

CONSTRUCTION QUALITY ASSURANCE PLAN

PLANT KRAFT
INACTIVE CCR LANDFILL
GRUMMAN ROAD ASH LANDFILL
CHATHAM COUNTY, GEORGIA
FOR



Georgia
Power

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1. GENERAL

- A. The Georgia EPD solid waste program will be notified of each major cell construction or closure construction event prior to construction. Construction Quality Assurance (CQA) will be provided by a fourth-party consulting engineering firm specializing in the inspection and testing of soils and geosynthetics. Resumes and qualifications including experience with projects of similar type, size, and complexity will be provided to Georgia Power for their review and approval.

This Construction Quality Assurance (CQA) Plan describes the quality assurance activities that will be undertaken during the consolidation and in-place closure of the Grumman Road Ash Landfill. The purpose of this document is to define the scope, formal organization, and procedures necessary to perform quality assurance tasks such that the construction elements of the consolidation and closure of the Grumman Road Ash Landfill comply with the design as shown or indicated in the approved CCR Permit and Closure Plan.

This CQA Plan addresses those area of construction pertaining to environmental protection. At the end of closure a CQA Report will be submitted to Georgia Environmental Protection Division (EPD) Solid Waste Program along with a certification by an engineer registered in the state of Georgia that the area was closed within the limitations of, and according to, the CCR Permit and approved Closure Plan.

Construction Quality Control (CQC) services will be provided by an independent third-party consulting engineering firm specializing in the inspection and testing of soils and geosynthetics. The services of the CQA firm are to oversee the CQC services required during construction and the installation of the final cover system are described in this CQA Plan.

Parties involved in the CQA program:

1. PURCHASER, OWNER, OPERATOR: Georgia Power Company (GPC).
2. CONTRACTOR: The entity awarded the contract to furnish the materials and perform the work as described herein and as specified in the Closure Plan.
3. CONSTRUCTION SITE MANAGER (CSM): The on-site manager of the project or his designated representative. He is the authorized representative at the site for the Purchaser.
4. DESIGN ENGINEER: The company or companies hired by the owner/operator to furnish the design, drawings, plans, and specifications for the facility. The DESIGN ENGINEER will be a registered professional engineer licensed in Georgia.
5. CQC ENGINEER/TECHNICIAN: Refers to the third party firm responsible for construction quality control monitoring, testing and documentation of all work performed during the construction at the facility. The CQC Engineer will be registered in their profession and licensed in the state of Georgia. The CQC technician, working under the direct supervision of the CQC Engineer, will provide inspection and testing of all materials to verify conformance with the technical specifications.

6. CQA ENGINEER, CQA FIRM, and CQA INSPECTOR: Refers to the fourth party firm responsible for CQA). The CQA Firm will oversee the CQC technician during monitoring, testing and documentation of all work performed during closure construction at the facility. The CQA Engineer will be a registered professional engineer licensed in Georgia and will provide certification to the Georgia Environmental Protection Division that the closure of the Grumman Road Landfill has been constructed in accordance with the CCR Permit and approved Closure Plan. The CQA technician will work under the direct supervision of the CQA Engineer.

7. AS BUILT SURVEYOR: As-built certification surveys will be performed by a registered professional land surveyor licensed in Georgia on the components identified in the CQA Plan.

2. CCR EXCAVATION AND REMOVAL CRITERIA

“CCR removal” refers to the process of verifying and documenting that CCR has been removed from the CCR unit. The CCR will be excavated until native soils are encountered indicating that the CCR has been removed. In addition, a six-inch layer of soil will be removed below the verified CCR/soil interface. The CCR excavation and removal criteria are described below.

Visual Verification of CCR Removal Procedure:

GPC will engage the services of a Construction Quality Assurance (CQA) firm to monitor and document CCR removal according to the following procedure:

1. The CQA Engineer will prepare a map using a 100-ft grid (or a 25-ft grid spacing for smaller removal areas). Grid points will be assigned a unique alphanumeric label for reference and documentation of CCR removal.
2. CCR will be excavated until there is no visible CCR present. This surface will be referred to as the CCR/soil interface.
3. CQA personnel will observe the CCR/soil interface at the working face to confirm that visible CCR has been removed. Observations will be made with reference to the grid map. Observations will include, but not be limited to, taking photographs, and describing soil color based on the Munsell Soil Color Chart. CQC personnel will document observations in field logs or reports.
4. The CCR/soil interface surface will be surveyed.
5. The excavation will continue to a minimum of 6-inches below the CCR/soil interface. This surface will be referred to as the bottom of excavation. Excavated soil will be disposed of at an off-site permitted landfill.
6. The bottom of excavation surface will be surveyed and confirmed to be a minimum of 6-inches below the CCR/soil interface.

3. GRADING

A. GENERAL

The CQA ENGINEER or his representative will observe and document all grading activities and test the placement and compaction of in-situ materials and structural fill. The CQA ENGINEER is responsible for certifying that the materials and construction were in accordance with the plans, specifications, and this CQA Plan.

B. RELATED WORK

The CQA ENGINEER will reference the grading section of the CQA Plan and technical specifications for pertinent soil materials physical properties and construction requirements.

C. SUBGRADES

During construction, conformance testing of the subgrade soil materials will be performed by the ENGINEERING TECHNICIANS. The CQA ENGINEER will monitor and document proofrolling of areas that are cut to achieve grade. Material placed to achieve grades indicated on the plans will be tested by the ENGINEERING TECHNICIANS in accordance with the test methods and frequencies listed herein to verify that the compacted fill materials used by the Contractor comply with the technical specifications. Areas of proofrolling or compacted fill that do not conform to the technical specifications will be delineated and reported to the Contractor. The CQA ENGINEER will document that these areas are reworked by the Contractor and retested until passing results are achieved.

The CQA ENGINEER will monitor and document if the subgrade is damaged by excess moisture (causing softening), insufficient moisture (causing desiccation and shrinkage), or by freezing. When such conditions exist, the CQA ENGINEER and ENGINEERING TECHNICIANS will evaluate the suitability of the subgrade by the following methods as applicable:

- moisture / density testing;
- continuous visual inspection during proofrolling;
- other test methods identified herein.

The CQA ENGINEER will inform the Contractor and will document when the Contractor repairs areas damaged as indicated above. The ENGINEERING TECHNICIANS will retest the repaired areas until passing results are achieved.

D. CONFORMANCE TESTING

It will be necessary for the CQA ENGINEER to observe the structural fill soils to ensure they are uniform and conform to the requirements of the CQA Plan and technical specifications. For soil materials obtained from on-site or off-site borrow areas, visual inspections and conformance tests will be performed by the ENGINEERING TECHNICIANS prior to the materials being used. Borrow area inspections may also be utilized by the CQA ENGINEER to ensure that only soil materials meeting the requirements of the CQA Plan and technical specifications are transported to the site. For both on-site and off-site borrow areas containing non-uniform materials, it will be necessary for the Contractor and the CQA ENGINEER to coordinate excavation, monitoring and proper segregation of soil materials. All materials failing to meet the requirements of the CQA Plan and technical specifications will be rejected for use.

CQA personnel will observe soils for deleterious materials, (e.g., roots, stumps, rocks, and large objects). When necessary, the Visual Manual procedure for the description and identification of soils will be conducted by the CQA ENGINEER in accordance with test method ASTM D2488.

E. TEST METHODS AND FREQUENCY

All testing will be conducted in accordance with the CQA Plan. The field testing methods used to evaluate the suitability of soils during their installation, will be performed by the CQA ENGINEER in accordance with current ASTM test procedures indicated in the table below.

Documentation and reporting of the test results will be the responsibility of the ENGINEERING TECHNICIANS.

The Standard Proctor Test (ASTM D698) will be used for the determination of moisture/density relationships unless otherwise indicated. In-place moisture / density testing will be by nuclear test method ASTM D6938, the sand cone test method ASTM D1556 or drive cylinder test method ASTM D2937. The sand cone test method ASTM D1556 or drive cylinder test method ASTM D2937 will be used to establish correlations of moisture and density in cases of uncertainty, and as a check of the nuclear surface moisture/density gauge calibration. Conflicts regarding acceptance of test results will be resolved by the CQA ENGINEER.

Testing will be conducted during the course of the work. The minimum construction testing frequencies are presented in the table below. The frequency may be increased at the discretion of the CQA ENGINEER or if variability of the materials is observed by the CQA ENGINEER. Sampling locations will be selected by the CQA ENGINEER. If necessary, the location of routine in-place density tests will be determined using a non-biased sampling approach.

A special testing frequency will be used at the discretion of the CQA ENGINEER when visual observations of construction performance indicate a potential problem.

Minimum Testing Requirements for Structural Fill	
Test	Frequency
Laboratory Moisture-Density/ASTM D698	1 Test for each Type of Soil Encountered
Liquid Limit, Plastic Limit, Plasticity Index/ASTMD 4318	1 Test for each Type of Soil Encountered
Sieve Analysis/ASTM D422	1 Test for each Type of Soil Encountered
Field Density and Moisture Content/ Sand Cone, ASTM D1556 Drive Cylinder, ASTM D2937 Nuclear, ASTM D6938	1 Test per 1,000 c.y. of Structural Fill

F. COMPACTION

The CQA ENGINEER will confirm that structural fill conforms to compaction requirements as follows:

Description	General Compaction	Top 12"
Sediment Pond Embankments	95%	95%
Roadways	95%	98%
Shoulders and Embankments	95%	95%
Utilities Under Structures	95%	95%
Other Areas	95%	95%

G. PROTECTION OF SUBGRADES AND FILL SURFACES

The CQA ENGINEER will monitor newly graded areas to verify the Contractor is protecting these areas from traffic and erosion until construction is complete.

3. REINFORCED GEOSYNTHETIC CLAY LINER (GCL)

The CQA ENGINEER will certify the material and installation are in accordance with the plans, technical specifications, and this CQA Plan.

A. GCL MANUFACTURER AND INSTALLER APPROVAL

The Contractor will submit the qualifications of the GCL Manufacturer and the GCL Installer to the CQA ENGINEER for review and confirmation that they meet the requirements of the CQA Plan and technical specifications.

B. GCL MATERIAL APPROVAL

1. GCL PRODUCT DATA:

The CQA ENGINEER will review the Contractor's submittals for conformance with the CQA Plan and technical specifications.

2. SHIPMENT AND STORAGE:

The CQA ENGINEER will verify that all GCL delivered to the project site is stored in a dry area protected from precipitation and direct sunlight. The GCL will be individually wrapped in protective plastic and placed on pallets to assure drainage beneath the rolls. The GCL will be completely covered with polyethylene and maintained in good condition until the GCL is deployed. GCL which has become wet (water content > 40%) prior to deployment will be rejected.

3. QUALITY CONTROL CERTIFICATES:

Upon delivery, the CQA ENGINEER will:

- Verify that the Manufacturer's quality control certificates have been provided at the specified frequency and that each certificate identified the rolls related to it, and
- Review the Manufacturer's quality control certificates and verify that the certified properties meet the technical specifications.

4. GCL MATERIAL CONTROL TESTS:

The CQA ENGINEER will perform the Material Control Tests in accordance with and at the frequencies listed below. The sampling should be performed at the manufacturing plant and the test results reviewed and accepted prior to delivery of the GCL to the project site.

Required GCL Properties¹				
Property	Test Method	Units	Value	Test Frequency
Hydraulic Conductivity (or by Index Flux)	ASTM D5084 ² (ASTM 5887 APPX 2)	cm/s	$K \leq 5.0 \times 10^{-9}$	Per GRI-GCL3

1. In addition to the requirements used on this table, the manufactured GCL will be tested and meet the requirements set forth in the latest version of the Geosynthetic Research Institute's specification GCL-3 (GRI-GCL3) for reinforced GCLs.
2. Conduct test at 30 psi effective stress.

Samples will be taken across the entire width of the roll and will not include the first lineal 3 feet. Unless otherwise specified, samples will be 3 feet long by the roll width. The CQA ENGINEER will mark the machine direction on the samples with an arrow. All test results must be available at the site prior to the deployment of all GCL. The CQA ENGINEER will examine all results from laboratory testing.

Material Control Test Failure:

The following procedure will apply whenever a sample fails a material control test:

- i. The Geosynthetic Manufacturer will replace the roll of GCL that is in non-conformance with the CQA Plan and technical specifications with a roll that meets the CQA Plan and technical specifications.
- ii. The Geosynthetic Manufacturer will remove samples for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the failed roll. These two samples must both conform to the CQA Plan and technical specifications. If either of these samples fail, then the next numerical roll will be tested until a passing roll is found. This additional testing will be at the expense of the Geosynthetic Manufacturer. If either of the two closest rolls fail, the CQA ENGINEER will dictate the frequency of additional testing. The CQA ENGINEER will document actions taken in conjunction with material control test failures.

C. GCL INSTALLATION

1. HANDLING AND PLACEMENT:

The CQA ENGINEER will monitor and document the installation of the GCL according to the CQA Plan and technical specifications and the manufacturer's installation recommendations.

2. SEAMS AND OVERLAPS:

The CQA ENGINEER will monitor and document the GCL is seamed or overlapped in accordance with CQA Plan and technical specifications.

3. REPAIRS:

The CQA ENGINEER will observe and document the repair of any holes or tears in the GCL, according to the CQA Plan and technical specifications.

4. PLACEMENT OF OVERLYING MATERIAL:

The CQA ENGINEER will monitor and document placement of materials located on top of the GCL in accordance with the project specifications.

D. DEFICIENCIES

The CQA ENGINEER will immediately determine the extent and nature of all defects and deficiencies and report them to the Georgia Power and SCS Project Managers. All defects and deficiencies will be properly documented by the CQA ENGINEER. The Contractor will correct defects and deficiencies to the satisfaction of the CQA ENGINEER. The CQA ENGINEER will observe all retests on repaired defects.

4. PROTECTIVE SOIL COVER FOR CAP (COMPONENT OF LANDFILL FINAL COVER)

A. GENERAL

The CQA ENGINEER will verify that the protective cover is placed in accordance with the approved plans, technical specifications, and this CQA Plan.

B. MATERIAL

1. Soil that meets all of the following requirements will be classified as select soil fill for use in construction of the protective soil cover for the cap.
 - a. Soil will be classified according to the Unified Soil Classification System (USCS) as ML, MH, CH, CL or SC. (ASTM D2487-83). Liquid limit, plasticity index (PI), and percent passing the No. 200 sieve will be considered for proper classification.
 - b. Select soil fill materials will be reasonably free of gypsum, ferrous, and/or calcareous concretions and nodules, refuse roots, or other deleterious substances.
 - c. The soil cover will be uniform, smooth, and substantially free of debris, rock, plant materials, and other foreign material larger than 1" in diameter. The material should contain no sharp edges.
2. The top 6" of soil cover must be capable of supporting growth of vegetative cover. The soils noted in 4.B. 1.a. can be expanded to include SM and SP soils in the top 6" of cover.

C. STOCKPILING AND MATERIAL APPROVAL

1. All material to be used as soil cover will be approved in advance by the CQA ENGINEER. The CQA ENGINEER must verify the soil meets all the material requirements.
2. Verification can be accomplished during excavation and stockpiling or prior to use at existing stockpiles.
3. The CQA ENGINEER will prepare reports of all testing, analysis, and verification.

D. CONSTRUCTION

1. The CQA ENGINEER will provide verification of the following:
 - a. Approved stockpiled material was used to construct the cover.
 - b. The soil cover was constructed in accordance with the approved plans, technical specifications, and this CQA Plan.
 - c. The soil cover thickness has been achieved:
2. The soil protective cover material will be spread and compacted using low ground pressure equipment such as a CAT D6 low ground pressure bulldozer or similar equipment. Material will be spread by pushing up slope and at no time will material be allowed to be pushed down any side slopes of the landfill cap. Cover material thickness will be at least 12" thick at all times during spreading and compaction.

E. SAMPLING AND TESTING

Construction quality assurance testing will meet the minimum requirements as contained in the table below.

Required Protective Cover Soil for Cap			
Item	Test Method	Minimum Frequency	Minimum Criteria
Borrow Source	Grain Size ASTM D422 with Hydrometer	5,000 cy	per CQA Plan and the technical specifications
	Atterberg Limits ASTM D4318	5,000 cy	per CQA Plan and the technical specifications
	Moisture – Density ASTM D698	5,000 cy	per CQA Plan and the technical specifications
	Permeability ASTM D5084	10,000 cy	per CQA Plan and the technical specifications
Construction	Density and Moisture (ASTM D6938, 1556, or 2937)	1 test/20,000 SF of planar cap surface area	per CQA Plan and the technical specifications

5. CERTIFICATION

- A. The CQA ENGINEER will provide certification that the CCR removal and final cover construction have been performed in accordance with the approved permit. Said certification will have the CQA ENGINEER's seal as a professional engineer registered in the State of Georgia.