10-ACRE POND REMOVAL ACTION
CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PLAN

KERR-MCGEE CHEMICAL CORP. – SODA SPRINGS PLANT
SUPERFUND SITE
SODA SPRINGS, CARIBOU COUNTY, IDAHO

Prepared for:

Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

Prepared by:

Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, MT 59601

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1.0 INTRODUCTION

1.1 PURPOSE

This Construction Quality Assurance/Quality Control Plan (CQA/QCP) provides guidance in attaining and maintaining high quality in the planned Removal Action (the Project) at the Kerr-McGee Chemical Corp. – Soda Springs Plant Superfund Site (the Site). Key components of the Project are removal of contaminated liquids and solids from the 10-Acre pond as well as the construction of liners and a leachate collection system for an on-Site repository. Execution of this plan will provide confidence that the Project is completed in accordance with the Contract Documents. This CQA/QCP is intended for use in conjunction with Project Plans and Specifications.

Specific Performance Standards for the Project are addressed in the 10-Acre Pond Removal Action Work Plan (RAWP) (Hydrometrics, 2018). One of the Performance Standards for the on-Site repository design requires establishment of a Construction Quality Assurance (CQA) program to ensure that the constructed cover meets or exceeds all design criteria and

specifications. This CQA/QCP along with the Plans and Specifications for the on-Site repository constitutes the Construction Quality Assurance Program.

1.2 SCOPE

This plan has been written to include both Quality Assurance (QA) and Quality Control (QC) elements that will be applicable during construction, including methods of observations, test procedures, and testing frequency. The overall requirements for inspection and quality assurance, as addressed in this CQA/QCP and in the Plans and Specifications, are the responsibility of the Prime Contractor. Construction QC requirements are the responsibility of the Construction Contractor as addressed in Section 2.0.

1.3 LIMITATIONS

This plan focuses on the most critical elements to the success of the Project, including removal of contaminated water and solids from the 10-Acre Pond and the on-Site repository geosynthetics and drainage materials. All elements of the Project will be inspected for compliance with Specifications by the Prime Contractor. Some elements represent routine types of civil engineering construction (roads, drainage ditches, etc.) and require no special QA or QC provisions other than those described in the Project Plans and Specifications. The testing frequencies listed herein should be considered a minimum. The Prime Contractor should use their judgment to implement additional testing if they suspect a change in materials or conditions.

2.0 CONSTRUCTION QUALITY ASSURANCE PLAN ELEMENTS

The following sections address CQA/QCP responsibilities and authorities, project records, and data management and control.

2.1 CQA/QCP RESPONSIBILITY AND AUTHORITY

Functional roles for the CQA/QC Plan are divided among the Multistate Trust, Design Engineer, Prime Contractor, and Construction Contractor. A summary of project responsibilities and authorities relative to QA and QC is included in the following sections. Figure 2-1 presents the QA/QC Functional Organization Chart for on-Site repository construction.

2.1.1 Regulatory Agencies

The U.S. Environmental Protection Agency (EPA) is the Lead Agency responsible for regulatory oversight at the Site along with the Idaho Department of Environmental Quality (IDEQ) as the Non-Lead Agency. The EPA and IDEQ are primarily responsible for ensuring public health and the environment is protected. The EPA has contracted with CH2M as their oversight contractor. Functional roles of the EPA during on-Site repository implementation are described in Table 2-1.

2.1.2 Project Owner

Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust, (the Multistate Trust) is the Owner of the Site and is responsible for the control and implementation of the Site activities. Hydrometrics will provide independent QA as the Multistate Trust's representative during the Project. Functional roles of the Multistate Trust are further defined in Table 2-1.

FIGURE 2-1. CONSTRUCTION QUALITY ASSURANCE FUNCTIONAL ORGANIZATION

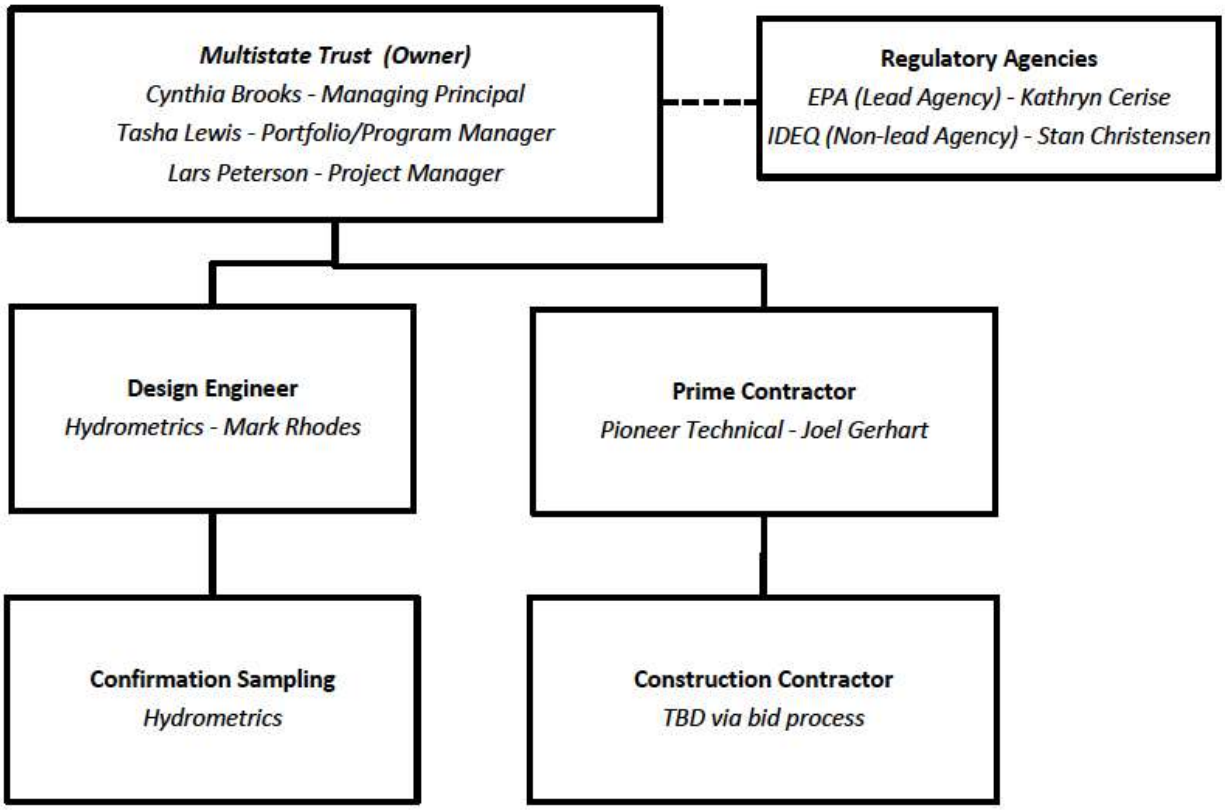

TABLE 2-1. QUALITY ASSURANCE AND QUALITY CONTROL ROLES BY FUNCTIONAL POSITION

Regulatory Agency (EPA)	Multistate Trust	Design Engineer (Hydrometrics)	Prime Contractor (Pioneer)	Construction Contractor
• Reviews and approves 10-Acre Pond Removal Action Work Plan. • Attends or participates in progress meetings, as necessary. • Coordinates government agency interaction, as necessary. • Ensures protection of public health and environment.	• Controls and effects implementation of the 10-Acre Pond Time Critical Removal Action • Assigns work to the Design Engineer and Prime Contractor • Responsible for Site Environmental Actions. • Obtains approvals needed to accomplish project completion. • Verifies completion of work and approves project closeout. • Ensures protection of public health and environment	• Prepares the 10-Acre Pond Removal Action Work Plan, including all construction plans and specifications, and other design documents. • Identifies approvals needed to accomplish project completion. • Provides project engineering and designs. • Performs any necessary design changes during construction to include updates to plans and specifications and construction changes.	• Assesses compliance with construction permits and approvals. • Maintains project records. • Implements portions of CQA/QCP including testing and construction inspection. • Performs independent, on-Site inspections, may include implementation or oversight of performance and certification testing. • Implements CQA/QCP including testing, reporting, and construction inspection. • Performs on-Site inspections, including oversight of performance and certification testing.	• Implements CQA/QCP for specific construction activities. • Provides required submittals including progress schedules, reports, and QC documentation. • Submits lists of equipment, material, and proposed methods of work to engineering inspectors. • Submits manufacturers' or suppliers' certification that materials meet specifications

2.1.3 Project Engineer

Hydrometrics is the Design Engineer for the Project. During project design, the Design Engineer is primarily responsible for providing development of designs, plans, and specifications which meet project requirements. Functional roles of the Design Engineer during design are addressed in Table 2-1.

2.1.4 Prime Contractor

Pioneer Technical Services (Pioneer) is the Prime Contractor for the Project. The overall responsibility of the Prime Contractor is to execute the activities specified under the CQA/QCP and to oversee the routine inspection of the Project and assure that quality standards specified by the design documents are met. The Prime Contractor will implement and assure adherence to the CQA/QCP. The Prime Contractor will provide a Project Manager to maintain project records as defined in Section 2.3. Functional roles of the Prime Contractor are addressed in Table 2-1.

2.1.5 Construction Contractor

Pioneer is the Prime Contractor for the project and will solicit bids and subcontract a Construction Subcontractor to perform the work. The Prime Contractor will be responsible for project administration and managing the Construction Contractor. During construction, the Construction Contractor will be responsible for construction QC. The Construction Contractor will designate a QC representative(s) responsible for ensuring adherence to the CQA/QCP. The Construction Conntractor will provide required submittals and documentation to the Prime Contractor. Functional roles of the Construction Contractor during design are addressed in Table 2-1.

2.2 PROJECT RECORDS

Project records will be maintained by the Prime Contractor's Project Manager. Submittals by various subcontractors and their vendors will include pertinent shop drawings, data sheets, material certifications, mix designs, permits, test results, and other pertinent or required submittals. The Project Manager will prepare various reports that describe the construction activities and provide documentation that the construction conforms to approved Plans and

Specifications. The specific reports, their content, distribution and distribution schedule will be developed for each specific construction activity. At a minimum, the following reports will be part of the project records:

1. Daily Inspector Report; and
2. Inspection Testing Forms.

Examples of these project reports are included in Attachment A.

2.3 DATA MANAGEMENT AND DOCUMENT CONTROL

All information relevant to construction activities will be categorized as either (a) data, or (b) construction project records. Data are results from the measurement of some parameter of media and can include sampling and analytical results, and other tests or measurement (e.g., survey information). Construction project records consist of all documentation pertinent to project construction activities.

The QA methods and procedures outlined in this CQA/QCP will be used to verify and document that the Project is completed in accordance with plans and specifications and codes, standards and practices referenced therein.

2.4 MEETINGS

To effectively implement this plan, several meetings will be held to promote communication. The meetings are described below.

2.4.1 Pre-Bid Meeting

The meeting will be held prior to bid opening and will allow interested construction subcontractors a chance to discuss questions with the Multistate Trust and Design Engineer and to visit the Site.

2.4.2 Pre-Construction Meeting

The meeting will be held before construction commences. The Construction Contractor, Prime Contractor, Design Engineer and Multistate Trust will attend this meeting. At this meeting, the

Design Engineer's oversight plans will be discussed as well as the CQA/QCP and any specific CQA/QCP addendum.

2.4.3 Progress Meetings

These meetings will be held during construction and their frequency may vary with the amount of construction activity ongoing. While discussion at these meetings may include a wide variety of topics, it should also include any problems encountered or anticipated that are related to CQA. The Construction Contractor, Prime Contractor, Design Engineer and Multistate Trust will attend progress meetings to monitor overall project progress and issues, particularly those related to QA and QC. EPA and IDEQ will be notified of progress meetings, provided an agenda and handouts, and may participate via phone or in person.

2.5 REPORTING

QA/QC issues will be recorded and reported to interested parties in a number of ways. The Prime Contractor will prepare general daily, weekly, and monthly reports documenting construction progress and issues. QA/QC test failures or non-conformance shall be noted on daily logs. Additionally, each test failure or non-conformance will be further reported on a special report documenting the issue and its resolution. Sample QA/QC test forms are included in Attachment A.

Daily reports and QA/QC issue reports will be distributed to the Design Engineer and Multistate Trust. Distribution methods may include hand delivery, fax, mail, e-mail, website, or other methods.

3.0 EARTHWORK

This section describes QA and QC measures for all earthwork to be performed.

3.1 QUALITY CONTROL MEASURES

The Construction Contractor shall perform QC measures on excavated on-Site soils, imported borrow materials, and other miscellaneous earthen materials.

QC measures for on-Site soils to be used for cover soil and subsoil shall include visual inspection. All organic material including roots, sticks, leaves, brush trash, and any other debris shall be removed before stockpiling or using excavated material.

QC measures for imported borrow materials to be used for drain aggregate shall include visual inspection, gradation, and liquid and plasticity limits (where applicable). Table 3-1 lists the specific tests, frequency of testing and acceptance criteria. For those QC tests whose frequency is listed as continuous in Table 3-1, QA tests will be performed at least once per shift for a minimum of 15 minutes.

3.2 QUALITY ASSURANCE MEASURES

The Prime Contractor's inspectors will perform QA testing to corroborate QC testing. In general, QA testing will use the same methods, standards and rejection criteria as QC testing. Visual test methods will be performed continuously by inspectors. QC placement tests (i.e., in-place density) will be observed by the inspectors for QA. Additional QA placement tests may be performed at the Prime Contractor's discretion.

TABLE 3-1. QC TESTS FOR SELECTED EARTHEN MATERIALS

Material	Test Description[1]	Test Method	Test Frequency	Standard	Test Rejection Criteria[4]
Drain Aggregate	Deleterious Materials	Visual	Continuous	--	All foreign material and undersized or oversized particles to be removed.
	Gradation	ASTM D-6913	1 per 5,000 cy[2]	Special provisions	No deviation from standard.
	Liquid and Plastic Limits and Plasticity Index	ASTM D-4318	1 per 5,000 cy[2, 3]	LL <40 PI <6	No deviation from standard.
General Waste Materials	Compaction	Visual; Proof roll	Continuous	8 passes (4 cycles) with proper compaction equipment	No deviation from standard.
	Lift Thickness	Visual Measurement	Continuous	2-foot lifts	No deviation from standard.
	Gradation	Visual Measurement	Continuous	At least one dimension less than 2 feet	Long oversized debris will be laid flat and void space minimized. Pipes and structures with large voids must be crushed or broken to minimize voids.
General Waste Materials	Moisture	Visual	Continuous	Special provisions	Pond solids with free water or that cannot be contained in a truck bed must be dried prior to hauling to the on-Site repository. Soil will be dried and/or mixed if necessary for compaction.
Geosynthetic Waste Materials	Size	Visual Measurement	Continuous	Special provisions	Geosynthetics must be shredded or otherwise sized to be compacted within the 2 foot waste lifts with minimal voids.
Bottom Liner Subgrade	Standard Proctor Density	ASTM D-698	1 test minimum	N/A	N/A
	In-Place Density	ASTM D-6938	3 per acre	90% of maximum dry density	No deviation from Standard. Rework and retest failed areas.

TABLE 3-1. QC TESTS FOR SELECTED EARTHEN MATERIALS (continued)

Material	Test Description	Test Method	Test Frequency	Standard	Test Rejection Criteria[4]
Calcine Cushion Material	Deleterious Materials	Visual	Continuous	--	All foreign material and undersized or oversized particles to be removed.
	Compaction	Visual	Continuous	Firm, unyielding surface meeting GCL subgrade requirements	No deviation from standard.
Cover Soil	Soil Quality	Visual	Continuous	No oversized particles, roots, sticks, leaves, brush, trash or other debris	Remove all material not meeting standard
Anchor Trench	Standard Proctor Density	ASTM D-698	1 test minimum	N/A	N/A
	In-Place Density	ASTM D-6938	1 per 750 linear feet per lift	92% of maximum dry density	No deviation from Standard. Rework and retest failed areas.

Notes:

(1) Inspection shall be by the Construction Contractor's QC representatives, equipment operators, laborers, or other personnel.
(2) Frequency shown is for each type of material. If there is a change in the material or supplier, the same frequency shall apply to the new material.
(3) Liquid and plastic limit testing not applicable to those materials with less than 1% (by weight) of material passing the No. 40 sieve.
(4) Unless otherwise specified, deviations shall be corrected by reworking material until the standard is met.

4.0 HDPE FLEXIBLE MEMBRANE LINERS

Flexible Membrane Liners (FMLs) provide the primary barrier layer for the on-Site repository bottom liner and cover liner. All FML specified for this project is 60 mil double-sided textured High Density Polyethylene (HDPE). The term geomembrane is used interchangeably with FML in the project documents.

Before shipping any FMLs to the Site, the Construction Contractor shall submit the manufacturer's QA testing results to the Prime Contractor. At a minimum, the manufacturer's QA tests shall consist of the tests list in Table 4-1. Test standards are minimum average roll values (MARV). The manufacturer's QA tests will be conducted on the particular lot(s) to be used for this Project.

On delivery of FMLs to the Project Site, the Prime Contractor shall collect additional samples for confirmation testing. The Prime Contractor shall select one roll of each FML lot and shall remove an appropriate length for confirmation testing. Confirmation testing shall duplicate the requirements specified in Table 4-1 at a frequency of 1 test per lot.

The Construction Contractor shall implement QC measures during FML installation. QC measures shall include visual inspection of the receiving surface, anchor trenches, panel placement, and seams as well as destructive and non-destructive testing of seams. Destructive testing will be conducted on seam samples that are cut from a completed seam. The samples shall be approximately 36 inches by 12 inches. From the sample, the Construction Contractor shall deliver to the Engineer two 12-inch by 12-inch pieces for laboratory testing and archival storage. The remainder will be used by the Construction Contractor for field testing. Table 4-2 lists the QC tests, their frequency, and rejection criteria.

The Prime Contractor shall implement QA procedures during FML installation. In general, Prime Contractor will perform the same tests as indicated in Table 4-2 at the same frequency.

TABLE 4-1. MANUFACTURER'S QA TESTS FOR FML

Property	Test Method	Test Frequency	Test Standard	Rejection Criteria
Thickness (mils) Minimum Average Lowest Individual Reading	ASTM D-5994	Every roll	 57 54	Material must meet all standards before delivery to site
Asperity Height (mils)	ASTM D-7466	Every 2 rolls	16	
Specific Gravity	ASTM D-1505	200,000 lb	≥0.94	
Tear Strength (pounds)	ASTM D-1004	50,000 lb	42	
Tensile Strength - each direction 1. Yield Stress (lb/in) 2. Break Stress (lb/in) 3. Yield Elongation (%) 4. Break Elongation (%)	ASTM D-6693 Type IV	20,000 lb	 126 90 12 100	
Puncture Resistance (lb)	ASTM D-4833	50,000 lb	90	
Stress Crack Resistance(1) (hours)	ASTM D-5397	200,000 lb	500	
Oxidative Induction Time – Standard OIT (min ave)(1,2)	ASTM D-3895	200,000 lb	100	
Carbon Black Content(1)	ASTM D-4218	20,000 lb	2 – 3%	
Carbon Black Dispersion(1)	ASTM D-5596	50,000 lb		

Notes:

(1) Engineer confirmation testing is not required for these properties. Confirmation tests may be completed at Engineer's discretion.

(2) Manufacturer may substitute High Pressure OIT testing (ASTM D-5885) for Standard OIT. Test standard for High Pressure OIT is 400 min.

TABLE 4-2. QUALITY CONTROL CRITERIA FOR FML

Parameter	Test Method	Frequency	Standard	Test Rejection Criteria
Surface Conditions	Visual Inspection	100%	No holes, ridges, voids, rocks, roots, ruts or other non-conformities	Reject and replace all surfaces with any of the items at left
Anchor Trenches	Visual/Tape Measure	100%	See dimensions on project plans	Reject and repair all non-conforming trenches
FML Placement	Visual	100%		Reject and replace non-conforming panels
Seaming	Visual	100%		
Seam Shear & Peel(1)	ASTM D-4437	1 per 500 to 1,000 feet of seam (see Special Provisions)	Shear strength: 120 lb/in – 60 mil Peel strength: 91 lb/in(2) – 60 mil 78 lb/in(3) – 60 mil	Reject and replace non-conforming seams
Trial Seam	ASTM D-4437	1) Beginning of each shift of seaming and every four hours thereafter 2) At any change in seam operator, equipment or weather	See Seam Shear & Peel values above	Repeat trial seaming until standard is met
Spark Test Vacuum Box or Internal Pressure	ASTM D-7240 ASTM D-4437 or ASTM D-5820	100%(4)	No spark No bubbles emerging from seams Loss of pressure ≤4 psi in 5 minutes	Identify, repair, and replace leaking seams

Notes:

(1) Four out of five tests must meet standard. All tests must exceed 80% of standard.
(2) Criterion for hot wedge seams.
(3) Criterion for extrusion welds.
(4) Hot wedge seams shall be tested by internal pressure. Extrusion welds shall be tested by vacuum box. Spark testing shall only be used where internal pressure and vacuum testing is not possible (e.g., liner penetrations). Prime Contractor shall observe tests for QA.

5.0 GEOCOMPOSITES

Geocomposites are used in the on-Site repository leachate collection system and cover liner system. The Construction Contractor will obtain the manufacturer's certification that the material conforms to the MARV Project Specifications shown in Table 5-1 and provide copies to the Prime Contractor. The Prime Contractor will be present during the delivery and unloading of geocomposites. Confirmation testing requirements are listed in Table 5-2. These will be performed by the manufacturer or Construction Contractor on the material lots used for this Project, and results will be provided to Prime Contractor no later than at delivery of the geocomposite.

The Prime Contractor and Design Engineer will be present during installation of the geocomposite and will visually confirm that overlap and panel fasteners conform to Project Specifications. Copies of manufacturer's certifications and the results of any testing or inspection conducted by the Prime Contractor will be provided to the Design Engineer.

Quality control measures to be implemented by the Construction Contractor shall include storage, handling, and complete visual inspection of overlaps and seaming procedures. QA measures implemented by the Design Engineer shall also include complete visual inspection of overlap and seaming procedures.

TABLE 5-1. MANUFACTURER'S QA TESTS FOR GEOCOMPOSITE

Property	Test Method	Test Frequency	Test Standard	Rejection Criteria
Geonet				Manufacturer must certify all standards before delivery to site
Core Thickness (mil)	ASTM D-5199	50,000 ft^2	250	
Transmissivity (gal/min/ft)	ASTM D-4716	50,000 ft^2	14	
Specific Gravity	ASTM D-1505	50,000 ft^2	0.94	
Tensile Strength (lb/in)	ASTM D-7179	50,000 ft^2	50	
Geotextile				
Mass per Unit Area (oz/yd^2)	ASTM D-5261	90,000 ft^2	8	
Grab Tensile Strength (lb)	ASTM D-4632	90,000 ft^2	220	
CBR Puncture Strength (lb)	ASTM D-6241	600,000 ft^2	500	
Permittivity (sec^{-1})	ASTM D-4491	600,000 ft^2	1.2	
Water Flow (gpm/ft^2)	ASTM D-4491	600,000 ft^2	90	
Apparent Opening Size (U.S. sieve, max)	ASTM D-4751	600,000 ft^2	80	
Geocomposite				
Ply Adhesion (lb/in)	ASTM D-7005	50,000 ft^2	1.0	
Transmissivity (gpm/ft (m^2/sec))	ASTM D-4716	600,000 ft^2	2.4 ($5x10^{-4}$)	

TABLE 5-2. CONFIRMATION SAMPLING FOR GEOCOMPOSITES

PARAMETER	TEST	MINIMUM TEST FREQUENCY	REJECTION CRITERIA
Thickness	ASTM D-5199	1 per lot(1)	Reject any lot sampling unit or lots that do not meet ASTM-D-4759, Section 5.
Geocomposite Transmissivity	ASTM D-4716 ≥22 psi normal pressure and 0.1 ft/ft hydraulic gradient	1 per lot(1)	Reject any lot sampling unit or lots that do not meet ASTM-D-4759, Section 5.

Notes:

(1) A lot is the smaller of 100,000 square feet or one production run.

6.0 GEOSYNTHETIC CLAY LINER

Geosynthetic Clay Liners (GCLs) are used as the secondary barrier layer component for the on-Site repository. The Construction Contractor or manufacturer shall provide acceptance testing of the GCL according to Table 6-1. Test results shall be provided to the Prime Contractor and Design Engineer before any GCL is shipped to the Project.

During GCL placement, the Construction Contractor shall perform QC tests according to Table 6-2. The Prime Contractor shall perform QA tests of the same type and at the same frequency as those tests shown in Table 6-2.

If any holes result in the GCL for any reason, the Construction Contractor shall repair the hole by placing a patch of GCL over the affected area. The patch will have a minimum of 12 inches of overlap on all sides from the affected area. Granular bentonite shall be uniformly scattered over the entire patch area at the same rate as used in panel overlaps. The Construction Contractor and Prime Contractor shall visually inspect all hole repairs.

TABLE 6-1. ACCEPTANCE TESTING FOR GCL

Parameter	Test Method	Frequency	Test Standard	Rejection Criteria
Bentonite Mass per Unit Area	ASTM D-5993	1 per lot(1)	0.75 lb/ft^2 MIN	Materials must pass all acceptance testing before delivery to site
Bentonite Swell Index (2 grams)	ASTM D-5890		24 ml MIN	
Bentonite Fluid Loss, ml	ASTM D-5891		18 ml MAX	
Bentonite moisture content	ASTM D-5993		35% MAX(2)	
Geotextile Density	ASTM D-5261		5.9 oz/yd^2 MIN	
Hydraulic Conductivity	ASTM D-5887		5 x 10^{-9}cm/sec MAX	
Tensile Strength	ASTM D-6768		45 lb/in MIN	
Peel Strength	ASTM D-6496		3.5 lb/in MIN	
Shear Strength	ASTM D-6243	1,000,000 ft^2	500 psf MIN(3)	

Notes:

(1) All material used on the project must be from the sampled lot(s).
(2) Bentonite moisture content measured after incorporation into GCL.
(3) Hydrated internal shear strength measured at 200 psf normal stress.

TABLE 6-2. QC MEASURES FOR GCL

Parameter	Test Method	Testing Frequency	Test Standard	Rejection Criteria
Minimum Overlap	Visual/Measuring Tape	100%	6 inches longitudinal 24 inches end of roll	Manually move panels to meet specifications
Subgrade Smoothness	Visual		No bridging of GCL≥1 inch	Manually repair area
GCL Rips, Tears, Holes	Visual		No irregularities	Patch all irregularities
Granular Bentonite in Overlaps	Visual		1/4 lb per foot or Internal longitudinal bentonite seam	Add granular bentonite to meet specification
Freezing/Unrestrained Hydration	Visual		Visibly uneven	Remove and replace affected GCL
Hole Repair	Visual		12 inches of overlap all around with granular bentonite	Remove and replace patch

7.0 SEPARATION GEOTEXTILE

A non-woven geotextile will be used as a separation layer between the leachate collection and removal system (LCRS) drain gravel and the overlying waste material. The Construction Contractor will obtain the manufacturer's certification that the material confirms to the MARV Project Specifications shown in Table 7-1 and provide copies to the Prime Contractor and Design Engineer. The Prime Contractor and Design Engineer will be present during the delivery and unloading of separation geotextile. Copies of manufacturer's certifications and the results of any testing or inspection conducted by the Prime Contractor will be provided to the Design Engineer.

Quality control measures to be implemented by the Prime Contractor shall include storage, handling, and complete visual inspection of geotextile placing and overlap procedures. QA measures implemented by the Design Engineer shall also include complete visual inspection of geotextile placing and overlap procedures.

TABLE 7-1. MANUFACTURER'S QA TESTS FOR GEOCOMPOSITE

Property	Test Method	Test Frequency	Test Standard	Rejection Criteria
Mass per Unit Area (oz/yd^2)	ASTM D-5261	90,000 ft^2	5.9	Manufacturer must certify all standards before delivery to site
Grab Strength (lb)	ASTM D-4632	90,000 ft^2	158	
Trapezoid Tear Strength (lb)	ASTM D-4533	90,000 ft^2	55	
Apparent Opening Size (U.S. sieve, max)	ASTM D-4751	600,000 ft^2	70	
Permittivity (sec^{-1})	ASTM D-4491		0.02	

8.0 LEACHATE COLLECTION SUMP AND PIPING

Perforated piping and smooth solid piping are used in the repository leachate collection systems. QA/QC measures for piping shall include obtaining manufacturer's certifications that the materials meet the Project Specifications, survey verification of pipe grades, verification that pipe joints were constructed according to the specifications, and verification that the pipe is not damaged during backfilling.

During construction of the leachate collection system, the Construction Contractor shall perform QC tests according to Table 8-1. The Prime Contractor shall perform QA tests of the same type and at the same frequency as those tests shown in Table 8-1.

TABLE 8-1. QA/QC MEASURES FOR LEACHATE COLLECTION SUMP AND PIPING

Parameter	Test Method	Testing Frequency	Test Standard	Rejection Criteria
Pipe Grade	Visual/Level	100%		Manually move piping to meet grade specifications
Pipe Joints	Visual			Repair joints to meet joint specifications.
Backfilling over Pipe	Visual		No damage	Remove and replace all piping damaged during backfilling.

9.0 REFERENCES

ASTM D-698, "Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort."

ASTM D-1004 "Test Method for Initial Tear Resistance of Plastic Film and Sheeting."

ASTM D-1505, "Standard Test Method for Density of Plastic by the Density-Gradient Technique."

ASTM D-3895, "Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry."

ASTM D-4218, "Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique."

ASTM D-4318, "Liquid Limit, Plastic Limit and Plasticity Index of Soils."

ASTM D-4437, "Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes."

ASTM D-4491, "Standard Test Methods for Water Permeability of Geotextiles by Permittivity."

ASTM D-4533, "Standard Test Method for Trapezoid Tearing Strength of Geotextiles."

ASTM D-4632, "Standard Test Method for Grab Breaking Load and Elongation of Geotextiles."

ASTM D-4716, "Standard Test Method for Constant Head Hydraulic Transmissivity (In-plane Flow) of Geotextiles and Geotextile Related Product."

ASTM D-4751, "Standard Test Methods for Determining Apparent Opening Size of a Geotextile."

ASTM D-4759, "Standard Practice for Determining the Specification Conformance of Geosynthetics."

ASTM D-4833, "Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products."

ASTM D-5199, "Measuring Nominal Thickness of Geotextiles and Geomembranes."

ASTM D-5261, "Standard Test Method for Measuring Mass per Unit Area of Geotextiles."

ASTM D-5397, "Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test."

ASTM D-5596, "Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics."

ASTM D-5820, "Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes."

ASTM D-5885, "Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry."

ASTM D-5887," Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter."

ASTM D-5890, "Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners."

ASTM D-5891, "Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners."

ASTM D-5993, "Standard Test Method for Measuring Mass Per Unit of Geosynthetic Clay Liners."

ASTM D-5994, "Standard Test Method for Measuring Core Thickness of Textured Geomembrane."

ASTM D-6241, "Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe."

ASTM D-6243, "Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method."

ASTM D-6496, "Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners."

ASTM D-6693, "Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes."

ASTM D-6768, "Standard Test Method for Tensile Strength of Geosynthetic Clay Liners."

ASTM D-6913, "Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis."

ASTM D-6938, "Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)."

ASTM D-7005, “Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.”

ASTM D-7179, “Standard Test Method for Determining Geonet Breaking Force.”

ASTM D-7240, “Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test).”

ASTM D-7466, “Standard Test Method for Measuring Asperity Height of Textured Geomembranes.”

Hydrometrics, 2018. 2018 10-Acre Pond Removal Action Work Plan, Kerr-McGee Superfund Site, Soda Springs, Caribou County, ID, March 2018.

ATTACHMENT A

FIELD FORMS