WESTERN NUCLEAR, INC.

UNION PLAZA SUITE 300, 200 UNION BOULEVARD, LAKEWOOD, COLORADO 80228
TELECOPIER (303) 989-8993 TELEPHONE (303) 989-8675

April 21, 1999

Mr. N. King Stablein
Uranium Recovery Projects Branch - MS-T-7-J-8
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

Attn: Mr. Robert Carlson, Project Manager

RE: DOCKET NO. 40-1162, LICENSE NO. SUA-56, LICENSE CONDITION NO. 27C, TAILING RECLAMATION PLAN, COMPLETION REPORT

Dear Mr. Stablein:

In accordance with License Condition No. 27C, Western Nuclear, Inc. (WNI) hereby submits three copies of the Split Rock Tailing Reclamation Construction Completion Report. Tailing reclamation construction was completed October 31, 1998. This report presents as-built drawings and summaries of results of the quality assurance and control testing to demonstrate that approved specifications were met. The original quality assurance and quality control data are on file at the site for your review if you desire.

Should you have any questions regarding this report, please contact us at your earliest convenience.

Sincerely,

Lawrence J. Corte
Manager
LJC/eks

w/attachments
cc: J.R. Gearhart
M.A. Pasha
L.L. Miller (SMI)
File

NL05

(ltr. only to all
distribution except:
w/encl.
File Center 1
CEN 4
[illegible]

9905170227 990421
PDR ADOCK 04001162
B PDR

Prepared For:

WESTERN NUCLEAR, INC.
Split Rock Project
Jeffrey City, WY

VOLUME 1 OF 2

SPLIT ROCK TAILING RECLAMATION CONSTRUCTION COMPLETION REPORT

Prepared By:

SHEPHERD MILLER, INC.
3801 Automation Way, Suite 100
Fort Collins, CO 80525

April 1999

Prepared For:

WESTERN NUCLEAR, INC.
Split Rock Project
Jeffrey City, WY

VOLUME 1 OF 2

SPLIT ROCK TAILING RECLAMATION CONSTRUCTION COMPLETION REPORT

Prepared By:

SHEPHERD MILLER, INC.
3801 Automation Way, Suite 100
Fort Collins, CO 80525

April 1999

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES
Continued

LIST OF FIGURES

LIST OF DRAWINGS

LIST OF APPENDICES

EXECUTIVE SUMMARY

This report addresses the results of the construction work involved with reclamation of the tailing disposal area at Western Nuclear, Inc.'s (WNI) uranium milling facility located approximately 2 miles north of Jeffrey City, Wyoming. The Tailing Reclamation Plan (TRP) was submitted to the U.S. Nuclear Regulatory Commission (NRC) in February 1994 (WNI, 1994). For reference, the Technical Specifications, Tables and Figures from the 2/94 TRP are included in Appendix Y of this report.

Reclamation of the tailing disposal area began in 1988. Early reclamation activities consisted of the following:

- Decommissioning and demolition of the mill facilities
- Clearing and grubbing
- Removal of windblown tailing and topsoil from the Northwest Valley area (see Figure 3 in Appendix Y)
- Placement of a minimum of 12 inches of clean interim cover over the mill site in 1989,
- Placement of coarse tailing over exposed slimes to provide a firm base for construction equipment
- Regrading to bring the disposal area to grade including the rough shaping of the Tailing Swale located on the surface of the tailing area with 12 inches of interim cover
- Installation of settlement monuments in 1990
- Installation of vertical band drains (wicks) in 1992 to accelerate settlement
- Placement of a 12" interim cover during 1990, 1991, and 1992.

These early reclamation activities were performed by WNI and by Salveson Construction, Inc., Cook's Fabrication, Inc., and Carr Construction Company, Inc., all of Casper, Wyoming and by Nilex Corporation of Englewood, Colorado.

Final surface reclamation construction was performed by Guernsey Stone and Construction Co., Inc. of Sheridan, Wyoming (1994), and N. A. Degerstrom, Inc. of Spokane, Washington (1995, to 1998). Because of the large size of the tailing disposal area (approximately 248 acres), it was not possible to perform all of the approved tailing reclamation construction in a single season. The tailing impoundment and the former mill area were divided into eight different areas as shown in Figure 1 of this report, and several of the areas were constructed each year until construction was complete. Construction began in 1994 with reclamation of Areas 3A and 3B. In 1995 construction continued with Areas 2A, 1C, and 2B. Construction of Areas 1A and 1B began in 1996 and was completed in 1997. Minor remedial construction and the addition of two additional confluences on the North Diversion Ditch were completed in 1998. Area 2C, is comprised of two winter storage ponds associated with the ground water corrective action program. No mill tailing were ever placed in Area 2C, and the area will be reclaimed when the ponds are no longer required.

Construction observation was provided by WNI personnel. All surveying was performed by C. E. Spurlock, Jr. and Associates, Inc., of Lander, WY. Inberg-Miller Engineers of Riverton, Wyoming performed QA/QC (quality assurance/quality control) verification testing of the material used for the radon barrier layer (Cody Shale clay) and testing of the rock used for riprap and filter layers. Testing performed on the Cody Shale clay included gradation tests, laboratory density (Standard Proctor) tests and field moisture/density (Sand Cone) tests. For the rock, testing included durability and gradation tests.

During construction WNI performed routine internal QA/QC field audits, and implemented a health and safety program (HASP) for protection of workers. The HASP consisted of an industrial safety/hygiene program and a radiological protection program.

The purpose of this completion report is to describe and document each component of the reclamation construction. The technical specifications and design drawings in the tailing reclamation plan were compared to the as-built conditions to determine if reclamation construction was completed in accordance with the approved design (as revised). Photographs that depict various elements of construction are presented in Appendix A.

The report that follows demonstrates that with a few exceptions, construction was completed in accordance with the approved design. Each deviation from the approved plan is documented and it is shown that all deviations are minor and will not impact the performance of the reclamation system as constructed. The first post-construction surface stability inspection performed on May 12-15, 1998, indicated that the reclamation system, including the rock-armored cover, is performing as designed.

1.0 AS-BUILT SUMMARY

1.1 Introduction

The Split Rock Mill Reclamation Plan was initially approved by the NRC on June 17, 1993, by Amendment No. 68 to Source Material License SUA-56. Subsequent to this approval, WNI made changes to the radon barrier and erosion protection designs. In addition, the plan was expanded to include reclamation of the ground-water corrective-action winter storage ponds. These revisions were addressed by WNI in a report titled, "Western Nuclear, Inc., Split Rock Mill, Addendum A (February 7, 1994) to Revision No. 5 to the June 30, 1987, Uranium Mill Tailings Reclamation Plan," (2/94 TRP) (WNI, 1994). This plan included technical analyses, technical specifications, tables, and figures. Except for the Technical Specification sections regarding health and safety and revegetation, the Reclamation Plan was approved by the NRC on March 25, 1994, as Amendment 71 to Source Material License SUA-56. (Note: For reference, the technical specifications, tables, and figures from the NRC approved 2/94 TRP are included as Appendix Y in this report.)

The 3/25/94 NRC approval of the 2/94 Tailing Reclamation Plan caused the following change to Source Material License SUA-56: License Condition No. 27(C) requires that, "A completion report including as-built drawings, verifying that reclamation of the site has been performed according to the approved reclamation plan shall be provided within 6 months after completion of construction. The report shall also include summaries of results of the quality assurance and control testing to demonstrate that approved specifications were met." This completion report is submitted in compliance with this license requirement.

The format chosen for this construction completion report is one that logically describes each component of the reclamation construction. Because this format is not the same as the format of the technical specifications in the NRC approved Tailing Reclamation Plan (2/94 TRP) (WNI, 1994), Section 1.3 below was prepared to provide a cross-check between the sections of the 2/94 TRP, as revised in a report dated March 31, 1997 (WNI, 1997a), and in this completion report. (Attachment 11 of the March 31, 1997, submittal to the NRC provided revised pages to the technical specifications).

1.2 Chronological Summary

In 1957 the Atomic Energy Commission (AEC), which was the predecessor of the NRC, granted an approval for the operation of the Split Rock Mill with the issuance of Source Material License SUA-56. Milling commenced in 1958 and continued until June 1981, when the mill was placed on standby status. The standby status remained until August 1986, when as requested by WNI, the mill was placed in possession-only status by NRC license amendment No 32.

Decommissioning and demolition of the mill began on June 13, 1988 and was completed on September 15, 1988. Materials from the mill which could not be salvaged were crushed or cut into smaller pieces according to the NRC approved decommissioning plan (WNI, November 30, 1987) and buried in ten approved burial sites within the reclaimed tailing area. A clean interim soil cover was placed over the demolished mill debris in 1989. The results of the decommissioning were documented in a report submitted to the NRC on October 1, 1989. Placement of an interim soil cover over the mill area was completed in 1989.

Efforts to dissipate the standing water in the tailing impoundment began in 1982, during milling operations, by sprinkling water along the inside slope of the main tailing dam using small Rainbird™ sprinklers. These efforts were accelerated with the installation of an enhanced mist evaporation system which operated from 1984 through 1987, and an enhanced evaporation spray system which operated during 1988 and 1989. By September 6, 1989, all of the standing water had been dissipated.

Regrading and reshaping of the tailing began in 1990. This included the placement of coarse tailing over fine tailing, retrieval and disposal of windblown and contaminated soils from outside of the reclamation cover boundary. In addition, borrow soils were placed over the regraded tailing to approximately the desired final reclamation subgrade configuration and interim soil cover was placed over the tailing areas.

To monitor settlement of the tailing, monuments were installed in 1990 and 1991 following regrading operations and in 1992 during the installation of vertical band drains (wicks). The wicks were installed to accelerate settlement and to assist in the tailing dewatering process. Vertical movement of the settlement monuments was recorded until primary consolidation was complete. The settlement data for monuments SP-1, SP-2, SP-3, SP-4, SP-10 and SP-11 was documented and submitted to the NRC for review and approval on February 27, 1992. The NRC agreed that primary consolidation was complete and placement of the final soil cover could proceed in the area where these wells were located. NRC approval was provided in a letter to WNI dated March 10, 1992. Settlement data for monuments SP-5, SP-6, SP-7, SP-8, SP-9, SP-12, SP-13, SP-14, and SP-15 was documented and submitted to the NRC for review and approval on March 18, 1996. The NRC agreed that primary consolidation was complete and provided approval in a letter to WNI dated April, 12, 1996.

Several borrow areas were developed to obtain construction materials. These included four soil borrow areas, a Cody Shale clay borrow area used for obtaining clay for radon barrier material, and a rock quarry which was developed on site. The four soil borrow areas are shown on Figure 3 of the NRC approved Tailing Reclamation Plan (2/94 TRP). (For reference, this figure is included in Appendix Y of this report). The borrow areas are the Northwest Valley Soil Borrow Area, Northeast Valley Soil Borrow Area, Southwest Valley Soil Borrow Area and South Soil Borrow Area. Prior to obtaining soil from these areas, all contaminated soils were removed and placed in the tailing impoundment. The areas were then verified by radiological survey. To confirm that tailing had not been redeposited over the borrow soils, an external gamma radiation survey was conducted before each construction season. Contaminated soils were removed and placed in the tailing impoundment beneath the radon barrier.

The Cody Shale clay borrow area is located about 9 miles south of the site. The area was developed by first constructing an access road to the site. Topsoil was then stripped and stockpiled for future reclamation of the Cody Shale clay borrow area. The Cody Shale clay material was tested in the borrow area to ensure that it met the gradation requirements. Material that met the requirements was then removed in 20-foot lifts and transported to the tailing site where it was moisture conditioned for use in the radon barrier layer. Material that did not meet the radon barrier specifications was either left in the borrow area or was used in the tailing impoundment as subgrade material, i.e., an additional clay layer placed to facilitate placement of the first layer of the radon barrier. As discussed in Section 1.3.1.3.4, this additional clay layer was referred to as sacrificial clay because it was not included in the radon attenuation model.

Rock for use as erosion protection material was obtained from an on-site granite source located north of the tailing impoundment as shown in Figure 3 of the NRC approved 2/94 TRP (WNI, 1994). (see Appendix Y of this report). Initial durability testing indicated that the rock was very hard, dense, and durable, and an excellent source for filter, rock mulch and riprap material. Rock from this area was blasted, crushed and blended to meet the gradation requirements for the various rock sizes required. The rock that met the durability and gradation requirements was then stockpiled on site for future use.

The erosion protection proposed in the 2/94 TRP (WNI, 1994) consisted of a soil/rock matrix layer for the tailing impoundment and riprap for the diversion ditches and tailing swale. The soil/rock matrix consisted of a layer of rock overlain by a thin layer of soil. Except for a small area located in the northwest portion of the tailing impoundment and the tailing area located east and south of the South Diversion Ditch (see Figure 5 of the 2/94 TRP which is included in Appendix Y of this report), the soil/rock matrix proposed for the tailing impoundment consisted of a 4-inch thick layer of rock overlain by a 2-inch thick soil layer. The median stone diameter (D_{50}) of the rock was 2 inches. Rock with a D_{50} of 3 inches was required for the small area in the northwest portion of the tailing impoundment and rock with a D_{50} of 6 inches was required for the tailing area east and south of the South Diversion Ditch. The thicknesses of these rock layers were 4 inches and 12 inches respectively (see Table 2C of the 2/94 TRP which is included in Appendix Y of this report). These rock layers were also overlain by a 2 inch layer of soil *(Note: As discussed in Section 1.3.1.1.2 of this report, the soil portion of the soil/rock matrix was deleted after the first year of construction (1994) by license condition 27(E)).* Four sizes of riprap were required for the diversion ditches and the Tailing Swale. These included D_{50}s of 3 inches, 6 inches, 12 inches, and 18 inches. Two sizes of filter material, Filter I and Filter II, were also required.

To avoid construction delays due to potential unavailability of certain construction materials, all of the required riprap, rock mulch and filter materials were produced and stockpiled on site in 1994 and 1995, well in advance of placement. The erosion protection materials were placed as soon as practicable after placement of the final reclamation cover. During construction the limits of rock placement were found to be more extensive than the limits shown in the 2/94 TRP (WNI, 1994); therefore, additional riprap had to be produced. In 1997 a crusher operation was set up and additional quantities of Filters I, and II, and riprap D_{50}s of 3 inches and 6 inches were produced from some of the excess larger rock that had already been tested for durability and stockpiled on site.

The areas adjacent to the tailing impoundment were surveyed to determine the extent of radiological contamination from windblown material. A program was developed for radiological cleanup and verification. The program report was submitted to the NRC for review and approval on December 15, 1995 (WNI, 1995). The program as revised on May 1 and May 29, 1996, was approved by the NRC in a letter to WNI dated June 24, 1996. Site clean up and verification occurred during 1996 and 1997. The clean-up verification results were documented and a report was submitted to the NRC on December 19, 1997 (WNI, 1997c).

A final reclamation cover, consisting of a radon barrier layer, and a soil borrow layer, was placed over subgrade material. The as-built thickness of the radon barrier layer varied from 6 inches to 45 inches depending on the radium content of the tailing in the area. The as-built borrow soil layer varied from 8 to 15 inches thick. As discussed above, erosion protection was provided by a soil/rock matrix layer or by a layer of rock mulch.

Four diversion ditches; the North Diversion Ditch, the South Diversion Ditch, the North Central Diversion Ditch and the South Central Diversion Ditch, were provided to divert flood flows away from the reclaimed tailing. Because of the difficulty of excavating on the steep granite outcrops that surround the tailing impoundment, portions of the ditches had to be located on the surface of the tailing impoundment. In those ditch portions, a final reclamation cover, consisting of a radon barrier layer, and a soil borrow layer was placed over subgrade material. The thickness of the radon barrier layer in the ditches was the same as the tailing area in which the portion of the ditch was located. The as-built borrow soil layer thickness varied from 6 to 7 inches. To prevent erosion, each diversion ditch was lined with a layer of riprap placed over one or two filter layers depending on the D_{50} size of the riprap. The as-built D_{50} of the riprap varied from 3-inches to 18-inches, and the riprap layer thicknesses varied from 6-inches to 27.5 inches.

Although not part of the NRC approved Reclamation Plan, all areas disturbed by construction, including the soil borrow areas, windblown tailing excavation areas, Cody Shale clay borrow area, and the rock quarry, were revegetated as of October 30, 1998 per the submitted plan. Topsoil (where available) was placed to a nominal depth of 6" over disturbed areas prior to seeding. Fertilizer was applied at an application rate of 30lbs/acre phosphorus and 40lbs/acre nitrogen (not urea based N). The seed mixture was as specified in Section 6.0 of the Technical Specifications in the 2/94 TRP (WNI, 1994). All seeded areas were mulched with certified weed-free hay at three tons per acre and crimped in place or hydromulched with 2,000lbs/acre.

1.3 Section Comparison

The format of this report is not the same as the format of the technical specifications. It was chosen since it logically describes each component of the reclamation construction. The following table has been prepared to provide a cross-check between the sections of the Technical Specifications (Appendix Y) and this report.

Approved Technical Specifications Section or Item		**Construction Completion Report Section or Item**	
1	General Project Requirements		No specific requirement (1)
1.1	General Description of Work		No specific requirement (1)
1.2	Reclamation Work Items		No specific requirement (1)
1.3	Sanitary Facilities		No specific requirement (1)
1.4	Reclamation Plan Drawings		No specific requirement (1)
1.5	As-Built Reclamation Plan Drawings		Entire As-Built Report
1.6	State, Local, and Environmental Laws and Permits	2.1	Site Preparation
1.7	Archaeological Considerations	2.1.2	Archeology
1.8	Construction Water	2.1.5	Construction Water
1.9	Codes and Standards		No specific requirement (1)
1.9.1	Health and Safety	3.0	Health and Safety Program
1.10	Submittals		No specific requirement (1)
1.10.1	Permits		No specific requirement (1)
1.10.1	Products		No specific requirement (1)
1.11	Definitions		No specific requirement (1)
2.0	Clearing and Grubbing	2.1.3	Clearing and Grubbing
2.1	General		No specific requirement (1)
2.1.1	Scope of Work		No specific requirement (1)
2.1.2	Related Work		No specific requirement (1)
2.1.3	Definitions		No specific requirement (1)
2.1.4	Products		No specific requirement (1)
2.2	Executive		No specific requirement (1)
3.0	Excavation		No specific requirement (1)
3.1	General		No specific requirement (1)
3.1.1	Scope of Work		No specific requirement (1)
3.1.2	Related Work		No specific requirement (1)
3.1.3	Definitions		No specific requirement (1)
3.1.4	Products		No specific requirement (1)
3.2	Execution		No specific requirement (1)
3.2.1	General		No specific requirement (1)
3.2.2	Tailing Material Excavation and/or Regrading	2.3.1	Subgrade
3.2.3	Windblown Tailing Excavation and Grading	2.3.1.2.2	Windblown Tailing and Affected Soils
3.2.4	Affected Soil Excavation	2.3.1.2.2	Windblown Tailing and Affected Soils
3.2.5	Diversion Ditch Excavation and Grading	2.3.4	Diversion Ditches and Tailing Swale
3.2.6	Placement of Interim Soil Cover	2.3.2	Interim Cover

(1) No specific requirement indicates that no information is required in this Construction Completion Report.

Approved Technical Specifications Section or Item		**Construction Completion Report Section or Item**	
3.2.7	Placement of Fill to Achieve Desired Subgrade	2.3.1	Subgrade
4.0	Final Reclamation Cover Placement	2.3.3	Final Reclamation Cover
4.1	General		No specific requirement (1)
4.1.1	Scope of Work		No specific requirement (1)
4.1.2	Related Work		No specific requirement (1)
4.1.3	Definitions		No specific requirement (1)
4.1.4	Products		No specific requirement (1)
4.2	Execution		No specific requirement (1)
4.2.1	General		No specific requirement (1)
4.2.2	Placement and Grading of Final Reclamation Cover	2.3.3	Final Reclamation Cover
4.2.2.1	Excavation, Hauling, Preparation, Placement, and Grading of Radon Barrier Layer	2.3.3.2	Radon Barrier Layer Requirements
4.2.2.2	Placement and Grading of Borrow Soil Layer	2.3.3.3	Borrow Soil Layer Requirements
5.0	Erosion Protection Placement	2.3.5	Erosion Protection
5.1	General		No specific requirement (1)
5.1.1	Scope of Work		No specific requirement (1)
5.1.2	Related Work		No specific requirement (1)
5.1.3	Definitions		No specific requirement (1)
5.1.4	Products		No specific requirement (1)
5.1.4.1	Riprap		No specific requirement (1)
5.1.4.2	Filter Material		No specific requirement (1)
5.1.4.3	Soil/Rock Matrix		No specific requirement (1)
5.2	Execution		
5.2.1	Rock Durability Testing and Permissible Use	2.3.5.2	Rock Durability Testing
5.2.2	Riprap, Filter, and Matrix Rock Size and Gradation Requirements	2.3.5.3	Rock Gradation Testing
5.2.3	Riprap Placement	2.3.5.4	Rock Placement
5.2.4	Filter Material Placement	2.3.5.4	Rock Placement
5.2.5	Soil/Rock Matrix	2.3.5.4	Rock Placement
5.2.6	Erosion Aprons	2.3.6.2	Outlet Aprons
6.0	Revegetation	1.1	Introduction
6.1	General		No specific requirement (1)
6.1.1	Scope of Work		No specific requirement (1)
6.1.2	Related Work		No specific requirement (1)
6.1.3	Definitions		No specific requirement (1)
6.1.4	Products		No specific requirement (1)
6.1.4.1	General		No specific requirement (1)
6.1.4.2	Site Seed Mixture		No specific requirement (1)
6.1.4.3	Mulch		No specific requirement (1)
6.2	Execution		No specific requirement (1)

(1) No specific requirement indicates that no information is required in this Construction Completion Report.

Approved Technical Specifications Section or Item		Construction Completion Report Section or Item	
6.2.1	General		No specific requirement (1)
6.2.2	Preparation		No specific requirement (1)
6.2.3	Seeding		No specific requirement (1)
6.2.4	Mulching		No specific requirement (1)
6.2.5	Restoration		No specific requirement (1)
7.0	Quality Control		Addressed elsewhere (2)
7.1	General		No specific requirement (1)
7.1.1	Scope		No specific requirement (1)
7.1.2	Related Work		No specific requirement (1)
7.1.3	Definitions		No specific requirement (1)
7.1.4	Products		No specific requirement (1)
7.2	Execution		No specific requirement (1)
7.2.1	Settlement Monitoring	1.1	Introduction
7.2.2	Borrow Soil Placement and Testing	2.3.3.3.2	Placement
7.2.2.1	Windblown Tailing Identification Survey	2.3.1.2.2	Windblown Tailing and Affected Soils
7.2.2.2	Affected Soils Identification Survey	2.3.1.2.2	Windblown Tailing and Affected Soils
7.2.3	Radon Barrier Layer Preparation, Placement, Compaction ,and Testing	2.3.3	Final Reclamation Cover
7.2.3.1	Radon Barrier Gradation Testing	2.3.3.2.2	Gradation Testing
7.2.3.2	Radon Barrier Layer Compaction Testing	2.3.3.2.3	Field Density/Moisture Tests
7.2.4	Riprap and Filter Rock Sizing and Testing	2.3.5	Erosion Protection
7.2.4.1	Rock Durability Testing	2.3.5.2	Rock Durability Testing
7.2.4.2	Riprap and Filter Gradation and Thickness	2.3.5.3 2.3.5.4	Rock Gradation Testing Rock Placement
7.2.5	Soil/Rock Matrix Placement, Compaction, and Testing	2.3.5.4	Rock Placement
7.2.6	Quality Control Procedures: Nuclear Density and Moisture Correlations	2.3.3.2.3	Field Density/Moisture Tests
7.2.7	Records		No specific requirement (1)
8.0	Health and Safety	3.0	Health and Safety Program
8.1	General		No specific requirement (1)
8.1.1	Scope		No specific requirement (1)
8.1.2	Related Work		No specific requirement (1)
8.1.3	Definitions		No specific requirement (1)
8.2	Safety Equipment	3.2.2	Equipment
8.2.1	Personal Protective Equipment	3.2.2	Equipment
8.2.2	Exposure Monitoring	3.2.3	Exposure Surveillance Program

(1) No specific requirement indicates that no information is required in this Construction Completion Report.

(2) Addressed elsewhere indicates that the information is addressed in several sections of this Construction Completion Report.

Approved Technical Specifications Section or Item		Construction Completion Report Section or Item	
8.3	Hazard Analysis	3.1 2.1	HASP Responsibilities Site Preparation
8.4	Radiological Safety	3.2	Radiological Protection Program
8.4.1	ALARA Program	3.2.5	As Low As Reasonably Achievable (ALARA) Activities
8.4.2	Training	3.2.1	Training
8.4.3	Management Audits	2.3.3.2.3 2.3.3.2.5 5.1 5.2	Field Density/Moisture Tests First Lift Thickness WNI Documentation WNI Audits
8.4.4	Radiation Work Permits	3.1	HASP Responsibilities
8.4.5	Radiation Surveys	3.2.3	Exposure Surveillance Program
8.4.6	Radiological Contamination Surveys	3.2.4	Radiological Contamination Survey
8.4.7	Respiratory Protection	3.2.1	Training
8.4.8	Inspections	5.0	Documentation, Audits, and Inspections
8.4.9	Restricted Area Access	3.2.6	Restricted Area Access
8.4.10	Minimizing Dusting	2.1.5	Construction Water
8.4.11	Written Procedures	3.0 3.1	Health and Safety Program HASP Responsibilities
8.5	Responsible Personnel	3.2.5	As Low as Reasonably Achievable (ALARA) Activities
8.5.1	Management Control	3.2.5	As Low as Reasonably Achievable (ALARA) Activities
8.6	Emergency Procedures	3.3	Emergency Procedures
8.7	Site Control and Decontamination	3.4	Site Control and Decontamination
8.8	General Site Health and Safety and Work Rules	3.1	HASP Responsibilities

(1) No specific requirement indicates that no information is required in this Construction Completion Report.

1.3.1 Changes from the Approved Technical Reclamation Plan

As reclamation construction activities progressed at the site it became necessary to revise certain aspects of the 2/94 TRP (WNI, 1994). There were three categories of revisions. The first category consisted of redesigning certain reclamation features, as discussed in Section 1.3.1.1 below. These changes were submitted to and approved by the NRC. The second category consisted of changes which were required because of unanticipated field conditions. In order to complete reclamation in a timely manner and to meet the required reclamation milestones in License Condition 75, field changes were not submitted to the NRC. Field changes are discussed in Section 1.3.1.2 below and justification for the changes is included in this report as Appendices C through F. The third category of changes consisted of deviations in the reclamation design which did not impact the performance of the reclamation system as designed. These deviations are discussed in Section 1.3.1.3.

1.3.1.1 NRC Approved Changes

1.3.1.1.1 Approved Change in One-Point Proctor Requirement

Section 7.2.3.2 of the 2/94 TRP Technical Specifications (WNI, 1994) titled, "Radon Barrier Layer Compaction Testing," required that Standard Proctor tests (ASTM D 698) be conducted at a rate of one test for every 15 field density tests. Additionally, one-point Proctor tests were to be conducted at a rate of one test for every 5 field density tests. During the first year of construction, both Standard Proctor and one-point Proctor tests were performed on the radon barrier layer (Cody Shale clay). The results of these tests indicated that the material had very uniform maximum density and optimum moisture values. Because of this uniformity, all of the Cody Shale clay material was determined to be "in the same family". Therefore, WNI proposed to the NRC that the one-point Proctor test requirement be deleted from the Technical Specifications. This proposal was approved by the NRC in Amendment 74 and License Condition 27(D) was added to SUA-56 to read as follows: "One-point Proctor tests shall not be required during placement of the Cody Shale clay."

1.3.1.1.2 Approved Change in Soil Rock Matrix Design

The erosion protection layer required for the tailing impoundment, as described in Section 5.2.5 of the approved Technical Specifications in the 2/94 TRP (WNI, 1994), was a soil/rock matrix consisting of a 2-inch layer of soil placed over a layer of rock mulch. This design is illustrated on Figure 10 of the 2/94 TRP (see Appendix Y). During the first year of construction, the required soil/rock matrix was placed in Areas 3A and 3B. For the remaining construction, WNI proposed that the soil portion of the soil/rock matrix be eliminated. The NRC agreed and in Amendment 74 to SUA-56 added License Condition 27(E) to read as follows: "The soil component of the erosion protection layer, consisting of soil/rock matrix, is deleted. This erosion protection layer, to be placed over the final surface reclamation soil cover, will consist of a minimum 4-inch thickness of rock with a minimum D_{50} of 2-inches."

1.3.1.1.3 Approved Change in Frequency of Rock Gradation and Durability Tests

Table 5 of the 2/94 TRP (WNI, 1994) specified the frequency at which rock durability and gradation testing would be performed. For durability the frequency was, "One test series prior to placement and one test series for every 10,000 cy of material from the rock source." For gradation testing, the frequency was "One test prior to placement and one test for every 10,000 cy of each size of material placed with a minimum of 3 tests for each material size. On August 18, 1995, the NRC in Amendment 75 to SUA 56, revised the rock durability testing frequency in License Condition 27(F) from one test for every 10,000 cy to one test per 20,000 cy. The revised License Condition 27(F) read as follows, "For rock durability tests, the frequency specified in Table 5, shall be one test series prior to placement and one test series for every 20,000 cubic yards of material from the rock source."

The gradation testing frequency in Table 5 of the 2/94 TRP (see Appendix Y) was revised by changing the word "placed" to "produced" and adding it as License Condition 27(G) to read as follows. "One test prior to placement and one test for every 10,000 cy of each size of material produced with a minimum of 3 tests for each material size. These gradation tests shall be performed as the material is being produced and prior to placement."

1.3.1.1.4 Approved Change in Radon Barrier Layer Design

The proposed final surface configuration of the tailing impoundment is shown in Figures 4 and 5 of the 2/94 TRP (see Appendix Y). In designing this configuration, it was necessary to estimate the volume of windblown tailing or contaminated soils that would have to be cleaned up and placed over tailing. As windblown tailing cleanup progressed, it became obvious that the actual volume of windblown tailing or contaminated soils was much greater than what had been assumed during the design phase. In order to provide disposal space for the additional windblown tailing or contaminated soils, it became necessary to raise the final surface of the tailing impoundment. However, because surface reclamation in all tailing areas with the exception of Areas 1A and 1B had already been completed, only the surfaces of these two areas were raised. Care was taken during this redesign so that the runoff pattern, which was toward the Tailing Swale, was not changed.

Due to the revised surface configuration and the additional thickness of windblown tailing, it became necessary to reevaluate the radon barrier designs of Areas 1A and 1B. However, since the approved radon barrier had already been placed in the southern half of these areas, only the radon barrier design in the northern half was reevaluated. For design purposes, Areas 1A and 1B were divided into northern and southern halves at the Northing 7,900 grid line. In addition, the northern half of Area 1B was further divided into a western portion and an eastern portion. These areas are as shown in Figure 2 of this report.

Additional soil samples obtained from the northern halves of Areas 1A and 1B were analyzed for ^{226}Ra. The results of these analyses indicated that radium activities were much lower than the values used in the 2/94 TRP to design the radon barrier layers. As a result, additional analyses were performed using NRC's RADON computer model (NRC, 1989) and (Rogers and others, 1984). The results of the modeling indicated that the thickness of the radon barrier layer in the northern half of Area 1A (see Figure 2 of this report) could be reduced from 33 inches to 16 inches. For Area 1B, the RADON modeling indicated that the approved 44-inch radon barrier layer could be reduced to 16 inches in the eastern portion of the area and to 6 inches in the western portion. These reduced radon barrier layer thicknesses were proposed in a March 31,1997, WNI submittal to the NRC titled, "License Condition # 27: Revisions to Surface Reclamation Design - License Condition #33: Addendum to Radiological Verification Program." (WNI, 1997a). Additional information was submitted by WNI in a May 30, 1997, report titled, "Addendum to 03/31/97 Submittal, Responses to 05/12/97 NRC Questions #3 and #4." (WNI, 1997b). The reduced radon barrier layer thicknesses were approved by the NRC in Amendment 80 to SUA-56 and Condition 27(H) was added to read as follows: "The radon barrier for the northern portions of Area 1A and Area 1B shall be constructed in accordance with material types, thicknesses, and placement criteria described in the license amendment request, License Condition # 27: Revisions to Surface Reclamation Design - License Condition #33: Addendum to Radiological Verification Program, dated March 31, 1997, and the supplemental information, dated May 12, 1997 and May 30, 1997."

Another area where the radon barrier layer design was reevaluated was Area 2A (see Figure 1). Reclamation of Area 2A was essentially completed in 1995 except for a small (0.8 acre) area at the southwestern edge which was not reclaimed because it contained power and pipe lines and provided access to the winter storage ponds. In 1997, additional soil samples were taken from the 0.8 acre area and analyzed for ^{226}Ra. This analysis indicated that radium activities in the 0.8 acre area were close to background values. A RADON analysis indicated a radon barrier layer 2-inches thick would be required. As a result of this analysis, WNI, in a report with cover letter to the NRC dated July 25, 1997, (WNI, 1997c) conservatively proposed a 6-inch thick radon barrier layer for the 0.8 acre area in Area 2A. This radon barrier was approved by the NRC in Amendment 81 and License Condition 27(I) was added to read as follows: "The thickness of the radon barrier in the 0.8 acre Area 2A shall be in accordance with the Western Nuclear, Inc. Western Nuclear Split Rock Site Redesign of Final Cover Thickness 0.8 Acre Area in Area 2A, transmitted to the NRC on July 25, 1997."

1.3.1.1.5 Change in Riprap and Rock Mulch Design

Since the final surfaces of Areas 1A and 1B had to be raised as discussed above, it became necessary to reevaluate the adequacy of the riprap in the Tailing Swale and the rock mulch on the tailing impoundment. The approved riprap sizes for these two reclamation features are shown in Table 2A of the 2/94 TRP (WNI,1994) (see Appendix Y of this report).

The Tailing Swale is a flat shallow channel that collects snowmelt or rain water from the reclaimed tailing impoundment and conveys it to the North Diversion Ditch. The location of the swale is shown on Figures 4 and 5 of the 2/94 TRP (WNI, 1994) (see Appendix Y of this report). The erosion protection design for the swale as shown in Table 2A of the 2/94 TRP is as follows:

Tailing Swale Stations	D_{50}
2+00 to 21+40	3
21+40 to 28+95	12

A reanalysis of the swale riprap indicated that 3-inch D_{50} riprap was adequate between swale stations 2+00 and 21+15 but not adequate between stations 21+15 and 21+40. Between these stations (21+15 to 21+40) a minimum 6-inch D_{50} was required. The 12-inch D_{50} between stations 21+40 and 28+95 was adequate. As a result of this reanalysis, WNI proposed the following riprap sizes to the NRC in the March 31, 1997 report, discussed above (WNI, 1997a).

Tailing Swale Stations	D_{50}
2+00 to 21+15	3
21+15 to 28+95	12

While this change to the rock sizing was not specifically approved by the NRC, the larger rock (12" D_{50}) was placed between stations 21+15 and 21+40 to ensure erosional stability.

1.3.1.2 Field Changes

1.3.1.2.1 Field Change in Confluence Design

Confluences provide smooth transitions of side drainages into the diversion ditches. Confluence locations are shown in Figure 5 of the 2/94 TRP (WNI, 1994) (see

Appendix Y of this report). In the 2/94 TRP, there was only one confluence on the North Diversion Ditch. This confluence, which is located at approximately Station 35+00 of the North Diversion Ditch, is shown on Figure 5 of the 2/94 TRP as North Confluence 1. During reclamation construction, grading and soil cleanup activities were so extensive that the alignment of the confluence proposed in the 2/94 TRP did not intercept all of the area draining into the North Diversion Ditch at the confluence location. As a result, the confluence had to be realigned and a reanalysis had to be performed to assure that the confluence dimensions (100 foot bottom width and 3H:1V side slopes) and the riprap size (12-inch D_{50}) proposed in the 2/94 TRP were adequate. The results of this reanalysis, which are presented in Appendix B, indicate that the dimensions and riprap proposed in the 2/94 TRP are acceptable for the realigned North Confluence 1.

The extensive grading and soil cleanup activities that occurred during reclamation construction also indicated that a new confluence would be required at approximately station 5+50 of the North Diversion Ditch. This confluence is identified as North Confluence 2 in Figure 3 of this report. An analysis was performed to determine the required dimensions and riprap size that would be required. Based on this analysis, a confluence with a 60-foot bottom width, 3H:1V side slopes, and 18-inch D_{50} riprap, was constructed at station 5+50 of the North Diversion Channel. The analysis of this confluence is presented in Appendix C of this report.

Another confluence that required a field change was South Confluence 2 which is located at approximately station 32+00 of the South Diversion Ditch. This confluence as proposed in the 2/94 TRP had a 50-foot bottom width, 3H:1V side slopes, and 18-inch D_{50} riprap. As shown in Table 2A of the 2/94 TRP (see Appendix Y of this report), the design D_{50} for this confluence was oversized by 12.5 percent because the necessary riprap size was only 16 inches. During construction it was determined that this confluence required extensive excavation. Since the riprap was already oversized, an analysis was performed to determine how much the bottom width could be reduced in order to reduce the amount of excavation. The results of this analysis, which are presented in Appendix D indicated that the bottom width of South Confluence 2 could be reduced from 50 feet to 42 feet and still remain erosionally stable with 18-inch D_{50} riprap.

1.3.1.2.2 Field Change in Diversion Ditch Alignment

In the 2/94 TRP, the North Central and South Central Diversion Ditches were located along the edge of the granite rock outcrops. In staking out the centerlines of the ditches during construction, it was discovered that the proposed alignment could not avoid the rock outcrops. This alignment would have required extensive rock excavation by blasting. Because shaping of the ditches would have been extremely difficult to accomplish using blasting techniques, it became necessary to realign portions of the ditches to move them away from the rock outcrops. Some blasting was still necessary to construct portions of the North Central and South Central Diversion Ditches.

The North Central Diversion Ditch was realigned between stations 0+00 and 10+00 and the South Central Diversion Ditch was realigned between stations 0+00 and 8+00. The realignment resulted in a 44-foot reduction in the length of the North Central Diversion Ditch and a 30-foot reduction in the length of the South Central Diversion Ditch. Because of these changes, it was necessary to reanalyze both ditches. In the reanalysis, the elevations and locations of the ditch outlets were fixed at the elevations and locations required in the 2/94 TRP.

In the redesign of the North Central Diversion Ditch, the bottom slopes of the ditch were assumed to be the same as those proposed in the 2/94 TRP so that the proposed riprap sizes would not have to be changed. However, since the length of the ditch was 44 feet shorter, it was necessary to excavate the ditch an additional 1.3 feet at the upstream end to maintain the proper bottom slope. By incorporating this design change it was possible to retain the riprap sizes proposed for the North Central Diversion Ditch in the 2/94 TRP. The results of the reanalysis are presented in Appendix E.

The upper end of the North Central Diversion Ditch (Station 0+00) is also Station 0+00 of the South Central Diversion Ditch (see Figure 5 of the 2/94 TRP which is included in Appendix Y of this report). Therefore, since the North Central Diversion Ditch had to be excavated an additional 1.3 feet at the upper end, so did the South Central Diversion Ditch. As a result, in the reanalysis of the South Central Diversion Ditch, both the elevations of the inlet and outlet were fixed as the inlet was 1.3 feet lower than that proposed in the 2/94 TRP and the outlet was as proposed in the 2/94 TRP which required a portion of the ditch to have a flatter slope. The slopes at the upper and lower ends of the ditch were assumed to be the same as they were in the 2/94 TRP so that the proposed riprap sizes would not have to be changed. However, the slope in the center portion of the ditch had to be reduced from 0.040 to 0.034. The results of the reanalysis which are presented in Appendix E, showed that the riprap sizes and ditch dimensions proposed in the TRP are adequate for the realigned South Central Diversion Ditch.

1.3.1.3 Deviations

1.3.1.3.1 Deviation of Reclamation Cover

The final reclamation cover placed on the tailing impoundment consists of a radon barrier layer and a borrow soil layer. Erosion protection is provided by a layer of rock mulch, except in Areas 3A and 3B where a soil/rock matrix layer was placed. The required limits of the reclamation cover are shown as the "extent of soil cover" on Figure 4 of the 2/94 TRP. The required limits of the rock mulch are shown on Figure 5 of the 2/94 TRP. (For reference Figures 4 and 5 of the 2/94 TRP are included in Appendix Y of this report). During construction, it was determined that additional tailing outside the limits shown in Figure 4 of the 2/94 TRP in the area between the South Diversion Ditch and the granite rock outcrops could not practicably be moved to the tailing side of the ditch. In these areas, the reclamation cover and the rock mulch were extended laterally beyond the limits shown in the 2/94 TRP. In the 2/94 TRP, the proposed radon barrier was estimated to cover about 248 acres (Note: This area does not include Area 2C which will be reclaimed at a later date). The actual as-built radon barrier covered 258 acres. The as-built area covered with rock erosion protection including soil/rock matrix, rock mulch, and riprap is approximately 304 acres. Areas where the reclamation cover and rock mulch were extended are discussed below. In some cases, the radon barrier layer, the borrow soil layer, and the rock mulch layer were all extended. In other cases only the rock mulch was extended. Drawing 1 of this report presents the as-built limits of the tailing reclamation cover which includes the radon barrier, and Drawing 2 presents the as-built limits of the erosion protection.

As shown on Figure 5 of the 2/94 TRP which is included in Appendix Y of this report, there is a tailing area on the east and south side of the South Diversion Ditch, that required reclamation cover and erosion protection. In this area, the reclamation cover and the rock mulch were extended east and south beyond the required boundary as shown in Drawing 2 of this report.

At the northwestern side of the tailing impoundment the 2 inch D_{50} rock mulch was extended between the North Diversion Ditch outlet and the reclamation cover boundary and between the North Central Diversion Ditch outlet and the reclamation cover boundary. This additional rock mulch was not included in the 2/94 TRP design.

Areas where no radon barrier or borrow soil were required but rock mulch was placed for erosional stability can be seen by comparing Drawing 1 and Drawing 2. These include an area between the outside toe of the North Central Diversion Ditch and Area 3B, an area between the outside toe of the South Central Diversion Ditch and Area 3B and an area between the inside toe of the South Central Diversion Ditch and Area 2A. As shown in Figure 5 of the 2/94 TRP (see Appendix Y of this report), only rock mulch was required in these areas.

Another area where radon barrier or borrow soil were not required, is between inside crest of the North Diversion Ditch and Areas 1A and 3A. In this area only rock mulch was required as shown in Figure 5 of the 2/94 TRP (see Appendix Y of this report).

During construction, a 6-inch layer of clay (Cody Shale clay) and a 12 inch layer of borrow soil were placed to match the surrounding grade and to prevent rilling or gullying until the rock mulch was placed.

1.3.1.3.2 Placement of Cody Shale Clay in Diversion Ditches

The erosion protection required in the North Diversion Ditch consists of riprap placed over one or two filter layers. To provide additional erosion protection prior to rock placement, a 6-inch thick layer of Cody Shale clay was placed on the inside slope of the North Diversion Ditch between the crest and the bottom of the ditch. This clay layer minimized the potential formation of rills or gullies. The 6-inch clay layer was placed so that the cross-sectional areas and flow depths of the ditch remained as designed in the 2/94 TRP.

1.3.1.3.3 Deviation in Demolition and Disposal of Buildings

Another field change concerned burial of the dismantled mill office building in the tailing Impoundment. When the mill was demolished and buried in 1988, the office building was left standing for use during reclamation construction. In 1997 as reclamation approached completion, the office building was demolished using procedures from the NRC approved decommissioning plan (WNI, November 30, 1987). The debris was then placed in Area 1A of the tailing impoundment and covered with the reclamation cover and rock mulch. The burial location in Area 1A was between the following coordinates: N8,200 to N8,400 and E12,600 to E12,900.

1.3.1.3.4 Addition of Sacrificial Clay Layer

The required reclamation cover consisted of a radon barrier (Cody Shale clay) layer with a minimum thickness varying from 6 inches to 44 inches, and a layer of borrow soil 8 to 12 inches thick. In 1994 during the initial stages of construction of Areas 3A and 3B, it was found that the subgrade surface did not provide an adequately firm base for placement of the first 6-inch thick lift of the radon barrier. As a result, an extra 4-inch thick layer of Cody Shale clay, was placed over the subgrade. This clay layer provided a firm surface with the dry strength needed to assure that the first radon barrier lift was a full 6 inches thick and was not mixed with tailing subgrade. This additional clay was referred to as “sacrificial clay” because it was not included in the RADON model.

This sacrificial clay layer was also placed over the subgrade during construction of Areas 2A, 2B, and 1C in 1995, and the southern part of Areas 1A and 1B in 1996. At the end of the 1996 construction season another sacrificial clay layer was placed as interim cover over the Northern parts of Areas 1A and 1B to prevent wind erosion of the subgrade material. In 1997 a second sacrificial clay layer was placed over the windblown material placed in the northern parts of Areas 1A and 1B prior to placement of the reclamation cover. A sacrificial clay layer was also placed over the 0.8 acre portion of Area 2A in 1997.

The additional clay layers enhanced the reclamation design by providing additional radon attenuation. However, since no credit was taken for these clay layers in the RADON model, NRC approval was not required.

1.3.1.3.5 Reclamation Schedule

Condition 75 of Source Material License SUA-56 provides a schedule for timely completion of reclamation of the site. This schedule was developed in accordance with a memorandum of understanding (MOU) between the NRC and the Environmental Protection Agency (EPA) (56 FR 55432, October 25, 1991). The reclamation milestones and their completion dates are as follows:

(1) Windblown tailing retrieval and placement on the pile - (complete).

(2) Placement of interim cover to decrease the potential for tailing dispersal and erosion - (complete).

(3) Placement of final radon barrier designed and constructed to limit emissions to an average flux of no more than 20 $pCi/m^2/s$ above background as described in WNI's submittal of June 14, 1994

(a) For Areas 3A and 3B - December 31, 1994 - (complete).

(b) For Area 2B - December 31, 1995 - (complete).

(c) For Area 1C - December 31, 1996 Completed December 31, 1995.

(d) Areas 1A, 1B, 2A, and 2C - Scheduled December 31, 1998. Completed as follows:

- Areas 1A and 1B Completed December 31, 1997.
- Area 2A Completed December 31, 1997.
- Area 2C To be completed after ground water storage ponds are no longer required as part of the ground water corrective action program.

(4) Placement of erosion protection as part of reclamation to comply with Criterion 6 of Appendix A of 10 CFR Part 40.

(a) For Areas 3A and 3B - Scheduled June 30, 1995. Completed 1994.

(b) For Area 2B - Scheduled June 30, 1996. Completed 1995.

(c) For Area 1C - Scheduled June 30, 1997. Completed 1995.

(d) For Areas 1A, 1B, 2A, and 2C - Scheduled June 30, 1999. Completed as follows:

- Areas 1A and 1B Completed December 31, 1997

- Area 2A Completed December 31, 1997

- Area 2C To be completed after ground water storage ponds are no longer required as part of the ground water corrective action program.

With the exception of Area 2C, surface reclamation has been completed. Area 2C consists of two ground water storage ponds which are part of the ground water corrective action program. The ponds contain no tailing as they are only used to store and evaporate contaminated ground water which has been pumped from the ground water table beneath the tailing. Once the ponds are no longer required, WNI will determine the radium activity of the pond sludge and verify that the 6-inch radon barrier layer proposed in the 2/94 TRP (WNI, 1994) is adequate. Should the recalculated radon barrier layer deviate from the proposed design, changes will be made accordingly and submitted to the NRC for review and approval prior to final reclamation. The criteria for placement of the final reclamation cover and erosion protection on Area 2C shall be the same as was used for reclamation of the remainder of the tailing impoundment.

1.3.1.3.6 Deviations Noted During Surface Stability Inspection

A post-construction surface stability inspection was performed during the week of May 12-15, 1998. The results of the inspection indicated that the reclamation system including the rock armored surface is performing as designed. However, there were several minor riprap placement deficiencies in several diversion ditches and some ponding of water on the reclaimed system. The results of the inspection including a detailed discussion of the deficiencies identified during the inspection are provided in Appendix F. These deviations included:

1. South Central Diversion Ditch - Abrupt riprap transitions at approximate Stations 3+50, 8+50 and 20+50.

2. Tailing Swale - Riprap discontinuity between approximate Stations 24+00 and

28+00.

3. North Diversion Ditch - Mulch and riprap missing on south bank at approximate Station 9+00, 20+00, and 29+00.
4. South Diversion Ditch at approximate Station 34+00 (South Confluence 3) - Ponded water in ditch and missing riprap on north bank.
5. Tailing Impoundment - Ponded water approximately 400 feet south of Tailing Swale station 13+00.

Deviations 1 through 4 required subsequent remedial construction which was completed on September 30, 1998. Deviation 5 which consisted of a low area on the reclaimed impoundment surface required no remediation as discussed in Attachment B to Appendix F. The design and documentation of the completion of the remedial construction is presented in Appendix G.

1.3.1.3.7 Required Remedial Construction Due to Rainfall Event

During the first week of June 1998, a severe rainfall event occurred over the site. Most of the reclamation system performed as designed and showed no adverse effects due to the runoff. However, the area north of the North Diversion Ditch did experience some erosion and gullying. This occurred because all of the vegetation, which normally would have provided erosion resistance, had been removed during the radiological cleanup of the site and revegetation efforts had yet to be completed.

The soil in the area north of the North Diversion Ditch consists of very fine grained sand with no cohesion. Therefore, the runoff water quickly became concentrated and saturated with sediment. As the sediment laden flood waters entered the ditch, some of the riprap on the north bank was undermined, and the sediment was quickly deposited in the ditch. The south bank of the North Diversion Ditch which is adjacent to the reclaimed tailing was not affected.

A field inspection conducted after the runoff event indicated that the radiological cleanup had resulted in an increase in the size of the drainage area that contributes runoff to the North Diversion Ditch. To remedy this situation, construction equipment was used to regrade and move the drainage divide towards the south so that the area that drained to the north prior to site reclamation would again drain in that direction. The field inspection also indicated that there were two main areas where runoff flows became concentrated before entering the ditch. These areas were between approximate stations 6+43 and 10+15 and 18+35 and 19+19 of the North Diversion Ditch. A review of various topographic maps indicated that prior to site development, natural runoff concentrated in these areas. As a result, it was concluded that two new confluences should be constructed in these areas. These confluences are identified as North Confluence 3 and North Confluence 4 in Figures 4 and 5 of this report respectively. Analyses were performed to determine the required dimensions and riprap size that would be required. Based on these analyses, Confluence 3 requires a 60-foot bottom width, 3H:1V side slopes, and 12-inch D_{50} riprap and Confluence 4 requires a 40-foot bottom width, 3H:1V side slopes, and 12-inch D_{50} riprap. The design analyses of these confluences are presented in Appendix H of this report. Figure 6 depicts the plan view as-built configuration of the two new confluences.

The area north of the North Diversion Ditch that experienced some erosion and gullying was riprapped with a 4-inch thickness of 2-inch D_{50} soil/rock mulch. The location of this soil/rock mulch is shown on Figure 6. The size and thickness of this riprap is consistent with the erosion protection layer for placement over reclamation soil cover as presented in Section 1.3.1.1.2. Figure 7 depicts a typical cross-section of this area.

Based on a visual inspection of this area conducted in February, 1999 and as documented in Appendix I, it is concluded that regrading of the contributing drainage area together with two new confluences and the placement of additional riprap placed on the north bank of the North Diversion Ditch, will meet the design requirements for erosion protection. In addition, once vegetation of the site is established sediment deposition in all of the diversion ditches will be minimized so that the NRC approved diversion ditch design including sediment deposition potential will be met.

2.0 ACTUAL CONSTRUCTION ASSESSMENT

2.1 Site Preparation

Prior to starting work, the contractor informed personnel of the required compliance with the health and safety program and ascertained that all pre-construction documentation was recorded. The contractor also cautioned personnel to guard against disturbing elements that were to remain intact during the construction period such as survey and settlement monuments and monitoring wells. In addition, the contractor also became thoroughly familiar with the content of the specifications and the reclamation plan drawings.

2.1.1 Mill Demolition

Decommissioning and demolition of the mill began June 13, 1988 and was completed on September 15, 1988. Materials from the mill which could not be salvaged were crushed or cut into smaller pieces according to the NRC approved decommissioning plan (WNI, November 30, 1987), and buried in ten approved burial sites within the restricted area boundary. In 1989 a clean soil cover was placed over the demolished mill debris. The location of the burial area is shown in Drawing 3. The as-built mill decommissioning report was submitted to the NRC on October 19, 1989.

2.1.2 Archaeology

A cultural resource inventory of 222 acres of proposed and potential borrow areas was performed in 1991. During this inventory, a variant of the Oregon Trail was encountered along with four prehistoric sites and four prehistoric isolates. The Wyoming Department of Commerce, Division of Parks and Cultural Resources, State Historic Preservation Office (SHPO) determined that the Oregon Trail site, although eligible for the National Register, is considered noncontributing as it retains no physical integrity. Therefore, no special protection is required for this trail segment. Two of the prehistoric sites were recommended for eligibility in the National Register. One site consisted of an area of approximately 10 acres located near the geographic center of the Northeast Valley Soil Borrow Area. A data recovery plan was developed for this site and a cultural resource inventory was completed in 1991 (Kail, 1991). (A copy of the Kail Report was submitted to the NRC in a WNI letter dated December 18, 1991). The second site was located outside of the boundaries of the Northwest Valley Soil Borrow Area and no additional work was performed in this site.

During reclamation activities, construction personnel were advised to be aware of the need to identify and protect any significant archaeological or anthropological artifacts that might be uncovered during construction. No archaeological or anthropological artifacts were uncovered during the construction activities.

2.1.3 Clearing and Grubbing

Clearing and grubbing activities were performed in accordance with the requirements of Section 2.0 of the 2/94 TRP (WNI, 1994) (see Appendix Y of this report). These activities were performed primarily in the soil borrow areas within the Southwest Valley, the Northwest Valley, and the Northeast Valley. The site was also cleared and grubbed to at least 20 feet outside the limits that were disturbed by reclamation construction. All brush and trees on the surface and all major roots beneath the surface to a depth of 6 inches were removed and placed in a stockpile where they were later burned. Topsoil was stripped to a minimum depth of 6 inches, and stockpiled. Samples from the topsoil stockpile were analyzed and the results were reported to the NRC in accordance with License Condition 33(C).

2.1.4 Monitoring Well Abandonment

Monitoring wells 9R, 9E, and 29, which were located in Area 2A, were abandoned during construction activities in Area 2A in March 1995. Well abandonment was performed in accordance with Wyoming Department of Environmental Quality (WDEQ) requirements.

2.1.5 Construction Water

The Technical Specifications in the 2/94 TRP required that the radon barrier material (Cody Shale clay) be placed within minus 2 percent to plus 4 percent of the optimum moisture content. Radon Barrier material that did not meet the minimum moisture requirement was moisture conditioned by adding water. Water for this purpose was obtained from the Sweetwater River under permits issued by the Wyoming State Engineer. A copy of the permit issued in 1996 is included in Appendix J. This source of water was also used for dust control during construction.

2.2 As-Built Materials Handling Quantities

2.2.1 Subgrade Quantities

The tailing impoundment was graded and fill (i.e., interim soil cover, borrow soil, sacrificial clay, windblown tailing, and affected soils) was imported to bring the tailing impoundment surface up to the required subgrade. Approximately 3,274,000 cubic yards (cy) of subgrade fill were placed in the tailing impoundment.

2.2.2 Final Reclamation Cover Quantities

A final reclamation cover consisting of a radon barrier layer, and a borrow soil layer were placed over the subgrade surface. The radon barrier material was obtained from the Cody Shale clay borrow area which was located about 9 miles south of the site. Borrow soil was obtained from excavation of the diversion ditches and from the Northwest Valley Soil Borrow Area, the Northeast Valley Soil Borrow Area and the Southwest Valley Soil Borrow Area. Soil borrow areas were excavated in accordance with the provisions of WNI correspondence to the NRC dated March 30, 1992. The total volume of radon barrier material utilized measured approximately 901,945 cy. The total borrow soil placed in the final reclamation cover was approximately 451,000 cy.

2.2.3 Soil Rock Matrix Quantities

Section 5.1.1 of the 2/94 TRP Technical Specifications (WNI, 1994) (see Appendix Y of this report), required that a soil/rock matrix be placed over the final reclamation cover for erosion protection. Three sizes of soil/rock matrix were proposed in the 2/94 TRP. These consisted of a 4-inch thick rock mulch layer having a D_{50} of 2 inches overlain by a 2-inch thick layer of compacted soil, a 4-inch thick rock mulch layer having a D_{50} of 3 inches overlain by a 2-inch thick layer of compacted soil, and a 12-inch thick rock mulch layer having a D_{50} of 6 inches overlain by a 2-inch thick layer of compacted soil. The required soil/rock matrix was placed only during the first year of construction (1994). After that, the NRC in License Condition 27(E) approved the deletion of the soil portion of the soil/rock matrix from the specifications. Therefore, during the remaining 1995 through 1997 construction period the erosion protection placed over the tailing impoundment consisted of only the rock mulch portion of the soil/rock matrix. Drawing 2 of this report shows the extent of erosion protection placement. Rock Mulch was also placed in a key trench located in areas where the rock mulch transitions to natural ground between the outlets of the North and North Central Diversion Ditches and between the outlets of the South and South Central Diversion Ditches (see Drawing 2). The rock mulch which met the thickness, gradation, and durability requirements specified in the 2/94 TRP, was obtained from the onsite rock stockpiles. The total volumes of rock mulch placed having D_{50}s of 2 inches, 3 inches and 6 inches were approximately 171,500 cy, 6,880 cy, and 9,810 cy respectively.

2.2.4 Filter and Riprap Material Quantities

Filter and riprap materials were placed in the diversion ditches, confluences, and in the Tailing Swale. The locations of these areas are indicated on Figure 5 of the 2/94 TRP (see Appendix Y of this report). The riprap, which met the thickness, gradation, and durability requirements specified in the 2/94 TRP, was obtained from the onsite rock stockpiles. The total filter volumes placed were approximately 42,250 cy of Filter I and 15,330 cy of Filter II. Rock volumes were 19,430 cy of 3-inch D_{50} riprap, 9,555 cy of 6-inch D_{50} riprap, 10,220 cy of 12-inch D_{50} riprap, and 34,960 cy of 18-inch D_{50} riprap.

2.3 As-Built Components

2.3.1 Subgrade

Subgrade is defined as the surface configuration that had to be achieved in the tailing impoundment prior to placement of the final reclamation cover, i.e., the bottom of the radon barrier layer.

2.3.1.1 Design Requirements

The subgrade had the following requirements as specified in Section 3.2.7 of the Technical Specifications in the 2/94 TRP:

- Excavated soil and tailing resulting from diversion ditch construction shall be used to achieve the desired configuration indicated on the Reclamation Plan Drawings. If necessary, borrow soil may be used to achieve desired grades. Placement of fill to final elevations will allow for placing not only the final reclamation cover, but also the filter material, riprap and soil/rock matrix to meet the configuration shown on the Reclamation Plan Drawings. *(Note: As discussed in Section 1.3.1.1.2 of this report, the soil portion of the soil/rock matrix was deleted by license condition 27(E)).*

- The existing surface shall be proof rolled prior to placement of either additional fill or the final reclamation cover, This proof rolling shall consist of at least 1 pass with a Caterpillar 815 (or equivalent) smooth drum compactor. All additional fill that will be placed prior to emplacement of the final reclamation cover will be placed in lifts not to exceed 8 inches in loose thickness and compacted with both local construction traffic and at least one pass with a Caterpillar 815 smooth drum compactor or equivalent.

- Depressions on slopes shall be filled beyond the configuration shown on the Reclamation Plan Drawings and shall be trimmed to the desired configuration for subsequent placement of the final reclamation cover. The fill shall be graded such that the surface of the final reclamation cover has a uniform grade without localized depressions and maintains the general configuration shown on Figures 4 and 5 (of the 2/94 TRP).

- The regraded tailing surface may have settled prior to final reclamation construction operations. The subgrade configuration depicted on the Reclamation Plan Drawings was determined immediately upon completion of regrading operations. If modest settlement of the tailing has been observed, fill shall be placed to attain the configuration shown on the Reclamation Plan Drawings. If instead, significant settlement of the tailing has been observed (i.e., significant settlement precludes reasonably attaining the configuration identified on the Reclamation Plan Drawings), then adjustments to the general configuration of the impoundment top will be made to compensate for observed field conditions and settlement. In all cases, the fill shall be graded such that the surface of the final reclamation cover has a uniform grade without localized depressions and maintains the general configuration shown on Figures 4 and 5 (of the 2/94 TRP).

2.3.1.2 Subgrade Materials

Subgrade materials consisted of tailing, windblown tailing, affected soils, clean fill and sacrificial clay.

2.3.1.2.1 Tailing

As discussed above, the area comprising the tailing impoundment was divided into smaller areas. Because each sub area had a different radon source term, the thickness of the radon barrier differed for each area. (Required radon barrier thicknesses are summarized in Table 1 of this report). During reclamation of the tailing impoundment, with one exception as discussed below, tailing was never moved from a high source term area having a thicker radon barrier thickness requirement to a lower source term area having a thinner radon barrier thickness requirement. For example, as shown in Table 1 the minimum required radon barrier thickness in Area 3A is 16 inches and in Area 3B it is 6 inches. Therefore, material from Area 3A was not moved to Area 3B. Although material from Area 3B could have been moved to Area 2B, it was not necessary to do so. As discussed in section 2.3.1.3, there was only one instance where material from an area requiring a thicker radon barrier was moved to an area requiring a thinner radon barrier. The radon barrier thickness was increased over the area receiving the tailing material to ensure placement was in full compliance with the specifications.

2.3.1.2.2 Windblown Tailing and Affected Soils

Windblown tailing consisted of tailing transported by wind that exhibit a gamma radiation survey value greater than 18μR/hr in areas not affected by shine and 30μR/hr in areas affected by shine (i.e., within approximately 50 feet of either granite outcrops or exposed tailing). Affected soils were any soils at depth that exhibited similar gamma radiation survey values. Soils that met these criteria could be used as borrow soils. Section 7.2.2.2 of the 2/94 TRP which is included in Appendix Y of this report describes the following survey procedures that were used to identify windblown tailing and affected soils:

> A random external gamma survey shall be conducted during borrow area excavation to identify affected soils present at depth in the soil borrow areas. The survey shall be conducted by traversing the borrow area at the following frequencies:
>
> 1. At least once each day for each active onsite borrow area previously impacted by windblown tailing
>
> 2. At least once each shift if the soil volume excavated exceeds 15,000 cubic yards per day per borrow area.

The actual frequency at which external gamma surveys were performed exceeded the above frequencies.

In addition to the external gamma survey methods that were used to determine the acceptability of borrow soils, a radiological verification program was developed and used for conducting radiological surveys in support of releasing lands for unrestricted use. This program, which was submitted to the NRC on December 15, 1995 (WNI, 1995), was supplemented and revised by letters to the NRC dated February 23, March 20, April 25, May 1, and May 5, 1996. The program was subsequently approved by the NRC in Amendment 78 to SUA-56. The Radiological Verification Completion Report (WNI, 1997c) demonstrated that all areas of the site were successfully remediated.

2.3.1.2.3 Clean Fill

Clean fill was also used as subgrade material. As required in the technical specifications, visual inspections were performed continuously to assure that the clean soil did not contain any particles larger than 6 inches.

2.3.1.2.4 Sacrificial Clay

As discussed in Section 1.3.1.3.4, a 4-inch thick sacrificial clay layer of Cody Shale clay was placed underneath the radon barrier layer. Since this sacrificial clay was not included in the radon modeling, it was considered to be subgrade material.

2.3.1.3 Placement

Subgrade materials included tailing, windblown tailing, affected soils, clean fill and sacrificial clay. A daily visual inspection was performed by a quality control representative from Inberg-Miller Engineers throughout the subgrade construction, and all inspections were documented in daily reports. In addition, a map was prepared to show areas of cut and fill. Except as discussed below, all subgrade materials were placed in maximum 8-inch loose lifts and compacted with construction traffic and at least one pass of a Caterpillar 815 smooth drum compactor or equivalent.

During the 1994 construction, all fill material placed in Area 3B came from excavation within Area 3B. Fill placed in Area 3A included soils from within Area 3A and contaminated soils from outside the reclamation cap boundary. There were no subgrade deficiencies or non-conformances in 1994 as the contractor met all of the acceptance criteria.

In 1995, during construction of Areas 2A, 2B, and 1C, there was an excess of material in Areas 2A and 2B that had to be relocated. This excess material was moved to Area 1B which was to be constructed in 1996 and had a higher radon barrier thickness requirement (see Table 1 for required radon barrier thicknesses).

During an internal WNI construction QA/QC audit conducted on July 7, 1995, a non-conformance was noted over an approximately 3-acre area in which the 8-inch subgrade lifts were being compacted with loaded scrapers and not with a smooth drum roller as required. The 3-acre area was inspected for soft spots and none were found. However, to ensure that there was adequate compaction, the entire 3-acre area was again wheel rolled with a loaded 657 scraper and then compacted by at least two passes of a Tampo vibratory roller. This corrective action ensured that the non-conformance did not adversely affect the integrity of the subgrade. (WNI audit summaries are presented in Appendix K).

Construction of the southern halves of Areas 1A, and 1B was initiated in 1996. During an internal field audit performed by WNI on May 22, 1996, it was found that material from Area 1B which had a radon barrier thickness requirement of 44 inches had inadvertently been moved to Area 1A which had a radon barrier thickness requirement of 33 inches. Since this did not conform with the design specifications as Area 1A had a lower radon barrier thickness requirement, a non-conformance was noted. A subsequent survey indicated that a maximum of 2.3 feet of Area 1B tailing had been placed over a limited area in Area 1A. This had then been covered with at least 3 feet of Area 1A tailing. To determine the impact on the radon barrier design, an analysis was performed using the NRC's RADON computer code. This analysis assumed that a 3-foot thick layer of 1A tailing would be placed over 2.3 feet of Area 1B tailing. The RADON program was allowed to adjust the radon barrier thickness so that the radon flux would be 20 pCi/m^{2}sec. The results of the analysis, which are presented in Appendix L indicated that a 35-inch thick radon barrier would be required instead of the 33-inch layer proposed for Area 1A. Therefore, the radon barrier layer placed in this area was a minimum of 35 inches thick. The area where the 35-inch thick radon barrier was placed is shown on Figure 8.

In 1997, the northern halves of Areas 1A and 1B were constructed as well as a small portion (0.8 acre) in Area 2A. During this construction, all material placed in the western portion of Area 1B came from within the area. Material placed in the north half of Area 1A and in the eastern portion of Areas 1B came from within these areas since the radon barrier thickness for the two areas was the same (16 inches) (see Table 1). Contaminated soils from outside the reclamation cap boundary were also placed in Area 1A and in the eastern portion of Areas 1B. All material placed in the small portion of Area 2A came from within the Area 2A. There were no subgrade deficiencies or non-conformances in 1997 as the contractor met all of the acceptance criteria.

2.3.1.4 Final Configuration

As shown in Table 1, the required thickness of the radon barrier varied from 6 inches to 44 inches. In order to assure a uniform final reclamation cover surface, i.e., top of rock mulch, the final configuration of the subgrade surface had to be lower where the radon barrier was thickest and higher where the radon barrier was thinnest. This required a radon barrier transition between tailing areas. As shown on Figure 9 of this report, the transition was made from the area having the thicker radon barrier to the area having the thinner radon barrier. This construction feature assured that the radon barrier thickness in each area was equal to or greater than the design thickness shown in Table 1.

2.3.2 Interim Cover

Interim cover is a layer of borrow soil that was placed over regraded tailing and over the former mill area.

2.3.2.1 Design Requirements

Once the tailing had been regraded, it was necessary to place an interim cover in order to minimize the potential for additional wind dispersal of tailing. Placement of the interim cover is discussed in Section 3.2.6 of the 2/94 Technical Specifications (WNI, 1994) (see Appendix Y of this report). The discussion is as follows:

> Using borrow soil meeting the requirements of these Specifications, a 2-foot thick interim soil cover was placed in areas 2A, 2B, 3A, and 3B over regraded tailing and the former mill area. In addition, a 1-foot thick interim soil cover was placed in Areas 1A, 1B, and 1C over regraded tailing. These areas are shown on Figure 4 of the Reclamation Plan Drawings. The interim soil cover was placed and compacted in accordance with the performance criteria described in these specifications. No credit has been taken, however, for any radon attenuation afforded by the interim soil cover.

2.3.2.2 Materials

The interim cover met the borrow soil material requirements specified in Section 1.11 of the 2/94 Technical Specifications (WNI, 1994) (see Appendix Y of this report). These requirements were as follows:

1. Soil shall not contain windblown tailing or affected soil.

2. No more than 10 percent of the soil volume shall contain particles larger than 6 inches.

All borrow soil materials were obtained from approved borrow areas and from the excavation of the diversion ditches. Gamma surveys were performed to assure that all borrow soils did not contain any windblown tailing exceeding 5 pCi/g above background. Visual observations indicated that there were no particles greater than 6 inches.

2.3.2.3 Thickness

As discussed above, Section 3.2.6 of the 2/94 Technical Specifications, states that the interim soil cover was placed and compacted in accordance with the performance criteria described in the specifications. The performance criteria, which are described in Section 3.2.7 of the 2/94 Technical Specifications, state that fill must be placed in lifts that do not exceed 8-inches in loose thickness, and compaction shall be by both local construction traffic and with at least one pass of a Caterpillar 815 (or equivalent) smooth drum compactor. These criteria were not intended to apply to the interim cover since the interim soil cover was placed two years before the Technical Specifications were approved. Since there were no formal lift or compaction specifications when the interim cover was placed, the lift thicknesses varied, some being greater than 8 inches, and the only compaction was by construction traffic. Therefore, Section 3.2.6 of the 2/94 Technical Specifications should not have stated that the interim cover was placed in accordance with the performance criteria described in the specifications. Instead the section should have stated that since the interim cover was placed two years before the Technical Specifications were approved, the lift thicknesses varied, some being greater than 8 inches, and the only compaction was by construction traffic.

It is concluded that not placing the interim cover in accordance with any formal lift thickness or compaction requirements will not affect the stability of the final reclamation cover because the additional fill placed over the interim cover was placed in accordance with Section 3.2.7 of the Technical Specifications and this served to compact the underlying interim fill.

2.3.2.4 Final Configuration

The final configuration of the interim cover generally mirrored the contours of the final cover shown on Figures 4 and 5 of the 2/94 TRP allowing for the thicknesses of additional windblown tailing placed, the final reclamation cover and the rock mulch erosion protection layer (For reference, Figures 4 and 5 from the 2/94 TRP are included in Appendix Y of this report).

2.3.3 Final Reclamation Cover

The final reclamation cover was placed over the tailing impoundment, the mill area, and in portions of the diversion ditches that were located over tailing. Drawing 1 shows the extent of the as-built radon cover limits, and Drawing 3 shows the location of the mill burial area.

2.3.3.1 Design Requirements

The final reclamation cover was designed to reduce ^{222}Rn emissions and to reduce infiltration due to precipitation. The cover had the following requirements as specified in Section 1.1 of the Technical Specifications:

> A final reclamation cover will be placed over either the existing interim cover or over the fill required to meet the desired subgrade. The final reclamation cover will consist of the following:
>
> 1. A radon barrier layer with varying thickness from 6 inches to 44 inches, placed over subgrade material (i.e., tailing, clean fill, or interim soil cover).
>
> 2. An 8-inch to 12-inch thick borrow soil layer placed over the radon barrier layer.

3. Each component of the reclamation cover will be placed, moistened, and compacted in accordance with the specific requirement for each layer as described in these Specifications.

2.3.3.2 Radon Barrier Layer Requirements

The radon barrier layer portion of the final reclamation cover had the following requirements as specified in Section 4.2.2.1 of the 2/94 technical specifications :

1. The material for the radon barrier layer shall be obtained from the designated borrow area and shall have at least 90 percent passing the number 200 sieve as determined by (ASTM D 1140).

2. The maximum density shall be determined using the Standard Proctor method (ASTM D 698). The compacted material shall be placed at a density of greater than 90% of the maximum density for the first six-inch lift and 95% for any subsequent lifts. The moisture content shall be between 2 percent below to 4 percent above the optimum moisture content determined using the Standard Proctor method (ASTM D 698). (Note: The moisture content shall not be below 16.9%).

3. The radon barrier layer shall be placed in lifts with a maximum nominal compacted thickness of 6 inches. Measurements will be taken at the intersecting points of a 200-foot by 200-foot survey grid to verify thickness of both the first 6-inch layer that must be compacted to at least 90% of the Standard Proctor density and, also, of the entire radon barrier layer following placement of the final lift comprising the radon barrier layer.

   3a. The thickness of the first 6-inch lift of the radon barrier layer may be less than 6 inches in all areas that will receive additional radon barrier material (Areas 1A, eastern portion of 1B, 1C, 2A, 2B, and 3A). Thickness measurements of the first 6-inch layer compacted at 90% of the Standard

Proctor density shall be taken just prior to placement of the second 6-inch layer to determine the actual thickness of the initial 6-inch lift.

3b. In areas where the total thickness of the radon barrier will be only 6 inches (Areas 3B, western portion of 1B, and 2C) the radon barrier layer shall be at least 6 inches thick. All radon barrier material in these two areas shall be compacted to at least 90% of the Standard Proctor density.

3c. Thickness measurements of the entire radon barrier shall be taken just prior to placement of the borrow soil layer to ensure that required thickness has been placed.

3d. For all areas, the total thickness of the radon barrier layer shall be at least the thickness required for the specific area as shown on the Reclamation Plan Drawings and in the March 28, 1997 report. Measurements shall indicate that no single measurement shall be less than the required thickness. The radon barrier layer shall be graded to have a uniform grade without localized depressions and to maintain the general configuration shown on Figures 4 and 5, and in Figure 8 of the March 28, 1997 report making an allowance for the thickness of the soil/rock matrix. *(Note: As discussed in Section 1.3.1.1.2 of this report, the soil portion of the soil/rock matrix was deleted by license condition 27(E)).*

3e. All transitions between areas with different radon barrier thickness requirements shall ensure that the minimum radon barrier thickness has been provided for all areas and that the final configuration shall be as shown on the Reclamation Plan Drawings and in Figure 8 of the March 28, 1997 report.

4. Radon barrier layer material placed adjacent to previously compacted radon barrier material shall be placed such that the new material overlaps the previously compacted material. At the area of overlap, the new and previously

placed material shall be compacted together such that the radon barrier layer is continuous without gaps or discernible seams.

5. After quality control testing assures the radon barrier layer has been placed and compacted as specified (e.g., considering density and moisture criteria), moisture shall be added to the surface of the radon barrier layer, as necessary, to prevent drying of the layer until the borrow soil layer is placed over the radon barrier layer. In addition, the borrow soil layer shall be constructed, as specified below, over the radon barrier layer, following completion of each portion of the radon barrier layer as soon as practicable as directed by the Owner.

The gradation testing requirements for the radon barrier layer portion of the final reclamation, as specified in Section 7.2.3.1 of the 2/94 technical specifications, were as follows:

> Gradation testing for percent passing the #200 sieve (ASTM D 1140), of off-site borrow soil to be used in the radon barrier layer shall be conducted at the following frequencies:
>
> 1. Minimum of one test for each 1,000 cubic yards of radon barrier layer material to be placed
>
> 2. Minimum of one test for each day when radon barrier layer material soil in excess of 150 cubic yards is placed.

The radon barrier field testing frequency requirements for Standard Proctor and field density (Sand Cone) tests as specified in Section 7.2.3.2 of the 2/94 TRP were as follows:

> The Standard Proctor test (ASTM D 698) will be used to determine the maximum density for compaction. The Standard Proctor test shall be conducted at a rate of one

test for every 15 field density tests. Additionally, One-point Proctor tests will be conducted at a rate of one test for every 5 field density tests. *(Note: As discussed in Section 1.3.1.1.1 of this report, the One-point Proctor testing requirement was deleted after the first year of construction by license condition 27(D)).*

In-place density and moisture content field tests shall be conducted at the following frequencies:

1. Minimum of one test for each 500 cubic yards of placed radon barrier layer
2. Minimum of two tests for each day when radon barrier layer material in excess of 150 cubic yards is placed
3. Minimum of one test per lift and a minimum of one test per full shift of radon layer compaction operations.

2.3.3.2.1 Material Requirements

All materials for the radon barrier layer were obtained from the approved Cody Shale clay borrow area. During excavation of the borrow area, near surface overburden material and Cody Shale clay with significant gypsum stringers were uncovered which did not meet the gradation requirement. These materials were discarded, left in the borrow area, or used in the sacrificial clay layers that were placed under the radon barrier layers.

2.3.3.2.2 Gradation Testing

Several methods were used to sample the Cody Shale clay material during construction of the radon barrier which lasted from 1994 to 1997. Gradation testing of the radon barrier layer material, to determine the percent passing the #200 sieve, was performed using the criteria in ASTM D 1140.

In 1994, the material was sampled out of the Cody Shale Pit as mining of the material progressed. Area and depth were measured to determine a volume that represented approximately 1,000 cy. Samples were taken and gradation tests were performed ahead of the next day's mining. This procedure worked well for the volume of material that was mined in 1994 but it became obvious that the sampling procedure would have to be revised in 1995 because the material volume was expected to be much larger. As a result, in 1995 a drilling crew collected samples out of the pit ahead of the mining. 50-foot square grids were set up and samples were collected and tested at 10 foot intervals to a depth of 30 feet. This meant that the volume represented by each gradation test was now approximately 925 cy. Two bore holes were drilled within each 50-foot square block and the samples were composited and split down to a manageable size for gradation testing. The mining progress was tracked weekly and the gradation test results were reported daily as material was hauled to a stockpile for conditioning.

This procedure was continued during the winter of 1995/1996, except that the drilling crew collected samples at 10 foot intervals to a total depth of 50 feet so that gradation tests for both the 1996 and 1997 construction of the radon barrier could be done at once. The volume represented by each gradation was maintained at approximately 925 cy. There was no need for sampling or testing in 1997 as it had already been completed in 1996. Also, a sufficient volume of radon barrier material was produced, tested, and stockpiled to allow for future reclamation of the ground water corrective action evaporation ponds (Area 2C). Therefore, additional gradation testing will not be required during reclamation of Area 2C.

Gradation testing of the radon barrier layer material was performed using the criteria in ASTM D 1140. A total of 13 gradation tests had less than the required 90% passing the #200 sieve. The material represented by these tests was not used as radon barrier material; instead it was used as sacrificial clay. All radon barrier material that was placed met the requirement of at least 90 percent passing the #200 sieve. The percent passing the #200 sieve ranged from 90.0 percent to 99.8 percent. A total of 1,135 passing gradation tests were performed on the 901,945 cubic yards of material that was placed for an average of one test per 795 cy. This exceeded the minimum gradation testing frequency of one test per 1,000 cy. The minimum daily volume of material placed exceeded 1,000 cy; therefore, the requirement of one test for each day when radon barrier layer material in excess of 150 cubic yards was placed, was also met. The number of gradation tests to be performed on a daily basis was estimated from the contractor's daily record of load counts. Radon barrier material that did not meet the gradation criteria was used as sacrificial clay material. Gradation test results for radon barrier material used on the tailing impoundment in 1994, 1995, 1996, and 1997 are summarized in Tables 2, 3, 4, and 5 respectively. Gradation test results for radon barrier material to be used for future reclamation of the ground water corrective action evaporation ponds (Area 2C) are summarized in Table 6.

2.3.3.2.3 Field Density/Moisture Tests

Although Section 7.2.6 of the 2/94 TRP technical specifications allow the use of either the Sand Cone Method or the Nuclear Gauge Method for use in determining field density, only the Sand Cone Method from ASTM D 1556 was used to determine the in-place density of the radon barrier layers. All moisture contents for acceptance were determined by drying the soil in a conventional oven. A microwave oven was used only for contractor estimates. Density/Moisture test locations were chosen randomly and tests were not taken until a desired grade and thickness had been achieved. Except for a few instances discussed below, if a test failed the contractor was immediately notified and the failed area was reworked and retested until the desired density was achieved. Visual inspections assured that completed surfaces were kept moist until the next lift could be placed.

A total of 1,848 Sand Cone tests were performed on 901,945 cy of in-place radon barrier material for an average of 1 test per 488 cy of material placed. This exceeded the testing requirement of a minimum of one test per 500 cy of material placed. A second requirement was that a minimum of two tests had to be performed when placement of radon barrier material exceeded 150 cy per day. This requirement was met because the actual volume of material placed exceeded 1,000 cy per day; and at least two Sand Cone tests per day were performed on the 1,000 cy of material placed. The third requirement of a minimum of one test per lift and one test per shift was also met. Tables 7, 8, 9, and 10 present summaries of the results of the field density tests for 1994, 1995, 1996, and 1997 respectively. Drawing 4 illustrates the locations and lifts where the Sand Cone tests were performed.

A total of 397 Sand Cone density tests were performed on the bottom 6 inch thick layer of the radon barrier which was compacted to a minimum of 90.0 percent of Standard Proctor density. 1,451 Sand Cone tests were performed on subsequent lifts. With the exception of five failed tests, identified during the WNI internal field audits, all subsequent layers were compacted to at least 95 percent of Standard Proctor density. The five failed tests had densities ranging from a low of 94.5 percent of Standard Proctor density to a high 94.9 percent of Standard Proctor density. Individual densities for the five failed tests are summarized in Table 11. While these five tests did not meet the minimum density requirement of 95 percent of Standard Proctor density, this non-conformance will not impact the performance of the final reclamation cover because placement of subsequent lifts compacted the lower lifts. Since the failed tests were within 0.5 percent or less of the required 95 percent compaction, it was deemed neither prudent nor necessary to attempt to excavate the lifts that had already been placed because the locations of the failed tests were not contiguous, as they were not in the same lift nor were they in the same construction season. One was in the 1994 construction, one in 1995, two in 1996 and one in 1997. In addition, five failed tests out a total of the 1,848 density tests that were performed is an insignificant failure rate (less than 0.3%). Furthermore, radon barrier layer thicknesses were determined assuming that all subsequent layers would be compacted to 95 percent of Standard Proctor density. Since the as-built average density was 98.9 percent of Standard Proctor Density, radon barrier thicknesses are more than sufficient to meet the radon flux criterion of 20 pCi/m^{2}sec.

Radon barrier material was conditioned to meet the moisture requirements. In 1994 the radon barrier material was placed directly on the tailing impoundment and moisture conditioned by using a large tractor and a construction disk. During the 1995, 1996, and 1997 construction, the radon barrier material was stockpiled on site and moisture conditioned using a pug mill or soil stabilizer. With the exception of eight moisture tests out of a total of 1,848, the radon barrier was placed at a moisture content between minus 2.0 and plus 4.0 percent of optimum moisture. Eight failures out of 1848 tests represent a failure rate of 0.4%. Of the eight failed tests, four were identified during the WNI internal field audits and four were identified during a review of the records performed after construction had been completed. The eight failed tests had moisture contents ranging from minus 3.3 percent to plus 4.9 percent of optimum moisture. Tables 12 and 13 present summaries of the failed moisture tests identified during the WNI audits and for the failures identified after completion of construction, respectively.

Although these tests did not meet the minus 2 percent to plus 4 percent moisture requirement, it was concluded that since the final reclamation cover including erosion protection had already been placed, it was neither necessary nor prudent to excavate the completed final reclamation cover. Factors considered in this conclusion included the following:

1. Eight moisture failures in 1848 sand cone tests presents a failure rate of 0.4%.

2. The moisture contents of six of the eight tests were within 0.1% to 1.3% of the minimum moisture requirement of minus 2% of optimum moisture, and the moisture contents of two of the eight tests were within 0.1% and 0.9% of the maximum moisture requirement of plus 4% of optimum moisture.

3. The eight moisture failures were not confined to a single area, a single radon barrier lift, or to a construction season.

4. All eight tests met or exceeded the minimum moisture requirement of 16.9% specified in Section 7.2.3.2 of the 2/94 technical specifications

5. Seven of the eight tests had densities ranging from 95.1% to 101.1% of Standard Proctor density. The eighth test, which was performed on the first lift, had a density of 93.4% of Standard Proctor density.

2.3.3.2.4 Standard Proctor Density

As discussed above, 1848 field density (Sand Cone) tests were performed. Since the specifications require one Standard Proctor test for each 15 field density tests, at least 123 Standard Proctor tests were required. Standard Proctor tests were performed using the method from ASTM D 698. A total of 127 Standard Proctor tests were performed for an average 1 Standard Proctor test per 14.6 Sand Cone tests. The Standard Proctor density testing frequency therefore exceeded the requirement of one test for every 15 field density tests. Standard Proctor density and moisture content test results are summarized in Tables 7, 8, 9, and 10.

In addition to the Standard Proctor tests, the specifications also required one-point Proctor tests. However, as discussed in Section 1.3.1.1.1, this requirement was deleted after the 1994 construction season. In 1994 a total of 212 field density tests were performed. Since the specifications required a one-point Proctor test for each 5 field density tests, at least 42 one-point Proctor tests were required and a total of 42 tests were performed. The one-point Proctor density testing frequency therefore met the requirement of one test for every 5 field density tests. One-point Proctor test results are documented in Table 14.

2.3.3.2.5 First Lift Thickness

Prior to placement of the radon barrier, the subgrade was surveyed to determine surface elevations on 200-foot centers. The first lift of the radon barrier was then placed and surveyed and the lift thickness was determined by subtracting the elevation of the top of the lift from the subgrade elevation. Thickness measurements of the first 6-inch layer were taken just prior to placement of the second layer to ensure that the required thickness of the initial 6-inch lift had been placed. Because the required compaction of the first lift was 90% of Standard Proctor density while the density of subsequent lifts was 95%, it was important that the first lift thickness not exceed 6 inches unless the compaction was equal to or greater than 95%. As shown in Tables 15 and 16, 245 measurements were made. Of these, there were 17 first lift measurements that exceeded 6 inches. (17/245 = 6.9%). Fifteen of the tests measured 6.5 inches and two measured 7.0 inches. The 15 tests that measured 6.5 inches were identified in a WNI QA/QC internal field audit performed on November 10, 1995. A review of the density results, performed during the audit, indicated that in the area of these thickness measurements, all density test results were greater than 95% of Standard Proctor. Therefore the first lift was treated as a subsequent lift and the emplaced 6.5-inch thicknesses were found to be acceptable. The two 7.0-inch measurements were not identified during routine construction QA/QC audits. However, since these two measurements were located in an area where the total radon barrier thickness requirement was only 6 inches, providing an extra inch of radon barrier material is acceptable. First lift measurement logs are presented in Appendix M and the WNI field audits are summarized in Appendix K.

The thickness of the radon barrier layer, placed in portions of the diversion ditches that were located over tailing, was measured at 100-foot station intervals along each diversion ditch. To determine the radon barrier thickness, measurements were made along the left side, centerline, and right side of the bottom of the diversion ditch and on the left and right side slopes. The radon barrier thickness was then determined by averaging the five measurements.

To assure that the first layer of radon barrier material and sacrificial layer could be placed without violating the integrity of the ditch slope, WNI decided to place a layer of clay (Cody Shale), approximately 4-inches thick, on the sandy subgrade prior to placing the first 6-inch lift of the radon barrier. This prevented mixing of the subgrade and the radon barrier and assured that a full 6-inch first lift of radon barrier material was placed. Initially it was difficult for construction equipment to place the 4-inch thick layer of clay without tracking subgrade material into the clay. Therefore, the first lift was 10 inches thick which represented a composite thickness of the 4-inch sacrificial clay layer and the 6-inch first lift of the radon barrier. The 4-inch thick clay layer was not considered in determining the total thickness of the radon barrier as it was assumed that the 10-inch thick layer was only 6-inches thick.

The North Central Diversion Ditch is located in tailing areas 3A and 3B. Therefore the required radon barrier thicknesses were 16 inches and 6 inches respectively (see Table 1 for radon barrier thickness requirements). During a review of placement records performed during a WNI QA/QC internal field audit conducted on November 14, 1996, it was noted that the first lift of the radon barrier placed in the North Central Diversion Ditch had exceeded the proposed 10-inch thickness by 2 inches at 5 station locations, by $1^1/_2$ inches at 3 station locations, and by 1 inch at 1 station location. The review also noted that the second radon barrier lift had exceeded the required 6-inch thickness by 2 inches at 8 station locations and by $2^1/_2$ inches at 1 station location. In addition, the 16-inch radon barrier in Area 3A had been placed in two 8-inch lifts instead of two 6-inch lifts and a 4-inch lift. A review of records for the North Central Diversion Ditch showed that all field density test results, including tests were greater than 95% of Standard Proctor density, averaging 95.9%. Also, the average moisture content, which was 18.3%, averaged 1.6% above optimum. Furthermore, the density testing in the diversion ditches was representative of the full 8-inch layer thickness. When this non-conformance was identified, the radon barrier had already been covered by the borrow soil and filter layers. It was therefore concluded that it was neither prudent nor necessary to attempt to excavate the completed layers and remove some of the radon barrier. Therefore, no corrective action was taken. First lift and total thickness measurement logs for the North Central Diversion Ditch are presented in Appendix N and summarized in Table 17.

The South Central Diversion Ditch is located in tailing Area 3B. Therefore, only one 6-inch thick radon barrier was required (see Table 1 for radon barrier thickness requirements). The total thickness of the radon barrier placed in the South Central Diversion Ditch as shown in Table 18, was 10 inches at all station locations. This includes a 6-inch thick radon barrier layer placed over a 4-inch thick sacrificial clay layer. Thickness measurement logs for the South Central Diversion Ditch are presented in Appendix N and summarized in Table 18.

The South Diversion Ditch is located in portions of tailing areas 1A, 1B, 1C, and 2B. As shown in Table 1, the radon barrier thickness requirement for Area 1A was 33 inches; for Area 1B, 44 inches; and for Areas 1C and 2B, 36 inches. First lift and total thickness measurement logs for the South Diversion Ditch are presented in and summarized in Table 19. As shown in Table 19, the first lift of the radon barrier placed in the South Diversion Ditch varied from 8.0 inches to 9.5 inches. This includes a 6-inch thick radon barrier layer placed over a sacrificial clay layer ranging in thickness from 2 to 3.5 inches.

The Tailing Swale is located in Area 3A, in the East portion of Area 1B located north of the Northing 7,900 line (Area 1BE), in the West portion of Area 1B north of the Northing 7,900 grid line (Area 1BW), and in Area 1A north of the Northing 7,900 grid line. The locations of these areas are shown in Figure 2. As shown in Table 1, the radon barrier thickness requirement was 16 inches for Area 3A, Area 1BE, and Area 1A north of the Northing 7,900 grid line. For Area 1BW the thickness requirement was 6 inches. The Tailing Swale radon barrier thicknesses were measured at 100-foot station intervals along the swale left and right toe and left and right top. As shown in Table 20, 24 of 25 first-lift thickness measurements varied from 5.0 inches to 6.0 inches, and one measurement was 6.5 inches. However, since the 6.5-inch measurement was located in an area where the total radon barrier thickness requirement was only 6 inches, providing an extra half-inch of radon barrier material is acceptable. First lift measurement logs for the Tailing Swale are presented in Appendix N.

2.3.3.2.6 Total Thicknesses

As discussed in Section 1.2, the as-built total thickness of the radon barrier layer placed on the tailing impoundment varied from 6 inches to 45 inches. These thicknesses were conservative because they were based on the radium activity of the tailing in the area which in some cases did not take credit for the radon attenuation provided by the windblown tailing, affected soils, and sacrificial clay layers which were placed underneath the radon barrier. Thickness layer measurement methods varied from year to year. In 1994 there were a maximum of three lifts so it was possible to hand auger through each lift and measure the thickness with a ruler. In 1995 the radon barrier material was conditioned in a pug mill or with a soil stabilizer. This produced very uniform material and because there were as many as seven lifts, it became very difficult to differentiate between lifts with a hand auger. As a result, grade ribbons were placed at 6 inches on laths at 50 foot centers and the lifts were then built to the ribbons. In 1996 and 1997, thicknesses were measured at the leading edge of each lift nearest each sand cone density test. In cases where there was not a leading edge to measure, the measurements were taken at the nearest fill stake which indicated a grade mark that dictated the thickness of the lift in that particular area. The thickness of the first lift and the total thickness of the radon barrier layer were always measured by surveying elevations before and after material placement.

Tables 21 and 22 present summaries of the total radon barrier thicknesses required and the thicknesses placed on the tailing impoundment. Total thickness measurement logs are presented in Appendix M. All of the radon barrier placement met or exceeded the required total thicknesses.

Total radon barrier thickness requirements were also met or exceeded, if required, in the Diversion Ditches. For the North Central Diversion Ditch total thicknesses are shown in Table 17. For the South Central Diversion Ditch total thicknesses are shown in Table 18. For the South Diversion Ditch, total thickness measurements are shown in Table 19, and for the Tailing Swale, total thicknesses are shown in Table 20. Total thickness measurement logs for the North Central Diversion Ditch, South Central Diversion Ditch, South Diversion Ditch, and Tailing Swale are presented in Appendix N.

2.3.3.2.7 Extent of Clay

The proposed lateral extent of the radon barrier was estimated to cover about 248 acres as shown in Figure 4 of the 2/94 TRP. During construction, clay placement was extended beyond the limits shown in Figure 4 of the TRP to cover all of the tailing material. This resulted in an improvement over the NRC approved reclamation plan. The as-built extent of clay placement covered 258 acres as shown in Drawing 2 of this report.

2.3.3.2.8 Radon Flux Performance Testing

Criterion 6 of 10 CFR 40 Appendix A requires ^{222}Rn emanation testing on the surface of the reclaimed tailing surface prior to placement of erosion protection barriers or other features. This testing is to confirm that the final reclamation cover is effective in limiting releases of ^{222}Rn to a level not exceeding 20 pCi/m^{2}s when averaged over the entire tailing. This information was previously submitted in detail to the NRC. A summary of the radon flux testing is presented here and in Appendix O for completeness.

283 ^{222}Rn flux measurements were made on top of the final reclamation cover. The results of the tests are presented in Appendix O and summarized in Tables 23, 24 and 25. The majority of radon flux measurements were less than 0.5 pCi/m^{2}s; however, three measurements exceeded 20 pCi/m^{2}s with readings of 22.9 pCi/m^{2}s, 29.9 pCi/m^{2}s, and 27.7 pCi/m^{2}s (see Table 25 Page 1 of 2). These high readings appear to be anomalies because they are much higher than adjacent measurements. In any event, the radon flux averaged over the entire final reclamation cover averaged less than 1 pCi/m^{2}s. This average complies with Criterion 6 of 10 CFR 40 Appendix A which specifies that the reclamation cover shall limit releases of ^{222}Rn to a maximum of 20 pCi/m^{2}s when averaged over the entire surface of the disposal area.

2.3.3.3 Borrow Soil Layer Requirements

The placement requirements for the borrow soil layer portion of the final reclamation cover were specified in 4.2.2.2 of the 2/94 technical specifications and the quality control and testing requirements were specified in Section 7.2.2 of the 2/94 technical specifications (see Appendix Y of this report).

2.3.3.3.1 Material Requirements

All materials for the borrow soil layer were obtained from the approved soil borrow areas and from excavation of the diversion ditches. Surveys were performed over all borrow areas to assure that the gamma radiation of the soil, used as borrow, was less than 18μR/hr in areas not affected by shine and 30μR/hr in areas affected by shine. The results of these surveys are presented in Appendix P.

2.3.3.3.2 Placement

The borrow soil layer of the final reclamation cover was placed in lifts not exceeding 8-inches in loose thickness and graded to have a uniform grade without localized depressions. As discussed in Section 7.2.2 of the 2/94 TRP technical specifications, there were no requirements for active compaction or density testing of the borrow soil layer. However, in order to achieve a firm surface for placement of the rock mulch, the borrow soil was compacted by construction traffic or by a smooth drum roller. (For reference, Section 7.2.2 of the 2/94 TRP technical specifications is included in Appendix Y of this report).

2.3.3.3.3 Thickness

Prior to placement of the borrow soil layer, the top of the final lift of the radon barrier was surveyed to determine surface elevations on 200-foot centers. The borrow soil layer was then placed and surveyed and the thicknesses were determined by subtracting the elevation of the top of the radon barrier from the elevation of the top of the borrow soil layer. Thickness measurements of the borrow soil layer were taken just prior to placement of the rock mulch layer to ensure the required thickness of borrow soil layer had been placed. The results of the measurements are presented in Appendix Q and summarized in Tables 26 and 27 As shown in these tables, the borrow soil layer had a total thickness ranging from 8.0 inches to 15.0 inches.

Section 4.2.2.2 of the 2/94 technical specifications required that the borrow soil layer be placed to a total thickness between 8 and 12 inches (see Appendix Y of this report). As shown in Table 27 of this report, the maximum requirement of 12 inches was exceeded in eight grid locations. (Eight failures out of a total of 249 borrow soil thickness measurements indicates a failure rate of 3.2 percent). Additional borrow soil would not necessarily reduce the radon flux from the tailing since the radon barrier calculations performed in the 2/94 TRP assumed that the borrow soil material had a ^{226}Ra concentration of 1.1 pCi/g. In order to determine how the radon flux would be affected by having borrow soil layers thicker than 12 inches, new analyses were performed for all tailing areas using the NRC's RADON computer model (NRC, 1989). Except for the borrow soil thickness, which was assumed to be 15 inches, all other parameters used in the modeling were the same as used in the original evaluation in the 2/94 TRP. The results of this analysis indicated that additional borrow soil reduces the radon flux (although not significantly) in all tailing areas. Therefore, the additional borrow soil that was placed as part of the final reclamation cover will not adversely affect the radon flux from the reclaimed tailing. The radon reanalysis is presented in Appendix R.

2.3.4 Diversion Ditches and Tailing Swale

Four riprap lined surface water diversion ditches were constructed around the perimeter of the former mill site and the reclaimed tailing impoundment. These are the North Diversion Ditch, South Diversion Ditch, North Central Diversion Ditch and the South Central Diversion Ditch. In addition, a riprap lined swale was constructed on top of the reclaimed tailing impoundment to efficiently divert flood flows into the North Diversion Ditch. Riprapped erosion aprons and scour trenches were constructed at the outlets of all the diversion ditches to prevent head cutting and long-term erosion. The locations of the diversion ditches are presented in Drawing 2 of this report and Figures 4 and 5 of the 2/94 TRP (see Appendix Y of this report). The Tailing Swale location is presented in Figure 11 of the March 1997 report (WNI, 1997a). Rock-filled key trenches were constructed to provide erosion protection in areas where the rock mulch tailing surface transitions onto the existing ground. These areas are between the outlets of the North and North Central Diversion Ditches and between the outlets of the South and South Central Diversion Ditches as shown in Drawing 2.

2.3.4.1 Design Requirements

The design requirements for the diversion ditches and Tailing Swale are shown in Figure 6 of the 2/94 TRP and summarized in Table 1 of the 2/94 TRP as revised in Attachment 11 of the March 1997 report (WNI 1997a). As shown in the revised Table 1, all ditches require bottom widths of 15 feet and 3H:1V side slopes. The swale has requires a bottom width of 15 feet except at the upstream end where the bottom width flares out from 15 feet at station 6+00 to 123 feet at station 2+00. The swale side slopes are 16H:1V from station 2+00 to station 20+00. Downstream of this station the swale side slopes steepen gradually to transition with the 3H:1V side slopes of the North Diversion Ditch. The bottom slopes of the ditches and swale vary as do the depths. With a few exceptions as discussed below, the ditches and swale were constructed as designed in the 2/94 TRP.

2.3.4.2 General Configurations

The as-built alignments of the North Diversion Ditch and the South Diversion Ditch are as shown in Drawing 2 of this report. However, changes were made to the side drainages that flow into these ditches. These side drainages are referred to as confluences in the 2/94 TRP. As discussed in Section 1.3.1.2.1 of this report, only one confluence was proposed in the 2/94 TRP for the North Diversion Ditch. This confluence was located at approximately Station 35+00 of the North Diversion Ditch. During reclamation construction the confluence had to be realigned because of the extensive grading and soil cleanup that had occurred. This realignment required reanalysis to verify the design. The results of this reanalysis, which are presented in Appendix B, indicated that the dimensions and riprap proposed in the 2/94 TRP were acceptable for the realigned confluence.

To prevent erosion, a new confluence was required at approximately station 5+50 of the North Diversion Ditch. An analysis was therefore performed to determine the dimensions and riprap size of the new confluence. As a result, a confluence with a 60-foot bottom width, 3H:1V side slopes, and 18-inch D_{50} riprap was required at Station 6+00 of the North Diversion Ditch. The analysis of this new confluence is presented in Appendix C.

Another confluence that was changed during construction was South Confluence 2 which is located at approximately station 32+00 of the South Diversion Ditch. This confluence, as proposed in the 2/94 TRP, had a 50-foot bottom width, 3H:1V side slopes, and 18-inch D_{50} riprap. During construction it was determined that this confluence would require extensive excavation. In an attempt to reduce the amount of excavation, the confluence was reanalyzed. Based on this reanalysis the design bottom width of the confluence was reduced from 50 feet to 42 feet. The side slopes and riprap D_{50} remained at 3H:1V and 18-inches respectively. The result of the reanalysis is presented in Appendix D.

In addition, two new confluences were required at approximate Stations 7+00 and 18+70 of the North Diversion Ditch. As discussed in Section 1.3.1.3.6, these new confluences were required because a severe rainfall event had resulted in some erosion and gullying. This occurred because all of the vegetation, which normally would have provided erosion resistance, had been removed during the radiological cleanup of the site. The analyses of North Confluences 3 and 4 are presented in Appendix H.

The alignments of the North Central Diversion Ditch and the South Central Diversion Ditch generally followed the alignments proposed in the 2/94 TRP. However, as discussed in Section 1.3.1.2.2, the North Central Diversion Ditch was realigned between stations 0+00 and 10+00 and the South Central Diversion Ditch was realigned between stations 0+00 and 8+00 in order to avoid extensive rock excavation. The realignment analysis for the North Central Diversion Ditch and the South Central Diversion Ditch are as shown in Appendix E of this report and the as-built alignments of both diversion ditches are shown in Drawing 2.

2.3.4.3 Diversion Ditch and Tailing Swale Slopes

The bottom slopes of the diversion ditches and Tailing Swale were determined by measuring the elevation of the flowline of the as-built ditches at stations located every 100 feet and dividing the differences in elevations between the stations by 100. As summarized in Table 28, some of the as-built slopes deviated from the proposed slopes in that some were slightly steeper and some were slightly flatter. However, the deviations were considered to be insignificant in that the ditch dimensions and erosion protection designs would not be adversely affected. It was therefore concluded that the as-built diversion ditch slopes are acceptable because they meet the intent of the design. Diversion ditch profile comparison logs are included in Appendix S.

2.3.4.4 Diversion Ditch and Tailing Swale Cross-Sectional Areas

Table 1 presented in the 2/94 TRP and revised in Attachment 11 of the March 1997 report (WNI 1997a), shows the required dimensions for each diversion ditch and for the Tailing Swale. These dimensions included bottom widths, side slopes and depths. By knowing these dimensions it is possible to calculate a required cross-sectional area. For example, if a ditch has a trapezoidal shape with a 15-foot bottom width (BW=15ft), 3H:1V side slopes (Z=3), and is 10 feet deep (D=10 ft), the required cross-sectional area would be $((BW)(D)+ (Z)(D^2) = ((15)(10)+(3)(10^2) = 450$ square feet (sq ft). In order to provide assurance that each ditch and the Tailing Swale were appropriately sized, cross-sectional areas were calculated at 100-foot stations for both the design and the as-built conditions. The design cross-sectional areas were calculated using the dimensions presented in Table 1 of the March 31, 1997, WNI report (WNI 1997a), and the as-built cross-sectional areas were calculated using dimensions determined in the field using surveying methods. The results of these calculations are presented in Appendix T. As shown in the calculations, although the depths, bottom widths, and side slopes sometimes varied slightly from the design parameters, all cross-sectional areas were greater than required.

2.3.5 Erosion Protection

The erosion protection consisted of soil/rock matrix and rock mulch placed over the tailing impoundment; filters and riprap placed in the Tailing Swale, the diversion ditches and outlet aprons; and rock mulch placed in key trenches where the rock mulch transitioned onto existing ground. The erosion protection is designed to withstand the flooding that would result from a Probable Maximum Precipitation event (see Appendix B of the 2/94 TRP).

2.3.5.1 Design Requirements

The material design requirements for the erosion protection cover are specified in Sections 5.1.4.1, 5.1.4.2, and 5.1.4.3 of the Technical Specifications. (For reference, the Technical Specifications are included in Appendix Y of this report.). A summary of these sections is as follows:

> Riprap, filter material and the rock portion of the soil/rock matrix shall consist of sized angular granite obtained from the specified on site source. *(Note: As discussed in Section 1.3.1.1.2 of this report, the soil portion of the soil/rock matrix was deleted by license condition 27(E)).* The riprap and rock mulch shall be angular, resistant to abrasion and weathering, and shall be free from cracks, seams, and other defects that would tend to increase weathering by water and frost action. The riprap shall be well-graded and sized as specified in Table 2A of the technical specifications (*Note: Table 2A was revised in Attachment 11 of the March 1997 report (WNI 1997a)*). The rock mulch shall be well-graded and sized as specified in Table 2C of the technical

specifications. The filter shall be reasonably free of clay, loam, or deleterious material and shall be well graded and sized as specified in Table 2B of the technical specifications (*Note: Table 2B was revised in Attachment 11 of the March 1997 report (WNI 1997a)).*

2.3.5.2 Rock Durability Testing

Rock durability testing, as specified in Section 5.2.1 of the technical specifications, consists of the following:

1. Bulk Specific Gravity ASTM C-127
2. Absorption ASTM C-127
3. Sodium Sulfate Soundness ASTM C-88
4. L. A. Abrasion at 100 cycles ASTM C-131 or ASTM C-535.

The results of the above testing shall be used to determine a rock durability rating in accordance with Table D1 of the NRC's Staff Technical Position, "Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites," August 1990 (NRC, 1990). The following criteria shall be used to determine acceptable uses of rock borrow based on rock durability rating:

1. Rock having a durability rating of greater than or equal to 80 may be used as riprap, filter, or soil/rock matrix. *(Note: As discussed in Section 1.3.1.1.2 of this report, the soil portion of the soil/rock matrix was deleted by license condition 27(E)).*
2. Rock having a durability rating of less than 80 and greater than or equal to 65 may be placed in diversion ditches or the tailing swale (i.e. "critical areas" as defined by the NRC's August 1990 STP) as riprap or filter material only after

being oversized in accordance with the criteria in Section 5.2.2 of these Specifications.

3. Rock having a durability rating of less than 80 and greater than or equal to 50 may be used in the rock mulch portion of the soil/rock matrix, a "non-critical area," only after being oversized in accordance with the criteria in Section 5.2.2 of these Specifications.

4. Rock having a durability rating of less than 65 may not be used for riprap or filter, and

5. Rock having a durability rating of less than 50 may not be used for any application.

The frequency at which durability testing was to be performed, as specified in Section 7.2.4.1 of the technical specifications, was as follows:

> In accordance with the STP requirements the durability testing frequency will include a minimum of initial testing before use and testing for each additional 10,000 cubic yards of rock from a particular rock source. Additional tests more frequent than every 10,000 cy may be conducted as directed by the Owner if it is suspected that the rock has changed substantially from that previously tested. Any visual change that is noted will be recorded as described in Section 7.2.7. *(Note: On August 21, 1995, the NRC authorized a change in the testing frequency from one test for every 10,000 cy to one test for every 20,000 cy).*

Rock durability testing was performed on a total of 354,312 cubic yards of rock produced, using the specified ASTM tests and the rating criteria from the NRC's August 1990 STP. As shown in Table 29, the volume of rock produced before August 21, 1995, when the testing frequency was changed, measured 173,881 cy. The requirement of an initial test plus one additional test for every 10,000 cy produced indicates that 19 durability tests were required. Table 29 shows that 20 tests were performed on the rock produced before August 21, 1995. An additional 180,431 cy were produced after August 21, 1995. The requirement of one test for every 20,000 cy produced indicated that nine tests were required and as shown in Table 29, nine tests were performed. The rock durability test results, which are summarized Table 30, indicate durability ratings between a low of 80 to a high of 93. These high scores show that that the rock used for erosion protection was of very high quality and met the durability requirements without oversizing.

2.3.5.3 Rock Gradation Testing

Rock gradation requirements as specified in Section 5.2.2 of the technical specifications, consists of the following:

> Tables 2A, 2B, and 2C of these specifications indicate the design D_{50} (median rock size) for each riprap and filter layer and for rock mulch sizes. Riprap, filter, and rock mulch shall conform to the following criteria:
>
> 1. A minimum of 50 percent by weight of the material shall be greater than the design D_{50} shown in Tables 2A, 2B, and 2C of these Specifications. (*Note: Tables 2A and 2B were revised in Attachment 11 of the March 1997 report (WNI 1997a)*).
>
> 2. The material shall be well-graded and shall meet the gradation requirements shown in Tables 2A, 2B, and 2C of these specifications. (*Note: Tables 2A and 2B were revised in Attachment 11 of the March 1997 report (WNI 1997a)*).
>
> 3. Rock to be used for riprap, filters, or rock mulch shall have a minimum durability rating as specified in Section 5.2.1 above.

The frequency at which gradation testing was to be performed, as specified in Section 7.2.4.2 of the technical specifications, was as follows:

> The riprap gradation used for erosion protection will be verified, at the frequency recommended in the January 1989 NRC STP on "Testing and Inspection Plans," for each different gradation of rock specified. Specifically, the gradation testing frequency will include a minimum of initial testing and testing for each additional 10,000 cubic yards of the particular riprap size (i.e., gradation requirement). A minimum of three gradation tests will be required for those riprap sizes with less than 30,000 cubic yards required (i.e., before use and after on third and two thirds of the total volume).

Rock gradation testing was performed at a frequency of at least one test for every 10,000 cy with at least three tests for each size material. The results of all gradation tests are summarized in Table 31. All gradation tests with the exception of the tests performed on 12-inch D_{50} riprap in 1994 met the specifications and the testing frequency. As shown in Table 31, page 6 of 7, the gradation tests performed on 12-inch D_{50} riprap in 1994 had 53 percent passing the 12-inch screen while the requirement was 25-50 percent. In addition, the gradation test performed on 10/20/94 also had 43 percent passing the 10 inch screen while the requirement was 17-42 percent. These deficiencies were identified in non conformance report CA-24. Having a larger percentage than required indicates that additional coarse rock is needed in the gradation. Therefore, approximately 60 tons of plus 12-inch D_{50} rock were added and blended in with the 12-inch D_{50} riprap produced in 1994. Although the blended riprap was not rescreened, an analysis was performed to estimate the gradation of the blended riprap. This analysis, which is included in Appendix U, indicated that the blended riprap met the gradation requirements for 12-inch D_{50} riprap with the exception of the 10-inch size which was 51 percent while the requirement was 25 to 50 percent. However, since it was only 1% smaller than required on the 10-inch screen, it was concluded that the 12-inch riprap produced in 1994 was acceptable.

2.3.5.4 Rock Placement

Riprap placement requirements as specified in Section 5.2.3 of the technical specifications, consist of the following:

> Riprap shall be placed at the locations and grades shown on the Reclamation Plan Drawings. The riprap shall be placed in a manner to prevent segregation and to provide a layer of riprap of the specified thickness. Hand placing will be required only to the extent necessary to ensure the results specified above.

Filter placement requirements as specified in Section 5.2.4 of the technical specifications, consist of the following:

> Each filter layer will be placed in one lift and tracked in-place by three passes of a Caterpillar D-8 bulldozer or equivalent. Minimum filter layer thickness for each particular application are specified in Table 2B. Each layer shall be placed in a manner that prevents segregation. (*Note: Table 2B was revised in Attachment 11 of the March 1997 report (WNI 1997a)).*

Soil/Rock Filter Matrix placement requirements are specified in Section 5.2.5 of the technical specifications. However, since the soil portion of the soil/rock matrix was deleted by license condition 27(E), only those portions of Section 5.2.5 that address the rock portion of the soil/rock matrix are applicable. These are as follows:

> The rock for the soil rock matrix shall be placed by end or belly dump trucks or other means in a manner that shall minimize segregation and separation of the material.

The procedures to be used for determining riprap and filter thicknesses as specified in Section 7.2.4.2 of the technical specifications, are as follows:

> The in-place riprap shall be visually inspected to confirm that material has been placed according to Section 5.0 of these Specifications. Furthermore, the riprap

> layer thickness shall be measured to confirm that the thickness is greater than the minimum specified in Tables 2A and 2B. *(Note: Tables 2A and 2B were revised in Attachment 11 of the March 1997 report (WNI 1997a)).* The thickness of riprap placed in the diversion ditches shall be verified by measuring the layer thickness in a test section (August 1990 NRC STP) constructed at the initial placement of a specified size riprap. In addition, the riprap layer thickness shall then be measured at the leading edge of the rock layer placement at intervals of 100 lineal feet.

The procedures to be used for determining the thickness of the rock mulch were specified in Section 7.2.5 of the technical specifications. However, since the soil portion of the soil/rock matrix was deleted by license condition 27(E), the term “soil/rock matrix” in the Section 7.2.5 specifications has been revised below to “rock mulch”.

> The thickness of the emplaced rock mulch shall be verified by construction control, staking, and probing. The measurements shall be conducted using the following procedures:
>
> 1. Establish a 200-foot by 200-foot grid over the tailing impoundment.
>
> 2. Use a tape measure or surveying equipment to locate and mark the center point of each grid square.
>
> 3. Use a spade to make a vertical, straight-edged cut that penetrates the rock mulch at the center point of the grid square.
>
> 4. Place a straight-edge horizontally on top of the rock at the edge of the cut and measure the vertical distance from the bottom of the straight-edge to the bottom of the rock mulch to the nearest 0.1 foot.
>
> 5. Record the thickness measurements for the rock mulch at each location.

6. If the average rock mulch thickness within the grid meets the requirements specified in Section 5, the rock mulch within the grid is acceptable.

7. If the average thickness within the grid does not meet the requirements specified in Section 5, mark the location and add additional rock mulch, or remove and recompact as necessary to achieve the specifications. Then repeat the test, starting with Step 2 above.

As required, filter and riprap layers and rock mulch were placed at the locations shown on the Reclamation Plan Drawings. The thickness of the soil/rock matrix and rock mulch on the tailing impoundment were measured on a 200-foot grid. The thicknesses of the riprap and filter material placed in the diversion ditches and Tailing Swale were measured approximately every 100 lineal feet.

The soil/rock matrix proposed for the tailing impoundment consisted of a layer of rock mulch covered by a 2-inch layer of soil. Three sizes of rock mulch were required; a 4-inch thick layer of rock mulch having a D_{50} of 2 inches, a 4-inch thick layer of rock mulch having a D_{50} of 3 inches, and a 12-inch thick layer of rock mulch having a D_{50} of 6 inches (see Table 2C of the 2/94 TRP which is included in Appendix Y in this report). After the first year of construction (1994), the soil portion of the soil/rock matrix was deleted with the approval of the NRC. This left only the rock mulch portion of the soil/rock matrix. Appendix V presents the soil/rock matrix and rock mulch thickness logs.

A total of 244 erosion protection thickness measurements were performed on a 200 foot grid system. Of these, 41 were measurements of the soil/rock matrix having a D_{50} of 2 inches, 10 were measurements of the soil/rock matrix having a D_{50} of 3 inches, 191 were of the rock mulch having a D_{50} of 2 inches, and 5 were of the rock mulch having a D_{50} of 6 inches. As summarized in Table 32, only the soil/rock matrix measurements deviated from the approved design in that the soil portion, which should have been 2 inches thick, varied from 0 to 2 inches. However, the total thicknesses of all the soil/rock matrix measurements equaled or exceeded the required thickness of 6 inches.

Since rock mulch is more stable than soil, placing rock mulch instead of soil in the soil/rock matrix results in improved erosion protection. Additionally, the soil portion of the soil/rock matrix was deleted for subsequent erosion protection placement. It was therefore concluded that all of the rock placement on the tailing impoundment was acceptable.

The as-built filter types and riprap sizes for the Tailing Swale and diversion ditches, along with the design requirements, are presented in Table 33 for the North Central Diversion Ditch, Table 34 for the South Central Diversion Ditch, Table 35 for the North Diversion Ditch, Table 36 for the South Diversion Ditch and Table 37 for the Tailing Swale. All of the as-built rock filters and riprap thicknesses were equal to or greater than required. Appendix W presents the Tailing Swale and diversion ditch filter and riprap thickness measurement logs.

The confluence as-built profile slopes, bottom widths, depths, and lengths, along with the design requirements, are presented in Table 38. Confluence locations are shown in Figure 5 of the 2/94 TRP (WNI, 1994). The profile slopes, bottom widths, depths, and lengths were determined by surveying and measuring after the filter and riprap layers had been placed. As shown in Table 38, the as-built profile slopes are somewhat different than the design slopes. This is because the confluences had to be field-fitted to the surface topography which in some cases had been changed from the topography used to design the confluences. Table 38 also shows that the bottom widths for all confluences are wider than the design. The as-built depths are shown as varying from zero to a maximum while the design depths are shown as a single value. This is because the confluence depth varies from zero where it daylights to existing ground to a maximum where it intersects the diversion ditch. For all confluences the maximum depths are greater than the design depths. The as-built lengths shown in Table 38 are less than the design lengths for all confluences and the discharge angles also vary from the design. Again, these deviations are due to the surface topography which was changed from the topography used in the design. However, these slight deviations will not impact the performance of the structures.

Prior to placement of the riprap in the diversion ditches, different riprap sizes were placed in test sections to confirm that the proposed rock placement procedures would result in adequate riprap placement without segregation of fine and coarse materials.

During placement, all of the rock was visually inspected and compared to the test sections to assure well graded mixtures. Each filter layer was placed in one lift and tracked by three passes of a Caterpillar D-8 bulldozer or equivalent. All areas showed that riprap placement was done in a manner that prevented segregation and provided a uniform well graded mixture of particle sizes.

2.3.6 Aprons and Key Trenches

Erosion aprons were constructed at the outlets of all diversion ditches. The erosion aprons consist of a flared section that will provide energy dissipation and a rock filled toe trench that extends below ground to the calculated maximum depth of scour. A rock filled key trench was constructed in areas where the rock mulch on the tailing impoundment transitions onto the existing soil. These aprons and key trenches will prevent head cutting and long-term erosion.

2.3.6.1 Design Requirements

The design requirements for diversion ditch outlet aprons, as specified in Section 5.2.6 of the Technical Specifications, consist of the following:

> Each rock apron and flare shall be constructed using the same filter and riprap as specified for the diversion ditch reach immediately upstream of the flare (i.e., North Reach 7, South Reach 5, North Central Reach 3, and South Central Reach 2). Filter(s) and riprap shall be well-graded, and shall be sized, placed, and tested in accordance with the criteria as specified for diversion ditch riprap and filter materials.
>
> Each rock apron shall be constructed by excavating a trench to a depth equal to or greater than the appropriate scour depth specified on Figure 9 of the Reclamation

Plan Drawings. Riprap shall be placed against the upstream sideslope of the excavated trench in a manner that achieves a uniform distribution of the larger and smaller rock fragments. These fragments shall form a densely placed layer of riprap that meets the thickness specified for the corresponding diversion ditch reach.

After the rock apron is constructed, the apron trench shall be backfilled with soil material to conform to the surrounding soil surface and to provide drainage from the flare to the native soil.

The design requirements for the key trench, which is located at the transition between the tailing impoundment rock mulch and the existing soil, are shown in the drawing detail titled "soil/rock matrix key" on Figure 10 of the 2/94 TRP (see Appendix Y). The key trench consists of a trapezoidal-shaped excavation backfilled with the same size rock as was used for the rock mulch on the tailing impoundment. The design requires an 18-inch bottom width, 1H:1V side slopes, and an excavated depth of 18 inches. Figure 10 of the 2/94 TRP shows that the 6 inch thick soil/rock matrix layer is extended over the rock in the key trench. This results in a key trench depth of 24 inches. However, since the 2-inch thick soil portion of the soil-rock matrix was deleted by license condition 27(E), the revised depth of the key was 22 inches.

2.3.6.2 Outlet Aprons

The bottom widths, flow depths, profile lengths and slopes, and scour depths of the outlet aprons were determined by surveying and measuring after the filter and riprap layers had been placed. The filter and riprap sizes were the same as were placed in the diversion ditches immediately upstream of the outlet aprons. Table 39 presents a summary of the design and the as-built outlet dimensions. As shown in the table, all bottom widths, flow depths, profile lengths, and scour depths were equal to or greater than the design dimensions. The profile slopes were all within 0.0005 ft/ft of the design slopes.

2.3.6.3 Key Trench

The key trench was excavated in areas where the rock mulch on the tailing impoundment meets native soil. The location of the as-built trench is shown in Drawing 2. The dimensions of the key trench were measured by scale every 100 feet along the length of the trench and are shown on Table 40.

2.3.7 General Surface Configuration

2.3.7.1 Design Requirements

The proposed final reclaimed contours for the tailing impoundment are shown in Figures 4 and 5 of the 2/94 TRP (For reference, these figures from the 2/94 TRP are included in Appendix Y of this report). However, as discussed in Section 1.3.1.1.4 of this report, during construction the final contours proposed for Areas 1A and 1B had to be raised to provide additional storage space for disposal of windblown tailing. Therefore, as discussed in Section 3.2.1 of the 2/94 TRP technical specifications (as revised in the March 31, 1997 report (WNI, 1997a), the final reclaimed contours in Areas 1C, 2A, 2B, 2C, 3A, and 3B are shown in Figures 4 and 5 of the 2/94 TRP, and for Areas 1A and 1B, the final reclaimed contours are shown in Figure 8 of the March 31, 1997 report (WNI, 1997a).

2.3.7.2 As-Built Topography

The as-built final topography is presented in Drawing 2. The topography shows that the final reclamation cover was completed in accordance with the approved design and maintains the general configuration shown in Figures 4 and 5 of the 2/94 TRP for Areas 2A, 2B, 3A, 3B, and 1C, and in Figure 8 of the March 1997 report for Areas 1A and 1B.

2.4 Post-Reclamation Surface Stability Monitoring Program

A post-construction surface stability inspection of the reclaimed site was conducted during the week of May 12-15, 1998, Based on this inspection it was concluded that the reclamation system including the rock armoring is performing as designed. However, there was a small area in Area 1A where ponding was observed. This ponding is due to settlement that has occurred since construction was completed. As a result of this limited ponding, a settlement analysis was performed as presented in Attachment F2 in Appendix F. The results of this analysis indicated that additional settlement and ponding may occur in this area. However, any additional settlement and ponding will not affect the performance of the reclaimed impoundment.

3.0 HEALTH AND SAFETY PROGRAM

The health and safety program (HASP) describes activities undertaken to assure that all reclamation construction work as described in Section 8 of the Technical Specifications was done in a manner that protected the health and safety of all workers. The HASP included both radiological and industrial safety. The radiological safety program is audited annually and the results are submitted to the NRC in accordance with License Condition # 42 of Source Material License SUA-56. Therefore, that information is not resubmitted in this report.

3.1 HASP Responsibilities

All aspects of HASP activities conducted on the Split Rock Mill Site were the ultimate responsibility of WNI. All WNI activities undertaken within the tailing impoundment were guided by the requirements of WNI's Source Material License SUA-56. As such, all work was performed under the auspices of radiation work permits (RWPs) which describe the hazards associated with the activity, protective measures to be taken to reduce radiological exposures, and radiological monitoring requirements undertaken during the activity. Industrial hazards, protective measures, and monitoring were also described in RWPs where applicable. The contractor, through contract terms, was required to provide and administer an industrial safety/hygiene program that fulfilled WNI requirements.

Activities were governed by the office of the State Mine Inspector or MSHA. The contractor was responsible for all aspects of industrial safety/hygiene during contract activities including training, enforcement, reporting, and documentation required to comply with all applicable NRC, State Mine Inspector, and WNI requirements.

3.2 Radiological Protection Program

A radiological protection program is a condition of Source Material License SUA-56 issued to WNI by the NRC. WNI must provide to all workers within the restricted area: 1) training regarding the health risks and protective measures regarding exposure to radiation or radioactive materials; and 2) radiation monitoring services to document exposures when there is a potential for exposure to radiation or radioactive materials. The following sections describe activities undertaken to protect workers and monitor their exposures during the reclamation construction activities.

3.2.1 Training

All workers employed on the reclamation construction project were provided with radiation protection training by the Radiation Safety Officer (RSO). Training was provided to workers in accordance with the provisions of 10 CFR 19.12, "Instructions to Workers." A total of 488 individuals involved with the 1994 - 1997 reclamation construction received training. Training included the instructions described in U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 8.29 "Instruction Concerning Risks From Occupational Radiation Exposure" (Revision 1, dated February 1, 1996). In addition, all female workers received instructions contained in NRC Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure" (Revision 1, dated November 1975).

A written test addressing applicable principles of the radiation safety program was administered to each worker. Test results were reviewed and any incorrect answers discussed to ensure worker understanding of appropriate protection practices. Results of testing are maintained in each worker's file.

Site conditions within the tailing impoundment at the inception of reclamation contract activity warranted adaptation of a respiratory protection training program. All contractor employees were required to have a pulmonary function evaluation signed by a physician stating that the individual could participate in the respiratory protection program. Respiratory protection training and fitting was not provided at initiation of reclamation construction. However, when reclamation work on bare tailing or when tailing were exposed during the reclamation process, thereby posing a potential airborne radiological hazard, all operations personnel received the required respiratory protection training and fitting. Thus, respiratory protection was provided when elevated concentrations of radionuclides characteristic of tailing were observed in the results of air sampling.

3.2.2 Equipment

The construction contract specified that WNI would provide all radiological protection equipment. A bioassay bottle was provided to each worker on the day training was received, prior to work on the tailing impoundment, to determine background uranium concentrations in urine. In addition, select workers were required to wear calibrated constant flow air sampling pumps. Respiratory protection equipment was available from the RSO. Other personal protective equipment, such as hard hats, work clothes or coveralls, work boots, reflective safety vests, and safety glasses were used in appropriate areas.

3.2.3 Exposure Surveillance Program

Gamma - External gamma surveys of the project area were performed with a gamma detector (PRM-7 or equivalent). These surveys were performed monthly or when warranted by work conditions. Time studies of the workers were performed and documented. The time any worker was on the site was documented on the Contractors Daily Log and/or the Contractor's time sheets. The time and gamma exposure rates were transferred to the Contractor's Restricted Area Occupancy Log for subsequent calculation for gamma exposure. The gamma exposures were recorded on the worker's Radiation Exposure Record.

Airborne Radionuclides - Surveys for airborne radionuclides were conducted weekly during the construction activities. At least one worker in each construction area was required to wear a calibrated constant air flow sampling pump. The sampling apparatus was distributed at the beginning of each shift and collected at the end of the shift. The filters were analyzed for gross alpha. The calculated thorium concentrations did not exceed 10 percent of the Derived Air Concentration, however, exposure calculations were performed to demonstrate compliance.

3.2.4 Radiological Contamination Surveys

Radiological contamination surveys were conducted in the construction equipment cabs, lunch rooms, and offices where applicable on a typical frequency of once every 2 weeks during active reclamation tasks. To minimize contamination, lunch rooms were cleaned weekly and the construction equipment cabs were swept daily and vacuumed weekly, which resulted in insignificant measurements of contamination.

All workers involved in reclamation activities were required to monitor themselves before eating lunch and at the end of their shift. A written procedure was posted near the personnel monitor. All workers were instructed in the proper use of the instrument. If the present alarm indicated the action level of 1,000 dpm total alpha/1000 square centimeters was exceeded, the worker would wash and perform a follow-up survey. Results of all exit surveys were documented on a log sheet posted near the survey monitor. Performance testing of monitor response was conducted and documented on a daily basis by using a check source.

3.2.5 As Low As Reasonably Achievable (ALARA) Activities

ALARA activities were conducted on a daily basis. Each shift began with a safety meeting for all employees conducted by the contractor's foreman. Project status was reviewed, status of the equipment fleet was discussed relative to specific tasks and assignments, current safety issues were reviewed including accident reviews, a consistent safety reminder or message was given, and WNI representatives were asked for any comments or input regarding safety issues. A WNI representative was at each of these meetings.

During these meetings, the foreman or RSO would answer general questions, review the results of monitoring, discuss radiation protection issues, address specific safety concerns, and/or discuss project-specific subjects.

WNI representatives, including the construction manager and/or the RSO, reviewed construction activity on a daily basis to verify compliance with reclamation commitments. In addition, safety issues observed in the field were discussed with contractor field supervisors and corrected.

3.2.6 Restricted Area Access

As required by License Condition 37 of SUA 56, all entrances to the restricted area were posted with the words, "Any area within this facility may contain radioactive material."

3.3 Emergency Procedures

The contractors provided WNI a copy of "Emergency Procedures," which specified the methods of emergency contact, a list of emergency phone numbers, a local facility for treatment of work injuries, and the appropriate routes to a treatment center.

3.4 Site Control and Decontamination

All equipment used in areas of tailing material or windblown tailing were decontaminated at an area designated by WNI using at different times, a steam cleaner, high pressure water, and scraping before release to an unrestricted area. All equipment was released in accordance with "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By Product or Source Materials," dated September 1984.

4.0 ENVIRONMENTAL MONITORING

An environmental monitoring program is required by License Conditions #24 and #25 of Source Material License SUA-56. The data obtained from this monitoring program are reported to the NRC in accordance with the requirements of 10 CFR 40.65. License condition #24 describes the monitoring activities required to assess potential impacts to ambient environmental conditions surrounding the tailing impoundment. The program, was in force during all phases of reclamation construction and semi-annual reports were submitted to the NRC as required by the license. In addition, WNI conducted annual audits of the environmental monitoring program as required by License condition #25.

5.0 DOCUMENTATION, AUDITS, AND INSPECTIONS

5.1 WNI Documentation

WNI site personnel prepared daily summary reports and numerous quality compliance report forms to document construction progress and compliance with the drawings and technical specifications. WNI personnel also prepared weekly reports.

Internal audits were also conducted by WNI during the course of the project. Additionally, NRC inspections were conducted during construction.

5.2 WNI Audits

A total of 43 audits were conducted by WNI during construction. A summary of the audits is presented in Appendix K. Non-conformances identified during the audits were documented in Corrective Action Logs. All non-conformances were corrected unless it was determined that a specific non-conformance would not affect the performance of the reclamation construction as shown on Table 41.

5.3 USNRC Inspections

A total of nine field inspections were conducted by the NRC. Documentation received from the NRC that occurred as a result of the inspections, is included in Appendix Y.

6.0 REFERENCES

Kail, 1991. "Archaeological Monitoring Report: Response to NRC Letter Dated May 14, 1991."

NRC, 1989. "Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers." U.S. Nuclear Regulatory Commission, Regulatory Guide 3.64. June.

NRC, 1990. "Staff Technical Position, Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites." August.

Rogers, V.C., K.K. Nielson, and D.R. Kalkwarf, 1984. "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design." U.S. Nuclear Regulatory Commission, NUREG/CR-3533. April.

WNI, 1994. "Western Nuclear, Inc., Split Rock Mill, Addendum A (February 1994) to Revision No. 5 to the June 30, 1987 Uranium Tailings Reclamation Plan." February.

WNI, 1995. "Western Nuclear, Inc., Radiological Verification Program." December 15.

WNI, 1995. Letter from S.J. Baker to J.J. Holonich, "Amendment Request to Uranium Tailings Reclamation Plan." March 27.

WNI, 1997a. "License Condition # 27: Revisions to Surface Reclamation Design - License Condition #33: Addendum to Radiological Verification Program." March 31.

WNI, 1997b. "License Condition #27, Addendum to 03/31/97 WNI Submittal, Responses to 05/12/97 NRC Questions #3 and #4." May 30.

WNI, 1997c. "Split Rock Project, Radiological Verification Completion Report." December 19.

WNI, 1997d. "Redesign of Final Cover Thickness, 0.8 Acre Area in Area 2A." July 25.

Table 1 Required Radon Barrier Thicknesses

Area (1)	Required Radon Barrier Thickness (inches)
Area 1A north of Northing 7,900 (2)	16
Area 1A south of Northing 7,900	33
East portion of Area 1B north of Northing 7,900 (2)	16
West portion of Area 1B north of Northing 7,900 (2)	6
Area 1B south of Northing 7,900	44
Area 1C	36
Main portion of Area 2A	42
0.8 acre portion of Area 2A (2)	6
Area 2B	36
Area 2C	6(3)
Area 3A	16
Area 3B	6

(1) Location of Areas shown in Figure 1.

(2) Radon barrier thicknesses for these areas are revised from those presented in the 2/94 TRP. These revised thicknesses were presented to and approved by the NRC. See Section 1.3.1.1.4 of this report.

(3) Once the water storage ponds in Area 2C are no longer required, WNI will determine the radium activity of the pond sludge and verify that the 6-inch radon barrier layer is adequate. Should the recalculated radon barrier layer deviate from the proposed design, changes will be made accordingly and submitted to the NRC for review and approval prior to final reclamation

Table 2 1994 Gradation Test Results - Radon Barrier Material (Page 1 of 4)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
1		91.6	Pass
2	0 to 1,000	95.3	Pass
3	1,000 to 2,000	91.3	Pass
4	2,000 to 3,000	91.3	Pass
5	3,000 to 4,000	90.4	Pass
6	4,000 to 5,000	98.4	Pass
7	5,000 to 6,000	95.1	Pass
8	6,000 to 7,000	91.9	Pass
9	7,000 to 8,000	95.1	Pass
10	8,000 to 9,000	96.3	Pass
11	9,000 to 10,000	96.7	Pass
12	10,000 to 11,000	94.6	Pass
13	11,000 to 12,000	90.0	Pass
14	12,000 to 13,000	92.7	Pass
15	13,000 to 14,000	91.9	Pass
16	14,000 to 15,000	95.8	Pass
17	15,000 to 16,000	94.6	Pass
18	16,000 to 17,000	96.2	Pass
19	17,000 to 18,000	90.6	Pass
20	18,000 to 19,000	93.4	Pass
21	19,000 to 20,000	94.4	Pass
22	20,000 to 21,000	94.0	Pass
23	21,000 to 22,000	98.7	Pass
24	22,000 to 23,000	96.2	Pass
25	23,000 to 24,000	92.4	Pass
26	24,000 to 25,000	92.9	Pass
27	25,000 to 26,000	96.6	Pass
28	26,000 to 27,000	92.2	Pass
29	27,000 to 28,000	98.6	Pass
30	28,000 to 29,000	97.6	Pass
31	29,000 to 30,000	98.3	Pass
32	30,000 to 31,000	96.9	Pass
33	31,000 to 32,000	97.2	Pass
34	32,000 to 33,000	98.3	Pass
35	33,000 to 34,000	95.2	Pass
36	34,000 to 35,000	84.9	Fail
37 (36R)	34,000 to 35,000	94.0	Pass
38 (36R)	34,000 to 35,000	92.2	Pass
39	35,000 to 36,000	94.5	Pass
40	36,000 to 37,000	94.2	Pass
41	37,000 to 38,000	95.9	Pass
42	38,000 to 39,000	97.9	Pass
43	39,000 to 40,000	98.8	Pass

R = Retest. Example: “37 (36R)” indicates that Test #37 was a retest of Test #36.

Table 2 1994 Gradation Test Results - Radon Barrier Material (Page 2 of 4)

Test #	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
44	40,000 to 41,000	93.9	Pass
45	41,000 to 42,000	94.8	Pass
46	42,000 to 43,000	93.3	Pass
47	43,000 to 44,000	94.9	Pass
48	44,000 to 45,000	97.1	Pass
49	45,000 to 46,000	97.5	Pass
50	46,000 to 47,000	93.9	Pass
51	47,000 to 48,000	92.2	Pass
52	48,000 to 49,000	95.2	Pass
53	49,000 to 50,000	94.6	Pass
54	50,000 to 51,000	94.1	Pass
55	51,000 to 52,000	95.3	Pass
56	52,000 to 53,000	94.9	Pass
57	53,000 to 54,000	94.0	Pass
58	54,000 to 55,000	94.0	Pass
59	55,000 to 56,000	97.1	Pass
60	56,000 to 57,000	94.3	Pass
61	57,000 to 58,000	90.5	Pass
62	58,000 to 59,000	93.6	Pass
63	59,000 to 60,000	95.8	Pass
64	60,000 to 61,000	96.4	Pass
65	61,000 to 62,000	96.0	Pass
66	62,000 to 63,000	94.2	Pass
67	63,000 to 64,000	91.7	Pass
68	64,000 to 65,000	90.5	Pass
69	65,000 to 66,000	95.6	Pass
70	66,000 to 67,000	92.5	Pass
71	67,000 to 68,000	91.9	Pass
72	68,000 to 69,000	93.2	Pass
73	69,000 to 70,000	90.2	Pass
74	70,000 to 71,000	90.1	Pass
75	71,000 to 72,000	94.6	Pass
76	72,000 to 73,000	93.8	Pass
77	73,000 to 74,000	91.1	Pass
78	74,000 to 75,000	84.1	Fail(1)
79	75,000 to 76,000	93.8	Pass
80	76,000 to 77,000	92.4	Pass
81	77,000 to 78,000	93.7	Pass
82	78,000 to 79,000	97.4	Pass
83	79,000 to 80,000	97.2	Pass
84	80,000 to 81,000	93.3	Pass
85	81,000 to 82,000	96.1	Pass
86	82,000 to 83,000	90.4	Pass

(1) Test 78 was retested – see 89 and 90 on page 3 of 4

Table 2 1994 Gradation Test Results - Radon Barrier Material (Page 3 of 4)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
87	83,000 to 84,000	95.3	Pass
88	84,000 to 85,000	90.1	Pass
89 (78R)	74,000 to 75,000	95.5	Pass
90 (78R)	74,000 to 75,000	96.6	Pass
91	85,000 to 86,000	94.5	Pass
92	86,000 to 87,000	93.6	Pass
93	87,000 to 88,000	93.8	Pass
94	88,000 to 89,000	94.6	Pass
95	89,000 to 90,000	97.2	Pass
96	90,000 to 91,000	97.3	Pass
97	91,000 to 92,000	93.4	Pass
98	92,000 to 93,000	94.3	Pass
99	93,000 to 94,000	95.8	Pass
100	94,000 to 95,000	93.0	Pass
101	95,000 to 96,000	93.7	Pass
102	96,000 to 97,000	89.6	Fail
103 (102R)	96,000 to 97,000	92.7	Pass
104 (102R)	96,000 to 97,000	93.1	Pass
105	97,000 to 98,000	91.6	Pass
106	98,000 to 99,000	92.0	Pass
107	99,000 to 100,000	92.0	Pass
108	100,000 to 101,000	92.2	Pass
109	101,000 to 102,000	93.2	Pass
110	102,000 to 103,000	94.4	Pass
111	103,000 to 104,000	94.1	Pass
112	104,000 to 105,000	97.7	Pass
113	105,000 to 106,000	94.4	Pass
114	106,000 to 107,000	96.3	Pass
115	107,000 to 108,000	90.6	Pass
116	108,000 to 109,000	93.4	Pass
117	109,000 to 110,000	90.5	Pass
118		94.8	Exploratory
119		90.0	Exploratory
120	110,000 to 111,000	90.3	Pass
121	111,000 to 112,000	95.0	Pass
122		89.2	Fail/Exploratory
123		96.2	Exploratory
124	112,000 to 113,000	93.1	Pass
125	113,000 to 114,000	93.0	Pass
126	114,000 to 115,000	98.3	Pass
127	115,000 to 116,000	96.1	Pass
128	116,000 to 117,000	94.5	Pass
129	117,000 to 118,000	92.2	Pass
130	118,000 to 119,000	90.1	Pass

R = Retest. Example: "103 (102R)" indicates that Test #103 was a retest of Test #102.

Table 2 1994 Gradation Test Results - Radon Barrier Material (Page 4 of 4)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
131	119,000 to 120,000	93.6	Pass
132	120,000 to 121,000	94.7	Pass
133	121,000 to 122,000	94.1	Pass
134	122,000 to 123,000	94.2	Pass
135	123,000 to 124,000	93.5	Pass
136	124,000 to 125,000	92.3	Pass
137	125,000 to 126,000	95.9	Pass
138	126,000 to 127,000	95.3	Pass
139	127,000 to 128,000	95.9	Pass
140	128,000 to 129,000	97.1	Pass
141	129,000 to 130,000	93.4	Pass
142	130,000 to 131,000	91.8	Pass
143	131,000 to 132,000	96.3	Pass
144	132,000 to 133,000	93.6	Pass
145	133,000 to 134,000	94.5	Pass
146	134,000 to 135,000	92.9	Pass
147	135,000 to 136,000	92.5	Pass
148		84.4	Fail/Not Placed
149	136,000 to 137,000	93.1	Pass
150	137,000 to 138,000	91.6	Pass
151	138,000 to 139,000	92.6	Pass
152	139,000 to 140,000	93.6	Pass
153	140,000 to 141,000	96.0	Pass
154	141,000 to 142,000	91.9	Pass
155	142,000 to 143,000	91.3	Pass
156	143,000 to 144,000	95.2	Pass
157	144,000 to 145,000	90.9	Pass
158	145,000 to 146,000	92.2	Pass
159	146,000 to 147,000	94.1	Pass
160	147,000 to 148,000	93.1	Pass
161	148,000 to 149,000	98.4	Pass
162	149,000 to 150,000	95.8	Pass
163	150,000 to 151,000	95.0	Pass
164	151,000 to 152,000	95.5	Pass
165	152,000 to 153,000	95.3	Pass

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 1 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
1	0 to 925	88.2	Fail/Redrilled
1R	0 to 925	93.3	Retested/Pass
2	925 to 1,850	96.3	Pass
3	1,850 to 2,775	88.3	Fail/Redrilled
3R	1,850 to 2,775	93.3	Retested/Pass
4	2,775 to 3,700	96.0	Pass
5	3,700 to 4,625	94.6	Pass
6	4,625 to 5,550	98.8	Pass
7	5,550 to 6,475	97.4	Pass
8	6,475 to 7,400	98.1	Pass
9	7,400 to 8,325	96.3	Pass
10	8,325 to 9,250	97.2	Pass
11	9,250 to 10,175	93.5	Pass
12	10,175 to 11,100	96.0	Pass
13	11,100 to 12,025	96.8	Pass
14	12,025 to 12,950	95.6	Pass
15	12,950 to 13,875	95.4	Pass
16	13,875 to 14,800	97.1	Pass
17	14,800 to 15,725	95.6	Pass
18	15,725 to 16,650	96.4	Pass
19	16,650 to 17,575	96.2	Pass
20	17,575 to 18,500	97.2	Pass
21	18,500 to 19,425	94.1	Pass
22	19,425 to 20,350	97.4	Pass
23	20,350 to 21,275	96.3	Pass
24	21,275 to 22,200	97.6	Pass
25	22,200 to 23,125	98.7	Pass
26	23,125 to 24,050	98.0	Pass
27	24,050 to 24,975	96.5	Pass
28	24,975 to 25,900	92.2	Pass
29	25,900 to 26,825	95.2	Pass
30	26,825 to 27,750	94.5	Pass
31	27,750 to 28,675	95.2	Pass
32	28,675 to 29,600	92.5	Pass
33	29,600 to 30,525	96.2	Pass
34	30,525 to 31,450	93.9	Pass
35	31,450 to 32,375	95.9	Pass
36	32,375 to 33,300	94.5	Pass
37	33,300 to 34,225	94.9	Pass
38	34,225 to 35,150	97.9	Pass
39	35,150 to 36,075	95.5	Pass
40	36,075 to 37,000	95.9	Pass
41	37,000 to 37,925	97.7	Pass

R = Retest

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 2 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
42	37,925 to 38,850	96.9	Pass
43	38,850 to 39,775	96.4	Pass
44	39,775 to 40,700	97.0	Pass
45	40,700 to 41,625	95.1	Pass
46	41,625 to 42,550	92.2	Pass
47	42,550 to 43,475	92.8	Pass
48	43,475 to 44,400	96.3	Pass
49	44,400 to 45,325	94.0	Pass
50	45,325 to 46,250	95.8	Pass
51	46,250 to 47,175	96.8	Pass
52	47,175 to 48,100	96.9	Pass
53	48,100 to 49,025	96.0	Pass
54	49,025 to 49,950	98.3	Pass
55	49,950 to 50,875	96.3	Pass
56	50,875 to 51,800	92.0	Pass
57	51,800 to 52,725	96.0	Pass
58	52,725 to 53,650	94.7	Pass
59	53,650 to 54,575	96.6	Pass
60	54,575 to 55,500	98.9	Pass
61	55,500 to 56,425	97.0	Pass
62	56,425 to 57,350	97.1	Pass
63	57,350 to 58,275	94.7	Pass
64	58,275 to 59,200	96.6	Pass
65	59,200 to 60,125	95.4	Pass
66	60,125 to 61,050	96.7	Pass
67	61,050 to 61,975	92.5	Pass
68	61,975 to 62,900	96.6	Pass
69	62,900 to 63,825	99.1	Pass
70	63,825 to 64,750	97.0	Pass
71	64,750 to 65,675	97.4	Pass
72	65,675 to 66,600	97.8	Pass
73	66,600 to 67,525	92.9	Pass
74	67,525 to 68,450	97.9	Pass
75	68,450 to 69,375	95.1	Pass
76	69,375 to 70,300	97.2	Pass
77	70,300 to 71,225	98.1	Pass
78	71,225 to 72,150	93.9	Pass
79	72,150 to 73,075	97.7	Pass
80	73,075 to 74,000	97.8	Pass
81	74,000 to 74,925	97.1	Pass
82	74,925 to 75,850	98.7	Pass
83	75,850 to 76,775	97.5	Pass
84	76,775 to 77,700	98.5	Pass
85	77,700 to 78,625	97.1	Pass
86	78,625 to 79,550	95.6	Pass
87	79,550 to 80,475	97.0	Pass
88	80,475 to 81,400	98.8	Pass

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 3 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
89	81,400 to 82,325	94.1	Pass
90	82,325 to 83,250	98.0	Pass
91	83,250 to 84,175	93.2	Pass
92	84,175 to 85,100	97.9	Pass
93	85,100 to 86,025	97.9	Pass
94	86,025 to 86,950	97.1	Pass
95	86,950 to 87,875	98.2	Pass
96	87,875 to 88,800	98.2	Pass
97	88,800 to 89,725	93.1	Pass
98	89,725 to 90,650	98.3	Pass
99	90,650 to 91,575	98.5	Pass
100	91,575 to 92,500	98.9	Pass
101	92,500 to 93,425	97.1	Pass
102	93,425 to 94,350	97.4	Pass
103	94,350 to 95,275	98.3	Pass
104	95,275 to 96,200	97.0	Pass
105	96,200 to 97,125	95.5	Pass
106	97,125 to 98,050	98.2	Pass
107	98,050 to 98,975	98.3	Pass
108	98,975 to 99,900	99.4	Pass
109	99,900 to 100,825	97.7	Pass
110	100,825 to 101,750	96.5	Pass
111	101,750 to 102,675	97.3	Pass
112	102,675 to 103,600	97.8	Pass
113	103,600 to 104,525	97.1	Pass
114	104,525 to 105,450	96.6	Pass
115	105,450 to 106,375	96.5	Pass
116	106,375 to 107,300	97.4	Pass
117	107,300 to 108,225	98.5	Pass
118	108,225 to 109,150	97.6	Pass
119	109,150 to 110,075	98.2	Pass
120	110,075 to 111,000	97.5	Pass
121	111,000 to 111,925	96.4	Pass
122	111,925 to 112,850	96.0	Pass
123	112,850 to 113,775	97.2	Pass
124	113,775 to 114,700	98.4	Pass
125	114,700 to 115,625	96.6	Pass
126	115,625 to 116,550	97.3	Pass
127	116,550 to 117,475	97.4	Pass
128	117,475 to 118,400	96.8	Pass
129	118,400 to 119,325	97.8	Pass
130	119,325 to 120,250	98.3	Pass
131	120,250 to 121,175	98.4	Pass
132	121,175 to 122,100	97.9	Pass
133	122,100 to 123,025	99.1	Pass
134	123,025 to 123,950	97.6	Pass
135	123,950 to 124,875	99.4	Pass

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 4 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
136	124,875 to 125,800	98.5	Pass
137	125,800 to 126,725	98.6	Pass
138	126,725 to 127,650	96.4	Pass
139	127,650 to 128,575	97.5	Pass
140	128,575 to 129,500	96.5	Pass
141	129,500 to 130,425	97.1	Pass
142	130,425 to 131,350	98.3	Pass
143	131,350 to 132,275	94.1	Pass
144	132,275 to 133,200	97.9	Pass
145	133,200 to 134,125	98.2	Pass
146	134,125 to 135,050	97.4	Pass
147	135,050 to 135,975	96.8	Pass
148	135,975 to 136,900	98.8	Pass
149	136,900 to 137,825	96.8	Pass
150	137,825 to 138,750	97.9	Pass
151	138,750 to 139,675	98.2	Pass
152	139,675 to 140,600	97.3	Pass
153	140,600 to 141,525	98.0	Pass
154	141,525 to 142,450	98.5	Pass
155	142,450 to 143,375	98.4	Pass
156	143,375 to 144,300	97.5	Pass
157	144,300 to 145,225	98.3	Pass
158	145,225 to 146,150	97.7	Pass
159	146,150 to 147,075	99.0	Pass
160	147,075 to 148,000	98.4	Pass
161	148,000 to 148,925	98.1	Pass
162	148,925 to 149,850	97.6	Pass
163	149,850 to 150,775	97.8	Pass
164	150,775 to 151,700	97.8	Pass
165	151,700 to 152,625	98.5	Pass
166	152,625 to 153,550	98.6	Pass
167	153,550 to 154,475	96.9	Pass
168	154,475 to 155,400	98.3	Pass
169	155,400 to 156,325	97.6	Pass
170	156,325 to 157,250	97.6	Pass
171	157,250 to 158,175	97.9	Pass
172	158,175 to 159,100	98.6	Pass
173	159,100 to 160,025	97.3	Pass
174	160,025 to 160,950	97.7	Pass
175	160,950 to 161,950	98.7	Pass
176	161,950 to 162,950	92.0	Pass
177	162,950 to 163,950	99.1	Pass
178	163,950 to 164,950	93.4	Pass
179	164,950 to 165,950	95.1	Pass
180	165,950 to 166,950	96.8	Pass
181	166,950 to 167,950	96.7	Pass
182	167,950 to 168,950	98.1	Pass

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 5 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
183	168,950 to 169,950	98.2	Pass
184	169,950 to 170,950	95.9	Pass
185	170,950 to 171,950	95.5	Pass
186	171,950 to 172,950	96.9	Pass
187	172,950 to 173,950	96.3	Pass
188	173,950 to 174,950	98.4	Pass
189	174,950 to 175,950	96.6	Pass
190	175,950 to 176,875	96.3	Pass
191	176,875 to 177,800	97.3	Pass
192	177,800 to 178,725	97.0	Pass
193	178,725 to 179,650	98.0	Pass
194	179,650 to 180,575	98.2	Pass
195	180,575 to 181,500	98.4	Pass
196	181,500 to 182,425	98.0	Pass
197	182,425 to 183,350	98.5	Pass
198	183,350 to 184,275	99.0	Pass
199	184,275 to 185,200	98.7	Pass
200	185,200 to 186,125	97.7	Pass
201	186,125 to 187,050	98.6	Pass
202	187,050 to 187,975	98.5	Pass
203	187,975 to 188,900	98.2	Pass
204	188,900 to 189,825	96.8	Pass
205	189,825 to 190,750	96.8	Pass
206	190,750 to 191,675	98.2	Pass
207	191,675 to 192,600	98.7	Pass
208	192,600 to 193,525	96.9	Pass
209	193,525 to 194,450	98.6	Pass
210	194,450 to 195,375	96.9	Pass
211	195,375 to 196,300	99.2	Pass
212	196,300 to 197,225	95.2	Pass
213	197,225 to 198,150	95.2	Pass
214	198,150 to 199,075	97.6	Pass
215	199,075 to 200,000	95.0	Pass
216	200,000 to 200,925	98.7	Pass
217	200,925 to 201,850	97.7	Pass
218	201,850 to 202,775	96.4	Pass
219	202,775 to 203,700	97.2	Pass
220	203,700 to 204,625	98.1	Pass
221	204,625 to 205,550	94.8	Pass
222	205,550 to 206,475	95.0	Pass
223	206,475 to 207,400	96.3	Pass
224	207,400 to 208,325	95.4	Pass
225	208,325 to 209,250	98.6	Pass
226	209,250 to 210,175	98.9	Pass
227	210,175 to 211,100	96.7	Pass
228	211,100 to 212,025	98.3	Pass
229	212,025 to 212,950	95.5	Pass

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 6 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
230	212,950 to 213,875	96.3	Pass
231	213,875 to 214,800	94.5	Pass
232	214,800 to 215,725	99.1	Pass
233	215,725 to 216,650	97.1	Pass
234	216,650 to 217,575	98.2	Pass
235	217,575 to 218,500	98.0	Pass
236	218,500 to 219,425	95.4	Pass
237	219,425 to 220,350	96.8	Pass
238	220,350 to 221,275	96.8	Pass
239	221,275 to 222,200	98.1	Pass
240	222,200 to 223,125	98.4	Pass
241	223,125 to 224,050	98.7	Pass
242	224,050 to 224,975	98.1	Pass
243	224,975 to 225,900	98.3	Pass
244	225,900 to 226,825	98.9	Pass
245	226,825 to 227,750	97.8	Pass
246	227,750 to 228,675	98.7	Pass
247	228,675 to 229,600	98.6	Pass
248	229,600 to 230,525	96.1	Pass
249	230,525 to 231,450	97.3	Pass
250	231,450 to 232,375	95.0	Pass
251	232,375 to 233,300	93.9	Pass
252	233,300 to 234,225	98.4	Pass
253	234,225 to 235,150	93.8	Pass
254	235,150 to 236,075	96.4	Pass
255	236,075 to 237,000	97.2	Pass
256	237,000 to 237,925	98.4	Pass
257	237,925 to 238,850	98.0	Pass
258	238,850 to 239,775	95.3	Pass
259	239,775 to 240,700	97.7	Pass
260	240,700 to 241,625	98.5	Pass
261	241,625 to 242,550	94.4	Pass
262	242,550 to 243,475	96.7	Pass
263	243,475 to 244,400	96.7	Pass
264	244,400 to 245,325	94.0	Pass
265	245,325 to 246,250	95.5	Pass
266	246,250 to 247,175	96.9	Pass
267	247,175 to 248,100	90.6	Pass
268	248,100 to 249,025	97.6	Pass
269	249,025 to 249,950	98.5	Pass
270	249,950 to 250,875	98.2	Pass
271	250,875 to 251,800	87.6	Fail/Redrilled
271R	250,875 to 251,800	98.5	Retested/Pass
272	251,800 to 252,725	93.2	Pass
273	252,725 to 253,650	91.6	Pass

R = Retest

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 7 of 9)

Test No.	Cumulative Volume (CY)			% Passing #200 Sieve	Pass or Fail
274	253,650	to	254,575	96.4	Pass
275	254,575	to	255,500	97.3	Pass
276	255,500	to	256,425	96.7	Pass
277	256,425	to	257,350	95.8	Pass
278	257,350	to	258,275	95.6	Pass
279	258,275	to	259,200	97.8	Pass
280	259,200	to	260,125	94.9	Pass
281	260,125	to	261,050	97.6	Pass
282	261,050	to	261,975	95.4	Pass
283	261,975	to	262,900	97.2	Pass
284	262,900	to	263,825	97.5	Pass
285	263,825	to	264,750	98.5	Pass
286	264,750	to	265,675	97.6	Pass
287	265,675	to	266,600	95.9	Pass
288	266,600	to	267,525	98.0	Pass
289	267,525	to	268,450	97.9	Pass
290	268,450	to	269,375	97.6	Pass
291	269,375	to	270,300	97.8	Pass
292	270,300	to	271,225	98.0	Pass
293	271,225	to	272,150	98.1	Pass
294	272,150	to	273,075	98.2	Pass
295	273,075	to	274,000	98.9	Pass
296	274,000	to	274,925	99.8	Pass
297	274,925	to	275,850	96.1	Pass
298	275,850	to	276,775	98.1	Pass
299	276,775	to	277,700	97.1	Pass
300	277,700	to	278,625	98.5	Pass
301	278,625	to	279,550	97.8	Pass
302	279,550	to	280,475	98.0	Pass
303	280,475	to	281,400	98.2	Pass
304	281,400	to	282,325	95.9	Pass
305	282,325	to	283,250	98.3	Pass
306	283,250	to	284,175	97.2	Pass
307	284,175	to	285,100	98.3	Pass
308	285,100	to	286,025	92.6	Pass
309	286,025	to	286,950	91.7	Pass
310	286,950	to	287,875	97.2	Pass
311	287,875	to	288,800	98.5	Pass
312	288,800	to	289,725	98.7	Pass
313	289,725	to	290,650	97.6	Pass
314	290,650	to	291,575	96.7	Pass
315	291,575	to	292,500	95.3	Pass
316	292,500	to	293,425	98.4	Pass
317	293,425	to	294,350	95.6	Pass
318	294,350	to	295,275	98.3	Pass
319	295,275	to	296,200	97.4	Pass
320	296,200	to	297,125	98.4	Pass

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 8 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
321	297,125 to 298,050	98.6	Pass
322	298,050 to 298,975	94.5	Pass
323	298,975 to 299,900	96.6	Pass
324	299,900 to 300,825	97.9	Pass
325	300,825 to 301,750	96.2	Pass
326	301,750 to 302,675	97.2	Pass
327	302,675 to 303,600	96.2	Pass
328	303,600 to 304,525	97.9	Pass
329	304,525 to 305,450	98.1	Pass
330	305,450 to 306,375	98.0	Pass
331	306,375 to 307,300	97.4	Pass
332	307,300 to 308,225	96.5	Pass
333	308,225 to 309,150	97.0	Pass
334	309,150 to 310,075	96.0	Pass
335	310,075 to 311,000	98.0	Pass
336	311,000 to 311,925	97.9	Pass
337	311,925 to 312,850	95.9	Pass
338	312,850 to 313,775	94.7	Pass
339	313,775 to 314,700	98.6	Pass
340	314,700 to 315,625	96.7	Pass
341	315,625 to 316,550	97.5	Pass
342	316,550 to 317,475	97.4	Pass
343	317,475 to 318,400	97.5	Pass
344	318,400 to 319,325	98.4	Pass
345	319,325 to 320,250	98.6	Pass
346	320,250 to 321,175	97.0	Pass
347	321,175 to 322,100	99.1	Pass
348	322,100 to 323,025	97.7	Pass
349	323,025 to 323,950	97.5	Pass
350	323,950 to 324,875	98.9	Pass
351		86.9	Fail/Sacrificial
352	324,875 to 325,800	97.3	Pass
353	325,800 to 326,725	97.7	Pass
354	326,725 to 327,650	98.0	Pass
355	327,650 to 328,575	99.5	Pass
356	328,575 to 329,500	99.5	Pass
357	329,500 to 329,963	93.5	Pass
358	329,963 to 330,888	96.0	Pass
359	330,888 to 331,813	97.9	Pass
360	331,813 to 332,738	98.2	Pass
361	332,738 to 333,663	96.9	Pass
362	333,663 to 334,588	96.9	Pass
363	334,588 to 335,513	97.5	Pass
364	335,513 to 336,438	97.8	Pass
365	336,438 to 337,363	97.6	Pass
366	337,363 to 338,288	98.6	Pass
367	338,288 to 339,213	97.5	Pass

Table 3 1995 Gradation Test Results - Radon Barrier Material (Page 9 of 9)

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
368	339,213 to 340,138	98.2	Pass
369	340,138 to 341,063	99.0	Pass
370	341,063 to 341,988	98.3	Pass
371	341,988 to 342,913	98.7	Pass
372	342,913 to 343,838	97.4	Pass
373	343,838 to 344,763	98.3	Pass
374	344,763 to 345,688	98.4	Pass
375	345,688 to 346,613	98.8	Pass
376	346,613 to 347,538	99.1	Pass
377	347,538 to 348,463	99.6	Pass
378	348,463 to 349,388	98.5	Pass
379	349,388 to 350,313	98.7	Pass
380	350,313 to 351,238	97.2	Pass
381	351,238 to 352,163	97.8	Pass
382	352,163 to 353,088	99.0	Pass
383	353,088 to 354,013	97.7	Pass
384	354,013 to 354,938	98.2	Pass
385	354,938 to 355,863	98.0	Pass
386	355,863 to 356,788	97.0	Pass
387	356,788 to 357,713	98.3	Pass
388	357,713 to 358,638	98.8	Pass
389	358,638 to 359,563	97.6	Pass
390	359,563 to 360,488	98.7	Pass
391	360,488 to 361,413	97.1	Pass
392	361,413 to 362,338	98.5	Pass
393	362,338 to 363,263	97.5	Pass
394	363,263 to 364,188	97.7	Pass
395	364,188 to 365,113	97.5	Pass
396	365,113 to 366,038	97.8	Pass
397	366,038 to 366,963	98.2	Pass
398	366,963 to 367,888	97.5	Pass
399	367,888 to 368,813	98.5	Pass
400	368,813 to 369,738	98.5	Pass
401	369,738 to 370,663	98.3	Pass
402	370,663 to 371,588	89.6	Fail
402R	370,663 to 371,588	92.2	Pass
403	371,588 to 372,513	92.7	Pass
404	372,513 to 373,438	96.6	Pass
405	373,438 to 374,636	97.9	Pass

R = Retest

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 1 of 9)

Test No.	Cumulative Volume (cy)			% Passing #200 Sieve	Pass or Fail
1	0	to	925	96.9	Pass
2	925	to	1,850	97.8	Pass
3	1,850	to	2,775	94.2	Pass
4	2,775	to	3,700	97.5	Pass
5	3,700	to	4,625	97.5	Pass
6	4,625	to	5,550	97.4	Pass
7	5,550	to	6,475	98.6	Pass
8	6,475	to	7,400	97.9	Pass
9	7,400	to	8,325	98.0	Pass
10	8,325	to	9,250	98.0	Pass
11	9,250	to	10,175	98.1	Pass
12	10,175	to	11,100	98.0	Pass
13	11,100	to	12,025	98.3	Pass
14	12,025	to	12,950	96.6	Pass
15	12,950	to	13,875	97.9	Pass
16	13,875	to	14,800	99.1	Pass
17	14,800	to	15,725	98.2	Pass
18	15,725	to	16,650	96.2	Pass
19	16,650	to	17,575	96.3	Pass
20	17,575	to	18,500	98.2	Pass
21	18,500	to	19,425	97.9	Pass
22	19,425	to	20,350	97.0	Pass
23	20,350	to	21,275	97.3	Pass
24	21,275	to	22,200	98.3	Pass
25	22,200	to	23,125	96.0	Pass
26	23,125	to	24,050	95.0	Pass
27	24,050	to	24,975	97.9	Pass
28	24,975	to	25,900	97.2	Pass
29	25,900	to	26,825	97.3	Pass
30	26,825	to	27,750	97.3	Pass
31	27,750	to	28,675	94.2	Pass
32	28,675	to	29,600	97.5	Pass
33	29,600	to	30,525	98.1	Pass
34	30,525	to	31,450	98.5	Pass
35	31,450	to	32,375	98.8	Pass
36	32,375	to	33,300	97.6	Pass
37	33,300	to	34,225	98.3	Pass
38	34,225	to	35,150	97.8	Pass
39	35,150	to	36,075	97.3	Pass
40	36,075	to	37,000	95.3	Pass
41	37,000	to	37,925	98.6	Pass
42	37,925	to	38,850	96.9	Pass
43	38,850	to	39,775	97.4	Pass
44	39,775	to	40,700	99.1	Pass
45	40,700	to	41,625	98.7	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 2 of 9)

Test No.	Cumulative Volume (cy)	% Passing #200 Sieve	Pass or Fail
46	41,625 to 42,550	98.7	Pass
47	42,550 to 43,475	97.1	Pass
48	43,475 to 44,400	98.9	Pass
49	44,400 to 45,325	99.5	Pass
50	45,325 to 46,250	97.6	Pass
51	46,250 to 47,175	99.2	Pass
52	47,175 to 48,100	98.6	Pass
53	48,100 to 49,025	98.9	Pass
54	49,025 to 49,950	98.9	Pass
55	49,950 to 50,875	99.3	Pass
56	50,875 to 51,800	98.8	Pass
57	51,800 to 52,725	98.1	Pass
58	52,725 to 53,650	98.1	Pass
59	53,650 to 54,575	97.8	Pass
60	54,575 to 55,500	98.3	Pass
61	55,500 to 56,425	98.7	Pass
62	56,425 to 57,350	99.4	Pass
63	57,350 to 58,275	98.3	Pass
64	58,275 to 59,200	99.1	Pass
65	59,200 to 60,125	98.6	Pass
66	60,125 to 61,050	99.0	Pass
67	61,050 to 61,975	97.3	Pass
68	61,975 to 62,900	96.0	Pass
69	62,900 to 63,825	98.5	Pass
70	63,825 to 64,750	99.1	Pass
71	64,750 to 65,675	98.9	Pass
72	65,675 to 66,600	99.1	Pass
73	66,600 to 67,525	98.4	Pass
74	67,525 to 68,450	98.9	Pass
75	68,450 to 69,375	98.0	Pass
76	69,375 to 70,300	99.1	Pass
77	70,300 to 71,225	97.9	Pass
78	71,225 to 72,150	99.2	Pass
79	72,150 to 73,075	98.3	Pass
80	73,075 to 74,000	98.7	Pass
81	74,000 to 74,925	98.5	Pass
82	74,925 to 75,850	96.5	Pass
83	75,850 to 76,775	97.6	Pass
84	76,775 to 77,700	96.6	Pass
85	77,700 to 78,625	96.5	Pass
86	78,625 to 79,550	97.6	Pass
87	79,550 to 80,013	97.9	Pass
88	80,013 to 80,938	98.9	Pass
89	80,938 to 81,863	99.4	Pass
90	81,863 to 82,788	99.1	Pass
91	82,788 to 83,713	99.4	Pass
92	83,713 to 84,638	96.0	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 3 of 9)

Test No.	Cumulative Volume (cy)	% Passing #200 Sieve	Pass or Fail
93	84,638 to 85,563	98.3	Pass
94	85,563 to 86,488	98.0	Pass
95	86,488 to 87,413	97.8	Pass
96	87,413 to 88,338	98.7	Pass
97	88,338 to 89,263	98.5	Pass
98	89,263 to 90,188	98.5	Pass
99	90,188 to 91,113	99.6	Pass
100	91,113 to 92,038	98.1	Pass
101	92,038 to 92,963	97.7	Pass
102	92,963 to 93,888	98.0	Pass
103	93,888 to 94,813	99.0	Pass
104	94,813 to 95,738	99.5	Pass
105	95,738 to 96,663	98.8	Pass
106	96,663 to 97,588	98.5	Pass
107	97,588 to 98,513	97.9	Pass
108	98,513 to 99,438	98.3	Pass
109	99,438 to 100,363	98.0	Pass
110	100,363 to 101,288	97.1	Pass
111	101,288 to 102,213	98.4	Pass
112	102,213 to 103,138	99.0	Pass
113	103,138 to 104,063	98.7	Pass
114	104,063 to 104,988	97.9	Pass
115	104,988 to 105,913	98.6	Pass
116	105,913 to 106,838	97.7	Pass
117	106,838 to 107,763	96.7	Pass
118	107,763 to 108,688	99.3	Pass
119	108,688 to 109,613	99.5	Pass
120	109,613 to 110,538	98.9	Pass
121	110,538 to 111,463	99.0	Pass
122	111,463 to 112,388	98.7	Pass
123	112,388 to 113,313	98.6	Pass
124	113,313 to 114,238	98.3	Pass
125	114,238 to 115,163	98.9	Pass
126	115,163 to 116,088	99.1	Pass
127	116,088 to 117,013	98.9	Pass
128	117,013 to 117,938	98.3	Pass
129	117,938 to 118,863	98.5	Pass
130	118,863 to 119,788	98.7	Pass
131	119,788 to 120,713	98.8	Pass
132	120,713 to 121,638	99.4	Pass
133	121,638 to 122,563	99.2	Pass
134	122,563 to 123,488	99.8	Pass
135	123,488 to 124,413	98.3	Pass
136	124,413 to 125,338	98.4	Pass
137	125,338 to 126,263	99.0	Pass
138	126,263 to 127,188	97.1	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 4 of 9)

Test No.	Cumulative Volume (cy)	% Passing #200 Sieve	Pass or Fail
139	127,188 to 128,113	98.3	Pass
140	128,113 to 129,038	98.6	Pass
141	129,038 to 129,963	99.2	Pass
142	129,963 to 130,888	97.4	Pass
143	130,888 to 131,813	98.2	Pass
144	131,813 to 132,738	97.4	Pass
145	132,738 to 133,663	97.7	Pass
146	133,663 to 134,588	98.4	Pass
147	134,588 to 135,513	92.4	Pass
148	135,513 to 136,438	97.8	Pass
149	136,438 to 137,363	98.9	Pass
150	137,363 to 138,288	97.7	Pass
151	138,288 to 139,213	99.1	Pass
152	139,213 to 140,138	97.1	Pass
153	140,138 to 141,063	98.3	Pass
154	141,063 to 141,988	97.9	Pass
155	141,988 to 142,913	98.7	Pass
156	142,913 to 143,838	97.9	Pass
157	143,838 to 144,763	98.1	Pass
158	144,763 to 145,688	97.2	Pass
159	145,688 to 146,613	98.3	Pass
160	146,613 to 147,538	99.3	Pass
161	147,538 to 148,463	99.0	Pass
162	148,463 to 149,388	99.0	Pass
163	149,388 to 150,313	99.3	Pass
164	150,313 to 151,238	94.8	Pass
165	151,238 to 152,163	98.4	Pass
166	152,163 to 153,088	98.3	Pass
167	153,088 to 154,013	99.0	Pass
168	154,013 to 154,938	98.7	Pass
169	154,938 to 155,863	97.8	Pass
170	155,863 to 156,788	92.5	Pass
171	156,788 to 157,713	97.5	Pass
172	157,713 to 158,638	97.2	Pass
173	158,638 to 158,563	98.7	Pass
174	159,563 to 160,488	99.0	Pass
175	160,488 to 161,413	95.2	Pass
176	161,413 to 162,338	97.6	Pass
177	162,338 to 163,263	98.6	Pass
178	163,263 to 164,188	98.8	Pass
179	164,188 to 165,113	99.1	Pass
180	165,113 to 166,038	99.6	Pass
181	166,038 to 166,963	98.4	Pass
182	166,963 to 167,888	99.6	Pass
183	167,888 to 168,813	98.6	Pass
184	168,813 to 169,738	98.7	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 5 of 9)

Test No.	Cumulative Volume (cy)			% Passing #200 Sieve	Pass or Fail
185	169,738	to	170,663	98.0	Pass
186	170,663	to	171,588	97.8	Pass
187	171,588	to	172,513	98.4	Pass
188	172,513	to	173,438	98.2	Pass
189	173,438	to	174,363	98.4	Pass
190	174,363	to	175,288	99.4	Pass
191	175,288	to	176,213	98.0	Pass
192	176,213	to	177,138	98.5	Pass
193	177,138	to	178,063	98.4	Pass
194	178,063	to	178,988	98.8	Pass
195	178,988	to	179,913	97.7	Pass
196	179,913	to	180,838	98.9	Pass
197	180,838	to	181,763	97.2	Pass
198	181,763	to	182,688	97.8	Pass
199	182,688	to	183,613	97.3	Pass
200	183,613	to	184,538	98.8	Pass
201	184,538	to	185,463	98.0	Pass
202	185,463	to	186,388	98.1	Pass
203	186,388	to	187,313	97.0	Pass
204	187,313	to	188,238	98.4	Pass
205	188,238	to	189,163	99.1	Pass
206	189,163	to	190,088	98.8	Pass
207	190,088	to	191,013	98.3	Pass
208	191,013	to	191,938	98.1	Pass
209	191,938	to	192,863	97.2	Pass
210	192,863	to	193,788	99.2	Pass
211	193,788	to	194,713	99.4	Pass
212	194,713	to	195,638	99.7	Pass
213	195,638	to	195,563	98.5	Pass
214	196,563	to	197,488	97.9	Pass
215	197,488	to	198,413	99.0	Pass
216	198,413	to	199,388	98.8	Pass
217	199,338	to	200,263	97.6	Pass
218	200,263	to	201,188	98.0	Pass
219	201,188	to	202,113	95.8	Pass
220	202,113	to	203,038	98.6	Pass
221	203,038	to	203,963	99.3	Pass
222	203,963	to	204,888	99.5	Pass
223	204,888	to	205,813	99.3	Pass
224	205,813	to	206,738	99.2	Pass
225	206,738	to	207,663	97.4	Pass
226	207,663	to	208,588	98.1	Pass
227	208,588	to	209,513	95.7	Pass
228	209,513	to	210,438	96.2	Pass
229	210,438	to	211,363	98.5	Pass
230	211,363	to	212,288	97.8	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 6 of 9)

Test No.	Cumulative Volume (cy)	% Passing #200 Sieve	Pass or Fail
231	212,288 to 213,213	98.7	Pass
232	213,213 to 214,138	98.6	Pass
233	214,138 to 215,063	98.4	Pass
234	215,063 to 215,525	98.8	Pass
235	215,525 to 216,450	91.7	Pass
236	216,450 to 217,375	98.7	Pass
237	217,375 to 218,300	98.6	Pass
238	218,300 to 219,225	97.8	Pass
239	219,225 to 220,150	98.0	Pass
240	220,150 to 221,075	99.1	Pass
241	221,075 to 222,000	99.0	Pass
242	222,000 to 222,925	98.0	Pass
243	222,925 to 223,850	98.6	Pass
244	223,850 to 224,775	95.9	Pass
245	224,775 to 225,700	98.4	Pass
246	225,700 to 226,625	97.7	Pass
247	226,625 to 227,550	97.6	Pass
248	227,550 to 228,475	98.4	Pass
249	228,475 to 229,400	96.5	Pass
250	229,400 to 230,325	97.4	Pass
251	230,325 to 231,250	99.5	Pass
252	231,250 to 232,175	99.6	Pass
253	232,175 to 233,100	99.1	Pass
254	233,100 to 234,025	99.0	Pass
255	234,025 to 234,950	99.4	Pass
256	234,950 to 235,875	99.4	Pass
257	235,875 to 236,800	99.0	Pass
258	236,800 to 237,725	98.8	Pass
259	237,725 to 238,650	99.5	Pass
260	238,650 to 239,575	97.4	Pass
261	239,575 to 240,500	97.9	Pass
262	240,500 to 241,425	98.8	Pass
263	241,425 to 242,350	99.7	Pass
264	242,350 to 243,275	98.3	Pass
265	243,275 to 244,200	98.3	Pass
266	244,200 to 245,125	98.8	Pass
267	245,125 to 246,050	97.8	Pass
268	246,050 to 246,975	98.0	Pass
269	246,975 to 247,900	97.4	Pass
270	247,900 to 248,825	97.7	Pass
271	248,825 to 249,750	95.3	Pass
272	249,750 to 250,675	98.0	Pass
273	250,675 to 251,600	99.0	Pass
274	251,600 to 252,525	98.5	Pass
275	252,525 to 253,450	96.2	Pass
276	253,450 to 253,913	98.4	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 7 of 9)

Test No.	Cumulative Volume (cy)	% Passing #200 Sieve	Pass or Fail
277	253,913 to 254,838	97.8	Pass
278	254,838 to 256,763	97.9	Pass
279	255,763 to 256,688	98.4	Pass
280	256,688 to 257,613	97.9	Pass
281	257,613 to 258,538	98.1	Pass
282	258,538 to 259,463	96.5	Pass
283	259,463 to 260,388	97.2	Pass
284	260,388 to 261,313	98.0	Pass
285	261,313 to 262,238	97.9	Pass
286	262,238 to 263,163	97.8	Pass
287	263,163 to 264,088	99.5	Pass
288	264,088 to 265,013	98.0	Pass
289	265,013 to 265,938	97.4	Pass
290	265,938 to 266,863	99.8	Pass
291	266,863 to 267,788	99.3	Pass
292	267,788 to 268,713	99.2	Pass
293	268,713 to 269,638	99.3	Pass
294	269,638 to 270,563	96.7	Pass
295	270,563 to 271,488	99.1	Pass
296	271,488 to 272,413	99.8	Pass
297	272,413 to 273,338	99.5	Pass
298	273,338 to 274,263	97.7	Pass
299	274,263 to 275,188	98.2	Pass
300	275,188 to 276,113	97.9	Pass
301	276,113 to 277,038	97.4	Pass
302	277,038 to 277,963	97.5	Pass
303	277,963 to 278,888	97.8	Pass
304	278,888 to 279,813	98.4	Pass
305	279,813 to 280,738	98.2	Pass
306	280,738 to 281,663	99.4	Pass
307	281,663 to 282,588	98.4	Pass
308	282,588 to 283,513	99.0	Pass
309	283,513 to 284,438	99.2	Pass
310	284,438 to 285,363	99.0	Pass
311	285,363 to 286,288	99.3	Pass
312	286,288 to 287,213	99.3	Pass
313	287,213 to 288,138	99.5	Pass
314	288,138 to 289,063	99.1	Pass
315	289,063 to 289,988	98.6	Pass
316	289,988 to 290,913	92.2	Pass
317	290,913 to 291,838	97.1	Pass
318	291,838 to 292,763	97.6	Pass
319	292,763 to 293,688	98.6	Pass
320	293,688 to 294,613	98.7	Pass
321	294,613 to 295,538	97.0	Pass
322	295,538 to 296,463	98.3	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 8 of 9)

Test No.	Cumulative Volume (cy)	% Passing #200 Sieve	Pass or Fail
323	296,463 to 297,388	96.2	Pass
324	297,388 to 298,313	99.4	Pass
325	298,313 to 299,238	98.8	Pass
326	299,238 to 300,163	99.4	Pass
327	300,163 to 301,088	98.6	Pass
328	301,088 to 302,013	98.7	Pass
329	302,013 to 302,938	98.9	Pass
330	302,938 to 303,863	99.0	Pass
331	303,863 to 304,788	99.2	Pass
332	304,788 to 305,713	99.2	Pass
333	305,713 to 306,638	98.9	Pass
334	306,638 to 307,563	98.6	Pass
335	307,563 to 308,488	98.6	Pass
336	308,488 to 309,413	97.7	Pass
337	309,413 to 310,388	99.3	Pass
338	310,338 to 311,263	97.5	Pass
339	311,263 to 312,188	96.1	Pass
340	312,188 to 313,113	98.9	Pass
341	313,113 to 314,038	98.0	Pass
342	314,038 to 314,963	96.0	Pass
343	314,963 to 315,888	97.8	Pass
344	315,888 to 316,813	99.4	Pass
345	316,813 to 317,738	98.3	Pass
346	317,738 to 318,663	97.3	Pass
347	318,663 to 319,588	98.2	Pass
348	319,588 to 320,513	99.1	Pass
349	320,513 to 321,438	98.8	Pass
350	321,438 to 322,363	98.3	Pass
351	322,363 to 323,288	98.9	Pass
352	323,288 to 324,213	98.8	Pass
353	324,213 to 325,138	99.1	Pass
354	325,138 to 326,063	99.4	Pass
355	326,063 to 326,988	99.5	Pass
356	326,988 to 327,913	95.7	Pass
357	327,913 to 328,838	97.4	Pass
358	328,838 to 329,763	98.8	Pass
359	329,763 to 330,688	98.8	Pass
360	330,688 to 331,613	97.1	Pass
361	331,613 to 332,538	97.9	Pass
362	332,538 to 333,463	99.2	Pass
363	333,463 to 334,388	98.4	Pass
364	334,388 to 335,313	98.6	Pass
365	335,313 to 336,238	99.4	Pass
366	336,238 to 337,163	98.7	Pass
367	337,163 to 338,088	99.1	Pass
368	338,088 to 339,013	96.6	Pass

Table 4 1996 Gradation Test Results - Radon Barrier Material (Page 9 of 9)

Test No.	Cumulative Volume (cy)			% Passing #200 Sieve	Pass or Fail
369	339,013	to	339,938	97.9	Pass
370	339,938	to	340,863	95.4	Pass
371	340,863	to	341,788	97.7	Pass
372	341,788	to	342,713	94.4	Pass
373	342,713	to	343,638	96.1	Pass
374	343,638	to	344,563	93.9	Pass
375	344,563	to	345,488	98.4	Pass
376	345,488	to	346,413	99.3	Pass
377	346,413	to	347,338	97.6	Pass
378	347,338	to	348,263	98.3	Pass
379	348,263	to	349,188	99.1	Pass
380	349,188	to	350,113	99.4	Pass
381	350,113	to	351,038	98.2	Pass
382	351,038	to	351,963	97.9	Pass
383	351,963	to	352,888	98.9	Pass
384	352,888	to	353,813	97.4	Pass
385	353,813	to	354,738	98.8	Pass
386	354,738	to	355,663	93.8	Pass
387	355,663	to	356,588	97.5	Pass
388	356,588	to	357,513	96.3	Pass
389	357,513	to	358,438	97.9	Pass
390	358,438	to	359,363	98.3	Pass
391	359,363	to	360,288	99.1	Pass
392	360,288	to	361,213	98.9	Pass
393	361,213	to	361,676	97.3	Pass
394	361,676	to	362,600	97.7	Pass
395	362,600	to	363,063	95.5	Pass
396	363,063	to	363,988	98.5	Pass
397	363,988	to	364,913	98.7	Pass
398	364,913	to	365,838	98.3	Pass
399	365,838	to	366,763	99.1	Pass
400	366,763	to	367,688	98.4	Pass
401	367,688	to	368,613	98.1	Pass
402	368,613	to	369,538	99.2	Pass
403	369,538	to	370,463	99.2	Pass
404	370,463	to	371,388	97.0	Pass
405	371,388	to	372,313	99.2	Pass
406	372,313	to	373,238	98.4	Pass
407	373,238	to	374,163	96.9	Pass
408	374,163	to	375,088	97.9	Pass
409	375,088	to	376,013	97.3	Pass

Table 5 1997 Gradation Test Results - Radon Barrier Material (Page 1 of 4)

Test No.	Cumulative Volume (CY)	%Passing #200 Sieve	Pass or Fail
1	0 to 925	99.3	Pass
2	925 to 1,850	99.3	Pass
3	1,850 to 2,775	99.5	Pass
4	2,775 to 3,700	98.1	Pass
5	3,700 to 4,625	99.3	Pass
6	4,625 to 5,550	98.5	Pass
7	5,550 to 6,475	99.2	Pass
8	6,475 to 7,400	98.7	Pass
9	7,400 to 8,325	99.2	Pass
10	8,325 to 9,250	97.7	Pass
11	9,250 to 10,175	98.7	Pass
12	10,175 to 11,100	98.8	Pass
13	11,100 to 12,025	98.9	Pass
14	12,025 to 12,950	99.1	Pass
15	12,950 to 13,875	98.5	Pass
16	13,875 to 14,800	98.2	Pass
17	14,800 to 15,725	98.3	Pass
18	15,725 to 16,650	98.8	Pass
19	16,650 to 17,575	98.8	Pass
20	17,575 to 18,500	97.1	Pass
21	18,500 to 19,425	99.5	Pass
22	19,425 to 20,350	97.6	Pass
23	20,350 to 21,275	98.2	Pass
24	21,275 to 22,200	99.7	Pass
25	22,200 to 23,125	97.9	Pass
26	23,125 to 24,050	99.1	Pass
27	24,050 to 24,975	98.1	Pass
28	24,975 to 25,900	99.0	Pass
29	25,900 to 26,825	98.5	Pass
30	26,825 to 27,750	99.2	Pass
31	27,750 to 28,675	98.1	Pass
32	28,675 to 29,600	99.2	Pass
33	29,600 to 30,525	98.7	Pass
34	30,525 to 31,450	99.3	Pass
35	31,450 to 32,375	99.0	Pass
36	32,375 to 33,300	98.5	Pass
37	33,300 to 34,225	98.8	Pass
38	34,225 to 35,150	99.5	Pass
39	35,150 to 36,075	99.2	Pass
40	36,075 to 37,000	98.6	Pass
41	37,000 to 37,925	99.4	Pass
42	37,925 to 38,850	99.4	Pass
43	38,850 to 39,775	98.1	Pass
44	39,775 to 40,700	98.6	Pass
45	40,700 to 41,625	97.8	Pass

Table 5 **1997 Gradation Test Results - Radon Barrier Material** (Page 2 of 4)

Test No.	Cumulative Volume (CY)	%Passing #200 Sieve	Pass or Fail
46	41,625 to 42,550	98.5	Pass
47	42,550 to 43,475	98.6	Pass
48	43,475 to 44,400	99.2	Pass
49	44,400 to 45,325	99.0	Pass
50	45,325 to 46,250	95.5	Pass
51	46,250 to 47,175	99.5	Pass
52	47,175 to 48,100	98.5	Pass
53	48,100 to 49,025	98.1	Pass
54	49,025 to 49,950	97.4	Pass
55	49,950 to 50,875	99.0	Pass
56	50,875 to 51,800	98.9	Pass
57	51,800 to 52,725	98.9	Pass
58	52,725 to 53,650	99.2	Pass
59	53,650 to 54,575	99.4	Pass
60	54,575 to 55,500	99.2	Pass
61	55,500 to 56,425	99.5	Pass
62	56,425 to 57,350	97.8	Pass
63	57,350 to 58,275	98.9	Pass
64	58,275 to 59,200	98.8	Pass
65	59,200 to 60,125	98.3	Pass
66	60,125 to 61,050	98.8	Pass
67	61,050 to 61,975	99.5	Pass
68	61,975 to 62,900	97.8	Pass
69	62,900 to 63,825	99.5	Pass
70	63,825 to 64,750	97.5	Pass
71	64,750 to 65,675	99.3	Pass
72	65,675 to 66,600	99.5	Pass
73	66,600 to 67,525	99.8	Pass
74	67,525 to 68,450	98.4	Pass
75	68,450 to 69,375	98.9	Pass
76	69,375 to 70,300	99.8	Pass
77	70,300 to 71,225	97.5	Pass
78	71,225 to 72,150	98.7	Pass
79	72,150 to 73,075	99.2	Pass
80	73,075 to 74,000	97.1	Pass
81	74,000 to 74,925	98.8	Pass
82	74,925 to 75,850	98.7	Pass
83	75,850 to 76,775	98.9	Pass
84	76,775 to 77,700	98.7	Pass
85	77,700 to 78,625	99.3	Pass
86	78,625 to 79,550	97.8	Pass
87	79,550 to 80,475	99.3	Pass
88	80,475 to 81,400	99.8	Pass
89	81,400 to 82,325	99.2	Pass
90	82,325 to 83,250	98.3	Pass

Table 5 **1997 Gradation Test Results - Radon Barrier Material** (Page 3 of 4)

Test No.	Cumulative Volume (CY)			%Passing #200 Sieve	Pass or Fail
91	83,250	to	84,175	98.9	Pass
92	84,175	to	85,100	97.0	Pass
93	85,100	to	86,025	98.9	Pass
94	86,025	to	86,950	99.4	Pass
95	86,950	to	87,875	98.6	Pass
96	87,875	to	88,800	97.2	Pass
97	88,800	to	89,725	97.6	Pass
98	89,725	to	90,650	98.7	Pass
99	90,650	to	91,575	98.2	Pass
100	91,575	to	92,500	95.6	Pass
101	92,500	to	93,425	97.5	Pass
102	93,425	to	94,350	97.6	Pass
103	94,350	to	95,275	99.1	Pass
104	95,275	to	96,200	98.4	Pass
105	96,200	to	97,125	98.6	Pass
106	97,125	to	98,050	99.3	Pass
107	98,050	to	98,975	98.2	Pass
108	98,975	to	99,900	99.3	Pass
109	99,900	to	100,825	98.6	Pass
110	100,825	to	101,750	99.0	Pass
111	101,750	to	102,675	98.9	Pass
112	102,675	to	103,600	99.3	Pass
113	103,600	to	104,525	99.8	Pass
114	104,525	to	105,450	99.4	Pass
115	105,450	to	106,375	99.5	Pass
116	106,375	to	107,300	99.3	Pass
117	107,300	to	108,225	99.0	Pass
118	108,225	to	109,150	98.9	Pass
119	109,150	to	110,075	99.1	Pass
120	110,075	to	111,000	98.5	Pass
121	111,000	to	111,925	99.2	Pass
122	111,925	to	112,850	99.0	Pass
123	112,850	to	113,775	98.4	Pass
124	113,775	to	114,700	99.1	Pass
125	114,700	to	115,625	98.6	Pass
126	115,625	to	116,550	98.9	Pass
127	116,550	to	117,475	99.0	Pass
128	117,475	to	118,400	99.4	Pass
129	118,400	to	119,325	99.7	Pass
130	119,325	to	120,250	99.4	Pass
131	120,250	to	121,175	99.8	Pass
132	121,175	to	122,100	97.3	Pass
133	122,100	to	123,025	99.6	Pass
134	123,025	to	123,950	99.3	Pass
135	123,950	to	124,875	98.7	Pass

Table 5 1997 Gradation Test Results - Radon Barrier Material (Page 4 of 4)

Test No.	Cumulative Volume (CY)			%Passing #200 Sieve	Pass or Fail
136	124,875	to	125,800	98.9	Pass
137	125,800	to	126,725	99.0	Pass
138	126,725	to	127,650	98.5	Pass
139	127,650	to	128,575	99.6	Pass
140	128,575	to	129,500	99.1	Pass
141	129,500	to	130,425	99.8	Pass
142	130,425	to	131,350	98.9	Pass
143	131,350	to	132,275	98.9	Pass
144	132,275	to	133,200	99.3	Pass
145	133,200	to	134,125	98.9	Pass
146	134,125	to	135,050	99.4	Pass
147	135,050	to	135,975	99.4	Pass
148	135,975	to	136,900	98.5	Pass
149	136,900	to	137,825	98.9	Pass
150	137,825	to	138,750	97.0	Pass
151	138,750	to	139,675	99.1	Pass
152	139,675	to	140,600	98.8	Pass
153	140,600	to	141,525	99.4	Pass
154	141,525	to	142,450	98.8	Pass
155	142,450	to	143,375	99.6	Pass
156	143,375	to	144,300	98.9	Pass

Table 6 1997 Gradation Test Results - Radon Barrier Material to be Used in Future Reclamation of Area 2C

Test No.	Cumulative Volume (CY)	% Passing #200 Sieve	Pass or Fail
1	0 to 925	99.1	Pass
2	925 to 1,850	99.0	Pass
3	1,850 to 2,775	98.4	Pass
4	2,775 to 3,700	97.8	Pass
5	3,700 to 4,625	94.7	Pass
6	4,625 to 5,550	96.4	Pass
7	5,550 to 6,475	94.7	Pass
8	6,475 to 7,400	97.9	Pass
9	7,400 to 8,325	99.1	Pass
10	8,325 to 9,250	98.2	Pass
11	9,250 to 10,175	99.0	Pass
12	10,175 to 11,100	98.2	Pass
13	11,100 to 12,025	98.9	Pass
14	12,025 to 12,950	99.8	Pass
15	12,950 to 13,875	96.8	Pass
16	13,875 to 14,800	98.6	Pass
17	14,800 to 15,725	98.3	Pass
18	15,725 to 16,650	98.3	Pass
19	16,650 to 17,575	99.3	Pass
20	17,575 to 18,500	97.9	Pass
21	18,500 to 19,425	99.8	Pass
22	19,425 to 20,350	97.9	Pass
23	20,350 to 21,275	98.5	Pass
24	21,275 to 22,200	99.5	Pass
25	22,200 to 23,125	99.4	Pass
26	23,125 to 24,050	98.8	Pass
27	24,050 to 24,975	99.4	Pass
28	24,975 to 25,900	98.8	Pass
29	25,900 to 26,825	99.2	Pass
30	26,825 to 27,750	98.9	Pass
31	27,750 to 28,675	99.1	Pass

Table 7 1994 Sandcone Test Summary (Page 1 of 7)

Proctor (1)			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
3	109.3	18.6	1	109.0	17.5	99.7	Pass	Pass
3	109.3	18.6	2	103.0	22.3	94.2	Pass	Pass
3	109.3	18.6	3	109.2	18.3	99.9	Pass	Pass
3	109.3	18.6	4	102.6	19.6	93.9	Pass	Pass
3	109.3	18.6	5	108.9	19.1	99.6	Pass	Pass
3	109.3	18.6	6	106.7	21.0	97.6	Pass	Pass
3	109.3	18.6	7	108.3	19.0	99.1	Pass	Pass
3	109.3	18.6	8	106.5	19.6	97.4	Pass	Pass
3	109.3	18.6	9	105.8	19.5	96.8	Pass	Pass
3	109.3	18.6	10	104.0	20.5	95.2	Pass	Pass
3	109.3	18.6	11	106.2	21.3	97.2	Pass	Pass
3	109.3	18.6	12	104.7	18.2	95.8	Pass	Pass
3	109.3	18.6	13	104.4	17.5	95.5	Pass	Pass
3	109.3	18.6	14	102.5	19.4	93.8	Pass	Pass
3	109.3	18.6	15	101.8	21.5	93.1	Pass	Pass
4	106.7	20.3	16	106.5	18.2	99.8	Pass	Fail (2)
4	106.7	20.3	17	102.6	21.9	96.2	Pass	Pass
4	106.7	20.3	18	99.7	21.9	93.4	Fail (3)	Pass
4	106.7	20.3	19	102.6	18.6	96.2	Pass	Pass
4	106.7	20.3	20	110.6	19.5	103.7	Pass	Pass
4	106.7	20.3	21	109.4	20.3	102.5	Pass	Pass
4	106.7	20.3	22	108.3	19.2	101.5	Pass	Pass
4	106.7	20.3	23	108.1	19.3	101.3	Pass	Pass
4	106.7	20.3	24	104.3	22.1	97.8	Pass	Pass
4	106.7	20.3	25	102.3	20.4	95.9	Pass	Pass
4	106.7	20.3	26	104.2	21.2	97.7	Pass	Pass
4	106.7	20.3	27	109.1	18.6	102.2	Pass	Pass
4	106.7	20.3	28	105.3	21.4	98.7	Pass	Pass
4	106.7	20.3	29	104.2	20.3	97.7	Pass	Pass
4	106.7	20.3	30	106.2	20.1	99.5	Pass	Pass
5	107.0	20.9	31	103.6	19.8	96.8	Pass	Pass
5	107.0	20.9	32	103.1	21.1	96.4	Pass	Pass

(1) Proctor Test nos. 1 and 2 are not included because clay that was obtained from the area where these tests were performed was not used as radon barrier material.

(2) Failed test identified after completion of construction. See Section 2.3.3.2.3 and Table 13.

(3) Refer to Sandcone Test "34 (18R)" for retest of failed compaction.

Table 7 1994 Sandcone Test Summary (Page 2 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
5	107.0	20.9	33	102.5	23.3	95.8	Pass	Pass
4	106.7	20.3	34(18R)	102.5	21.0	96.1	Pass	Pass
5	107.0	20.9	35	108.0	20.7	100.9	Pass	Pass
5	107.0	20.9	36	108.2	17.6	101.1	Pass	Fail (1)
5	107.0	20.9	37	101.5	21.7	94.9	Pass	Pass
5	107.0	20.9	38	106.3	20.9	99.3	Pass	Pass
5	107.0	20.9	39	107.0	19.1	100.0	Pass	Pass
5	107.0	20.9	40	107.9	20.0	100.8	Pass	Pass
5	107.0	20.9	41	106.4	19.5	99.4	Pass	Pass
5	107.0	20.9	42	103.1	20.4	96.4	Pass	Pass
5	107.0	20.9	43	103.9	19.5	97.1	Pass	Pass
5	107.0	20.9	44	106.9	19.8	99.9	Pass	Pass
5	107.0	20.9	45	106.9	19.8	99.9	Pass	Pass
5	107.0	20.9	46	98.5	22.8	92.1	Pass	Pass
6	107.0	19.9	47	103.5	20.0	96.7	Pass	Pass
6	107.0	19.9	48	105.7	22.4	98.8	Pass	Pass
6	107.0	19.9	49	109.0	19.5	101.9	Pass	Pass
6	107.0	19.9	50	108.0	19.6	100.9	Pass	Pass
6	107.0	19.9	51	109.3	20.0	102.1	Pass	Pass
6	107.0	19.9	52	106.2	20.6	99.3	Pass	Pass
6	107.0	19.9	53	108.7	18.4	101.6	Pass	Pass
6	107.0	19.9	54	101.5	20.5	94.9	Pass	Pass
6	107.0	19.9	55	102.4	17.9	95.7	Pass	Pass
6	107.0	19.9	56	104.9	21.4	98.0	Pass	Pass
6	107.0	19.9	57	103.8	22.0	97.0	Pass	Pass
6	107.0	19.9	58	101.8	20.0	95.1	Pass	Pass
6	107.0	19.9	59	104.2	22.7	97.4	Pass	Pass
6	107.0	19.9	60	102.9	22.8	96.2	Pass	Pass
6	107.0	19.9	61	103.9	23.0	97.1	Pass	Pass
7	108.2	19.3	62	100.4	24.0	92.8	Pass	Pass
7	108.2	19.3	63	107.4	20.0	99.3	Pass	Pass
7	108.2	19.3	64	107.7	18.1	99.5	Pass	Pass

R= Retest due to failed initial test. Example: "34(18R)" indicates that Test 34 was a retest of Test 18.

(1) Failed test identified after completion of construction. See Section 2.3.3.2.3 and Table 13

Table 7 1994 Sandcone Test Summary (Page 3 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
7	108.2	19.3	65(62R)	103.3	21.7	95.5	Pass	Pass
7	108.2	19.3	66	107.4	20.2	99.3	Pass	Pass
7	108.2	19.3	67	94.4	23.0	87.2	Pass	Pass
7	108.2	19.3	68	106.8	18.6	98.7	Pass	Pass
7	108.2	19.3	69	106.4	20.9	98.3	Pass	Pass
7	108.2	19.3	70	104.8	18.6	96.9	Pass	Pass
7	108.2	19.3	71	103.0	23.2	95.2	Pass	Pass
7	108.2	19.3	72	104.8	20.7	96.9	Pass	Pass
7	108.2	19.3	73	105.0	18.4	97.0	Pass	Pass
7	108.2	19.3	74	101.3	22.6	93.6	Fail (1)	Pass
7	108.2	19.3	75	102.2	21.9	94.5	Fail (1)	Pass
7	108.2	19.3	76(67R)	103.3	21.4	95.5	Pass	Pass
7	108.2	19.3	77	101.2	21.3	93.5	Fail (1)	Pass
7	108.2	19.3	78	106.2	21.7	98.2	Pass	Pass
8	108.5	19.6	79	104.3	21.6	96.1	Pass	Pass
8	108.5	19.6	80	103.8	21.7	95.7	Pass	Pass
8	108.5	19.6	81	103.0	22.0	94.9	Pass	Pass
8	108.5	19.6	82	101.7	23.8	93.7	Fail (1)	Pass
8	108.5	19.6	83	104.1	20.8	95.9	Pass	Pass
7	108.2	19.3	84(74R)	107.4	20.5	99.3	Pass	Pass
8	108.5	19.6	85	106.9	19.1	98.5	Pass	Pass
8	108.5	19.6	86	98.1	21.8	90.4	Fail (1)	Pass
8	108.5	19.6	87(86R)	106.8	19.5	98.4	Pass	Pass
8	108.5	19.6	88	103.1	20.2	95.0	Pass	Pass
8	108.5	19.6	89	99.7	21.6	91.9	Fail (1)	Pass
8	108.5	19.6	90	103.1	21.9	95.0	Pass	Pass
8	108.5	19.6	91	109.1	20.7	100.6	Pass	Pass
8	108.5	19.6	92	103.2	21.0	95.1	Pass	Pass
7	108.2	19.3	93(75R)	107.0	20.2	98.9	Pass	Pass
8	108.5	19.6	94	105.3	19.8	97.1	Pass	Pass
8	108.5	19.6	95	103.8	20.5	95.7	Pass	Pass
8	108.5	19.6	96	105.7	16.9	97.4	Pass	Fail (1)

R= Retest due to failed initial test. Example: "76(67R)" indicates that Test 76 was a retest of Test 67.

(1) Failed tests were identified during WNI Field Audits. Areas were ripped and reworked, then recompacted retested and passed. (See Audit Summaries in Appendix K).

Table 7 1994 Sandcone Test Summary (Page 4 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
8	108.5	19.6	97(82R)	103.2	17.5	95.1	Pass	Fail (1)
7	108.2	19.3	98(77R)	104.6	18.4	96.7	Pass	Pass
8	108.5	19.6	99(89R)	103.1	18.8	95.0	Pass	Pass
9	109.2	19.7	100	105.8	19.6	96.9	Pass	Pass
9	109.2	19.7	101	103.5	18.7	95.0	Pass	Pass
9	109.2	19.7	102	109.0	18.3	99.8	Pass	Pass
9	109.2	19.7	103	105.2	20.5	96.3	Pass	Pass
9	109.2	19.7	104	108.0	18.7	98.9	Pass	Pass
9	109.2	19.7	105	109.6	19.5	100.4	Pass	Pass
9	109.2	19.7	106	101.9	21.3	93.3	Fail (1)	Pass
9	109.2	19.7	107	106.0	19.4	97.1	Pass	Pass
9	109.2	19.7	108	106.6	20.7	97.6	Pass	Pass
9	109.2	19.7	109	112.3	18.0	102.8	Pass	Pass
9	109.2	19.7	110	110.7	18.9	101.4	Pass	Pass
9	109.2	19.7	111	102.2	20.7	93.6	Fail (1)	Pass
9	109.2	19.7	112	107.9	18.1	98.8	Pass	Pass
9	109.2	19.7	113	106.1	21.3	97.2	Pass	Pass
9	109.2	19.7	114	108.3	18.1	99.2	Pass	Pass
10	107.5	19.7	115	105.4	20.4	98.0	Pass	Pass
10	107.5	19.7	116	107.3	19.8	99.8	Pass	Pass
10	107.5	19.7	117	102.3	22.6	95.2	Pass	Pass
10	107.5	19.7	118	104.2	21.6	96.9	Pass	Pass
10	107.5	19.7	119	104.1	22.0	96.8	Pass	Pass
10	107.5	19.7	120	102.5	23.2	95.3	Pass	Pass
10	107.5	19.7	121	111.1	20.1	103.3	Pass	Pass
10	107.5	19.7	122	107.1	17.0	99.6	Pass	Fail (2)
10	107.5	19.7	123	103.6	20.2	96.4	Pass	Pass
10	107.5	19.7	124	109.2	19.1	101.6	Pass	Pass
10	107.5	19.7	125	103.2	20.3	96.0	Pass	Pass
10	107.5	19.7	126	104.9	21.3	97.6	Pass	Pass
10	107.5	19.7	127	100.0	23.5	93.0	Pass	Pass
10	107.5	19.7	128	103.5	23.1	96.3	Pass	Pass

(1) Failed tests were identified during WNI Field Audits. Areas were ripped and reworked, then recompacted retested and passed. (See Audit Summaries in Appendix K).

(2) Failed test identified after completion of construction. See Section 2.3.3.2.3 and Table 13

Table 7 1994 Sandcone Test Summary (Page 5 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
10	107.5	19.7	129	100.4	23.8	93.4	Pass	Fail/NR (1)
11	108.5	19.8	130	110.2	18.2	101.6	Pass	Pass
11	108.5	19.8	131	103.8	21.4	95.7	Pass	Pass
11	108.5	19.8	132	100.6	20.4	92.7	Fail (2)	Pass
11	108.5	19.8	133	108.5	19.1	100.0	Pass	Pass
11	108.5	19.8	134	111.4	17.9	102.7	Pass	Pass
11	108.5	19.8	135	104.7	20.1	96.5	Pass	Pass
11	108.5	19.8	136	105.5	21.6	97.2	Pass	Pass
11	108.5	19.8	137	109.1	20.0	100.6	Pass	Pass
11	108.5	19.8	138	104.4	21.5	96.2	Pass	Pass
11	108.5	19.8	139	107.6	20.7	99.2	Pass	Pass
9	109.2	19.7	140(106R)	104.7	20.1	95.9	Pass	Pass
8	108.5	19.6	141(96R)	104.5	18.4	96.3	Pass	Pass
11	108.5	19.8	142	106.0	19.1	97.7	Pass	Pass
11	108.5	19.8	143	106.5	19.4	98.2	Pass	Pass
11	108.5	19.8	144	110.1	18.8	101.5	Pass	Pass
11	108.5	19.8	145	108.3	18.4	99.8	Pass	Pass
11	108.5	19.8	146	106.6	19.7	98.2	Pass	Pass
12	108.3	19.5	147	103.9	20.3	95.9	Pass	Pass
12	108.3	19.5	148	104.2	21.9	96.2	Pass	Pass
12	108.3	19.5	149	102.3	17.6	94.5	Pass	Pass
9	109.2	19.7	150(111R)	103.3	18.1	94.6	Fail/NR (3)	Pass
12	108.3	19.5	151	111.8	18.6	103.2	Pass	Pass
12	108.3	19.5	152	104.7	20.2	96.7	Pass	Pass
12	108.3	19.5	153	106.7	21.0	98.5	Pass	Pass
12	108.3	19.5	154	108.4	19.8	100.1	Pass	Pass
12	108.3	19.5	155	104.4	21.0	96.4	Pass	Pass
12	108.3	19.5	156	108.5	20.6	100.2	Pass	Pass
12	108.3	19.5	157	109.5	20.6	101.1	Pass	Pass
12	108.3	19.5	158	107.4	20.0	99.2	Pass	Pass
12	108.3	19.5	159	106.0	18.2	97.9	Pass	Pass
12	108.3	19.5	160	111.7	16.8	103.1	Pass	Fail (4)

(1) Failed test was identified during WNI Field Audit. NR indicates area was not reworked. See Table 12.

(2) Failed test was reworked and recompacted. See Test No. 173(132R) on next page.

(3) Failed test was identified during WNI Field Audit. NR indicates area was not reworked. See Table 11.

(4) Failed test was identified during WNI Field Audit. Area was ripped and reworked, then recompacted retested and passed. (See Audit Summaries in Appendix K).

Table 7 1994 Sandcone Test Summary (Page 6 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
12	108.3	19.5	161	97.5	23.3	90.0	Pass	Pass
12	108.3	19.5	162	107.8	19.1	99.5	Pass	Pass
13	107.1	19.7	163	101.0	20.7	94.3	Pass	Pass
13	107.1	19.7	164	109.0	19.2	101.8	Pass	Pass
13	107.1	19.7	165	108.9	19.2	101.7	Pass	Pass
13	107.1	19.7	166	105.1	18.7	98.1	Pass	Pass
13	107.1	19.7	167	111.0	18.8	103.6	Pass	Pass
13	107.1	19.7	168	108.2	21.0	101.0	Pass	Pass
13	107.1	19.7	169	106.1	20.5	99.1	Pass	Pass
13	107.1	19.7	170	104.5	20.4	97.6	Pass	Pass
13	107.1	19.7	171	107.7	19.8	100.6	Pass	Pass
13	107.1	19.7	172	109.1	20.0	101.9	Pass	Pass
11	108.5	19.8	173(132R)	103.7	20.5	95.6	Pass	Pass
13	107.1	19.7	174	105.3	20.3	98.3	Pass	Pass
13	107.1	19.7	175	109.5	19.1	102.2	Pass	Pass
13	107.1	19.7	176	105.0	20.2	98.0	Pass	Pass
13	107.1	19.7	177	105.8	18.5	98.8	Pass	Pass
13	107.1	19.7	178	109.1	19.2	101.9	Pass	Pass
14	106.5	20.0	179	106.5	19.9	100.0	Pass	Pass
14	106.5	20.0	180	109.9	18.4	103.2	Pass	Pass
14	106.5	20.0	181	101.2	19.0	95.0	Pass	Pass
14	106.5	20.0	182	104.0	21.4	97.7	Pass	Pass
14	106.5	20.0	183	108.1	20.6	101.5	Pass	Pass
14	106.5	20.0	184	96.0	21.4	90.1	Pass	Pass
14	106.5	20.0	185	108.5	18.6	101.9	Pass	Pass
14	106.5	20.0	186	104.8	18.0	98.4	Pass	Pass
14	106.5	20.0	187	109.4	19.4	102.7	Pass	Pass
12	108.3	19.5	188(160R)	104.0	22.1	96.0	Pass	Pass
14	106.5	20.0	189	106.8	20.6	100.3	Pass	Pass
14	106.5	20.0	190	108.0	18.3	101.4	Pass	Pass
14	106.5	20.0	191	104.6	20.1	98.2	Pass	Pass
14	106.5	20.0	192	104.4	21.4	98.0	Pass	Pass

R= Retest due to failed initial test. Example: "173(132R)" indicates that Test 173 was a retest of Test 132.

Table 7 1994 Sandcone Test Summary (Page 7 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
14	106.5	20.0	193	106.5	21.1	100.0	Pass	Pass
14	106.5	20.0	194	104.6	20.4	98.2	Pass	Pass
15	108.0	19.2	195	104.3	19.6	96.6	Pass	Pass
15	108.0	19.2	196	105.0	19.1	97.2	Pass	Pass
15	108.0	19.2	197	108.1	20.2	100.1	Pass	Pass
15	108.0	19.2	198	103.7	20.1	96.0	Pass	Pass
15	108.0	19.2	199	104.7	19.5	96.9	Pass	Pass
15	108.0	19.2	200	104.8	21.3	97.0	Pass	Pass
15	108.0	19.2	201	104.7	20.1	96.9	Pass	Pass
15	108.0	19.2	202	106.7	18.8	98.8	Pass	Pass
15	108.0	19.2	203	109.6	19.3	101.5	Pass	Pass
15	108.0	19.2	204	105.1	20.7	97.3	Pass	Pass
15	108.0	19.2	205	107.9	19.2	99.9	Pass	Pass
15	108.0	19.2	206	105.5	19.9	97.7	Pass	Pass
15	108.0	19.2	207	103.4	19.2	95.7	Pass	Pass
15	108.0	19.2	208	105.1	18.2	97.3	Pass	Pass
15	108.0	19.2	209	104.9	18.7	97.1	Pass	Pass
16	107.2	20.7	210	104.4	20.5	97.4	Pass	Pass
16	107.2	20.7	211	110.4	18.9	103.0	Pass	Pass
16	107.2	20.7	212	106.9	18.9	99.7	Pass	Pass

Table 8 **1995 Sandcone Test Summary** (Page 1 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
1	108.6	20.0	1	105.6	18.6	97.2	Pass	Pass
1	108.6	20.0	2R	103.6	20.3	95.4	Pass	Pass
1	108.6	20.0	3	110.2	18.0	101.5	Pass	Pass
1	108.6	20.0	4	108.5	19.1	99.9	Pass	Pass
1	108.6	20.0	5	105.5	19.4	97.1	Pass	Pass
1	108.6	20.0	6	107.8	18.5	99.3	Pass	Pass
1	108.6	20.0	7	105.6	19.6	97.2	Pass	Pass
1	108.6	20.0	8	109.6	18.3	100.9	Pass	Pass
1	108.6	20.0	9	103.7	18.6	95.5	Pass	Pass
1	108.6	20.0	10	108.7	18.5	100.1	Pass	Pass
1	108.6	20.0	11	110.5	18.2	101.7	Pass	Pass
1	108.6	20.0	12	108.5	18.1	99.9	Pass	Pass
1	108.6	20.0	13	107.3	20.2	98.8	Pass	Pass
1	108.6	20.0	14	107.4	18.0	98.9	Pass	Pass
1	108.6	20.0	15	107.3	19.1	98.8	Pass	Pass
2	109.5	18.7	16	105.6	18.5	96.4	Pass	Pass
2	109.5	18.7	17	104.3	19.9	95.3	Pass	Pass
2	109.5	18.7	18	104.5	17.8	95.4	Pass	Pass
2	109.5	18.7	19	105.3	19.1	96.2	Pass	Pass
2	109.5	18.7	20	106.2	20.1	97.0	Pass	Pass
2	109.5	18.7	21R	108.4	18.1	99.0	Pass	Pass
2	109.5	18.7	22	104.3	19.0	95.3	Pass	Pass
2	109.5	18.7	23	104.9	19.0	95.8	Pass	Pass
2	109.5	18.7	24	105.1	19.5	96.0	Pass	Pass
2	109.5	18.7	25	104.5	19.6	95.4	Pass	Pass
2	109.5	18.7	26	104.7	20.1	95.6	Pass	Pass
2	109.5	18.7	27	106.2	19.8	97.0	Pass	Pass
2	109.5	18.7	28	105.9	20.5	96.7	Pass	Pass
2	109.5	18.7	29	107.1	19.5	97.8	Pass	Pass
2	109.5	18.7	30	109.6	17.8	100.1	Pass	Pass
3	110.8	17.7	31	109.9	18.6	99.2	Pass	Pass
3	110.8	17.7	32	111.5	17.1	100.6	Pass	Pass
3	110.8	17.7	33	106.2	18.8	95.8	Pass	Pass
3	110.8	17.7	34	109.2	19.2	98.6	Pass	Pass
3	110.8	17.7	35	105.4	17.7	95.1	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 2 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
3	110.8	17.7	36	105.9	19.4	95.6	Pass	Pass
3	110.8	17.7	37	105.5	18.6	95.2	Pass	Pass
3	110.8	17.7	38	110.8	16.9	100.0	Pass	Pass
3	110.8	17.7	39	105.7	19.6	95.4	Pass	Pass
3	110.8	17.7	40	109.2	19.0	98.6	Pass	Pass
3	110.8	17.7	41R	108.9	18.4	98.3	Pass	Pass
3	110.8	17.7	42	105.3	20.2	95.0	Pass	Pass
3	110.8	17.7	43	106.4	18.9	96.0	Pass	Pass
3	110.8	17.7	44	106.9	18.9	96.5	Pass	Pass
3	110.8	17.7	45	107.8	20.0	97.3	Pass	Pass
4	109.0	19.5	46	106.2	19.3	97.4	Pass	Pass
4	109.0	19.5	47	105.9	19.7	97.2	Pass	Pass
4	109.0	19.5	48	106.5	18.7	97.7	Pass	Pass
4	109.0	19.5	49	106.6	19.5	97.8	Pass	Pass
4	109.0	19.5	50	110.2	18.2	101.1	Pass	Pass
4	109.0	19.5	51	109.6	20.4	100.6	Pass	Pass
4	109.0	19.5	52	112.1	17.7	102.8	Pass	Pass
4	109.0	19.5	53	113.6	17.7	104.2	Pass	Pass
4	109.0	19.5	54	110.5	19.0	101.4	Pass	Pass
4	109.0	19.5	55	107.1	18.8	98.3	Pass	Pass
4	109.0	19.5	56	108.6	18.2	99.6	Pass	Pass
4	109.0	19.5	57	108.7	18.8	99.7	Pass	Pass
4	109.0	19.5	58	108.8	18.7	99.8	Pass	Pass
4	109.0	19.5	59	106.5	17.9	97.7	Pass	Pass
4	109.0	19.5	60	107.1	18.5	98.3	Pass	Pass
5	109.6	19.0	61	104.5	18.5	95.3	Pass	Pass
5	109.6	19.0	62	105.8	19.2	96.5	Pass	Pass
5	109.6	19.0	63	106.2	20.1	96.9	Pass	Pass
5	109.6	19.0	64	107.5	18.0	98.1	Pass	Pass
5	109.6	19.0	65R	110.5	18.9	100.8	Pass	Pass
5	109.6	19.0	66	108.2	19.1	98.7	Pass	Pass
5	109.6	19.0	67	105.4	20.3	96.2	Pass	Pass
5	109.6	19.0	68	106.8	20.5	97.4	Pass	Pass
5	109.6	19.0	69	110.0	18.3	100.4	Pass	Pass
5	109.6	19.0	70	108.4	17.3	98.9	Pass	Pass

R= Retest due to failed initial test

Table 8 **1995 Sandcone Test Summary** (Page 3 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
5	109.6	19.0	71	105.5	18.9	96.3	Pass	Pass
5	109.6	19.0	72	107.3	19.4	97.9	Pass	Pass
5	109.6	19.0	73R	108.9	16.9	99.4	Pass	Fail (1)
5	109.6	19.0	74	108.4	20.5	98.9	Pass	Pass
5	109.6	19.0	75	105.8	20.4	96.5	Pass	Pass
6	110.1	17.9	76	106.8	19.0	97.0	Pass	Pass
6	110.1	17.9	77	107.4	19.6	97.5	Pass	Pass
6	110.1	17.9	78	108.9	17.2	98.9	Pass	Pass
6	110.1	17.9	79	107.1	16.9	97.3	Pass	Pass
6	110.1	17.9	80	107.3	18.2	97.5	Pass	Pass
6	110.1	17.9	81	109.3	17.5	99.3	Pass	Pass
6	110.1	17.9	82	109.3	17.3	99.3	Pass	Pass
6	110.1	17.9	83	106.1	19.7	96.4	Pass	Pass
6	110.1	17.9	84	106.5	18.4	96.7	Pass	Pass
6	110.1	17.9	85	105.0	17.3	95.4	Pass	Pass
6	110.1	17.9	86	106.6	19.4	96.8	Pass	Pass
6	110.1	17.9	87	108.9	19.6	98.9	Pass	Pass
6	110.1	17.9	88R	107.6	18.5	97.7	Pass	Pass
6	110.1	17.9	89	104.6	20.3	95.0	Pass	Pass
6	110.1	17.9	90	105.3	19.0	95.6	Pass	Pass
7	110.3	18.7	91	109.4	17.9	99.2	Pass	Pass
7	110.3	18.7	92	108.8	17.0	98.6	Pass	Pass
7	110.3	18.7	93	110.9	17.2	100.5	Pass	Pass
7	110.3	18.7	94	107.9	17.3	97.8	Pass	Pass
7	110.3	18.7	95	109.7	17.0	99.5	Pass	Pass
7	110.3	18.7	96	113.2	17.0	102.6	Pass	Pass
7	110.3	18.7	97	105.9	17.1	96.0	Pass	Pass
7	110.3	18.7	98	110.9	18.6	100.5	Pass	Pass
7	110.3	18.7	99	106.5	19.5	96.6	Pass	Pass
7	110.3	18.7	100	105.6	20.8	95.7	Pass	Pass
7	110.3	18.7	101	107.4	20.2	97.4	Pass	Pass
7	110.3	18.7	102	109.8	17.5	99.5	Pass	Pass
7	110.3	18.7	103	108.9	17.8	98.7	Pass	Pass
7	110.3	18.7	104	108.0	19.2	97.9	Pass	Pass
7	110.3	18.7	105	107.9	17.6	97.8	Pass	Pass

R= Retest due to failed initial test.

(1) Failed test identified after completion of construction. See Section 2.3.3.2.3 and Table 13.

Table 8 1995 Sandcone Test Summary (Page 4 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
8	110.0	18.7	106	108.6	18.4	98.7	Pass	Pass
8	110.0	18.7	107	108.0	19.7	98.2	Pass	Pass
8	110.0	18.7	108	109.5	18.4	99.5	Pass	Pass
8	110.0	18.7	109	109.4	17.0	99.5	Pass	Pass
8	110.0	18.7	110	108.1	19.1	98.3	Pass	Pass
8	110.0	18.7	111	108.4	17.5	98.5	Pass	Pass
8	110.0	18.7	112	108.5	18.7	98.6	Pass	Pass
8	110.0	18.7	113	109.3	17.8	99.4	Pass	Pass
8	110.0	18.7	114	104.6	20.9	95.1	Pass	Pass
8	110.0	18.7	115	108.1	18.5	98.3	Pass	Pass
8	110.0	18.7	116	108.4	17.0	98.5	Pass	Pass
8	110.0	18.7	117	106.9	19.4	97.2	Pass	Pass
8	110.0	18.7	118	107.3	18.3	97.5	Pass	Pass
8	110.0	18.7	119	104.5	20.0	95.0	Pass	Pass
8	110.0	18.7	120	105.5	19.1	95.9	Pass	Pass
9	110.0	18.8	121	106.8	19.7	97.1	Pass	Pass
9	110.0	18.8	122	111.8	17.0	101.6	Pass	Pass
9	110.0	18.8	123	108.5	19.8	98.6	Pass	Pass
9	110.0	18.8	124	112.1	17.7	101.9	Pass	Pass
9	110.0	18.8	125	109.1	18.9	99.2	Pass	Pass
9	110.0	18.8	126R	109.2	18.2	99.3	Pass	Pass
9	110.0	18.8	127	109.7	17.0	99.7	Pass	Pass
9	110.0	18.8	128	109.3	17.5	99.4	Pass	Pass
9	110.0	18.8	129	105.9	18.3	96.3	Pass	Pass
9	110.0	18.8	130	106.4	17.5	96.7	Pass	Pass
9	110.0	18.8	131R	110.8	18.0	100.7	Pass	Pass
9	110.0	18.8	132	107.8	17.9	98.0	Pass	Pass
9	110.0	18.8	133	110.7	17.5	100.6	Pass	Pass
9	110.0	18.8	134	111.4	17.8	101.3	Pass	Pass
9	110.0	18.8	135	110.0	18.0	100.0	Pass	Pass
10	110.7	17.6	136	107.9	18.0	97.5	Pass	Pass
10	110.7	17.6	137	107.6	18.8	97.2	Pass	Pass
10	110.7	17.6	138	109.7	17.2	99.1	Pass	Pass
10	110.7	17.6	139	111.4	18.3	100.6	Pass	Pass
10	110.7	17.6	140	108.4	18.3	97.9	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 5 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
10	110.7	17.6	141	109.7	18.1	99.1	Pass	Pass
10	110.7	17.6	142	109.3	19.9	98.7	Pass	Pass
10	110.7	17.6	143	105.5	19.7	95.3	Pass	Pass
10	110.7	17.6	144	111.3	17.6	100.5	Pass	Pass
10	110.7	17.6	145	112.4	17.2	101.5	Pass	Pass
10	110.7	17.6	146	106.0	19.0	95.8	Pass	Pass
10	110.7	17.6	147	107.5	18.0	97.1	Pass	Pass
10	110.7	17.6	148	111.6	18.2	100.8	Pass	Pass
10	110.7	17.6	149	111.8	17.0	101.0	Pass	Pass
10	110.7	17.6	150	110.1	17.1	99.5	Pass	Pass
11	110.8	18.2	151	105.3	17.3	95.0	Pass	Pass
11	110.8	18.2	152R	109.2	18.6	98.6	Pass	Pass
11	110.8	18.2	153	107.5	17.3	97.0	Pass	Pass
11	110.8	18.2	154	106.1	18.4	95.8	Pass	Pass
11	110.8	18.2	155	110.7	17.4	99.9	Pass	Pass
11	110.8	18.2	156R	112.1	17.4	101.2	Pass	Pass
11	110.8	18.2	157	106.5	18.9	96.1	Pass	Pass
11	110.8	18.2	158	108.2	19.1	97.7	Pass	Pass
11	110.8	18.2	159	108.4	18.0	97.8	Pass	Pass
11	110.8	18.2	160	105.3	18.5	95.0	Pass	Pass
11	110.8	18.2	161	107.3	20.5	96.8	Pass	Pass
11	110.8	18.2	162	110.5	18.4	99.7	Pass	Pass
11	110.8	18.2	163	108.8	18.1	98.2	Pass	Pass
11	110.8	18.2	164	111.5	19.5	100.6	Pass	Pass
11	110.8	18.2	165R	106.4	19.1	96.0	Pass	Pass
12	110.2	17.8	166	104.7	19.2	95.0	Pass	Pass
12	110.2	17.8	167	104.8	20.3	95.1	Pass	Pass
12	110.2	17.8	168	109.1	18.3	99.0	Pass	Pass
12	110.2	17.8	169	105.3	19.4	95.6	Pass	Pass
12	110.2	17.8	170	111.5	17.0	101.2	Pass	Pass
12	110.2	17.8	171	105.8	19.3	96.0	Pass	Pass
12	110.2	17.8	172	107.9	19.4	97.9	Pass	Pass
12	110.2	17.8	173	108.9	18.2	98.8	Pass	Pass
12	110.2	17.8	174	108.5	18.6	98.5	Pass	Pass
12	110.2	17.8	175	108.4	18.8	98.4	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 6 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
12	110.2	17.8	176R	110.7	17.4	100.5	Pass	Pass
12	110.2	17.8	177	110.1	18.3	99.9	Pass	Pass
12	110.2	17.8	178	107.2	18.5	97.3	Pass	Pass
12	110.2	17.8	179	109.6	18.0	99.5	Pass	Pass
12	110.2	17.8	180	111.7	16.9	101.4	Pass	Pass
13	110.7	17.9	181	111.9	17.4	101.1	Pass	Pass
13	110.7	17.9	182	107.2	19.2	96.8	Pass	Pass
13	110.7	17.9	183	105.1	19.6	94.9	Pass	Pass
13	110.7	17.9	184	106.2	18.4	95.9	Pass	Pass
13	110.7	17.9	185	109.1	18.7	98.6	Pass	Pass
13	110.7	17.9	186	109.0	17.1	98.5	Pass	Pass
13	110.7	17.9	187	110.1	17.8	99.5	Pass	Pass
13	110.7	17.9	188	107.8	17.1	97.4	Pass	Pass
13	110.7	17.9	189	105.4	18.4	95.2	Pass	Pass
13	110.7	17.9	190	107.6	19.0	97.2	Pass	Pass
13	110.7	17.9	191	108.6	18.0	98.1	Pass	Pass
13	110.7	17.9	192	110.7	18.3	100.0	Pass	Pass
13	110.7	17.9	193R	106.2	20.2	95.9	Pass	Pass
13	110.7	17.9	194	106.8	19.6	96.5	Pass	Pass
13	110.7	17.9	195R	109.1	18.3	98.6	Pass	Pass
14	108.9	19.3	196	108.7	17.7	99.8	Pass	Pass
14	108.9	19.3	197	105.3	19.9	96.7	Pass	Pass
14	108.9	19.3	198	106.0	20.0	97.3	Pass	Pass
14	108.9	19.3	199	105.1	19.8	96.5	Pass	Pass
14	108.9	19.3	200	108.9	20.0	100.0	Pass	Pass
14	108.9	19.3	201	105.9	18.3	97.2	Pass	Pass
14	108.9	19.3	202	103.7	19.1	95.2	Pass	Pass
14	108.9	19.3	203	103.9	18.1	95.4	Pass	Pass
14	108.9	19.3	204	106.5	19.2	97.8	Pass	Pass
14	108.9	19.3	205	106.8	17.4	98.1	Pass	Pass
14	108.9	19.3	206	104.0	22.8	95.5	Pass	Pass
14	108.9	19.3	207	109.3	17.7	100.4	Pass	Pass
14	108.9	19.3	208	103.9	18.5	95.4	Pass	Pass
14	108.9	19.3	209	107.7	18.8	98.9	Pass	Pass
14	108.9	19.3	210	105.5	19.5	96.9	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 7 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
15	108.1	19.4	211	104.7	19.7	96.9	Pass	Pass
15	108.1	19.4	212	109.4	18.1	101.2	Pass	Pass
14	108.9	19.3	205	106.8	17.4	98.1	Pass	Pass
14	108.9	19.3	206	104.0	22.8	95.5	Pass	Pass
14	108.9	19.3	207	109.3	17.7	100.4	Pass	Pass
14	108.9	19.3	208	103.9	18.5	95.4	Pass	Pass
14	108.9	19.3	209	107.7	18.8	98.9	Pass	Pass
14	108.9	19.3	210	105.5	19.5	96.9	Pass	Pass
15	108.1	19.4	211	104.7	19.7	96.9	Pass	Pass
15	108.1	19.4	212	109.4	18.1	101.2	Pass	Pass
15	108.1	19.4	213R	111.8	17.5	103.4	Pass	Pass
15	108.1	19.4	214	106.9	18.5	98.9	Pass	Pass
15	108.1	19.4	215	108.9	17.5	100.7	Pass	Pass
15	108.1	19.4	216	110.9	17.4	102.6	Pass	Pass
15	108.1	19.4	217	109.9	17.4	101.7	Pass	Pass
15	108.1	19.4	218	106.3	20.5	98.3	Pass	Pass
15	108.1	19.4	219	105.4	19.4	97.5	Pass	Pass
15	108.1	19.4	220	113.4	17.5	104.9	Pass	Pass
15	108.1	19.4	221R	106.6	18.5	98.6	Pass	Pass
15	108.1	19.4	222	105.2	20.2	97.3	Pass	Pass
15	108.1	19.4	223	110.3	17.4	102.0	Pass	Pass
15	108.1	19.4	224	108.1	17.6	100.0	Pass	Pass
15	108.1	19.4	225	108.7	18.5	100.6	Pass	Pass
16	109.2	19.6	226	105.1	21.2	96.2	Pass	Pass
16	109.2	19.6	227	106.3	19.6	97.3	Pass	Pass
16	109.2	19.6	228	108.7	18.5	99.5	Pass	Pass
16	109.2	19.6	229	109.2	17.6	100.0	Pass	Pass
16	109.2	19.6	230R	109.6	18.1	100.4	Pass	Pass
16	109.2	19.6	231	107.7	18.4	98.6	Pass	Pass
16	109.2	19.6	232	108.7	18.2	99.5	Pass	Pass
16	109.2	19.6	233	108.0	17.8	98.9	Pass	Pass
16	109.2	19.6	234	107.3	19.1	98.3	Pass	Pass
16	109.2	19.6	235	110.9	17.6	101.6	Pass	Pass
16	109.2	19.6	236	111.8	17.6	102.4	Pass	Pass
16	109.2	19.6	237	108.1	18.1	99.0	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 8 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
16	109.2	19.6	238	105.2	17.6	96.3	Pass	Pass
16	109.2	19.6	239	109.8	17.8	100.5	Pass	Pass
16	109.2	19.6	240	105.7	19.7	96.8	Pass	Pass
17	110.0	18.3	241	105.7	18.5	96.1	Pass	Pass
17	110.0	18.3	242	104.7	17.7	95.2	Pass	Pass
17	110.0	18.3	243	108.8	18.9	98.9	Pass	Pass
17	110.0	18.3	244	104.7	20.1	95.2	Pass	Pass
17	110.0	18.3	245	104.5	19.0	95.0	Pass	Pass
17	110.0	18.3	246	105.4	19.6	95.8	Pass	Pass
17	110.0	18.3	247	108.2	17.1	98.4	Pass	Pass
17	110.0	18.3	248	106.7	18.6	97.0	Pass	Pass
17	110.0	18.3	249	105.9	19.9	96.3	Pass	Pass
17	110.0	18.3	250	106.4	19.1	96.7	Pass	Pass
17	110.0	18.3	251	107.5	18.6	97.7	Pass	Pass
17	110.0	18.3	252	109.1	18.7	99.2	Pass	Pass
17	110.0	18.3	253R	105.7	17.4	96.1	Pass	Pass
17	110.0	18.3	254	107.5	17.3	97.7	Pass	Pass
17	110.0	18.3	255	109.8	17.1	99.8	Pass	Pass
18	111.0	18.6	256	108.7	18.9	97.9	Pass	Pass
18	111.0	18.6	257	110.2	17.5	99.3	Pass	Pass
18	111.0	18.6	258R	112.1	17.0	101.0	Pass	Pass
18	111.0	18.6	259	110.3	17.9	99.4	Pass	Pass
18	111.0	18.6	260	109.5	17.3	98.6	Pass	Pass
18	111.0	18.6	261	108.3	17.2	97.6	Pass	Pass
18	111.0	18.6	262	111.7	17.4	100.6	Pass	Pass
18	111.0	18.6	263	111.0	17.0	100.0	Pass	Pass
18	111.0	18.6	264	105.8	19.3	95.3	Pass	Pass
18	111.0	18.6	265	106.8	18.6	96.2	Pass	Pass
18	111.0	18.6	266	107.5	18.6	96.8	Pass	Pass
18	111.0	18.6	267	109.8	18.7	98.9	Pass	Pass
18	111.0	18.6	268	111.0	17.8	100.0	Pass	Pass
18	111.0	18.6	269	109.9	17.1	99.0	Pass	Pass
18	111.0	18.6	270	106.7	18.7	96.1	Pass	Pass
19	111.0	17.3	271	109.1	17.6	98.3	Pass	Pass
19	111.0	17.3	272	107.5	18.7	96.8	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 9 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
19	111.0	17.3	273	105.3	18.5	94.9	Pass	Pass
19	111.0	17.3	274	111.4	17.0	100.4	Pass	Pass
19	111.0	17.3	275	106.6	17.5	96.0	Pass	Pass
19	111.0	17.3	276	107.4	17.1	96.8	Pass	Pass
19	111.0	17.3	277	106.8	18.8	96.2	Pass	Pass
19	111.0	17.3	278R	109.5	17.1	98.6	Pass	Pass
19	111.0	17.3	279	105.9	17.9	95.4	Pass	Pass
19	111.0	17.3	280	105.6	19.5	95.1	Pass	Pass
19	111.0	17.3	281	108.5	17.3	97.7	Pass	Pass
19	111.0	17.3	282	108.5	18.3	97.7	Pass	Pass
19	111.0	17.3	283	107.0	18.9	96.4	Pass	Pass
19	111.0	17.3	284	107.3	17.8	96.7	Pass	Pass
19	111.0	17.3	285	108.1	19.3	97.4	Pass	Pass
20	111.1	18.5	286	107.2	19.2	96.5	Pass	Pass
20	111.1	18.5	287	107.3	18.4	96.6	Pass	Pass
20	111.1	18.5	288	106.3	18.0	95.7	Pass	Pass
20	111.1	18.5	289	105.5	17.9	95.0	Pass	Pass
20	111.1	18.5	290R	105.6	18.4	95.0	Pass	Pass
20	111.1	18.5	291R	106.4	17.1	95.8	Pass	Pass
20	111.1	18.5	292	109.8	17.1	98.8	Pass	Pass
20	111.1	18.5	293	108.4	17.0	97.6	Pass	Pass
20	111.1	18.5	294	105.7	19.1	95.1	Pass	Pass
20	111.1	18.5	295	105.5	18.2	95.0	Pass	Pass
20	111.1	18.5	296	107.7	18.8	96.9	Pass	Pass
20	111.1	18.5	297	107.6	18.7	96.8	Pass	Pass
20	111.1	18.5	298	107.2	18.7	96.5	Pass	Pass
20	111.1	18.5	299	107.2	18.1	96.5	Pass	Pass
20	111.1	18.5	300	109.0	18.4	98.1	Pass	Pass
21	110.6	17.4	301	105.9	20.2	95.8	Pass	Pass
21	110.6	17.4	302	107.4	18.9	97.1	Pass	Pass
21	110.6	17.4	303	105.5	19.0	95.4	Pass	Pass
21	110.6	17.4	304	107.5	19.1	97.2	Pass	Pass
21	110.6	17.4	305	108.0	18.2	97.6	Pass	Pass
21	110.6	17.4	306	105.5	19.9	95.4	Pass	Pass
21	110.6	17.4	307	109.9	17.2	99.4	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 10 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
21	110.6	17.4	308	107.3	18.4	97.0	Pass	Pass
21	110.6	17.4	309	102.0	21.4	92.2	Pass	Pass
21	110.6	17.4	310	104.9	19.9	94.8	Pass	Pass
21	110.6	17.4	311	109.1	18.1	98.6	Pass	Pass
21	110.6	17.4	312	105.8	18.8	95.7	Pass	Pass
21	110.6	17.4	313	107.4	20.5	97.1	Pass	Pass
21	110.6	17.4	314	107.1	17.5	96.8	Pass	Pass
21	110.6	17.4	315	105.3	18.2	95.2	Pass	Pass
22	108.4	19.6	316	105.5	20.7	97.3	Pass	Pass
22	108.4	19.6	317	106.3	20.4	98.1	Pass	Pass
22	108.4	19.6	318	103.1	20.2	95.1	Pass	Pass
22	108.4	19.6	319	108.6	18.6	100.2	Pass	Pass
22	108.4	19.6	320	104.4	18.1	96.3	Pass	Pass
22	108.4	19.6	321	110.2	17.6	101.7	Pass	Pass
22	108.4	19.6	322	109.4	19.3	100.9	Pass	Pass
22	108.4	19.6	323	108.1	18.9	99.7	Pass	Pass
22	108.4	19.6	324	110.9	17.7	102.3	Pass	Pass
22	108.4	19.6	325	103.3	19.7	95.3	Pass	Pass
22	108.4	19.6	326	107.7	18.9	99.4	Pass	Pass
22	108.4	19.6	327	101.2	20.1	93.4	Pass	Pass
22	108.4	19.6	328	106.8	17.6	98.5	Pass	Pass
22	108.4	19.6	329	108.3	18.3	99.9	Pass	Pass
22	108.4	19.6	330	107.4	18.2	99.1	Pass	Pass
23	107.8	19.2	331	104.4	19.7	96.8	Pass	Pass
23	107.8	19.2	332	105.8	19.6	98.1	Pass	Pass
23	107.8	19.2	333	106.1	19.8	98.4	Pass	Pass
23	107.8	19.2	334	107.4	19.4	99.6	Pass	Pass
23	107.8	19.2	335	106.5	18.7	98.8	Pass	Pass
23	107.8	19.2	336	106.3	18.9	98.6	Pass	Pass
23	107.8	19.2	337	108.5	18.0	100.6	Pass	Pass
23	107.8	19.2	338	109.1	17.2	101.2	Pass	Pass
23	107.8	19.2	339	107.1	18.2	99.4	Pass	Pass
23	107.8	19.2	340	111.5	17.2	103.4	Pass	Pass
23	107.8	19.2	341	108.8	19.4	100.9	Pass	Pass
23	107.8	19.2	342R	108.7	18.6	100.8	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 11 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
23	107.8	19.2	343	107.4	18.3	99.6	Pass	Pass
23	107.8	19.2	344	102.5	20.1	95.1	Pass	Pass
23	107.8	19.2	345	109.2	17.7	101.3	Pass	Pass
24	108.1	18.7	346	110.8	18.2	102.5	Pass	Pass
24	108.1	18.7	347R	110.2	18.7	101.9	Pass	Pass
24	108.1	18.7	348R	105.1	18.4	97.2	Pass	Pass
24	108.1	18.7	349	108.5	20.4	100.4	Pass	Pass
24	108.1	18.7	350	106.6	17.5	98.6	Pass	Pass
24	108.1	18.7	351	109.5	18.8	101.3	Pass	Pass
24	108.1	18.7	352	105.7	19.7	97.8	Pass	Pass
24	108.1	18.7	353	110.2	17.7	101.9	Pass	Pass
24	108.1	18.7	354	111.5	17.8	103.1	Pass	Pass
24	108.1	18.7	355	104.5	19.3	96.7	Pass	Pass
24	108.1	18.7	356	110.3	17.9	102.0	Pass	Pass
24	108.1	18.7	357	106.8	18.5	98.8	Pass	Pass
24	108.1	18.7	358	106.8	18.5	98.8	Pass	Pass
24	108.1	18.7	359	106.4	19.7	98.4	Pass	Pass
24	108.1	18.7	360	109.5	17.0	101.3	Pass	Pass
25	108.4	17.5	361	111.5	17.2	102.9	Pass	Pass
25	108.4	17.5	362R	107.5	20.3	99.2	Pass	Pass
25	108.4	17.5	363	107.8	18.7	99.4	Pass	Pass
25	108.4	17.5	364	107.4	16.9	99.1	Pass	Pass
25	108.4	17.5	365	106.9	18.8	98.6	Pass	Pass
25	108.4	17.5	366	106.8	20.0	98.5	Pass	Pass
25	108.4	17.5	367	106.3	18.6	98.1	Pass	Pass
25	108.4	17.5	368	110.3	17.3	101.8	Pass	Pass
25	108.4	17.5	369	108.2	17.9	99.8	Pass	Pass
25	108.4	17.5	370	103.8	19.6	95.8	Pass	Pass
25	108.4	17.5	371	109.6	17.0	101.1	Pass	Pass
25	108.4	17.5	372	105.5	18.0	97.3	Pass	Pass
25	108.4	17.5	373	108.0	19.1	99.6	Pass	Pass
25	108.4	17.5	374	111.0	18.3	102.4	Pass	Pass
25	108.4	17.5	375	108.0	17.1	99.6	Pass	Pass
26	108.8	19.0	376	108.5	18.5	99.7	Pass	Pass
26	108.8	19.0	377	103.5	19.8	95.1	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 12 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
26	108.8	19.0	378	104.5	19.7	96.0	Pass	Pass
26	108.8	19.0	379	111.2	17.1	102.2	Pass	Pass
26	108.8	19.0	380	110.2	18.1	101.3	Pass	Pass
26	108.8	19.0	381	106.2	19.7	97.6	Pass	Pass
26	108.8	19.0	382	106.4	18.8	97.8	Pass	Pass
26	108.8	19.0	383	107.5	18.6	98.8	Pass	Pass
26	108.8	19.0	384	105.3	20.2	96.8	Pass	Pass
26	108.8	19.0	385	105.3	17.1	96.8	Pass	Pass
26	108.8	19.0	386	109.1	17.1	100.3	Pass	Pass
26	108.8	19.0	387	105.6	17.9	97.1	Pass	Pass
26	108.8	19.0	388	105.4	19.4	96.9	Pass	Pass
26	108.8	19.0	389	108.1	21.2	99.4	Pass	Pass
26	108.8	19.0	390	106.6	18.2	98.0	Pass	Pass
27	109.5	18.7	391	109.1	17.6	99.6	Pass	Pass
27	109.5	18.7	392	106.8	18.3	97.5	Pass	Pass
27	109.5	18.7	393	110.1	18.3	100.5	Pass	Pass
27	109.5	18.7	394	107.6	19.6	98.3	Pass	Pass
27	109.5	18.7	395	104.0	20.3	95.0	Pass	Pass
27	109.5	18.7	396	108.5	18.6	99.1	Pass	Pass
27	109.5	18.7	397	108.4	18.7	99.0	Pass	Pass
27	109.5	18.7	398	111.5	18.1	101.8	Pass	Pass
27	109.5	18.7	399	109.4	19.9	99.9	Pass	Pass
27	109.5	18.7	400	110.6	18.6	101.0	Pass	Pass
27	109.5	18.7	401	109.5	19.1	100.0	Pass	Pass
27	109.5	18.7	402	103.3	21.2	94.3	Pass	Pass
27	109.5	18.7	403	106.2	18.9	97.0	Pass	Pass
27	109.5	18.7	404	108.1	19.3	98.7	Pass	Pass
27	109.5	18.7	405	107.5	18.1	98.2	Pass	Pass
27	109.5	18.3	406R	109.0	17.9	99.5	Pass	Pass
28	109.5	18.3	407	109.2	18.2	99.7	Pass	Pass
28	109.5	18.3	408	107.0	18.6	97.7	Pass	Pass
28	109.5	18.3	409R	107.0	17.9	97.7	Pass	Pass
28	109.5	18.3	410	110.0	19.0	100.5	Pass	Pass
28	109.5	18.3	411	106.6	19.2	97.4	Pass	Pass
28	109.5	18.3	412	106.3	18.7	97.1	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 13 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	**Maximum Dry Density (lbs/ft^3)**	**Optimum Moisture Content (%)**	**Test No.**	**Dry Density (lbs/ft^3)**	**Moisture Content (%)**	**Percent Proctor (%)**	**Compaction**	**Moisture**
28	109.5	18.3	413R	109.2	18.5	99.7	Pass	Pass
28	109.5	18.3	414	110.2	18.6	100.6	Pass	Pass
28	109.5	18.3	410	110.0	19.0	100.5	Pass	Pass
28	109.5	18.3	411	106.6	19.2	97.4	Pass	Pass
28	109.5	18.3	412	106.3	18.7	97.1	Pass	Pass
28	109.5	18.3	413R	109.2	18.5	99.7	Pass	Pass
28	109.5	18.3	414	110.2	18.6	100.6	Pass	Pass
28	109.5	18.3	415	105.2	18.7	96.1	Pass	Pass
28	109.5	18.3	416	110.0	19.1	100.5	Pass	Pass
28	109.5	18.3	417	107.9	18.1	98.5	Pass	Pass
28	109.5	18.3	418	107.5	19.1	98.2	Pass	Pass
28	109.5	18.3	419	108.6	19.2	99.2	Pass	Pass
28	109.5	18.3	420	109.1	17.7	99.6	Pass	Pass
29	109.6	18.7	421R	104.0	18.6	94.9	Fail/NR (1)	Pass
29	109.6	18.7	422	109.6	18.4	100.0	Pass	Pass
29	109.6	18.7	423	109.6	18.4	100.0	Pass	Pass
29	109.6	18.7	424	108.6	17.5	99.1	Pass	Pass
29	109.6	18.7	425	108.5	17.5	99.0	Pass	Pass
29	109.6	18.7	426	108.0	18.1	98.5	Pass	Pass
29	109.6	18.7	427	105.1	17.0	95.9	Pass	Pass
29	109.6	18.7	428	104.1	19.4	95.0	Pass	Pass
29	109.6	18.7	429	104.1	18.6	95.0	Pass	Pass
29	109.6	18.7	430	112.4	17.0	102.6	Pass	Pass
29	109.6	18.7	431	108.1	17.7	98.6	Pass	Pass
29	109.6	18.7	432	104.1	20.4	95.0	Pass	Pass
29	109.6	18.7	433R	110.8	17.7	101.1	Pass	Pass
29	109.6	18.7	434	106.4	18.8	97.1	Pass	Pass
29	109.6	18.7	435	105.7	18.3	96.4	Pass	Pass
30	108.2	19.3	436	108.3	17.4	100.1	Pass	Pass
30	108.2	19.3	437	106.2	18.7	98.2	Pass	Pass
30	108.2	19.3	438	112.5	19.4	104.0	Pass	Pass
30	108.2	19.3	439	111.5	17.8	103.0	Pass	Pass
30	108.2	19.3	440	111.1	18.1	102.7	Pass	Pass
30	108.2	19.3	441	112.7	17.8	104.2	Pass	Pass
30	108.2	19.3	442	111.6	17.8	103.1	Pass	Pass

R= Retest due to failed initial test

(1) Failed test was identified during WNI Field Audit. NR indicates that area was not reworked. See Table 11.

Table 8 1995 Sandcone Test Summary (Page 14 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
30	108.2	19.3	443	109.3	17.6	101.0	Pass	Pass
30	108.2	19.3	444	109.8	19.3	101.5	Pass	Pass
30	108.2	19.3	445	109.0	18.0	100.7	Pass	Pass
30	108.2	19.3	446	106.1	20.4	98.1	Pass	Pass
30	108.2	19.3	447R	108.1	17.3	99.9	Pass	Pass
30	108.2	19.3	448	110.0	17.9	101.7	Pass	Pass
30	108.2	19.3	449	104.8	17.0	96.9	Pass	Fail (1)
30	108.2	19.3	450	108.2	17.5	100.0	Pass	Pass
31	109.5	18.4	451	110.3	17.3	100.7	Pass	Pass
31	109.5	18.4	452	110.2	17.4	100.6	Pass	Pass
31	109.5	18.4	453	110.7	17.9	101.1	Pass	Pass
31	109.5	18.4	454R	111.6	17.9	101.9	Pass	Pass
31	109.5	18.4	455	110.9	17.0	101.3	Pass	Pass
31	109.5	18.4	456	105.8	19.7	96.6	Pass	Pass
31	109.5	18.4	457	112.6	17.0	102.8	Pass	Pass
31	109.5	18.4	458	108.3	16.9	98.9	Pass	Pass
31	109.5	18.4	459	111.3	17.0	101.6	Pass	Pass
31	109.5	18.4	460	110.1	16.9	100.5	Pass	Pass
31	109.5	18.4	461	104.5	17.8	95.4	Pass	Pass
31	109.5	18.4	462	109.4	18.6	99.9	Pass	Pass
31	109.5	18.4	463	111.6	17.9	101.9	Pass	Pass
31	109.5	18.4	464	110.6	19.3	101.0	Pass	Pass
31	109.5	18.4	465R	105.4	18.5	96.3	Pass	Pass
32	110.0	18.3	466	109.1	19.1	99.2	Pass	Pass
32	110.0	18.3	467	112.7	17.6	102.5	Pass	Pass
32	110.0	18.3	468	111.3	18.3	101.2	Pass	Pass
32	110.0	18.3	469	111.6	17.4	101.5	Pass	Pass
32	110.0	18.3	470	105.2	19.3	95.6	Pass	Pass
32	110.0	18.3	471	105.0	20.5	95.5	Pass	Pass
32	110.0	18.3	472	106.7	19.4	97.0	Pass	Pass
32	110.0	18.3	473	109.1	18.9	99.2	Pass	Pass
32	110.0	18.3	474	106.5	20.5	96.8	Pass	Pass
32	110.0	18.3	475R	105.7	19.6	96.1	Pass	Pass
32	110.0	18.3	476	110.7	18.4	100.6	Pass	Pass
32	110.0	18.3	477	106.4	19.0	96.7	Pass	Pass

R= Retest due to failed initial test

(1) Failed test identified after completion of construction. See Section 2.3.3.2.3 and Table 13.

Table 8 1995 Sandcone Test Summary (Page 15 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
32	110.0	18.3	478	111.4	18.0	101.3	Pass	Pass
32	110.0	18.3	479	109.2	18.5	99.3	Pass	Pass
32	110.0	18.3	480	109.8	18.6	99.8	Pass	Pass
33	111.2	17.3	481	111.1	17.4	99.9	Pass	Pass
33	111.2	17.3	482	111.6	17.3	100.4	Pass	Pass
33	111.2	17.3	483	107.1	17.4	96.3	Pass	Pass
33	111.2	17.3	484	112.3	17.8	101.0	Pass	Pass
33	111.2	17.3	485	107.8	20.4	96.9	Pass	Pass
33	111.2	17.3	486	108.9	19.2	97.9	Pass	Pass
33	111.2	17.3	487	109.8	17.8	98.7	Pass	Pass
33	111.2	17.3	488	111.7	17.3	100.4	Pass	Pass
33	111.2	17.3	489	107.2	17.3	96.4	Pass	Pass
33	111.2	17.3	490	111.4	18.6	100.2	Pass	Pass
33	111.2	17.3	491	111.2	18.8	100.0	Pass	Pass
33	111.2	17.3	492	112.3	17.7	101.0	Pass	Pass
33	111.2	17.3	493	110.2	19.1	99.1	Pass	Pass
33	111.2	17.3	494	109.6	18.0	98.6	Pass	Pass
33	111.2	17.3	495	111.7	18.2	100.4	Pass	Pass
34	111.2	17.3	496	106.4	19.2	95.7	Pass	Pass
34	111.2	17.3	497	111.1	18.5	99.9	Pass	Pass
34	111.2	17.3	498	105.9	18.6	95.2	Pass	Pass
34	111.2	17.3	499	105.7	18.8	95.1	Pass	Pass
34	111.2	17.3	500	105.6	18.0	95.0	Pass	Pass
34	111.2	17.3	501R	106.6	17.4	95.9	Pass	Pass
34	111.2	17.3	502	110.1	18.0	99.0	Pass	Pass
34	111.2	17.3	503	110.3	17.8	99.2	Pass	Pass
34	111.2	17.3	504	106.8	18.7	96.0	Pass	Pass
34	111.2	17.3	505	108.5	18.4	97.6	Pass	Pass
34	111.2	17.3	506	111.0	17.6	99.8	Pass	Pass
34	111.2	17.3	507	109.8	17.8	98.7	Pass	Pass
34	111.2	17.3	508	111.9	17.2	100.6	Pass	Pass
34	111.2	17.3	509	111.3	19.3	100.1	Pass	Pass
34	111.2	17.3	510	107.8	17.5	96.9	Pass	Pass
35	112.2	17.5	511	107.4	17.2	95.7	Pass	Pass
35	112.2	17.5	512	111.0	17.3	98.9	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 16 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
35	112.2	17.5	513	107.6	18.3	95.9	Pass	Pass
35	112.2	17.5	514	111.3	17.0	99.2	Pass	Pass
35	112.2	17.5	515	107.1	18.7	95.5	Pass	Pass
35	112.2	17.5	516	109.5	18.2	97.6	Pass	Pass
35	112.2	17.5	517	111.7	17.5	99.6	Pass	Pass
35	112.2	17.5	518	106.8	17.4	95.2	Pass	Pass
35	112.2	17.5	519	106.6	18.3	95.0	Pass	Pass
35	112.2	17.5	520	109.3	16.9	97.4	Pass	Pass
35	112.2	17.5	521R	106.8	17.1	95.2	Pass	Pass
35	112.2	17.5	522	106.8	17.1	95.2	Pass	Pass
35	112.2	17.5	523	108.4	17.2	96.6	Pass	Pass
35	112.2	17.5	524	112.9	17.3	100.6	Pass	Pass
35	112.2	17.5	525	112.7	16.9	100.4	Pass	Pass
36	111.0	19.1	526	108.6	17.8	97.8	Pass	Pass
36	111.0	19.1	527	109.6	17.6	98.7	Pass	Pass
36	111.0	19.1	528R	113.2	17.3	102.0	Pass	Pass
36	111.0	19.1	529	112.6	17.1	101.4	Pass	Pass
36	111.0	19.1	530	106.2	17.4	95.7	Pass	Pass
36	111.0	19.1	531	106.7	17.2	96.1	Pass	Pass
36	111.0	19.1	532	109.6	17.7	98.7	Pass	Pass
36	111.0	19.1	533	111.5	18.3	100.5	Pass	Pass
36	111.0	19.1	534R	112.5	17.2	101.4	Pass	Pass
36	111.0	19.1	535	108.9	17.8	98.1	Pass	Pass
36	111.0	19.1	536	109.3	18.2	98.5	Pass	Pass
36	111.0	19.1	537	112.2	17.3	101.1	Pass	Pass
36	111.0	19.1	538	113.4	18.6	102.2	Pass	Pass
36	111.0	19.1	539	109.1	18.3	98.3	Pass	Pass
36	111.0	19.1	540	108.7	18.5	97.9	Pass	Pass
37	111.7	18.3	541	106.6	18.9	95.4	Pass	Pass
37	111.7	18.3	542	106.2	20.9	95.1	Pass	Pass
37	111.7	18.3	543	106.8	18.3	95.6	Pass	Pass
37	111.7	18.3	544	106.4	19.1	95.3	Pass	Pass
37	111.7	18.3	545	109.8	17.6	98.3	Pass	Pass
37	111.7	18.3	546	107.5	17.2	96.2	Pass	Pass
37	111.7	18.3	547	107.6	18.7	96.3	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 17 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
37	111.7	18.3	548	108.9	17.8	97.5	Pass	Pass
37	111.7	18.3	549	109.9	18.7	98.4	Pass	Pass
37	111.7	18.3	550R	106.7	18.3	95.5	Pass	Pass
37	111.7	18.3	551R	108.1	18.6	96.8	Pass	Pass
37	111.7	18.3	552	106.5	16.9	95.3	Pass	Pass
37	111.7	18.3	553	106.1	18.2	95.0	Pass	Pass
37	111.7	18.3	554	106.5	17.6	95.3	Pass	Pass
37	111.7	18.3	555	109.6	18.1	98.1	Pass	Pass
38	112.0	18.7	556	108.8	17.0	97.1	Pass	Pass
38	112.0	18.7	557	105.6	19.0	94.3	Pass	Pass
38	112.0	18.7	558	107.4	16.9	95.9	Pass	Pass
38	112.0	18.7	559	109.7	17.0	97.9	Pass	Pass
38	112.0	18.7	560R	107.2	17.6	95.7	Pass	Pass
38	112.0	18.7	561	107.1	19.3	95.6	Pass	Pass
38	112.0	18.7	562	103.7	18.6	92.6	Pass	Pass
38	112.0	18.7	563	101.2	21.5	90.4	Pass	Pass
38	112.0	18.7	564	109.7	18.3	97.9	Pass	Pass
38	112.0	18.7	565	105.2	19.0	93.9	Pass	Pass
38	112.0	18.7	566	101.9	18.0	91.0	Pass	Pass
38	112.0	18.7	567	105.0	18.6	93.8	Pass	Pass
38	112.0	18.7	568	108.2	17.6	96.6	Pass	Pass
38	112.0	18.7	569R	106.4	18.0	95.0	Pass	Pass
38	112.0	18.7	570	108.8	17.0	97.1	Pass	Pass
39	111.0	17.2	571	105.4	17.7	95.0	Pass	Pass
39	111.0	17.2	572	107.2	18.4	96.6	Pass	Pass
39	111.0	17.2	573	102.8	19.9	92.6	Pass	Pass
39	111.0	17.2	574	111.1	17.6	100.1	Pass	Pass
39	111.0	17.2	575	108.4	17.2	97.7	Pass	Pass
39	111.0	17.2	576	105.5	21.7	95.0	Pass	Pass
39	111.0	17.2	577	111.9	17.1	100.8	Pass	Pass
39	111.0	17.2	578	111.0	17.4	100.0	Pass	Pass
39	111.0	17.2	579	110.8	17.0	99.8	Pass	Pass
39	111.0	17.2	580	109.8	17.5	98.9	Pass	Pass
39	111.0	17.2	581	109.4	18.3	98.6	Pass	Pass
39	111.0	17.2	582	107.3	18.5	96.7	Pass	Pass

R= Retest due to failed initial test

Table 8 **1995 Sandcone Test Summary** (Page 18 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
39	111.0	17.2	583	108.1	17.8	97.4	Pass	Pass
39	111.0	17.2	584	105.5	18.4	95.0	Pass	Pass
39	111.0	17.2	585	105.4	19.1	95.0	Pass	Pass
40	110.8	17.2	586	111.4	17.3	100.5	Pass	Pass
40	110.8	17.2	587	112.0	17.7	101.1	Pass	Pass
40	110.8	17.2	588	109.6	17.1	98.9	Pass	Pass
40	110.8	17.2	589	111.1	17.1	100.3	Pass	Pass
40	110.8	17.2	590	109.0	18.7	98.4	Pass	Pass
40	110.8	17.2	591R	109.2	18.0	98.6	Pass	Pass
40	110.8	17.2	592	113.3	17.0	102.3	Pass	Pass
40	110.8	17.2	593	112.1	17.1	101.2	Pass	Pass
40	110.8	17.2	594	107.5	17.6	97.0	Pass	Pass
40	110.8	17.2	595	111.2	18.4	100.4	Pass	Pass
40	110.8	17.2	596	107.9	17.9	97.4	Pass	Pass
40	110.8	17.2	597	109.5	19.0	98.8	Pass	Pass
40	110.8	17.2	598	109.2	17.8	98.6	Pass	Pass
40	110.8	17.2	599	109.4	17.9	98.7	Pass	Pass
40	110.8	17.2	600R	112.6	16.9	101.6	Pass	Pass
41	110.9	18.8	601	106.9	18.0	96.4	Pass	Pass
41	110.9	18.8	602	110.5	17.0	99.6	Pass	Pass
41	110.9	18.8	603	107.7	18.7	97.1	Pass	Pass
41	110.9	18.8	604	105.5	19.7	95.1	Pass	Pass
41	110.9	18.8	605	107.4	18.8	96.8	Pass	Pass
41	110.9	18.8	606	109.3	17.2	98.6	Pass	Pass
41	110.9	18.8	607	111.7	18.3	100.7	Pass	Pass
41	110.9	18.8	608	108.6	18.3	97.9	Pass	Pass
41	110.9	18.8	609	113.8	17.1	102.6	Pass	Pass
41	110.9	18.8	610	111.2	18.1	100.3	Pass	Pass
41	110.9	18.8	611	111.2	18.7	100.3	Pass	Pass
41	110.9	18.8	612	110.6	19.3	99.7	Pass	Pass
41	110.9	18.8	613	108.9	19.1	98.2	Pass	Pass
41	110.9	18.8	614	110.9	17.0	100.0	Pass	Pass
41	110.9	18.8	615	111.8	17.2	100.8	Pass	Pass
42	110.7	18.7	616	106.1	20.2	95.8	Pass	Pass
42	110.7	18.7	617	110.0	18.5	99.4	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 19 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
42	110.7	18.7	618	109.5	17.3	98.9	Pass	Pass
42	110.7	18.7	619	112.2	17.0	101.4	Pass	Pass
42	110.7	18.7	620	110.9	17.6	100.2	Pass	Pass
42	110.7	18.7	621	107.7	18.1	97.3	Pass	Pass
42	110.7	18.7	622	107.8	17.7	97.4	Pass	Pass
42	110.7	18.7	623	105.2	18.1	95.0	Pass	Pass
42	110.7	18.7	624	109.2	18.5	98.6	Pass	Pass
42	110.7	18.7	625	112.4	17.5	101.5	Pass	Pass
42	110.7	18.7	626	110.3	17.1	99.6	Pass	Pass
42	110.7	18.7	627	109.2	17.9	98.6	Pass	Pass
42	110.7	18.7	628	110.2	19.3	99.5	Pass	Pass
42	110.7	18.7	629	108.6	17.4	98.1	Pass	Pass
42	110.7	18.7	630R	109.3	18.0	98.7	Pass	Pass
43	112.0	17.6	631	109.3	18.4	97.6	Pass	Pass
43	112.0	17.6	632	108.2	17.5	96.6	Pass	Pass
43	112.0	17.6	633	110.6	17.6	98.8	Pass	Pass
43	112.0	17.6	634	108.8	18.3	97.1	Pass	Pass
43	112.0	17.6	635R	106.6	19.1	95.2	Pass	Pass
43	112.0	17.6	636	110.7	19.9	98.8	Pass	Pass
43	112.0	17.6	637	106.7	19.0	95.3	Pass	Pass
43	112.0	17.6	638	109.2	18.5	97.5	Pass	Pass
43	112.0	17.6	639	107.7	18.3	96.2	Pass	Pass
43	112.0	17.6	640	111.6	17.6	99.6	Pass	Pass
43	112.0	17.6	641	112.0	17.3	100.0	Pass	Pass
43	112.0	17.6	642	108.2	18.2	96.6	Pass	Pass
43	112.0	17.6	643	108.5	17.6	96.9	Pass	Pass
43	112.0	17.6	644	108.3	20.3	96.7	Pass	Pass
43	112.0	17.6	645	110.5	17.9	98.7	Pass	Pass
44	111.2	18.5	646	113.1	17.3	101.7	Pass	Pass
44	111.2	18.5	647	106.3	18.9	95.6	Pass	Pass
44	111.2	18.5	648	106.0	19.8	95.3	Pass	Pass
44	111.2	18.5	649	109.2	19.1	98.2	Pass	Pass
44	111.2	18.5	650	108.8	18.5	97.8	Pass	Pass
44	111.2	18.5	651	109.7	18.5	98.7	Pass	Pass
44	111.2	18.5	652	107.4	18.3	96.6	Pass	Pass

R= Retest due to failed initial test

Table 8 1995 Sandcone Test Summary (Page 20 of 20)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
44	111.2	18.5	653	107.8	17.4	96.9	Pass	Pass
44	111.2	18.5	654	110.9	18.2	99.7	Pass	Pass
44	111.2	18.5	655	106.4	17.0	95.7	Pass	Pass
44	111.2	18.5	656	105.9	18.9	95.2	Pass	Pass
44	111.2	18.5	657	108.2	18.1	97.3	Pass	Pass
44	111.2	18.5	658	106.4	18.9	95.7	Pass	Pass
44	111.2	18.5	659	106.7	17.7	96.0	Pass	Pass
44	111.2	18.5	660	106.5	19.8	95.8	Pass	Pass
45	111.9	17.7	661	107.3	18.2	95.9	Pass	Pass
45	111.9	17.7	662	107.4	17.9	96.0	Pass	Pass
45	111.9	17.7	663	106.3	20.1	95.0	Pass	Pass
45	111.9	17.7	664	106.4	19.5	95.1	Pass	Pass
45	111.9	17.7	665	106.5	19.9	95.2	Pass	Pass
45	111.9	17.7	666	106.5	19.2	95.2	Pass	Pass
45	111.9	17.7	667	111.5	19.2	99.6	Pass	Pass
45	111.9	17.7	668	107.7	19.0	96.2	Pass	Pass
45	111.9	17.7	669	106.5	18.2	95.2	Pass	Pass
45	111.9	17.7	670	108.7	18.4	97.1	Pass	Pass
45	111.9	17.7	671	108.1	17.2	96.6	Pass	Pass
45	111.9	17.7	672	107.1	19.0	95.7	Pass	Pass
45	111.9	17.7	673	106.3	19.1	95.0	Pass	Pass
45	111.9	17.7	674	107.0	19.0	95.6	Pass	Pass
45	111.9	17.7	675	107.1	19.4	95.7	Pass	Pass
46	110.2	19.0	676	106.3	17.8	96.5	Pass	Pass
46	110.2	19.0	677	111.2	17.6	100.9	Pass	Pass
46	110.2	19.0	678	104.8	18.0	95.1	Pass	Pass
46	110.2	19.0	679	108.8	18.1	98.7	Pass	Pass
46	110.2	19.0	680	106.6	17.0	96.7	Pass	Pass
46	110.2	19.0	681	108.2	19.2	98.2	Pass	Pass
46	110.2	19.0	682	105.8	19.1	96.0	Pass	Pass
46	110.2	19.0	683	111.6	18.0	101.3	Pass	Pass
46	110.2	19.0	684	110.5	18.1	100.3	Pass	Pass
46	110.2	19.0	685	110.4	17.9	100.2	Pass	Pass
46	110.2	19.0	686R	110.4	18.0	100.2	Pass	Pass
46	110.2	19.0	687	107.9	18.2	97.9	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 1 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
1	107.5	18.1	1	103.7	20.2	96.5	Pass	Pass
1	107.5	18.1	2	104.7	21.5	97.4	Pass	Pass
1	107.5	18.1	3	107.4	18.4	99.9	Pass	Pass
1	107.5	18.1	4	108.9	19.2	101.3	Pass	Pass
1	107.5	18.1	5	104.9	19.5	97.6	Pass	Pass
1	107.5	18.1	6	104.4	19.6	97.1	Pass	Pass
1	107.5	18.1	7	103.7	19.4	96.5	Pass	Pass
1	107.5	18.1	8	103.2	20.3	96.0	Pass	Pass
1	107.5	18.1	9	106.3	21.1	98.9	Pass	Pass
1	107.5	18.1	10	112.6	19.3	104.7	Pass	Pass
1	107.5	18.1	11	107.2	20.3	99.7	Pass	Pass
1	107.5	18.1	12	108.5	17.0	100.9	Pass	Pass
1	107.5	18.1	13	109.9	17.7	102.2	Pass	Pass
1	107.5	18.1	14	103.0	18.6	95.8	Pass	Pass
1	107.5	18.1	15	111.4	17.5	103.6	Pass	Pass
2	108.4	17.8	16	114.6	16.9	105.7	Pass	Pass
2	108.4	17.8	17	111.4	19.0	102.8	Pass	Pass
2	108.4	17.8	18	111.1	18.4	102.5	Pass	Pass
2	108.4	17.8	19	109.2	16.9	100.7	Pass	Pass
2	108.4	17.8	20	106.1	19.7	97.9	Pass	Pass
2	108.4	17.8	21	110.1	18.8	101.6	Pass	Pass
2	108.4	17.8	22	111.9	18.7	103.2	Pass	Pass
2	108.4	17.8	23	109.4	18.7	100.9	Pass	Pass
2	108.4	17.8	24	109.1	19.2	100.6	Pass	Pass
2	108.4	17.8	25	108.1	20.2	99.7	Pass	Pass
2	108.4	17.8	26	108.2	18.9	99.8	Pass	Pass
2	108.4	17.8	27	107.0	19.9	98.7	Pass	Pass
2	108.4	17.8	28	103.1	19.9	95.1	Pass	Pass
2	108.4	17.8	29	108.1	20.1	99.7	Pass	Pass
2	108.4	17.8	30	107.2	19.9	98.9	Pass	Pass
3	108.8	17.5	31	103.9	19.7	95.5	Pass	Pass
3	108.8	17.5	32	104.7	20.2	96.2	Pass	Pass
3	108.8	17.5	33R	106.8	20.4	98.2	Pass	Pass
3	108.8	17.5	34	104.8	20.0	96.3	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 2 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
3	108.8	17.5	35	110.6	17.6	101.7	Pass	Pass
3	108.8	17.5	36	107.3	20.1	98.6	Pass	Pass
3	108.8	17.5	37	105.4	19.6	96.9	Pass	Pass
3	108.8	17.5	38	109.7	17.6	100.8	Pass	Pass
3	108.8	17.5	39	107.4	18.1	98.7	Pass	Pass
3	108.8	17.5	40	107.9	19.8	99.2	Pass	Pass
3	108.8	17.5	41	103.9	18.7	95.5	Pass	Pass
3	108.8	17.5	42	104.7	17.2	96.2	Pass	Pass
3	108.8	17.5	43	109.2	17.6	100.4	Pass	Pass
3	108.8	17.5	44	105.0	18.4	96.5	Pass	Pass
3	108.8	17.5	45	105.0	18.7	96.5	Pass	Pass
4	107.9	17.7	46	107.9	20.2	100.0	Pass	Pass
4	107.9	17.7	47	115.8	17.6	107.3	Pass	Pass
4	107.9	17.7	48	107.9	20.8	100.0	Pass	Pass
4	107.9	17.7	49	104.4	21.3	96.8	Pass	Pass
4	107.9	17.7	50	108.4	18.3	100.5	Pass	Pass
4	107.9	17.7	51	106.8	19.9	99.0	Pass	Pass
4	107.9	17.7	52	110.5	19.1	102.4	Pass	Pass
4	107.9	17.7	53	107.9	20.5	100.0	Pass	Pass
4	107.9	17.7	54	110.9	19.3	102.8	Pass	Pass
4	107.9	17.7	55	106.8	21.1	99.0	Pass	Pass
4	107.9	17.7	56R	107.7	18.3	99.8	Pass	Pass
4	107.9	17.7	57	107.4	19.0	99.5	Pass	Pass
4	107.9	17.7	58R	109.4	17.3	101.4	Pass	Pass
4	107.9	17.7	59	110.7	17.7	102.6	Pass	Pass
4	107.9	17.7	60R	110.5	19.1	102.4	Pass	Pass
5	108.3	17.2	61	107.9	19.3	99.6	Pass	Pass
5	108.3	17.2	62	107.6	18.0	99.4	Pass	Pass
5	108.3	17.2	63	110.5	17.7	102.0	Pass	Pass
5	108.3	17.2	64	111.8	17.5	103.2	Pass	Pass
5	108.3	17.2	65	111.4	18.2	102.9	Pass	Pass
5	108.3	17.2	66	106.9	19.4	98.7	Pass	Pass
5	108.3	17.2	67	112.9	17.4	104.2	Pass	Pass
5	108.3	17.2	68	113.0	17.0	104.3	Pass	Pass

R= Retest due to failed initial test.

Table 9 1996 Sandcone Test Summary (Page 3 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
5	108.3	17.2	69	108.4	18.6	100.1	Pass	Pass
5	108.3	17.2	70	112.1	18.3	103.5	Pass	Pass
5	108.3	17.2	71	108.4	19.1	100.1	Pass	Pass
5	108.3	17.2	72	106.9	19.7	98.7	Pass	Pass
5	108.3	17.2	73	114.8	17.6	106.0	Pass	Pass
5	108.3	17.2	74	112.0	19.0	103.4	Pass	Pass
5	108.3	17.2	75	111.7	18.1	103.1	Pass	Pass
6	108.7	17.1	76	108.0	17.1	99.4	Pass	Pass
6	108.7	17.1	77	106.1	20.0	97.6	Pass	Pass
6	108.7	17.1	78	111.1	18.1	102.2	Pass	Pass
6	108.7	17.1	79R	109.7	18.4	100.9	Pass	Pass
6	108.7	17.1	80	113.1	17.0	104.0	Pass	Pass
6	108.7	17.1	81	112.2	17.8	103.2	Pass	Pass
6	108.7	17.1	82R	113.9	16.9	104.8	Pass	Pass
6	108.7	17.1	83	110.6	18.8	101.7	Pass	Pass
6	108.7	17.1	84	113.5	17.1	104.4	Pass	Pass
6	108.7	17.1	85R	107.3	17.8	98.7	Pass	Pass
6	108.7	17.1	86R	104.4	20.2	96.0	Pass	Pass
6	108.7	17.1	87	108.8	18.7	100.1	Pass	Pass
6	108.7	17.1	88	109.6	17.6	100.8	Pass	Pass
6	108.7	17.1	89	109.3	20.3	100.6	Pass	Pass
6	108.7	17.1	90	104.8	20.1	96.4	Pass	Pass
7	108.7	18.4	91	109.4	20.9	100.6	Pass	Pass
7	108.7	18.4	92	110.7	19.0	101.8	Pass	Pass
7	108.7	18.4	93	106.3	19.1	97.8	Pass	Pass
7	108.7	18.4	94	108.2	17.7	99.5	Pass	Pass
7	108.7	18.4	95	110.0	18.6	101.2	Pass	Pass
7	108.7	18.4	96	106.0	18.9	97.5	Pass	Pass
7	108.7	18.4	97R	108.7	17.5	100.0	Pass	Pass
7	108.7	18.4	98	108.8	17.7	100.1	Pass	Pass
7	108.7	18.4	99	106.2	18.4	97.7	Pass	Pass
7	108.7	18.4	100	106.6	19.6	98.1	Pass	Pass
7	108.7	18.4	101	106.9	17.9	98.3	Pass	Pass
7	108.7	18.4	102	110.5	19.0	101.7	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 4 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
7	108.7	18.4	103	110.4	19.4	101.6	Pass	Pass
7	108.7	18.4	104	112.2	17.3	103.2	Pass	Pass
7	108.7	18.4	105R	104.3	17.6	96.0	Pass	Pass
8	109.4	18.3	106R	111.4	17.1	101.8	Pass	Pass
8	109.4	18.3	107	112.9	17.6	103.2	Pass	Pass
8	109.4	18.3	108	110.3	18.1	100.8	Pass	Pass
8	109.4	18.3	109R	111.5	17.3	101.9	Pass	Pass
8	109.4	18.3	110	110.7	17.3	101.2	Pass	Pass
8	109.4	18.3	111	110.5	17.5	101.0	Pass	Pass
8	109.4	18.3	112R	104.1	18.2	95.2	Pass	Pass
8	109.4	18.3	113R	104.2	18.0	95.2	Pass	Pass
8	109.4	18.3	114R	108.3	17.9	99.0	Pass	Pass
8	109.4	18.3	115	110.7	17.0	101.2	Pass	Pass
8	109.4	18.3	116	112.1	17.4	102.5	Pass	Pass
8	109.4	18.3	117	110.5	18.1	101.0	Pass	Pass
8	109.4	18.3	118	106.6	19.2	97.4	Pass	Pass
8	109.4	18.3	119	104.2	23.0	95.2	Pass	Pass
8	109.4	18.3	120	108.3	19.1	99.0	Pass	Pass
9	107.3	18.8	121	105.8	19.5	98.6	Pass	Pass
9	107.3	18.8	122	109.4	18.4	102.0	Pass	Pass
9	107.3	18.8	123	102.4	18.9	95.4	Pass	Pass
9	107.3	18.8	124	108.7	19.5	101.3	Pass	Pass
9	107.3	18.8	125	109.5	17.7	102.1	Pass	Pass
9	107.3	18.8	126	113.3	18.0	105.6	Pass	Pass
9	107.3	18.8	127	104.2	19.9	97.1	Pass	Pass
9	107.3	18.8	128R	105.4	19.1	98.2	Pass	Pass
9	107.3	18.8	129	109.7	19.5	102.2	Pass	Pass
9	107.3	18.8	130	109.0	18.2	101.6	Pass	Pass
9	107.3	18.8	131	106.4	20.2	99.2	Pass	Pass
9	107.3	18.8	132	111.8	18.0	104.2	Pass	Pass
9	107.3	18.8	133	104.5	20.0	97.4	Pass	Pass
9	107.3	18.8	134	106.1	19.7	98.9	Pass	Pass
9	107.3	18.8	135	109.7	17.2	102.2	Pass	Pass
10	109.6	18.3	136	109.7	17.7	16.1	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 5 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
10	109.6	18.3	137	111.5	19.0	101.7	Pass	Pass
10	109.6	18.3	138	107.8	18.0	98.4	Pass	Pass
10	109.6	18.3	139	109.7	18.2	100.1	Pass	Pass
10	109.6	18.3	140	111.5	17.3	101.7	Pass	Pass
10	109.6	18.3	141	111.4	17.1	101.6	Pass	Pass
10	109.6	18.3	142R	108.1	18.6	98.6	Pass	Pass
10	109.6	18.3	143R	107.0	18.6	97.6	Pass	Pass
10	109.6	18.3	144	104.5	18.9	95.3	Pass	Pass
10	109.6	18.3	145	106.8	19.6	97.4	Pass	Pass
10	109.6	18.3	146	105.9	18.4	96.6	Pass	Pass
10	109.6	18.3	147	104.5	19.9	95.3	Pass	Pass
10	109.6	18.3	148R	106.9	17.9	97.5	Pass	Pass
10	109.6	18.3	149R	108.7	18.2	99.2	Pass	Pass
10	109.6	18.3	150	109.2	18.7	99.6	Pass	Pass
11	110.3	16.7	151	106.7	19.7	96.7	Pass	Pass
11	110.3	16.7	152	106.7	18.7	96.7	Pass	Pass
11	110.3	16.7	153R	110.3	17.8	100.0	Pass	Pass
11	110.3	16.7	154	109.4	18.3	99.2	Pass	Pass
11	110.3	16.7	155	112.0	17.6	101.5	Pass	Pass
11	110.3	16.7	156	110.2	18.2	99.9	Pass	Pass
11	110.3	16.7	157	111.9	17.7	101.5	Pass	Pass
11	110.3	16.7	158	108.6	19.1	98.5	Pass	Pass
11	110.3	16.7	159	106.2	18.3	96.3	Pass	Pass
11	110.3	16.7	160	106.7	19.8	96.7	Pass	Pass
11	110.3	16.7	161	110.0	17.3	99.7	Pass	Pass
11	110.3	16.7	162	109.5	18.4	99.3	Pass	Pass
11	110.3	16.7	163	105.9	18.4	96.0	Pass	Pass
11	110.3	16.7	164	104.7	19.7	94.9	Fail/NR (1)	Pass
11	110.3	16.7	165	107.0	17.3	97.0	Pass	Pass
12	110.3	17.7	166	110.5	17.5	100.2	Pass	Pass
12	110.3	17.7	167	106.2	18.0	96.3	Pass	Pass
12	110.3	17.7	168	110.4	18.4	100.1	Pass	Pass
12	110.3	17.7	169	106.4	17.8	96.5	Pass	Pass
12	110.3	17.7	170	113.0	17.3	102.4	Pass	Pass

R= Retest due to failed initial test

(1) Failed Test identified during WNI Field Audit. NR indicates area was not reworked. See Table 11.

Table 9 1996 Sandcone Test Summary (Page 6 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
12	110.3	17.7	171	111.9	18.8	101.5	Pass	Pass
12	110.3	17.7	172	113.6	17.9	103.0	Pass	Pass
12	110.3	17.7	173	114.1	16.9	103.4	Pass	Pass
12	110.3	17.7	174	115.6	17.6	104.8	Pass	Pass
12	110.3	17.7	175	109.5	20.0	99.3	Pass	Pass
12	110.3	17.7	176	108.8	18.4	98.6	Pass	Pass
12	110.3	17.7	177	108.7	20.4	98.5	Pass	Pass
12	110.3	17.7	178	108.6	19.2	98.5	Pass	Pass
12	110.3	17.7	179R	106.0	19.8	96.1	Pass	Pass
12	110.3	17.7	180	113.4	16.9	102.8	Pass	Pass
13	110.0	17.9	181	108.0	19.2	98.2	Pass	Pass
13	110.0	17.9	182	109.5	18.4	99.5	Pass	Pass
13	110.0	17.9	183	106.2	20.1	96.5	Pass	Pass
13	110.0	17.9	184	108.7	18.0	98.8	Pass	Pass
13	110.0	17.9	185	112.4	17.8	102.2	Pass	Pass
13	110.0	17.9	186	114.5	16.9	104.1	Pass	Pass
13	110.0	17.9	187	108.3	21.2	98.5	Pass	Pass
13	110.0	17.9	188	111.5	17.8	101.4	Pass	Pass
13	110.0	17.9	189	109.5	17.8	99.5	Pass	Pass
13	110.0	17.9	190	111.0	17.0	100.9	Pass	Pass
13	110.0	17.9	191	116.2	16.9	105.6	Pass	Pass
13	110.0	17.9	192	108.0	17.4	98.2	Pass	Pass
13	110.0	17.9	193	110.7	17.4	100.6	Pass	Pass
13	110.0	17.9	194	106.8	19.0	97.1	Pass	Pass
13	110.0	17.9	195	110.9	19.0	100.8	Pass	Pass
14	109.2	17.5	196	113.0	18.1	103.5	Pass	Pass
14	109.2	17.5	197	111.1	18.2	101.7	Pass	Pass
14	109.2	17.5	198	109.8	18.3	100.5	Pass	Pass
14	109.2	17.5	199	110.9	18.6	101.6	Pass	Pass
14	109.2	17.5	200	111.2	18.1	101.8	Pass	Pass
14	109.2	17.5	201	111.3	18.5	101.9	Pass	Pass
14	109.2	17.5	202	107.0	19.8	98.0	Pass	Pass
14	109.2	17.5	203	109.4	20.3	100.2	Pass	Pass
14	109.2	17.5	204	105.8	20.9	96.9	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 7 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
14	109.2	17.5	205	108.9	18.4	99.7	Pass	Pass
14	109.2	17.5	206	111.7	18.5	102.3	Pass	Pass
14	109.2	17.5	207R	110.1	19.3	100.8	Pass	Pass
14	109.2	17.5	208	106.0	20.0	97.1	Pass	Pass
14	109.2	17.5	209R	106.1	20.2	97.2	Pass	Pass
14	109.2	17.5	210	111.2	18.2	101.8	Pass	Pass
15	110.1	17.1	211	113.0	17.3	102.6	Pass	Pass
15	110.1	17.1	212R	108.0	22.0	98.1	Pass	Fail/NR (1)
15	110.1	17.1	213	104.6	16.6	95.0	Pass	Pass
15	110.1	17.1	214	105.7	17.4	96.0	Pass	Pass
15	110.1	17.1	215	109.8	18.6	99.7	Pass	Pass
15	110.1	17.1	216	112.8	17.1	102.5	Pass	Pass
15	110.1	17.1	217	111.4	17.5	101.2	Pass	Pass
15	110.1	17.1	218R	108.2	18.7	98.3	Pass	Pass
15	110.1	17.1	219	107.2	16.9	97.4	Pass	Pass
15	110.1	17.1	220	110.6	17.7	100.5	Pass	Pass
15	110.1	17.1	221	111.1	18.8	100.9	Pass	Pass
15	110.1	17.1	222	110.9	16.9	100.7	Pass	Pass
15	110.1	17.1	223	105.5	19.8	95.8	Pass	Pass
15	110.1	17.1	224	112.1	17.3	101.8	Pass	Pass
15	110.1	17.1	225	109.4	18.8	99.4	Pass	Pass
16	109.6	17.5	226	110.4	17.6	100.7	Pass	Pass
16	109.6	17.5	227	106.7	18.3	97.4	Pass	Pass
16	109.6	17.5	228	114.0	17.4	104.0	Pass	Pass
16	109.6	17.5	229	104.4	17.8	95.3	Pass	Pass
16	109.6	17.5	230	108.0	18.7	98.5	Pass	Pass
16	109.6	17.5	231	113.2	18.3	103.3	Pass	Pass
16	109.6	17.5	232	105.5	17.5	96.3	Pass	Pass
16	109.6	17.5	233	108.9	18.0	99.4	Pass	Pass
16	109.6	17.5	234	111.0	17.9	101.3	Pass	Pass
16	109.6	17.5	235R	108.4	18.5	98.9	Pass	Pass
16	109.6	17.5	236	110.2	18.6	100.5	Pass	Pass
16	109.6	17.5	237	109.6	20.4	100.0	Pass	Pass
16	109.6	17.5	238	110.1	18.4	100.5	Pass	Pass

R= Retest due to failed initial test

(1) Failed Test identified during WNI Field Audit. NR indicates area was not reworked. See Table 12.

Table 9 1996 Sandcone Test Summary (Page 8 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
16	109.6	17.5	239	105.4	20.6	96.2	Pass	Pass
16	109.6	17.5	240	108.6	17.2	99.1	Pass	Pass
17	110.8	17.1	241	112.0	18.1	101.1	Pass	Pass
17	110.8	17.1	242	111.5	17.8	100.6	Pass	Pass
17	110.8	17.1	243	111.6	17.4	100.7	Pass	Pass
17	110.8	17.1	244	112.0	18.0	101.1	Pass	Pass
17	110.8	17.1	245	112.6	17.8	101.6	Pass	Pass
17	110.8	17.1	246R	104.5	18.2	94.3	Pass	Pass
17	110.8	17.1	247R	102.9	19.7	92.9	Pass	Pass
17	110.8	17.1	248	109.1	17.8	98.5	Pass	Pass
17	110.8	17.1	249	109.9	18.4	99.2	Pass	Pass
17	110.8	17.1	250	111.4	18.2	100.5	Pass	Pass
17	110.8	17.1	251	103.7	18.5	93.6	Pass	Pass
17	110.8	17.1	252	107.1	20.9	96.7	Pass	Pass
17	110.8	17.1	253	112.8	17.1	101.8	Pass	Pass
17	110.8	17.1	254	104.3	18.0	94.1	Pass	Pass
17	110.8	17.1	255R	107.5	18.4	97.0	Pass	Pass
18	109.7	17.5	256R	107.7	17.6	98.2	Pass	Pass
18	109.7	17.5	257	108.3	19.1	98.7	Pass	Pass
18	109.7	17.5	258	110.9	18.1	101.1	Pass	Pass
18	109.7	17.5	259	109.4	18.1	99.7	Pass	Pass
18	109.7	17.5	260R	106.4	20.0	97.0	Pass	Pass
18	109.7	17.5	261	113.2	17.0	103.2	Pass	Pass
18	109.7	17.5	262	107.4	17.9	97.9	Pass	Pass
18	109.7	17.5	264R	104.3	18.5	95.1	Pass	Pass
18	109.7	17.5	265R	107.6	18.0	98.1	Pass	Pass
18	109.7	17.5	266R	107.1	17.9	97.6	Pass	Pass
18	109.7	17.5	267	108.4	17.1	98.8	Pass	Pass
18	109.7	17.5	268R	104.3	16.9	95.1	Pass	Pass
18	109.7	17.5	269	104.8	16.9	95.5	Pass	Pass
18	109.7	17.5	270	104.9	20.1	95.6	Pass	Pass
19	109.7	18.2	271	109.2	17.1	99.6	Pass	Pass
19	109.7	18.2	272	111.0	17.0	101.2	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 9 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
19	109.7	18.2	273	107.7	17.7	98.2	Pass	Pass
19	109.7	18.2	274	106.2	18.3	96.8	Pass	Pass
19	109.7	18.2	275	109.3	18.7	99.6	Pass	Pass
19	109.7	18.2	276	111.5	17.7	101.6	Pass	Pass
19	109.7	18.2	277	110.8	18.2	101.0	Pass	Pass
19	109.7	18.2	278	106.9	19.6	97.4	Pass	Pass
19	109.7	18.2	279	105.4	18.4	96.1	Pass	Pass
19	109.7	18.2	280	107.0	17.0	97.5	Pass	Pass
19	109.7	18.2	281	108.2	18.4	98.6	Pass	Pass
19	109.7	18.2	282R	105.1	18.7	95.8	Pass	Pass
19	109.7	18.2	283	111.5	18.4	101.6	Pass	Pass
19	109.7	18.2	284	108.6	19.2	99.0	Pass	Pass
19	109.7	18.2	285	105.3	19.7	96.0	Pass	Pass
20	110.2	17.6	286	105.9	20.5	96.1	Pass	Pass
20	110.2	17.6	287	109.4	20.0	99.3	Pass	Pass
20	110.2	17.6	288	106.5	16.9	96.6	Pass	Pass
20	110.2	17.6	289	110.9	17.2	100.6	Pass	Pass
20	110.2	17.6	290	107.5	18.5	97.5	Pass	Pass
20	110.2	17.6	291R	108.8	18.7	98.7	Pass	Pass
20	110.2	17.6	292	114.5	17.4	103.9	Pass	Pass
20	110.2	17.6	293	106.3	17.5	96.5	Pass	Pass
20	110.2	17.6	294	104.7	18.5	95.0	Pass	Pass
20	110.2	17.6	295	103.5	17.6	93.9	Pass	Pass
20	110.2	17.6	296	99.8	20.3	90.6	Pass	Pass
20	110.2	17.6	297R	110.2	18.1	100.0	Pass	Pass
20	110.2	17.6	298R	109.2	17.5	99.1	Pass	Pass
20	110.2	17.6	299	109.7	18.0	99.5	Pass	Pass
20	110.2	17.6	300	105.5	18.9	95.7	Pass	Pass
21	109.7	17.0	301	105.1	18.5	95.8	Pass	Pass
21	109.7	17.0	302	105.3	20.0	96.0	Pass	Pass
21	109.7	17.0	303R	107.1	17.9	97.6	Pass	Pass
21	109.7	17.0	304R	104.7	18.2	95.4	Pass	Pass
21	109.7	17.0	305	104.8	19.1	95.5	Pass	Pass
21	109.7	17.0	306	108.2	19.4	98.6	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 10 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
21	109.7	17.0	308	105.1	20.8	95.8	Pass	Pass
21	109.7	17.0	309	109.7	17.7	100.0	Pass	Pass
21	109.7	17.0	310	111.4	17.7	101.5	Pass	Pass
21	109.7	17.0	311	112.3	17.0	102.4	Pass	Pass
21	109.7	17.0	312	108.8	20.0	99.2	Pass	Pass
21	109.7	17.0	313R	104.5	17.1	95.3	Pass	Pass
21	109.7	17.0	314R	106.1	18.6	96.7	Pass	Pass
21	109.7	17.0	315R	107.7	17.4	98.2	Pass	Pass
22	109.9	17.3	316	110.1	17.2	100.2	Pass	Pass
22	109.9	17.3	317	106.7	18.6	97.1	Pass	Pass
22	109.9	17.3	318R	110.5	17.6	100.5	Pass	Pass
22	109.9	17.3	319	106.2	20.1	96.6	Pass	Pass
22	109.9	17.3	320R	104.4	17.5	95.0	Pass	Pass
22	109.9	17.3	321R	104.4	19.1	95.0	Pass	Pass
22	109.9	17.3	322	110.5	17.3	100.5	Pass	Pass
22	109.9	17.3	323R	108.5	17.0	98.7	Pass	Pass
22	109.9	17.3	324	108.5	18.9	98.7	Pass	Pass
22	109.9	17.3	325	111.4	19.3	101.4	Pass	Pass
22	109.9	17.3	326	109.9	17.4	100.0	Pass	Pass
22	109.9	17.3	327	109.4	19.3	99.5	Pass	Pass
22	109.9	17.3	328	108.1	18.7	98.4	Pass	Pass
22	109.9	17.3	329	113.7	17.0	103.5	Pass	Pass
22	109.9	17.3	330	108.7	18.6	98.9	Pass	Pass
23	110.6	17.9	331	105.9	20.1	95.8	Pass	Pass
23	110.6	17.9	332	106.9	17.0	96.7	Pass	Pass
23	110.6	17.9	333	107.1	19.1	96.8	Pass	Pass
23	110.6	17.9	334	105.5	19.9	95.4	Pass	Pass
23	110.6	17.9	335R	107.5	17.8	97.2	Pass	Pass
23	110.6	17.9	336	105.1	18.8	95.0	Pass	Pass
23	110.6	17.9	337	105.0	20.3	94.9	Fail/NR (1)	Pass
23	110.6	17.9	338	105.2	20.0	95.1	Pass	Pass
23	110.6	17.9	339	105.7	21.4	95.6	Pass	Pass
23	110.6	17.9	340	108.7	18.0	98.3	Pass	Pass

R= Retest due to failed initial test

(1) Failed Test identified during WNI Field Audit. NR indicates area was not reworked. See Table 11.

Table 9 1996 Sandcone Test Summary (Page 11 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
23	110.6	17.9	341	107.5	19.4	97.2	Pass	Pass
23	110.6	17.9	342	105.8	19.5	95.7	Pass	Pass
23	110.6	17.9	343	105.3	18.0	95.2	Pass	Pass
23	110.6	17.9	344R	106.9	18.0	96.7	Pass	Pass
23	110.6	17.9	345	111.3	17.0	100.6	Pass	Pass
24	110.9	17.3	346	107.4	17.0	96.8	Pass	Pass
24	110.9	17.3	347	107.3	19.6	96.8	Pass	Pass
24	110.9	17.3	348	111.7	17.7	100.7	Pass	Pass
24	110.9	17.3	349	108.8	19.3	98.1	Pass	Pass
24	110.9	17.3	350	105.8	21.3	95.4	Pass	Pass
24	110.9	17.3	352	106.7	20.1	96.2	Pass	Pass
24	110.9	17.3	353	114.5	18.2	103.2	Pass	Pass
24	110.9	17.3	354	115.6	18.0	104.2	Pass	Pass
24	110.9	17.3	355	110.4	18.8	99.5	Pass	Pass
24	110.9	17.3	356	105.5	21.3	95.1	Pass	Pass
24	110.9	17.3	357	111.3	17.0	100.4	Pass	Pass
24	110.9	17.3	358	110.2	19.5	99.4	Pass	Pass
24	110.9	17.3	359	112.1	16.9	101.1	Pass	Pass
24	110.9	17.3	360	109.7	17.8	98.9	Pass	Pass
25	110.9	16.9	361	106.4	18.8	95.9	Pass	Pass
25	110.9	16.9	362	108.4	20.6	97.7	Pass	Pass
25	110.9	16.9	363	106.5	20.2	96.0	Pass	Pass
25	110.9	16.9	364	110.3	19.8	99.5	Pass	Pass
25	110.9	16.9	365	109.6	17.3	98.8	Pass	Pass
25	110.9	16.9	366	111.8	18.9	100.8	Pass	Pass
25	110.9	16.9	367	108.9	18.9	98.2	Pass	Pass
25	110.9	16.9	368	110.4	17.9	99.5	Pass	Pass
25	110.9	16.9	369	107.3	20.0	96.8	Pass	Pass
25	110.9	16.9	370	105.6	20.0	95.2	Pass	Pass
25	110.9	16.9	371R	107.4	19.5	96.8	Pass	Pass
25	110.9	16.9	372	111.4	20.4	100.5	Pass	Pass
25	110.9	16.9	373	106.9	19.8	96.4	Pass	Pass
25	110.9	16.9	374	109.6	18.3	98.8	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 12 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
25	110.9	16.9	375	110.1	17.9	99.3	Pass	Pass
26	109.6	17.6	376	105.8	19.7	96.5	Pass	Pass
26	109.6	17.6	377R	107.7	19.6	98.3	Pass	Pass
26	109.6	17.6	378	112.1	16.9	102.3	Pass	Pass
26	109.6	17.6	379	111.1	17.9	101.4	Pass	Pass
26	109.6	17.6	380	101.4	19.9	92.5	Pass	Pass
26	109.6	17.6	381	105.4	21.2	96.2	Pass	Pass
26	109.6	17.6	382	113.1	19.4	103.2	Pass	Pass
26	109.6	17.6	383	108.9	20.5	99.4	Pass	Pass
26	109.6	17.6	384	110.1	19.5	100.5	Pass	Pass
26	109.6	17.6	385	104.5	21.5	95.3	Pass	Pass
26	109.6	17.6	386	100.5	18.4	91.7	Pass	Pass
26	109.6	17.6	387	102.5	19.0	93.5	Pass	Pass
26	109.6	17.6	388	106.3	18.1	97.0	Pass	Pass
26	109.6	17.6	389	108.4	18.6	98.9	Pass	Pass
26	109.6	17.6	390	107.8	20.3	98.4	Pass	Pass
27	110.3	17.4	391	109.6	18.9	99.4	Pass	Pass
27	110.3	17.4	392	107.7	20.0	97.6	Pass	Pass
27	110.3	17.4	393	113.0	17.9	102.4	Pass	Pass
27	110.3	17.4	394	107.2	19.5	97.2	Pass	Pass
27	110.3	17.4	396	104.9	20.8	95.1	Pass	Pass
27	110.3	17.4	397	111.3	17.4	100.9	Pass	Pass
27	110.3	17.4	398	113.1	17.0	102.5	Pass	Pass
27	110.3	17.4	399	104.8	19.9	95.0	Pass	Pass
27	110.3	17.4	400	106.8	20.1	96.8	Pass	Pass
27	110.3	17.4	401	112.5	18.1	102.0	Pass	Pass
27	110.3	17.4	402	109.6	16.9	99.4	Pass	Pass
27	110.3	17.4	403	109.8	18.8	99.5	Pass	Pass
27	110.3	17.4	404	105.7	18.8	95.8	Pass	Pass
27	110.3	17.4	405	104.8	19.8	95.0	Pass	Pass
28	109.7	17.4	406	106.2	18.3	96.8	Pass	Pass
28	109.7	17.4	407R	110.5	18.2	100.7	Pass	Pass
28	109.7	17.4	408	106.0	17.2	96.6	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 13 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
28	109.7	17.4	409R	107.9	17.2	98.4	Pass	Pass
28	109.7	17.4	410	106.6	19.0	97.2	Pass	Pass
28	109.7	17.4	411	108.0	17.7	98.5	Pass	Pass
28	109.7	17.4	412	107.7	19.4	98.2	Pass	Pass
28	109.7	17.4	413R	107.0	17.1	97.5	Pass	Pass
28	109.7	17.4	414	107.6	19.8	98.1	Pass	Pass
28	109.7	17.4	415	106.7	19.0	97.3	Pass	Pass
28	109.7	17.4	416	105.5	18.8	96.2	Pass	Pass
28	109.7	17.4	417	105.2	20.3	95.9	Pass	Pass
28	109.7	17.4	418	111.2	17.5	101.4	Pass	Pass
28	109.7	17.4	419	110.2	17.1	100.5	Pass	Pass
28	109.7	17.4	420	107.9	18.3	98.4	Pass	Pass
29	110.5	17.2	421	105.0	17.4	95.0	Pass	Pass
29	110.5	17.2	422	108.8	19.3	98.5	Pass	Pass
29	110.5	17.2	423	106.2	16.9	96.1	Pass	Pass
29	110.5	17.2	424R	111.8	17.8	101.2	Pass	Pass
29	110.5	17.2	425	113.0	17.0	102.3	Pass	Pass
29	110.5	17.2	426	111.7	17.2	101.1	Pass	Pass
29	110.5	17.2	427	108.4	18.4	98.1	Pass	Pass
29	110.5	17.2	428	110.3	17.8	99.8	Pass	Pass
29	110.5	17.2	429	109.4	18.5	99.0	Pass	Pass
29	110.5	17.2	430	110.1	17.8	99.6	Pass	Pass
29	110.5	17.2	431	105.5	17.8	95.5	Pass	Pass
29	110.5	17.2	432	108.1	19.7	97.8	Pass	Pass
29	110.5	17.2	433	109.2	18.4	98.8	Pass	Pass
29	110.5	17.2	434	112.0	17.9	101.4	Pass	Pass
29	110.5	17.2	435	109.6	18.7	99.2	Pass	Pass
30	109.8	18.2	436	111.0	19.0	101.1	Pass	Pass
30	109.8	18.2	437	108.3	20.8	98.6	Pass	Pass
30	109.8	18.2	438	111.4	16.9	101.5	Pass	Pass
30	109.8	18.2	440	110.6	18.0	100.7	Pass	Pass
30	109.8	18.2	441	111.4	17.4	101.5	Pass	Pass
30	109.8	18.2	442	109.1	18.0	99.4	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 14 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	**Maximum Dry Density (lbs/ft^3)**	**Optimum Moisture Content (%)**	**Test No.**	**Dry Density (lbs/ft^3)**	**Moisture Content (%)**	**Percent Proctor (%)**	**Compaction**	**Moisture**
30	109.8	18.2	443	106.3	19.8	96.8	Pass	Pass
30	109.8	18.2	444	110.5	17.0	100.6	Pass	Pass
30	109.8	18.2	445	107.1	19.0	97.5	Pass	Pass
30	109.8	18.2	446	106.5	19.3	97.0	Pass	Pass
30	109.8	18.2	447	109.8	17.6	100.0	Pass	Pass
30	109.8	18.2	448	107.6	18.7	98.0	Pass	Pass
30	109.8	18.2	449	106.8	19.7	97.3	Pass	Pass
30	109.8	18.2	450	106.1	19.5	96.6	Pass	Pass
31	109.0	18.0	451	109.7	18.1	100.6	Pass	Pass
31	109.0	18.0	452	107.9	16.9	99.0	Pass	Pass
31	109.0	18.0	453	110.7	17.8	101.6	Pass	Pass
31	109.0	18.0	454	109.4	18.4	100.4	Pass	Pass
31	109.0	18.0	455R	107.7	16.9	98.8	Pass	Pass
31	109.0	18.0	456R	105.4	17.6	96.7	Pass	Pass
31	109.0	18.0	457	108.8	16.9	99.8	Pass	Pass
31	109.0	18.0	458	105.1	19.3	96.4	Pass	Pass
31	109.0	18.0	459	107.4	18.6	98.5	Pass	Pass
31	109.0	18.0	460	109.0	19.1	100.0	Pass	Pass
31	109.0	18.0	461	105.0	20.4	96.3	Pass	Pass
31	109.0	18.0	462	106.8	22.0	98.0	Pass	Pass
31	109.0	18.0	463	112.4	16.9	103.1	Pass	Pass
31	109.0	18.0	464	113.1	17.0	103.8	Pass	Pass
31	109.0	18.0	465	108.8	17.6	99.8	Pass	Pass
32	108.3	18.6	466	108.7	17.1	100.4	Pass	Pass
32	108.3	18.6	467	104.1	20.1	96.1	Pass	Pass
32	108.3	18.6	468	112.5	18.2	103.9	Pass	Pass
32	108.3	18.6	469	103.7	20.7	95.8	Pass	Pass
32	108.3	18.6	470	108.2	18.3	99.9	Pass	Pass
32	108.3	18.6	471	112.8	17.1	104.2	Pass	Pass
32	108.3	18.6	472	109.2	17.3	100.8	Pass	Pass
32	108.3	18.6	473	103.3	22.0	95.4	Pass	Pass
32	108.3	18.6	474	109.4	18.7	101.0	Pass	Pass
32	108.3	18.6	475R	104.1	17.4	96.1	Pass	Pass
32	108.3	18.6	476R	105.6	18.1	97.5	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 15 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
32	108.3	18.6	477	103.1	19.8	95.2	Pass	Pass
32	108.3	18.6	478R	105.9	18.8	97.8	Pass	Pass
32	108.3	18.6	479	103.6	19.0	95.7	Pass	Pass
32	108.3	18.6	480	107.8	18.2	99.5	Pass	Pass
33	109.0	18.1	481R	108.2	18.4	99.3	Pass	Pass
33	109.0	18.1	482	111.1	16.9	101.9	Pass	Pass
33	109.0	18.1	484	103.7	21.2	95.1	Pass	Pass
33	109.0	18.1	485	107.7	19.9	98.8	Pass	Pass
33	109.0	18.1	486	108.3	19.1	99.4	Pass	Pass
33	109.0	18.1	487	108.4	18.8	99.4	Pass	Pass
33	109.0	18.1	488	108.3	18.8	99.4	Pass	Pass
33	109.0	18.1	489R	103.8	20.8	95.2	Pass	Pass
33	109.0	18.1	490	105.0	21.1	96.3	Pass	Pass
33	109.0	18.1	491	108.9	19.0	99.9	Pass	Pass
33	109.0	18.1	492	109.8	19.3	100.7	Pass	Pass
33	109.0	18.1	493	109.1	18.8	100.1	Pass	Pass
33	109.0	18.1	494	111.0	17.7	101.8	Pass	Pass
33	109.0	18.1	495R	106.0	21.0	97.2	Pass	Pass
34	109.2	17.9	496R	113.1	17.2	103.6	Pass	Pass
34	109.2	17.9	497	107.3	18.8	98.3	Pass	Pass
34	109.2	17.9	498R	107.5	18.5	98.4	Pass	Pass
34	109.2	17.9	499	105.8	17.2	96.9	Pass	Pass
34	109.2	17.9	500	106.9	20.2	97.9	Pass	Pass
34	109.2	17.9	501	108.2	19.3	99.1	Pass	Pass
34	109.2	17.9	502	106.3	20.0	97.3	Pass	Pass
34	109.2	17.9	503R	104.0	20.0	95.2	Pass	Pass
34	109.2	17.9	504	114.6	17.4	104.9	Pass	Pass
34	109.2	17.9	505	113.1	17.8	103.6	Pass	Pass
34	109.2	17.9	506	109.1	19.1	99.9	Pass	Pass
34	109.2	17.9	507	106.0	19.2	97.1	Pass	Pass
34	109.2	17.9	508	109.0	18.5	99.8	Pass	Pass
34	109.2	17.9	509	105.1	19.1	96.2	Pass	Pass
34	109.2	17.9	510R	108.4	20.3	99.3	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 16 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
35	108.9	17.5	511	110.8	17.3	101.7	Pass	Pass
35	108.9	17.5	512	107.5	18.6	98.7	Pass	Pass
35	108.9	17.5	513	108.0	19.2	99.2	Pass	Pass
35	108.9	17.5	514	113.1	17.2	103.9	Pass	Pass
35	108.9	17.5	515R	108.2	19.2	99.4	Pass	Pass
35	108.9	17.5	516	106.8	20.2	98.1	Pass	Pass
35	108.9	17.5	517	110.2	18.2	101.2	Pass	Pass
35	108.9	17.5	518	112.6	17.8	103.4	Pass	Pass
35	108.9	17.5	519	108.1	19.5	99.3	Pass	Pass
35	108.9	17.5	520	109.5	17.5	100.6	Pass	Pass
35	108.9	17.5	521	105.3	19.1	96.7	Pass	Pass
35	108.9	17.5	522	109.4	17.5	100.5	Pass	Pass
35	108.9	17.5	523	112.6	17.5	103.4	Pass	Pass
35	108.9	17.5	524	110.3	17.8	101.3	Pass	Pass
35	108.9	17.5	525	110.4	17.2	101.4	Pass	Pass
36	109.0	17.9	526	106.5	19.2	97.7	Pass	Pass
36	109.0	17.9	529	113.3	17.2	103.9	Pass	Pass
36	109.0	17.9	530	109.3	18.3	100.3	Pass	Pass
36	109.0	17.9	531	111.5	17.8	102.3	Pass	Pass
36	109.0	17.9	532	111.5	17.0	102.3	Pass	Pass
36	109.0	17.9	533	114.1	17.0	104.7	Pass	Pass
36	109.0	17.9	534	114.3	16.9	104.9	Pass	Pass
36	109.0	17.9	535	113.0	17.2	103.7	Pass	Pass
36	109.0	17.9	536R	105.0	17.6	96.3	Pass	Pass
36	109.0	17.9	537	110.8	17.6	101.7	Pass	Pass
36	109.0	17.9	538	112.7	18.0	103.4	Pass	Pass
36	109.0	17.9	539	105.7	20.2	97.0	Pass	Pass
36	109.0	17.9	540	112.8	17.3	103.5	Pass	Pass
37	110.0	18.1	541	110.5	17.8	100.5	Pass	Pass
37	110.0	18.1	542	111.7	17.5	101.5	Pass	Pass
37	110.0	18.1	543	109.3	18.8	99.4	Pass	Pass
37	110.0	18.1	544	109.8	19.1	99.8	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 17 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
37	110.0	18.1	545	110.3	18.2	100.3	Pass	Pass
37	110.0	18.1	546	108.5	19.4	98.6	Pass	Pass
37	110.0	18.1	547	108.0	18.0	98.2	Pass	Pass
37	110.0	18.1	548	104.6	19.8	95.1	Pass	Pass
37	110.0	18.1	549	106.7	17.2	97.0	Pass	Pass
37	110.0	18.1	550	107.7	17.5	97.9	Pass	Pass
37	110.0	18.1	551	105.4	17.3	95.8	Pass	Pass
37	110.0	18.1	552	104.5	17.0	95.0	Pass	Pass
37	110.0	18.1	553	106.8	19.6	97.1	Pass	Pass
37	110.0	18.1	554	109.3	19.3	99.4	Pass	Pass
37	110.0	18.1	555R	108.8	18.8	98.9	Pass	Pass
38	108.7	18.0	556	106.5	17.4	98.0	Pass	Pass
38	108.7	18.0	557	109.1	18.9	100.4	Pass	Pass
38	108.7	18.0	558	109.6	19.2	100.8	Pass	Pass
38	108.7	18.0	559	108.5	17.0	99.8	Pass	Pass
38	108.7	18.0	560	114.1	17.3	105.0	Pass	Pass
38	108.7	18.0	561	105.1	20.6	96.7	Pass	Pass
38	108.7	18.0	562	106.3	20.3	97.8	Pass	Pass
38	108.7	18.0	563	109.6	18.4	100.9	Pass	Pass
38	108.7	18.0	564	109.7	17.1	100.9	Pass	Pass
38	108.7	18.0	565	106.2	19.2	97.7	Pass	Pass
38	108.7	18.0	566	105.0	18.9	96.6	Pass	Pass
38	108.7	18.0	567	108.8	18.1	100.1	Pass	Pass
38	108.7	18.0	568	107.0	19.9	98.4	Pass	Pass
38	108.7	18.0	569	110.1	17.3	101.3	Pass	Pass
38	108.7	18.0	570	109.4	17.7	100.6	Pass	Pass
39	108.0	17.8	572	103.9	20.8	96.2	Pass	Pass
39	108.0	17.8	573	106.6	20.1	98.7	Pass	Pass
39	108.0	17.8	574	108.1	17.8	100.1	Pass	Pass
39	108.0	17.8	575	109.5	17.3	101.4	Pass	Pass
39	108.0	17.8	576	109.5	19.5	101.4	Pass	Pass
39	108.0	17.8	577	104.9	20.6	97.1	Pass	Pass
39	108.0	17.8	578	104.8	19.3	97.0	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 18 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
39	108.0	17.8	579	107.3	19.3	99.4	Pass	Pass
39	108.0	17.8	580	107.3	19.2	99.4	Pass	Pass
39	108.0	17.8	581	106.1	18.6	98.2	Pass	Pass
39	108.0	17.8	582	106.9	19.3	99.0	Pass	Pass
39	108.0	17.8	583	109.3	18.4	101.2	Pass	Pass
39	108.0	17.8	584	110.2	18.0	102.0	Pass	Pass
39	108.0	17.8	585	105.6	18.6	97.8	Pass	Pass
40	109.1	17.7	586	108.1	18.0	99.1	Pass	Pass
40	109.1	17.7	587	109.1	17.9	100.0	Pass	Pass
40	109.1	17.7	588	113.9	17.3	104.4	Pass	Pass
40	109.1	17.7	589	108.4	19.4	99.4	Pass	Pass
40	109.1	17.7	590	110.7	19.6	101.5	Pass	Pass
40	109.1	17.7	591	109.4	18.3	100.3	Pass	Pass
40	109.1	17.7	592	105.7	20.1	96.9	Pass	Pass
40	109.1	17.7	593	106.2	19.8	97.3	Pass	Pass
40	109.1	17.7	594	107.6	19.3	98.6	Pass	Pass
40	109.1	17.7	595	105.8	19.7	97.0	Pass	Pass
40	109.1	17.7	596	110.4	18.2	101.2	Pass	Pass
40	109.1	17.7	597	106.6	20.0	97.7	Pass	Pass
40	109.1	17.7	598	105.0	19.0	96.2	Pass	Pass
40	109.1	17.7	599	110.9	17.9	101.6	Pass	Pass
40	109.1	17.7	600	103.9	21.7	95.2	Pass	Pass
41	110.0	17.8	601	109.6	17.6	99.6	Pass	Pass
41	110.0	17.8	602	108.4	20.7	98.5	Pass	Pass
41	110.0	17.8	603	108.4	17.7	98.5	Pass	Pass
41	110.0	17.8	604	108.4	18.1	98.5	Pass	Pass
41	110.0	17.8	605	112.7	17.1	102.5	Pass	Pass
41	110.0	17.8	606	110.9	18.2	100.8	Pass	Pass
41	110.0	17.8	607	107.9	19.7	98.1	Pass	Pass
41	110.0	17.8	608	110.3	18.9	100.3	Pass	Pass
41	110.0	17.8	609R	106.4	20.2	96.7	Pass	Pass
41	110.0	17.8	610	110.6	18.8	100.5	Pass	Pass
41	110.0	17.8	611	111.2	17.9	101.1	Pass	Pass
41	110.0	17.8	612	106.2	20.1	96.5	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 19 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
41	110.0	17.8	613	109.8	18.9	99.8	Pass	Pass
41	110.0	17.8	614	109.0	16.9	99.1	Pass	Pass
42	110.8	17.6	616	112.6	17.0	101.6	Pass	Pass
42	110.8	17.6	617	106.4	19.7	96.0	Pass	Pass
42	110.8	17.6	618	109.1	19.5	98.5	Pass	Pass
42	110.8	17.6	619	110.3	17.4	99.5	Pass	Pass
42	110.8	17.6	620	110.7	17.8	99.9	Pass	Pass
42	110.8	17.6	621	112.7	18.7	101.7	Pass	Pass
42	110.8	17.6	622	110.5	18.9	99.7	Pass	Pass
42	110.8	17.6	623	114.2	17.2	103.1	Pass	Pass
42	110.8	17.6	624	111.3	17.8	100.5	Pass	Pass
42	110.8	17.6	625	108.9	20.5	98.3	Pass	Pass
42	110.8	17.6	626	107.3	18.1	96.8	Pass	Pass
42	110.8	17.6	627	112.0	18.1	101.1	Pass	Pass
42	110.8	17.6	628	109.3	18.3	98.6	Pass	Pass
42	110.8	17.6	629	109.1	17.4	98.5	Pass	Pass
42	110.8	17.6	630	109.5	17.6	98.8	Pass	Pass
43	110.0	16.9	631R	111.5	17.1	101.4	Pass	Pass
43	110.0	16.9	632	109.8	18.0	99.8	Pass	Pass
43	110.0	16.9	633	107.8	19.8	98.0	Pass	Pass
43	110.0	16.9	634	109.8	18.8	99.8	Pass	Pass
43	110.0	16.9	635	108.0	18.8	98.2	Pass	Pass
43	110.0	16.9	636	113.7	18.5	103.4	Pass	Pass
43	110.0	16.9	637	108.6	19.4	98.7	Pass	Pass
43	110.0	16.9	638	111.6	16.9	101.5	Pass	Pass
43	110.0	16.9	639	107.4	18.9	97.6	Pass	Pass
43	110.0	16.9	640	108.5	18.6	98.6	Pass	Pass
43	110.0	16.9	641	108.8	17.2	98.9	Pass	Pass
43	110.0	16.9	642	113.7	17.3	103.4	Pass	Pass
43	110.0	16.9	643	111.3	17.2	101.2	Pass	Pass
43	110.0	16.9	644	110.6	18.7	100.5	Pass	Pass
43	110.0	16.9	645R	106.6	19.6	96.9	Pass	Pass
44	110.4	17.5	646R	106.5	21.1	96.5	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 20 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
44	110.4	17.5	647	105.4	20.5	95.5	Pass	Pass
44	110.4	17.5	648	109.2	19.9	98.9	Pass	Pass
44	110.4	17.5	649	112.5	18.3	101.9	Pass	Pass
44	110.4	17.5	650R	107.0	21.2	96.9	Pass	Pass
44	110.4	17.5	651	109.1	19.1	98.8	Pass	Pass
44	110.4	17.5	652	112.1	17.9	101.5	Pass	Pass
44	110.4	17.5	653	109.0	19.6	98.7	Pass	Pass
44	110.4	17.5	654	106.6	19.1	96.6	Pass	Pass
44	110.4	17.5	655	112.2	17.5	101.6	Pass	Pass
44	110.4	17.5	656	113.2	17.0	102.5	Pass	Pass
44	110.4	17.5	657	105.7	20.4	95.7	Pass	Pass
44	110.4	17.5	658	105.4	17.8	95.5	Pass	Pass
44	110.4	17.5	660	107.0	18.9	96.9	Pass	Pass
45	110.6	16.9	661R	110.2	18.7	99.6	Pass	Pass
45	110.6	16.9	662	110.2	17.6	99.6	Pass	Pass
45	110.6	16.9	663	107.4	18.7	97.1	Pass	Pass
45	110.6	16.9	664	109.9	20.7	99.4	Pass	Pass
45	110.6	16.9	665R	107.9	18.1	97.6	Pass	Pass
45	110.6	16.9	666	105.3	19.6	95.2	Pass	Pass
45	110.6	16.9	667	105.3	18.4	95.2	Pass	Pass
45	110.6	16.9	668	108.1	19.8	97.7	Pass	Pass
45	110.6	16.9	669	109.1	17.3	98.6	Pass	Pass
45	110.6	16.9	670	111.1	17.4	100.5	Pass	Pass
45	110.6	16.9	671	110.3	18.9	99.7	Pass	Pass
45	110.6	16.9	672	110.7	17.8	100.1	Pass	Pass
45	110.6	16.9	673	109.0	18.8	98.6	Pass	Pass
45	110.6	16.9	674	112.9	17.9	102.1	Pass	Pass
45	110.6	16.9	675	110.7	16.9	100.1	Pass	Pass
46	111.2	16.7	676	107.6	18.6	96.8	Pass	Pass
46	111.2	16.7	677	107.3	17.1	96.5	Pass	Pass
46	111.2	16.7	678	104.9	17.9	94.3	Pass	Pass
46	111.2	16.7	679	111.9	16.9	100.6	Pass	Pass
46	111.2	16.7	680	109.5	20.0	98.5	Pass	Pass

R= Retest due to failed initial test

Table 9 1996 Sandcone Test Summary (Page 21 of 21)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft^3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft^3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
46	111.2	16.7	681	107.3	19.5	96.5	Pass	Pass
46	111.2	16.7	682	114.1	16.9	102.6	Pass	Pass
46	111.2	16.7	683	108.0	17.2	97.1	Pass	Pass
46	111.2	16.7	684	108.3	19.2	97.4	Pass	Pass
46	111.2	16.7	685	105.6	17.9	95.0	Pass	Pass
46	111.2	16.7	686	106.6	19.0	95.9	Pass	Pass
46	111.2	16.7	687	106.9	18.5	96.1	Pass	Pass
46	111.2	16.7	688	106.9	16.9	96.1	Pass	Pass
46	111.2	16.7	689	109.7	18.6	98.7	Pass	Pass
46	111.2	16.7	690	111.9	18.4	100.6	Pass	Pass
47	111.2	17.2	691	111.2	18.1	100.0	Pass	Pass
47	111.2	17.2	692	112.0	19.1	100.7	Pass	Pass
47	111.2	17.2	693	109.7	18.8	98.7	Pass	Pass
47	111.2	17.2	694	109.0	19.9	98.0	Pass	Pass
47	111.2	17.2	695	111.1	18.6	99.9	Pass	Pass
47	111.2	17.2	696	111.7	19.0	100.4	Pass	Pass
47	111.2	17.2	697	113.2	17.4	101.8	Pass	Pass
47	111.2	17.2	698	110.5	19.0	99.4	Pass	Pass
47	111.2	17.2	699	107.8	19.2	96.9	Pass	Pass
47	111.2	17.2	700	110.3	17.0	99.2	Pass	Pass
47	111.2	17.2	701	110.8	17.9	99.6	Pass	Pass
47	111.2	17.2	702	111.9	17.6	100.6	Pass	Pass
47	111.2	17.2	703	106.8	19.0	96.0	Pass	Pass
47	111.2	17.2	704	108.9	17.9	97.9	Pass	Pass
47	111.2	17.2	705	105.6	18.5	95.0	Pass	Pass
48	110.8	17.5	706	105.3	19.6	95.0	Pass	Pass
48	110.8	17.5	707	100.3	18.9	90.5	Pass	Pass
48	110.8	17.5	708	106.4	19.3	96.0	Pass	Pass
48	110.8	17.5	709	105.5	18.6	95.2	Pass	Pass
48	110.8	17.5	710	103.0	20.6	93.0	Pass	Pass
48	110.8	17.5	711	107.5	20.0	97.0	Pass	Pass
48	110.8	17.5	712	108.8	19.1	98.2	Pass	Pass
48	110.8	17.5	713	105.3	18.8	95.0	Pass	Pass

R= Retest due to failed initial test

Table 10 1997 Sandcone Test Summary (Page 1 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
1	111.8	16.2	1	111.4	18.2	99.6	Pass	Pass
1	111.8	16.2	2	112.5	16.9	100.6	Pass	Pass
1	111.8	16.2	3R	107.1	18.7	95.8	Pass	Pass
1	111.8	16.2	4	112.3	18.7	100.5	Pass	Pass
1	111.8	16.2	5	107.8	19.2	96.4	Pass	Pass
1	111.8	16.2	6	108.4	18.9	97	Pass	Pass
1	111.8	16.2	7	112.5	17.1	100.6	Pass	Pass
1	111.8	16.2	8R	107.2	19.2	95.9	Pass	Pass
1	111.8	16.2	9	111.5	17.1	99.7	Pass	Pass
1	111.8	16.2	10	103.8	18.5	92.8	Pass	Pass
1	111.8	16.2	11	108.2	17.5	96.8	Pass	Pass
1	111.8	16.2	12	108.2	19.1	96.8	Pass	Pass
1	111.8	16.2	13	111.8	17.1	100	Pass	Pass
1	111.8	16.2	14	106.8	18.8	95.5	Pass	Pass
1	111.8	16.2	15	107.1	17.1	95.8	Pass	Pass
2	110.1	18.2	16	107.9	17.8	98	Pass	Pass
2	110.1	18.2	17	106	19.3	96.3	Pass	Pass
2	110.1	18.2	18	107.5	20.8	97.6	Pass	Pass
2	110.1	18.2	19	109.3	17.4	99.3	Pass	Pass
2	110.1	18.2	20	104.1	20.5	94.6	Pass	Pass
2	110.1	18.2	21	103.9	21.3	94.4	Pass	Pass
2	110.1	18.2	22	105.5	18.8	95.8	Pass	Pass
2	110.1	18.2	23	104	18.3	94.5	Pass	Pass
2	110.1	18.2	24	108	18.4	98.8	Pass	Pass
2	110.1	18.2	25	102.2	18.3	92.8	Pass	Pass
2	110.1	18.2	26	107.1	19.3	97.3	Pass	Pass
2	110.1	18.2	27	108	17.3	98.1	Pass	Pass
2	110.1	18.2	28	109.2	18.5	99.2	Pass	Pass
2	110.1	18.2	29	106.5	18.8	96.7	Pass	Pass
2	110.1	18.2	30	106.5	18.9	96.7	Pass	Pass
3	110.8	16.8	31	105.9	19.5	95.6	Pass	Pass
3	110.8	16.8	32	105.7	18.1	95.4	Pass	Pass
3	110.8	16.8	33	107.7	17.9	97.2	Pass	Pass
3	110.8	16.8	34	105.2	18.1	95	Pass	Pass
3	110.8	16.8	35R	107.9	18.7	97.4	Pass	Pass

R= Retest due to failed initial test

Table 10 1997 Sandcone Test Summary (Page 2 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
3	110.8	16.8	36R	109	17.9	98.4	Pass	Pass
3	110.8	16.8	37	107.5	17	97	Pass	Pass
3	110.8	16.8	38	106.9	17.1	96.5	Pass	Pass
3	110.8	16.8	39	105.1	18.9	94.9	Pass	Pass
3	110.8	16.8	40	107.4	18.2	96.9	Pass	Pass
3	110.8	16.8	41R	108.2	18	97.7	Pass	Pass
3	110.8	16.8	42	105.8	20.1	95.5	Pass	Pass
3	110.8	16.8	43	105.5	19.8	95.2	Pass	Pass
3	110.8	16.8	44R	106.5	17.6	96.1	Pass	Pass
3	110.8	16.8	45	108.3	18.7	97.7	Pass	Pass
4	111.2	17.2	46	109.3	18.9	98.3	Pass	Pass
4	111.2	17.2	47	108.9	16.9	97.9	Pass	Pass
4	111.2	17.2	48	108.7	17.1	97.8	Pass	Pass
4	111.2	17.2	49	108.4	18.8	97.5	Pass	Pass
4	111.2	17.2	50R	106.3	18.9	95.6	Pass	Pass
4	111.2	17.2	51R	106.4	19.7	95.7	Pass	Pass
4	111.2	17.2	52	108.4	17.5	97.5	Pass	Pass
4	111.2	17.2	53	111.2	17.6	100	Pass	Pass
4	111.2	17.2	54	107	17.4	96.2	Pass	Pass
4	111.2	17.2	55	107.3	18.5	96.5	Pass	Pass
4	111.2	17.2	56R	113.8	17.1	102.3	Pass	Pass
4	111.2	17.2	57R	107.9	18.6	97	Pass	Pass
4	111.2	17.2	58	106.7	18.2	96	Pass	Pass
4	111.2	17.2	59R	113.2	16.9	101.8	Pass	Pass
4	111.2	17.2	60	107.6	18.7	96.8	Pass	Pass
5	111.3	17.4	61	106.3	18.8	95.5	Pass	Pass
5	111.3	17.4	62	111.4	17.2	100.1	Pass	Pass
5	111.3	17.4	63	107.2	18.7	96.3	Pass	Pass
5	111.3	17.4	64R	106.7	20.8	95.9	Pass	Pass
5	111.3	17.4	65R	109.4	17.1	98.3	Pass	Pass
5	111.3	17.4	66	106.8	18.2	96	Pass	Pass
5	111.3	17.4	67	104.4	18.1	93.8	Pass	Pass
5	111.3	17.4	68	104.8	18	94.2	Pass	Pass
5	111.3	17.4	69	103.5	18.9	93	Pass	Pass
5	111.3	17.4	70	105.5	19.3	94.8	Pass	Pass

R= Retest due to failed initial test

Table 10 1997 Sandcone Test Summary (Page 3 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
5	111.3	17.4	71	105.4	18.4	94.7	Pass	Pass
5	111.3	17.4	72	106.9	18	96	Pass	Pass
5	111.3	17.4	73	108	17.8	97	Pass	Pass
5	111.3	17.4	74	104.8	19.3	94.2	Pass	Pass
5	111.3	17.4	75	106.1	18.4	95.3	Pass	Pass
6	110.1	17.2	76	106.9	19.3	97.1	Pass	Pass
6	110.1	17.2	77	107.6	18	97.7	Pass	Pass
6	110.1	17.2	78	105.1	19.5	95.5	Pass	Pass
6	110.1	17.2	79	110	18	99.9	Pass	Pass
6	110.1	17.2	80	108.2	18.5	98.3	Pass	Pass
6	110.1	17.2	81	106.3	19	96.5	Pass	Pass
6	110.1	17.2	82	106.8	19.9	97	Pass	Pass
6	110.1	17.2	83	105.4	19.4	95.7	Pass	Pass
6	110.1	17.2	84	109.5	17.8	99.5	Pass	Pass
6	110.1	17.2	85	111.2	17.3	101	Pass	Pass
6	110.1	17.2	86	106.1	18.8	96.4	Pass	Pass
6	110.1	17.2	87	107.1	20.8	97.3	Pass	Pass
6	110.1	17.2	88R	110.5	17.1	100.4	Pass	Pass
6	110.1	17.2	89	107.4	18.2	97.5	Pass	Pass
6	110.1	17.2	90	104.6	19.7	95	Pass	Pass
7	110.4	17.3	91	110.3	18.7	99.9	Pass	Pass
7	110.4	17.3	92	106.6	18.7	96.6	Pass	Pass
7	110.4	17.3	93	111.2	17.4	100.7	Pass	Pass
7	110.4	17.3	94	108.8	17.7	98.6	Pass	Pass
7	110.4	17.3	95	106.4	17.7	96.4	Pass	Pass
7	110.4	17.3	96	106.5	18.6	96.5	Pass	Pass
7	110.4	17.3	97	106.9	18.5	96.8	Pass	Pass
7	110.4	17.3	98	110.8	17.3	100.4	Pass	Pass
7	110.4	17.3	99	107.2	18.2	97.1	Pass	Pass
7	110.4	17.3	100R	105.4	20.9	95.5	Pass	Pass
7	110.4	17.3	101	111.4	18.1	100.9	Pass	Pass
7	110.4	17.3	102	107.1	18.9	97	Pass	Pass
8	110.3	17.8	109	107.7	18.8	97.6	Pass	Pass
8	110.3	17.8	110	107.5	18.1	97.5	Pass	Pass
8	110.3	17.8	111	109.3	17.3	99.1	Pass	Pass

R= Retest due to failed initial test

Table 10 1997 Sandcone Test Summary (Page 4 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
8	110.3	17.8	112R	109	17	98.8	Pass	Pass
8	110.3	17.8	113	107.3	17.8	97.3	Pass	Pass
8	110.3	17.8	114	105.6	17.7	95.7	Pass	Pass
8	110.3	17.8	115R	106.5	17.4	96.6	Pass	Pass
8	110.3	17.8	116R	109.3	17.6	99.1	Pass	Pass
8	110.3	17.8	117R	110.3	18.5	100	Pass	Pass
8	110.3	17.8	118R	107.7	18.4	97.6	Pass	Pass
8	110.3	17.8	119	106.2	18.4	96.3	Pass	Pass
8	110.3	17.8	120	106.8	18.3	96.8	Pass	Pass
9	109.7	18	121	109.5	19.5	99.8	Pass	Pass
9	109.7	18	122	109.5	18	99.8	Pass	Pass
9	109.7	18	123R	113	17.2	103	Pass	Pass
9	109.7	18	124R	106.3	19.9	96.9	Pass	Pass
9	109.7	18	125	111.1	17.3	101.3	Pass	Pass
9	109.7	18	126R	109.3	17.8	99.6	Pass	Pass
9	109.7	18	127	109.3	17.7	99.6	Pass	Pass
9	109.7	18	128	106.4	19.2	97	Pass	Pass
9	109.7	18	129	106.4	18.2	97	Pass	Pass
9	109.7	18	130	106.5	19.4	97.1	Pass	Pass
9	109.7	18	131	105.2	18.2	95.9	Pass	Pass
9	109.7	18	132	106.8	18.3	97.4	Pass	Pass
9	109.7	18	133	106.9	18.8	97.4	Pass	Pass
9	109.7	18	134	108.4	18.8	98.8	Pass	Pass
9	109.7	18	135	105.1	19.9	95.8	Pass	Pass
10	110.3	17.8	137	105.5	16.9	95.6	Pass	Pass
10	110.3	17.8	138	107.8	18.7	97.7	Pass	Pass
10	110.3	17.8	139	105.4	17.1	95.6	Pass	Pass
10	110.3	17.8	140	105.5	18.3	95.6	Pass	Pass
10	110.3	17.8	141	107.4	18.4	97.4	Pass	Pass
10	110.3	17.8	142	104.9	18.6	95.1	Pass	Pass
10	110.3	17.8	143	107.4	18.2	97.4	Pass	Pass
10	110.3	17.8	150	106.9	18.3	96.9	Pass	Pass
11	111.3	17.4	151	106.6	18.9	95.8	Pass	Pass
11	111.3	17.4	152R	107.7	18.7	96.8	Pass	Pass
11	111.3	17.4	153	107.6	19.1	96.7	Pass	Pass

R= Retest due to failed initial test

Table 10 1997 Sandcone Test Summary (Page 5 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
11	111.3	17.4	154	105.1	19.6	94.4	Pass	Pass
11	111.3	17.4	155	113.4	16.9	101.9	Pass	Pass
11	111.3	17.4	156	107.2	18.8	96.3	Pass	Pass
11	111.3	17.4	157	107.1	18.9	96.2	Pass	Pass
11	111.3	17.4	158	108	18.5	97	Pass	Pass
11	111.3	17.4	159	104.8	21	94.2	Pass	Pass
11	111.3	17.4	160	103.5	19.8	93	Pass	Pass
11	111.3	17.4	161R	105.2	19.5	94.5	Fail(1)	Pass
11	111.3	17.4	162	106.8	18.9	96	Pass	Pass
11	111.3	17.4	163	108.3	17.2	97.3	Pass	Pass
11	111.3	17.4	164	107.6	18.8	96.7	Pass	Pass
11	111.3	17.4	165	101.6	19.6	91.3	Pass	Pass
12	110.2	16.9	166	107.7	17.8	97.7	Pass	Pass
12	110.2	16.9	167	107	19.1	97.1	Pass	Pass
12	110.2	16.9	168	102.1	19.5	92.6	Pass	Pass
12	110.2	16.9	169	107.8	18.5	97.8	Pass	Pass
12	110.2	16.9	170	106.2	18.7	96.4	Pass	Pass
12	110.2	16.9	171	105.3	20.5	95.6	Pass	Pass
12	110.2	16.9	172	107.3	19.7	97.4	Pass	Pass
12	110.2	16.9	173	105.9	18.5	96.1	Pass	Pass
12	110.2	16.9	174	107.3	19.5	97.4	Pass	Pass
12	110.2	16.9	175	105.4	19.4	95.6	Pass	Pass
12	110.2	16.9	176	106.2	18.5	96.4	Pass	Pass
12	110.2	16.9	177	107.9	18.4	97.9	Pass	Pass
12	110.2	16.9	178	105.6	20	95.8	Pass	Pass
12	110.2	16.9	179	105.8	19.6	96	Pass	Pass
12	110.2	16.9	180	105.8	19.9	96	Pass	Pass
13	109	17.4	181	108.6	18.7	99.6	Pass	Pass
13	109	17.4	182	108.7	18.6	99.7	Pass	Pass
13	109	17.4	183	105.7	19	97	Pass	Pass
13	109	17.4	190	104.1	19.2	95.5	Pass	Pass
13	109	17.4	191R	109.2	18.2	100.2	Pass	Pass
13	109	17.4	192	105.3	18	96.6	Pass	Pass
13	109	17.4	193	103.4	19.1	94.9	Pass	Pass

R= Retest due to failed initial test

(1) Failed test was identified during WNI Field Audit. See Table 11.

Table 10 1997 Sandcone Test Summary (Page 6 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
13	109	17.4	194	107.7	18.6	98.8	Pass	Pass
13	109	17.4	195	104.6	19.5	96	Pass	Pass
14	109.7	17.2	196	105.9	19.5	96.5	Pass	Pass
14	109.7	17.2	197	111	17.1	101.2	Pass	Pass
14	109.7	17.2	198	109.1	18	99.5	Pass	Pass
14	109.7	17.2	199	104.6	18.6	95.4	Pass	Pass
14	109.7	17.2	200	107.9	18.5	98.4	Pass	Pass
14	109.7	17.2	201	106.2	18.5	96.8	Pass	Pass
14	109.7	17.2	202	107.9	18.1	98.4	Pass	Pass
14	109.7	17.2	203	106.8	19.2	97.4	Pass	Pass
14	109.7	17.2	204	107.3	18.6	97.8	Pass	Pass
14	109.7	17.2	205	106.5	19.3	97.1	Pass	Pass
14	109.7	17.2	206	104.5	18.4	95.3	Pass	Pass
14	109.7	17.2	207R	106.3	19.2	96.9	Pass	Pass
14	109.7	17.2	208	109.3	17.6	99.6	Pass	Pass
14	109.7	17.2	209	106.1	18.8	96.7	Pass	Pass
14	109.7	17.2	210	105.2	20.1	95.9	Pass	Pass
15	110.8	17.6	211	111.4	19	100.5	Pass	Pass
15	110.8	17.6	212	106	17.6	95.7	Pass	Pass
15	110.8	17.6	213	107.5	18.9	97	Pass	Pass
15	110.8	17.6	214	105.4	19.4	95.1	Pass	Pass
15	110.8	17.6	215	106	19.8	95.7	Pass	Pass
15	110.8	17.6	216	105.3	18.7	95	Pass	Pass
15	110.8	17.6	217	106.6	19.9	96.2	Pass	Pass
15	110.8	17.6	218	105.6	20.7	95.3	Pass	Pass
15	110.8	17.6	219	112.5	17.5	101.5	Pass	Pass
15	110.8	17.6	220	109.6	18.3	98.9	Pass	Pass
15	110.8	17.6	221	103.5	19.8	93.4	Pass	Pass
15	110.8	17.6	222	104.8	18.6	94.6	Pass	Pass
15	110.8	17.6	223	107.8	19	97.3	Pass	Pass
16	109.7	18.6	230R	110.3	17.7	100.5	Pass	Pass
16	109.7	18.6	231	108	18.2	98.5	Pass	Pass
16	109.7	18.6	232	105.4	19.7	96.1	Pass	Pass
16	109.7	18.6	233	107.4	19.3	97.9	Pass	Pass

R= Retest due to failed initial test

Table 10 1997 Sandcone Test Summary (Page 7 of 7)

Proctor			Sandcone Moisture/Density Test				Results	
Test No.	Maximum Dry Density (lbs/ft3)	Optimum Moisture Content (%)	Test No.	Dry Density (lbs/ft3)	Moisture Content (%)	Percent Proctor (%)	Compaction	Moisture
16	109.7	18.6	234	107.3	20	97.8	Pass	Pass
16	109.7	18.6	235	110.5	17.9	100.7	Pass	Pass
16	109.7	18.6	236R	107.1	18.7	97.6	Pass	Pass
16	109.7	18.6	237	104.8	20.9	95.5	Pass	Pass
16	109.7	18.6	238	107.4	19	97.9	Pass	Pass
16	109.7	18.6	239	106.9	19.5	97.4	Pass	Pass
16	109.7	18.6	240	108	19	98.5	Pass	Pass
17	109.5	18	241	107.8	19	98.4	Pass	Pass
17	109.5	18	242R	107.3	18.6	98	Pass	Pass
17	109.5	18	243	110.4	17.9	100.8	Pass	Pass
17	109.5	18	244	108	16.9	98.6	Pass	Pass
17	109.5	18	245	111.8	17.2	102.1	Pass	Pass
17	109.5	18	246	110.9	17.8	101.3	Pass	Pass
17	109.5	18	247	110.7	17.3	101.1	Pass	Pass
17	109.5	18	248	108.1	19.3	98.7	Pass	Pass
17	109.5	18	249	105.9	20.4	96.7	Pass	Pass
17	109.5	18	250	105.5	19.4	96.4	Pass	Pass

R= Retest due to failed initial test

Table 11 Radon Barrier Density Failures Identified During WNI Audits

Date of Audit	Proctor No.	Proctor Density (lbs/ft^3)	% of Proctor Density (Required)	Sand Cone Test No.	Density		% of Proctor Density (Actual)
					Required (lbs/ft^3)	Actual (lbs/ft^3)	
Oct 27, 1994	9	109.2	95.0	150(111R)	103.7	103.3	94.6 (1)
Oct 13, 1995	29	109.6	95.0	421R	104.1	104.0	94.9 (1)
Aug 21, 1996	11	110.3	95.0	164	104.8	104.7	94.9 (2)
Sep 13, 1996	23	110.6	95.0	337	105.1	105.0	94.9 (2)
Oct 2, 1997	11	111.3	95.0	161R	105.7	105.2	94.5 (2)

R = Retest

(1) See Table 41 (Page 1 of 4) for description of failure and corrective action.

(2) See Table 41 (Page 2 of 4) for description of failure and corrective action.

Table 12 Radon Barrier Moisture Content Failures Identified During WNI Audits

Date of Audit	Proctor No.	Proctor Optimum Moisture (%)	Required Moisture (%)	Sand Cone Test No.	Actual Mosture		Failure (1) (%)
					%	Minus or Plus of Optimum	
Sep. 29, 1994	8	19.6	17.6 to 23.6	97(82R)	17.5	Minus 2.1 % of optimum	Too Dry By 0.1 %
Oct. 27, 1994	10	19.7	17.7 to 23.7	129	23.8	Plus 4.1 % of optimum	Too Wet By 0.1 %
Sept 21, 1995	5	19.0	17.0 to 23.0	73R	16.9	Minus 2.1 % of optimum	Too Dry By 0.1 %
Aug 21, 1996	15	17.1	15.1 to 21.1	212R	22.0	Plus 4.9 % of optimum	Too Wet By 0.9 %

R = Retest

(1) See Table 41 (Page 1 of 4) for description of failure and corrective action.

Table 13 Radon Barrier Moisture Content Failures Identified After Completion of Construction

Construction Season	Proctor No.	Proctor Optimum Moisture (%)	Required Moisture (%)	Sand Cone Test No.	Actual Moisture		Failure [1] (%)
					%	Minus or Plus % of Optimum	
1994	4	20.3	18.3 to 24.3	16	18.2	Minus 2.1 % of optimum	Too Dry By 0.1 %
1994	5	20.9	18.9 to 24.9	36	17.6	Minus 3.3 % of optimum	Too Dry By 1.3 %
1994	10	19.7	17.7 to 23.7	122	17.0	Minus 2.7 % of optimum	Too Dry By 0.7 %
1995	30	19.3	17.3 to 23.3	449	17.0	Minus 2.3 % of optimum	Too Dry By 0.3 %

[1] Since all of these failed tests were identified after compeletion of construction, it was not considered prudent or necessary to excavate the already placed radon barrier, borrow soil, filter and rock mulch layers. (See Section 2.3.3.2.3).

Table 14 One-Point Proctor Test Results

One-Point Proctor Test No.	Dry Density (lb/ft^3)	Moisture (%)	Volume Placed (cy)	Comments
1	108.6	18.0	0	Placed as Sacrificial
2	108.6	18.8	0	Placed as Sacrificial
3P	105.3	21.6	0 - 2,500	Derived from Standard Proctor No. 3
3	107.9	20.2	2,500 - 5,000	
4	105.3	18.0	5,000 - 7,500	
4P	106.6	19.9	7,500 - 10,000	Derived from Standard Proctor No. 4
5	109.4	17.9	10,000 - 12,500	
6	103.5	16.8	12,500 - 15,000	
5P	106.7	21.7	15,000 - 17,500	Derived from Standard Proctor No. 5
7	104.3	17.3	17,500 - 20,000	
8	106.6	18.7	20,000 - 22,500	
6P	107.0	19.7	22,500 - 25,000	Derived from Standard Proctor No. 6
9	105.9	17.6	25,000 - 27,500	
10	107.5	20.5	27,500 - 30,000	
7P	108.2	19.0	30,000 - 32,500	Derived from Standard Proctor No. 7
11	107.5	20.0	32,500 - 35,000	
12	105.7	21.2	35,000 - 37,500	
8P	108.4	19.6	37,500 - 40,000	Derived from Standard Proctor No. 8
13	106.5	20.9	40,000 - 42,500	
14	103.3	22.6	42,500 - 45,000	
9P	108.7	20.6	45,000 - 47,500	Derived from Standard Proctor No. 9
15	104.4	22.4	47,500 - 50,000	
16	106.7	20.6	50,000 - 52,500	
10P	106.7	20.8	52,500 - 55,000	Derived from Standard Proctor No. 10
17	107.5	19.7	55,000 - 57,500	
18	107.2	19.8	57,500 - 60,000	
11P	108.5	19.8	60,000 - 62,500	Derived from Standard Proctor No. 11
19	106.7	18.1	62,500 - 65,000	
20	108.6	17.9	65,000 - 67,500	
12P	107.6	18.5	67,500 - 70,000	Derived from Standard Proctor No. 12
21	105.5	19.7	70,000 - 72,500	
22	105.4	19.5	72,500 - 75,000	
13P	107.1	17.9	65,000 - 67,500	Derived from Standard Proctor No. 13
23	107.6	19.8	77,500 - 80,000	
24	106.7	21.2	80,000 - 82,500	
14P	106.1	20.5	82,500 - 85,000	Derived from Standard Proctor No. 14
25	105.4	20.4	85,000 - 87,500	
26	105.2	21.1	87,500 - 90,000	
15P	107.8	19.7	90,000 - 92,500	Derived from Standard Proctor No. 15
27	105.6	20.8	92,500 - 95,000	
28	108.1	18.9	95,000 - 97,500	
16P	107.0	20.3	97,500 - 99,000	Derived from Standard Proctor No. 16
Total: 42			**99,000**	**Final Volume Placed**

"P" indicates that One-Point Proctor was derived from the Standard Proctor

Table 15 First Lift Radon Barrier Thickness in Inches - Areas 3A, 3B, 2A, 1C, and 2B

	E 7,500	E 7,700	E 7,900	E 8,100	E 8,300	E 8,500	E 8,700	E 8,900	E 9,100	E 9,300	E 9,500	E 9,700	E 9,900	E 10,100	E 10,300
N 8,900					6.0	6.0	6.0	6.0	6.0						
N 8,700				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
N 8,500				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
N 8,300					6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
N 8,100					6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
N 7,900								6.0	6.0	6.0	6.0	6.0	6.0		
N 7,700								6.0	6.0	6.0	6.0	6.5	6.0		
N 7,500									6.0	6.0	6.5	6.0			
N 7,300									5.0	3.5	6.0	6.0			
N 7,100								5.5	6.0	4.5	6.5	4.5			
N 6,900							6.0	6.0	6.5	6.0	6.0	6.0			
N 6,700						5.5	6.0	5.5	4.0	4.5	5.0	5.0			
N 6,500				5.0	5.5	6.5	6.0	5.0	5.5	5.0	6.0				
N 6,300			6.0	5.0	5.5	5.0	5.5	4.5	5.0	4.0	5.5				
N 6,100		6.0	6.5	5.0	5.0	6.5	6.0	6.5	5.5	5.0	5.5				
N 5,900	5.0	6.5	6.5	6.5	3.5	6.5	5.5	5.5	6.0	6.0					
N 5,700	6.0	6.0	6.0	6.0	3.5										
N 5,500	7.0	6.0	6.5	6.5											
N 5,300		6.5													

AREA [1]	REQUIRED FIRST LIFT RADON BARRIER THICKNESS
3A	6 inches
3B	6 inches
2A	6 inches
2B	**6 inches**
1C	6 inches
0.8 acre area in Area 2C[2]	6 inches

Note: Yellow cells indicate locations where the first lift exceeded 6 inches in thickness.

(1) Area locations are shown in Figure 1.

(2) Refer to Section 1.3.1.1.4 for discussion on the 0.8 acre area in Area 2A

Table 16 First Lift Radon Barrier Thickness in Inches - Areas 1A and 1B

	E 9,900	E 10,100	E 10,300	E 10,500	E 10,700	E 10,900	E 11,100	E 11,300	E 11,500	E 11,700	E 11,900	12,100	12,300	12,500	12,700	E 12,900	13,100	E 13,300
N 8,900																		
N 8,700					7.0	5.0	5.5	5.0	6.0	5.5	6.0	5.0	5.0	5.5	5.5	6.0	5.5	6.0
N 8,500				6.0	7.0	6.0	6.0	6.0	5.0	5.5	5.5	5.5	5.5	5.0	6.0	6.0	6.0	5.5
N 8,300			6.0	swale[1]	swale[1]	swale[1]	6.0	5.5	5.5	5.0	5.5	5.5	6.0	rock[2]	6.0	6.0		
N 8,100			6.0	6.0	6.0	6.0	swale[1]	swale[1]	swale[1]	swale[1]	5.5	5.5	3.0	5.0	5.5	5.0		
N 7,900		5.5	5.5	5.5	5.5	6.0	5.0	5.5	5.5	6.0	swale[1]	swale[1]	swale[1]	swale[1]	6.0			
N 7,700		6.0	5.5	6.0	5.5	5.0	5.5	6.0	5.0	5.5	5.5	5.5	5.5					
N 7,500	5.5	5.5	4.5	5.5	6.0	5.5	5.5	5.5	5.0	5.5	6.0	6.0	4.0					
N 7,300	5.5	6.0	5.0	5.0	6.0	6.0	5.0	5.5	5.5	6.0	6.0	5.5						
N 7,100	5.0	5.0	5.0	5.0	5.0	5.5	5.5	5.5	5.5	6.0	6.0							
N 6,900	5.5	6.0	6.0	6.0	4.5	5.5	6.0	5.0	5.5									
N 6,700							3.5											

[1] Impoundment swale is located in this grid location. The radon barrier thickness is documented in the swale thickness record in Table 20 of this report.

[2] An existing rock island outcrop is located in this grid location, therefore, a radon barrier was not required.

Note: Yellow cells indicate locations where the first lift exceeded 6 inches in thickness. However, since these two measurements were located in an area where the total radon barrier thickness was only 6 inches, providing an extra inch of radon barrier material was acceptable.

AREA[3]	REQUIRED FIRST LIFT RADON BARRIER THICKNESS
West 1B North of N 7,900	6 inches
East 1B North of N 7,900	6 inches
1A North of N 7,900	6 inches
1B South of N 7,900	6 inches
1A South of N 7,900	6 inches

[3] Area locations are shown in Figure 2

Table 17 First Lift and Total Radon Barrier Thickness - North Central Diversion Ditch

Required Total Thickness: **Area 3A = 16 inches**
Area 3B = 6 inches

Station Number	Area (1)	First Lift Thickness (2)	Total Layer Thickness
0 + 00	3B	10.0	10.0
1 + 00	3B	11.0	11.0
2 + 00	3B	11.5	11.5
3 + 00	3B	10.0	10.0
4 + 00	3A	12.0	20.0
5 + 00	3A	12.0	20.0
6 + 00	3A	12.0	20.0
7 + 00	3A	12.0	20.0
8 + 00	3A	11.0	20.0
9 + 00	3A	12.0	20.0
10 + 00	3A	12.0	20.0
10 + 56	3A	11.5	20.5
11 + 56	3A	11.5	20.0

(1) Area Locations are as shown in Figure 1.

(2) First lift thicknesses includes a 4-inch thick layer of "sacrificial clay" that was placed to provide a firm base for construction equipment.

Table 18 First Lift and Total Radon Barrier Thickness - South Central Diversion Ditch

Required Total Thickness: Area 3B = 6 inches

Station Number	Area (1)	First Lift Thickness (2)	Total Layer Thickness
1 + 00	3B	10.0	10.0
2 + 00	3B	10.0	10.0
3 + 00	3B	10.0	10.0
4 + 00	3B	10.0	10.0

(1) Area Locations are as shown in Figure 1.

(2) First Lift Thicknesses includes a sacrificial clay layer that was placed to provide a firm base for construction equipment. The thickness of this sacrificial clay ranged from 3 to 4 inches.

Table 19 First Lift and Total Radon Barrier Thickness - South Diversion Ditch (Page 1 of 2)

Required Total Thickness: **Area 1A = 33 inches**

Station Number	Area (1)	First Lift Thickness (2)	Total Layer Thickness
0 + 00	1A	9.5	38.0
1 + 00	1A	10.0	37.5
2 + 00	1A	9.0	39.0
3 + 00	1A	10.0	38.0
4 + 00	1A	9.5	38.0
5 + 00	1A	9.5	38.0
6 + 00	1A	10.0	38.0
7 + 00	1A	10.0	37.5
8 + 00	1A	9.5	37.5
9 + 00	1A	9.5	38.0
10 + 00	1A	10.0	41.5
11 + 00	1A	9.5	38.5
12 + 00	1A	9.5	38.5
13 + 00	1A	9.0	38.5
14 + 00	1A	9.5	38.5
15 + 00	1A	9.0	39.0
16 + 00	1A	9.5	38.0
17 + 00	1A	9.5	38.5
18 + 00	1A	9.0	38.5
19 + 00	1A	9.5	8.5
20 + 00	1A	9.5	42.0
21 + 00	1A	9.5	38.5
22 + 00	1A	9.0	38.5
23 + 00	1A	9.0	44.0
24 + 00	1A	9.5	38.5
25 + 00	1A	9.5	41.5
26 + 00	1A	9.5	41.0
27 + 00	1A	9.5	40.0

(1) Area Locations are as shown in Figure 1.

(2) First Lift Thicknesses includes a sacrificial clay layer that was placed to provide a firm base for construction equipment. The thickness of this sacrificial clay ranged from 3 to 4 inches.

Table 19 First Lift and Total Radon Barrier Thickness - South Diversion Ditch (Page 2 of 2)

Required Total Thickness: **Area 1A = 33 inches** **Area 1B = 44 inches**
Area 1C = 36 inches **Area 2B = 36 inches**

Station Number	Area [1]	First Lift Thickness [2]	Total Layer Thickness
28+00	1A	9.5	40.5
29+00	1A	9.5	40.5
30+00	1A	9.5	39.5
31+00	1A	9.5	40.5
32+00	1A	9.0	38.0
33+00	1A	9.5	38.0
34+00	1A	8.5	49.5
35+00	1B	8.0	49.5
36+00	1B	9.0	50.0
37+00	1B	9.0	48.5
38+00	1B	9.0	48.5
39+00	1B	8.5	49.0
40+00	1B	9.0	49.0
41+00	1B	9.0	49.0
42+00	1B	8.5	48.5
43+00	1B	9.5	49.5
44+00	1C	9.0	40.0
45+00	1C	8.5	40.0
46+00	1C	9.0	40.0
47+00	1C	9.5	40.5
48+00	1C	8.5	40.0
49+00	1C	9.0	40.0
50+00	2B	8.5	40.5
51+00	2B	9.5	41.5
52+00	2B	10.0	41.0
53+00	2B	9.5	41.5
54+00	2B	10.0	40.0

(1) Area Locations are as shown in Figure 1.

(2) First Lift Thicknesses includes a sacrificial clay layer that was placed to provide a firm base for construction equipment. The thickness of this sacrificial clay ranged from 2 to 4 inches.

Table 20 First Lift and Total Radon Barrier Thickness - Tailings Swale

Required Total Thickness: **Area 1A and 1B East = 16 inches**
Area 1B West = 6 inches

Station Number	Area [1]	First Lift Thickness	Total Layer Thickness
2 + 00	1A	5.5	17.0
3 + 00	1A	5.5	16.5
4 + 00	1A	6.0	18.0
5 + 00	1A	5.5	16.5
6 + 00	1A	5.5	17.0
7 + 00	1A	5.5	17.0
8 + 00	1A	5.5	16.5
9 + 00	1A	5.5	17.0
10 + 00	1A	5.5	16.5
11 + 00	1A	5.5	17.0
12 + 00	1A	5.5	17.0
13 + 00	1A	5.0	16.0
14 + 00	1A	5.5	16.5
15 + 00	1A	5.0	16.0
16 + 00	1BE	5.5	16.5
17 + 00	1BE	5.5	16.5
18 + 00	1BE	5.5	16.0
19 + 00	1BE	5.5	16.0
20 + 00	1BE	5.5	16.0
21 + 00	1BW	6.0	6.5
22 + 00	1BW	6.0	6.5
23 + 00	1BW	6.0	6.5
24 + 00	1BW	6.5	6.5
25 + 00 / 26 + 00	These stations constructed in 1994 (See note below)		
27 + 00	3A	6.0	18.5
28 + 00	3A	6.0	17.0

[1] Area Locations are shown in Figures 1 and 2.

Note: In 1994, the thickness of the radon barrier was measured on a 200x200 ft grid. This included the portion of the Tailing Swale in Area 3A between stations 24+00 and 27+00. See note in Table 21.

Table 21 Total Radon Barrier Thickness in Inches - Areas 3A, 3B, 2A, 1C and 2B

	E 7,500	E 7,700	E 7,900	E 8,100	E 8,300	E 8,500	E 8,700	E 8,900	E 9,100	E 9,300	E 9,500	E 9,700	E 9,900	E 10,100	E 10,300
N 8,900					18.0	18.0	18.0	18.0	18.0						
N 8,700				16.8	18.0	18.0	18.0	18.0	18.0	17.0	18.0				
N 8,500				18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	19.2	18.0
N 8,300					16.8	18.0	18.0	18.0	18.0	18.0	18.0	17.0	18.0	18.0	
N 8,100					17.0	18.0	18.0	18.0	18.0	16.0	18.0	18.0	18.0	16.8	
N 7,900								6.0	6.0	6.0	18.0	17.0	18.0		
N 7,700								6.0	6.0	6.0	6.0	36.5	37.0		
N 7,500									6.0	6.0	39.0	38.5			
N 7,300									44.0	36.0	36.5	38.0			
N 7,100								44.0	43.5	37.5	36.5	36.5			
N 6,900							42.5	45.0	36.5	36.5	36.5	37.0			
N 6,700						43.5	43.0	42.0	37.5	36.0	36.5	37.0			
N 6,500				43.0	42.0	42.5	42.5	45.0	36.0	36.0	37.5				
N 6,300			44.0	45.0	42.0	43.0	42.5	42.0	36.5	36.5	36.0				
N 6,100		43.5	43.5	44.5	43.0	42.0	44.0	43.0	**36.0**	**36.5**	**36.0**				
N 5,900	43.0	43.5	43.0	43.5	42.0	42.0	42.0	42.0	**37.0**	**38.0**					
N 5,700	44.0	43.0	43.5	43.0	42.0										
N 5,500	7.0	42.0	43.0	43.5											
N 5,300		43.0													

AREA [(1)]	REQ'D FIRST LIFT RADON BARRIER THICKNESS
3A	6 inches
3B	6 inches
2A	6 inches
2B	**6 inches**
1C	6 inches
0.8 acre area in Area 2C[(2)]	6 inches

Note: Grid N10,100 E8,500 is located at approximately Station 26+50 of the Tailing Swale.
Grid N10,300 E8,500 is located at approximately Station 24+50 of the Tailing Swale.

(1) Area locations are shown in Figure 1.

(2) Refer to Section 1.3.1.1.4 for discussion on the 0.8 acre area in Area 2A

Table 22 Total Radon Barrier Thickness in Inches - Areas 1A and 1B

	E 9,900	E 10,100	E 10,300	E 10,500	E 10,700	E 10,900	11,100	E 11,300	E 11,500	E 11,700	E 11,900	E 12,100	12,300	12,500	12,700	12,900	13,100	E 13,300
N 8,900																		
N 8,700					7.0	16.0	16.0	16.5	17.0	17.0	16.0	16.5	16.0	16.0	16.5	16.5	16.5	16.5
N 8,500				6.0	7.0	16.0	18.0	16.5	17.5	16.5	16.5	17.0	17.5	16.5	16.5	17.0	17.0	17.5
N 8,300			6.0	swale (1)	swale (1)	swale (1)	16.0	17.0	17.5	17.0	16.0	17.5	16.5	rock (2)	17.5	16.0		
N 8,100			6.0	6.0	16.0	17.0	swale (1)	swale (1)	swale (1)	swale (1)	16.5	16.5	16.5	17.0	16.0	16.0		
N 7,900		44.5	45.5	44.5	45.0	45.0	33.5	33.5	33.5	33.5	swale (1)	swale (1)	swale (1)	swale (1)	16.5			
N 7,700		44.5	44.5	45.0	44.5	44.5	33.5	33.5	33.5	34.0	33.5	34.0	34.0					
N 7,500	45.0	46.0	45.0	45.5	45.0	34.5	34.5	34.5	33.5	34.5	34.0	33.5	34.0					
N 7,300	44.5	45.0	45.0	45.0	45.5	33.5	34.5	33.0	33.5	34.0	34.0	33.0						
N 7,100	45.5	46.0	45.0	45.0	46.0	33.5	33.5	34.0	33.0	34.0	33.5							
N 6,900	44.0	44.5	44.5	44.5	44.0	35.0	34.0	34.5	34.5									
N 6,700							33.0											

(1) Impoundment swale is located in this grid location. The total radon barrier soil thickness is documented in the swale thickness record in Table 20 of this report.

(2) An existing rock island outcrop is located in this grid location, therefore, radon barrier was not required.

AREA (3)	REQUIRED AS-BUILT TOTAL RADON BARRIER THICKNESS
West 1B North of N 7,900	6 inches
East 1B North of N 7,900	16 inches
1A North of N 7,900	16 inches
1B South of N 7,900	44 inches
1A South of N 7,900	33 inches

(3) Area locations are shown in Figure 2

Table 23 Radon Flux Measurements - Areas 3A and 3B

CHARCOAL CANISTERS SET ON 8/12/95, REMOVED ON 8/22/95 AND COUNTED ON 8/23/95.

	E 8,100	E 8,300	E 8,500	E 8,700	E 8,900	E 9,100	E 9,300	E 9,500	E 9,700	E 9,900	E 10,100	E 10,300
N 8,900		3 <0.5	12 <0.5	13 <0.5	18 <0.5	32 0.5						
N 8,700	1 <0.5	4 <0.5	11 <0.5	14 <0.5	19 <0.5	31 <0.5	33 <0.5	44 <0.5				
N 8,500	2 <0.5	5 <0.5	10 <0.5	15 <0.5	20 <0.5	30 <0.5	34 <0.5	43 <0.5	45 <0.5	52 <0.5	55 <0.5	56 <0.5
N 8,300		6 <0.5	9 <0.5	16 <0.5	21 <0.5	29 <0.5	35 <0.5	42 <0.5	46 <0.5	51 <0.5	54 <0.5	
N 8,100		7 <0.5	8 <0.5	17 <0.5	22 <0.5	28 <0.5	36 <0.5	41 <0.5	47 <0.5	50 <0.5	53 <0.5	
N 7,900					23 <0.5	27 <0.5	37 <0.5	40 <0.5	48 <0.5	49 <0.5		
N 7,700					24 <0.5	26 <0.5	38 <0.5	57 <0.5				
N 7,500						25 <0.5	39 13.3					

2 <0.5

Location # — Radon Flux in pCi/m^{2}s

Minimum Measurement = < 0.5 pCi/m^{2}s
Maximum Measurement = 13.3 pCi/m^{2}s
Average Radon Flux = 0.73 pCi/m^{2}s

Placement of charcoal canisters may vary slightly from the indicated Northing and Easting locations.
See Appendix O for exact canister placement locations.

Table 24 Radon Flux Measurements - Areas 2A, 2B, and 1C

CHARCOAL CANISTERS SET ON 9/10/96, REMOVED ON 9/11/96 AND COUNTED ON 9/12/96.

	E 7,600	E 7,800	E 8,000	E 8,200	E 8,400	E 8,600	E 8,800	E 9,000	E 9,200	E 9,400	E 9,600	E 9,800
N 7,800												69 <0.5
N 7,600											65 <0.5	68 <0.5
N 7,400										58 3.1	64 1.9	67 <0.5
N 7,200									50 <0.5	57 <0.5	63 <0.5	66 <0.5
N 7,000								41 <0.5	49 <0.5	56 <0.5	62 <0.5	
N 6,800							34 <0.5	40 <0.5	48 <0.5	55 <0.5	61 <0.5	
N 6,600						27 <0.5	33 <0.5	39 <0.5	47 1.4	54 <0.5	60 <0.5	
N 6,400			13 <0.5	18 <0.5	22 <0.5	26 <0.5	32 <0.5	38 <0.5	46 0.6	53 <0.5	59 <0.5	
N 6,200		8 <0.5	12 <0.5	17 <0.5	21 <0.5	25 <0.5	31 <0.5	37 <0.5	45 <0.5	52 <0.5		
N 6,000	3 <0.5	7 <0.5	11 <0.5	16 <0.5	20 <0.5	24 <0.5	30 <0.5	36 <0.5	44 <0.5	51 <0.5		
N 5,800	2 <0.5	6 <0.5	10 <0.5	15 <0.5	19 <0.5	23 <0.5	29 <0.5	35 <0.5	43 <0.5			
N 5,600	1 <0.5	5 <0.5	9 <0.5	14 <0.5								
N 5,400		4 <0.5										

2 <0.5

Location # — Radon Flux in pCi/m²s

Minimum Measurement = < 0.5 pCi/m^{2}s

Maximum Measurement = 3.1 pCi/m^{2}s

Average Radon Flux = 0.57 pCi/m^{2}s

Placement of charcoal cannisters may vary slightly from the indicated Northing and Easting locations.
See Appendix O for exact canister placement locations.

Table 25 Radon Flux Measurements - Areas 1A and 1B (Page 1 of 2)

CHARCOAL CANISTERS SET ON 9/10/97, REMOVED ON 9/11/97 AND COUNTED ON 9/12/97.

	E 9,933	E 10,093	E 10,254	E 10,413	E 10,573	E 10,733	E 10,893	E 11,053	E 11,213	E 11,373	E 11,533	E 11,693	E 11,853	E 12,013	E 12,173	E 12,333
N 7,845		90 <0.5	91 <0.5	92 <0.5	93 <0.5	94 <0.5	95 <0.5	96 <0.5	97 <0.5	98 <0.5	99 <0.5	100 <0.5		89 <0.5		
N 7,685	73 <0.5	74 0.9	75 <0.5	76 0.5	77 <0.5	78 <0.5	79 <0.5	80 <0.5	81 <0.5	82 <0.5	83 <0.5	84 0.7	85 <0.5	86 <0.5	87 0.5	88 <0.5
N 7,525	58 <0.5	59 0.5	60 <0.5	61 <0.5	62 <0.5	63 <0.5	64 <0.5	65 1.8	66 0.7	67 1.0	68 0.5	69 <0.5	70 27.7	71 0.7	72 <0.5	
N 7,365	43 0.6	44 0.7	45 0.5	46 <0.5	47 <0.5	48 0.9	49 <0.5	50 0.9	51 0.8	52 1.0	53 0.5	54 <0.5	55 0.6	56 <0.5	57 1.1	
N 7,205	29 0.5	30 1.0	31 0.7	32 0.8	33 <0.5	34 <0.5	35 <0.5	36 1.0	37 1.3	38 6.0	39 29.9	40 17.8	41 1.5	42 <0.5		
N 7,045	16 1.0	17 0.9	18 0.8	19 1.0	20 0.8	21 0.5	22 0.8	23 3.4	24 3.0	25 0.5	26 0.8	27 22.9	28 1.1			
N 6,885	5 <0.5	6 <0.5	7 <0.5	8 <0.5	9 1.0	10 <0.5	11 0.5	12 0.5	13 0.6	14 <0.5	15 <0.5					
N 6,725						4 0.9	1 <0.5	2 <0.5	3 0.5							

2 <0.5

Location # — Radon Flux in pCi/m²s

Minimum Measurement = < 0.5 pCi/m²s
Maximum Measurement = 29.9 pCi/m²s
Average Radon Flux = 1.68 pCi/m²s

Shaded cells indicate location where Radon Flux exceeded 20 pCi/m²s

Placement of charcoal cannisters may vary slightly from the indicated Northing and Easting locations.
See Appendix O for exact canister placement locations.

Table 25 Radon Flux Measurements - Areas 1A and 1B (Page 2 of 2)

CHARCOAL CANISTERS AT LOCATIONS 1 TO 36 AND 46 TO 48 WERE SET ON 7/14/98, REMOVED ON 7/15/98 AND COUNTED ON 7/16/98 AND,
CHARCOAL CANISTERS AT LOCATIONS 37 TO 45 AND 49 TO 59 WERE SET ON 7/15/98, REMOVED ON 7/16/98 AND COUNTED ON 7/17/98.

	E 10,310	E 10,450	E 10,650	E 10,840	E 11,040	E 11,230	E 11,430	E 11,620	E 11,820	E 12,010	E 12,210	E 12,400	E 12,600	E 12,800	E 13,000	E 13,200	E 13,380
N 8,700				49 0.6	50 <0.5	51 <0.5	52 <0.5	53 <0.5	54 <0.5	55 <0.5	56 <0.5	57 <0.5	58 <0.5	59 <0.5	48 <0.5		
N 8,500		33 <0.5	34 <0.5	35 <0.5	36 <0.5	37 <0.5	38 <0.5	39 <0.5	40 <0.5	41 <0.5	42 <0.5	43 <0.5	44 <0.5	45 <0.5		46 <0.5	47 <0.5
N 8,300	19 <0.5		20 <0.5	21 <0.5	22 <0.5	23 <0.5	24 <0.5	25 <0.5	26 <0.5	27 <0.5	28 <0.5	29 <0.5	30 <0.5	31 <0.5	32 <0.5		
N 8,150	5 <0.5	6 <0.5	7 <0.5	8 <0.5	9 <0.5	10 <0.5	11 <0.5	12 <0.5	13 <0.5	14 <0.5	15 <0.5	16 <0.5	17 <0.5	18 <0.5			
N 7,950										1 <0.5	2 <0.5	3 <0.5	4 <0.5				

5 <0.5

Location # Radon Flux in pCi/m^{2}s

Minimum Measurement = < 0.5 pCi/m^{2}s
Maximum Measurement = 0.6 pCi/m^{2}s
Average Radon Flux = 0.53 pCi/m^{2}s

Placement of charcoal cannisters may vary slightly from the indicated Northing and Easting locations.
See Appendix O for exact canister placement locations.

Table 26 Borrow Soil Thickness - Areas 3A, 3B, 2A, 1C, and 2B

	E 7,500	E 7,700	E 7,900	E 8,100	E 8,300	E 8,500	E 8,700	E 8,900	E 9,100	E 9,300	E 9,500	E 9,700	E 9,900	E 10,100	E 10,300
N 8,900					12.0	8.0	12.0	12.0	12.0						
N 8,700				8.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0				
N 8,500				12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	swale [1]	swale [1]
N 8,300					12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
N 8,100					12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
N 7,900								12.0	12.0	12.0	12.0	12.0	12.0		
N 7,700								12.0	12.0	12.0	12.0	12.5	10.5		
N 7,500									12.0	12.0	10.0	10.0			
N 7,300									10.4	11.0	11.0	11.5			
N 7,100								10.0	10.5	10.0	11.5	10.5			
N 6,900							10.9	10.0	13.0	10.0	11.0	12.5			
N 6,700						11.5	12.5	13.5	11.0	11.5	12.0	11.0			
N 6,500				10.5	11.5	11.0	11.5	10.0	12.0	10.5	10.5				
N 6,300			12.5	11.5	11.0	11.0	10.0	12.0	10.5	11.0	12.5				
N 6,100		11.0	10.5	13.0	10.5	12.0	10.0	10.5	10.5	10.5	11.0				
N 5,900	11.0	11.5	11.0	10.5	10.0	10.5	11.0	11.0	11.0	11.0					
N 5,700	9.2	10.0	12.0	10.0	12.0										
N 5,500	11.1	11.5	8.5	15.0											
N 5,300		12.0													

[1] Impoundment Swale is located in this grid location.

AREA [1]	REQUIRED BORROW SOIL THICKNESS
3A	8 to12 inches
3B	8 to12 inches
2A	8 to12 inches
2B	**8 to 12 inches**
1C	8 to12 inches

[1] Area Locations are shown in Figure 1

Yellow cells indicate locations where the borrow soil thickness exceeded 12 inches.

Table 27 Borrow Soil Thickness - Areas 1A and 1B

	E 9,900	10,100	10,300	10,500	10,700	10,900	11,100	E 11,300	11,500	11,700	11,900	12,100	12,300	12,500	12,700	12,900	13,100	13,300	13,500
N 8,900																			
N 8,700				11.0	11.0	11.0	10.5	10.5	11.5	11.0	11.5	12.0	12.0	12.0	11.0	11.0	10.0	11.5	
N 8,500				10.5	11.0	11.5	10.0	10.0	10.5	11.5	10.0	11.0	10.5	11.0	11.0	10.0	11.0	9.0	11.0
N 8,300			11.5	swale (1)	swale (1)	swale (1)	10.0	11.0	10.0	11.5	10.5	10.0	10.5	rock (2)	10.0	11.5			
N 8,100			11.0	11.5	11.0	11.0	swale (1)	swale (1)	swale (1)	swale (1)	11.5	11.0	10.5	10.5	10.5	11.0			
N 7,900		11.5	11.0	11.0	11.5	11.5	11.0	10.5	11.5	11.5	10.5	10.0	10.5	10.5	11.5				
N 7,700		12.0	11.0	11.5	12.0	11.0	10.0	10.5	11.0	11.0	11.0	11.0	10.5						
N 7,500	10.5	11.0	11.5	10.5	11.0	10.0	10.0	10.5	10.5	10.5	10.0	10.0	10.0						
N 7,300	11.0	11.0	10.5	10.5	10.0	11.0	10.5	11.0	11.0	10.5	10.0	10.5							
N 7,100	11.0	12.0	11.0	11.5	10.0	10.5	10.5	10.5	11.0	10.0	11.0								
N 6,900	11.0	11.5	11.5	12.0	11.5	10.0	10.0	10.5	10.0										
N 6,700							10.0												

Notes: (1) Impoundment swale is located in this grid location.

(2) An existing rock island outcrop is located in this grid location.

AREA (3)	REQUIRED BORROW SOIL THICKNESS
West 1B North of N 7,900	8 to 12 inches
East 1B North of N 7,900	8 to 12 inches
1A North of N 7,900	8 to 12 inches
1B South of N 7,900	8 to 12 inches
1A South of N 7,900	8 to 12 inches

(3) Area locations are shown in Figure 2.

Table 28 Diversion Ditch and Swale Profile Comparisons

Stations	Slope		Deviation From Design	
	Required (1) (ft/ft)	As-built (2) (ft/ft)		
South Central Diversion Ditch				
0+00 to 6+50	0.0069	0.0095	Slope is steeper than design slope b 0.0026 ft/ft	0.0026
6+50 to 8+00	0.0343	0.0232	Slope is flatter than design slope by 0.0111 ft/ft	-0.0111
8+00 to 15+44	0.0154	0.0144	Slope is flatter than design slope by 0.0010 ft/ft	-0.0010
15+44 to 22+20	0.0090	0.0089	Slope is flatter than design slope by 0.0001 ft/ft	-0.0001
22+20 to 23+20	0.0068	0.0032	Slope is flatter than design slope by 0.0036 ft/ft	-0.0036
North Central Diversion Ditch				
0+00 to 4+95	0.0050	0.0053	Slope is steeper than design slope b 0.0003 ft/ft	0.0003
4+95 to 11+46	0.0300	0.0300	As-built slope = design slope	0.0000
11+46 to 14+81	0.0050	0.0042	Slope is flatter than design slope by 0.0008 ft/ft	-0.0008
South Diversion Ditch				
0+00 to 1+00	0.0650	**no data**		
1+00 to 11+50	0.0082	0.0080	Slope is flatter than design slope by 0.0002 ft/ft	-0.0002
11+50 to 45+00	0.0040	0.0040	As-built slope = design slope	0.0000
45+00 to 48+00	0.0229	0.0229	As-built slope = design slope	0.0000
48+00 to 64+93	0.0231	0.0231	As-built slope = design slope	0.0000
64+93 to 65+93	0.0050	0.0049	Slope is flatter than design slope by 0.0001 ft/ft	-0.0001
North Diversion Ditch				
0+00 to 1+00	0.0597	**no data**		
1+00 to 29+50	0.0050	0.0059	Slope is steeper than design slope by	0.0009
29+50 to 36+70	0.0387	0.0387	As-built slope = design slope 0.0000 ft/ft	0.0000
36+70 to 42+50	0.0387	0.0380	Slope is flatter than design slope by	-0.0007
42+50 to 46+50	0.0303	0.0289	Slope is flatter than design slope by 0.0014 ft/ft	-0.0014
46+50 to 53+00	0.0200	0.0214	Slope is steeper than design slope b 0.0014 ft/ft	0.0014
53+00 to 55+44	0.0300	0.0238	Slope is flatter than design slope by 0.0062 ft/ft	-0.0062
55+44 to 56+44	0.0050	**no data**		
Tailing Swale				
2+00 to 6+00	0.0236	0.0203	Slope is flatter than design slope by 0.0033 ft/ft	-0.0033
6+00 to 21+15	0.0070	0.0070	As-built slope = design slope	0.0000
21+15 to 24+08	0.0409	0.0416	Slope is steeper than design slope b 0.0007 ft/ft	0.0007
24+08 to 27+85	0.0481	0.0485	As-built slope = design slope	
27+85 to 29+91	0.0577	**no data**		

Notes: (1) Required slopes are from Table 1 of the 2/94 TRP as revised in the March 31, 1997 submittal to the NRC
(2) As-built slopes are from logs presented in Appendix S.

Table 29 Rock Durability Testing Summary

Date	Test No.	Rating	Cumulative Volume (cy)	Total Cumulative Volume Produced (cy) 1994 and 1995	Comments
07/18/94	1	93	-	-	Initial test delineating quarry area
07/26/94	2	93	-	-	Test delineating quarry area to represent 0 - 10,000 CY
08/09/94	3	89	-	-	Test delineating quarry area to represent 10,000 - 20,000 CY
08/11/94	4	89	-	-	Test delineating quarry area to represent 20,000 - 30,000 CY
08/17/94	5	89	372	372	Test delineating quarry area to represent 30,000 - 40,000 CY
08/30/94	6	89	12,172	12,172	Test delineating quarry area to represent 40,000 - 50,000 CY
10/11/94	-	-	42,976	42,976	1994 production completed
03/10/95	7	84	-	42,976	Initial 1995 test
04/07/95	8	86	12,636	55,612	
04/07/95	9	85	12,636	55,612	Test delineating quarry area to represent 50,000 - 60,000 CY
04/27/95	10	86	32,003	74,979	
05/04/95	11	84	40,226	83,202	
05/17/95	12	85	50,344	93,320	
06/03/95	13	85	61,940	104,916	
06/12/95	14	85	70,383	113,359	
06/20/95	15	88	80,735	123,711	
06/30/95	16	83	91,508	134,484	
07/12/95	17	80	100,277	143,253	
07/21/95	18	84	114,836	157,812	
08/02/95	19	84	120,919	163,895	
08/09/95	20	84	130,905	173,881	
08/21/95	-	-	-	-	NRC authorized a reduction in the rock durability testing frequency from 1 test /10,000 cy to 1 test /20,000 cy.
08/31/95	21	83	151,124	194,100	
09/14/95	22	84	171,171	214,147	
09/28/95	23	80	190,521	233,497	
10/10/95	24	80	212,947	255,923	
10/24/95	25	90	231,663	274,639	
11/04/95	26	85	251,020	293,996	
11/15/95	27	86	270,859	313,835	
12/02/95	28	85	293,363	336,339	
12/16/95	29	90	311,336	354,312	

Table 30 Rock Durability Test Results

Test No.	Bulk Specific Gravity	Absorption (%)	Sodium Sulfate Soundness (%)	L. A. Abrasion (@ 100 cycles) (%)	Actual Rock Durability Rating	Required Minimum Rock Durability Rating (Without Oversizing)
1	2.74	0.50	1.0	3.6	93	80
2	2.71	0.47	3.6	4.6	93	80
3	2.66	0.58	1.0	3.5	89	80
4	2.66	0.65	1.0	3.3	89	80
5	2.66	0.46	1.0	3.6	89	80
6	2.66	0.54	1.0	2.7	89	80
7	2.67	0.52	2.0	3.5	84	80
8	2.63	0.43	1.0	3.1	86	80
9	2.64	0.61	1.0	4.8	85	80
10	2.65	0.43	1.0	3.4	86	80
11	2.61	0.74	1.0	4.4	84	80
12	2.64	0.55	1.0	3.2	85	80
13	2.64	0.61	1.0	3.9	85	80
14	2.65	0.52	1.0	4.1	85	80
15	2.65	0.75	1.0	3.6	88	80
16	2.63	0.68	0.0	6.1	83	80
17	2.62	0.67	2.0	5.0	80	80
18	2.62	0.73	1.0	3.0	84	80
19	2.61	0.73	1.0	3.7	84	80
20	2.60	0.73	1.0	3.3	84	80
21	2.66	0.72	2.0	4.8	83	80
22	2.63	0.77	1.0	3.7	84	80
23	2.64	0.56	2.0	3.8	80	80
24	2.63	0.65	2.0	3.6	80	80
25	2.65	0.42	0.0	3.4	90	80
26	2.62	0.67	1.0	2.8	85	80
27	2.64	0.36	0.0	3.5	86	80
28	2.63	0.67	0.0	3.8	85	80
29	2.65	0.42	0.0	3.3	90	80

Table 31 **Rock Gradation Test Results** (Page 1 of 7)

FILTER I			**Allowable Percent Passing for a Given Screen Size**					
			2"	1"	$^{3}/_{4}$"	$^{1}/_{2}$"	$^{3}/_{8}$"	Sieve #4
			100	85-95	61-78	38-52	26-39	10-21
Test No.	**Date**	**Volume (cy)**						
1994 Gradation Tests								
1	10/11/94	0	100	86	65	41	29	14
2	10/11/94	398	100	92	73	52	35	15
3	10/12/94	796	100	92	73	52	37	16
1995 - 1996 Gradation Tests								
1	08/23/95	1,777	100	87	67	38	28	16
2	08/29/95	11,181	100	90	68	40	29	18
3	09/07/95	21,564	100	88	65	38	28	16
4	09/14/95	29,455	100	87	66	41	32	19
5	12/13/95	37,519	100	95	69	39	28	15
6	10/16/97	37,519	100	97	77	48	32	6
6R	10/16/97	37,519	100	91	76	51	37	17
7	10/20/97	39,486	100	89	71	47	34	16

R = Retest

Table 31 Rock Gradation Test Results (Page 2 of 7)

FILTER II			Allowable Percent Passing for a Given Screen Size				
			6"	4"	3"	2"	1"
			100	56-74	32-51	12-26	0-1
Test No.	**Date**	**Volume (cy)**					
1994 Gradation Tests							
1	09/23/94	0	100	62	37	19	1
2	09/27/94	430	100	69	50	25	1
3	09/28/94	863	100	69	50	25	1
1995 & 1997 Gradation Tests							
1	08/19/95	2,298	100	63	42	12	1
2	09/23/95	4,473	100	71	47	18	1
3	09/29/95	10,730	100	58	38	13	1
4	12/07/95	13,312	100	67	45	17	1
5	10/10/97	13,312	94	42	27	11	1
5R	10/10/97	13,312	100	61	36	14	1
6	10/14/97	13,889	100	75	40	13	1
6R	10/17/97	13,889	100	74	42	14	1

R = Retest

Table 31 Rock Gradation Test Results (Page 3 of 7)

2" D_{50}			Allowable Percent Passing for a Given Screen Size					
			6"	4"	3"	2"	1"	¾"
			100	88-100	52-84	25-50	2-20	0-12
Test No.	**Date**	**Volume (cy)**						
1994 Gradation Tests								
1	08/16/94	0	100	94	70	35	8	2
2	08/23/94	10,000	100	96	57	25	7	2
3	09/06/94	20,000	100	96	72	42	11	3
4	09/22/94	32,504	100	89	68	39	9	2
1995 Gradation Tests								
1	03/21/95	4,902	100	98	78	40	6	3
2	04/10/95	11,045	100	100	76	31	4	2
3	04/26/95	22,413	100	100	70	30	5	3
4	05/12/95	36,110	100	100	81	46	9	3
5	06/02/95	46,160	100	94	59	26	7	3
6	06/08/95	55,431	100	93	59	28	8	5
7	06/17/95	65,423	100	99	71	29	6	3
8	06/26/95	74,482	100	97	66	27	6	3
9	07/05/95	82,529	100	99	81	40	9	4
10	07/14/95	92,050	100	97	72	38	8	4
11	10/06/95	100,964	100	99	68	33	7	3
12	10/12/95	111,194	100	95	76	42	8	3
13	10/20/95	122,131	100	98	81	44	8	3
14	10/31/95	130,649	100	95	68	36	7	2
15	11/09/95	141,706	100	98	70	33	6	2
16	11/14/95	149,864	100	98	73	33	7	3
17	11/20/95	158,559	100	98	77	45	7	3
18	12/04/95	168,568	100	100	83	43	3	0

Table 31 **Rock Gradation Test Results** (Page 4 of 7)

3" D$_{50}$			**Allowable Percent Passing for a Given Screen Size**						
			10"	6"	4"	3"	2"	1"	¾"
			100	89-100	55-69	35-50	10-30	0-10	0-6
Test No.	**Date**	**Volume (cy)**							
1994 Gradation Tests									
1	09/23/94	0	100	100	62	37	19	1	1
2	09/27/94	3,028	100	100	69	50	25	1	1
3	09/28/94	6,056	100	100	69	50	25	1	1
1995 & 1997 Gradation Tests									
1	08/02/95	1,655	100	98	63	39	11	3	2
2	08/11/95	10,347	100	99	67	42	13	3	3
3	08/17/95	16,465	100	99	69	40	11	2	2
4	12/07/95	17,930	100	96	68	50	24	1	1
5	10/08/97	17,930	100	99	73	45	20	4	1
5R	10/08/97	17,930	100	99	68	37	13	1	1
6	10/14/97	19,084	100	93	49	31	15	3	1
6R	10/14/97	19,084	100	100	60	40	19	4	1

R = Retest

Table 31 Rock Gradation Test Results (Page 5 of 7)

6” D_{50}			Allowable Percent Passing for a Given Screen Size						
			15”	12”	10”	6”	4”	3”	2”
			100	85-100	71-92	30-50	10-35	2-20	0-10
Test No.	**Date**	**Volume (cy)**							
1995 Gradation Tests									
1	08/28/95	36	100	97	81	39	16	6	1
2	09/23/95	3,656	100	95	87	47	23	9	2
3	10/09/95	8,045	100	100	91	44	16	3	2
1997 Gradation Tests									
4	10/01/97	8,045	100	100	98	61	28	17	5
4R	10/01/97	8,045	100	100	91	43	21	13	4
5	10/03/97	9,045	100	100	87	32	16	9	3

R = Retest

Table 31 Rock Gradation Test Results (Page 6 of 7)

12" D_{50}			Allowable Percent Passing for a Given Screen Size								
			20"	15"	12"	10"	6"	4"	3"	2"	1"
			100	30-100	25-50	17-42	5-20	0-13	0-10	0-6	0-1
Test No.	**Date**	**Volume (cy)**									
1994 Gradation Tests											
1	10/20/94	0	100	83	53	43	5	1	0	0	0
2	10/21/94	1,024	100	79	53	35	10	1	0	0	0
3	10/21/94	2,047	100	76	53	39	8	2	0	0	0
1995 Gradation Tests											
1	10/12/95	10	100	79	39	21	7	5	3	2	1
2	10/31/95	4,358	100	86	50	25	6	1	1	1	0
3	11/13/95	8,171	100	69	33	17	6	4	3	2	1

Highlighted values are "out of spec." See Appendix U.

Table 31 Rock Gradation Test Results (Page 7 of 7)

18" D_{50}			**Allowable Percent Passing for a Given Screen Size**								
			36"	24"	20"	15"	12"	10"	6"	4"	3"
			100	50-100	30-60	15-37	10-32	4-20	0-10	0-5	0-1
Test No.	**Date**	**Volume (cy)**									
1995 Gradation Tests											
1	07/11/95	0	100	62	37	19	13	9	3	1	1
2	08/08/95	10,638	100	83	50	20	10	5	1	1	1
3	09/14/95	21,654	100	81	58	33	21	13	5	2	1
4	09/28/95	30,470	100	83	55	30	22	15	7	2	1
5	12/04/95	40,014	100	84	60	33	19	11	4	2	1
6	12/19/95	52,540	100	66	43	23	12	7	2	1	1

Table 32 Soil/Rock and Rock Matrix and Mulch Thickness Summary in Inches (Page 2 of 2)

	E 10,600	E 10,800	E 11,000	E 11,200	E 11,400	E 11,600	E 11,800	E 12,000	E 12,200	E 12,400	E 12,600	E 12,800	E 13,000	E 13,200	E 13,400
N 8,800															
N 8,600	4.5	4.0	4.0	5.0	4.0	4.5	4.0	4.5	4.5	4.0	4.5	4.0	4.0	4.0	4.0
N 8,400	4.0	5.5	4.5	4.0	4.0	4.0	4.0	4.5	4.0	4.0	4.0	4.0	4.0	SDD	
N 8,200	4.5	SWALE	SWALE	SWALE	SWALE	4.5	5.0	4.5	4.0	4.0	4.0	4.5	SDD	13.5	
N 8,000	4.0	4.5	4.0	4.5	5.0	SWALE	SWALE	SWALE	SWALE	SWALE	4.5	4.0			
N 7,800	4.5	5.0	4.0	4.5	5.5	4.5	4.5	4.0	SWALE	SWALE	SDD	SDD			
N 7,600	4.0	4.0	5.0	5.0	4.5	4.0	4.5	4.0	4.0	SDD					
N 7,400	5.0	4.0	4.0	4.5	4.5	4.0	5.0	4.5	SDD	12.5					
N 7,200	4.0	4.5	4.5	5.0	4.5	4.0	4.0	4.0							
N 7,000	4.5	5.0	4.5	5.0	5.0	4.5	4.0								
N 6,800	4.5	4.0	4.5	4.0	4.5										

SWALE = Tailing Swale. Riprap and Filter Thicknesses are shown in Table 37.

SDD = South Diversion Ditch. Riprap and Filter Thicknesses are shown in Table 36.

Table 32 Soil/Rock Matrix and Rock Mulch Thickness Summary in Inches (Page 1 of 2)

	E 7,600	E 7,800	E 8,000	E 8,200	E 8,400	E 8,600	E 8,800	E 9,000	E 9,200	E 9,400	E 9,600	E 9,800	E 10,000	E 10,200	E 10,400
N 9,000															
N 8,800				**2 / 4**	**1 / 5.5**	**1 / 5**	**1 / 5**	**1 / 6**	**2 / 6**						
N 8,600				**2 / 6**	**1 / 5**	**1 / 4.5**	**2 / 5**	**2 / 6.5**	**1 / 6.5**	**1 / 6.5**	**1 / 6.5**	**1 / 6**	**SWALE**	**1 / 5**	SWALE
N 8,400				**1 / 5.5**	**0 / 6**	**1 / 6**	**1 / 6**	**0 / 6**	**1 / 6**	**1 / 5.5**	**2 / 6**	**1 / 6.5**	**1 / 5**	**1 / 6**	4.0
N 8,200				**1 / 6.5**	**1 / 7**	**0 / 6**	**1 / 5**	**1 / 6.5**	**0 / 6.5**	**1 / 6**	**1 / 6**	**1 / 5.5**	**1 / 6**	4.0	4.0
N 8,000					**1 / 5.5**			**1 / 6**	**1 / 6**	**0 / 6.5**	**1 / 6.5**	**1 / 6**	**2 / 5.5**	4.5	4.0
N 7,800								**1 / 6**	**1 / 6.5**	**1 / 5.5**	**2 / 5.5**	5.0	5.0	5.5	4.5
N 7,600								**1 / 5.5**	**2 / 5.5**	4.5	4.0	4.5	5.0	4.5	5.5
N 7,400									**1 / 6**	5.0	5.0	6.0	5.0	5.5	4.0
N 7,200									4.5	5.0	4.0	5.0	4.5	5.0	5.5
N 7,000								5.5	5.0	4.5	5.0	5.5	4.0	4.5	5.0
N 6,800							4.5	4.5	5.0	5.5	5.5	5.0			
N 6,600					4.0	5.0	4.5	4.5	5.0	5.0	4.5	13.0			
N 6,400		4.5	4.0	5.5	4.0	4.0	4.5	6.0	5.5	5.0		14.0			
N 6,200		5.0	5.0	5.0	6.0	6.0	5.5	4.0	5.0	5.0					
N 6,000	5.5	5.0	4.0	6.0	5.0	5.5	4.5	4.0	4.0	5.5					
N 5,800	5.5	6.0	5.5	4.5	6.0	6.0	5.5	4.0							
N 5,600	4.0	4.0	5.0	5.5	5.0	5.5	4.0	6.0							
N 5,400		4.0	4.0	4.0	4.5	5.0	5.0	5.5							

Notes: (1) Values shown in bold indicate areas constructed in 1994 when the erosion protection consisted of a soil/rock matrix layer. This layer consisted of a thin layer of soil placed over a layer of rock mulch. Values shown as **"X/Y"** indicate the soil thickness over the rock mulch thickness. For example, "1/6.5" indicates 1 inch of soil placed over a 6.5 inch thick rock mulch layer.

(2) After the 1994 construction season, the soil portion of the soil/rock matrix was deleted. Therefore, the erosion protection after 1994 consisted of a single rock mulch layer. Values shown as a single number indicate the rock mulch thickness. For example, "4.0" indicates a 4-inch thick rock mulch layer without an overlying soil layer.

(3) Yellow grid locations indicate areas where 3-inch D_{50} rock was placed (required thickness = 4 inches). The location of the tailing area requiring 3-inch D_{50} is in Area 3A as shown on Figure 5 of the 2/94 TRP.

(4) Other grid locations indicate areas where 2-inch D_{50} rock was placed (required thickness = 4 inches). The location of the tailing areas requiring 2-inch D_{50} is shown on Figure 5 of the 2/94 TRP.

Table 33 Riprap and Filter Layer Thicknesses - North Central Diversion Ditch

Station	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
0 + 00	3	3	6	6.0	n/r	n/r	6	6.0
1 + 00	3	3	6	6.5	n/r	n/r	6	6.0
2 + 00	3	3	6	6.0	n/r	n/r	6	6.0
3 + 00	3	3	6	6.0	n/r	n/r	6	6.0
4 + 00	3	3	6	6.5	n/r	n/r	6	6.0
5 + 00	12	12	18	18.0	6	6.5	6	6.0
6 + 00	18	18	27	27.0	6	6.0	6	6.0
7 + 00	18	18	27	27.0	6	6.0	6	6.0
8 + 00	18	18	27	27.0	6	6.0	6	6.0
9 + 00	12	12	18	18.0	6	6.5	6	6.5
10 + 00	12	12	18	18.0	6	6.5	6	6.5
10 + 56	12	12	18	18.0	6	6.5	6	6.0
11 + 56	12	12	18	18.0	6	6.0	6	7.0
12 + 56	3	3	6	6.0	n/r	n/r	6	7.0
13 + 56	3	3	6	6.0	n/r	n/r	6	7.0
14 + 56	3	3	6	6.5	n/r	n/r	6	6.0
14 + 81	3	3	6	6.0	n/r	n/r	6	6.0

n/r = Not Required

Table 33 Riprap and Filter Layer Thicknesses - North Central Diversion Ditch

Station	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
0 + 00	3	3	6	6.0	n/r	n/r	6	6.0
1 + 00	3	3	6	6.5	n/r	n/r	6	6.0
2 + 00	3	3	6	6.0	n/r	n/r	6	6.0
3 + 00	3	3	6	6.0	n/r	n/r	6	6.0
4 + 00	3	3	6	6.5	n/r	n/r	6	6.0
5 + 00	12	12	18	18.0	6	6.5	6	6.0
6 + 00	18	18	27	27.0	6	6.0	6	6.0
7 + 00	18	18	27	27.0	6	6.0	6	6.0
8 + 00	18	18	27	27.0	6	6.0	6	6.0
9 + 00	12	12	18	18.0	6	6.5	6	6.5
10 + 00	12	12	18	18.0	6	6.5	6	6.5
10 + 56	12	12	18	18.0	6	6.5	6	6.0
11 + 56	12	12	18	18.0	6	6.0	6	7.0
12 + 56	3	3	6	6.0	n/r	n/r	6	7.0
13 + 56	3	3	6	6.0	n/r	n/r	6	7.0
14 + 56	3	3	6	6.5	n/r	n/r	6	6.0
14 + 81	3	3	6	6.0	n/r	n/r	6	6.0

n/r = Not Required

Table 34 Riprap and Filter Layer Thicknesses - South Central Diversion Ditch

	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
Location	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
1 + 00	6	6	12	12.5	n/r	n/r	6	6.0
2 + 00	6	6	12	12.0	n/r	n/r	6	6.0
3 + 00	6	6	12	12.0	n/r	n/r	6	6.0
4 + 00	6	6	12	12.5	n/r	n/r	6	7.0
5 + 00	6	6	12	12.5	n/r	n/r	6	6.5
6 + 00	6	6	12	12.0	n/r	n/r	6	6.0
7 + 00	12	12	18	18.0	6	6.0	6	6.5
8 + 00	12	12	18	18.0	6	6.5	6	6.5
9 + 00	6	6	12	12.5	n/r	n/r	6	6.0
9 + 70	6	6	12	12.5	n/r	n/r	6	7.0
10 + 70	6	6	12	12.5	n/r	n/r	6	6.5
11 + 70	6	6	12	12.5	n/r	n/r	6	6.5
12 + 70	6	6	12	12.5	n/r	n/r	6	6.0
13 + 70	6	6	12	12.5	n/r	n/r	6	6.0
14 + 70	6	6	12	12.5	n/r	n/r	6	6.0
15 + 70	6	6	12	12.5	n/r	n/r	6	6.5
16 + 70	6	6	12	12.0	n/r	n/r	6	7.0
17 + 70	6	6	12	13.0	n/r	n/r	6	6.5
18 + 70	6	6	12	13.0	n/r	n/r	6	6.0
19 + 70	6	6	12	12.5	n/r	n/r	6	6.0
20 + 70	6	6	12	12.5	n/r	n/r	6	6.0
21 + 70	6	6	12	12.0	n/r	n/r	6	6.5
22 + 70	6	6	12	12.0	n/r	n/r	6	6.5
23 + 20	6	6	12	12.0	n/r	n/r	6	6.5

n/r = Not Required

Table 35 Riprap and Filter Layer Thicknesses - North Diversion Ditch (Page 1 of 2)

Location	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
1 + 00	18	18	27	27.5	6	6.0	6	6.0
2 + 00	3	3	6	6.0	n/r	n/r	6	6.0
3 + 00	3	3	6	6.0	n/r	n/r	6	7.0
4 + 00	3	3	6	6.0	n/r	n/r	6	6.5
5 + 00	18	18	27	27.0	6	6.0	6	7.0
6 + 00	18	18	27	27.0	6	6.0	6	6.5
7 + 00	3	3	6	6.0	n/r	n/r	6	7.0
8 + 00	3	3	6	6.0	n/r	n/r	6	6.0
9 + 00	3	3	6	6.5	n/r	n/r	6	6.5
10 + 00	3	3	6	6.0	n/r	n/r	6	6.5
11 + 00	3	3	6	6.0	n/r	n/r	6	6.0
12 + 00	3	3	6	6.0	n/r	n/r	6	7.0
13 + 00	3	3	6	6.5	n/r	n/r	6	6.5
14 + 00	3	3	6	6.5	n/r	n/r	6	6.5
15 + 00	3	3	6	6.0	n/r	n/r	6	6.0
16 + 00	3	3	6	6.0	n/r	n/r	6	7.0
17 + 00	3	3	6	6.0	n/r	n/r	6	7.0
18 + 00	3	3	6	6.0	n/r	n/r	6	6.5
19 + 00	3	3	6	6.5	n/r	n/r	6	6.5
20 + 00	3	3	6	6.5	n/r	n/r	6	6.5
21 + 00	3	3	6	6.5	n/r	n/r	6	7.0
22 + 00	3	3	6	6.0	n/r	n/r	6	6.5
23 + 00	3	3	6	6.5	n/r	n/r	6	7.0
24 + 00	3	3	6	6.5	n/r	n/r	6	7.0
25 + 00	3	3	6	6.5	n/r	n/r	6	6.5
26 + 00	3	3	6	6.0	n/r	n/r	6	7.0
27 + 00	3	3	6	6.5	n/r	n/r	6	6.5
28 + 00	3	3	6	6.0	n/r	n/r	6	7.0

n/r = Not Required

Table 35 Riprap and Filter Layer Thicknesses - North Diversion Ditch (Page 2 of 2)

Location	**Riprap**				**Filter II**		**Filter I**	
	D_{50} Size		**Thickness**		**Thickness**		**Thickness**	
	Design (inches)	**As-Built (inches)**	**Design (inches)**	**As-Built (inches)**	**Design (inches)**	**As-Built (inches)**	**Design (inches)**	**As-Built (inches)**
29 + 00	3	3	6	6.0	n/r	n/r	6	6.5
30 + 00	18	18	27	27.0	6	6.0	6	7.0
31 + 00	18	18	27	27.5	6	6.5	6	6.5
32 + 00	18	18	27	27.5	6	6.0	6	6.5
33 + 00	18	18	27	27.5	6	6.0	6	6.0
34 + 00	18	18	27	27.5	6	6.0	6	6.5
35 + 00	18	18	27	27.5	6	6.0	6	7.0
36 + 00	18	18	27	27.0	6	6.0	6	7.0
37 + 00	18	18	27	27.5	6	6.0	6	6.5
38 + 00	18	18	27	27.0	6	6.0	6	6.0
39 + 00	18	18	27	27.5	6	6.0	6	6.0
40 + 00	18	18	27	27.5	6	6.0	6	7.0
41 + 00	18	18	27	27.0	6	6.0	6	6.0
42 + 00	18	18	27	27.5	6	7.0	6	6.5
43 + 00	18	18	27	27.0	6	6.0	6	6.0
44 + 00	18	18	27	27.0	6	6.5	6	6.0
45 + 00	18	18	27	27.5	6	6.0	6	6.0
46 + 00	18	18	27	27.0	6	6.5	6	6.5
47 + 00	18	18	27	27.5	6	6.5	6	6.5
48 + 00	18	18	27	27.0	6	6.0	6	6.0
49 + 00	18	18	27	27.0	6	6.0	6	6.0
50 + 00	18	18	27	27.0	6	6.0	6	6.0
51 + 00	18	18	27	27.5	6	6.0	6	6.0
52 + 00	18	18	27	27.0	6	7.5	6	6.5
53 + 00	18	18	27	27.0	6	6.0	6	6.0
54 + 00	18	18	27	27.5	6	6.5	6	6.5
55 + 00	18	18	27	27.0	6	6.0	6	6.0
56 + 00	18	18	27	27.0	6	6.0	6	6.5

n/r = Not Required

Table 36 Riprap and Filter Layer Thicknesses - South Diversion Ditch (Page 1 of 3)

Location	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
0+00	3	3	6	6.5	n/r	n/r	6	6.0
1+00	3	3	6	6.5	n/r	n/r	6	6.0
2+00	3	3	6	6.0	n/r	n/r	6	6.5
3+00	3	3	6	6.5	n/r	n/r	6	6.5
4+00	3	3	6	6.5	n/r	n/r	6	6.0
5+00	3	3	6	6.0	n/r	n/r	6	6.0
6+00	12	12	18	18.0	6	7.0	6	6.0
7+00	12	12	18	18.5	6	6.5	6	6.0
8+00	3	3	6	6.5	n/r	n/r	6	6.0
9+00	3	3	6	6.0	n/r	n/r	6	6.0
10+00	3	3	6	6.5	n/r	n/r	6	6.0
11+00	3	3	6	6.0	n/r	n/r	6	6.5
12+00	3	3	6	6.0	n/r	n/r	6	6.0
13+00	3	3	6	6.5	n/r	n/r	6	6.0
14+00	3	3	6	6.5	n/r	n/r	6	6.0
15+00	3	3	6	6.0	n/r	n/r	6	6.0
16+00	3	3	6	6.5	n/r	n/r	6	6.0
17+00	3	3	6	6.0	n/r	n/r	6	6.0
18+00	3	3	6	6.0	n/r	n/r	6	6.0
19+00	3	3	6	6.5	n/r	n/r	6	6.0
20+00	3	3	6	6.5	n/r	n/r	6	6.5
21+00	3	3	6	6.5	n/r	n/r	6	6.5
22+00	3	3	6	6.0	n/r	n/r	6	7.0
23+00	18	18	27	27.0	n/r	n/r	6	7.0
24+00	18	18	27	27.5	n/r	n/r	6	6.0
25+00	3	3	6	6.0	n/r	n/r	6	6.0

n/r = Not Required

Table 36 Riprap and Filter Layer Thicknesses - South Diversion Ditch (Page 2 of 3)

Location	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
26+00	3	3	6	6.0	n/r	n/r	6	6.0
27+00	3	3	6	6.0	n/r	n/r	6	6.5
28+00	3	3	6	6.5	n/r	n/r	6	6.5
29+00	3	3	6	6.0	n/r	n/r	6	6.5
30+00	3	3	6	6.0	n/r	n/r	6	6.5
31+00	12	12	18	18.5	6	6.5	6	6.0
32+00	12	12	18	18.0	6	6.0	6	6.0
33+00	12	12	18	18.0	6	6.0	6	6.5
34+00	3	3	6	6.5	n/r	n/r	6	6.0
35+00	3	3	6	6.5	n/r	n/r	6	7.0
36+00	3	3	6	6.5	n/r	n/r	6	7.0
37+00	3	3	6	6.5	n/r	n/r	6	6.0
38+00	3	3	6	6.5	n/r	n/r	6	6.0
39+00	3	3	6	6.5	n/r	n/r	6	6.5
40+00	3	3	6	7.0	n/r	n/r	6	7.0
41+00	3	3	6	6.5	n/r	n/r	6	6.0
42+00	3	3	6	7.0	n/r	n/r	6	6.5
43+00	3	3	6	7.0	n/r	n/r	6	6.5
44+00	3	3	6	6.0	n/r	n/r	6	6.0
45+00	18	18	27	27.0	6	6.5	6	6.0
46+00	18	18	27	27.0	6	7.0	6	6.0
47+00	18	18	27	27.0	6	7.0	6	6.5
48+00	18	18	27	27.0	6	7.0	6	6.0
49+00	18	18	27	27.0	6	6.5	6	6.5
50+00	18	18	27	27.0	6	7.0	6	6.0

n/r = Not Required

Table 36 Riprap and Filter Layer Thicknesses -- South Diversion Ditch (Page 3 of 3)

Location	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
51+00	18	18	27	27.5	6	6.5	6	6.0
52+00	18	18	27	27.5	6	6.0	6	6.5
53+00	18	18	27	27.0	6	6.0	6	6.0
54+00	18	18	27	27.5	6	6.0	6	6.0
55+00	18	18	27	27	6	6.5	6	6.0
56+00	18	18	27	27.5	6	6.0	6	7.0
57+00	18	18	27	27	6	6.0	6	7.0
58+00	18	18	27	27	6	6.0	6	7.0
59+00	18	18	27	27	6	6.0	6	7.0
60+00	18	18	27	27	6	6.0	6	6.5
61+00	18	18	27	27	6	6.0	6	8.0
62+00	18	18	27	27.5	6	6.5	6	6.0
63+00	18	18	27	27	6	6.0	6	6.5
64+00	18	18	27	27	6	6.5	6	6.5
65+00	18	18	27	27	6	6.5	6	6.5
65+93	18	18	27	27	6	8.0	6	6.5

Table 37 Riprap and Filter Layer Thicknesses - Tailing Swale

Location	Riprap				Filter II		Filter I	
	D_{50} Size		Thickness		Thickness		Thickness	
	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)	Design (inches)	As-Built (inches)
2 + 00	3	3	6	7.5	n/r	n/r	6	6.0
3 + 00	3	3	6	6.0	n/r	n/r	6	6.0
4 + 00	3	3	6	6.0	n/r	n/r	6	6.5
5 + 00	3	3	6	6.0	n/r	n/r	6	7.0
6 + 00	3	3	6	6.0	n/r	n/r	6	6.5
7 + 00	3	3	6	6.0	n/r	n/r	6	6.0
8 + 00	3	3	6	7.5	n/r	n/r	6	6.5
9 + 00	3	3	6	6.0	n/r	n/r	6	6.0
10 + 00	3	3	6	6.0	n/r	n/r	6	6.5
11 + 00	3	3	6	6.0	n/r	n/r	6	6.0
12 + 00	3	3	6	6.0	n/r	n/r	6	6.0
13 + 00	3	3	6	6.0	n/r	n/r	6	6.5
14 + 00	3	3	6	6.5	n/r	n/r	6	6.0
15 + 00	3	3	6	6.0	n/r	n/r	6	6.0
16 + 00	3	3	6	6.5	n/r	n/r	6	6.0
17 + 00	3	3	6	6.0	n/r	n/r	6	7.0
18 + 00	3	3	6	6.5	n/r	n/r	6	7.0
19 + 00	3	3	6	7.0	n/r	n/r	6	6.0
20 + 00	3	3	6	6.0	n/r	n/r	6	7.0
21 + 00	*	*	6	10.5	n/r	n/r	6	6.0
22 + 00	12	12	18	18.0	6	6.5	6	6.0
23 + 00	12	12	18	18.0	6	6.0	6	6.5
24 + 00	12	12	18	18.0	6	7.0	6	6.0
25 + 00	12	12	18	18.0	6	7.0	6	6.0
26 + 00	12	12	18	18.0	6	6.0	6	7.0
27 + 00	18	18	27	27.0	6	6.0	6	7.0
28 + 00	18	18	27	27.5	6	6.5	6	7.0

* Transition area where riprap D_{50} changes from 3-inches to 12-inches
n/r = Not Required

Table 38 Confluence Characteristics

Confluence	Approximate Centerline Station	Profile Slope (ft / ft)		Bottom Width (ft)		Depth (ft)		Length (ft)		Discharge Angle (degrees)	
		Design	As-built	Design	As-built	Design	As-built	Design	As-built	Design	As-built
North 1 (1)	35 + 00	0.0920	0.1242	100	101.2	.020	varies (7) 0 to 6.6	325	108.3	48	72
North 2 (2)	5 + 50	0.0600	0.0502	60	62.7	varies 0 to 7.5	varies (7) 0 to 7.5	125.0	261.9	90	90
North 3 (3)	7+00	0.1600	0.1169	60	63.4	varies 0 to 7.5	varies 0 to 8.5	111	144.5	90	90
North 4 (3)	18+70	0.1800	0.1344	40	41.2	varies 0 to 7.8	varies 0 to 8.1	120	226.3	90	90
South 1 (4)	6 + 00	0.0625	0.0561	75	88.9	0.61	varies (7) 0 to 5.0	160	123.0	78	83
South 2 (4)	24 + 00	0.0700	0.0526	42 (6)	55.6	1.20	varies (7) 0 to 10.4	311	200.7	70	88
South 3 (4)	32 + 00	0.1130	0.1060	50	96.8	0.60	varies (7) 0 to 9.8	250	135.6	90	90
South 4 (4)	52 + 00	0.0670	0.0619	50	52.0	1.21	varies (7) 0 to 9.9	258	144.5	60	79
North Central 1 (5)	8 + 00	0.3320	see note 5.	75	see note 5	0.20	varies (7) 0 to 5.3	97	see note 5	89	see note 5

(1) North Confluence 1 was redesigned to fit field conditions, which required a slightly steeper slope and reduced length. See Appendix B of this report.

(2) North Confluence 2 was not originally anticipated in the 2/94 TRP. However, the extensive grading and soil cleanup activities that occurred during construction indicated that a new confluence was required at this location. As a result, a new confluence was constructed during the 1997 construction season. See Appendix C of this report.

(3) North Confluences 3 and 4 were not originally anticipated in the 2/94 TRP. However, an extreme rainfall event that occurred after construction had been completed resulted in erosion of the north bank of the completed North Diversion Ditch. As a result, new confluences were constructed at these two locations. See Appendix H.

(4) South Confluences 1, 2, 3, and 4 were constructed to fit field conditions, which required reduced lengths.

(5) North Central Confluence 1 was not included in the construction drawings as a confluence but as a composite side slope at approximate station 8+00 on the left side slope looking downstream in the North Central Diversion Ditch. It's measurements are therefore included in the North Central Diversion Ditch rather than here.

(6) The bottom width of South Confluence 2 was reduced from 50 feet shown in Figure 9 of the 2/94 TRP to 42 feet as discussed in Appendix D of this report.

(7) Confluence depths vary from a maximum where the confluence enters the diversion ditch to zero where it daylights with the existing ground.

Table 39 Diversion Ditch Outlet Apron Characteristics

Diversion Ditch	Profile Slope (ft / ft)		Bottom Width				Flow Depth				Profile Length (ft)		Scour Depth (ft)	
			Initial (ft)		Final (ft)		Initial (ft)		Final (ft)					
	Design	As-Built	Design	As-Built	Design	As-Built	Design	As-Built	Design	As-Built	Design	As-Built	Design	As-Built
North	0.0050	0.0047	15	15.0	90	90.6	7.50	8.5	3.06	4.0	100	101.8	13.1	14.8
South	0.0050	0.0052	15	15.4	90	90.1	7.70	9.0	2.37	3.6	100	101.3	12.6	12.8
South Central	0.0068	0.0063	15	16.0	50	50.7	5.08	6.5	2.09	6.1	50	51.3	7.0	7.5
North Central	0.0050	0.0048	15	15.0	50	50.0	3.86	4.3	1.47	3.9	50	50.8	5.4	5.6

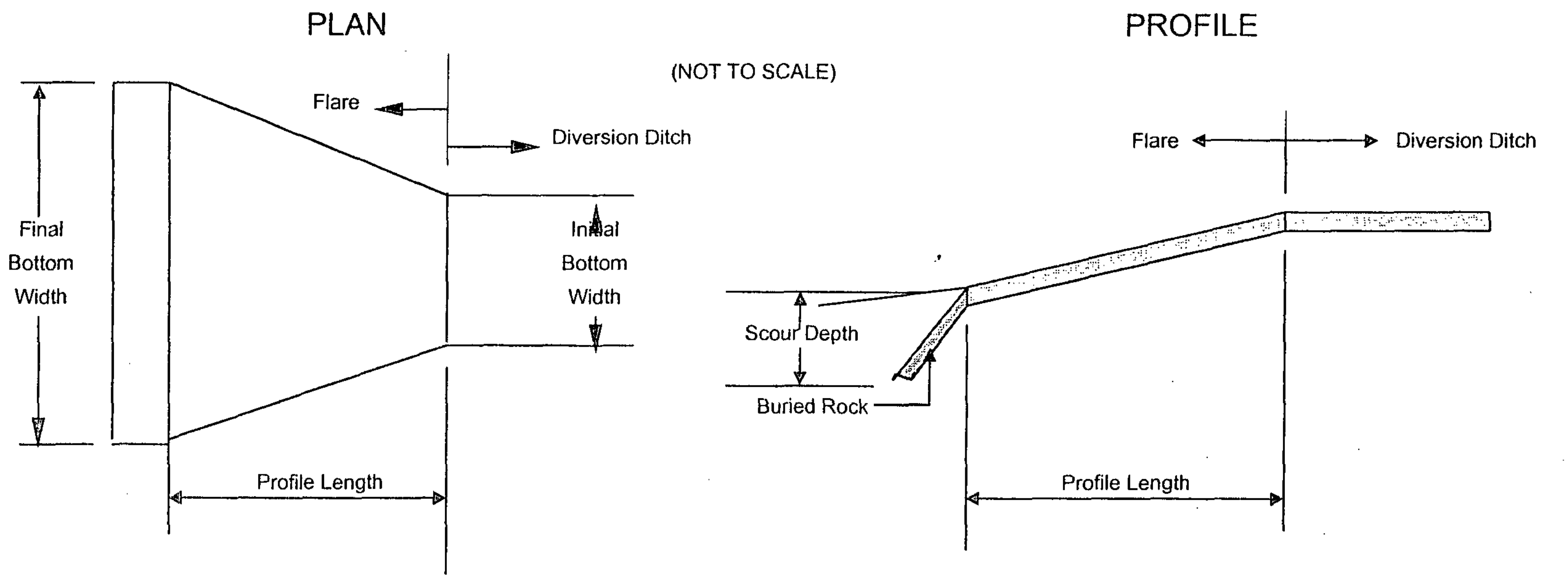


Table 40 Key Trench Characteristics (Page1 of 3, North Key Trench)

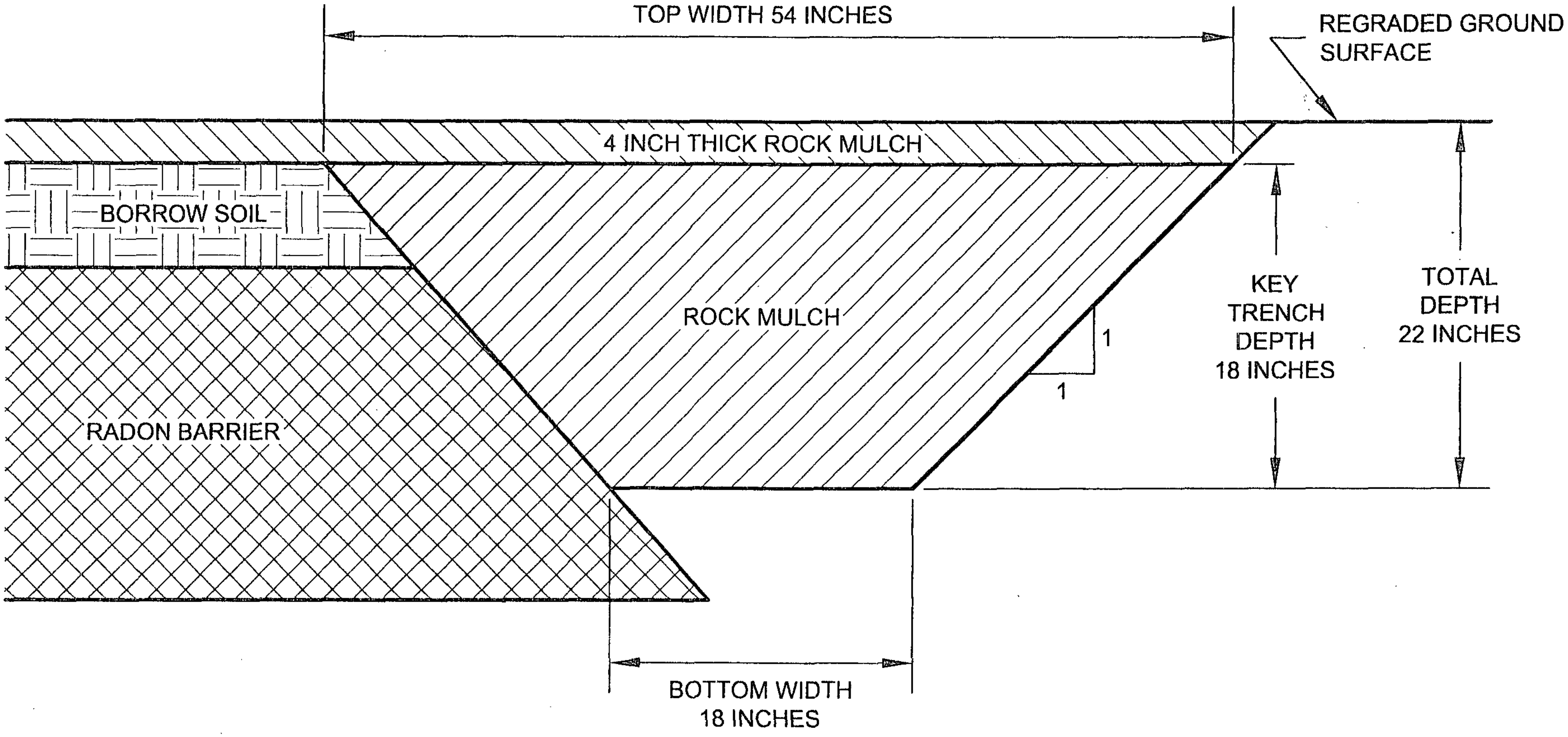
	Approx. Station	Bottom Width (in) (1)		Top Width (in) (1)		Key Trench Depth (in) (1)		Total Depth (in) (1)	
		Design	As-Built	Design	As-Built	Design	As-Built	Revised Design	As-Built
Tie in to North Ditch	0+00	18	19	54	54	18	18	22	22
	1+00	18	18	54	56	18	18	22	22
	2+00	18	18	54	54	18	19	22	23
	3+00	18	20	54	55	18	19	22	23
	4+00	18	18	54	58	18	18	22	22
	5+00	18	19	54	54	18	20	22	24
	6+00	18	18	54	54	18	18	22	22
	7+00	18	21	54	56	18	19	22	23
	8+00	18	20	54	54	18	20	22	24
	9+00	18	18	54	57	18	22	22	26
Tie in to North Central Ditch	10+00	18	22	54	55	18	18	22	22

(1) Minimum required dimensions are as illustrated on Page 3 of 3.

Table 40 Key Trench Characteristics (Page 2 of 3, South Key Trench)

	Approx. Station	Bottom Width (in) (1)		Top Width (in) (1)		Key Trench Depth (in) (1)		Total Depth (in) (1)	
		Design	As-Built	Design	As-Built	Design	As-Built	Revised Design	As-Built
Tie in to South Central Ditch	0+00	18	18	54	56	18	19	22	23
	1+00	18	19	54	56	18	20	22	24
	2+00	18	18	54	54	18	18	22	22
	3+00	18	20	54	54	18	19	22	23
	4+00	18	22	54	55	18	21	22	25
	5+00	18	19	54	54	18	20	22	24
	6+00	18	18	54	57	18	18	22	22
	7+00	18	21	54	54	18	22	22	26
	8+00	18	19	54	58	18	19	22	23
	9+00	18	18	54	56	18	20	22	24
	10+00	18	20	54	55	18	21	22	25
	11+00	18	18	54	54	18	19	22	23
	12+00	18	18	54	57	18	22	22	26
	13+00	18	19	54	54	18	18	22	22
	14+00	18	18	54	55	18	19	22	23
	15+00	18	20	54	55	18	18	22	22
	16+00	18	18	54	54	18	18	22	22
	17+00	18	22	54	55	18	19	22	23
	18+00	18	20	54	58	18	20	22	24
	19+00	18	18	54	54	18	19	22	23
	20+00	18	19	54	55	18	19	22	23
	21+00	18	19	54	54	18	18	22	22
Tie in to South Ditch	22+00	18	19	54	57	18	19	22	23

(1) Minimum required dimensions are as illustrated on Page3 of 3.



NOTE: DIMENSIONS SHOWN ARE MINIMUM REQUIREMENT

NOT TO SCALE

SHEPHERD MILLER
INCORPORATED

TABLE 40
KEY TRENCH CHARACTERISTICS

Date:	MARCH 1999
Project:	100060\DWG
File:	COV-SECT

Table 41 Summary of Deficiencies Identified During WNI Audits for which No Physical Reconstruction was Warranted (Page 1 of 4)

Date of Audit	Test No.	Description of Failure	Corrective Action
Moisture of Radon Barrier			
29-Sep-94	97 (82R)	Required Minimum Moisture = 17.6% Actual Minimum Moisture = 17.5% Moisture was too wet by 0.1%	No physical reconstruction was warranted. From a practical standpoint, it was deemed not prudent or necessary to attempt to excavate the already placed completed borrow soil and rock mulch layers which would violate the integrity of the completed layer. The -0.1 deficiency was well above the minimum moisture requirement of 16.9%.
27-Oct-94	129	Required Maximum Moisture = 23.7% Actual Maximum Moisture = 23.8% Moisture was too wet by 0.1%	No physical reconstruction was warranted. This non-conformance was due to oversight and was not noted until the date of this audit. It was deemed not prudent or necessary to attempt to excavate the upper lifts already placed. This test had passed the density and minimum 16.9% moisture requirement.
21-Sep-95	73R	Required Minimum Moisture = 17.0% Actual Minimum Moisture = 16.9% Moisture was too dry by 0.1%	No physical reconstruction was warranted. From a practical standpoint, it was deemed not prudent or necessary to attempt to excavate the already placed next lift which would violate the integrity of the completed layer. The 0.1% deficiency met the minimum 16.9% moisture requirement.
21-Aug-96	212R	Required Maximum Moisture = 21.1% Actual Maximum Moisture = 22.0% Moisture was too wet by 0.9%	No physical reconstruction was warranted. This area had already been covered by subsequent radon barrier layers. From a practical standpoint it was deemed not prudent or necessary to attempt to excavate the already placed lifts which would violate the integrity of the completed layer.
Density of Radon Barrier			
27-Oct-94	150 (111R)	Required Density = 103.7 psf Actual Density = 103.3 psf Density Failed by 0.4 psf Density was 94.6 % of Proctor Density Failed by 0.4% of Proctor	No physical reconstruction was warranted. The non-conformance was not noted until the final lift of the radon barrier, borrow soil and rock mulch layers had been placed. It was deemed not prudent or necessary to excavate the already placed layers which would violate the integrity of the completed layers.
13-Oct-95	421R	Required Density = 104.1 psf Actual Density = 104.0 psf Density failed by 0.1 psf Density was 94.9 % of Proctor Density failed by 0.1% of Proctor	No physical reconstruction was warranted. When this non-conformance was noted in the audit, the next lift had already been placed. The -0.1% deficiency at94.9% of Proctor density did not justify excavating the completed layers.

Table 41 Summary of Deficiencies Identified During WNI Audits for which No Physical Reconstruction was Warranted (Page 2 of 4)

Date of Audit	Test No.	Description of Failure	Corrective Action
Density of Radon Barrier (Continued)			
21-Aug-96	164	Required Density = 104.8 psf Actual Density = 104.7 psf Density failed by 0.1 psf Density was 94.9 % of Proctor Density failed by 0.1% of Proctor	No physical reconstruction was warranted. When this non-conformance was noted, the area had already been covered by 2 successive lifts. The 0.1% Proctor deficiency did not justify excavating the completed lifts.
13-Sep-96	337	Required Density = 105.1 psf Actual Density = 105.0 psf Density failed by 0.1 psf Density was 94.9 % of Proctor Density failed by 0.1% of Proctor	No physical reconstruction was warranted. When this non-conformance was noted, the area had already been covered. The 0.1% Proctor deficiency did not justify excavating the completed lifts.
2-Oct-97	161R	Required Density = 105.7 psf Actual Density = 105.2 psf Density failed by 0.5 psf Density was 94.5 % of Proctor Density failed by 0.5% of Proctor	Area represented by failing test was ripped, reworked and retested 3 times. The third test was mistakenly determined to be a passing test as record showed density to be >95% of Proctor density. In reality, the density was only 94.5%. When this non-conformance was noted, the area, had already been covered by the next radon barrier layer as well as the borrow soil layer. The 0.5% Proctor deficiency did not justify excavating the completed layers.
Thickness of Radon Barrier Lifts			
10-Nov-95	N/A	Required 1st Lift = 6 inches Actual 1st Lift at 15 grid points was 6.5 inches	No physical reconstruction was warranted. Required compaction of 1st lift is 90% of Proctor density. Required compaction of all subsequent lifts is 95% of Proctor density. Therefore, if the compaction of the 1st lift is =>95%, then the 1st lift can be thicker than 6-inches (within reason). 6.5 inches is considered to be reasonable. Actual densities of the 15 samples were greater than 95% of Proctor.
14-Nov-96	N/A	First lift of the radon barrier placed in the North Central Diversion Ditch exceeded the required 6-inch thickness by 2 inches at five stations; by 1 ½ inches at three stations and by 1-inch at one station.	No physical reconstruction was warranted. When this non-conformance was noted, the borrow soil and filter layers had already been placed. From a practical standpoint, it was deemed not prudent or necessary to excavate the completed layers and remove the excess radon barrier thickness. A review of the density results showed that all Density tests were greater than 95% of Proctor density. Also, the moisture content averaged 1.6% above optimum.

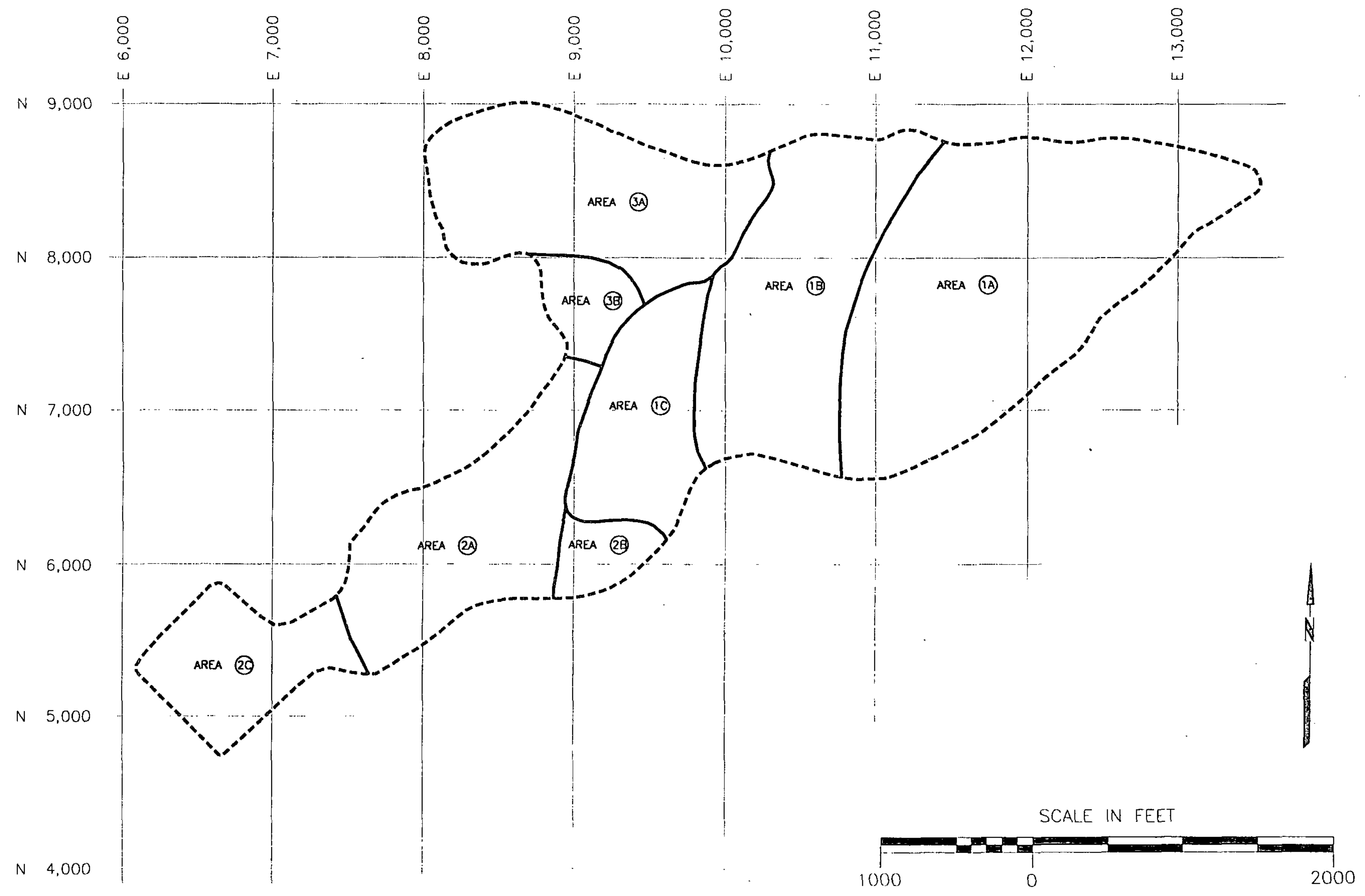
Table 41 Summary of Deficiencies Identified During WNI Audits for which No Physical Reconstruction was Warranted (Page 3 of 4)

Date of Audit	Test No.	Description of Failure	Corrective Action
Thickness of Radon Barrier Lifts (Continued)			
14-Nov-96	N/A	Second lift of the radon barrier placed in the North Central Diversion Ditch exceeded the required 6-inch thickness by 2 inches at eight stations, and by 2½ inches at one station. Also the radon barrier was placed in two 8-inch lifts instead of two 6 inch lifts and a 4 inch lift.	No physical reconstruction was warranted. When this non-conformance was noted, the borrow soil and filter layers had already been placed. From a practical standpoint, it was deemed not prudent or necessary to excavate the completed layers and remove the excessive radon barrier thicknesses.
Rock Sample Size			
7-Jul-95	N/A	Minimum required rock gradation sample size = 330 lbs. Actual rock gradation sample size = 327.5 lbs. Sample was 2.5 lbs. too light.	No physical reconstruction was warranted. Contractor was notified to ensure that all future sample sizes met or exceeded the minimum requirement.
Borrow Soil Thickness			
10-Nov-95	N/A	Required thickness = 8 to 12 inches. Actual thickness at 11 grid points was 12.5 to 15 inches.	No physical reconstruction was warranted. From a practical standpoint, it was deemed not prudent or necessary to attempt to remove the already placed rock mulch layer since removal could potentially damage the integrity of the completed layer. SMI analyzed the effects of thicker borrow soil layers and concluded that layers as thick as 15 inches result in greater radon attenuation and are thus acceptable.
Filter I Thickness			
26-Mar-97	N/A	Average Filter I thickness at Station 6+00 of the North Central Diversion ditch was 5.5 inches instead of 6 inches.	No physical reconstruction was warranted. At the time the non-conformance was noted, subsequent riprap layer had been placed. Due to the minor nature of the non-conformance, the riprap layer was not removed.

Table 41 Summary of Deficiencies Identified During WNI Audits for which No Physical Reconstruction was Warranted (Page 4 of 4)

Date of Audit	Test No.	Description of Failure	Corrective Action
Filter II Thickness			
26-Mar-97	N/A	Average Filter II thickness at Station 6+00 of the North Central Diversion Ditch was 5.5 inches instead of 6 inches.	No physical reconstruction was warranted. At the time the non-conformance was noted, subsequent riprap layer had been placed. Due to the minor nature of the non-conformance, the riprap layer was not removed.
Diversion Ditch Bottom Width			
26-Mar-97	N/A	Excavated bottom elevation of south diversion ditch at station 25+00 was in non-compliance by 0.08 foot making the ditch slightly larger at this point.	No physical reconstruction was warranted. At the time the non-conformance was noted, subsequent radon barrier lifts had been placed. Due to the minor nature of the non-conformance, the radon barrier was not removed. Also, the finished ditch cross-section was larger than required.

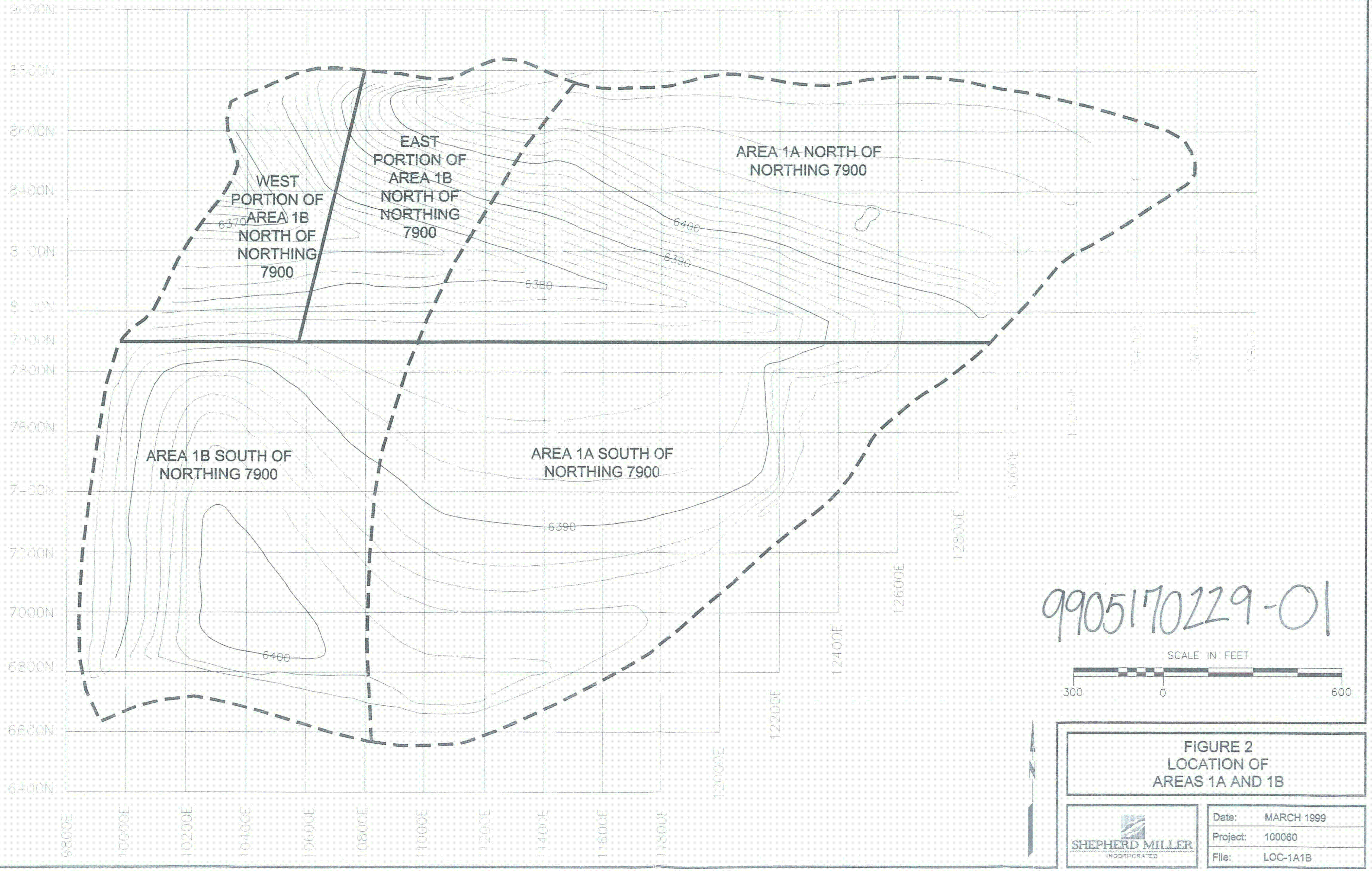
Note: A Corrective Action Report was completed and filed for each of these deficiencies identified during construction or WNI audits. Review by WNI construction and audit representatives determined that reconstruction activity for these isolated deficiencies would not materially improve the reclamation cover and could damage the overall integrity of the reclamation cover.



SHEPHERD MILLER
INCORPORATED

FIGURE 1
TAILING RECLAMATION AREAS

Date:	MARCH 1999
Project:	100060
File:	REC-AREA



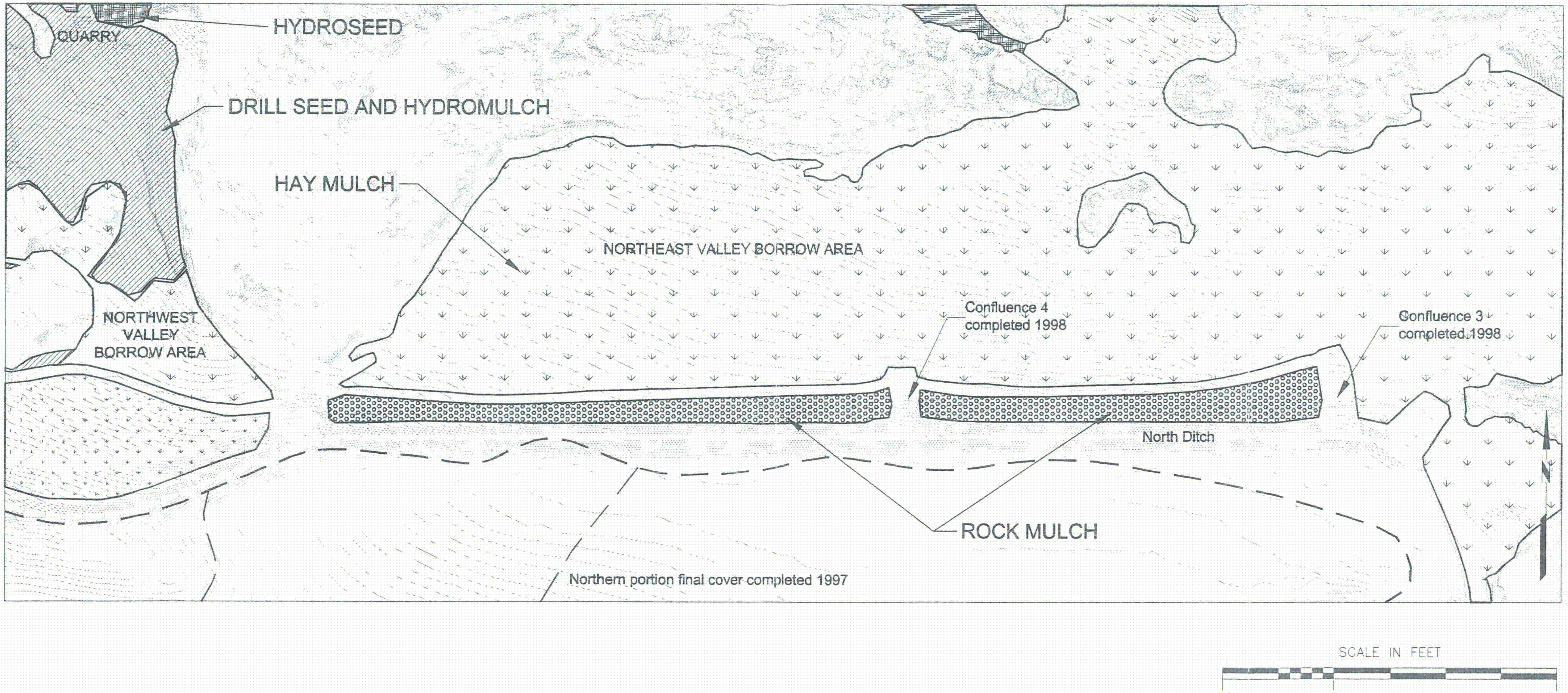
9905170229-01

FIGURE 2
LOCATION OF
AREAS 1A AND 1B

SHEPHERD MILLER
INCORPORATED

Date: MARCH 1999
Project: 100060
File: LOC-1A1B

Filename: 060\DWG\LOC-1A1B.dwg
Date: [illegible]/1999
Time: 10:12:08.56



9905170229-02

NOTES:

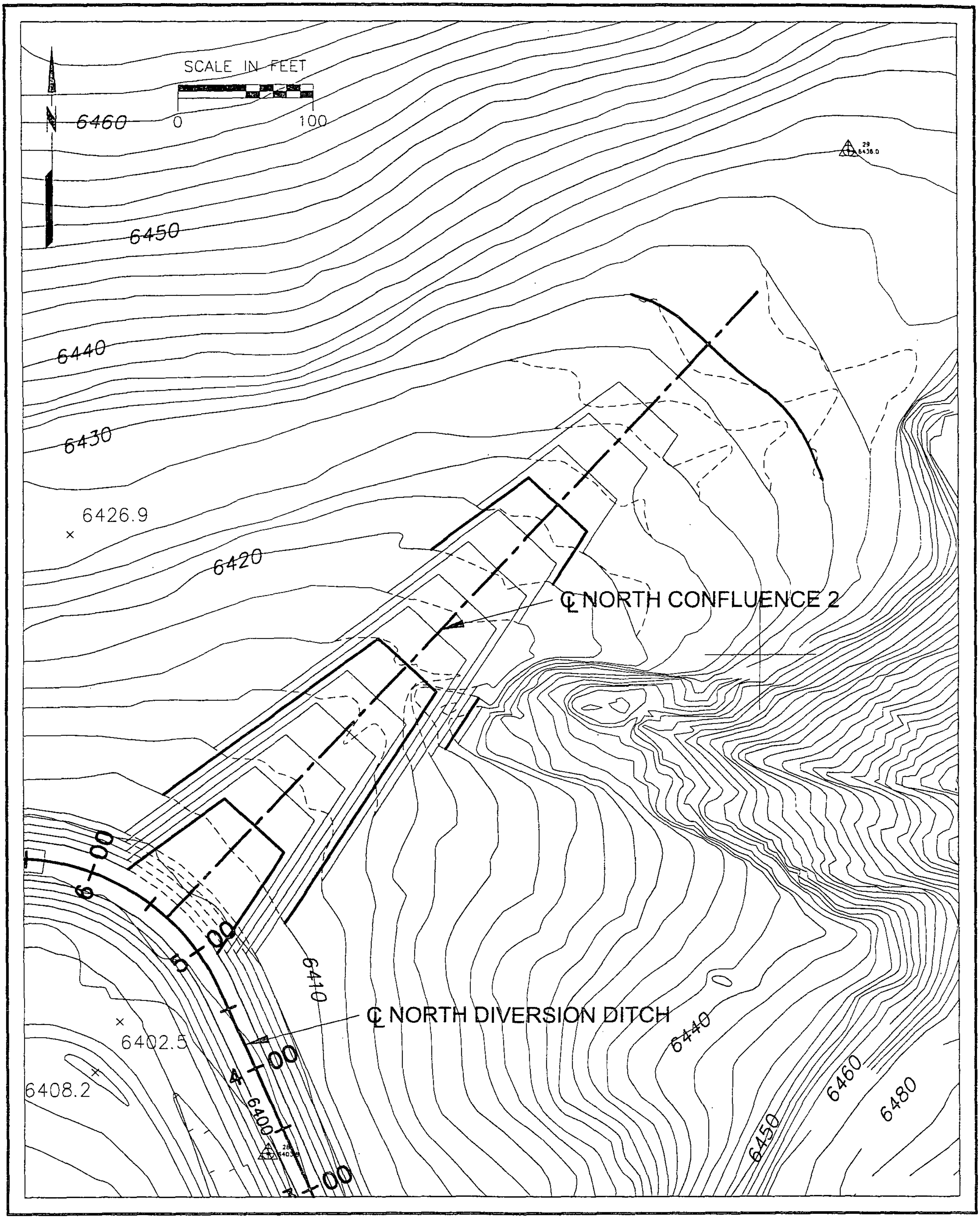
1. Terrain contours are from aerial survey supplied by Datamap Digital Services and ground surveys performed by C.E. Spurlock Jr. & Associates.

FIGURE 6
LOCATION OF CONFLUENCES 3 & 4
AND ROCK MULCH

SHEPHERD MILLER
INCORPORATED

Date: MARCH 1999
Project: 100060
File: NEBORROW.WG

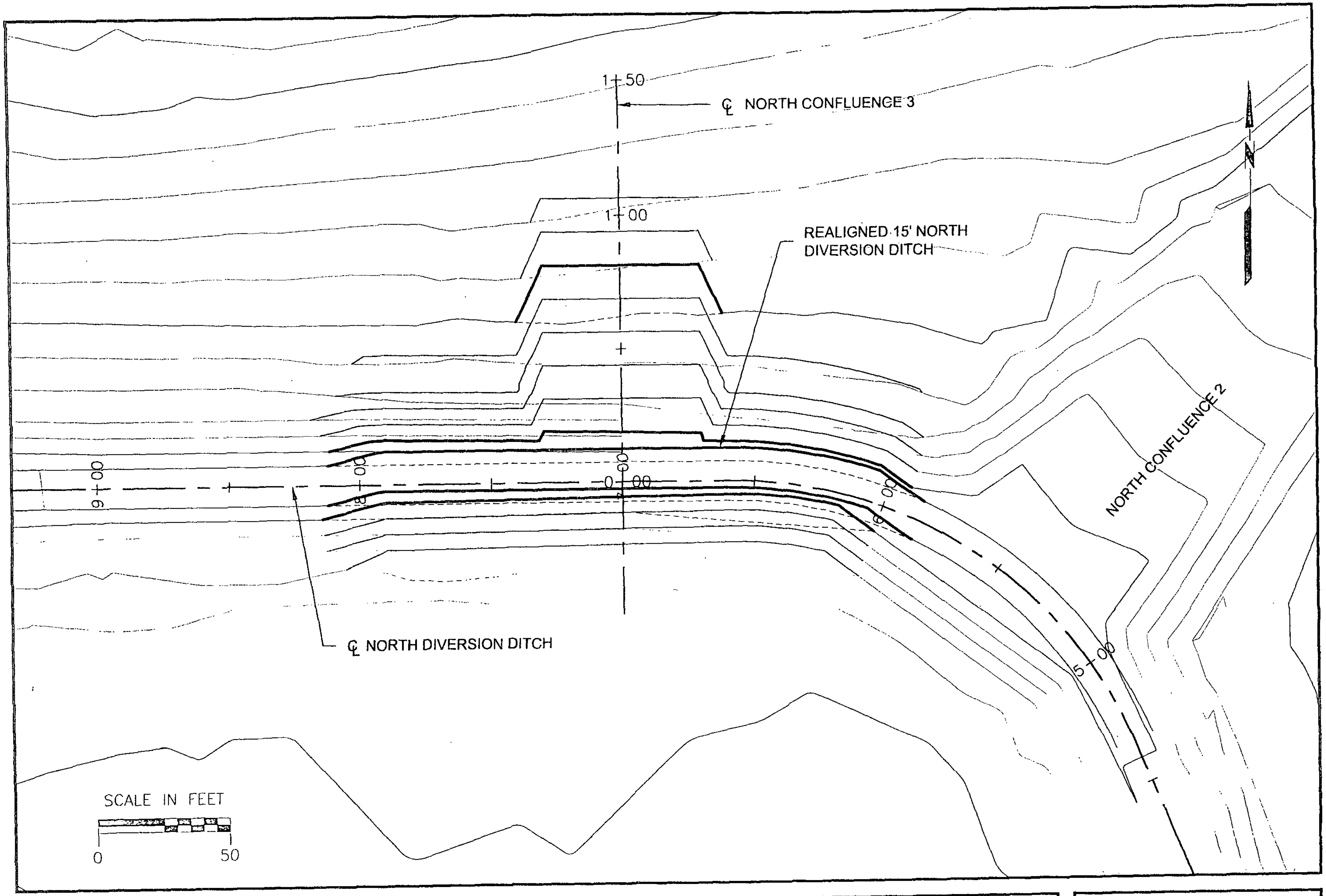
Filename: [illegible]060\DWG\NEBORROW.dwg
Date: [illegible]/1999
Time: 09:44:55.60



SHEPHERD MILLER
INCORPORATED

FIGURE 3
NORTH CONFLUENCE 2

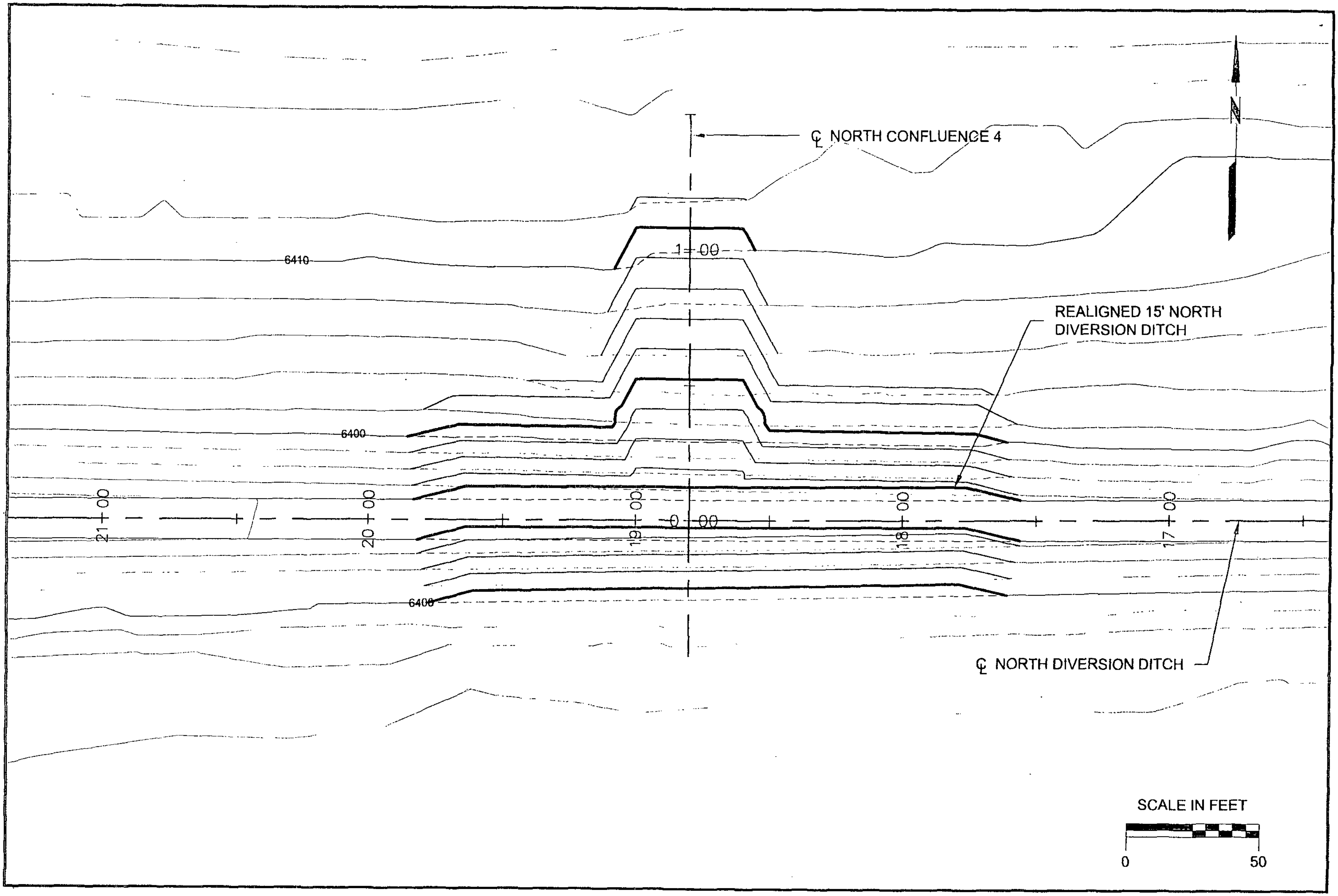
Date:	MARCH 1999
Project:	100060
File:	CHAN60FT



SHEPHERD MILLER
INCORPORATED

FIGURE 4
LOCATION OF
NORTH CONFLUENCE 3

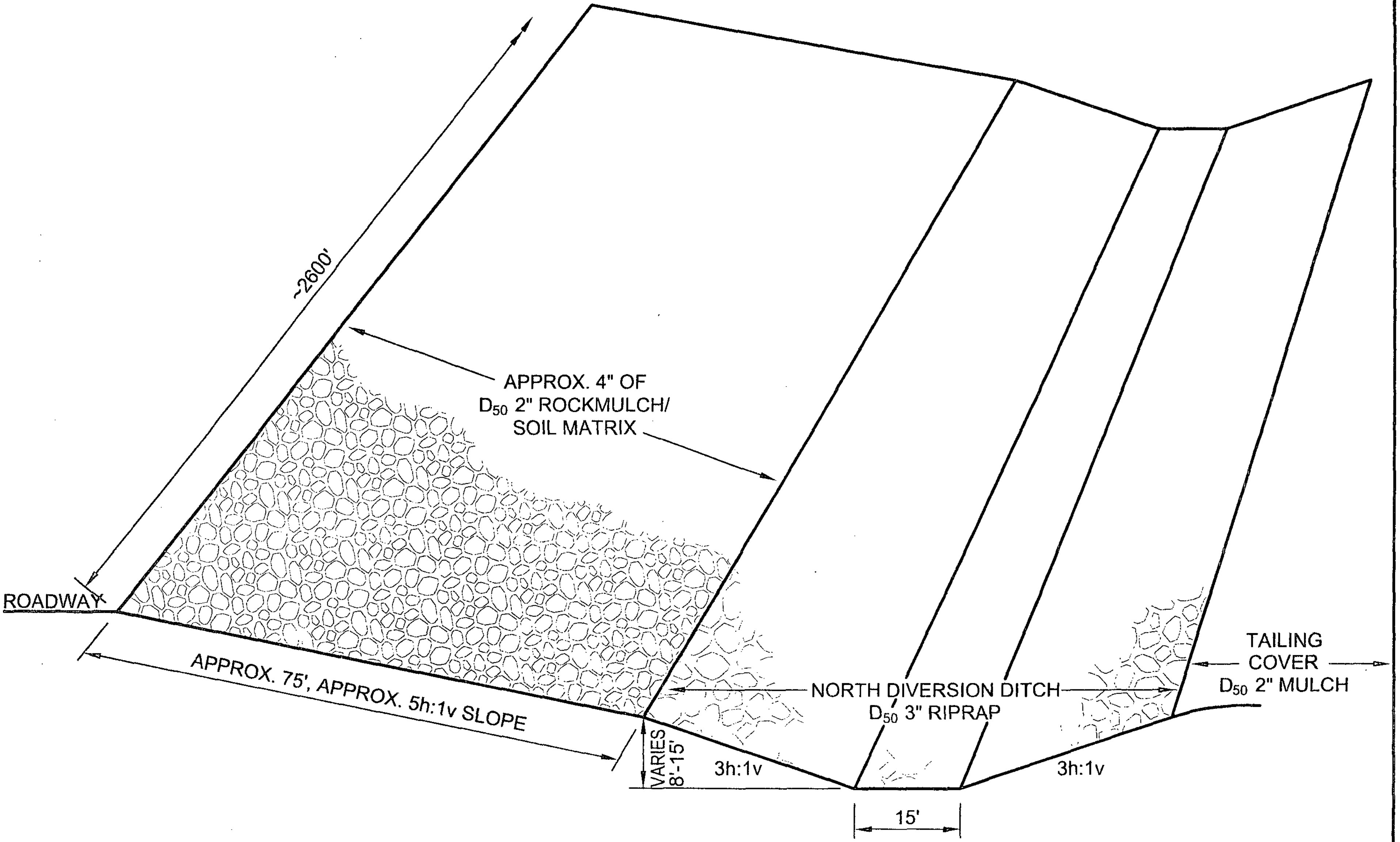
Date:	MARCH 1999
Project:	100060
File:	NCONF3



SHEPHERD MILLER
INCORPORATED

FIGURE 5
LOCATION OF NORTH CONFLUENCE 4

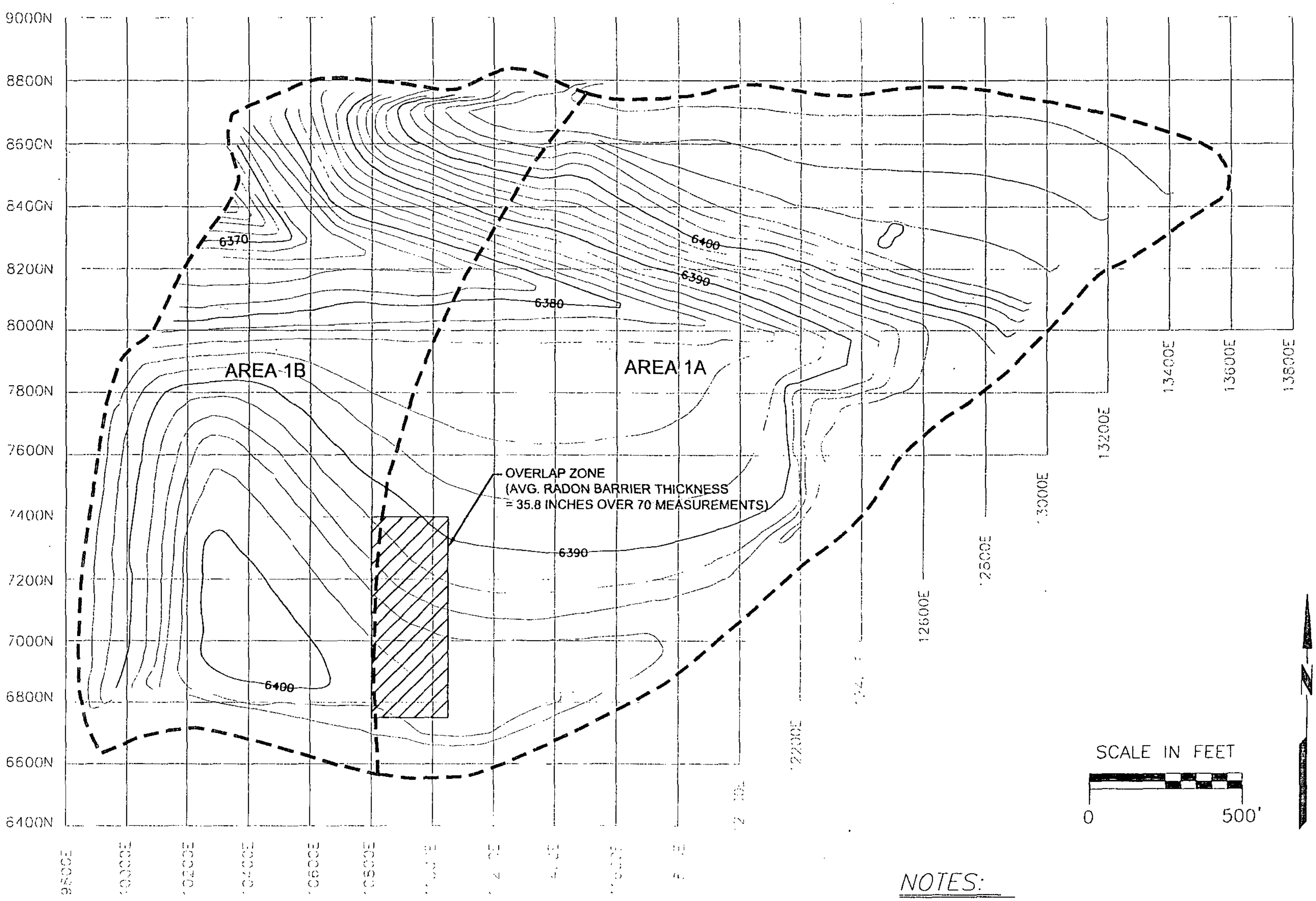
Date:	MARCH 1999
Project:	100060
File:	NCONF4



SHEPHERD MILLER
INCORPORATED

FIGURE 7
ROCK MULCH ON NORTH SIDE OF
NORTH DIVERSION DITCH TYPICAL SECTION

Date:	MARCH 1999
Project:	100060\FIGS
File:	NDIV-PER.dwg



OVERLAP ZONE
(AVG. RADON BARRIER THICKNESS
= 35.8 INCHES OVER 70 MEASUREMENTS)

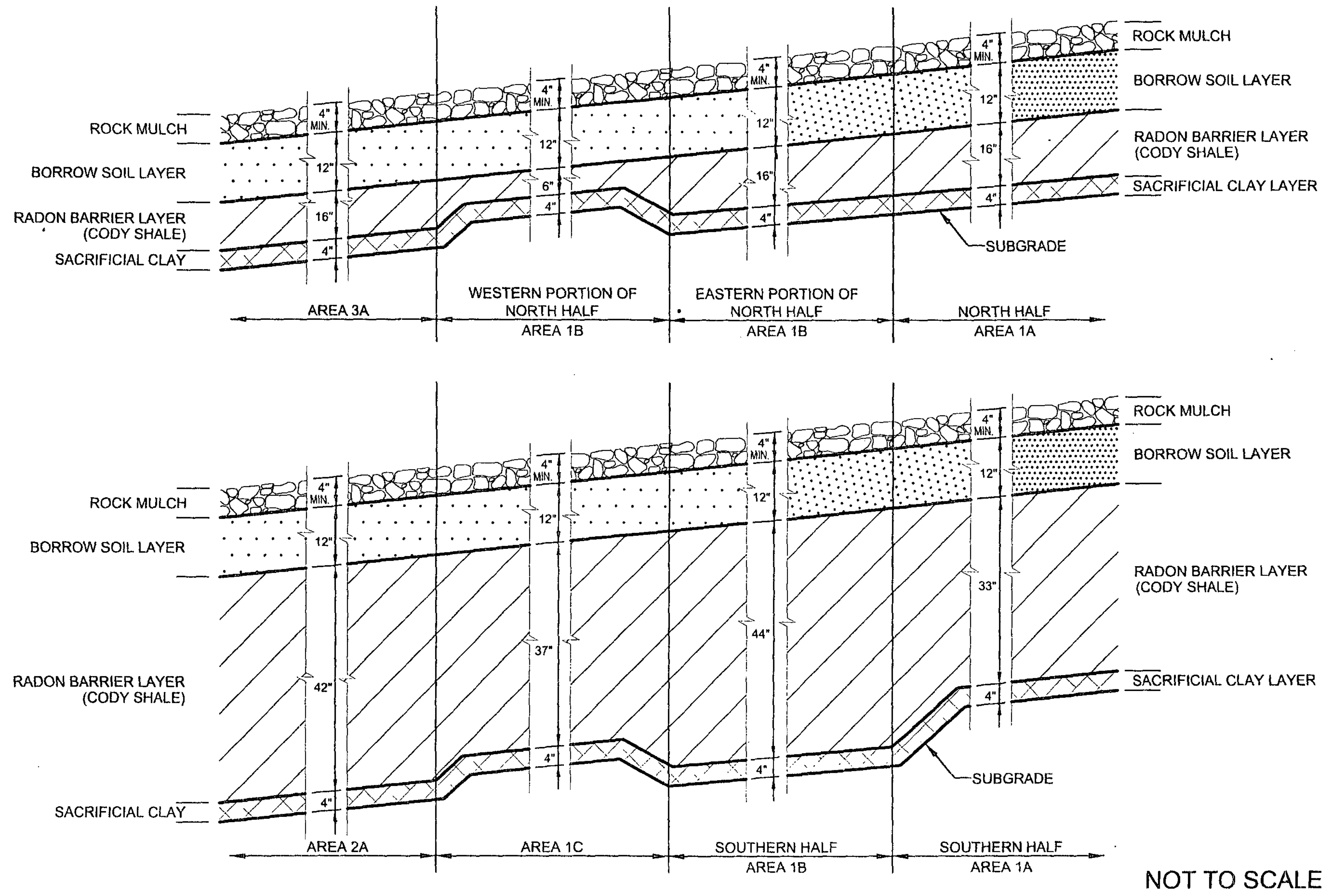
NOTES:

1. *Ground surveys performed by C.E. Spurlock Jr. & Associates.*

SHEPHERD MILLER
INCORPORATED

FIGURE 8
AREA 1A/1B
OVERLAP ZONE

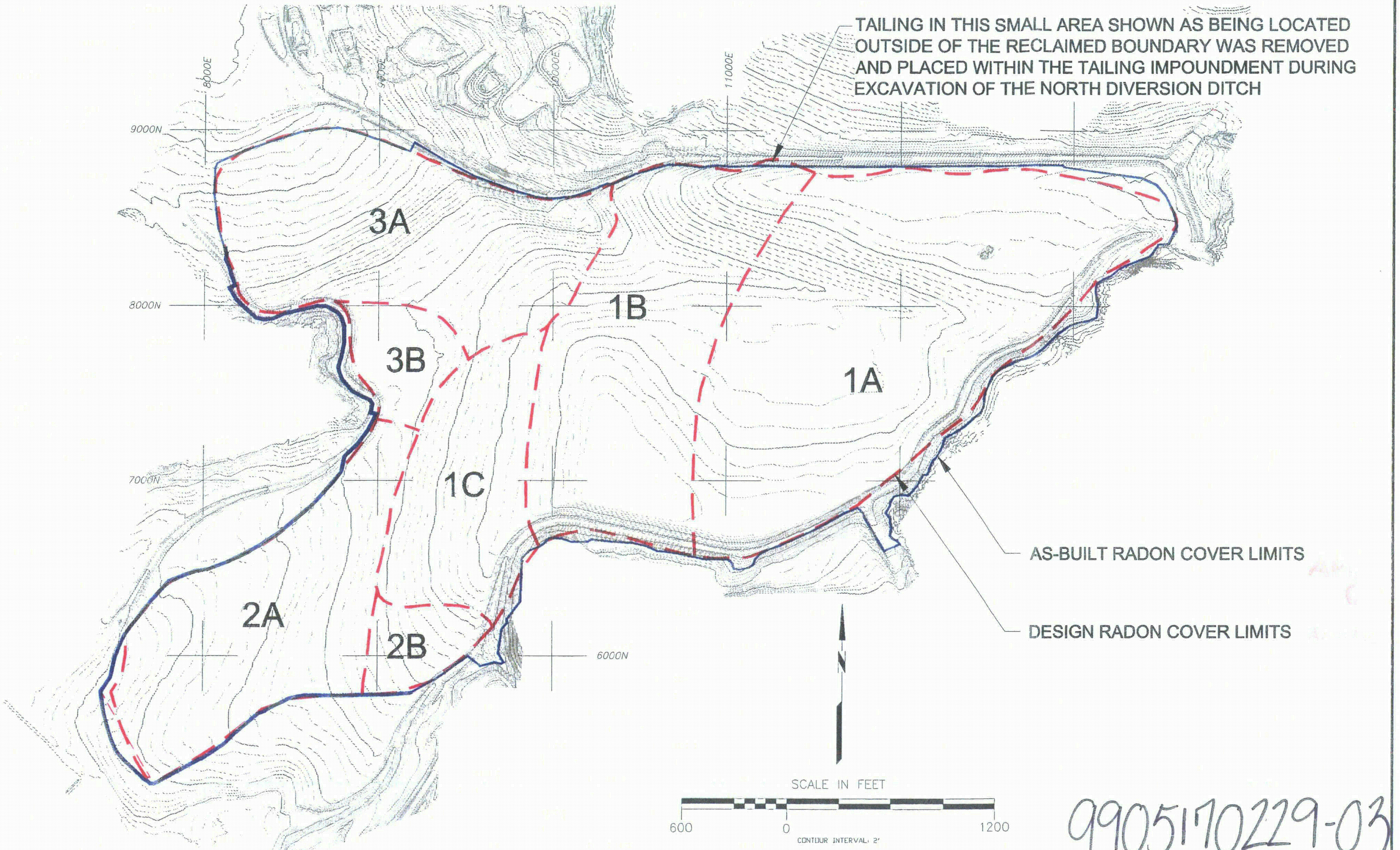
Date:	MARCH 1999
Project:	100060\DWG
File:	OVERLAP



SHEPHERD MILLER
INCORPORATED

FIGURE 9
TYPICAL COVER CROSS SECTIONS

Date:	MARCH 1999
Project:	100060\DWG
File:	COV-SECT



9905170229-03

NOTES:

1. *Design radon cover boundary was supplied by Shepherd Miller, Inc.*
2. *Terrain contours are from aerial survey supplied by Datamap Digital Services and ground surveys performed by C.E. Spurlock Jr. & Associates.*
3. *As-built radon cover limits drawn from ground surveys performed by C.E. Spurlock Jr. & Associates.*

FROM THE OFFICE OF C. E. SPURLOCK, JR. & ASSOC., LANDER, WY

PROJECT AREA:
SPLIT ROCK MILLSITE
STATE WYOMING COUNTY FREMONT
SECTION 1,2,11,12 TWP. 29N RGE. 92W

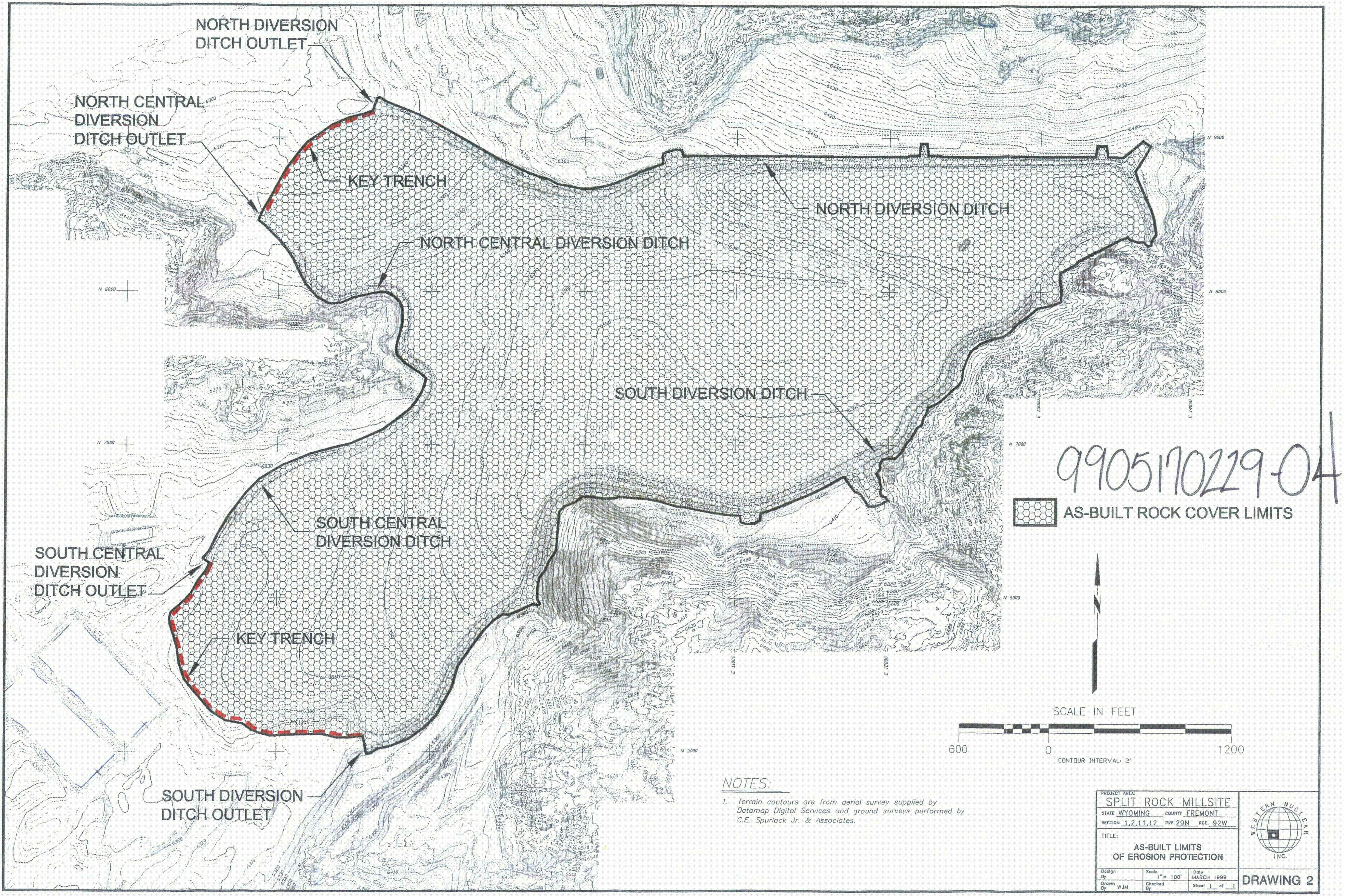
TITLE:
DESIGN VERSUS AS-BUILT LIMITS OF FINAL RADON COVER

WESTERN NUCLEAR INC.

Design By	Scale 1"= 600'	Date MARCH 1999
Drawn By TGB	Checked By	Sheet ___ of ___

DRAWING 1

Filename: E:\100[illegible]\FIG-RADN.dwg
Date: 04/13/1999
Time: 08:37:21.84



9905170229-04

NOTES:

1. *Terrain contours are from aerial survey supplied by Datamap Digital Services and ground surveys performed by C.E. Spurlock Jr. & Associates.*

PROJECT AREA:
SPLIT ROCK MILLSITE
STATE WYOMING COUNTY FREMONT
SECTION 1,2,11,12 TWP. 29N RGE. 92W

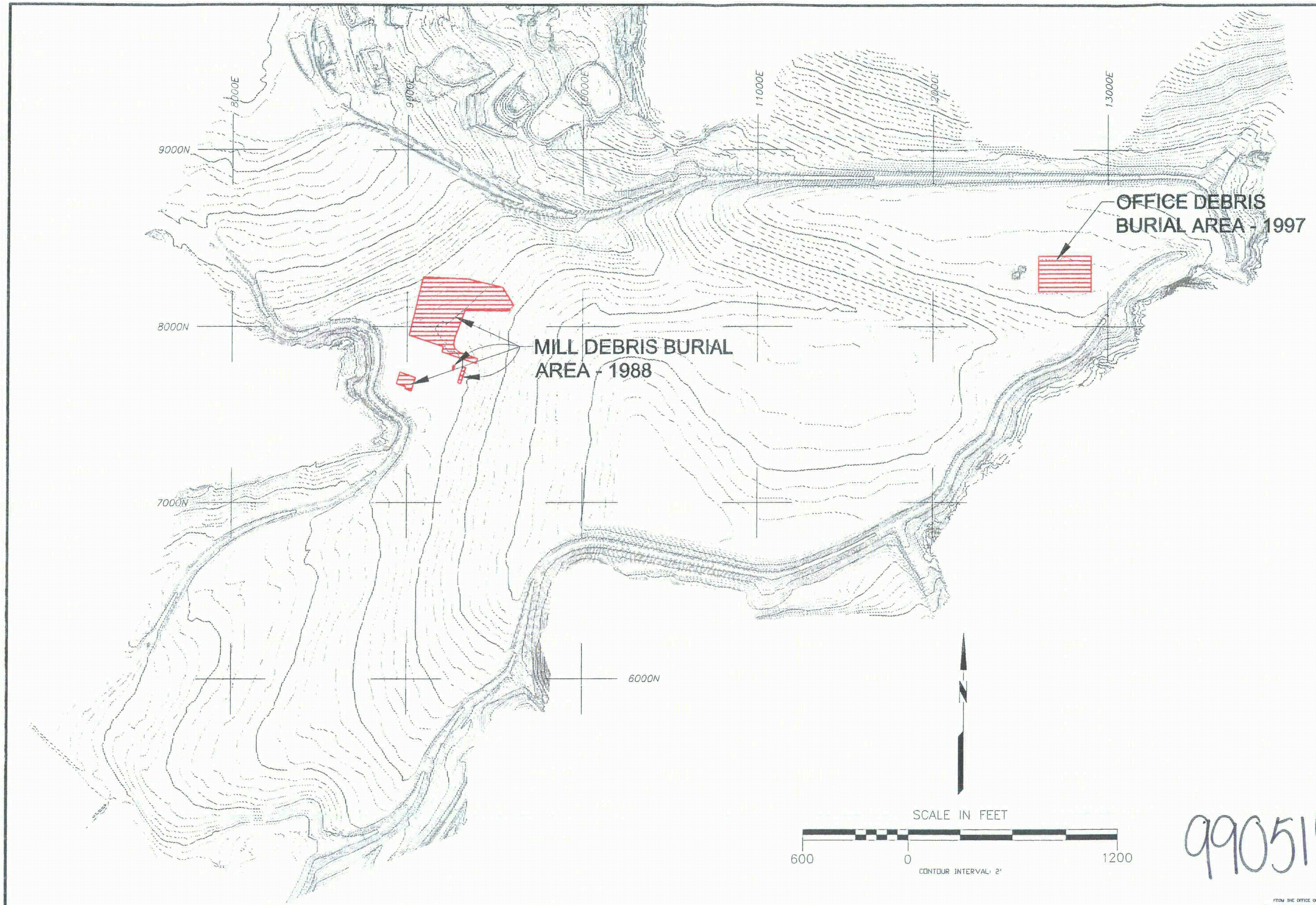
TITLE:
AS-BUILT LIMITS
OF EROSION PROTECTION

Design By	Scale 1"= 100'	Date MARCH 1999
Drawn By WJM	Checked By	Sheet 1 of 1

WESTERN NUCLEAR INC.

DRAWING 2

Filename: E:\10006C [illegible] IG-ROCK.dwg
Date: 04/13/1999
Time: 09:08:39.20



9905170229-05

NOTES:

1. *Terrain contours are from aerial survey supplied by Datamap Digital Services and ground surveys performed by C.E. Spurlock Jr. & Associates.*

FROM THE OFFICE OF C. E. SPURLOCK, JR. & ASSOC., LANDER, WY

PROJECT AREA:
SPLIT ROCK MILLSITE
STATE WYOMING COUNTY FREMONT
SECTION 1,2,11,12 TWP. 29N RGE. 92W

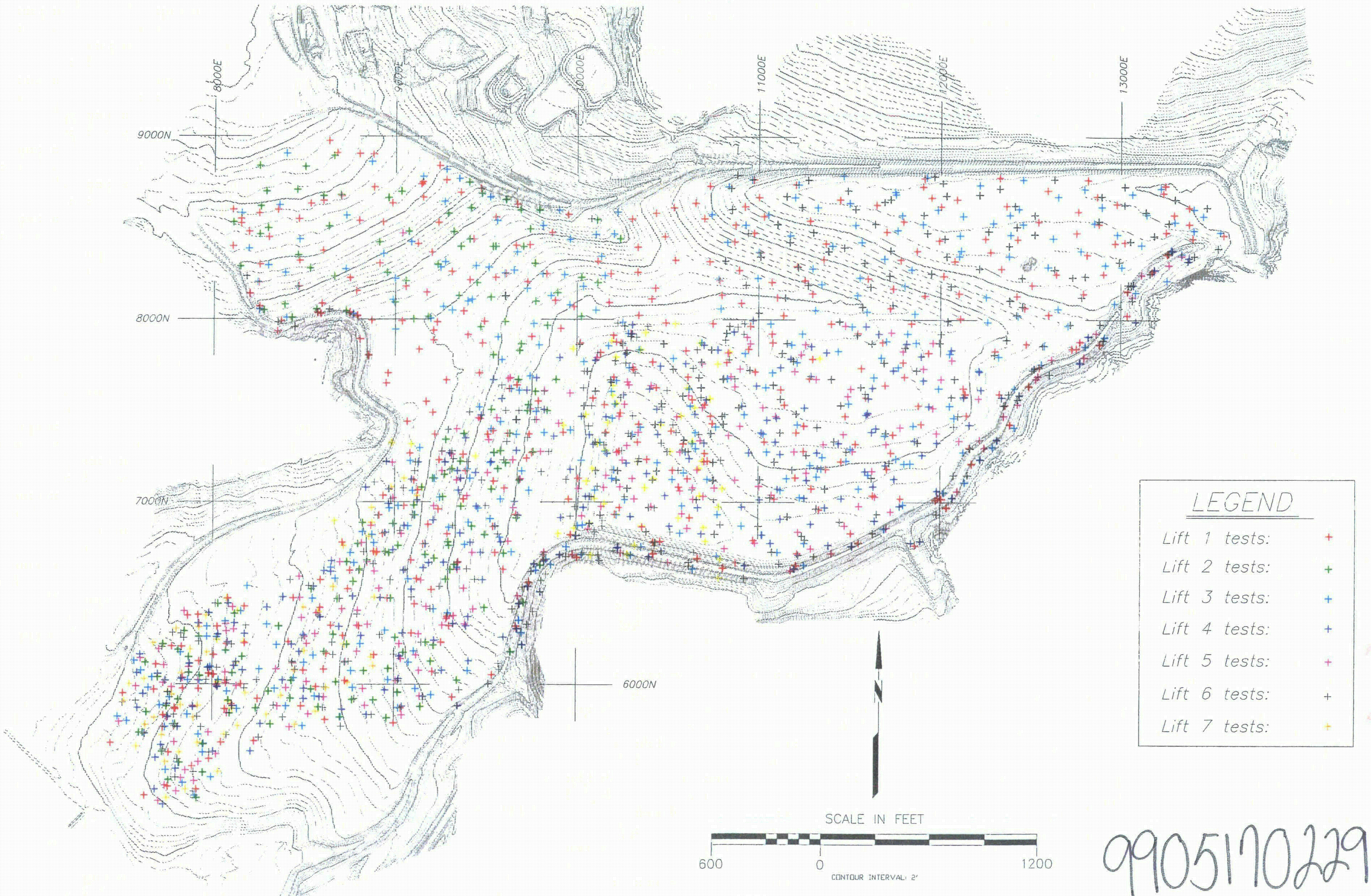
TITLE:
MILL BURIAL AREA

WESTERN NUCLEAR INC.

Design By	Scale 1"= 100'	Date MARCH 1999
Drawn By WJM	Checked By	Sheet 1 of 1

DRAWING 3

Filename: E:\100[illegible]\DWG\BURIAL.dwg
Date: 04/12/1999
Time: 13:21:49.07



9905170229-06

NOTES:

1. *Density test location data was supplied by Inberg Miller Engineers.*
2. *Terrain contours are from aerial survey supplied by Datamap Digital Services and ground surveys performed by C.E. Spurlock Jr. & Associates.*

FROM THE OFFICE OF C. E. SPURLOCK, JR. & ASSOC., LANDER, WY

PROJECT AREA:
SPLIT ROCK MILLSITE
STATE WYOMING COUNTY FREMONT
SECTION 1,2,11,12 TWP 29N RGE. 92W

TITLE:
MAP OF RADON BARRIER DENSITY TEST LOCATIONS BY LIFT (1994 - 1997)

Design By	Scale 1"= 100'	Date MARCH 1999
Drawn By WJM	Checked By	Sheet 1 of 1

WESTERN NUCLEAR INC.

DRAWING 4

Filename: E:\100060 .. FIG-TEST.dwg
Date: 04/12/1999
Time: 13:13:08.86

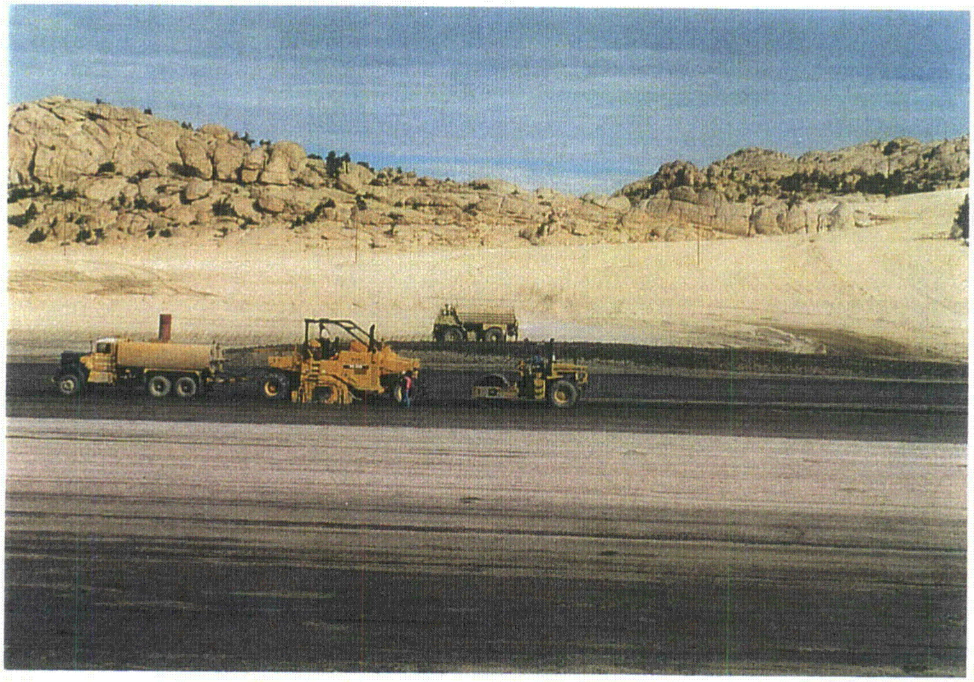


Photo 14 – Area 1A North – Showing stabilizer process in water added and rolling behind stabilizer, September, 1997

Photo 15 - Area 1C - Rolling clay, September, 1995

APPENDIX A

CONSTRUCTION PHOTOGRAPHS

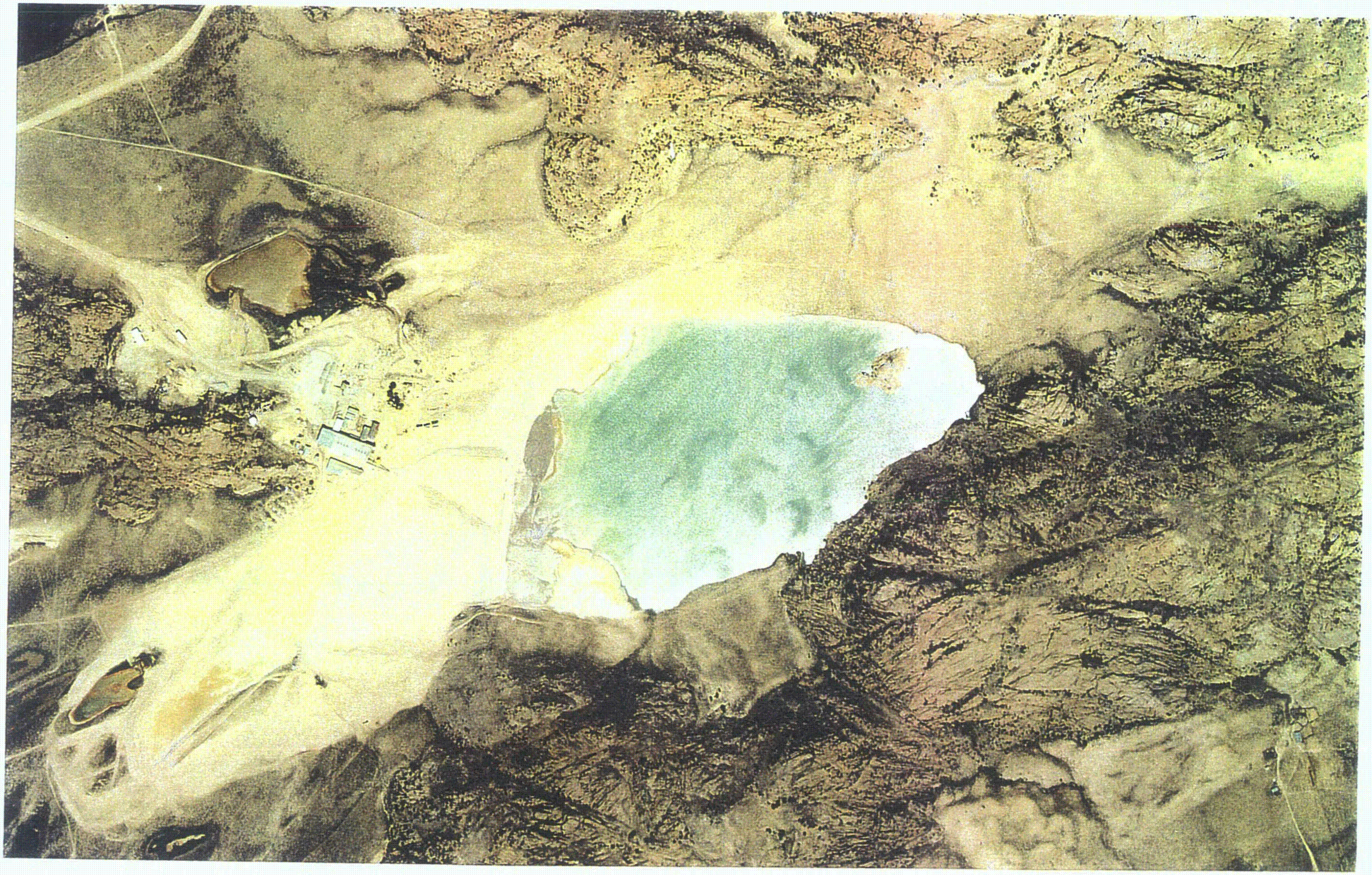


Photo 1 - Pre-reclamation, 1978

Photo 2 - Office Demolition, May 13, 1997

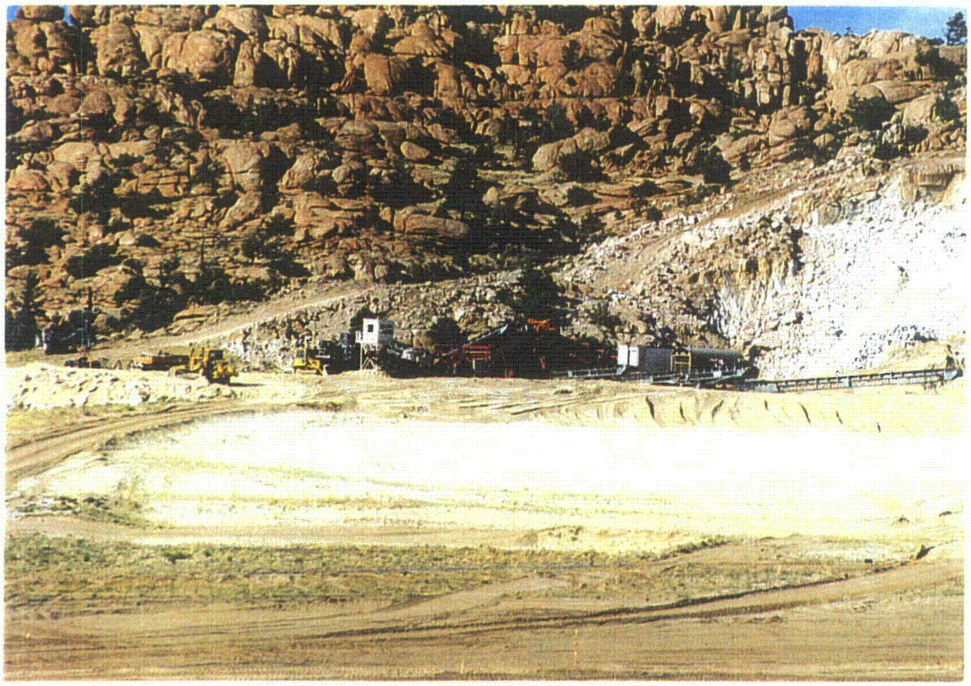


Photo 3 - Guernsey Stone - Crusher, 1994

Photo 4 - Area 1B Right - Preparing subgrade, April, 1996

Photo 5 - Area 3A - Shaping subgrade, 1994

Photo 6 - Proof rolling subgrade surface and regraded areas of Area 1A prior to sacrificial placement, May, 1996

Photo 7 – Area 1B – Completed subgrade, GPS surveying for design elevation and beginning to haul Cody Shale clay for sacrificial clay layer, July, 1996

Photo 8 - Loading Cody Shale for haulage to tailing area

Photo 9 - Area 1B - Sacrificial clay placement, July, 1996

Photo 10 - Area 1B - sacrificial clay placement / spreading to 4", May, 1996

Photo 11 - Area 3A - Placing Radon Barrier, 1994

Photo 12 – Moisture Density testing radon barrier in swale and GPS survey locating test – Area 1A – North, September, 1997

Photo 13 - Area 1A - Soil stabilizer processing clay for radon barrier and double drum vibratory roller compacting radon barrier, July, 1996

Photo 16 - Area 2A - Pug Mill moisturizing clay, August, 1995

Photo 17 - Area 3A - Moisture conditioning stockpiled clay, 1994

Photo 18 - Area 3A - Spreading clay - Disk processing clay - Spraying water, sand cone density testing in foreground, 1994

Photo 19 - Area 2A - Checking Grade and Thickness, August, 1995

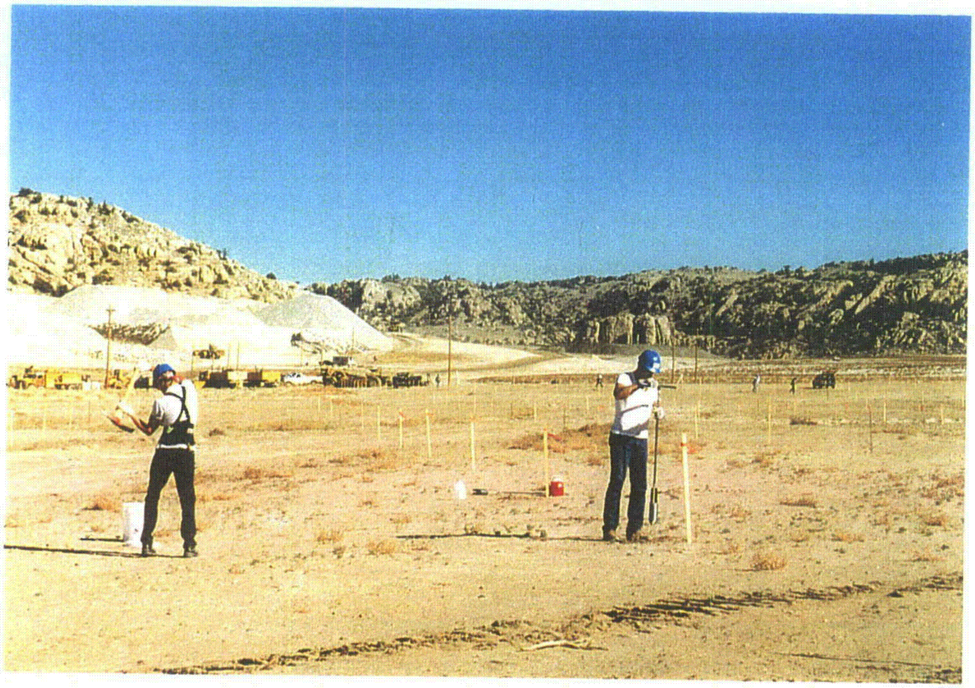


Photo 20 - Rad Verification Testing

Photo 21 - Area 3A - Spreading borrow soil layer, 1994

Photo 39 - South Diversion Ditch - measuring scour trench, December, 1997

Photo 40 - Filter in confluence 4 North Diversion Ditch, September, 1998

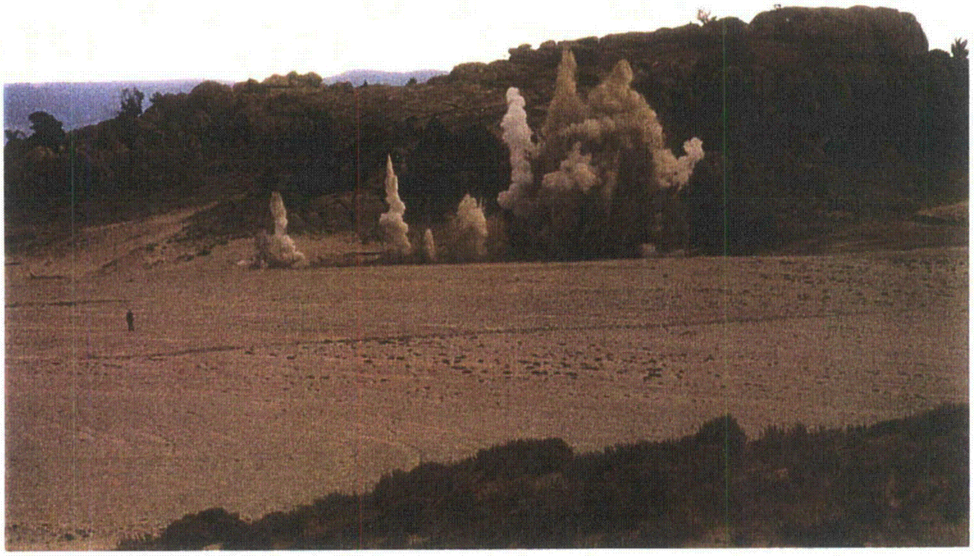


Photo 22 - Northeast Diversion Ditch - Blasting, 1995

Photo 23 - North Diversion Ditch - Compacting subgrade, July, 1997

Photo 24 – North Diversion Ditch - Placement on inside slope, October, 1997

Photo 25 - North Diversion Ditch by confluence, November, 1997

Photo 26 - Excavating and shaping South Central Diversion Ditch, August, 1995

Photo 27 - Compacting Radon barrier South Diversion Ditch, October, 1995

Photo 28 - Area 1B – South Diversion Ditch - Clay layer, July, 1996

Photo 29 – South Diversion Ditch - Sacrificial clay and first lift - Approximately station 9+00 - Outside slope. Note hand compaction around granite outcrops, August, 1996

Photo 30 – South Diversion Ditch - Approx. Sta. 5+00 looking southeast at compacted radon barrier and confluence no.1, September, 1996

Photo 31 - Blasting at rock quarry to make granite erosion control mulch and riprap, September, 1995

Photo 32 – Gradation testing D_{50}18” riprap, September, 1995

Photo 33 - Area 2A - Laying 2” mulch, May 4, 1995

Photo 34 - Area 3A/3B - 4" D_{50} 2" rock mulch over top of 10" - 12" Borrow soil, 1994

Photo 35 – D_{50}2" rock mulch at least 4" deep, September 1997

Photo 36 – South Diversion Ditch approximately station 15+00 looking east at placement of D_{50}3" riprap over Filter I. D_{50}6" rock mulch above and to right at juncture with rocks, October, 1996

Photo 37 - Placing D_{50}18" riprap in South Diversion Ditch at approximately station 32+00 and at approximately station 37+00, November, 1997

Photo 38 - Key Trench by Area 3A - depth measurement, December, 1997

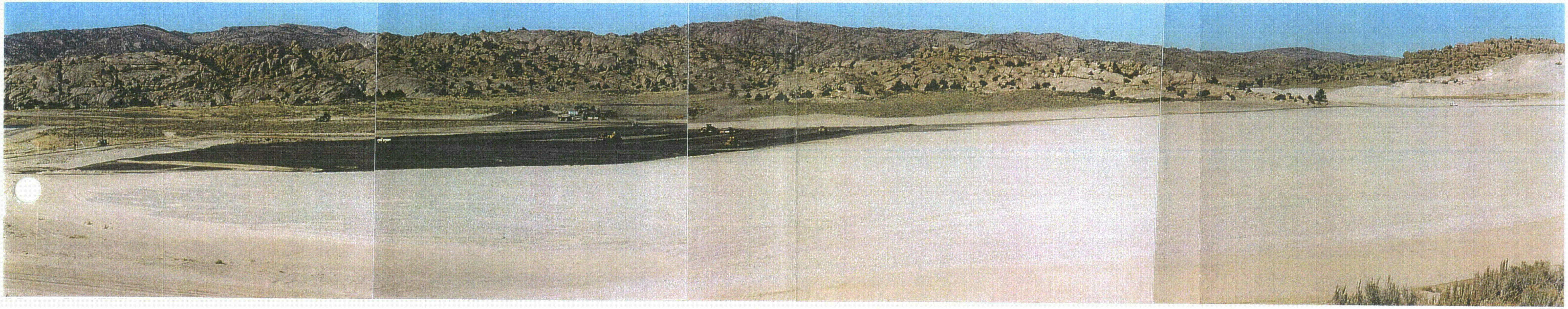


Photo 41 - Looking Northwest to North at Areas 2A, 2B, and 1C (left to right), October 23, 1995

9905170229-01

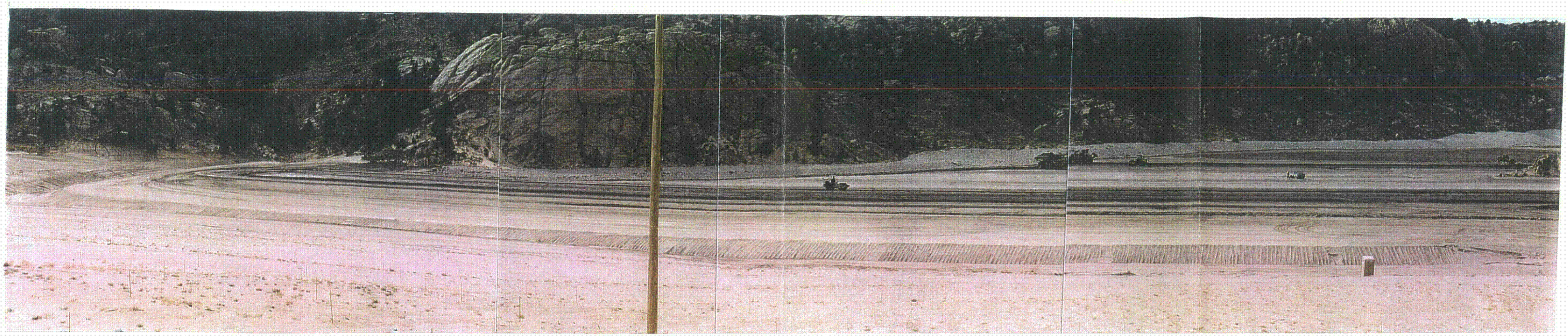


Photo 42 - Areas 2A, 2B, and 1C - Work almost complete - Looking Southeast to Southwest, November, 1995, (continued below)

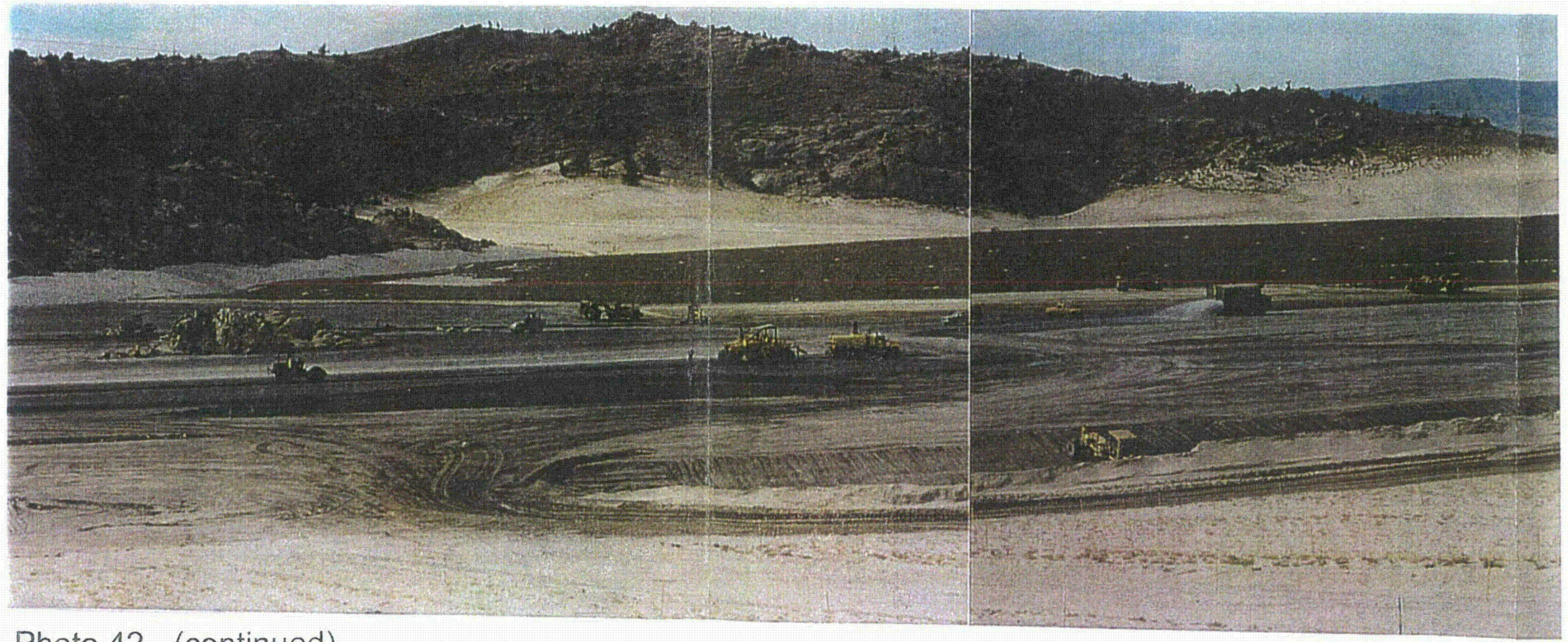


Photo 42 - (continued)

9905170229-08

Photo 43 – First layer of hay mulch for reseeding in North East Borrow Area – October, 1998

Photo 44 – Pronghorn antelope utilizing volunteer vegetation in Area 1A South, September, 1998