

**Sediment Basin Addition for Laurel Hill Chert Pit
Specifications
For Tennessee Wildlife Resources Agency (TWRA)
ITB 32801-13319**

This solicitation is for the procurement of the excavation of the existing sediment basin at Laurel Hill Chert Pit, expansion to include a two-foot-thick compacted clay liner, regrading and recompacting of the exiting dam breach, stabilization of the sediment basin CMP outlets and bottom, demolition of the existing sediment basin piping, and installation of a rock check dam.

1. General Information:

The Scope of Services required for this project includes the following:

- a. The existing sediment basin at Laurel Hill Chert Pit shall be excavated and expanded to include a two-foot-thick compacted clay liner.
 1. The existing dam breach shall be regraded and re-compacted to function as an emergency spillway.
 2. A Type-2 aluminized corrugated metal outlet system shall drain the detention pond.
 3. Riprap shall be placed at the spillway and spillway outlet locations.
 4. The contractor shall stabilize the sediment basin CMP outlets and bottom.
 5. Final stabilization shall achieve 75% vegetative cover for any 3' x 3' area.
 6. The existing sediment basin piping shall be demolished.
 7. A rock check dam shall be installed for proper erosion control.
- b. The Contractor shall be paid for construction services within 45 days following successful completion.
- c. All applicable project permits, licenses, and easements will be acquired by the Tennessee Wildlife Resources Agency before project commencement.
- d. The Contractor shall have work complete within 120 calendar days of issued purchase order.
- e. A construction general permit shall not be required as land disturbance does not exceed one acre.
- f. Prior to construction activities, the boundary of the subject construction area shall be determined by construction with eh engineer and TWRA and staked in the ground to confirm project locations.

2. Site Visit:

- a. Contractors who intend to bid on this event shall attend the mandatory site visit.
- b. Site Visit Date/Time: May 13, 2024, at 9:00 AM CST
- c. Due to the remoteness of the project site, all Contractors shall meet at the Laurel Hill WMA Headquarters no later than 9:00 AM CST, this will ensure all prospective bidders will be able to find the site.
- d. Laurel Hill WMA Headquarters Address: 291 Napier Rd., Lawrenceburg, TN 38464
- e. Site Visit Contacts:
 - I. **Josh Campbell**
p. 615-781-6644 c. 865-755-6307
Josh.campbell@tn.gov
 - II. **Pam McDonald**
p. 615-332-5090 c. 6153325090
Pam.McDonald@tn.gov
- f. Contractors Shall contact site visit contact at least 24 hours before the intended visit to confirm.
- g. After meetup at the Laurel Hill WMA Headquarters, Contractors will then be guided to the project site, 39 Peter Cave Rd, Lawrenceburg, TN 38464.
- h. In case of inclement weather, which prevents the site visit from taking place on the scheduled date of May 13, 2024, the Site visit date will be moved to May 14, 2024, at 9:00 AM CST. All site visit requirements will remain

the same.

3. Site and Subsurface Investigation by Contractor:

- a. The Contractor shall be responsible for having a thorough knowledge of Drawings, Specifications, General and Supplementary Conditions, and other Contract Documents.
- b. The Contractor shall be responsible for determining the existing conditions of the site.
- c. The contractor shall thoroughly examine all factors reasonably available to him, including but not limited to the Drawings, Specifications, geotechnical report, site boundary and topography, site conditions, site history, local information, and seasonal weather conditions.
- d. The Contractor shall be responsible for acceptance of the site and preparation of the site to the proper grade and compaction requirements as indicated by the Contract Documents including Construction Drawings and Specifications.
- e. Any construction performed by the Contractor on the project shall constitute acceptance of the site.

4. Site Preparation and Demolition – shall include the following:

- a. Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
- b. Protection of existing structures, trees, or vegetation that are indicated in Contract Documents to remain.
- c. Stripping topsoil from areas that are to be incorporated into limits of the project or as otherwise indicated on Construction Drawings.
- d. Provide, erect, and maintain erosion control devices, temporary barriers, and security devices at locations indicated on Construction Drawings.
- e. Prevent movement or settlement of remaining adjacent structures and provide bracing and shoring as needed.
- f. Mark the location of existing utilities. Protect and maintain in safe and operable condition utilities that are to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities that are acceptable to governing authorities and utility owners.
- g. Conduct operations with a minimum of interference to public or private access. Maintain ingress and egress at all times.
- h. Comply with Title 40, Code of Federal Regulations (40 CFR).

5. Environment Requirements – Shall include the following:

- a. Construct temporary erosion control systems as shown on Construction Drawings.
- b. Site disturbance is planned to be less than 1 acre. If site-work on this project will disturb one (1) or more acres, the Contractor shall not begin construction without posting on site the "National Pollution Discharge Elimination System" (NPDES) permit governing the discharge of stormwater from the site for the entire construction period. NPDES permit requires Stormwater Pollution Prevention Plan (SWPPP) to be in place during construction. The Contractor shall apply for and obtain the required NPDES permit.
- c. Contractor shall be responsible for conducting stormwater management practices under NPDES permit and for enforcement action taken or imposed by Federal or State agencies, including the cost of fines, construction delays, and remedial actions resulting from the Contractor's failure to comply with provisions of NPDES permit.

6. Project Conditions:

- a. Off-site materials shall be transported to the project using well-maintained and operating vehicles.
- b. Contractor shall verify existing plant life that shall remain and ensure clearing limits are tagged, identified, and marked in such manner as to ensure their safety throughout construction operations.

7. Protections – Contractor shall:

- a. Protect trees, plant growth, and features designated to remain as part of final landscaping.
- b. Conduct operations with minimum interference to public or private accesses and facilities.
- c. Always maintain ingress and egress and clean or sweep roadways daily as required by SWPPP or governing authority.
- d. Dust control shall be provided with sprinkling systems or equipment provided by the Contractor.
- e. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If the marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary.
- f. Provide traffic control as required, by the U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices" and applicable state highway department and/or local municipal requirements. MUTCD 11th Edition - 2023 (dot.gov)

8. Clearing and Topsoil Excavation – Shall the following:

- a. Clear areas required for access to the site and execution of work.
- b. Remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with the installation of new construction, unless otherwise indicated on Construction Drawings.
Removal includes:
 - I. Digging out stumps and roots
 - II. Depressions caused by clearing and grubbing operations shall be filled to subgrade elevation to avoid ponding of water
- c. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that can handle such material according to applicable laws and regulations in which permission has been secured for the disposal.
- d. Topsoil shall consist of organic surficial soil found in a depth of not less than 6 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, weeds, roots, and other objectionable material.
- e. Cut heavy growths of grass from areas before stripping and remove cuttings with the remainder of cleared vegetative material.
- f. Strip topsoil from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.
- g. Stockpile topsoil in storage piles in a manner that will freely drain surface water. Cover storage piles as required to prevent windblown dust. Excess topsoil shall be removed from the site by the Contractor unless specifically noted otherwise on the Construction Drawings or through written approval from the Owner.

9. Earthwork – Shall include the following:

a. Materials:

- 1. Excavated and re-used material for subsoil fill as specified herein.
- 2. Aggregate fill
- 3. Imported fill material shall be approved by the Owner or his designated representative and specified herein.
- 4. Acceptable stabilization fabrics and geogrids
- 5. Filter and drainage fabrics

b. Preparation:

1. Identify required lines, spot elevations, contours, and benchmark datum.
2. Locate and identify existing utilities that shall remain and protect from damage.
3. Notify utility companies to remove or relocate utilities that conflict with proposed improvements.
4. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs from damage by excavating equipment and vehicular traffic.
5. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If the marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by same.
6. Remove from site, material encountered in grading operations that, in the opinion of the Owner or his designated representative, is unsuitable or undesirable for backfilling, subgrade, or foundation purposes. Dispose of material in a manner satisfactory to governing authorities.
7. Before placing fill in low areas, such as previously existing creeks, ponds, or lakes, Contract shall perform the following procedures:
 - I. Drain the water out by gravity with a ditch having a flow line lower than the lowest elevation in a low area. If drainage cannot be performed by gravity ditch, Contractor shall use an adequate pump to obtain the same results.
 - II. After drainage of the low area is complete, Contractor shall remove muck, mud, debris, and other unsuitable material by using acceptable equipment and methods that shall keep natural soils underlying the low area dry and undisturbed.
 - III. If muck, mud, and other materials removed from low areas are proposed for fill, it shall be dried on-site by spreading in thin layers for observation. Material shall be inspected and, if found to be appropriate for use as fill material, shall be incorporated into the lowest elevation of site filling operation, but not under building subgrade areas, including 10'-0" outside of exterior building lines, or within the upper 10 feet of paving subgrade. If, after observation, the material is found to be unsuitable, the material shall be removed from the site.

c. Excavation for Filling and Grading:

1. Classification of Excavation: By submitting a bid, the Contractor acknowledges that the site has been investigated to determine the type, quantity, quality, and character of excavation work shall be performed. Excavation shall be considered unclassified excavation, except as specifically indicated by the Contract Documents.
2. When performing grading operations during periods of wet weather, Contractor shall provide adequate drainage and groundwater management to control the moisture of soils.
3. Shore, brace, and drain excavations shall be performed as necessary to maintain excavation as safe, secure, and free of water at all times.
4. Excavated material containing rock or stone greater than 6-in. in the largest dimension shall be unacceptable as fill within the proposed building subgrade and paving subgrade.
5. Rock or stone less than 6-in. in largest dimension shall be acceptable as fill to within 24-in. of the surface of proposed subgrade when mixed with suitable material.
6. Rock or stone less than 2-in. in the largest dimension and mixed with suitable material shall be acceptable as fill within the upper 24-in. of the proposed subgrade.

d. Filling and Subgrade Preparation – Contractor shall:

1. Fill areas to contours and elevations shown on Construction Drawings with acceptable materials. The use of frozen or frost-containing materials shall be not acceptable for filling operations.
2. Place fill-in continuous lifts as specified herein.
3. Soil stabilization using lime, cement, fly ash, and geotextile fabrics.
4. Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to a minimum depth of 8-in. and compacted to a minimum of 95 percent of optimum density, by ASTM D 698 (or 92 percent of optimum density, by ASTM D 1557) at a moisture content of not less than 1 percent below and not more than 3 percent above optimum moisture content. These areas shall then be proof-rolled to detect areas of insufficient compaction. Proof rolling shall be accomplished by making a minimum of 2 complete passes with a fully loaded

tandem-axle dump truck, or approved equal, in each of 2 perpendicular directions while under the supervision and direction of the independent testing laboratory. Areas of failure shall be excavated and recompacted as specified.

5. Fill materials used in the preparation of subgrade shall be placed in lifts or layers not to exceed 8-in. loose measure and compacted to a minimum density of 95 percent of optimum density, by ASTM D 698, (or 92 percent of the optimum density, by ASTM D 1557) at a moisture content of not less than 1 percent below and not more than 3 percent above optimum moisture content.
6. Material imported from off-site shall have CBR or LBR value equal to or above pavement design subgrade CBR or LBR value indicated on Construction Drawings.

e. Borrow Sites:

1. Upon completion of borrow operations, Contractor shall clean up borrow areas as indicated on Construction Drawings neatly and reasonably to the satisfaction of the borrow area property owner.

f. Finish Grading – Contractor shall:

1. Grade areas where finish grade elevations or contours are indicated on Construction Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. The finished subgrade surface shall not be more than 0.10 feet above or below the established finished subgrade elevation. Ground surfaces shall vary uniformly between indicated elevations. Finish ditches shall be graded to allow for proper drainage without ponding and in a manner that will minimize erosion potential.
2. Correct settled and eroded areas within 1 year after the date of completion at no additional expense to the Owner. Bring grades to the proper elevation. Replant or replace grass, shrubs, bushes, or other vegetation that appears dead, dying, or disturbed by construction activities.

10. RipRap:

a. Reference Standards:

1. American Society for Testing and Materials (ASTM) latest edition D5034, D5035, or D1777 for geotextiles.
2. Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction", latest Edition Section 709 – Riprap and Slope Pavement

b. Quality Assurance:

1. The Contractor shall provide the Engineer with certifications from the manufacturer/supplier of the geotextiles, that the materials shipped to the job site meet or exceed the physical parameters outlined in these specifications.
2. Incoming loads of riprap shall be inspected randomly by a representative of the Owner, before placement to ensure the material appears clean and is free of excessive cracks and mineral lenses.

c. Submittals:

1. Submit the name of the supplier of riprap with certifications as to the density specific gravity, and gradation of stone.
2. Submit geotextile physical properties to the Engineer.

d. Materials:

1. Riprap shall consist of machined limestone shot rock that is angular and free of excessive soil particles, sand, organic material, and other objectionable material that may be washed by precipitation. Rounded stone shall not be used. The limestone rock shall have a specific gravity of at least 2.5 and be free of excessive cracks, and mineral lenses.
2. Unless otherwise specified, stones used as riprap shall weigh between 50 and 150 lbs. (10" to 14.4" in diameter), and at least 60 percent of stones shall weigh 100 lbs. each (12.6" in diameter).
3. Geotextile shall be placed over the subgrade unless filter stone is called for in the plans. The woven or non-woven monofilament geotextile shall have an Apparent Opening Size (AOS) no larger than 0.25 mm (Greater than or equal to U.S. Standard Sieve no. 60). The grab tensile strength of the geotextile shall be greater than 120 lbs.
4. Acceptable fabrics include or equivalent:

- I. Propex Geotex 311
- II. Typar 3401 or 3501
- III. TenCate Mirafi 140N or 150N

If filter stone is used in place of the geotextile filter the gradation shall be as follows:

RIPRAP CLASSIFICATION	GRADATION OF FILTER STONE
50 lb to 100 lb	AASHTO (TDOT) No. 1 Aggregate
TDOT Class A-1	AASHTO (TDOT) No. 467 Aggregate

e. Equipment:

Off-site materials shall be transported to the project site using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

f. Preparation:

1. Slopes and other areas to be protected shall be dressed to line and grade shown on Construction Drawings before placing of riprap. Undercut areas to receive riprap to an elevation equal to the final elevation less average maximum dimension of stones before placing riprap. The subgrade shall be compacted to a minimum of 95 percent of optimum density, by ASTM D 698 at a moisture content of not less than 1 percent below and not more than 3 percent above optimum moisture content. These areas shall then be proof-rolled to detect areas of insufficient compaction. Proof rolling shall be accomplished by making a minimum of 2 complete passes with a fully loaded tandem-axle dump truck, or approved equal, in each of 2 perpendicular directions while under the supervision and direction of the independent testing laboratory. Areas of failure shall be excavated and recompacted as specified.
2. Before placing riprap in low areas, such as previously existing creeks, ponds, or lakes, Contractor shall perform the following procedures:
 - I. Drain the water out by gravity with a ditch having a flow line lower than the lowest elevation in a low area. If drainage cannot be performed by gravity ditch, Contractor shall use an adequate pump, and if necessary, in combination with a coffer dam to obtain the same results.
 - II. After drainage of the low area is complete, remove muck, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying the low area dry and undisturbed. Remove muck and other unsatisfactory fill material from the site.

g. Placement of Geotextile:

1. Geotextile shall be used as a separation layer unless filter stone is called for in the plans or approved by the Engineer.
2. Filter stone shall be dumped and spread in a 6" layer before placing the riprap.

h. Placement of Riprap:

1. Geotextile or filter stone shall be installed before placement of riprap. Riprap shall be placed so as not to tear the geotextile or displace the filter stone. Riprap causing tears in the geotextile or displacement of the filter stone shall be removed before repairing/replacing the geotextile or replacing the filter stone.
2. Riprap shall be placed so that a greater portion of the weight is carried by the earth and not by adjacent stones. Stones shall be placed to the thickness specified in the plans or as specified for riprap classified by TDOT with close joints. Upright areas of stone shall make an angle of approximately 90 degrees with an embankment slope. Courses shall be placed from the bottom of the embankment upward, with larger stones being placed in lower courses. Open joints shall be filled with spalls. Stones shall be embedded in embankment as necessary to present a uniform top surface such that variation between tops of stones shall not exceed 3".

3. When placing riprap on slopes, the riprap at the toe of the slope shall be placed at a thickness 2 times the thickness called for in the Construction Plans ("specified thickness"). The length of the transition from the toe of the slope to the "specified thickness" shall be 2 times the "specified thickness".

11. Slope Protection and Erosion Control:

a. Environmental Requirements:

Contractor shall utilize best management practices throughout the life of the contract to ensure water resources and adjacent properties are protected from erosion and sediment damage.

b. Materials – Contractor shall use the following:

1. Quick-growing grasses such as wheat, rye, or oats.
2. Hay or straw bales as specified on Construction Drawings.
3. Fencing for siltation control as specified on Construction Drawings.
4. Acceptable Filter/Drainage Fabrics.
 - I. TenCate Mirafi 140N
 - II. Typar 3341
 - III. Or equivalent (will need to be approved before project begins)
5. Curlex blankets by American Excelsior Company or approved equal.
6. Two bale stakes for each hay/straw bale shall be a minimum of 4 ft in length and shall be either #2 rebars, 2 steel pickets, or 2-in. x 2-in. hardwood stakes driven 1'-6" into the ground.
7. Temporary mulches such as loose hay, straw, netting, wood cellulose, or agricultural silage.
8. Fence stakes shall be a minimum of 5 ft in length and be either metal stakes or 2-in. x 2-in. Hardwood stakes driven 1'-6" into the ground.

c. Preparation:

1. Contractor shall review Construction Drawings.

d. Erosion Control and Slope Protection Implementation:

1. The Contractor shall place erosion control systems in accordance with Construction Drawings.
2. TWRA or designated representative has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrowing, and embankment operations. The contractor shall incorporate permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Temporary pollution control measures may be required at TWRA's discretion if permanent control measures are not in place in a reasonable time. Cut slopes shall be permanently seeded and mulched when finish grades are achieved as excavation proceeds to an extent considered desirable and practical.
3. Temporary erosion control systems installed by the Contractor shall be constantly maintained to control siltation during the life of the contract. The contractor shall respond to maintenance or additional work as required by the Owner or his designated representative within 48 hours.
4. Any additional material and/or work beyond the extent this solicitation and provided construction drawings shall not be covered under this Contract.
5. Contractor shall be responsible for protecting all slopes when erosion begins by using all necessary methods.

12. Clay Liner:

a. Clay Liner Material:

Clay liner material shall have a minimum plasticity index of 12 ($PI \geq 12$) and a minimum percentage passing the No. 200 sieve (P200) as specified in the construction plans. The clay liner material shall be capable of providing a liner with a hydraulic conductivity (permeability) of 1×10^{-6} centimeters per second or less.

Proposed liner material properties shall be determined in the lab prior to placement for each different borrow area and material, at the specified minimum frequency shown in Table 1. These tests are typically done in the design phase with additional tests required when unpredicted changes in borrow material are observed.

A standard or modified proctor test density curve, and optimum moisture, shall be developed from the borrow materials. A hydraulic conductivity (permeability) shall be determined on a re- compacted sample. The sample shall be re-compacted to the minimum density and moisture content specified in Section 6, Compaction.

Table 1 Borrow Material Testing	
Test Reference	Minimum Frequency
Standard Proctor (ASTM D 698)	1 test required for project. If borrow material changes in field, do Atterberg Limit Test to determine if further testing is required.
Atterberg Limit (ASTM D 4318) and Percent Fines (ASTM D 1140)	1 test required for project. If borrow material changes in field, do Atterberg Limit Test to determine if further testing is required.
Permeability (ASTM D 5084)	1 test required for project. If borrow material changes in field, do Atterberg Limit Test to determine if further testing is required.

b. Foundation Preparation:

Foundation surfaces shall be graded to remove surface irregularities and shall be scarified or otherwise acceptably scored or loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the clay liner. The surface materials of the foundation shall be compacted and bonded with the first layer of the clay liner as specified for subsequent layers of clay liner.

c. Placement:

1. The clay liner shall not be placed until the required foundation preparation has been completed and the foundation has been inspected and approved by the Technician or Engineer.
2. The clay liner shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the clay liner.
3. Clay materials shall contain no sod, brush, roots, frozen soil, or other perishable materials. Rock particles larger than 3 inches shall be removed before compaction of the clay.
4. The clay liner shall be placed in lifts. The thickness of each lift before compaction shall not exceed the smaller of 6 inches or the length of the teeth of the footed compactor used.
5. The distribution of materials throughout the clay liner shall be essentially uniform, and the clay liner shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.
6. If the surface of any layer becomes too hard and smooth for a proper bond with the succeeding layer, it shall be scarified to a depth of not less than 2 inches before the next layer is placed.

d. Control of Moisture Content:

1. During placement and compaction of the clay liner, the moisture content of the clay being placed shall be maintained above the optimum moisture as determined by the standard proctor test or modified proctor test.
2. The application of water to the clay shall be accomplished at the borrow areas in so far as practicable. Water may be applied by sprinkling the clay after placement and before compaction of the liner, if necessary. Uniform moisture distribution shall be obtained by diskings.

e. Compaction:

1. The clay liner shall be compacted to a minimum of 95% of standard proctor dry density or to a minimum of 90% of modified proctor dry density. The compacted linear shall have a permeability of 1×10^{-6} centimeters per second or less.
2. The clay liner shall be compacted with a footed compactor weighing at least 25,000 pounds, operated continuously over the clay material.

f. Reworking or removal and replacement of Defective Liner:

Clay liners placed at densities lower than the specified minimum density at moisture contents lower than the optimum moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the specifications or removed and replaced. The replacement clay material and the fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.

g. Testing Method Specifications:

1. ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
2. ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
3. ASTM D 4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
4. ASTM D 1140 Standard Test Methods for Amount of Material in Soils Finer than No. 200 (75 μ m) Sieve
5. ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth)
6. ASTM D7698 Standard Test Method for In-Place Estimation of Density and Water Content of Soil and Aggregate by Correlation with Complex Impedance Method
7. ASTM D 2937 Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method
8. ASTM D 2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
9. ASTM D 1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
10. ASTM D 5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

h. Testing Frequency:

1. Clay liner construction shall be tested and documented by a third-party engineering or testing firm at the specified minimum frequency shown in Table 2.
2. Field density tests shall be completed on the compacted in-place clay liner, as the liner is being placed. Atterberg limit and percent fines shall be completed on samples obtained next to the field density test. After the completion of the liner, undisturbed samples shall be taken from the constructed clay liner for permeability verification.
3. Copies of the test locations and test results (documentation report) shall be provided to the owner to document compliance with this specification.

i. **TABLE 2 LINER TESTING:**

Test Reference	Minimum Frequency (Standard mathematical rounding rules apply)
Field Density (ASTM D 2922, or D 6938, or D 2167, or D 1556 or ASTM D 7698)	1 test per 6" lift of placed clay liner. Total of 4 tests for a 2' clay liner.
Atterberg Limit (ASTM D 4318) and Percent Fines (ASTM D 1140)	1 test required for project.
Permeability (ASTM D 5084)	1 test per 6" lift of placed clay liner. Total of 4 tests for a 2' clay liner.

At least one of these tests shall be obtained from the side slope of the facility.

All undisturbed sample test holes in the constructed clay liner shall be backfilled using powdered bentonite mixed with clay soil used in liner construction and compacted by hand tamping. The clay shall be broken down into clods less than ½ inch in diameter. A minimum of 25% of each backfilled test hole volume shall be occupied by powdered bentonite after backfilling.

13. Aluminized Steel Type 2 Corrugated Metal Pipe – Shall meet the following requirements:

- a. **Design Standards-** The CSP meets the design parameters of the American Association of State Highway and Transportation Officials (AASHTO) Standard Specification for Highway Bridges, AASHTO LRFD Bridge Design, and/or the American Iron and Steel Institute (AISI).
- b. **Material-** The Aluminized Steel Type 2 coils shall conform to the applicable requirements of AASHTO M 274 or ASTM A929.
- c. **Pipe-** The CSP shall be manufactured by the applicable requirements of AASHTO M 36 or ASTM A760. The pipe sizes, gauges, and corrugations shall be as shown on the project plans. All fabrication of the product shall occur within the United States.
- d. **Coupling Bands-** Coupling bands for the CSP shall be made of the same base metal and coatings as the CSP to a minimum of 18 gauge. 5.2 Ends of the CSP are rerolled with annular corrugations for proper indexing. Connection fasteners will be provided.
- e. **Handling & Assembly-** Refer to the recommendations of the National Corrugated Steel Pipe Association (NCSPA).
- f. **Installation-** The installation shall be by AASHTO Standard Specifications for Highway Bridges, LRFD, Section 26, Division II, NCSPA, or ASTM A798 and in conformance with the project plans and specifications. If there are any inconsistencies or conflicts, the contractor must bring them to the attention of the project engineer. It is always the contractor's responsibility to follow OSHA guidelines for safe practices.
- g. **Construction Loads-** Construction loads may be greater than design loads. The contractor shall follow the recommendations for additional compacted material per manufacturer's or NCSPA guidelines.