Construction Report

Tailings Cell 4A

White Mesa Uranium Mill - Tailings Management System

International Uranium (USA) Corporation
Independence Plaza
Suite 950
1050 Seventeenth Street
Denver, Colorado 80265

August 2000

Central file

HAROLD R. ROBERTS, P.E.

4051 South Holly Street • Englewood, Colorado 80111 • (303) 756-2440

September 7, 2000

Mr. Ronald F. Hochstein
President and Chief Executive Officer
International Uranium (USA) Corporation
1050 Seventeenth Street
Suite 950
Denver, Colorado 80265

Dear Ron:

Enclosed are four (4) copies of the Cell 4A Construction Report. This Report was compiled from my own historical knowledge and records of the construction activities, as well data available at the White Mesa Mill offices and the central files in the Denver office of IUC. I have also enclosed computer disks containing representative photographs of the construction activities and the text of the Construction Report.

If you need any additional information, please feel free to contact me.

Very truly yours,

Harold R. Roberts, P. E.

/hrr

Enclosure

Table of Contents

	Page
List of Figures	i
List of Attachments	ii
Construction Report	
1.0 Introduction and Summary	1
2.0 Design	2
3.0 Quality Plan	4
4.0 Regulatory Approvals	5
5.0 Construction Activities	6
5.1 Topsoil Removal	7
5.2 Soil Excavation	7
5.3 Dike Construction	7
5.4 Rock Excavation	8
5.5 Plugging of Existing Monitor Wells	9
5.6 Clay Liner	9
5.7 Leak Detection System	9
5.8 Synthetic Liner	10
5.9 Slimes Drain	10
6.0 Design Modifications and Changes	11
7.0 Reporting	12
8.0 Supporting Documentation	13

- Figures
- Attachments
- Construction Photos

List of Figures

Figure 1 Cell 4A Layout and Coordinates

Figure 2 Cell 4A As-Built Contours

List of Attachments

Attachment A	NRC License Amendment No. 20 - Authorization to Construct and Operate Cell 4A
Attachment B	Authorizations to Construct Cell 4A - State of Utah
Attachment C	Form F-1 Construction Activities Report
Attachment D	Compliance Report
Attachment E	Form F-3 Fill Observation and Testing
Attachment F	Form F-4 Soil Sampling Log
Attachment G	Abandonment of Monitor Well # 13
Attachment H	Clay Liner - Moisture Content Verification
Attachment I	Leak Detection System - Piping Detail
Attachment J	Design and Field Change Orders
Attachment K	Regulatory Submittals
Attachment L	Table of Contents - Data Books (1 through 4)

Section 1.0 Introduction and Summary

This Report provides a summary of the Cell 4A construction activities undertaken by Umetco Minerals Corporation at the White Mesa Uranium Mill. The White Mesa Uranium Mill is located approximately 6 miles south of Blanding, Utah.

The design of Cell 4A is detailed in documents prepared in August 1988 by Umetco Minerals, the operator of the Mill at the time of construction. The Cell was designed to be in compliance with current U. S. Nuclear Regulatory Commission requirements, as well as 40 CFR Part 61, and was approved by both the U. S. Nuclear Regulatory Commission and State of Utah regulatory agencies within the areas of their specific jurisdiction.

Cell 4A was designed to have a capacity of approximately 1150 acre-feet of storage volume with a final surface area of 40 acres. The Cell was designed as a below-grade repository similar to the previous cells in the Tailings Management System.

U. S. Nuclear Regulatory Commission approval for construction and operation of Cell 4A was received on March 1, 1990. Construction of the Cell actually began on May 9, 1989 following submittal of the design documents on February 8, 1989. Construction of the Cell was essentially complete on November 30, 1989.

Construction activities consisted of excavation of the interior portion of the Cell, with suitable materials from the excavation used for construction of the dikes which makeup the containment along the west, south and southeast sides of the Cell. The interior Cell bottom was lined with a one (1.0) foot thick layer of compacted clay. A system of gravel filled trenches within the clay liner, holding a perforated pipe, provides a leak detection system for the Cell. The entire enclosed area of the Cell was lined with a synthetic liner to provide a double lining system.

Monitor Well 13, installed after the earlier completion of Cell 3, was located within the Cell 4A area and was abandoned and plugged as a part of the construction activities.

In order to facilitate dewatering of tailings sand deposited in Cell 4A, a slimes drain system consisting of perforated pipes covered with a sand filter was installed in the south west corner of the Cell.

In general, Cell 4A was constructed in accordance with the design plans and specification except as changes are detailed in the body of this report.

Harold R. Roberts, P.E.
Utah Registered Professional Engineer
No. 165838

Section 2.0 Design

Umetco Minerals Corporation prepared the design documents and Plans and Specifications for Cell 4A, with assistance from Western Engineers, Inc., Grand Junction, Colorado. The design was completed in August of 1988. The Cell was designed to be in compliance with current U. S. Nuclear Regulatory Commission requirements as well as 40 CFR Part 61, and was approved by both Federal and State of Utah regulatory agencies within the areas of their specific jurisdiction.

After the construction of the first three cells at the White Mesa site, regulations enacted by the U.S. Environmental Protection Agency limited the size of newly constructed uranium tailings storage facilities to no more than 40 acres. Cell 4 was originally projected to be approximately 62 acres in size, but was reconfigured and split into 2 cells, each 40 acres, in order to comply with the new regulations.

The following references were used in the design of Cell 4A:

Chen and Associates, Inc., 1978. Soil Property Study, Earth Lined Tailings Retention Cells, White Mesa Uranium Project, Blanding, Utah.

Chen and Associates, Inc., 1979. Soil Property Study, Proposed Tailings Retention Cells, White Mesa Uranium Project, Blanding, Utah.

Dames and Moore, 1978a. Site Selection and Design Study - Tailing Retention and Mill Facilities, White Mesa Uranium Project, January 17, 1978.

Dames and Moore, 1978b. Environmental Report, White Mesa Uranium Project, San Juan County, Utah, January 20, 1978, revised May 15, 1978.

D'Appolonia Consulting Engineers, Inc., 1979. Engineers Report, Tailings Management System, White Mesa Uranium Project, Blanding, Utah.

D'Appolonia Consulting Engineers, Inc., 1981. Engineer's Report, Second Phase Design - Cell 3 Tailings Management System, White Mesa Uranium Project, Blanding, Utah.

NUREG/CR-4403, November, 1965. Summary of the Waste Management Programs at Uranium Recovery Facilities as They Relate to the 40 CFR Part 192 Standards.

U. S. Nuclear Regulatory Commission, 1977. Regulatory Guide 3.11, Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills, Revision 2, 1977.

U. S. Nuclear Regulatory Commission, 1979. Final Environmental Statement - White Mesa Uranium Project, NUREG-0556.

U. S. Nuclear Regulatory Commission, 1985. Standard Review Plan for. UMTRA Title I Mill Tailings - Remedial Action Plans, Division of Waste Management.

Title 10, Code of Federal Regulations, Part 40, Appendix A.

Environmental Protection Agency, 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants; Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings.

3.0 Quality Plan

The Quality Plan for construction of Cell 4A was developed as a part of the Cell 4A Design and submitted to regulatory agencies for approval. The Plan is detailed in Attachment II to the Cell 4A Design, August 1988. The Quality Plan details the specific inspection, monitoring, and documentation activities that must take place in order to verify that all phases of the Cell construction are completed according to the Plans and Specifications. The Quality Plan had the following objectives:

1) Quality Control: Quality Control (QC) verifies that the construction is in accordance with the Plans and Specifications.

2) Quality Assurance: Quality Assurance provides the cross-checks and auditing function for Quality Control.

3) Monitoring: Monitoring provides the required information and data to evaluate the effects of Construction Activities.

The Quality Plan detailed specific frequencies for observations and inspections of all phases of the work, and provided forms for fulfilling the requirements. Examples of the completed forms are included in the Attachments to this Report, with a full set of the QA/QC documentation on file at the White Mesa Mill office (see section 8.0 below).

4.0 Regulatory Approvals

The Cell 4A Design was first submitted to the U.S. Nuclear Regulatory Commission on February 8, 1989 in the form of an amendment request to Source Materials License No. SUA-1358. It was followed by submittal of supporting information and clarifications on February 24, April 10, May 12, August 23, September 6 and 29, November 8, 1989, and January 10, 1990.

A copy of License Amendment No. 20 is included as Attachment A to this Report, which authorized Umetco Minerals Corporation to construct and operate Cell 4A.

Approval to construct was also received from the State of Utah Department of Natural Resources, Division of Water Rights - Dam Safety, and the State of Utah Department of Health, Division of Environmental Health. Copies of correspondence from these two State agencies is included as Attachment B to this Report.

5.0 Construction Activities

In general, the construction of Cell 4A was performed according to the Plans and Specifications as set forth in the Cell 4A Design prepared by Umetco Minerals Corporation, August 1988. Variations from the design are described herein and drawings of the revised conditions, where appropriate, are included in the Attachments. Figure 1, included with this Report, details the as-built layout and coordinates of Cell 4A.

Construction of Cell 4A began May 9, 1989 and was completed by November 30, 1989. Major elements of the construction described herein include:

- Topsoil removal
- Soil excavation
- Dike Construction
- Rock excavation
- Plugging of existing monitor wells
- Clay Liner and Leak Detection System
- Liner installation
- Installation of Slimes Drain System

The majority of the construction work was contracted to Landmark Reclamation, Inc., Denver, Colorado. Monitoring of the construction operations was performed by authorized and qualified personnel employed by, or subcontracted to, Umetco Minerals Corporation. These personnel observed the Cell construction during all phases of the project and managed the activities for Quality Control/Quality Assurance (QA/QC) according to the approved Plans and Specifications.

The following equipment was utilized in the construction of Cell 4A:

1 - Caterpillar 633 Scraper
2 - Caterpillar 637 Scraper
1 - Caterpillar 633 Water Wagon
1 - Caterpillar 631D Water Wagon
1 - Caterpillar 14G Motor Patrol
1 - Caterpillar 988B Front End Loader
3 - Caterpillar 769 Truck
1 - Caterpillar 815B Compactor
1 - Raygo 65 Compactor
1 - Caterpillar CS553 Smooth Drum Roller
1 - Caterpillar CS323 Smooth Drum Roller
1 - Fiat Allis HD-31 Dozer
1 - Caterpillar D8K Dozer
4 - Portable Light Plants
1 - Portable Soils Laboratory

The majority of the earthwork functions for the project took place on a 2 shift per day basis. QA/QC personnel were on-site during all construction activities and completed the necessary reports documenting the work. Attachment C to this report includes selected copies of Form F-1, Construction Activities Report, which details the daily work activities, including weather conditions, equipment utilized and general observations and description of the work. This Form was completed for each working shift through the duration of the project.

5.1 Topsoil Removal

Removal of the topsoil in the Cell 4A area was performed by excavating to a depth of approximately 8 inches below the ground surface. One 633 and two 637 Caterpillar scrapers were utilized to excavate the topsoil and place it in areas to the east of the Cell designated as topsoil storage. Signs were placed on the completed topsoil stockpiles for later identification and use during the reclamation process. Project photos attached to this report show the beginning of topsoil removal from the Cell area. The estimated design quantity for topsoil removal was 39,340 cubic yards. Final quantities indicate approximately 41,920 cubic yards of topsoil was stockpiled for later use.

5.2 Soil Excavation

Soil, other than topsoil, from within the Cell area was utilized as fill for dike construction or stockpiled for later use. The estimated design quantity for soil excavation was 584,660 cubic yards. Approximately 292,100 cubic yards of soil was used in the construction of Cell 4A Dike. The remainder of the soil excavated from Cell 4A was utilized for interim cover on Cell 2, or was stockpiled in areas to the east of the Cell 4A tailings pond.

5.3 Dike Construction

The Cell 4A dikes are engineered fills, utilizing selected soils available on the site, compacted to 95% of the maximum Standard Proctor Dry Density (ASTM D-698). On-site soils were originally investigated by Dames & Moore, 1978, and later by D'Appolonia, 1981. Numerous test pits were excavated as well as extensive auger drilling in the earlier Dames & Moore work. Based on this work, the cell dikes were designed utilizing the known characteristics and classification of the on-site soils. Details on the dike design are included in the Cell 4A Design report.

During construction of previous dikes on the White Mesa site, several areas of calcareous soils were discovered, which were removed and replaced with more suitable soils. Small areas of calcareous soils were noted under the Cell 4A dike area following removal of topsoil, and these areas were excavated prior to placement of fill material.

After topsoil removal and prior to dike construction, the majority of the area within the Cell 4A area was sprinkled with fresh water for several days to raise the overall moisture content of the soils prior

to final conditioning and placement in the dike fill. Without this pre-wetting effort, the construction time for the dike would have been unacceptably slow due to the need to raise the moisture content in the soils from the inplace moisture of approximately 4%, to the required 14-15%.

Prior to placing fill material, the footprint of the Cell dike was inspected and approved by the QA/QC personnel to ensure the foundation was adequate and in compliance with the Plans and Specifications. The area was inspected for removal of vegetative (organic) matter, and to verify that areas needing additional compaction, prior to the placement of fill material, had been adequately "proof-rolled". Attachment D to this Report contains copies of the Compliance Reports for the Dike foundation.

QA/QC personnel measured the inplace density and moisture content as the fill material was being placed, utilizing the compaction curves and optimum moisture content developed from regular on-site sampling. Areas not passing the initial testing were re-worked and tested again until the specifications were met. Form F-3, Fill Observation and Testing, was completed by QA/QC personnel, at, or greater than, the frequency specified in the Plans and Specifications. Selected copies of these reports are included as Attachment E to this Report. Form F-4, Soils Sampling Log, provides the characterization of the soils and the compaction curves from the routine field and laboratory testing. Selected copies of these reports are included as Attachment F to this Report.

Figure 2, included with this Report, show the final as-built contours of the Cell 4A dikes. Project photos attached to this report show various phases of dike construction.

5.4 Rock Excavation

Excavation of rock began upon completion of soil excavation. The rock consisted primarily of sandstone with localized pockets of weathered claystone. The estimated design quantity for rock excavation was 280,000 cubic yards. Excavation was performed by ripping the surface of the rock in successive stages with rippers attached to a Fiat-Allis HD-31 dozer, or by selectively drilling and blasting. The rock was then removed with Caterpillar 769 haul trucks and a Caterpillar 988 front-end loader. The rock encountered in Cell 4A was very similar to the material that was excavated from the previous cells. In order to meet the final design contours it was necessary to drill and blast a portion of the rock material in order to remove the "hard caps" that were encountered. As experienced in the previous construction, the size of the rock removed from the Cell varied from approximately 36 inches to coarse sand size. The final Cell contours, after completion of excavation, were at or below the contours specified in the design documents. Any areas of the Cell bottom which were over excavated from the design contours were backfilled to the design grade by use of clay material similar to that specified for the clay liner. All of the rock material was placed in the random fill stockpile area, to the east of the Cell, for later use in reclamation of the tailings cells, or was utilized for interim cover on Cell 2. Project photos attached to this report show various phases of rock excavation from the Cell area. Approximately 161,000 cubic yards of soil and rock was utilized as interim cover for Cell 2 during the Cell 4A construction activities.

5.5 Plugging of Existing Monitoring Wells

Monitor Well 13, installed after the earlier completion of Cell 3, was located within the Cell 4A area and was abandoned and plugged as a part of the construction activities. During the excavation of soil and rock, the well casing was preserved in order to prevent any foreign material from entering the well and jeopardizing the integrity of the plugging operations. After soil and rock excavation in the area of the well had reached a point close to the final design contours the well casing was removed by drilling the casing out of the hole utilizing a tri-cone bit slightly larger than the casing. A concrete grout mixture was then prepared and pumped down the open monitor well hole through the drill steel pipe, until the entire length of the hole was filled. Details of the well abandonment procedures are included as Appendix G to this Report

5.6 Clay Liner

A 12 inch thick layer of native clay was placed in the bottom of Cell 4A to act as a secondary liner for prevention of seepage of tailings solution into the underlying rock formations. The clay material was obtained from within the cell excavation area, located in thin lenses close to the soil/rock interface. Material which could not be cleanly excavated, that is with no rock or soil contamination, was placed in the random fill stockpile for later use. Project photos attached to this report show various phases of the clay liner installation. A total of 97,320 cubic yard of clay material was identified, with 52,820 cubic yards utilized in the clay liner, and the remainder stockpiled for later use.

The clay material utilized as liner material was tested according to the design specifications for gradation, Atterberg limits and Proctor compaction curves (ASTM D-698). Examples of the test results are included as Appendix E to this report. In addition to requirements for final dry density of the inplace material, the clay liner moisture content must be within -1% to +3% of optimum just prior to placement of the synthetic liner material. Verification of this was accomplished through daily notification by the contractor of areas to be covered with liner and final testing and acceptance by QA/QC personnel. Documentation of the approval is included as Attachment H to this report

5.7 Leak Detection System

The installation of the leak detection system used for detection and collection of leakage between the synthetic liner and the clay liner consisted of 5,600 feet of four (4) inch diameter PVC slotted pipe, installed in a V-shaped channel cut approximately 8 - 10 inches into the clay liner. The channel was lined with 30 mil PVC, and the slotted pipe was placed in the bottom of the V and backfilled with course gravel up to the top of the clay base. The 4 inch perforated pipes were connected to a 12 inch diameter high density polyethylene (HDPE) access riser located in a trench in the southwest corner of the Cell. The original design of the leak detection system called for a rectangular section of the clay liner to be removed, lined with HDPE or PVC, and backfilled with gravel surrounding the perforated pipe. The V section was determined to be more efficient from a constructability standpoint, and preserved more of the clay liner as a secondary barrier to fluids.

After the piping connections were complete, the access riser was backfilled with soil material similar to that used in the construction of the cell dike. Project photos attached to this report show various phases of the leak detection system installation. Details are also provided in Attachment I, which shows specifics of the piping connections which were modified from the original approved plans and specifications. All piping installations and connections were made prior to any liner installation.

5.8 Synthetic Liner Installation

A 40 mil thick High Density Polyethylene (HDPE) liner was installed in Cell 4A to act as one of two barriers against seepage of fluids from the Cell into the underlying bedrock. Due to a variety of factors since the original installation, the HDPE liner has become ineffective as a solution barrier and will need to be replaced prior to the use of Cell 4A as a tailings storage facility. Therefore, the construction activities and the QA/QC data for the installation of the liner has not been included in this Report.

5.9 Slimes Drain

The slimes drain system is designed to dewater and consolidate the tailings sands. The system was designed similar to the one installed in Cell 2 and Cell 3, and consists of 4 inch diameter slotted PVC pipe connected to a 12 inch diameter HDPE riser installed up the slope in the southwest corner of Cell 4A. All slotted sections of the PVC pipe were contained in an envelope of pea gravel wrapped with geotextile fabric. The 12 inch diameter HDPE riser was connected to the PVC pipe via fabricated fittings and a flanged connection utilizing 316 stainless steel bolts. Project photos attached to this Report show the installation of the slimes drain system. The installation was completed according to Design Change Order #6 included with Attachment J to this Report.

6.0 Design Modification and Changes

A total of ten (10) Design/Field Change Orders were issued throughout the duration of the project. The majority of the Change Orders involved additions to the contractor's scope of work to facilitate items not covered in the Plans and Specifications, and had no material effect on the function of the Cell as a tailings disposal facility. Copies of the Change Orders are included as Attachment J to this Report.

7.0 Reporting

Regulatory approval required routine reporting of construction progress and milestones, specifically with respect to the frequency of soils and compaction tests on the dike construction and the ratio of tests per cubic yard of material placed. The reports were sent weekly to the U. S. Nuclear Regulatory Commission and to the State of Utah, Department of Natural Resources, Division of Water Resources - Dam Safety. Copies of the weekly reports are included as Attachment K to this Report.

8.0 Supporting Documentation

All of the required Quality Assurance/Quality Control (QA/QC) requirements were fulfilled for the Construction of Cell 4A according to the approved Plans and Specifications. Because of the large volume of documentation generated from the QA/QC program, only selected examples have been presented in the Attachments to this Report. Copies of all QA/QC reports, laboratory test results, equipment calibration reports, and other supporting documentation on the construction of Cell 4A are on file at the offices of International Uranium (USA) Corporation, White Mesa Uranium Mill, Blanding, Utah.

The Table of Contents for each of four (4) binders containing the supporting documentation is included in Attachment L to this Report.

Figures

Figure 1 Cell 4A Layout and Coordinates

Figure 2 Cell 4A As-Built Contours

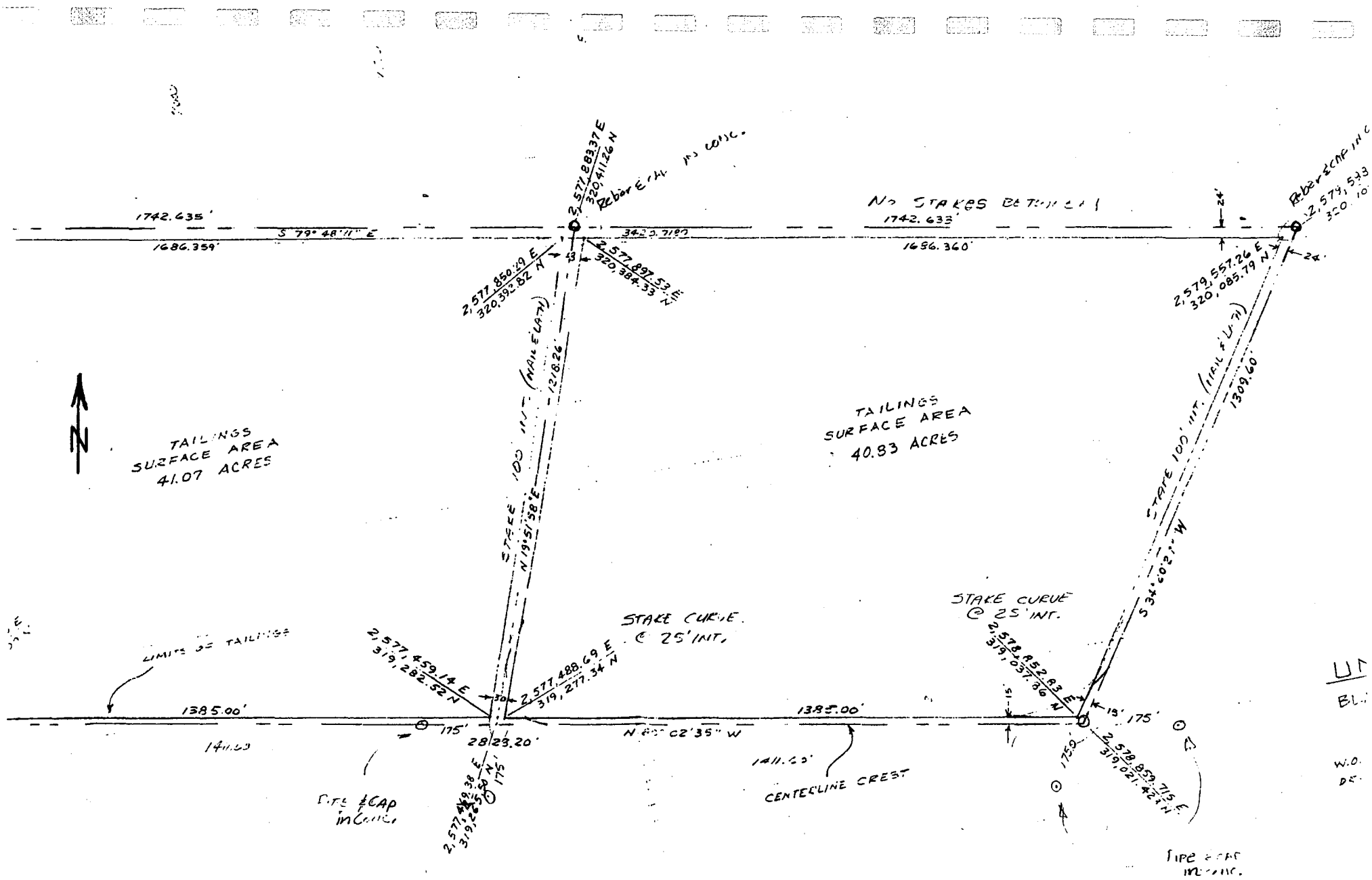
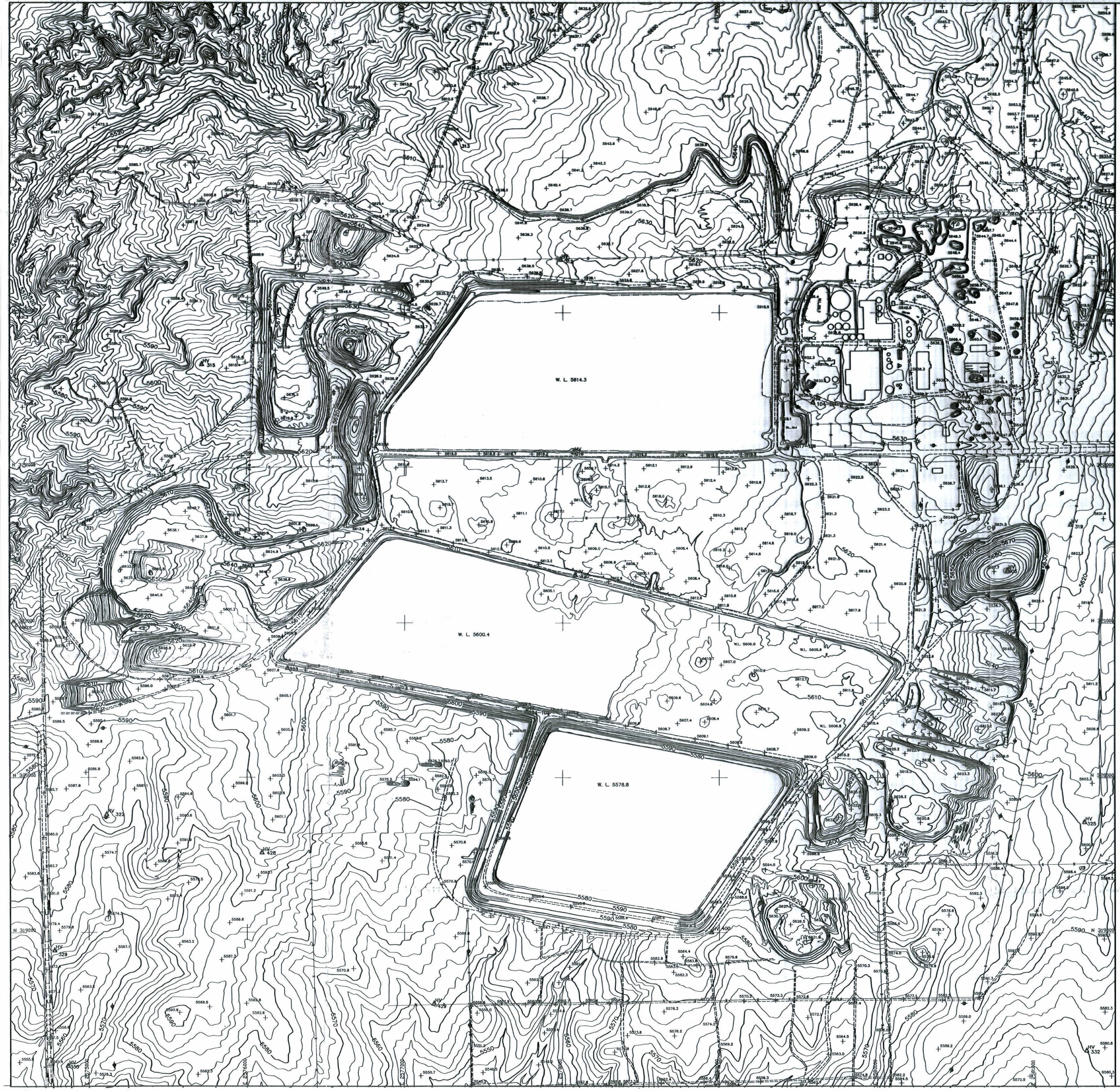


Figure 1

Cell 4A - Layout and Coordinates



200 100 0 200 400
SCALE 1" = 200'
CONTOUR INTERVAL 2'

Topography by Intermountain Technical Services Inc.
from aerial photography dated: September 22, 1990

Control by Western Engineers Inc.

UMETCO MINERALS CORPORATION

WHITE MESA MILL SITE
BLANDING, UTAH

DATE: OCTOBER 18, 1990
SCALE: 1" = 200'

JN 90066

ITS INTERMOUNTAIN TECHNICAL SERVICES, INC.

Figure 2

Attachments

Attachment A	NRC License Amendment No. 20 - Authorization to Construct and Operate Cell 4A
Attachment B	Authorizations to Construct Cell 4A - State of Utah
Attachment C	Form F-1 Construction Activities Report
Attachment D	Compliance Report
Attachment E	Form F-3 Fill Observation and Testing
Attachment F	Form F-4 Soil Sampling Log
Attachment G	Abandonment of Monitor Well # 13
Attachment H	Clay Liner - Moisture Content Verification
Attachment I	Leak Detection System - Piping Detail
Attachment J	Design and Field Change Orders
Attachment K	Regulatory Submittals
Attachment L	Table of Contents - Data Books (1 through 4)

Attachment A

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

XC Letter Only
EWS GGR
WWB KHC
MDV
XC Both
JSH SLS
RXS GFR
Central File

MAR 1 1990

URFO:DLJ
Docket No. 40-8681
SUA-1358, Amendment No. 20
04008681210R

Rcvd
3-5-90

Umetco Minerals Corporation
ATTN: Don Sparling, Plant Superintendent
White Mesa Uranium Mill
P.O. Box 669
Blanding, Utah 84511

Dear Mr. Sparling:

Our office is in receipt of your amendment request dated February 8, 1989, to construct Cell 4A. Based on the supporting information submitted on February 24, April 10, May 12, August 23, September 6 and 29, November 8, 1989, and January 10, 1990, we have concluded that the plan is acceptable. Accordingly, we are revising your license to authorize construction and operation of Cell 4A. Additionally, maximum water surface elevations have been established for Cells 1-I, 3, and 4A.

Pursuant to Title 10, Code of Federal Regulations, Part 40, Source Material License SUA-1358 is hereby amended by modifying License Condition No. 51 to read as follows:

51. The licensee is authorized to construct Cell 4A in accordance with the plans and specifications contained in the licensee's February 8, 1989, submittal as revised by the January 10, 1990, submittal. Additionally, the following conditions will also apply.

    A. Effective with issuance of Amendment No. 20 and until April 30, 1990, the maximum operating elevation in Cell No. 1-I shall not exceed 5616.1 feet. Beginning on May 1, 1990, the maximum operating elevation in Cell No. 1-I shall not exceed 5615.4 feet, which will provide 2.8 feet of freeboard.

    B. Effective with issuance of Amendment No. 20 and until April 30, 1990, the maximum operating elevation in Cell No. 3 shall not exceed 5605.4 feet. Beginning on May 1, 1990, the maximum operating elevation in Cell No. 3 shall not exceed 5603.0 feet which will provide 5.0 feet of freeboard. When the volume of tailings approaches 600,000 tons, considering all tailings placed since October 23, 1989, the licensee shall revise the maximum operating elevation for Cell No. 3 in accordance with

the procedures specified in their January 10, 1990, submittal. The revised elevation shall be submitted for NRC review and approval in the form of a license amendment request. The amendment request shall be submitted to NRC by the time the total tonnage of dry tailings reaches the 600,000 ton limit.

C. The maximum operating elevation for Cell 4A shall not exceed 5596.4 feet, which will provide 1.6 feet of freeboard.

D. Ditches 1, 2, and 3 shall be constructed as shown and described in the licensee's January 10, 1990, submittal. The construction shall be completed by March 31, 1990.

E. The crest of the dike in Drainage Basin B1 shall be raised to elevation 5648.5 feet by March 31, 1990.

F. Cell No. 2 will be maintained in a dry condition until a lined spillway is constructed to allow excess liquids to flow into Cell No. 3. Before construction is initiated, the licensee shall submit detailed plans and provide assurance that the spillway and liner will remain stable during a design basis flood event. This detailed design shall be submitted to NRC at least 60 days prior to initiation of construction. After the spillway is constructed, storage of liquids and tailings will be allowed in Cell No. 2.

All other conditions of the license shall remain the same. The License is being reissued in order to incorporate the modified condition.

This amendment was discussed and agreed to by J. Hamrick of your organization and D. L. Jacoby of my staff on February 27, 1990.

Sincerely,

Ramon E. Hall
Director

Enclosure:
Source Material License SUA-1358

Case Closed: 04008681210R

Attachment B

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Robert L. Morgan
State Engineer

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS
Dam Safety

1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156
801-538-7240

May 12, 1989

Mr. John Hamrick,
Site Environmental Coordinator
Umetco Minerals Corporation
White Mesa Mill
P. O. Box 669
Blanding, UT 84511

RE: Cell 4 tailings pond construction

Gentlemen:

Plans and specifications for the above-referenced project are hereby approved pursuant to Section 73-5-5 of the Utah Code Annotated 1953, as amended. In order for the approval to remain valid, the conditions outlined in the following paragraphs must be complied with.

Prior to the initiation of any construction, the following information must be submitted to the State Engineer:

1. The names and qualifications of the inspector for the project.

2. The name of the contractor for the project, including the name of the contractor's representative(s) responsible for the project.

3. The estimated starting and completion dates for the project.

During the construction phase, the following information must be submitted to the State Engineer for review:

1. Summaries of results of all material tests undertaken should be submitted on a weekly basis.

2. Copies of daily inspection reports should also be submitted weekly along with the material tests.

3. Documentation of any major change in construction practices or materials must be submitted, in writing, and approved prior to their use.

Before the dam can be placed in operation, the following condition must be met to obtain final approval to store water:

1. The State Engineer's office must be notified of, and involved in, a final inspection of the project that involves all interested parties.

Within sixty (60) calendar days of the completion of the project, the State Engineer should be supplied with a final set of mylars that represent the "as-constructed" project. Failure to provide such plans may cause the State Engineer to rescind his approval of the project.

If you have any questions or need further clarification, please feel free to contact me or Richard Hall of our Dam Safety Section.

Sincerely,

Robert L. Morgan

Robert L. Morgan, P.E.
State Engineer

RLM/rbh/jm

cc: Mark Page, Price Area Engineer

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

May 17, 1989

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, UT 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

In response to the requests in you letter dated May 12, 1989, the following is submitted:

1. An organizational chart of responsible persons is attached as are resumes for:

   J. S. Hamrick
   G. L. Swanson
   H. H. Sampson
   T. S. Krake
   R. Day

2. The contractor for the project is Landmark Reclamation.

   Representatives are identified on the attached organizational chart.

3. A construction schedule is attached.

Weekly summaries of materials, tests and the results of inspections will be submitted by Henry H. Sampson Jr. P.E., QA Consultant.

Sincerely,

J S Hamrick

UMETCO MINERALS CORPORATION
J. S. Hamrick
Q A Officer

JSH/gp

Norman H. Bangerter
Governor
Suzanne Dandoy, M.D., M.P.H.
Executive Director
Kenneth L. Alkema
Director

State of Utah

DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH

288 North 1460 West
P.O. Box 16690
Salt Lake City, Utah 84116-0690
(801) 538-6121

BAQE-375-89

May 22, 1989

John S. Hammrick
Umetco Minerals
P.O. Box 669
Blanding, Utah 84511

Dear Mr. Hammrick:

Re: Intent to Approve Cells 4A and 4B
San Juan County, CDS A1

Air pollution producing sources and/or their air control facilities may not be constructed, installed, established, or modified prior to the issuance of an approval order by the Executive Secretary of the Utah Air Conservation Committee. The notice of intent for the above-referenced project has been evaluated and has been found to be consistent with the requirements of the Utah Air Conservation Regulations (UACR) and the Utah Air Conservation Act.

A notice of intent to issue an approval order will be published in the Salt Lake Tribune on May 25, 1989. A 30-day period following the publishing date will be allowed during which the proposal and evaluation of the impact on air quality will be available for public review and comment. If within 15 days of publication of the notice anyone so requests, a hearing will be held. Any comments received during the 30-day period and the hearing, if held, will be evaluated. The intent to approve or the conditions of approval may be modified as a result of those comments. Unless modified, the approval order would be based upon the following conditions:

1. Umetco Minerals Corporation, located near Blanding, San Juan County, Utah, shall construct and operate Cell #4 according to the information submitted in the notice of intent dated February 15, 1989.

2. The equipment used to construct shall consist of the following:

   A. Scrapers (3)
   B. Cat trucks (3)
   C. Cat crawlers (2)
   D. Front-end loader (1)
   E. Compactor (1)
   F. Grader (1)
   G. Water truck (1)
   H. Personnel vehicles (1)
   I. Other equipment which does not produce air contaminants

3. Cell #4 shall consist of two separate cells, known as Cell A and Cell B. Cells 4A and 4B shall be sized to each have a volume not exceeding 1150 acre-feet (1,855,333 cubic yards) with a phased final surface area of no more than 40 acres each. Cell #4 shall be designed as a below-grade repository similar to the previously constructed cells in the Tailings Management System.

4. Visible emissions from any point or fugitive emission source associated with the installation or control facilities of Cell #4 shall not exceed 20% opacity. Opacity observations of emissions from stationary sources shall be conducted in accordance with 40 CFR 60, Appendix A, Method 9. Opacity observations of intermittent sources shall use procedures similar to Method 9, but the requirement for observations to be made at 15-second intervals over a 6-minute period shall not apply. The averaging time shall be the actual time interval over which visible emissions are observed. Any time interval with no visible emissions shall not be included.

5. All unpaved roads and other unpaved operational areas shall be water sprayed and/or chemically treated to the extent necessary to maintain a surface damp condition. Control is required at all times including weekends and holidays until such time as the pit has been reclaimed and the top soil has been replaced. An operational water truck shall be maintained on site and available during each operating day. If the water truck is out of service and the roads or operational areas become dry they shall not be used until a truck has been obtained and water has been applied. In addition, water shall be applied to these areas at least one hour before the day's normal operation begins in order to provide sufficient time for the moisture to permeate the ground prior to the use of other operating equipment. The equipment shall be capable of delivering a minimum application rate of water of 0.5 gallons per square yard. Records of water treatment shall be kept for all periods when the plant is in operation. The records shall include the following items:

   A. Date
   B. Number of treatments made
   C. Rainfall received, if any, and approximate amount
   D. Time of day treatments were made

   Records of treatment shall be made available to the Executive Secretary upon request and shall include a period of time equal to the entire duration of the project. If chemical treatment is to be used, the plan must be approved by the Executive Secretary.

6. Fugitive dusts from the disturbed areas shall be controlled through the use of watering as dry conditions warrant or as determined necessary by the Executive Secretary. The speed of compactors shall not exceed 3 mph at any time.

7. The storage piles shall be watered to minimize generation of fugitive dusts as dry conditions warrant or as determined necessary by the Executive Secretary.

8. For front-end loading operations and truck dumping operations, the drop distances shall be kept as small as practicable. The speed of the scrapers shall not exceed 3 mph while loading and 12 mph while dumping. The moisture content of the materials shall be no less than 4% by weight during these operations. The moisture content shall be tested if directed by the Executive Secretary using a test method approved by the Executive Secretary.

9. The owner/operator shall comply with 40 CFR 61, Subpart W, National Emission Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings. The owner/operator shall comply with Section 4.5.5, UACR during the construction and operation of the cells.

10. When the cells are filled with tailings, the surfaces shall be reclaimed in a manner such that wind-blown particulate emissions from the site are minimized. A plan for reclaiming the site shall be submitted to the Executive Secretary for approval no less than 180 days before the ponds are filled with tailings.

11. All installations and facilities authorized by this approval order shall be adequately and properly maintained.

12. The Executive Secretary shall be notified in writing upon start-up of the installation, as an initial compliance inspection is required.

Any future modifications to the equipment approved by this order must also be approved in accordance with Section 3.1.1, UACR.

This approval order in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including the Utah Air Conservation Regulations.

"Allowable emissions" as defined in Section 1.12, UACR, for this source (the entire plant) are currently calculated at 214.32 tons/yr for particulate, 62.3 tons/yr for SO_2, 80.7 tons/yr for NO_x, 1.1 tons/yr for VOC, and 4.5 tons/yr for CO. These calculations are for the purposes of determining the applicability of PSD and nonattainment area major source requirements of the UACR. They are not to be used for purposes of determining compliance.

Please review and, if you have any comments on these conditions, respond by letter prior to the close of the comment period.

The Bureau of Air Quality is authorized to charge a fee for reimbursement of the actual costs incurred in the issuance of approval orders. Unless public comments are received which require additional work, the fee for this approval order will be $676.00. Assuming no comments are received your approval order will be mailed upon receipt of payment. If comments are received you will be notified.

Sincerely,

F. Burnell Cordner

F. Burnell Cordner, Executive Secretary
Utah Air Conservation Committee

FBC:DER:slt

cc: EPA Region VIII, John Dale
Southeastern Utah District Health Department

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

June 2, 1989

Mr. Burnell Cordner, Director
Bureau of Air Quality
Utah Department of Health
288 North 1460 West
Salt Lake City, UT 84116-0700

Attention: Mr. Don Robinson
Re: License Condition 5, BAQE-375-89

Dear Mr. Cordner:

This letter is in response to the proposed approval order for Umetco Minerals Corporation's White Mesa Mill Cell 4, dated May 22, 1989, and a phone conversation on June 2, 1989 with Mr. Don Robinson.

Specifically, Umetco is concerned about some of the language of License Condition 5 including the undefined term "other unpaved operational areas", the phrase "to maintain a surface damp condition" and the phrase "control is required at all times" when related to the tailings area.

Umetco, as the operator of the White Mesa uranium mill, is subject to regulation by the Nuclear Regulatory Commission. Minimization of blowing tails has and continues to receive a high priority from the NRC. As part of the yearly unannounced compliance inspection, the NRC closely reviews operating practices, current conditions, dust minimization measures, and potential exposure pathways in and around the tailings area using the ALARA (As Low As Reasonably Achievable) principle. Umetco has committed to a program which we feel is the equivalent of BAQ's License Condition 5. Umetco feels that House Bill number 57 of the 1987 General Session is applicable in this case.

In addition, the White Mesa Mill is a zero discharge facility. Each tailings cell is underlain by an impervious liner. Any liquid added to a particular cell remains in the cell unless recycled or evaporated. This means that there is at most a thin layer, typically one to two inches of material, that may be dry. This layer is on top of moist tailings sand that grades into a saturated zone within one to four feet. Experience gained during the eight years since the commencement of operations has shown that even the dry layer tends to "self seal" due to the formation of a salt crust when the sand is deposited.

If this salt crust becomes disturbed or if dry conditions exist, Umetco has committed to the following actions, as appropriate: flooding the area with new tailing slurry, spraying the area with tailings solutions, using chemical stabilizers, or applying the first layer of final reclamation cover.

Umetco believes that these actions shall constitute compliance with Utah Air Conservation regulations, the BAQ Approval Order, and applicable NRC requirements. Umetco reserves any rights to proceed with this matter, but stands ready to continue discussions in hopes of a speedy resolution. Representatives of Umetco will be in contact with the appropriate members of BAQ staff.

John S Hamrick

John S. Hamrick
Site Environmental Coordinator

D K Sparling

D. K. Sparling
Site Manager

Attachment C

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. CHACON

Date 5/9/84

Daily Report No. 1

Technician Ed. Sucerson

Approved By J Stamnier

WEATHER CONDITIONS AND TEMPERATURE 70-80°F, Clear to partly cloudy, no precipitation

EQUIPMENT (1) scraper, (1) Grader, (1) Water truck, moderately windy
note: a 2nd scraper was put in operation @ 10:30 am

CONSTRUCTION ACTIVITIES Stripping 6" of top soil and vegetation from cell 4A area by "Landmark Reclamation".
Total cuvit 161 X 20 = 3,220 cu. yds. Top Soil removed and stockpiled
w/ Truck 8 X 8,000 = 64,000 gallons water for dust control

No second shift is scheduled for the day.

OBSERVATIONS Western Engineers
1.) 2 man surveyed party was in doing cross-sections of cell 4A
2.) Dusty conditions, but water truck was watering haul pathways
3.) Preliminary pictures were taken in start-up stripping operation
4.) Western Tech. was contacted to come in on 5/16/84 for initial "Proctor" soil samples.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 5/10/89

Daily Report No. 2A, Shift 1

Technician G.L. Swanson

Approved By J Stamnier

WEATHER CONDITIONS AND TEMPERATURE 70-80°F, Clear and moderately windy with strong gusts

EQUIPMENT (2) Scrapers, (1) Grader, (1) 8,000 Gal. water truck
one Scraper and grader were placed in operation 2 hours into shift.

CONSTRUCTION ACTIVITIES "Landmark Reclamation" stripping 6" of top soil and vegetation from Cell 4 A. One Scraper was down most of the day. (Transmission shifting Problems)
1st shift Load Count 68 X 20 = 1,360 Cu.yds Top Soil removed and stockpiled
Wtr. Truck 7 X 8,000 = 56,000 gallons water for dust control

The site had dusty conditions, but water truck was watering haul pathways and the area being stripped.

OBSERVATIONS Support Activities:
1.) Waterline is being extended, Joints of pipe have been preassembled, Tee and fittings are on hand for assembly 2.) Subcontractor was in with sprinkler system. 3.) Tom Kreke of Western Technologies was in to sample site for initial proctors; Five (5) samples were taken; (3) bulk samples were taken across the South half of future pond and (2) bulk samples from the North half (inside northwest corner and inside northeast corner). 4.) Bruce Rurther was locating water meter for contractor's water line.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 5/10/89

Daily Report No. 2B, Shift 2

Technician G.L. Swanson

Approved By J.S. Hamrier

WEATHER CONDITIONS AND TEMPERATURE 70-80° F, Windy, no precipitation in last 24 hours

EQUIPMENT (1) Paddle Wheel Scraper, (1) Grader, (1) 8,000 Gal Water truck
(1) Dozer

CONSTRUCTION ACTIVITIES Stripping 6" of top Soil and vegetation from Cell 4A area by "Landmark Reclamation". Also crew working on extending 6" H.D.P.E. waterline for sprinkler system and truck filling.
Load Count 80 x 20 = 1600 Cu.yds. Top Soil removed and stockpiled
water truck 4 X 8000 = 32,000 gallons water for dust control

OBSERVATIONS
1) 2nd Scraper was down all shift because of transmission shifting problems
2) Dusty conditions, but water truck was watering haul pathways
3.) Dozer used to push in test pits
4) One Light plant was available to light the area on the second shift.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 6/1/89

Daily Report No. 17A, Shift 1

Technician G.L. Swenson

Approved By J S Hamrick

WEATHER CONDITIONS AND TEMPERATURE Clear, fairly Calm, 50-65°F, no precipitation

EQUIPMENT (2) Scrapers (1 regular & 1 paddle wheel), (1) Dozer being used to push regular scraper, (2) Water trucks, (1) Grader, (2) Compactors

CONSTRUCTION ACTIVITIES "Landmark" Continued to excavate pond bottom in the East half of the pond area. The Lifts continued to be laid between stations 16+00 and 25+00.

Load Count: 142 x 20 yd³/Load = 2840, Dike Construction

30 x 20 yd³/Load = 600, Random stockpile

15 x 20 yd³/Load = 300, Clay stockpile

Area Watering: 8M wtr. Truck = 7 x 8,000 = 56,000 gallons

10M Wtr. Truck = 6 x 10,000 = 60,000 gallons

Mill Area 8M wtr. Truck = 2 x 8,000 = 16,000 gallons Total = 116,000 gallons

OBSERVATIONS

1.) Witnessed compaction testing by Sand Cone method being done by Tom Krake of "Western Tech".

2.) Tom Krake of "Western Tech" recalibrated sand density and sand cone volume.

3.) Area Sprinklers stayed in the same Location during day shift.

4.) Day Shift was 7 hrs.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 6/1/89

Daily Report No. 17A

Technician T. Krake

Approved By L. Swanson

WEATHER CONDITIONS AND TEMPERATURE Clear, 50° → 80°

EQUIPMENT 2-Compactors, 2-Water Wagons, 2-Scrapers, 1-Dozer, 1-Blade

CONSTRUCTION ACTIVITIES Placement and compaction of Fill material for the south dike began at approx 10:30. The top lift on the dike was watered and reworked prior to placing Fill material. The area being worked is from sta 16+00 to sta 26+00. The material continues to be hauled from the prewet areas.

OBSERVATIONS

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 6-1-89

Daily Report No. 17B-SHIFT 2

Technician HENRY H. SAMPSON JR.

Approved By J Stemmer

WEATHER CONDITIONS AND TEMPERATURE CLEAR & MILD

EQUIPMENT 2 SCRAPERS, 1 WATER WAGON, 1 COMPACTOR, 1 MAINTAINER

CONSTRUCTION ACTIVITIES FILLING FULL WIDTH OF S. DIKE FROM STATION 16+00 TO STA 27+00, EXCAVATING FILL SOIL FROM NE AND SW CORNERS OF CELL. SPRINKLERS PRE-WETTING SOIL ~~on~~ ALONG AN EAST-WEST LINE NEAR THE CENTER OF THE CELL.

OBSERVATIONS

4 LIGHTS SET UP FOR GENERAL LIGHTING FOR FILL AND CUT AREAS.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 6-1-89

Technician R. Day

Daily Report No. 17B

Approved By H. L. Swanson

WEATHER CONDITIONS AND TEMPERATURE Clear, 45° to 75°

EQUIPMENT 1- Blade, 1- Compactor, 1- Water Wagon, 2- Scrapers

CONSTRUCTION ACTIVITIES Landmark continues to place and compact fill material on south dike approx sta 17+00 to 27+00. Fill material is being excavated from N.E. side of cell. Prewetting of some areas of fill material continues.

Load Count: 176 X 20 yd³/Load = 3,520 cu yds to Dike Construction

C-4A, Area Watering 8M water truck 1 Load = 8,000 gallons
10M water truck 6 Loads = 60,000 gallons
68,000 gallons

OBSERVATIONS

Some of the calcareous material is being excavated. moisture and compaction are within project requirements. More lights are needed for visibility and safety at approx sta 25+00 to 27+00

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 6/15/89

Daily Report No. 27A, day shift

Technician G.L. Swanson

Approved By J Hamrick

WEATHER CONDITIONS AND TEMPERATURE Clear, windy, Temp 60°-90°F, no precipitation

EQUIPMENT (3) Scrapers, (2) Compactors, (1) Blade, (1) water truck, (1) Dozer
Shift was 10 hours

CONSTRUCTION ACTIVITIES "Landmark" continued to place and compact fill on the southwest corner of Cell 4A.

Load Count: 250 X 20 yd³/Ld = 5,000 yd³, to the dike
67 X 20 yd³/Ld = 1,340 yd³, to Clay stockpile

Area Watering: #WW2 10M wtr Truck = 10 lds X 10,000/Ld = 100,000 gallons

OBSERVATIONS

1.) Sand Cone and Troxler in place density tests failed on the outer edge of the southwest corner area was reworked to pass. (Too dry and also low density).

2) Reviewed Soil Tech Joe Sanchez @ work on: field densities and Lab determinations for 1½ to 2 hrs. His work was satisfactory.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 6/15/89

Daily Report No. 27A

Technician T Krake

Approved By [illegible]

WEATHER CONDITIONS AND TEMPERATURE Clear, 40° 50°

EQUIPMENT 3-Scrapers, 2-Compactors, 1-Pick, 1-Dozer, 1-water wagon

CONSTRUCTION ACTIVITIES Landmark is placing and compacting fill on the southwest corner to bring this area up even with the rest of the dike.

OBSERVATIONS

Some of the fill material brought in was dry and this caused some areas to be worked in more than others

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C44WM

Date 6-15-89

Daily Report No. 278-SHIFT 2

Technician HENRY H. SAMPSON JR.

Approved By J S Hamrick

WEATHER CONDITIONS AND TEMPERATURE PARTLY CLOUDY & WARM

EQUIPMENT 1-MAINTAINER, 2-COMPACTORS, 2-WATER WAGONS, 3 SCRAPERS

CONSTRUCTION ACTIVITIES ONE SCRAPER EXCAVATING CLAY MATERIAL FROM NORTHEAST CORNER OF FILL TO STOCKPILE FOR FIRST HALF OF SHIFT WHILE SOIL WAS BEING WETTED AND MIXED IN SOUTHWEST CORNER OF FILL. OTHER TWO SCRAPERS EXCAVATING FROM NEAR CENTER OF CELL AND FILLING WEST DIKE, FULL WIDTH FROM CELL 3 DIKE TO STATION 30+00.

OBSERVATIONS

LIGHTING WAS ADEQUATE FOR ACTIVITIES ON WEST DIKE.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4A WM

Date 6-15-89

Technician J. Sanchez

Daily Report No. 27B

Approved By G.L. Swanson

WEATHER CONDITIONS AND TEMPERATURE 85-90 - mild breeze

EQUIPMENT 1-blade, 2 waterwagons, 2 sheepsfoot compactors
Shift was 10 hours

CONSTRUCTION ACTIVITIES Landmark worked west berm of Dike and continued Fill operations

Load Count:

242 x 20 yd³/ld = 4,840 yd³, to dike construction
36 x 20 yd³/ld = 720 yd³, to Clay Stockpile
1 x 20 yd³/ld = 20 yd³, to random stockpile

Area watering: #WW2 10M wtr. Truck = 8 lds x 10,000/ld = 80,000 gallons
#WW1 8M wtr. Truck = 6 lds x 8,000/ld = 48,000 gallons
128,000 gallons

OBSERVATIONS

Southwest corner was remarked due to dry Fill brought in

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. G4AWM

Date June 30, 1989

Daily Report No. 38A, day shift

Technician G.L. Swanson

Approved By J S Hamrick

WEATHER CONDITIONS AND TEMPERATURE Clear, 60-90°F, no precipitation

EQUIPMENT (3) Scrapers, (2) Compactors, (1) Grader, (2) water trucks
Smaller dozer pushing & ripping material in center of cell

CONSTRUCTION ACTIVITIES "Landmark" continued construction of the West dike over most of the length.

Load Count: 240 x 20 yd³/ld = 4,800 cyd to dike construction

Area Watering

WW #1 used 8 hrs hauling 8 lds x 8,000/ld = 64,000 gallons

WW #2 used 7 hrs hauling 5 lds x 10,000/ld = 50,000 gallons

Mill Yard: WW #2 1 ld x 10,000/ld = 10,000 gallons 114,000 gallons

OBSERVATIONS

1.) Larger "Fiat-Allis" dozer was tested for hydraulic leaks prior to mounting cab
2.) surveyed in settlement plate to of pipe with cap off was 5576.96', reference elev. was 5578.6' @ sta 16+00 on So. dike. The change since last survey was -0.01' (1/8"). 3.) 8 hr shift

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-W1

Date 6/30/89

Daily Report No. 38A

Technician T. Kroke

Approved By [illegible]

WEATHER CONDITIONS AND TEMPERATURE Clear, 60-90°

EQUIPMENT 3-Scrapers, 2-Compactors, 2-Water Wagons, 1-Blade, 1-Dozer

CONSTRUCTION ACTIVITIES Landmark continues to place and compact fill material for the west side of cell 4A.

OBSERVATIONS

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WIM

Date 6-30-89

Daily Report No. 388, 2nd Shift

Technician H Kuebler

Approved By [signature]

WEATHER CONDITIONS AND TEMPERATURE Partly Cloudy Winds gust up to 10mph

EQUIPMENT 2-scrapers, 1 waterwagon, 1 blade, 2 sheepfoots compactors

CONSTRUCTION ACTIVITIES Sand Mark continued to build west dike

Load Count: 161 X 20 yd³/Ld = 3,220 cyd to dike Construction

Area Watering: WW #1 used 4 hrs hauling 3Lds X 8,000/Ld = 24,000 gallons
WW #2 used 4 hrs hauling 4Lds X 10,000/Ld = 40,000 gallons
64,000 gallons

OBSERVATIONS

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 6-30-89

Daily Report No. 38B - SHIFT 2

Technician HENRY H. SAMPSON JR

Approved By J S Hamrick

WEATHER CONDITIONS AND TEMPERATURE CLEAR & WARM

EQUIPMENT 1- MAINTAINER, 1-WATER WAGON, 2-COMPACTORS, 3-SCRAPERS

CONSTRUCTION ACTIVITIES EXCAVATING FROM NEAR THE CENTER OF THE CELL, FILLING THE WEST DIKE, FULL WIDTH FROM STATION 27+00 TO THE CELL 3 DIKE.

OBSERVATIONS

A COMPACTOR ROLLED FROM TOP OF WEST DIKE UP AND ON TO TOP OF CELL 3 DIKE.

TOOK SOME RANDOM LEVEL SHOTS TO VERIFY FILL STAKES.

F-1 CONSTRUCTION ACTIVITIES REPO...

Project No. C4AWM

Date 7/17/89

Daily Report No. 48

Technician G.L. Swanson

Approved By

WEATHER CONDITIONS AND TEMPERATURE Clear, 60-90°F, no precipitation

EQUIPMENT (3) Scrapers, (2) water trucks, (3) rock trucks, (2) dozers & (1) Loader

CONSTRUCTION ACTIVITIES "Landmark" placed the final quantity to the East dike and continued to excavate the center of the cell and place cover material on the N.E. Corner of Cell #2. Dike Construction done pending results of Western Engineers Survey this week.

Load Count 1st Shift

Dike Construction = 24 Lds x 20yd³/Ld = 480 cuyds

Cell #2 Cover = 132 Lds x 20yd³/Ld = 2,640 cuyds

Random Stockpile = 186 Lds x 20yd³/Ld = 3,720 cuyds

Load Count 2nd Shift

Cell #2 Cover = 213 Lds x 20yd³/Ld = 4,260 cuyds

Random Stockpile = 231 Lds x 20yd³/Ld = 4,620 cuyds

OBSERVATIONS

Area Watering: 1st Shift

WW#1 used (1) hr 1 Ld = 8,000 gallons

WW#2 used 7½ hrs 6 Lds = 60,000 gallons

Total 68,000 gallons

2nd Shift

WW#2 used 3 hrs, 3 Lds = 30,000 gallons

Mill Yard WW#1, 1 Ld = 8,000 gallons

F-1 CONSTRUCTION ACTIVITIES REPO...

Project No. C-4A-WM

Date 7/17/89

Daily Report No. 48A

Technician T. Krake

Approved By [illegible]

WEATHER CONDITIONS AND TEMPERATURE Clear 60-90

EQUIPMENT 3-Rock Trucks, 3 scrapers, 2-Dozer, 2-Water wagons, 1-Loader

CONSTRUCTION ACTIVITIES Landmark completed fill on the dike until a final survey is done.

OBSERVATIONS

F-1 CONSTRUCTION ACTIVITIES REPO...

Project No. C-4-AV 1

Date 7-24-89

Daily Report No. 53-A-B

Technician H Huebler

Approved By A L Swanson

WEATHER CONDITIONS AND TEMPERATURE Cloudy with afternoon showers, High 80's

EQUIPMENT 2 scrapers, 2 dozers, 1 waterwagon, 1 sheepfoot compactor, 1 blade, 2 ore trucks.

CONSTRUCTION ACTIVITIES Sundmark completed dike building

1st shift, 10hrs 2nd Shift, 10hrs - 1½ due to rain

Final Dike Const. 49 Lds x 20 yd³/Ld = 980 cu.yds.

Cell No. 2 Cover 177 Lds x 20 yd³/Ld = 3540 cu.yds Cell No. 2 Cover 126 x 20 yd³/Ld = 2520 cu.yds.

To Random pile 31 Lds x 20 yd³/Ld = 620 cu.yds.

Area watering:

Used WW2 10hrs 4 Lds = 40,000 gallons WW1, 1hr, 1 Ld. = 10,000 gallons

OBSERVATIONS

1.) 1st Shot was made on rock in cell area

2.) Completed (19) inplace moisture/density tests on the topped out dike; one area failed moisture and was reworked to pass. The soil being used was sampled (sample #80) and std Proctor optimum conditions were determined.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4ACUM

Date Aug. 1, 1989

Daily Report No. 59 A & B

Technician G.L. Swanson

Approved By J Stamrow

WEATHER CONDITIONS AND TEMPERATURE Cloudy, Light Misty rain 0.04", Temp 55-70°F

EQUIPMENT (1) Grader, (2) Dozers, (1) Drill Rig, (3) Scrapers (Paddle wheel was down 3-4 hrs) Loaders and trucks were still down on rock hauling, needing repairs.

CONSTRUCTION ACTIVITIES "Land mark" Continued to excavate the west of center portion of the cell, with two scrapers placing material for cell #2 reclamation cover. Grader continued to work on South dike inside slope.

1st Shift, 8hrs

Cell #2 Cover = 117 Lds x 20 yd³/ld = 2340 cuyds

Random Stockpile = 38 Lds x 20 yd³/ld = 760 cuyds

3100 cuyds

2nd Shift, 6 hrs on Scrapers

Cell #2 Cover = 90 Lds x 20 yd³/ld = 1800 cuyds

Random Stockpile 41 Lds x 20 yd³/ld = 820 cuyds

2620 cuyds

No area watering was required for dust control.

OBSERVATIONS

1.) Shot bottom rock around 8:00 am

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. CHAUM

Date Aug. 15, 1989

Daily Report No. 70 A&B

Technician G.L. Swanson

Approved By J. Stkunier

WEATHER CONDITIONS AND TEMPERATURE Partly cloudy to clear, Temp 55-90°F, no precipitation

EQUIPMENT (1) Scraper, (2) Rock Trucks, (1) Loader, (1) Dozer, (1) Water Wagon & (1) Grader
(1) Drill Rig with water tank in use

CONSTRUCTION ACTIVITIES "Landmark" continued to excavate the cell bottom; at the Southeast Corner with rock trucks and loader; along the bottom of the North Slope with dozer and Scraper. Also, work continued on the 3:1 shaping of the North Dike Slope.

1st Shift, 10 hrs		2nd Shift, 10 hours	
Cell #2 Cover	2840 cu yds	Cell #2 Cover	2320 cu yds
Random Stockpile	1700 cu yds	Random / Rock	800 cu yds
Total	4540 cu yds		3120 cu yds
Area Watering:	10 hrs / 7 Lts = 70,000 gallons	Area Watering:	1 hr. / 1 Lt = 10,000 gallons

OBSERVATIONS

1.) Surveyed in Settlement plate to top of pipe elev. was 5576.96, unchanged from Survey of 8/3/89.

2.) Drill Rig drilling for next blast

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date Sept 1, 1989

Daily Report No. 83 A & B

Technician G.L. Swanson

Approved By J S Hermsen

WEATHER CONDITIONS AND TEMPERATURE Clear, 60-85°F, no precip.

EQUIPMENT (4) Dozers, (1) Grader, (1) Scraper, (1) Raygo Compactor, (1) water truck, (1) rock drill rig, (1) Monitor well drill rig, Roller Compactor

CONSTRUCTION ACTIVITIES "Landmark" continued to excavate the center to East bottom of the cell. Clay was being placed in the west bottom area and was being watered and rolled with the "Raygo" to break-up claystone.

1st. Shift, 10 hrs

Rock stockpile = 900 cu. yds

To Clay bottom = 600 cu. yds

WW#2 10 hrs 8 Lds, 80,000 gallons

2nd Shift,

Dozers only

OBSERVATIONS

1.) Blasted north of east center ramp area in Am.

2) Chained west dike 2:1 slope for the second time.

3.) Roller pulled up and let down west dike slope to smooth and dress slope for liner

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 9/1/89

Daily Report No.

Technician T. Krake

Approved By [illegible]

WEATHER CONDITIONS AND TEMPERATURE Clear

EQUIPMENT 4-Dozers, 1-Scraper, 2-Compactors, 1-water wagon, 2-Rock Trucks, 1-Blade

CONSTRUCTION ACTIVITIES Landmark continued with the excavation of rock from cell bottom. Placement of clay liner material is continuing.

OBSERVATIONS

Blasted rock on east side in A.M.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 9/15/89

Daily Report No. 92 A&B

Technician G.L. Swanson

Approved By J. Stauffer

WEATHER CONDITIONS AND TEMPERATURE Clear, Cool 55-75°F, no precipitation

EQUIPMENT (3) dozers, (3) rock trucks, (1) blade, (1) roller compactor, (1) water truck
(2) scrapers, H.D.P.E. assembly and testing equipment

CONSTRUCTION ACTIVITIES "Landmark" continued to excavate in the East part of cell and was grading and rolling the North slope. The south ramp into the cell is being shortened/removed. "Crestliners" continued liner fabrication along the West dike bottom, air testing of seams in the So. West corner, and vacuum testing for specific leaks.

To Rock Stockpile = 3400 Cu. yds. Dozer work only on 2nd shift

Area Watering WW #2 8 Lts = 80,000 gallons for both shifts

OBSERVATIONS

1.) Contacted Crest Liner foreman on dirt and pebbles getting ontop Geotextile fabric from broken "dirt-bags". He said he would vacuum up pebbles and "over-bag" bags with holes.

2) 3 1/2 hrs & 5 hrs watering on weekend

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 9/15/89

Daily Report No. 65

Technician T. Krake

Approved By H L Swanson

WEATHER CONDITIONS AND TEMPERATURE Clear

EQUIPMENT 1-Blade, 1-Scraper, 2-Rock Trucks, 1-Water Wagon, 2-Dozers, 1-loader

CONSTRUCTION ACTIVITIES Landmark continued with the rock excavation for the cell bottom. No clay base was processed today.

Crest-liners installed 3 rows of HDPE liner on the cell bottom and continued pressure testing in the SW corner

OBSERVATIONS

Witnessed pressure testing of seams 16 thru 20. #20 was defective and was reweldded by hand

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. WMC4A

Date 9-15-89

Daily Report No. 48

Technician Henry Sampson

Approved By J S Hamrick

WEATHER CONDITIONS AND TEMPERATURE Clear & Mild

EQUIPMENT

CONSTRUCTION ACTIVITIES Excavating East side of cell.
Steel wheel rolling of slope on Cell 3 Dike
Spreading and mixing clay on bottom. Wetting accepted clay bottom.
Placing fabric and liner from top of Cell 3 Dike to toe of South Dike. Welding seams and testing of seams from previous days activity.

OBSERVATIONS
Welders marking areas for patching during welding operations.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 10/2/89

Daily Report No. 102

Technician G.L. Swanson

Approved By

WEATHER CONDITIONS AND TEMPERATURE Clear, windy, Temp. 50-80°F, no precipitation

EQUIPMENT (1-2) Scrapers, (1) Water truck, (1-2) Dozers, (1) Grader
(1) Steel roller

CONSTRUCTION ACTIVITIES "Landmark" continued to level material in the East end of the cell they also continued to transport clay into the cell bottom and to start working it and conditioning it with water spray.

Clay transported to cell bottom — 3,380 cu yds.

Water used for conditioning and dust control — WW#2, 10hrs, 12hts

Total Water used = 120,000 gallons.

OBSERVATIONS

1.) Several meetings were held concerning Crest Liners and the Liner installation.

2) "Crest Liners" continued vacuum testing of seams and did some patching.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 10/2/89

Daily Report No. 26

Technician T. Krake

Approved By D. L. Hanson

WEATHER CONDITIONS AND TEMPERATURE Clear, 845-70

EQUIPMENT 1-Blade, 1-water wagon, 2-Scrapers, 1-Dozer

CONSTRUCTION ACTIVITIES Landmark continues to haul in clay base material for processing at a later date. They are excavating rock material from east end of cell.

Crestliner continues with testing and patching of ~~[illegible]~~ liner material.

OBSERVATIONS

Meetings were held concerning liner installation.

F1, F5, sample log

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 10-2-89

Daily Report No. 58

Technician HENRY H. SAMPSON JR.

Approved By J S Harrison

WEATHER CONDITIONS AND TEMPERATURE CLEAR- MILD- WINDY

EQUIPMENT

CONSTRUCTION ACTIVITIES HAULING, WETTING & MIXING CLAY MATERIAL. LINER CONTRACTOR PERFORMING VACUUM BOX TESTING OF BOTTOM SEAMS, PERFORMING REPAIRS IN VARIOUS AREAS.

OBSERVATIONS

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 10/16/89

Daily Report No. 112

Technician G.L. Swanson

Approved By

WEATHER CONDITIONS AND TEMPERATURE Cloudy at start of day but clearing, 0.15" precip previous night.

EQUIPMENT (2) Scraper, (1) Steel Roller Compactor, (1) water truck, (1) Dozer, (1) Grader
H.D.P.E. welding and testing equipment

CONSTRUCTION ACTIVITIES "Landmark" continued removal of the Northeast Corner ramp, conditioned inplace clay for another approved clay surface for liner placement. "Crest" liners continued with 100% Q.C. and repair of problem areas in material already laid down, no new H.D.P.E was laid down. Mopped up excess water from 0.15" rainfall.

Random Stockpile = 3,260 Cu. yds.

Clay Conditioning: WW#2, 10 hrs, 7 Lds = 70,000 gallons

OBSERVATIONS

1.) "Western Tech". Continued Q.A. vacuum/visual inspection of West 2:1 slope panels and seams.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 10/16/89

Daily Report No. 86

Technician T. Krake / H Koehler

Approved By S.L. Swanson

WEATHER CONDITIONS AND TEMPERATURE Clear, 37°-65°, liner surface temps 85-90°F

EQUIPMENT 1-Blade, 2-scrapers, 1-compactor, 1-water wagon, 1-Dozer

CONSTRUCTION ACTIVITIES Landmark continues to remove the access ramp in the northeast corner. They are processing another area of clay base material.

Cretlinon is continuing with their O.C. of material already installed. They are also cleaning up from weekend showers and winds.

Q.A. inspection was performed on panels P36 thru P66. Areas in need of repair were marked.

OBSERVATIONS

1) Peel and shear testing of weld samples appears to be acceptable

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4A WM

Date 10-16-89

Daily Report No. 70

Technician HENRY H. SAMPSON JR.

Approved By J Stumpier

WEATHER CONDITIONS AND TEMPERATURE CLEAR TO PARTLY CLOUDY & MILD

~~EQUIPMENT~~ RAINED 0.16 INCH LAST NIGHT, WATER STANDING IN SOUTHWEST CORNER ON LINER AND EXTENDING OUT 100' TO 200'. LINER BLOWN OUT OF TRENCH

CONSTRUCTION ACTIVITIES AT TOP OF CELL 3 DIKE FOR APPROXIMATELY 200 FEET. LINER CUT IN 3 PLACES (CREST TO TOE) AND PULLED BACK UP SLOPE AND BAGGED INTO DITCH. THESE CUTS WERE THEN FUSION WELDED. DITCH AT TOP OF DIKES AND AWAY FROM SOUTHWEST CORNER DUG OUT AND BAGGED, BAGS PLACED ON LINER AT CREST OF SOUTH AND WEST DIKES. VACUUM BOX AND TENSILE TESTING, PATCHING AND REPAIRING AREA OF WEST DIKE. WORKING BOTTOM CLAY, REMOVING MATERIAL FROM NORTHEAST CORNER OF CELL. DIGGING EXTENSIONS FOR LEAK DETECTION DITCHES.

OBSERVATIONS

SIX SHEETS OF FABRIC FROM CREST OF CELL 3 DIKE TO CREST OF SOUTH DIKE WET, SOME UNDERLYING CLAY "SPONGY". ALL SEEMED TO DRY CONSIDERABLY DUE TO WIND AND SUN. PEA GRAVEL SETTLING 2"-4" IN LEAK DETECTION DITCHES - POINTED OUT TO LANDMARK WITH SUGGESTION THAT GRAVEL BE "MOUNDED" ON EXTENSION OF LINES.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 10/31/89

Daily Report No. 125

Technician G.L. Swanson

Approved By

WEATHER CONDITIONS AND TEMPERATURE Clear, 25°F - 55°F, no precipitation

EQUIPMENT (1) Grader, (1) water truck, (1) Steel Roller Compactor,

CONSTRUCTION ACTIVITIES "Landmark" continued with conditioning and smoothing the last sections of Clayey Liner material. "Crestliner" continued with Liner Q.C. and repairs.

Clay Conditioning = 3 Lds = 30,000 gallons

OBSERVATIONS

1.) No Geotextile fabric was received

2.) Western Tech. worked on Clayey Q.C. and Liner Q.A. with the inspection of the No. West 2:1 / 3:1 Corner Slope.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-W17

Date 10/31/89

Daily Report No. 99

Technician T. Krake / H Kuebler

Approved By [signature]

WEATHER CONDITIONS AND TEMPERATURE Clear, 26 - 51°, liner surface temp - 30° → 68°F

EQUIPMENT 1-blade, 1-water wagon, 1-compactor

CONSTRUCTION ACTIVITIES Landmark continues with the processing of the clay base material.

Cantlinen continues with their Q.C. and making repairs. Due to lack of cushion material no liner material was placed today.

Q.A. testing was performed on seams S99 to S104 and on panels P98 to P114.

OBSERVATIONS

11 Area were dirt was placed over slimes drain not checked completely due to excess dirt on panels. Material under "skid plate" sheet was checked by Others.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 10-31-89

Daily Report No. 85

Technician HENRY H. SAMPSON JR.

Approved By J S Hamner

WEATHER CONDITIONS AND TEMPERATURE CLEAR- 60°

EQUIPMENT

CONSTRUCTION ACTIVITIES LANDMARK- FINISHED [illegible]ING BOTTOM CLAY- ROLLING CLAY THAT HAS PASSED MOISTURE DENSITY TESTS, [illegible]TING ROAD AROUND PERIMITER OF CELL. CRESTLINER- VACUUM BOX AND TENSILE TESTING, PATCHING, REPAIRING, VISUAL INSPECTION.

OBSERVATIONS

STILL WAITING ON GEO-FABRIC- DISCUSSED PROBLEM AND POSSIBLE CONSEQUENCES WITH DON SPARLING, GARY SWANSON, AND LYNN LAWS.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 11/15/89

Daily Report No. 137

Technician G.L. Swanson

Approved By

WEATHER CONDITIONS AND TEMPERATURE Clear to partly cloudy, Cool 35-55°F, no precipitation

EQUIPMENT (1) Backhoe, H.D.P.E. welding and testing equipment

CONSTRUCTION ACTIVITIES "Crest Liners" ran out of Liner in the am. Crews were involved in tieing in toe along the North dike and bottom. This included some grinding and extruding of "T"-seams where leaks normally occur.

OBSERVATIONS

1.) "Crest" ran out of Liner with 28'x250' still needed.

2.) "Western Tech" was released with the general feeling that "Crest" Liner Q.C. was now adequate.

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 11-15-89

Daily Report No. 100

Technician Henry H. Sampson Jr.

Approved By J. Harris

WEATHER CONDITIONS AND TEMPERATURE CLEAR - COLD

EQUIPMENT

CONSTRUCTION ACTIVITIES CRESTLINERS - DEPLOY LINER ON SLOPE OF CELL 3 DIKE. VACUUM BOX AND TENSILE TESTING, PATCH, REPAIR, AND VISUAL INSPECTION. COMPLETE TIE IN OF WALL TO FLOOR SHEETS ALONG TOE OF CELL 3 DIKE. RAN OUT OF LINER.

LANDMARK - BLADE EAST, SOUTH, AND WEST DIKE ROADS.

OBSERVATIONS

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C-4A-WM

Date 11/15/87

Daily Report No. 110

Technician T. Krake / H Kuebler

Approved By D.C. Swenson

WEATHER CONDITIONS AND TEMPERATURE Clear

EQUIPMENT

CONSTRUCTION ACTIVITIES Western Tech demobilized and left the jobsite. The HDPE liner still has many areas that are in need of repair. The cell slopes have not been completed or checked for defects at this time.

OBSERVATIONS

F-1 CONSTRUCTION ACTIVITIES REPORT

Project No. C4AWM

Date 11/30/89

Daily Report No. 146

Technician G.L. Swanson

Approved By

WEATHER CONDITIONS AND TEMPERATURE Clear, Cool 28°-50°F, no precipitation

EQUIPMENT (1) Loader,

CONSTRUCTION ACTIVITIES "Landmark" completed placing of dirt loads along the pond banks for Liner "blowout" protection per Change order #10. "Landmark" Lynn Laws, "Crest" Don Roberts and I walked the pond Liner for 2½ hours filling in voids in the Q.C. data. Approx. (110) paperwork Corrections were made from this walkthru. A document of our findings was made and signed by the three parties. Following this inspection final acceptance of the liner installation and quality control documentation was signed off. "Crest" is working on the As-built drawings per Paul Anderson. Also, warranty papers are needed.

OBSERVATIONS

Attachment D

Specification No. S-C4AWM
Quality Plan No. QP-C4A-WM
Project No. C4A WM

COMPLIANCE REPORT

Work Area White Mesa Mill Cell 4A Area

Construction Activity Removal of Vegetation, removal of 6" of top soil and preparation of site for dike Construction

Date of Start May 9, 1989

Date of Completion May 16, 1989

Comments On May 9, 1989, Western Engineers surveyed in the "footprint" and original cross-sections of the Cell 4A area. Removal of vegetation and stripping of top soil started on this date and continued thru the day shift of May 16, 1989 with 41,920 cu. yds. of material being removed and placed on the topsoil stockpile. Work continues with excavation of random fill and initial dike construction on May 17, 1989.

(Initial Comments)

Approved **Signatures**

Quality Control Officer A. L. Swanson

Site Manager J Stewart

Specification No. S-C4AWM
Quality Plan No. QP-C4AWM
Project No. C4AWM

COMPLIANCE REPORT

Work Area White Mesa Mill Cell 4A Area

Construction Activity Proof rolling of Dike area "foot print" prior to initial lift of material being laid down.

Date of Start 5/17/89

Date of Completion 5/17/89

Comments Before Construction started on the South dike of Cell 4A, an area between stations 17+00 and 21+00 on the South dike was "Proof-Rolled". This "Proof Rolling" was observed and found to be satisfactory by Q.C. and Q.A. Consultant Henry Sampson. Laying of base course materials started on the same date and has continued in this section of dike.
(Initial Comments)

Approved	Signatures
Quality Control Officer	D. L. Swanson
Site Manager	J Stamnios
On-Site Coordinator	

Specification No. S-C4AWM
Quality Plan No. QP-C4AWM
Project No. C4AWM

COMPLIANCE REPORT

Work Area White Mesa Mill Cell 4 A Area

Construction Activity West Dike, Proof rolling of Dike area "foot print" prior to initial Lift of material being Laid down.

Date of Start 6/5/89

Date of Completion 6/5/89

Comments Before Construction started on the West dike of Cell 4A, an area between stations 27+00 and 34+00 was "Proof-Rolled". This "Proof Rolling" was observed and found to be satisfactory by Q.C. G.L. Swanson & Tom Krake of "Western Tech" and Q.A. Consultant Henry Sampson. Laying of base Coarse materials started on the same date and continued along with some placement on the south dike.
(Initial Comments)

Approved **Signatures**

Quality Control Officer G.L. Swanson

Site Manager J Stamsier

On-Site Coordinator

Specification No. S-C4AWM
Quality Plan No. QP-C4AWM
Project No. C4AWM

COMPLIANCE REPORT

Work Area White Mesa Mill Cell 4A Area

Construction Activity East Dike, Proof Rolling of Dike Area prior to initial Lift of material being laid down.

Date of Start 7/6/89

Date of Completion 7/6/89

Comments Before construction started on the East dike of Cell 4A, an area between stations 9+00 and 14+00 was roughed-up, wetted and "Proof-Rolled". This "Proof Rolling" was observed and found to be Satisfactory by Q.C. G.L. Swanson & Tom Krake and Q.A. Consultant Henry Sampson. Laying of base Course materials started on the same date and continued with placement on South dike.
(Initial Comments)

	Signatures
Approved	
Quality Control Officer	G.L. Swanson
Site Manager	J Stamper
On-Site Coordinator	

Attachment E

Dike Construction

F-3 FILL OBSERVATIO & TESTING

Project No. C-4A-WM

Technician T. Krake / R. Dig

Date 5/18/89

Approved By [illegible]

Daily Report No. 8

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
1	Sta 20+00 80' Lt of CL	5563	110.7	15.2	106.3	12.3	96	Sandy Silt
2	Sta 19+15 60' Lt of CL	5565	114.0	13.5	115.4	11.8	100	Sandy Silt SAND CONE
3	Sta 20+20 On CL (Sandcone)	5566	114.0	12.1 ~~13.5~~ *	111.4	12.1	98	Sandy Silt
4	Sta 17+75 70' Rt. of E	5571	114.0	12.1 ~~13.5~~ *	109.2	11.0	96	Sandy Silt
5	Sta 18+80 20' Lt of E	5566	114.0	12.1 ~~13.5~~ *	112.0	11.0*	98	Sandy Silt
6	Sta 20+80 20' Rt of E	5565	114.0	12.1 ~~13.5~~ *	109.7	15.0*	96	Sandy Silt
5R	Retest of test # 5 (Sand cone)	[illegible]	114.0	12.1 ~~13.5~~ *	110.1	13.1	97	Sandy Silt

SPECIFICATION COMPACTION & MATERIAL

Min 95%, ± 2% moisture*

TYPE AND NUMBER OF EARTH MOVING UNITS [illegible]

TYPE AND NUMBER OF COMPACTION UNITS 1 - [illegible]

NUMBER OF PASSES

THICKNESS OF LIFT 8 → 12"

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATIO & TESTING

Project No. C-4A-WM

Technician T. Krake / F. Dau

Date 6-18-89

Approved By S G Swanson

Daily Report No. 8

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
7	STA 18+60 on E	5567	114.0	~~13.5~~ 12.1 *	113.4	12.9	99	Sandy Silt
8	STA 20+50 40' RHOF E	5565	114.0	~~13.5~~ 12.1 *	111.0	13.0	97	Sandy Silt *

SPECIFICATION COMPACTION & MATERIAL

Min 95%, ±2% Moisture

TYPE AND NUMBER OF EARTH MOVING UNITS 2 - Scrapers

TYPE AND NUMBER OF COMPACTION UNITS 1-Sheep Foot
1-Grader

NUMBER OF PASSES THICKNESS OF LIFT 8-12"

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

~~* Serves as retest of Moisture on Test #6~~

F-3 FILL OBSERVATI(& TESTING

Project No. C-4A-WM

Technician T. Krake / R. Day

Date 6/1/89

Approved By [illegible]

Daily Report No. 17A + B

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
54	Sta 22+40 50' Rt of ℄ (Sandcone)	5574	112.0	14.7	114.2	12.9	100	Sandy Silt
55	Sta 19+00 30' Lt of ℄	5575	112.0	14.7	108.3	12.7	97	Sandy Silt
56	Sta 16+00 40' Lt of ℄	5577	112.0	14.7	111.0	16.7	99	Sandy Silt
57	Sta 21+70 65' Lt of ℄ (Sandcone)	5573	112.0	14.7	118.0	13.9	100	Sandy Silt
58	Sta 19+00 ON ℄	5575	112.0	14.7	108.4	15.4	97	Sandy Silt
59	Sta 24+40 40' Rt of ℄	5573	112.0	14.7	110.8	14.2	99	Sandy Silt
60	Sta 27+00 ON ℄	5572	112.0	14.7	109.2	13.1	98	Sandy Silt

SPECIFICATION COMPACTION & MATERIAL

Min Den - 95%, ±2% Moisture

TYPE AND NUMBER OF EARTH MOVING UNITS 2 - Scrapers

TYPE AND NUMBER OF COMPACTION UNITS 2 - Compactors

NUMBER OF PASSES THICKNESS OF LIFT 8-12"

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATI(& TESTING

Project No. C-9A-WM

Technician R. Day

Date 6-1-89

Approved By A L Swanson

Daily Report No. 17B

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
61	Sta 25+60 30' Lt. of ℄	5573	112.0	14.7	111.0	12.8	99	Sandy Silt
62	Sta 18+40 50' Rt. of ℄	5575	112.0	14.7	107.9	13.8	96	Sandy Silt

SPECIFICATION COMPACTION & MATERIAL
min. Den 95%, ± 2% moisture

TYPE AND NUMBER OF EARTH MOVING UNITS 2- Scrapers

TYPE AND NUMBER OF COMPACTION UNITS 1- Compactor

NUMBER OF PASSES THICKNESS OF LIFT 8-12"

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATI[illegible] & TESTING

Project No. C-4A-WM

Technician T. Krake

Date 6/15/89

Approved By [illegible]

Daily Report No. 27A, 27B

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
169	Sta 16+50 30' Rt	5580	113.3	13.6	109.0	12.2	96	Silty Sand
170	Sta 28+20 20' Rt	5580	113.3	13.6	116.2	13.2	100	Silty Sand
171	Sta 27+50 40' Lt	[illegible]	[illegible]	[illegible]	107.4	13.0	100	Clayey Sand
172	Sta [illegible] 50' Lt	[illegible]	113.3	13.6	109.2	11.8	96	Silty Sand
172	STA [illegible]	5581	113.3	13.6	114.7	11.7	100	Silty Sand
173	STA 29+60 30' LT of CL	5579	113.3	13.6	119	12.7	100	Silty Sand
174	STA 31+50 20' LT of CL	5577	113.3	13.6	118.2	12.2	100	Silty Sand

SPECIFICATION COMPACTION & MATERIAL
Min 15" lift, ±2" moisture

TYPE AND NUMBER OF EARTH MOVING UNITS [illegible], 2 sheepsfoot
1-blade, 2 water wagons

TYPE AND NUMBER OF COMPACTION UNITS 2 sheepsfoot

NUMBER OF PASSES THICKNESS OF LIFT

METHOD OF ADDING MOISTURE [illegible]

☑ FILL TESTED MEETS SPECIFICATIONS.
☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.
☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATI[illegible] & TESTING

Project No. C-4A-WM

Technician J Sinchez

Date [illegible]-15-89

Approved By [illegible]

Daily Report No. 27B

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
175	STA 27+10 30' LT of CL (Rd)	5582	113.3	13.6	113.7	[illegible]	100	Silty Sand
176	STA 27+20 30' LT of CL	5582	113.3	13.6	108.[illegible]	15.2	95	Silty Sand
177	STA 29+00 30' LT of CL	5581	113.3	13.6	115.5	11.6	100	Silty Sand
178	STA 32+00 ON ~~[illegible]~~ of CL	5580	113.3	13.6	118.5	13.4	100	Silty Sand
179	STA 34+50 ON CL	5580	113.3	13.6	115.9	12.5	100	Silty Sand
180	STA 30+20 10' RT of CL	5581	113.3	13.6	112.8	12.0	99	Silty Sand
181	Sta 27+00 on CL (Sand Core)	5582	113.3	13.6	105.9	11.1*	94	Silty Sand

SPECIFICATION COMPACTION & MATERIAL
Min 95% Den, 12% moisture

TYPE AND NUMBER OF EARTH MOVING UNITS 2 scrapers, 1 blade

TYPE AND NUMBER OF COMPACTION UNITS 2 sheep foot
2 water wagon

NUMBER OF PASSES THICKNESS OF LIFT

METHOD OF ADDING MOISTURE Spray

☐ FILL TESTED MEETS SPECIFICATIONS.

☑ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) 181
AND SHOULD BE REMOVED OR REWORKED.

☑ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVAT. N & TESTING

Project No. C-4A-WM

Technician T. Krake

Date 7/5/89

Approved By Gary L Swanson

Daily Report No. 39A

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
314	Sta 26+00 20'R+ F9	5589	116.0	13.2	110.8	15.1	96	Silty Sand w/sandstone
315	Sta 22+00 20 R+ F8	5590	116.0	13.2	111.1	13.9	96	"
316	Sta 24+00 on CL F7	5591	116.0	13.2	110.1	11.9	95	"
317	Sta 21+90 on CL F8	5590	116.0	13.2	112.0	16.4 *	97	"
318	Sta 19+90 on CL F9	5589	116.0	13.2	109.9	11.9	95	"
317R	Retest of 317	5590	116.0	13.2	114.1	14.6	98	"
319	Sta 16+10 20'R+ F10	5588	116.0	13.2	120.0	11.3	100+	"

SPECIFICATION COMPACTION & MATERIAL
Min Den - 95%, ± 2% Moisture

TYPE AND NUMBER OF EARTH MOVING UNITS 3 - Scrapers

TYPE AND NUMBER OF COMPACTION UNITS 2 - Compactors

NUMBER OF PASSES THICKNESS OF LIFT

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVA .ON & TESTING

Project No. C-4A-WM

Technician H. Koehler

Date 7/5/89

Approved By [signature]

Daily Report No. 39A, 39B

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
320	Sta 18+00 20' Rt Fb	5592	116.0	13.2	115.4	12.0 ✓	99 ✓	silty sand w/sandstone
321	Sta 25+50 20' L/CL Sand Cone Fb	5592	116.0	13.2	124.3	12.9 ✓	100+ ✓	"
322	Sta 16+00 10 L/CL Sand Cone FID	5588	116.0	13.2	116.2	12.5 ✓	100 ✓	"
323	Sta 24+75 CL Sand Cone FL	5592			109.2	7.6 *		silt
324R	Retest of 323 Sand Cone Fb	5592			120.3	8.4 *		silt
325	Sta 15+75 20' L/CL Sand Cone FID	5588	116.0	13.2	113.3	14.9 ✓	98 ✓	silty sand w/sandstone

SPECIFICATION COMPACTION & MATERIAL

Min Den 95%, ±2% M/C

TYPE AND NUMBER OF EARTH MOVING UNITS 3 Scrapers

TYPE AND NUMBER OF COMPACTION UNITS 1 Sheepfoot

NUMBER OF PASSES

THICKNESS OF LIFT

METHOD OF ADDING MOISTURE Spray

☐ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

* = approved by Henry Samson (SA) HSA

F-3 FILL OBSERVAT N & TESTING

Project No. C-4A-WM

Technician T. Krake | H Kuebler

Date 7/14/85

Approved By D. L. Swanson

Daily Report No. 47A

TEST NO.	LOCATION		DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
388	Sta 5+00 on CL	SC	5595	114.6	13.5	116.6	11.6	100	clayey sand
389	Sta 6+00 5' Rt	SC	5596	114.6	13.5	117.2	12.2	100	"
390	Sta 7+00 5' Lt	SC	5596	114.6	13.5	118.9	12.1	100	"
391	Sta 8+10 on CL		5595	114.6	13.5	113.8	14.5	99	"
392	Sta 9+00 5' Rt		5595	114.6	13.5	115.4	11.6	100	"
393	Sta 6+50 5' Lt	F-1	5597	114.6	13.5	112.8	15.4	98	"
394	Sta 8+50 on CL	F-1	5597	114.6	13.5	115.8	13.2	100	"

SPECIFICATION COMPACTION & MATERIAL

Min Den - 95%, ±2% Moisture

TYPE AND NUMBER OF EARTH MOVING UNITS 2 - Scrapers

TYPE AND NUMBER OF COMPACTION UNITS 1 - Compactor

NUMBER OF PASSES **THICKNESS OF LIFT**

METHOD OF ADDING MOISTURE Spray

- ☑ FILL TESTED MEETS SPECIFICATIONS.
- ☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) AND SHOULD BE REMOVED OR REWORKED.
- ☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATION & TESTING

Project No. C-4A-WM

Technician H Kuebler

Date 7-14-89

Approved By G. L. Swanson

Daily Report No. 47-B

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
395	Sta 12+75 on CL F-1	5597	114.6	13.5	122.6	12.6	100	Clayey/Sand

SPECIFICATION COMPACTION & MATERIAL

TYPE AND NUMBER OF EARTH MOVING UNITS

TYPE AND NUMBER OF COMPACTION UNITS

NUMBER OF PASSES THICKNESS OF LIFT

METHOD OF ADDING MOISTURE

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

Clay Liner Construction

F-3 FILL OBSERVA. ON & TESTING

Project No. C-4A-WM

Technician T Krake

Date 9/1/89

Approved By [illegible]

Daily Report No. 56A

TEST NO.	LOCATION	DEPTH OR ELEVATION* (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
416	Sta 26+00, Sta 30+00 B1	100	111.4	15.7	106.0	11.3*	95	Lean Clay
417	Sta 26+25, Sta 32+00 D1	100	111.4	15.7	109.7	11.0*	98	Lean Clay
418	Sta 26+00, Sta 33+00 E1	100	111.4	15.7	110.5	7.0*	99	Lean Clay
419	Sta 26+00, Sta 35+00 G1	100	111.4	15.7	112.1	7.4*	100	Lean Clay
420								

SPECIFICATION COMPACTION & MATERIAL

Den - 95% min, Moisture -1 to +3%*

TYPE AND NUMBER OF EARTH MOVING UNITS 1-Scraper

TYPE AND NUMBER OF COMPACTION UNITS 1-Sheepsfoot

NUMBER OF PASSES THICKNESS OF LIFT 1'

METHOD OF ADDING MOISTURE Spray

☐ FILL TESTED MEETS SPECIFICATIONS.

☒ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) 416, 417, 418, 419, AND SHOULD BE REMOVED OR REWORKED.

☒ CONTRACTOR ADVISED

OBSERVATIONS

* 100 = Top of Clayey Material

F-3 FILL OBSERVATION & TESTING

Project No. C-4A-WM

Technician T Krake

Date 9/6/89

Approved By D L Swanson

Daily Report No. 58

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
416R	Retest of 416	100	111.4	15.7	110.0	15.7	99	Lean Clay
417R	Retest of 417	100	111.4	15.7	108.8	16.7	98	Lean Clay
418R	Retest of 418	100	111.4	15.7	111.3	14.8	100	Lean Clay

SPECIFICATION COMPACTION & MATERIAL

Min. Den. 95%, Moisture -1 → +3%

TYPE AND NUMBER OF EARTH MOVING UNITS 2-Scrapers

TYPE AND NUMBER OF COMPACTION UNITS 1-Compactor

NUMBER OF PASSES THICKNESS OF LIFT 12"

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATION & TESTING

Project No. C-4A-WM

Technician T. Krake / H Kuebler

Date 10/11/89

Approved By [signature]

Daily Report No. 83

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
455	C4 E. Side S.C.	5563.5	111.4	15.7	113.4	16.2	100	Lean Clay
456	E4 E. Side S.C.	5564.5	111.4	15.7	110.3	16.6	99	Lean Clay
457	J4 S.C.	5566.5	111.4	15.7	117.6	14.8	100	Lean Clay
458	J5 Center	5567.5	111.4	15.7	105.9	16.8	95	Lean Clay
459	J6 N. Side	5568.5	111.4	15.7	108.9	17.3	98	Lean Clay
460	J7 S. Side	5569.0	111.4	15.7	108.0	15.6	97	Lean Clay
461	J8 Center	5570.0	111.4	15.7	111.8	15.3	100	Lean Clay

SPECIFICATION COMPACTION & MATERIAL

Min Den - 95%, Moisture -1% to +3%

TYPE AND NUMBER OF EARTH MOVING UNITS 1-Scraper

TYPE AND NUMBER OF COMPACTION UNITS 1-Compactor

NUMBER OF PASSES THICKNESS OF LIFT 12"

METHOD OF ADDING MOISTURE

Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATION & TESTING

Project No. C-4A-WM

Technician T. Krake / H. Kuebler

Date 11/1/89

Approved By G. Swanson

Daily Report No. 100

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
549	I 14 Center (S.C)	5574	101.0	20.2	103.0	22.1	100	lean clay 102
550	H 14 W. side (S.C)	5573	101.0	20.2	107.5	20.9	100	lean clay 106.4
551	G 14 Center	5572.5	101.0	20.2	97.2	21.1	96	lean clay
552	F 14 E. Side	5572.5	101.0	20.2	99.1	20.5	98	lean clay
553	E 14 Center	5571.5	101.0	20.2	101.0	20.9	100	lean clay
554	I 15 Center	5574.5	101.0	20.2	98.4	23.0	97	lean clay
555	H 15 Center	5574	101.0	20.2	101.5	23.0	100	lean clay 101.5

SPECIFICATION COMPACTION & MATERIAL

Min Den - 95%, Moisture -1% to +3%

TYPE AND NUMBER OF EARTH MOVING UNITS 1 - blade

TYPE AND NUMBER OF COMPACTION UNITS 1 - compactor

NUMBER OF PASSES THICKNESS OF LIFT 12"

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

F-3 FILL OBSERVATION & TESTING

Project No. C-4A-WM

Technician T. Krake / H Kuebler

Date 11/1/89

Approved By [signature]

Daily Report No. 100

Small Section of dike in Northeast Corner to allow anchoring of Liner

TEST NO.	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY MAXIMUM DRY DENSITY (pcf)	LABORATORY OPTIMUM MOISTURE CONTENT (%)	FIELD DRY DENSITY (pcf)	FIELD MOISTURE CONTENT (%)	PERCENT COMPACTION	SOIL TYPE
556	Sta 1+25 on CL	5605	101.0	20.2	98.4	22.0	97	Lean Clay
557	Sta 0+75 5' Rt	5606	101.0	20.2	98.6	21.0	98	Lean Clay

SPECIFICATION COMPACTION & MATERIAL

Min Den - 95%, Moisture ±2%

TYPE AND NUMBER OF EARTH MOVING UNITS 1- Scraper

TYPE AND NUMBER OF COMPACTION UNITS 1- Compactor

NUMBER OF PASSES THICKNESS OF LIFT 12"

METHOD OF ADDING MOISTURE Spray

☑ FILL TESTED MEETS SPECIFICATIONS.

☐ FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S)
AND SHOULD BE REMOVED OR REWORKED.

☐ CONTRACTOR ADVISED

OBSERVATIONS

Attachment F

Dike Construction

F-4 SOIL SAMPLING LOG

SAMPLE NO. 78

PROJECT NO. C-4A-WM

DATE 7/13/89

DELIVERED TO LABORATORY

SAMPLED BY J Krake

DATE 7/13/89

Q.C. G.L. Swanson

LOCATION Sta 33+00 off grade

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Silty Sand

INTENDED USE Dike Construction

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, P.I.

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

WORKSHEET

TECHNICIAN: T. Kraky
PROJECT NO: C-4A-WM
APPROVED BY: [illegible]
DATE 7/13/89

SAMPLE NO. 28
VISUAL DESCRIPTION: Silty Sand

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED					16.7	51.2
DRY WT. PASSING					1007.9	973.4
% OF TOTAL PASSING					98.4	95.0
					W% =	

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	1127.1	1024.0
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	85.8 / 91.9	938.8 / 932.7	91.7 / 91.0
16	103.7	920.9	90.
30 (40)	128.1 / 165.6	896.5 / 859	88 / 84
50	268.4	756.2	74
100	513.7	510.9	50
200	751.7	272.9	27
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH	675.5			
WT. DRY SOIL AND DISH	614.2			
WT. DISH				
WT. OF DRY SOIL	614.2	= W		
% MOISTURE	10.0			

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____
DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____ % SAND _____ % CLAY-SILT _____ %. STORAGE LOCATION _____

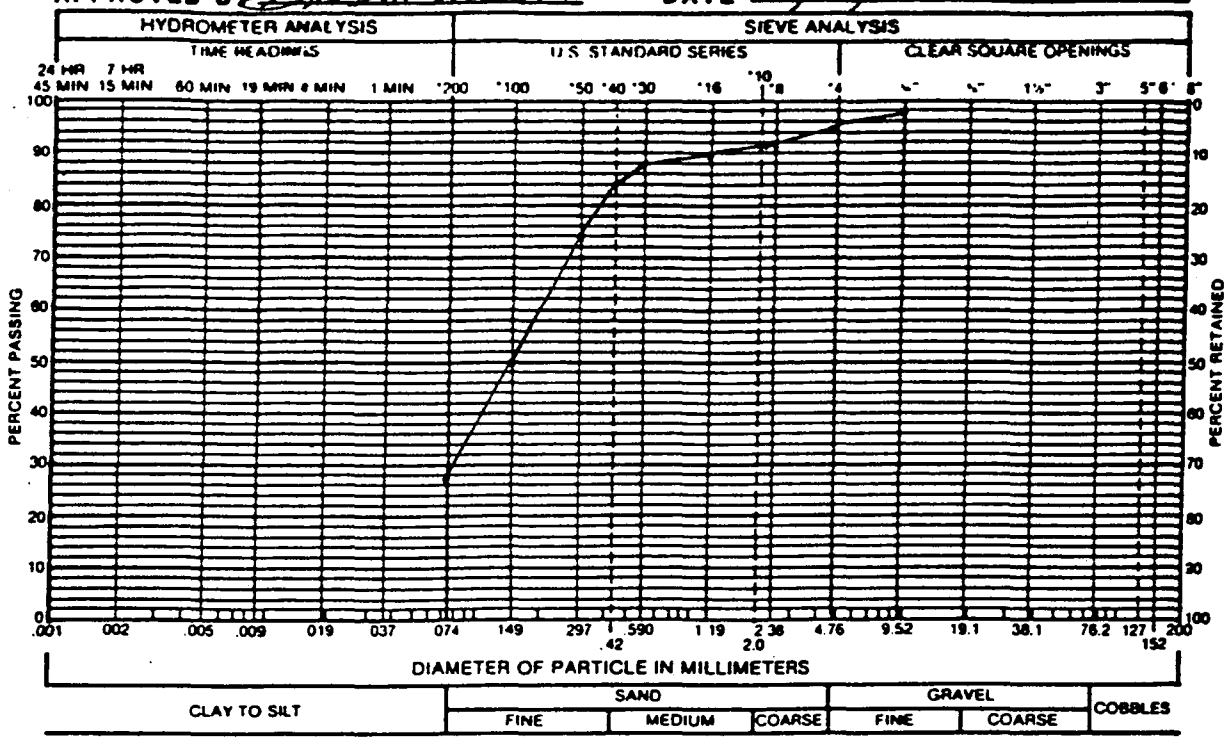
* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

C-2-79

F-12 GRADATION TEST RESULTS

TECHNICIAN T. Kraky PROJECT NO. C-4A-WM

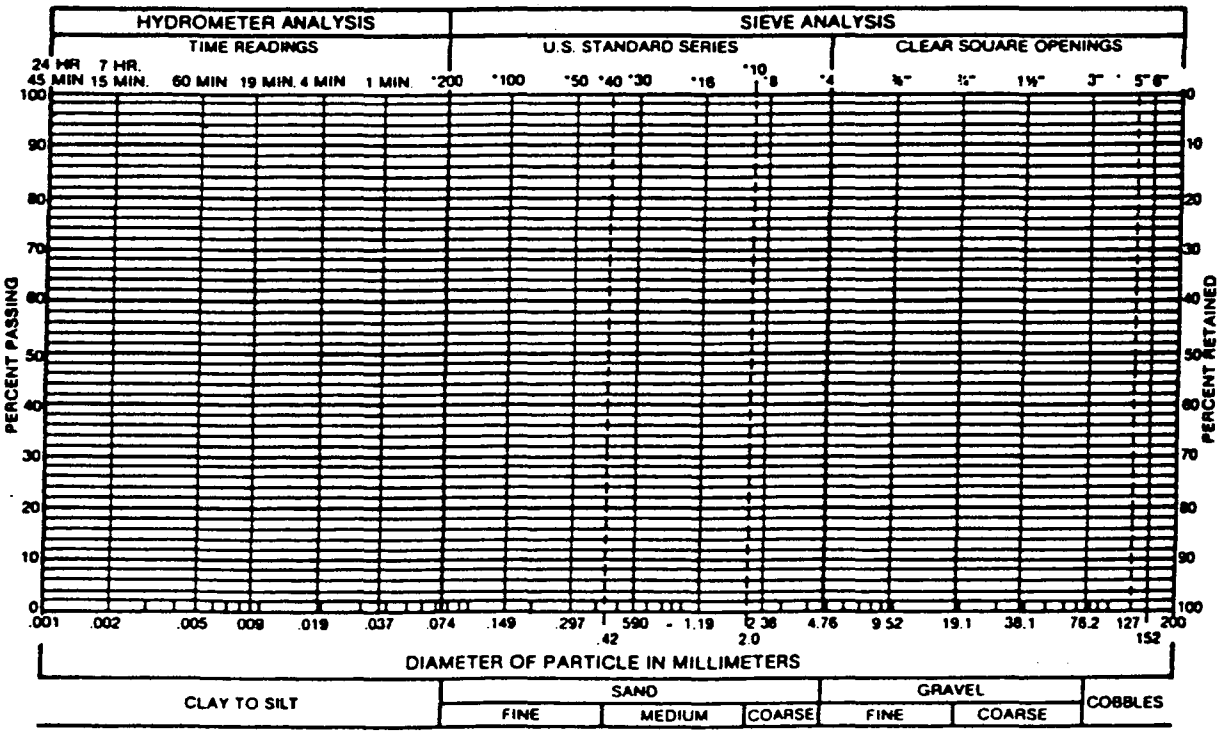
APPROVED BY L. L. Swanson DATE 2/13/89



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Silty Sand FROM Sta 33+00



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN H. Kuebler PROJECT NO. C-4A-WM
APPROVED BY [illegible] DATE 7/13/89

SAMPLE NO. 78
SAMPLE DESCRIPTION Silty Sand COLOR

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS		
DISH NO.		
WT. OF WET SOIL & DISH		
WT. OF DRY SOIL & DISH		
WT. OF DISH		
WT. OF WATER		
WT. OF DRY SOIL		
WATER CONTENT		

Cannot be rolled

10 taps before sized Tests

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL _____
PLASTIC INDEX, PI _____ ← Nonplastic

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

REMARKS:

F-4 SOIL SAMPLING LOG

SAMPLE NO. 60

PROJECT NO. C-4A-WM

DATE 7/5/89

DELIVERED TO LABORATORY

SAMPLED BY V Krake
P.C. Hanson

DATE 7/5/89

LOCATION Sta 22+00 off grade
(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk
(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Silty Clayey Sand

INTENDED USE Dike Construction
(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, PI, Proctor
(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

SOIL/AGGREGATE - MOISTURE DENSITY RELATIONS

#60

Job No. C-4A-WM

Lab./Invoice No.

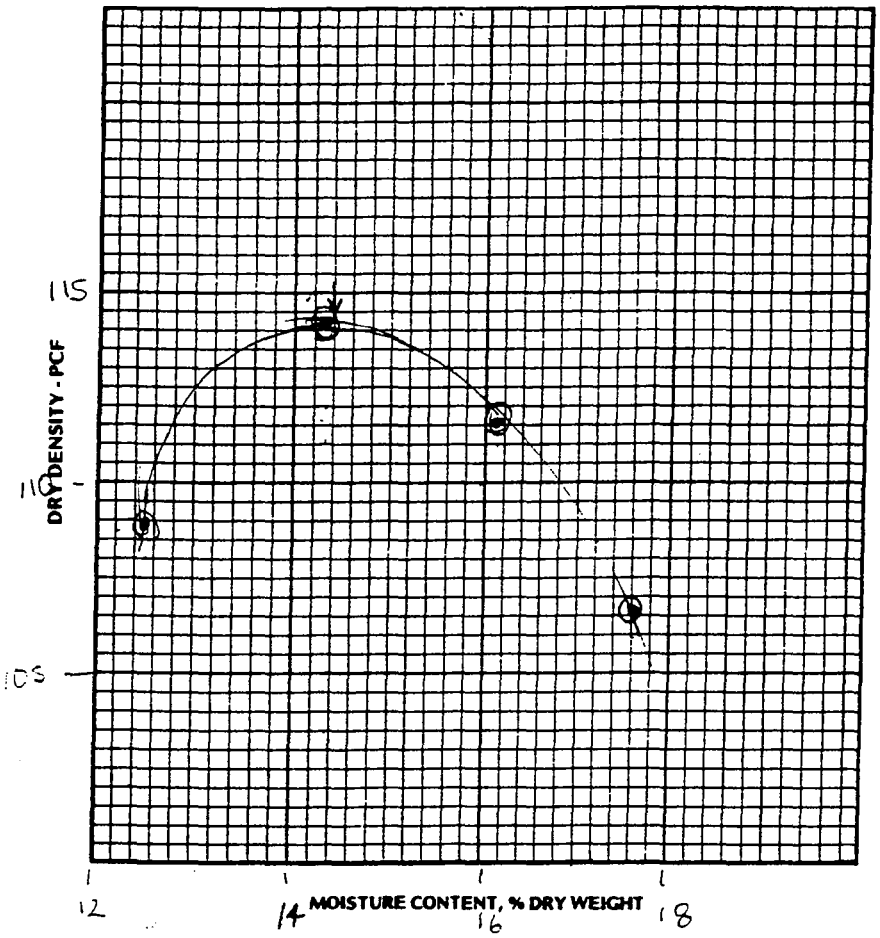
Type of Material Silty Clayey Sand — Sampled By TK — Date 7-5-89

Source of Material Sta 22+00 — Submitted By — Date

Test Procedure D698 — Tested/Calc. By H Kuebler — Date 7-6-89

Reviewed By [illegible] — Date 7/7/89

Trial No.	1	2	3	4	5	6	7
Water, estimated %							
Water, cc	50	100	0	150			
Wt. Sample + Mold	6200	6188	6078	6124			
Wt. Mold	4227	4227	4227	4227			
Wt. Wet Sample, gm	1973	1961	1851	1897			
Wt. Wet Sample, lbs.	4.35	4.32	4.08	4.18			
Wet Density, pcf	130.5	129.6	122.4	125.4			
Moisture Sample, wet	304.0	267.0	268.2	312.4			
Moisture Sample, Dry	266.0	230.0	238.5	265.6			
Wt. Moisture	38.0	37.0	29.7	46.8			
Moisture, %	14.3	16.1	12.5	17.6			
Dry Density, pcf	114.2	111.6	108.8	106.6			



Max. Dry density, pcf 114.3

Optimum Moisture Content, % 14.4

Diameter of Mold, in. 4inch

Height of Mold, in. 4.584

No. of Layers 3

Blows per Layer 25

Wt. of Hammer, lbs. 5.5.

Height of Drop 12inch

Material Used #4 material

WESTERN TECHNOLOGIES INC.

WORKSHEET

TECHNICIAN: T. Krake
PROJECT NO: C-4A-WM
APPROVED BY: L. L. Swanson
DATE 7/5/85

SAMPLE NO. 60
VISUAL DESCRIPTION: Silty Clayey Sand

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED						17.4
DRY WT. PASSING						378.0
% OF TOTAL PASSING						98.1
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	1010.0	895.4
RETAINED ON NO. 4	_____	_____
PASSING NO. 4	_____	_____

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	48.1 / 54.2	874.3 / 841.2	99.6 / 93.9
16	67.6	827.8	92.5
30 (40)	87.7 / 110.0	807.7 / 735.4	90.2 / 88
50	152.9	742.5	83
100	253.7	641.7	72
200	461.1	434.3	49
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH	330.4			
WT. DRY SOIL AND DISH	280.5			
WT. DISH				
WT. OF DRY SOIL		= W		
% MOISTURE	17.8			

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____
DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____ % SAND _____ % CLAY-SLIT _____ %. STORAGE LOCATION _____

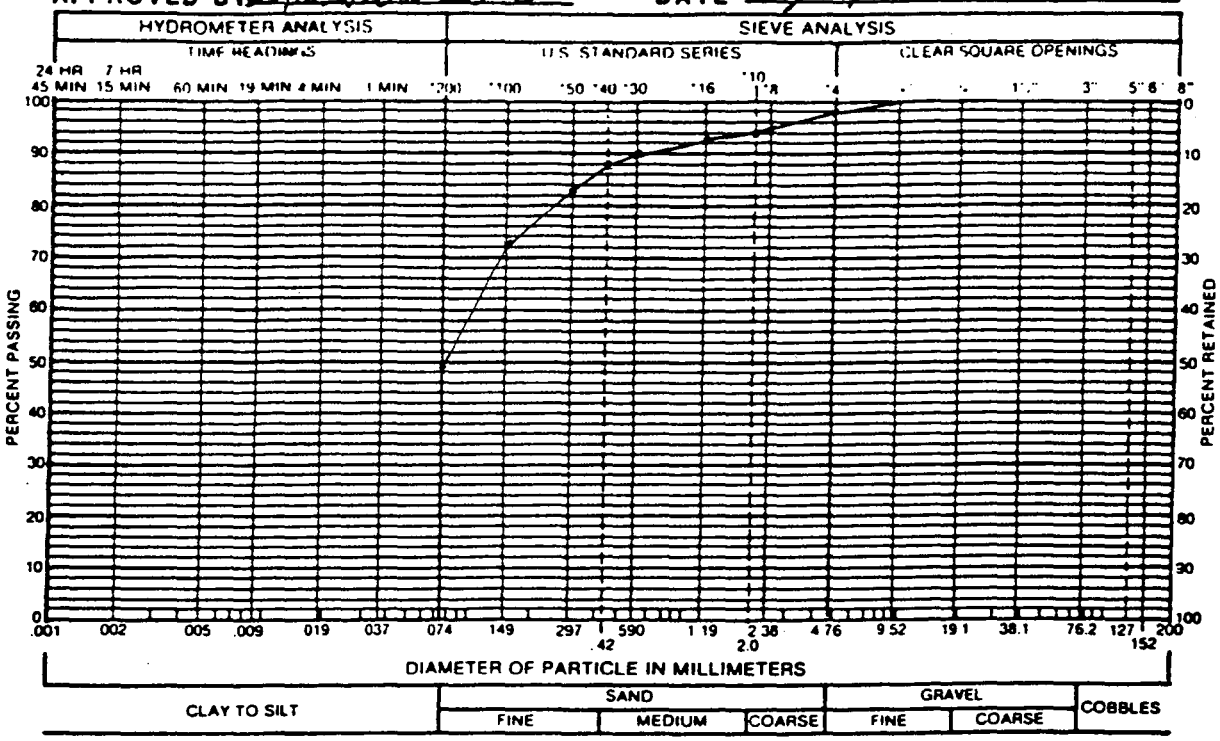
* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

CA-2-79

F-12 GRADATION TEST RESULTS

TECHNICIAN T. Krake PROJECT NO. C-4A-WM

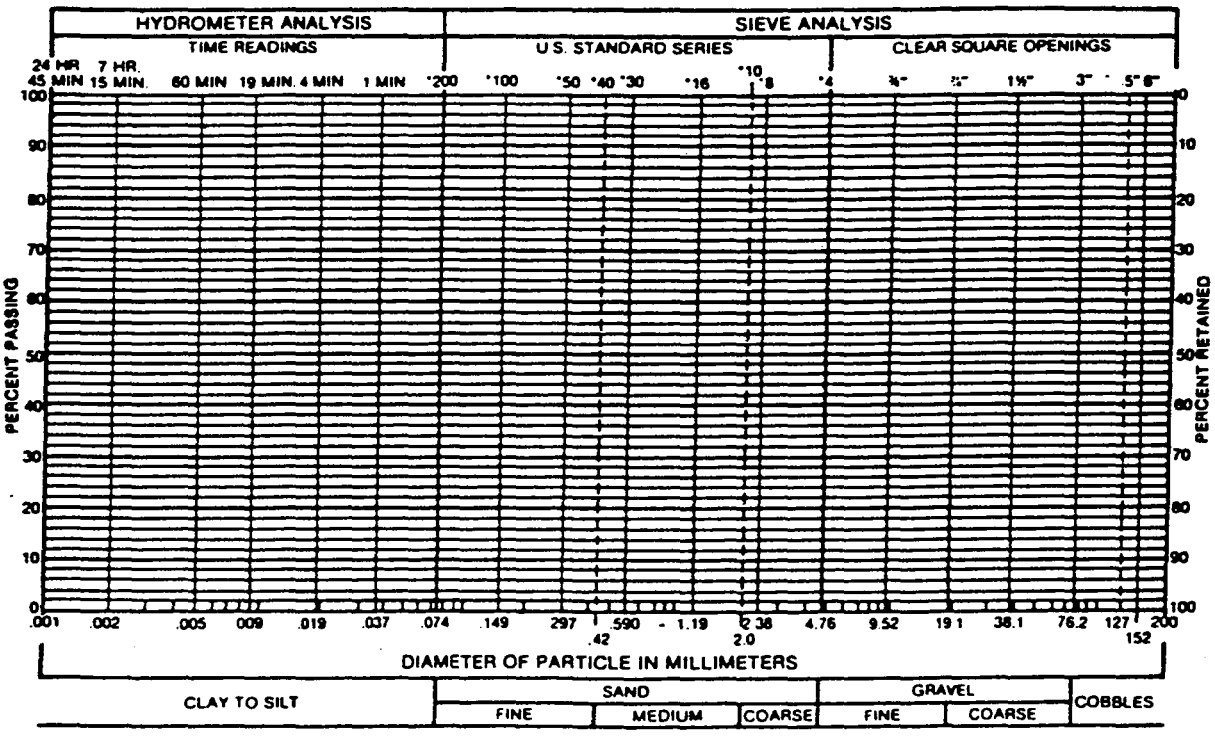
APPROVED BY H. L. Swanson DATE 7/5/89



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Silty Clayey Sand FROM Sta 22+00



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN H Knobler PROJECT NO. C-4A-WM
APPROVED BY [illegible] DATE 7/5/89

SAMPLE NO. 60
SAMPLE DESCRIPTION Silty Clayey Sand COLOR Red-tan

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS	—	20
DISH NO.	17	19
WT. OF WET SOIL & DISH	11.00	20.90
WT. OF DRY SOIL & DISH	10.61	19.10
WT. OF DISH	7.60	10.79
WT. OF WATER	.39	1.80
WT. OF DRY SOIL	3.01	8.31
WATER CONTENT	13.0	21.7

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

.97X LIQUID LIMIT, LL 21
PLASTIC INDEX, PI 8 ok

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

REMARKS: _____

F-4 SOIL SAMPLING LOG

SAMPLE NO. 33

PROJECT NO. C-4A-WM

DATE 6/15/89

DELIVERED TO LABORATORY

SAMPLED BY T Krake
Q.C. D.L. Swanson

DATE 6/15/89

LOCATION Sta 27+00 off grade
(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk
(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Clayey Sand

INTENDED USE Dike Construction
(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, P.I., L.L.
(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

WORKSHEET

TECHNICIAN: J. Sanchez PROJECT NO: C-4A-WM

APPROVED BY: [signature] DATE 6/15/89

SAMPLE NO. 33

VISUAL DESCRIPTION: Clayey Sand

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN					0.0	0.0
DRY WT. RETAINED					37.0	9[illegible]
DRY WT. PASSING					849.1	788.1
% OF TOTAL PASSING					95.8	89
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	957.9	886.1
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	108 / 149	778.1 / 737.1	88 / 83
16	173	713.1	80
30 (40)	249 / 275	637.1 / 611.1	72 / 69
50	306	580.1	65
100	377	509.1	57
200	577	309.1	35
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH	1287.5			
WT. DRY SOIL AND DISH	1191.4			
WT. DISH	0.0			
WT. OF DRY SOIL	1191.4	_____ = W		
% MOISTURE	8.1			

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____

DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

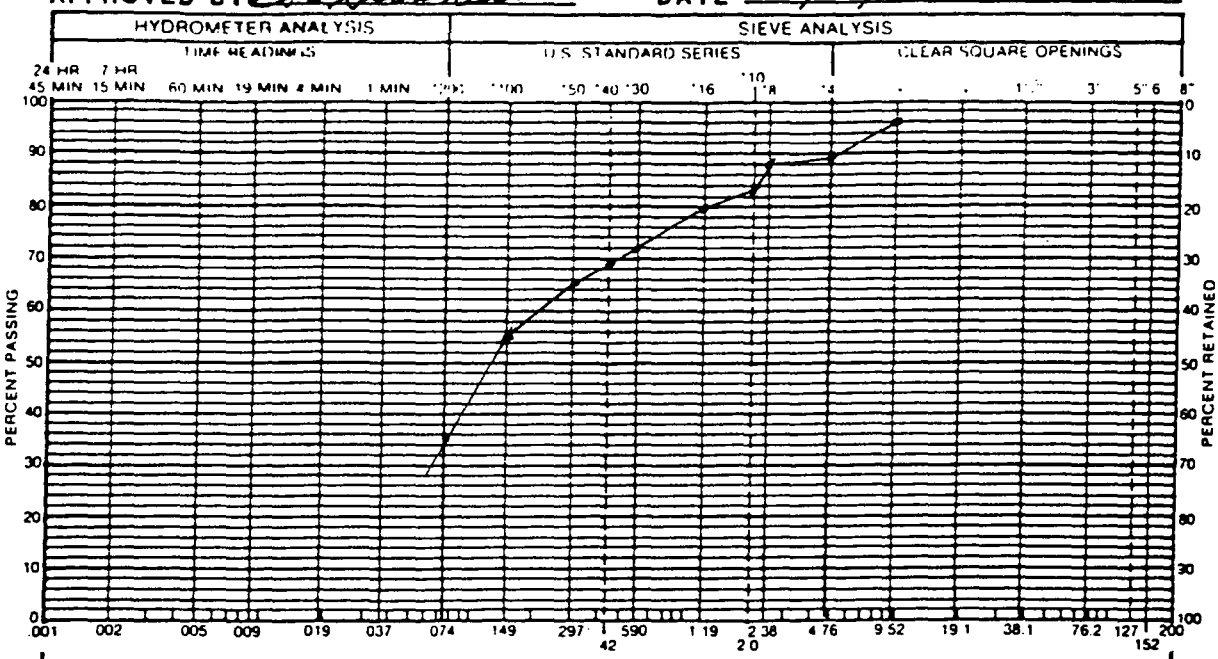
GRAVEL _____ % SAND _____ % CLAY-SLIT _____ %. STORAGE LOCATION _____

* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

F-12 GRADATION TEST RESULTS

TECHNICIAN T. Krakye PROJECT NO. C-4A-WM

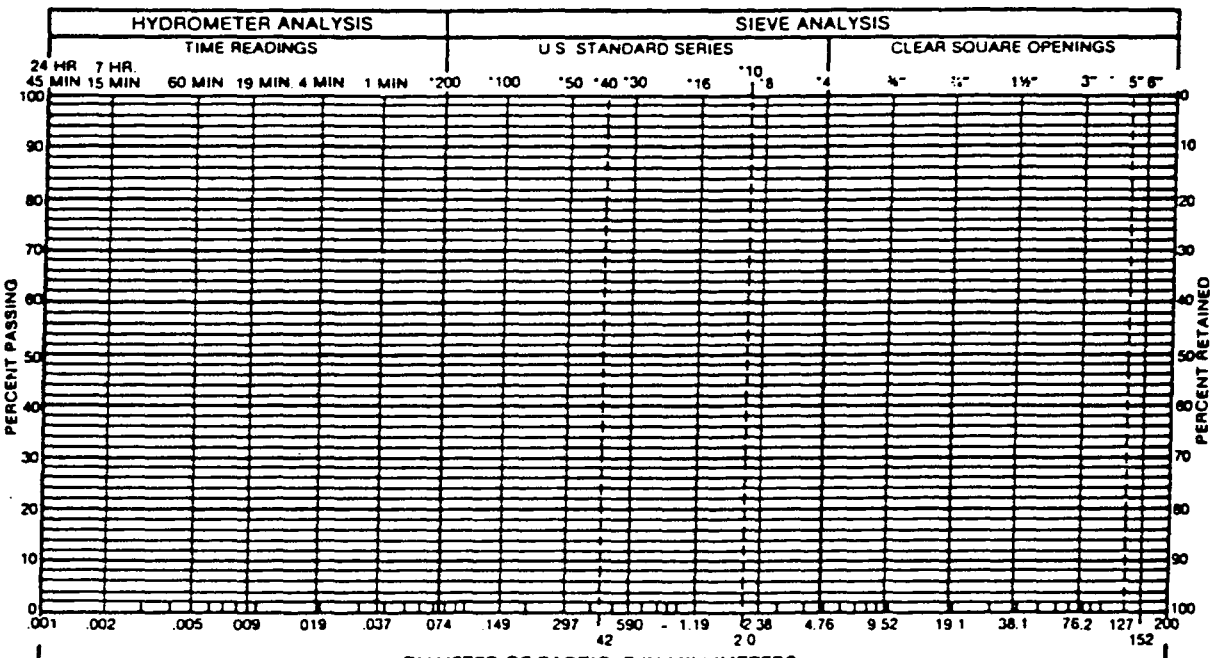
APPROVED BY [illegible] DATE 6/15/89



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Clayey Sand FROM Sta 27+00



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN: T Krabe PROJECT NO. C-4A-WM
APPROVED BY: [illegible] DATE 6/15/89

SAMPLE NO. 33
SAMPLE DESCRIPTION Clayey Sand COLOR

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS		20
DISH NO.	14	
WT. OF WET SOIL & DISH	18.21	41.72
WT. OF DRY SOIL & DISH	17.60	39.19
WT. OF DISH	13.03	29.31
WT. OF WATER	.61	2.53
WT. OF DRY SOIL	4.57	9.88
WATER CONTENT	13.3	25.6

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL 25
PLASTIC INDEX, PI 12

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

REMARKS:

F-4 SOIL SAMPLING LOG

SAMPLE NO. 15

PROJECT NO. C-4A-WM

DATE 6/1/89

DELIVERED TO LABORATORY

SAMPLED BY T. Krake

DATE 6/1/89

P.C. Swanson

LOCATION Sta 20+00 off grade

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Sandy Silt

INTENDED USE Dike Construction

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Proctor, Sieve, P.I.

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

SOIL/AGGREGATE - MOISTURE DENSITY RELATIONS

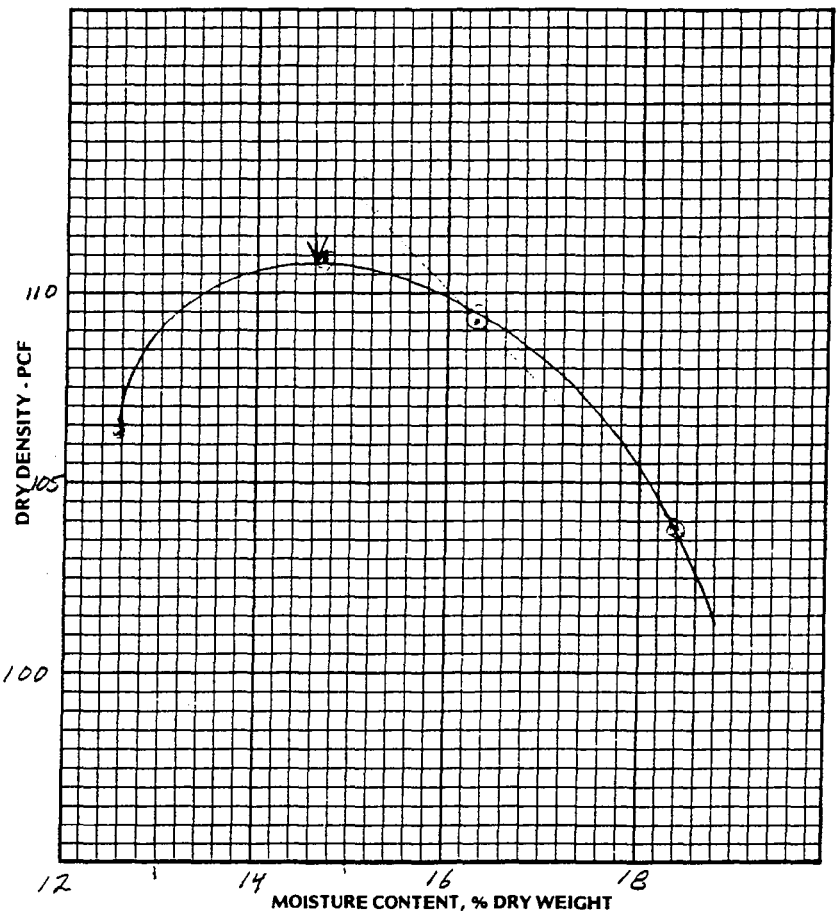
C-4A-WM
#15

Job No. _____

Lab./Invoice No. _____

Type of Material: Sandy Silt
Sampled By: _____ Date: _____
Source of Material: Sta 20+00
Submitted By: _____ Date: _____
Test Procedure: D-698 A
Tested/Calc. By: Randy Day Date: 6-1-89
Reviewed By: H. Swanson Date: 6/6/89

Trial No.	1	2	3	4	5	6	7
Water, estimated %							
Water, cc	50	100	150	0			
Wt. Sample + Mold	6151	6148	6086	6038			
Wt. Mold	4227	4227	4227	4227			
Wt. Wet Sample, gm	1924	1921	1859	1811			
Wt. Wet Sample, lbs.	4.242	4.235	4.098	3.992			
Wet Density, pcf	127.2	127.1	122.9	119.8			
Moisture Sample, wet	324.5	344.0	352.5	316.4			
Moisture Sample, Dry	283.0	295.9	297.6	281.1			
Wt. Moisture	41.5	48.1	54.9	35.3			
Moisture, %	14.7	16.3	18.4	12.6			
Dry Density, pcf	110.9	109.3	103.8	106.4			



Max. Dry density, pcf: 110.9
Optimum Moisture Content, %: 14.6

Diameter of Mold, in.: 4
Height of Mold, in.: 4.584
No. of Layers: 3
Blows per Layer: 25
Wt. of Hammer, lbs.: 5.5
Height of Drop: 12

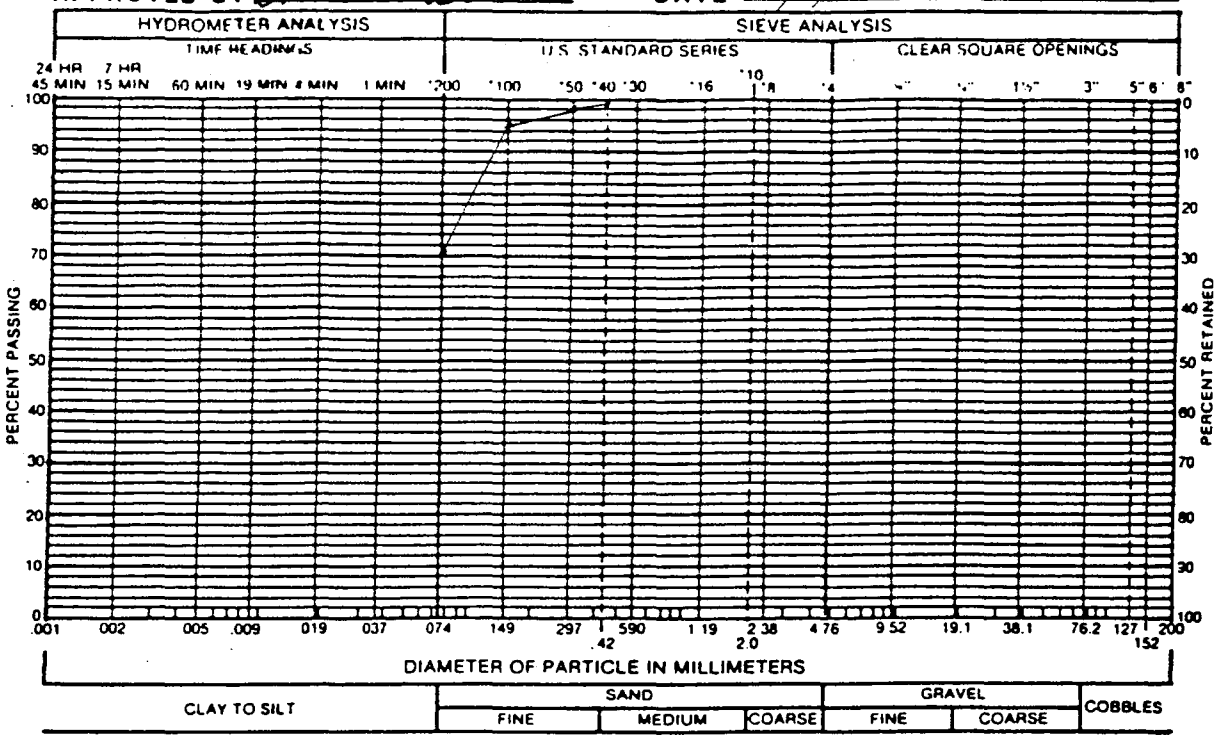
Material Used: - #4

WESTERN TECHNOLOGIES INC.

F-12 GRADATION TEST RESULTS

TECHNICIAN R. Day PROJECT NO. C-4A-WM

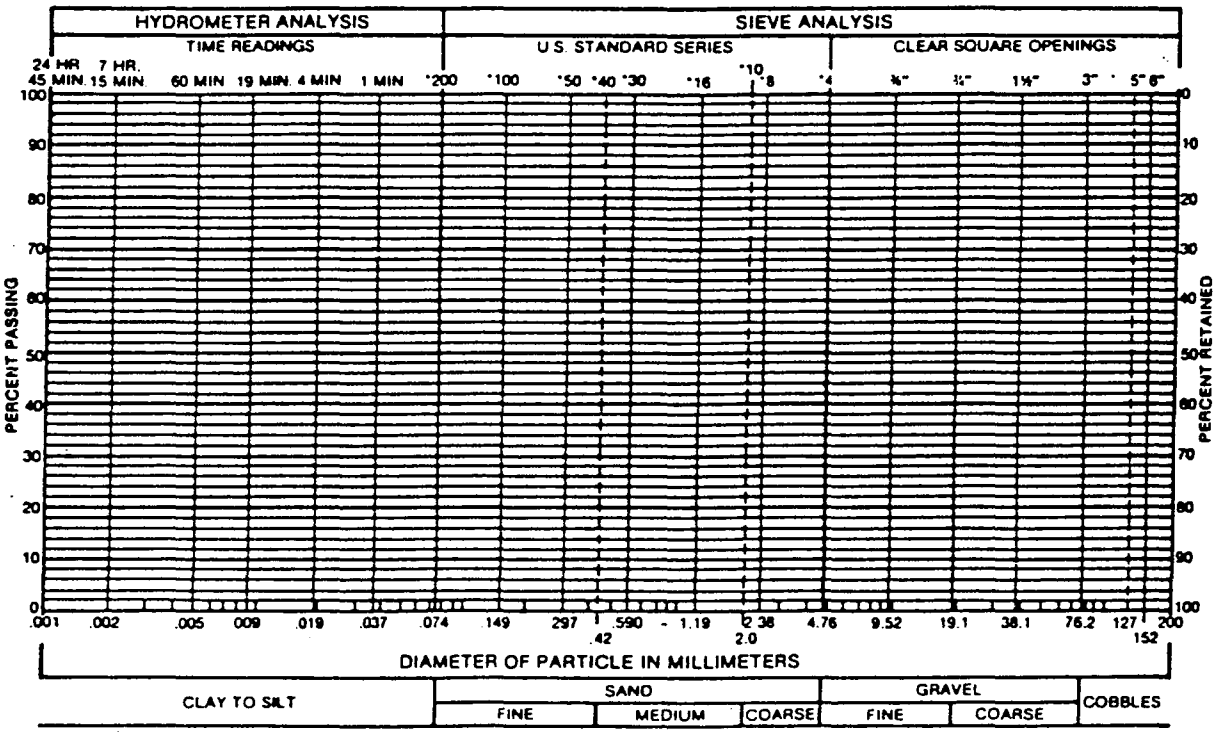
APPROVED BY [illegible] DATE 6/1/89



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Sandy Silt FROM Sta 20+00



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

WORKSHEET

TECHNICIAN: R. Day
APPROVED BY: [signature]
PROJECT NO: C-4A-WM
DATE: 6/1/89

SAMPLE NO. 15
VISUAL DESCRIPTION: Sandy Silt

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED				0	0	0
DRY WT. PASSING				766.6	766.6	766.6
% OF TOTAL PASSING				100	100	100
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	878.5	766.6
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	1.1 / 2.0	765.5 / 764.6	99.8 / 99.7
16	3.3	763.3	99.6
30 (40)	7.0 / 8.9	759.6 / 757.7	99.1 / 98.8
50	12.7	753.9	98.3
100	33.1	723.5	95.7
200	224.5	542.1	71
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH	674.4			
WT. DRY SOIL AND DISH	588.3			
WT. DISH	0.0			
WT. OF DRY SOIL	588.3	= W		
% MOISTURE	14.6			

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____
DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____ % SAND _____ % CLAY-SLIT _____ %. STORAGE LOCATION _____

* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN: Drake PROJECT NO. C-4A-WM
APPROVED BY: [illegible] DATE: 4/1/89

SAMPLE NO. 15
SAMPLE DESCRIPTION: Sandy Silt COLOR: Red

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS	—	25
DISH NO.		19
WT. OF WET SOIL & DISH		30.01
WT. OF DRY SOIL & DISH		27.05
WT. OF DISH		10.79
WT. OF WATER	NP	2.96
WT. OF DRY SOIL		16.26
WATER CONTENT		18.2

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL 18
PLASTIC INDEX, PI NP

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

MARKS: _____

F-4 SOIL SAMPLING LOG

SAMPLE NO. 7

PROJECT NO. C-4A-WM

DATE 5/22/89

DELIVERED TO LABORATORY

SAMPLED BY JK

DATE

Q.C. M. Swanson

LOCATION Sta 17+00 Off Grade Approx elv 5570

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Sandy Silt

INTENDED USE Dike Construction

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, P.I

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

WORKSHEET

TECHNICIAN: T. Krake PROJECT NO: C-4A-WM
APPROVED BY: L L Swanson DATE 2/22/89

SAMPLE NO. 7
VISUAL DESCRIPTION: Sandy Silt

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED					0	0
DRY WT. PASSING					620.0	620.0
% OF TOTAL PASSING					100	100
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	—	620.0
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

FACTOR = W%/W = _____ = _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	0 / 0	620.0 / 620.0	100 / 100
16	1.1	618.9	99.8
30 (40)	1.5 / 10.1	618.5 / 609.9	99.8 / 98.4
50	17.6	602.4	97.2
100	55.7	564.3	91.0
200	292.3	327.7	53
PAN			—
TOTAL			—

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH				
WT. DRY SOIL AND DISH				
WT. DISH				
WT. OF DRY SOIL		_____ = W		
% MOISTURE				

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____
DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____% SAND _____% CLAY-SILT _____%. STORAGE LOCATION _____

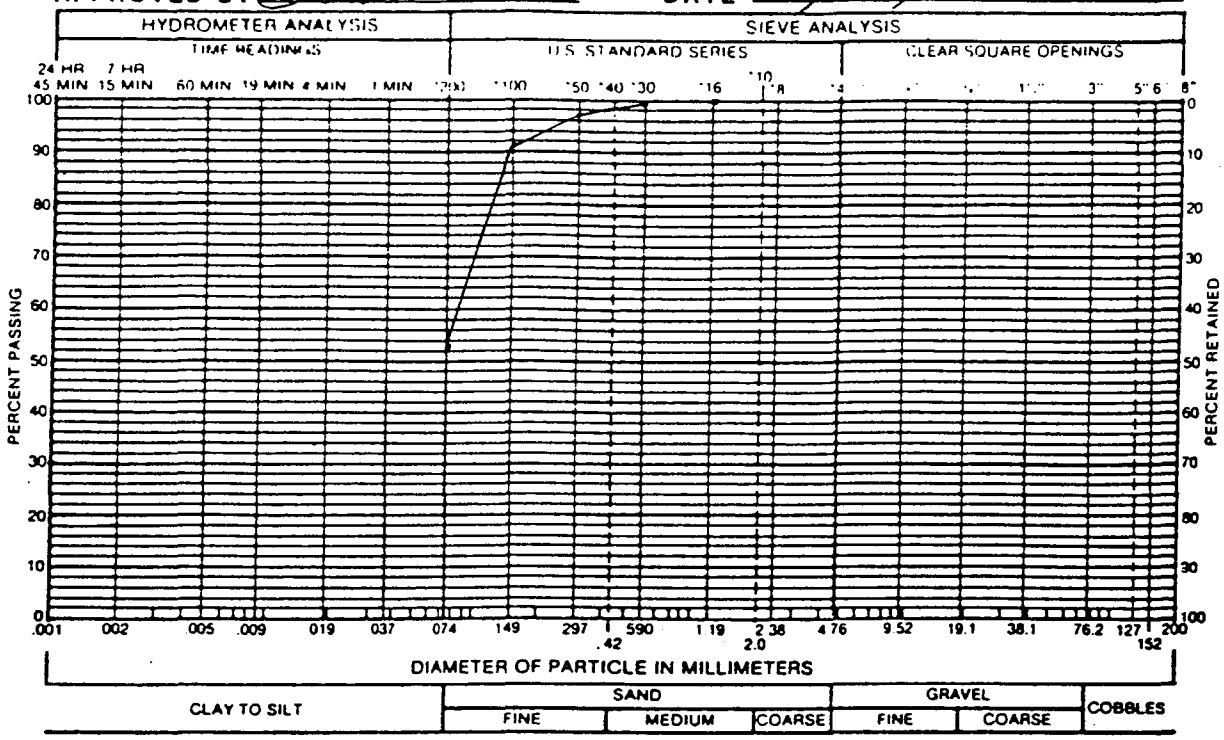
* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

CA-2-79

F-12 GRADATION TEST RESULTS

TECHNICIAN T Krake PROJECT NO. C-4A-WM

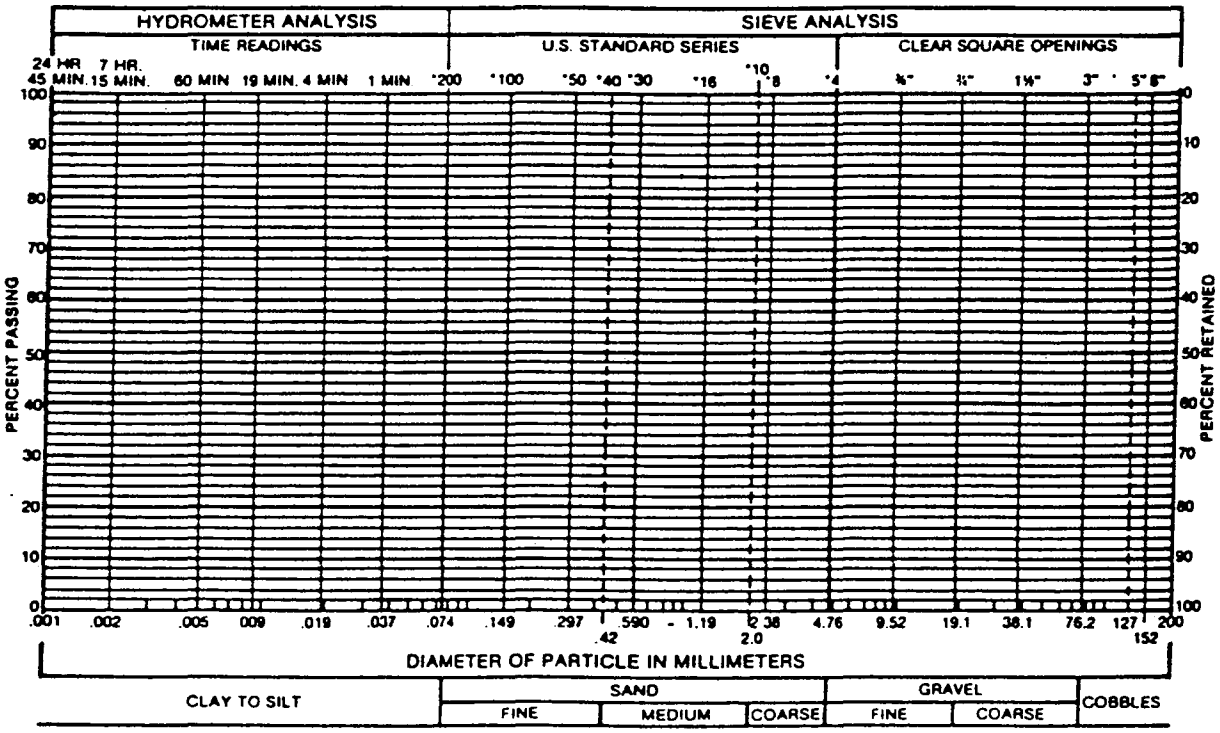
APPROVED BY L Thurnson DATE 5/22/89



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT 21 % PLASTICITY INDEX NP %

SAMPLE OF Sandy Silt FROM Sta 14 17+00



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN T. Krake PROJECT NO. C-4A-WM
PPROVED BY _____ DATE 5/22/89

SAMPLE NO. 7
SAMPLE DESCRIPTION _____ COLOR _____

ATTERBERG LIMITS	PL	LL
PREP. DISH _____	RUN BY _____	
NO. OF BLOWS	—	30
DISH NO.	19	10
WT. OF WET SOIL & DISH		28.77
WT. OF DRY SOIL & DISH		25.79
WT. OF DISH	10.82	11.54
WT. OF WATER	NP	2.98
WT. OF DRY SOIL		14.25
WATER CONTENT		20.9

-200	
RUN BY _____	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL 21
PLASTIC INDEX, PI NP

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY _____	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY _____	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

MARKS: _____

F-4 SOIL SAMPLING LOG

SAMPLE NO. 6

PROJECT NO. C-4A-W 1.7

DATE 5/19/87

DELIVERED TO LABORATORY

SAMPLED BY T. Krake

DATE 5/19/87

Q.C. S.L. Swanson

Daily Report No. 8

LOCATION Sta 13+00 on ℄ as dumped

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-6"

SAMPLE TYPE Bulk

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

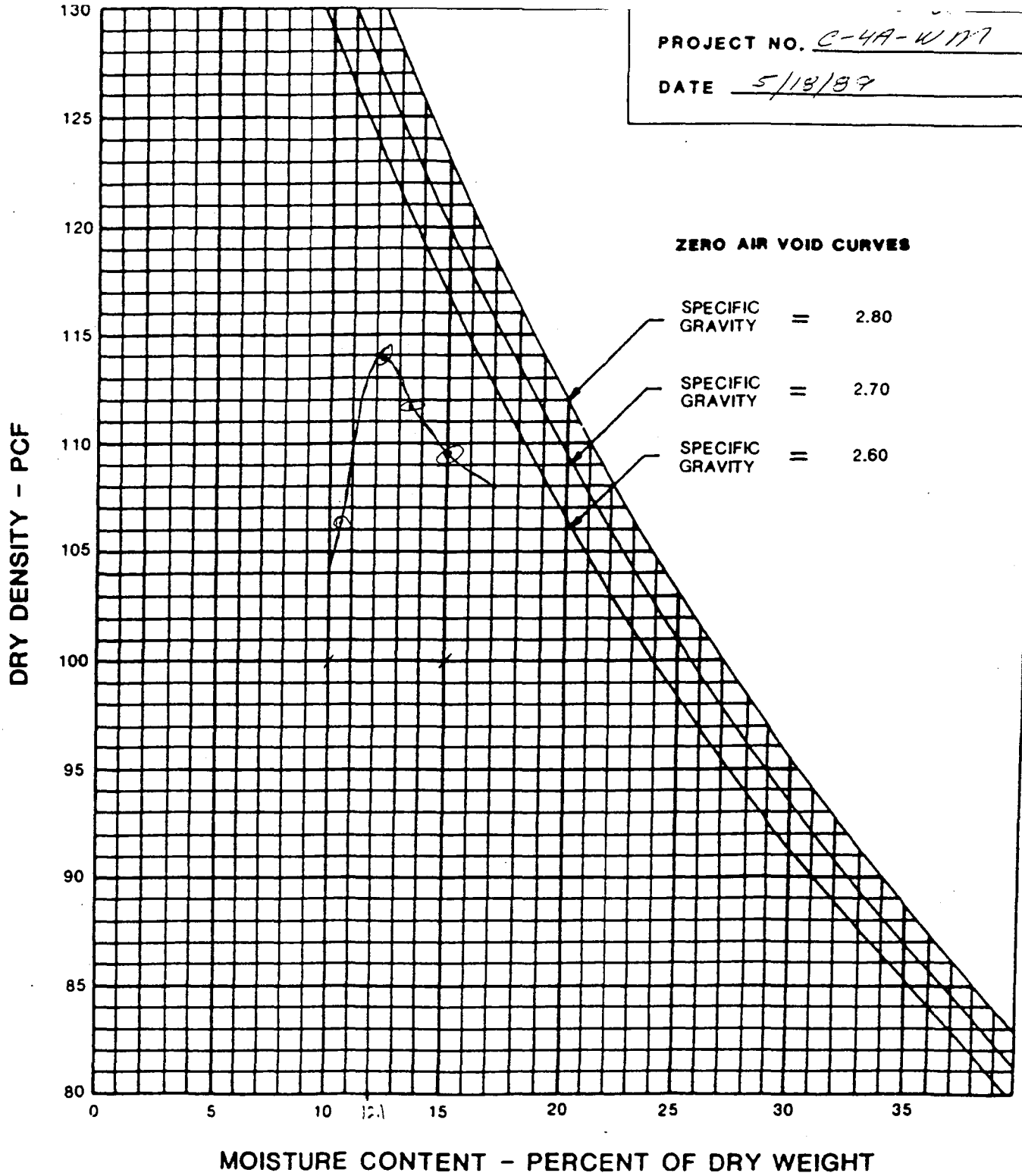
VISUAL CLASSIFICATION Sandy Silt

INTENDED USE Dike Construction

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Proctor

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)



LOCATION : Sta 18+00 ON CL	F-8 MOISTURE-DENSITY RELATIONSHIPS - 1
SAMPLE NO:	
MATERIAL DESCIPTION: Sandy SILT (12.1)	
MAX. DRY DENSITY : 114.0 PCF OPT. MOIST. CONTENT : 13.5 %	PROCEDURE: D 698 A
LIQUID LIMIT : PLASTICITY INDEX :	TECHNICIAN: T Page
GRAVEL : % SAND : % SILT AND CLAY (-200) : %	APPROVED BY: L Stevenson

TECHNICIAN. T Krake PROJECT NO. C-414-[illegible]
APPROVED BY [illegible] DATE 5/12/87

SAMPLE NO. Sta 18+00 on ℄ as dumped
SAMPLE DESCRIPTION Sandy Silt COLOR Lt Red
ASTM D 698-78 ☑ ASTM D 1557-78 ☐ METHOD: (A) B C D OTHER

TEST DATA

POINT NUMBER	1	2	3	4	5	6	7
WT. OF SOIL AND TARE							
AMOUNT OF ADDED WATER, WT.							
WT.OF SOIL, WATER & TARE							
AMOUNT OF WATER ADDED, VOL.	200	150	100				
WT. OF MOLD AND WET SOIL	13.54	13.57	13.23	13.51			
WT. OF MOLD	9.31						
WT.OF WET SOIL	4.23	4.26	3.92	4.20			
WET DENSITY PCF	126.9	127.8	117.8	126.0			
DISH NUMBER							
WT. OF DISH AND WET SOIL							
WT. OF DISH AND SOIL							
WT. OF DISH							
WT. OF WATER							
WT. OF DRY SOIL							
MOISTURE CONTENT %	13.5	12.1	10.6	15.0			
DRY DENSITY PCF	111.8	114.0	106.3	107.6			

AT WHICH POINT WAS SOIL PUMPING ? #1

AT WHICH POINT WAS SOIL BLEEDING ? _____

OPTIMUM MOISTURE CONTENT 13.5 %

MAXIMUM DRY DENSITY 114.0 pcf

ROCK CORRECTION DATA
(WEIGHTS ARE PER POINT)

+#4 _____ %= _____ lb.

-#4 _____ %= _____ lb.

100%= _____ lb.

COMMENTS: _____

F-4 SOIL SAMPLING LOG

SAMPLE NO. 1

PROJECT NO. C-4A-WM

DATE 5/10

DELIVERED TO LABORATORY

SAMPLED BY JK

DATE 5/10/89

LOCATION sta 15+00 180' N of S. Dike

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 1' below stripped material

SAMPLE TYPE Bulk sample

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION [illegible]

INTENDED USE Dike Construction

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, P.I., [illegible]

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

WORKSHEET

TECHNICIAN Tom Kraus PROJECT NO. C-4A-WM
APPROVED BY [illegible] DATE 5/15/89

SAMPLE NO. Sta 15+00 180'N of South Dike
SAMPLE DESCRIPTION Sandy Silty Clay COLOR
ASTM D 698-78 ☑ ASTM D 1557-78 ☐ METHOD: (A) B C D OTHER

TEST DATA

POINT NUMBER	1	2	3	4	5	6	7
WT. OF SOIL AND TARE							
AMOUNT OF ADDED WATER, WT.							
WT.OF SOIL, WATER & TARE							
AMOUNT OF WATER ADDED, VOL.	150	200	250	300			
WT. OF MOLD AND WET SOIL	6020.5	6097.9	6153.3	6219.1			
WT. OF MOLD	4221.0						
WT.OF WET SOIL	1799.5	1873.9	1931.3	1998.1			
WET DENSITY PCF	119.1	124.2	127.8	132.4			

DISH NUMBER							
WT. OF DISH AND WET SOIL	237.5	253.0	218.7	202.7			
WT. OF DISH AND SOIL	213.1	223.0	199.5	176.7			
WT. OF DISH ? →	—						
WT. OF WATER	24.4	30.0	29.2	32.3			
WT. OF DRY SOIL ? →	213.1	223.0	199.5	176.7			

MOISTURE CONTENT %	11.5	13.5	15.4	17.4			
DRY DENSITY PCF	106.8	109.4	110.7	106.8			

AT WHICH POINT WAS SOIL PUMPING ? _____

AT WHICH POINT WAS SOIL BLEEDING ? _____

OPTIMUM MOISTURE CONTENT 15.4 %

MAXIMUM DRY DENSITY 110.7 pcf

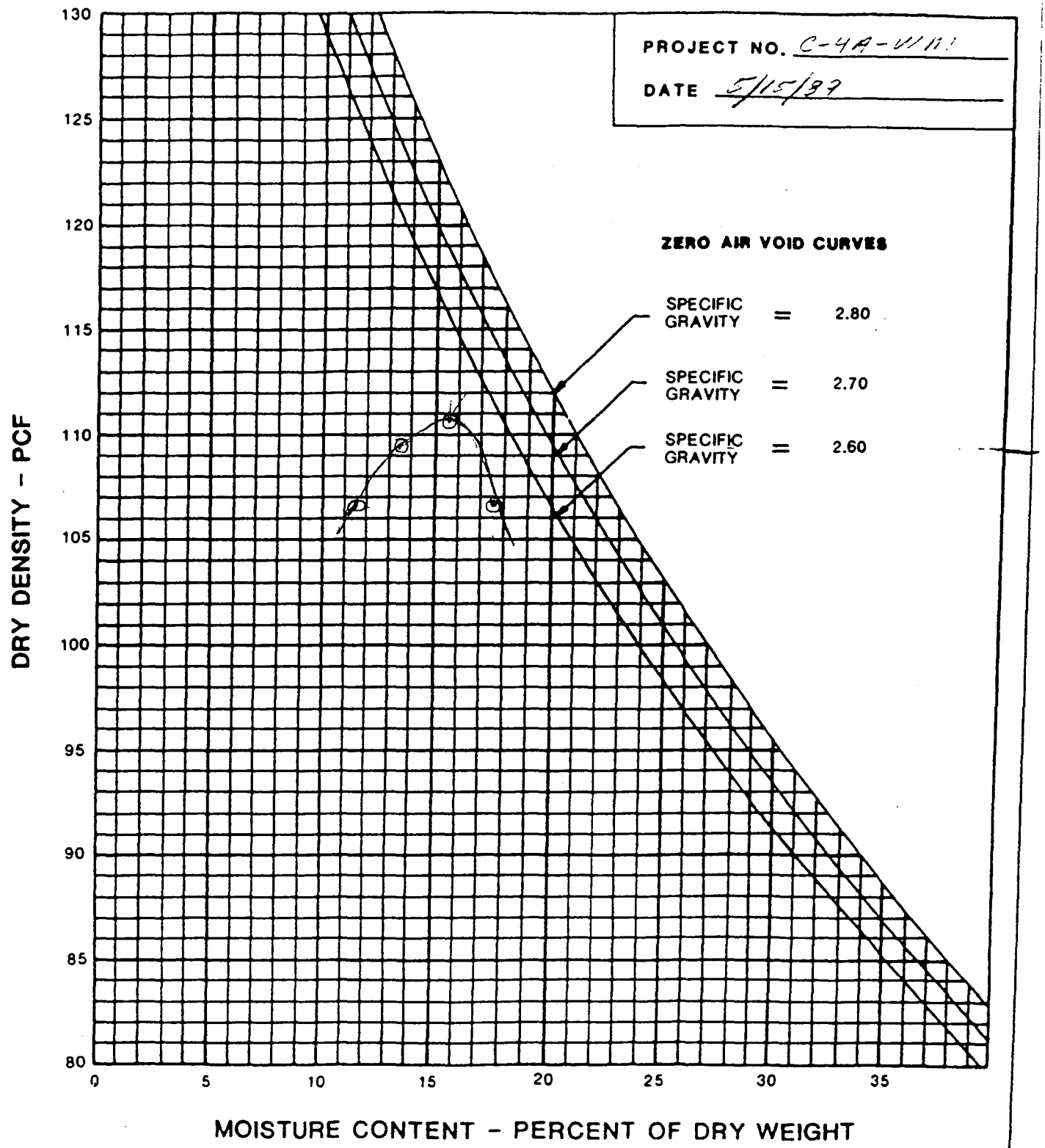
ROCK CORRECTION DATA
(WEIGHTS ARE PER POINT)

+#4 _____ %= _____ lb.

-#4 _____ %= _____ lb.

100%= _____ lb.

COMMENTS: _____



LOCATION : Sta 15+00 180' N of South Dike	F-8 MOISTURE-DENSITY RELATIONSHIPS - 1
SAMPLE NO:	
MATERIAL DESCIPTION: Sandy Silty Clay	
MAX. DRY DENSITY 110.7 PCF OPT. MOIST. CONTENT : 15.4 %	PROCEDURE: D698 A
LIQUID LIMIT : 26 PLASTICITY INDEX : 8	TECHNICIAN: Tom Krake
GRAVEL : % SAND : % SILT AND CLAY (-200) : %	APPROVED BY:

XIII

WORKSHEET

TECHNICIAN: Tom Kirake PROJECT NO: C-4A-WM

APPROVED BY: [illegible] DATE 5/10/89

SAMPLE NO. Sta 15+00 180' N of South Dike

VISUAL DESCRIPTION: Silty Sandy Clay

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE					0	0
WT. OF PAN					0	0
DRY WT. RETAINED					0	0
DRY WT. PASSING						
% OF TOTAL PASSING					100	100
	W% = 5.6					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	959.2	903.3
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	0 / 0.3	100 / 908.0	100 / 100
16	1.6	906.7	99.8
30 (40)	5.6 / 8.9	901.7 / 899.4	99.4 / 99
50	13.2	895.1	98.5
100	32.4	875.9	96.4
200	285.8	622.5	68.5 ✓
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH				
WT. DRY SOIL AND DISH				
WT. DISH				
WT. OF DRY SOIL		= W		
% MOISTURE				

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT: _____

DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____ % SAND _____ % CLAY-SLIT _____ %. STORAGE LOCATION _____

* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

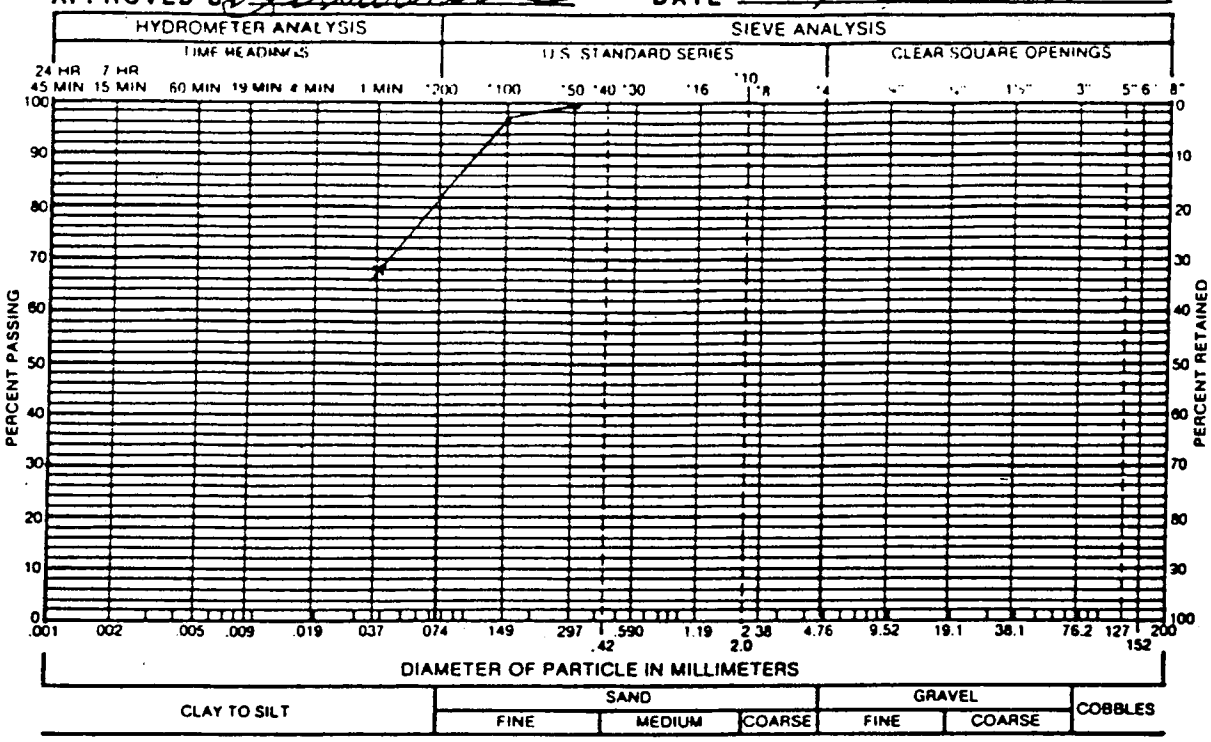
CA-2-79

Miss Flow
-200

F-12 GRADATION TEST RESULTS

TECHNICIAN Tom Krake PROJECT NO. C-4A-WM

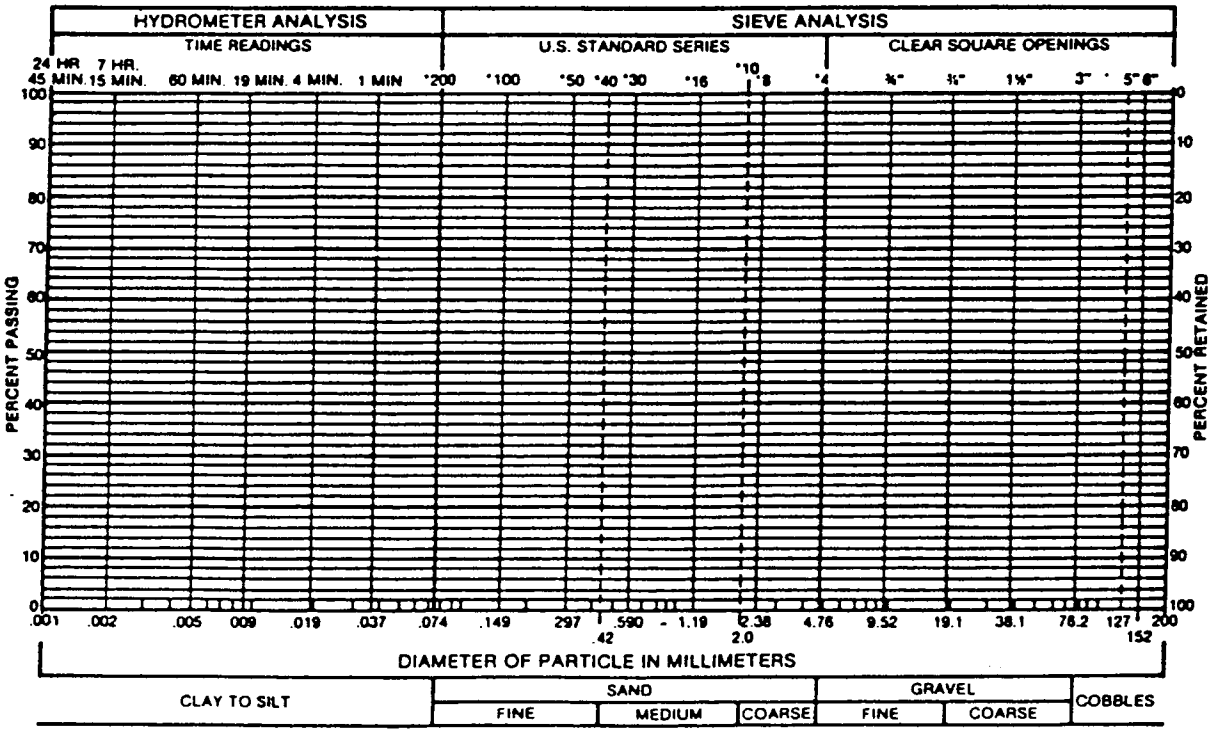
APPROVED BY [illegible] DATE 5/15/99



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Silty Sandy Clay FROM Sta 15+00



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

OK

TECHNICIAN: Tom Keake PROJECT NO. C-4A-WM
APPROVED BY: [illegible] DATE: 5/10/89

SAMPLE NO. Sta 15+00 180' N of South Dike
SAMPLE DESCRIPTION Sand Silty Clay COLOR Lt Red

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY LW	
NO. OF BLOWS	—	26
DISH NO.	19	18
WT. OF WET SOIL & DISH	16.99	26.88
WT. OF DRY SOIL & DISH	16.04	23.80
WT. OF DISH	10.79	11.71
WT. OF WATER	0.95	3.08
WT. OF DRY SOIL	5.25	12.09
WATER CONTENT % →		

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL 26 ✓
PLASTIC INDEX, PI 8 ✓

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

MARKS: _____

SOIL/AGGREGATE - MOISTURE DENSITY RELATIONS

Job No. 3149J037

Lab./Invoice No. 31490318

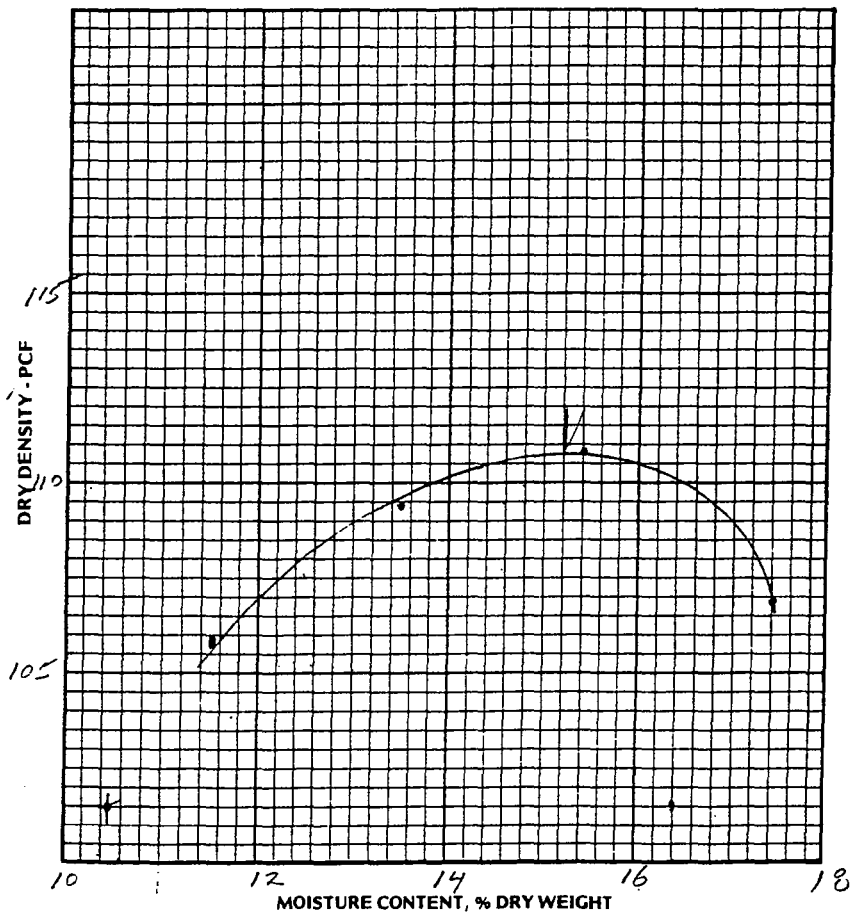
Type of Material _____ Sampled By TK Date 5/10/89

Source of Material Sta 15+00 180' N of S. Dike Submitted By ↓ Date ↓

Test Procedure 0698 A Tested/Calc. By C. Smalkranyen Date 5-15-89

Reviewed By _____ Date _____

Trial No.	1	2	3	4	5	6	7
Water, estimated %							
Water, cc	[illegible]	[illegible]	[illegible]	[illegible]			
Wt. Sample + Mold	[illegible]	[illegible]	[illegible]	6,179.1			
Wt. Mold	[illegible]	[illegible]	[illegible]				
Wt. Wet Sample, gm	1799.5	1878.9	1931.3	1896.1			
Wt. Wet Sample, lbs.	3.97	4.14	4.26	4.18			
Wet Density, pcf	119.1	124.2	127.8	125.4			
Moisture Sample, wet	[illegible]	653.0	218.7	[illegible]			
Moisture Sample, Dry	[illegible]	[illegible]	[illegible]	[illegible]			
Wt. Moisture	24.4	30.0	29.2	30.8			
Moisture, %	11.5	13.5	15.4	17.4			
Dry Density, pcf	106.8	109.4	110.7	106.8			



Max. Dry density, pcf 110.7

Optimum Moisture Content, % 15.2

Diameter of Mold, in. [illegible]

Height of Mold, in. [illegible]

No. of Layers [illegible]

Blows per Layer [illegible]

Wt. of Hammer, lbs. [illegible]

Height of Drop 12

Material Used [illegible]

WESTERN TECHNOLOGIES INC.

SIEVE ANALYSIS

Type of Material: L-CL Sandy Silty Clay Job No. 3149J037

Source of Material: Sta 15+00 Lab./Invoice No. 31490318

Sieve	Weight Retained	% Retained	% Pass Accum.	Specs.
4				
3				
2				
1½				
1⅛				
1				
¾				
½				
⅜	0	0	100	
¼, 3				
#4	0	0	100	
Ret #4				Tech.
Wet		Wet Weight Before Wash	959.2	
Pass #4 Dry		Dry Weight Before Wash	908.3	
Total Dry		Weight After Wash		
Initial Total		Elutriation		
8	0	0	100	
10	0.3	0	100	
16	1.6	.2	99.8	
30	5.6	.6	99.4	
40	8.9	1.0	99	
50	13.2	1.5	98.5	
100	32.4	3.6	96.4	
200	285.8	32	68	
Finer Than 200				
Total				

Sampled By: TK Date: 5/10/87

Submitted By: ↓ Date

Test/Calc. By Date

Reviewed By Date

Classification:

Test Procedure

☐ Aggregate

Sieve ASTM C136-

-200 ASTM C117-

☐ Soil

Sieve ASTM D422-

-200 ASTM D1140-

☐

☐

Special Instructions:

M/C: wet 244.4
231.5
5.6%

WESTERN TECHNOLOGIES INC.

PLASTICITY INDEX
ASTM D4318-

Type of Material: ML-CL Sandy Silty Clay Job No. 3149J037

Source of Material: Sta 15+00 180'W of S. Dike Lab./Invoice No. 31490318

Sampled By: TK Date: 5/10/87

Submitted By: ↓ Date: ↓

Test/Calc. By Date

Reviewed By Date

LIQUID LIMIT

Taps	26	
Container Identification	18	
Wet Weight + Container	26.88	
Dry Weight + Container	− 23.80	
Weight of Water	= 3.08	
Dry Weight + Container	23.80	
Weight of Container	− 11.71	
Weight of Dry Soil	= 12.09	
Weight of Water / Weight of Dry Soil × 100 = Liquid Limit	= 25.5	
Liquid Limit at 25 Taps	= 26	

PLASTIC LIMIT

Container Identification	19	
Wet Weight + Container	− 16.99	
Dry Weight + Container	= 16.04	
Weight of Water	.95	
Dry Weight + Container	= 16.04	
Weight of Container	− 10.79	
Weight of Dry Soil	= 5.25	
Weight of Water / Weight of Dry Soil × 100 = Plastic Limit	= 18	

PLASTICITY INDEX ASTM D4318- = 8

WESTERN TECHNOLOGIES INC.

Clay Liner Construction

F-4 SOIL SAMPLING LOG

SAMPLE NO. 110

PROJECT NO. C-4A-WM

DATE 10/31/89

DELIVERED TO LABORATORY

SAMPLED BY H Kuebler

Q. C. G. L. Swanson

DATE 10/31/89

LOCATION Cell Bottom

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1

SAMPLE TYPE Bulk

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Sandy lean Clay

INTENDED USE Clay base material

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, PI, Proctor

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

SOIL/AGGREGATE - MOISTURE DENSITY RELATIONS

Job No. C-4A WM

Lab./Invoice No.

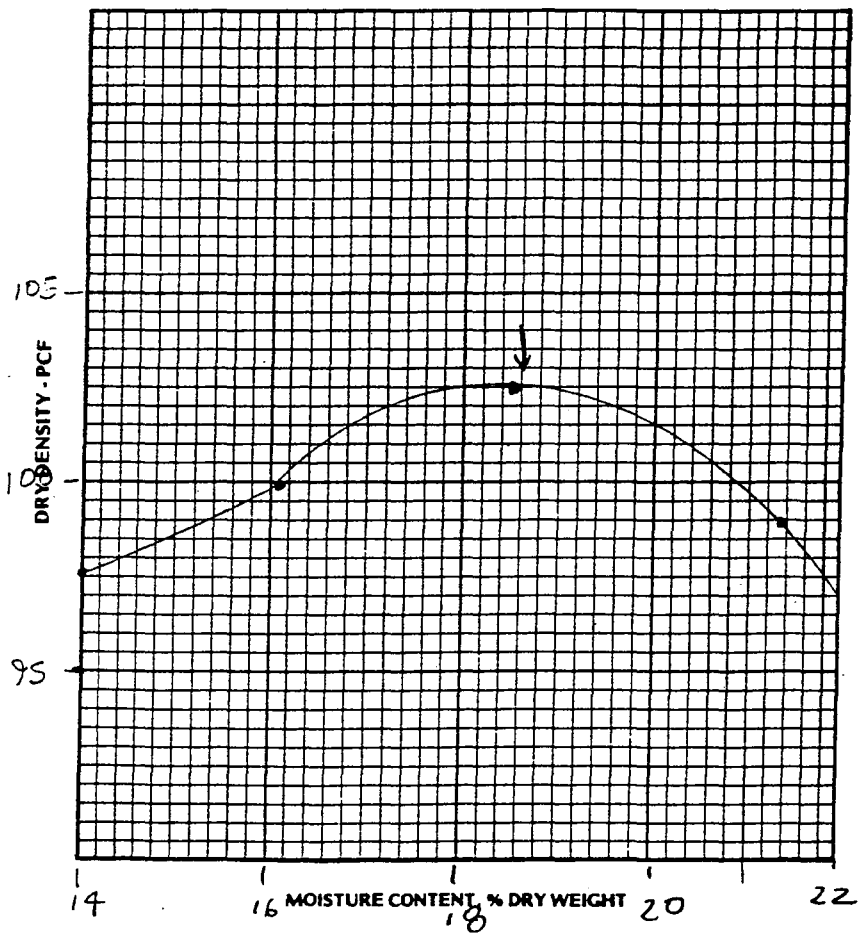
Type of Material Sandy Lean Clay — Sampled By H Kueber — Date 11-1-89

Source of Material Cell Bottom — Submitted By — Date

Test Procedure ASTM 698A — Tested/Calc. By — Date

Reviewed By S L Swanson — Date 11/2/89

Trial No.	1	2	3	4	5	6	7
Water, estimated %							
Water, cc	300	250	350	200			
Wt. Sample + Mold	6266	5982	6044	5912			
Wt. Mold	4228	→	→				
Wt. Wet Sample, gm	1938	1754	1816	1684			
Wt. Wet Sample, lbs.	4.05	3.87	4.00	3.71			
Wet Density, pcf	121.5	116.1	120.0	111.3			
Moisture Sample, wet	273.5	343.7	288.1	412.0			
Moisture Sample, Dry	230.8	296.1	237.6	361.5			
Wt. Moisture	42.7	47.6	50.5	50.5			
Moisture, %	18.5	16.1	21.3	14.0			
Dry Density, pcf	102.5	100.0	98.9	97.6			



Max. Dry density, pcf 102.5

Optimum Moisture Content, % 18.6

Diameter of Mold, in. 4 inch

Height of Mold, in. 4.584

No. of Layers 3

Blows per Layer 25

Wt. of Hammer, lbs. 5.5

Height of Drop 12 inch

Material Used -4 material

WESTERN TECHNOLOGIES INC.

WORKSHEET

TECHNICIAN: _____ PROJECT NO: C-4-A-WM

APPROVED BY: G.E. Swanson DATE: 11-1-89

SAMPLE NO. 110

VISUAL DESCRIPTION: Sandy lean Clay

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED				0	6.1	49.0
DRY WT. PASSING				804	797.9	755.0
% OF TOTAL PASSING				100	99	94
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	904.5	804.0
RETAINED ON NO. 4	_____	_____
PASSING NO. 4	_____	_____

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	98.0 / 105.8	706 / 698.2	88 / 87
16	131.3	672.7	84
30 (40)	153.2 / 162.0	650.8 / 642	81 / 80
50	175.0	629.0	78
100	218.3	584.7	73
200	289.4	514.6	64
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH				
WT. DRY SOIL AND DISH				
WT. DISH				
WT. OF DRY SOIL		_____ = W		
% MOISTURE				

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____

DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____% SAND _____% CLAY-SILT _____%. STORAGE LOCATION _____

* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN H Kubly PROJECT NO. C-4-A WM
APPROVED BY [illegible] DATE

SAMPLE NO. #110
SAMPLE DESCRIPTION Sandy lean Clay COLOR Brw

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS	—	21
DISH NO.	17	18
WT. OF WET SOIL & DISH	15.73	27.35
WT. OF DRY SOIL & DISH	14.82	22.57
WT. OF DISH	10.78	11.76
WT. OF WATER	.91	4.78
WT. OF DRY SOIL	4.04	10.81
WATER CONTENT	23	44.2

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL 43
PLASTIC INDEX, PI 20

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	735.0
WT. OF DISH & DRY SOIL	652.5
WT. OF DISH	—
WT. OF WATER	82.5
WT. OF DRY SOIL	12.6

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

MARKS:

Western T.
Approved
Thomas S. Krake

F-4 SOIL SAMPLING LOG

SAMPLE NO. 100

PROJECT NO. C-4A-WM

DATE 10/4/89

DELIVERED TO LABORATORY

SAMPLED BY H. Kuebler
Q.C. [illegible]

DATE 10/4/89

LOCATION Stockpile #2
(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk
(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Lean clay w/shale

INTENDED USE Clay Base Material
(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, PI
(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

10

SOIL/AGGREGATE - MOISTURE DENSITY RELATIONS

Job No. C4AWM

Lab./Invoice No.

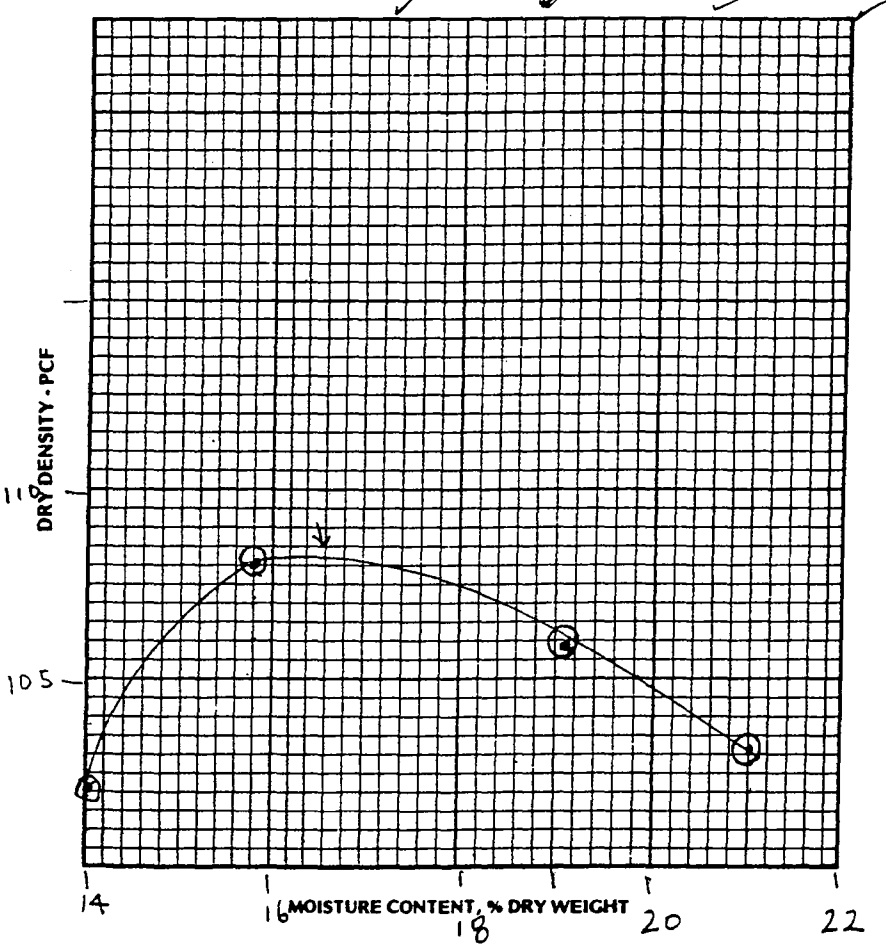
Type of Material: Clay with shale — Sampled By: H Kuebler — Date: 10-4-89

Source of Material: stockpile #2 — Submitted By: — Date:

Test Procedure: ASTM 698-A — Tested/Calc. By: — Date: 10-6-89

Reviewed By: [illegible] — Date: 10/9/89

Trial No.	1	2	3	4	5	6	7
Water, estimated %							
Water, cc	250	300	200	150			
Wt. Sample + Mold	6134	6115	6122	5988			
Wt. Mold	4230	4230	4230	4230			
Wt. Wet Sample, gm	1904	1885	1892	1758			
Wt. Wet Sample, lbs.	4.20	4.16	4.17	3.88			
Wet Density, pcf	126.0	124.8	125.1	116.4			
Moisture Sample, wet	278.9	221.0	193.8	190.1			
Moisture Sample, Dry	234.1	182.5	167.4	166.8			
Wt. Moisture	44.8	38.5	26.4	23.3			
Moisture, %	19.1	21.0	15.8	14.0			
Dry Density, pcf	105.8	103.1	108.0	102.1			



Max. Dry density, pcf: 108.3

Optimum Moisture Content, %: 16.6

Diameter of Mold, in.: 4 inch

Height of Mold, in.: 4.584

No. of Layers: 3

Blows per Layer: 25

Wt. of Hammer, lbs.: 5.5

Height of Drop: 12

Material Used: #4 material

Western Tech
Approved
Thomas S. Krake
WESTERN TECHNOLOGIES INC.

F-10 GRADATION ANALYSIS WORKSHEET

TECHNICIAN: H. Kuebler PROJECT NO: C-4A-WM
APPROVED BY: [illegible] DATE 10/4/89

SAMPLE NO. #100
VISUAL DESCRIPTION: Clay with Shale

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED					0	1.2
DRY WT. PASSING					549.3	548.1
% OF TOTAL PASSING					100	100
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	589.9	549.3
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

FACTOR = W%/W = _____ = _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	10.0 / 15.6	539.3 / 533.4	98 / 98
16	45.8	503.5	92
30 (40)	90.2 / 112.2	459.1 / 437.1	84 / 80
50	138.4	410.9	75
100	210.0	339.3	62
200	289.1	260.2	47
PAN			—
TOTAL			—

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH	720.0			
WT. DRY SOIL AND DISH	670.3			
WT. DISH	0.0			
WT. OF DRY SOIL	670.3	= W		
% MOISTURE	7.4			

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____
DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____% SAND _____% CLAY-SILT _____%. STORAGE LOCATION _____

* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

Western Tech
Approved
Thomas S. Krake

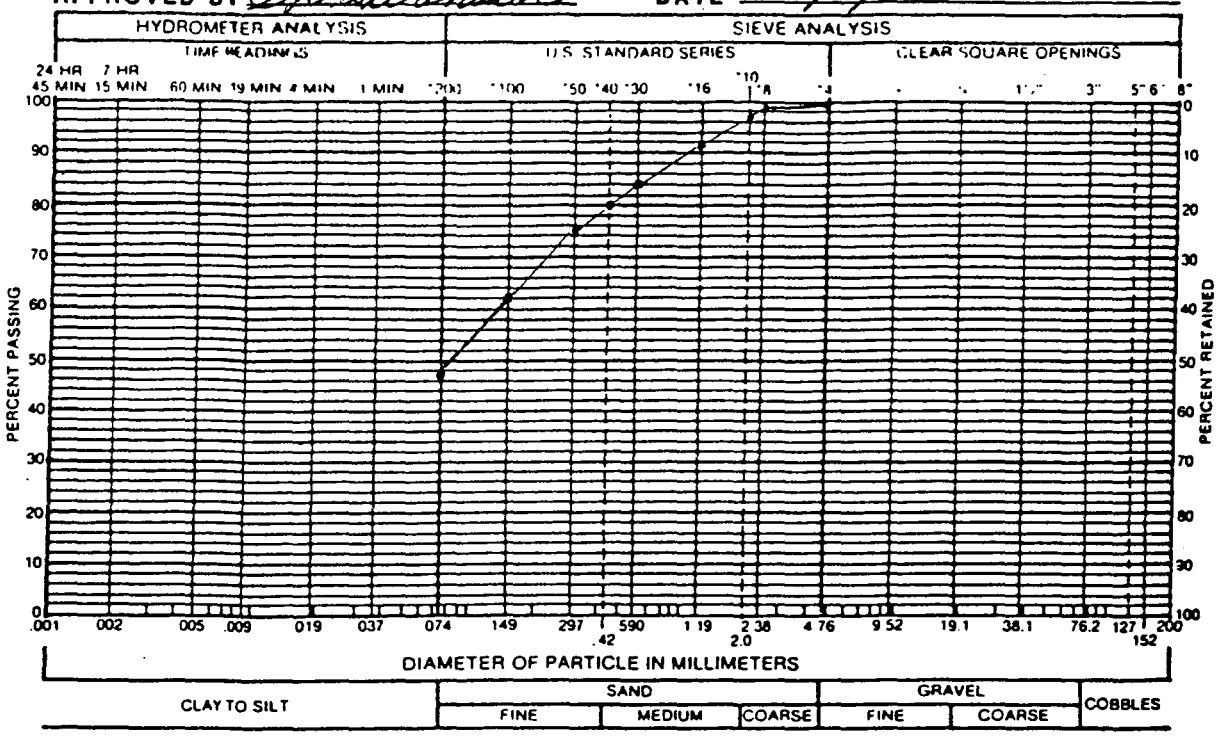
C. 2-79

#100
OK-XRI

F-12 GRADATION TEST RESULTS

TECHNICIAN H Kuether PROJECT NO. C-4A-W10

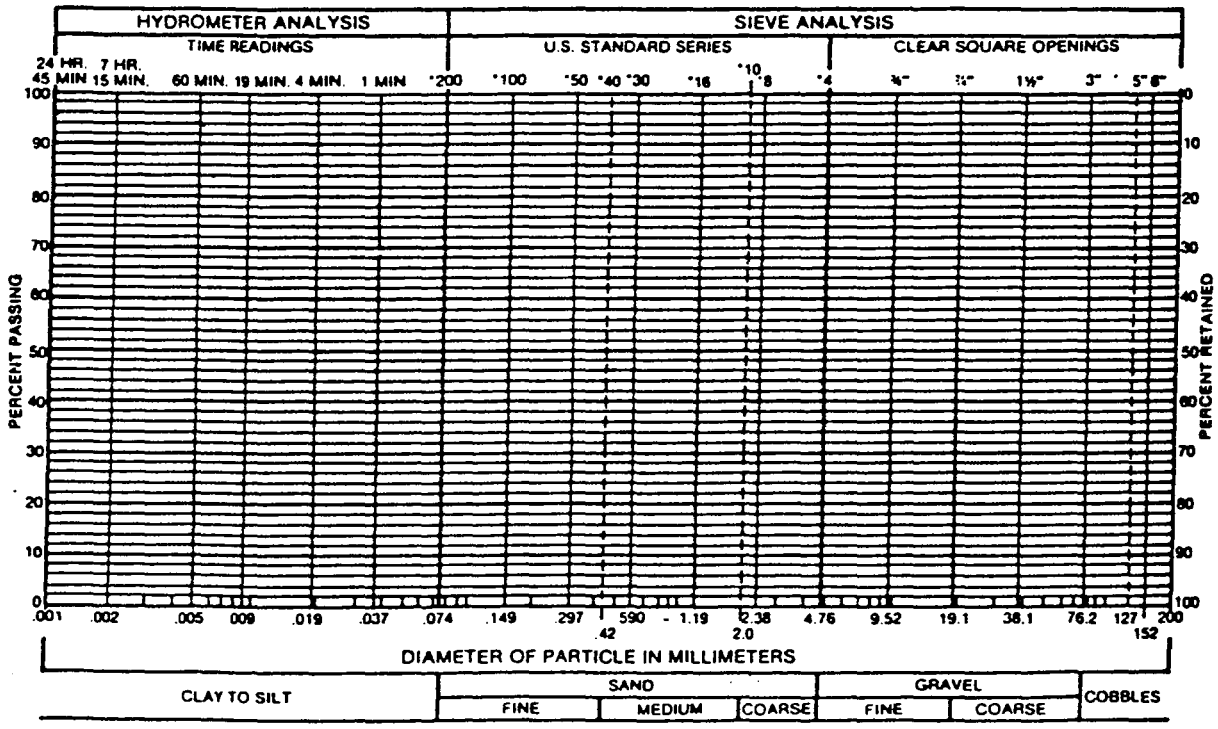
APPROVED BY [illegible] DATE 10/4/89



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT 35 % PLASTICITY INDEX 13 %

SAMPLE OF FROM Stockpile #2



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

Western Tech
Approved
Thomas S. Krake

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

#100
OK-XM

TECHNICIAN H Kuelper PROJECT NO. C-4A-WM
APPROVED BY L L Swanson DATE 10/4/89

SAMPLE NO. 100
SAMPLE DESCRIPTION Lean Clay w/shale COLOR Gray-Green

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS	—	22
DISH NO.	17	18
WT. OF WET SOIL & DISH	12.73	24.0
WT. OF DRY SOIL & DISH	11.80	20.77
WT. OF DISH	7.60	11.73
WT. OF WATER	.93	3.23
WT. OF DRY SOIL	4.20	9.04
WATER CONTENT	22	35.7

.985 LIQUID LIMIT, LL 35
PLASTIC INDEX, PI 13

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

DRY DENSITY _____ PCF

REMARKS: _____

Western Tech
Approved
Thomas S. Krake

F-4 SOIL SAMPLING LOG

SAMPLE NO. 96

PROJECT NO. C-449-0177

DATE 9/14/89

DELIVERED TO LABORATORY

SAMPLED BY J Krake

DATE 9/14/89

Q.C. G. L. Swanson

LOCATION Stockpile

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Lean Clay

INTENDED USE Clay Base

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, PI

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

F-10 GRADATION ANALYSIS WITH HYDROMETER

WORKSHEET

TECHNICIAN: T. Krake PROJECT NO. C-4A-WM

APPROVED BY: [signature] DATE 9/14/87

SAMPLE NO. 96

VISUAL DESCRIPTION: Lean Clay

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED					0	26.5
DRY WT. PASSING					883.0	856.5
% OF TOTAL PASSING					100	97
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	965.4	883.0
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	35.3 / 53.0	847.7 / 830.0	96 / 94
16	83.3	794.7	90
30 (40)	123.6 / 132.4	757.4 / 750.6	86 / 85
50	229.6	653.4	74
100	264.9	618.1	70
200	335.5	547.5	62
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH	492.6			
WT. DRY SOIL AND DISH	451.5			
WT. DISH	0.0			
WT. OF DRY SOIL	451.5	= W		
% MOISTURE	9.1			

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____

DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

GRAVEL _____ % SAND _____ % CLAY-SLIT _____ %. STORAGE LOCATION _____

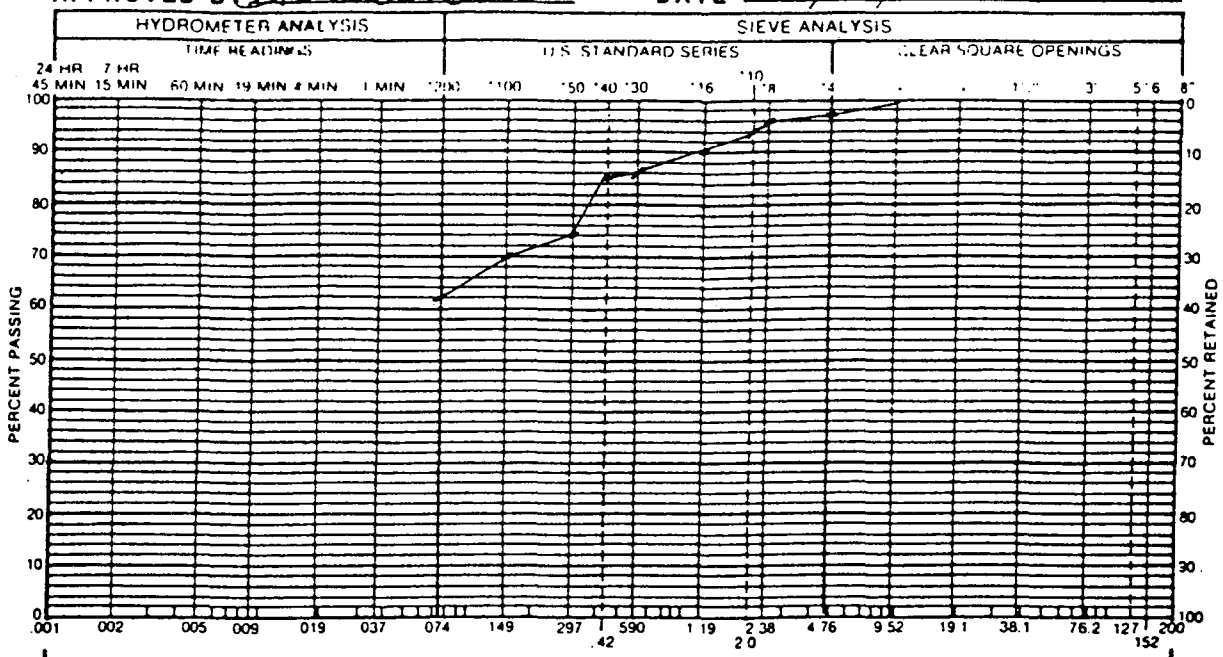
* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

CA -79

F-12 GRADATION TEST RESULTS

TECHNICIAN T. Krake PROJECT NO. C-48-WM

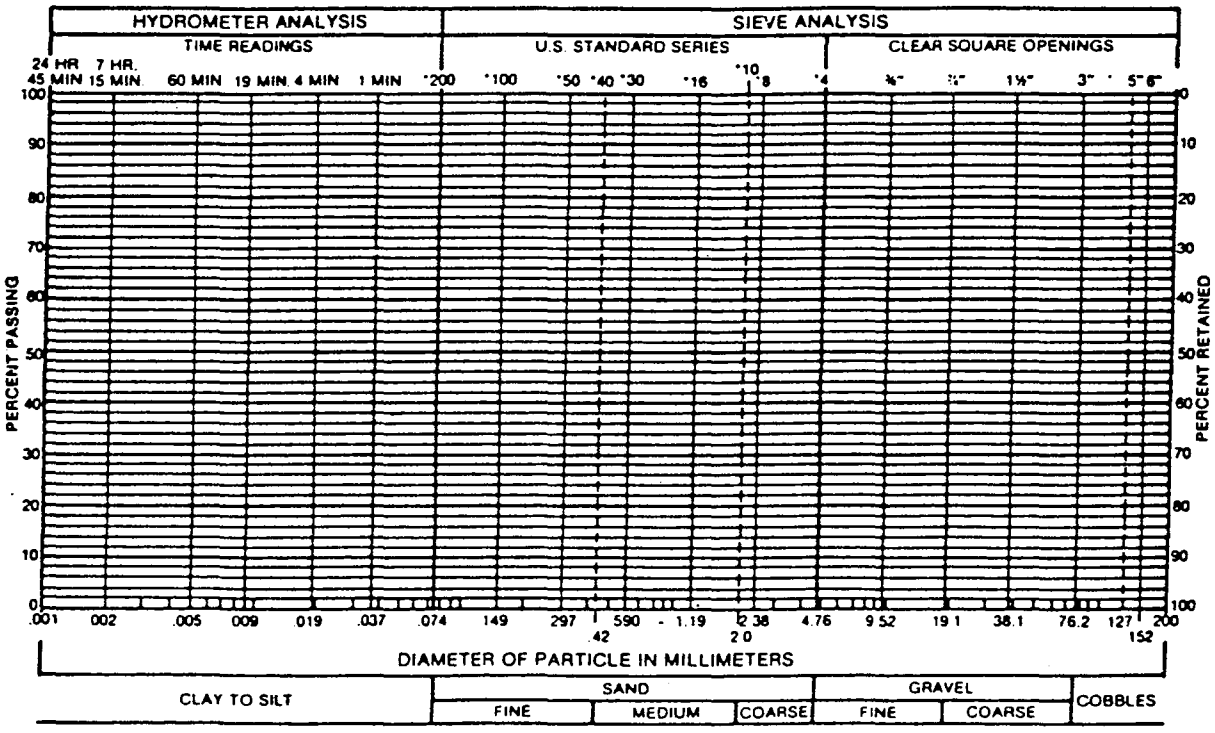
APPROVED BY [illegible] DATE 9/14/89



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Lean Clay FROM Stockpile



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN T. Krak PROJECT NO. C-4A-WM
APPROVED BY [illegible] DATE 9/14/89

SAMPLE NO. 96
SAMPLE DESCRIPTION Lean Clay COLOR Green

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS	—	24
DISH NO.	C	E
WT. OF WET SOIL & DISH	15.03	24.14
WT. OF DRY SOIL & DISH	13.96	20.44
WT. OF DISH	5.67	8.43
WT. OF WATER	1.07	3.70
WT. OF DRY SOIL	8.29	12.01
WATER CONTENT	12.9	30.8

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL 31
PLASTIC INDEX, PI 18 OK

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

REMARKS: _____

F-4 SOIL SAMPLING LOG

SAMPLE NO. 90

PROJECT NO. C-4A-WM

DATE 9/7/89

DELIVERED TO LABORATORY

SAMPLED BY T Krake

DATE 9/7/89

R.C. G. Swanson

LOCATION Stockpile

(EXAMPLE: STOCKPILE, BORROW AREA, TRUCK, FILL)

DEPTH 0-1'

SAMPLE TYPE Bulk

(EXAMPLE: LARGE BULK SAMPLE, DRIVE CYLINDER, ECT.)

VISUAL CLASSIFICATION Lean Clay

INTENDED USE Clayey Liner Material

(EXAMPLE: CLAYEY BORROW, RANDOM FILL, ETC.)

TESTING PROGRAM Sieve, PI

(EXAMPLE: STANDARD COMPACTION TEST, ATTERBERG LIMITS, ETC.)

WORKSHEET

TECHNICIAN: T. Krake PROJECT NO: C-4A-WM
APPROVED BY: [illegible] DATE 9/7/89

SAMPLE NO. 90
VISUAL DESCRIPTION: Lean Clay

SAMPLE PREPERATION

RUN BY _____ SIEVING TIME _____

SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4
OF PAN AND SAMPLE						
WT. OF PAN						
DRY WT. RETAINED					0	1.5
DRY WT. PASSING					796.2	794.7
% OF TOTAL PASSING					100	100
	W% = _____					

SAMPLE WEIGHTS	WET	DRY
TOTAL SAMPLE	817.7	796.2
RETAINED ON NO. 4		
PASSING NO. 4		

SIEVE AND HYDROMETER ANALYSIS

RUN BY _____ SIEVING TIME _____

SIEVE NO.	WEIGHT RETAINED	WEIGHT PASSING	% OF TOTAL PASSING
8 (10)	17.5 / 19.6	778.7 / 776.6	98 / 98
16	22.1	774.1	97
30 (40)	26.2 / 28.9	770.0 / 767.3	97 / 96
50	35.9	760.3	95
100	75.0	721.2	91
200	142.3	653.9	82
PAN			—
TOTAL			—

FACTOR = $\frac{W\%}{W}$ = _____ = _____

MOISTURE DETERMINATION

	+4 MATERIAL	-4 MATERIAL	HYGRO. MOISTURE	HYDRO. SAMPLE
DISH NO.				
WT. WET SOIL AND DISH	457.4			
WT. DRY SOIL AND DISH	445.2			
WT. DISH				
WT. OF DRY SOIL		= W		
% MOISTURE	2.7			

HYDROMETER ANALYSIS

RUN BY _____

CYLINDER NO. _____ SPECIFIC GRAVITY _____ DISPERSING AGENT _____
DISH NO. _____ DATE _____ AMOUNT _____ ml DATE CALIB. _____

CLOCK TIME	TEST TIME	TEMP. C°	HYD. READ	HYD.* CORR	CORR READ	FACTOR X CORRECTED READING = % OF TOTAL PASSING	% OF TOTAL PASSING	PARTICLE DIAMETER	
	START MIX	—	—	—	—		—	—	
	STOP MIX	—	—	—	—		—	—	
	0.5 min							0.050 mm	
	1.0 min							0.037 mm	
	4.0 min							0.019 mm	
	19 min							0.009 mm	
	60 min							0.005 mm	
	7h 15 min							0.002 mm	
	25h 45 min							0.001 mm	

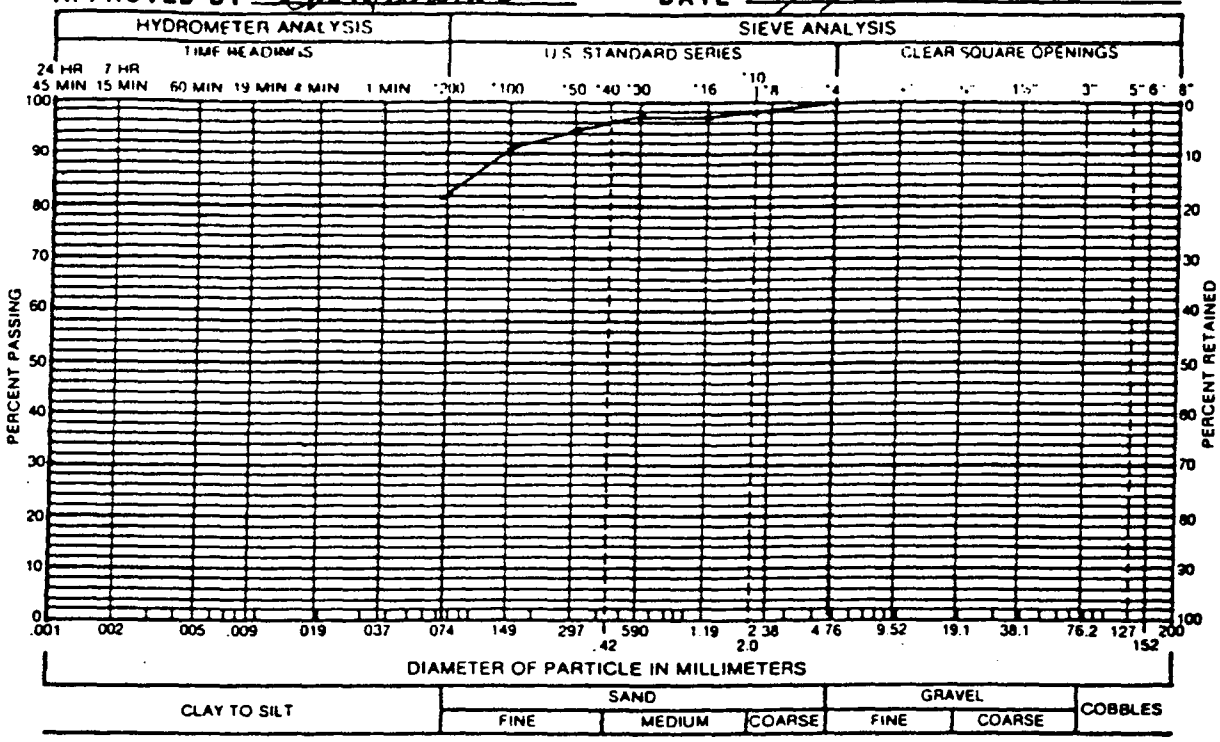
GRAVEL _____ % SAND _____ % CLAY-SILT _____ %. STORAGE LOCATION _____

* CORRECTION INCLUDES TEMP., MENISCUS, AND DEFLOCULENT

F-12 GRADATION TEST RESULTS

TECHNICIAN T. Krake PROJECT NO. C-4R-WM

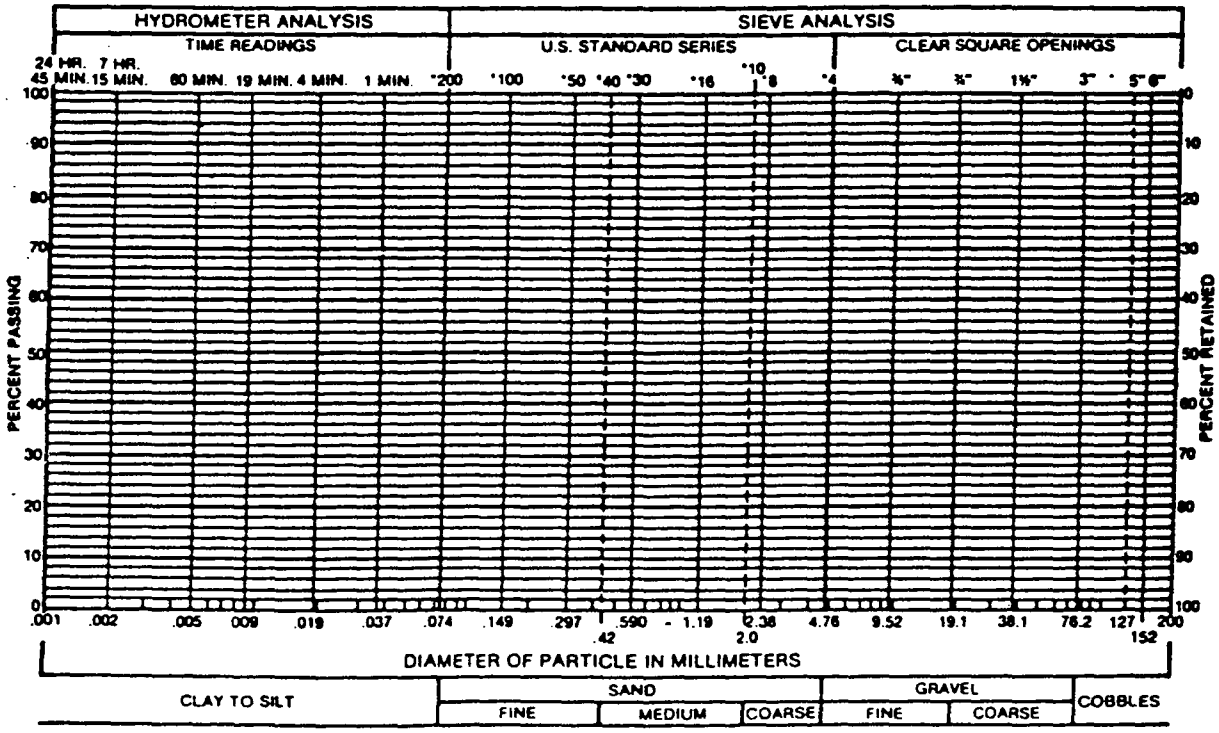
APPROVED BY [illegible] DATE 9/7/88



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Lean Clay FROM Stockpile



GRAVEL % SAND % SILT AND CLAY %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF FROM

F-14 ATTERBERG, -200, MOISTURE & DENSITY
WORKSHEET

TECHNICIAN: J Krake PROJECT NO. C-4A-WM
APPROVED BY: [illegible] DATE: 9/7/88

SAMPLE NO. 90
SAMPLE DESCRIPTION: Lean Clay COLOR: Green

ATTERBERG LIMITS	PL	LL
PREP. DISH	RUN BY	
NO. OF BLOWS	—	20
DISH NO.	J	19
WT. OF WET SOIL & DISH	8.39	35.02
WT. OF DRY SOIL & DISH	7.36	28.65
WT. OF DISH	2.21	10.86
WT. OF WATER	1.03	6.37
WT. OF DRY SOIL	5.15	17.79
WATER CONTENT	20.0	35.8

-200	
RUN BY	
DISH NO.	
WT. OF DISH & DRY SOIL	
WT. OF DISH & WASHED SOIL	
WT. OF DISH	
WT. OF -200	
WT. OF TOTAL SOIL, DRY	

LIQUID LIMIT, LL 35
PLASTIC INDEX, PI 15

PERCENT -200 _____ %

MOISTURE CONTENT	
RUN BY	
DISH NO.	
WT. OF DISH & WET SOIL	
WT. OF DISH & DRY SOIL	
WT. OF DISH	
WT. OF WATER	
WT. OF DRY SOIL	

DENSITY	
RUN BY	
LENGTH	
DIAMETER	
VOLUME	
WT. OF WET SOIL	
WT. OF DRY SOIL	

MOISTURE CONTENT _____ %

DRY DENSITY _____ PCF

MARKS: _____

Attachment G

Umetco Minerals Corporation

INTERNAL CORRESPONDENCE

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

To (Name) J. S. Hamrick

Date June 23, 1989

Division

Originating Dept. H. H. Sampson

Location

Area

Area

Answering Letter Date

Copy to

Subject Grouting of Observation Well No. 13 Located at the Inside Toe of West Dike, Cell 4-A, Approximate Station 28+00.

The following were observed on June 22, 1989:

1. A Mayhew (2000?) portable drill reamed out the in place casing, (4" diameter) including the drilled and slotted sections for the entire depth of the well (reported to be approximately 115 feet). A 5-1/8" diameter tri-cone rock bit was used. Various sized portions of the PVC casing circulated to the surface.

2. The well was drilled past the bottom of the bottom cap to a depth of 120 feet, and air pumped for approximately 20 minutes.

3. A cement, quick gel (bentonite), and water slurry was mixed and pumped to the bottom of the hole through open drill pipe as the bit had been removed and the pipe returned to one foot off of bottom.

4. The following batches were mixed and pumped as indicated:

	(Gals) Water	(Sacks) Cement	(Sacks) Quick Gel	Depth Placed
A.	30	10	1	119 Ft.
B.	30	10	---	80 Ft.
C.	45	10	1/4	40 Ft.
D.	30	10	1/2	20 Ft.

5. The cement used was Portland Type II.

6. After the final batch was pumped the grout surface was at a depth of approximately 3 feet, which will be about ground surface when excavation of the cell is completed.

Henry H. Sampson, Jr., P.E.

HHS/gp

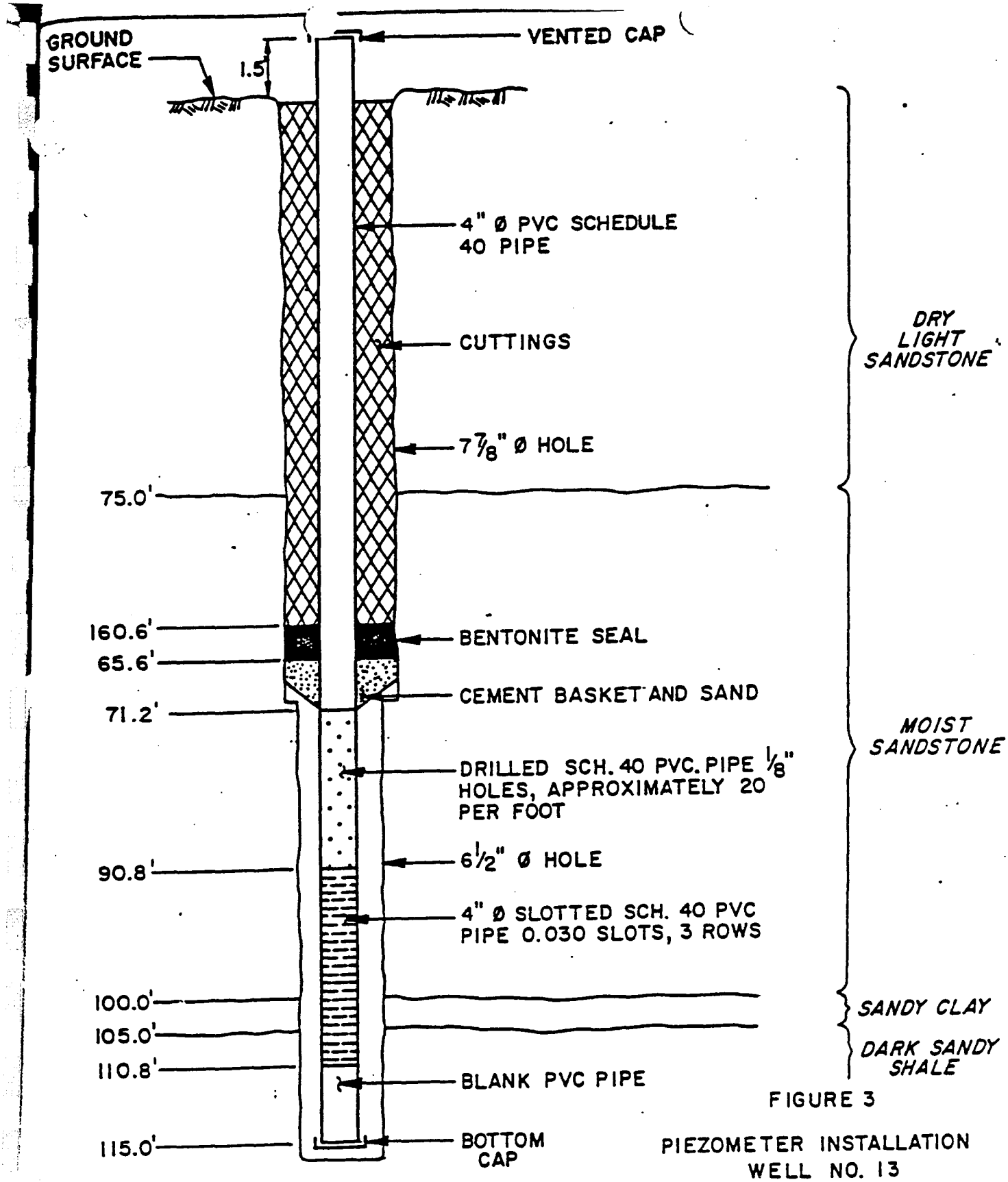


FIGURE 3

PIEZOMETER INSTALLATION
WELL NO. 13
CONSTRUCTION DETAILS

PREPARED FOR

ENERGY FUELS NUCLEAR, INC.
DENVER, COLORADO

1 Portland Cement 94 lbs
3-5% Bentonite (needs to hydrate when mixed)
<7 gal/sack
Log Quantity - by stage with grout packers

NOT TO SCALE

D'APPOLONIA

PART 2 - PRODUCTS

2.1 MATERIALS

A. Approved sealing materials are as follows:

[1. Cement used for sealing mixtures shall meet the requirements of ASTM C150 "Standard Specification for Portland Cement". Type of cement to be used for sealing mixtures will depend on the existing groundwater and well condition, and shall be one of the following types as approved by the Contractor:

a. Type I: General Use

John use

b. Type II: Moderate Sulfate Resistance

c. Type III: High Early Strength (For wells packed with fine sands)

d. Type IV: High Sulfate Resistance]*

2. Cement grout shall be composed of one sack of Portland Cement (94 pounds), with 3 to 5 percent, by weight, of commercially processed sodium bentonite, to not more than 7 gallons of potable water. The weight of the neat cement shall be sufficient to prevent flow of water into the well from any aquifer penetrated. Calcium chloride may be added to a Portland cement grout to accelerate the set, but it shall not exceed two (2) pounds per sack of dry cement.

PART 3 - EXECUTION

3.1 GENERAL

A. Wells shall be sealed in a manner that is compatible with the well design and so as not to act as a conduit for future contamination of groundwater. Detailed well sealing criterion are outlined in the Environmental Protection Agency (EPA) Manual of Water Well Construction Practices, EPA-570/9-75-001, Article 56, pages 133-142 and in Wyoming Water Quality Division Requirements, Chapter XI, Section 70. The basic premise of the EPA criteria is to seal

* Addendum No. 2

existing surface shall be filled with a mixture of uncontaminated fine-grained (ML or CL) soil and a minimum of 25 percent by weight of commercially processed sodium bentonite and shall be hand-tamped, as required.

f. The top of the plug of each abandoned well shall be clearly and permanently marked by inscription; either in the cement or on a steel plate embedded in the cement, with the permit number, well identification number and date of plugging.

6. The Subcontractor shall provide the following notification of the well sealing operation:

a. The Subcontractor shall notify the Contractor one week prior to commencement of well sealing operations.

b. Within 15 days of the completion of well sealings, the Subcontractor shall submit a written well sealing record with the Water Quality Control Division.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

Measurement for payment for sealing of monitor wells will be by the linear feet of casing sealed. The measurement will be from bottom of casing to the top of seal.

4.2 PAYMENT

Payment for sealing of monitor wells will be by the unit price per linear foot quoted therefor in the Bid Schedule. The price quoted shall include full compensation for furnishing all materials, equipment, tools, accessories, incidentals, labor, and for performing the work specified in this Section including decontamination and disposal of materials and equipment.

END OF SECTION 02090

c. The approved methods for the placement of a grout seal shall be as follows:

1) In wells where casing is removed, the cement grout shall be introduced at the bottom of the well or interval to be sealed (or filled) and placed progressively upward to the top of the well. The grout shall be placed by the use of grout pipe, drop pipe, tremie, cement bucket or dump bailer, in such a way as to avoid segregation or dilution of the sealing materials. Dumping grout material from the top of the well shall not be permitted.

2) In wells where casing is not removed, the calculated amount of neat cement grout required to fill the well interval plus the annular space outside the lining shall be placed within the space to be grouted, running the grout through a special cementing packer manufactured for this purpose and installed immediately above the perforated or ripped zone. The grout shall be injected at a pressure calculated to be at least 50 psi greater than the normal hydrostatic pressure within the well at the point of injection.

d. For all wells located in areas where the construction grade elevation will be greater than or equal to the existing grade surface, existing casings and cement grout seals shall be removed to a minimum depth of 2 feet below the existing grade surface, or as required by the Contractor. Grouting shall extend to 2 feet below the existing grade. The interval from the top of the grout to the existing grade surface shall be filled with a mixture of uncontaminated fine-grained (ML or CL) soil and a minimum of 25 percent by weight of commercially processed sodium bentonite and shall be hand-tamped, as required.

e. For all wells located in areas where the construction grade surface will be less than the existing grade surface (i.e. in areas of proposed cut), the existing casings and cement grout seals shall be removed to a minimum of 2 feet below the grade cut elevation as shown on the Subcontract Drawings or as required by the Contractor. Grouting shall extend to 2 feet below the grade cut elevation. The interval from the top of the grout to the

abandoned wells and to restore, as much as possible, the geohydrologic regime in existence before the well was constructed. The following criteria shall apply to all wells to be sealed on and in the vicinity of the site:

1. Well sealing operations shall be performed by a licensed drilling or grouting contractor, with demonstrated experience in sealing of wells.

2. All wells shall be sealed in such a manner that they will not act as a conduit for fluids to flow from the specific strata in which they were originally encountered.

3. All wells shall be located in the field and sealed by the Subcontractor prior to the beginning of stripping, grading or other surface-disturbing activities that will hinder the detection and sealing of wells. If any well cannot be located after a reasonable search, the Subcontractor shall, prior to the commencement of the well sealing operations, submit to the Contractor a written report documenting the well number, the areas covered and the effort spent in the search.

4. Upon discovery of any unknown wells during the earthwork operations, the Subcontractor shall give the Site Manager immediate verbal notice followed by written confirmation within 24 hours.

5. Wells shall be sealed according to the following procedures:

   a. The Subcontractor shall check each well to be sealed for obstructions that may interfere with the sealing operation and shall remove any such obstructions prior to starting filling operations.

   b. In order to seal the well properly it is preferable to remove the well casings by methods approved by the Contractor as outlined in Article 56 of the EPA Manual of Water Well Construction Practices. Upon removal, if the casings or the materials are found to be contaminated, they shall be decontaminated as required by the Contractor, or disposed of in an off-site disposal area. If casing removal is not feasible, the casing shall be perforated, ripped or otherwise disintegrated by methods outlined in Article 56, to ensure grouting of the entire annular space between the casing and the borehole.

Attachment H

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date:

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East #3 North to South B-3 to J-3

Date: 9-18-89 Signature Thomas Kuale

Acceptance: ✓

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303/595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date:

Landmark Reclamation here-by submits for surface acceptance grids.

West to East #3 North to South B-3 to J-3

Date: 9-18-89 Signature Tom Jernigan

Acceptance: ✓

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date:

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East A1 to A-3 North to South A-1 to J1

Date: 9-13-89 Signature Thomas Krebs

Acceptance: ✓

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date:

Landmark Reclamation here-by submits for surface acceptance grids.

West to East A-1 to A-3 North to South A-1 to J-1

Date: 9-13-89 Signature Tom Jernigan

Acceptance: ✓

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date:

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East ~~B-2~~ North to South B-2 to I-2

Date: 9-12-89 Signature Thomas Kuale

Acceptance: ✓

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date:

Landmark Reclamation here-by submits for surface acceptance grids.

West to East _____ North to South B-2 to E-2

Date: 9-12-89 Signature Tom Jernigan

Acceptance: ✓

Rejection: _____

Comments: Includes all of West Dike

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Larry McGuire ~~Tom Jernigan~~

From: Lynn Laws

Subject: Liner Bed Preparation

Date: 10-12-89

Landmark Reclamation here-by submits for surface acceptance grids.

West to East J5 thru J8 Grid 4 North to South A 4 to J4

Date: 10-12-89 Signature Lynn Laws

Acceptance: Larry McGuire - Crest Sewer

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-12-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East J5 thru J-8 Grid #4 North to South 4A to 4J

Date: 10-11-89 Signature Lynn Laws

Acceptance: [illegible]

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-19-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East Grids 7 North to South I 7 to A 7

Date: 10-19-89 Signature Thomas L. Kuehn

Acceptance: DK

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date:

Landmark Reclamation here-by submits for surface acceptance grids.

West to East Grids 7 North to South I 2 to A 7

Date: 10-20-89 Signature Lm

Acceptance: _____

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303-595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-17-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East Grids 5 North to South I-5 to B-5

Date: 10-17-89 Signature Thomas L. Kale

Acceptance: JK

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date:

Landmark Reclamation here-by submits for surface acceptance grids.

West to East Grids 5 North to South I 5 to A5

Date: 10-18-89 Signature [illegible]

Acceptance: _____

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date:

Landmark Reclamation here-by submits for surface acceptance grids.

West to East Grids 6 North to South A6 to I6

Date: 10-18-89 Signature [illegible]

Acceptance: _____

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303-595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-18-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East Grid's 6 North to South A6 to I6

Date: 10-18-89 Signature Thomas S. Kuska

Acceptance: OK

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-25-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East Grids 8 North to South A thru J

Date: 10-20-89 Signature Thomas A Rhoades

Acceptance: TR

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date:

Landmark Reclamation here-by submits for surface acceptance grids.

West to East Grids 8 North to South A thru J

Date: 10-25-89 Signature L. Laws

Acceptance: [illegible]

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303/595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-28-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East 11 North to South A11 → J11

Date: 10/28/89 Signature Thomas S. Kreuke

Acceptance: JK

Rejection:

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-29-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East Grid 12 North to South A12-J12

Date: 10/29/89 Signature Thomas S. Ruche

Acceptance: JK

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: John S. Hamrick

From: Lynn Laws

Subject: Liner Bed

Date: 10-31-89

Landmark Reclamation here-by submits for compaction and moisture evaluation grids.

West to East Grids 13, 14, 15 North to South A13-J13, D14-J14, H15-J15

Date: 10/31/89 Signature Thomas A. Ruake

Acceptance: JK

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date: 11-2-89

Landmark Reclamation here-by submits for surface acceptance grids.

West to East Grid 11 North to South J11 to J11

Date: 11-2-89 Signature Larry M. Lewis

Acceptance: OK.

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303·595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date: 11-2-89

Landmark Reclamation here-by submits for surface acceptance grids.

West to East Grid 12 North to South A12 - J-12

Date: 11-2-89 Signature Larry W. Laws

Acceptance: [illegible]

Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303 595-0933

LANDMARK RECLAMATION

To: Tom Jernigan

From: Lynn Laws

Subject: Liner Bed Preparation

Date: 11-2-89

Landmark Reclamation here-by submits for surface acceptance grids.

West to East Grids 13,14,15 North to South A-13 to J-13. D-14-J14"

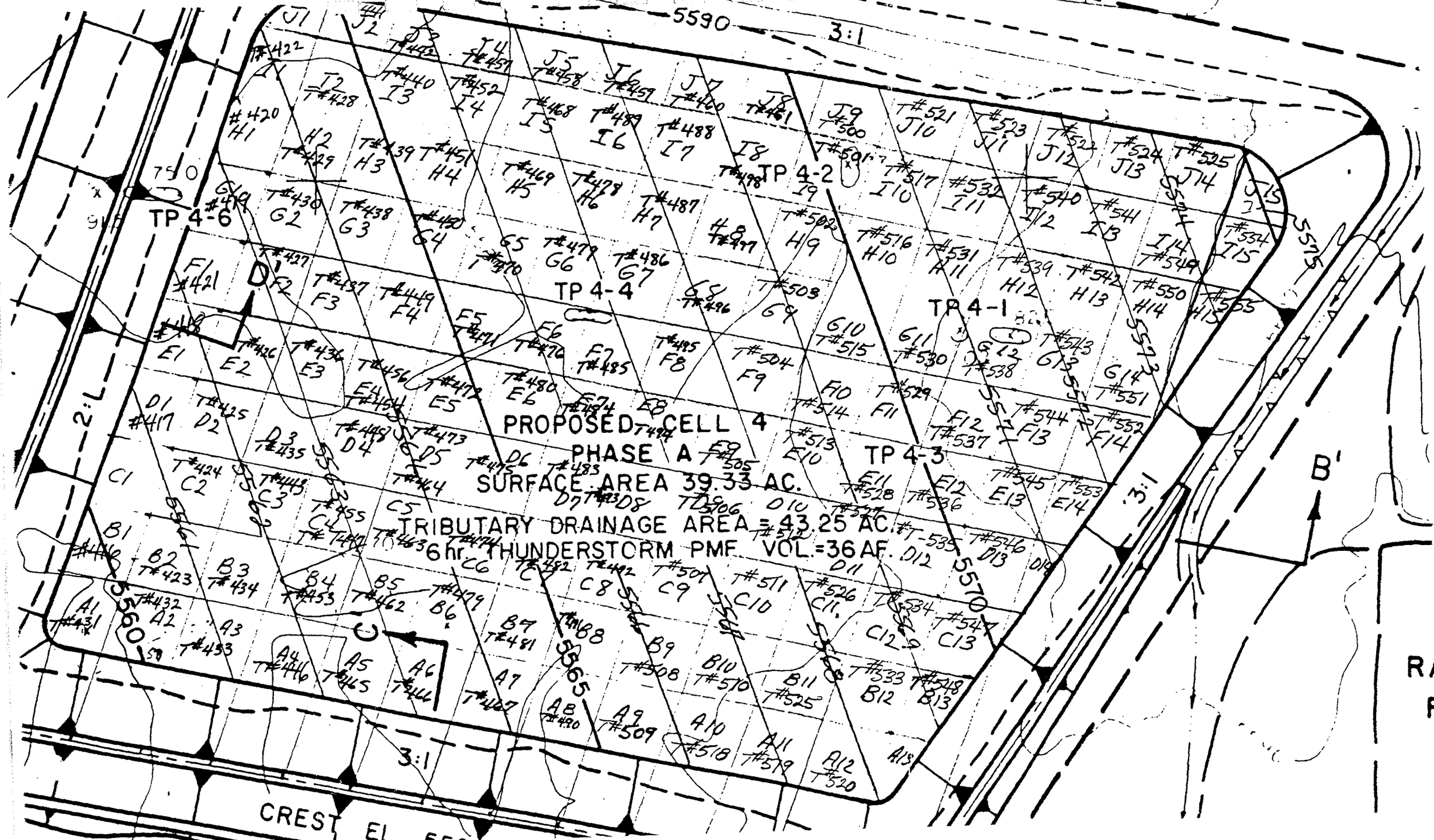
Date: 11-2-89 Signature [illegible]

Acceptance: OK [illegible]

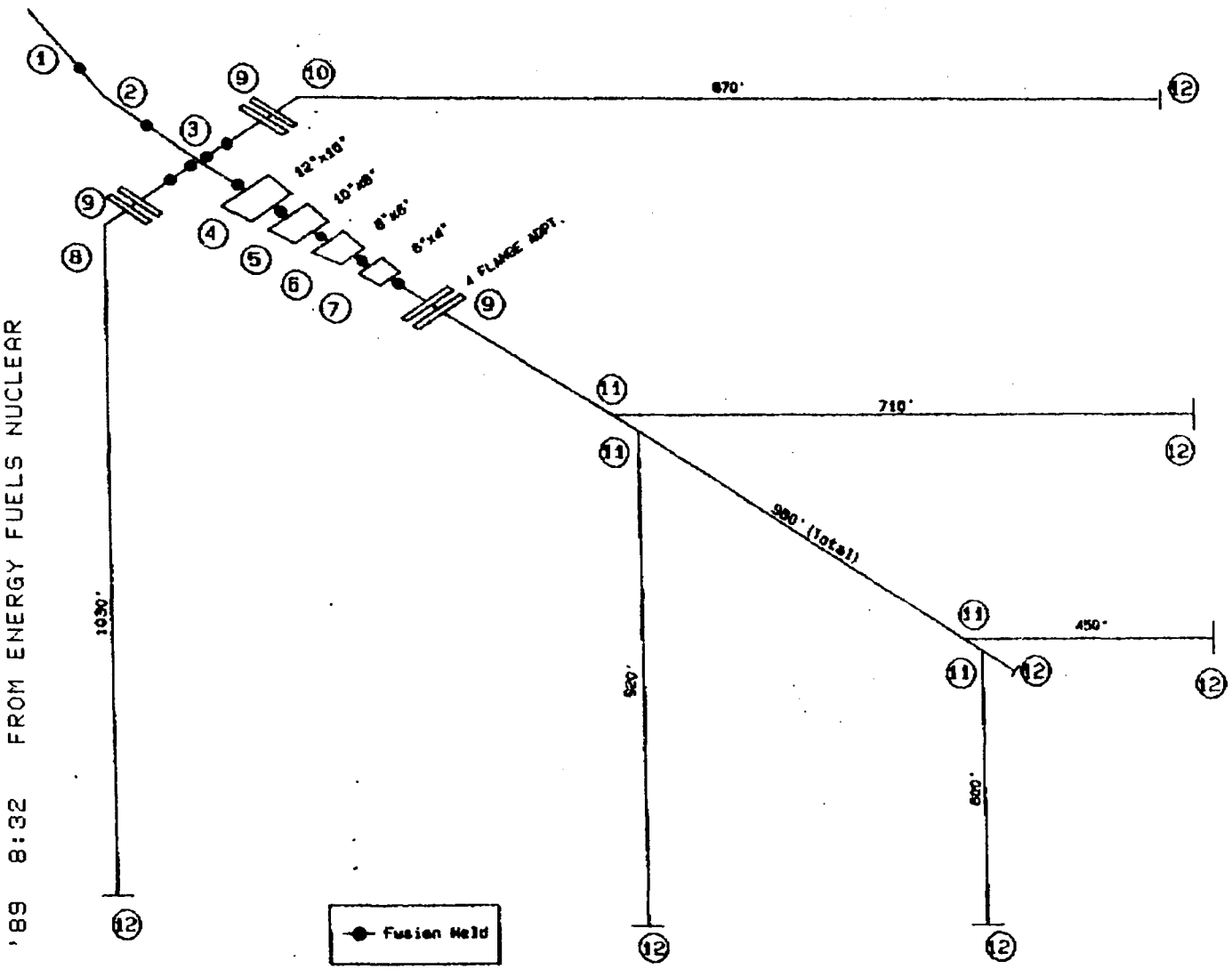
Rejection: _____

Comments:

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303/595-0933


PROPOSED CELL 4
PHASE A
SURFACE AREA 39.33 AC.
TRIBUTARY DRAINAGE AREA = 43.25 AC.
6 hr. THUNDERSTORM PMF VOL.=36 AF.
TP 4-1
TP 4-2
TP 4-3
TP 4-4
TP 4-6
5590
5575
5570
5565
5560
3:1
2:1
CREST

Attachment I



SHOP MATERIAL

ITEM NO.	QUAN	DESCRIPTION
3	1	12"DIA. DRISCO SPOOL W/2EA 4"TAPPED FLG. INCLUDING FLANGE ADAPTIVE & BACKUP RINGS.

FIELD MATERIAL

1	120'	12"DIA. 100PSI DRISCO
2	1	12"DIA. 22 1/2° ELL. DRISCO
4	1	12"X10"REDUCER, DRISCO
5	1	10"X8" REDUCER, DRISCO
6	1	8"X6" REDUCER, DRISCO
7	1	6"X4" REDUCER, DRISCOL
8	1	4" FLANGE ADAPTER, DRISCO, W/ BACKUP RING
9	2	4"PVC FLANGE, SOCKET WELD
10	2	4" PVC 45° ELL SOCKET WELD
11	4	4" PVC WYE, SOCKET WELD
12	7	4" PVC CAP, SOCKET WELD
	5560	4" SLOTTED PVC,

H.A.A. 7/89

Attachment J

Form No. F-26

DESIGN CHANGE ORDER #10

Project No. C4AWM Date Nov. 28, 1989

Drawing No. N/A

Specification No. N/A

Design feature

Spot dirt loads along the pond banks 50' on center. Prewet dirt and banks to prevent loss of material because of high winds.

Change in design

Liner side slope protection as required against high winds.

Reason

Have dirt available to push into the pond for "blowout protection" for the pond liner.

Initiated by: Liner Contractor, Larry McGuire

Approvals:

Site Manager RK Spurlin

Design Engineer G. L. Swanson

Form No. F-26

DESIGN CHANGE ORDER #7

Project No. C4A-WM Date October 28, 1989

Drawing No. C4-1

Specification No. _____

Design feature

North east corner of Cell 4A

Change in design

Provide a smooth transition for liner installation in north east corner of cell. The transition is to be by means of compacted fill.

Reason

No fill is indicated in this area. Liner installation requires a smooth transition.

Initiated by: J S Hamrick

Approvals:

Site Manager DK Spalding

Engineer J S Hamrick

Design Change Order
No. 7

LANDMARK RECLAMATION

DAILY TIME SHEET

DATE 11-1-89

CLIENT Umetco Minerals
LOCATION
PROJECT Build up NE Corner for Tie In
JOB/AREA
UNIT CODE
WORK DESCRIPTION of Liner From East Dike to Existing Cell 3 S Dike

	EMPLOYEE	CLASS	Reg Rate / O.T.Rate	Reg Hrs / O.T.Hrs	Reg.Amt.	O.T.Amt	TOTAL
5046	Stan Fuja	C-Oper	6.00	3	—	18.00	18.00
5200	Eric Byles	A-Oper		3			—
5053	Elmer Hurst	A-Oper		3			—
5091	Ron McKenzie	A-Oper		3			—
			TOTALS				18.00

EQUIPMENT

UNIT #	TYPE / MODEL	RATE	HRS.	AMOUNT
DW II	631 Water Wagon	104.62	3	313.86
S-1	637 Scraper	124.18	3	372.54
14-G	Motor Grader	49.97	3	149.91
Raygo	Raygo Compacter	42.07	3	126.21
		TOTAL		962.52

MATERIAL / SUBCONTRACT (ATTACH BACKUP)

INVOICE #	VENDOR	AMOUNT
	TOTAL	

COMMENTS Work per request John Hamrick. Tie in for Liner
Oper rate included in Equip rate

LABOR	18.00
EQUIPMENT	962.52
MATERIAL / SC	—
	980.52
TOTAL	

Lynn F Lowe
PROJECT SUPERINTENDENT / MANAGER

AUTHORIZED BY

Design Change Order
NO. 7

DAILY TIME SHEET

DATE 11-3-89

CLIENT Unocal Minerals
LOCATION
PROJECT Cell 4A
JOB/AREA UNIT CODE
WORK DESCRIPTION Build up NE corner of Dike area requiring Design Change as per John Hamrick

	EMPLOYEE	CLASS	Reg Rate / O.T.Rate	Reg Hrs / O.T.Hrs	Reg.Amt.	O.T.Amt	TOTAL
5046	Stan Fuja	C-Oper		3			—
5200	Eric Boyles	A-Oper		3			—
5053	Elmer Hurst	A-Oper		3			—
	Lynn Laws	Foreman		3			—
			TOTALS				—

EQUIPMENT

UNIT #	TYPE / MODEL	RATE	HRS.	AMOUNT
14-G	Motor Grader	49.97	3	149.91
5-1	637 Scraper	124.18	3	372.54
WW II	631 Water Wagon	104.62	3	313.86
	Rayco Compactor	42.07	3	126.21
		TOTAL		962.52

MATERIAL / SUBCONTRACT (ATTACH BACKUP)

INVOICE #	VENDOR	AMOUNT
	TOTAL	

COMMENTS Work done to tie into N Dike of Cell #4
Oper rate included in Equipment rate.

LABOR	—
EQUIPMENT	962.52
MATERIAL / SC	—
	962.52
TOTAL	

PROJECT SUPERINTENDENT / MANAGER

AUTHORIZED BY

Form No. F-26

DESIGN CHANGE ORDER #9

Project No. C4AWM Date November 28, 1989

Drawing No. N/A

Specification No. N/A

Design feature

Grade road around Cell No. 4A

Change in design

Construction of unsurfaced road around Cell No. 4A with drainage ditches as required.

Reason

Provide access road for inspection of dike erosion, etc.

Initiated by: J.S. Hamrick

Approvals:

Site Manager DK Sparling

Design Engineer [illegible]

Design Change Order
No. 9

LANDMARK RECLAMATION

DAILY TIME SHEET

DATE 11-2-89

CLIENT Umetco Minerals
LOCATION
PROJECT Blade Road around Cell #4
JOB/AREA
UNIT CODE
WORK DESCRIPTION Finish blading road around Cell #4 install drain ditches.

	EMPLOYEE	CLASS	Reg Rate / O.T.Rate	Reg Hrs / O.T.Hrs	Reg.Amt.	O.T.Amt	TOTAL
5091	Ron McKenzie	A-Oper		3			—
			TOTALS				—

EQUIPMENT

UNIT #	TYPE / MODEL	RATE	HRS.	AMOUNT
14-6	Motor Grader	49.97	3	149.91
			TOTAL	149.91

MATERIAL / SUBCONTRACT (ATTACH BACKUP)

INVOICE #	VENDOR	AMOUNT
	TOTAL	

COMMENTS Oper rate included in Equip rate. Work per request of John Hamrick

LABOR	—
EQUIPMENT	149.91
MATERIAL / SC	—
	149.91
TOTAL	

Ryan F Jaus
PROJECT SUPERINTENDENT / MANAGER

AUTHORIZED BY

Design Change Order
No. 9

LANDMARK RECLAMATION

DAILY TIME SHEET

DATE 10-31-89

LIENT Umetco Minerals
LOCATION Blanding
PROJECT Road around Cell #4
JOB/AREA Blanding UNIT CODE
WORK DESCRIPTION Build Road around Cell 4A tie it back into Road South side of Cell 3 As per John Hamrick

	EMPLOYEE	CLASS	Reg Rate / O.T.Rate	Reg Hrs / O.T.Hrs	Reg.Amt.	O.T.Amt	TOTAL
5091	Ron McKenzie	A-Oper		4			—
5046	Stan Fuja	B-Oper		2			—
				TOTALS			—

EQUIPMENT

UNIT #	TYPE / MODEL	RATE	HRS.	AMOUNT
WW II	631 Water Wagon	104.62	2	209.24
14-G	Motor Grader	49.97	4	199.88
			TOTAL	409.12

MATERIAL / SUBCONTRACT (ATTACH BACKUP)

INVOICE #	VENDOR	AMOUNT
	TOTAL	

COMMENTS Operators time to be included in Equip rate.

LABOR	—
EQUIPMENT	409.12
MATERIAL / SC	—
	409.12
TOTAL	

Lynn F Fauss
ROJECT SUPERINTENDENT / MANAGER

AUTHORIZED BY

Umetco Minerals Corporation

INTERNAL CORRESPONDENCE

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

To (Name) M. D. Vincelette
G. F. Richards
H. R. Roberts
D. K. Sparling
C. O. Sealy
J. S. Hamrick
L. Laws
K. Wood

Division

Location

Area

Copy to

Date October 17, 1989

Originating Dept. G. L. Swanson

Area

Answering Letter Date

Subject Cell 4A Design Change No. 6

Enclosed is a design change order issued to cover installation of slimes drain system. Please review and if any questions arise please advise.

Sincerely,

G. L. Swanson

G. L. Swanson
Q C Officer

GLS/gp

Attachments (3)

#6
Page 1 of 3

Form No. F-26

DESIGN CHANGE ORDER

Project No. CHAWM Date September 20, 1989

Drawing No. C4-5

Specification No. 7.2.3, 7.3, 7.4

Design feature

Slimes Drain System: 1) Drainage Material, 2) Installation of Drainage Access Pipes, 3) Drainage Material Placement

Change in design

1. No soil cover on 12" access pipe on side slopes. Cover material to be placed at base of slope only, for stabilization (Detail "B")
2. Install collar on access pipe at crest. Collar attached to 6' long "deadman" buried in anchor trench. See attached drawing. (Detail "A")

Reason

1. Soil cover over 12" access pipe will wash away. Collar at top of dike will provide required stability.
2. "Pea" gravel & and filter fabric will provide stability and required filter area. Vibratory rolling would be detrimental to pipe.

Initiated by:

Approvals: D.C. Swanson

Site Manager

Engineer J S Hamrick

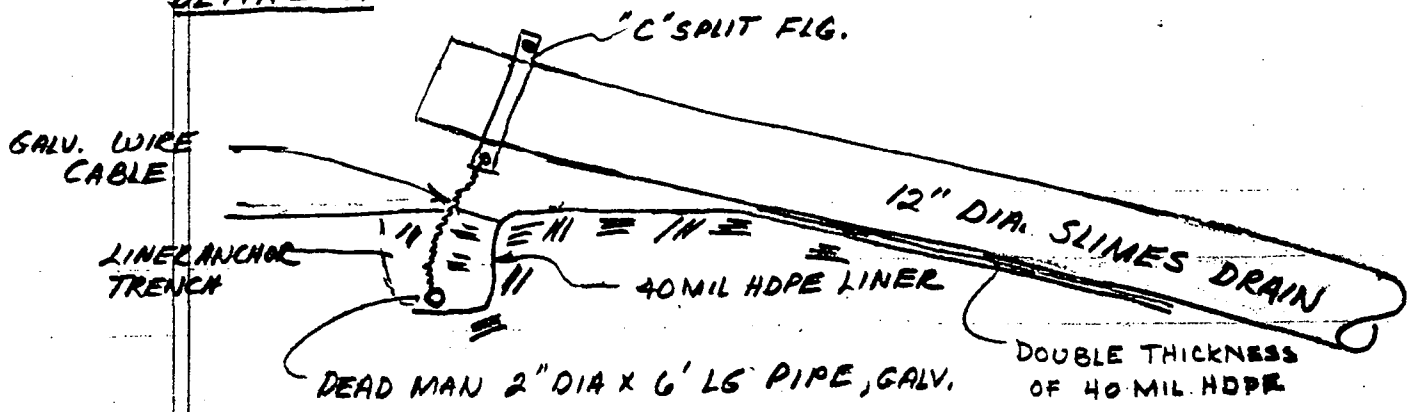
Change in Design (continued)

3. Replace crushed sandstone drainage material with "Pea" gravel. Size specification and distribution to be equivalent to the "pea" gravel placed in the Leak Detection System trenches.

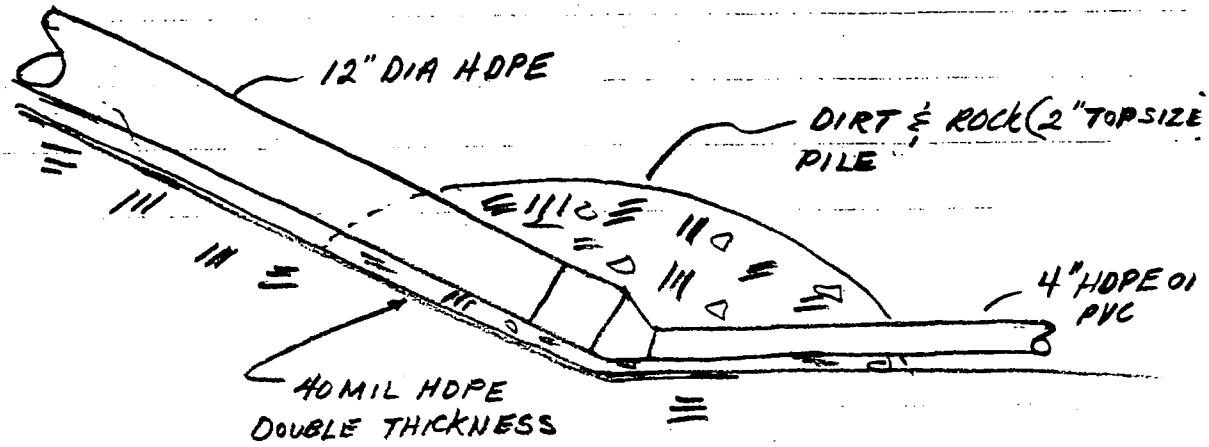
4. Use the filter fabric approved for placement on the subgrade as a blanket around the slimes drain perforated pipe and "pea" gravel. Heat seal the fabric seam along its length. Fabric and gravel to extend 2 feet past slots on both ends. See Detail "C" and Section A-A'

Design Change Order #6

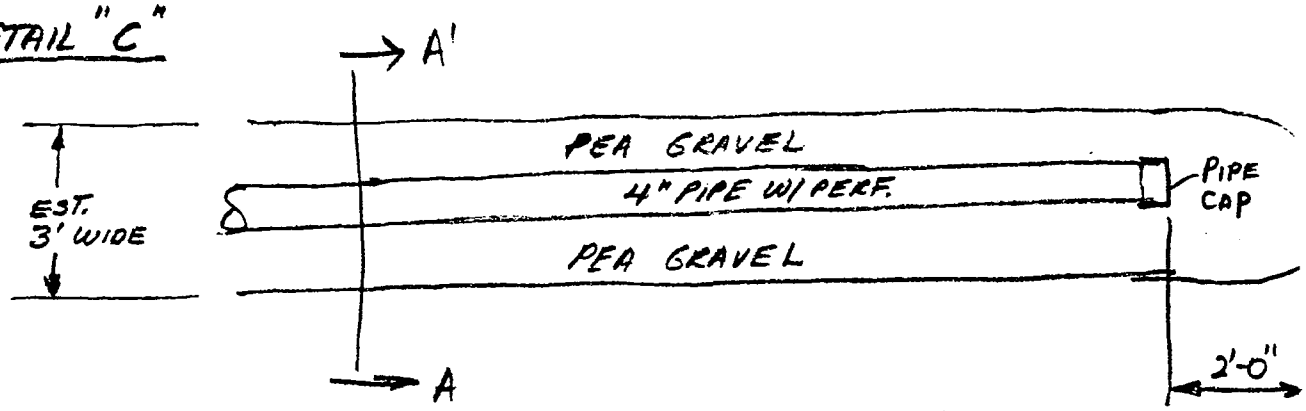
DETAIL "A"

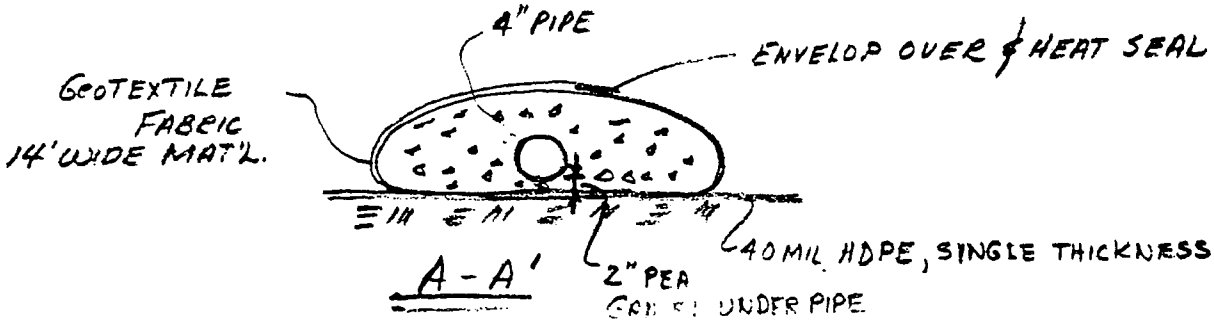


DETAIL "B"



DETAIL "C"





A - A'

Form No. F-26

DESIGN CHANGE ORDER

Project No. C4AWM Date May 18, 1989

Drawing No. _____

Specification No. 4.3

Design feature

Preparation of Cell 4A Footprint prior to the placement of the compacted fill

Change in design

Excavate calcareous soil lenses exposed by stripping in the footprint of Cell 4A Dike.

Reason

Calcareous soils are unsuitable for the Dike and/or Dike base. Material was checked in the site chem-lab and found to contain 30% Calcium Compounds.

Initiated by: John Hamrick

Approvals:

Site Manager J S Hamrick

Engineer [illegible]

Form No. F-26

DESIGN CHANGE ORDER

Project No. C4AWM Date May 16, 1989

Drawing No. C4-1 and C4-2

Specification No.

Design feature

Provide a means to measure dike settlement.

Change in design

Install a settlement plate (to be provided by Umtco) at a point selected by Engineer. The plate pipe will protrude at the foot of the main dike at the slope break between maindike slope and toe dike crest.

Reason

Regulatory compliance requires dike settlement to be measured.

Initiated by: C.O. Sealy

Approvals:

Site Manager John S Hamrick

Design Engineer

Form No. F-26

DESIGN CHANGE ORDER

Project No. C4AWM Date June 9, 1989

Drawing No. C4-1

Specification No. 4.4

Design feature

The area where the south and west embankments meet in the southwest corner of Cell 4A.

Change in design

Construct the corner with the radius layout on 6-8-89.

Reason

The sharp crease in the corner will inhibit liner installation and is unsafe to construct.

Initiated by: Lynn Lawes / Gary Swanson

Approvals:

Site Manager J Stanziar

Engineer G. L. Swanson

Form No. F-26

DESIGN CHANGE ORDER

Project No. C4/AWSM Date June 9-1989

Drawing No. C4-1

Specification No. 4.2.2

Design feature

Placement of excavated materials in designated stockpile areas.

Change in design

Haul and place materials designated by John Hamrick and/or Gary Swanson on Cell 2. To be completed by June 9, 1989.

Reason

The White Mesa Mill desires stockpiled material to be used for Cell 2 reclamation cover. The completion deadline will allow the partnership to evaluate proposed costs.

Initiated by: John Hamrick

Approvals:

Site Manager John S Hamrick

Engineer G Swanson

Umetco Minerals Corporation

INTERNAL CORRESPONDENCE

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

To (Name) M. D. Vincelette
G. F. Richards
Division H. R. Roberts
D. K. Sparling
Location C. O. Sealy
J. S. Hamrick
Area L. Laws
K. Wood

Copy to

Date June 29, 1989

Originating Dept. G. L. Swanson

Area

Answering Letter Date

Subject Cell 4 Design Change

Enclosed is a design change order issued to cover placement of excavated Cell 4A material as cover on Cell 2. Please review and if any questions arise please advise.

Sincerely,

G. L. Swanson

G. L. Swanson
Q. C. Officer

GLS/gp

Attachments (3)

Form No. F-26

DESIGN CHANGE ORDER

Project No. C4AWM Date June 28, 1989

Drawing No. C4-1

Specification No. 4.2.2

Design feature

Excavated material- placement in stockpiles

Change in design

Place Random Fill material (as defined on the attached sheet) in a 3 foot maximum lift on ~~the~~ Cell 2. Placement areas will by designated by Engineer. The cost for placement will be as stated in the June 21, 1989 letter, attached.

Reason

Phased reclamation is a continuing activity at the White Mesa Mill

Initiated by: John Hamrick

Approvals:

Site Manager R K Spurling

Engineer John S Hamrick

LANDMARK RECLAMATION

June 21, 1989

Mr. Don K. Sparling
UMETCO Minerals Corporation
P. O. Box 669
Blanding, Utah 84511

Dear Don:

We have reviewed the situation with respect to placement of random excavation material from the Cell 4A construction into the Cell 2 area for reclamation.

As we discussed this morning, our cost for transporting material and placing it as cover over Cell 2 will be an additional $0.54 per cubic yard. This is in addition to the reimbursement to Landmark under our existing contract for excavation of material from the Cell 4A area. This additional cost is a reflection of the increased cycle time for equipment to make the round trip and dump material over the Cell 2 tailings and the cost for dozer time to spread the material over the tailings. Also included is the increased cost of maintenance and dust control measures on the additional length of haul road.

This additional cost of $0.54 per cubic yard covers material placed only on the east end of the Cell 2 area working toward the west of the tailings pond. We have included no additional cost for raising the moisture content of the random fill or compaction of this fill material over the Cell 2 area.

Because of the soft and deformative nature of the tailings material over which this random fill will be placed, I would suggest that we measure the additional payment for these yards on the basis of load count only. An accurate survey volume of the material placed in the Cell 2 area will be very difficult to obtain. The 20 cubic yards per scraper, which we have been using as our estimated per load volume removed from the Cell 4A area, is a conservative load factor based on the Cell 1, 2 and 3 construction utilizing the identical equipment which is on site now. If this number is acceptable to you, I would propose an amendment or change order to our existing contract to cover this additional cost of yardage taken to Cell 2 for reclamation.

If you have any questions, please feel free to call.

Very truly yours,

Harold R. Roberts
Vice President and
General Manager

HRR:pl

One Tabor Center 1200 17th Street Suite 2500 Denver, Colorado 80202
303/595-0933

Where practical, raffinate crystals shall be compacted by at least two passes of a D-7 Dozer or equivalent. During construction, the compaction requirements for the crystals shall be reevaluated based on field conditions and modified by the Site Manager or his designated representative with the agreement of the NRC Project Manager.

The contaminated soils and other cleanup materials after the bridging lift shall be compacted to at least 80 percent of standard Proctor maximum density (ASTM D-698).

5.0 CELLS 2, 3, AND 4 (PROPOSED)

5.1 Earth Cover

An earth cover shall be placed over tailings Cells 2, 3, and 4. The general grading plan is shown on Drawing WM-1. Reclamation cover cross-sections are shown on Drawings WM-2 and WM-3.

The earth cover shall be constructed of the following materials.

• Random Fill (lower layer)	4.0 feet (minimum)
• Clay Liner	1.0 foot
• Filter Material	1.0 foot
• Random Fill (Upper layer)	3.5 feet
• Vegetative Support Material	0.5 foot

5.2 Materials

5.2.1 Physical Properties

The physical properties of materials for use as cover soils shall meet the following:

Random Fill (upper and lower layers) - These materials will be mixtures of clayey sands and silts with random amounts of gravel and rock size material. Rock sizes up to 12 inches in diameter will be allowed in the fill but at least 30 percent of the material will pass the No. 40 sieve. For that portion passing the No. 40 sieve, these soils will classify as CL, SC, MC or SM materials under the Unified Soil Classification System.

Clay Layer Materials - Clays shall have at least 40 percent passing the No. 200 sieve. The minimum liquid limit of these soils shall be 25 and the plasticity index shall be 15 or greater. These soils shall classify as CL or CH materials under the Unified Soil Classifiction System.

Filter Materials - The soils will be SM materials obtained from on-site soils or by crushing sandstone bedrock. The permeability of this material will be at least 2 orders of magnitude greater than the clay layer material.

Vegetative Support Material - This material will consist of near surface soils stripped and stockpiled from previous construction operations.

Form No. F-25

FIELD CHANGE ORDER

Project No. C4AWM Date May 23, 1989

Drawing No. _____

Specification No. 1) 4.2.2
2) Section 20 of the Articles

Design feature

1) Suitability of materials for dike construction and for stockpile selection.

2) Safe work conditions

Modifications

Provide sufficient portable lighting for work after sunset.

Reason

1) Lighting is required to determine calcareous nature of soils so that proper placement, either in embankment or stockpile, can be made

2) Poor lighting contributes to unsafe conditions for personnel working on foot.

Initiated by: H.H. Sampson

Approved by: J S Hamner
Umetco Construction Superintendent

Form No. F-25

FIELD CHANGE ORDER

Project No. C4AWM Date May 16, 1989

Drawing No. C4-1 and C4-6

Specification No. _____

Design feature

The location of the excavation stockpiles is shown on C4-1. The Cell 4 drainage pattern is shown on C4-6.

Modifications

Excavation stockpiles may be reoriented and moved so that they are contiguous with the eastern edge of Cell 4-A. This change must not alter the drainage pattern shown on C4-6 or allow the excavation stockpile to drain into Cell 4-A.

Reason

This change will allow better access to the excavation stockpiles by the excavation equipment.

Site

Initiated by: Lynn Laws

Approved by: John S Hamrick

Site Manager

Attachment K

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

May 17, 1989
REPORT NO. 1

Mr. Ed Hawkins, Director
U. S. Nuclear Regulatory Commission
Region IV
Uranium Recovery Field Office
Box 25325
Denver, CO 80225

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period May 9, 1989 to May 12, 1989, 4 days of construction activity occurred.

These activities consisted of: Stripping.

Testing activities included:

0 In place density tests (Nuclear)

0 In place density tests (sand cone)

5 ASTM D-698 Moisture Density Relations

5 ASTM D 1140-54 Soils Finer than No. 200 Sieve

5 ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed None

failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

May 17, 1989

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period May 9, 1989 to May 12, 1989, 4 days of construction activity occurred.

These activities consisted of: Stripping.

Testing activities included:

0 In place density tests (Nuclear)

0 In place density tests (sand cone)

5 ASTM D-698 Moisture Density Relations

5 ASTM D 1140-54 Soils Finer than No. 200 Sieve

5 ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed None

failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

May 23, 1989
REPORT NO. 2

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period May 15, 1989 to May 19, 1989, 5 days of construction activity occurred.

These activities consisted of: Stripping, proof rolling, placing fill in south dike, removal and stockpiling of calcareous material from cell.

Testing activities included:

11	In place density tests (Nuclear)
3	In place density tests (sand cone)
1	ASTM D-698 Moisture Density Relations
0	ASTM D 1140-54 Soils Finer than No. 200 Sieve
0	ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed Two in-place density tests indicated moisture contents that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

May 30, 1989
REPORT NO.3

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period May 22, 1989 to May 26, 1989, 5 days of construction activity occurred.

These activities consisted of: Placing fill in south dike, removal and stockpiling of calcareous material from cell.

Testing activities included:

25 In place density tests (Nuclear)

6 In place density tests (sand cone)

2 ASTM D-698 Moisture Density Relations

4 ASTM D 1140-54 Soils Finer than No. 200 Sieve

4 ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed Five in-place density tests indicated moisture contents that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

June 7, 1989
REPORT NO.4

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period May 30, 1989 to June 2, 1989, 4 days of construction activity occurred.

These activities consisted of: Placing fill in south dike, removal and stockpiling of calcareous material and clay material from the cell.

Testing activities included:

26 In place density tests (Nuclear)

8 In place density tests (sand cone)

4 ASTM D-698 Moisture Density Relations

4 ASTM D 1140-54 Soils Finer than No. 200 Sieve

4 ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed Two in-place density tests indicated moisture content that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

June 20, 1989
REPORT NO.5

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period June 5, 1989 to June 9, 1989, 5 days of construction activity occurred.

These activities consisted of: Placing fill in south and west dikes and removal and stockpiling of clay material from the cell.

Testing activities included:

49	In Place Density Tests (Nuclear)
6	In Place Density Tests (Sand Cone)
4	ASTM D-698 Moisture Density Relations
7	ASTM D 1140-54 Soils Finer Than No. 200 Sieve
7	ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed Six in-place density tests indicated moisture content that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

Frequency of Testing Activities
Stated as Tests Per Cubic Yard

This Period	Cumulative	
6/5/89 to 6/9/89	5/17/89 to 6/9/89	
1:747	1:795	In Place Densities And Moisture Content
1:5866	1:4959	Atterberg Limits Tests
1:5866	1:4959	Soil Gradations
1:10265	1:6943	Moisture Density Relations

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

June 23, 1989
REPORT NO. 6

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period June 12, 1989 to June 16, 1989, 5 days of construction activity occurred.

These activities consisted of: Placing fill in south and west dikes and removal and stockpiling of clay material from the cell.

Testing activities included:

55 In Place Density Tests (Nuclear)

11 In Place Density Tests (Sand Cone)

5 ASTM D-698 Moisture Density Relations

12 ASTM D 1140-54 Soils Finer Than No. 200 Sieve

12 ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed Two in-place density tests indicated moisture content that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

Frequency of Testing Activities
Stated as Tests Per Cubic Yard

This Period	Cumulative	
6/12/89 to 6/16/89	5/17/89 to 6/16/89	
1:790	1:801	In Place Densities And Moisture Content
1:4345	1:4596	Atterberg Limits Tests
1:4345	1:4596	Soil Gradations
1:10428	1:8225	Moisture Density Relations

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

June 28, 1989
REPORT NO. 7

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period June 19, 1989 to June 23, 1989, 5 days of construction activity occurred.

These activities consisted of: Placing fill in south and west dikes and removal and stockpiling of clay and random material from the cell.

Testing activities included:

63 In Place Density Tests (Nuclear)

16 In Place Density Tests (Sand Cone)

7 ASTM D-698 Moisture Density Relations

12 ASTM D 1140-54 Soils Finer Than No. 200 Sieve

12 ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed Ten in-place density tests indicated moisture content that failed to meet specification requirements, and 2 in-place density tests indicated densities that failed to meet specification requirements

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

Frequency of Testing Activities
Stated as Tests Per Cubic Yard

This Period	Cumulative	
6/19/89 to 6/23/89	5/17/89 to 6/23/89	
1:569	1:735	In Place Densities And Moisture Content
1:3750	1:4193	Atterberg Limits Tests
1:3750	1:4193	Soil Gradations
1:6429	1:7189	Moisture Density Relations

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

July 7, 1989
REPORT NO. 8

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period June 26, 1989 to June 30, 1989, 5 days of construction activity occurred.

These activities consisted of: Placing fill in west dike and removal and stockpiling of clay material from the cell.

Testing activities included:

39	In Place Density Tests (Nuclear)
9	In Place Density Tests (Sand Cone)
5	ASTM D-698 Moisture Density Relations
11	ASTM D 1140-54 Soils Finer Than No. 200 Sieve
11	ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed 5 in-place density tests indicated moisture content that failed to meet specification requirements, and 1 in-place density tests that indicated densities that failed to meet specification requirements

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

Frequency of Testing Activities
Stated as Tests Per Cubic Yard

This Period	Cumulative	
6/26/89 to 6/30/89	5/17/89 to 6/30/89	
1:796	1:744	In Place Densities And Moisture Content
1:3475	1:4059	Atterberg Limits Tests
1:3475	1:4059	Soil Gradations
1:7644	1:7258	Moisture Density Relations

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

July 14, 1989
REPORT NO. 9

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period July 5, 1989 to July 8, 1989, 4 days of construction activity occurred.

These activities consisted of: Placing fill in south, east and west dikes and removal and stockpiling of clay material from the cell, and material classified as random.

Testing activities included:

26	In Place Density Tests (Nuclear)
9	In Place Density Tests (Sand Cone)
4	ASTM D-698 Moisture Density Relations
8	ASTM D 1140-54 Soils Finer Than No. 200 Sieve
8	ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed 7 in-place density tests indicated moisture content that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

Frequency of Testing Activities
Stated as Tests Per Cubic Yard

This Period	Cumulative	
7/5/89 to 7/8/89	5/17/89 to 7/8/89	
1:653	1:735	In Place Densities And Moisture Content
1:2858	1:3916	Atterberg Limits Tests
1:2858	1:3916	Soil Gradations
1:5715	1:7091	Moisture Density Relations

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson / A. L. Swanson

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

July 20, 1989
REPORT NO. 10

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period July 10, 1989 to July 14, 1989, 5 days of construction activity occurred.

These activities consisted of: Placing fill in south, east and west dikes and removal and stockpiling of clay material from the cell, and material classified as random. Also placing 3' of random cover on Tailings Cell No. 2.

Testing activities included:

33 In Place Density Tests (Nuclear)

14 In Place Density Tests (Sand Cone)

5 ASTM D-698 Moisture Density Relations

10 ASTM D 1140-54 Soils Finer Than No. 200 Sieve

10 ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed 2 in-place density tests indicated moisture content that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

Frequency of Testing Activities
Stated as Tests Per Cubic Yard

This Period	Cumulative	
7/10/89 to 7/14/89	5/17/89 to 7/14/89	
1:602	1:719	In Place Densities And Moisture Content
1:2828	1:3775	Atterberg Limits Tests
1:2828	1:3775	Soil Gradations
1:5656	1:6920	Moisture Density Relations

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson / H. L. Swanson

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Umetco Minerals Corporation

WHITE MESA MILL • P.O. BOX 669 • BLANDING, UTAH 84511
☎ (801) 678-2221

July 31, 1989
REPORT NO. 11

Mr. Robert L. Morgan, P.E.
State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
Dam Safety
1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156

Re: Cell 4A Tailings Pond Construction

Gentlemen:

During the period July 17, 1989 to July 24, 1989, 6 days of construction activity occurred.

These activities consisted of: Topping out fill on south, east & west dikes and removal and stockpiling of clay material from the cell, and material classified as random. Also placing 3' of random cover on Tailings Cell No. 2.

Testing activities included:

20	In Place Density Tests (Nuclear)
2	In Place Density Tests (Sand Cone)
1	ASTM D-698 Moisture Density Relations
1	ASTM D 1140-54 Soils Finer Than No. 200 Sieve
1	ASTM D 4318-84 Atterberg Limits Tests.

Of the tests performed 1 in-place density tests indicated moisture content that failed to meet specification requirements.

All of the material that failed to meet specified requirements was reworked to meet specifications or was removed from the structure.

Only 1,460 cu. yds. of fill material was placed during this 6 day period to fill in low spots and bring all dikes to the specified elevations.

Frequency of Testing Activities
Stated as Tests Per Cubic Yard

This Period	Cumulative	
7/17/89 to 7/24/89	5/17/89 to 7/24/89	
1:66	1:682	In Place Densities And Moisture Content
1:1460	1:3751	Atterberg Limits Tests
1:1460	1:3751	Soil Gradations
1:1460	1:6804	Moisture Density Relations

All individual materials tests and inspection reports are filed in the project files on site.

Sincerely,

Henry H. Sampson / A D Swanson

Henry H. Sampson, Jr. P. E.
Q A Consultant
Umetco Minerals Corporation
White Mesa Mill

xc: J. S. Hamrick

Attachment L

Cell 4A Construction Report

Activities Data

Book 1

Table of Contents

- Construction Contract
- Work Orders and Purchase Orders
- Correspondence
- Cost Codes and Monthly Cost Data
- Schedules
- Form F-1 Construction Activities Report

Cell 4A Construction Report

Activities Data

Book 2

Table of Contents

- Form F-2 Excavation Observation Report
- Form F-3 Fill Observation Report
- Form F-5 Field Density Test (Sand cone, Balloon)
- Special Testing Calcareous Soils
- Soils lab - Calibrations
- Weekly Reports - Internal
- Reports to NRC
- Reports to State of Utah
- Regulatory Letters
- Field Change Orders
- Design Change Orders
- Compliance Reports
- Clay Acceptance

Cell 4A Construction Report

Activities Data

Book 3

Table of Contents

- Form F-4 Soil Sampling Log

Cell 4A Construction Report

Activities Data

Book 4

Table of Contents

- Form F-19 Liner Seam Nondestructive Tests
- Form F-20 Liner Assembly Daily Report

Construction Photographs

Photo No. 1 - Soil Removal from Cell 4A Interior (note water sprinklers to increase moisture content of soil to be used in Dike Construction)

Photo No. 2 - Construction of Cell Dike (south side)

Photo No. 3 - Construction of Cell Dike (west side)

Photo No. 4 - Dike Construction and Rock Removal Activities

Photo No. 5 - Rock Removal Activities

Photo No. 6 - Installation of Clay Liner

Photo No. 7 - Preparation of Side Slopes Prior to Liner Installation

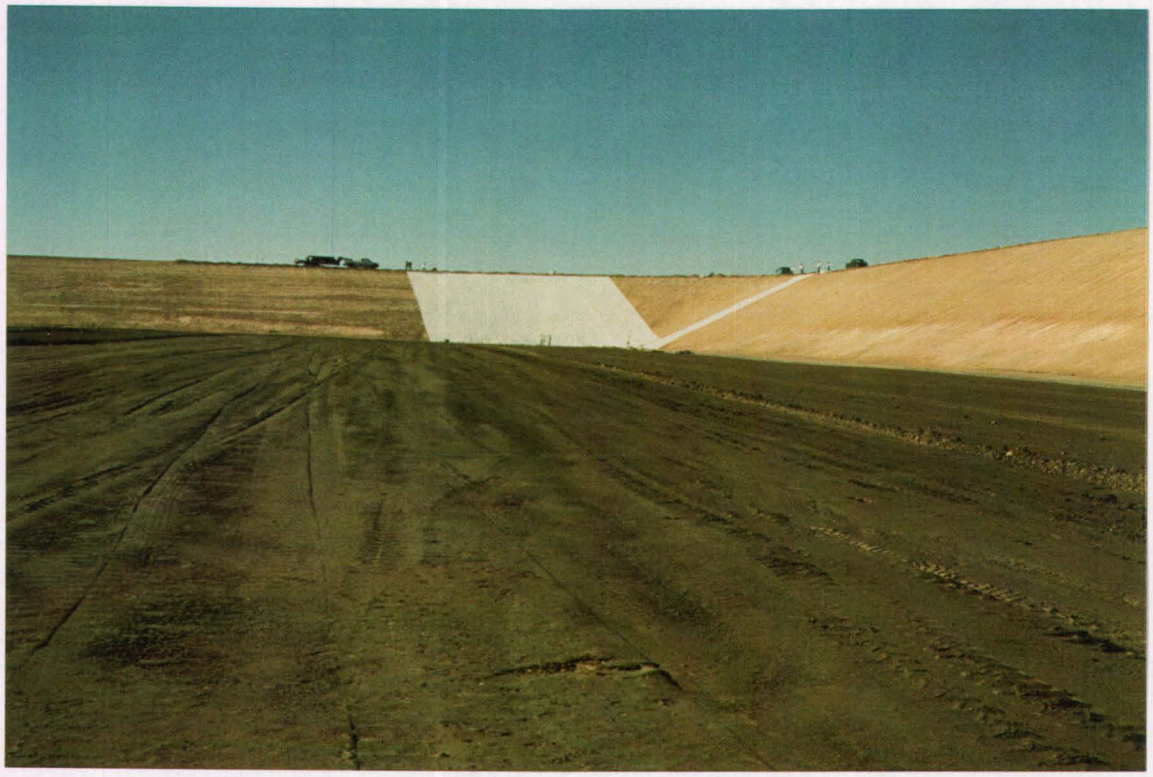


Photo No. 8 - Clay Liner Prior to Final Grading

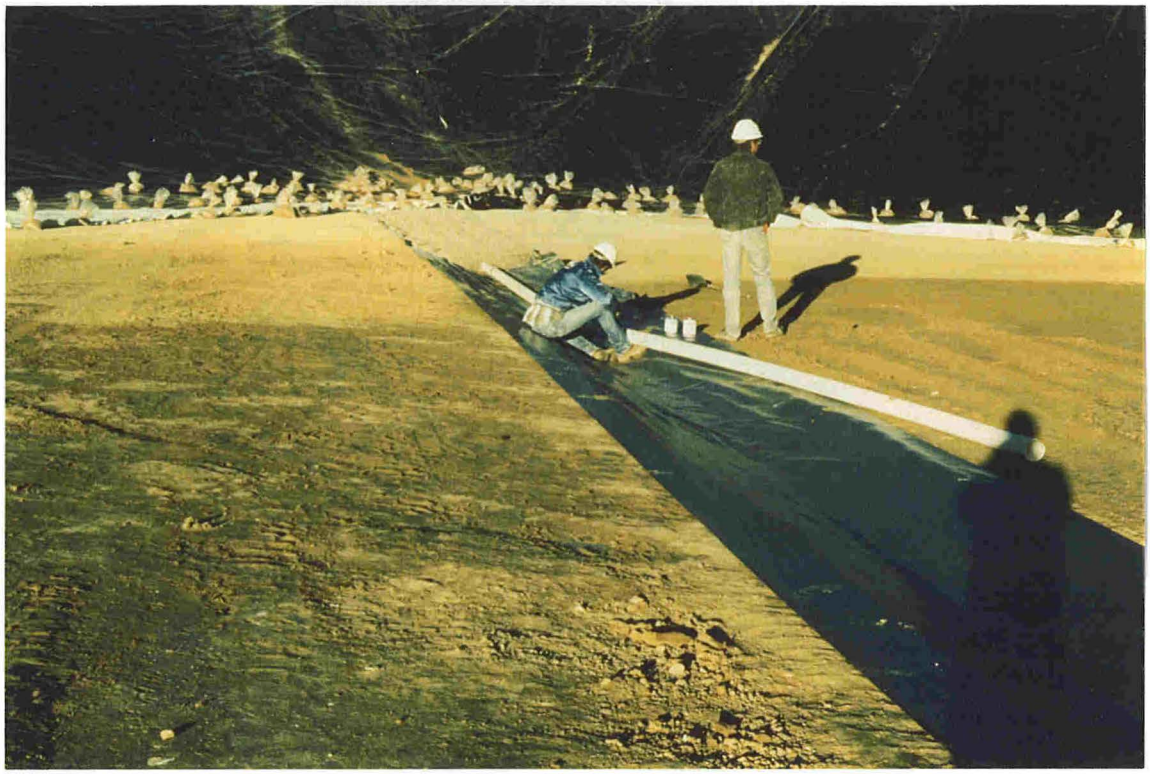


Photo No. 9 - Installation of Leak Detection Piping

Photo No. 10 - Leak Detection Pipe Trench

Photo No. 11 - Partially Complete Clay Liner and Leak Detection System

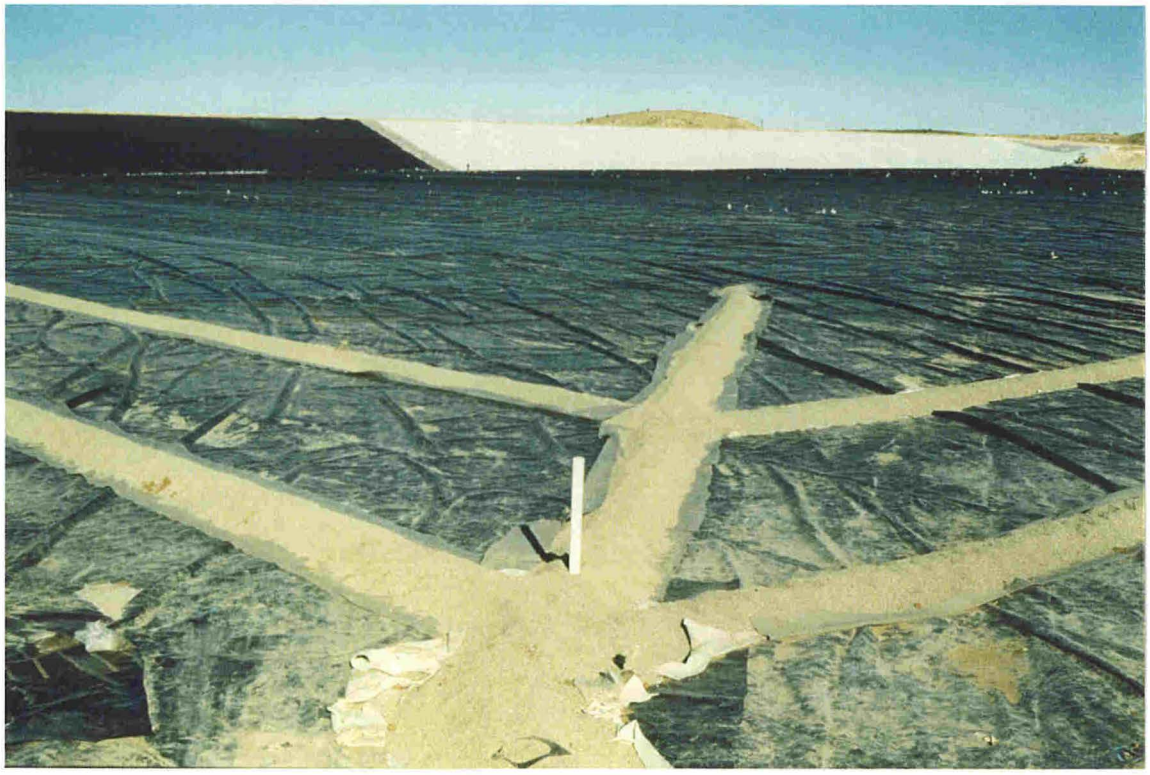


Photo No. 12 - Slimes Drain System over Synthetic Liner

Photo No. 13 - Aerial View of Cell 4A Construction

Photo No. 14 - Aerial View of Cell 4A Construction