of the flood wave to reach that point from the beginning of the failure of Sabin Dam. The location of the front edge of the flood wave was identified as the point where the river levels begin to rise due to the dam failure. Travel times shown are those predicted using the DAMBRK computer model for the failure assumptions used in the analysis. Actual travel times may vary depending on the type of failure and antecedent flood.
APPENDIX A
INVESTIGATION AND ANALYSES OF DAMBREAK FLOODS
SABIN HYDROELECTRIC PROJECT

1. Scope of Project

Dam failure analyses were earlier performed as a part of the Emergency Action Plan (EAP) to determine the extent of hazardous flooding that could occur as a result of a failure of the Sabin Dam. The dam failure analyses were performed for two antecedent flow conditions: normal flows, and the flood condition. The study includes computer simulated routing of the breach outflow hydrograph downstream of the dam to a point where no additional hazard would be expected to occur as a result of the failure of Sabin Dam. Delineation of the flood affected areas due to the dam failures is also part of this study.

2. Description of the Project

The Sabin Dam is located on the Boardman River in Grand Traverse County, approximately three miles upstream of Traverse City, Michigan.

All elevations are given in feet and are referenced to National Geodetic Vertical Datum (NGVD). The normal headwater elevation at the Sabin Dam is 609.0 the drainage area of the Boardman River at the Sabin Dam is 239 square miles.

Project structures are referred to in this report as left and right looking downstream. The Sabin Dam spans a stretch of the Boardman River valley that is approximately 200 feet wide. The project structure consists of 60 foot long earth embankment, a 64 food wide powerhouse, a 52 foot long earth embankment, a spillway section, and a 330 foot long earth embankment. Part of the right earth embankment is built around the piers of the original spillway structure which was built in 1906.

The Boardman Dam, also owned by Grand Traverse County, is located 0.7 miles upstream of the Sabin Dam. The Union Street Dam, owned by the City of Traverse City, is located 4.0 miles downstream of Sabin Dam. Union Street Dam impounds Boardman Lake in Traverse City.

3. Antecedent Flooding

Normal Flow- For the normal flow failure analysis, an antecedent flow of 325 cfs was assumed. This was determined using the drainage area at the dam and the average discharge for the period of record at the USGS gage located just downstream of the Sabin Dam. The discharge per square mile at the gage was applied to the drainage area at the Sabin Dam to determine an approximate normal discharge. There are no significant tributaries located between the Sabin Dam and Lake Michigan.
Flood Condition. It has been determined from the 1994 Probable Maximum Flood (PMF) and inflow Design Flood (IDF) analysis for the Sabin Dam that the spillway capacity at the Sabin Dam is adequate. As a result, the IDF is less than the spillway capacity. During flood flows between 2,000 cfs and 3,650 cfs (Sabin Dam spillway capacity) the Union Street Dam, located downstream of the Sabin Dam, would be overtopped and assumed to have failed prior to the Sabin Dam failure. Also, no structures would experience a significant rise in water levels due to the Sabin Dam failure if the Union Street Dam had already failed. Therefore, the IDF for the Sabin Dam is determined to be 2,000 cfs, which is the largest flow during which a failure for the Sabin Dam would be expected to cause a failure of the Union Street Dam. This IDF was used as the antecedent flood for the flood condition failure.

4. Type of Failure

The “worst-case” failure of the Sabin Dam was assumed to occur in the right dike section. The entire right dike was assumed to fail down to the natural ground elevation 595.0 feet. Conservatively, the entire dike width of 60 feet was assumed to fail with vertical slopes down to the natural ground level. The time for the breach to develop was assumed to be 0.1 hours. These failure parameters are conservative and consistent with the current FERC guidelines.

Failure of the Union Street Dam, located downstream of the Sabin Dam, was assumed to occur during the 2,000 cfs failure at the Sabin Dam. The Union Street Dam failure is assumed to occur in the earth dike section. The breach was assumed to have an average width of 74.4 feet, equal to four times the height of the dam, with 1V:1H side slopes, and a bottom elevation of 575.4. The breach formation time was assumed to be 0.1 hours. These failure parameters are also conservative and consistent with current FERC guidelines.

5. Flood Routing

Using the National Weather Service DAMBRK computer flood routing model, the breach outflow wave was developed and routed to the point where no additional hazard will occur due to failure of the dam. This point is defined as the point where the river level due to failure of the dam is less than 2 feet greater than the river level if the dam were to remain in place. The downstream boundary for the DAMBRK model was Lake Michigan, which has a constant level of 581.5.

Normal Flow. The flood wave created by the failure of the Sabin Dam during normal flows was routed to a point 1.79 miles downstream. The peak discharge from the Sabin Dam during the normal flow failure is 11,020 cfs. This discharge attenuates to 3,400 cfs approximately 1.9 miles downstream. Beyond this point the rise in river levels is less than 2 feet due to the failure of Sabin Dam. The Sabin Dam failure flood wave is further attenuated to 820 cfs as it passes through Boardman Lake, and the Union Street dam is not in danger of failing, as the rise in headwater level is only .8 feet. DAMBRK input and output summaries are presented in Part 7 of this Section. Table A-1 summarizes the results of the normal flow failure analysis at key cross-sections located downstream of the dam.
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<th>Rise (feet)</th>
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**Flood Condition.** The flood wave created by the failure of the Sabin Dam during the flood condition failure was routed to a point 4.65 miles downstream of the dam. The peak discharge from the Sabin Dam during the flood condition failure is 12,700 cfs. This discharge attenuates to 9,180 cfs approximately 4.65 miles downstream. The rise in river levels is less than 2 feet downstream at that point due to the Sabin Dam failure. Union Street Dam is assumed to have failed as a result of the Sabin Dam failure during the 2,000 cfs inflow. These results in significant rises in the downstream river levels further downstream than occurred for the normal flow failure, during which the Union Street Dam was not assumed to fail. DAMBRK input and output summaries are presented in Part 7. Table A-2 summarizes the results of the flood condition failure analysis at each cross-section located downstream of the dam.
Table A-2
Flood Crest Summary - Flood Condition Failure of Sabin Dam

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1. Inundation Maps

Topographic maps showing the areas inundated during the dam failures modeled in this study are included as Section VII of this Emergency Action Plan. The area inundated by the normal flow failure is outlined by the dashed line and colored in yellow. The additional area inundated during the flood condition failure is outlined by the solid line and colored in orange.

The travel times shown on the inundation map are the time for the front of the flood wave to reach that location on the downstream channel and the time for the peak of the flood wave to reach that point from the beginning of the failure of Sabin Dam. The location of the front edge of the flood wave was identified as the point where the river levels begin to rise due to the dam failure. Travel times shown are those predicted using the DAMBRK computer model for the failure assumptions used in the analysis, actual travel times may vary depending on the type of failure and antecedent flood.
DAMBRK Input and Output Summaries

For

- Sunny Condition, Normal Flow Failure

Flood Condition Failure
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Sabin Dam 1994 EAP
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Head & Hunt, Inc.
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END OF OUTPUT
APPENDIX B

PLANS FOR TRAINING, EXERCISING, UPDATING AND POSTING THE EAP

1. Posting of Notification Flowcharts and Distribution of Emergency Action Plan

A copy of this Plan will be posted at the powerhouse, Central Dispatch (9-1-1), and the Emergency Management Office.

2. Annual Training

A training session will be conducted for responsible operating and security personnel and supervisory staff for the purpose of explaining the procedures to follow in the event of a project emergency, answering questions regarding the procedures, and testing employee understanding of the plan. Documentation of the training session will be prepared by the Emergency Action Plan Coordinator and provided to the Federal Energy Regulatory Commission upon demand.

The above training program will be conducted annually, after review and/or revision of the plan, or within 30 days after assignment of new operating and security personnel or plant supervisors. Notification procedures indicated in this Emergency Action Plan will be reviewed for both normal business hours and for non-business hours and hours of darkness.

3. Annual Review and Update of the Emergency Action Plan

Once each year a comprehensive review of the adequacy and accuracy of the Emergency Action Plan will be made. The review will include updating of personnel and telephone numbers, and a determination of changes in downstream development that would have an impact on required notification procedures. Required revisions and/or updates will be prepared with pages marked “Revised MO/DA/YR” and routed to all plan holders.

4. Exercising

Each year the Emergency Action Plan will be tested by conducting a drill to test the state of training and readiness of responsible operating personnel. The drill will be initiated by Grand Traverse County personnel with the flowchart being followed in its entirety.
Any revisions to the Emergency Action Plan determined to be necessary as a result of the test will be prepared and distributed to all plan holders.

A critique of the test will be prepared by the Emergency Action Plan Coordinator, along with required changes, or a statement that no revisions or updates are needed as a result of the test.
APPENDIX C

SITE-SPECIFIC CONCERNS

Response and Access:

When personnel are dispatched to the site under adverse conditions, the employees should be equipped with portable lighting and a two-way portable radio.

A rapidly developing dam failure could inundate some downstream roads and therefore require preplanned transportation routes. Sabin Dam should be approached as it is normally approached, from the west (Cass Road). The powerhouse and spillway are west of the earth embankment and the earth embankment is about 1.7 feet below the spillway walkway. Hence, overtopping at the embankment will occur prior to overtopping at the spillway.

Dated Notification Charts Follow:

(Subject to vacancy)

BOARDMAN/SABIN DAM
LOGANS PLACE WEST
SOUTH BUILDINGS

NOTES:
A. DO NOT SEND MAILER TO ADDRESSES MARKED AVACANT
   VERIFY OCCUPANCY IF MAILING TO THESE ADDRESSES IS DESIRED
B. ZIP CODE IS 49684 FOR #1-49 UNLESS MARKED DIFFERENTLY

1. YMCA 3000 RACQUET CLUB DR 933-9622
2. Occupant 3180-A RACQUET CLUB DR
3. Occupant 3180-B RACQUET CLUB DR
4. ON-SITE ENGINEERING 3180-C RACQUET CLUB DR 946-7111
   Mail: PO Box 5647
   Traverse City, MI 49685
5. Occupant 3180-D RACQUET CLUB DR
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24. NORTHERN STAFFING 3143 LOGAN VALLEY RD SERVICES
929-7460

25. COMMUNITY HEALTH 3147 LOGAN VALLEY RD CLINIC
935-0668

26. MANPOWER 3135 LOGAN VALLEY RD 947-3840
27. Stafford-Smith 3139 LOGAN VALLEY RD

28. VACANT 3252 LOGAN VALLEY RD

29. G.T. Regional Healthcare Coalition 3155 LOGAN VALLEY RD

30. NORTHERN MICH PSYCHIATRIC SERV 3287-A RACQUET CLUB DR 935-0355

31. LOGAN WEST DENTAL 3287-C RACQUET CLUB DR 935-1948

32. TRAVERSE TAX & 3291-A RACQUET CLUB DR ACCOUNTING, INC 946-2980

33. HANTZ FINANCIAL 3291-B RACQUET CLUB DR 995-3610

34. URA 3291-C RACQUET CLUB DR 929-7759

CENTER BUILDINGS (CENTER)

35. OCCUPANT 3183 LOGAN VALLEY RD

36. SQUARE D COMPANY 3185 LOGAN VALLEY RD 946-3773

37. WALLACE TUTTLE 3189 LOGAN VALLEY RD 941-0750
38. OCCUPANT
   3191 LOGAN VALLEY RD

39. IN HOME HEALTH
   3197 LOGAN VALLEY RD
   4005

40. NORTHERN
    CHIROPRACTIC
   3221 LOGAN VALLEY RD
   0100

41. OCCUPANT
    3229 LOGAN VALLEY RD

42. SUE ARCHER, CPA
    3199 LOGAN VALLEY RD

43. OCCUPANT
    3225 LOGAN VALLEY RD

WEST BUILDINGS (NORTH)

44. NORTHERN STAFFING SERVICES
    3281 RACQUET CLUB DR

45. TC VA CLINIC
    3271 RACQUET CLUB DR
    932-9720

46. HR BLOCK
    3263 RACQUET CLUB DR
    946-5300

47. HR BLOCK
    3257 RACQUET CLUB DR

48. IRS/US BANKRUPTCY COURT
    3241 RACQUET CLUB DR
    616-456-2693
    800-829-1040

49. PAT NOLAND
    (LOGANS PLACE LANDOWNER)
    955 E. 8TH ST
    Traverse City, MI 49686

(EAST OF) LOGANS PLACE WEST
ON SOUTH SIDE OF S. AIRPORT RD

50. ALTEL
    2021 S AIRPORT RD W*
    929-3800

LOGANS LANDING INTERNATIONAL MALL
NOTES:
A. DO NOT SEND MAILER TO ADDRESSES MARKED AVACANT®
   VERIFY OCCUPANCY IF MAILING TO THESE ADDRESSES IS
   DESIRED
B. ZIP CODE IS 49684 FOR #1-28 UNLESS MARKED DIFFERENTLY

1. DAVID CHOWN
   2006-B S AIRPORT RD W
   Mail: 3797 Pleasant Ridge Dr
   Williamsburg, MI 49690
   883-6756

2. GALAXY SYSTEMS
   2016 S AIRPORT RD W
   946-6420

3. TINKERTUNES MUSIC
   2018 S AIRPORT RD W
   935-4429

4. CHILDRENS ORCHARD
   2020 S AIRPORT RD W
   929-1700

5. AUNTIE PASTAS
   2030 S AIRPORT RD W
   941-8147

6. RIVERSIDE RESALE
   FURNISHINGS
   2034 S AIRPORT RD W
   STE 1
   941-4599

7. SCHIEBER'S
   MENS WEAR
   2034 S AIRPORT RD W
   STE 2
   941-4446

8. PANDA NORTH
   2038 S AIRPORT RD W
   929-9722

9. ADVENTURE GOLF
   SERVICES
   2042 S AIRPORT RD W
   STE 15
   922-8166

10. CHIRO HEATH
    CENTER-DR SHAW
    2044 S AIRPORT RD W
    947-0755

11. COMPLETE BODYWORK
    & MASSAGE
    2044 S AIRPORT RD W
    922-5959

12. VINCES FINE
    JEWELERY
    2046-A S AIRPORT RD W

13. THE EBB TIDE
    2048 S AIRPORT RD W
    935-1600

14. SMITH-DEAN
    2050 S AIRPORT RD W
    941-1777

15. HANDS DOWN
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**LOGANS COVE**

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<thead>
<tr>
<th>26. SIMMONS, SCHRODER, &amp; ROSSER, PHD</th>
<th>2226 S AIRPORT RD W STE A</th>
<th>947-2442</th>
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<td>27. ADVANCED MAPPING TECHNOLOGIES</td>
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<td>28. KEVIN PAUL KELLY &amp; ASSOCIATES</td>
<td>2226 S AIRPORT RD W STE C</td>
<td>933-4009</td>
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APPENDIX D

DOCUMENTATION

Included in this Appendix are recent documented consultations with Federal, State, and local agencies, including public safety and law enforcement bodies. Only the most recent documentation should be maintained.
APPENDIX E

APPROVAL OF THE EMERGENCY ACTION PLAN

The Emergency Action Plan has been reviewed and approved; there is agreement to the individual responsibilities for its execution.

Gregg Bird, Emergency Management Coordinator
GRAND TRAVERSE COUNTY

Date 11/16/15
DAM SAFETY INSPECTION REPORT

SABIN DAM
DAM ID NO. 513

BOARDMAN RIVER
GRAND TRAVERSE COUNTY
SECTION 27, T27N, R11W

OWNER:
Grand Traverse County
400 Boardman Avenue
Traverse City, Michigan 49684-2577
231-946-0921

OPERATOR:
Grand Traverse County
Department of Public Works
2650 LaFranier Road
Traverse City, Michigan 49684

HAZARD POTENTIAL CLASSIFICATION:
High

INSPECTION DATE:
August 20, 2015

REPORT DATE:
September 9, 2015

INSPECTED AND PREPARED BY:

James T. Pawloski, P.E.
Dam Safety Program
Water Resources Division
Department of Environmental Quality
2100 M-32 West
Gaylord, Michigan 49735
989-370-1528

[Signature]
INTRODUCTION

The purpose of this inspection report was to evaluate the structural condition and hydraulic capacity of the Sabin Dam as required by Part 315, Dam Safety (Part 315), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). This inspection was conducted in response to a request from the dam’s owner, Grand Traverse County. The report is limited to a discussion of observations based on a visual investigation and review of any available previous inspection reports, plans, and data. This report should not be considered an in-depth engineering investigation.

All references to “right” and “left” in this report are based on the observer facing downstream.

CONCLUSIONS AND RECOMMENDATIONS

The Sabin Dam is in satisfactory condition. Conditions at the Sabin Dam have changed very little since the inspection in 2012; therefore, much of the language in this report may be similar or identical to the previous report.

There were no deficiencies observed during the inspection that would lead to the dam’s immediate failure. The dam has adequate spillway capacity under existing conditions.

The following recommended actions should be completed by the dates indicated:

1. Update the existing Emergency Action Plan (EAP) to reflect changes in ownership and any other essential activities in the EAP. Continue to annually review the EAP with the Emergency Services Coordinator for Grand Traverse County and update it as appropriate. In accordance with Part 315, provide a copy of the findings of the EAP review and any plan updates to the Dam Safety Program and the County Emergency Management Coordinator by December 31, 2015.

2. Remove trees and brush from the embankment by December 31, 2015.

The current high hazard rating is appropriate.

PROJECT INFORMATION

The Sabin Dam consists of a 60-foot long left embankment, a 64-foot wide powerhouse, a 52-foot long center embankment, a 32-foot long stop log spillway section, a tainter gate spillway, and a 330-foot long right embankment. The impoundment is approximately 40 acres in surface area at normal water levels.
The embankments are all constructed of sand fill. All structures are founded on sand, gravel, and clay glacial deposits. The right embankment has a maximum height of approximately 20 feet. Between 1985 and 1988, the embankments were raised approximately one foot in elevation.

The stop log section of the spillway has two feet of stop logs above the spillway crest. There are three low-flow outlets with wood lift gates in the stop log section that are no longer utilized. The tainter gate section contains one 18-foot wide by 5.5-foot high steel tainter gate. The gate is operated with a fixed electric cable hoist. An agitator system (aerators) is in place upstream of the tainter gate to prevent ice buildup during the winter season.

The powerhouse is a reinforced concrete substructure with a brick superstructure and contains one power generating unit. The intake structure is integral to the powerhouse and contains the water flow, which discharges directly to the Boardman River just downstream from the powerhouse.

The 2005 Supporting Technical Information Document, authored by Gannett Fleming, Incorporated, which was prepared as a part of the Potential Failure Modes Analysis required by the Federal Energy Regulatory Commission, was used as the primary reference for this report.

**Boardman River Dams Committee**

From 2005 through 2009, a local coalition of interested parties called the Boardman River Dams Committee (BRDC) studied the Brown Bridge, Boardman, Sabin, and Union Street Dams on the Boardman River to determine what the eventual fate of the dams should be. The Brown Bridge, Boardman, and Sabin Dams had been power-producing dams, but power production was discontinued by Traverse City Light and Power, operator of the dams. When power production ceased, the owner requested, and was granted, the surrender of their license issued by the Federal Energy Regulatory Commission, and they were no longer exempted from regulation by state dam safety regulations.

The BRDC entered a split recommendation: either remove the three power-producing dams, or continue to study them further to reenergize them. They also recommended maintaining and modifying the Union Street Dam. The owners of the dams, the City of Traverse City (Brown Bridge and Union Street) and Grand Traverse County (Boardman and Sabin) each resolved to remove the dams, with the exception of Union Street. The BRDC continues to be involved with this process and is preparing to retain design and construction professionals to implement the removal decisions made by the community.

In 2011, the Sabin Pond was drawn down approximately six feet in preparation for eventual removal of the dam.
SITE INVESTIGATION

The following discussion of the dam’s physical condition and appurtenances is based on observations and photographs obtained on the date of the inspection.

The embankments are in good condition, as shown in the attached photographs. There were no indications of settlement, sinkholes, or other deficiencies in the embankments. There is some light brush and small trees beginning to encroach on the embankment. These should all be removed by December 31, 2015, and as it develops. The embankment should be maintained in a grass-covered condition.

The stop log section of the spillway is in fair condition, as shown in Photographs 7 and 8. There is significant concrete spalling. The spalling should normally be addressed, due to a loss of the concrete section and structural integrity. However, since the decision has been made to remove the dam in the near future and the impoundment has been drawn down, it is not necessary to implement minor repairs on the structure at this time. If a decision were made to re-impound the water, then corrective action would be necessary.

The overflow spillway is in good condition, as shown in Photographs 6 and 9. The tainter gate was fully open on the date of the inspection and is in good condition. The concrete surfaces of the spillway chute are all in good condition.

The powerhouse intake structure is in good condition, as shown in Photographs 3 and 4. The trash racks are functional.

The powerhouse also appears to be in good condition overall, as shown in Photographs 2, 3, and 11. Some minor spalling is evident on the downstream face of the powerhouse. However, since the dam is scheduled for removal and the spalling is limited, no action is necessary at this time.

STRUCTURAL STABILITY

Based on the conditions observed during the field inspection, the dam appears to be stable. No further structural stability analysis is warranted at this time.

HYDRAULICS AND HYDROLOGY

The total drainage area of the Boardman River at the dam is 268 square miles, and the contributing drainage area is 211 square miles. The design discharge for this dam is the one-half percent flood discharge, which is estimated to be 1,900 cubic feet per second (cfs).
The existing spillway capacity is estimated to be approximately 3,600 cfs, with no freeboard. Therefore, the dam has adequate spillway capacity. Spillway calculations are included in a Mead & Hunt report, 1991 Spillway Design Flood Studies.

**OPERATION AND MAINTENANCE**

Grand Traverse County Department of Public Works operates and maintains the dam. A written Operations and Maintenance Plan is on file.

**EMERGENCY ACTION PLAN**

Since this dam has a high hazard potential rating, an EAP is required. An EAP is on file with the Dam Safety Program, but it was prepared by Traverse City Light and Power and reflects their organization and operation. The EAP should be updated by Grand Traverse County personnel and reflect the change in ownership and any other activities contained in the EAP. The EAP should be reviewed and updated annually.

In accordance with Part 315, Grand Traverse County must provide a copy of the findings of the EAP review and any plan updates to the Dam Safety Program and County Emergency Management Coordinator by December 31, 2015.

**APPENDICES**

A location map and inspection photographs are included with this report.
Photograph 1 – Powerhouse access road and left embankment.

Photograph 2 – Powerhouse viewed from the left abutment.
Photograph 3 – Powerhouse intake and spillway entrance.

Photograph 4 – Closer view of the powerhouse intake.
Photograph 5 – Spillway walkway.

Photograph 6 – Spillway stop log section entrance.
Photograph 7 – Downstream face of the spillway stop log section.

Photograph 8 – Downstream face of the spillway stop log section.
Photograph 9 – Spillway viewed from the deck.

Photograph 10 – Powerhouse viewed from downstream.
Photograph 11 – Left downstream training wall.

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Photograph 13 – Right embankment viewed from the right abutment.

Photograph 14 – Downstream face of the right embankment – original spillway foundation.
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DIVISION 01 - GENERAL REQUIREMENTS

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MEASUREMENT AND PAYMENT

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1.2   UNIT PRICE PAYMENT ITEMS

PART 2   MEASUREMENTS AND MATERIALS

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2.2   BID ITEM DIVISION 1 - SABIN DAM BREACHING AND DEMOLITION
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2.4   BID ITEM DIVISION 3 - OPTIONS
2.5   BID ITEM DIVISION 4 - INCIDENTALS

PART 3   EXECUTION (NOT USED)

-- End of Section Table of Contents --
PART 1   GENERAL

1.1 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 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.

1.2 UNIT PRICE PAYMENT ITEMS

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

PART 2   MEASUREMENTS AND MATERIALS

2.1 GENERAL

A. The pay items listed below describe the measurement of and payment for the Work to be done under the respective items listed on the Bid Schedule. The components of Work include specialty items involving:

1. Sabin Dam Breaching and Demolition.
   a. Earthwork and Site Preparation
   b. Spillway Demolition
   c. Construction of Flow Diversion Berm
   d. Construction of Bulk Bag Cofferdam
   e. Powerhouse and Appurtenances Demolition
   f. Restoration Channel through Dam
   g. Incidental Construction and Revegetation

2. River Restoration
   a. Sediment Management
   b. Channel and Floodplain Excavation
   c. Placement and Grading of Spoils
   d. Channel Bed and Bank Construction
   e. Large Wood Placement
   f. Seeding and Planting

3. Boardman - Options
   a. Boardman - Option Items

4. Incidentsals
a. General Project Items

B. Each unit or Job price stated in the Bid shall constitute full compensation, as herein specified, for each item of the Work completed.

2.2 BID ITEM DIVISION 1 - SABIN DAM BREACHING AND DEMOLITION

A. Site Clearing
1. Bid Item Division 1, Item 1 shall be paid for at the Contract Job Price for site clearing of trees and vegetation.
2. Provide all labor, materials, equipment, and incidentals necessary for the clearing of trees and vegetation within the Project Limits of Disturbance. Protect trees as indicated on Drawings. No trees within the clearing area are anticipated to meet the criteria for in stream large wood.
3. Job Price shall include estimated Drawing quantity of 1 AC. Interim payments will be based on percentage completed. Engineers estimate, 1 AC of area (plan quantity) for information only. Contractor to verify quantities.

B. Spillway Demolition and Removal
1. Bid Item Division 1, Item 2 shall be paid for at the Contract Job price for concrete and sheetpile removed from the Sabin Dam spillway.
2. Provide all labor, materials, equipment, and incidentals necessary for removal of the concrete and sheetpile wall designated in the Drawings.
3. Job price shall include estimated quantity of 500 CY of material and 400 SF of deck. Engineers estimate, 500 CY of material and 400 SF of deck (plan quantity) for information only. Contractor to verify quantities.

C. Earth Fill - Downstream Flow Diversion Berm
1. Bid Item Division 1, Item 3 shall be paid for at the Contract Job price for earth fill placed to construct the downstream flow diversion berm.
2. Provide all labor, materials, equipment, and incidentals necessary for placement of earth fill designated in the Drawings for the downstream flow diversion berm.
3. Job price shall include estimated quantity of 1,500 CY. Engineers estimate, 1,500 CY of material (plan quantity) for information only. Contractor to verify quantities.

D. Woven Geotextile - Downstream Flow Diversion Berm
1. Bid Item Division 1, Item 4 shall be paid for at the Contract unit price per square yard of woven geotextile placed in the downstream flow diversion berm.
2. Provide all labor, materials, equipment, and incidentals necessary for placement of woven geotextile designated in the Drawings of the downstream flow diversion berm. Placement of geotextile shall only occur after base materials have been placed and site has been prepared.
3. Payment shall be made based on Government Representative measurements of square yards of installed material.

E. Rip Rap - Downstream Flow Diversion Berm
1. Bid Item Division 1, Item 5 shall be paid for at the Contract unit price per ton of rip rap placed on the downstream flow diversion berm.
2. Provide all labor, materials, equipment, and incidentals necessary for placement of rip rap designated in the Drawings of the downstream flow diversion berm. Placement of rip rap shall only occur after base materials have been placed and site has been prepared.
3. Payment shall be made based on Government Representative measurements of installed material.

F. Powerhouse Superstructure and Appurtenances Demolition
1. Bid Item Division 1, Item 6 shall be paid for at the Contract Job price.
2. Provide all labor, materials, equipment, and incidentals necessary to demolish and dispose of concrete on-site the existing Powerhouse building including, but not limited to the following:
   a. Superstructure.
   b. Generator Floor.
   c. Walls.
   d. Scroll Case.
   e. Draft Tube.
   f. Base Slab.
   g. Downstream Retaining Walls
   h. Wing Walls
   i. Provide all labor, materials, equipment, and incidentals necessary to complete hazardous materials testing on any suspected hazardous materials contained within the powerhouse in accordance to all environmental and disposal regulations.
   j. Provide all labor, materials, equipment, and incidentals necessary to completely and properly dispose of hazardous materials off-site.
   k. Disposal of non-hazardous materials on-site to include up to 5 hibernaculum as detailed in the Drawings. Locations to be determined by COR.
3. Job Price shall include estimated quantity of 1,350 CY of material and 39,000 CFT of superstructure. Engineers estimate of materials (plan quantity) for information only. Contractor to verify quantities.

Also include accommodation of two weeks of time to allow The county, the third party owner or their representative to remove all existing powerhouse equipment.

G. Temporary Bulk Bag Cofferdam
1. Bid Item Division 1, Item 7 shall be paid for at the Contract Job price.
2. Provide all labor, materials, equipment, and incidentals necessary for installation and removal of the temporary bulk bag cofferdam as indicated on the Drawings. Materials include aggregate base layer, non-woven geotextile separator, impermeable liner, riprap armoring, and bulk bags.
3. Job price shall include estimated 100 LF of bulk bag cofferdam. Engineers estimate, 100 LF of structure (plan quantity) for information only. Contractor to verify quantities.

H. Earthwork - River Access and Stormwater Basin
1. Bid Item Division 1, Item 8 shall be paid for at the Contract unit price per cubic yard of soil moved.
2. Provide all labor, materials, equipment, and incidentals necessary to construct the river access road and stormwater basin and trenches on the west embankment as shown on the Drawings.
3. Job price shall include known Drawing quantity 110 CY. Interim payments will be based on percentage completed. Engineers estimate, 110 CY of material (plan quantity) for information only. Contractor to verify quantities.

I. Erosion Control
1. Bid Item Division 1, Item 9 shall be paid for at the Contract Job
price for erosion control measures implemented at the Project site.
2. Provide all labor, materials, equipment, and incidentals necessary to completely and properly install soil erosion control measures such as silt fencing, turf reinforcement mats, rip rap, and check dams in accordance with the Specification and Drawings.
3. Payment shall be made based on percentage completed.

2.3 BID ITEM DIVISION 2 - RIVER RESTORATION

A. Impoundment and Dam Embankment Excavation
1. Bid Item Division 2, Item 1 shall be paid for at the Contract Job price for sediment, soil, or other materials excavated or removed from the new stream channel and floodplain, loaded, hauled and disposed in the designated spoils areas or as otherwise indicated.
2. Provide all labor, materials, equipment, and incidentals necessary for excavation. Excavation will primarily be performed in the wet. Excavated materials shall be placed within the spoils areas shown on the Drawings.
3. Payment shall be made based on the total estimated design quantity of 102,625 CY, which is based on comparison of the existing topography and design topography for river and floodplain shown on the Drawings. No measurement will be made for this item. Engineers estimate of material (plan quantity) for information only. Contractor to verify quantities.

B. Earthwork - Downstream Transition Excavation & Fill (from Sabin Dam to downstream limit)
1. Bid Item Division 2, Item 2 shall be paid for at the Contract Job price for sediment, soil, or other materials for the excavation and fill as required to develop the subgrade for the constructed channel and the new floodplain through and downstream of the Sabin Powerhouse (Station 121+70 to 115+75).
2. Provide all labor, materials, equipment, and incidentals necessary for excavation and fill required to develop the subgrade for the downstream transition of the restored river channel and floodplain. Excavations and fill will primarily be performed in the wet. Any excavated materials not suitable for reuse and not utilized for design shall be placed within the spoils areas shown on the Drawings.
3. Job price shall include estimated 3,750 CY of material, based on estimate of fill between existing and design subgrade surfaces. Engineers estimate, 3,750 CY of material (plan quantity) for information only. Contractor to verify quantities.

C. Earthwork - Downstream Floodplain Fill (Station 121+70 to 115+75)
1. Bid Item Division 2, Item 3 shall be paid for at the Contract unit price per surface square yard of the constructed floodplain fill at location indicated that conforms with the details of the Drawings and Specifications, complete and in place.
2. Provide all labor, materials, equipment, and incidentals necessary for excavation and fill required to develop the downstream floodplain. Any excavated materials shall be placed within the spoils areas shown on the Drawings.
3. Payment shall be made based on measurement of finished floodplain fill surface area by Government Representative.

D. Install and Maintain Sediment Traps
1. Bid Item Division 4, Item 4 shall be paid for at the Contract Job

SECTION 01 29 01 Page 5
price for sediment trap construction and maintenance.

2. Provide all labor, materials, equipment, and incidentals necessary for construction, excavation, and maintenance of sediment traps within the Boardman River as indicated on the Drawings. This item shall include maintaining the sediment traps as required to conduct the river channel restoration or as directed by the COR. Excavated sediment shall be placed in spoils areas.

3. Job price shall include estimated 2 sediment traps required for the project.

E. Seed (floodplain mix) Floodplain Corridor
1. Bid Item Division 2, Item 5 shall be paid for at the Contract unit price per acre.

2. Provide all labor, materials, equipment, and incidentals necessary for seeding and mulching of excavated or constructed floodplain as shown on the Drawings. Seed and mulch shall be installed as described in the Specifications and at the locations shown on the Drawings or as directed by the COR. Seed and mulch mixture shall be the floodplain mixture described in the Specifications or as approved by the COR. Also, included in this item is the maintenance and protection of seeded areas until revegetation has occurred.

3. Payment will be made at 50% at time of application and the remaining 50% after achieving the field quality control criteria in "Planting" section 32 90 00 Part 3.1.

F. Seed (Upland mix) Spoils and all other Areas within the limits of disturbance
1. Bid Item Division 2, Item 6 shall be paid for at the Contract unit price per acre.

2. Provide all labor, materials, equipment, and incidentals necessary for hydroseeding and mulching on exposed upland stockpile and spoils areas, and all other areas within the limits of disturbance as shown on the Drawings. This item shall include the installation of all soil amendments required for this work. Amendments, seed and mulch shall be installed as described in the Specifications and at the locations shown on the Drawings or as directed by the COR. Seed and mulch mixture shall be as described in the Specifications or as approved by the COR. Also, included in this item is the maintenance and protection of seeded areas until revegetation has occurred.

3. Payment will be made at 50% at time of application and the remaining 50% after achieving the field quality control criteria in "Planting" section 32 90 00 3.1.

G. In-Channel Dig and Pitch (Operator and Excavator)
1. Bid Item Division 2, Item 7 shall be paid for at the Contract unit price per day which shall be defined as a full 8-hour shift for an excavator of sufficient size and character to efficiently complete the required work (minimum size CAT 315 or equivalent), an excavator operator, and a laborer/grade setter.

2. Provide all labor, materials, equipment, and incidentals necessary for construction of in-channel pools, bars and riffles as indicated on the Drawings or in the Specifications, and/or indicated in the field by the Government Representative.

3. Payment shall be made based on the number of days completed for this activity as defined above and will be tracked by Government Representative.

H. Channel Bed Construction (Station 121+70 to 115+75)
1. Bid Item Division 2, Item 8 shall be paid for at the Contract unit...
price per surface square yard of the constructed channel bed that
conforms with the details of the Drawings and Specifications, complete
and in place.

2. Provide all labor, materials, equipment, and incidentals necessary for
construction of in stream channel bed and floodplain cutoff in the
station range indicated on the Drawings. Subgrade excavation below the
lines and grades shown on the Drawings for construction of channel bed
is incidental to this Item.

3. Payment shall be made based on measurement of finished constructed
channel bed surface area by Government Representative, including areas
beneath constructed bank treatments.

I. FES Bank Construction
1. Bid Item Division 4, Item 9 shall be paid for at the Contract unit
price per running length (face foot) of each lift installed, complete
and in place.

2. Provide all labor, materials, equipment, and incidentals necessary for
construction of FES stream bank, as shown on the Drawings. Subgrade
excavation below the lines and grades shown on the Drawings for
construction of FES channel banks is incidental to this Item.

3. Payment shall be made based on measurement of constructed channel FES
channel bank by Government Representative.

J. Large Wood Logs (Large wood logs shown on drawings throughout project
extent)
1. Bid Item Division 2, Item 10 shall be paid for at the Contract unit
price per each large wood log supplied and installed, complete and in
place. Placement of slash and mechanical anchorage (fully threaded
rod, washers, nuts, and cable connection) is incidental to large wood
log placement.

2. Provide all labor, materials, equipment, and incidentals necessary for
construction of these materials in the large wood installations as
shown on the Drawings. Subgrade excavation below the lines and grades
shown on the Drawings for construction of Large Wood Logs is
incidental to this Item.

3. Payment shall be made based on the count of installed large wood logs
recorded by Government Representative.

K. Large Wood Piles (Large wood piles shown on drawings throughout project
extent)
1. Bid Item Division 2, Item 11 shall be paid for at the Contract unit
price per each large wood pile supplied and installed, complete and
in place. Placement of slash and mechanical anchorage (fully threaded
rod, washers, nuts, and cable connection) is incidental to large wood
pile placement.

2. Provide all labor, materials, equipment, and incidentals necessary for
construction of these materials in the large wood installations as
shown on the Drawings. Subgrade excavation below the lines and grades
shown on the Drawings for construction of Large Wood Piles is
incidental to this Item.

3. Payment shall be made based on the county of installed large wood piles
recorded by Government Representative.

L. Large Wood Logs with Rootwads (Large wood logs with Rootwads shown on
drawings throughout project extent)
1. Bid Item Division 2, Item 12 shall be paid for at the Contract unit
price per each large wood log with rootwad supplied and installed,
complete and in place. Placement of slash and mechanical anchorage
2. Provide all labor, materials, equipment, and incidentals necessary for construction of these materials in the large wood installations as shown on the Drawings. Subgrade excavation below the lines and grades shown on the Drawings for construction of Large Wood Logs with Rootwads is incidental to this Item.

3. Payment shall be made based on the count of installed large wood logs with rootwads recorded by Government Representative.

M. Vegetation salvage and installation
1. Bid Item Division 2, Item 13 shall be paid for at the Contract unit price per square yard of vegetative mat salvaged and installed. This item covers salvage and installation placement per the details on the plans and specifications at final location to be determined in the field.

2. Provide all labor, materials, equipment, and incidentals necessary for the salvage and installation of Vegetation Salvage per the details of the Drawings and Specifications, and as indicated by the Engineer.

3. Payment shall be made based on measurement of square yards of installed Vegetation Salvage by Government Representative.

N. Trees and Shrubs (potted stock)
1. Bid Item Division 2, Item 14 shall be paid for at the Contract unit price per tree and shrub installed in areas of FES bank construction. This item covers installation per the details on the Drawings and in the specifications at final location to be determined in the field.

2. Provide all labor, materials, equipment, and incidentals necessary for the installation of potted stock trees and shrubs per the details of the Drawings and Specifications, and as indicated by the Engineer.

3. Payment shall be made based on the count of installed potted trees and shrubs by Government Representative.

O. Trees and Shrubs (bare root stock)
1. Bid Item Division 2, Item 15 shall be paid for at the Contract unit price per tree and shrub installed. This item covers installation per the details on the Drawings and in the specifications at final location to be determined in the field.

2. Provide all labor, materials, equipment, and incidentals necessary for the installation of bare root stock trees and shrubs per the details of the Drawings and Specifications, and as indicated by the Engineer.

3. Payment shall be made based on the count of installed bare root trees and shrubs by Government Representative.

P. Trees and Shrubs (live stakes)
1. Bid Item Division 2, Item 16 shall be paid for at the Contract unit price per live stake installed. This item covers installation per the details on the Drawings and in the specifications at final location to be determined in the field.

2. Provide all labor, materials, equipment, and incidentals necessary for the installation of live stakes per the details of the Drawings and Specification, and as indicated by the Engineer.

3. Payment shall be made based on the count of installed live stakes by Government Representative.

2.4  BID ITEM DIVISION 3 - OPTIONS

A. Large Wood Logs (restored channel)
1. Bid Item Division 3, Item 1 shall be paid for at the Contract unit
price per each large wood log supplied and installed, complete and in place. This item covers placement per the details on the plans at final locations to be determined in the field. Placement of slash and mechanical anchorage (fully threaded rod, washers, nuts, and cable connections) is incidental to large wood log placement.

2. Provide all labor, materials, equipment, and incidentals necessary for construction of these materials in the restored channel per the details indicated on the Drawings and in the Specifications, and as indicated by the COR. Subgrade excavation below the lines and grades shown on the Drawings for construction of Large Wood Logs is incidental to this Item.

3. Payment shall be made based on count of installed large wood logs recorded by Government Representative.

B. Large Wood Piles (restored channel)
1. Bid Item Division 3, Item 2 shall be paid for at the Contract unit price per each large wood pile supplied and installed, complete and in place. Placement of slash and mechanical anchorage (fully threaded rod, washers, nuts, and cable connections) is incidental to large wood pile placement.

2. Provide all labor, materials, equipment, and incidentals necessary for construction of these materials in the restored channel per the details indicated on the Drawings and in the Specifications, and as indicated by the COR. Subgrade excavation below the lines and grades shown on the Drawings for construction of Large Wood Piles is incidental to this Item.

3. Payment shall be made based on count of installed large wood piles recorded by Government Representative.

C. Large Wood Logs with Rootwads (restored channel)
1. Bid Item Division 3, Item 3 shall be paid for at the Contract unit price per each large wood log with rootwad supplied and installed, complete and in place. This item covers placement per the details on the plans at final locations to be determined in the field. Placement of slash and mechanical anchorage (fully threaded rod, washers, nuts, and cable connections) is incidental to large wood log with rootwad placement.

2. Provide all labor, materials, equipment, and incidentals necessary for construction of these materials in the restored channel per the details indicated on the Drawings and in the Specifications, and as indicated by the Engineer. Subgrade excavation below the lines and grades shown on the Drawings for construction of Large Wood Logs with Rootwads is incidental to this Item.

3. Payment shall be made based on count of installed large wood rootwads recorded by Government Representative.

D. Topsoil Spoils and adjacent upland areas
1. Bid Item Division 3, Item 4 shall be paid for at the Contract unit price per acre.

2. Provide all labor, materials, equipment, and incidentals necessary for covering spoils and adjacent impacted upland areas with 6-inches of topsoil prior to hydroseeding and mulching.

3. Payment will be made based on Engineer's measurement of area covered.

E. FES Bank Construction (restored channel)
1. Bid Item Division 3, Item 5 shall be paid for at the Contract unit price per running length (face foot) of each lift installed, complete and in place. This item covers placement per the details on the plans at final locations to be determined in the field within the limits of project construction.
2. Provide all labor, materials, equipment, and incidentals necessary for construction of FES stream bank in the restored channel, per the details of the Drawings and Specifications, and as indicated by the Engineer. Subgrade excavation below the lines and grades shown on the Drawings for construction of FES channel banks is incidental to this Item.

3. Payment shall be made based on measurement of constructed channel FES channel bank by Government Representative.

F. Fabric Slope Protection (restored channel)
1. Bid Item Division 3, Item 6 shall be paid for at the Contract unit price per square yard of finished streambank treated, complete and in place. This item covers placement per the details on the plans at final locations to be determined in the field.
2. Provide all labor, materials, equipment, and incidentals necessary for construction of Fabric Slope Protection in the restored channel, per the details of the Drawings and Specifications, and as indicated by the Engineer.
3. Payment shall be made based on measurement of constructed Fabric Slope Protection by Government Representative.

G. Channel Bed Construction (Upstream Transition)
1. Bid Item Division 3, Item 7 shall be paid for at the Contract unit price per cubic yard of the constructed channel bed to transition the channel grades at the upstream extent of the project, as indicated by the COR in the field if required, complete and in place.
2. Provide all labor, materials, equipment, and incidentals necessary for construction of in stream channel bed as indicated by the COR at the upstream extent of the project channel. Subgrade excavation below the finish lines and grades indicated by the COR is incidental to this Item.
3. Payment shall be made based on measurement of cubic yards of finished constructed channel bed by Government Representative.

H. Earthwork - Supplemental East Tributary Grading
1. Bid Item Division 3, Item 8 shall be paid for at the per unit price for supplemental grading to define the alignment and channel for the east tributary which enters the Boardman River at approximate station 142+00. Excess excavated material, loaded, hauled and disposed in the designated spoils areas or as otherwise indicated.
2. Provide all labor, materials, equipment, and incidentals necessary for grading as indicated by the COR. Excavated materials shall be placed within the spoils areas shown on the Drawings.
3. Payment shall be made based on the total measured quantity of earthwork by Government Representative if this option is utilized.

I. Habitat Boulders (Stations 121+70 to 115+75)
1. Bid Item Division 3, Item 9 shall be paid for at the Contract unit price per each 3 ft habitat boulder, measured on the median axis, installed as indicated by the COR, complete and in place. Excavation required to seat each boulder in the constructed streambed is incidental to boulder placement.
2. Provide all labor, materials, equipment, and incidentals necessary for construction of these materials as indicated by the COR. Subgrade excavation to seat the boulders in the stream bed is incidental to this Item.
3. Payment shall be made based on number of habitat boulders required to be installed as indicated by Government Representative.
2.5 BID ITEM DIVISION 4 - INCIDENTALS

A. Mobilization
   1. Bid Item Division 4, Item 1 shall be paid for at the Contract Job price.
   2. Provide all labor, materials, equipment, and incidentals necessary to completely and properly furnish items in accordance with the Specifications and Drawings and as described below, including, but not limited to:
      a. Bonds and insurance.
      b. Mobilization of personnel and equipment.
      c. Construction Office
      d. Temporary Construction Entrances
      e. Site restoration of disturbed areas.
      f. Final site cleanup.
      g. Demobilization.
      h. Project closeout.
      i. Other work not specifically included in other items including:
         - compliance with applicable regulatory requirements;
         - preconstruction and construction period planning, scheduling, reporting, administration, and documentation; and spill control.
   3. Payment shall be made for lump sum costs associated with mobilization and demobilization, as defined in Special Clause PAYMENT FOR MOBILIZATION AND DEMOBILIZATION

B. Haul Roads
   1. Bid Item Division 4, Item 2 shall be paid for at the Contract unit price per linear foot of temporary haul road.
   2. Provide all labor, materials, equipment, and incidentals necessary to completely and properly install, maintain, and restore haul roads as detailed in the Specifications and indicated on the Drawings. Items to be included, but not limited to:
      a. Aggregate base material
      b. Geotextile fabric
      c. Temporary culverts
      d. Top soil
   3. Payment shall be made based on measurements of installed material by Government Representative.

C. Signage
   1. Bid Item Division 4, Item 3 shall be paid for at the Contract Job price.
   2. Provide all labor, materials, equipment, and incidentals necessary to furnish and install trails and river warning signs at the entrances to the project site, at the upstream river confluence with the project site, and other locations as indicated in the specifications. The work shall include sign supports and removal and restoration when the project is complete.
   3. Job price shall include the signs as presented in specification section 32 60 00.
PART 3 EXECUTION (NOT USED)

-- End of Section --
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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.

U.S. ARMY CORPS OF ENGINEERS (USACE)


1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Project Schedule; G, AOF

1.3 SCHEDULE PREPARER

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

PART 2   PRODUCTS

Not Used

PART 3   EXECUTION

3.1 GENERAL REQUIREMENTS

Prepare for approval a Project Schedule, as specified herein, pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS. Show in the schedule the sequence in which the Contractor proposes to perform the work and dates on which the Contractor contemplates starting and completing all schedule activities. The scheduling of the entire project, including the design and construction sequences, is required. The scheduling of the entire project is the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Staff working on the project shall also contribute in developing and maintaining
an accurate Project Schedule. Provide a schedule that is a forward planning as well as a project monitoring tool.

3.1.1 Approved Project Schedule

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

3.1.2 Schedule Status Reports

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

3.1.3 Default Terms

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

3.2 BASIS FOR PAYMENT AND COST LOADING

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

3.3 PROJECT SCHEDULE DETAILED REQUIREMENTS

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

3.3.1 Critical Path Method

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

3.3.2 Level of Detail Required

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

3.3.2.1 Activity Durations

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

3.3.2.2 Procurement Activities

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

3.3.2.3 Mandatory Tasks

The following tasks must be included and properly scheduled:

a. Submission, review and acceptance of design packages.

b. Submission and approval of O & M manuals.

c. Submission and approval of as-built drawings.

d. Performance Verification testing.

e. Contractor's pre-final inspection.

f. Correction of punchlist from Contractor's pre-final inspection.

g. Government's pre-final inspection.

h. Correction of punch list from Government's pre-final inspection.

i. Final inspection.

3.3.2.4 Government Activities

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

3.3.2.5 Activity Responsibility Coding (RESP)

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

3.3.2.6 Activity Work Area Coding

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew, from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities shall not have more than one Work Area Code. Not all activities are required to be Work Area coded. A lack of Work Area coding will indicate the activity is not resource or space constrained.

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

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

3.3.2.8 Contract Line Item (CLIN) Coding (BIDI)

Code all activities to the CLIN on the Contract Line Item Schedule to which the activity belongs. An activity shall not contain more than one CLIN Item Code. CLIN Item code all activities, even when an activity is not cost loaded.
3.3.2.9 Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities. Examples of phase of work are design phase, procurement phase and construction phase. Each activity can have only one Phase of Work code.

a. Code proposed fast track design and construction phases proposed to allow filtering and organizing the schedule by fast track design and construction packages.

b. If the contract specifies phasing with separately defined performance periods, identify a Phase Code to allow filtering and organizing the schedule accordingly.

3.3.2.10 Category of Work Coding (CATW)

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

3.3.2.11 Definable Features of Work Coding (FOW1, FOW2, FOW3)

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

3.3.3 Scheduled Project Completion and Activity Calendars

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

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. Include as the first activity in the project schedule an activity called "Start Project" (or NTP). The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was
3.3.3.2 Schedule Constraints and Open Ended Logic

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

3.3.3.3 Early Project Completion

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

3.3.4 Interim Completion Dates

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

3.3.4.1 Start Phase

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

3.3.4.2 End Phase

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

3.3.4.3 Phase "X" Hammock

Include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" hammock activity shall be logically tied to the earliest and latest activities in the phase.
3.3.5 Default Progress Data Disallowed

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

3.3.6 Out-of-Sequence Progress

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

3.3.7 Negative Lags and Start to Finish Relationships

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

3.3.8 Calculation Mode

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

3.3.9 Milestones

The schedule must include milestone activities for each significant project event including but not limited to: complete drawdown of impoundment; removal of powerhouse and dam intake works; and completion of habitat restoration, seeding and planting within the impoundment. Each project milestone completion date is listed below.
1. Complete drawdown of the impoundment - June, July, August 2017
2. Powerhouse and intake works removed - August, 2017
3. Completion of habitat restoration, seeding and planting within the impoundment - December 1, 2018

3.4 PROJECT SCHEDULE SUBMISSIONS

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

Submit the Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days for approval within 15 calendar days after the NTP is acknowledged. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Government acceptance of the associated design package(s) and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (POW1, POW2, POW3).

3.4.2 Initial Project Schedule Submission

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

3.4.3 Periodic Schedule Updates

Based on the result of the meeting, specified in PERIODIC SCHEDULE UPDATE MEETINGS, submit periodic schedule updates. These submissions will enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.4.4 Standard Activity Coding Dictionary

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

<table>
<thead>
<tr>
<th>Field</th>
<th>Activity Code</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WRKP</td>
<td>3</td>
<td>Workers per Day</td>
</tr>
<tr>
<td>2</td>
<td>RESP</td>
<td>4</td>
<td>Responsible Party (e.g. GC, subcontractor, USACE)</td>
</tr>
<tr>
<td>3</td>
<td>AREA</td>
<td>4</td>
<td>Area of Work</td>
</tr>
<tr>
<td>4</td>
<td>MODF</td>
<td>6</td>
<td>Modification or REA number</td>
</tr>
<tr>
<td>5</td>
<td>BIDI</td>
<td>6</td>
<td>Bid Item (CLIN)</td>
</tr>
<tr>
<td>6</td>
<td>PHAS</td>
<td>2</td>
<td>Phase of Work</td>
</tr>
<tr>
<td>7</td>
<td>CATW</td>
<td>1</td>
<td>Category of Work</td>
</tr>
<tr>
<td>8</td>
<td>FOW1</td>
<td>10</td>
<td>Feature of Work (used up to 10 characters in length)</td>
</tr>
<tr>
<td>9</td>
<td>FOW2</td>
<td>10</td>
<td>Feature of Work (used up to 20 characters in length)</td>
</tr>
<tr>
<td>10</td>
<td>FOW3</td>
<td>10</td>
<td>Feature of Work (used up to 30 characters in length)</td>
</tr>
</tbody>
</table>

### 3.5 SUBMISSION REQUIREMENTS

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

#### 3.5.1 Data CD's

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

#### 3.5.2 Narrative Report

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

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

3.5.4 Schedule Reports

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

3.5.4.1 Activity Report

A list of all activities sorted according to activity number.

3.5.4.2 Logic Report

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

3.5.4.3 Total Float Report

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

3.5.4.4 Earnings Report by CLIN

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

3.5.5 Network Diagram

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

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

3.5.5.2 Project Milestone Dates

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

3.5.5.3 Critical Path

Clearly show the critical path.

3.5.5.4 Banding

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

3.5.5.5 S-Curves

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

3.6 PERIODIC SCHEDULE UPDATE MEETINGS

Conduct periodic schedule update meetings for the purposes of reviewing the Contractor's proposed out of sequence corrections, determining causes for delay, correcting logic, maintaining schedule accuracy and determining earned value. Meetings shall occur at least monthly within five days of the proposed schedule data date and after the Contractor has updated the schedule with Government concurrence respecting actual start dates, actual finish dates, remaining durations and percent complete for each activity it intend to status. Provide a computer with the scheduling software loaded and a projector during the meeting which allows all meeting participants to view the proposed schedule update during the meeting. The meeting and resultant approvable schedule update shall be a condition precedent to a formal submission of the update as described in SUBMISSION REQUIREMENTS and to the submission of an invoice for payment. The meeting will be a working interactive exchange which will allow the Government and the Contractor the opportunity to review the updated schedule on a real time and interactive basis. The Contractor's authorized scheduling representative will organize, sort, filter and schedule the update as requested by the Government. The meeting will last no longer than 8 hours. A rough draft of the proposed activity logic corrections and narrative report shall be provided to the Government 48 hours in advance of the meeting. This monthly schedule update meeting is the responsibility of the USACE. The Contractor's Project Manager and Authorized Scheduler shall attend the meeting with the Authorized Representative of the Contracting Officer.

3.6.1 Update Submission Following Progress Meeting

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

3.6.2 Status of Activities

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

3.6.2.1 Start and Finish Dates

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

3.6.2.2 Remaining Duration

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

3.6.2.3 Percent Complete

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

3.6.2.4 Logic Changes

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

3.6.2.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule that does not represent the actual or planned prosecution and progress of
the work.

3.7 REQUESTS FOR TIME EXTENSIONS

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

3.7.1 Justification of Delay

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

3.7.2 Submission Requirements

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

a. A list of affected activities, with their associated project schedule activity number.

b. A brief explanation of the causes of the change.

c. An analysis of the overall impact of the changes proposed.

d. A sub-network of the affected area.

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

3.7.3 Additional Submission Requirements

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

3.8 DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The Contracting Officer will approve
proposed revisions to the schedule prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. Include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 WEEKLY PROGRESS MEETINGS

a. Meet weekly with the Government (or as otherwise mutually agreed to) between the meetings described in paragraph PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. The then current and approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The Contractor's Project Manager and the Authorized Representative of the Contracting Officer shall attend. The weekly progress meeting will address the status of RFI's, RFP's and Submittals. Weekly progress meeting is the responsibility of the contractor and they are to prepare meeting agenda and meeting minutes.

b. Provide a bar chart produced by the scheduling software, organized by Total Float and Sorted by Early Start Date, and a two week "look-ahead" schedule by filtering all schedule activities to show only current ongoing activities and activities schedule to start during the upcoming two weeks, organized by Work Area Code (AREA) and sorted by Early Start Date.

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

3.10 OWNERSHIP OF FLOAT

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

3.11 TRANSFER OF SCHEDULE DATA INTO RMS/QCS

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

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SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1   GENERAL

1.1   REFERENCE

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2   SUMMARY

A. This Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs and digital videos.
   2. Construction photographs.
   3. Completion photographs.

B. Related Sections include the following:
   1. Division 01 Section "Submittal Procedures" for submitting construction photographs.
   2. Division 01 Section "Closeout Procedures" for submitting photographic negatives/files as Project Record Documents at Project closeout.

1.3   SUBMITTALS

A. Construction Photographs
   Color photographs will be taken with ordinary digital cameras at high resolutions and submitted as JPG files. The JPG files may be submitted on CD's or as email attachments. The Contractor is responsible for selecting formats and media compatible with Government equipment. The government utilizes ordinary office software and hardware with Windows based products.

   1. Furnish a minimum of 10 electronic photographs (via e-mail) per day when active work is on-going to the Contracting Officer's Representative.
      a. Include a description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   2. Provide a digital copy of all photographs on compact discs (CDs).

B. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Contracting Officer's Representative.

PART 2   PRODUCTS

2.1   PHOTOGRAPHIC MEDIA

A. Photographs
   1. Digital: 6.0 Megapixels minimum.
PART 3 EXECUTION

3.1 PRE-WORK PHOTOGRAPHS

A. Before work begins, the Contractor shall photograph salient site features and conditions with particular attention to the existing dam, impoundment, and surrounding land features. Images shall be chosen so that a comparison with final photographs will provide a comprehensive record of the work accomplished under this contract.

3.2 CONSTRUCTION PHOTOGRAPHS

A. During construction, the Contractor shall photograph every activity, every crew and every major piece of construction equipment. The Contractor will take special care to photograph activities resulting from each contract modifications.

B. Contracting Officer's Representative-Directed Construction Photographs: From time to time, Contracting Officer's Representative will instruct photographer about number and frequency of color photographs and general directions on vantage points. Photographer shall select actual vantage points and take photographs to best show the status of construction and progress since the last photographs were taken. Professional photographer not required.

C. Additional Photographs: Contracting Officer's Representative may issue requests for additional photographs, in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum. Professional photographer not required.

1. Photographer will be given three days' notice, where feasible.
2. In emergency situations, photographer shall take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:
   a. Special events planned at Project site.
   b. Immediate follow-up when on-site events result in construction damage or losses.
   c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
   d. Substantial Completion of a major phase or component of the Work.
   e. Extra record photographs at time of final acceptance.

3.3 COMPLETION PHOTOGRAPHS

A. At completion, the Contractor shall photograph salient site features and conditions with particular attention to the new river channel, floodplains, and spoils pile areas and installation details. Images shall be chosen so that a comparison with pre-work photographs will provide a comprehensive record of the work accomplished under this contract.

3.4 PHOTO DATABASE

A. The Contractor shall compile a simple database using common office software. Microsoft Access and Excel are examples of acceptable source software. The database may be submitted on a CD. The Contractor is
responsible for selecting formats and media compatible with Government equipment. The Government utilizes ordinary office software and hardware with Windows based products. The Contractor shall prepare a single database where each and every submitted photograph submitted under this section is represented by a single record. At a minimum, each record in the database shall include the following fields: descriptive title, date taken, contract number.

-- End of Section --
SECTION 01 33 00

SUBMITTAL PROCEDURES

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PART 1   GENERAL

1.1  SUMMARY

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

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

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

Contractor's Quality Control (CQC) System Manager to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as:

Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

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

A submittal register showing items of equipment and materials for when submittals are required by the specifications is provided as "Appendix A - Submittal Register".

1.2  DEFINITIONS

1.2.1  Submittal Descriptions (SD)

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

SD-01 Preconstruction Submittals

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

Certificates of insurance
Surety bonds
List of proposed Subcontractors
List of proposed products
Construction progress schedule
Network Analysis Schedule (NAS)
Submittal register
Schedule of prices or Earned Value Report
Health and safety plan
Work plan
Quality Control(QC) plan
Environmental protection plan

SD-02 Shop Drawings

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

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

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

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.

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

SD-04 Samples

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

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

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.
SD-06 Test Reports

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

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

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

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 the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

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

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

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

SD-10 Operation and Maintenance Data

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

This data is intended to be incorporated in an operations and maintenance manual or control system.
SD-11 Closeout Submittals

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

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

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.

1.2.2 Approving Authority

Office or designated person authorized to approve submittal.

1.2.3 Work

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

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with this section.

SD-01 Preconstruction Submittals

Submittal Register; G, AOF

1.4 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.4.1 Designer of Record Approved (DA)

Designer of Record (DOR) 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 Contracting Officer. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are considered to be "shop drawings." Contractor to provide the Government with the number of copies designated hereinafter of all DOR approved submittals. The Government may review any or all Designer of Record approved submittals for conformance to the Solicitation, Accepted Proposal and the completed design. The Government will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below. Design submittals to be in accordance with Section 01 33 16.00 10 DESIGN DATA (DESIGN AFTER AWARD). Generally, design submittals should be identified as SD-05 Design Data submittals.
1.4.2 Government Approved (G)

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

1.4.3 For Information Only

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

1.4.4 Sustainability Reporting Submittals (S)

Submittals for Guiding Principle Validation (GPV) or Third Party Certification (TPC) are indicated with an "S" designation. Submit the information required by the technical sections that demonstrates compliance with the sustainable requirement, and for inclusion in the Sustainability Notebook as required by Section 01 33 29 SUSTAINABILITY REPORTING. A full submittal for an item may be provided under another SD; however, for the "S" submittal, only provide that portion of the submittal that demonstrates compliance with the sustainable requirement. If the sustainable submittal does require Government Approval, it may be tagged under another SD with a "G."

Schedule submittals for these items throughout the course of construction as provided; do not wait until closeout.

1.5 PREPARATION

1.5.1 Transmittal Form

Transmittal forms are included in the QCS software that the Contractor is required to use for this contract. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise special care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item.

1.5.2 Source Drawings for Shop Drawings

The entire set of Source Drawing files (DWG) will not be provided to the Contractor. Only those requested by the Contractor to prepare shop drawings may be provided. Request the specific Drawing Number only for the preparation of Shop Drawings. These drawings may only be provided after award.

1.5.2.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature.
against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic Source Drawing files are not construction documents. Differences may exist between the Source Drawing files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic Source Drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source Drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic Source Drawing files for use in producing construction data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.5.3 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. Compile the submittal file as a single, complete document, to include the Transmittal Form described within. Name the electronic submittal file specifically according to its contents, coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is legible. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is both searchable and can be copied. If documents are scanned, Optical Character Resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature, or scan of a signature.

Email electronic submittal documents fewer than 10MB to an email address as directed by the Contracting Officer. Provide electronic documents over 10MB on an optical disc, or through an electronic file sharing system such as the AMRDEC SAFE Web Application located at the following website: https://safe.amrdec.army.mil/safe/.

Provide hard copies of submittals when requested by the Contracting Officer. Up to 2 additional hard copies of any submittal may be requested at the discretion of the Contracting Officer, at no additional cost to the Government.

1.6 QUANTITY OF SUBMITTALS

1.6.1 Number of Samples SD-04 Samples

a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be
b. Submit one sample panel or provide one sample installation where directed. Include components listed in technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of non-solid materials.

1.7 INFORMATION ONLY SUBMITTALS

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

1.8 SUBMITTAL REGISTER

Prepare and maintain submittal register, as the work progresses. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by Government; retain data which is output in columns (a), (g), (h), and (i) as approved. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required. Maintain a submittal register for the project in accordance with Section 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE (RMS CM)).

1.8.1 Use of Submittal Register

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

1.8.2 Contractor Use of Submittal Register

Update the following fields with each submittal throughout contract.

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

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

Column (c) List date of submittal transmission.

Column (d) List date approval received.
1.8.3 Approving Authority Use of Submittal Register

Update the following fields in the program utilized by Contractor.

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

Column (l) List date of submittal receipt.

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

Column (q) List date returned to Contractor.

1.8.4 Copies Delivered to the Government

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

1.9 VARIATIONS

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

1.9.1 Considering Variations

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

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

1.9.2 Proposing Variations

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

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

1.9.3 Warranting that Variations are Compatible

When delivering a variation for approval, Contractor, including its Designer(s) of Record, warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.
1.9.4 Review Schedule Extension

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

1.10 SCHEDULING

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

a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.

b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A."

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.

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

1.11 GOVERNMENT APPROVING AUTHORITY

When approving authority is Contracting Officer, the Government will:

a. Note date on which submittal was received.

b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with markings appropriate for action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date submittals. 1 copy of the submittal will be retained by the Contracting Officer and 1 copy of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

1.11.1 Review Notations

Contracting Officer review will be completed within 14 calendar days after
date of submission. Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections.

c. Submittals marked "not approved" or "disapproved," or "revise and resubmit," indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

d. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

1.12 DISAPPROVED OR REJECTED SUBMITTALS

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

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

1.13 APPROVED SUBMITTALS

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

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

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

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

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

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

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

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

1.15 WITHHOLDING OF PAYMENT

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

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --
## Sabin Dam Removal and River Restoration

### SUBMITTAL REGISTER

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**SUBMITTAL REGISTER**

**TITLE AND LOCATION**

Sabin Dam Removal and River Restoration

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SPECIAL PROJECT PROCEDURES

PART 1   GENERAL

1.1 DEFINITIONS

COR - Contracting Officer's Representative

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.

U.S. GOVERNMENT CODE OF FEDERAL REGULATIONS (CFR)

33 CFR 320-330 General Regulatory Policies, Permits, Enforcement and Definitions

40 CFR 233 State Program Regulations

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

1. Erosion control program

2. Hazardous waste manifest
   Submit a copy of the uniform Hazardous Waste Manifest form

3. Utility Locating Plan; G-AOF.
   Submit a copy of the utility location findings prior to commencing work on the site.

SD-11 Closeout Submittals

4. As-Built Technician's Qualifications

   Submit the identity and qualifications of the persons assigned to prepare the as-built information at least 10 calendar days in advance of preparing the drawings.

5. As-built Drawings; G-AOF.

   Within ten (10) calendar days after the substantial completion date as
established by the Contracting Officer, submit the as-built details of the work performed under this contract on a set of prints of the contract drawings marked in red. Following review and approval by the Government, the Contractor shall prepare electronic as-built drawings for submittal within 30 calendar days following receipt of comments from the Government. Electronic files shall be submitted in latest version of AutoCADD file format. The electronic medium for file transfers shall be agreed to prior to the time of submittal and shall be compatible with current industry 1.2 standards and hardware configurations.

1.4 REGULATORY REQUIREMENTS

1.4.1 Additional Work Proposed and Not Authorized

1.4.1.1 Work Subject to 33 CFR 320-330

Any additional work (not specifically shown on the plans or delineated in the specifications) proposed by the Contractor in or affecting navigable waters, including wetlands (as defined in 33 CFR 320-330, published in the Federal Register Vol.51, No. 219, Thursday, November 13, 1986) shall not be performed without a Department of the Army Permit. This requirement shall be applicable to all work, permanent or temporary, and/or fill(s). The Department of the Army Permit shall be approved by the District Engineer or Deputy District Engineer in accordance with the laws of the United States and the regulations promulgated thereunder, including, but not limited to, the River and Harbor Act of 1899, the Clean Water Act and the National Environmental Policy Act of 1969, as amended. Corps employees (Contracting Officer's Representatives (COR) or inspectors) are not delegated authority to authorize such work. Information on making application for such permit(s) may be obtained by contacting one of the offices as listed hereinafter. When applying for information or a permit, a copy of any correspondence should be directed to the Contracting Officer of this contract. If a permit is not obtained, the additional work cannot be accomplished. Any delay in processing the permit will not constitute the basis of a claim under this contract. The fact that the Contractor is performing work under a Department of the Army Contract will give the Contractor no greater rights than any other applicant for a Department of the Army Permit.

MICHIGAN-INDIANA

Regulatory Branch
Engineering and Technical Services Division
U.S. Army Engineer District, Detroit
P. O. Box 1027
Detroit, MI 48231
Telephone: 313-226-6813

1.4.1.2 Work Subject to 40 CFR 233

Any additional work (not specifically shown on the plans or included in the specifications), proposed by the Contractor, in or affecting waters of the United States, including wetlands, in the State of Michigan (as defined in 40 CFR 233, published in the Federal Register, Vol. 49 No. 192, Tuesday October 2, 1984) shall not be performed without a State of Michigan regulatory permit. Information on making an application for such permit may be obtained by contacting the office listed hereinafter. When applying for a permit or for information, a copy of any correspondence shall be furnished to the Contracting Officer. If a permit
is not obtained, the additional work shall not be performed. Any delay in obtaining or processing the permit will not constitute a basis for a claim under this contract.

STATE OF MICHIGAN

Department of Environmental Quality
Land & Water Management Division
P.O. Box 30458
Constitution Hall
Lansing, MI 48909
Telephone: 517-373-1170

1.5 ACCESS & USE OF PREMISES

A. Access
1. At all times, provide the Contracting Officer's Representative access to the work whenever it is in preparation and progress. Provide such access so the Contracting Officer's Representative may perform his functions.

B. Use of Site
1. Confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and do not unreasonably encumber the Site with any materials or equipment.
2. Confine all operations to the areas shown on the Drawings. If it is necessary to use portions of the Site beyond these limits, obtain permission in writing from the Owner. Be responsible for all damages and restore the Site as specified in Section 31 20 40 Site Restoration.

1.6 Existing Vegetation, Structures, Equipment, Utilities & Improvements

General locations of applicable existing utilities, vegetation, structures, equipment and improvements, based upon latest information available to the Government have been shown on the drawings. However, it is the Contractor's obligation to establish the exact horizontal and vertical location and size of all existing utility lines which are located within the required work area. The Contractor shall submit a utility locating plan for locating existing utilities and a copy of its utility location findings prior to commencing work on the site. Any utility lines which are not found by the Contractor, but which are known to exist at the project site, shall be reported to the Contracting Officer immediately. The Contracting Officer will have the option of directing commencement of work at the site or requiring the Contractor to submit further plans for locating the utility lines. Once the utilities have been located and marked, the Contractor shall be deemed to have the location made known to it pursuant to CLAUSE titled "PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS." If the Contractor damages any existing utility line, vegetation, structure, equipment or improvement, a report thereof shall be made immediately to the Contracting Officer. In any event, existing utility lines, vegetation, structures, equipment or improvements shall be protected from damage, and if damaged, shall be repaired by the Contractor at its own expense.

1.7 PARKING

A. Limit parking of vehicles to an area designated by the Contracting Officer's Representative.
1.8 ENVIRONMENTAL REQUIREMENTS

A. The following requirements are in addition to all applicable laws and regulations.
1. No burning will be permitted on the Site.
2. Control dust by water sprinkling, temporary enclosures, or other acceptable methods to the Government. Comply with governing regulations.
3. Coordinate noisy operations, such as pounding and drilling, with the Government to minimize disturbance to existing occupancy.
4. Provide proper ventilation for enclosed spaces during construction.
5. In the generation of temporary power or heat, or in the operation of equipment of any kind, do not use fuels which leave deposits on building surfaces.
6. Provide and maintain accurate thermometers. Keep a record of daily outdoor high and low temperatures during the execution of the Work.
7. Appropriate measures shall be taken to prevent the accumulation of dirt, silt, and other similar materials on County roads and in the storm sewer system. Provide the necessary cleaning techniques such as hosing and sweeping to keep City streets clean at all times.
8. Take such necessary precautions as to minimize soil erosion as a result of construction activities. Erect erosion protection control devices such as silt fences, straw bails, etc., as approved by the Contracting Officer's Representative. Prepare and submit an erosion control program prior to construction.
9. Clearing and grubbing shall commence when the Contractor is sufficiently prepared to start construction and initial erosion control items are installed.
10. Excavated materials shall be stockpiled on the uphill side of trenches.
11. Trenches and other excavations shall be backfilled as soon as possible and temporarily protected from erosion by seeding and/or mulching. No more than 200 lineal feet of trench shall be open at one time, and trenches shall be backfilled at the end of the day.
12. Any undisturbed green area shall be preserved between the construction site and any water courses. Borrow areas shall be protected from erosion during and after construction.
13. The Contractor shall continue to maintain all erosion control facilities in the event of work delay.
14. Unpaved areas shall be wet down as often as required to minimize dust generation.
15. Final grading shall be compatible with natural drainage patterns, and reseeding shall occur as soon as possible. Site restoration shall include reseeding, mulching and watering to achieve and maintain a firm root pattern.
16. All excess or unsuitable excavated material shall be properly disposed of off-site. Dumping of such material on public or private wetlands is prohibited.
17. Equipment operation will be confined to the project site and prohibited from wetlands, unless otherwise noted on Drawings.
18. Equipment, vehicles, and construction materials shall be stored only in areas designated by the Contracting Officer's Representative.
19. Water pumped from excavations shall be settled in siltation basins or directed through straw filters prior to discharging to stabilized sites. Stabilized sites include streams or storm sewers but not exposed soils, stream banks, or other areas where erosion may occur. Sediment laden water pumped from excavations shall not be discharged directly into surface waters, wetlands, or storm sewers.
20. Discharging of pollutants such as chemicals, fuels, lubricants, bituminous materials, and raw sewage to or alongside streams, wetlands, or impoundments is prohibited.
1.9  HAZARDOUS MATERIAL PROCEDURES

A. Hazardous materials and equipment not needed for the Project shall not be brought onto the Site.

B. Store volatile materials and waste in approved sealable containers, outside and away from structures, in Contractor-furnished storage facilities. Provide adequate ventilation during storage and use of volatile and noxious substances.

C. Prevent accumulation of wastes that might create hazardous conditions.

D. Each Contractor shall be responsible for the identification of and proper disposal of his own hazardous waste.

E. Hazardous waste shall be classified by the regulations published by the U.S. Environmental Protection Agency.

F. Identification and Disposal
   1. Each Contractor shall maintain an inventory of all chemicals stored on the jobsite.
   2. All materials classified as hazardous shall be clearly labeled as being hazardous.
   3. Contractor shall obtain a Material Safety Data Sheet for each chemical on the jobsite. Copies of the MSDS shall be submitted to the Contracting Officer's Representative.
   4. All hazardous waste shall be lawfully disposed of by the Contractor through a Licensed Hazardous Waste Hauler. A copy of the uniform Hazardous Waste Manifest form shall be submitted to the Contracting Officer's Representative.
   5. All hazardous waste shall be disposed of at an approved hazardous waste management facility.
   6. The Contractor shall be responsible for all costs involved in the clean-up of improperly disposed of hazardous waste.

1.10 TRANSPORTATION AND SAFETY PRACTICES

A. The Contractor shall minimize traffic disruption and maximize safety during construction. Site access roads will be clearly marked and properly maintained. Signs, barricades, and traffic diversions will be used to minimize the effects of traffic disruptions.

B. Construction shall be limited to 6:00am - 10:00pm, in accordance with Garfield Township Ordinance 47 - Noise Ordinance.

C. All construction vehicles shall be provided with proper silencers, mufflers, and emission control equipment.

D. The Contractor shall provide immediate through access for police, fire, and emergency vehicles at all times.

1.11 CLEANING UP

A. The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work he shall remove all his waste materials and rubbish from and about the Project as well as all his tools, construction equipment, machinery and surplus materials.
B. Provide closed trash containers in sufficient quantity to properly collect trash as it accumulates. Empty such containers and clean Site daily.

C. If the Contractor fails to clean up during construction and at the completion of the Work, the Owner may do so as provided in the General Conditions and Supplemental General Conditions. The cost thereof shall be charged to the Contractor.

**PART 2 PRODUCTS**

2.1 AS-BUILT DRAWINGS

The as-built drawing details shall be accurate and of professional quality prepared those with adequate as-built technician's qualifications.

**PART 3 EXECUTION (NOT APPLICABLE)**

-- End of Section --
PART 1 GENERAL

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-- End of Section Table of Contents --
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 SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

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

ASME INTERNATIONAL (ASME)

ASME B30.22 (2010) Articulating Boom Cranes
ASME B30.3 (2012) Tower Cranes
ASME B30.5 (2011) Mobile and Locomotive Cranes
ASME B30.8 (2010) Floating Cranes and Floating Derricks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2013) Standard for Portable Fire Extinguishers

U.S. ARMY CORPS OF ENGINEERS (USACE)


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

29 CFR 1910 Occupational Safety and Health Standards
29 CFR 1910.146 Permit-required Confined Spaces
29 CFR 1926 Safety and Health Regulations for Construction
29 CFR 1926.16 Rules of Construction
29 CFR 1926.500 Fall Protection
1.2 DEFINITIONS

a. Mishap. Any unplanned, undesired event that occurs during the course of work being performed. The term "mishap" includes accidents, incidents and near-misses.

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

c. Load Handling Equipment (LHE). Load Handling Equipment includes cranes, derricks, hoists, and power-operated equipment that can be used to raise, lower and/or horizontally move a suspended load.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

- Accident Prevention Plan (APP); G, AOF
- Activity Hazard Analysis (AHA); G, AOF
- Crane Critical Lift Plan; G, AOF
- Proof of qualification for Crane Operators; G, AOF
- Site Layout Plan; G, AOF
- Access/Haul Road Plan; G, AOF
- Traffic Control Plan
- Fall Protection and Prevention Plan; G, AOF
- Demolition/Renovation Plan (to include engineering survey)
- Excavation/Trenching Plan; G, AOF

SD-06 Test Reports

- Notifications and Reports
  - Submit reports as their incidence occurs, in accordance with the requirements of the paragraph, "Notifications and Reports."
- Accident Reports; G, AOF
- Crane Reports
SD-07 Certificates

Confined Space Entry Permit

License Certificates

Certificate of Compliance; G, AOF

See paragraph 1.11.4, "Certificate of Compliance"

1.4 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, comply with the most recent edition of USACE EM 385-1-1, and all federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

1.5 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.5.1 Personnel Qualifications

1.5.1.1 Site Safety and Health Officer (SSHO)

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

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

1.5.1.1.1 Contractor Quality Control (QC) Person:

The Contractor Quality Control Person can be the SSHO on this project except during the dam removal phase of the project when a separate person must be identified as the SSHO and shall have no other duties or responsibilities outside those required as the SSHO.

1.5.1.2 Load Handling Equipment and Crane Operators

Meet the Load Handling Equipment (LHE) and crane operators requirements in USACE EM 385-1-1, Section 16. Provide proof of current qualification.
1.5.2 Personnel Duties

1.5.2.1 Contractor Site Safety and Health Officer (SSHO)

The SSHO shall:

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Include safety inspection logs in the Contractors' daily quality control report.

b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.

c. Maintain applicable safety reference material on the job site.

d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.

e. Implement and enforce accepted APPS and AHAs.

f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. Post a list of unresolved safety and health deficiencies on the safety bulletin board.

g. Ensure sub-contractor compliance with safety and health requirements.

h. Maintain a list of hazardous chemicals on site and their material safety data sheets.

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

1.5.3 Meetings

1.5.3.1 Preconstruction Conference

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP.

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated work activities and DFOWs that will require AHAs to be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

c. Deficiencies in the submitted APP will be brought to the attention of
the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

d. The functions of a Preconstruction conference may take place at the Post-Award Kickoff meeting for Design Build Contracts.

1.6 ACCIDENT PREVENTION PLAN (APP)

Use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan". Specific requirements for some of the APP elements are described below. The APP shall be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The Contractor shall identify each major phase of work that will be performed; and within each phase, all activities, tasks or DPOWs shall be identified that will require an AHA. The APP shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer, the Contractor Quality control Manager, and any designated CSP or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified, at no cost to the Government and no change in the contract performance period.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34,) and the environment.

Copies of the accepted plan will be maintained at the resident engineer's office and at the job site. Continuously review and amend the APP, as necessary, throughout the life of the contract. Incorporate unusual or
high-hazard activities not identified in the original APP as they are discovered.

1.6.1 APP Content

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

Competent Person(s) Credentials

1.7 CONTRACTOR RISK MANAGEMENT PROCESS (AHAs)

The Contractor Risk Management Process (AHAs) format shall be in accordance with USACE EM 385-1-1, Section 1.A.14. Submit the AHA for review at least 15 calendar days prior to the start of each phase. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

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

Develop the activity hazard analyses using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor performing that work activity and a Risk Assessment Code (RAC) is assigned to each step, to the risk that remains after controls have been applied (residual risk). The AHA is provided to the prime contractor for submittal to the Contracting Officer.

1.8 DISPLAY OF SAFETY INFORMATION

Within one calendar day(s) after commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, shall be deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, section 01.A.07. Additional items required to be posted include:

a. Confined space entry permit.

b. Hot work permit.

1.9 SITE SAFETY REFERENCE MATERIALS

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

1.10 EMERGENCY MEDICAL TREATMENT

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

1.11.1 Mishap Notification

Notify the Contracting Officer as soon as practical, but no more than four hours after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than $5,000, or any load handling equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted.

1.11.2 Mishap Reports

Conduct an investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, property damage accidents resulting in damages equal to or greater than $5,000, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. Complete the applicable USACE Accident Report Form 3394, and provide the report to the Contracting Officer within 5 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms. Near misses are not required to be reported on an Accident Report Form 3394, however they shall be reported in a manner determined during the Pre Construction Meeting.

1.11.3 LHE and Crane Reports

Submit crane inspection reports required in accordance with USACE EM 385-1-1, and as specified herein as part of the Daily Reports of Inspections.

1.11.4 Certificate of Compliance

Provide a Certificate of Compliance for each crane and LHE equipment prior to arrival on-site (see Form 16-1 "Certificate of Compliance for LHE and Rigging" from EM 385-1-1). Post certifications on the crane and piece of LHE.

1.12 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the Government shall not be closed or obstructed without written permission from the Contracting Officer.

1.13 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must:

a. Secure outside equipment and materials and place materials that could be damaged in protected areas.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.
c. Ensure that temporary erosion controls are adequate.

d. If lightning is observed, all LHE, drill rigs, work on elevated platforms or scaffolding, or other work in open areas shall stop. If lightning is 10-miles away or less, work should stop until 30-minutes after the last audible thunder or visible flash of lightning (see Section 1.E.01.(4) of EM 385-1-1.

e. Where floating plants, boats, or other marine activities may be endangered by severe weather, plans shall be made for removing or securing plants and evacuation of personnel in emergencies (see Section 19.A of EM 385-1-1).

1.14 CONFINED SPACE ENTRY REQUIREMENTS.

Contractors entering and working in confined spaces while performing general industry work are required to follow the requirements of OSHA 29 CFR 1926 and comply with the requirements in Section 34 of EM 385-1-1, OSHA 29 CFR 1910, and OSHA 29 CFR 1910.146.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 CONSTRUCTION AND OTHER WORK

3.1.1 Hazardous Material Exclusions

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

3.1.2 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR Part 1910.1000). If material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."
3.2 PRE-OUTAGE COORDINATION MEETING

Apply for utility outages at least 14 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist and an energized work permit shall be submitted to GDA for acceptance.

3.3 FALL HAZARD PROTECTION AND PREVENTION PROGRAM

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

3.3.1 Fall Protection Training Program

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

3.3.2 Fall Protection Equipment and Systems

Enforce use of the fall protection equipment and systems designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Section 21.0 through 21.0.66. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, Paragraphs 21.N through 21.N.04. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems are required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with 29 CFR 1926.500 Subpart M, USACE EM 385-1-1 and ASSE/SAFE A10.32.

3.3.2.1 Personal Fall Arrest Equipment

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

3.3.3 Horizontal Lifelines

Design, install, certify and use under the supervision of a qualified person horizontal lifelines for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.3.4 Guardrails and Safety Nets

Design, install and use guardrails and safety nets in accordance with EM 385-1-1 and 29 CFR 1926 Subpart M.

3.3.5 Rescue and Evacuation Procedures

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

3.4 EQUIPMENT

3.4.1 Material Handling Equipment

a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.4.2 Load Handling Equipment

a. Equip, inspect and operate cranes, derricks and other LHEs as specified in EM 385-1-1, Section 16.

c. Comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in ASME B30.5). Perform all testing in accordance with the manufacturer's recommended procedures.
d. Comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, and ASME B30.8 for floating cranes and floating derricks.

e. Under no circumstance shall a Contractor make a lift at or above 90 percent of the cranes rated capacity in any configuration.

f. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and follow the requirements of USACE EM 385-1-1 Section 11 and ASME B30.5 or ASME B30.22 as applicable.

g. Do not crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane.

h. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.

i. All employees must keep clear of loads about to be lifted and of suspended loads.

j. Use cribbing when performing lifts on outriggers.

k. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

l. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.

m. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by Contracting Officer personnel.

n. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by Contracting Officer personnel.

o. Certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

3.5 EXCAVATIONS

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

3.5.1 Utility Locations

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

3.5.2 Utility Location Verification

Physically verify underground utility locations, including utility depth,
by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system.

3.5.3 Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces

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

3.6 WORK IN CONFINED SPACES

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

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

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

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

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 41 00

REGULATORY REQUIREMENTS

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PART 2   PRODUCTS  (NOT APPLICABLE)

PART 3   EXECUTION  (NOT APPLICABLE)

-- End of Section Table of Contents --
PART 1   GENERAL

1.1   CODES

A. General
1. Work required by the Contract Documents shall be performed in compliance with the following Codes and in accordance with the current edition of the Americans with Disabilities Act (ADA).

B. Building Codes

C. Mechanical Codes

D. Electrical Codes

E. Structural

F. Plumbing

G. Additional Codes & Regulations
1. OSHA Regulations, as applicable.
3. NFPA 820.

H. Federal, State and Local Environmental Regulatory Requirements. Comply with applicable regulations. Refer to section 01 57 20.00 20 Environmental Protection 1.1 for the regulations. These regulations are for Contractor's information only.

1.2   PERMITS

A. Contractor shall secure and pay for all permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the work which are customarily secured after execution of the Contract and which are legally required at the time the Bids are received.

B. If required by governmental authority, USACE will make application for permits and licenses using forms obtained and prepared by the Contractor and with costs paid by the Contractor.

1.3   TAXES

A. Contractor shall pay all sales, consumer, use and other similar taxes for the work or portions thereof provided by the Contractor which are
legally enacted at the time Bids are received, whether or not yet effective.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

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DIVISION 01 - GENERAL REQUIREMENTS

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-- End of Section Table of Contents --
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 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 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.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL  60018
Ph: 847-699-2929
Internet: http://www.asse.org

ASME INTERNATIONAL (ASME)
Two Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-843-2763
Fax: 973-882-1717
E-mail: customercare@asme.org
Internet: http://www.asme.org

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 877-909-2786
Internet: http://www.astm.org

INTERNATIONAL CODE COUNCIL (ICC)
500 New Jersey Avenue, NW
6th Floor, Washington, DC 20001
Ph: 800-786-4452 or 888-422-7233
E-mail: order@iccsafe.org
Internet: www.iccsafe.org

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
PART 2   PRODUCTS

Not used

PART 3   EXECUTION

Not used

-- End of Section --
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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 45 00.00 10

QUALITY CONTROL

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QUALITY CONTROL

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 D3740 (2012a) Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction


INTERNATIONAL CODE COUNCIL (ICC)


1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all associated costs will be included in the applicable Bid Schedule unit or Job prices.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
   Contractor Quality Control (CQC) Plan; G, AOF

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system in
compliance with the Contract Clause titled "Inspection of Construction." QC consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. Cover all construction operations, both onsite and offsite, and be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent must maintain a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 QUALITY CONTROL PLAN

Submit no later than 10 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The Government will consider an interim plan for the first 5 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional work.

3.2.1 Content of the CQC Plan

Include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, 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 will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager who reports to the project superintendent.

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

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Copies of these letters must be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, suppliers and purchasing agents. These procedures must be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by
f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

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

j. Any special inspection requirements as required in accordance with ICC IBC.

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 Government reserves the right to require the Contractor to make changes in his 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 CQC Plan, notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 10 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and the Contracting Officer and will 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.
3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager must report directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff must maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who is responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC Manager shall have a minimum of 5 years' experience in related work and can show experience on three projects involving structural demolitions of the same scale and complexity as this project. This CQC System Manager must be on the site at all times during construction and be employed by the prime Contractor or major subcontractor. The CQC System Manager is assigned as CQC System Manager but can have duties as Site Safety Health Officer (SSHO) in addition to quality control. The CQC System Manager may not also be the Site Superintendent. Identify in the plan an alternate to serve in the event of the CQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: civil; structural. This individual may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

The person assigned as Site Superintendent shall have a minimum of 5 years' experience in related work and can show experience on three projects involving structural demolition of the same scale and complexity as this project.
3.4.4 Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered at various Area Offices in the Detroit District.

3.4.5 Organizational Changes

Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, must comply with the requirements in Section 01 33 00 SUBMITTAL PROCEDURES. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 23 08 00.00 10 COMMISSIONING OF HVAC SYSTEMS are included in the contract, the submittals required by those sections must be coordinated with Section 01 33 00 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control must be conducted by the CQC System Manager for each definable feature of the construction work as follows:

3.6.1 Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

a. A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.

b. Review of the contract drawings.

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

d. Review of provisions that 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. 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. Review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government must be notified at least 24 hours in advance of beginning the preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

a. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as 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 Government must be notified at least 24 hours in advance of beginning the initial phase. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for future reference and comparison with follow-up phases.

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

3.6.3 Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may
be affected by the deficient work. Do not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases 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, onsite 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 Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. Procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. 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. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel must meet criteria detailed in ASTM D3740 and ASTM E329.
3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Conduct an inspection of the work by the CQC Manager near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications, as required by paragraph DOCUMENTATION. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph must be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative must be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notify the Contracting Officer at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, 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. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

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

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

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

g. Offsite 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.

k. Contractor's verification statement.

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit one report for every 7 days of no work and on the last day of a no work period. All calendar days must be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports must be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the CQC System Manager Report.

3.10 NOTIFICATION OF NONCOMPLIANCE

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

-- End of Section --
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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 45 00.10 10

QUALITY CONTROL SYSTEM (QCS)

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1.1.1   Correspondence and Electronic Communications
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1.2   QCS SOFTWARE
1.3   SYSTEM REQUIREMENTS
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1.6.1   Administration
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1.6.3.2   Deficiency Tracking.
1.6.3.3   QC Requirements
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1.8   DATA SUBMISSION VIA OPTICAL DISK
1.8.1   File Medium
1.8.2   Optical Disk Labels
1.8.3   File Names
1.9   MONTHLY COORDINATION MEETING
1.10  NOTIFICATION OF NONCOMPLIANCE

PART 2   PRODUCTS

PART 3   EXECUTION
"IMPORTANT: This section Quality Control System (QCS) is currently being transitioned to a newer version known as Resident Management System Contractor Mode (RMS CM) Section 01 45 00.15 10. Once the RMS CM version is fully deployed and fully functional the Contractor will no longer use QCS (01 45 00.10 10) and will fully utilize Resident Management System Contractor Mode RMS CM (01 45 00.15 10) for contract management."

1.1 Contract Administration

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor must use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The Contractor module, user manuals, updates, and training information can be downloaded from the RMS web site (http://rms.usace.army.mil). This joint Government-Contractor use of RMS and 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 Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government 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.

1.1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10 PROJECT SCHEDULE, Section 01 33 00 SUBMITTAL PROCEDURES, and Section 01 45 00.00 10 QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith will be included in the contract pricing for the work.
1.2 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor will be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on optical disk. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.3 SYSTEM REQUIREMENTS

The following is the minimum system configuration required to run QCS:

<table>
<thead>
<tr>
<th>Minimum QCSSystem Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
</tr>
<tr>
<td>Windows-based PC</td>
</tr>
<tr>
<td>RAM</td>
</tr>
<tr>
<td>Hard drive disk</td>
</tr>
<tr>
<td>Optical Disk (CD or DVD) Reader</td>
</tr>
<tr>
<td>Monitor</td>
</tr>
<tr>
<td>Mouse or other pointing device</td>
</tr>
<tr>
<td>Windows compatible printer</td>
</tr>
<tr>
<td>Connection to the Internet</td>
</tr>
<tr>
<td><strong>Software</strong></td>
</tr>
<tr>
<td>MS Windows</td>
</tr>
<tr>
<td>Word Processing software</td>
</tr>
<tr>
<td>Internet browser</td>
</tr>
<tr>
<td>Email</td>
</tr>
<tr>
<td>Virus protection software</td>
</tr>
</tbody>
</table>

1.4 RELATED INFORMATION

1.4.1 QCS User Guide

After contract award, download instructions for the installation and use of QCS from the Government RMS Internet Website. In case of justifiable
difficulties, the Government will provide an optical disk (CD/DVD) containing these instructions.

1.4.2 Contractor Quality Control (CQC) Training

The use of QCS will be discussed with the QC System Manager during the mandatory CQC Training class.

1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by using the Government's SFTP repository built into QCS import/export function. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.6 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 Government (e.g., daily reports, submittals, RFI's, schedule updates, payment requests, etc.) using the Government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, email or optical disk may be used instead of QCS (see Paragraph DATA SUBMISSION VIA OPTICAL DISK). The QCS database typically includes current data on the following items:

1.6.1 Administration

1.6.1.1 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 software from the Government, deliver Contractor administrative data in electronic format.

1.6.1.2 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. Assign each subcontractor/trade a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, deliver subcontractor administrative data in electronic format.

1.6.1.3 Correspondence

Identify all Contractor correspondence to the Government with a serial number. Prefix correspondence initiated by the Contractor's site office with "S". Prefix letters initiated by the Contractor's home (main) office with "H". Letters must be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.6.1.4 Equipment

Contain within the Contractor's QCS database a current list of equipment planned for use or being used on the jobsite, including the most recent
and planned equipment inspection dates.

1.6.1.5 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 Control checklists.

1.6.1.6 Request For Information (RFI)

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

1.6.2 Finances

1.6.2.1 Pay Activity Data

Include within the QCS database a list of pay activities that the Contractor must develop in conjunction with the construction schedule. The sum of all pay activities must be equal to the total contract amount, including modifications. Group pay activities Contract Line Item Number (CLIN); the sum of the activities must equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.6.2.2 Payment Requests

Prepare all progress payment requests using QCS. Complete the payment request worksheet, prompt payment certification, and payment invoice in QCS. Update the work completed under the contract, measured as percent or as specific quantities, at least monthly. After the update, generate a payment request report using QCS. Submit the payment request, prompt payment certification, and payment invoice with supporting data using the Government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, email or a optical disk may be used. A signed paper copy of the approved payment request is also required, which will govern in the event of discrepancy with the electronic version.

1.6.3 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 Government a Contractor Quality Control (CQC) Plan within the time required in Section 01 45 00.00 10 QUALITY CONTROL. Within seven calendar days of Government 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.

1.6.3.1 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 45 00.00 10 QUALITY CONTROL. Electronically submit reports to the Government within 24 hours after the date covered by the report. Also provide the Government a signed, printed copy of the daily CQC report.

1.6.3.2 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 Government will log the deficiencies it has identified using its QA punch list items. The Government'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.

1.6.3.3 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 Government via QCS.

1.6.3.4 Three-Phase Control Meetings

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

1.6.3.5 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.

1.6.3.6 Accident/Safety Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government'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 Government 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.

1.6.3.7 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.

1.6.3.8 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.
1.6.4 Submittal Management

The Government 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 Government will be included in its export file to the Contractor. Use QCS to track and transmit all submittals. ENG Form 4025, 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.

1.6.5 Schedule

Develop a construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10 PROJECT SCHEDULE. Input and maintain in the QCS database this schedule either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). Include with each pay request the updated schedule.

1.6.6 Import/Export of Data

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

1.7 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 Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.8 DATA SUBMISSION VIA OPTICAL DISK

The Government-preferred method for Contractor's submission of QCS data is by using the Government's SFTP repository built into QCS export function. Other data should be submitted using email with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of optical disk for data transfer. Export data onto optical disks using the QCS built-in export function. If used, submit optical disks in accordance with the following:

1.8.1 File Medium

Submit in English required data on optical disk conforming to industry standards used in the United States.

1.8.2 Optical Disk Labels

Affix a permanent exterior label to each optical disk 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.

1.8.3 File Names

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

1.9 MONTHLY COORDINATION MEETING

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

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

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer 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 Used

PART 3 EXECUTION

Not Used

-- End of Section --
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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 45 00.15 10

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  1.2.1   Correspondence and Electronic Communications
  1.2.2   Other Factors
1.3   RMS SOFTWARE
  1.3.1   RMS CONTRACTOR'S MODE (CM)
1.4   SYSTEM REQUIREMENTS
1.5   RELATED INFORMATION
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1.6   CONTRACT DATABASE
1.7   DATABASE MAINTENANCE
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  1.7.3   Quality Control (QC)
    1.7.3.1   Daily Contractor Quality Control (CQC) Reports.
    1.7.3.2   Deficiency Tracking.
    1.7.3.3   QC Requirements
    1.7.3.4   Three-Phase Control Meetings
    1.7.3.5   Labor and Equipment Hours
    1.7.3.6   Accident/Safety Reporting
    1.7.3.7   Features of Work
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  1.7.6   Import/Export of Data
1.8   IMPLEMENTATION
1.9   MONTHLY COORDINATION MEETING
1.10  NOTIFICATION OF NONCOMPLIANCE

PART 2   PRODUCTS

PART 3   EXECUTION

-- End of Section Table of Contents --
PART 1   GENERAL

1.1 REFERENCES

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

U.S. ARMY CORPS OF ENGINEERS (USACE)


1.2 Contract Administration

The Government will use the Resident Management System (RMS) to assist in its monitoring and administration of this contract. The Contractor uses the Government-furnished Construction Contractor Mode of RMS, referred to as RMS CS, to record, maintain, and submit various information throughout the contract period. The Contractor mode user manuals, updates, and training information can be downloaded from the RMS web site (http://rms.usace.army.mil). The joint Government-Contractor use of RMS facilitates 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 Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

1.2.1 Correspondence and Electronic Communications

For ease and speed of communications, exchange correspondence and other documents in electronic format to the maximum extent feasible between the Government and Contractor. Correspondence, pay requests and other documents comprising the official contract record are 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.

1.2.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10PROJECT SCHEDULE, Section 01 33 00 SUBMITTAL PROCEDURES, and Section 01 45 00.00 10 QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS. Also, there is no separate payment for establishing and maintaining the RMS database; costs...
associated will be included in the contract pricing for the work.

1.3 RMS SOFTWARE

RMS is a Windows-based program that can be run on a Windows based PC meeting the requirements as specified in Section 1.3. The Government will make available the RMS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor will be responsible to download, install and use the latest version of the RMS software from the Government's RMS Internet Website. Any program updates of RMS will be made available to the Contractor via the Government RMS Website as the updates become available.

1.3.1 RMS CONTRACTOR'S MODE (CM)

RMS Contractor's Mode or RMS CM is the replacement for Quality Control System or QCS. The database remains the same. References to RMS in this specification includes RMS CM.

1.4 SYSTEM REQUIREMENTS

The following is the minimum system configuration required to run RMS and Contractor Mode:

<table>
<thead>
<tr>
<th>Minimum RMS System Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
</tr>
<tr>
<td>Windows-based PC</td>
</tr>
<tr>
<td>RAM</td>
</tr>
<tr>
<td>Hard drive disk</td>
</tr>
<tr>
<td>Monitor</td>
</tr>
<tr>
<td>Mouse or other pointing device</td>
</tr>
<tr>
<td>Windows compatible printer</td>
</tr>
<tr>
<td>Connection to the Internet</td>
</tr>
<tr>
<td><strong>Software</strong></td>
</tr>
<tr>
<td>MS Windows</td>
</tr>
<tr>
<td>Word Processing software</td>
</tr>
</tbody>
</table>
### Minimum RMS System Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Requirement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft.NET Framework</td>
<td>Coordinate with Government QA Representative for free version required</td>
</tr>
<tr>
<td>Email</td>
<td>MAPI compatible</td>
</tr>
<tr>
<td>Virus protection software</td>
<td>Regularly upgraded with all issued manufacturer's updates and is able to detect most zero day viruses.</td>
</tr>
</tbody>
</table>

### 1.5 RELATED INFORMATION

#### 1.5.1 RMS User Guide

After contract award, download instructions for the installation and use of RMS from the Government RMS Internet Website.

### 1.6 CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for RMS. The Government will provide data updates to the Contractor as needed. These updates will generally consist of submittal reviews, correspondence status, Quality Assurance (QA) comments, and other administrative and QA data.

### 1.7 DATABASE MAINTENANCE

Establish, maintain, and update data in the RMS database throughout the duration of the contract at the Contractor's site office. Submit data updates to the Government (e.g., daily reports, submittals, RFI's, schedule updates, payment requests) using RMS. The RMS database typically includes current data on the following items:

#### 1.7.1 Administration

##### 1.7.1.1 Contractor Information

Contain within the database the Contractor's name, address, telephone numbers, management staff, and other required items. Within 7 calendar days of receipt of RMS software from the Government, deliver Contractor administrative data in electronic format in RMS.

##### 1.7.1.2 Subcontractor Information

Contain within the database the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor is listed separately for each trade to be performed. Assign each subcontractor trade a unique Responsibility Code, provided in RMS. Within 7 calendar days of receipt of RMS software from the Government, deliver subcontractor administrative data in electronic format.
1.7.1.3 Correspondence

Identify all Contractor correspondence to the Government with a serial number. Prefix correspondence initiated by the Contractor's site office with "S". Prefix letters initiated by the Contractor's home (main) office with "H". Letters are numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.7.1.4 Equipment

Contain within the Contractor's RMS database a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.7.1.5 Management Reporting

RMS 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 RMS. Among these reports are: Progress Payment Request worksheet, Quality Assurance/Quality Control (QA/QC) comments, Submittal Register Status, Three-Phase Control checklists.

1.7.1.6 Request For Information (RFI)

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

1.7.2 Finances

1.7.2.1 Pay Activity Data

Include within the RMS database a list of pay activities that the Contractor develops in conjunction with the construction schedule. The sum of pay activities equals the total contract amount, including modifications. Each pay activity must be assigned to a Contract Line Item Number (CLIN). The sum of the activities equals the amount of each CLIN. The sum of all CLINs equals the contract amount.

1.7.2.2 Payment Requests

Prepare all progress payment requests using RMS. Complete the payment request worksheet, prompt payment certification, and payment invoice in RMS. Update the work completed under the contract, measured as percent or as specific quantities, at least monthly. After the update, generate a payment request report using RMS. Submit the payment request, prompt payment certification, and payment invoice with supporting data using RMS CM. If permitted by the Contracting Officer, email or an optical disc may be used. A signed paper copy of the approved payment request is also required and will govern in the event of discrepancy with the electronic version.

1.7.3 Quality Control (QC)

RMS 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
1.7.3.1 Daily Contractor Quality Control (CQC) Reports.

RMS includes the means to produce the Daily CQC Report. The Contractor can use other formats to record basic Quality Control (QC) data. However, the Daily CQC Report generated by RMS must be the Contractor's official report. Summarize data from any supplemental reports by the Contractor and consolidate onto the RMS-generated Daily CQC Report. Submit daily CQC Reports as required by Section 01 45 00.00 10 QUALITY CONTROL. Electronically submit reports to the Government within 24 hours after the date covered by the report. Also provide the Government a signed, printed copy of the daily CQC report.

1.7.3.2 Deficiency Tracking.

Use RMS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using its Quality Control (QC) punch list items. Maintain a current log of its QC punch list items in the RMS database. The Government will log the deficiencies it has identified using its Quality Assurance (QA) punch list items. The Government'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.

1.7.3.3 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 RMS. Update data on these QC requirements as work progresses, and promptly provide the information to the Government via RMS.

1.7.3.4 Three-Phase Control Meetings

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

1.7.3.5 Labor and Equipment Hours

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

1.7.3.6 Accident/Safety Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be provided via RMS CM. Regularly update the correction status of the safety comments. In addition, utilize RMS to advise the Government of any accidents occurring on the jobsite. A brief supplemental entry of an accident is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 300.
1.7.3.7 Features of Work

Include a complete list of the features of work in the RMS database. A feature of work is 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.

1.7.3.8 Hazard Analysis

Use RMS CM to develop a hazard analysis for each feature of work included in the CQC Plan. The Activity Hazard Analysis will include information required by EM 385-1-1, paragraph 01.A.13.

1.7.4 Submittal Management

The Government will provide the initial submittal register in electronic format. Thereafter, maintain a complete list of submittals, including completion of data columns. Dates when submittals are received and returned by the Government will be included. Use RMS CM to track and transmit submittals. ENG Form 4025, submittal transmittal form, and the submittal register update is produced using RMS. RMS will be used to update, store and exchange submittal registers and transmittals. In addition to requirements stated in specification 01 33 00, actual submittals are to be stored in RMS CM, with hard copies also provided. Exception will be where the Contracting Officer specifies only hard copies required, where size of document cannot be saved in RMS CM, and where samples, spare parts, color boards, and full size drawings are to be provided.

1.7.5 Schedule

Develop a construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10 PROJECT SCHEDULE. Input and maintain in the RMS database the schedule either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). Include with each pay request the updated schedule. Provide electronic copies of transmittals.

1.7.6 Import/Export of Data

RMS includes the ability to import schedule data using SDEF.

1.8 IMPLEMENTATION

Use of RMS CM as described in the preceding paragraphs is mandatory. Ensure that sufficient resources are available to maintain contract data within the RMS CM system. RMS CM is an integral part of the Contractor's management of quality control.

1.9 MONTHLY COORDINATION MEETING

Update the RMS CM database each workday. At least monthly, generate and submit a schedule update. At least one week prior to submittal, meet with the Government representative to review the planned progress payment data submission for errors and omissions.

Make required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will not be accepted. The
Government will not process progress payments until all required corrections are processed.

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer 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 Used

PART 3 EXECUTION

Not Used

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SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1   GENERAL

1.1   DEFINITION

   COR - Contracting Officer's Representative

1.2   REFERENCE

   A. The requirements of Division 1 apply to the work of all other sections.

1.3   GENERAL

   A. Provide and maintain as a minimum the temporary facilities described herein. Locate all facilities where approved by Contracting Officer's Representative and remove same at completion of the work or when otherwise directed.

   B. Comply with all laws, regulations and safe practices.

   C. Provide temporary utilities throughout construction period as required to facilitate progress of work, to protect work, to provide safe and adequate working conditions throughout Project, to provide for public safety, and to meet all construction needs.

   D. Temporary utilities include, but are not limited to, temporary heating, ventilating, electricity, lighting, telephone, water, toilets, fire protection, and enclosures.

   E. Remove all temporary utilities, repair all damage caused in installation and restore to specified condition.


1.4   TEMPORARY UTILITIES

   A. Monitor Temporary Utilities

      1. Any party designated to provide a temporary utility shall be responsible for all damage to his work or to that of other Contractors caused by a defect in such utility.

      a. Enforce compliance with applicable codes and standards.

      b. Enforce safe practices.

      c. Prevent abuse of services and utilities.

      d. Prevent damage to finishes.

      2. Do not allow wasteful use of consumables.

   B. Use of Permanent Systems for Construction Purposes

      1. Obtain prior written authorization for use of systems from Contracting
Officer's Representative.
Indicate:
a. Conditions and reasons for use.

2. Modify and extend system as necessary to meet temporary utility requirements.
3. Upon completion of work, or when required by Contracting Officer's Representative, restore permanent system to specified condition prior to Substantial Completion.
   a. Provide all new filters in heating and ventilating systems.
   b. Replace all [burned out and defective] lamps.
   c. Repair or restore all damaged parts or components.

C. Use of Existing Systems for Construction Purposes
1. Make all arrangements with the Contracting Officer's Representative.
2. The Contracting Officer's Representative will authorize use of existing systems for:
   a. Temporary electricity.
   b. Temporary lighting.
3. Limitations:
   a. Regulate all parts of existing systems used for construction purposes.
   b. Do not overload systems. If project requirements exceed system capacity, provide separate system to meet needs.
   c. Prevent interference with:
      1) Owner's normal use of system.
      2) Safety.
      3) Orderly progress of work.
4. Modify, supplement and extend system as necessary to meet temporary utility requirements for project, subject to approval of Contracting Officer's Representative.
5. Maintain strict supervision of use of temporary facilities.
   a. Enforce conformance with Owner's regulations and applicable codes and standards.
   b. Use only designated facilities, systems or portions thereof.
      1) Temporary Lighting
         a) Provide and maintain additional lighting, extend from existing system, to comply with temporary lighting requirements.
         b) General Contractor to maintain lamps and ballasts in existing fixtures.
         c) Contractor shall replace lamps and fixtures damaged by Contractor.
6. Upon completion of work, or when required by the Contracting Officer's Representative, restore existing systems to original condition.

D. Materials
1. General
   a. May be new or used, but must be adequate for purposes intended. Must not create unsafe or unsanitary conditions, nor violate requirements of applicable codes. Comply with applicable Federal and State regulations.
   b. Must be removed when Project is completed.
2. Temporary Electricity
   a. Provide and maintain all required facilities, including transformers, poles, conductors, raceways, breakers, fuses and switches.
3. Temporary Lighting
   a. Receptacles, fixtures:
1) Standard products, meeting UL requirements.
2) Provide heavy duty guards on fixtures.
3) Provide appropriate types of fixtures and receptacles for environment in which used, in accordance with NEC, NEMA, and OSHA standards.

E. Installation
1. General
   a. Comply with Federal and State regulations.
   b. Install work in neat and orderly manner.
   c. Make structurally, mechanically and electrically sound throughout.
   d. Maintain to give safe, continuous service, and to provide safe working conditions.
   e. Modify and extend systems as work progress requires.
2. Temporary Heating: Heating: Locate units to provide equitable distribution of heat. Meet project progress requirements. Avoid interference with:
   a. Work or movement of personnel.
   b. Traffic areas.
   c. Materials handling.
   d. Storage areas.
   e. Work of other contracts.
   f. Finishes.
   g. Stairwells, access ramps and ladders.
3. Temporary Electricity: Do not run branch circuits on floor or on ground. Wiring for temporary heating and ventilating equipment:
   a. Wire all safety devices specified for operation of equipment.
   b. Check operation of all safety devices.
4. Temporary Lighting
   a. Control lighting at secondary power centers unless otherwise specified.
   b. Install exterior security lighting
      1) Illuminate project site as specified.
      2) Control lighting by photo electric cell and separate disconnect from primary power source.
5. Temporary Telephone: Service and distribution wiring may be overhead or underground.
6. Temporary Water
   a. Do not run piping on floor or on ground.
   b. Provide drip pan under each water service connection located within building(s), connect drain to sewer.
   c. Provide insulation, or other means, to prevent pipes from freezing.
   d. When necessary to maintain pressure, provide temporary pumps, tanks, and compressors.
7. Temporary Toilets
   a. Erect securely, anchor to prevent dislocation.
   b. Service as often as necessary to prevent accumulation of wastes and creation of unsanitary conditions.

F. Temporary Electricity
1. Comply with NEC and OSHA.
2. Provide and maintain specified minimum temporary primary electric power system for construction needs throughout construction period.
3. Provide secondary power centers for miscellaneous tools and equipment used in construction work.
   a. Provide minimum of one on each floor.
   b. Locate so that power is available at any desired point with no more than 100 ft extension.
   c. Provide weatherproof distribution box with grounded outlets, a
minimum of:
1) 4 (quantity).
d. Provide circuit protection for each circuit.
e. Provide ground fault protection for each circuit in accordance with applicable Federal and State requirements.
f. Each contractor and subcontractor using the secondary power centers shall provide their own grounded, UL listed extension cords and other accessories from secondary power centers to point of operation.
4. Provide additional service connections required for:
a. Field office(s).
b. Temporary lighting.
c. Temporary heating.
d. Temporary ventilating.
e. Pumping.
f. Testing and checking all permanent mechanical, electrical, elevator and hoisting equipment.
5. All Contractors or subcontractors who require primary power, secondary power centers or service connections in excess of the specified minimum shall make arrangements with the General Contractor and pay all costs thereof.
6. Power Source
a. Prior to availability of service, provide specified power by means of portable power plants.

G. Temporary Lighting
1. Provide temporary lighting required for construction needs, safe and adequate working conditions throughout Project, public safety, security lighting, and field office(s).
2. Additional lighting required for safety purposes or as shown on Drawings.
3. Provide work lighting from dusk to dawn for all night time construction activities.
4. All lamps shall be covered with safety guard or deeply recessed in reflector. Do not suspend by their electric cords unless cord and fixture are designed for that purpose.

H. Temporary Water
1. Maintain adequate volume of water for all purposes.
2. Each Contractor and subcontractor provides drinking water for his own forces.

I. Temporary Sanitary Facilities
1. Provide temporary toilet facilities for use of all workers and authorized parties throughout construction period.
2. Provide the following minimum number of approved enclosed combination toilet and urinal units for construction personnel:
a. For less than 20 workers: 1.
b. For 20 or more workers: 2 per 40 workers.
c. Provide private facility adjacent to Contracting Officer's Representative.
3. Location
a. Within the project site.
b. Secluded from public observation.
c. Obtain acceptance of locations by the Contracting Officer's Representative.
4. Enclosures for Toilet Facilities
a. Weatherproof, sightproof, sturdy temporary enclosures.
b. Ventilated to meet applicable Federal and State requirements.
c. For enclosures accommodating two or more persons, provide privacy screens for each toilet fixture.

J. Temporary Fire Protection
1. Schedule means of fire protection of all construction, materials and personnel prior to starting work in accordance with governing authority.
2. Secure approval of the local fire department and other governing authority, as required.
3. Provide and perform protection and prevention during the construction period in accordance with Owner's underwriters recommendations for protection of buildings under construction and all other laws and regulations.

K. Removal: Each installing Contractor shall remove his temporary utility, repair all damage caused in installation and restore to original conditions.

L. Cost of Installation, Operation and Maintenance
1. General Contractor to provide and maintain specified temporary utilities until Date of Substantial Completion unless otherwise indicated. Pay all costs of installation, operation and maintenance of temporary utilities.

M. Cost of Consumables
1. General Contractor to pay all costs of consumables for temporary utilities unless otherwise indicated.

1.5 CONSTRUCTION AIDS

A. General: Provide all items, such as cranes, hoists, temporary elevators, and other lifting devices; all scaffolding, staging, platforms, runways and ladders; and all temporary flooring, partitioning and stairs as required by the various trades for the proper execution of all work. Excavate, level, or otherwise treat existing grade as required for placement of construction plant items. Provide such equipment with proper guys, bracing, guards, railings, and other safety devices as required by governing authority and safety standards.

B. Temporary Enclosures: In areas requiring temporary heating, provide sufficient preliminary enclosure to prevent entrance or infiltration of rainwater, wind and other elements and to prevent undue heat loss from within enclosed areas.

C. First Aid: Provide all articles necessary for first aid treatment. Make arrangements with the nearest hospital for treatment of seriously injured workers.

1.6 BARRIER AND ENCLOSURES

A. Guardrails and Barricades
1. General Contractor shall provide guardrails, barricades, fences, footways and other devices necessary to protect personnel and employees at the site, and the public, against hazards on or adjacent to the construction site. Remove fences when directed.
2. Temporary barricades and other work required for the protection of the public, the construction personnel, existing buildings, shall be constructed and maintained by the General Contractor during the period of construction.
3. Erect barricades as required by applicable laws at excavation slab edges, slab openings, and other building hazards.
   a. Barricades shall be erected prior to placing of concrete slabs.
   b. Remove and legally dispose of barricades when directed.
4. All construction of this nature shall conform to the requirements of the local building code.
   a. Provide signs, warning lights, signals, flags and illumination as necessary to alert persons to hazards and to provide safe, adequate visibility in the areas of hazards.
5. "No Trespassing" signs shall be provided to meet OSHA requirements.
6. Fences
   a. Provide a construction fence along a line shown on the Site plan.
   b. Materials and design of fence shall be reviewed by Contracting Officer's Representative before the fence is constructed.
7. Construct fence 6 feet high, with steel line posts 10 feet O.C. Provide corner posts, framing, bracing, and accessories as required.
8. Provide gates as shown, hinged or sliding and equipped with locks.

B. Tree and Plant Protection: Protect existing trees and plants that are to remain.

1.7 SECURITY

A. Protection of Work and Property
1. General Contractor shall maintain at least the present level of security during his occupation of the Site. This may necessitate temporary fencing, temporary gates, watchmen, and other appropriate precautions.
2. Each Contractor shall be responsible for security of his own workers, tools, materials and equipment, and the security of any visitors to the Site.
3. Each Contractor shall be responsible for the completed work until accepted by the Contracting Officer's Representative.

B. General
1. Erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards for safety and protection, including, but not limited to, posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent utilities.
2. Provide protection at all times against damage from vandalism, theft, weather, and other causes of all completed work, materials, and apparatus.
3. Protect existing trees, planting, structures, road and walks during progress of the work.
4. Do not load or permit any part of the work to be loaded so as to endanger its safety.

C. Water
1. Protect foundation excavations, trenches, and completed work from rain, spring or ground water, backing up of drains, or other flooding.
2. Construct and maintain temporary drainage and dispose of pumped water to prevent flooding in the construction and storage areas.
3. Provide and operate sufficient pumping equipment to maintain excavations and other construction areas free of water.

D. Snow and Ice: Remove all snow and ice for proper protection and prosecution of the work.

E. Security
1. Maintain Site security at all times.
2. Provide temporary weathertight enclosures for all exterior openings. Equip exterior doors with locks. At the end of each day's work, close

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and lock all temporary enclosures.
3. If required to maintain security and to protect the Contractor's interest, employ 1 or more watchmen at no extra cost to the USACE.

F. Shoring, Sheetin9 and Bracing: Provide adequate shoring, sheetin9, and bracing required to retain excavations and prevent slides or cave-ins.

G. Safety Devices: Provide all fences, barricades, bridges, railings, and guards for protection of construction personnel and the public.

H. Fences
1. Provide a construction fence along a line shown on the Site plan.
2. Materials and design of fence shall be reviewed by the Contracting Officer's Representative before the fence is constructed.
3. Construct fence 6 feet high, with steel line posts 10 feet O.C. Provide corner posts, framing, bracing, and accessories as required.
4. Provide gates as shown, hinged or sliding and equipped with locks.

I. Guard Lights: Provide guard lights at all barricades, railings, and obstructions in the streets or sidewalks and at all trenches or pits adjacent to public walks or roads.

J. Existing Underground Utilities
1. Contractor shall comply with all laws and regulations concerning the identification and locations of all underground utilities.
2. Utilities data on Drawings have not been verified. USACE shall not be responsible or liable for the data supplied. Data shall not be relied upon by Contractor in complying with Contract Documents or safety requirements.
3. Contractor shall contact MISS DIG and the utilities to confirm this information. Contractor shall notify MISS Dig and each utility 3 working days in advance of commencing work and shall cause the utility owner to stake, mark, or otherwise designate the location, depth, and course of its facilities.
4. Within 10 days of award of this Contract, Contractor shall notify all utilities of the name, address, and phone number of Contractor.
5. Contractor shall report to the utility any break, leak, dent, gouge, groove, or any other damage to facilities whether or not caused by the Contractor.
6. Contractor shall notify Contracting Officer's Representative and nearby occupants of emergency situations that may arise.

1.8 ACCESS ROADS AND PARKING AREAS

A. Access Roads
1. Construct and maintain, in good usable condition, required temporary roads and other access to the Site.
   a. Provide galvanized or concrete culvert pipe as required by governing authorities.
2. Such temporary roads may be used for the base of permanent roads and parking areas if they conform to the paving Specifications herein. The subbase shall be properly repaired, depressions filled, and properly graded and otherwise prepared to receive surfacing.
3. Whenever Contractor's operations obstruct or endanger a used traffic lane, and no marked detour has been provided, he shall furnish a flagman to direct traffic through or around the congested area. The Contracting Officer's Representative shall have the right to require additional flagmen as he may deem necessary. Permits required shall be the Contractor's obligation and responsibility.
4. The Contractor shall neither shut off nor unnecessarily interfere with Project operations or vehicular access on the property without the consent of the Contracting Officer's Representative.
5. The Contractor shall be responsible for removal of any debris, dirt, etc., which is lost outside the construction site on County roads or on private property.

B. Parking Areas
1. Limit parking of vehicles to area designated by the Contracting Officer's Representative. Provide one on site parking space for Contracting Officer's Representative.
2. There will be limited on site parking available for construction personnel. Do not obstruct Owner's operations and deliveries, nor park in unauthorized locations.

C. Construction Traffic: Shall obey all posted traffic regulations at all times and shall proceed so as not to interfere with normal operations of adjacent facilities. Wherever crossing or traffic guards are required, such personnel shall be furnished by the Prime Contractor.

D. Temporary Signs: Temporary traffic signs will be erected by the General Contractor.

1.9 TEMPORARY CONTROLS

A. Construction Cleaning
1. At all times, keep the premises free from accumulation of waste materials and rubbish caused by operations. Provide closed trash containers in sufficient quantity to properly collect trash as it accumulates. Empty such containers and clean Site and Building daily. At completion of work, remove all waste materials and rubbish from and about the Project as well as all tools, construction equipment, machinery, and surplus materials.
2. Each Contractor shall do its own cleanup, move materials that are in the way of construction, and repair or replace any work damaged in the process.
3. General Contractor shall be responsible for the cleanup of unidentifiable debris, dirt and dust in the contract work area. Periodic cleanup must be maintained daily or more often as directed by the Contracting Officer's Representative.
4. Refuse from eating shall be immediately disposed in waste containers.
5. General Contractor shall be responsible for keeping streets free of mud and other debris resulting from this project construction operations and vehicular traffic leaving site. Clean streets in vicinity of job site daily, or more often, to satisfaction of the Contracting Officer's Representative.
6. The above work shall be accomplished in a reasonable length of time.
7. The Contractor shall clean up during construction and at the completion of the work.
8. Clean product and surrounding area as work progresses. Adjust operation of product or equipment to operate easily and smoothly, immediately prior to final acceptance by the Contracting Officer's Representative.
9. Do not burn or bury waste and rubbish on Site. Dispose of waste and rubbish legally, off Site. Do not dispose of waste and rubbish in storm or sanitary sewers, or in streams or waterways.
10. Select and use cleaning materials and equipment which will not scratch, mar, deface, stain or discolor surfaces being cleaned. Use only cleaning substances which are recommended by the manufacturer of
the product being cleaned and only on materials recommended by the cleaning substance manufacturer.

B. Erosion and Sediment Control: Contractor shall submit erosion and sediment control plan and procedure for the Contracting Officer's Representative approval prior to commencing work. Coordinate with Section 31 40 00 slope protection and erosion control.

C. Surface Water Control
1. Protect foundation excavations, trenches and completed work from rain, spring and ground water, backing up of drains, and other flooding.
2. Construct and maintain temporary drainage. Dispose of pumped water to prevent flooding in construction and storage areas.
3. Provide and operate sufficient pumping equipment to maintain excavations and other construction areas free of water.

D. Repair of Damaged Facilities: Prime Contractors: Shall be responsible for any damage to roads or other facilities on the Owner's property resulting from hauling, or storage of their materials, or other activities in connection with their work. They shall repair, or have repaired or replace the damage areas at no expense to the USACE. Repairs or replacement shall be made to the satisfaction of the Contracting Officer's Representative.

1.10 FIELD OFFICES AND SHEDS

A. Contractor's Office: Provide a weathertight office of sufficient size and facilities to accommodate Contractor's field personnel, his Subcontractors, job meetings, storage of field documents, layout space for Drawings, drafting table for production of As Built Drawings.

B. Contracting Officer's Representative's Office: The Contractor shall, prior to the start of work, furnish a temporary field office for Government personnel, physically and acoustically separated from the Contractor's offices, located near the site of the work, as approved by the Contracting Officer. The Contractor shall have the option of providing the field office facility in an existing or new building, or a trailer. All utilities as specified or required shall be hooked up and in working order prior to the start of work and shall be maintained during the entire contract period. The entire cost to the Contractor for furnishing, equipping and maintaining the accommodations shall be included in the contract price. If the Contractor fails to meet these requirements, the facilities will be secured by the Contracting Officer and the cost thereof will be deducted from payments to the Contractor. All facilities provided for the use of Government personnel under this Paragraph shall remain the property of the Contractor.

Field Office
The temporary field office shall have approximately 200 square feet of floor space and a minimum of seven (7) feet of headroom. An eight (8) foot by thirty (30) foot office trailer is acceptable. The field office or trailer shall be provided with a work table, two (2) lockable desks, and five (5) chairs. It shall be weatherproof and be supplied with heat in season, a minimum of one (1) door, electric lights, a telephone, a medium production rate plain paper copier with sorter and paper supplies, a sufficient number of adjustable windows for adequate light and ventilation, toilet facilities with a wash basin with unheated water, and water cooler with approved drinking water. Telephone and internet service to the Government's field office.
will be provided by the Government. Contractor will be responsible for installation of cabling to support phone service from phone company's nearest point of presence into the Government's trailer. Exterior portable toilet facilities without wash basin may be provided in lieu of interior toilet facilities. The windows shall be screened and provided with locking devices, arranged to open and be securely fastened from the inside. In warm weather, air conditioning shall be furnished which will maintain the office at 50 percent relative humidity and a room temperature of 75 degrees F, or 20 degrees below the outside temperature when the outside temperature is 95 degrees F or higher. In addition to the above requirements, the Government field office or trailer shall be provided with the following:

1. Door Locks
   Each exterior door shall be provided with an approved deadbolt lock in the door, key operated from both sides and tamperproof heavy duty hasp bolted to the door. Each lock shall be provided with two (2) keys.

2. Lighting
   A light shall be installed over each exterior door and shall be kept lighted at night, including Saturdays, Sundays and holidays.

3. Storage Closet
   The field office building or trailer shall have a closet for storage of pilferable equipment. The closet shall be at least three (3) foot by three (3) foot, floor to ceiling height, and have one (1) upper shelf. The door to the closet shall have an approved deadbolt lock or a hasp with an approved padlock. The hasp shall be installed with tamperproof type fastenings. Two (2) keys shall be provided for the deadbolt lock or padlock. Leaves of door hinges shall be unexposed.

4. Cleaning
   The Contractor shall clean the office facility once each work week, or as directed. Cleaning shall include, but not be limited to, sweeping the floor, dusting furniture, collecting trash, floor scrubbing, window washing and toilet facility cleaning.

C. Subcontractors' Offices: Subcontractors may provide an on site facility for their own use and at their own expense, as approved by the General Contractor.

D. Sheds: Provide water tight sheds for storage of materials subject to weather damage, vandalism, or theft. Provide lockable doors and floors raised above the ground.

1.11 CONSTRUCTION DOCUMENTS

A. Maintain a complete set of Contract Documents on site. Such Contract Documents shall be readily accessible to the Contracting Officer's Representative.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

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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.

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 261 Identification and listing of Hazardous Waste

ENGINEERING MANUALS (EM)


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 (archaeological and historic resources); and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive materials; and other pollutants.

1.3 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

1.4 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a discharge permit from the applicable governing agency.
1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G-EC.

Submit in writing an Environmental Protection Plan within 10 calendar days after receipt of Notice to Proceed. See Article titled ENVIRONMENTAL PROTECTION PLAN for details.

1.6 ENVIRONMENTAL PROTECTION REQUIREMENTS

The Contractor shall be knowledgeable of and comply with all applicable Federal, State, and local laws, regulations, permits and licenses concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations. Note any unique requirements for this contract in the environmental pollution control plan. Also see Clauses titled "CLEAN AIR AND WATER" and "PERMITS AND RESPONSIBILITIES." 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.

1.6.1 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 confine its activities to areas defined by the drawings and specifications. The Contractor shall protect those environmental features, indicated specially on the drawings or in the specifications, in spite of interference which their preservation may cause to the Contractor's work under the contract.

1.6.2 Permits

The Contractor shall obtain any necessary permits and licenses that have not been obtained by the Government. This section supplements the Contractor's responsibility under the contract clause PERMITS AND RESPONSIBILITIES to the extent that the Government has already obtained environmental permits. The Contractor shall comply with the terms, and conditions of these permits. The Contractor shall also comply with other environmental commitments made by the Government, including any environmental documents pertaining to the project.

1.6.3 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., proposed alternate borrow areas, disposal areas, staging areas, alternate access routes, etc.) could result in the requirement for the Government to reanalyze the project from an environmental standpoint. Deviations from the construction methods and procedures indicated by the plans and specifications which may have an environmental impact will require an extended review, processing, and approval time by the Government. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.7 ENVIRONMENTAL PROTECTION PLAN

The Contractor shall submit an Environmental Protection Plan for review and acceptance by the Contracting Officer. The Government 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. Acceptance is conditional and is predicated upon satisfactory performance during construction. The Government reserves the right to require the Contractor to make changes in the Environmental Protection Plan or operations if the Contracting Officer determines that environmental protection requirements are not being met. The plan shall detail the actions which 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. The Contractor shall refer to the applicable existing environmental documentation to ensure that the natural, historic, and cultural resources specific or unique to this project are protected. Any necessary coordination with and/or notices to all interested agencies and the public have been made by the Government for environmental documentation prepared by the Government. Copies of the documents are available for review at the offices of the Detroit District, Planning, Programs and Project Division, Environmental Analysis Branch, 7th Floor, 477 Michigan Avenue, Detroit, MI 48226. 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:

1.7.1 Federal, State and Local Laws and Regulations

The Contractor shall be knowledgeable of all Federal, State and local environmental laws and regulations which apply to the construction operations under the Contract and shall list any unique requirements applicable to this contract as part of the Environmental Protection Plan.

1.7.2 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 EM 385-1-1. 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 Contracting Officer in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity spill occurs. The plan shall contain a list of the required reporting channels and telephone numbers.

1.7.3 Recycling and Waste Minimization Plan

The Contractor shall submit a Recycling and Waste Minimization Plan as a part of the Environmental Protection Plan. The plan shall detail the Contractor's actions to comply with the following recycling and waste minimization requirements:

a. The Contractor shall participate in State and local government sponsored recycling programs to reduce the volume of solid waste materials at the source.

1.7.4 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.

1.7.5 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, including, but not limited to, monitoring of land, air, and water resources, including noise, odors and vibrations.
PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 SPECIAL ENVIRONMENTAL PROTECTION REQUIREMENTS

3.1.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas where the work is to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible during darkness. The Contractor shall convey to its personnel the purpose of marking and/or protection of all necessary objects.

3.1.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features to be preserved, indicated and defined on the drawings submitted by the Contractor as a part of the Environmental Protection Plan shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. Vegetated soil surfaces disturbed by construction activities shall be re-vegetated as soon as practicable after completing operations in the disturbed area.

3.1.2.1 Tree Protection

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

3.1.3 Reduction of Exposure of Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated and specified. Where stormwater/erosion control requirements of the drawings and specifications conflict with those of the NPDES Permit for Stormwater Discharges from Construction Sites (if such permit is required), the NPDES permit requirement will prevail. 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 instances where the constructed features obscures borrow areas, quarries and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas developed as approved by the Contracting Officer.

3.1.3.1 Temporary Protection of Disturbed Areas

Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation.
a. Retardation and Control of Runoff

Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and the Contractor shall also utilize any measure required by area-wide plans approved under Section 208 of the Clean Water Act.

3.1.3.2 Erosion and Sedimentation Control Devices

The Contractor shall construct or install all temporary erosion and sedimentation control features as may be required. Temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, plastic sheeting or geotextile over staked straw bales, grassing and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.

3.1.4 Land Resources

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.

3.1.5 U.S. Department of Agriculture (USDA) Quarantine Considerations

The Contractor shall thoroughly clean all construction equipment (prior to its being brought to the job site and prior to its removal when no longer needed at the site) in a manner that ensures all residual soil is removed and that egg deposits from plant pests are not present to prevent the spread of non-indigenous and/or pest species. The Contractor shall consult with the USDA Plant Protection and Quarantine (USDA - PPQ) jurisdictional office for additional cleaning requirements that may be necessary.

3.1.5.1 Control of Non-Indigenous Aquatic Nuisance Species

The Contractor shall conduct diligent operating practices to prevent the spread of Aquatic Nuisance Species (ANS) from one location to another on the Great Lakes, or from one waterbody to another. Such practices shall include, but not be limited to, cleaning equipment and watercraft (prior to it's being brought to the project site and prior to its removal when no longer needed at the site) to prevent the spread of seeds, eggs, larvae, soil, plant material, or other dispersal vectors; and discharging or exchanging ballast water or other water from a vessel of any type only at a location where the chances for survival of ANS are minimal, such as at cold, deep regions of the Great Lake which are far from shore.

3.1.6 Disposal of Waste Materials

Disposal of any materials, waste, effluents, trash, garbage, oil, grease,
chemicals, etc., in areas adjacent to streams, rivers, or lakes and in areas not authorized for waste disposal shall not be permitted. If any waste material is dumped or placed in unauthorized areas, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, ground which has become contaminated through the fault or negligence of the Contractor shall be excavated, disposed of as directed by the Contracting Officer, and replaced with suitable fill material compacted and finished with topsoil and planted as required to re-establish vegetation, all at the expense of the Contractor. Disposal of waste, trash and other materials off the project site shall be in accordance with all applicable Federal, State, and local laws, rules and regulations. Removed vegetation, including trees, shall be put to beneficial reuse and not placed into landfills.

3.1.6.1 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 shall be placed in containers and 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 Government property and dispose in compliance with Federal, State, and local requirements.

3.1.6.2 Chemicals and Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Government. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

3.1.6.3 Spillages

Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, ashes, sawdust, waste washings, herbicides and insecticides, rubbish or sewage, and other pollutants from entering public waters.

3.1.7 Demolition Products

Demolition products shall be transported from Government property for proper disposal in compliance with Federal, State, and local requirements.

3.1.8 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 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 Government property 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. A copy of the manifest shall be provided to the Contracting Officer for any hazardous waste disposed of under this contract.

3.1.9 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 in accordance with Federal, State, and local laws and regulations.

3.1.10 Hydrocarbons, Carbon Monoxide, and Oxides of Nitrogen and Sulfur

Vapor/gaseous emissions of hydrocarbons, carbon monoxide, oxides of nitrogen and sulfur oxides from equipment shall be controlled to Federal and State limits at all times.

3.1.11 Odors

Odors from all construction activities, processing and preparation of shall be controlled at all times and shall not cause a health hazard.

3.1.12 Ground Vibrations

Ground vibrations from construction activities shall be controlled at all times to prevent damage to adjacent structures including buildings, utilities, and roads within the vicinity of the existing powerhouse and concrete spillway, such as the pavilion or viewing deck at the Grand Traverse County Conservation District.

3.1.13 Protection from Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to prevent damage by noise. Construction equipment shall be fitted with noise control devices.

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., human remains or associated objects, or artifacts are discovered), such items shall be protected in place and the observations shall be reported immediately to the Contracting Officer so that the District Archaeologist, Archaeologist from the Bureau of Indian Affairs, and the State of Michigan Archaeologist 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 Waste Water

Disposal of waste water shall be as specified below.

a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related waste water off-Government property in accordance with all Federal, State, Regional and Local laws and regulations.

b. For discharge of ground water, the Contractor shall surface discharge in accordance with all Federal, State, and local laws and regulations.

c. Water generated from the flushing of lines after hydrostatic testing discharged into the sanitary sewer with prior approval and/or notification to the Waste Water Treatment Plant's Operator.

3.4 PROTECTION OF FISH AND WILDLIFE RESOURCES

3.4.1 Protection of Fish, Wildlife and Flora

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish, wildlife and flora. Species that require specific attention along with measures for their protection shall be listed by the Contractor prior to beginning construction operations. See Subparagraph titled "Environmental Protection Plan."

3.4.2 Protection of Birds

The Contractor shall ensure that Migratory Bird Treaty Act (16 U.S.C. 703-712) Guidelines and Strategies are incorporated. Avoid clearing live or dead vegetation containing active nests of migratory birds. Ensure that appropriate and reasonable measures are taken to prevent injury to and death of migratory birds.

3.4.3 Protection of Northern Long Eared Bat

Tree cutting is restricted to outside the bat active period of June 1 to August 15.

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, aerosols, and gaseous by-products 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, borrow areas, and all other work areas free from airborne dust which would cause a hazard or nuisance.

3.6 INSPECTION

If the Contracting Officer 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 Contracting Officer of proposed corrective action and take such action to correct the noncompliance. If the Contractor fails to comply promptly, the Contracting Officer 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 required to be discussed shall include recognition and protection of archaeological sites, artifacts, and historic structures.

3.9 POST CONSTRUCTION CLEANUP OR OBLITERATION

The Contractor shall obliterate all signs of temporary facilities such as haul roads, work area, structures, stock piles of excess or waste materials, fencing, buoys, stakes, or other vestiges of construction within the work, storage and access areas or as directed by the Contracting Officer. Except for surfaced areas, the areas shall be restored to near natural conditions which will permit the growth of vegetation thereon. In areas where restoration to near natural conditions is not required, surfaces shall be evenly and smoothly dressed, sloped to drain, and the edges of the restored area graded to be flush with the surrounding existing grade even if original contours are not restored. All damaged non-surfaced areas shall be restored by topsoiling, seeding and mulching, unless otherwise specified or directed. The topsoiling, seeding, and mulching shall be in accordance with section 31 20 40 SITE
3.10 RESTORATION OF LANDSCAPE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the Contractor's submitted plan, as approved by the Contracting Officer. The work shall be accomplished at the Contractor's expense.

-- End of Section --
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DIVISION 01 - GENERAL REQUIREMENTS

SECTION [01 58 00]

CONSTRUCTION PROJECTS AND SAFETY PERFORMANCE SIGNS

PART 1   GENERAL

1.1   SUBMITTALS
1.2   QUALITY CONTROL

PART 2   PRODUCTS

2.1   SIGN CONSTRUCTION
   2.1.1   Contractor-Furnished Materials
          2.1.1.1   Sign Lettering

PART 3   EXECUTION

3.1   INSTALLATION
3.2   MAINTENANCE
3.3   REMOVAL

ATTACHMENTS:

GENERIC PROJECT IDENTIFICATION SIGN

GENERIC SAFETY PERFORMANCE SIGN

-- End of Section Table of Contents --
PART 1  GENERAL

1.1  SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Sign Layouts; G-AOF.

Submit the proposed layouts before applying lettering.

1.2  QUALITY CONTROL

The Contractor shall establish and maintain a quality control system for all operations performed under this Section to assure compliance with contract requirements and maintain records of its quality control for all operations performed, including, but not limited to the following:

a. Quality - materials and workmanship.

b. Overall appearance of signs and site.

c. Observance of safety regulations.

PART 2  PRODUCTS

2.1  SIGN CONSTRUCTION

The materials to be used and the manner in which they are to be assembled and installed are shown on the enclosed sketches GENERIC PROJECT IDENTIFICATION SIGN and GENERIC SAFETY PERFORMANCE SIGN.

2.1.1  Contractor-Furnished Materials

All materials necessary for construction of the signs as described on the sketches except those furnished by the Government, shall be furnished by the Contractor. All wood members shall be of well seasoned, kiln dried, clear redwood, bald cypress, red cedar, Douglas fir, spruce, tulip poplar or white pine. The lumber materials shall be free of splits, wane and loose knots or pitch pockets. Wood materials for posts, braces and stakes shall be preservative treated. All members of the sign shall be fastened with screws or bolts of type, size, number and spacing to provide rigid construction and a neat appearance. The Contractor shall furnish twelve (12) each 1/4 inch diameter by four (4) inches long Allen head bolts,
threaded to match the T-nuts.

2.1.1.1 Sign Lettering

In the location provided on each sign panel, the Contractor shall apply the applicable project title, Contractor name [and architect/engineer name]. Specific information for sign layouts will be provided by the Contracting Officer's Representative (COR) at the conference specified hereinbefore in clause titled "PRE-CONSTRUCTION CONFERENCE." Lettering shall be black. The materials used for lettering shall be of a type which will adhere to the high density overlay plywood panels under all weather conditions and shall be applied in accordance with the lettering manufacturer's recommendations.

PART 3 EXECUTION

3.1 INSTALLATION

The Contractor shall affix the panels to the posts with the Allen head bolts prior to erection of the signs, including drilling counter-sunk 1/4 inch diameter holes in the posts to match the T-nut locations. The Contractor shall take all precautions necessary to protect the faces of the signs from damage during assembly and construction. The signs shall be installed upon commencement of the work under this contract. The location in which each sign is to be installed shall be as directed by the Contracting Officer. The site on which the signs are to be installed shall be cleared and leveled to facilitate the installation of, and provide easy visual contact with, the signs. Installation and positioning of the posts, braces and stakes shall be as indicated on the referenced sketches. Excavation and backfilling of the holes for posts and installation of the posts, braces and stakes shall be such that signs are installed plumb and level.

3.2 MAINTENANCE

The Contractor shall maintain the signs in good condition and the sign site in a neat condition throughout the construction period.

3.3 REMOVAL

Upon completion of all contract work, the signs shall be removed by the Contractor and turned over to the Contracting Officer's Representative at the site.

-- End of Section --
Design and Construction
Supervised by:

LINE 1
LINE 2
LINE 3

Refer to Section 01 58 00.00 03 for Project Identification Label

U.S. ARMY CORPS OF ENGINEERS
DETROIT DISTRICT
(313) 226-6766
WWW.LRE.USACE.ARMY.MIL

Contractor: Information

NOTE:
FOR SIDE VIEW, SEE PLATE 0158 00.00 03-2

GENERIC PROJECT IDENTIFICATION SIGN
NOT TO SCALE

PLATE 0158 00.00 03-1
This project started

Date since last lost time accident
Total lost time injuries

Safety is a Job Requirement

3/4" Plywood

4' x 4" Post

2x4 Bracket Between Posts

2x4 Braces for Each Post

2x4 Stakes

8' - 0"

4' - 0"

1' x 6" x 4'

42" (max.)

Line 1: Refer to Section 0158 00.00 03 for Project Identification Label

Contractor Information

Generic Safety Performance Sign

Not to Scale
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SECTION 01 60 00
PRODUCT REQUIREMENTS

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1.2   FABRICATION
1.3   SHOP PRIMING
1.4   DELIVERY, STORAGE AND HANDLING
1.5   INSTALLATION STANDARDS

PART 2   PRODUCTS   (NOT APPLICABLE)

PART 3   EXECUTION   (NOT APPLICABLE)

-- End of Section Table of Contents --
PART 1 GENERAL

1.1 REFERENCE

A. The requirements of Division 1 apply to the work of all other sections.

1.2 FABRICATION

A. Fabricate all items in the shop insofar as possible. Where items cannot be completely shop fabricated and assembled for shipment, assemble and fit in shop, disassemble and ship. Identify parts for field assembly. Fabricate items to be straight, square, in proper alignment, and with hairline joints where joints are necessary. Pre plan field joints to be as inconspicuous as possible.

1.3 SHOP PRIMING

A. Shop prime or seal surfaces of all products to receive paint materials in accordance with requirements of the Contract Documents. Apply a primer or sealer compatible with the specified paint materials. If such primer is determined to be incompatible with the specified paint materials, provide a barrier coat or remove the primer and prime again as required.

1.4 DELIVERY, STORAGE AND HANDLING

A. Packing: Deliver products in properly identified original packages or other containers with unbroken seals and manufacturer's labels, grade marks and other means of identification in place.

B. Shipping/Delivery
1. Protect products during shipment to maintain the product's original characteristics.
2. Deliver materials and equipment which will require controlled storage conditions on Site after the controlled storage provisions have been made on Site.
3. Deliver materials, supplies, or equipment to Project site during working hours.
4. Deliveries made during other than normal working hours must be received by an authorized agent of Contractor involved or be received by other means which shall be the sole responsibility of that Contractor.
5. No employee of the Owner or Contracting Officer's Representative is authorized to receive any shipment designated for this Project.
6. The Contracting Officer's Representative assumes no responsibility for receiving any shipment designated for this Project.
7. Any materials delivered in the presence of the Contracting Officer's Representative shall be accounted for by the respective Contractor.
8. Under no circumstances may shipments be directed to, or in care of,
the Contracting Officer's Representative.

9. Each Contractor, Subcontractor, manufacturer, or supplier furnishing materials to the site shall identify, ship, address, consign, etc. all such materials to the Contractor who may be charged therewith by giving the name of the Contractor, the name and address of the Project.

C. Unloading and Acceptance
1. Deliver products in properly identified original packages or other containers with unbroken seals and manufacturer's labels, grade marks and other means of identification in place.
2. Check each item for completeness of order, physical condition and conformance to the Contract Documents. Reject products which do not conform to these requirements, or which have been damaged beyond repair or restoration to original condition as approved by Engineer.

D. Protection
1. Protect products during shipment and on Site to maintain the original product characteristics.
2. Protect all finished surfaces from damage during installation. Provide protective devices as required and as recommended by the manufacturer. Cover work subject to damage at the end of each day's work.
3. Coat concealed surfaces of metal products with a bituminous or other approved coating to prevent contact between dissimilar metals or other material which can cause deterioration.
4. Correct damage by repairing or replacing as required by Engineer. Repairing will be permitted only where the repair is undetectable and does not cause structural damage or interfere with proper functioning of the part.
5. Protect finish of installed products until Substantial Completion of the Project by use of wrappings, covers, or other approved protective devices. Remove such protection immediately prior to final cleaning.

E. On Site Storage
1. Store hazardous products, such as paint materials, in well ventilated areas in accordance with applicable standards and governing laws.
2. Store materials off the ground and in a manner to prevent damage or intrusion of moisture or other foreign matter.
3. Cover materials which may be damaged by weather, allowing for proper circulation of air.
4. When possible, store materials inside the building or in sheds.
5. When storing materials in the building, stockpile materials in a manner which will not overload the structure.
6. Store all materials in a manner immediately accessible for inspection.
7. Store small items, such as finish hardware and other items easily stolen or vandalized, in a security area. Where possible, do not deliver such items until immediately prior to installation.

1.5 INSTALLATION STANDARDS

A. Examination of Substrate: Examine the substrate or structure to which a product is to be applied or installed. Check the substrate or structure for proper clearances and tolerances. Tolerances are listed in each Section. Do not proceed until unsatisfactory conditions have been corrected. Starting the work indicates acceptance of conditions and the installer assumes full responsibility for results.

B. Preparation
1. Substrate: Where products are applied to a substrate, prepare the substrate as recommended by the product manufacturer, generally as
follows:
a. Bring substrate to a uniform surface by smoothing uneven surfaces and filling holes, cracks and low places with recommended filler or parent material.
b. Remove substances, such as dust, oils and other foreign matter, not compatible with the product.
c. Surfaces shall be dry, unless a moisture content or wetting is specified.

2. Inserts and Anchorages
a. Installer shall furnish built in fastening devices for his product to the proper trade for installation as the work proceeds.
b. If such devices are not furnished in time to be built in, installer shall provide alternate methods for attaching his product. Submit Drawings and other required data as Reference Submittals.

3. Templates: Provide templates, diagrams and other coordinating documents to the proper Contractor, manufacturer, or supplier of related items affecting the work.

4. Dimensions
a. If the exact location of an item is not indicated by dimension on the Drawings or noted in the Specifications, Engineer reserves the right to determine such location in the field prior to roughing in.
b. If the exact dimensions of a product are not indicated, Engineer reserves the right to determine dimensions prior to ordering or fabricating the product.
c. Such dimensional changes shall not be a basis for changes in the Contract Sum.
d. Where miscellaneous devices, such as thermostats, switches, controls, grilles, pipes, or outlets of any nature are not exactly located by the Contract Documents, request such location or obtain approval of the location prior to installation. If approval has not been obtained, Engineer may require the relocation of such devices at the expense of the installer.

C. Installation
1. Install products in accordance with the manufacturer's recommendations or the requirements of trade associations, listed standards, conforming Shop Drawings, and Contract Documents. Where a conflict exists between these references, the most strict requirements govern. If printed instructions are not available, consult with the manufacturer's field representative.
2. Provide hangers, auxiliary framing, and other means for installing ceiling suspension systems, lighting fixtures, diffusers, and other equipment in ceilings to avoid ducts, piping, etc.
a. Suspend from structural members, such as joists or beams, and not from ducts or piping.
3. Install work in a manner which will not interfere with the proper installation of the work of other trades and to facilitate operating, servicing, and repairing.
4. Install products straight, plumb, level, and in line. Securely attach items to the substrate, using recommended adhesives, mechanical fasteners or other devices. Where holes are provided for attachment, do not field drill or cut new holes without approval of Engineer.
5. Match all finished work to the submitted Samples or Sample panels.
6. Conceal fasteners wherever possible, unless exposed fasteners are permitted or specified.
7. Weld in accordance with AWS standards for qualifications of operators and for workmanship.
PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

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-- End of Section Table of Contents --
PART 1   GENERAL

1.1   GRADES, LINES, AND LEVELS

A. Information pertaining to preliminary investigations, such as test borings, location of utilities, existing structures, and existing grades appear on the Drawings and specifications. While such data has been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing or that unforeseen developments may not occur. The Contractor must put his own interpretation on the results of such investigation and shall satisfy himself as to materials to be excavated and materials upon which fill or other work may be placed. Where underground services, utilities, structures, etc., are located on the Drawings or given at the site, they are based on available records, but are not guaranteed to be complete or correct. They are merely given to assist each Contractor.

B. The General Contractor shall immediately upon entering the site for purpose of beginning work, locate general reference points and take such action as is necessary to prevent their destruction. He shall lay out his own work and be responsible for all lines, elevations, and measurements of the building, utilities, and other work executed by him under the contract. He must exercise proper precaution to verify figures on the Drawings before laying out work and will be held responsible for any error resulting from his failure to exercise such precaution.

C. Using datum furnished by the USACE, the lot lines and present levels have been established as shown on the Plot Plan. Other grades, lines, levels, and bench marks shall be established and maintained by the General Contractor who shall be responsible for them.

D. The General Contractor shall employ a registered land surveyor to lay out the Project on the site and establish critical benchmark elevations.

E. As work progresses, the General Contractor shall lay out on construction stakes as a guide to all trades, and fix column center lines and walls.

F. The General Contractor shall make provision to preserve property line stakes, bench marks, or datum point. If any are lost, displaced, or disturbed through neglect of any other Contractor or Subcontractor, his agents or employees, the other Contractor or Subcontractor shall pay the cost of restoration.

G. Each Contractor, as it applies to his contract, shall verify grades, lines, levels, locations, and dimensions as shown on Drawings and report any errors or inconsistencies to the Architect before commencing work. Starting of work by the Contractor shall signify his acceptance.
H. Request for electronic files of the site civil drawings can be provided in a PDF or DWG (AutoCAD) format.

1.2 RECORD OF EXISTING SITE AND BUILDING

A. Prior to starting the work, review existing structures and Site work with the Contracting Officer's Representative.

B. Pre-Construction Photographs
1. Photograph entire area of construction to show existing conditions prior to any construction work proceeding, and the inside and outside conditions of existing structures.
2. The photographs shall consist of Digital photos with a 6.0 Megapixels minimum size, in sharp focus with full depth of field to show details clearly. If possible, exclude objects having no bearing on or not belonging in the Project.
3. Identify each photograph with the Project name. Consecutively number all photographs taken for the Project. Provide a separate indexed description of each photograph, indicating the photographer's position, the direction and view of the photograph, and the date when the photograph was taken.
4. The number and content of the photographs shall be adequate to indicate all existing surface conditions and features that might be affected by construction.
5. Submit one set of all photographs to Contracting Officer's Representative for approval.

1.3 SUBMITTALS

SD-10 Operation and Maintenance Data

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys; G-DR: Submit two copies signed by land surveyor.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
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1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data
Warranty Management Plan

SD-08 Manufacturer's Instructions
Preventative Maintenance
Condition Monitoring (Predictive Testing)
Inspection
Posted Instructions

SD-10 Operation and Maintenance Data
Operation and Maintenance Manuals

SD-11 Closeout Submittals
As-Built Drawings; G-AOF
Record Drawings; G-AOF
Interim Form DD1354; G
Checklist for Form DD1354; G
Final approved shop drawings

1.2 PROJECT RECORD DOCUMENTS

1.2.1 As-Built Drawings

As-built drawings are developed and maintained by the Contractor and depict actual conditions, including deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to Contractor submitted Requests for Information; direction from the Contracting Officer; designs which are the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as red-lined hard copies on site.

This paragraph covers as-built drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings showing as-built conditions. The final as-built drawings must consist of electronic files in the AutoCAD and PDF format.
1.2.2 Record Drawings

Record Drawings shall include a survey by a registered land surveyor of as-built conditions including In-channel floodplain, and upland area survey. In-channel and floodplain survey should include cross sections and profile of the river. Up land areas and upland habitat structures survey shall be to the sub foot accuracy. In-channel, floodplain areas and in-channel habitat structures survey shall be to the 100th foot accuracy. The record drawings must consist of electronic files in the AutoCAD and PDF format.

1.2.2.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file record drawings.

1.2.2.2 Working As-Built and Final As-Built Drawings

Revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. Show on the working and final as-built drawings, but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the as-built drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

c. Changes in details of design or additional information obtained from
working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

d. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

e. Changes or modifications which result from the final inspection.

f. Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.

g. Modifications (include within change order price the cost to change working and final As-built drawings to reflect modifications) and compliance with the following procedures.

(1) Follow directions in the modification for posting descriptive changes.

(2) Place a Modification Delta at the location of each deletion.

(3) For new details or sections which are added to a drawing, place a Modification Delta by the detail or section title.

(4) For minor changes, place a Modification Delta by the area changed on the drawing (each location).

(5) For major changes to a drawing, place a Modification Delta by the title of the affected plan, section, or detail at each location.

(6) For changes to schedules or drawings, place a Modification Delta either by the schedule heading or by the change in the schedule.

(7) The Modification Delta size shall be 1/2 inch diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

1.2.2.3 Drawing Preparation

Modify the as-built drawings as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project and must be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Government.

1.2.2.4 Computer Aided Design and Drafting (CADD) Drawings

Only employ personnel proficient in the preparation of CADD drawings to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, prepare them using the
specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final as-built drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CADD files. The Contractor will be furnished "as-designed" drawings in latest version of AutoCADD file format. The electronic files will be supplied on optical disk. Provide all program files and hardware necessary to prepare final as-built & record drawings. The Contracting Officer will review final as-built & record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

a. Provide CADD "base" colors of red, green, and blue. Color code for changes as follows:

   (1) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.

   (2) Additions (Green) - Added items, lettering in notes and leaders.

   (3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

b. Rename the Contract Drawing files in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. All changes shall be made on the layer/level as the original item.

c. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Mark all other contract drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date original contract drawings in the revision block.

d. Within 10 days after Government approval of all of the working as-built drawings for a phase of work, prepare the final CADD as-built drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 7 days revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 10 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic files in the AutoCAD aaaaand PDF format on optical disk and one set of the approved working record drawings. They must be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final record drawing files and marked prints as specified will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made to the Contractor.
1.2.2.5 Payment

No separate payment will be made for record drawings required under this contract, and all costs accrued in connection with such drawings are considered a subsidiary obligation of the Contractor.

1.3 Final Approved Shop Drawings

Furnish final approved project shop drawings 30 days after transfer of the completed facility.

1.4 Construction Contract Specifications

Furnish final record (as-built) construction contract specifications, including modifications thereto, 30 days after transfer of the completed facility.

1.5 PREVENTATIVE MAINTENANCE

Submit Preventative Maintenance, Condition Monitoring (Predictive Testing) and Inspection schedules with instructions that state when systems should be retested.

a. Define the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a signoff blank for the Contractor and Contracting Officer for each test feature; e.g., gpm, rpm, psi. Include a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventative maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair.

b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.6 WARRANTY MANAGEMENT

1.6.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to the clause Warranty of Construction in the contract. At least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Government upon acceptance of
the work. The construction warranty period will begin on the date of project acceptance and continue for the full product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Include within the warranty management plan, but not limited to, the following:

a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subContractors, manufacturers or suppliers involved.

b. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

c. A list for each warranted equipment, item, feature of construction or system indicating:

   (1) Name of item.
   (2) Model and serial numbers.
   (3) Location where installed.
   (4) Name and phone numbers of manufacturers or suppliers.
   (5) Names, addresses and telephone numbers of sources of spare parts.
   (6) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
   (7) Cross-reference to warranty certificates as applicable.
   (8) Starting point and duration of warranty period.
   (9) Summary of maintenance procedures required to continue the warranty in force.
   (10) Cross-reference to specific pertinent Operation and Maintenance manuals.
   (11) Organization, names and phone numbers of persons to call for warranty service.
   (12) Typical response time and repair time expected for various warranted equipment.

d. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

1.6.2 Performance Bond

The Contractor's Performance Bond must remain effective throughout the construction period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.
c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.6.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.6.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. Include within the report the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframes specified, the Government will perform the work and backcharge the construction warranty payment item established.

a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

1.6.5 OPERATION AND MAINTENANCE MANUALS

Submit 1 hard copy and 4 electronic copies of the project operation and maintenance manuals 30 calendar days prior to testing the system involved. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.
1.6.5.1 Configuration

Operation and Maintenance Manuals must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Bind information in manual format and grouped by technical sections. Test data must be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for vendor data and manuals must have 0.3937-inch holes and be bound in 3-ring, loose-leaf binders. Organize data by separate index and tabbed sheets, in a loose-leaf binder. Binder must lie flat with printed sheets that are easy to read. Caution and warning indications must be clearly labeled.

1.6.6 CLEANUP

Leave premises "broom clean." Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 AS-BUILT DRAWINGS

3.1.1 As-Built Drawings Content

Revise As-Built Drawings in accordance with ERDC/ITL TR-12-1 and ERDC/ITL TR-12-6. Provide 2 sets of paper copies from PDF drawings to show the as-built conditions by red-line process during the execution of the project. Keep these working as-built markup drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract drawings which are made during construction or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. The accuracy of the notations on the contract working drawings and shop drawings will be regularly reviewed by the Government monthly. For failure to maintain the working and final as-built drawings as specified herein, the Contracting Officer will withhold 10 percent of the monthly progress payment until approval of updated drawings. Shown on the as-built drawings, but no limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the as-built drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

c. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the
Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
d. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.
e. Changes or Revisions which result from the final inspection.
f. Where contract drawings or specifications present options, show only the option selected for construction on the working as-built markup drawings.
g. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.
h. Changes in location of equipment and architectural features.
i. Modifications (include within change order price the cost to change working as-built markup drawings to reflect modifications).
j. Actual location of anchors, construction and control joints, etc., in concrete.
k. Unusual or uncharted obstructions that are encountered in the contract work area during construction.
l. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.
m. Shop drawings shall also be maintained with notation of any changes made.

3.2 FINAL AS-BUILT DRAWING FILES

If additional drawings are required, prepare them using the AutoCAD file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final as-built drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CAD files. Provide all program files and hardware necessary to prepare final PDF record drawings. The Contracting Officer will review final PDF as-built drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

3.2.1 Rename the CAD Drawing files

Rename the CAD Drawing files using the contract number as the Project Code field, (e.g., W91238-15-C-10A-102.DWG) as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. Make all changes on the layer as the original item.
a. For AutoCAD files (DWG), enter all as-built delta changes and notations on the AS-BUILT layer.
b. When final revisions have been completed, show the wording "RECORD DRAWING AS-BUILTS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Date RECORD DRAWING AS-BUILTS" drawing revisions in the revision block.

3.3 FINAL AS-BUILT DRAWINGS

Prepare final as-built drawings quarterly and upon completion of the construction, the contractor shall submit a hard copy or electronic copy of the red line working drawings for review. Once approved, transfer the changes from the approved working as-built markup drawings to the original electronic CAD drawing files. Modify the as-built CAD drawing files to correctly show the features of the project as-built by bringing
the working CAD drawing set into agreement with approved working as-built markup drawings, and adding such additional drawings as may be necessary. Refer to ERDC/ITL TR-12-1 Chapter 11 Drawing Revisions. Jointly review the working as-built markup drawings with printouts from working as-built CAD drawing PDF files for accuracy and completeness. Monthly review of working as-built CAD drawing PDF file printouts must cover all sheets revised since the previous review. These PDF drawing files are part of the permanent records of this project. Any drawings damaged or lost must be satisfactorily replaced at no expense to the Government.

a. Drawing revisions (include within change order price the cost to change working and final record drawings to reflect revisions) and compliance with the following procedures.
   (1) Follow directions in the revision for posting descriptive changes.
   (2) The revision delta size must be 5/16 inch unless the area where the delta is to be placed is crowded. Use a smaller size delta for crowded areas.
   (3) Place a revision delta at the location of each deletion.
   (4) For new details or sections which are added to a drawing, place a revision delta by the detail or section title.
   (5) For minor changes, place a revision delta by the area changed on the drawing (each location).
   (6) For major changes to a drawing, place a revision delta by the title of the affected plan, section, or detail at each location.
   (7) For changes to schedules or drawings, place a revision delta either by the schedule heading or by the change in the schedule.

3.4 FINAL APPROVED SHOP DRAWINGS

Upon completing the work under the contract, the Contractor shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the construction is completed and accepted. Record shop drawings shall be submitted in their native format. If drawings were prepared manually or using software other than AutoCAD, an electronic PDF copy shall also be provided. One full-sized hard copy of all shop drawings shall be also be provided. Submit final approved project shop drawings 30 days after transfer of the completed facility.

3.5 Final Record Drawing Package

Final Record Drawing Package should include:
1. Final as-Built Drawings
2. Survey of as-built conditions as described in 1.3.2

Submit the final record PDF and CAD drawings package for the entire project within 30 days of substantial completion of all phases of work. Submit one set of ANSI D size PDF and CAD files on optical disc, read-only memory (ROM), and one set of the approved working record drawings. The package must be complete in all details and identical in form and function to the contract drawing files supplied by the Government.

3.6 CONSTRUCTION CONTRACT SPECIFICATIONS

Submit final PDF file record construction contract specifications, including revisions thereto, 30 days after transfer of the completed facility.
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LISTING OF ENCLOSED DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS (AMENDMENT 0002)

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LISTING OF ENCLOSED DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS (AMENDMENT 0002)

PART 1 GENERAL

1.1 ENCLOSURES

This Section contains documents referenced in other Sections of the specifications. They are consolidated in this Section for the convenience of the Contractor and the Government. The Contractor may reproduce the enclosed forms for its use or obtain a supply of the forms from the Contracting Officer.

TITLE

1. MDEQ signed permit
2. Natural river zoning permit

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

-- End of Section --
May 10, 2017

Grand Traverse County
c/o Tom Menzel
400 Boardman Avenue
Traverse City, Michigan 49684

Dear Mr. Menzel:

Enclosed is Natural River Zoning Permit BM2017001U for your project on the Boardman River, located in T27N, R11W, Section 27, Garfield Township, Grand Traverse County. This permit grants authorization to remove the Sabin Dam, excavate a new channel in the former impoundment, and to install instream habitat in the newly created channel. Any proposed change in the authorized project must be reviewed by this office.

After the project is complete, please notify me so I can conduct a final inspection. Note that any future construction within 400 feet of the river that is not authorized by this permit requires a separate Natural River Permit. Thank you for your cooperation. If you have any questions, I can be reached at 989-732-3541 extension 5047.

Sincerely,

Patrick Ertel
Natural Rivers Administrator
Fisheries Division

Enclosures

cc: Ms. Robyn Schmidt, DEQ, Cadillac
    Mr. Bruce Remai, Grand Traverse County Soil Erosion Agent
    Mr. Dan DeVaun, AECOM, Traverse City
    Mr. Luke Trumble, DEQ, WRD, Lansing
    Mr. Jim Pawloski, DEQ, WRD, Gaylord
    Mr. Scott Heinzelman, DNR, Fisheries, Cadillac
    Ms. Heather Hettinger, DNR, Fisheries, Traverse City
NATURAL RIVER PERMIT CONDITIONS

NAME: Grand Traverse County
PERMIT: BM2017001U
DATE: 05-10-17

1. SITE PLAN – Dam removal, channel construction and instream habitat installation shall correspond to the attached site plan stamped APPROVED May 10, 2017.

2. NATURAL VEGETATION STRIP - Vegetation may not be cut, cleared or mowed within 75 feet of the Boardman River (100 feet on State of Michigan lands). Existing conditions may be maintained. Dead or dying trees and noxious weeds such as poison ivy may be removed. No additional permits are required for planting native vegetation within the vegetated buffer. Non-native vegetation should not be planted in the vegetated buffer.

The purpose of this vegetated buffer is to protect the river’s water quality, provide fish and wildlife habitat, cool the stream’s waters and screen development. The buffer protects water quality by providing an intact zone of vegetation that filters out sediments, harmful nutrients and other polluting agents before they reach the water. The vegetation and its root systems also help stabilize riverbanks and prevent harmful erosion. Streamside vegetation and stable woody debris within the river provide essential areas of shaded cover for fish. Undisturbed vegetation provides valuable habitat and travel corridors for wildlife, especially for some of Michigan’s most sensitive species.

3. PERMITS - All other required state and local permits must be secured prior to commencing construction.

4. RIPRAP - Any rock riprap shall be field stone. No angular quarried rock or broken concrete shall be used.
Michigan Department of Natural Resources - Fisheries Division

NATURAL RIVER UTILITY / PUBLIC AGENCY PERMIT
Issued under authority of Public Act 451, Part 305, Natural Rivers, of 1994 as amended. Failure to comply with the conditions of this permit shall be cause for revocation of this permit and may result in initiation of enforcement action.

<table>
<thead>
<tr>
<th>PERMITTEE/PROPERTY INFORMATION</th>
</tr>
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<tbody>
<tr>
<td>Permit No.: BM2017001U</td>
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<tr>
<td>Date of Issue: 05/10/2017</td>
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<tr>
<td>Permit Expiration Date: 05/10/2019</td>
</tr>
<tr>
<td>Name of permittee: Grand Traverse County -</td>
</tr>
<tr>
<td>Telephone Number of Permittee: (231) 922-4780</td>
</tr>
<tr>
<td>Address: 400 Boardman Avenue</td>
</tr>
<tr>
<td>Property Address: 1450 Cass Road</td>
</tr>
<tr>
<td>City, State, and Zipcode: Traverse City, MI 49684</td>
</tr>
<tr>
<td>Property City, State, and Zipcode: Traverse City, MI 49684</td>
</tr>
<tr>
<td>County / Town - Range / Township Name / Section / QQ (Tributary / River Name): Grand Traverse / T27N - R11W / 2805 / 27 / (Mainstream / Boardman River)</td>
</tr>
<tr>
<td>Property Tax No.: 28-005-034-009-00</td>
</tr>
<tr>
<td>Subdivision / Lot #: None</td>
</tr>
</tbody>
</table>

Description of Use:

Restore the Boardman River to a free-flowing, cold-water river throughout the Sabin impoundment, by removing Sabin Dam and recreating the former Boardman River channel. This includes excavation, selective grading, floodplain creation, erosion control, and additions of instream habitat features.

CERTIFICATION

I hereby certify that I have inspected the site of the approved use as described above and find that the site inspection confirms all information contained in the approved application for permit, variance, or specific use, including conditions attached to such approval.

Inspection Date: 03/10/2017
Applicant/Agent Present During Inspection: No

This zoning permit is approved subject to the following conditions:

Please see enclosed Natural Rivers Permit Conditions sheet.

Zoning Administrator: Patrick Ertel
Telephone Number: 989-732-3541
Date: 05/10/2017

LIABILITY. Permittee hereby releases, waives, discharges and covenants not to sue, the State of Michigan, its departments, officers, employees and agents, from and against all liability to Permittee, its officers, employees and agents, for all losses, injury, death or damage, and any claims or demands whatsoever, on account of injury to persons or property, or resulting in death of Permittee, its officers, employees or agents. whether caused by the State of Michigan, its departments, officers, employees or agents, in reference to the activities of this permit.

IDENTIFICATION. Permittee hereby covenants and agrees to indemnify and save harmless, the State of Michigan, its departments, officers, employees and agents, from any and all claims and demands, for all loss, injury, death or damage, that any person or entity may have or make, in any manner, arising out of any occurrence related to (1) this permit; (2) the activities authorized by this permit; and (3) the use or occupancy of the premises which are the subject of this permit, as well as any other state-owned lands. This indemnification and save harmless agreement shall extend to all loss, injury, death or damage, proximity caused or arising out of the negligence of the State of Michigan, its departments, officers, employees and agents.

I have read the terms and conditions contained in this permit. By commencing construction, I agree to abide by same and assume all obligations contained herein. I understand that issuance of this permit does not revoke, annul, cancel, or in any way impair or interfere with existing provisions of law, ordinances, or any rules, regulations, or premises or with any private restrictions placed upon property by covenant or deed.

PR 8035 (Rev 3/28/2007)
SECTION TABLE OF CONTENTS

DIVISION 02 - EXISTING CONDITIONS

SECTION 02 01 00

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PART 2   PRODUCTS

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  2.1.1   Design Requirements

PART 3   EXECUTION

3.1   EXAMINATION

-- End of Section Table of Contents --
PART 1 GENERAL

1.1 JOB CONDITIONS

A. The Contractor will be responsible for visually documenting, by photograph or by video, the pre-work condition of the site, including nearby roads and properties adjacent to the site including Cass Road, Keystone Road and all adjacent surface and pavement that potentially will be disturbed or impacted during or after completion of the site construction and restoration activities. Refer to 01 71 23 FIELD ENGINEERING Section 1.2 RECORD OF EXISTING SITE AND BUILDING.

B. Locations of utilities and underground structures (if any) within the work area are unknown. Therefore, it is the Contractor's responsibility to notify MISS-DIG, verify the presence and location of all utilities potentially present, and if necessary, contact the Grand Traverse County to locate all utilities within the work area and ROWs prior to proceeding with any field activities. Any disruption in utility service as a result of this work must be coordinated as to not adversely impact adjacent residential properties and business operations to the satisfaction of the Engineer and residential owner and business owner/operator. All such work shall be incidental to the project.

C. Wherever culverts, sewers, drains, manholes, catch basins, catch basin connections, water mains, valve chambers, electric conduits, telephone conduits, or any other underground constructions are encountered by the Contractor during the Work, they shall be protected and firmly supported in place by the Contractor, at his/her own expense, until the site construction and restoration activities are complete and the existing structures are made secure, except where removal and replacement of the utility are specified. Damage to any such utilities/structures caused by or resulting from the Contractor's work shall be repaired at the Contractor's expense. The authority having jurisdiction over any particular underground structure shall be notified promptly of any damage to its structure.

D. The Boardman River including floodplain and adjacent properties and all restored areas surrounding the river shall be protected and secured by the Contractor, by the use of appropriate protective measures until all site construction and restoration activities are complete. All work required to secure, protect, or support the river and its floodplain and adjacent properties shall be incidental to the project. Damage to the river including floodplain and all restored surrounding areas along the river alignment caused by or resulting from the Contractor's work shall be repaired or restored to its original condition or better at the Contractor's expense.

E. No additional compensation shall be allowed for any delays, inconvenience, or damage sustained by the Contractor due to any interference from said utilities or the operation of moving them by the utility companies.
F. Cooperation with Utilities:

1. The Contractor will be responsible for providing temporary electrical service for operation of the equipment and for use at the site trailer. The electrical power may be coordinated with the local electrical utility service provider or provided via a suitable electric generator(s). The electrical service should be sufficient to provide and support all electrical draw. As mentioned above, it is the Contractor's responsibility to notify MISS-DIG, Grand Traverse County, as appropriate, and locate all utilities within the Work area prior to initiating any field work.

2. The Contractor shall allow the Owner, Engineer, Grand Traverse County personnel, other contractors, and public service corporations, or their agents, to enter upon the work area for the purpose of constructing, maintaining, repairing, removing, altering or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances as are not located or as may be required or permitted at or on the work by the Contracting Officer's Representative. The Contractor shall cooperate with all aforesaid parties and shall allow reasonable facilities for the prosecution of any other work by others to be done in connection with this work. Care shall be taken at all times to not inconvenience adjacent residential properties and commercial businesses as much as possible.

3. If necessary, temporary provisions shall be made by the Contractor to insure proper functioning of all sewer inlets, and drainage ditches, which shall not be obstructed except as approved by the Contracting Officer's Representative.

G. Cleaning of the trash racks on the Sabin Dam intakes is the responsibility of the Contractor. The Contractor shall inspect and clean debris from the trash racks as necessary to maintain optimal intake efficiency. The goal of this operation is to maintain the lowest possible water surface elevation within the impoundment. At a minimum, the Contractor shall inspect and, if necessary, clean the trash racks each week and following major flow events. To assist with this effort, the Contractor may install debris traps, such as A-Jacks, in the channel directly upstream of the powerhouse.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Not Used.

2.1.1 Design Requirements

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of
utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site. The contractor to field verify all utilities and is responsible for the protection of the utilities and communications with the affected utility owner.

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3.5 CONTRACTOR PARKING AREA
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3.7 STAGING AND STOCKPILING AREA

-- End of Section Table of Contents --
PART 1 GENERAL

1.1 SUMMARY

A. Site preparation shall be conducted by the Contractor and shall include, but may not be limited to, the following:
   1. Dust Control
   2. Temporary Work Area Fence
   3. Temporary Access Road and Contractor Parking
   4. Protection of Utilities and Structures
   5. Clearing and Grubbing
   6. Decontamination Area
   7. Sediment Stabilization/Dewatering Area
   8. Temporary Cofferdams
   9. Staging and Stockpiling Areas

1.2 REFERENCES

   Michigan Legislature
   PA 451 of 1994 as amended, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT

   Michigan Department of Transportation (MDOT)
   MDOT MDOT Standard Specifications

1.3 DEFINITIONS

A. Structures and Surface Features: Existing structures and surface features including sheet pile walls, signs, fences, utility poles, bridges, trees, landscaped areas including shrubs, and other surface features.

B. Utilities: Existing gas mains, water mains, electric lines (underground or overhead), storm sewers and conduits, telephone and other communication lines and conduits, sewer pipes, cable television, other utilities, and appurtenances.

C. Clearing and Grubbing: Removal of trees, shrubs, or other vegetative cover.

D. Debris: Include items such as refuse/trash, rubble, logs, as well as other similar items.

1.4 SUBMITTALS

SD-01 Preconstruction Submittals
A. The Contractor shall submit as part of the Work Plan (Section 01 33 00, Submittal Procedures) all necessary procedures and measures that demonstrate the Contractor's means and methods for site preparation. In
addition to fugitive dust, odor and noise mitigation measures, engineering controls, equipment, etc., the Contractor shall also provide the following information:

1. Mobilization and storage/staging plan for all equipment and supplies.
2. The location and size of any proposed temporary fencing to secure the Work area during the site construction and restoration activities.
3. A site layout plan to show locations of equipment/supplies laydown area, sediment loading area, sediment staging/stabilization pad layout, sheet piling storage area, bulk storage area, sediment dewatered water treatment area, monitoring equipment placement, haul roads, and river access area.
5. Means and methods to minimize generation, tacking, and dispersion of dust and mud including equipment necessary to control dust and how adjacent streets and public right-of-ways (ROWs) will be cleaned on a daily basis.
6. Temporary measures and controls to protect subsurface structures during the site activities.
7. Type of major equipment to be used to implement the site activities.
8. Measures and controls necessary to execute the site activities in a safe manner.
9. Construction sequencing and detailed project implementation schedule.

SD-06 Test Reports
B. Sabin Powerhouse Stop Logs Inspection
1. Stop logs for the powerhouse intake structure are located on site. These stop logs will require an inspection from a certified engineer prior to use. Engineer's inspection report must be submitted prior to the start of work.

PART 2 PRODUCTS
A. Temporary chain link fencing.
B. Safety plastic mesh fencing to provide visual warning and control. The color of fencing shall be orange.

PART 3 EXECUTION
3.1 PREPARATION
A. Traffic: The Contractor shall minimize or prevent interferences with nearby roads, side-walks, and all adjacent facilities.

B. Utility Locating: The Contractor shall notify MISSDIG and obtain and review all available as-builts to properly locate and mark all existing utilities prior to commencing the site activities.

C. Pollution, Erosion and Sedimentation Controls: The Contractor shall not commence any site activities prior to installation of all necessary pollution, erosion, and sedimentation controls.

D. Temporary Staging Areas: The Contractor shall locate all temporary...
staging areas to be used for storage of equipment and supplies and loading and hauling removed materials and debris.

3.2 DUST CONTROL

A. The Contractor shall use the appropriate measures to control dust 24 hours a day 7 days a week before it becomes a nuisance to public, neighboring properties, and site workers and visitors. Dust control shall be implemented throughout the duration of the project.

3.3 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

A. The Contractor shall protect all existing utilities and adjacent structure and site improvements to remain in place during Work. If it is determined by the Government that the integrity of a site utility, improvement or an adjacent structure has been compromised as a result of the Contractor's or its subcontractors' activities, the Contractor shall re-pair the damage at the Contractor's expense.

B. The Contractor shall not interrupt any utility unless permitted by the Government. The Government shall be notified of any utility interruptions at least 72 hours in advance of any proposed and anticipated utility interruptions. The Contractor shall not proceed with any utility interruption without a written permission from the Government.

3.4 TEMPORARY WORK AREA FENCING

A. The Contractor shall install and maintain temporary fence with gates to secure and protect the Work area. The fencing shall be installed in a manner that will not impede or hinder access to fire hydrants, if present and emergency vehicles.

B. Temporary Fence shall meet the requirements of MDOT Standard Specifications for Construction Section 808.03 C.

C. The Contractor shall install and maintain the fencing at the proper height. The fence must remain vertical.

D. The Contractor shall repair existing pavement surfaces caused by installation of the temporary fencing upon completion of the site activities and prior to demobilization.

3.5 CONTRACTOR PARKING AREA

A. The Contractor shall locate and establish a temporary vehicle parking area for site construction workers and site visitors. Parking on public streets or adjacent parking lots belong to adjacent private or commercial properties will not be allowed.

B. The Contractor shall maintain all designated haul routes for truck traffic during dredging/excavation activities. The Contractor shall seek the Government's permission prior to installing or constructing temporary haul roads. All haul roads shall be cleared of debris and cleaned on a regular basis throughout the duration of the project.
C. The Contractor shall install sediment/soil tracking pad at the areas where loaded trucks exit the Work area in accordance with the Slope Protection and Sediment Control Plan (see Section 01 33 00, Submittal Procedures and Section 31 40 00, Slope Protection and Erosion Control). The tracking pad(s) shall be constructed with 6-inch aggregate atop a minimum of 16 ounce per square yard nonwoven geotextile fabric. The pad(s) shall be at least 12 inches thick and maintained in good condition throughout the duration of the project.

D. The Contractor shall install the appropriate signs along adjoining public and private access roads to direct truck traffic entering the Work area and alert pedestrians. All roads including site access roads and site entrance shall be kept clean on a regular basis with commercial grade street sweepers. Tracking mud, dirt, or debris from the Work area onto temporary site access roads and adjacent private and public roads will not be permitted.

3.6 CLEARING AND GRUBBING

A. The Contractor shall locate and mark areas designated for clearing and grubbing in the field for inspection and approval by the Contracting Officer's Representative.

B. The Contractor shall clear the approved designated area of interfering trees, stumps, landscaped areas including shrubs and other objects. Clearing trees from areas or locations outside the limits of the designated Work area will not be allowed.

C. All materials removed as a result of clearing and grubbing shall be managed in accordance with the provisions of Section 31 10 00 and Section 32 90 00. Materials not designated for reuse shall be disposed of offsite according to all applicable Local, State and Federal regulations. Burning of materials onsite will not be allowed. Trees cleared that meet the size requirements for large wood as specified in Section 31 39 00, shall be salvaged and stored for later use as part of the river restoration.

Contractor to comply with requirements of NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT PA 451 of 1994.

3.7 STAGING AND StockPILING AREA

A. The Contractor shall locate areas to be designated for staging and stockpiling of non-contaminated materials (riprap, stones, engineered fill materials, etc.) These areas must be approved by the Contracting Officer's Representative.

B. Staging and stockpiling areas shall be constructed and installed in a manner to contain surface runoff and prevent generation of fugitive dust. All staging and stockpiling areas shall be inspected and maintained by the Contractor on a regular basis. Any repair work required to maintain the staging and stockpiling area(s) functional and in good condition shall be conducted immediately by the Contractor. Such repair work is incidental to the project.

-- End of Section --
PART 1 GENERAL

ATTACHMENTS:

THE COMPLETE GEOTECHNICAL DATA REPORT AND LOGS

-- End of Section Table of Contents --
A. OWNER'S DISCLAIMER

1. Geotechnical investigations, to determine the nature of subsoil conditions, have been made at various locations on the Project site. Borings indicate only the subsoil conditions at the point where borings were made and samples were taken, and are not intended to indicate the subsoil conditions for the entire Project site.

   a. Data contained in the report and logs are not intended as representations or warranties of accuracy or continuity of such subsoil conditions between borings. It is expressly understood that neither the Government nor the Engineer will be responsible for interpretations or conclusions drawn therefrom by Bidders and the successful Bidder. Data are made available for the convenience and information of the Bidders. Calculations and data included in the Report are to be used for information only.

2. Additional borings and other explanatory operations may be made by the Contractor and shall be done at no additional cost to the Government.

B. REPORTS AND LOGS

Enclosed in this section is:
THE COMPLETE GEOTECHNICAL DATA REPORT AND LOGS
Geotechnical Data Report
Sabin Dam Removal and Boardman River Restoration
Traverse City, Michigan
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Table 5-5: Summary of Unconfined Compressive Strength of Concrete Cores
1 Introduction

This Geotechnical Data Report presents the results of AECOM's geotechnical exploration performed in conjunction with the Sabin Dam removal project, in Traverse City, Michigan and as part of the larger Boardman River Restoration Project.

The information derived from our exploration is assembled herein and includes a description of the results of our field exploration, laboratory testing program and a graphic presentation of the boring logs. Interpretation of subsurface conditions and geotechnical engineering recommendations for the project will be incorporated into the project plans and specifications and/or will be provided under a separate cover within various technical memoranda prepare as part of the project scope.

1.1 Existing Site Conditions

The Sabin Dam is located (approximate latitude N 44.7079° and longitude W 85.622968° (NAD 83)), in Garfield Township, Grand Traverse County, Michigan. The investigated project site is located on the grassy area to the west of the auxiliary spillway and within the auxiliary spillway slab itself, as shown in Figure 1 – General Location Map in the report attachments.

The Sabin Dam is a hydroelectric dam originally constructed in 1906 and then completely rebuilt in 1930. Power generation was terminated after 2006, and the dam was decommissioned. Upon decommissioning, dam safety inspections were conducted in compliance with Michigan Department of Environmental Quality regulations. Based on these regulations water levels were required to be lowered approximately 4 feet. This pool elevation has been maintained ever since. The current impoundment has a normal pool elevation around 609 feet and an approximate surface area of 25 acres (gates fully open). Prior to 2011, the pool elevation was maintained at around 613 feet with a pool surface area of 38 acres. In its current configuration, the Boardman River flows through the existing powerhouse at Sabin Dam during normal flows, and overflows into the adjacent auxiliary spillway during large floods. The auxiliary spillway is a concrete ogee structure, with reinforced concrete sidewalls, floor slab, and appurtenances. Tetrahedron rip-rap is present at the downstream end of the spillway, to protect against scour. The spillway and powerhouse intake are regulated with gates, and the impoundment elevation is currently maintained with the gates fully open.

1.2 Project Understanding

After an extensive feasibility study and public involvement process, the Boardman River Dams Committee resolved in 2007 to remove Sabin Dam, as part of a program that will also remove or modify the other dams (Brown Bridge, Boardman and Union Street dams) and perform restoration along more than 20 miles of the Boardman River near Traverse City, Michigan. The goals of the restoration project are to restore the river to a natural cold water, free flowing river and improve cold water species fish passage and habitat. The Sabin Dam removal is the last of the three dams to be removed in this larger project, the Brown Bridge Dam having been removed in 2012 and the Boardman Dam scheduled for removal in 2017. The goal of this project is to successfully remove the Sabin Dam in a controlled manner with downstream transport of impounded sediment minimized and limited to a degree that is practical given the nature of dam removal projects. The project also includes an array of ecological restoration objectives, including restored fish passage, improved water quality, and restoration of aquatic and riparian habitat.

The overall project will include removal of the existing Sabin Dam, and construction/restoration of approximately 4,100 LF of the Boardman River channel and adjacent floodplain areas. This geotechnical exploration has been performed to support the dam/powerhouse removal activities. The dam removal will involve demolition of the auxiliary spillway and powerhouse and construction of a new restored channel aligned to cross the current location of the powerhouse. The (currently underwater) slopes of the pond adjacent to the dam will be nominally regraded and stabilized.

Sabin Dam will be demolished and removed in a staged breaching sequence. Breaching will begin by removing the auxiliary spillway to the top of the powerhouse intake sill elevation (approximate El. 606). The removal will be performed in 1 foot increments to allow for drawdown of the pond in a controlled manner. Once the pond has been drawn down to the powerhouse intake, stop logs will be installed across the intake and a diversion berm will be constructed between the powerhouse and spillway on the downstream side of the dam. At this time, all upstream river flows will pass only over the auxiliary spillway. Spillway demolition will then continue to El. 598.5, while simultaneously constructing the permanent river channel downstream of the powerhouse. An upstream diversion berm will then be constructed to divert flows away from the
powerhouse intake and isolate the powerhouse. Upon completion of this berm, the powerhouse will be completely demolished and removed, and the permanent river channel will be constructed at and upstream of the powerhouse. Upon completion of the channel, the upstream diversion berm will be removed, and river flows will be switched over the newly-constructed channel on the powerhouse side. The remainder of the spillway will then be demolished and removed.
2 Geotechnical Exploration Program

2.1 Field Exploration

A total of four (4) exploratory borings were advanced for this study to depths of 25.0 to 59.3 feet below existing ground surface (bgs). The approximate locations of the borings are shown on Figure 2 – Geotechnical Boring Location Map.

Prior to drilling, specific boring locations were established within the auxiliary spillway and/or very close vicinity of the proposed dam removal. Boring locations were identified in the field relative to existing site features. AECOM contacted the MISS DIG system at least 72 hours before drilling, to locate and mark underground utilities. Prior to drilling the borings within the spillway (B-1 and B-2, see below), the spillway gate system and slab were repaired/cleaned by the City.

2.1.1 Exploratory Soil Borings

The exploratory soil borings were drilled on August 31 and September 1, 2016. A summary of subsurface exploration performed and the corresponding boring locations are presented in Table 2-1, below:

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</tr>
</tbody>
</table>

The boring locations were identified in the field relative to existing site features and were not formally surveyed. At the site, AECOM used a handheld global positioning device (GPS) unit and hand measurements from established landmarks to obtain the position of each boring. These data are summarized above in Table 2-1.

Drilling was performed by two different contractors hired by AECOM, Pearson Drilling, Co. and Gosling Czubak Engineering Sciences Inc., of Lake City, MI and Traverse City, MI, respectively. Pearson Drilling, Co. advanced borings B-01 and B-02 from the existing spillway floor slab using an Action Renegade Rubber-track ATV-mounted drill rig, in conjunction with 4.25-inch inner diameter hollow stem augers. The drill rig was lowered into the spillway using a crane operation. Gosling Czubak Engineering Sciences Inc. advanced boings B-03 and B-04 using a CME 75 Truck MT mounted drill rig, in conjunction with 4.25-inch inner diameter hollow stem augers.

Soil samples were generally retrieved at 2.5-foot vertical intervals, (after coring through the concrete floor at borings B-01 and B-02), in the upper 10 feet bgs and 5-foot intervals thereafter; using nominal 2-inch diameter split spoon samplers. Sampling generally occurred as follows: After each borehole was drilled to the specified depth, the sampler mounted on the drill rods was lowered to the bottom, seated, and then driven into the soil with a hammer to retrieve a Standard Penetration Test (SPT) sample in general accordance with ASTM D1586. The SPT samplers were advanced using a 140-pound safety hammer with a free fall of 30 inches for each blow. The number of hammer blows required to advance the sampler each of three successive 6-inch increments was recorded in the field. The number of blows required to advance the sampler for the last 12 inches was recorded as the penetration resistance (blows-per foot or “N”). Where fine-grained soils were encountered, a pocket penetrometer was used to correlate the shear strength of the samples.

Groundwater levels were observed and measured during and immediately after drilling in the open boreholes. Borings B-01 and B-02 were backfilled with bentonite chips and sand and finished with a concrete patch to match the concrete floor in kind. Borings B-03 and B-04 were finished as groundwater observation wells.
All drilling and backfill operations were supervised by an AECOM Engineering Geologist, who logged and visually classified the soils encountered during drilling in accordance with the Unified Soil Classification System (ASTM D 2487). The SPT samples were placed in glass jars, sealed with a lid, and then transported to AECOM’s Cleveland, Ohio office, where our geotechnical project team further inspected the samples and verified the field classifications. Select representative samples were shipped to AECOM’s soil mechanics laboratory in Conshohocken, PA for laboratory testing.

Logs of the borings were prepared based on the soil classification made in the field and modified based on the results of laboratory testing results. Graphical boring logs are presented in Appendix A of this report.

### 2.1.2 Spillway Wall Concrete Coring

Four (horizontal) concrete cores were obtained from the sidewalls of the auxiliary spillway, two from the right (eastern) wall and two from the left (western) wall, to determine concrete strength. The cores were nominal 4-inch diameter.

All cores were drilled from the internal face of the spillway. The eastern wall cores were designated as C-01 and C-02. C-01 was cored 39 feet north from the toe of the ogee spillway and measured 1.5 feet from the top and 5.3 feet from the bottom of the wall. The core went completely through the wall at 24-inches in depth. C-02 was cored 10 feet north from the toe of the ogee spillway and measured 5 feet from the top of the wall and 2.1 feet from the bottom of the wall. The core was drilled to 43.5-inches and did not make it through the wall. The western wall cores were designated as C-03 and C-04. C-03 was cored 11 feet north of the toe of the ogee spillway and measured 1.5 feet from the top and 4.4 feet from the bottom of the wall. The core was drilled completely though the wall to 25.5-inches in depth. C-04 was cored 37 feet north of the ogee spillway and measured 5.5 feet from the top and 1.5 feet from the bottom of the wall. The core was drilled completely though the wall to 24-inches in depth.

Information related to the concreted cores tested can be found in subsequent sections. Laboratory testing results are presented in Appendix B of this report.

### 2.2 Laboratory Testing

Representative soil samples obtained from the exploratory borings were tested at AECOM’s soil mechanics laboratory in Conshohocken, PA. The laboratory program consisted of the following type and number of tests:

- Moisture content determination (ASTM D2216) – 16 tests
- Particle-size analysis (ASTM D422) – 15 tests
- Atterberg limits determination (ASTM D4318) – 3 tests
- Organic Content (ASTM D2974) – 2 tests
- Compressive Strength Test of Concrete Cores (ASTM C42) – 4 tests

The results of the laboratory testing are summarized in Appendix A on the logs of borings at the corresponding sample depths. Complete results of the laboratory tests are presented in Appendix B of this report.
3 Regional Geologic Setting

3.1 Locational Setting

Sabin Dam is located in Garfield Township, Grand Traverse County, MI approximately 1800 feet west of the intersection of N. Keystone Road and Birmley Road. At the approximate center of the Sabin Dam, the latitude and longitude coordinates are N 44.707961°, W -85.622968°. The elevation of the spillway is approximately 612 feet above sea level. Sabin Pond is formed behind the dam as a result of surface water impoundment. The Boardman River flows through Sabin Pond from the south, then flows over the Sabin Dam northward and downstream approximately 1.9 miles into Boardman Lake and then flows approximately 2.3 miles northward into the West Arm Traverse Bay of Lake Michigan.

3.2 Physiographic Setting

Sabin Dam is located within the Northern Lower Peninsula Tunneled Uplands sub-region of the major physiographic region identified as the Northern Lower Peninsula High Hills. The Northern Lower Peninsula Tunneled Uplands is characterized as a high relief area of large, broad, generally flat-floored valleys between uplands formed in thick, sandy drift; upland areas are steep-sided, gullied and/or hummocky (Schaetzl et al., 2013).

3.3 Geological Setting

Repeated advancements and retreats of glaciers during the Pleistocene (1.8 million to 11.7 thousand years ago) Ice Age shaped the landscape and deposited soils in the vicinity of Sabin Dam. Glacial-related deposits and events during the late-Wisconsinan period (approximately 24,000 to 11,700 years ago) and Holocene period (11,700 years ago to present) shaped the present surface and drainage path of the Boardman River in the Sabin Dam area. Earlier Pleistocene glacial events deposited glacial material which is not well distinguished in the soil profile.

In Grand Traverse County, glaciers deposited the Manistee Moraine consisting of hummocky topography, 0.5 to 4.5 miles in width; the Manistee Moraine is located within 1500 feet east of the eastern Sabin Pond shoreline and generally forms a "v-shaped" border along the upstream course of the Boardman River from Sabin Dam to a point approximately 2.5 mile south of Sabin Dam; at this point the Boardman River flows southeast to northwest through the Manistee Moraine.

The moraine consists largely of coarse-grained till deposits (unsorted mixture of gravel, sand, silt and clay) deposited by melting ice during the final glacial retreat in the Michigan area between 13,000 and 11,850 years ago. The Port Huron Moraine, deposited just prior to the Manistee Moraine, was located 3 to 6 miles south of the Manistee Moraine. As glacial ice deposited by the Manistee moraine receded northward, large volumes of glacial meltwater could not flow northward because the glacier occupied Traverse Bay; therefore glacial meltwater flowed southwestward, confined between the two moraines in part, and towards the eastern shore of Lake Michigan where glacial fluvial outwash deposits consisting of sorted sand and gravel were deposited along its course. In this way, the upper portion of the Boardman River, south east of Sabin Pond, was formed on the south side of the Manistee Moraine. After this event, continued northward glacial retreating creating more meltwater was followed by a complicated history of variable ancestral Lake Michigan stages, caused by variable ancestral Great Lakes outlets and isostatic uplift. (Isostatic uplift is the crustal-upward "springing" action caused by the release of weight from the glacier as it melted; it continues to the present time at a rate in the Traverse City area of approximately 0.5 feet per century (Larsen, 1987)).

Between approximately 11,600 and 10,000 years ago, Lake Algonquin, (an ancestral lake to Lake Huron and Lake Michigan) occupied portions of the Traverse Bay area and portions of the Lake Michigan basin and transgressed onto the Traverse City area to approximate elevation 605 feet, depositing lacustrine sands and gravel within the Boardman River valley and sometimes over previous glacial till deposits. Between 10,000 and 3000 years ago, ancestral Traverse Bay lake levels dropped and rose to elevations lower or higher than the present day; during low water level periods, headward (southward) erosion and drainage development on the north side of the Manistee Moraine, eventually cut through its entire width at an area approximately 3 miles south of Sabin Dam. Once this breach occurred, the upper Boardman River (located on the south side of the Manistee Moraine) was captured and diverted to flow northward through the general area of the current lower Boardman River course. The Boardman River deposited alluvium consisting of sorted deposits of mostly sand and gravel within the
immediate river area and sorted silt and clay deposits within its floodplain areas. Some of the alluvium was reworked glacial fluvial material that had been deposited earlier.

At Sabin Dam, bedrock was identified as the Devonian-age (419 to 359 million years ago) Ellsworth Shale. The top of bedrock is indicated to be between elevation 200 and 400 feet, indicating that bedrock is between 212 and 412 feet deep (Cummings, 1990). The Ellsworth Shale is part of the western flank of the Michigan Basin where bedrock dips to the southeast.

### 3.4 Historical Subsurface Information

AECOM reviewed reports and information pertaining to two historical subsurface investigations conducted by others at the Sabin Dam. These included:


The Mead and Hunt work included two borings drilled at the crest and downstream toe of the pond perimeter embankment slope, approximately 200 ft to the east of the auxiliary spillway. The report included boring logs for each boring, three grain size analyses, and three Atterberg Limit tests. The borings indicated primarily loose to medium dense sandy soils comprising the embankment, with silty sands interbedded with silts and organic soils encountered at the toe of the embankment.

The MTC work included one boring drilled from the crest of the ogee weir at the auxiliary spillway and advanced to a depth of 77 ft below the crest. The boring encountered primarily loose to medium dense sands to a depth of about 40 ft below the crest of the weir (which were interbedded with organic soils in the uppermost 20 ft), underlain by dense to very dense sands interbedded with hard clays. The report also included limited index and direct shear testing, mostly from the uppermost loose sands and organic soils.

Location Maps, boring logs, and laboratory data from these historical explorations have been excerpted and are presented in Appendix C of this report.
4 Site and Subsurface Conditions

4.1 Subsurface Conditions

The subsurface soils at the project site are Wisconsinan age glacial till, lacustrine, and fluvial deposits. The subsurface profile of the Site is relatively consistent, and was generally comprised of the following units (from highest to lowest elevation): Surficial materials consisting of topsoil; fill material deposit soils; Alluvium deposits; and Coarse-grained glaciofluvial soils, which has Lacustrine layers at greater depths.

The following sections describe the site-specific subsurface conditions in detail and are based on the results of the field exploration and laboratory testing performed at this site.

4.1.1 Surficial Materials

Topsoil was encountered at the ground surface in all borings. The topsoil thickness ranged from about 3-inches to about 4-inches.

4.1.2 Fill Material Deposits

Fill Material deposits were encountered below the topsoil in borings outside of the spillway. The deposit was described as a moist, brown with gray motting silty sand (SM), with varying amounts of sand, and trace amounts of gravel. The materials were first encountered within 1 foot of the ground surface, and extended and extended to depths varying from about 0.5 to about 8.5 ft. below ground surface (bgs), and had an average thickness of 4.5 ft. The deposit terminated in a laminated structure, indicating that it may be native material of lacustrine origin.

SPT results in the sandy fill materials ranged from 4 to 8 blows per foot (bpf), with an average value near 6 bpf.

4.1.3 Alluvium Deposited Soils

Alluvium Deposited soils, were encountered below the fill material on the northern side of the spillway and beneath the spillway, at all boring locations. The soils were most frequently described as moist to wet, brown to gray interbedded sand (SP) to a silty sand (SM or SP-SM). The sands generally presented variable interbedded layers of clay and peat content (less than or too 1 ft. thick) and was noted within the deposit at three borings, B-01, B-02, and B-04. The interbedded alluvium unit was first encountered at a depth of approximately 3.0 ft. bgs in the spillway borings and 9.0 ft. bgs in the borings on the northern side of the spillway. The material extends to the depth approximately 17.0 ft. of borings B-01 and B-02, while borings B-03 and B-04 show the alluvium material extending to approximately 25.0 ft.

SPT results in the alluvium deposited soils ranged from 1 bpf to 19 bpf, with an average of 5 bpf. The average SPT N-value, indicating a loose to medium dense deposit in the ranges described above.

4.1.4 Glacial Fluvial Deposited Soils

Glacial Fluvial deposited soils were encountered subsequently following the alluvium deposits in all borings. The soils were most frequently described as wet light brown to brown poorly graded sand (SP) to with trace to with gravel. This material was throughout borings B-01, B-02, and B-04 until termination, 25.0 ft., 25.0 ft., and 40.0 ft.; respectively. However, boring B-03 had intermediate layers of lacustrine, glacial fluvial, and till deposits. The interlayered lacustrine deposits are described as wet grayish-brown clayey sand (SC), interbedded with lean clay. In addition, the glacial fluvial deposits were described as wet brown sand (SP-SM or SW-SM) with gravel. In this boring, auger advancement was terminated at a depth of 59.3 ft. bgs.

SPT results in the lacustrine materials ranged from 15 to 21 blows per foot (bpf), with an average value near 18 bpf. Pocket penetrometer values ranged from 0.5 to greater than 2.75 tons per square foot (tsf), with an average near 1.5 tsf, indicating a soft to stiff consistency, on average.

4.1.5 Groundwater Conditions

Groundwater was monitored during and after the completion of drilling operations. Borings B-01 and B-02 were advanced in the auxiliary spillway and therefore the water ranged from 8-inches to 15-inches above ground surface at start of drilling.
During drilling of B-03 and B-04, groundwater was first noted in the samples at a depth of approximately 6.0 ft. and 13.5 ft. at boring locations, respectively. Water measurements in developed wells of B-03 and B-04 was 17.4 ft. bgs 62 minutes after development and 6.4 ft. bgs 45 minutes after development, respectively.

It is noted that, due to the short time that the boreholes and wells that were monitored and the season of drilling, groundwater levels during the subsurface exploration most likely did not reach equilibrium. The static groundwater table will most likely follow the natural topography and will fluctuate with seasonal variations in climate.
5 Summary of Laboratory Testing Results

5.1 Summary of Laboratory Testing Scope

The laboratory testing program performed for the Sam Dam removal was intended to obtain information on index properties of the subsurface materials at the site. The laboratory testing program for characterization of the materials at Sabin Dam are summarized in Table 5-1.

<table>
<thead>
<tr>
<th>ASTM Designation</th>
<th>Test Type</th>
<th>Number of Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2216</td>
<td>Moisture Content</td>
<td>16</td>
</tr>
<tr>
<td>D4318</td>
<td>Atterberg Limits</td>
<td>3</td>
</tr>
<tr>
<td>D422</td>
<td>Sieve/Hydrometer</td>
<td>15</td>
</tr>
<tr>
<td>D2974</td>
<td>Organic Content</td>
<td>2</td>
</tr>
<tr>
<td>C42</td>
<td>Unconfined Compressive Strength</td>
<td>4</td>
</tr>
</tbody>
</table>

5.2 Summary of Laboratory Testing Results

A summary of laboratory test results for each stratum encountered during the exploration at Sabin Dam are presented in Tables 5-2, 5-3, and 5-4. Concrete core laboratory test results are summarized in Table 5-5. See Appendix B and boring logs in Appendix A for a complete list of laboratory test data and results.

5.2.1 Fill Material

Table 5-2 summarizes the results of laboratory testing performed within the fill material.

<table>
<thead>
<tr>
<th>LAB TEST</th>
<th>Range</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index/General Properties:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Content (%) (1 test)</td>
<td>-</td>
<td>10.0</td>
</tr>
<tr>
<td>Particle Size Analysis (%) (1 test)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Gravel (retained &gt; No. 4 Sieve)</td>
<td>-</td>
<td>6.8</td>
</tr>
<tr>
<td>Percent Sand (&lt; No. 4 and &gt; No. 200 Sieve)</td>
<td>-</td>
<td>68.5</td>
</tr>
<tr>
<td>Percent Fines (passing No. 200 Sieve)</td>
<td>-</td>
<td>24.6</td>
</tr>
</tbody>
</table>
5.2.2 Alluvium Deposits

Table 5-3 summarizes the results of laboratory testing performed within the alluvium deposits.

<table>
<thead>
<tr>
<th>LAB TEST</th>
<th>Range</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index/General Properties:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Content (%) (6 test)</td>
<td>12.9 – 97.1</td>
<td>33.3</td>
</tr>
<tr>
<td>Atterberg Limits (%) (2 test)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Plastic Limit</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td><strong>Particle Size Analysis (%) (5 test)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Gravel (retained &gt; No. 4 Sieve)</td>
<td>0.0 – 12.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Percent Sand (&lt; No. 4 and &gt; No. 200 Sieve)</td>
<td>60.7 – 97.3</td>
<td>77.7</td>
</tr>
<tr>
<td>Percent Fines (passing No. 200 Sieve)</td>
<td>2.7 – 33.9</td>
<td>17.2</td>
</tr>
<tr>
<td>Organic Content (%) (2 test)</td>
<td>7.5 – 11.0</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Note: NP indicates non-plastic material

5.2.3 Glacial Fluvial Deposits

Table 5-4 summarizes the results of laboratory testing performed within the glacial fluvial deposits.

<table>
<thead>
<tr>
<th>LAB TEST</th>
<th>Range</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index/General Properties:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Content (%) (9 test)</td>
<td>9.0 – 23.4</td>
<td>15.4</td>
</tr>
<tr>
<td>Atterberg Limits (%) (1 test)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Plastic Limit</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td><strong>Particle Size Analysis (%) (9 test)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Gravel (retained &gt; No. 4 Sieve)</td>
<td>0.0 – 56.9</td>
<td>19.5</td>
</tr>
<tr>
<td>Percent Sand (&lt; No. 4 and &gt; No. 200 Sieve)</td>
<td>35.9 – 96.4</td>
<td>68.3</td>
</tr>
<tr>
<td>Percent Fines (passing No. 200 Sieve)</td>
<td>3.6 – 55.6</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Note: NP indicates non-plastic material
5.2.4 Concrete Cores

Four concrete cores samples obtained from the sidewalls at the auxiliary spillway were prepared at a 2:1 (length:diameter) ratio and tested in unconfined compression. The results of the unconfined compressive strength for the concrete cores ranged between 2,889 to 6,277 pound per square inch (psi); with an average strength of 4,827 psi. The dry unit weight of the concrete cores ranged between 132 to 148 pounds per square foot (pcf).

Table 5-3 summarizes the results of the unconfined compressive strength testing on the concrete cores.

<table>
<thead>
<tr>
<th>Core No.</th>
<th>Orientation Downstream</th>
<th>Unit Weight (pcf)</th>
<th>Unconfined Compressive Strength (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-01</td>
<td>Right</td>
<td>134.2</td>
<td>6,277</td>
</tr>
<tr>
<td>C-02</td>
<td>Right</td>
<td>148.4</td>
<td>5,459</td>
</tr>
<tr>
<td>C-03</td>
<td>Left</td>
<td>132.5</td>
<td>2,889</td>
</tr>
<tr>
<td>C-04</td>
<td>Left</td>
<td>147.4</td>
<td>4,685</td>
</tr>
</tbody>
</table>
6 Limitations

This report presents only the findings and data obtained during the course of the subsurface exploration performed. The data presented herein represent the conditions encountered at the specific locations and at the specific times at which our exploration took place. It should be noted that variations in stratigraphy and characteristics and groundwater conditions between exploration locations, that may become evident during construction, are possible.

The geotechnical information presented in this report is based on the data collected for this project. The geotechnical information presented in this report should not be used for other projects or purposes. Conclusions made from these data by others are their responsibility. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

This geotechnical investigation was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the geological and geotechnical engineering professions. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.
Figures

Figure 1 – General Site Location Map
Figure 2 – Geotechnical Boring Location Map
Figure 1. Site Location and USGS Topographic Map
Created for: Grand Traverse County, November 11, 2016, JMM, AECOM Project: 60506700

Sabin Dam Removal and Boardman River Restoration Project
Garfield Township, Grand Traverse County, Michigan
### Key to Log of Boring

**Project:** Sabin Dam Removal  
**Project Location:** Garfield Township, MI  
**Project Number:** 60506700.1

#### COLUMN DESCRIPTIONS

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Elevation: Elevation in feet referenced to mean sea level (MSL) or site datum.</td>
</tr>
<tr>
<td>2</td>
<td>Depth: Depth in feet below the ground surface.</td>
</tr>
<tr>
<td>3</td>
<td>Sample Type: Type of soil sample collected at depth interval shown; sampler symbols are explained below.</td>
</tr>
<tr>
<td>4</td>
<td>Sample Number: Sample identification number.</td>
</tr>
<tr>
<td>5</td>
<td>Sampling Resistance: Number of blows required to advance driven sampler each 6-inch interval, or distance noted, using a 140-lb hammer with a 30-inch drop.</td>
</tr>
<tr>
<td>6</td>
<td>Recovery: Percentage of driven sample length actually recovered.</td>
</tr>
<tr>
<td>7</td>
<td>Pocket Penetrometer: Pocket penetrometer field consistency measurement in tons per square foot (tsf).</td>
</tr>
</tbody>
</table>

#### TYPICAL MATERIAL GRAPHIC SYMBOLS

- [ ] lean CLAY (CL)  
- [ ] poorly graded SAND (SP)  
- [ ] sandy CLAY (SC)  
- [ ] Peat  
- [ ] Topsoil  
- [ ] well graded GRAVEL (GW)

#### OTHER GRAPHIC SYMBOLS

- [ ] Water level in boring ATD  
- [ ] Water level in boring at time indicated after drilling  
- [ ] Minor change in material properties within a lithologic stratum  
- [ ] Inferred or gradational lithologic contact

#### TYPICAL WELL GRAPHIC SYMBOLS

- [ ] Drill cuttings  
- [ ] PVC pipe in cement  
- [ ] Slotted PVC pipe in filter sand  
- [ ] PVC pipe in bentonite chips  
- [ ] PVC pipe in filter sand  
- [ ] Bottom plug in filter sand

#### TYPICAL SAMPLER GRAPHIC SYMBOLS

- [ ] Split Spoon

### Soil Classifications

Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.
Drilling Method: Electric Concrete Coring with water/Hollow Stem Auger
Drill Rig Type: Action Renegade Rubber Track ATV
Groundwater Level(s): 8" below ground surface upon completion of coring; 5" at completion of drilling

**MATERIAL DESCRIPTION**

- **SS-1**: 2 4 6 33 NA
  - Material: 11.5" Concrete
  - Description: Loose, wet, brown coarse to fine SAND (SP-SM), trace gravel [FILL]
  - Recovery, %: NA
  - Pocket Penetrometer, lbf: NA

- **SS-2**: 3 3 2 83 NA
  - Material: Concrete cobbles and granite cobbles (up to 3.5" in diameter)
  - Description: Loose, moist to wet, light brown interbedded fine SAND (SP) and peaty sand [ALLUVIUM]
  - Recovery, %: NA
  - Pocket Penetrometer, lbf: NA

- **SS-3**: 3 12 7 33 NA
  - Material: 1.5" undecayed tree wood
  - Description: Becomes medium dense and brown
  - Recovery, %: NA
  - Pocket Penetrometer, lbf: NA

- **SS-4**: 20 11 16 50 NA
  - Material: Medium dense, wet, light brown poorly graded SAND (SP-SM) with silt and gravel [GLACIAL FLUVIAL]
  - Recovery, %: NA
  - Pocket Penetrometer, lbf: NA

- **SS-5**: 10 16 50/4.5" 73 NA
  - Material: Becomes very dense, with increasing sand
  - Recovery, %: NA
  - Pocket Penetrometer, lbf: NA

- **SS-6**: 20 10 7 78 NA
  - Material: Becomes medium dense and light brown
  - Recovery, %: NA
  - Pocket Penetrometer, lbf: NA

- **SS-7**: 25 9 8 NR NA
  - Material: Becomes mostly fine SAND without gravel
  - Recovery, %: NA
  - Pocket Penetrometer, lbf: NA

**REMARKS AND OTHER DETAILS**

- Water Content, %: 38.3
  - %G=0.0
  - %S=85.0
  - %F=15.0
  - Organics = 7.5%

- Elevation, feet: 0
  - DEPTH
  - SAMPLING
  - RECOVERY

**End of Boring at 25.0´ bgs**
**Log of Boring B-02**

**Project: Sabin Dam Removal**
**Project Location:** Garfield Township, MI
**Project Number:** 60506700.1

---

**Date(s) Drilled:** 8/31/2016
**Logged By:** T. George
**Checked By:** V. Gautam

**Drilling Method:** Electric Concrete Coring with water/Hollow Stem Auger
**Drill Rig Type:** Action Renegade Rubber Track ATV
**Groundwater Level(s):** 15" below ground surface at start up
**Boring Location:** N 509,759.1 E 19,358,572.6

<table>
<thead>
<tr>
<th>Elevation, feet</th>
<th>Depth, feet</th>
<th>Type</th>
<th>Number</th>
<th>Sampling Method</th>
<th>Recovery, %</th>
<th>Hammer Data</th>
<th>Remarks and Other Details</th>
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<tbody>
<tr>
<td>575</td>
<td>0</td>
<td>SS-1T</td>
<td>WOH</td>
<td>2&quot; Split Spoon</td>
<td>78</td>
<td>140#/30&quot; Drop Auto</td>
<td>Very loose, wet, brown and dark brown organic clayey SAND (SP) [ALLUVIUM]</td>
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<tr>
<td>590</td>
<td>0</td>
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<td>WOH</td>
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<td>1</td>
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<td>Very soft, moist to wet, dark brown PEAT (PT)</td>
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<td>590</td>
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<td>1</td>
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<td>1</td>
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<td>Loose, wet, light brown fine SAND (SP) with minor interbedded peat layers (&lt;0.25&quot; thick, spaced &gt;2&quot; apart) [ALLUVIUM]</td>
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<td>585</td>
<td>15</td>
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<td>Loose, wet, brown poorly graded GRAVEL (GP-GW) [GLACIAL FLUVIAL]</td>
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<tr>
<td>580</td>
<td>15</td>
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<td>becomes medium dense</td>
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<td>SS-5</td>
<td>5</td>
<td>74</td>
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<td>Very dense, wet, light brown poorly graded coarse to fine SAND (SP) with gravel [GLACIAL FLUVIAL]</td>
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<tr>
<td>580</td>
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<td></td>
<td>becomes medium dense and gray brown</td>
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<tr>
<td>575</td>
<td>25</td>
<td>SS-6</td>
<td>3</td>
<td>56</td>
<td>NA</td>
<td></td>
<td>23.4</td>
</tr>
</tbody>
</table>

**End of Boring at 25.0’ bgs**

---

**Note:** Water was added to augers to prevent heaving sands.
**MATERIAL DESCRIPTION**

**S-1** 3 4 61 NA

Loose, moist, brown medium to fine silty SAND (SM), trace coarse sand [FILL]

becomes with increasing silt content, trace gravel

**S-2** 3 3 83 NA

becomes with trace grayish brown, trace dark gray organic staining

**S-3** 3 3 61 NA

Stiff, moist, light brown lean CLAY (CL) with silt laminae

**S-4T** 2 1.75

Stiff, moist, light brown lean CLAY (CL) with silt laminae

**S-4M** 2 78

Stiff, moist, light brown lean CLAY (CL) with silt laminae

**S-4B**

Stiff, moist, light brown lean CLAY (CL) with silt laminae

**S-5** 3 1 89 NA

0.8

Very loose, wet, brown silty SAND (SM), trace gravel [ALLUVIUM]

**WOB**

0.8

**WOB**

100 NA

0.8

**S-6**

becomes gray

becomes brown

**S-7T** 2 1.75

Medium dense, wet, brown fine SAND (SP-SM) [GLACIAL FLUVIAL]
**LOG OF BORING B-03**

---

**MATERIAL DESCRIPTION**

- Possibly less gravel at 57' bgs
- Becomes very dense

**SAMPLES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
<th>Sampling Resistance Blow</th>
<th>Recovery, %</th>
<th>Pocket Penetrometer, ft</th>
<th>Graphic Log</th>
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<td>SS-14</td>
<td>14</td>
<td>50/3&quot;</td>
<td>NR</td>
<td>NA</td>
<td>End of Boring at 59.3' bgs</td>
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</tbody>
</table>

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**DEPTH, ELEVATION**

- Depth, feet: 540
- Elevation, feet: 535

---

**PROJECT: Sabin Dam Removal**

**Project Location:** Garfield Township, MI

**Project Number:** 60506700.1
Dark brown vegetative silty SAND (SM) with roots

- Loose, moist, dark becoming light brown fine sandy SILT (SM), trace gravel, possible FILL

Loose, moist, light brown with oxidation staining fine to medium SAND (SP-SM), trace gravel, horizontal bedding [ALLUVIUM]

- becomes very loose, wet
- becomes grayish-brown without oxidation staining
- 2" undecayed tree wood at 6.8' bgs

Medium stiff, moist, grayish brown brown lean CLAY (CL) with interbedded peat

- Loose, wet, light brown fine to medium poorly graded SAND (SP) [ALLUVIUM]

Medium fine, loose SILT (SM) with roots

- becomes light and dark brown, with interbedded roots, organics

Loose, fine SAND (SP) without roots [ALLUVIUM]

- becomes light brown fine SAND (SP) without roots [ALLUVIUM]

- becomes medium dense, trace gravel [GLACIAL FLUVIAL]
<table>
<thead>
<tr>
<th>Depth, feet</th>
<th>SAMPLES</th>
<th>MATERIAL DESCRIPTION</th>
<th>ELEVATION</th>
<th>DEPTH, %</th>
<th>REMARKS AND OTHER DETAILS</th>
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</thead>
<tbody>
<tr>
<td>30</td>
<td>SS-8</td>
<td>becomes without gravel</td>
<td>8</td>
<td>11</td>
<td>NA</td>
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<td>35</td>
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<td>83</td>
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<td>40</td>
<td>SS-10</td>
<td>becomes with trace coarse sand</td>
<td>13</td>
<td>16</td>
<td>33</td>
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</table>

*End of Boring at 40.0’ bgs*
# SUMMARY OF LABORATORY TEST RESULTS

<table>
<thead>
<tr>
<th>Boring and Sample Number</th>
<th>Depth (feet)</th>
<th>Classification</th>
<th>USCS Symbol</th>
<th>Water Content (%)</th>
<th>Dry Unit Weight (pcf)</th>
<th>Plastic Limit</th>
<th>Plastic Specific Gravity</th>
<th>Organic Content (%)</th>
<th>Grain Size</th>
<th>&lt;200 (%)</th>
<th>&lt;2 (%)</th>
<th>Triaxial Compression</th>
<th>Unconfined Compression (psi)</th>
<th>Stress (psi)</th>
<th>Strain (%)</th>
<th>UU</th>
<th>CIU</th>
<th>Permeability (cm/sec)</th>
<th>Special Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1 SS-2</td>
<td>3.5-5.0'</td>
<td>Dark brown SILTY SAND</td>
<td>SM</td>
<td>38.3</td>
<td>7.5</td>
<td>15</td>
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</tr>
<tr>
<td>B-1 SS-4</td>
<td>8.5-10.0'</td>
<td>Brown POORLY GRADED SAND with SILT and GRAVEL</td>
<td>SP-SM</td>
<td>11.4</td>
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<td>6</td>
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</tr>
<tr>
<td>B-1 SS-5</td>
<td>13.5-15.0'</td>
<td>Brown POORLY GRADED SAND with SILT and GRAVEL</td>
<td>SP-SM</td>
<td>9.9</td>
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<td>8</td>
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</tr>
<tr>
<td>B-1 SS-6</td>
<td>18.5-20.0'</td>
<td>Brown POORLY GRADED SAND with SILT</td>
<td>SP-SM</td>
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<td>B-2 SS-2</td>
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<td>B-2 SS-6</td>
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<td>B-3 SS-6</td>
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<tr>
<td>B-3 SS-9</td>
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<td>Brown POORLY GRADED SAND with SILT</td>
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<td>B-3 SS-10</td>
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<td>B-4 SS-9</td>
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<td>Brown POORLY GRADED SAND</td>
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</tr>
</tbody>
</table>

Note: The soil classification is based partially on visual classification unless both grain size and Atterberg limits are performed.

★ Refer to Laboratory Test Curves

Project File Path: Project No.: 60506700

Project: Sabin Dam

Project No.: 60506700
**SUMMARY OF LABORATORY TEST RESULTS**

<table>
<thead>
<tr>
<th>Boring and Sample Number</th>
<th>Depth (feet)</th>
<th>Classification</th>
<th>USCS Symbol</th>
<th>Water Content (%)</th>
<th>Dry Unit Weight (pcf)</th>
<th>Atterberg Limits</th>
<th>Grain Size</th>
<th>Compaction</th>
<th>Consolidation</th>
<th>Unconfined Compression Stress (psi)</th>
<th>Unconfined Compression Strain (%)</th>
<th>Triaxial Compression UU</th>
<th>Triaxial Compression CIU</th>
<th>Permeability (cm/sec)</th>
<th>Special Tests</th>
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*Note: The soil classification is based partially on visual classification unless both grain size and Atterberg limits are performed.*

★ Refer to Laboratory Test Curves
### Particle Size Distribution

#### Sabin Dam Distribution

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<tr>
<th>SYMBOL</th>
<th>DESCRIPTION AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>Dark brown SILTY SAND (SM)</td>
</tr>
<tr>
<td>□</td>
<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
</tr>
<tr>
<td>▲</td>
<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
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</table>

**Project Number**: 60506700

**Completed Date**: October 2016

**Figure**: 1

---

## Particle Size (mm) vs. Percent Passing

### Particle Size Distribution

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION AND REMARKS</th>
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</thead>
<tbody>
<tr>
<td>●</td>
<td>Dark brown SILTY SAND (SM)</td>
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<tr>
<td>□</td>
<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
</tr>
<tr>
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<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
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</table>

**Project Number**: 60506700

**Completed Date**: October 2016

**Figure**: 1

---

## Particle Size Distribution

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION AND REMARKS</th>
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</thead>
<tbody>
<tr>
<td>●</td>
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<tr>
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<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
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<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
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</tbody>
</table>

**Project Number**: 60506700

**Completed Date**: October 2016

**Figure**: 1

---

## Particle Size Distribution

<table>
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<tr>
<th>SYMBOL</th>
<th>DESCRIPTION AND REMARKS</th>
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<tbody>
<tr>
<td>●</td>
<td>Dark brown SILTY SAND (SM)</td>
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<tr>
<td>□</td>
<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
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<tr>
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<td>Brown POORLY GRADED SAND with SILT and GRAVEL (SP-SM)</td>
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**Project Number**: 60506700

**Completed Date**: October 2016

**Figure**: 1
### SYMBOLS

<table>
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<th>DESCRIPTION AND REMARKS</th>
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</thead>
<tbody>
<tr>
<td>●</td>
<td>Brown POORLY GRADED SAND with SILT (SP-SM)</td>
</tr>
<tr>
<td>□</td>
<td>Brown POORLY GRADED GRAVEL with SILT and SAND (GP-GM)</td>
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<td>Brown POORLY GRADED SAND with GRAVEL (SP)</td>
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</table>

### PARTICLE SIZE DISTRIBUTION

Sabin Dam

<table>
<thead>
<tr>
<th>Project Number</th>
<th>October 2016</th>
<th>Figure 2</th>
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<tr>
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<td>October 2016</td>
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</table>
Gray brown POORLY GRADED SAND (SP)

Brown SILTY SAND (SM)

Brown SILTY SAND (SM)

Sabin Dam

Project Number 60506700

October 2016

Figure 3
### Particle Size Distribution

**Sabin Dam**

**Project Number:** 60506700  **October 2016**  **Figure 4**

---

**SYMBOL** | **DESCRIPTION AND REMARKS**
--- | ---
● | Brown SILTY SAND (SM)
■ | Gray brown POORLY GRADED SAND with SILT (SP-SM)
▲ | Gray brown SANDY SILT (ML)

---

**SYMBOL** | **Boring** | **Sample Spec** | **Spec**
--- | --- | --- | ---
● | B-3 | B-3 | B-3
■ | SS-6 | SS-9 | SS-10

**Depth (in)** | **% +3”** | **% Gravel** | **% Sand** | **% Fines** | **% -2µ** | **Cc** | **Cu** | **LL** | **PL** | **PI** | **USCS** | **w (%)**
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
18.5-20.0” | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.43 | 3.20 | NP | NP | NP | SM | 12.9
33.5-35.0” | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.43 | 3.20 | NP | NP | NP | SP-SM | 12.9
38.5-40.0” | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.43 | 3.20 | NP | NP | NP | ML | 12.9

---

**PARTICLE SIZE DISTRIBUTION**

- **2”**
- **1 1/2”**
- **1”**
- **3/4”**
- **1/2”**
- **3/8”**
- **4”**
- **10”**
- **20”**
- **40”**
- **60”**
- **100”**
- **200”**

---

**U.S. STANDARD SIEVE OPENING IN INCHES**

- 6
- 4
- 3
- 2
- 1.5
- 1
- 3/4
- 3/8
- 4
- 10
- 20
- 40
- 60
- 100
- 200

---

**U.S. STANDARD SIEVE NUMBERS**

- 1
- 2
- 3
- 4
- 6
- 10
- 20
- 40
- 60
- 100
- 200

---

**HYDROMETER COEFFICIENTS**

- **Cc**
- **Cu**
- **LL**
- **PL**
- **PI**
- **USCS**
- **w (%)**

---

**PERCENT PASSING**

- **PERCENT FINER**

---

**SYMBOLS**

- ●
- ■
- ▲
<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>Brown POORLY GRADED SAND (SP)</td>
</tr>
<tr>
<td>□</td>
<td>Brown POORLY GRADED SAND (SP)</td>
</tr>
<tr>
<td>▲</td>
<td>Brown POORLY GRADED SAND (SP)</td>
</tr>
</tbody>
</table>

**Per cent passing**

<table>
<thead>
<tr>
<th>Particle Size (Sieve #)</th>
<th>2&quot;</th>
<th>1 1/2&quot;</th>
<th>1&quot;</th>
<th>3/4&quot;</th>
<th>1/2&quot;</th>
<th>3/8&quot;</th>
<th>4</th>
<th>10</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCENT PASSING</td>
<td></td>
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</tr>
<tr>
<td>0</td>
<td>100.0</td>
<td>100.0</td>
<td>87.9</td>
<td>87.9</td>
<td>87.9</td>
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<td>99.8</td>
<td>89.3</td>
<td>85.4</td>
<td>91.0</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Sieve Opening**

- U.S. Standard Sieve Numbers
- Hydrometer

**Grades**

- Cobble
- Gravel
- Sand
- Silts or Clays

**Sabin Dam Distribution**

- Project Number: 60506700
- October 2016
- Figure 5

**Sabin Dam Sample**

- Spec
- Depth (in) 18.5-20.0'
- % +3" 0.0
- % Gravel 0.0
- % Sand 97.3
- % Fines 2.7
- % -2µ 1.04
- Cc 18.6
- Cu 2.09
- LL 1.04
- PI 1.89
- USCS SP
- w (%) 19.8

**Sabin Dam Boring**

- Symbol
- Depth (in) 18.5-20.0'
- % +3" 0.0
- % Gravel 0.0
- % Sand 97.3
- % Fines 2.7
- % -2µ 1.04
- Cc 18.6
- Cu 2.09
- LL 1.04
- PI 1.89
- USCS SP
- w (%) 19.8
### Project Information
- **Project Name:** Sabin Dam
- **Project Number:** 60506700
- **Assignment Number:** 2016-10-03
- **Report Date:** 14-Oct-16

### Sample Data
- **Boring:** C1
- **Core:** C1-2
- **Depth:** 0.83 (ft)
- **Average Length:** 7.023 (in)
- **Average Diameter:** 3.741 (in)
- **Area:** 10.99 (in$^2$)
- **L/D Ratio:** 1.9
- **Description:**

### Test Results
- **Test Date:** 11-Oct-16
- **Load at Failure:** 69,000 (lb)
- **Unconfined Compressive Strength:** 6,277 (psi)
- **Dry Unit Weight:** 134.2 (pcf)
- **Load Rate:** 0.28 (%/min)
- **Tested by:** CD
- **Reviewed by:** YM

### Before Test
![Before Test Image]

### After Test
![After Test Image]
## Project Information
- **Project Name:** Sabin Dam
- **Project Number:** 60506700
- **Assignment Number:** 2016-10-03
- **Report Date:** 14-Oct-16

## Sample Data
- **Boring:** C2
- **Core:** C2-3
- **Depth:** 1 (ft)
- **Average Length:** 7.270 (in)
- **Average Diameter:** 3.741 (in)
- **Area:** 10.99 (in²)
- **L/D Ratio:** 1.9

## Test Results
- **Test Date:** 11-Oct-16
- **Load at Failure:** 60,000 (lb)
- **Unconfined Compressive Strength:** 5,459 (psi)
- **Dry Unit Weight:** 148.4 (pcf)
- **Load Rate:** 0.28 (%/min)
- **Tested by:** CD
- **Reviewed by:** YM

## Before Test
![Before Test](image1.png)

## After Test
![After Test](image2.png)
### Project Information
- **Project Name:** Sabin Dam  
- **Project Number:** 60506700  
- **Assignment Number:** 2016-10-03  
- **Report Date:** 14-Oct-16

### Sample Data
- **Boring:** C3  
- **Core:** C3-3  
- **Depth:** 1 ft  
- **Average Length:** 6.963 in  
- **Average Diameter:** 3.741 in  
- **Area:** 10.99 in\(^2\)  
- **L/D Ratio:** 1.9

### Description:

### Test Results
- **Test Date:** 11-Oct-16  
- **Load at Failure:** 31,750 lb  
- **Unconfined Compressive Strength:** 2,889 psi  
- **Dry Unit Weight:** 132.5 pcf  
- **Load Rate:** 0.28 %/min  
- **Tested by:** CD  
- **Reviewed by:** YM

### Before Test
![Before Test Image]

### After Test
![After Test Image]
### Project Information
- **Project Name:** Sabin Dam
- **Project Number:** 60506700
- **Assignment Number:** 2016-10-03
- **Report Date:** 14-Oct-16

### Sample Data
- **Boring:** C4
- **Core:** C4-4
- **Depth:** 0.83 (ft)
- **Average Length:** 6.895 (in)
- **Average Diameter:** 3.741 (in)
- **Area:** 10.99 (in$^2$)
- **L/D Ratio:** 1.8

### Description:

### Test Results
- **Test Date:** 11-Oct-16
- **Load at Failure:** 51,500 (lb)
- **Unconfined Compressive Strength:** 4,685 (psi)
- **Dry Unit Weight:** 147.4 (pcf)
- **Load Rate:** 0.28 (%/min)
- **Tested by:** CD
- **Reviewed by:** YM

---

**Before Test**

![Before Test Image]

**After Test**

![After Test Image]
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>SAMPLE</th>
<th>REC.</th>
<th>PENETRATION (BLOWS PER FT)</th>
<th>UNIF. SOIL CLASS.</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>S1</td>
<td>5</td>
<td>12-15-15</td>
<td>SP, SM</td>
<td>Brown coarse to fine SAND, some coarse to fine gravel, little+ silt, moist</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>S2</td>
<td>10</td>
<td>9-7-8</td>
<td>SP, SM</td>
<td>Grades with light brown SAND</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>S3</td>
<td>15</td>
<td>9-8-8</td>
<td>SP, SM</td>
<td>Wet at 19.5'</td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>S4</td>
<td>20</td>
<td>5-5-6</td>
<td>SP, SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>S5a</td>
<td>25</td>
<td>4-4-5</td>
<td>SP</td>
<td>Grayish brown coarse to fine SAND with frequent black sand seams, trace fine gravel, trace silt, wet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S5b</td>
<td></td>
<td></td>
<td></td>
<td>Change approx</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>S6</td>
<td>30</td>
<td>12-12-17</td>
<td>SP</td>
<td>Brown coarse to fine sand, some coarse to fine gravel, trace silt, wet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>35</td>
<td>Spoon Refusal</td>
<td></td>
<td>Unable to sam material-32'o Driller encountered large cobbles and broken up cen</td>
<td></td>
</tr>
</tbody>
</table>

End of Boring at 38'
**LOG OF BORING**

**Project No.** 2740-88/345M  
**Boring No.** B-2  
**Sheet** 1 of 1

**Client** Mead & Hunt, Inc.  
**Location** Boardman River, Traverse City, Mi  
**Contractor** Mateco Drilling Company

<table>
<thead>
<tr>
<th>Crew Chief</th>
<th>Drill Type</th>
<th>TYPE</th>
<th>DIA.</th>
<th>NO.</th>
<th>GROUNDWATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Taggart</td>
<td>CME-850</td>
<td>HSA</td>
<td>4½&quot;</td>
<td></td>
<td>During 14'+</td>
</tr>
<tr>
<td>Inspector</td>
<td>Plugging Record: Cave in</td>
<td>Sampler</td>
<td>SPT</td>
<td>2&quot;</td>
<td>End 8'</td>
</tr>
<tr>
<td>Reviewed By</td>
<td></td>
<td>Core</td>
<td></td>
<td></td>
<td>Seepage</td>
</tr>
<tr>
<td>Elevation</td>
<td></td>
<td>Tube</td>
<td></td>
<td></td>
<td>Date Depth</td>
</tr>
<tr>
<td>Datum</td>
<td></td>
<td>Soil</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Notes</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>SAMPLE</th>
<th>REC.</th>
<th>PENETRATION (BLOWS PER 4&quot;) UNIF. SOIL CLASS.</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>S1</td>
<td>0.7</td>
<td>3-3-3</td>
<td>SP, SM</td>
<td>Brown coarse to fine+SAND, little silt, rock fragments (fill)</td>
</tr>
<tr>
<td>10</td>
<td>S2</td>
<td>1.2</td>
<td>2-3-3</td>
<td>ML, PT</td>
<td>Grayish brown clayey SILT, trace fine sand, and PEAT</td>
</tr>
<tr>
<td>15</td>
<td>S3</td>
<td>0.7</td>
<td>4-4-3</td>
<td>SM</td>
<td>Brown medium to fine SAND, little silt, wet</td>
</tr>
<tr>
<td>20</td>
<td>S4</td>
<td>1.5</td>
<td>4-5-7</td>
<td>SM, PT</td>
<td>PEAT</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>End of Boring at 22'</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Auger refusal at 22'</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Change approx. 8.5'</td>
</tr>
</tbody>
</table>

**Depth Drilled:** 22'
<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRANUL</th>
<th>% sands</th>
<th>% silts</th>
<th>% clays</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>21.9</td>
<td>68.9</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.0</td>
<td>88.4</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>□</td>
<td>0.0</td>
<td>38.5</td>
<td>62.7</td>
<td>6.8</td>
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</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D_85</th>
<th>D_60</th>
<th>D_50</th>
<th>D_30</th>
<th>D_15</th>
<th>D_10</th>
<th>C_c</th>
<th>C_r</th>
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<tbody>
<tr>
<td>0</td>
<td>NP</td>
<td>20.89</td>
<td>0.48</td>
<td>0.39</td>
<td>0.254</td>
<td>0.1681</td>
<td>0.1260</td>
<td>1.06</td>
<td>3.1</td>
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<tr>
<td>A</td>
<td>NP</td>
<td>0.47</td>
<td>0.27</td>
<td>0.25</td>
<td>0.208</td>
<td>0.1700</td>
<td>0.1665</td>
<td>0.94</td>
<td>1.0</td>
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<tr>
<td>□</td>
<td>NP</td>
<td>13.34</td>
<td>0.82</td>
<td>0.50</td>
<td>0.304</td>
<td>0.1963</td>
<td>0.1560</td>
<td>0.72</td>
<td>5.4</td>
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<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>USCS</th>
<th>AASHTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ BROWN C-F SAND, SOME C-F GRAVEL, TRACE SILT</td>
<td>SP-SM</td>
<td>SP</td>
</tr>
<tr>
<td>△ BROWN C-F SAND, TRACE C-F GRAVEL, TRACE SILT</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>□ BROWN C-F SAND, SOME C-F GRAVEL, TRACE SILT</td>
<td>SP</td>
<td></td>
</tr>
</tbody>
</table>

Project No.: 2740-88 / 345M
Project: Sabin Dam, Traverse City, Michigan

○ Location: B-1, S-3, 13.0-14.5'
△ Location: B-1, S-5B, 23.5-24.5'
□ Location: B-1, S-6, 28.0-29.5'

Date: 11-9-88

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT
MATERIALS TESTING CONSULTANTS

Fig. No.
Source: An 8 1/2 x 11-in drawing dated October 1994 prepared by Mead and Hunt.
BORING LOG TERMINOLOGY

Casing Type:  HSA = Hollow Stem Auger
             SSA = Solid Stem Auger
             FC = Flush Coupled

Sampler Type:  SPT = Standard Penetration Test split spoon; 2.0" in O.D.
               SS = Split Spoon; other than 2.0" O.D.
               CS = CME Continuous Sampler

Core Type:  NX (core diameter 2.16 in.)
            NQ (core diameter 1.88 in.)

Tube Type:  Shelby Adaptor
            Piston Adaptor

Other Types:  Rotary
              Pressuremeter

Groundwater Observations:
During - indicates water encountered during the boring
End - indicates water level immediately after drilling
Date and Depth - indicates measurements taken in an open boring on the noted date.

Depth of water is measured from the top of ground to the top of water level. Water observations in pervious soils are considered reliable groundwater levels for the date. Water observations in impervious soils may not be accurate groundwater measurements unless records are made over several days time. The groundwater level will fluctuate for both pervious and impervious soils.

Sample Number:  S = SPT, split barrel sample (ASTM D 1586)
                *S = other than 2.0" O.D. split barrel sample, size noted on log
                L = SPT with Liner
                U = Tube Sample (ASTM D 1587)
                A = Auger Cuttings
                R = Rock Coring Run
                PM = Pressuremeter

Minor Component Quantifying Terms:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace</td>
<td>&lt; 5%</td>
</tr>
<tr>
<td>Few</td>
<td>5-10%</td>
</tr>
<tr>
<td>Little</td>
<td>15-25%</td>
</tr>
<tr>
<td>Some</td>
<td>30-45%</td>
</tr>
<tr>
<td>Mostly</td>
<td>50-100%</td>
</tr>
</tbody>
</table>

Percentages are visual estimates of component percentage by weight, unless particle size analyses are performed.

Soil Type:

Coarse-Grained Soil Component:  Size or Sieve No.
Boulders:  Larger than 12"
Cobbles:  12" to 3"
Gravel - Coarse:  3" to 3/4"
    - Fine:  3/4" to No. 4
Sand - Coarse:  No. 4 to No. 10
    - Medium:  No. 10 to 40
    - Fine:  No. 40 to No. 200

Fine-Grained Soil Component Index
Silt:  < 4
Silty Clay:  4 to 7
Lean Clay:  > 7
ASTM D 2488
"Standard Practice for Description and Identification of Soils" - Visual Manual Procedure

COARSE-GRAINED

GRAVEL (% gravel > % sand)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Group Symbol</th>
<th>Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5% fines</td>
<td>GW &lt; 15% sand, ≥ 15% sand</td>
<td>Well-graded GRAVEL, Well-graded GRAVEL with sand</td>
</tr>
<tr>
<td></td>
<td>GP &lt; 15% sand, ≥ 15% sand</td>
<td>Poorly graded GRAVEL, Poorly graded GRAVEL with sand</td>
</tr>
<tr>
<td>10% fines</td>
<td>GW-GM &lt; 15% sand, GW-GC ≥ 15% sand</td>
<td>Well-graded GRAVEL with silt, Well-graded GRAVEL with clay and sand</td>
</tr>
<tr>
<td></td>
<td>GP-GM &lt; 15% sand, GP-GC ≥ 15% sand</td>
<td>Poorly graded GRAVEL with silt, Poorly graded GRAVEL with clay and sand</td>
</tr>
<tr>
<td>≥ 15% fines</td>
<td>GM &lt; 15% sand, GC ≥ 15% sand</td>
<td>Silty GRAVEL, Clayey GRAVEL with sand</td>
</tr>
</tbody>
</table>

SAND (% sand > % gravel)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Group Symbol</th>
<th>Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5% fines</td>
<td>SW &lt; 15% gravel, SP ≥ 15% gravel</td>
<td>Well-graded SAND, Poorly graded SAND with gravel</td>
</tr>
<tr>
<td></td>
<td>SW-SM &lt; 15% gravel, SW-SC ≥ 15% gravel</td>
<td>Well-graded SAND with silt, Well-graded SAND with clay and gravel</td>
</tr>
<tr>
<td>10% fines</td>
<td>SW-SM &lt; 15% gravel, SP-SM ≥ 15% gravel</td>
<td>Poorly graded SAND with silt, Poorly graded SAND with clay and gravel</td>
</tr>
<tr>
<td></td>
<td>SP-SC &lt; 15% gravel, SC ≥ 15% gravel</td>
<td>Poorly graded SAND with clay, Poorly graded SAND with clay and gravel</td>
</tr>
<tr>
<td>≥ 15% fines</td>
<td>SM &lt; 15% gravel, SC ≥ 15% gravel</td>
<td>Silty SAND, Clayey SAND with gravel</td>
</tr>
</tbody>
</table>

NOTE - Percentages are based on estimating amounts of fines, sand and gravel to the nearest 5%.
# Materials Testing Consultants, Inc.

<table>
<thead>
<tr>
<th>Project</th>
<th>Sabin Dam</th>
<th>Boring No.</th>
<th>W0303.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>Traverse City Light and Power</td>
<td>Sheet:</td>
<td>1 of 2</td>
</tr>
<tr>
<td>Location</td>
<td>Boardman R. Grand Traverse Co., MI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drill Type</td>
<td>CME 45 - Skid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crew Chief</td>
<td>D. Fair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspector</td>
<td>D. Sabin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rev. By</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevation</td>
<td>610.1 ft. (Top of Concrete)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Datum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>70'E of SE corner of powerhouse</td>
<td></td>
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</table>

**Log of Boring**

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Sample Number</th>
<th>Recovery (Blows Per 6&quot;)</th>
<th>Penetration (ASTM D 1556)</th>
<th><em>Unified Soil Class.</em></th>
<th><em>Description</em></th>
<th>Remarks</th>
<th>QP</th>
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</thead>
<tbody>
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<td>609.1</td>
<td>1</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>609.1</td>
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<tr>
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<tr>
<td>606.1</td>
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<td>605.1</td>
<td>5</td>
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<td>604.1</td>
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<td>601.1</td>
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<td>598.1</td>
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<td></td>
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<tr>
<td>598.1</td>
<td>12</td>
<td>0.1</td>
<td>7-13-15</td>
<td>SM</td>
<td>Brown silty SAND; mostly fine sand, wet</td>
<td>2' from top of concrete to steel grade drilling platform.</td>
<td></td>
</tr>
<tr>
<td>597.1</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>597.1</td>
<td>14</td>
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<tr>
<td>595.1</td>
<td>16</td>
<td>0.0</td>
<td>14-4-22</td>
<td>PT</td>
<td>Dark brown to blackish organic Silt (PEAT); mostly silty</td>
<td>Headwater at 613.3. Steel grade platform at 612.1.</td>
<td></td>
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<tr>
<td>594.1</td>
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<td></td>
</tr>
<tr>
<td>593.1</td>
<td>17</td>
<td>1.3</td>
<td>1/9'-2-4-4</td>
<td>PT</td>
<td></td>
<td>Driving on concrete core obstruction at L-1 and L-2.</td>
<td></td>
</tr>
<tr>
<td>592.1</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>591.1</td>
<td>19</td>
<td>0.8</td>
<td>4-2-2-4</td>
<td>SP</td>
<td>Grayish-brown poorly graded SAND; mostly fine sand, trace silty</td>
<td>L-5: Drove on boulder sampler partially blocked. Boulder</td>
<td>20'</td>
</tr>
<tr>
<td>590.1</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>589.1</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>588.1</td>
<td>22</td>
<td>1.0</td>
<td>6-8-17-100</td>
<td>SW-SM</td>
<td>Gray well graded SAND with silt and gravel, wet</td>
<td>L-7, pulled 4&quot; and switched to 3&quot; casing</td>
<td>20'</td>
</tr>
<tr>
<td>587.1</td>
<td>23</td>
<td>0.0</td>
<td>100&quot;</td>
<td>SW-SM</td>
<td>Grades with little coarse to fine gravel</td>
<td>Cobble/boulder at 26'. Drilled with 2.78&quot; roller bit from 28' to 30.5.</td>
<td></td>
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<tr>
<td>586.1</td>
<td>24</td>
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<tr>
<td>585.1</td>
<td>25</td>
<td>0.9</td>
<td>7-7-9-8</td>
<td>SW-SM</td>
<td></td>
<td>Drilling on obstruction at 38.5.</td>
<td></td>
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<tr>
<td>584.1</td>
<td>26</td>
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<td>583.1</td>
<td>27</td>
<td>0.8</td>
<td>7-7-14-15</td>
<td>SW-SM</td>
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<td>582.1</td>
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<tr>
<td>580.1</td>
<td>30</td>
<td>0.1</td>
<td>2-2-1-1</td>
<td>SP-SM</td>
<td>Gray poorly graded SAND with silt; mostly medium to fine sand, few silty</td>
<td></td>
<td></td>
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<tr>
<td>579.1</td>
<td>31</td>
<td></td>
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<td>578.1</td>
<td>32</td>
<td>0.1</td>
<td>9-15-9-4</td>
<td>SP-SM</td>
<td>Grades with few coarse to fine gravel, occasional COBBLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>577.1</td>
<td>33</td>
<td>0.8</td>
<td>14-6-8-9</td>
<td>SP-SM</td>
<td></td>
<td></td>
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<tr>
<td>576.1</td>
<td>34</td>
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<td>575.1</td>
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<td>574.1</td>
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<tr>
<td>573.1</td>
<td>37</td>
<td>0.8</td>
<td>1-11-9-8</td>
<td>SM</td>
<td>Brownish-gray silty SAND; mostly fine sand, little silty, little coarse</td>
<td></td>
<td>37'</td>
</tr>
<tr>
<td>572.1</td>
<td>38</td>
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<tr>
<td>571.1</td>
<td>39</td>
<td>0.8</td>
<td>5-5-8-12</td>
<td>SP-SM</td>
<td>Brownish-gray poorly graded SAND with silt, mostly fine sand, wet</td>
<td></td>
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<tr>
<td>570.1</td>
<td>40</td>
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<td></td>
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* Visual estimate following ASTM D 2488 unless laboratory testing has been performed
<table>
<thead>
<tr>
<th>Elev. FT.</th>
<th>Depth FT.</th>
<th>Sample Number</th>
<th>Penetration (Blows Per 6&quot;)</th>
<th>*Unified Soil Class.</th>
<th>*DESCRIPTION</th>
<th>REMARKS</th>
<th>QP</th>
</tr>
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<tbody>
<tr>
<td>596.1</td>
<td>41</td>
<td>S-13</td>
<td>0.0</td>
<td>-</td>
<td>Brownish-gray poorly graded SAND with silt, mostly fine sand, wet</td>
<td>No recovery at S-13 and S-14. Casing was open (no blow-in) at S-13 and S-14. Switched to rotary drilling with mud after S-14.</td>
<td></td>
</tr>
<tr>
<td>596.1</td>
<td>42</td>
<td>S-14</td>
<td>0.0</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>566.1</td>
<td>44</td>
<td>S-15</td>
<td>1.3</td>
<td>SP-SM</td>
<td>Grades with occasional some coarse to fine gravel lenses (1-2&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>562.1</td>
<td>48</td>
<td>20-24-26-30</td>
<td></td>
<td>SP-SM</td>
<td>SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>561.1</td>
<td>49</td>
<td>12-20-35-29</td>
<td></td>
<td>SP-SM</td>
<td>Gray silty SAND; mostly coarse to fine sand, little coarse to fine gravel, little silty fines, wet</td>
<td>1&quot; Fractured limestone lens at 48.9'</td>
<td></td>
</tr>
<tr>
<td>560.1</td>
<td>50</td>
<td>15-17-26-35</td>
<td></td>
<td>CL</td>
<td>Gray lean CLAY; mostly clayey fines, trace fine gravel, moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>559.1</td>
<td>51</td>
<td>18-31-37-42</td>
<td></td>
<td>SM</td>
<td>Gray silty SAND; mostly fine sand, little silty fines, wet</td>
<td>50'</td>
<td></td>
</tr>
<tr>
<td>558.1</td>
<td>52</td>
<td>23-27-40</td>
<td></td>
<td>SP-SM</td>
<td>Gray poorly graded SAND with silt; mostly medium to fine sand, few silty fines, wet</td>
<td>60'</td>
<td></td>
</tr>
<tr>
<td>557.1</td>
<td>53</td>
<td>21-22-30</td>
<td></td>
<td>CL/SC</td>
<td>Gray sandy lean CLAY; mostly clayey fines, some coarse to fine sand, moist</td>
<td>64'</td>
<td>2.5</td>
</tr>
<tr>
<td>555.1</td>
<td>54</td>
<td>45-58-82/5&quot;</td>
<td></td>
<td>SC</td>
<td>Gray clayey SAND; mostly medium to fine sand, some clayey fines, trace fine gravel, wet</td>
<td>73'</td>
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<tr>
<td>554.1</td>
<td>55</td>
<td>57</td>
<td></td>
<td>SP-SM</td>
<td>Brownish-gray poorly graded SAND with silt; wet</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

End of Boring at 77'

* Indicates 3" O.D. SBS sampler with steel liners.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed
Project No.: W0303.3  Well No.: MW-1  Date Installed: 8/7/95
Location: Sabin Dam - Spillway Chamber
Drilling Method/Size: Casing - Rotary / 3" and 2 7/8"
Screen Type: Stainless Steel  ID: 1 1/4"
Riser Type: Galvanized  ID: 1 1/4"
Depth of Borehole: 77'  Screened Interval: 12 to 15'
Protective Cover: Yes or No Dia. ___ in. Flush Cover: Yes or No Lock: Yes or No

**Well Diagram:**
- Ground Surface
- Concrete Seal/Pad
- Seal Material
- Backfill Material: Cement/Bentonite Grout
- Seal Material: Bentonite Holeplug
- Filter Pack Material: Filter Sand
- Seal Material: NA
- Backfill Material: Natural Soil
- Filter Sand

**Depth vs Elevation:**
- 610.1 ft.
- 7.5 ft. 602.6
- 9 ft. 601.1
- 12 ft. 598.1
- 15 ft. 595.1
- 77 ft. 533.1

**Volume of Water in Casing or Hole**

<table>
<thead>
<tr>
<th>Diameter of Casing or Hole (in)</th>
<th>Gallons per foot of Depth</th>
<th>Cubic Feet per foot of Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.041</td>
<td>0.0055</td>
</tr>
<tr>
<td>1.5</td>
<td>0.092</td>
<td>0.0123</td>
</tr>
<tr>
<td>2</td>
<td>0.163</td>
<td>0.0218</td>
</tr>
<tr>
<td>2.5</td>
<td>0.259</td>
<td>0.0351</td>
</tr>
<tr>
<td>3</td>
<td>0.367</td>
<td>0.0491</td>
</tr>
<tr>
<td>3.5</td>
<td>0.500</td>
<td>0.0668</td>
</tr>
<tr>
<td>4</td>
<td>0.653</td>
<td>0.0873</td>
</tr>
<tr>
<td>4.5</td>
<td>0.826</td>
<td>0.1104</td>
</tr>
</tbody>
</table>

**Well Development Record**

- **SWL Prior to Development:**
- **SWL After Development:**
- Below top or riser: ____  Below top of riser: ____
- Elevation: _____  Elevation: _____

- **Method of Development:**
- **Well Volume Removed/Added:**
- **Water Clarity Before Development:**
- **Water Clarity After Development:**
- **Odor:** Yes or No  If yes, describe:

**Measurements Taken During Development**

- **Well Volume Removed:**
- **pH:**
- **EC:**

- **Date Sampled:**
- **Sample No.'s. and Quantity:**

- **Samples Taken To:**
- **Other Measurements Taken:**

**Remarks:**

---
# SUMMARY OF LABORATORY TEST DATA

<table>
<thead>
<tr>
<th>Boring Number</th>
<th>Sample Depth</th>
<th>Sample Type**</th>
<th>Sample Description and USCS Classification</th>
<th>Unit Weight pcf</th>
<th>Unconfined Compressive Strength KSF</th>
<th>Percent Finer No. 200 Sieve</th>
<th>Specific Gravity</th>
<th>Natural Moisture Content</th>
<th>Atterberg Limits</th>
<th>Direct Shear (Phi)</th>
<th>Organic Content %</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>19-19.5'</td>
<td>SS</td>
<td>Grayish-brown poorly graded SAND (SP)</td>
<td>113.1</td>
<td>92.7</td>
<td>4.7</td>
<td></td>
<td>21.9</td>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>B-1</td>
<td>16-16.5'</td>
<td>SS</td>
<td>Dark brown organic silt, PEAT (PT)</td>
<td>76.8</td>
<td>27.7</td>
<td>4.7</td>
<td></td>
<td>177.2</td>
<td></td>
<td>30</td>
<td>28.4</td>
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</tbody>
</table>

* Graphic Presentations of Results of Triaxial, Consolidation, CBR, Proctor, Grain Size, and other tests follow this summary

** SS = Split Spoon Sample (ASTM D 1586)
UD = Undisturbed Sample (ASTM D 1587)
REPORT OF
DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED
DRAINED CONDITIONS ASTM D 3080-90

Project: Sabin Dam
Location: Traverse City
Sample Identification: B-1, L-4
Sample Depth: 19.0' - 19.5'
Sample Description: Brown poorly graded sand (SP)
Shear Device: WFDC 2.5
Sample Preparation: Remolded
Initial Sample Thickness: 0.862 in.
Initial Sample Diameter: 2.500 in.
Initial Water Content: 21.9%*
Initial Dry Unit Weight: 92.8 PCF
Initial Dry Mass: 103.0 g
Initial Wet Unit Weight: 113.1 PCF
Rate of Deformation: 0.007 inches per minute

<table>
<thead>
<tr>
<th></th>
<th>Point 1</th>
<th>Point 2</th>
<th>Point 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Stress (ksf)</td>
<td>1.44</td>
<td>2.88</td>
<td>4.33</td>
</tr>
<tr>
<td>Shear Stress (ksf)</td>
<td>0.94</td>
<td>1.78</td>
<td>2.68</td>
</tr>
<tr>
<td>Displacement at Failure (in.)</td>
<td>0.210</td>
<td>0.190</td>
<td>0.230</td>
</tr>
<tr>
<td>Sample Thickness at Failure (in.)</td>
<td>0.835</td>
<td>0.809</td>
<td>0.807</td>
</tr>
<tr>
<td>Final Dry Unit Weight (pcf)</td>
<td>95.8</td>
<td>98.8</td>
<td>99.1</td>
</tr>
<tr>
<td>Final Wet Unit Weight (pcf)</td>
<td>116.8</td>
<td>120.5</td>
<td>120.8</td>
</tr>
<tr>
<td>Final Moisture Content (%)</td>
<td>21.9*</td>
<td>21.9*</td>
<td>21.9*</td>
</tr>
</tbody>
</table>

*Due to the small quantity of sample available for testing, the moisture content was determined after the three test points were completed.
SAMPLE IDENTIFICATION:
B-1, L-4, 19.0' - 19.5'

FRICTION ANGLE = 32°

△ NORMAL STRESS = 1.44
□ NORMAL STRESS = 2.88
○ NORMAL STRESS = 4.33
GRAIN SIZE DISTRIBUTION TEST REPORT

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
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</thead>
<tbody>
<tr>
<td>0.0</td>
<td>3.6</td>
<td>91.7</td>
<td>4.7</td>
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<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D&lt;sub&gt;85&lt;/sub&gt;</th>
<th>D&lt;sub&gt;60&lt;/sub&gt;</th>
<th>D&lt;sub&gt;50&lt;/sub&gt;</th>
<th>D&lt;sub&gt;30&lt;/sub&gt;</th>
<th>D&lt;sub&gt;15&lt;/sub&gt;</th>
<th>D&lt;sub&gt;10&lt;/sub&gt;</th>
<th>C&lt;sub&gt;c&lt;/sub&gt;</th>
<th>C&lt;sub&gt;u&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>0.55</td>
<td>0.34</td>
<td>0.30</td>
<td>0.235</td>
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MATERIAL DESCRIPTION
- Poorly graded sand

USCS: SP

AASHTO:

Project No.: W0303.3
Project: TCLP Sabin Dam
- Location: B-1, L-4, 19'-19.5'

Date: 9-21-95

GRAN SIZE DISTRIBUTION TEST REPORT
MATERIALS TESTING CONSULTANTS

Remarks:
REPORT OF
DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED
DRAINED CONDITIONS ASTM D 3080-90

Project: Sabin Dam
Location: Traverse City
Sample Identification: B-1, L-3
Sample Depth: 16.0' - 16.5'
Sample Description: Dark brown PEAT (PT), organic content=28.4%
Shear Device: WFDC 2.5
Sample Preparation: Remolded
Initial Sample Thickness: 0.862 in.
Initial Sample Diameter: 2.500 in.
Initial Water Content: 177.2%*
Initial Dry Unit Weight: 27.7 PCF
Initial Dry Mass: 30.7g
Initial Wet Unit Weight: 76.8 PCF
Rate of Deformation: 0.047 inches per minute

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<th>Point 1</th>
<th>Point 2</th>
<th>Point 3</th>
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<td>Final Moisture Content (%)</td>
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*None of the samples failed at 0.500 inches (20% relative lateral displacement), the maximum travel of the shear box.

*Due to the small quantity of sample available for testing, the moisture content was determined after the three test points were completed.

*Note: Deviated from ASTM D 3080-90 by running the shear strain rate at 0.47"/min rather than at 50 x t_50. t_50 values were 1.2 min, 1.3 min and 1.3 min.
About AECOM

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SECTION 02 41 16

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1.4 DEFINITIONS
1.5 PROJECT CONDITIONS
1.6 SUBMITTALS
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-- End of Section Table of Contents --
SECTION 02 41 16
STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Contractor shall furnish all labor, equipment, and materials necessary for the selective demolition, removal, and/or abandonment of some existing structures, as shown on the Drawings and as approved by the Engineer. Work includes, but is not limited to, the following:
   1. Protection of facilities, structures, utilities, etc. designated to remain, and facilities, structures and equipment to be removed by the Owner or their representative.
   2. The partial demolition of the Sabin Dam powerhouse, training walls, end walls and wing walls, and safety buoy and cable upstream of the powerhouse intake, full removal of other minor structures, as required to facilitate the Work and as approved by the Contracting Officer's Representative.
   3. The partial removal of the concrete spillway, retaining walls, and sheetpile.
   4. Coordination with the Contracting Officer or their representative to perform sufficient selective demolition to allow for the Owner to perform removal of in-place powerhouse equipment.
   5. The Contractor will allow time not to exceed 14 calendar days, for the third party Owner or their representative to remove all existing powerhouse equipment. The Contractor will not be eligible for additional compensation for stop of demolition work during this period. During this period the Contractor will be allowed to continue work on any project tasks not in conflict with powerhouse equipment removal.
   6. The Contracting Officer will notify the Contractor to resume selective demolition work once removal of existing powerhouse equipment is completed.
   7. Removal and salvage/reclamation of trash racks and other salvageable steel.
   8. Demolition work performed for the convenience of the Contractor will not be considered for payment.
   9. Hazardous materials testing on any suspected hazardous materials contained within the powerhouse in accordance to all environmental and disposal regulations.
   10. Completely and properly dispose of hazardous materials off-site
   11. Safety measures and required contamination / environmental controls shall be utilized by the Contractor in the demolition of materials containing lead-based paint, mercury, and/or asbestos containing material.
   12. Off-site disposal of zebra mussels that are attached to gates, track rack, turbines and concrete. Zebra mussels shall be disposed of in
accordance with local, State, and Federal requirements.

B. Sampling, analysis, characterization, transportation, and/or disposal of demolished materials are included in and shall be in accordance with Section 02 42 09, "Waste Removal and Handling"

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 11 00: Summary of Work.
B. Section 01 33 00: Submittal Procedures.
C. Section 02 42 09: Waste Removal and Handling.
D. Section 31 23 00: Earthwork.
E. Section 31 23 19: Dewatering
F. Section 31 40 00: Slope Protection and Erosion Control.

1.4 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Existing to Remain: Existing items of construction that are not to be removed that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.5 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Contracting Officers Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Existing Powerhouse Equipment:
   1. The Contractor shall coordinate with the Government to locate existing powerhouse equipment to be removed by the Owner and provide adequate means of protection during demolition operations. These items include the following:
      a. One (1) 74" Dia. Francis Type 14 Bucket Turbine / Runner Assembly; Including:
         o 24 Gates
   o Headcover with Adapter Coupling and Locking Bracket
   o All Setting Rings and hardware and components as designed, engineered and installed by W.J. Bauer, Inc. & Lunda Construction Co., 1984-1986
      b. One (1) 5 Ton Grand Traverse Overhead Bridge Crane
         Including:
         o Hoist, Trolley, Bridge and Runway

2. Should uncharted, or incorrectly identified equipment be encountered
during demolition, consult the Government Representative immediately for directions, and cooperate with the Owner in protecting respective equipment. Contractor shall repair or compensate the Owner for damaged equipment to satisfaction of the Owner.

D. Demolition contractor should review and become familiar with areas where hazardous material remains in place. Refer to "Boardman River Feasibility Study Environmental Assessment" at: http://theboardman.org/archived-documents/historical/feasibility-study.html for potential Hazardous, Toxic, and Radiological Waste at Sabin Dam and powerhouse. Following are the potential hazardous material identified in the "Boardman River Feasibility Study Environmental Assessment":
1. Potential ACMs (Asbestos-Containing Material) observed at Sabin Dam: weathered and damaged caulk on windows, sealant materials, and roofing materials.
2. Possible lead-based Material observed within the interior of the powerhouse: paint, lead-encased wiring
3. Possible mercury-containing Material observed within the interior of the powerhouse: fluorescent light tubes
4. Possible PCB-contaminated or PCB-containing equipment: weathered and damaged window caulking, fluorescent light ballasts, oil staining on the main level of powerhouse from removed equipment, electrical switches and other equipment, and a pad-mounted transformer located on the west bank.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Existing Utilities:
1. The Contractor shall locate in the field existing utilities within and adjacent to the powerhouse in the areas of work. If utilities are to remain in-place, provide adequate means of protection during demolition operations. Cap or fill all abandoned pipes and conduits encountered during construction with grout.
2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the utility companies in keeping respective services in operation. Contractor shall repair damaged utilities to satisfaction of the utility owner.

G. Use of Explosives:
1. Use of explosives shall not be allowed.

1.6 SUBMITTALS

SD-01 Preconstruction Submittals

A. Qualification Data: For demolition firm.

B. Demolition Plan; G-DR.
1. Thirty (30) working days prior to initiating any field activities, Contractor shall submit a Dam Demolition Plan for review and approval by the Contracting Officer's Representative. The plan shall include, but may not be limited to, detailed descriptions of dam demolition methods, schedule, stoppage for powerhouse equipment removal by the Owner or their representative, and construction sequencing with other
work items, such as installation of water control structure (WCS), installation of turbidity controls and monitoring equipment, dewatering, erosion control measures and site restoration. Contractor shall seek and obtain approval for the plan prior to proceeding with any field construction activities.

2. Indicate the detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

3. Indicate the means of protection for items to remain.

4. In addition to the requirements listed above, comply with the most recent edition of USACE EM 385-1-1.

C. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins. Refer to 01 71 23 FIELD ENGINEERING Section 1.2 RECORD OF EXISTING SITE AND BUILDING

SD-06 Test Reports

D. Results of the Hazardous Material testing; G-DR. Refer to 02 42 09 Waste Removal and Handling.

SD-10 Operation and Maintenance Data

E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.7 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Government Representative.

1. Owner has indicated that there are no known items they wish to salvage.

2. Coordinate with Contracting Officer's Representative, who will establish special procedures for removal and salvage.

1.8 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction as well as those of the destination disposal facilities.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review areas where existing construction is to remain and requires protection.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. When unanticipated structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the COR.

C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL / ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Division 1 Section 01 50 00 "Construction Facilities and Temporary Controls".

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area.

C. Spill Containment Boom, turbidity Control and Monitoring Measures: Provide spill containment boom and turbidity control measures such as turbidity curtain downstream, and install upstream and downstream turbidity monitoring equipment and data transmission infrastructure.
3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent indicated on Drawings. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Dispose of demolished items and materials promptly.
   2. Use demolition methods and methods of protection least likely to result in damage to existing powerhouse equipment to be removed by the Owner.

B. Existing Structure to Remain: Protect construction indicated to remain against damage during selective demolition.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, removed by the Owner or their representative, or otherwise indicated to remain Owner's property, remove demolished materials and dispose of on-site, unless deemed a hazardous material such as Mercury, asbestos, etc.
   1. Remove and transport debris in a manner that will prevent spillage on adjacent areas.
   2. Comply with requirements specified in Division 1 Section 01 41 00 "Regulatory Requirements."

B. Hazardous Materials:
   1. All hazardous materials (if any) encountered during the work shall be removed from the project site and disposed of at a licensed facility approved for each specific material. The Contractor shall provide the Professional with manifests, certificates and other such evidence as may be required by Federal, State, and Local regulations, to show that hazardous waste materials of all types were properly transported to, received at, and disposed in approved disposal facilities.

3.6 SELECTIVE DEMOLITION

A. Existing Items to Be Removed:
   1. Existing Dam
      a. Downstream retaining walls
      b. Wing walls
      c. Concrete Spillway
      d. Powerhouse

B. Existing Items to Remain:
   1. Portions of concrete Retaining Wall Footings
   2. Portions of Spillway Sheet Pile Wall
   3. Powerhouse foundation

-- End of Section --
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DIVISION 02 - EXISTING CONDITIONS

SECTION 02 42 09

WASTE REMOVAL AND HANDLING

PART 1 GENERAL

1.1 SUMMARY
1.2 RELATED WORK SPECIFIED ELSEWHERE
1.3 SUBMITTALS
1.4 WASTE CONTAINERS
1.5 ON-SITE MANAGEMENT AND STORAGE OF MATERIALS
1.6 SAMPLING AND TESTING OF WASTES

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section Table of Contents --
PART 1  GENERAL

1.1  SUMMARY

A. This Section includes a description of responsibilities for proper transportation and disposal of waste materials including, but not limited to, clearing and grubbing debris, demolition debris (concrete, brick, timber piles or cribbing, miscellaneous metal, wood, and other demolition debris, etc.); ancillary waste (disposable personal protection equipment (PPE), plastic sheeting and sampling equipment); and site trash.

B. Clearing and grubbing materials and debris from the embankment dam shall be used for covering of Spoils Areas adjacent to the dam.

C. The Contractor shall be responsible for general excavation/removal, handling, and storage of waste materials.

1.2  RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 11 00: Summary of Work.

B. Section 01 57 20.00 20: Environmental Protection.

C. Section 02 41 16: Structure Demolition.

D. Section 31 23 00: Earthwork

1.3  SUBMITTALS

SD-01 Preconstruction Submittals

A Work Plan shall be submitted prior to start of the Work as referenced in Sections 01 11 00 and 02 41 16. The Contractor shall include as a component of the Work Plan, the planned means and methods for management of all waste materials removed or generated as a component of the Work.

SD-06 Test Reports

B. Lab Testing Results; G-DR

The Contractor shall submit to the COR the results of all laboratory testing of lead based paint, mercury or asbestos-based wastes, PCB Contaminated or Contained waste and provide location and estimate of material that contain those material.

1.4  WASTE CONTAINERS

A. Waste containers shall be provided as follows:

1. The Contractor shall provide appropriate legal containers and/or trucks for the management and off-site disposal/recycling of,
non-contaminated demolition debris, all other non-contaminated debris removed during site preparation.

2. Contractor shall provide plastic bags for disposable PPE. Plastic bags shall have a minimum thickness of six (6) mils.

3. Contractor shall provide portable, temporary storage tanks (Frac tanks, Baker tanks, etc.) for the storage of collected liquids at the decontamination pad (i.e. decontamination fluids) that contains oil, grease, fuel, or other petroleum products. The Contractor is responsible for the rental of the tanks or similar containers and cleaning and demobilization of tanks at the end of the project. The Contractor shall identify the specific type and number of portable containers/tanks that are required.

4. Containers (e.g., roll-off containers) for non-hazardous municipal trash and debris. Roll-off containers shall be provided by Contractor and utilized for storage of wastes generated during the site preparation activities, construction activities, and waste materials from site cleanup activities. The Contractor shall identify the specific type and number of roll-off containers that are required.

5. Michigan Department of Transportation (MDOT)-approved, steel drums (55-gallon capacity) with lids for possible storage of residual contaminated materials or materials with high waste liquid content shall be provided by the Contractor.

B. Transporter hired by Contractor shall provide trucks and equipment required for loading Lead based paint, mercury or asbestos contaminated demolition debris.

C. Container Identification. Trucks or containers shall be labeled with MDOT approved placards based on the type of waste and associated risk.

1.5 ON-SITE MANAGEMENT AND STORAGE OF MATERIALS

A. The Contractor shall be responsible for proper on-site management of wastes generated in compliance with all Federal, State and local regulations. Management shall include handling, segregating, processing (as required), and storing all wastes generated during the Contractor's Work.

B. Contractor shall control dust generation during waste handling, as specified in Section 01 57 20.00 20.

C. The Contractor shall segregate contaminated from non-contaminated demolition materials. Contaminated materials shall be segregated into hazardous and non-hazardous materials as required for proper off-site disposal.

D. On-site material processing may be required to prepare the material for off-site transportation and disposal. Processing shall occur in consultation with the Government to establish a solid waste with minimal volume and weight to reduce disposal costs. Processing may include:

1. Dewatering waste material to remove excess water. Dewatering shall include constructing sumps in stockpile containment areas to collect drained water and turning soil to expose to air to facilitate drying.

2. Bulking the waste material with added soils or agents to solidify and stabilize material. Bulking options could include the addition of proportions of lime, kiln dust, ash, or other drier soil of same waste character. All bulking proposals by the Contractor shall be reviewed and approved by the COR prior to implementation.
E. Contaminated waste soil is not anticipated to exist on site. If encountered or if construction operations induce contamination (e.g., hydraulic fluid contamination from possible ruptured hydraulic lines), it shall be segregated for off-site disposal shall be approved by the COR for off-site disposal.

F. The Contractor shall be responsible for coordinating the movement of the containers, trucks, etc. into positions required for proper loading and management of material generated during Work.

G. The Contractor shall be responsible for loading waste containers, trucks, etc. with excavated soil and removed material/debris generated.

H. The Contractor shall limit the quantity and duration of on-site stockpiling of waste materials to the extent practical.

I. The Contractor shall not load waste containers, trucks, etc. with non-contaminated materials prior to determination that the decontamination of the waste container/truck has been achieved.

J. The Contractor shall be responsible for coordinating the schedule for delivery and pickup of supplied waste containers. The Contractor shall also be responsible for movement and storage of containers within the site to allow the progress of the Work.

K. The Contractor shall install stockpile containment areas for contaminated material storage associated with Work, as appropriate. Line and berm contaminated material stockpile areas with plastic sheeting to contain dewatering fluids and capture contaminated storm water runoff. Cover stockpiles with plastic sheeting to prevent erosion of the stockpiles and limit contact with precipitation. The plastic sheeting shall be weighted down, as required, with ropes, sandbags, and tires, or other similar means.

1.6 SAMPLING AND TESTING OF WASTES

A. All waste characterization for demolition debris shall be completed by the Contractor.

1. If contaminated material is encountered, the Contractor shall collect samples and coordinate testing to adequately characterize each waste type and quantity.
   a. Laboratory testing of wastes shall be performed by a laboratory certified by the Michigan Department of Environmental Quality (MDEQ).
   b. All laboratory test methods and frequencies shall be in accordance with MDEQ requirements.
   c. Laboratory reports shall be prepared by the subcontracted laboratory to include all requirements of the State.

2. The Contractor shall collect test samples in the following manner:
   a. The Contractor shall supply equipment and personnel to collect waste samples.
   b. The Contractor shall at its discretion move waste stockpiles and segregate material, and/or prepare samples, including breaking large waste debris into sample-sized portions.

B. Sampling and testing shall not be required for clearing and grubbing debris or general site trash.
C. Sampling and testing of demolition debris shall be completed by the Contractor at their discretion based on the following conditions:
1. Possible existence of contaminated material.
2. Location of the removed material.
3. Observation of in situ contact of the removed material with free product such as oil, hydraulic fluid or other similar contamination.
4. Indications of in situ contact with contaminated material as noted by olfactory or visual screening.

D. Sampling and testing of liquid waste (i.e. decontamination fluids, construction dewatering, and contaminated storm water) shall be completed by the Contractor using the required methods and at the required frequency of the Treatment, Storage and Disposal Facility if it is suspected to contain oil, grease, fuel or other petroleum products.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

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DIVISION 31 - EARTHWORK

SECTION 31 10 00

CLEARING

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PART 3 EXECUTION

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3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL
3.3 EXISTING UTILITIES
3.4 CLEARING AND GRUBBING
3.5 SITE IMPROVEMENTS
3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

-- End of Section Table of Contents --
SECTION 31 10 00
CLEARING

PART 1 GENERAL

1.1 DESCRIPTION
A. Clear site of trees, undergrowth, plant life and grass, retaining vegetative matter as wetland salvage, designated for reuse per Section 32 90 00 and woody vegetation and trees for use as large wood and slash in large wood structure construction, in the manner described.
B. Remove root system of trees.
C. Remove rocks, boulders and other debris.
D. Remove miscellaneous equipment and structures as shown on the Drawings.

1.2 SUBMITTALS
SD-01 Preconstruction Submittals
A. Demolition Procedure and Sequencing
1. Demolition procedures and sequence for review and acceptance by the COR.
2. Tree removal survey/tree clearing staking; confirmation of tree clearing limits; G-AOF
B. Permits and Certificates
1. Permits and/or notices authorizing demolition.
2. Certificates of severance of utility services.
3. Permit for transportation and disposal of debris.

1.3 PROJECT CONDITIONS
A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the Government and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by the Government or authorities having jurisdiction.
B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises, in staging areas.
C. Salvageable Vegetation: Carefully remove vegetation designated for reuse, handle, store and install per the provisions of Section 32 90 00.
D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
E. Do not commence site clearing operations until temporary erosion and
sedimentation control measures are in place.

F. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 PRODUCTS
2.1 MATERIALS

A. Cleared Vegetative Materials - Salvage and stockpile, or distribute the material as follows:
1. Vegetation designated for reuse shall be removed, handled, stored, staged and installed per the provisions of Section 32 90 00.
2. Trees of non-invasive species meeting the requirements for Large Wood per Section 31 39 00 shall be cleared with root fans intact, retained, stockpiled, and utilized in the Work as Large Wood.

B. Trees and shrubs of non-invasive species not meeting the requirements for Vegetation Reuse or Large Wood shall be retained, stockpiled and utilized in the Work in order of priority as slash in the construction of large wood structures, evenly spread over debris pile locations, or as otherwise indicated by the Engineer.

C. All other cleared vegetative matter of non-invasive species shall be retained, stockpiled and evenly spread across debris pile or floodplain areas, as indicated by the Engineer.

D. All other cleared debris shall be considered non-useable debris, and disposed in accordance will all applicable laws and regulations.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated, or to be reused in the Work.

C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Government.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Refer to Specification 31 40 00 for details on Slope Protection and Erosion Control.
3.3 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify COR not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without COR's written permission.

3.4 CLEARING AND GRUBBING

A. Clear areas as required for access to site excavation and performance of the work.

B. Cut and remove all trees, stumps and undergrowth noted on plans, except for those indicated to remain. All trees cleared that meet the large wood requirements (Section 31 39 00) shall not be cut, and shall be salvaged with root fans intact. All woody material meeting the requirements for use as slash (Section 31 39 00) shall be retained for use in large wood structure construction. All vegetation designated for reuse as vegetation salvage shall be excavated and handled per the provisions of Section 32 90 00.

C. Within all areas to be compacted, understructures and all concrete and/or bituminous pavements, roots shall be removed to a depth of 12" below rough subgrades. At other areas the stumps shall be removed, but roots may be cut off at rough subgrade.

D. Clear out undergrowth and deadwood, without disturbing sub-soil.

E. Do not disturb trees or roots of trees which are to remain.

F. Remove rocks and boulders, bituminous pavements, concrete pavements and concrete curb and gutter as noted.

3.5 SITE IMPROVEMENTS

A. Remove existing above and below-grade improvements as indicated and necessary to facilitate new construction.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.
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SECTION 31 23 00

EARTHWORK

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PART 1   GENERAL

1.1   SUMMARY

A. This Section covers excavation, filling/backfilling, compaction, grading, final grading, and temporary access for restoration of the Boardman River channel and floodplain as well as spoils pile grading. Major work elements include but are not limited to:

1. Boardman River Restoration
   a. Excavation of soil and sediment to restore the relic river channel.
   b. Construction and maintenance of Sediment Traps for sediment management.
   c. Placement of excavated material in spoil areas noted.
   d. Earthwork associated with constructed and stabilized channel and floodplain.
   e. Establishment and maintenance of access routes and river crossings as needed to support earthwork.
   f. Habitat enhancement excavation.

2. Sabin Impoundment Dewatering
   a. Excavation of dredged channel and sand trap in front of Spillway.
   b. Fill and grading of existing spillway channel.

4. Temporary Bulk Bag Cofferdam
   a. Installation of temporary Bulk bags, aggregate, riprap, and geotextiles in the final breach step upstream of the existing powerhouse.

5. Downstream Flow Diversion Berm
   a. Construction of an earthen berm.
   b. Installation of geotextile and riprap for armoring.

6. Stormwater Basin
   a. Excavation of ditches and basin.
   b. Installation of riprap for armoring of basin outlet.

B. Contractor is advised that excavation for restoration of the Boardman River channel and floodplain will proceed with significant construction assistance and observation from the COR as well as the Government Representative. Typical lines and grades are shown on the drawings to set approximate design topography and limits, and to quantify mass cut/fill volumes. Actual final line, grades and dimensions will deviate to mimic natural river features. Typical deviations include deeper bed elevations in pools with a narrower channel section and wider channel sections with shallow beds in riffle and run sections, and floodplain elevations and widths which vary from those depicted on the plans. Specific locations of these features (pools, riffles, runs) will be verified as excavation encounters the design grade and/or the pre-dam channel surface and features such as historical stumps, at which point field adjustment may occur.

C. Control of surface water run-off and run-on during construction, shall be in accordance with Section 31 23 19 Dewatering.
1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 11 00: Summary of Work
B. Section 01 33 00: Submittal Procedures
C. Section 02 41 16: Structure Demolition
D. Section 02 42 09: Waste Removal and Handling
E. Section 31 23 19: Dewatering
F. Section 31 40 00: Slope Protection and Erosion Control
G. Section 32 90 00: Planting
H. Section 31 39 00: Large Wood
I. Section 31 36 00: Streambank Construction
J. Section 31 37 00: Streambed Construction

1.3 REFERENCES

The publications listed below form a part of this Section to the extent referenced. The most recent issue of each publication shall apply, unless otherwise noted. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)


ASTM D422 Standard Test Method for Particle-Size Analysis of Soils

ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D3740 (2012a) Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction


ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Rock
1.4 SUBMITTALS

A. The Contractor shall submit the following items to the Government Representative in accordance with Section 01 33 00 Submittal Procedures:

SD-01 Preconstruction Submittals

1. Excavation and backfill plan, including means, methods, sequencing equipment, and schedule for any work that involves excavation of soils and sediment of the site and backfill of soils/sediments, whether in spoils areas, earthwork associated with stabilized channel and floodplain construction, or as permanent backfill in the existing spillway channel that will be filled and decommissioned by the project. The plan shall include provisions for salvage and management of native substrate and soil for reuse in project construction.
   a. Submit as a component of the Work Plan, as described in Section 01 11 00 Summary of Work.

2. Sediment Excavation Sequencing Plan; G-DR
   a. A preliminary sediment excavation sequence is included in the drawings. The Contractor shall submit to the COR for approval a revised plan that includes description of the planned approach to excavation and disposal of the impounded reservoir sediments, including description of means and methods, equipment to be used, and sequencing with other work items such as drawdown of the headpond and dam demolition.
   b. Temporary Stream Crossing Plan
      Plans for access and temporary stream crossings shall be documented. Crossings must maintain river flow and may be wet or dry depending on their frequency of use and must maintain the access alignment above or outside of the active flowing stream, unless otherwise approved by COR. Provisions for temporary stream crossings shall be of the Contractor's own design and construction, comply with all applicable regulations and permits, and provide a level of service that facilitates completion of the work. Boardman River flow data is available on Drawing sheet T-1.2.

SD-03 Product Data

3. Borrow Source(s):
   a. The Contractor shall provide the proposed source(s) for borrow materials prior to initiation of work.
   b. Laboratory testing data shall be provided.

4. Decontamination Pad:
   a. Submit two (2) copies of the following:
      (1) Details for the decontamination pad, including location and materials.

SD-06 Test Reports

5. Quality Control Testing Laboratory:
   a. The name and qualifications of an independent third-party commercial testing laboratory to be used for borrow source testing (geotechnical) and in-place soil/construction materials testing shall be submitted as soon as possible, but no later than 7 days following notice to proceed.
   b. The proposed geotechnical laboratory shall meet the requirements of ASTM D3740.
6. Analytical Testing Laboratory:
   a. The name and qualifications of an independent third-party commercial testing laboratory to be used for contaminated soil testing (analytical) shall be submitted as soon as possible, but no later than 7 days following notice to proceed.

7. Quality Control Test Reports:
   a. Submit two copies of the following reports:
      (1). Geotechnical laboratory test reports for select borrow source materials.
      (2). Field in-place density (compaction) test reports of material for backfill within the new channel at and adjacent to the powerhouse.

1.5 PROJECT CONDITIONS

A. Site Information:
   1. Survey data provided on topographic (surface and bathymetric) conditions are not intended as representations or warranties of accuracy or continuity between data points. It is expressly understood that neither the Owner, engineer, nor the government will be responsible for interpretations or conclusions drawn there from by Contractor. Data are made available for the convenience and information of the Contractor.
   2. Grades and Lines provided for restoration are provided as guidance only and are expected to be adapted during project construction. Areas for field adjustment are those areas of the floodplain and below the bankfull elevation of the river channel which will be adapted to pre-dam features such as relic stumps and channel indicators and the final grades and volume of spoils areas may vary.
   3. Work will occur within a dynamic riverine environment with the probability of significant changes to site conditions during the project. Flooding, groundwater drainage, and drawdown of the impoundment will require diligent attention to site conditions on a daily basis.
   4. Subsurface information is provided for the Contractor in section 02 30 00 Geotechnical Data. Subsurface data are not intended as representations or warranties of accuracy of subsurface conditions. It is expressly understood that neither the government, nor the engineer will be responsible for interpretations or conclusions drawn there from by Contractor. Data are made available for the convenience and information of the Contractor. Additional test borings and other exploratory operations may be made by Contractor at their own expense.

B. Existing Utilities:
   1. The Contractor shall locate in the field existing underground and above ground utilities in the areas of work prior to commencing operations. If utilities are to remain in place, provide adequate means of protection during earthwork operations. Cap or fill all abandoned pipes and conduits encountered during construction with grout.
   2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, notify the COR, and consult the utility owner immediately for directions. Cooperate with the utility companies in keeping respective services in operation. Contractor shall repair damaged utilities to satisfaction of the utility owner.

C. Use of Explosives:
1. Use of explosives shall not be allowed.

1.6 PROTECTION OF FACILITIES AND SITE

A. The Contractor shall protect existing site features and structures to remain, and utilities, trees, vegetation, and drainage ways which are to remain. The Contractor shall employ similar precautions, as necessary, to prevent damage to or pollution of adjoining properties or rights of way.

B. The Contractor shall use the necessary precautions to prevent damage to pipes, conduits, and other underground facilities that are to remain.

1. At a minimum, the Contractor shall notify MISS DIG System, Inc. at least 72 hours in advance of any subsurface activities, including but not limited to excavation, trenching, grading, pavement milling, saw cutting, fence post installation, etc.

C. The Contractor shall repair and/or replace, at no additional cost, any site features, utilities, or property damaged by its employees or subcontractors during construction.

D. Protection of Persons and Property:

1. Barricade and mark open excavations occurring as part of this work in accordance with applicable standards.

2. Protect structures, utilities, sidewalks, pavements, and other facilities designated to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations and truck traffic.

E. Any equipment operating within the river shall utilize a non-petroleum based hydraulic fluid. Hydraulic fluid shall be Chevron Clarity or approved equivalent.

1.7 DEFINITIONS

A. Contaminated Soils/Sediments:

1. Contaminated soils/sediments are not anticipated to be encountered during the work. Contaminants soils/sediments are those materials that contain substances that exceed environmental or human exposure thresholds.

B. Unsatisfactory Soil/Material:

1. Unsatisfactory soils/materials include but are not limited to peat and/or highly organic soils (classified as OL, OH, or Pt by ASTM D2487), stumps/brush, trash, refuse, debris, frozen soils, contaminated soils that do not meet site re-use criteria, soils containing materials greater than the allowable size (see below), saturated soils, and soils which are either too wet or too dry to compact, as defined herein and as determined by the Government Representative.

C. Construction Demolition Debris:

1. Demolition debris consists of concrete, brick, wood, metal, glass, any other deleterious former construction product.

D. Satisfactory Soil/Material:

1. Satisfactory soils/materials shall meet the requirements specified in this Section, and shall be used in areas as shown on the Construction Drawings or as directed by the COR.

E. Cohesionless and Cohesive Soils:
1. Cohesionless soils include gravels, sand-gravel mixtures, sands, and gravelly-sands, classified as GW, GP, SW, or SP by the Unified Soil Classification System (ASTM D2487).

2. Cohesive soils include clayey gravels, sand-clay mixtures, clayey sands, clays, and silts, classified as GC, SC, CL, CH, ML, or MH by the Unified Soil Classification System (ASTM D 2487). Soils classified as GM and SM will be identified as cohesionless only when the fines are determined to be non-plastic.

3. Testing required for the classification of soil shall be in accordance with ASTM D4318, ASTM C136, and ASTM D422.

F. Degree of Compaction:
1. Degree of compaction (percent compaction) required is expressed as a percentage of the maximum dry density, at the optimum moisture content.

2. The maximum dry density and optimum moisture content shall be obtained by the test procedure presented in ASTM D698 (Standard Proctor).

G. Organic Soil:
1. Excavated impoundment material having a visibly darker coloration indicating the presence of organic materials within the matrix, but also contains a substantial proportion of mineral soil.

H. Sand Soil:
1. Excavated impoundment material composed completely of sand or other coarse particles without any visible indication of organic material within the matrix.

I. Native Substrate:
1. Excavated impoundment material derived from stream or glacial sources that is typically rounded and may include the following in varying proportions: sand, gravel, cobble and boulders.

J. Floodplain:
1. The area lying adjacent to and above the top of bank of the main river channel.

K. River Channel:
1. The bed and banks that contain normal flow of the river

L. Pre-Dam Channel
1. The Boardman River channel that existed before the dam was built

M. Bankfull Channel:
1. The channel bed and banks lying below the top of bank elevation also considered the floodplain elevation. This is the channel that carries normal water flow.

N. Floodplain Terrace:
1. Land at design elevation 2' above the surrounding floodplain.

O. Floodplain Fill:
1. Fill material containing a combination of soil, sand, gravel, cobble and small boulders used to construct the floodplain fill as indicated.

P. Subgrade Fill
1. Granular fill material containing a combination of sand, gravel, and cobble used to fill to create the subgrade for constructed streambed where fill over existing grade is requisite to attain subgrade.
1.8 SOURCE QUALITY CONTROL TESTING

A. Borrow source (including material sourced from the project site) testing shall be conducted on all soil materials proposed for construction. The Contractor shall subcontract the services of an independent, third-party geotechnical laboratory testing and inspection service to perform testing of any borrow material to be furnished by the Contractor as specified below.

1. Common Borrow:
   Test                                      Methodology1      No. of Tests2
   a. Particle-Size Analysis                ASTM D 422      1 test for every 10,000 CY of material, or 3 tests min
      (combined sieve/hydrometer)
   b. Atterberg Limits                      ASTM D 4318     1 test for every 10,000 CY of material, or 3 tests min
   c. Proctor (Standard)                    ASTM D 698      1 test for every 10,000 CY of material, or 3 tests min

2. Granular Borrow:
   Test                                      Methodology1      No. of Tests2
   a. Particle-Size Analysis                ASTM D 422      1 test for every 10,000 CY of material, or 3 tests min
   b. Proctor (Standard)                    ASTM D 698      1 test for every 10,000 CY of material, or 3 tests min

3. Aggregate Base:
   Test                                      Methodology1      No. of Tests2
   a. Particle-Size Analysis                ASTM D 422      1 test for every 10,000 CY of material, or 3 tests min
   b. Proctor (Standard)                    ASTM D 698      1 test for every 10,000 CY of material, or 3 tests min

Notes:
1. Other testing methods may be considered acceptable, based on prior approval of the Government Contracting Officer.
2. Number of tests shall be as listed, at any change in borrow source.

1.9 MANAGEMENT OF EXCAVATED MATERIALS

A. Some or all of the soil that is excavated to support Powerhouse demolition may be reclaimed for re-use as backfill to achieve final grades.
provided it meets the requirements of Common Borrow, as determined by the Contractor and approved by the Government Representative.

B. The Contractor shall determine if excavated soil/sediment that appears to be contaminated requires testing and characterization prior to off-site disposal or re-use.

C. The Contractor shall ensure required waste characterization has been completed to the satisfaction of the pre-designated treatment, storage, and/or disposal facility (TSDF) prior to transporting material for off-site disposal for any contaminated soils/sediments.

D. Waste removal, handling, and management shall be in accordance with Section 02 42 09 Waste Removal and Handling.

E. Transportation and disposal of excavated materials that require off-site disposal shall be in accordance with Section 02 42 09 Waste Removal and Handling.

PART 2 PRODUCTS

2.1 COMMON BORROW

A. Common Borrow shall be used, as necessary, to supplement excavated soils to be placed to achieve final grades of the dam embankment as shown on the drawings.

B. Common Borrow shall consist of earth and shall be free from frozen materials, perishable rubbish, peat, and other Unsatisfactory Soil/Material. Common Borrow shall be soil not identified as Unsatisfactory and consisting of cohesionless or cohesive soils. The soil should also be capable of producing a maximum dry density of at least 100 pounds per cubic foot using the Standard Proctor Effort.

C. Common Borrow shall be of such a nature and character that it can be compacted to the specified density (Subsection 3.8).

D. The moisture content shall be sufficient to provide the required compaction in subsection 3.8. In no case shall the moisture content exceed 3% above optimum nor be less than 3% below optimum, which shall be determined in accordance with ASTM D698.

E. Common Borrow, whether from off-site borrow or re-claimed material from the project site, must meet soil use and re-use criteria specified in subsection 1.7.D of this Section.

2.2 GRANULAR BORROW

A. Granular Borrow shall be used to create the Downstream Flow Diversion Berm and backfill the channel at the existing spillway between Stations 1+25 and 3+50 as shown on the Drawings.

B. Granular Borrow shall consist of earth and shall be free from frozen materials, perishable rubbish, peat, and other Unsatisfactory Soil/Material. Granular Borrow shall meet the following gradation requirements:
Granular Borrow may be obtained as reclaimed material on site if it meets the material gradation requirements.

2.3 NATIVE SUBSTRATE

A. Excavated impoundment or river channel material derived from stream or glacial sources that is typically rounded and may include the following in varying proportions: sand, gravel, cobble and boulders. If previously reviewed and approved by the COR as suitable, salvaged native substrate may be used as a component of the substrate mixture for stream bed construction shown on the Drawings.

2.4 AGGREGATE BASE

A. Aggregate Base shall be used as borrow fill for reinforcement or surfacing of temporary access roads and as temporary fill for installation of temporary culverts along temporary access roads.

B. MDOT 21AA Aggregate shall be used. Refer to MDOT Specification Division 9 Section 902: Aggregate.

2.5 BULK BAGS

A. Bulk bags shall be constructed from woven polypropylene fabric. Bulk Bag fabrics shall be tested per ASTM G-154 Light/Water Exposure of Nonmetallic Materials and ASTM D-4329 Light/Water Exposure of Plastics for UV and Water resistance. Bulk Bags shall have a minimum capacity of 3000 pounds and have a closed top. Bulk Bags shall be a Spread Strap container with 36-inch by 36-inch base as manufactured by Bag Corp, or approved equal.

2.6 Bulk Bag Aggregate Base Layer

A. Aggregate Base Layer shall be placed as fill at least 6 inches thick prior to placing the bulk bags.

B. MDOT 6AAA shall be used. Refer to MDOT Specification Division 9 Section 902: Aggregate, except that slag shall not be used to meet the requirements of MDOT 6AAA.

2.7 Bulk Bag Waterproof Liner

A. An impermeable liner shall be wrapped on the upstream side of the bulk bags to minimize seepage through the berm.
2.8 Bulk Bag Non-Woven Geotextile Separator

A. Non-woven geotextile separator shall meet the requirements of MDOT standard specifications 910.

2.9 Bulk Bag MDOT Heavy RipRap

A. MDOT Heavy RipRap shall be used to armor the area directly downstream of the Bulk Bag Cofferdam as shown on the Drawings. Refer to MDOT specification Division 9 Section 916: Erosion Control Materials.

2.10 OIL ABSORBENT BOOMS

A. Shall be 5-inch, minimum, diameter and constructed of an outer mesh that contains oil absorbent filler material.

B. Shall be capable of absorbing all hydrocarbons including, oil, gasoline, diesel and lubricating oils.

C. Shall not sink when saturated with oil.

D. Shall be of a length that to span the active flow of the river.

2.11 Woven Geotextile - Downstream Flow Diversion Berm

A. A woven geotextile liner shall meet the requirements of MDOT standard specifications 910.

2.12 MDOT Plain Riprap

A. MDOT Plain RipRap shall be used to temporarily armor the Downstream Flow Diversion Berm and permanently armor the outlet of the Stormwater Basin shown on the Drawings. Refer to MDOT standard specification Division 9 Section 916: Erosion Control Materials.

2.13 Subgrade Fill

A. Subgrade Fill shall be a well-mixed, poorly-graded material that combines cobbles, gravel and sand and is suitable for placement to construct subgrade for constructed streambed where required.

B. Placement may occur below water level. Material must be sufficiently coarse and granular to achieve target consolidation in a saturated condition where present.

C. Subgrade Fill may be prepared from salvaged onsite sources, or provided from offsite sources. Proposed source shall be reviewed for approval by COR prior to transport and use.

2.14 FINAL GRADING

A. Contractor shall grade the site to prevent ponding, promote positive drainage, and taper to existing Limits of Work/Fence Lines unless shown otherwise on the drawings.

B. Topsoil shall be placed at 6 inches in thickness. If topsoil or organic matter is not added, the existing subsoil shall be tilled to a
depth of at least 6 inches to increase water and root penetration of seeding. Tilling to this depth shall be performed with a tractor-mounted trailer.

2.15 Floodplain Fill

A. Floodplain Fill shall be a well-mixed, poorly graded material that combines small boulders, cobbles, gravel, sand and soil and is capable of supporting riparian vegetative growth.

B. Gravel and cobble-sized particles shall be rounded to sub-angular.

C. Floodplain fill shall have a size range meeting the following gradation:

<table>
<thead>
<tr>
<th>Sieve Size or Median Axis Dimension</th>
<th>Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 inches</td>
<td>100</td>
</tr>
<tr>
<td>5 inches</td>
<td>50</td>
</tr>
<tr>
<td>1 inch</td>
<td>30</td>
</tr>
<tr>
<td>No. 4 Sieve</td>
<td>25</td>
</tr>
<tr>
<td>No. 200 Sieve</td>
<td>0-5</td>
</tr>
</tbody>
</table>

D. Minimum specific gravity for the gravel, cobble and boulder sizes shall be 2.5.

E. Floodplain fill may be prepared from salvaged onsite sources, or provided from offsite sources. Proposed source shall be reviewed for approval by COR prior to transport and use. Testing to certify the D50 size may be required.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the COR, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 EXCAVATION

A. General excavation consists of removal, handling/management, placement or disposal of material encountered during the following Site activities:
   1. Boardman River Restoration
   2. Sabin Dam Removal
B. Excavation of Impoundment Sediment:
1. Ensure all controls are available or in place.
2. An average channel and floodplain template used to establish grading shown on the drawings. Cut slopes along channel banks are 2H:1V (horizontal to vertical); all other cut and fill slopes are 3H:1V (horizontal to vertical) unless steeper native slopes are encountered. The final channel geometry will vary from the average section, which will be adapted during construction with the assistance of the Government Representative. Adjustments will be made for indications of the pre-dam channel and floodplain, such as pre-dam river bed and the position of relic stumps indicating channel and floodplain positions and elevations.
3. Approximate excavation depths and dimensions are provided on the Drawings. The Government Representative will provide assistance to interpret field conditions uncovered during excavation. Depth of excavation should be guided by elevations noted in the Drawings as well as the presence of stumps or gravels and cobbles indicating the position and elevation of the pre-dam river channel. Excavation shall not proceed below coarse bed material (gravel) or tree roots without the approval of the COR or Government Representative as these may be indicators of the pre-dam channel and floodplain areas.
4. Excavated spoils should be cast onto the adjacent floodplain then moved to disposal areas or spoiled directly in spoils areas if feasible. The top surface of all spoil areas shall be covered with a soil mix containing a minimum 5% organic content with a minimum of 6" layer after consolidation.
5. During drawdown and excavation ensure that sediment transported by the river is collected in sediment traps. Preliminary locations of sediment traps are shown on the Drawings. Locations shall be verified by the Contractor's Sediment Excavation Sequencing Plan. More sediment traps than shown on the drawings may be required to facilitate the work as site conditions dictate. Sediment traps may require frequent cleanout until sediment delivery decreases. Excavation shall proceed in an upstream to downstream direction.
6. Channel excavation near the dam embankment shall remove known and accumulated sediment to the maximum extent practical before removing the final barrier to flow at the dam.
7. Removal of obstructions and undesirable materials in excavation includes, but is not necessarily limited to, removal of old foundations, existing construction, logs, riprap, and any other materials which may be concealed beneath the waterline or present grade, as required to perform the Work as indicated on the Drawings and in the Specifications. If undesirable material and obstructions are encountered during excavation, remove material and replace with consultation as directed by the Government Representative.
8. Impounded sediments to be excavated may consist of cobble, gravel, sand, silts, clays and organic material. Varying soil moisture contents will be encountered during the excavation. The Contractor shall be equipped to handle excavation with moisture content ranging from dry to very wet during excavation including handling, loading, transport and disposal.
9. The top lift placed in all spoils areas shall include a soil mix with a minimum 5% organic content to a thickness of 6 inches to promote vegetation growth. Excavated material that is classified as organic soil may be stockpiled and placed as the top lift in spoils areas. The Contractor may instead import organic soil from a prior approved source to meet this requirement if deemed more efficient and economical. No extra compensation will be made if the Contractor chooses to import organic soil instead of salvage organic soil from onsite locations.
sources for this purpose.

10. Excavated materials not earmarked for salvage, stockpile and reuse shall be disposed at the excavation spoils piles designated on the Drawings, and unless otherwise indicated in the field by the COR. The Contractor shall spread or shape the spoils at the spoils areas as necessary to complete the work and to result in landforms with variable side slopes, resulting in landforms that are natural in appearance and character.

11. Do not carry excavations beyond that shown on the Drawings except as indicated by COR. No extra compensation will be made to Contractor for excavation beyond the grades shown on the Drawings without prior approval and modification by the Contracting Officer.

12. The Contractor is required to design, furnish and maintain all temporary stream crossings as necessary to complete the work. Temporary crossings shall be removed completely at the end of the Work.

13. The Contractor is required to completely remove Aggregate Base used for the temporary crossings at the end of construction.

C. Sediment traps shall be excavated and/or constructed at locations shown on Drawings or as approved by the COR. Traps shall be in place prior to the start of drawdown.

1. Pool depth may be maintained by using Bulk Bags, or equal, as a weir or weirs to control optimal water depth.

2. Monitoring shall ensure flow does not erode around Bulk Bags and compromise water control.

3. Traps shall not be excavated lower than the pre-dam channel elevation unless approved by the COR. If excavation below pre-dam or proposed grades as indicated in the Drawings occurs, coarse material shall be stockpiled and replaced to original grades following construction.

4. Sediment traps shall be maintained by periodically removing accumulated sediment. Sediment traps shall be maintained as required to reduce the transport of sediment within and downstream of the project area.

5. Sediment spoils excavated during sediment trap construction or maintenance shall be placed in spoil areas as shown on the Drawings.

D. Construction of Spoil Areas:

1. No material shall be spoiled outside of the areas noted on the Drawings without approval by the COR.

2. Construct embankments and fills at locations and to the approximate lines and grades indicated or as directed by Government Representative, to result in landforms that are natural in appearance and character.

3. Vegetation material removed from excavation areas or found in place not designated for other uses may be buried in spoils areas with COR approval.

4. Spoil areas must be fully contained within the limits indicated in the Drawing to avoid inadvertent wetland impacts. Do not deviate from the limits shown without prior approval by the COR.

5. Spoil areas grades may be adjusted in the field by the Government Representative to maximize material handling efficiency and to result in naturalized landforms.

6. Maximum slopes of Spoil areas must not exceed 3H:1V.

E. Habitat Enhancement Excavation by Dig and Pitch Method:

1. Following completion of dam removal and major excavation within the impoundment to the lines and grades shown on the drawings and/or as adapted by the Government Representative, additional excavation work will be required to re-establish habitat and geomorphic features
in the channel (pools, bars and riffles) as shown in typical details on the Drawings or as indicated by the Government Representative.

2. Habitat Enhancement Excavation will follow a "fit in the field" dig and pitch method with the Government Representative working directly with the Contractor to determine the final channel bed lines and grades. This work primarily consists of digging pools in the channel bed, using the excavated material to create bars within the channel, and locally steepening channel areas to create riffles, all at locations that are in relationship to the planform of the channel.

3. The work will generally result in balance cut and fill in the streambed. Spoils areas shall be used to waste material, as required.

F. Powerhouse Dam Excavation:

1. The Contractor shall excavate to the vertical and horizontal limits defined on the Construction Drawings to facilitate the demolition of the powerhouse and removal of portions of the dam powerhouse to form the new river channel.

2. Permanent stable excavation slopes shall be maintained as described on the Drawings and in subsection 3.3 of this Section.

3. Excavated soils shall be stockpiled on-site and re-used as appropriate to achieve final grading of the channel at the embankment dam provided that the soils meet backfill criteria.

G. Sabin Dam Breaching:

1. The contractor shall excavate earthen material surrounding the powerhouse in area of proposed restored river channel to the vertical and horizontal limits defined on the Drawings.

H. Bulk Bag Cofferdam

1. A 2 ft deep trench shall be excavated where the bulk bags are to be placed and filled with 12 inches of bulk bag aggregate base layer, such that the bottom of the first layer of bulk bags is 1 ft below the proposed river channel elevation of 596 ft. An impermeable layer shall be placed over the aggregate and under the bulk bags, then wrapped around the upstream face of the bulk bags and secured over the top of the bags to prevent water from seeping through the bulk bags.

2. Bulk Bags are to be filled with clean sandy material in the dry and then placed per manufacture's recommendations in locations indicated on the plans or as indicated by the Government Representative.

3. Sandy material from Bulk Bags can be used as fill material in areas shown on the plans or as directed by the Government Representative. The Bulk Bags will remain as property of the Contractor and shall be disposed of per section 02 42 09.

3.3 STABILITY OF EXCAVATIONS

A. Slope sides of temporary excavations shall comply with applicable codes and ordinances. Unsupported excavations should be sloped back or shored to permit safe working conditions, in accordance with OSHA requirements for protective systems (29 CFR 1926.652) and/or any applicable codes and ordinances that are more stringent. The soils through which excavations will extend should be considered OSHA Soil Type C, unless otherwise verified by an Excavation Competent Person. Shore and brace where sloping is not possible because of space restrictions, stability of material excavated, or where protection of adjacent structures is required.

B. Maintain sides and slopes of excavations in a safe condition until
completion of backfilling and grading, or longer if specified or directed by the COR.

C. The Contractor shall barricade areas within the influence of excavation to preclude access or vehicle traffic/operations.

3.4 SOIL/MATERIAL HANDLING AND STORAGE

A. During daily excavation activities, locate and retain soil materials away from edge of excavations. All temporary/daily stockpiles shall be maintained a sufficient distance from the excavation to prevent surcharge loading of the slope and to provide for stability of the slope.

B. During excavation, demolition debris shall be segregated from contaminated soil/sediment that must be disposed of off-site, and from reclaimed soil that meets site Common Borrow specification guidelines. All waste soils and materials shall be handled in accordance with Section 02 42 09 Waste Removal and Handling.

C. The Contractor shall direct load and unload soil/materials into and from trucks to the extent possible to minimize on-site storage of soil/materials.

D. Designated storage/stockpile areas shall be established for the following soils/materials, as required:
   1. Demolition debris;
   2. Reclaimed soil for re-use as material for Common Borrow backfill or other reuse classification;
   3. Imported borrow soil and aggregate that meets criteria for use on site; and
   4. Soil and sediment that shall be placed in spoils areas on site.

E. The Contractor shall place, grade, and shape stockpiles to provide for proper drainage. Stockpiles shall incorporate appropriate erosion and sedimentation controls in accordance with Section 31 40 00 Slope Protection and Erosion Control to prevent the off-site migration of sediments. Stockpiles shall be located, shaped, and managed so as to prevent run-on from entering the stockpile and run-off from entering the excavation.

F. Dispose of excess soil and sediment as specified herein at spoils areas, and dispose of contaminated material and waste soil/materials as specified herein and in accordance with Section 02 42 09 Waste Removal and Handling.

3.5 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing if filling is to be performed on that surface when atmospheric temperature is less than 35 F.

B. Do not place fill materials that are frozen.

3.6 CLOSING ABANDONED UNDERGROUND UTILITIES

A. Close open ends of abandoned underground utilities, indicated to remain, permanently with closures sufficiently strong to withstand pressures which may result after closing.
B. Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs, or other suitable method for the type of material and size of pipe. Do not use wood plugs.

C. Close open ends of concrete and masonry utilities with not less than 8-inch thick brick masonry bulkheads, constructed to completely fill the opening.
   1. Wet brick before laying. Lay brick in mortar so as to form a full bed with ends and side joints in one operation. Joints shall not be more than 3/8 inch wide. Protect fresh masonry from freezing or from rapid drying, as necessary, and maintain protection until mortar has set.

3.7 GRADING

A. The Contractor shall uniformly grade areas within the limits of work for the channel, floodplain, embankment regrading, and spoils areas.

B. At the dam embankment, smooth finished surface within 0.5 foot (horizontal and vertical) of design lines and grades, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades. Finish surfaces to be free from irregular surface changes, and should not be consistently high or low relative to the design lines and grades.

C. In the remaining spoils areas rough and irregular surfaces are acceptable, provided a stable fill is constructed.

D. Channel dimensions are expected to change during construction and will be guided by the Government Representative. Grading above the bankfull elevation of the channel is expected to incur less adjustment, but may be adapted to pre-dam indicators.

E. Finished slopes along the daylight edge of the floodplain and within the spoils areas are critical to maintaining the stability of material. When completed, the average plane of the slopes shall conform to the slopes indicated on the Drawings, and no point on the completed slopes shall vary from the designated plane by more than 0.5 feet measured at right angles to the slope, unless indicated or approved by the COR.

3.8 BACKFILL AND FILL PLACEMENT AND COMPACTION

A. General:
   1. Obtain approval from COR with regard to suitability of soils and acceptable subgrade prior to subsequent operations.
   2. Provide system necessary to successfully complete excavation, compaction and construction requirements.
   3. Place satisfactory soil material in layers to required subgrade elevations.
   4. Do not place backfill or fill material within the limits of the new channel on surfaces that are muddy, frozen, or contain frost or ice.

B. Fill/Backfill Placement Near Dam:
   1. Place Common Borrow materials in loose layers not more than 8-inches in loose thickness, unless otherwise specified.
   2. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact Common Borrow to at least 95 percent of the material's maximum dry density and within 3% (plus or minus) of the material's Optimum Moisture Content as determined by ASTM D698.

4. Compact Granular Borrow to at least 95 percent of the material's maximum dry density as determined by ASTM D698.

5. Compact Aggregate Base to at least 98 percent of the material's maximum dry density as determined by ASTM D698.

C. Fill in Spoils Areas: Compact each layer at spoils areas as necessary to facilitate efficient and timely execution of the work, and to the satisfaction of the Government Representative.

D. Place backfill and fill materials evenly to required elevations.

E. Floodplain Fill: Fill floodplain fill areas as indicated to 85 percent of the material's dry density as determined by ASTM D698. Care shall be taken to prevent segregation of material sizes during handling and placement of the material.

F. Subgrade Fill: Fill areas between existing grade and design subgrade to prepare for placement of channel bed material for constructed and stabilized streambed as indicated to 90 percent of the material's dry density as determined by ASTM D698. Care shall be taken to prevent segregation of material sizes during handling and placement of the material.

3.9 FIELD QUALITY CONTROL TESTINGS

A. Field testing shall be conducted on all soil materials during construction. The Contractor shall subcontract the services of an independent, third-party geotechnical laboratory testing and inspection service to perform testing of any borrow material to be furnished by the Contractor as specified below.

1. Common Borrow:
   Test                      Methodology(1)            Frequency(2)

2. Granular Borrow:
   Test                      Methodology(1)            Frequency(2)

3. Aggregate Base:
   Test                      Methodology(1)            Frequency(2)

Notes:
1. Other testing methods may be considered acceptable, based on prior approval of the COR.
2. Testing frequency shall be as listed, at any change in borrow source, or at any discernable change in material delivered to the site (as determined by the COR).
3. Three tests per lift for every 5,000 square foot of material placed.

B. The Government Representative will establish or designate control points for the work as follows:
1. The horizontal and vertical control monuments designated by the Government Representative will consist of at least four monuments with horizontal and vertical coordinates.
2. Provide without charge, such competent person, tools, stakes, and other materials as Government Representative may require in establishing or designating control points; in establishing construction easement boundaries; or in checking layout, survey, and measurement of work performed by the Contractor.

C. Provide all additional survey, layout, and measurement work required in accordance with Section 01 71 23 Field Engineering.
   1. Work performed by a qualified professional engineer or registered land surveyor acceptable to the COR.
   2. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
      a. Make no changes or relocations without prior written notice to the governing agency.
      b. Report to Government Representative when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
      c. Require surveyor to replace Project control points and all Federal, State, City, County and private land monuments that may be lost or destroyed.
         a) Establish replacements based on original survey control.
         b) Comply with local and State requirements for monument replacement and restoration.
   3. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means.
   4. Periodically verify layouts by the same methods.
   5. Maintain a complete, accurate log of all control and survey work as it progresses.
   6. On request of the Government, submit documentation to verify accuracy of field engineering work.

3.10 EARTHWORK TOLERANCES

A. Channel and floodplain dimensions are expected to change during construction and will be guided by the Government Representative. The Contractor shall proceed with channel and floodplain excavation with the anticipation that the final grades will be at or below the lines and grades shown on the Drawings, and then anticipate adjustments to the same as excavation nears the lines and grades shown on the Drawings to conform to field and pre-dam indicators, including relic pre-dam channel and floodplain materials, stumps, and other indicators.

B. Finished slopes along the daylight edge of the floodplain and within the spoils areas are critical to maintaining the stability of material. When completed, the average plane of the slopes shall conform to the slopes indicated on the Plans, and no point on the completed slopes shall vary from the designated plane by more than 0.5 feet measured at right angles to the slope, unless indicated or approved by the COR.

3.11 MAINTENANCE

A. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion.
   2. Keep free of trash and debris.
B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas:
   1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and recompact as specified in subsections 3.7 and 3.8.

3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS

   A. Removal from Site:
      1. Remove waste materials, including excess and unacceptable excavated material, trash and debris, and properly dispose of it off the property in accordance with Section 02 42 09 Waste Removal and Handling.

3.13 SITE RESTORATION

   A. Unless otherwise specified, all disturbed areas shall be prepared as specified in paragraph 2.10.

   B. All areas designated by the Government Representative shall be seeded in accordance with Section 32 90 00.

   -- End of Section --
SECTION TABLE OF CONTENTS

DIVISION 31 - EARTHWORK

SECTION 31 23 19

DEWATERING

PART 1   GENERAL

1.1   RELATED DOCUMENTS
1.2   SUMMARY
1.3   DEFINITIONS
1.4   COORDINATION

PART 2   PRODUCTS

2.1   DEWATERING MATERIALS

PART 3   EXECUTION

3.1   PERFORMANCE
3.2   CONSTRUCTION DEWATERING
3.3   REMOVAL OF TEMPORARY WORKS

-- End of Section Table of Contents --
PART 1   GENERAL

1.1     RELATED DOCUMENTS
A.   Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2     SUMMARY
A.   Section includes description of acceptable material and placement of:
   1.   Dewatering

1.3     DEFINITIONS
A.   Dewatering: Controlled collection, withdrawal, handling, and/or disposal of ground and surface water entering trenches, excavations, any braced/sheeted excavations, and drawdown of areas to provide for construction activity.

1.4     COORDINATION
A.   Coordinate with the demolition of the existing spillway and powerhouse structures as indicated on the Drawings and as directed by the COR.

PART 2   PRODUCTS

2.1     DEWATERING MATERIALS
A.   Contractor shall provide equipment and materials necessary to remove water from excavations and trenches using pumps, drains, well points, piping, sediment trap, check dams, flow diversion materials and execution and any other facilities necessary to keep the excavations and trenches free of water, as approved by the COR.
   1.   The Contractor shall have spare equipment available for immediate use in the event of equipment breakdowns.

B.   Dewatering Equipment and Supplies:
   1.   As necessary, best adapted to design and construction requirements.

C.   Stream Diversion:
   1.   Bulk Bags specified in Section 31 23 00 shall be utilized for river diversion per manufacture's specifications.
PART 3  EXECUTION

3.1  PERFORMANCE

A.  General:
1.  Contractor shall design, maintain, and operate a dewatering system, including any permitting, handling and treatment that may be required for the discharge of the water as required to facilitate and complete the Work, as described herein and approved by the COR. Any reference to dewatering on the drawings is conceptual only.

B.  Damage:
1.  The Contractor shall be responsible for any and all damage resulting from the dewatering operations or the failure to maintain the Work that is specified to be performed in the dry in a suitable dry condition.
2.  Take all necessary precautions to protect new work and excavation from flooding during storms or from other causes.

3.2  CONSTRUCTION DEWATERING

A.  Contractor shall dewater excavations, trenches, and other parts of the construction site to facilitate construction that is specified to be performed in the dry to keep free of standing water, to prevent sidewall sloughing, to mitigate subgrade softening, piping, and/or heave, and/or to prevent excessively muddy conditions and facilitate completion of Work in a timely manner.
1.  Dewatering methods that cause a loss of fines will not be permitted.
2.  Direct discharge to storm drain systems, sewer systems, to watercourses downstream of the dam, or over land downstream of the dam is not allowed. Discharge from dewatering operations shall be treated for sediment prior to release, in addition to any other treatment that may be required by the permitting agency.

B.  Furnish, install, operate, and maintain Bulk Bags and other equipment needed to perform excavation and construction as specified.

C.  Furnish, install, operate, and maintain all drains, sumps, pumps, and other equipment needed to perform construction dewatering as specified.

3.3  REMOVAL OF TEMPORARY WORKS

After the temporary works have served their purpose, remove them or level and grade them to the extent required to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

-- End of Section --
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DIVISION 31 - EARTHWORK

SECTION 31 36 00

STREAMBANK CONSTRUCTION

PART 1   GENERAL

1.1 RELATED DOCUMENTS
1.2 References
1.3 SUMMARY
1.4 Related Sections
1.5 QUALITY ASSURANCE
1.6 SUBMITTALS

PART 2   PRODUCTS

2.1 MATERIALS

PART 3   EXECUTION

3.1 INSTALLATION

-- End of Section Table of Contents --
PART 1   GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 References

The publications listed below form a part of this Section to the extent referenced. The most recent issue of each publication shall apply, unless otherwise noted. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D6525</td>
<td>Test for Measuring Nominal Thickness of Permanent Rolled Erosion Control Products</td>
</tr>
<tr>
<td>ASTM D1117</td>
<td>Standard Guide for Evaluating Nonwoven Fabrics</td>
</tr>
<tr>
<td>ASTM D6475</td>
<td>Test for Measuring Mass Per Unit Area of Erosion Control Blankets</td>
</tr>
<tr>
<td>ASTM D1388</td>
<td>Test for Stiffness of Fabrics</td>
</tr>
<tr>
<td>ASTM D6818</td>
<td>Test for Ultimate Tensile Properties of Turf Reinforcement Mats</td>
</tr>
<tr>
<td>ASTM D1777</td>
<td>Test for Thickness of Textile Materials</td>
</tr>
<tr>
<td>ASTM D4595</td>
<td>Test for Tensile Properties of Geotextiles by the Wide-Width Strip Method</td>
</tr>
<tr>
<td>ASTM D3776</td>
<td>Test for Mass Per Unit Area (Weight) of Fabric</td>
</tr>
</tbody>
</table>

Erosion Control Technology Council (ECTC)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECTC</td>
<td>Standard Specification for Rolled Erosion Control Products</td>
</tr>
</tbody>
</table>

1.3 SUMMARY

A. Section Includes:
1. Fabric Encapsulated Soil (FES) Lift construction at the locations indicated in the plans/drawings.
2. In other areas, the two streambank construction methods detailed below are considered OPTION items to be exercised at the Government's discretion.

1.4 Related Sections

1. Section 31 23 00 - Earthwork
2. Section 31 40 00 - Slope Protection and Erosion Control
3. Section 31 37 00 - Streambed Construction
5. Section 32 90 00 - Planting

1.5 QUALITY ASSURANCE

A. Reference Standards:
Refer 1.2 REFERENCES.

B. Coir fabrics shall consist of 100% biodegradable mats. Nylon fiber material in any of the coir fabrics is not acceptable. Only those coir fabrics specified will be accepted unless otherwise approved by the COR.

C. Each roll of coir and filter fabric shall be packaged individually in a suitable sheet, wrapper, or container to protect the fabric from damage to ultraviolet light, moisture, and mud during normal storage and handling.

D. Each roll of coir and filter fabric shall be identified with a tag or label securely affixed to the outside of the roll on one end. The label shall include the manufacturer or supplier, the style number, and the roll and lot numbers.

E. Store all coir and filter fabrics elevated off the ground and ensure that they are adequately covered to protect the material from damage. Protect coir and filter fabrics from sharp objects which may damage the fabric.

F. Coir and filter fabrics damaged during transport, storage or placement shall be replaced at the Contractors expense.

G. The Government may randomly select and obtain samples from rolls of coir and filter fabric after arrival on the site and prior to installation to compare to previously submitted samples.

H. Coir and filter fabric with seams are not acceptable.

1.6 SUBMITTALS

SD-04 Samples

1. Samples; G-DR
   a. Submit technical data for and samples of coir fabrics (woven and nonwoven), wood stakes, and wood staples proposed for use in construction of FES lifts for approval by the COR.
   b. Submit sources and intended willow species to be used for Live Stakes.
PART 2 MATERIALS

A. Nonwoven (inner) Coir Fabric
   1. The inner layer of nonwoven coir fabric shall be North American Green (NAG) style C125BN 100% biodegradable coconut fiber mat or approved equal. The fabric shall meet or exceed the following criteria:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>ASTM D6525</td>
<td>0.28 in (7.11 mm)</td>
</tr>
<tr>
<td>Resiliency</td>
<td>ECTC Guidelines</td>
<td>85%</td>
</tr>
<tr>
<td>Water Absorbency</td>
<td>ASTM D1117</td>
<td>365%</td>
</tr>
<tr>
<td>Mass/Unit Area</td>
<td>ASTM D6475</td>
<td>8.83 oz/yd2 (300 g/m2)</td>
</tr>
<tr>
<td>Swell</td>
<td>ECTC Guidelines</td>
<td>Yes</td>
</tr>
<tr>
<td>Smolder Resistance</td>
<td>ECTC Guidelines</td>
<td>Yes</td>
</tr>
<tr>
<td>Stiffness</td>
<td>ASTM D1388</td>
<td>0.11 oz-in</td>
</tr>
<tr>
<td>Light Penetration</td>
<td>ECTC Guidelines</td>
<td>17.7%</td>
</tr>
<tr>
<td>Tensile Strength - MD</td>
<td>ASTM D6818</td>
<td>141.6 lbs/ft (2.1 kN/m)</td>
</tr>
<tr>
<td>Elongation - MD</td>
<td>ASTM D6818</td>
<td>14%</td>
</tr>
<tr>
<td>Tensile Strength - TD</td>
<td>ASTM D6818</td>
<td>222 lbs/ft (3.29 kN/m)</td>
</tr>
<tr>
<td>Elongation - TD</td>
<td>ASTM D6818</td>
<td>14.3%</td>
</tr>
<tr>
<td>Roll Width</td>
<td>Measured</td>
<td>6.6 ft.</td>
</tr>
</tbody>
</table>

B. Woven (outer) Coir Fabric
   1. The outer layer of woven coir fabric shall be a high strength 700 Weight (100% coconut fiber), continuously woven mat. Seams that run the length of the fabric are not acceptable. The fabric shall meet or exceed the following criteria:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Method</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>ASTM D1777</td>
<td>0.30 inches</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D4595</td>
<td>100 lb/in x 70 lb/in</td>
</tr>
<tr>
<td>Mass/Unit Area</td>
<td>ASTM D3776</td>
<td>20 oz./yd2</td>
</tr>
<tr>
<td>Open Area</td>
<td>Measured</td>
<td>50%, maximum</td>
</tr>
<tr>
<td>Roll Width</td>
<td>Measured</td>
<td>9.9 ft or 13.2 ft (see below)</td>
</tr>
</tbody>
</table>

C. Channel Bed Material
   1. Shall be as defined in Section 31 37 00 Streambed Construction

D. Organic Soil
   1. Shall be soil material salvaged from project excavation as defined in Section 312300 Earthwork. Sources to be used for Streambank Construction to be reviewed for approval by COR prior to installation. Soil shall generally be silty and/or sandy soil with notable organic material content, free of chemical contaminants, stumps, and other deleterious materials and organic material greater than 2 inches in diameter. Organic Soil shall be suitable to enable vegetative establishment by native riparian or other vegetation.

E. Wood Stakes
   1. Wood Stakes shall be used to anchor all coir fabrics. Stakes shall be wooden stakes solid and free of knots or defects. Stakes shall be 18 inches length. Stakes shall be wedge shaped with a minimum equivalent diameter equal to 1.5 inches at the top and should come to a point at the bottom. Stakes shall be constructed by cutting a standard grade 2 inch x 4 inch lumber lengthwise along the diagonal to create wedge shaped stakes, or by some other method resulting in a stake of dimensions approved by the COR.
F. Wood Staples
1. Wood Staples shall be 12 inches in length, untreated, solid, and free of knots or defects. Wood Staples shall be North American Green 12 inch Eco-stakes or Approved Equal.

G. Seed
1. Material requirements for Seed shall be as defined in Section 32 90 00 Planting.

H. Live Stakes
1. Live Stakes consist of Stakes from live stems of shrubs or trees that are provided in an un-rooted condition and have the ability to establish roots and shoots if planted under proper conditions.
2. Live Stakes shall be sourced from willow, or dogwood species if placed during dormancy, native to Grand Traverse County that are adapted to growing in streambank areas. Live Stakes shall include a mix of 2 to 3 species meeting these requirements. The species intended for use shall be submitted for review and approval by the COR.
3. Live Stakes shall be taken from healthy plants within 100 miles of the project site.
4. The materials shall be collected between October 15 and March 1 and no more 14 days before installation. Live Stakes harvested between budding and leaf-off are not acceptable. Contractor shall provide documentation from supplier that the materials were harvested no more than 14 days prior to planting. Any deviation from these sourcing requirements requires approval of the COR. Documentation authenticating the date cuttings were acquired shall be submitted to the Government prior to acceptance.
5. Cuttings shall remain continuously wet from harvest to placement, stored in water and shade with approximately 80% of length from distal end submerged. Water should be changed every 1 to 2 days if cuttings are kept in a container.
6. The basal end (bottom) of the materials shall be indicated by a clean, slanted cut. All lateral stems shall be removed at the juncture with the main stem. Tops of the materials (distal ends) shall be indicated by a cut perpendicular to the stem.
7. The diameter of Live Stakes shall be 1.0 to 1.5 inch at their midpoint, and shall be of sufficient length to satisfy the installation requirements shown on the Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. areas of required bank construction shall be isolated from the active flowing stream.

B. Fabric Encapsulated Soil (FES) Lifts

1. The number of lifts to be installed for each section of streambank shall be according to the total vertical bank height designated for FES lift construction as follows:

<table>
<thead>
<tr>
<th>Total Vertical Bank Height</th>
<th>Number of Lifts</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1.5'</td>
<td>1</td>
</tr>
<tr>
<td>1.6' to 3.0'</td>
<td>2</td>
</tr>
<tr>
<td>3.1' to 4.5'</td>
<td>3</td>
</tr>
</tbody>
</table>

SECTION 31 36 00 Page 5
2. Fabric widths: 13.1 foot wide woven coir (outer) fabrics shall be used for the top and bottom lift at each location. 9 foot wide woven coir (outer) fabrics shall be used for all middle (if required) lifts.

3. Perform all shaping of the subgrade to the elevations, lines and grades, as indicated on the Drawings. Shape, trim, and finish slopes of channels to conform with the subgrade lines, grades, and cross sections as indicated on the Drawings. The subgrade shall be graded to a smooth condition free from depressions and protruding rocks, sticks, and other debris which may prevent a smooth application or that may damage the fabric. Care shall be taken to remove all objects that would interfere with application or damage the coir fabrics. The finished subgrade shall be approved by the COR prior to placement of any new material.

4. Do not carry the excavation for the subgrade deeper than the elevation shown on the Drawings. Excavation carried below the subgrade lines shown on the Drawings shall be replaced with constructed streambed. The Contractor shall bear all costs for correcting over excavated areas.

5. FES lift construction sequence:
   a. Place forms along the bank in locations to achieve the lines and grades shown on the Drawings.
   b. Roll woven (outer) coir fabric along the streambank and place fabric against the subgrade and (vertical) form face with embedment lengths as indicated.
   c. Roll nonwoven (inner) coir fabric along the streambank and place on top of the woven coir fabric to achieve the embedment length shown on the Drawings.
   d. Remove all wrinkles in coir fabric and insure that fabrics rest tightly against the subgrade and form face with the proper embedment lengths. Allow excess coir fabric to drape over the form toward the stream channel.
   e. Apply Floodplain Seed to that portion of nonwoven coir fabric that is placed against the vertical face of the form.
   f. Fill material as designated on the Drawings shall be placed in layers not to exceed 0.5 feet and then compacted to 85% maximum density. Additional layers of soil mixtures shall be placed and compacted to reach a lift height of 1.0 to 1.5 feet as indicated.
   g. Apply Floodplain Seed to the soil lift prior to wrapping with fabric. In the case of multiple lifts, be sure to seed only those areas exposed following completion of the entire bank.
   h. Pull coir fabrics that are draped over the form back over seeded soil. Mechanically pull coir fabrics tight and stake according to the Specifications and Drawings, taking care not to rip the fabric.
   i. Supplemental stakes shall be installed in any areas where the fabric is loose and can easily be pulled away from the surface. Finished fabric installation should be tight and not easily moved by hand.
   j. Wood stakes and staples may be placed through both layers of coir fabrics. It is not required to anchor the nonwoven and woven fabrics individually. Wood stakes and staples shall be placed
between the fibers of the woven coir fabric. Cutting of the coir fabrics to facilitate wooden stake placement will not be allowed.

k. Damaged coir fabric shall be repaired or replaced. If damaged coir fabric has a tear of 6 inches or less, scrap fabric may be placed beneath damaged woven coir fabric such that it extends 24 inches beyond the damaged area in all directions. Stake around the tear with 4 wooden stakes on 12-inch centers. Coir fabrics with tears greater than 6 inches shall be replaced at the Contractor's expense.

l. Remove forms. Note, forms can be removed by hand, or pried with a bar if necessary. Contractor shall not use motorized equipment to remove forms. Shape the face of the completed lifts to result in a modestly sloping face profile.

m. Compress the face of the FES Lift so that it forms a 45° angle from vertical. This process shall not minimize the tension of the woven (outer) or nonwoven (inner) fabrics.

n. Repeat a-m above to achieve the lines and grade shown on the Drawings.

o. Install live Stakes by driving at a 45° angle toward the stream centerline, through exposed horizontal surface of the lift. Cuttings should be driven below the suspected groundwater or stream flow elevation, at a minimum of 1 ft below the bottom of the lowermost lift. Live Stakes should be driven with a dead blow hammer, rubber mallet or other device to minimize damage to the cutting. A rebar rod or other rod may be used to create a planting hole. The outer fabric should not be cut, but individual strands may be pulled apart to accommodate for the diameter of the cutting.

6. Maintenance: Live Stakes and Riparian Seed placed in Fabric Encapsulated Soil Lifts shall be watered and maintained by Contractor following installation until the dormant period that follows their installation.

B. Fabric Slope Protection

1. Fabric Slope Protection is an OPTIONAL item to be placed in the project site as needed at the discretion of the Government.

2. Install according to manufacturer's instructions and as shown on the Drawings and indicated herein. Install woven (outer) coir fabrics over nonwoven (inner) coir fabric in installation of the work.

3. The area to be covered by the coir fabrics shall be graded to a smooth condition free from depressions and protruding rocks, sticks, and other debris which may prevent a smooth application or that may damage the fabric. Care shall be taken to remove all objects that would interfere with application or damage the coir fabrics.

4. Following surface preparation, install Floodplain Seed as indicated herein prior to placement of coir fabrics.

5. The coir fabrics shall be placed and anchored as indicated on the Drawings and herein using wood stakes. Wood stakes may be placed through both layers of coir fabrics. It is not required to anchor the nonwoven and woven fabrics individually. Wood stakes shall be placed between the fibers of the woven (outer) coir fabric. Cutting of the coir fabrics to facilitate wooden stake placement will not be allowed.

6. Damaged coir fabric shall be repaired or replaced. If damaged coir fabric has a tear of 6 inches or less, scrap fabric may be placed beneath damaged woven coir fabric such that it extends 24 inches beyond the damaged area in all directions. Stake around the tear with 4 wooden stakes on 12-inch centers. Coir fabrics with tears greater than 6 inches shall be replaced at the Contractor's expense.
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SECTION 31 37 00

STREAMBED CONSTRUCTION

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3.1 INSTALLATION

-- End of Section Table of Contents --
Sabin Dam Removal and River Restoration

SECTION 31 37 00
STREAMBED CONSTRUCTION

PART 1   GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 References

ASTM INTERNATIONAL (ASTM)

ASTM C127 Test Method for Specific Gravity and Absorption of Coarse Aggregate


ASTM C535 Test for Resistance to Degradation of Large-Size Course Aggregate

1.3 SUMMARY

A. Section Includes: Streambed construction as indicated.

1.4 Related Sections

1. Section 31 23 00 - Earthwork
2. Section 31 40 00 - Slope Protection and Erosion Control
3. Section 31 36 00 - Streambank Construction

1.5 QUALITY ASSURANCE

A. Reference Standards:
   Refer 1.2 REFERENCES

1.6 SUBMITTALS

SD-01 Preconstruction Submittals

1. Sources and locations for Channel Bed Material and Boulders; G-DR Proposed sources and locations for supply of Channel Bed Material and Boulders shall be submitted. Contractor shall arrange for Government Representative to review the material at the source(s) prior to acceptance and transport of materials to the site.

SD-06 Test Reports

Test Reports and certifications of compliance with material quality requirements
1. Channel Bed Material test results and certification of compliance; G-DR
   a. Gradation
   b. Specific gravity
   c. Absorption
   d. Abrasion
2. Boulders test results and certification of compliance; G-DR
   a. Gradation
   b. Specific gravity
   c. Absorption
   d. Abrasion

PART 2 PRODUCTS

2.1 MATERIALS

A. Channel Bed Material
1. Shall be rounded, hard, durable, resistant to weathering and to water action, and be free from overburden, spoil, shale, limestone, structural defects and organic material. The least dimension of any piece of stone shall not be less than one-third its greatest dimension. Unless otherwise approved, the materials shall meet the following quality requirements:

<table>
<thead>
<tr>
<th>Test and Method</th>
<th>Specification Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent Specific Gravity,</td>
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<td>ASTM C127, min</td>
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<tr>
<td>Absorption,</td>
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</tr>
<tr>
<td>ASTM C127,</td>
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<tr>
<td>% max</td>
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</tr>
<tr>
<td>Abrasion,</td>
<td>35</td>
</tr>
<tr>
<td>ASTM C535,</td>
<td></td>
</tr>
<tr>
<td>% max/500 rev</td>
<td></td>
</tr>
</tbody>
</table>

2. Channel Bed Material installed in place shall form a compact and consolidated streambed with limited void space, free from segregation of stone sizes. Channel Bed Material will meet the gradation listed below. Testing Required shall be in accordance ASTM C136.

<table>
<thead>
<tr>
<th>Channel Bed Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Passing</td>
</tr>
<tr>
<td>Weight Basis</td>
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<tr>
<td>100</td>
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<tr>
<td>30</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

B. Native Substrate
1. Shall be as defined in Section 312300 (Earthwork)

C. Boulders (OPTION ITEM)
1. Boulders shall meet the same material quality requirements as listed for Channel Bed Material in Paragraph 313700.2.1.A.1.

2. Boulders shall have a minimum dimension of 3 feet when measured on the median axis.

PART 3 EXECUTION

3.1 INSTALLATION

A. Channel Bed Material shall be placed to form designated sections of the streambed as herein specified and as indicated on the Drawings. Channel Bed Material shall be placed to match the design grades shown on the Drawings.

B. Native Substrate exhumed from the former streambed surface during excavation, Section 312300 (Earthwork) shall be stockpiled and reused as determined by the Government.

C. Do not carry the excavation for the channel shape deeper than the typical subgrade elevation shown on the Drawings. Excavation carried below subgrade shall be replaced with Native Substrate or Channel Bed Material as appropriate. The Contractor shall bear all costs for correcting over excavated areas.

D. In areas where existing grade is below the design subgrade elevation, install Subgrade Fill to form the subgrade for placement of channel bed material.

E. The finished subgrade will be reviewed by the COR and approved prior to placement of Channel Bed Material and Native Substrate.

F. Place Channel Bed Material in a manner that prevents segregation of stone sizes. Stone shall be placed such that the constructed river bed forms a well-mixed, consolidated, compact layer, which will require mixing in place and/or water-jetting of the placed material to fill voids in the placed layers.

G. Place Channel Bed Material according to the following method, or alternative method approved by the COR:

1. Typical sequence for construction of Channel Bed Material in the streambed portion of the installation as indicated herein is as follows. In the following sequence specification, 'framework' is used to describe the Channel Bed Material equal to or larger than 6 inches in diameter, and 'small fraction' is used to describe the Channel Bed Material smaller than 6 inches in diameter.

2. Grade subgrade.

3. Place a 4- to 6-inch thick loose layer of the small fraction as first course.

4. Place single layer of framework and work the rocks down so they fit securely into the underlying small fraction material.

5. Place stone material in an alternating sequence of framework with small fraction locally in a sufficiently small area and work sufficient volume of small fraction in to fill the voids of the framework. Small fraction shall not inhibit stone to stone contact of framework.

6. Hydraulic washing of small fraction into framework shall be required with each placement of small fraction to fill voids of framework. A pump discharge of sufficient volume and force to compact and settle the smaller streambed Material shall be used. Jet water onto the
streambed material to wash and settle small fraction into the voids within the framework. Recycled water collected from within the work area may be used. The method and duration of water application shall be sufficient to ensure that small fraction material penetrates to the full depth of the voids in the framework and that all of the voids are completely filled with small fraction materials at an even gradation of sizes. Contractor shall control discharge of wash water per Specifications and applicable regulations.

7. Repeat as necessary to meet the thickness and grades indicated on the Drawings. Place channel material in a manner that prevents segregation of stone sizes. Stone shall be placed such that the constructed stream bed form a consolidated layer.

H. Grade tolerance for Channel Bed Material is +0.3' (no under), when considering the neat line across the installed materials.

I. Boulders (OPTION ITEM) shall be installed in a manner that simultaneously integrates the boulders with the surrounding channel Bed Material or native substrate, in order to prevent segregation of material sizes within the placed channel Bed Material or native substrate, and that results in tight, consolidated contact between the boulders and the surrounding materials. Boulder installation will be a field set item, installed with direct assistance of the Government Representative.

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DIVISION 31 - EARTHWORK

SECTION 31 39 00

LARGE WOOD

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2.1 MATERIALS

PART 3 EXECUTION

3.1 INSTALLATION

-- End of Section Table of Contents --
SECTION 31 39 00

LARGE WOOD

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 REFERENCES

ASTM INTERNATIONAL (ASTM)

ASTM A194 Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

ASTM F436 Standard Specification for Hardened Steel Washers

ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

1.3 SUMMARY

A. Section Includes: supply and installation of Large Wood Logs (Logs), Large Wood with Rootwads, and Large Wood Piles (Piles) including mechanical connections using fully threaded rod and cable.

B. Large Wood installation as indicated on Drawings is included in the base bid for the project. Other large wood installation is considered an OPTION item to be exercised at the Government's discretion. Large Wood installed as option items will be used for habitat elements and/or as bank protection.

C. Large Wood may be installed following completion of excavation activities.

1.4 RELATED SECTIONS

1. Section 31 10 00 - Clearing
2. Section 31 23 00 - Earthwork
3. Section 31 40 00 - Slope Protection and Erosion Control

1.5 QUALITY ASSURANCE

A. Reference Standards:
Refer 1.2 REFERENCES.
1.6 SUBMITTALS

SD-03 Product Data
A. Large Wood
1. Submit source, quantity, size and tree species to be used for Large Wood, Logs, Large Wood Piles and Large Wood Logs with Rootwads to the COR for review.

B. Fully Threaded Rod
1. Submit technical data for fully threaded rod and associated hardware proposed for use in securing Large Wood to the COR for review.

C. Pile Driving Equipment
1. Manufacturer and model number of the vibratory or vibrasonic pile driver to be used for log pile installation. Equipment shall be capable of driving piles to required depths.

D. Cable
1. Submit technical data for cable and associated hardware proposed for use in securing Large Wood to the COR for review.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials, including large wood and rootwads shall be obtained from clearing of onsite trees, where possible. See Section 31 10 00 - Clearing for details as well as the criterion below for applicability. If unavailable from onsite sources, Contractor shall furnish large wood materials from offsite sources.

B. Large Wood:
1. Logs and Piles:
   a. Large Wood, Logs and Piles shall be Cedar, White Pine, Oak, Sugar Maple, or approved equivalent.
   b. Trunk diameter measured at breast height (DBH) of Logs and Piles shall be minimum of 15 inches. Trunk length shall be minimum of 25 feet.
   c. Large Wood, Logs shall be trimmed of branches less than 6 inches diameter.
   d. Large Wood for use as Piles shall have minimum tip diameter of 10 inches and shall be trimmed of branches to enable driving the materials into the subgrade.
   e. Logs and Piles shall be free from rot or decay.
   f. Care should be taken when handling Large Wood materials to minimize damage such as abrasion, splitting, crushing and shearing to the tree trunk.

2. Logs with Rootwads:
   a. Logs with Rootwads shall be Cedar, White Pine, Oak, Sugar Maple or approved equivalent.
   b. Logs with Rootwads will consist of rot resistant logs. Trunk diameter of Logs with Rootwads shall be minimum of 15 inches measured at breast height (DBH). Trunk length shall be minimum of 25 feet, measured from the crown of the rootwad where it meets the trunk to the tip of the log.
   c. Logs with Rootwads shall be trimmed of branches less than 6 inches diameter.
d. Logs with Rootwads shall have a root fan diameter greater than 4 feet which shall remain preserved through transport and handling.

e. Logs with Rootwads shall be free from rot or decay.

f. Care should be taken when handling Logs with Rootwads materials to minimize damage such as abrasion, splitting, crushing and shearing to the tree trunk and roots.

3. Slash:
   a. Slash shall consist of cleared woody debris of non-invasive species not meeting the requirements for Large Wood described above, generated by site clearing activities, to be added to large wood installations as a field set item with the approval of the Government Representative.

C. Fully Threaded Rod (FTR):
   1. FTR shall be 7/8 inch diameter, galvanized and meet the requirements of ASTM F1554, Grade 55. FTR shall be of sufficient length to fasten through at least two log diameters.
   2. Steel washers shall be galvanized 7/8 inch diameter and meet the requirements of ASTM F436
   3. Steel nuts shall be galvanized 7/8 inch diameter and meet the requirements of ASTM A194, Grade 2H.

D. Cable
   1. Cable shall be galvanized, steel core, 3/8-inch diameter wire rope and shall have a minimum nominal tensile capacity of 7 tons.
   2. Cable clamps shall be galvanized steel and shall meet the performance requirements of Federal Specification FF-C-450 TYPE 1 CLASS 1. Cable clamps shall be Crosby Clips (G-450) or Approved Equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Large Wood Installation
   1. Areas of large wood construction along channel banks shall be isolated from the active flowing stream.
   2. Large wood is a field set item. Place Large Wood where required in final configuration with assistance of Government Representative. Final configuration may vary from that shown on the Drawings in order to conform the installations to field conditions and to adjust for variability in available materials at the time of installation. Slash shall also be placed at each location with the assistance of the COR.
   3. Excavate as necessary to place Large Wood while minimizing disturbance to existing or design grade. Shape, trim, and finish grade to allow for placement of Large Wood as shown on the Drawings.
   4. Fasten Large Wood as shown on the drawings or as indicated by the Government Representative.
   5. Log piles shall be installed with a vibratory or vibrasonic pile driver or other method to drive the piles to the required depth if pre-approved by the COR. Equipment shall be capable of driving piles to required depths.
   6. The Government Representative must be present during log pile installation.
   7. Test Piles for load as noted in the Drawings.
   8. Maintain all pile driving equipment in safe operating condition at all times.
   9. Any equipment or methods which result in damage to the log piles

SECTION 31 39 00 Page 4
during driving, or is detrimental to the pull-out capacity of log piles already driven, will be rejected by the Government Representative.

10. Up to 0.5 cubic yards of packed slash will be required for each log or log with rootwad.

11. Up to 2 mechanical connections (FTR and cable as indicated on the Drawings) will be required for each log, pile, or log with rootwad.

12. See Drawing for FTR connection requirements.

13. Where logs will be cabled to other logs, the axis of the cable shall be perpendicular to the axis of each piece of woody debris to hold the woody debris tightly to each other. Use two cable clamps at each clamping location, as indicated.

14. Following clamping, cable shall not have any gap between the cable and the woody debris when levered with a steel bar. No slack shall be allowed.

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DIVISION 31 - EARTHWORK

SECTION 31 40 00

SLOPE PROTECTION AND EROSION CONTROL

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1.4   REFERENCES
1.5   PROJECT REQUIREMENTS

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3.2   PERMANENT CONTROLS
   3.2.1   STORM WATER DISCHARGE INSPECTIONS

-- End of Section Table of Contents --
SECTION 31 40 00

SLOPE PROTECTION AND EROSION CONTROL

PART 1   GENERAL

1.1 SECTION INCLUDES

A. Installation and maintenance of temporary erosion controls.
B. Prevent siltation of water courses, sewers, streams and/or lakes.
C. Confinement of fuels, oils, bituminous materials, chemicals and other harmful materials.
D. Prevention of dust and airborne materials.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures
B. Section 31 90 00 - Planting
C. Section 31 23 00 - Earthwork

1.3 SUBMITTALS

SD-01 Preconstruction Submittals

A. Permits, Certificates, and Inspection Logs
1. Grading permit from local governing authority.
2. Storm water discharge permit as required from local governing authority.
3. Copy of "Notice of Coverage."
4. Grading permit from local governing authority for off-site borrow areas.
5. Permit for disposal of excess materials and/or debris.
6. Soil erosion control inspection logs.

B. Erosion Control Program
1. A schedule of soil erosion control activities.

SD-02 Shop Drawings

C. Shop Drawings; G-DR

1.4 REFERENCES

A. The following reference, may not be a comprehensive or complete list, are part of this specification to the extent referenced:
ASTM INTERNATIONAL (ASTM)


ASTM D4632  Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

ASTM D5261  Standard Test Method for Measuring Mass per Unit Area of Geotextiles

ASTM D4632  Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

ASTM D4533  Standard Test Method for Trapezoid Tearing Strength of Geotextiles

ASTM D4355  Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

ASTM D4751  Standard Test Method for Determining Apparent Opening Size of a Geotextile

ASTM D4491  Standard Test Methods for Water Permeability of Geotextiles by Permittivity

State of Michigan

Act 451  Part 31, Water Resources Protection of the Natural Resources and Environmental Protection Act, 1994

Act 451  Part 91, Soil Erosion and Sedimentation Control

National Pollutant Discharge Elimination System (NPDES)

NPDES Regulations

B. The Contractor shall be responsible for identifying and complying with any additional references as applicable.

1.5 PROJECT REQUIREMENTS

A. All applicable state and local statutes, relating to the prevention and abatement of pollution, shall be complied with during the performance of the contract.

B. All applicable permits and requirements thereof shall be complied with.

C. Construction operations shall be conducted in such manner as to provide permanent and temporary erosion controls and to prevent damaging siltation of watercourses, streams or lakes.

D. The Contractor shall conduct his work in a manner such that all soil, fuels, oils, bituminous materials, chemicals, sanitary sewage, and other
harmful materials, resulting from the construction of the project are confined within project limits, properly disposed of, and prevented from entering watercourses, rivers, lakes, or entering onto or causing damage to adjoining or other properties.

E. A schedule of soil erosion activities shall be submitted prior to any earth-change activity.
   1. This Schedule shall be updated as necessary to update changed activities.
   2. If a schedule is not provided, then the Contractor shall install the temporary erosion control measures immediately after completing any earth change activity.

F. Should any requirement for protecting against soil erosion and sedimentation be neglected or not adequately followed, the Contracting Officer may, upon written notice, require the Contractor to immediately cease construction operations and to apply his entire efforts to meet the omitted requirements before proceeding further with the project.
   1. Should the Contractor, upon such written notice, neglect, refuse, or fail to adequately correct matters causing or contributing to uncontrolled erosion or sedimentation, the Contracting Officer may, and without prejudice to any other recourse, on three-days written notice, execute the required work in the most expedient manner he may elect and deduct all related costs from the contract amount.
   2. No extension of the completion date will be allowed relating to such defaulted work.

G. During any excavating and grading operations where siltation is likely to be a problem, the Contractor's operation shall be scheduled and performed such that required permanent soil stabilization can follow immediately thereafter if the project conditions permit; otherwise, temporary approved erosion and siltation control measure will be required between successive construction stages.

H. The Contractor shall control dust from his operation, in a manner approved by the local enforcing agency. The Contractor shall use the appropriate measures to control dust 24 hours a day 7 days a week before it becomes a nuisance to public, neighboring properties, and site workers and visitors. Dust control shall be implemented throughout the duration of the project.

I. The Contractor shall be responsible for disposing of excess excavation in a lawful manner.
   1. Before any spoil material is taken from the site, the Contractor shall identify, in writing, the proposed spoil areas.
   2. Where such area is other than property owned by the Contractor or a licensed landfill operation, the Contractor shall also submit, with such identification, a written certification from the local enforcing agency that the proposed disposition of such material will not result in violation of applicable local ordinances or state laws.
   3. Any cost of such certification and/or related erosion or sedimentation control measures shall be the responsibility of the Contractor.

J. If borrow areas are required on this project, the Contractor shall be responsible for securing necessary borrow or fill materials.
   1. Before any borrow or fill is placed on the site, the Contractor shall identify, in writing, the source of all borrow or fill to be used on the project.
   2. Where such material is not taken from property owned by the Contractor.
or a commercial operation, the Contractor shall also submit, with such identification, a written certification from the local enforcing agency that removal of such material will not result in violation of applicable local ordinances or state laws.

3. Any cost of such certification and/or related erosion or sedimentation control measure shall be the responsibility of the Contractor.

PART 2   PRODUCTS

2.1 MATERIALS

A. Seed
1. Temporary seed shall be composed of a mixture blended in accordance with Section 32 90 00.
2. Permanent seed shall conform to the requirements of Section 32 90 00.

B. MDOT 21AA Aggregate
Aggregate shall meet the requirements of MDOT Standard Specifications for Construction Section 902 for 21AA aggregate.

C. Peastone
1. MDOT 34R material.

D. Rip-Rap, Plain
1. Rip-Rap, Plain shall meet the requirements of MDOT Standard Specifications for Construction Section 916 except that riprap must be natural stone. Do not use broken concrete, broken pavement or precast concrete.

E. Geotextile (Silt Fence)
1. The geotextile properties shall conform to:

   Puncture Resistance       ASTM D4833       lbs.       60
   Grab Elongation           ASTM D4632       %          15
   Weight                    ASTM D5261       oz./yd²     3.2
   Grab Strength             ASTM D4632-86   lbs.       100
   Trapezoidal Tear          ASTM D4533-85   lbs.       50
   UV Stability              ASTM D4355       %          90

   Xenon Arc = 500 hours

   AOS:                      ASTM D4751-87   US Sieve 30-70
   Flow Rate                 ASTM D4491-85   gpm/s.f.  15

F. Non-Woven Geotextile Fabric
1. Meet AASHTO M288 requirements as modified:
   a. A.O.S.:  70-100.
   b. Flowrate: 100 gal/min/ft² minimum.
   c. Trapezoidal Tear: 65 pounds minimum.
   d. Puncture Resistance: 90 pounds minimum.
   e. Grab Tensile: 160 pounds minimum.
   f. Weight: 6.0 oz./yd² minimum.

G. Erosion Control Blankets
1. North American Green, or approved equal, meeting the requirements of Models S 75, S 150, SC-150, or P 300, as required.

H. Inlet Silt Control Bag
1. Silt Sak as manufactured by ACF Environmental, or approved equal.
2. Catch-all as manufactured by Marathon Materials, or approved equal.
3. All sediment control bags shall contain an overflow capability.
I. Permanent Turf Reinforcement Mats
   1. North American Green, or approved equal, meeting the requirements of Model SC250.

PART 3 EXECUTION

3.1 TEMPORARY CONTROLS

A. Prior to, or as the first step in construction, perimeter controls around the boundaries of this site against erosion and sediment shall be initiated.

B. Temporary controls include, but are not limited to, silt fences, Inlet silt control bags in catch basins and manholes, seeding of stockpiled erodible materials and borrow areas, erosion control blankets, placing stone filter material, diversion ditches, rock check dams, and sediment traps.

C. In addition to temporary measures required by the Drawings, the Contractor shall be responsible for providing any additional measures required to properly control erosion and sedimentation as may become necessary or may arise from conditions which may develop during construction as directed by the Contracting Officer.
   1. Except for emergencies, proposed additional temporary controls shall be approved by the COR.

D. Where seasonal limitations or construction delays prevent scheduled installation of permanent control facilities, approved temporary measures shall be installed within 15 calendar days and maintained until replaced by the permanent facility.

E. All temporary erosion control facilities shall be removed at the completion of construction, unless approved by the COR to remain in place. Care shall be taken during removal to minimize siltation in any drainage course.

F. Erosive or sediment producing areas, including stockpiled areas, exposed for up to 12 months shall be protected by seeding or by seeding in conjunction with other measures.

G. As much as possible, grading work shall be coordinated with work specified in 31 23 00 Earthwork to minimize the duration of soil exposure to erosive elements.

H. All mud/dirt tracked onto existing city/county roads from this site, due to construction, shall be promptly removed by the Contractor. Inspect daily and if necessary removal of mud/dirt shall be carried out.

I. All mud/dirt tracked or spilled on paved roads/surfaces within this site shall be promptly removed by the Contractor. Inspect daily and if necessary removal of mud/dirt shall be carried out.

J. Protection of Inlets and Catch Basins
   1. Protection shall be provided for those inlets identified on the Drawings.
   2. Additional protection shall be provided for others if necessary during...
3. Low area or parking lot catch basins or curb inlets shall be protected before paving, seeding or sodding by sediment traps, stone inlet filters, silt fence, inlet silt control bag, or by other means as shown on the Drawings or approved by the COR.
4. Approval by responsible officials shall be obtained prior to locating any temporary structures in any public right-of-way.

K. Stone Outlet Filter
1. Outlet filters shall be placed as shown on the Drawings or as necessary in conjunction with temporary measures installed during construction.
2. Material shall be washed peastone or filter stone as specified in this Section. The top of the filter area shall be concave and shall be depressed at least six inches below the top of the adjacent berm.
3. During construction periodic inspection and maintenance shall be provided. Where flow through the filter is such that the material filtering stone washes downstream and cannot be maintained, a screening material shall be installed.

L. Straw Bale Diversion Berm
1. Construction shall be as shown on the Drawings. Berms shall be placed as shown on the Drawings and as required as temporary control measures determined necessary during construction.
2. A minimum of two (2) hold-down stakes shall be used per bale. Wood stakes shall be at least 2" by 2". All stakes shall be sufficient in length to penetrate a minimum of 1' into the ground.
3. A six inch (minimum) ridge of peastone or compacted earth shall be placed along the base of the bale on the side from which flow will come. This area shall be periodically inspected and maintained to prevent piping.

M. Silt Fence
1. Dig a trench for fabric toe-in where the fence is to be installed (6 inches deep by 6 inches wide).
2. Set posts securely in the ground within a few inches of the trench and attach support material to posts. Posts spacing shall be 7'-8".
3. Attach fabric to fence structure allowing six (6) inches to lay in the toe-in trench. Hog nose rings, nails and wire have all been effectively used in attaching fabric to fence.
4. Fill toe-in trench with soil and compact.
5. Preassembled fences may be used in relatively flat areas as an option to steps 2-4, if desired.

N. Erosion Blankets
1. The placement of blankets shall be in accordance with the manufacturer's recommendations and as indicated in the following table:

<table>
<thead>
<tr>
<th>Slope</th>
<th>Blanket</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:1 to 3:1</td>
<td>S 75</td>
</tr>
<tr>
<td>3:1 to 2:1</td>
<td>S 150</td>
</tr>
<tr>
<td>2:1 to 1:1</td>
<td>SC-150</td>
</tr>
<tr>
<td>Channel Bottoms,</td>
<td></td>
</tr>
<tr>
<td>Ditch Bottoms</td>
<td>P 300</td>
</tr>
</tbody>
</table>

O. Inlet Silt Control Bag
1. Installation and maintenance shall be per manufacturers requirements.

P. All temporary erosion control measures shall be inspected weekly and immediately after rainfall events by the Contractor, and all measures
requiring maintenance, repair, or replacement shall be corrected at the Contractor's expense.
1. Written record of such inspections shall be maintained by the Contractor, with copies being furnished to the Government.

3.2 PERMANENT CONTROLS

A. Permanent soil erosion control measures, plantings, and mulching for all slopes, channels, ditches or any disturbed land area shall be completed within 15 calendar days after final grading or the final earth change has been completed.
1. When it is not possible to permanently stabilize a disturbed area after an earth change has been completed or where significant earth change activity ceases, temporary soil erosion control measures shall be implemented within 15 calendar days.
2. All temporary soil erosion control measures shall be maintained until permanent soil erosion control measures are implemented.

B. All permanent soil erosion control measures will be implemented, maintained, and established before a certificate of compliance is issued.

C. Installation of permanent controls shall include, but is not limited to: finish seeding, asphaltic concrete paving, concrete paving, storm sewers, stormwater basin and ditches, ground cover and plantings.

D. Placement of permanent controls shall be as specified in related sections.

3.2.1 STORM WATER DISCHARGE INSPECTIONS

A. Contractor to comply with requirements of Act 451 and The National Pollutant Discharge Elimination System (NPDES) Storm Water Regulations including, but not limited to, observations and written records.
1. Contractor shall file a "Notice of Coverage" for the Owner under the Michigan Permit by Rule.
2. Contractor shall comply with all requirements of the Permit by Rule during performance of the Work.

B. At completion of construction activities, submit inspection log book to the Government for deliverance to Owner.

-- End of Section --
SECTION TABLE OF CONTENTS

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 60 00

RIVER SIGNAGE

PART 1   GENERAL

  1.1   SUMMARY
  1.2   RELATED WORK SPECIFIED ELSEWHERE
  1.3   SUBMITTALS

PART 2   PRODUCTS

PART 3   EXECUTION

  3.1   SIGN PLACEMENT

ATTACHMENTS:

Exhibit: Sample River Warning Signs

-- End of Section Table of Contents --
SECTION 32 60 00

RIVER SIGNAGE

PART 1   GENERAL

1.1 SUMMARY

A. The Contractor shall furnish all labor, equipment, and materials necessary for the installation and maintenance of the appropriate river signs as shown in the exhibits of this specification and as approved by the COR. Work includes, but is not limited to, the following:
   1. Installation prior to commencement of construction activities and removal after project completion of all signs in the locations described and shown in the exhibits of this specification.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 11 00: Summary of Work.
B. Section 01 33 00: Submittal Procedures.

1.3 SUBMITTALS

SD-01 Preconstruction Submittals
Copy of signs to be installed.

PART 2   PRODUCTS

A. The signs shall be constructed using durable materials to withstand all anticipated weather conditions. The signs shall also be mounted on posts capable of withstanding possible inundation and flood conditions. Contractor shall maintain these signs throughout the duration of the construction and restoration activities, including downtime periods.

PART 3   EXECUTION

3.1 SIGN PLACEMENT

A. Prior to initiating any construction activities, including access, Contractor shall provide and install exclusion signs according to the signage map provided in the exhibit and/or as directed by the COR. Using clear, accurate and appropriate commercial fonts, signs shall read as shown in the exhibit following this section.

Exhibit: Sample River Warning Signs

-- End of Section --
ATTENTION PADDLERS!!!
DAM REMOVAL AHEAD!!!

BEITNER ROAD IS THE LAST SAFE LOCATION TO EXIT THE RIVER WHILE BOARDMAN DAM IS REMOVED AND CRITICAL HABITAT IS RESTORED

For more information, contact the Grand Traverse Conservation District at 231.941.0960
DAM REMOVAL AHEAD

PORTAGE AREA

EXIT NOW
EXPOSED BOTTOMLANDS ARE FRAGILE ECOLOGICAL RESTORATION AREAS

KEEP OFF

For more information contact the Grand Traverse Conservation District: 231.941.0960
Or visit www.theboardman.org
Please Keep Off

THE EXPOSED BOTTOMLANDS ARE FRAGILE AND UNSTABLE. IT IS CRITICAL THAT HUMANS AND PETS STAY OFF THESE SENSITIVE AREAS TO ALLOW NATIVE VEGETATION AND WETLANDS TO REESTABLISH.

For more information, contact the Grand Traverse Conservation District at 231.941.0960
STOP

RECOMMENDED TAKE-OUT POINT BEFORE ENTERING POND

STEEP BANKS BEYOND THIS POINT MAKE REMOVAL DIFFICULT

PROCEED AT YOUR OWN RISK

FOR MORE INFORMATION CONTACT THE GRAND TRAVERSE CONSERVATION DISTRICT AT 941-0960 OR VISIT WWW.THEBOARDMAN.ORG
Trail Closed

THIS TRAIL IS TEMPORARILY CLOSED DUE TO CONSTRUCTION RELATED TO THE REMOVAL OF BOARDMAN DAM.

For more information, contact the Grand Traverse Conservation District at 231.941.0960
WARNING
EXPOSED BOTTOMLANDS ARE SOFT AND MAY BE UNSAFE FOR HUMANS & PETS.
KEEP OFF

For More Information Contact Grand Traverse Conservation District: 231.941.0960
Or Visit www.theboardman.org
SECTION TABLE OF CONTENTS

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 90 00

PLANTING

PART 1 GENERAL

1.1 SUMMARY
1.2 RELATED WORK
1.3 REFERENCES
1.4 DEFINITIONS
1.5 SUBMITTALS
1.6 QUALITY ASSURANCE
1.7 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.1 PLANT MATERIAL
2.2 AMENDMENTS

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL
3.2 SEEDING - FLOODPLAIN
3.3 SEEDING - UPLAND
3.4 Planting
3.5 IRRIGATION
3.6 VEGETATION SALVAGE
3.7 PROTECTION
3.8 MAINTENANCE
3.9 ACCEPTANCE

-- End of Section Table of Contents --
PART 1   GENERAL

1.1  SUMMARY

A. This Section includes the furnishing of all labor, equipment, and material to complete final site restoration and proper seeding and planting for the Sabin Dam Removal and Boardman River Restoration project.

B. Seeding, hydro-seeding and mulching will be measured by the acre seeded to the nearest one-tenth of an acre.

C. Planting will be measured by each individual plant.

D. Contractor should comply with the Invasive Species Management Plan for the Boardman River (AMEC, 2011) found at http://theboardman.org/archived-documents. The objectives of this document should be reviewed with all contractor staff prior to initiation of work activities.

E. This planting specification has been prepared in coordination with the Draft Tribal Traditional Ecological Knowledge Relative to the Boardman River Watershed (Andrews Cultural Resources, 2011) and the Little Traverse Bay Bands of Odawa Indians Native Plants Initiative (Pilette, 2009).

1.2  RELATED WORK

A. Section 31 10 00 – Cleaning

A. Section 31 23 00 – Earthwork

B. Section 31 40 00 – Slope Protection and Erosion Control

1.3  REFERENCES

AMEC, 2011

AMEC, 2011 Invasive Species Management Plan for the Boardman River.(Refer to http://theboardman.org/archived-documents)

Andrews Cultural Resources


Little Traverse Bay Bands of Odawa Indians

Pilette, 2009 Little Traverse Bay Bands of Odawa Indians
1.4 DEFINITIONS

A. Native Species. Native species are plants that are indigenous to Grand Traverse County, Michigan and are well adapted to the local habitat and climate. Native species selected for permanent vegetation are chosen based upon plants that would naturally occur in the restoration communities. Seed for restoration and seed used to produce plants for restoration will be harvested directly from wild, native stands or will be seed that was originally collected from native stands and put into production. All plant material (i.e., seed, plugs, rootstock, container-grown, etc.) used for permanent vegetation will have its source of origin within 250 miles of the restoration site.

B. Noxious Weeds. Noxious weeds are any plant recognized by the State of Michigan in the Michigan Seed Law (Act 329 of 1965) as prohibited or restricted noxious weeds. Seeds of prohibited noxious weeds are prohibited as contaminants in seed offered for sale. Prohibited noxious weeds include:

- Agropyron repens (aka Elytrigia repens) - quackgrass
- Ambrosia elatior - ragweed
- Berteora incana - hoary alyssum
- Brassica spp - mustards
- Cardaria draba - whitetop, hoary cress or perennial peppergrass
- Carduus acanthoides - plumeless thistle
- Carduus nutans - musk thistle
- Centaurea maculosa - spotted knapweed
- Centaurea picris - Russian knapweed
- Cirsium arvense - bull thistle
- Cirsium vulgare - Canada thistle
- Convolvulus arvensis - field bindweed
- Convolvulus sepium - hedge bindweed
- Cuscuta spp - dodder
- Cyperus esculentus, both seed and tubers - yellow nutsedge, chufa
- Euphorbia esula - leafy spurge
- Ipomoea spp - morning glory
- Nasella trachoma - serrated tussock
- Rhus toxicodendron - poison ivy
- Solanum carolinense - horsenettle
- Sonchus arvensis - perennial sowthistle
- Sorghum halapense - Johnsonsgrass
- Toxicodendron vernix - poison sumac
- Tribulus terrestris - puncturevine

Seeds of restricted noxious weeds are restricted as contaminants in seed offered for sale with a general limit of one seed per 2,000 seeds offered for sale. Restricted noxious weeds include:

- Abutilon theophrasti - Velvetleaf
- Allium canadense - Wild onion
- Allium vineale - Wild garlic
- Avena fatua - Wild oat
- Barbarea vulgaris - Yellow rocket
- Berteroa incana - Hoary alyssum
- Brassica juncea - Indian mustard
- Brassica nigra - Black mustard
- Datura stramonium - Jimsonweed
- Daucus carota - Wild carrot
- Plantago lanceolata - Buckhorn plaintain
- Raphanus raphanistrum - Wild radish
- Rumex crispus - Curled dock
- Seteria faberii - Giant foxtail
- Sinapis arvensis - Charlock
- Solanum spp - Nightshade complex
- Thalspi arvense - Fanweed
- Xanthium strumarium - Cocklebur

C. Pure Live Seed (PLS). Pure live seed is the viable/sproutable seed of particular species. Therefore, when ordering one PLS pound of a given species, more than one bulk pound may be delivered to make up for any inert material (stems, hulls or seed that won't germinate). Pure Live Seed is defined by the formula:

\[ PLS = \frac{(Percent\ Purity\ of\ the\ Seed \times\ Germination\ Percentage)}{100} \]

D. Potted stock. Potted stock are native trees and shrubs grown and delivered in pots with size defined by pot volume in gallons.

E. Bare root stock (BRS). Bare root stock or BRS are native trees and shrubs delivered as plants with roots but no or limited attached soil. Size of BRS plants is defined by height from ground to tip of the main stem.

F. Live stake. Live stakes are native trees or shrubs delivered as live stakes cut during dormancy. Live stakes are typically willow, alder and/or dogwood species capable of vegetative reproduction.

G. Vegetation salvage. Vegetation salvage is excavated mats of wetland plants (sedges, rushes, forbs) and woody wetland plants (dogwood, alder, shrub willow) root systems and attached soil excavated and reused as intact mats. It is understood that intact mats may not be able to be harvested and reused intact due to the predominance of sandy soils. In that case, wetland salvage is defined as wetland plants and root systems excavated and reused as loose aggregations of plant and soil material.

1.5 SUBMITTALS

SD-03 Product Data

A. Grower's Certification: A report from the grower indicating native plant species supplied and location of genetic origin (county and state of source material) for each native species supplied. Grower's certification shall be submitted to the COR at least ten (10) calendar days prior to initiation of seeding activities for review and approval. No seeding shall commence until the Grower's Certification submittal has been approved by the COR.

B. Seed Test: Test report for all seed to be used on the restoration
site shall be submitted to the COR at least ten (10) calendar days prior to initiation of seeding activities. Seed tests shall be less than nine (9) months old and shall indicate the Lot Number that can be traced to seed bag labels delivered to the restoration site. Seed test reports shall indicate purity, germination, and noxious weed seed content, and shall meet the PLS requirements as prescribed herein. No seeding shall commence until the Seed Test submittal has been approved by the COR.

C. Irrigation plan. The Contractor shall submit an irrigation plan to sustain plants through the guarantee period, including schedule, an approved water source and materials to be used for irrigation.

D. Planting schedule. Within 10 calendar days after receiving the notice to proceed, the contractor shall submit a time schedule for approval indicating dates for commencement and completion of the following operations:

- Tagging of plants in the nurseries
- Delivery of plants to the site.
- Estimated completion of work date to indicate start of guarantee period.

E. The Contractor shall submit a 3-Year Maintenance Plan for vegetated areas for the Government Representative's approval at least 21 days prior to the anticipated date of substantial project completion.

F. Seed bag tags and containerized plant tags must be submitted to the Government Representative prior to installation.

1.6 QUALITY ASSURANCE

A. Field Supervision: Contractor shall maintain an experienced full-time field supervisor on the restoration site when work is in progress. Field supervisor shall be experienced in natural area restoration and shall have at least 5 years of successful experience in potted, bareroot and live stake stock planting, planting native grass and forb seed using hydro-seeding, native seed drill, and traditional broadcast methods.

B. Unless specified otherwise, seed shall meet the requirements for noxious weeds listed in Paragraph 1.4.A. of this specification, or otherwise specified in the Michigan Seed Law, as amended. In case of conflict, the more stringent criteria shall prevail. For weed species not listed in Paragraph 1.4.A. or in the Michigan Seed Law, as amended, seed should not contain in excess of one (1) percent of weed seed; zero (0) percent is preferred and the Contractor shall endeavor to meet this goal. Sampling and testing of the seed and seed tag labeling requirements shall be done in accordance with the seed regulations for the State of Michigan (Michigan Seed Law, Act 329 of 1965, as amended) and with the Rules for Testing Seeds adopted by the Association of Official Seed Analysts (2010).

C. Substitutions: If specified plant, seed or products are not commercially available, submit to Contracting Officer a proposal for use of an equivalent product.

D. Planting Kickoff Meeting: At least 14 days prior to initiating seeding work in the field, Contractor shall host a field meeting with the Government Representative at the restoration site to review required
submittals and reports and to discuss methods and sequence of work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. During all operations, seed and seed bags will be kept covered, dry, shaded and out of direct sunlight. Seeds will not be stored in locations or vehicles where the temperature will be in excess of 90°F.

B. Storage of wetland salvage. Wetland salvage material shall be stockpiled no more than 4 feet high above ground and for no longer than 72 hours. Intact mats may not be stacked. Salvage mats and piles shall be watered regularly and soils kept moist for the duration of the storage period. Care should be taken not to overwater and cause soil loss from root systems.

PART 2 PRODUCTS

2.1 PLANT MATERIAL

A. All plant materials shall conform to State and Federal laws relating to inspection for diseases and infestation. All delivered plant materials shall be certified free of disease, insect pests, and other infestations. Plants shall be inspected for conformity to specification requirements and approval from the Engineer. A valid certificate of nursery inspection by the appropriate state agency shall accompany each plant delivery. All certificates shall bear the name and address of the source of the plants.

B. All plants shall be species native to Michigan and nursery grown in accordance with good horticultural practices. Shrubs and trees shall be healthy, vigorous, well-rooted, well branched, densely foliated when in leaf, free of disease and insects (eggs or larvae) and established in the container in which they are growing. They shall have tops of good quality and be in a healthy growing condition.

C. Any adjustments or substitutions in plants species, sizes, container types, or quantities, must be approved by the Government Representative.

D. Plants should not be stored on-site for more than 24 hrs prior to installation.

E. All plants shall be labeled by plant name and size. Labels shall be attached securely to all plants, bundles, and containers of plant materials when delivered. Plant labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.

F. Only plants with vigorous root and shoot growth shall be accepted and installed. These materials will be provided by the Contractor and shall be reviewed and approved by the Engineer prior to installation. Labels shall identify the species and quantity.

G. Fertilizer, including slow release fertilizer, shall be withheld from all nursery-grown plants for a period of at least three weeks prior to established delivery date. The only exception to this is if fertilizer has been incorporated into the container soil.

H. Nurse Crop
1. Nurse crops are temporary crops consisting of an annual, non-competitive crop sown with the permanent vegetation. The nurse crop provides erosion control and reduces the risk of invasive weeds until the permanent vegetation becomes established. Nurse crop will consist of one of the following species depending on the site conditions and the time of seeding as provide in Table 1.

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Bulk lbs/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avena sativa</td>
<td>Spring oats</td>
<td>60(1)</td>
</tr>
<tr>
<td>Lolium multiflorum</td>
<td>Annual rye</td>
<td>25(2)</td>
</tr>
</tbody>
</table>

(1) Spring and Early Summer Seeding
(2) Late Summer and Fall Seeding

I. Native Seed

1. Native seed will be supplied on the basis of PLS. The seed will be from the most recent harvest [one (1) year old or less]. These seeds will be supplied as single species, partial seed mixes, or full seed mixes in separate bags. Seed mixes will be as specified in Tables 2 and 3, based on commercial availability, with minimum PLS percentage for each of the various groupings. The seed will contain no prohibited noxious weeds.

2. All native seed will be cleaned/threshed/screened to remove the fruiting bracts, scales, floral parts, awns, perigynia, and other non-seed debris to the maximum practicable extent. Seeds will be fresh, free of deleterious material and disease, and delivered to the site in the original, unopened bags showing a certified net weight, date of testing, supplier's name, and certified guarantee of analysis including the composition, PLS information, and percent weed seed. Seed will be kept dry and unopened until needed for use. Damaged or faulty packages will not be used.

3. All native seed used for permanent vegetation will have its source of genetic origin within 250 miles of the restoration site.

Table 2  Floodplain Mix (8 PLS lbs/acre x approximately 10 acres)

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Indicator</th>
<th>Percentage of Mix(by weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andropogon gerardii</td>
<td>Big bluestem</td>
<td>FAC-</td>
<td>15</td>
</tr>
<tr>
<td>Carex hystericina</td>
<td>Porcupine sedge</td>
<td>OBL</td>
<td>5</td>
</tr>
<tr>
<td>Carex vulpinoidea</td>
<td>Fox sedge</td>
<td>OBL</td>
<td>4</td>
</tr>
<tr>
<td>Elymus virginicus</td>
<td>Virginia wild rye</td>
<td>FACW-</td>
<td>30</td>
</tr>
<tr>
<td>Glyceria striata</td>
<td>Fowl mana grass</td>
<td>OBL</td>
<td>3</td>
</tr>
<tr>
<td>Leersia ozyoides</td>
<td>Rice cut grass</td>
<td>OBL</td>
<td>15</td>
</tr>
<tr>
<td>Panicum virgatum</td>
<td>Switch grass</td>
<td>FAC+</td>
<td>15</td>
</tr>
<tr>
<td>Scirpus atroviolens</td>
<td>Dark green rush</td>
<td>OBL</td>
<td>2</td>
</tr>
<tr>
<td>Scirpus cyperinus</td>
<td>Wool grass</td>
<td>OBL</td>
<td>1</td>
</tr>
<tr>
<td>Scirpus validus</td>
<td>Great bulrush</td>
<td>OBL</td>
<td>3</td>
</tr>
<tr>
<td>Verbena hastata</td>
<td>Blue vervain</td>
<td>FAC</td>
<td>2</td>
</tr>
<tr>
<td>Aesclepis incarnata</td>
<td>Swamp milkweed</td>
<td>OBL</td>
<td>3</td>
</tr>
<tr>
<td>Carex stricta</td>
<td>Tussock sedge</td>
<td>OBL</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3  Upland Mix (15 PLS lbs/acre x approximately 100 acres)

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Indicator</th>
<th>Percentage of Mix(by weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andropogon gerardii</td>
<td>Big bluestem</td>
<td>FAC-</td>
<td>20</td>
</tr>
</tbody>
</table>
Coreopsis lanceolata          Coreopsis       FACU         8
Elymus canadensis            Canada wild rye       FAC-         25
Panicum virgatum            Switch grass           FAC+         10
Rudbeckia hirta              Blk eyed Susan        FACU         3
Schizachyrium scoparium       Little bluestem        FACU         15
Sorghastrum nutans           Indian grass           FACU+        10
Sporobolus cryptandrus       Sand dropseed          FACU-        4
Asclepias syriaca            Common milkweed        FACU-        3
Aster nova aglaiae           New England aster       FAC          2
Total  100

J. Potted stock
1. Potted stock shall be used primarily in areas receiving FES or Surface Fabric treatment as shown on the Drawings. Potted stock plants shall be supplied by the Contractor.
2. The supplier of potted stock materials shall be identified and approved by the Engineer in advance of plant delivery.
3. The delivery date for potted stock plant materials shall be arranged with the nursery and the Contractor, and subject to the approval of the Government Representative.
4. Potted stock shall include the following species:

<table>
<thead>
<tr>
<th>Species</th>
<th>Latin name</th>
<th>Size</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderberry</td>
<td>Sambucus canadensis</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Nannyberry</td>
<td>Viburnum lentago</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Serviceberry</td>
<td>Amelanchier arborea</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Gray Dogwood</td>
<td>Cornus racemosa</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Red Osier Dogwood</td>
<td>Cornus stolinifera</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>High bush cranberry</td>
<td>Viburnum trilobum</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Silky Dogwood</td>
<td>Cornus amomum</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Winterberry</td>
<td>Ilex verticulata</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Ninebark</td>
<td>Physocarpus opulifolius</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Chokecherry</td>
<td>Prunus virginiana</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Nannyberry</td>
<td>Viburnum lentago</td>
<td>2 gallon</td>
<td>20</td>
</tr>
<tr>
<td>Pussy willow</td>
<td>Salix dicolor</td>
<td>2 gallon</td>
<td>20</td>
</tr>
</tbody>
</table>

K. Bare root stock
1. Bare root stock shall be used primarily in areas receiving FES or Surface Fabric treatment as shown on the Drawings, but also in non-fabric areas. Potted stock plants shall be supplied by the Contractor.
2. The supplier of bare root stock materials shall be identified and approved by the Government Representative in advance of plant delivery.
3. The delivery date for bare root stock plant materials shall be arranged with the nursery and the Contractor, and subject to the approval of the Government Representative.
4. Bare root stock shall include the following species:

<table>
<thead>
<tr>
<th>Species</th>
<th>Latin name</th>
<th>Size</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>White cedar</td>
<td>Thuja occidentalis</td>
<td>5 gallon</td>
<td>60</td>
</tr>
<tr>
<td>Yellow birch</td>
<td>Betula alleghaniensis</td>
<td>5 gallon</td>
<td>60</td>
</tr>
<tr>
<td>Paper birch</td>
<td>Betula papyrifera</td>
<td>5 gallon</td>
<td>60</td>
</tr>
<tr>
<td>Red maple</td>
<td>Acer rubrum</td>
<td>5 gallon</td>
<td>60</td>
</tr>
</tbody>
</table>
SHRUBS

<table>
<thead>
<tr>
<th>Name</th>
<th>Scientific Name</th>
<th>Container Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderberry</td>
<td>Sambucus canadensis</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Nannyberry</td>
<td>Viburnum lentago</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Serviceberry</td>
<td>Amelanchier arbutus</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Gray Dogwood</td>
<td>Cornus racemosus</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Red Osier Dogwood</td>
<td>Cornus stolonifera</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>High bush cranberry</td>
<td>Viburnum trilobum</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Silky Dogwood</td>
<td>Cornus amomum</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Winterberry</td>
<td>Ilex verticulata</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Ninebark</td>
<td>Physocarpus opulifolius</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Chokecherry</td>
<td>Prunus virginiana</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Nannyberry</td>
<td>Viburnum lentago</td>
<td>BRS</td>
<td>50</td>
</tr>
<tr>
<td>Pussy willow</td>
<td>Salix dicolor</td>
<td>BRS</td>
<td>50</td>
</tr>
</tbody>
</table>

TREES

<table>
<thead>
<tr>
<th>Name</th>
<th>Scientific Name</th>
<th>Container Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>White cedar</td>
<td>Thuja occidentalis</td>
<td>BRS</td>
<td>100</td>
</tr>
<tr>
<td>Yellow birch</td>
<td>Betula alleghaniensis</td>
<td>BRS</td>
<td>100</td>
</tr>
<tr>
<td>Paper birch</td>
<td>Betula paperyifera</td>
<td>BRS</td>
<td>100</td>
</tr>
<tr>
<td>Red maple</td>
<td>Acer rubrum</td>
<td>BRS</td>
<td>100</td>
</tr>
<tr>
<td>White pine</td>
<td>Pinus strobus</td>
<td>BRS</td>
<td>100</td>
</tr>
</tbody>
</table>

5. Any adjustments or substitutions in plant species, sizes, container types, or quantities shall be pre-approved in writing by the County.

6. Bare root stock shall be a minimum of 18" in height at the time of installation, and shall otherwise conform to American Standard for Nursery Stock guidelines.

7. All non-authorized adjustments or substitutions by the Contractor will not be compensated for in any fashion by the County.

L. Live stakes

1. Live stakes consist of live cuttings installed vertically. Live cuttings are obtained from live stems of shrubs or trees that are provided in an un-rooted condition and have the ability to establish roots and shoots if planted under proper conditions.

2. Live stakes shall be sourced from shrub willow, red osier dogwood and speckled alder native to Grand Traverse County that are adapted to growing in streambank areas. The sources intended for use shall submitted for review and approval by the Government Representative.

3. Live stakes shall be taken from healthy plants within 100 miles of the project site.

4. The materials shall be collected between November 1 and March 1 and no more 14 days before installation. Contractor shall provide documentation from supplier that the materials were harvested no more than 14 days prior to planting. Any deviation from these sourcing requirements requires approval of the Owner. Documentation authenticating the date cuttings were acquired shall be submitted to the Owner prior to acceptance.

5. Stakes shall remain continuously wet from harvest to placement, stored in water and shade with approximately 80% of length from distal end submerged. Water should be changed every 1 to 2 days if cuttings are kept in a container.

6. The basal end (bottom) of the materials shall be indicated by a clean, slanted cut. All lateral stems shall be removed at the juncture with the main stem. Tops of the materials (distal ends) shall be indicated by a cut perpendicular to the stem.

7. The diameter of Live Stakes shall be 1.0 to 1.5 inches at their midpoint, and shall be a minimum of 4.0 feet in length.
M. PROTECTION FENCING (Potted trees only)
   1. Protection Fencing shall consist of galvanized hardwire cloth held in place by two stakes.
   2. Oak stakes shall be at least 0.5 inches thick, 2.0 inches wide and 4 feet high.
   3. Galvanized hardwire cloth shall have the following dimensions:
      a. Grid spacing between 2.5 inches ±0.5 inches.
      b. Height of 5 feet.
      c. Diameter of 3 feet

2.2 AMENDMENTS

A. Wood Slurry Mulch (Hydro Mulch)
   1. Hydro mulch shall be fiber-processed from whole wood chips manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard.
   2. Moisture content shall not exceed 10 percent, plus or minus 3 percent, as defined by the pulp and paper industry standards. Fiber shall have a water holding capacity of not less than 900 grams of water per 100 grams fiber.
   3. Hydro mulch shall disperse into a uniform slurry when mixed with water and shall be nontoxic to plant life or animal life.
   4. Hydro mulch shall contain a non-petroleum based tackifier and a green dye for visual monitoring during application, and shall not harm germination or plant growth.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Seeded areas guarantee: Areas that do not meet seed success criteria (below) for native seed mix establishment on the July 1st following the Substantial Completion Date shall be re-seeded during the first available seeding period, as determined by the Owner. Seed success criteria assessment shall be done accordingly:
   1. For seeding completed before July 1st, success criteria will be measured after July 1st of the year following completion.
   2. For seeding completed after July 1st, success criteria will be measured after July 1st of the second year following completion.

B. Seeding success criteria: The Owner will conduct surveys to verify seeding success. Overall coverage will be the dominant criteria, not species assemblage. An area will be considered satisfactory if it meets the following criteria:
   1. A minimum of 80 percent intended vegetative cover (noxious weeds and undesirable non-native species will not be considered to be intended vegetation);
   2. Not more than 10% of the seeded area with bare spots larger than 1 square foot; and
   3. Vegetation shall be in healthy condition.

C. Planting guarantee: The Contractor shall provide all equipment, labor, materials, and technical expertise to install, maintain and irrigate site plantings through the completion of the project, demobilization, and for a minimum three-year period (potted stock) and one-year period (bare root stock).
1. Minimum warranty requirements:
   a. Tree and Shrub warranty: The Contractor shall replace all potted plants judged by the Owner, within the three-year warranty period after approval of the Final Completion Date, to be dead or in less than vigorous health. Plant replacements shall be of the same species, quality and size as originally installed, or with substitutes pre-approved in writing by the Engineer. Replanting shall be performed at the Contractor's expense.
   
   b. Bare root stock warranty: The Contractor shall replace all bare root stock plants judged by the Owner, within the one-year warranty period after approval of the Final Completion Date, to be dead or in less than vigorous health. Plant replacements shall be of the same species, quality and size as originally installed, or with substitutes pre-approved in writing by the Owner. Replanting shall be performed at the Contractor's expense.
   
   c. Replanting shall be conducted according to the original planting specifications.
   
   d. Replanting must be conducted within 30 days of notification during acceptable planting period (March-July, October-November). Deviations from this plan must be pre-approved in writing by the Engineer.

3.2 SEEDING - FLOODPLAIN

A. Floodplain consists of areas below the historic pool of Sabin Pond immediately adjacent to the new river channel, between the edge of water on the channel bank and the toe of the transition slopes that lead up to the spoils piles and other surrounding areas. Floodplain includes the above water portion of the channel bank and excavated riparian zone. Floodplain seeding shall include the areas as indicated on the Plans.

B. Stake out Floodplain in the field and field verify with COR. Contractor shall provide surveyed quantities (acres) of the Floodplain to the COR prior to seeding.

C. Seedbed shall be prepared using a spike-tooth harrow with finishing pulverizer in areas where soils are not compacted, or equivalent method that has previously been reviewed and approved by the COR. Compacted layers shall be disked in the top 6 inches of the soil profile and then firmed and smoothed using a roller harrow, culti-packer, or similar implement to firm and remove large clods. The final prepared seedbed shall not contain soil clods greater than 2 inches in diameter.

D. Contractor shall seed in accordance with Table 2 (Floodplain Mix) and using appropriate nurse crop in Table 1. Seeding shall occur within 24 hours of seedbed preparation and shall be performed using traditional broadcast methods (followed by harrowing) or using a culti-packer to achieve seed-to-soil contact. Native seed shall never be planted more than ¼ inch deep. No-till drilling may also be used as an alternative method.

E. Areas not accessible using the methods above may be hand broadcasted or hydro-seeded if previously reviewed and approved by the COR.

F. If hydro-seeding, Contractor shall mix nurse crop (Table 1), AND
native seed (Table 2, Floodplain Mix) together with hydro-mulch in hydro-seeder tank and spray apply together in accordance with manufacturer recommendations. Hydro-seeding shall occur such that the entire mixture is evenly distributed across the entire Floodplain without bare spots. Wood slurry mulch (hydro-mulch) to be applied at a rate of 1500 lbs/acre.

G. Floodplain seeding shall occur between April 1st and December 1st unless proposed alternative timing for seeding is reviewed and approved by COR. No seeding shall occur when snow is on the ground.

H. Care of Seeded Areas During Construction - All seeded areas shall be protected and maintained throughout the construction of the project and until the work is accepted. No construction traffic, except for maintenance, will be allowed over a seeded or planted area once the seed and erosion control measures have been completed. Foot traffic shall be minimized and workers shall travel along completed banks only in designated areas. Any damage to seeded areas caused by construction traffic or construction activities shall be repaired and re-seeded at no additional cost to the Government.

3.3 SEEDING - UPLAND

A. Upland consists of areas outside the Floodplain to the limits of disturbance, including the spoils piles. Stake out the Upland area to be seeded and field verify with COR. Contractor shall provide surveyed quantities (acres) of the Upland to the Government prior to seeding.

B. Except on steep slopes, seedbed shall be prepared using a spike-tooth harrow with finishing pulverizer in areas where soils are not compacted, or equivalent method that has previously been reviewed and approved by the COR. Compacted layers shall be disked in the top 6 inches of the soil profile and then firmed and smoothed using a roller harrow, culti-packer, or similar implement to firm and remove large clods. The final prepared seedbed shall not contain soil clods greater than 2 inches in diameter. On steep slopes, Mechanical seedbed preparation is not required, however, Contractor shall hand rake areas with deep ruts (4 inches or deeper) to provide a smooth uniform seedbed.

C. Contractor shall broadcast nurse crop (Table 1) and native seed (Table 3, Upland Mix) onto Upland. Seeding shall occur within 24 hours of seedbed preparation and shall be performed using traditional broadcast methods (followed by harrowing) or using a culti-packer to achieve seed-to-soil contact. Native seed shall never be planted more than ¼ inch deep. No-till drilling may also be used as an alternative method. On steep slopes, seeding shall be by manual walk-behind broadcaster or hand broadcasting methods. Seeding shall occur such that the entire mixture is evenly distributed across the entire Upland without bare spots.

D. If areas of Upland are inaccessible, Contractor may hydro-seed if previously reviewed and approved by the COR. Hydro-seeding shall be accomplished using a wood slurry mulch (hydro mulch) mixed with and native seed (Table 3) providing complete coverage at a rate of 2000 lbs/acre on the Upland.

E. Upland seeding shall occur between April 1st and October 10th unless proposed alternative timing for seeding is reviewed and approved by COR. No seeding shall occur when snow is on the ground.
F. Care of Seeded Areas During Construction - All seeded areas shall be protected and maintained throughout the construction of the project and until the work is accepted. No construction traffic, except for maintenance, will be allowed over a seeded or planted area once the seed and erosion control measures have been completed. Foot traffic shall be minimized and workers shall travel along completed banks only in designated areas. Any damage to seeded areas caused by construction traffic or construction activities shall be repaired and re-seeded at no additional cost to the Government.

3.4 Planting

A. Potted stock, bare root stock and live stake installation shall occur in non-fabric areas, and in the FES and/or Surface Fabric as determined by the Engineer in the field. Planting may occur through fabrics.

B. The location of potted stock, bare root stock and live stakes will be as determined by the Engineer in the field. Spacing and clustering will vary.

C. Planting shall not be permitted during the following conditions unless otherwise approved:
   1. Temperatures less than 32 degrees Fahrenheit
   2. Temperatures greater than 90 degrees Fahrenheit
   3. Saturated soil conditions
   4. Wind velocities greater than 20 mph.

D. Potted and bare root stock plants:
   1. Planting shall follow general specifications for planting as given in MDOT Specifications 917 and American Standard Nursery Stock (ANSI 60.1).
   2. Small cuts may be made in the coir fabric to allow for plant installation. No more than two strands of the non-woven coir fabric may be cut parallel to the river flow. Strands may be stretched and the hole sealed by sewing coir strands as needed and by installing no less than 6 staples.
   3. All plants shall be set approximately plumb and to a depth sufficient for the top of the root mass to be even with the soil surface. Soil from planting pit excavation shall then be filled in around the root mass to half the depth, tamped to remove all air pockets.

E. Live stakes
   1. Live stakes shall be driven into the bank using a dead blow hammer or approved device. Pilot holes may be drilled using hand driven rebar rod, but must not exceed the diameter of the live stake.
   2. Live stakes must be driven to a depth of 1 ft below the normal water level of the river, and must be installed within 4 feet of the edge of water.

F. Plant protection:
   1. Protection Fencing shall be placed around each potted tree.
   2. Protection must be held in place for the duration of the warranty period unless directed in writing by the Owner. Upon final acceptance of the project by the Owner, all plant protection shall be removed by the Contractor.
3.5 IRRIGATION

A. Fall and Winter Irrigation - If the project is completed from October 1 to March 31, the following conditions apply:
1. Seeded areas shall not receive irrigation until April 1 of the spring following fall construction. After April 1, seeded areas shall receive a total of 2 inches (1.25 gal/sq. ft) of water per week in the form of irrigation or irrigation supplemented by rain. This is intended to minimize seed germination and mortality in late fall and maximize spring germination. This plan may be altered given unusually warm weather forecasted conditions, but must be prior approved by the Engineer.
2. After April 1 of the spring following fall construction, irrigation water shall be applied evenly and continuously at a rate of no more than 0.25 inches per hour until the required total of 2 inches is met. Watering will be required on a weekly basis until full germination. To reduce the amount of water required at a given time, the project area may be segregated into segments to be watered at different times during the week.
3. Following full germination, seeded areas shall receive irrigation or irrigation supplemented by rain for a period as needed to achieve acceptable survival.
4. Immediately prior to and following the installation of all woody plants, all soil that contacts the woody plants shall be thoroughly watered with 0.15 gallons per square foot.

B. Spring and Summer Irrigation - If the project is completed from April 1 to September 30, the following conditions apply:
1. Within 36 hours of installation, all seeded areas shall receive a total of 2 inches (1.25 gal/sq. ft) of water per week in the form of irrigation or irrigation supplemented by rain.
2. Irrigation water shall be applied evenly and continuously at a rate of no more than 0.25 inches per hour until the required total of 2 inches is met. Watering will be required on a weekly basis until full germination. To reduce the amount of water required at a given time, the project area may be segregated into segments to be watered at different times during the week.
3. Following full germination, seeded areas shall receive irrigation or irrigation supplemented by rain for a period as needed to achieve acceptable survival.
4. Immediately prior to and following the installation of all woody plants, all soil that contacts the woody plants shall be thoroughly watered with 0.15 gallons per square foot.

3.6 VEGETATION SALVAGE

A. Areas of potential vegetation salvage are shown on the drawings. Actual areas to be targeted for salvage will be as marked by Government Representative.

B. Vegetation salvage shall be managed in accordance with storage requirements described above, and coordinated and staged in conjunction with grading operations to minimize the time between salvage and placement in the work.

C. Prior to salvage, top woody shrubs in areas designated for salvage at a height 2 feet above the root crown of the plants. Contractor shall endeavor to preserve as much of the root mass as practicable ofr each area of salvage.
D. Vegetation salvage shall be placed in areas shown on the Drawings, modified as designated by Government Representative, with excavation staged so that the root crowns of the wetland salvage plants are at the approximate finish grade elevation for the work.

3.7 PROTECTION

A. The contractor shall erect barricades and warning signs as required to protect newly planted areas from traffic. Barricades shall be maintained throughout the maintenance period until vegetation is established.

3.8 MAINTENANCE

A. The Contractor shall perform maintenance of seeded areas after planting to ensure that adequate grass cover is established. This does not include continued maintenance, such as mowing, once adequate cover is established, but is to include any maintenance that is necessary to ensure that adequate grass coverages has been established. Maintenance includes but is not limited to, further filling of low spots or newly eroded areas, reseeding if necessary, watering, and controlling erosion.

3.9 ACCEPTANCE

A. When Work is substantially completed, including maintenance, the Government COR will, upon request, make an inspection to determine acceptability. Lawn Work may be inspected for acceptance in parts agreeable to Engineer, provided Work offered for inspection is complete including maintenance.

B. The Contractor shall replant rejected work and continue specified maintenance until re-inspected by the COR and found to be acceptable.

C. Seeded vegetation will be acceptable provided requirements, including maintenance, have been met and healthy uniform seed of specified vegetation is established free of weeds, bare spots, and surface irregularities.

-- End of Section --