



BRUCE KING
GOVERNOR

State of New Mexico
ENVIRONMENT DEPARTMENT
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2850

JUDITH M. ESPINOSA
SECRETARY

RON CURRY
DEPUTY SECRETARY

**CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

May 3, 1993

Brigadier General Richard N. Goddard
Base Commander
27 FW/CC
100 South DL Ingram Blvd. Suite 100
Cannon AFB, New Mexico 88103-5214

RE: NOTICE OF DEFICIENCY: CONSTRUCTION QUALITY ASSURANCE PLAN

Dear General Goddard:

On September 22, 1992, the Hazardous and Radioactive Materials Bureau (HRMB) of the New Mexico Environment Department (NMED) approved the closure plan for Cell 3 Landfill 5 with four conditions (see attachment 2). One of the conditions for closure plan approval was NMED acceptance of the contractor's quality control plan. HRMB has reviewed Cannon AFB's Draft plan entitled: Construction Quality Assurance Plan for Landfill #5 Cell #3, which was submitted to meet this condition, and has found it to be deficient as follows. Additional specific deficiencies are listed in Attachment 1.

HRMB provided Cannon AFB with an EPA Technical Guidance Document which presented the elements of an approvable construction quality assurance (CQA) plan to aid in the preparation of the site-specific CQA plan for this project. The objective was that the CQA plan together with the contractor's quality control (CQC) plan would ensure that the landfill cap is constructed to meet or exceed all design criteria, plans, and specifications.

The CQA activities are not presented with sufficient detail for HRMB to make an evaluation regarding their adequacy. As stated in the technical guidance, the CQA plan must include detailed descriptions of all CQA activities to be performed to manage the construction quality

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of the project. CAFB must supply information at a sufficient level of detail for HRMB to know exactly what CQA activities are to be conducted on a daily basis, including all observations, tests, and other evaluations. For example, site-specific inspection data sheets (checklists) for all daily activities performed must be developed and provided as part of the CQA plan. CAFB must also revise the plan such that the CQA activities are specified separately from the CQC activities.

Secondly, the CQA plan must specify how the CQA activities will interface with the CQC plan stipulated in the project specifications (Section 01400). For example, the overall organization with regard to QA/QC document transmittal, evaluation, and final acceptance has not been specified.

Construction of the soil cap may begin once CAFB receives approval of the final CQA plan from HRMB. Bear in mind that the final approved CQA plan is component of the approved closure plan and must be implemented as such. Within 60 days of completion of closure, CAFB must submit a certification, signed by the Commander of CAFB, attesting that Cell 3 of Landfill 5 has been closed in accordance with the approved closure plan. Documentation validating the closure of the unit as required by HWMR-7, Part VI, Section 40 CFR 265.115, must be furnished with the certification of closure. This documentation should be published as a final report with adequate and detailed information for HRMB to verify certification of closure.

If there are any questions regarding this matter, please contact Ms. Stephanie Stoddard of my staff at (505) 827-4308.

Sincerely,



Barbara Hoditschek
Program Manager, RCRA Permits
Hazardous and Radioactive Materials Bureau

Attachments.

xc: Will Moats, NMED/HRMB
Col. Christopher S. Long, CAFB
Mark Wittrock, COE
Thomas Manning, AFCEE
file CAFB 93/RED

May 3, 1993

ATTACHMENT 1

Table of Contents

CAFB must reorganize the contents of the CQA plan to separate CQC from CQA as follows:

Section I: Responsibility and Authority

Section II: Personnel Qualifications

Section III: CQC Inspection Activities

Section IV: CQA Inspection Activities

Section V: CQC Documentation

Section VI: CQA Documentation

List of Appendices

Appendix - A: CQA Organization and Chain of Authorities

Appendix - B: Delete Albuquerque District Quality Assurance Plan and replace with Pioneer Industries Quality Control Plan.

Appendix - D: Becomes new Appendix C

Appendix - F: Delete or Provide.

Section I: Responsibility and Authority

A. Introduction

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A.2. Paragraph 2

"RCRA-characteristic" wastes must be changed to RCRA hazardous wastes. Delete the following: "for approximately six weeks following the landfill disposal restrictions on these wastes that became effective on 1 November 1098." Delete the third paragraph on RCRA groundwater monitoring wells in its entirety.

A.5 Paragraph 1

Change all references to "CQA/QC plan" to simply "CQA plan".

B. Organizations Involved in CQA

To avoid ambiguity, change all references such as "constructing the hazardous waste land disposal facility" to reflect the project more closely i.e. constructing the landfill cap. Similar phrases appear throughout the entire text of the document.

B.4 Paragraph 1

The responsibilities of the CQA Officer are defined. However, the other CQA personnel's responsibilities with respect to this CQA plan as well as the chain of command must be specified.

C. Project Meetings

Provide an explanation for how the requirements of #1 will actually be met and amend this portion accordingly. Minutes of the Preconstruction CQA Meeting, Work Deficiency Meetings, and the Postconstruction CQA Meeting must be forwarded to HRMB. Change the text where necessary to reflect this.

For all meetings, change the plan so that the CQA officer will record minutes of project meetings whenever CQA inspection personnel are not present.

C.3 Problem or Work Deficiency Meetings

First sentence

Change "special meetings may be held..." to "special meetings must be held..."

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Section II Personnel Qualifications

A current resume for William J. McCollam must be added to Appendix D. CAFB must describe his responsibilities with respect to the other Administrative Contract Officer, Karen Durham-Aguilara.

A. CQA Officer Second Paragraph

CAFB must provide an organization chart showing the flow of all documentation to all organizations.

Section III Inspection Activities

Remove References to CQA activities. Document all CQA activities under new Section IV, CQA Inspection Activities. With regard to CQC inspection activities as written in this section, some statements are paraphrased and do not exactly mirror the language in the project specifications. Wherever discrepancies are found project specifications supersede those incorporated in the CQA plan.

Section V. Documentation

Section G and H are missing.

C. Block Evaluation Reports Sentence 1

Please clarify.

Will each definable feature of work constitute a block? CAFB must specify what will constitute a block.

F. Document Control Paragraph 1

CAFB must have NMED approval prior to any revisions made to the approved CQA plan.

F. Document Control Paragraph 3

The text reads, "For CQA documentation, a control scheme will be used to organize and index all CQA documents." CAFB must specify the control scheme to be used.

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I. Storage of Records

CAFB must specify where the facility copies of the construction records and all CQA plan documents will be kept.

Comments to the CQC Plan (to be added to new Section V: CQC Documentation)

Add inspection data sheet forms (checklists) to include the information previously requested as follows or explain how this requirement has been met.

- Document Control Number
- Type of Inspection Activity, Standard Method
- Location or Increment of Inspection/Test (X,Y,Z,)
- Test/Observation Data, Including Calculations
- Instrument Calibration
- Results in Comparison to Project Specifications
- Name of the Inspector(s)
- Date and Time of Test
- Weather Conditions
- Serial Number or other Instrument ID#

Add problem identification and corrective measures report forms (checklists) previously requested as follows or explain how this requirement has been met.

- Document Control Number
- Description of Problem or Deficiency
- Location of Problem (X,Y,Z)
- How and When (Date and Time) problem was Located
- Estimation of How Long Problem Has Existed
- Suggested Corrective Measures
- Documentation of Correction (Include Reference to Relevant Inspection Data Sheets)
- Final Results
- Suggested Method to Prevent Similar Problems
- Signature of CQC Inspector and Concurrence by CQC Officer

ATTACHMENT 2

State of New Mexico
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RETURN RECEIPT REQUESTED

September, 22, 1992

Colonel Christopher S. Long
27 SG/CC
100 S DL Ingram Blvd Suite 200
Cannon Air Force Base, New Mexico 88103-5217

RE: Closure Plan Approval, Cell 3 of Landfill 5
NM7572124454

Dear Colonel Long:

On July 31, 1992, the Hazardous and Radioactive Materials Bureau (HRMB) of the New Mexico Environment Department (NMED) issued public notice for the closure plan for Cell 3, Landfill 5. The Closure Plan consisted of drawings and specifications for the Geocomposite Soil Cap (dated July, 1992) and the Closure Plan portion (pp. 1-38) of the document entitled: "Closure and Post Closure for Landfill Cell No.3 at Cannon Air Force Base Revised Final October 1988 Revised July 1992". The public comment period ended on August 31, 1992, and no comments were received.

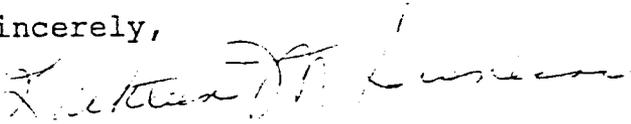
During the public comment period, NMED received an updated version of the specifications and drawings dated August 1992. Several minor changes to the July 1992 submission were made in the updated version. NMED is approving the August 1992 version of the plans and specifications with 4 conditions (see attached). However, after extensive discussion regarding the appropriateness of applying the cap to Cell 3 at this time, NMED extends to CAFB the option to defer placement of the cap and include Cell 3 in the investigations of Landfill 5 pursuant to CAFB's HSWA Permit.

In addition, issuance of the post-closure care permit will be deferred until characterization of Landfill 5 is completed. CAFB may therefore disregard the Notice of Deficiency issued after technical review of the post-closure care permit application (dated 9/02/92). CAFB will be required to continue groundwater monitoring under EWMR-6, Part VI, Section 40 CFR 265.90 and all other interim status requirements for Cell 3 of Landfill 5.

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9/22/92
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If there are any questions regarding this matter, please contact Mr. Benito Garcia at (505) 827-4358.

Sincerely,



Kathleen M. Sisneros, Director
Water and Waste Management Division

xc: William K. Honker, U.S. EPA Region 6
Barbara Hoditschek, HRMB
William Moats, HRMB
Steve Alexander, HRMB
David Morgan, NMED
Thomas Manning, AFCEE

CAFB
Closure Plan Approval
9/22/92

ATTACHMENT

1. Notification of Construction Schedule

Cannon Air Force Base (CAFB) shall provide HRMB with copies of all contractor-prepared Construction Progress Charts required under Section 01310 of the Specifications.

CAFB shall notify HRMB in writing at least 5 days prior to the installation of the gas vent system and to the placement of the geocomposite membrane liner system in order to afford State personnel the opportunity to witness site preparation and system placement.

2. Submission of Contractor Quality Control Plan

CAFB must submit the contractor's quality control plan pursuant to Section 01400 of the specifications for HRMB review and acceptance prior to the start of construction.

3. Availability of the Submittal Register

CAFB must supply HRMB a copy of the initial and final approved Submittal Register pursuant to Section 01300 of the specifications.

4. Specific Design Changes

PVC Vent Pipes: No solvents or adhesives may be used at the joints between sections of pipe. Threaded pipe may be used as an alternative.

ATTACHMENT 2

State of New Mexico

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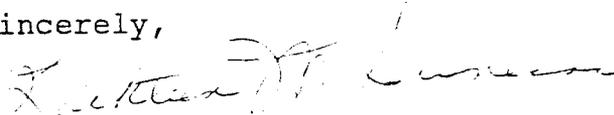
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CAFB
Closure Plan Approval
9/22/92

ATTACHMENT

1. Notification of Construction Schedule

Cannon Air Force Base (CAFB) shall provide HRMB with copies of all contractor-prepared Construction Progress Charts required under Section 01310 of the Specifications.

CAFB shall notify HRMB in writing at least 5 days prior to the installation of the gas vent system and to the placement of the geocomposite membrane liner system in order to afford State personnel the opportunity to witness site preparation and system placement.

2. Submission of Contractor Quality Control Plan

CAFB must submit the contractor's quality control plan pursuant to Section 01400 of the specifications for HRMB review and acceptance prior to the start of construction.

3. Availability of the Submittal Register

CAFB must supply HRMB a copy of the initial and final approved Submittal Register pursuant to Section 01300 of the specifications.

4. Specific Design Changes

PVC Vent Pipes: No solvents or adhesives may be used at the joints between sections of pipe. Threaded pipe may be used as an alternative.

A H m

**REQUIREMENTS FOR CANNON AIR FORCE BASE CONSTRUCTION QUALITY
ASSURANCE (CQA) PLAN**
March 1993

I. Responsibility and Authority

A. Introduction

1. Location of Project
2. Brief History of Landfill
3. Brief Description of Landfill
4. Brief Description of Project
5. Objective of CQA Plan

B. Organizations Involved in CQA

1. Responsibilities and Line Authorities of Organizations, and Key Personnel (by Title)
 - a. Permitting Agency (NMED)
 - b. Facility Owner/Operator (CAFB)
 - c. Design Engineer (US Army Corp of Engineers)
 - d. CQA Personnel (?)
 - e. Construction Contractor ✓(?)

C. Project Meetings *purpose*

1. Preconstruction CQA Meeting (All Organizations)
 - a. Method to Provide CQA Documentation to Each Organization
 - b. Overview of CQA Plan
 - c. Overview of Organization Responsibilities
 - d. Overview of Lines of Authority and Communication Between Organizations
 - e. Discussion of Observations and Tests
 - f. Discussion of Mitigating Identified Deficiencies and Problems
 - g. Recordkeeping Procedures
 - h. Distribution and Storage of CQA Documents
 - i. Security and Health & Safety
 - j. Storage Locations and Procedures for Construction Materials
 - k. Site Tour of Project Area
 1. Determining if Changes Required for CQA Plan. —
2. Daily Progress Meetings (CQA Personnel and Contractor Representative)
 - a. Review Activities and Responsibilities for the Day
 - b. "Tailgate" Health and Safety Meeting
 - c. Discussion of Potential Problems
3. Problem or Work Deficiency Meetings (CQA Personnel and Contractor Representative)
 - a. Define the deficiency
 - b. Identify Solutions
 - c. Implement a Corrective Measures Plan
4. Postconstruction CQA Meeting (All Organizations)
 - a. Overview of Plan Implementation and Success
 - b. Overview of Deficiencies and Corrective Measures Taken

*we want
to attend* →

*note
(All ready
change)*

× II. Personnel Qualifications

A. COA Officer

1. Responsible for Implementation of all Aspects of the CQA Plan.
2. Reports to Facility Owner/Operator
3. Preferably, Should Function Independently of Owner/Operator and especially Design Engineer and Contractor
4. Name of Individual
5. Resume Denoting Relevant Training and Experience

B. COA Inspection Personnel

1. Report to CQA Officer
2. Names and Titles of Individuals
3. Resumes Denoting Relevant Training and Experience

C. Consultants

1. Names and Titles of Individuals
2. Name of Consulting Company
3. Description of Service Provided
4. Documentation of Qualifications

III. Inspection Activities

A. General Preconstruction Activities

1. CQA Officer Review of Drawings and Specifications
2. Preconstruction Training
 - a. Testing Methodologies
 - b. Health and Safety (29CFR 1910.120)
 - c. Review Of Site Investigations and Site Conditions
3. Locate Survey Control Points and Grade Stakes

B. Foundations (Existing Cover and Bedding)

1. Preconstruction
 - a. CQA Review of Drawings and Specifications
 - b. Check if Proposed Bedding Meets Specifications and Determine Maximum Density-Optimum Moisture Relationship (ASTM D 1557 or ASTM D 4253).
 1. Gradation Test (ASTM C 136, ASTM D 422, and ASTM E 11), Bedding Must Be GW, GP, GM, GC, SW, SP, SC, SM, or CL by ASTM D 2487.
 2. Free from organic debris, trash, and frozen materials
 - c. Measure Atterburg Limits of Bedding Material (ASTM D 4318)
 - d. Determine if Type/Weight/Foot of Compacting Equipment Meets Requirements
2. Construction
 - a. Clear and Grub to Remove Organic Matter and Debris
 - b. Observations of Stripping and Excavations, Remove All Unsuitable Material
 - c. Bench Slopes > 4H:1V
 - d. Ensure Surface Properly Wetted (or Dried)
 - e. Tests and Observations to Ensure Quality of Bedding Construction (Must be Certified by Registered Professional Engineer)
 1. Compactor Speeds 5 mph or Less
 2. Number of Passes
 3. Must be compacted to 90% ASTM D 1557 or 95% ASTM D 4253
 4. 8" Loose Lift for Full Width of Fill, > 3" Compacted Lift
 5. Adequate Moisture/Aerating Using Disc
 6. Scarify 2" of Surface Between Lifts
 7. Gradation Tests (ASTM C 136, ASTM D 422, ASTM E 11)
 8. LL and PI (ASTM D 4318)
 9. Soil Classification (ASTM D 2487)
 10. Density (ASTM D 1557 or ASTM D 4253)
 11. Moisture (ASTM D 2216 or ASTM D 4643); When ASTM D 4643 Used, Check Minimum of 1 in 10 Using ASTM D 2216

- 12. Daily Determination of Maximum Laboratory Dry Density and Optimum Moisture Content (ASTM D 1557 or ASTM D 4253)
- 13. Daily Determination of Gradation (ASTM C 136, ASTM D 422, and ASTM E 11)
- 14. Daily Determination of Atterburg Limits (ASTM D 4318)
- 15. Grade Stake and Test Holes Backfilled
- 3. Postconstruction
 - a. Observations of Subgrade Surface
 - 1. Free of Organic Matter and Debris
 - 2. Check Grades and Slopes
 - 3. Smooth Surface
- 4. ~~Test Methods~~ and Sampling Strategies for Each Quality Characteristic Under Evaluation
 - a. Sampling Units or Blocks
 - b. Number of Measurements or Frequency of Testing per Unit or Block
 - 1. Gradation - 1/1000 CY or Minimum 3/d
 - 2. LL and PI - 1/1000 CY or Minimum 3/d
 - 3. Soil Classification - 1/1000 CY or Minimum 3/d
 - 4. Density - 1/10,000 SF/Lift or Fraction thereof
 - 5. Moisture Content - 1/10,000 SF/Lift or Fraction Thereof
 - 6. Daily Percent Maximum Density - 1/d or material change
 - 7. Daily Atterburg Limits - 1/d or material change
 - 8. Daily Gradation - 1/d or material change
 - 9. Visual Observations - Continuous
 - c. Methodology for Selection of Sampling Locations
 - 1. Gradation
 - 2. LL and PI
 - 3. Soil Classification
 - 4. Density
 - 5. Moisture Content
 - 6. Daily Percent Maximum Density
 - 7. Daily Atterburg Limits
 - 8. Daily Gradation
 - 9. Visual Observations- Sitewide
 - d. Treatment of Outliers
 - 1. Gradation
 - 2. LL and PI
 - 3. Soil Classification
 - 4. Density
 - 5. Moisture Content
 - 6. Daily Percent Maximum Density
 - 7. Daily Atterburg Limits
 - 8. Daily Gradation

- e. Acceptance/Rejection Criteria
 - 1. Gradation
 - 2. LL and PI
 - 3. Soil Classification
 - 4. Density - Only Passing Tests Accepted
 - 5. Moisture Content
 - 6. Visual Observations
- f. Corrective Measures (Delineate Failed area and Standard Corrective Procedures)
 - 1. Extent of Failed Area Determined by Testing
 - 2. Failures Repaired and Testing Repeated
 - 3. Need a Minimum of Two Passing Tests to Verify Compliance of Failed Density or Moisture Test
 - 4. Standard Corrective Procedures for Failed:
 - A. Gradation Test
 - B. LL and PI Tests
 - C. Soil Classification Test
 - D. Density Tests
 - E. Moisture Content Tests
 - F. Visual Observations
- g. Control Charts

C. 6" Sand/Gas Vent Layer

1. Preconstruction

- a. CQA Review of Drawings and Specifications
- b. Check if Proposed Material Meets Specifications and Determine Maximum Density-Optimum Moisture Relationship (ASTM D 4253). Aggregate Samples Taken Following ASTM D 75
 - 1. Classify by ASTM D 2487. Must Meet Gradation Under 1.3.1.1, Section 02224.
 - 2. Free from organic debris, trash, and frozen materials
 - 3. Tough Durable Particles
 - 4. Limestone and Caliche Not Acceptable
- c. Determine if Compacting Equipment Meets Requirements (> 10 ton Vibratory Steel-Wheel Roller)

2. Construction

- a. Tests and Observations to Ensure Quality of Construction (Observations and Test Results Must Be Certified by Registered Professional Engineer)
 - 1. Must be compacted to 95% ASTM D 4253
 - 2. 8" Loose Lift for Full Width of Fill, > 3" Compacted
 - 3. Moisture at Optimum or Greater (ASTM D 2216 or ASTM D 4643. When ASTM D 4643 Used, Check Minim of 1 in 10 Using ASTM D 2216)
 - 4. Gradation Tests (ASTM C 136, ASTM D 422, ASTM E 11)
 - 5. Density Tests (ASTM 4253)
 - 6. Soil Classification (ASTM D 2487)
 - 7. Daily Determination of Maximum laboratory Dry Density and Optimum Moisture (ASTM D 4253)
 - 8. Daily Determination of Gradation (ASTM D 136, ASTM D 422, and ASTM E 11)
- b. Grade Stake and Test Holes Backfilled

3. Postconstruction

- a. Observations of Finished Surface
 - 1. Thickness within +/- 1/2"
 - 2. Check Grades and Slopes
 - 3. Smooth, Uniform Surface within +/- 3/8" Using 12' Straightedge

4. Test Methods and Sampling Strategies for Each Quality Characteristic Under Evaluation

- a. Sampling Units or Blocks
- b. Number of Measurements or Frequency of Testing per Unit or Block
 - 1. Gradation - 1/1000 CY or Minimum 3/d
 - 2. Soil Classification - 1/1000 CY or Minimum 3/d
 - 3. Density - 1/10,000 SF/Lift or Fraction thereof

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 [Signature]

4. Moisture Content - 1/10,000 SF/Lift or Fraction Thereof
5. Daily Percent Maximum Density - 1/d
6. Daily Gradation - 1/d
7. Visual Observations - Continuous
- c. Methodology for Selection of Sampling Locations
 1. Gradation
 2. Soil Classification
 3. Density
 4. Moisture Content
 5. Daily Percent Maximum Density
 6. Daily Gradation
 7. Visual Observations- Sitewide
- d. Treatment of Outliers
 1. Gradation
 2. Soil Classification
 3. Density
 4. Moisture Content
 5. Daily Percent Maximum Density
 6. Daily Gradation
- e. Acceptance/Rejection Criteria
 1. Gradation
 2. Soil Classification
 3. Density - Only Passing Tests Accepted
 4. Moisture Content
 5. Visual Observations
- f. Corrective Measures (Delineate Failed area and Standard Corrective Procedures)
 1. Extent of Failed Area Determined by Testing
 2. Failures Repaired and Testing Repeated
 3. Need a Minimum of Two Passing Tests to Verify Compliance of Failed Density or Moisture Test
 4. Standard Corrective Procedures for Failed:
 - A. Gradation Test
 - B. Soil Classification Test
 - C. Density Tests
 - D. Moisture Content Tests
 - E. Visual Observations
- g. Control Charts

D. Non-Woven Filter Fabric

1. Preconstruction
 - a. Materials - Must Meet Definition of ASTM D 123 and Specifications Under Table 1 of Section 02215
 - b. Finished Edges to Prevent Unraveling
 - c. Sheets Fabricated > 6' Wide
 - d. Mill Certification or Affidavit of Quality
 - e. Shipping & Storage: Wrapped in Protective Covering to Protect From Sun Light, Mud , Dirt. Temperature < 140° F
 - f. Securing Pins: Steel, 3/16" Dia., 18" Long
2. Construction
 - a. Reject if Ripped or Damaged
 - b. Subgrade Smooth From Objects
 - c. Place Wrinkle/Fold Free
 - d. Minimum 12" Overlap
 - e. Protect From Contamination
 - f. Must be Covered Within 7 days
 - g. Check Seams Completed Properly
3. Postconstruction
 - a. Check Surface for Damage
 - b. Test Samples of Seams Using ASTM D 1683
4. Test Methods and Sampling Strategies for Each Quality Characteristic Under Evaluation
 - a. Sampling Units or Blocks
 - b. Number of Measurements or frequency of Testing per Unit or Block
 - c. Methodology for Selection of Sampling Locations
 1. Same Production Lot as Destined For Project
 2. Samples Must be Full Width and at least 10 Ft Long
 3. Seam Samples May be Folded Over and Stitched for at least 5 Ft
 - d. Treatment of Outliers
 - e. Acceptance/Rejection Criteria
 1. Mill Certificate or Affidavit; However, Contracting Officer May Request Samples for any Type of Testing. All Failed Material Will be Rejected or Replaced
 - f. Corrective Measures
 - g. Control Charts

E. 40 Mil HDPE Sheet with Bentonite (GML)

1. Preconstruction
 - a. Materials: Must Meet Specifications Under Paragraph 1.4.1 and 1.4.2 of Section 02245
 - b. GML Manufacture(s) Must Have Product in Service for Minimum of 1 Year and at Least 5,000,000 SF
 - c. Transport and Storage: Store in Packing Crates, Protect From Sunlight
 - d. Mill Certification of Quality
 - e. Certified Copies of Test Results for Bentonite
 - d. Foundation Inspection
2. Construction
 - a. Authorized Representative of GML Manufacturer Certification that Subgrade is Acceptable
 - b. Manufacturer' Representative to Supervise Installation
 - c. Anchors (Locations, Meets Design Cross-Section)
 - d. Vent Pipe Seats Properly Sealed
 - e. Weather Restrictions Observed (> 45°F, no Rain, Snow, or Bad Weather)
 - f. Inspect for Damage as Unrolled, Repair if Damaged
 - g. Followed Installation Plan
 - h. Bentonite Face Down (or Blanket Underneath)
 - i. Joints Overlapped by 1 Ft Minimum
 - j. Joints Taped →
 - k. No Wrinkles/Folds, Signs of Stress
3. Postconstruction
 - a. Check for Damage
 - b. Ensure all Joints Taped
 - c. Survey
4. Test Methods and Sampling Strategies for Each Quality Characteristic Under Evaluation
 - a. Sampling Units or Blocks
 - b. Number of Measurements or frequency of Testing per Unit or Block
 - A. Lab Material Test
 - B. Lab Seam Test
 - C. Field Tests
 - c. Methodology for Selection of Sampling Locations
 - d. Treatment of Outliers
 - e. Acceptance/Rejection Criteria
 1. Mill Certificate or Affidavit; However, Contracting Officer May Request Samples for Testing. All Failed Material Will be Rejected or Replaced
 - f. Corrective Measures
 - g. Control Charts

F. 6" Lateral Drainage Layer (?)

1. Preconstruction
 - a. CQA Review of Drawings and Specifications
 - b. Check if Proposed Material Meets Specifications and Determine Maximum Density-Optimum Moisture Relationship (ASTM D 4253). Aggregate Samples taken Following ASTM D 4253)
 1. Classify by ASTM D 2487. Must Meet Gradation Under 1.3.1.1, Section 02224.
 2. Free from organic debris, trash, and frozen materials
 3. Tough Durable Particles
 4. Limestone and Caliche Not Acceptable
 - c. Determine if Compacting Equipment Meets Requirements (> 10 ton Vibratory Steel-Wheel Roller)
2. Construction
 - a. Tests and Observations to Ensure Quality of Construction (Observations and Test Results Must Be Certified by Registered Professional Engineer)
 1. Must be compacted to 95% ASTM D 4253
 2. 8" Loose Lift for Full Width of Fill, > 3" Compacted
 3. Moisture at Optimum or Greater (ASTM D 2216 or ASTM D 4643. When ASTM D 4643 Used, Check Minimum of 1 in 10 Using ASTM D 2216)
 4. Gradation Tests (ASTM D 422, ASTM C 136, ASTM E 11)
 5. Density Tests (ASTM D 4253)
 6. Soil Classification (ASTM D 2487)
 7. Daily Determination of Maximum Laboratory Dry Density and Optimum Moisture (ASTM D 4253)
 8. Daily Determination of Gradation (ASTM D 422, ASTM C 136, and ASTM E 11)
 - b. Grade Stake and Test Holes Backfilled
3. Postconstruction
 - a. Observations of Finished Surface
 1. Thickness within +/- 1/2"
 2. Check Grades and Slopes
 3. Smooth, Uniform Surface within +/- 3/8"
4. Test Methods and Sampling Strategies for Each Quality Characteristic Under Evaluation
 - a. Sampling Units or Blocks
 - b. Number of Measurements or Frequency of Testing per Unit or Block
 1. Gradation - 1/1000 CY or Minimum 3/d
 2. Soil Classification - 1/1000 CY or Minimum 3/d
 3. Density - 1/10,000 SF/Lift or Fraction thereof

4. Moisture Content - 1/10,000 SF/Lift or Fraction Thereof
 5. Daily Percent Maximum Density - 1/d
 6. Daily Gradation - 1/d
 7. Visual Observations - Continuous
- c. Methodology for Selection of Sampling Locations
1. Gradation
 2. Soil Classification
 3. Density
 4. Moisture Content
 5. Daily Percent Maximum Density
 6. Daily Gradation
 7. Visual Observations- Sitewide
- d. Treatment of Outliers
1. Gradation
 2. Soil Classification
 3. Density
 4. Moisture Content
 5. Daily Percent Maximum Density
 6. Daily Gradation
- e. Acceptance/Rejection Criteria
1. Gradation
 2. Soil Classification
 3. Density - Only Passing Tests Accepted
 4. Moisture Content
 5. Visual Observations
- f. Corrective Measures (Delineate Failed area and Standard Corrective Procedures)
1. Extent of Failed Area Determined by Testing
 2. Failures Repaired and Testing Repeated
 3. Need a Minimum of Two Passing Tests to Verify Compliance of Failed Density or Moisture Test
 4. Standard Corrective Procedures for Failed:
 - A. Gradation Test
 - B. Soil Classification Test
 - C. Density Tests
 - D. Moisture Content Tests
 - E. Visual Observations
- g. Control Charts

G. 24" Compacted Cover Material

1. Preconstruction

- a. CQA Review of Drawings and Specifications
- b. Check if Proposed Cover Material Meets Specifications and Determine Maximum Density-Optimum Moisture Relationship (ASTM D 1557 or ASTM D 4253).
 - 1. Material Must Meet: Fines (- #200) > 30%, PI > 15%, Course (+ #4) < 10%, No Particles > 1" by ASTM D 422, ASTM C 136, and ASTM E 11
 - 2. Free from organic debris, trash, and frozen materials
- c. Measure Atterburg Limits (ASTM D 4318)
- d. Determine if Type/Weight/Foot of Compacting Equipment Meets Requirements

2. Construction

- a. No Equipment Operating Directly On GML
- b. First Lift Over GML Must Be Compacted with Rubber Tire or Steel Wheel Rollers Only
- c. Tests and Observations to Ensure Quality of Construction (Must be Certified by Registered Professional Engineer)
 - 1. Compactor Speeds 5 mph or Less
 - 2. Number of Passes
 - 3. Must be compacted to 90% ASTM D 1557
 - 4. 8" Loose Lift for Full Width of Fill, > 3" Compacted Lift
 - 5. Adequate Moisture/Aerating Using Disc
 - 6. Scarify 2" of Surface Between Lifts
 - 7. Gradation Tests (ASTM C 136, ASTM D 422, and ASTM E 11)
 - 8. LL and PI (ASTM D 4318)
 - 9. Soil Classification (ASTM D 2487)
 - 10. Density (ASTM D 1557)
 - 11. Moisture (ASTM D 2216 or ASTM D 4643);
When Using ASTM D 4643, Check Minimum of 1 in 10 Using ASTM D 2216
 - 12. Daily Determination of Maximum Laboratory Dry density and Optimum Moisture Content (ASTM D 1557)
 - 13. Daily Determination of Gradation (ASTM C 136, ASTM D 422, and ASTM E 11)
 - 14. Daily Determination of Atterburg Limits (ASTM D 4318)
 - 15. Grade Stakes and Test Holes Backfilled

3. Postconstruction

- a. Observations of Subgrade Surface
 - 1. Check Grades and Slopes
- 4. Test Methods and Sampling Strategies for Each Quality Characteristic Under Evaluation
 - a. Sampling Units or Blocks

- b. Number of Measurements or Frequency of Testing per Unit or Block
 - 1. Gradation - 1/1000 CY or Minimum 3/d
 - 2. LL and PI - 1/1000 CY or Minimum 3/d
 - 3. Soil Classification - 1/1000 CY or Minimum 3/d
 - 4. Density - 1/10,000 SF/Lift or Fraction thereof
 - 5. Moisture Content - 1/10,000 SF/Lift or Fraction Thereof
 - 6. Daily Percent Maximum Density - 1/d or material change
 - 7. Daily Atterburg Limits - 1/d or material change
 - 8. Daily Gradation - 1/d or material change
 - 9. Visual Observations - Continuous
- c. Methodology for Selection of Sampling Locations
 - 1. Gradation
 - 2. LL and PI
 - 3. Soil Classification
 - 4. Density
 - 5. Moisture Content
 - 6. Daily Percent Maximum Density
 - 7. Daily Atterburg Limits
 - 8. Daily Gradation
 - 9. Visual Observations- Sitewide
- d. Treatment of Outliers
 - 1. Gradation
 - 2. LL and PI
 - 3. Soil Classification
 - 4. Density
 - 5. Moisture Content
 - 6. Daily Percent Maximum Density
 - 7. Daily Atterburg Limits
 - 8. Daily Gradation
- e. Acceptance/Rejection Criteria
 - 1. Gradation
 - 2. LL and PI
 - 3. Soil Classification
 - 4. Density - Only Passing Tests Accepted
 - 5. Moisture Content
 - 6. Visual Observations
- f. Corrective Measures (Delineate Failed area and Standard Corrective Procedures)
 - 1. Extent of Failed Area Determined by Testing
 - 2. Failures Repaired and Testing Repeated
 - 3. Need a Minimum of Two Passing Tests to Verify Compliance of Failed Density or Moisture Test
 - 4. Standard Corrective Procedures for Failed:
 - A. Gradation Test
 - B. LL and PI Tests

- C. Soil Classification Test
- D. Density Tests
- E. Moisture Content Tests
- F. Visual Observations
- g. Control Charts

H. Topsoil

- 1. Preconstruction
 - a. Determine if Meets Specifications (Natural Friable Surface Soil Representative of Those Found in Area, Can Support Vegetation)
- 2. Construction
 - a. Scarify Upper 2" of Cover Prior to Topsoil Placement
 - b. Spread 8" Loose Thickness and Grade
 - c. Compact with One Pass of Dozer Track
- 3. Postconstruction
 - a. Check if Surface Smooth and Graded Within +/- 0.15 Ft

V. Documentation

A. Daily Recordkeeping

1. Daily Summary Report
 - a. Document Control Number
 - b. Date, Project Name, Location
 - c. Weather Conditions
 - d. Meeting Reports
 - e. Construction Activities for the Day
 - f. Equipment and Personnel
 - g. Inspected Areas or Units
 - h. Offsite Materials Received, Including any Quality Certification Documentation
 - i. Instrument Calibration Records
 - j. Decisions regarding Approval of Units
 - k. Inspection Data Sheets
 - l. Corrective Measures Reports
 - m. Signature of CQA Officer

B. Inspection Data Sheets

1. Best to Standardize for Type of Testing
2. Document Control Number
3. Type of Inspection Activity, Standard Method
4. Location or Increment of Inspection/Test (X, Y, Z)
5. Test/Observation Data, Including Calculations
6. Instrument Calibration
7. Results in Comparison to Project Specifications
8. Name of Inspector(s)
9. Signature of Inspector(s)
10. Date and Time of Test
11. Weather Conditions
12. Serial Number or other Instrument ID#

C. Problem Identification and Corrective Measures Reports

1. Document Control Number
2. Description of Problem or Deficiency
3. Location of Problem (X, Y, Z)
4. Probable Cause
5. How and When (Date & Time) Problem was Located
6. Estimation of How Long Problem Has Existed
7. Suggested Corrective Measure
8. Documentation of Correction (Include Reference to Relevant Inspection Data Sheets)
9. Final Results
10. Suggested Method to Prevent Similar Problems
11. Signature of CQA Inspector and Concurrence by CQA Officer

D. Photographs

1. Document Control Number
2. Date, Time, Location, Direction
3. Scale
4. Description
5. Purpose
6. Signature of Photographer

E. Block Evaluation Reports

1. Document control Number
2. Description of Block
3. Quality Characteristics Being Evaluated
4. Sampling Requirements
5. Sample Locations
6. Inspections Performed
7. Summary of Inspection Results (Averages and Standard Deviations for Each Quality Characteristic)
8. Define Acceptance Criteria and Identify if Block is in Compliance with all Project Specifications
9. Signature of CQA Officer

F. Review by COA Officer

1. Daily Summary Reports
2. Inspection Data Sheets
3. Problem Identification and Corrective Measures Reports
4. Photographs
5. Block Evaluation Reports

G. Final Documentation Report, Including As-Built Drawings (To be Submitted to the NMED and the Owner/Operator)

H. Document Control Indexing Procedure (NMAC)

List every inspection report

I. Storage of Records

Final Doc report - To include everything certification that all QC procedures were followed in accordance w/plan