ENERGYSOLUTIONS

January 4, 2008 CD08-0008

Mr. Dane Finerfrock
Executive Secretary
Utah Radiation Control Board
Utah Water Quality Board
P.O. Box 144850
Salt Lake City, Utah 84114-4850

Re: Request for approval of 11e.(2) embankment design change, amendment of RML UT2300249, and modification of Groundwater Discharge Permit No. UGW450005.

Dear Mr. Finerfrock:

Energy*Solutions* hereby requests that the Division of Radiation Control review and approve a design change to the 11e.(2) disposal embankment. The design change constitutes an amendment of the Radioactive Material License (RML) No. UT2300249 and modification of Groundwater Discharge Permit (GWDP) No. UGW450005. The design would permit disposal of both LLRW and 11e.(2) waste within the current footprint of the 11e.(2) embankment.

The purpose of this request is to convert existing approved 11e.(2) disposal capacity to LLRW capacity. Overall disposal capacity at the Clive facility will not be increased. The existing 11e.(2) embankment would be re-named the Class A South/11e.(2) embankment.

Attached please find a summary of technical review matters associated with this request. Included with this summary are location and design drawings, and proposed revisions of the RML UT2300249, GWDP No. UGW450005, and the LLRW and 11e.(2) CQA/QC Plan. Additionally, a check in the amount of $200.00 (No. 081032) is enclosed to cover the license amendment fee associated with this request.

Please contact me at 649-2000 with any questions regarding this submittal.

Sincerely,

Tye Rogers

Tye Rogers
Senior Vice President of Regulatory Affairs

enclosure

cc: Loren Morton, DRC (w/ encl.)
John Hultquist, DRC (w/ encl.)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering, the information the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

423 West 300 South, Suite 200 • Salt Lake City, Utah 84101
801.649.2000 • Fax: 801.321.0453 • www.energysolutions.com

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

Energy*Solutions* LLC (Energy*Solutions*) requests that the Utah Division of Radiation Control (DRC) review and approve a design change to the 11e.(2) disposal embankment. This design change constitutes an amendment to both Radioactive Material License (RML) # UT 2300249 (the Class A LLRW license) and Ground Water Quality Discharge Permit No. UGW450005. Proposed changes to these documents are provided in redline/strikeout format as Attachment 1a and 1b to this Amendment Request. Energy*Solutions* has performed a review of the 11e.(2) RML #UT2300478, and has determined that no amendment to specific license conditions will be required.

This amendment would permit disposal of both LLRW and 11e.(2) waste within the current 11e.(2) embankment footprint. The purpose of this amendment request is to convert existing approved 11e.(2) disposal capacity to LLRW capacity. The overall embankment footprint and geometry is not changed; except minor changes needed to address the transition between cover designs for LLRW and 11e.(2) wastes. Overall disposal capacity at the Clive facility is not increased.

The existing 11e.(2) embankment will be re-named the Class A South/11e.(2) embankment. The LLRW portion of the embankment will be located to the west of existing 11e.(2) waste in the embankment. Please see engineering drawing series 07021 provided as Attachment 2 to this Amendment Request.

The LLRW portion of the proposed Class A South/11e.(2) embankment will be constructed to the approved engineering specifications applicable to the existing Class A and Class A North embankments; with one significant change. The lower (Type B) filter zone material in the LLRW portion of the side slopes of the Class A South/11e.(2) embankment will be thicker than it is for the Class A and Class A North embankments. The increased thickness facilitates drainage off of the larger surface area of cover, reducing infiltration and ensuring that the groundwater protection standards will be met. See section 1.2.2.6 below for further discussion.

The 11e.(2) portion of the proposed Class A South/11e.(2) embankment will be constructed to the approved engineering specifications applicable to the existing 11e.(2) embankment. Additional construction specifications and transition details apply to the boundary between LLRW and 11e.(2) waste disposal areas.

Waste placement in the embankment will follow the existing approved LLRW & 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Manual (currently approved as Rev. 22f, October 19, 2007). As discussed in section 1.3.1 below, Energy*Solutions* proposes to revise the CQA/QC Manual to add a new work element for construction of the boundary between Class A and 11e.(2) disposal areas. See also Attachment 3. As waste placement in the existing Class A and Class A North embankments nears completion, LLRW waste disposal operations will move to the LLRW portion of the Class A South/11e.(2) embankment.

In order to evaluate potential groundwater impacts from the Class A South/11e.(2) embankment, Attachment 4 provides "Energy*Solutions* Class A South Cell Infiltration and Transport Modeling", December 7, 2007. This report was prepared by Whetstone

Associates consistent with previous groundwater modeling performed for embankments at the Clive facility.

Because this amendment request, if granted, would permit additional Class A LLRW placement in a new embankment, the following text focuses on Class A LLRW procedures and controls. All existing license requirements and basis for 11e.(2) waste placement is incorporated by reference and will generally not be discussed below.

1.1.1 IDENTITY OF APPLICANT

Energy*Solutions*, LLC is a Utah limited liability corporation with its principal place of business located at the Clive disposal facility described in Section 1.2 below. Corporate headquarters are located at 423 West 300 South, Suite 200, Salt Lake City, UT 84101.

Energy*Solutions*' directors and principal officers are as follows:

R. Steve Creamer
Chairman, Chief Executive Officer
423 West 300 South, Suite 200
Salt Lake City, UT 84101

Board Members/Managers:
Lance L. Hirt
Director
Lindsay, Goldberg & Bessemer
630 Fifth Avenue, 30th Floor
New York, NY 10111

Jordan W. Clements
Director
Peterson Partners, LLC
299 South Main, Suite 2250
Salt Lake City, UT 84111

Alan E. Goldberg
Director
Lindsay, Goldberg & Bessemer
630 Fifth Avenue, 30th Floor
New York, NY 10111

Robert D. Lindsay
Director
Lindsay, Goldberg & Bessemer
630 Fifth Avenue, 30th Floor
New York, NY 10111

Andrew S. Weinberg
Director
Lindsay, Goldberg & Bessemer
630 Fifth Avenue, 30th Floor
New York, NY 10111

E. Gail de Planque, Ph.D.
Director
11136 Powder Horn Drive
Potomac, MD 80854

David B. Winder
Director
490 16th Avenue
Salt Lake City, UT 84103

J.I. Everest II
Vice Chairman and Director
423 West 300 South, Suite 200
Salt Lake City, UT 84101

Principle Officers:
Val J. Christensen
Executive Vice President, General Counsel and Secretary
423 West 300 South, Suite 200
Salt Lake City, UT 84101

Raul A. Deju
President and Chief Administrative Officer
423 West 300 South, Suite 200
Salt Lake City, UT 84101

Alan M. Parker
Executive Vice President and Chief Operating Officer
423 West 300 South, Suite 200
Salt Lake City, UT 84101

Philip O. Strawbridge
Executive Vice President and Chief Financial Officer
423 West 300 South, Suite 200
Salt Lake City, UT 84101

1.1.2 QUALIFICATIONS OF APPLICANT

1.1.2.1 TECHNICAL QUALIFICATIONS

As a corporation, Energy*Solutions* has 20 years of experience with the design, construction, management, engineering, and operation of radioactive waste disposal embankments. Since receiving its first radioactive material license in 1988, Energy*Solutions*, formerly Envirocare, has constructed a naturally occurring radioactive material (NORM) disposal embankment, a low-activity radioactive waste (LARW) disposal embankment, a RCRA mixed radioactive and hazardous waste disposal (Mixed Waste) embankment, the Class A and Class A North disposal embankments, and a uranium- and thorium-mill radioactive tailings 11e.(2) disposal embankment.

There will be no change to the waste types received, waste placement procedures, or basic embankment design systems; therefore, Energy*Solutions*' past experience translates directly to the Class A South/11e.(2) embankment.

1.1.2.2 FINANCIAL QUALIFICATIONS

Energy*Solutions*, LLC is a subsidiary of Energy*Solutions*, Inc. a publicly held corporation. In accordance with UAC R313-25-33(6), Energy*Solutions* is required to submit a financial statement annually to DRC. These financial statements demonstrate on an ongoing basis that Energy*Solutions* is financially qualified to carry out licensed activities.

In addition, Energy*Solutions* maintains comprehensive sureties. These sureties are calculated to ensure that all costs associated with facility closure and post-closure monitoring are accounted for, thereby protecting the State of Utah against any default by the company.

As detailed in Section 10 below, Energy*Solutions* will fund existing surety instruments in an amount adequate to close the Class A South/11e.(2) embankment in compliance with the approved design specifications; therefore, existing information regarding financial qualifications is adequate for the Class A South/11e.(2) embankment.

1.1.3 ORGANIZATIONAL STRUCTURE

Detailed requirements and qualifications for significant organizational positions are described in Energy*Solutions*' Class A LLRW license, Condition 32, Appendix I (currently approved revision is Rev. 19, October 6, 2006).

There will be no changes to the organization for purposes of constructing the Class A South/11e.(2) embankment.

1.2 GENERAL FACILITY DESCRIPTION

Operations are conducted in Section 32, Township 1 South, Range 11 West, SLBM, Tooele County, Utah. This location is known as Clive, Utah (also referred to as South Clive). Energy*Solutions*' Clive disposal facility will be referred to herein as the facility. The Class A South/11e.(2) embankment will be located completely within Section 32. Engineering Drawing 07021-G1 illustrates the location of the Class A South embankment in relation to other site facilities.

Energy*Solutions*' Class A LLRW RML and 11e.(2) RML allow for the disposal of specified radioactive wastes in accordance with specified conditions and restrictions. Waste receipt, management, and disposal operations of LLRW waste at the proposed Class A South/11e.(2) embankment will be conducted in accordance with the Class A RML. Similarly, 11e.(2) waste will be managed in accordance with the 11e.(2) RML.

Aside from the Class A South/11e.(2) embankment, there will be no change to existing facilities as part of this amendment request.

1.2.1 LAND USE

Most of the land within a 10-mile radius of the site is public domain administered by the Bureau of Land Management. Engineering drawing 07021-G1 in Attachment 2 delineates the property owned by Energy*Solutions*. Additional information regarding land use near the site is located in Section 1.2.2 of the 2005 Class A LLRW RML License Renewal Application (June 20, 2005; hereafter referred to as the 2005 LRA).

Land use in the immediate vicinity of the site will not be affected by the Class A South/11e.(2) embankment, since the embankment is located entirely within the licensed area of Section 32.

1.2.2 PRINCIPLE FEATURES

1.2.2.1 RESTRICTED AREAS

Any area utilized for waste unloading, hauling/handling, and placement in the Class A South/11e.(2) embankment will be considered a restricted (or controlled) area as defined in 10 CFR 20.3(a)(14). Any person working within the restricted area is assigned, and must wear, a personnel monitoring badge to measure their exposure to radiation.

The fence is conspicuously posted with "Caution -- Radioactive Materials" signs bearing the standard radiation symbol. Other signs are posted as appropriate. In accordance with the existing radiation safety program, the restricted area boundary may change as waste placement proceeds in the Class A South/11e.(2) embankment. There will not, however, be any changes to the requirements for control of the restricted areas as a result of the Class A South/11e.(2) embankment.

1.2.2.2 SITE BOUNDARY AND BUFFER ZONE

Energy*Solutions* controls, through fences, gates, and security monitoring, all access to property at the Clive facility. In addition, all restricted/controlled areas are fenced. Upon completion of the embankment, it will be permanently fenced and posted, leaving a minimum 94 feet of buffer zone between the toe of waste and the fence. This allows room inside of the fence for an inspection roadway and groundwater monitoring wells.

A buffer zone of at least 300 feet is maintained between the closest edge of any embankment (i.e., toe of waste) and the outside site boundary or property line. A buffer zone of at least 100 feet is maintained between the closest edge of any embankment and the Vitro site fence.

Class A South/11e.(2) embankment buffer zones are the same as buffer zone dimensions approved for the current LARW, Class A, Class A North, Mixed Waste, and 11e.(2) embankments. See also Sections 3.1.11 and 3.2.11 below.

1.2.2.3 GROUNDWATER USERS

No domestic water use occurs within 10 km of the facility.

1.2.2.4 UTILITY SUPPLIES AND SYSTEMS

Utility information was provided in the 2005 LRA (Section 1.2.3.4).

1.2.2.5 CLASS A SOUTH/11e.(2) EMBANKMENT

The proposed embankment design is shown in detail in engineering drawing series 07021. The construction materials are comprised of native clays and native rock from a local quarry.

1.2.2.6 COVERS

Cover design for the Class A South/11e.(2) embankment is detailed on drawing 07021-V7.

The cover for the LLRW portion of the Class A South/11e.(2) embankment will have identical components, specifications, and construction procedures to the currently approved Class A and Class A North embankment cover; with one significant change. The lower (Type B) filter zone material in the side slopes of the LLRW portion of the Class A South/11e.(2) embankment will be thicker than it is for the Class A and Class A North embankments. The increased thickness facilitates drainage off of the larger surface area of cover, reducing infiltration and ensuring that the groundwater protection standards will be met. See section 1.3.1 below for further discussion.

The cover for the 11e.(2) portion of the Class A South/11e.(2) embankment will have identical components, specifications, and construction procedures to the currently approved 11e.(2) embankment. A transition area between the LLRW and 11e.(2) portions of the embankment will be constructed as detailed on drawing 07021-V5 and discussed further in section 1.3.1 below.

1.2.2.7 SURFACE WATER CONTROL FEATURES

During construction, the Class A South/11e.(2) embankment will be surrounded by run-on berms (as illustrated on drawing 07021-V1). Run-on berms are designed to prevent stormwater run-on, from ambient precipitation in the vicinity of the facility, into the emplaced waste before final cover is built.

Run-off berms are used during operation of the facility to ensure that precipitation that falls on emplaced waste is collected and does not carry contamination off of the site. These surface water controls have been utilized at the Clive facility for nearly 20 years.

In addition, internal controls will be needed at the Class A South/11e.(2) embankment to prevent Class A contact water from draining into emplaced 11e.(2) waste. Because the isotopes associated with 11e.(2) waste are a subset of those associated with Class A LLRW, contact stormwater will be managed to drain from 11e.(2) areas into Class A areas. This is consistent with existing approvals for water management under the GWQDP. See the revised CQA/QC Manual, work element "Class A South/11e.(2) Clay Barrier", specification: "Runoff Control", provided in Attachment 3. Following closure, drainage ditches will be constructed around the proposed embankment to facilitate efficient water removal. Further details are provided in Sections 3.1.4 and 3.2.4 below.

1.2.2.8 INTRUDER BARRIERS

This topic is addressed in the 2005 LRA (Section 1.2.3.8). Upon completion, permanent fencing will surround the facility. Further details are provided in Sections 3.1.8 and 3.2.8 below.

1.2.2.9 MARKERS

Permanent granite markers will be placed at the facility to identify the location and type of disposal material as described in the 2005 LRA (Section 1.2.3.9). These markers are similar to those markers currently marking the Vitro embankment located at the site.

1.2.2.10 BOUNDARIES AND MARKERS

This topic is addressed in the 2005 LRA (Section 1.2.3.10). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.11 SURVEY CONTROL PROGRAM

This topic is addressed in the 2005 LRA (Section 1.2.3.11). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.12 SITE UTILIZATION PLAN

This topic is addressed in the 2005 LRA (Section 1.2.3.12). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.13 SUPPORT FACILITIES

This topic is addressed in the 2005 LRA (Section 1.2.3.13). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.14 ADMINISTRATION BUILDINGS

This topic is addressed in the 2005 LRA (Section 1.2.3.14). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.15 STORAGE AND WASTE HANDLING AREAS

This topic is addressed in the 2005 LRA (Section 1.2.3.15). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.16 DECONTAMINATION AREAS

This topic is addressed in the 2005 LRA (Section 1.2.3.16). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.17 PHYSICAL SECURITY

Site security procedures for the Clive facility are provided in the Site Radiological Security Plan (LLRW RML Condition 54, currently approved as revision 2, March 28, 2006). There will be no changes to the Site Radiological Security Plan for construction of the Class A South/11e.(2) embankment.

1.2.2.18 EQUIPMENT AND EQUIPMENT STORAGE

This topic is addressed in the 2005 LRA (Section 1.2.3.18). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

1.2.2.19 EXCAVATED MATERIALS AREA

This topic is addressed in the 2005 LRA (Section 1.2.3.19). There will be no change in management of excavated materials for the Class A South/11e.(2) embankment.

1.3 SCHEDULES

Energy*Solutions* (previously Envirocare) has conducted NORM waste disposal operations at the Clive facility since 1988. LLRW disposal operations began in 1991. Mixed waste disposal operations have been conducted since 1992. 11e.(2) disposal operations began in November of 1993. Energy*Solutions* will continue placing 11e.(2) waste in the Class A South/11e.(2) embankment throughout the licensing process in accordance with existing approvals. LLRW waste placement could begin shortly after approval of the amendment request, depending on the status of waste placement in the Class A and Class A North embankments.

1.3.1 CONSTRUCTION

Construction of the Class A South/11e.(2) embankment liner and cover will be conducted on a cut and fill basis. This will allow for the construction of disposal embankment space as disposal capacity is needed and for the capping and completion of embankment areas as they are filled. Construction of both the liner and the cover systems will progress throughout the active life of the disposal facility.

Furthermore, construction of the clay barrier between LLRW and 11e.(2) wastes in the Class A South/11e.(2) embankment is planned to proceed generally from north to south, with bulk waste lifts brought up concurrently with the clay barrier between waste types. CQA/QC language to control construction of the clay barrier is provided in the draft revised LLRW and 11e.(2) CQA/QC Manual provided as Attachment 4.

Generally, the Clive facility receives much less 11e.(2) waste than Class A LLRW. In order to provide additional operational flexibility for stockpiling 11e.(2) waste to bring up this side of the Class A South/11e.(2) embankment, longer-term stockpiling within existing volume limits may be needed. Therefore, the attached CQA/QC Manual revision removes the former stockpile ("in-cell bulk disposal" in the CQA/QC terminology) placement deadline of August 31 each year.

The attached CQA/QC Manual also includes a revised settlement monitoring plan for the Class A South/11e.(2) embankment. See Figure 4 of Attachment 4 to this amendment request.

1.3.2 OPERATIONS

Energy*Solutions* estimates that receipt of wastes and disposal operations may continue for up to 20 years.

1.3.3 CLOSURE

Closure of the Class A South/11e.(2) embankment will take place during normal operations. As new areas are constructed, the filled areas will be covered to meet final design specifications before being closed. Closure activities will include a settlement monitoring program prior to cover construction as provided in the LLRW and 11e.(2) CQA/QC Manual, work element "Temporary Cover Placement and Monitoring." This program will continue unchanged for the Class A South/11e.(2) embankment. Upon final closure of all disposal embankments, the site will be decommissioned and the long-term surveillance period will begin.

1.4 INSTITUTIONAL INFORMATION

In accordance with a letter dated November 18, 1987, from the Director of the Bureau of Radiation Control, and in accordance with R447-25-9(2) an exemption was granted, allowing for disposal activities on privately owned land at Clive. A supplemental exemption was granted on March 8, 1991. These exemptions were not specific to a particular disposal embankment or land area. On March 16, 1993, Envirocare and the Utah Department of Environmental Quality entered into an Agreement Establishing Covenants and Restrictions related to LLRW disposal activities on privately owned land. This Agreement specifically applies to all of Section 32, less the defined property of the Vitro embankment. Energy*Solutions* continues to be bound by this Agreement.

Accordingly, since it will be located entirely within Section 32, the Class A South/11e.(2) embankment is addressed by the existing land ownership exemption for LLRW management and disposal.

Energy*Solutions* will retain ownership of the land, and will be responsible for site closure, as well as the long-term maintenance and monitoring of the disposal site. In accordance with 10 CFR Part 40.28, the ownership of the land will be transferred to the Department of Energy (DOE), another Federal Agency designated by the President, or the State of Utah. The land will be transferred at no cost to the DOE. The DOE or other designated agency will be responsible under the general license for custody of and long-term care of the site, including monitoring, maintenance, and emergency measures necessary to protect the public health and the safety and other actions necessary to comply with the standards.

It is anticipated that the State of Utah will retain a function in the post-closure activities at the site in an oversight role.

Funds for the closure, remediation and long-term surveillance of the facility are discussed in Section 10 below. Upon State of Utah request to draw upon the irrevocable letter of credit established at Zions First National Bank, funds are maintained in trust for the benefit of the State of Utah with Wells Fargo Bank.

1.5 MATERIALS INCORPORATED BY REFERENCE

Energy*Solutions* has summarized the references listed in each Section as Section 11 of this License Amendment Request.

1.6 CONFORMANCE TO REGULATORY GUIDES

To the extent practicable, the information presented in this amendment request conforms to the recommendations provided in "Standard Format and Content of a License Application for a Low-Level Radioactive Waste Disposal Facility" (NUREG-1199, USNRC, January 1991).

A complete list of regulatory guides applied to facility design is included in Section 1.6 of the 2005 LRA.

1.7 SUMMARY OF PRINCIPLE REVIEW MATTERS

Energy*Solutions* requests that DRC issue a license amendment for the proposed Class A South/11e.(2) embankment.

Energy*Solutions* has reviewed LLRW RML #UT 2300249, 11e.(2) RML #UT 2300478, and GWQDP No. UGW450005, as well as supporting documents for each. The embankment liner, waste placement, and cover systems for LLRW are identical (except the Type B filter thickness as noted above) to the existing Class A and Class A North embankments; therefore, many RML and GWQDP conditions and supporting documents are unaffected by the proposed Class A South/11e.(2) embankment. Similarly, liner, waste placement, and cover systems are unaffected for 11e.(2) wastes.

Revisions to the LLRW RML and GWQDP are provided in redline/strikeout format in Attachment 1a and 1b respectively.

2.0 SITE CHARACTERISTICS

Site characteristics of the Clive site have been the subject of many investigations and regulatory reviews. Because this basic information about the site is not affected by the Class A South/11e.(2) embankment, the most recent summary found in section 2 of the 2005 LRA is incorporated by reference.

2.1 GEOGRAPHY, DEMOGRAPHY, AND FUTURE DEVELOPMENTS

2.1.1 SITE LOCATION AND DESCRIPTION

2.1.1.1 LOCATION OF THE FACILITY

The Clive site is on the eastern edge of the Great Salt Lake Desert, 3 miles west of the Cedar Mountains, 2.5 miles south of Interstate 80, and 1 mile south of a switch point called Clive on the tracks of the Union Pacific Railroad system. The facility is located at approximate latitude 40° 41' 18" North, longitude 113° 06' 54" West.

The licensed disposal area is a parcel of land consisting of Section 32 of T1S, R11W, in Tooele County, Utah, with the exception of approximately 100 acres used in the Vitro Remedial Action project. The DOE owns the 100 acres used in the Vitro Remedial Action project.

The Class A South/11e.(2) embankment will be located entirely within Section 32.

2.1.1.2 NEARBY FACILITIES

This topic is addressed in the 2005 LRA (Section 2.1.1.2). Since there is no change in the types of waste that will be managed nor are there any new facilities in the area since that submittal, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.1.2 POPULATION DISTRIBUTION

This topic is addressed in the 2005 LRA (Section 2.1.3). This information is unaffected by the Class A South/11e.(2) embankment.

2.2 METEOROLOGY AND CLIMATOLOGY

Energy*Solutions* has operated a weather station at Clive since April 1992. The station monitors wind speed and direction, 2-m and 9-m temperatures, precipitation, pan evaporation and solar irradiation. A 12-year summary report from July 1, 1992 through June 30, 2004 was provided as Appendix E to the 2005 LRA. Since the Class A

South/11e.(2) embankment will be located entirely within Section 32, this information adequately characterizes the site.

2.3 GEOLOGY AND SEISMOLOGY

2.3.1 REGIONAL and SITE GEOLOGY

This topic is addressed in the 2005 LRA (Section 2.4.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.3.2 SEISMOLOGY

This topic is addressed in the 2005 LRA (Section 2.4.2); and has been independently reviewed and updated by AMEC Earth & Environmental in the course of licensing the Class A Combined embankment in 2005-2006. References for the AMEC update report and interrogatory responses are provided below. Since this information applies to Section 32 as a whole, this discussion will be unaffected by the Class A South/11e.(2) embankment.

- AMEC, "Report: Combined Embankment Study, Envirocare," December 13, 2005
- AMEC, "Round 2 Interrogatories and Response, Class A Embankment Height Study, Energy*Solutions* Facility Near Clive, Utah," April 28, 2006
- AMEC, "Interrogatory Statement and Response, AMEC Interrogatory Response Letter Dated April 28, 2006, Class A Embankment Height Study, Energy*Solutions* Facility Near Clive, Utah," May 22, 2006

The 2005 LRA summarizes work dating back to 1985, during the initial site investigation for the Vitro disposal cell. These investigations developed seismic design values for a Maximum Credible Earthquake of 6.5 with peak acceleration of 0.37g. The original 11e.(2) cell geometry has previously been evaluated against this design value and found to meet acceptable safety factors. See the Application for 11e.(2) Radioactive Material License Renewal, February 17, 2006 (hereafter referred to as the 11e.(2) LRA), sections 2.6 and 4.6; and Appendix H. This original cell geometry is essentially unchanged for the Class A South/11e.(2) embankment.

In reviewing the historical seismic design value work, AMEC found that it was both poorly-documented and conservative by current standards. Therefore, the seismic hazard was updated based on more current knowledge and information. The updated seismic hazard develops a design maximum earthquake of 7.1 with peak acceleration of 0.24g.

2.4 HYDROLOGY

2.4.1 SURFACE WATER HYDROLOGY

This topic is addressed in the 2005 LRA (Section 2.5). Since surface water hydrology was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.4.2 GROUNDWATER CHARACTERIZATION

This topic is addressed in the 2005 LRA (Section 2.5). Since groundwater was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.5 GEOTECHNICAL CHARACTERISTICS

2.5.1 FIELD INVESTIGATIONS

This topic is addressed in the 2005 LRA (Section 2.8.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.5.2 FIELD AND LABORATORY TESTING AND ENGINEERING PROPERTIES

This topic is addressed in the 2005 LRA (Section 2.8.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.5.3 GROUNDWATER CONDITIONS

A significant amount of water quality data and geochemical information has been developed for the subsurface soil and groundwater below Section 32. This information was submitted to DRC on September 1, 2004, as a Comprehensive Groundwater Quality Evaluation Report (CD04-0405). Since groundwater quality was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.5.4 BORROW MATERIALS

This topic is addressed in the 2005 LRA (Section 2.8.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.5.5 STRATIGRAPHY AND DESIGN PARAMETERS

This topic is addressed in the 2005 LRA (Section 2.8.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.6 GROUNDWATER HYDROLOGY

2.6.1 HYDROGEOLOGY

Site hydrogeology has been characterized in a Revised Hydrogeologic Report submitted to the DRC on September 1, 2004 (CD04-0404), and a Comprehensive Groundwater Quality Evaluation Report, submitted September 1, 2004 (CD04-0405). Since site hydrogeology was characterized for all of Section 32, this information is unaffected by the Class A South/11e.(2) embankment.

2.6.2 GROUNDWATER MODELING

Groundwater modeling was conducted for the Class A South/11e.(2) embankment (Whetstone, December 7, 2007). The purpose of conducting this modeling was to simulate flow in the unsaturated and saturated zones to aid in understanding infiltration and groundwater flow below and adjacent to the Clive site.

- UNSAT-H, a one-dimensional finite difference numerical model, was selected to evaluate the migration of water in the unsaturated soils at the site. Hydrologic Evaluation of Landfill Performance (HELP) was also used to evaluate the migration of water through the cover. PATHRAE was used to evaluate the fate and transport of radionuclides, metals, and organic contaminants through the unsaturated zone and the aquifer. These results support design and performance analyses and are discussed in further detail in section 3.2.1 below.

2.7 GROUNDWATER QUALITY AND GEOCHEMICAL CHARACTERISTICS

A significant amount of water quality data and geochemical information has been developed for the subsurface soil and groundwater below Section 32. This information was submitted to DRC on September 1, 2004, as a Comprehensive Groundwater Quality Evaluation Report (CD04-0405). Since groundwater quality was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.8 NATURAL RESOURCES

2.8.1 GEOLOGICAL RESOURCES

This topic is addressed in the 2005 LRA (Section 2.9.1). Since geological resources were characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.8.2 WATER RESOURCES

This topic is addressed in the 2005 LRA (Section 2.9.2). Since water resources were characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.9 BIOTIC FEATURES

2.9.1 VEGETATION

Regional vegetation is characterized in the 11-Year Meteorologic Summary Report submitted to the DRC on January 12, 2004 (CD04-0016). This information is applicable to the Class A South/11e.(2) embankment. Further discussion of this topic is addressed in the 2005 LRA (Section 2.10.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

2.9.2 TERRESTRIAL LIFE

This topic is addressed in the 2005 LRA (Section 2.10.2). Since terrestrial life was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.9.3 AQUATIC BIOTA

Aquatic ecosystems do not occur on or near the South Clive site.

2.9.4 ENDANGERED AND THREATENED SPECIES

This topic is addressed in the 2005 LRA (Section 2.10.4). Since endangered and threatened species were characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

2.10 PREOPERATIONAL ENVIRONMENTAL MONITORING

This topic is addressed in the 2005 LRA (Section 2.11). Since preoperational environmental monitoring was characterized for all of Section 32, this information is applicable to the Class A South/11e.(2) embankment.

3.0 FACILITY DESIGN AND CONSTRUCTION

Latitude and Longitude coordinates for the Class A South and 11e.(2) portions of the Class A South/11e.(2) embankment are provided in Table 3.1. Drawing Set 07021 has been created to define the embankment.

Table 3.1. Buffer Zone Coordinates

Embankment Name	Corner	Latitude	Longitude
Class A South portion of the Class A South/11e.(2)	NW Corner	40°41'12.531691"N	113°7'24.037415"W
	SW Corner	40°41'55.004159"N	113°7'24.684273"W
	SE Corner	40°41'54.607958"N	113°7'5.135960"W
	NE Corner	40°41'12.138756"N	113°7'4.494419"W
11e.(2) portion of the Class A South/11e.(2)	NW Corner	40° 41' 13.134998" N	113° 7' 7.749387" W
	SW Corner	40° 40' 53.624289" N	113° 7' 8.390974" W
	SE Corner	40° 40' 53.390682" N	113° 6' 54.216013" W
	NE Corner	40° 41' 12.901791" N	113° 6' 53.560833" W

For waste placement, EnergySolutions will utilize construction specifications that have already been approved for the Class A and 11e.(2) embankments. No novel engineering designs or construction methods will be implemented for the CAN embankment, nor will the waste disposed in the Class A South portion of the embankment differ from waste disposed in the Class A embankment in regards to radioactivity or potential hazard.

EnergySolutions will construct the Class A South/11e.(2) embankment in accordance with the waste placement, design and construction procedures and specifications found in the current LLRW and 11e.(2) CQA/QC Manual. Therefore, the engineering analyses performed for existing waste disposal practices at the Class A Disposal embankment are also valid for the Class A South/11e(2) embankment. Detailed explanation of waste placement specifications and supporting documentation is located in the 2005 LRA (Section 3).

Specific discussion of the topics identified in NUREG-1199 is provided below.

3.1 PRINCIPLE DESIGN FEATURES

3.1.1 WATER INFILTRATION

The Class A South/11e.(2) embankment cover has been designed to direct ambient precipitation away from the disposal unit. Cover design is detailed in drawings 07021-V2 through 07021-V7.

Flow from offsite precipitation is controlled during disposal operations by run-on berms that completely surround the disposal unit. Construction specifications for run-on berms are provided in the LLRW and 11e.(2) CQA/QC Manual, Work Element – General Requirements, specification "Runon Control During Project". No revision to this specification will be needed for construction of the Class A South/11e.(2) embankment. Groundwater does not need to be directed away from the disposal cell, since the lowest top of liner elevation is 6 feet above the highest recorded elevation for the upper, unconfined aquifer. The lowest top of liner elevation will be at approximately 4261.30 feet above sea level (see the southwest corner of the liner on drawing 07021-V1); the highest recorded elevation for the upper, unconfined aquifer is 4255 feet above sea level.

The post-closure drainage system surrounding the Class A South/11e.(2) embankment has been designed to direct flow from ambient precipitation away from the disposal unit. Drainage system design for the Class A South/11e.(2) embankment is detailed in drawings 07021-V1, 07021-V5, and 07021-V6.

3.1.2 DISPOSAL UNIT COVER INTEGRITY

The cover system for the Class A portion of the Class A South/11e.(2) embankment consists of the same layers and material specifications as the existing Class A embankment, with the exception of a thicker Type B filter zone on the embankment side slope. Therefore, the cover's ability to perform for the required period of time and to avoid the need for continuing active maintenance has been assessed previously in permitting the Class A embankment.

A comprehensive summary of cover integrity design criteria for the Class A embankment is provided in Sections 3.1.1.2, 3.1.2.1 and 3.1.3.3 of the 2005 LRA; performance assessments against these design criteria are discussed in Sections 3.3.1.2, 3.3.2.1 and 3.3.3.3 of that document. The scope of these assessments include differential settlement, internal erosion, and material stability/external erosion. The cover's ability to resist degradation by biotic activity is addressed in Sections 3.1.3.1.5 and 3.3.3.1.5 of the 2005 LRA.

The cover system for the 11e.(2) portion of the Class A South/11e.(2) embankment is unchanged from the current approved design. Please refer to section 6.2 of the 11e.(2) LRA for evaluation of this cover design.

3.1.3 STRUCTURAL STABILITY

Waste placement in the Class A South/11e.(2) embankment will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. No changes to waste placement specifications and controls will be necessary for the Class A South/11e.(2) embankment. Class A and 11e.(2) wastes will be separated by a vertical clay barrier constructed to bulk soil waste lift specifications, so as to perform similarly. Therefore, structural stability has been assessed previously in permitting the Class A embankment. A comprehensive summary of structural stability design criteria for the Class A embankment is provided in Sections 3.1.2.2 and 3.1.3.4 of the 2005 LRA; performance assessments against these design criteria are discussed in Sections 3.3.2.2 and 3.3.3.4 of that document.

3.1.4 CONTACT WITH STANDING WATER

The Class A South embankment will be subject to identical stormwater management requirements during operations as the existing Class A embankment. See Condition I.E.7 of GWQDP UGW450005 as well as design criteria presented in Section 3.1.1.1.1 of the 2005 LRA; performance assessments against these design criteria are discussed in Section 3.3.1.1.1 of that document. Contact with standing water after closure will be controlled using the post-closure drainage ditch system; see Section 3.1.1 above and 3.1.5 below.

3.1.5 SITE DRAINAGE

There are no surface water features within 5 miles of Section 32, as established in Section (x) and Appendix J of "Pre-licensing Plan Approval Application" dated March 15, 2000. Therefore, site drainage is addressed in terms of direct precipitation runoff and sheet flow associated with the Probable Maximum Flood event. The post-closure drainage system surrounding the Class A South/11e.(2) embankment has been designed to direct water from precipitation or sheet flow away from the disposal unit. Drainage system design for the Class A South/11e.(2) embankment is detailed in drawings 07021-V1, 07021-V5, and 07021-V6.

3.1.6 SITE CLOSURE AND STABILIZATION

Long-term isolation of the waste in the Class A South/11e.(2) embankment will be ensured consistent with cover design features and waste placement specifications in place for the existing Class A and 11e.(2) embankments with the exception of change in the Type B Filter thickness. Preventing the need for active maintenance is addressed within the analyses referenced in Sections 3.1.2 and 3.1.3 above. A cover system designed to minimize infiltration without the need for active maintenance is considered a complementary feature that has improved the site's natural characteristics.

3.1.7 LONG-TERM MAINTENANCE

Preventing the need for active maintenance is addressed within the analyses referenced in Sections 3.1.2 and 3.1.3 above. Design criteria for the various elements of the liner, waste placement, and cover systems have been set to incorporate a factor of safety of at least 1.0 against failure under normal, abnormal, and accident conditions. Tables 3.2 and 3.4 of the 2005 LRA provide a comprehensive discussion of embankment design criteria, their basis, conditions evaluated, and projected performance for the Class A embankment. This discussion is applicable to the Class A South/11e.(2) embankment because liner, waste placement, and cover specifications are generally the same for each embankment.

3.1.8 INADVERTENT INTRUDER BARRIER

Both during site operations and after closure, barriers are maintained to prevent inadvertent intrusion to LLRW. The barrier consists of chain link fencing. Post-closure fencing shall be constructed in accordance with the LLRW and 11e.(2) CQA/QC Manual, Work Element – Permanent Chain Link Fences. In addition, the embankment cover system provides a further barrier to inadvertent intrusion, with 3.5 feet of rock layers plus 2 feet of clay above the waste.

3.1.9 OCCUPATIONAL EXPOSURE

Occupational radiation protection is addressed in Section 7 of this document.

3.1.10 SITE MONITORING

Operational environmental monitoring is addressed in Section 4.4 of this document. Post-operational environmental monitoring is addressed in Section 5.3 of this document.

3.1.11 BUFFER ZONE

Buffer zone coordinates for the Class A and 11e.(2) portions of the Class A South/11e.(2) embankment are provided in Table 3.1 above and illustrated on drawing 07021-U1. A discussion of the design criteria and projected performance of the buffer zone is located in the 2005 LRA, Sections 3.1.5 and 3.3.5, respectively. This discussion is applicable to the Class A South/11e.(2) embankment because the buffer zone is 100 feet, exceeding the evaluated width of 94 feet.

3.2 DESIGN CONSIDERATIONS FOR NORMAL/ABNORMAL ACCIDENT CONDITIONS

Principal design criteria applicable to the Class A South/11e.(2) embankment are located in the 2005 LRA, Section 3.0. Specifically, design criteria of the principal design features are summarized in table 3.2 of that document. Projected performance against these design criteria are summarized in table 3.4 of that document. The 2005 LRA focuses on the Class A embankment; this discussion is generally applicable to the Class A South/11e.(2) embankment because the liner, waste placement, and cover systems are similar for both embankments.

As previously discussed, the only difference is in the Type B filter zone layer thickness on the side slope of the embankment. This dimension increases from 6 inches thick for the Class A embankment to 18 inches thick for the Class A South portion of the Class A South/11e.(2) embankment. For the top slope, the Type B filter thickness remains at 6 inches. The impacts of this increased thickness on the required functions of the cover system, as presented in Table 3.4 of the 2005 LRA, are summarized in Table 3.2 below:

Table 3.2: Summary of Impacts of Thicker Type B Filter

Required Function	**Complementary Aspect**	**Impact of Thicker Type B Filter**
Minimize Infiltration	Minimize infiltration	Required to reduce infiltration through side slopes. See section 3.2.1 below
	Encourage runoff	Not affected.
	Prevent desiccation	Not affected.
	Limit frost penetration	Thicker side slope improves performance slightly.
	Limit biointrusion	Thicker side slope improves performance slightly.
Reduce Exposure	Surface dose rates	Thicker side slope improves performance slightly.
Ensure Cover Integrity	Mitigate differential settlement	Not affected; critical case for differential settlement is in the top slopes.
	Prevent internal erosion	Not affected.
	Material stability/external erosion	Not affected.

Ensure Structural Stability	Settlement	Not affected.
	Maintain slope stability	Not affected.

3.2.1 WATER INFILTRATION

Water infiltration is evaluated through infiltration and transport modeling provided as Attachment 4 to this request. The approach and methodology for this modeling are similar to previous evaluations performed for other embankments at the Clive facility. For the 11e.(2) portion of the Class A South/11e.(2) embankment, the currently approved 11e.(2) Cell Infiltration and Transport Modeling Report, 2001, continues to apply; since there will be no change to that cover design.

The Class A South model indicates that 0.276 cm/yr infiltration would occur through the top slope. With an 18" Type B filter zone, 0.286 cm/yr infiltration would occur through the Class A South side slope. These values compare with modeled infiltration of 0.265 cm/yr for the top slope and 0.364 cm/yr for the side slope of the Class A embankment. Note that sensitivity analyses at 6" and 12" were performed for the Type B filter zone thickness in both the top and side slopes, as discussed in Section 3.4.3 of the model.

At these modeled average infiltration rates, PATHRAE modeling of the fate and transport of radioactive and hazardous constituents from the waste demonstrates that the Ground Water Protection Levels will not be exceeded for at least 500 years for radiological constituents and at least 200 years for heavy metals and formerly characteristic organic wastes, provided that the concentrations of 5 radionuclides are restricted as presented in Table 3.3 below:

Table 3.3: Class A South Limiting Concentrations

Isotope	**pCi/g**	**Ci/m^3**
Bk-247	0.0000906	1.63E-10
Ca-41	1.322	2.38E-06
Cl-36	0.268	4.83E-07
Re-187	5,556.0	1.00E-02
Tc-99	77,778.0	1.40E-01

These limiting concentrations are captured in the draft Radioactive Material License provided in Attachment 1a, at condition 55.

3.2.2 DISPOSAL UNIT COVER INTEGRITY

Design criteria for protecting the disposal unit cover against erosion are provided in Sections 3.1.3.3.2 and 3.1.3.3.3 of the 2005 LRA. Projected performance of the cover system against these design criteria is provided in Sections 3.3.3.3.2 and 3.3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the cover materials and specifications are essentially identical to that of the Class A embankment. The thicker Type B filter zone in the Class A South/11e.(2) embankment does not affect these calculations, since layer thickness is not an input.

Design criteria for settlement and subsidence are provided in Sections 3.1.1.2, 3.1.2.1 and 3.1.3.3 of the 2005 LRA. Projected performance of the cover system against these design criteria are discussed in Sections 3.3.1.2, 3.3.2.1 and 3.3.3.3 of this document. These analyses are applicable to the Class A South/11e.(2) embankment because the liner, waste placement, and cover materials and specifications are essentially identical to that of the Class A embankment. The thicker Type B filter zone in the Class A South/11e.(2) embankment is limited to the side slopes and does not increase the load for settlement evaluations beyond that already accounted for at the embankment top slopes.

3.2.3 STRUCTURAL STABILITY

Evaluations of structural stability in terms of settlement and differential settlement are discussed in Section 3.2.2, above. Design criteria for ensuring structural stability are provided in Sections 3.1.2.2 and 3.1.3.4 of the 2005 LRA. Projected performance of the cover system against these design criteria is provided in Sections 3.3.2.2 and 3.3.3.4 of the 2005 License Renewal Application. These analyses are applicable to the Class A South embankment because the waste placement and cover materials and material specifications are identical to that of the Class A embankment. See also Section 4.4 and Appendix H to the 11e.(2) LRA; as well as section 2.3.2 above.

3.2.4 CONTACT WITH STANDING WATER

Design criteria for preventing contact of waste with standing water are provided in Section 3.1.1.1 of the 2005 LRA. Projected performance against these design criteria is provided in Section 3.3.1.1 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the liner materials and material specifications are identical to that of the Class A embankment.

3.2.5 SITE DRAINAGE

Design criteria for site drainage systems are provided in Section 3.1.4 of the 2005 LRA. Projected performance of the site drainage system against these design criteria is provided in Section 3.3.4 of that document. See also Section 4.2 and Appendix G to the 11e.(2) LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the embankment shape is essentially identical to that of the currently permitted 11e.(2) embankment geometry.

3.2.6 SITE CLOSURE AND STABILIZATION

Closure of the Class A South/11e.(2) embankment will be accomplished by construction of final cover as areas of the embankment reach their design height. This is consistent with the "cut and cover" approach used at the LARW and Class A embankments. Accordingly, all of the principal design criteria discussed herein are applicable to site closure and stabilization, as these criteria affect embankment construction. Each of the performance assessments referenced herein includes analysis of the effects of design-basis abnormal events.

3.2.7 LONG-TERM MAINTENANCE

Design criteria for anticipated material durability to prevent the need for long-term maintenance is evaluated for the Class A embankment in Section 3.1.3.3.3 of the 2005 LRA. Projected performance against these design criteria is provided in Section 3.3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the erosion barrier materials and specifications are identical to that of the Class A embankment.

Design criteria for anticipated erosion effects to prevent the need for long-term maintenance is evaluated for the Class A embankment in Sections 3.1.3.3.2 and 3.1.3.3.3 of the 2005 LRA. Projected performance against these design criteria is provided in Sections 3.3.3.3.2 and 3.3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the erosion barrier materials and material specifications are identical to that of the Class A embankment.

The potential effects of design-basis abnormal events on long-term maintenance requirements are addressed concurrent with projected performance under normal, abnormal, and accident conditions for each design feature. A factor of safety of at least 1.0 against failure is maintained under normal, abnormal, and accident conditions. Tables 3.2 and 3.4 of the 2005 LRA provide a comprehensive discussion of embankment design criteria, their basis, conditions evaluated, and projected performance for the Class A embankment. This discussion is applicable to the Class A South/11e.(2) embankment because liner, waste placement, and cover specifications are essentially the same for each embankment.

3.2.8 INADVERTENT INTRUDER BARRIER

Both during site operations and after closure, a barrier is maintained to prevent inadvertent intrusion to LLRW. During site operations, the barrier consists of chain link fencing. Post-closure fencing shall be constructed in accordance with the LLRW and 11e.(2) CQA/QC Manual, Work Element – Permanent Chain Link Fences. The embankment cover system provides the long-term barrier to inadvertent intrusion, with a minimum of 3.5 feet of rock layers plus 2 feet of clay above the waste. Material stability of cover rock layers is evaluated for the Class A embankment in Section 3.1.3.3.3 of the 2005 LRA. Projected performance against these design criteria is provided in Section 3.3.3.3.3 of the 2005 LRA. These analyses are applicable to the Class A South/11e.(2) embankment because the erosion barrier materials and material specifications are identical to that of the Class A embankment.

3.2.9 OCCUPATIONAL EXPOSURE

ALARA requirements for receiving, inspection, handling, storage, and disposal areas are discussed in Section 7, below. Wastes received at the Class A South portion of the Class A South/11e.(2) embankment will be identical to those approved under the current license for the Class A embankment; therefore, there is no need to evaluate required shielding for higher activity wastes. Energy*Solutions*' procedures for handling the accidental rupture of nonstable waste containers are discussed in Section 4.5, below.

3.2.10 SITE MONITORING

Monitoring systems will be inspected for degradation as a component of each sampling event. Long-term monitoring systems include the groundwater monitoring wells and settlement monitoring plates as discussed in Section 5.3 of this document.

3.2.11 BUFFER ZONE

A discussion of the design criteria and projected performance of the buffer zone is located in the 2005 LRA, Sections 3.1.5 and 3.3.5, respectively. This discussion is applicable to the Class A South/11e.(2) embankment because the buffer zone is 100 feet, exceeding the evaluated width of 94 feet.

3.2.12 STRUCTURAL DESIGN FOR BELOW-GROUND VAULTS AND EARTH MOUNDED CONCRETE BUNKERS

Below ground vaults are defined as warehouse-sized vaults buried beneath grade. Concrete bunkers are defined as concrete lined trenches with compartmental separation for different waste classes. Energy*Solutions* does not perform either of these types of disposal and therefore this topic is not applicable to the Class A South/11e.(2) embankment.

3.3 CONSTRUCTION CONSIDERATIONS

3.3.1 CONSTRUCTION METHODS AND FEATURES

Construction methods for the Class A South/11e.(2) embankment are provided in the LLRW and 11e.(2) CQA/QC Manual. The LLRW and 11e.(2) CQA/QC Manual has been revised to incorporate the Class A South/11e.(2) Clay Barrier, and is included as Attachment 3 to this amendment request. Engineering drawings are provided in drawing series 07021, included as Attachment 2 to this amendment request.

3.3.1.1 SITE PREPARATION

Site preparation requirements for the Class A South/11e.(2) embankment are provided in the LLRW and 11e.(2) CQA/QC Manual, Work Element – Foundation Preparation. Because these specifications are identical to those of the Class A embankment, no revision to the LLRW and 11e.(2) CQA/QC Manual is needed. The existing surface as of January, 2008 includes areas of approved clay liner, areas excavated to near-foundation elevation; and areas that have not been disturbed. As indicated on drawing 07021-U3, existing groundwater wells GW-36, GW-37, and GW-38R are located within the embankment footprint and will be abandoned prior to liner construction. Furthermore, the 2000 Evaporation Pond is also located within the embankment footprint and will be decommissioned prior to liner construction.

3.3.1.2 CONTROL AND DIVERSION OF WATER

Surface water is controlled by a system of run-on and run-off berms. A comprehensive discussion of berm systems for the Class A embankment is provided in Section 3.4.4 of the 2005 LRA. This discussion is applicable to the Class A South/11e.(2) embankment because berm requirements will be identical for the Class A and the Class A south/11e.(2) embankments. The highest groundwater elevation is 6 feet below the top of liner elevation; therefore, groundwater control will not be necessary.

3.3.1.3 CONSTRUCTION OF DISPOSAL UNITS

The Class A South/11e.(2) embankment will be constructed to the existing liner, waste placement, and to similar cover requirements of the LLRW and 11e.(2) CQA/QC Manual. See also engineering drawing series 07021.

3.3.1.4 CONCRETE AND STEEL CONSTRUCTION

One aspect of disposal at the Class A South/11e.(2) embankment will incorporate concrete as a component of disposal facility construction: Controlled Low-Strength Material (CLSM) used to fill voids in debris placement. CLSM use will be controlled in accordance with existing requirements applicable to disposal in the Class A and 11e.(2) embankments. CLSM requirements are located in the LLRW and 11e.(2) CQA/QC Manual, Work Element – Waste Placement, specification "CLSM Pours".

3.3.1.5 BACKFILLING

Waste placement in the Class A South/11e.(2) embankment will be controlled in accordance with the LLRW CQA/QC Manual, Work Element – Waste Placement. No changes to existing approved waste placement methods are requested.

3.3.1.6 CLOSURE OF INDIVIDUAL DISPOSAL UNITS

The cover over the Class A South/11e.(2) embankment will be constructed in accordance with the LLRW and 11e.(2) CQA/QC Manual, Work Elements – Radon Barrier Borrow Material, Radon Barrier Test Pad, Radon Barrier Placement, Filter Zone, Sacrificial Soil Placement, and Rock Erosion Barrier. See also drawing series 07021.

3.3.1.7 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

Applicable codes and standards are discussed concurrent with establishment of design criteria for each of the principal design features, as referenced above. In addition, ASTM standards applicable to construction of the Class A South/11e.(2) embankment are listed in Appendix B of the LLRW and 11e.(2) CQA/QC Manual and referenced in individual specifications as appropriate.

3.3.1.8 CONSTRUCTION MATERIALS AND QUALITY ASSURANCE

Construction materials for the Class A South/11e.(2) embankment will consist of native soils and rock. Specifications for each component are provided as discussed above. Quality assurance and quality control measures required for construction are provided in the LLRW and 11e.(2) CQA/QC Manual. All construction materials and procedures for the Class A South/11e.(2) embankment will be identical to those currently approved for the Class A embankment.

3.3.1.9 SITE PLANS, ENGINEERING DRAWINGS, AND CONSTRUCTION SPECIFICATIONS

Engineering drawing series 07021 details the Class A South/11e.(2) embankment and is provided as Attachment 2 to this amendment request. In accordance with Condition I.H.6 of the GWQDP, Energy*Solutions* is required to provide an annual as-built report and drawing set documenting embankment construction.

3.3.2 CONSTRUCTION EQUIPMENT

Construction equipment will consist of standard heavy construction and earth-moving equipment. Equipment used to construct the Class A South/11e.(2) embankment will be equal to that used in construction of the Class A embankment.

3.3.3 CONSTRUCTION AND OPERATION CONSIDERATIONS FOR BELOW-GROUND VAULTS AND EARTH MOUNDED CONCRETE BUNKERS

Below ground vaults are defined as warehouse-sized vaults buried beneath grade. Concrete bunkers are defined as concrete lined trenches with compartmental separation for different waste classes. Energy*Solutions* does not perform either of these types of disposal and therefore this topic is not applicable to the Class A South/11e.(2) embankment.

3.4 DESIGN OF AUXILARY SYSTEMS AND FACILITIES

3.4.1 UTILITY SYSTEMS

A discussion of site utility systems is located in the 2005 LRA, Section 3.4.1. This discussion is applicable to the Class A South/11e.(2) embankment because no additional utility systems will be needed for the embankment.

3.4.2 AUXILIARY FACILITIES

A discussion of auxiliary facilities is located in the 2005 LRA. Section 3.4.2. This discussion is applicable to the Class A South/11e.(2) embankment because no additional auxiliary facilities will be needed for the embankment.

3.4.3 FIRE PROTECTION SYSTEM

A discussion of the fire protection system is located in the 2005 License Renewal Application, Section 3.4.3. This discussion is applicable to the Class A South/11e.(2) embankment because no additional fire protection system will be needed for the embankment.

3.4.4 EROSION AND FLOOD CONTROL SYSTEM

For information regarding site drainage and flood protection following closure, please refer to Sections 3.1.5 and 3.2.5, above. A discussion of operational erosion and flood control is located in the 2005 LRA, Section 3.4.4. This discussion is applicable to the Class A South/11e.(2) embankment because Energy*Solutions* will implement similar run-on and run-off control berms around the Class A South/11e.(2) embankment.

4.0 FACILITY OPERATIONS

4.1 RECEIPT AND INSPECTION OF WASTE

Incoming shipments of wastes will be inspected and received in accordance with the currently approved LLRW Waste Characterization Plan (RML condition 58, currently approved revision date February 27, 2006). There will be no changes to these requirements for purposes of constructing the Class A South/11e.(2) embankment.

4.1.1 PROCEDURE FOR VISUAL EXAMINATION OF SHIPPING DOCUMENTS

This topic is addressed in the LLRW Waste Characterization Plan, Step 3. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.2 PROCEDURE FOR VISUAL EXAMINATION OF WASTE PACKAGES

This topic is addressed in the Waste Characterization Plan, Step 3. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.3 PROCEDURE FOR VERIFICATION SURVEYS

This topic is addressed in the 2005 LRA (Section 4.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.4 PROCEDURE ON VERIFYING WASTE CLASS

This topic is addressed in the Waste Characterization Plan, Step 2. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.5 PROCEDURE FOR ANALYTICALLY VERIFYING WASTE CHARACTERISTICS AND FORM

This topic is addressed in the Waste Characterization Plan, Step 2. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.1.6 OTHER PROCEDURES TO ENSURE WASTE ACCEPTANCE CRITERIA ARE MET

This topic is addressed in the Waste Characterization Plan. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.2 WASTE HANDLING AND INTERIM STORAGE

Waste handling and interim storage will be managed in accordance with existing controls and at existing facilities provided by the RML and the GWQDP, according to the waste type being managed. There will be no changes to these requirements for purposes of constructing the Class A South/11e.(2) embankment.

4.3 WASTE DISPOSAL OPERATIONS

Waste disposal operations will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. As bulk waste placement in the existing Class A and Class A North embankments is completed, bulk waste disposal operations will move to the Class A South portion of the Class A South/11e.(2) embankment. There will be no changes to waste placement, testing, and documentation requirements for purposes of constructing the Class A South/11e.(2) embankment.

4.3.1 WASTE EMPLACEMENT

Waste placement will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. It is anticipated that bulk Class A waste placement in the Class A South portion of the embankment will begin at the northern boundary and progress generally south and west. The exact sequence will necessarily depend on timing and volumes of 11e.(2) waste receipts, so that 11e.(2), clay barrier, and bulk Class A waste lifts all come up roughly together.

4.3.2 FILLING OF VOID SPACES

The LLRW and 11e.(2) CQA/QC Manual provides controls for filling void spaces. Since there is no change in waste placement procedures for the Class A South/11e.(2) embankment, these controls are unaffected..

4.3.3 WASTE COVERING

Waste covering operations will be controlled in accordance with the LLRW and 11e.(2) CQA/QC Manual. As discussed in Section 3 above, cover system specifications and construction procedures will be essentially identical to that approved for the existing Class A embankment; with the exception being Type B filter zone thickness.

4.3.4 LOCATION DISPOSAL UNITS AND BOUNDARY MARKERS

This topic is addressed in the 2005 LRA (Section 4.3.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.3.5 DISPOSAL UNIT CLOSURE AND STABILIZATION

This topic is addressed in the 2005 LRA (Section 4.3.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.3.6 BUFFER ZONE

This topic is addressed in the 2005 LRA (Section 4.3.6). The Class A South/11e.(2) embankment is designed with a 100 foot buffer zone, consistent with the minimum dimension of 94 feet.

4.4 OPERATIONAL ENVIRONMENTAL MONITORING AND SURVEILLANCE

4.4.1 REVIEW AND AUDIT OF FACILITY OPERATIONS

Energy*Solutions*' program for facility review and audit is provided in the 2005 LRA, Appendix V, Quality Assurance Manual. Since there is no change to the types of waste that will be managed, this plan will be unaffected by the Class A South/11e.(2) embankment.

4.4.2 FACILITY ADMINISTRATION AND OPERATING PROCEDURES

This topic is addressed in the 2005 LRA (Section 4.8). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

4.4.3 ENVIRONMENTAL MONITORING AND SURVEILLANCES

Environmental monitoring for the Class A RML is addressed at License condition 26, incorporating LRA Appendix R dated October 3, 2006 by reference. Environmental monitoring for the 11e.(2) RML is addressed at License condition 9.3, incorporating LRA Appendix LL dated July 6, 2007. These monitoring plans will continue to apply at the Class A South/11e.(2) embankment. Drawing number 07021-U3 illustrates environmental monitoring station locations in the immediate vicinity of the proposed Class A South/11e.(2) embankment, is included in Attachment 2. In addition, Section 1.5 of this Amendment Request details revisions needed to the GWQDP for incorporation of groundwater monitoring for the Class A South/11e.(2) embankment.

Monitoring wells will be installed immediately downgradient of the Class A portion of the Class A South/11e.(2) embankment. Four wells will be located directly under the vertical clay barrier as shown on drawing 07021-U3. The 11e.(2) portion of the embankment will continue to be monitored using the existing monitoring network. The wells installed downgradient of the LLRW embankment will be installed using either directional drilling techniques or installed as horizontal wells prior to cell construction. Either installation technique will provide direct evidence as to whether or not the LLRW embankment is the source area, should contamination be detected. Existing monitoring wells downgradient of the 11e.(2) embankment will provide evidence as to whether or not the 11e(2) embankment is the source area. This monitoring network will demonstrate adequate waste isolation.

4.5 EMERGENCY AND CONTINGENCY PLAN

Energy*Solutions*' currently approved Emergency Response and Contingency Plan is applicable to the Class A South/11e.(2) embankment. Since there is no change to the types of waste that will be managed, this plan will be unaffected by the Class A South/11e.(2) embankment.

5.0 SITE CLOSURE PLAN AND INSTITUTIONAL CONTROLS

The embankment is designed to eliminate to the extent practicable the need for active maintenance after closure. Once the proposed Class A South/11e.(2) embankment is closed, no further maintenance to the embankment is anticipated. Embankment closure is executed on a continuing basis, with cover construction generally completed within a relatively short time after a section of the embankment reaches its design limit of waste placement. As required by RML condition 74, Energy*Solutions* will submit a detailed site decontamination and decommissioning plan at least one year prior to the anticipated closure of the site. This plan will address site closure in the context of site conditions at that time.

5.1 SITE STABILIZATION

This topic is addressed in the 2005 LRA (Section 5.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.1.1 SURFACE DRAINAGE AND EROSION PROTECTION

This topic is addressed in the 2005 LRA (Section 5.1.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.1.2 GEOTECHNICAL STABILITY

This topic is addressed in the 2005 LRA (Section 5.1.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.1A SITE CLOSURE AND STABILIZATION CONSIDERATIONS FOR BELOW-GROUND VAULTS AND EARTH MOUNDED CONCRETE BUNKERS

Below ground vaults are defined as warehouse-sized vaults buried beneath grade. Concrete bunkers are defined as concrete-lined trenches with compartmental separation for different waste classes. Energy*Solutions* does not perform either of these types of disposal and therefore this topic is not applicable to the Class A South/11e.(2) embankment.

5.2 DECONTAMINATION AND DECOMISSIONING

This topic is addressed in the 2005 LRA (Section 5.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

5.3 POST-OPERATIONAL ENVIRONMENTAL MONITORING

This topic is addressed in the 2005 LRA (Section 5.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.0 SAFETY ASSESSMENT

This topic is addressed in the 2005 LRA, section 6. Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment. Furthermore, the dose assessments are confirmed by monitoring data reported to DRC. Personnel monitoring information is provided to DRC by April 30 of each year in the annual report required by 10 CFR 20.2206. Monitoring of dose to the general public is reported to DRC with the quarterly environmental monitoring reports required by RML condition 29.A. Both of these regular reports confirm Energy*Solutions*' ongoing compliance with the applicable dose limits.

6.1 RELEASE OF RADIOACTIVITY

Anticipated sources and radioactivity of wastes will be no different than radioactive wastes currently being placed in the Class A and Class A North embankments, i.e., Class A LLRW. License Condition 9.B prohibits receipt of Class B and C LLRW.

6.1.1 DETERMINATION OF TYPES, KINDS, AND QUANTITIES OF WASTE

This topic is addressed in the 2005 LRA (Section 6.1-6.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.2 INFILTRATION

This topic is addressed in the 2005 LRA (Section 6.3.1.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.3 RADIONUCLIDE RELEASE – NORMAL CONDITIONS

This topic is addressed in the 2005 LRA (Section 6.3.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.4 RADIONUCLIDE RELEASE – ACCIDENTAL OR UNUSUAL OPERATIONAL CONDITIONS

This topic is addressed in the 2005 LRA (Section 6.3.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.5 RADIONUCLIDE TRANSFER TO HUMAN ACCESS LOCATION

This topic is addressed for groundwater, air, surface water, and other transfer mechanisms in the 2005 LRA (Sections 6.4.1 – 6.4.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.1.6 ASSESSMENT OF IMPACTS AND REGULATORY COMPLIANCE

The analyses provided and referenced above demonstrate that Energy*Solutions*' exiting operations have impacts that are maintained within the applicable regulatory limits. Furthermore, personnel and environmental monitoring data confirm that the applicable limits are met on a continuing basis. Since there is no change in the types of waste that will be managed, this issue will be unaffected by the Class A South/11e.(2) embankment.

6.2 INTRUDER PROTECTION

6.2.1 NORMAL RELEASES

The waste to be disposed in the Class A South portion of the Class A South/11e.(2) embankment is identical to that approved for the existing Class A and Class A North embankments. Therefore, there is no difference in potential radiological release with the proposed embankment. For confirmation that releases meet all applicable regulatory requirements, see the quarterly environmental monitoring reports referenced in Section 6.0 above.

6.2.1.1 CONTROL OF WINDBORNE DISPERSION

Engineering and operational controls to prevent the resuspension and dispersion of particulate radioactivity are provided at RML condition 53 and in the LLRW and 11e(2) CQA/QC Manual. Those controls will be implemented without revision in construction of the Class A South/11e.(2) embankment.

6.2.1.2 CONTROL OF SURFACE CONTAMINATION

All equipment, vehicles, and personnel are screened for both alpha and beta contamination before being released from the site. There will be no revision to these requirements associated with the Class A South/11e.(2) embankment.

6.2.2 POTENTIAL ACCIDENTAL RELEASES

Construction of the proposed Class A South/11e.(2) embankment will not change the nature of possible potential accidental releases that have been addressed in Energy*Solutions*' previous licensing actions. No new emergency response or contingency plans will be generated, as the nature of the waste that will be disposed of in the proposed Class A South portion of the Class A South/11e.(2) embankment is identical to the waste currently being disposed of in the Class A embankment.

6.2.3 POTENTIAL RELEASES FOLLOWING OPERATIONS

6.2.3.1 RADIONUCLIDE TRANSFER TO HUMAN ACCESS LOCATIONS

The construction of the proposed Class A South/11e.(2) embankment will not change the nature of possible transfer to human access locations discussed in previous licensing actions.

6.2.3.2 PROJECTED DOSES TO MEMBERS OF THE GENERAL PUBLIC

Since there will be no change to the waste handled or to the operating and disposal procedures, previous dose assessment work remains applicable to the Class A South/11e.(2) embankment. Furthermore, the dose assessments are confirmed by monitoring data reported to DRC. Monitoring of dose to the general public is reported to

DRC with the quarterly environmental monitoring reports required by RML condition 29.A.

6.3 LONG-TERM STABILITY

6.3.1 SURAFACE DRAINAGE AND EROSION PROTECTION

6.3.2 SLOPE STABILITY

This topic is addressed in the 2005 LRA (Section 6.4.3.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.3.2.1 SITE AND SLOPE AREA CHARACTERIZATION

This topic is addressed in the 2005 LRA (Section 6.4.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

6.3.3 SETTLEMENT AND SUBSIDENCE

Design criteria for settlement and subsidence are provided in Sections 3.1.1.2, 3.1.2.1 and 3.1.3.3 of the 2005 LRA. Projected performance of the cover system against these design criteria are discussed in Sections 3.3.1.2, 3.3.2.1 and 3.3.3.3 of that document. These analyses are applicable to the Class A South/11e.(2) embankment because the liner, waste placement, and cover materials and material specifications are essentially identical to that of the Class A and Class A North embankments. See also Section 3.2.2 above.

7.0 OCCUPATIONAL RADIATION PROTECTION

7.1 OCCUPATIONAL RADIATION EXPOSURES

7.1.1 POLICY CONSIDERATIONS

The objective of Energy*Solutions*' Radiation Protection Program is to ensure that all reasonable actions are taken to reduce radiation exposures and effluent concentrations to levels that are considered As Low As Reasonably Achievable (ALARA).

Energy*Solutions*' ALARA management policy is detailed in Section 5 of the ALARA Program document. Section 4 of the ALARA Program describes the organizational structure of the ALARA program and the responsibilities of those involved in managing and implementing the ALARA program. The ALARA Program is located in the 2005 LRA (, Appendix H).

The waste type and classification that will be disposed of in the Class A South portion of the Class A South/11e.(2) embankment will be no different than waste currently being disposed of in the Class A and Class A North embankments. Therefore, the ALARA Program will not require revision for the Class A South/11e.(2) embankment.

7.1.2 DESIGN CONSIDERATIONS

This topic is addressed in the 2005 LRA (Section 7.1.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.1.3 OPERATIONAL CONSIDERATIONS

This topic is addressed in the 2005 LRA (Section 7.1.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.2 RADIATION SOURCES

The types and quantities of materials received for disposal in the Class A South portion of the Class A South/11e.(2) embankment will be no different than materials disposed of in the Class A and Class A North embankments. Therefore, radiation protection, access control to restricted areas, and personnel protective equipment policies will not change from what is currently being performed.

7.3 RADIATION PROTECTION DESIGN FEATURES

7.3.1 FACILITY DESIGN FEATURES

This topic is addressed in the 2005 LRA (Section 7.3.1). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.3.2 SHIELDING

This topic is addressed in the 2005 LRA (Section 7.3.2). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.3.3 VENTILATION

This topic is addressed in the 2005 LRA (Section 7.3.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e(2) embankment.

7.3.4 AREA RADIATION AND AIRBORNE RADIOACTIVITY MONITORING INSTRUMENTATION

This topic is addressed in the 2005 LRA (Section 7.3.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.3.5 EQUIPMENT, INSTRUMENTATION, AND FACILITIES

This topic is addressed in the 2005 LRA (Section 7.3.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.4 RADIATION PROTECTION PROGRAM

This topic is addressed in the 2005 LRA (Section 7.4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

7.4.1 ORGANIZATION

This topic is addressed in the 2005 LRA (Section 7.4.9). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.0 CONDUCT OF OPERATIONS

Operations at the Clive facility will not change with respect to the Class A South/11e.(2) embankment. The type of waste, method of disposal and engineering design of the proposed embankment are no different than what is currently performed in the Class A and Class A North embankments.

8.1 ORGANIZATIONAL STRUCTURE

Detailed requirements and qualifications for significant organizational positions are described in the Class A RML, Condition 32, Appendix I (currently approved revision is Rev. 19, October 6, 2006).

8.2 QUALIFICATIONS OF APPLICANT

A discussion of applicant qualifications is provided in Section 1.1.2 of this License Amendment Request.

8.3 TRAINING PROGRAM

This topic is addressed in the 2005 LRA (Section 7.4.3). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.4 EMERGENCY PLANNING

This topic is addressed in the 2005 LRA (Section 4.5). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.5 REVIEW AND AUDIT

This topic is addressed in the 2005 LRA (Section 4.6). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.6 FACILITY ADMINISTRATIVE AND OPERATING PROCEDURES

This topic is addressed in the 2005 LRA (Section 4). Since there is no change in the types of waste that will be managed, this discussion will be unaffected by the Class A South/11e.(2) embankment.

8.7 PHYSICAL SECURITY

The Site Radiological Security Plan is incorporated in the Class A RML at condition 54 (currently approved as revision 2, March 28, 2006). Since there is no change to the types of waste that will be managed, this plan will be unaffected by the Class A South/11e.(2) embankment.

9.0 QUALITY ASSURANCE

The currently approved Quality Assurance Manual was updated in the 2005 LRA (Appendix V). Since there is no change to the types of waste that will be managed, this plan will be unaffected by the Class A South/11e.(2) embankment.

10.0 FINANCIAL ASSURANCE

In order to protect the State of Utah from financial damage arising from having to close and decommission the facility, the LLRW financial surety will be revised to include cost estimates for the closure of the LLRW portion of the Class A South/11e.(2) embankment. Financial surety for the 11e.(2) portion of the Class A South/11e.(2) embankment is covered under the currently approved 11e.(2) surety.

Because the annual surety review submitted August 31, 2007 is under review by DRC, a revised surety estimate is not included with this amendment request. Energy*Solutions* anticipates that the surety will need to be revised to include new groundwater monitoring wells; and may require an adjustment for fencing and construction of haul roads around the LLRW portion of the embankment. Adjustments will be made to the surety revision approved at the time this license amendment is approved, then funded prior to initiating any Class A waste placement in the Class A South/11e.(2) embankment.

Any proportional decrease within the 11e.(2) portion of the embankment will be captured within an annual update to the 11e.(2) Surety after approval of the proposed amendment. Current open cell limitations for the 11e.(2) portion of the Class A South/11e.(2) Cell will not change.

10.1 FINANCIAL QUALIFICATIONS OF APPLICANT

Energy*Solutions'* financial qualifications are discussed in Section 1.1.1.2 above.

10.2 FUNDING ASSURANCES

10.2.1 SPECIFIC ACCEPTABLE FINANCIAL ASSURANCES

10.2.1.1 SURETIES OR PERFORMANCE BONDS

Sureties are a type of financial mechanism provided to help protect the State of Utah from financial damage as a result of closing and decommissioning the facility. Performance bonds are another type of financial mechanism. Energy*Solutions* has chosen an alternative financial mechanism approved by the State.

10.2.1.2 LETTERS OF CREDIT

Energy*Solutions* has chosen as its financial mechanism an irrevocable letter of credit. This irrevocable letter of credit has been entered into by Energy*Solutions* and Zions First National Bank for the benefit of the Executive Secretary of the Utah Radiation Control Board.

Upon DRC approval of the Class A South/11e.(2) embankment and associated financial surety calculations, and prior to placing waste within the embankment, Energy*Solutions* will amend the letters of credit as necessary to ensure funding for closure and post-closure monitoring of the Class A South portion of the Class A South/11e.(2) embankment. The 11e.(2) portion of the Class A South/11e.(2) embankment is covered under a separate irrevocable letter of credit in accordance with Radioactive Material License UT2300478.

10.3 FINANCIAL ASSURANCE FOR INSTITUTIONAL CONTROLS

In addition to the estimated costs for decommissioning the facility, the financial surety also covers estimated costs of long-term surveillance of the site. This includes sampling of groundwater monitoring wells, site inspections and repairs and other miscellaneous costs. See also the discussion in Section 10.0 above.

11.0 REFERENCES

10 CFR 20.3(a)(14), definition of a restricted (or controlled) area.

CEntry, "Overpack Design", submitted to DRC on March 20, 2003.

Envirocare of Utah, Inc., "Application for License Amendment: Containerized Class A, B, and C LLRW Disposal," December 13, 2000.

Envirocare of Utah, Inc., "Comprehensive Groundwater Quality Evaluation Report", submitted September 1, 2004.

Envirocare of Utah, Inc., "Durability Assessment of Concrete Overpacks", submitted to DRC on March 10, 2003.

Envirocare of Utah, Inc., "Engineering Justification Report: Addendum", October 2, 2001.

Energy*Solutions* LLC, "Ground Water Quality Discharge Permit (GWQDP) UGW450005".

Energy*Solutions* LLC, "LLRW CQA/QC Manual", currently approved as Rev. 17a, September 16, 2004.

Energy*Solutions* LLC, "Organization", currently approved as Rev. 19, October 6, 2006.

Envirocare of Utah, Inc., "Quality Control Inspection List", submitted to DRC on June 11, 2003.

Energy*Solutions* LLC, "Radiation Safety Manual", currently approved as Rev. 7, August 4, 2006.

Envirocare of Utah, Inc., Radioactive Material License Renewal Application, March 16, 1998.

Envirocare of Utah, Inc., Radioactive Material License Renewal Application, provided to DRC on July 2, 2003.

Energy*Solutions* LLC, "Radioactive Material License (RML) UT 2300249".

Envirocare of Utah, Inc., "Request for License Amendment: Containerized Class A LLRW Disposal", April 12, 2001.

Envirocare of Utah, Inc., "Revised Hydrogeologic Report", submitted to the DRC on September 1, 2004.

Envirocare of Utah, Inc., "Safety Evaluation Report", August 1998.

Envirocare of Utah, Inc., "Safety Evaluation Report", June, 2001.

Energy*Solutions* LLC, "Site Radiological Security Plan", currently approved revision date March 28, 2006.

Envirocare of Utah, Inc., "Siting Evaluation Report", May 2, 2000.

Energy*Solutions* LLC, "Waste Characterization Plan", currently approved revision date February 27, 2006.

Meteorological Solutions, Inc., "October 2002 through September 2003 and July 1992 through June 2003 Summary Report of Meteorological Data Collected at the Envirocare's Clive, Utah Facility", MSI Report No. 12040453, December 2004. Submitted to DRC January 12, 2004.

USNRC, "Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 11e.(2) Byproduct Material Near Clive, Utah", Docket Number 40-8989, August, 1993.

USNRC, NUREG-1199 Rev. 02, "Standard Format and Content of a license application for a Low-Level Radioactive Waste Disposal Facility", January 1991.

Whetstones Associates, "Envirocare of Utah Class A, B, & C Cell Infiltration and Transport Modeling", August 1, 2000.

Whetstone Associates, "Envirocare of Utah Class A Cell Infiltration and Transport Modeling", Whetstone, July 19, 2000.

ATTACHMENT 1 a

LICENSE AMENDMENT

UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF RADIATION CONTROL
RADIOACTIVE MATERIAL LICENSE

Pursuant to Utah Code Annotated, Title 19, Chapter 3 and the Radiation Control Rules, Utah Administrative Code (UAC) R313, and in reliance on statements and representations heretofore made by the Licensee designated below, a license is hereby issued authorizing the Licensee to transfer, receive, possess, and use the radioactive material designated below; and to use radioactive material for the purpose(s) and at the place(s) designated below. The license is subject to all applicable rules, and orders now or hereafter in effect and to all conditions specified below.

****

LICENSEE		) 3. License Number UT 2300249) Amendment # 22E
1. Name	EnergySolutions, LLC (EnergySolutions	)
		)***********************************
2. Address	423 West 300 South Suite 200 Salt Lake City, UT 84101	) 4. Expiration Date) October 22, 2003 (Under Timely Renewal))***********************************
		) 5. License Category 4-a

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6. Radioactive Material (element and mass number)		7. Chemical and/or physical form		8. Maximum Radioactivity and/or quantity of material the Licensee may possess at any one time.
A.	Any Radioactive Material including Special Nuclear Material specified in License Condition 13 A through J.	A. and B. Notwithstanding Conditions 9 (Authorized Use), 16 (Prohibitions and Waste Requirements), and 56 (containerized waste), typically large volume, bulky or containerized, soil or debris. Debris can include both decommissioning (cleanup) and routinely generated operational waste including but not limited to radiologically contaminated paper, piping, rocks, glass, metal, concrete, wood, bricks, resins, sludge, tailings, slag, residues, personal protective equipment (PPE) that conforms to the size limitations in currently approved QA/QC Manual.	A.	20,000 Curies***
B	Special Nuclear Material		B.	As specified in License Condition 13.A through J.

UTAH DIVISION OF RADIATION CONTROL
RADIOACTIVE MATERIAL LICENSE
SUPPLEMENTARY SHEET

License #UT 2300249
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6. Radioactive Material (element and mass number)		7. Chemical and/or physical form		8. Maximum Radioactivity and/or quantity of material the Licensee may possess at any one time.
C.	Cesium-137	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	C.	Not to exceed 11 millicuries per source
D.	Americium-241	Sealed Neutron Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	D.	Not to exceed 51 millicuries per source
E.	Americium-241 Americium-243 Neptunium-237 Plutonium-239 Plutonium-242 Thorium-229 Thorium-230 Uranium-232 Uranium-238	Liquid	E.	Not to exceed 5 microcuries total activity per source
F.	Strontium-90/Yttrium-90	Liquid	F.	Not to exceed 5 microcuries total activity
G.	Americium-241	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	G.	Not to exceed 5 microcuries total activity
H.	Thorium-230	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	H.	Not to exceed 48.6 microcuries total activity
I.	Plutonium-239	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	I.	Not to exceed 21.9 microcuries total activity

UTAH DIVISION OF RADIATION CONTROL
RADIOACTIVE MATERIAL LICENSE
SUPPLEMENTARY SHEET

License #UT 2300249
Amendment #~~22E~~22F

6. Radioactive Material (element and mass number)		7. Chemical and/or physical form		8. Maximum Radioactivity and/or quantity of material the Licensee may possess at any one time.
J.	Strontium-90/Yttrium-90 and Americium-241	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	J.	Not to exceed 8.1 millicuries per source
K.	Depleted Uranium	Custom Source - 55 gallon drum containing Depleted Uranium shavings in a homogenous concrete mix	K.	Not to exceed 250 pounds, 56.8 millicuries or 110,000 picocuries of Depleted Uranium
L.	Uranium-234, Uranium-235, Uranium-238, Americium-241, and Plutonium-239	Calibration or Reference Combined Source(s)	L.	Not to exceed 5 nanocuries per source
M.	Cobalt-60 and Cesium-137	Calibration or Reference Combined Source(s)	M.	Not to exceed 0.4 microcuries per source
N.	Cadmium-109, Cobalt-60, Cerium-139, Mercury-203, Tin-113, Cesium-137, Yttrium-88, and Cobalt-60	Calibration or Reference Combined Source(s)	N.	Not to exceed 5 microcuries per source
O.	Americium-241 and Europium-152	Calibration or Reference Combined Sources	O.	Not to exceed 2 microcuries per source
P.	Cesium-137	Sealed Source(s) registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation	P.	Not to exceed 12 millicuries per source

***Applies to undisposed maximum quantity at the Class A disposal cell and the Mixed Waste landfill cell.
****

9. AUTHORIZED USE

A. Licensee may receive, store, and dispose by land burial, radioactive material as naturally occurring and accelerator produced material (NARM) and low-level radioactive waste. Prior to receiving an initial, low-level radioactive waste shipment for disposal from a generator, the Licensee shall obtain documentation which demonstrates that the low-level radioactive wastes have been approved for export to the Licensee. Approval is required from the low-level radioactive waste compact of origin (including the Northwest Compact), or for states unaffiliated with a low-level radioactive waste compact, the state of origin, to the extent a state can exercise such approval.

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B. In accordance with Utah Code Annotated 19-3-105, the Licensee may not receive Class B or Class C low-level radioactive waste without first receiving approval from the Executive Secretary of the Utah Radiation Control Board and also receiving approval from the Governor and the Legislature.

C. The Licensee shall fulfill and maintain compliance with all conditions and shall meet all compliance schedules stipulated in the Ground Water Quality Discharge Permit, number UGW 450005 (hereafter GWQ Permit), issued by the Executive Secretary of the Utah Water Quality Board.

D. Reserved

E. The Licensee may dispose of Class A Low-Level Radioactive Waste (LLRW) and NARM in ~~both~~ the Class A, ~~and~~ Class A North, and Class A South disposal cells described in License Condition 40, and in the Mixed Waste Landfill Cell. Class A waste is defined in Utah Radiation Control Rule R313-15-1008 and NARM at R313-12-3.

F. Effective January 1, 2002, the Licensee shall not accept, possess, store or dispose of any radioactive waste delivered to the disposal site by any conveyance, unless the associated Shipping Documents have a valid Generator Site Access Permit number, issued by the Utah Division of Radiation Control, affixed.

G. The Licensee may receive, treat, and dispose radioactively contaminated aqueous liquids and liquid mercury as characterized in the waste profile at the mixed waste facilities only, the waste must be Class A LLRW at receipt.

H. The Licensee may receive and utilize as a training device one radioactively contaminated USDOT Specification 7A Type A shipping cask at the Containerized Waste Facility. The cask is to be maintained as referenced in License Condition 88.T.(2).

I. Licensed material in Items 6.C and 6.D, Sealed source(s) contained in compatible portable gauging devices (registered pursuant to R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation) for measuring properties of materials.

J. Licensed material in Items 6.E through 6.L, for operational checks and efficiency determinations of radiation detection instrumentation.

K. Licensed material in Items 6.M through 6.O, calibration or reference combined source(s) for use in conjunction with the Licensee's whole body counter.

L. Licensed material in Item 6.P, sealed source(s) contained in MGP Instruments, Inc. Model IRD-2000 dosimeter calibrators/irradiators for tests and source checks of electronic dosimeters.

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SITE LOCATION

10. A. The Licensee may receive, store and dispose of licensed material at the Licensee's facility located in Section 32 of Township 1 South and Range 11 West, Tooele County, Utah.

B. Section 32, Township 1 South and Range 11 West, Tooele County, Utah, is defined by the following points of reference:

Southwest Section Corner:	Latitude 40° 40' 51.894060" N Longitude 113° 7' 28.579640" W
Elevation	4269.76 feet above mean sea level (amsl)
Southeast Section Corner	Latitude 40° 40' 50.906471" N Longitude 113° 6' 20.023247" W
Elevation	4277.27 feet-amsl
Northwest Section Corner	Latitude 40° 41' 44.093832" N Longitude 113° 7' 27.371551" W
Elevation	4273.06 feet-amsl
Northeast Section Corner	Latitude 40° 41' 43.107203" N Longitude 113° 6' 18.839771" W
Elevation	4280.83 feet-amsl

C. The Southwest Section Corner marker of Section 32 shall be the Point of Beginning (POB).

D. The Licensee shall cause a survey to be conducted by a Utah licensed land surveyor to identify the section corners of Section 32, Township 1 South, and Range 11 West, Tooele County, Utah (as defined in Condition 10.B). Licensee shall place monuments with brass caps at the identified section corner locations. Monuments shall be permanent and constructed in a manner that will protect them from being disturbed.

E. Licensed material in Items 6.C through 6.P shall be used only at the Licensee's facilities referenced in Condition 10.B.

11. The open cell area within the Class A, ~~and~~ Class A North, and Class A South disposal embankments where waste disposal/placement has or may occur, but the cover system has not been completed shall be limited to 3,650,000 square feet. Uncovered radioactive waste shall be limited to a surface area of 1,020,000 square feet.

12. Pursuant to UAC R313-12-55(1), the Licensee is granted an exemption to UAC R313-25-9, as it relates to land ownership and assumption of ownership.

SPECIAL NUCLEAR MATERIAL

13. In accordance with the Order issued by the U.S. Nuclear Regulatory Commission dated January 14, 2003, Docket No. 040-8989, License No. SMC-1559, the EnergySolutions may possess Special Nuclear Material (SNM) within the restricted area of the EnergySolutions facility as described in Condition 10 provided that:

A. Concentrations of SNM in individual waste containers must not exceed the values listed in Table 13-A at time of receipt:

Table 13-A

Column 1 Radionuclide	Column 2 Maximum Concentration (pCi/g)	Column 3 Measurement Uncertainty (pCi/g)
U-235[a]	1,900	285
U-235[b]	1,190	179
U-235[c]	26	10
U-235[d]	680	102
U-233	75,000	11,250
Pu-236	500	75
Pu-238	10,000	1,500
Pu-239	10,000	1,500
Pu-240	10,000	1,500
Pu-241	350,000	50,000
Pu-242	10,000	1,500
Pu-243	500	75
Pu-244	500	75

a - for uranium below 10 percent enrichment and a maximum of 20 percent of the weight of the waste of materials listed in License Condition 13.B

b - for uranium at or above 10 percent enrichment and a maximum of 20 percent of the weight of the waste of materials listed in License Condition 13.B c - for uranium at any enrichment with unlimited quantities of materials listed in License Condition 13.B and License Condition 13.C

d - for uranium at any enrichment with sum of materials listed in License Condition 13.B and License Condition 13.C not exceeding 45 percent of the weight of the waste

*The measurement uncertainty values in Column 3 above represent the maximum one-sigma uncertainty associated with the measurement of the concentration of the particular radionuclide.
The SNM must be homogeneously distributed throughout the waste. If the SNM is not homogeneously distributed, then the limiting concentrations must not be exceeded on average in any contiguous mass of 600 kilograms.

B. Except as allowed by notes a, b, c, and d in Condition 13.A, waste must not contain "pure forms" of chemicals containing carbon, fluorine, magnesium, or bismuth in bulk quantities (e.g., a pallet of drums, a B-25 box). By "pure forms," it is meant that mixtures of the above elements such as magnesium oxide, magnesium carbonate, magnesium fluoride, bismuth oxide, etc. do not contain other elements. These chemicals would be added to the waste stream during processing, such as at fuel facilities or treatment such as at mixed waste treatment facilities. The presence of the above materials will be determined by the generator, based on process knowledge or testing.

C. Except as allowed by notes c and d in Condition 13.A, waste accepted must not contain total quantities of beryllium, hydrogenous material enriched in deuterium, or graphite above one percent of the total weight of the waste. The presence of the above materials will be determined by the generator, based on process knowledge, physical observations, or testing.

D. Waste packages must not contain highly water soluble forms of uranium greater than 350 grams of uranium-235 or 200 grams of uranium-233. The sum of the fractions rule will apply for mixtures of U-233 and U-235. Highly soluble forms of uranium include, but are not limited to: uranium sulfate, uranyl acetate, uranyl chloride, uranyl formate, uranyl fluoride, uranyl nitrate, uranyl potassium carbonate, and uranyl sulfate. The presence of the above materials will be determined by the generator, based on process knowledge or testing.

E. Mixed waste processing of waste containing SNM will be limited to stabilization (mixing waste with reagents), micro-encapsulation, macro-encapsulation using low-density and high density polyethylene, macroencapsulation using cementatious mix (Macro Mix), and thermal desorption.

When waste is processed using the thermal desorption process, EnergySolutions shall confirm the SNM concentration following processing and prior to returning the waste to temporary storage.

Liquid waste may be stabilized provided the SNM concentration does not exceed the SNM concentration limits in License Condition 13.A. For containers of liquid waste with more than 600 kilograms of waste, the total activity (pCi) of SNM shall not exceed the SNM concentration in License Condition 13.A times 600 kilograms of waste. Waste containing free liquids and the solids shall be mixed prior to treatment. Any solids shall be maintained in a suspended state during transfer and treatment.

F. EnergySolutions shall require generators to provide the following information for each waste stream:

Before Receipt

1. Waste Description. The description must detail how the waste was generated, list the physical forms in the waste, and identify uranium chemical composition.
2. Waste Characterization Summary. The data must include a general description of how the waste was characterized (including the volumetric extent of the waste, and the number, location, type, and results of any analytical testing), the range of SNM concentration ranges, and the analytical results with error values used to develop the concentration ranges.
3. Uniformity Description. A description of the process by which the waste was generated showing that the spatial distribution of SNM must be uniform, or other information supporting spatial distribution.
4. Manifest Concentration. The generator must describe the methods to be used to determine the concentrations on the manifests. These methods could include direct measurement and the use of scaling factors. The generator must describe the uncertainty associated with sampling and testing used to obtain the manifest concentrations.

EnergySolutions shall review the above information and, if adequate, approve in writing this pre-shipment waste characterization and assurance plan before permitting the shipment of a waste stream. This will include statements that EnergySolutions has a written copy of all the information required above, that the characterization information is adequate and consistent with the waste description, and that the information is sufficient to demonstrate compliance with Conditions 13.F.1 through 13.F.4. Where generator process knowledge is used to demonstrate compliance with Conditions 13.A, 13.B, 13.C, or 13.D, EnergySolutions shall review this information and determine when testing is required to provide additional information in assuring compliance with the conditions. EnergySolutions shall retain this information as required by the State of Utah to permit independent review.

At Receipt

EnergySolutions shall require generators of SNM waste to provide a written certification with each waste manifest that states the SNM concentrations reported on the manifest do not exceed the limits in Condition 13.A, that the measurement uncertainty does not exceed the uncertainty value in Condition 13.A, and that the waste meets Conditions 13.B through 13.D.

G. Sampling and radiological testing of waste containing SNM must be performed in accordance with the following: One sample for each of the first ten shipments of a waste stream; or one sample for each of the first 100 cubic yards of waste up to 1,000 cubic yards of a waste stream;

and one sample for each additional 500 cubic yards of waste following the first ten shipments or following the first 1,000 cubic yards of a waste stream. Sampling and radiological testing of debris waste containing SNM can be waived if the SNM concentration is lower than one tenth of the applicable limit in License Condition 13.A.

H. EnergySolutions shall notify the NRC, Region IV office within 24 hours if any of the above conditions are violated, including if a batch during a treatment process exceeds the SNM concentration in License Condition 13.A. A written notification of the event must be provided within 7 days.

I. EnergySolutions shall obtain NRC approval prior to changing any activities associated with the above conditions.

J. Notwithstanding License Condition13.A through 13.I, for the Containerized Waste Facility described in License Condition 10.F, the following limits for possession of SNM apply to the total combined quantities of SNM at the Containerized Waste Facility:

Consistent with the definition of special nuclear material given in UAC R313-12-3, the maximum quantity of special nuclear material which the EnergySolutions may possess at any one time, shall not exceed: 350 grams of U-235, 200 grams of U-233, and 200 grams Pu, or any combination of them in accordance with the following formula:

$$\frac{\text{(Grams U-235)}}{350} + \frac{\text{(Grams U-233)}}{200} + \frac{\text{(Grams Pu)}}{200} \leq 1$$

"Possession" and "Disposal" are defined in License Conditions 63 and 64 respectively.

MIXED WASTE

14. A. The Licensee may receive for treatment, storage, and disposal any radioactive waste as authorized by this license that is also determined to be hazardous (commonly referred to as mixed waste) as permitted by the "Hazardous Waste Plan Approvals" issued and modified by the Executive Secretary, Utah Solid and Hazardous Waste Control Board and "HSWA Permit" issued by the U.S. Environmental Protection Agency.

B. The Licensee shall dispose of these wastes in the "mixed waste" disposal embankment only. Characteristic or listed hazardous waste treated at the Licensee's facility shall not be disposed of in the Class A North, the Class A, or the Class A South/ ~~or the~~ 11.e(2) disposal cell.

WASTE TREATMENT AND PROCESSING

15. A. Prior to receipt of any low level radioactive or mixed wastes requiring treatment before disposal,

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the Licensee shall, based on knowledge of the technology to be used for treatment/processing of each particular radioactive or mixed waste, calculate and document that the resultant processed waste is neither Class B nor Class C waste.

B Reserved

C. Following treatment at the Mixed Waste facility the Licensee shall classify the resultant processed waste in accordance with UAC R313-15-1008.

D. The Licensee shall manifest treated waste from the Mixed Waste facility for disposal in accordance with UAC R313-15-1006.

PROHIBITIONS AND WASTE ACCEPTANCE REQUIREMENTS

16. A. Sealed sources as defined in Utah Administrative Code (UAC) R313-12 shall not be accepted for disposal.

B. In accordance with UAC R313-15-1008(2)(a)(v), waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.

C. In accordance with UAC R313-15-1008(2)(a)(vi), waste shall not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste.

D. In accordance with UAC R313-15-1008(2)(a)(vii), waste shall not be pyrophoric.

E. Waste containing untreated biological, pathogenic, or infectious material including radiologically contaminated laboratory research animals is prohibited

F. Liquid Waste Restrictions

i. Except for liquid mercury, receipt of nonaqueous liquid waste is prohibited unless specifically approved by the Executive Secretary.

ii. Treated liquid radioactive waste shall be disposed in the Mixed Waste Landfill Cell in accordance with ~~LLRW~~ the LLRW and 11e.(2) Construction QA/QC Manual.

iii. Only Utah Division of Radiation Control approved solidification or absorption agents as listed in the State-issued Part B Permit are authorized for liquid waste treatment.

iv. Liquid radioactive waste shall be solidified or absorbed in a manner such that no liquid component is disposed.

v. Only containers authorized by the U. S. Department of Transportation as specified in the regulations (49 CFR parts 100 thru 180) for transporting liquid radioactive materials shall

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be accepted for all liquid radioactive wastes, regardless of radioactivity concentrations.

G. In accordance with UAC R313-15-1008(2)(a)(viii), gaseous waste received for disposal in the Containerized Waste Facility shall be packaged at an absolute pressure that does not exceed 1.5 atmospheres at a temperature of 20 degrees Celsius and the total activity of any container shall not exceed 100 curies (3.7×10^{12} Bequerels).

H. In accordance with UAC R313-15-1008(2)(a)(ii), waste received for disposal in the Containerized Waste Facility shall not be packaged in cardboard or fiberboard containers.

I. The Licensee shall not accept for disposal any neutron source (e.g., polonium-210, americium-241, radium-226 in combination with beryllium or other target).

J. Incinerator ash shall be treated, in preparation for disposal, in a manner that renders it non-dispersible in air.

K. Radioactive waste containing chelating agents greater than 0.1 percent by weight shall be disposed of in the Mixed Waste Landfill Cell.

L. The Licensee shall not accept containerized radioactive waste unless each waste package has been:
   i. Classified in accordance with R313-15-1008, "Classification and Characteristics of Low-Level Radioactive Waste." In addition, the Licensee shall require that all radioactive waste received for disposal meet the requirements specified in the Nuclear Regulatory Commission, " Branch Technical Position on Concentration Averaging and Encapsulation", as amended.
   ii. Marked as either Class A Stable or Class A Unstable as defined in the most recent version of the "Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification." originally issued May, 1983 by the U.S. Nuclear Regulatory Commission.
   iii. Marked with a unique package identification number, clearly visible on the package, that can be correlated with the manifest for the waste shipment in which the package arrives at the facility.

M. The Licensee may accept containerized Class A LLRW in the following waste packages for disposal in the Containerized Waste Facility of the Class A, ~~or~~ Class A North, or Class A portion of the Class A/11e.(2) disposal cell:

   i. DOT "strong, tight" containers in accordance with 49 CFR 173 and meeting the following void space criteria: void spaces within the waste and between the waste and its packaging shall be reduced to the extent practicable, but in no case shall less than 85 percent of the capacity of the container be filled
   ii. High-Integrity Containers (HICs) exceeding the void space criteria provided in License Condition 16.M.i, shall be approved by the Executive Secretary.

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iii. DOT "strong, tight" containers in accordance with 49 CFR 173 exceeding the void space criteria provided in License Condition 16.M.i and large components shall be placed as approved by the Executive Secretary.

iv. Oversized DOT containers (larger than 215 cubic feet) meeting the void space criteria provided in License Condition 16.M.i shall be placed in accordance with the currently approved LLRW and 11e.(2) Construction QA/QC Manual.

MANAGEMENT OF FREE LIQUIDS

17. In accordance with UAC R313-15-1008(2)(a)(iv), solid waste received for disposal shall contain as little free standing and non-corrosive liquid as reasonably achievable, but shall contain no more free liquids than one percent of the volume of the waste. Solid waste received and containing free liquid in excess of 1% by volume shall have the liquid removed and placed in the evaporation ponds or the liquid solidified prior to management. In addition, the Licensee shall notify the Division of Radiation Control within 24 hours that the shipment(s) failed the requirements for acceptance and manage in accordance with the Waste Characterization Plan.

RADIATION SAFETY

18. The Licensee shall comply with the provisions of UAC R313-18, "Notices, Instructions and Reports to Workers by Licensees or Registrants--Inspections"; and UAC R313-15, "Standards for Protection Against Radiation."

19. The Licensee may transport licensed material or deliver licensed material to a carrier for transport in accordance with the provisions of UAC R313-19-100, Transportation."

20. Written procedures incorporating operating instructions and appropriate safety precautions for licensed activities shall be maintained and available at the location specified in License Condition 10.A. The written procedures established shall include the activities of the radiation safety and environmental monitoring programs, the employee training program, operational procedures, analytical procedures, and instrument calibration. At least annually, the Licensee shall review all procedures to determine their continued applicability.

21. The Licensee's Corporate Radiation Safety Officer shall review and approve written procedures as stated in License Condition 20 and subsequent changes to the procedures related to waste disposal operations.

ROUTINE MONITORING AND CONTAMINATION SURVEYS

22. The Licensee shall conduct contamination surveys in accordance with Table 22-A:

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TABLE 22-A

Type	Location	Frequency
A. Gamma Radiation Levels	1. Perimeter of Restricted Area(s)	1. Weekly
	2. Office Area (s)	2. Weekly
	3. Lunch/Change Area(s)	3. Weekly
	4. Transport Vehicles	4. Upon vehicle arrival at site and before departure.
	5. Mixed Waste Facility	5. Weekly
	6. Decontamination facilities	6. Weekly
B. Contamination Wipes	1. Eating Area(s) 2. Change Area(s)	1. Weekly 2. Weekly
	3. Office Areas(s)	3. Weekly
	4. Railcar rollover and control shack	4. Weekly
	5. Equipment/Vehicles	5. Once before release
	6. Decontamination facilities	6. Weekly
	7. Mixed Waste Facility	7. Weekly
	8. Shredder Facility and control room	8. Weekly
	9. Rotary Dump and control room	9. Weekly
C. Employee/Personnel	1. Skin & Personal clothing	1. Prior to exiting restricted area
D. Gamma Exposure	1. Administration Bldg.(s)	1. Quarterly
E. Radon Concentration	1. Administration Bldg.(s)	1. Quarterly

23. The Licensee shall determine internal exposure of employees under its bioassay program, in accordance with UAC R313-15-204.

24. The Licensee shall implement a respiratory protection program that is in accordance with UAC R313-15-703.

25. The Licensee shall calibrate air sampling equipment at intervals not to exceed six months.

26. The operational environmental monitoring program shall be conducted in accordance with the License Renewal Application, Appendix R (revised), dated October 3, 2006. [no change here]

27. Vehicles, containers, facilities, materials, equipment or other items for unrestricted use, except conveyances used for commercial transport of radioactive waste, shall not be released from the Licensee's control if contamination exceeds the limits found in Table 27-A.

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TABLE 27-A

Nuclide[a]	Column 1 Average [b,c,f]	Column 2 Maximum [b,d,f]	Column 3 Removable [b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm alpha/ $100cm^2$	15,000 dpm alpha/ $100cm^2$	1,000 dpm alpha/ $100cm^2$
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/$100cm^2$	300 dpm/$100cm^2$	20 dpm/$100cm^2$
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/$100cm^2$	3,000 dpm/$100cm^2$	200 dpm/$100cm^2$
Beta-gamma emitters (nuclides with decay modes other than alpha emissions or spontaneous fission) except Sr-90 and other noted above.	5,000 dpm beta, gamma/$100cm^2$	15,000 dpm beta-gamma/$100cm^2$	1,000 dpm beta-gamma/$100cm^2$

a. Where surface contamination on both alpha-and beta-gamma emitting nuclides exists, the limits established for alpha-and beta-gamma emitting nuclides should apply independently.

b. As used in this table, dpm (disintegration's per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

c. Measurements of average contamination should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each such object.

d. The maximum contamination level applies to an area of not more than 100 cm^2.

e. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping the area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

f. The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters shall not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

REPORTING

28. Reserved.

29. The Licensee shall submit the following reports to the Executive Secretary:

A. Quarterly results from the Environmental Monitoring Program (Appendix R, as amended). The

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report(s) shall be submitted within 90 days after the expiration of each calendar quarter. Calendar Quarter shall mean:

First Quarter	January, February, and March
Second Quarter	April, May, and June
Third Quarter	July, August, and September
Fourth Quarter	October, November, and December

B. A quarterly summary report detailing the radioisotopes, activities, weighted average concentrations, volume, and tonnage for waste disposed of during the calendar quarter. The report of volume (cubic feet and cubic yards) and tonnage (tons) shall be partitioned according to waste type: Low Level Radioactive Waste (LLRW), LLRW with PCBs, Mixed Waste (MW), MW with PCBs, MW Treatment, NORM, Containerized Class A, uranium/thorium mill tailings (i.e. 11e.(2) wastes), and waste generated prior to congress passing the Uranium Mill Tailings Radiation Control Act in 1978. The report(s) shall be submitted within 30 days after the expiration of each calendar quarter. Calendar Quarter shall mean:

First Quarter	January, February, and March
Second Quarter	April, May, and June
Third Quarter	July, August, and September
Fourth Quarter	October, November, and December

C. Reserved

D. For the Mixed Waste Landfill Cell, the Licensee shall ensure that the maximum acceptable activities, used as source terms in the groundwater performance modeling are not exceeded after facility closure. Therefore, the Licensee shall notify the Executive Secretary, at the earliest knowledge, that the following nuclides are scheduled for disposal: berkelium-247 and chlorine-36.

E. For the Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) disposal cells, the Licensee shall ensure that the maximum acceptable activities used as source terms in the groundwater performance modeling are not exceeded after facility closure. Therefore, the Licensee shall notify the Executive Secretary, at the earliest knowledge, that the following nuclides are scheduled for disposal: aluminum-26, berkelium-247, calcium-41, californium 250, chlorine-36, rhenium-187, terbium-157, and terbium-158.

F. An annual report shall be submitted by March 31st and shall report the cumulative void space (expressed as a percent of waste volume) disposed of in the Containerized Waste Facility for the previous year.

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G. Reserved

30. Except as provided by this condition, the Licensee shall maintain the results of sampling, analyses, surveys, and instrument calibration, reports on inspections, and audits, employee training records as well as any related review, investigations and corrective actions, for five (5) years. The Licensee shall maintain personnel exposure records in accordance with UAC R313-15-201.

STAFFING/QUALIFICATIONS

31. Radiation Safety operations for bulk, containerized and mixed waste, portable gauging device(s), radioactive source(s), and dosimeter calibrator(s)/irradiator(s) shall be conducted by or under the supervision of Mark Ledoux, Corporate Radiation Safety Officer.

32. A. The Licensee's staff shall meet the qualifications as described in Appendix I (October 6, 2006, rev 19).

B. Licensed material in License Conditions 6.C and 6.D. shall be used by, or under the supervision and in the physical presence of, the Corporate Radiation Safety Officer or individuals who have been trained in the Licensee's standard operating and emergency procedures and have satisfactorily completed at least one of the following:

i. The device manufacturer's training course for safe use and handling of portable gauging devices containing licensed material; or
ii. A portable gauge training program conducted in accordance with the provisions of a specific license issued by the Executive Secretary, an Agreement State or the U.S. Nuclear Regulatory Commission.

C. Licensed material in License Conditions 6.E through 6.P shall be used by, or under the supervision of, the Corporate Radiation Safety Officer, or individuals designated in writing by the Corporate Radiation Safety Officer.

CONSTRUCTION ACTIVITIES

33. The Licensee shall obtain prior written approval from the Executive Secretary prior to construction of significant facilities. Significant facilities shall include, but are not limited to waste, stormwater, and wastewater related handling, storage, and transfer projects.

34. Reserved.

35. Reserved.

36. A. The West Rail Spur and Unloading facility shall be operated as a transfer station for Surface Contaminated Objects (SCO) and large components, (waste storage is prohibited). These objects

may be set on the gravel pad for 24 hours to facilitate unloading and transferring to the Class A disposal cell.

B. The West Rail Spur and Unloading facility shall be operated as a transfer station for conveyances to be unloaded at the Containerized Waste Facility (unloading of waste packages is prohibited).

37. All ion exchange resins shall be disposed of as follows:

A. Solidified using solidification agents approved by the Executive Secretary and disposed of in the Containerized Waste Facility; or

B. Packaged in High-Integrity Containers (HIC) approved by the Executive Secretary, carbon-steel liners, unapproved HICs, or poly HICs meeting the void space criteria described in License Condition 16.M.i and disposed of in the Containerized Waste Facility; or

C. Packaged in High-Integrity Containers (HIC) approved by the Executive Secretary, carbon-steel liners, unapproved HICs, or poly HICs not meeting the void space criteria described in License Condition 16.M.i and disposed of as approved by the Division under License Condition 16.M.ii or 16.M.iii in the Containerized Waste Facility; or

D. Disposed of in accordance with the requirements of the LLRW and 11e.(2) Construction Quality Assurance/Quality Control Manual.

38. The Licensee shall construct the Class A disposal Cell identified in Table 40-A in accordance with approved engineering design drawings "Series 9821".

39 Waste placement and backfilling within the Containerized Waste Facility shall be conducted in accordance with the following:

A. The Containerized Waste Facility shall conform to the characteristics defined, analyzed, and described in the Engineering Justification Report "Class A Disposal Cell Containerized Waste Facility" (dated April 12, 2001); Engineering Justification Report, Addendum "Fifteen Percent Void Space Criteria" (Revision 1 dated October 10, 2001); and the AMEC letter to Envirocare of Utah, Inc. "Placement of Drums and B-25 Containers with 15 Percent Voids; Envirocare Class A - Containerized Waste Facility Near Clive, Utah" (dated October 2, 2001). Waste containers that have void space in excess of 15 percent shall be filled to the top of the container opening using Controlled Low Strength Material (CLSM) in accordance with the LLRW and 11e.(2) Construction QA/QC manual. The Licensee is exempt from the CLSM cold weather requirements and the 48 hour notification for void remediation only at the CWF Facility.

B. Waste container placement configurations and associated waste placement procedures, backfill materials and procedures, and backfill cover materials shall be those approved by the Executive Secretary following testing according to Work Element: Containerized Waste Facility-Waste

Placement Test Pad of the currently approved LLRW and 11e.(2) Construction Quality Assurance/Quality Control Manual.

C. Waste delivered in a shielded transportation cask shall remain in the cask until the waste is approved for disposal and the disposal location is prepared for the shipment. Waste received for disposal in the Containerized Waste Facility shall not be handled, stored or transferred within the contaminated portion of the Restricted Area without the approval of the Containerized Waste Facility Corporate Radiation Safety Officer.

D. The Containerized Waste Facility shall be operated as a contamination-free portion of the Restricted Area until containerized waste disposal operations are completed. Bulk waste may then be used to complete the filling of the cell.

E Interim storage is applicable only to the Containerized Waste Facility. Packages containing radioactive material shall not be stored for a period of longer than 30 days from the date of receipt. Retention of waste materials above ground pending disposal up to 3 working days does not constitute storage. All packages in storage shall be shielded so that the package or shielding shall not exceed 40 mR/hour at one meter from the surface.

40. The LARW and Class A Disposal Cells, shall be defined by the areas enclosed by the points of reference in Table 40-A. The Containerized Waste Facility within the Class A disposal cell shall be separated from the non-containerized area by a 6-foot chain link fence on the berm around the Containerized Waste Facility perimeter area.

TABLE 40-A

Disposal Cell Boundaries	Coordinates	
	Latitude	Longitude
LARW Disposal Cell		
Northeast Corner	40°41' 10.700524" N	113° 6' 36.372920" W
Southeast Corner	40°40' 52.230624" N	113° 6' 36.713462" W
Southwest Corner	40°40' 52.379041" N	113° 6' 51.184491" W
Northwest Corner	40°41' 10.851418" N	113° 6' 50.846182" W
Class A Disposal Cell		
NW corner	40°41' 28.004487" N	113°7' 23.847971" W
SW corner	40°41' 14.175042" N	113°7' 24.153414" W
SE corner	40°41' 13.717662" N	113°6' 54.827468" W
NE corner	40°41' 27.547403" N	113°6' 54.521700" W
Class A North Disposal Cell		
NW corner	40°41'46.28824"N	113°07'23.12804"W

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SW corner	40°41'36.32803"N	113°07'23.11315"W
SE corner	40°41'36.35311"N	113°06'52.98226"W
NE corner	40°41'46.31332"N	113°06'52.99589"W
Class A South Portion of the Class A South/11e.(2) Disposal Cell		
NW corner	40°41'12.531691"N	113°7'24.037415"W
SW corner	40°41'55.004159"N	113°7'24.684273"W
SE corner	40°41'54.607958"N	113°7'5.135960"W
NE corner	40°41'12.138756"N	113°7'4.494419"W

[confirm coordinates against my edits to the application and/or the final drawings]

41. Reserved.

42. ~~Reserved.~~The Licensee shall construct the Class A South portion of the Class A South/11e.(2) disposal cell identified in Table 40-A in accordance with approved engineering design drawings "Series 07021".

43. The Licensee shall construct the Class A North disposal cell identified in Table 40-A in accordance with approved engineering design drawings "Series 04080".

44. The Licensee shall fulfill all requirements and maintain compliance with all conditions in the LLRW and 11e.(2) CQA/QC Manual and engineering drawings currently approved by the Executive Secretary.

45. All engineering related soil tests conducted by the Licensee to demonstrate compliance with Condition 44 shall be performed by a laboratory certified and accredited by the AASHTO Materials Reference Laboratory (AMRL). Said certification / accreditation shall apply to clay liner, clay radon barrier, soil filter layers, sacrificial soils, and riprap materials, or other soil or man-made materials as directed by the Executive Secretary. Said certification shall include all engineering test methods required by License Condition 44, or as directed by the Executive Secretary. The Licensee shall secure said certification and accreditation on or before December 31, 2006.

46. Reserved

47. The Licensee shall not initiate disposal operations in newly excavated areas until the Division has inspected and the Executive Secretary has approved the cell/embankment liner.

CONSTRUCTION DRAWINGS.

48. A. The Licensee shall provide a comprehensive set of drawings for the entire Clive site. The drawings shall correctly: (1) locate all structures, utilities, fences, ponds, drainage features railroad tracks, roads, storage facilities, loading and off-loading facilities, disposal embankments, all environmental monitoring locations including instruments/devices, and any other

appurtenances related to the operation, maintenance and closure of the disposal facility; and (2) provide structural details including site elevation. A directory shall be included that identifies drawings by discrete number, title, date and revision. The drawings shall indicate as-built conditions as they existed no earlier than 30 days prior to the submittal. Drawings of finished construction shall be marked as "As-Built."

B. Drawings showing approved future designs, shall be marked as "Record Drawings." Record drawings or construction drawings shall be certified by a Utah registered professional engineer.

C. Within 30 days of the completion of any project that requires approval by the Executive Secretary, a set of "As-Built" drawings shall be submitted for review and inclusion into the comprehensive drawing set.

SITE OPERATING PROCEDURES

49. Shipments containing free liquid in excess of 1% shall be absorbed, evaporated, or the liquids removed only at facilities with approved secondary containment or the rail rollover facility.

50. A. On-site generated waste shall be managed according to its radiological, physical and chemical characteristics. Solid phase material shall be disposed in ~~either~~ the Class A Cell, Class A North Cell, Class A South/11e.(2) Cell, or Mixed Waste Cell~~, or the 11e.(2) Cell~~. Waste water from decontamination facilities will be put in the evaporation ponds or sprayed on disposal cells for purposes of dust and engineering controls.

B. Site equipment that has reached the end of its useful life, is not operational and does not meet the removable contamination limits of License Condition 27, Table 27-A, shall be disposed in the LLRW Class A Cell, ~~or~~ Class A North Cell, or Class A South portion of the Class A South/11e.(2) Cell within 90 days as debris in accordance with requirements of the LLRW and 11e.(2) Construction Quality Assurance/Quality Control Manual or stored on approved facilities for storage, transfer, and sampling of bulk waste.

C. Facility vehicles transferring or unloading waste shall not be left unattended.

51. The following shall be implemented for LLRW and 11e.(2) Waste segregation purposes:

A. LLRW and 11e.(2) waste shall not be managed simultaneously at the Rail rollover facility, Shredder Facility, Rotary Dump Facility, or Rail Digging facility;

B. Any vehicle or facility used to manage waste for disposal within the 11e.(2) disposal embankment, must be clearly labeled to designate 11e.(2) management. The labels shall be visible from both sides of a vehicle/facility designated for 11e.(2) waste management.

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C. Equipment, vehicles and facilities, which are used for management of LLRW will be cleaned of any material before being used for 11e.(2) waste management activities. Equipment, vehicles and facilities shall be cleaned of all waste material to a limit of 500 grams per square foot prior to being used for other waste types.

52. Waste shipments or transportation packages received shall meet the following contamination control requirements for removable contamination

*Less then 220 dpm/100cm^2 alpha
*Less then 2200 dpm/100cm^2 Beta-gamma

If a shipment or transportation package does not meet the above contamination requirements, the Licensee shall take actions to reduce the risk for spread of contamination.

53. A. Quarterly, the Licensee shall clean the facility roads, or more frequently when needed. The material collected from cleaning the roads shall be disposed within an approved disposal embankment for Class A waste.

B. On a biweekly basis (once every two weeks) between the first day of May and the last day of September, the Licensee shall spray a polymer solution on all exposed contaminated cell areas and areas of waste within the Class A Cell ~~and~~, Class A North Cell, and Class A South portion of the Class A South/11e.(2) Cell which have been disturbed in the previous two weeks. The Licensee will apply a polymer-based stabilizer in accordance with the manufacturer's instructions.

C. The Licensee shall minimize the dust created during the process of placing and moving waste, through the use of water. Water or other engineering controls shall be placed on roads and in areas which work is being performed.

D. The Licensee shall cease loading, hauling, and dumping of un-containerized waste whenever the 5-minute average wind velocities exceed 35 miles per hour. When both the 5-minute average and 5-minute maximum wind velocities are less than 35 mph as observed on the meteorological station, management of un-containerized waste may resume.

54. The Licensee shall fulfill and maintain compliance with all conditions and requirements in the Site Radiological Security Plan (Revision 2, March 28, 2006).

55. A. For the Class A and Class A North disposal cells, the Licensee shall ensure that the actual cumulative activity of chlorine-36 does not exceed 0.2828 picocuries per gram in accordance with the following formula:

$$\frac{\text{Total Activity of chlorine-36 Received (picocuries)}}{\text{Total Mass of Active Cell (grams) + Completed Cell (grams)}} \leq 0.2828 \text{ picocuries per gram}$$

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B. For the Class A and Class A North disposal cells, the Licensee shall ensure that the actual cumulative activity of berkelium-247 does not exceed 0.0001 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of berkelium-247 Received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} \le \textit{0.0001 picocuries per gram}$$

C. For the Mixed Waste disposal cell, the Licensee shall ensure that the actual cumulative activity of chlorine-36 does not exceed 8.75 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of chlorine-36 Received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} \le \textit{8.75 picocuries per gram}$$

D. For the Mixed Waste disposal cell, the Licensee shall ensure that the actual cumulative activity of berkelium-247 does not exceed 0.00314 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of berkelium-247 Received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} \le \textit{0.00314 picocuries per gram}$$

E. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of berkelium-247 does not exceed 0.00009 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of berkelium-247 received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} < \textit{0.00009 picocuries per gram}$$

F. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of calcium-41 does not exceed 1.322 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of calcium-41 received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} < \textit{1.322 picocuries per gram}$$

G. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of chlorine-36 does not exceed 0.268 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of chlorine-36 received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} < \textit{0.268 picocuries per gram}$$

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H. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of rhenium-187 does not exceed 5,556.0 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of rhenium-187 received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} < 5{,}556.0 \textit{ picocuries per gram}$$

I. For the Class A portion of the Class A South/11e.(2) disposal cell, the Licensee shall ensure that the actual cumulative activity of technecium-99 does not exceed 77,778.0 picocuries per gram in accordance with the following formula:

$$\frac{\textit{Total Activity of technecium-99 received (picocuries)}}{\textit{Total Mass of Active Cell (grams) + Completed Cell (grams)}} < 77{,}778.0 \textit{ picocuries per gram}$$

56. Containerized Class A waste shall be certified by the generator to meet the Licensee's Waste Acceptance Criteria in accordance with the Waste Characterization Plan described in License Condition 58.

57. The Licensee shall move rail shipments into the Restricted Area within seven (7) days of arrival or return to the carrier when management of the waste is not possible within the (7) day period, unless additional time is approved by the Executive Secretary of the Division of Radiation Control. The Licensee may perform the following activities on rail lines, not including the main line adjacent to Section 32:

    A. Visual Inspection

    B. Radiation level surveys

    C. Affix labels

58. The Licensee shall fulfill and maintain compliance with all conditions and requirements in the LLRW Waste Characterization Plan (February 27, 2006). [no change for Class A South]

59. Reserved.

60. All wind dispersed litter located outside of the disposal cell/embankments, shall be retrieved by the Licensee and returned to the Licensee's control within 24 hours.

61. Truck, railcar, and other equipment washdown (decontamination) facilities, including evaporation ponds, shall be controlled with fences or other approved barriers to prevent intrusion.

62. All burial embankments and waste storage areas, including immediately adjacent drainage structures, shall be controlled areas, surrounded by a six-foot chain link fence. Upon site closure, all permanent fences shall be six-feet high chain link topped with three strand barbed wire, tip tension wire, and twisted selvedge.

63. Radioactive and mixed wastes within Section 32 and all rail spurs controlled by the Licensee around the Licensee's Disposal Facility are possessed by the Licensee. Waste conveyed to the facility by truck is in transport as long as the commercial carrier driver and vehicle remain at the Clive disposal facility. The Licensee does not possess such waste for purposes of determining compliance with surety requirements and SNM quantity limits, except that the Licensee does, however, possess any waste containing SNM that is not disposed of on the day it is delivered to the facility.

64. "Disposal" is the locating of radioactive waste into a lift of the disposal embankment. Disposal does not include the storage of waste in containers on a lift when the container will ultimately be emptied, the staging of containerized waste in the disposal embankment; or waste as "In Cell Bulk Disposal".

MANIFEST/SHIPPING REQUIREMENTS

65. The Licensee shall comply with UAC R313-15-1006 and UAC R313-25-33(8), Requirements for Low-Level Waste Transfer for Disposal at Land Disposal Facilities and Manifests.

66. The Licensee shall not accept radioactive waste for storage and disposal unless the Licensee has received from the shipper a completed manifest that complies with UAC R313-15-1006 and UAC R313-25-33(8).

67. The Licensee shall maintain copies of complete manifests or equivalent documentation required under Conditions 65 and 66 until the Executive Secretary authorizes their disposition.

68. The Licensee shall immediately notify the Executive Secretary or the Division's on-site representative of any waste shipment where there may be a possible violation of applicable rules or license conditions.

69. The Licensee shall require anyone who transfers radioactive waste to the facility to comply with the requirements in UAC R313-15-1006.

70. The Licensee shall acknowledge receipt of the waste within one (1) week of waste receipt by returning a signed copy of the manifest or equivalent document to the shipper. The shipper to be notified is the Licensee who last possessed the waste and transferred the waste to the Licensee. The returned copy of the manifest or equivalent documentation shall indicate any discrepancies between materials listed on the manifest and materials received.

71. The Licensee shall notify the shipper (e.g., the generator, the collector, or processor) and the Division when any shipment or part of a shipment has not arrived within 60 days after receiving the advance manifest.

72. The Licensee shall maintain a record for each shipment of waste disposed of at the site. At a minimum, the record shall include:

    A. The date of disposal of the waste;

    B. The location of the waste in the disposal site;

    C. The condition of the waste packages received;

    D. Any discrepancy between the waste listed on the shipment manifest or shipping papers and the waste received in the shipment;

E. A description of any evidence of leaking or damaged packages or radiation or contamination in excess of applicable regulatory limits; and

F. A description of any repackaging of wastes in any shipment.

FINANCIAL ASSURANCE/CLOSURE

73. The Licensee shall at all times maintain a Surety that satisfies the requirements of UAC R313-25-31 in an amount adequate to fund the decommissioning and reclamation of Licensees' grounds, equipment and facilities by an independent contractor. The Licensee shall annually review the amount and basis of the surety and submit a written report of its findings by August 31 each year for Executive Secretary approval. At a minimum, this annual report shall meet the following requirements:

a. Summary of Changes – the annual report shall include a written summary of any change in the cost estimate previously approved by the Executive Secretary, including, but not limited to:

i. A description of any modification, addition, or deletion of any direct cost or post-closure monitoring and maintenance (PCMM) cost line item, including supporting justification, calculations and basis;

ii. Any change to the unique reference number (cost line item) assigned approved by the Executive Secretary for any direct or PCMM cost line item.

b. Indirect Costs shall be based on the sum of all direct costs in accordance with the following values:

Surety Reference No.	Description	Percentage
300	Working Conditions	5.5%
301	Mobilization / Demobilization	4.0%
302	Contingency	11.0%
303	Engineering and Redesign	2.25%
304	Overhead and Profit	19.0%
305	Management Fee and Legal Expenses	4.0%
306	DEQ Oversight	4.0%

c. RS Means Guide estimates of direct construction costs provided in the annual report shall be derived from or based on the most recent edition of the RS Means Guide for Construction.

d. Report Certification – the annual report shall be prepared under the direct supervision of and be certified by a professional with at least 5 years of construction cost estimation experience, who bears the seal of either a Professional Engineer or Professional Geologist currently licensed by the State of Utah.

e. Electronic Format – the Licensee shall provide the report in both paper and electronic formats, as directed by the Executive Secretary.

f. Within 60-days of Executive Secretary approval of said annual report, the Licensee shall submit written evidence that the surety has been adequately funded.

74. One (1) year prior to the anticipated closure of the site, the Licensee shall submit for review and approval by the Executive Secretary a site decontamination and decommissioning plan. As part of this plan, the Licensee shall demonstrate by measurements and/or modeling that concentrations of radioactive materials which may be released to the general environment, after site closure, will not result in an annual dose exceeding 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public.

75. In accordance with UAC R313-25-33(6), the Licensee shall submit a financial statement annually by March 31st of each year for the previous year.

76. The Licensee shall revise the currently approved surety to account for future reclamation, decontamination and decommissioning of new facilities, as follows:

A. Rotary Dump Facility – before handling, storage or processing of any radioactive waste at the Rotary Dump Facility, the Licensee shall submit a revised surety estimate for Executive Secretary review, and receive approval thereof. Said estimate shall include the Rotary Dump Facility and all related conveyances and appurtenances; and be submitted in conjunction with the As-Built Report required by Part I.I.5 of the GWQ Permit.

B. East Side Drainage Project – on or before February 28, 2007, the Licensee shall submit a revised surety estimate for the East Side Drainage Project for Executive Secretary review. Said estimate shall be submitted in conjunction with the As-Built Report required by Part I.I.7 of the GWQ Permit.

SPECIAL HANDLING

77. Except while waste packages are being handled in the active areas of the Containerized Waste Facility, external gamma radiation levels shall not exceed 40 mR/hr at one meter from the surface of any emplaced waste package or from shielding placed around disposed waste containers.

78. The Licensee shall observe the following controls on waste handling at the Containerized Waste Facility:

A. Before unloading any waste container whose external gamma radiation at the surface exceeds 10 R/hr, an ALARA review shall be performed and documented and a pre-job briefing shall be conducted.

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B. As part of the ALARA review, the Licensee shall determine and record (1) estimates of the radiation dose rates for the waste container, disposal unit working face, and any other potentially significant radiation sources; (2) expected durations of exposures to and distances from each radiation source; and (3) expected doses to each person involved in the actual disposal operation.

C. Before unloading any waste container whose external gamma radiation at the surface exceeds 200 R/hr, a practice run shall be conducted. The practice run shall involve shielding, container(s) filled with non-radioactive material, and handling equipment that are similar to those involved with the actual shipment. Similarity includes similar rigging and physical characteristics (e.g., weight, dimensions, and attachments). Those personnel who will participate in receiving, processing, handling, and disposing of the actual waste will participate in the practice run, using actual procedures. The Licensee shall notify the Division 24 hours in advance of conducting the practice runs.

D. On a case-by-case basis, the Executive Secretary may exempt the Licensee from conducting the required practice run, considering the results of earlier practice runs and actual experience handling waste containers with high radiation levels.

79. Reserved.

80. The Licensee shall notify in writing the Executive Secretary at the earliest possible date, but no later than 10 days before scheduled receipt of each shipment with contact radiation levels in excess of 200 R/hr. The notification shall include the anticipated dates of receipt and plan for disposal in the Containerized Waste Facility.

81. The Corporate Radiation Safety Officer or other qualified person he designates shall be present for and shall observe the receipt, processing, handling, and disposal of each waste package with contact radiation levels in excess of 200 R/hr.

82. The Licensee shall dispose of only closed containers in the Containerized Waste Facility. The Licensee shall not dispose of any breached waste container in the Containerized Waste Facility without first repairing the breached container or overpacking it in an undamaged container. The Licensee is authorized to open packages at its facility only to:

A. Repair or repackage breached containers.

B. Inspect for compliance with conditions of this license.

C. Confirm package contents and fill voids in packages/containers that have greater than 15% void space.

D. Accomplish other purposes as approved by the Executive Secretary.

83. The Licensee shall handle and emplace LLRW packages in the Containerized Waste Facility such that packaging integrity is maintained during handling, emplacement, and subsequent backfilling. Waste packages deposited in the Containerized Waste Facility shall be protected from any adverse effects of operations which may damage them.

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SEALED SOURCES AND/OR DEVICES

84. A. i. Sealed sources shall be tested for leakage and/or contamination at intervals not to exceed the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by equivalent regulations of an Agreement State.

ii. In the absence of a certificate from a transferor indicating that a leak test has been made within the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by equivalent regulations of an Agreement State prior to the transfer, a sealed source received from another person shall not be put into use until tested.

iii. Sealed sources need not be tested if they are in storage and are not being used. However, when they are removed from storage for use or transferred to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 3 years without being tested for leakage and/or contamination.

iv. The leak test shall be capable of detecting the presence of 185 becquerels (0.005 μCi) of radioactive material on the test sample. If the test reveals the presence of 185 becquerels (0.005 μCi) or more of removable contamination, a report shall be filed with the Executive Secretary in accordance with R313-15-1208, and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Utah Radiation Control Rules. The report shall be filed within 5 days of the date the leak test result is known with the Division of Radiation Control, P.O. Box 144850, Salt Lake City, Utah 84114-4850. The report shall specify the source involved, the test results, and corrective action taken.

v. (a) The Licensee is authorized to collect leak test samples in accordance with Condition 85.D of this license, the Licensee's renewal application (dated March 1, 2001), and the Licensee's Memo (dated March 11, 2002).

(b) The analysis of leak test samples shall only be performed by individuals who meet the qualifications of a Health Physics Technician I or II, as defined by this license. The analysis of leak test samples shall be performed in accordance with the Licensee's renewal application (dated March 1, 2001), and the Licensee's Memo (dated arch 11, 2002). Alternatively, tests for leakage and/or contamination, including sample collection and analysis, may be performed by other persons specifically licensed by the Executive Secretary, the U.S. Nuclear Regulatory Commission, or an Agreement State to perform such services.

vi. Records of leak test results shall be kept in units of Becquerels or microcuries and shall be maintained for inspection by representatives of the Executive Secretary.

B. Sealed sources or source rods, containing licensed material shall not be opened or sources removed from source holders, devices, or detached from source rods by the Licensee, except as specifically licensed by the Executive Secretary, an Agreement State, or the U.S. Nuclear Regulatory Commission to perform such services.

C. The Licensee shall conduct a physical inventory every six months to account for all sealed sources and/or devices received and possessed under this license. The records of inventories shall be maintained for three years from the date of the inventory for inspection by the Division, and shall include the quantities and kinds of radioactive material, manufacturer's name and model numbers, location of the sources and/or devices, and the date of the inventory.

PORTABLE GAUGING DEVICES:

85. A. Each portable gauging device shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage or when not under the direct surveillance of an authorized user.

B. Each portable gauging device shall be kept under the constant surveillance (direct surveillance) of individuals trained in accordance with Condition 32.B of this license, when the device is not in secured storage, as required by Condition C of this license condition.

C. When a portable gauging device is not in transit or under constant surveillance (direct surveillance) as required by Condition B of this license condition:

i The Licensee shall secure the device in accordance with R313-15-801(1) and (2).

ii. The Licensee shall not:

(a) leave the device unattended or unsecured;

(b) chain the device to a post, chain the device in the back of an open bed truck; or secure the device in any similar manner.

D. Any cleaning and/or maintenance of portable gauging device(s) or the collection of leak test samples, performed by the Licensee, shall only be performed with the radioactive source/source rod in the safe shielded position.

E. All cleaning and/or maintenance of portable gauging device(s), performed by the Licensee shall only be performed in accordance with Condition D of this license condition, and the manufacturer's instructions and recommendations.

F. Any cleaning, maintenance, or repair of portable gauging device(s) that requires removal of the sources/source rod shall be performed only by the manufacturer or by other persons specifically licensed by the Executive Secretary, an Agreement State, or the U.S. Nuclear Regulatory Commission to perform such services.

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DOSIMETER CALIBRATOR(S)/IRRADIATOR(S):

86. A. The LDM-2000 reader shall only be connected to a maximum of two IRD-2000 irradiator modules.

B. Devices(s) shall only be:
   i. installed in areas where device(s) can be secured and limited to individuals authorized to use device(s) pursuant to Condition A of this license condition and Condition 32.C of this license.
   ii. used by individuals who meet the qualifications of a Health Physics Technician I or II, as defined by this license.
   iii. used in accordance with the manufacturer's operating manual and certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by equivalent regulations of an Agreement State. The Licensee shall follow the manufacturer's recommendations for preventative maintenance and operational testing.

C. Maintenance and servicing of device(s) shall only be performed by the manufacturer or persons specifically licensed by the Executive Secretary, the U.S. Nuclear Regulatory Commission, or an Agreement State to perform such services.

D. The Licensee shall not perform calibration(s) for non-MGP Instrument dosimeters.

INCREASED CONTROL CONDITIONS

87. The Licensee shall comply with the requirements described in the Division's letter dated November 14, 2005 and attached document to the Division's letter entitled "Increased Controls for Licensees that Possess Sources Containing Radioactive Material Quantities of Concern." The Licensee shall complete implementation of said requirements before May 15, 2006 or the first day that radionuclides in quantities of concern are possessed at or above the limits specified in Table 1, provided as an attachment to the Division's letter dated November 14, 2005, whichever is later. Within 25 days after the implementation of the requirements of this License Condition, the Licensee shall notify the Executive Secretary in writing that it has completed the requirements of this License Condition.

CLOSEOUT CONDITIONS

88. Except as specifically provided otherwise in this license, the Licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Utah Radiation Control Rules, Utah Administrative Code R313 shall govern unless the statements, representations, and procedures in the Licensee's application and correspondence are more restrictive than the rules.
   A. License renewal application, revision 6, dated 16 March 1998.
   B. Letter dated October 23, 1998.
   C. Letter dated January 15, 1999.

D. Letters dated February 16, 1999, March 10, 1999, and March 23, 1999.
E. Letter dated April 19, 1999, and the U.S. Nuclear Regulatory Commission's Order dated May 7, 1999, and other administrative changes.
F. Letter dated July 15, 1999.
G. Letter dated September 1, 1999.
H. Letters dated July 15, 1999, June 28, 1999, August 27, 1999, October 19, 1998 and August 19, 1999.
I. Letters dated October 15, 1999, and November 4, 1999.
J. Letters dated June 3, 1999, November 5, 1999, February 16, 2000, and March 21, 2000.
K. Letters dated April 28, 2000, May 5, 2000, May 10, 2000, and June 6, 2000.
L. The following documents refer to the Class A disposal cell.
    (1) Letters dated September 24, 1999, March 6, 2000, April 14, 2000, July 21, 2000, July 26, 2000, August 8, 2000 and August 15, 2000.
    (2) Revised Run-On/Run Off Berm Calculations dated May 26, 2000.
    (3) Revised Engineering and Modeling Analysis dated June 19, 2000.
M. Request for License Amendment: Containerized Class A LLRW Disposal, dated Apr.12, 2001.
N. Engineering Justification Report, Addendum "Fifteen Percent Void Space Criteria" (Revision 1 dated October 10, 2001).
O. AMEC letter to Envirocare of Utah, Inc. "Placement of Drums and B-25 Containers with 15 Percent Voids; Envirocare Class A - Containerized Waste Facility Near Clive, Utah" (dated October 2, 2001).
P. AMEC letter to Envirocare of Utah, Inc. "Response to Interrogatory Number 2: Placement of HICs in Caissons; Envirocare Class A Disposal Facility Near Clive, Utah"(dated October 1, 2001).
Q. The following documents refer to revisions made in Amendment 14.
    (1) Letters dated January 22, 2002, June 28, 2002.
    (2) Appendix I, *Organization* (dated July 31,2002, Revision 14d). Letter dated July 31, 2002.
    (3) Site Radiological Security Plan (dated June 27, 2002, Revision 0). Letter dated June 27, 2002.
    (4) In reference to Thermal Desorption treatment, letter dated May 13, 2002.
R. Letter CD02-0475, dated November 19, 2002, (Change of Address)
S. Letter CD03-0045, dated January 24, 2003 refers to revisions made in Amendment 16.
T. The following documents refer to revisions made in Amendment 17:
    (1) Letter CD03-0259, dated June 6, 2003 refers to increase in open cell area.
    (2) Letter CD03-0249, dated May 29, 2003 refers to maintenance of a contaminated shipping cask used as a training aid device.
    (3) Letter CD03-0145, dated March 31, 2003 refers to revisions to Appendix I, *Organization*.
    (4) Letter CD03-0139, dated March 27, 2003 refers to personnel title changes.
    (5) Email: Tye Rogers to Dane Finerfrock, 4/14/03 11:12AM, Subject: Amendment 16.
    (6) Letter CD02-0447, dated October 31, 2002 refers to revisions to Appendix R, *Environmental Monitoring and Surveillance Plan*.
U. The following documents refer to revisions made in Amendment 18:
    (1) Letter CD02-0374, dated September 16, 2002 refers to initial amendment request.
    (2) Email: Tye Rogers to John Hultquist, August 5, 2003 correspondence regarding several

issues regarding proposed changes to Waste Characterization Plan.

(3) Letter from Radiation Control to Tye Rogers dated August 26, 2003 refers to proposed changes to the Waste Characterization Plan.

(4) Letter CD03-0371 dated August 27, 2003 response to DRC letter dated August 26, 2003 and revised Waste Characterization Plan dated August 27, 2003.

A. The following documents refer to revisions made in Amendment 19:

a. *Envirocare of Utah Mixed Waste Cell Infiltration and Transport Modeling,* Whetstone Associates, November 22, 2000.

b. Letter CD01-0377, dated August 23, 2001, addendum to Class A Cell modeling (Whetstone Associates, Inc August 21, 2001 Technical Memorandum).

c. Letter DRC, dated March 5, 2003 acceptance of Mixed Waste disposal cell cover system design.

d. Letter CD03-0123, dated March 24, 2003, initial request to allow full Class A LLRW at the Mixed Waste Facility.

e. Letter CD03-0428, dated October 20, 2003, response to DRC's request for additional information regarding Class A waste at the Mixed Waste Cell.

f. Letter CD03-0430, dated October 22, 2003, justification for allowable concentrations of Californium isotopes at the Mixed Waste Cell.

g. Letter CD03-0257, dated June 5, 2003, initial request to allow placement of mobile wastes in the sideslopes of the LARW Cell.

h. Letter CD03-0295, dated July 7, 2003, response to DRC concern regarding the transition zones between the non-mobile and mobile cover designs.

i. Letter DRC, dated October 9, 2003, authorization for Licensee to dispose of mobile wastes in accordance with the Groundwater Discharge Permit modification prior to amending the License.

j. Letter DRC, dated April 23, 2004, approval of open cell area expansion request.

W. The following documents refer to revisions made in Amendment 20:

(1) Letter CD03-0303, dated February 14, 2003: Waste Management Plan (WMP).

(2) Email: Tye Rogers to John Hultquist, dated August 6, 2003 regarding several issues proposed to the Waste Management Plan.

(3) Letter dated November 12, 2003, regarding four issues pertaining to the Waste Management Plan.

(4) Letter CD03-0495, dated December 1, 2003, Response to November 12, letter regarding issues pertaining to the Waste Management Plan.

(5) Letter dated December 9, 2003, Waste Management Plan issues.

(6) Email from John Hultquist to Tye Rogers, regarding meeting held January 13, 2004.

(7) Letter CD04-0033, dated January 22, 2004, Waste Management Plan issues.

(8) Letter dated February 6, 2004, responding to Envirocare's letter dated January 22, 2004.

(9) Letter CD03-0303, dated July 9, 2003, Organization rev. 15a.

(10) Letter CD04-0082, dated February 19, 2004, rev 16, and Letter CD04-0195, dated April 23, 2004, rev_16; Appendix I, *Organization.*

(11) Letter CD03-0405, dated September 23, 2003, request to amend license conditions 37,

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76, and 78.

(12) Meeting notes from two meetings held with Envirocare dated November 19, 2003 and June 17, 2004.

(13) Email from Boyd Imai to Mark Ledoux dated June 22, 2004.

(14) Letter CD04-0338, August 25, 2004, amendment request regarding license conditions 76 and 78.

X. The following documents refer to revisions made in Amendment 21:

Letter and renewal application CD04-0549, dated December 23, 2004, request to change license condition 1.

Letter CD04-0499, dated November 8, 2004, Radiological Security Plan revision, license condition 54.

Letter CD04-0508, dated November 17, 2004, Radiological Security Plan revision, license condition 54.

Letter CD05-0071, dated February 17, 2005, request to amend license conditions 39(C) and 39(E).

Letter CD05-0073, dated February 16, 2005, request for interim storage/corrective action plan.

(1) Email from John Hultquist to Mark Ledoux, dated February 11, 2005, regarding interim storage/corrective action plan.

(2) Email from Mark Ledoux to John Hultquist, dated January 27, 2004, regarding interim storage/corrective action plan.

Email from Dane Finerfrock to Mark Ledoux, dated November 2, 2004, regarding interim storage/corrective action plan.

Letter CD05-0024, dated January 20, 2004 self identification concrete overpack QA/QC deficiencies.

Letter CD05-0095, dated February 28, 2005, changes to the license application regarding electronic dosimetry.

Email from Joe Heckman to John Hultquist dated 12-17-2004, regarding revised documents to eliminate 50 mR/hr investigation.

Letter CD05-0064, dated February 10, 2005, request to amend license condition 11.

Letter from Dane Finerfrock to Tye Rogers, dated February 22, 2005, increase open cell approval.

(3) Letter and renewal application CD01-0089, dated March 1, 2001, application for license renewal (UT 2300320).

(4) Email: Brian Clayman to Julie Felice, dated January 7, 2002, request for the addition of another gauge storage location and the designation of a different Radiation Safety Officer for license (UT 2300320).

(5) Memo: Brian Clayman to Clark Clements, dated March 11, 2002, supplementary information for renewal of license (UT 2300320).

(6) Email: Brian Clayman to Clark Clements, CD02-0132 dated April 3, 2002, supplementary information for renewal of license (UT 2300320).

(7) Letter CD02-0304, dated August 2, 2002, request to add sealed sources for whole body

counter to license (UT 2300320).

(8) Letter CD02-0471, dated November 15, 2002, request for approval to move nuclear gauge storage location (UT2300320).

(9) Letter CD03-0055, dated February 3, 2003, supplementary infonnation regarding gauge storage in Engineering Lab Trailer (UT2300320).

(10) Letter CD03-0091, dated June 5, 2003, request to purchase a model MC-S-24 strata nuclear gauge (UT 2300320).

(11) Letter CD03-0320, dated July 22, 2003, request to change Site Radiation Safety Officer for UT 2300320.

(12) Letter CD04-0057, dated February 5, 2004, request to add a sealed source (contained in a calibrator) for the calibration of electronic dosimeters (UT2300320).

(13) Letter CD04-0216, dated May 3, 2004, request to change Corporate Radiation Safety Officer and add radioactive materials to UT 2300249.

Y. The following documents refer to revisions made in Amendment 22:

(1) Letter CD04-0481, dated October 27, 2004, Amendment and Modification Request – Class A North Embankment.
Letter CD04-0548, dated December 23, 2004, Revised Class A North Disposal Embankment License Amendment Request.
URS Review of Revised Class A North Embankment Amendment Request, dated December 29, 2004.
Letter CD05-0024, dated January 17, 2005, Class A North Disposal Embankment License Amendment Request Revision 2.
Letter CD05-0265, dated May 20, 2005, Revision of Appendix R, Environmental Monitoring and Surveillance Plan.
Letter CD05-0266, dated May 25, 2005, Surety Calculations for the Class A North Disposal Cell.
Memo: Treesa Parker to John Hultquist, dated May 25, 2005, Proposed revisions to RML for Amendment 22
Email: Treesa Parker to Christine Hiaring, dated June 1, 2005, License Amendment 22 Minor Changes for Consistency.

Z. The following documents refer to revisions made in Amendment 22A:

(1) Division letter dated November 14, 2005.

AA. The following documents refer to revisions made in Amendment 22B:

(1) Letter CD05-0333, dated June 30, 2005, RML no. UT 2300249 Request for approval of revisions to Appendix I, Organization, and amendment of License Condition 32 A.

(2) Memorandum dated August 2, 2005, Subject; Review of Appendix I

(3) Letter CD05-0398, dated August 16, 2005, Request for approval of revisions to Appendix I, Organization and amendment of license condition 31.A,B,C, and 32A.

(4) Letter CD05-0507, October 26, 2005, Additional infonnation regarding proposed revisions to Appendix I, Organization and amendment of license condition 31.A,B,C, and 32A.

(5) Letter CD05-0453, dated September 19, 2005 Request for amendment of License

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Condition 9.10 RML UT2300478; Organization.
(6) Letter dated November 22, 2005, Request for information regarding request to revise Appendix I of the 11e(2) License Application and Amendment of L.C. 9.10.
(7) Letter dated October 11, 2005, Re: Request for Information: Revision to Appendix I and amendment 31A. B. C. and 32A. dated August 16, 2005 (CD05-0398).
(8) Memorandum, dated October 3, 2005, Subject; Appendix I, revisions to RML UT2300249 conditions 31 A, B, C, and 32 A.
(9) Letter CD05-0411, dated August 23, 2005, Payment of administrative cost for Appendix I amendment request dated August 16, 2005.
(10) Letter CD05-0472, dated September 30, 2005, License condition 39.E amendment
(11) Email dated August 10, 2005, Subject: Draft amendment for LC 39.E and attached august 10, 2005, License Condition 39 E. amendment "draft".
(12) Email dated September 16, 2005, Subject: RE: FW: Draft amendment for LC 39.E.
(13) Letter CD05-0285, dated June 1, 2005, Envirocare containerized waste facility concrete overpacks corrective action plan.
(14) Letter dated June 2, 2005, filling waste package voids at the containerized waste facility using controlled low strength material (CLSM)
(15) Letter CD05-0326, dated June 27, 2005, Re: Letter to Mr. Dane Finerfrock, dated April 13, 2005, CD05-0181.
(16) Letter CD05-0366, dated July 26, 2005, Re: Letter to Dane Finerfrock, dated June 27, 2005, CD05-0326.
(17) Letter CD06-0011, dated January 12, 2006, Request to amend License Condition No. 2, Address.
(18) Letter CD06-0043, dated February 3, 2006, Request to amend License Condition No. 1, Company Name.
(19) Letter dated February 6, 2006, evidence of name change with the Utah Department of Commerce.
(20) Email dated October 6, 2005, Subject: License condition 39.E.
(21) Memorandum from Woodrow W. Campbell through Loren Morton and Dane Finerfrock to Envirocare File, dated January 13, 2006 regarding AMRL Soils Lab Certification for the Envirocare Soils Lab.
(22) Email dated February 15, 2006 from Loren Morton to Dan Shrum, Subject: License Amendment for Condition 73.
(23) Email dated December 23, 2005 from Loren Morton to Dane Finerfrock, Subject: Proposed Changes to License Condition 73 - Annual Surety Evaluation Report.
(24) Letter dated February 22, 2006, Subject: Revise void remediation procedure OPC-6.0.

BB. The following documents refer to revisions made in Amendment 22C:
(1) Letter CD05-0435, dated September 8, 2005, Request to amend RML UT 2300249: Condition 58, Waste Characterization Plan.
(2) Letter CD05-0557, dated December 5, 2005, RML UT 2300249; Condition 58 Waste Characterization Plan –Revised License Amendment Request.
(3) Letter CD06-0072, dated February 27, 2006, Radioactive Material License UT 2300249:

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Condition 58 Waste Characterization Plan – Revised License Amendment Request.

(4) Email dated February 24, 2006 from Boyd Imai to Sean McCandless Re: Waste Characterization Plan.

(5) Letter CD06-0059, dated February 15, 2006, Radioactive Material License UT 2300249 – Self Identified Noncompliance.

(6) Letter dated March 17, 2006, from the DRC regarding the February 15. 2006 letter of noncompliance.

(7) Letter CD06-0055) dated February 9, 2006, Request to Amend RML UT 2300249 to show addition of Liquid Radioactive Sources to License Condition 6.E.

(8) Letter (CD06-0092) dated March 8, 2006, RML UT 2300249; Request for administrative amendment. Conditions 21A and B and Condition 81.

CC. The following documents refer to revisions made in Amendment 22E:

(1) CD06-0389, "Request to amend Radioactive Materials License No. UT 23000249 and 11e.(2) Radioactive Materials License No. UT 23000478 – Request for approval revised Appendix I, *Organization*," October 6, 2006.

(2) Shredder Facility

a. CD05-0448, "Radioactive Materials License No. UT 2300249 (RML) and Groundwater Quality Discharge Permit UGW450005 (GWQDP). Request to Construct Shredding Facility," September 15, 2005.

b. CD05-0532, "Request to Construct Shredding Facility – Revised Design and Interrogatory Response," November 14, 2005.

c. CD05-0556, "Request to Construct Shredding Facility – Additional Information," December 2, 2005.

d. CD06-0036, "Request to Construct Shredding Facility – Response to Round 2 Interrogatories", February 1, 2006.

e. CD06-0098, "Request to Construct Shredding Facility – Response to Round 3 Interrogatory," March 10, 2006.

f. ASTM F-1417, "ASTM Method F 1417-92," March 29, 2006.

g. CD06-0188, "Request to Construct Shredder Facility – Response to Round 4 Interrogatory," May 9, 2006.

h. CD06-0211, "Request to Construct Shredder Facility – Response to Round 4B Interrogatory," May 25, 2006.

i. CD06-0234, "Requests to Construct Shredder and Rotary Dump Facilities – Revised Wastewater Management Process," June 19, 2006.

j. "EnergySolutions LLC Low-Level Radioactive Waste Closure & Post-Closure Trust License UT 2300249 Trust #16673400," June 29, 2006.

k. CD-0346, "Interim Wastewater Management Plan for the Shredder Facility – Response to August 18, 2006 Request for Additional Information," August 31, 2006.

l. CD06-0388, "Radioactive Material License UT 2300429 and Groundwater Quality Discharge Permit (GWDP) No UGW450005 Shredder Facility – Request to Operate," October 5, 2006.

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m. CD06-0407, "Comment on Proposed Amendment of Radioactive Material License UT 2300249 and Groundwater Quality Discharge Permit (GWDP) No UGW450005, October 18, 2006.
n. CD06-0414, "Radioactive Material License UT 2300249 and Groundwater Quality Discharge Permit No UGW450005 Shredder Facility – Submittal of Revised Drawings" October 25, 2006.
o. CD06-0425, "Groundwater Quality Discharge Permit No UGW450005 (GWQDP) Submittal of Revised Appendix J and K," November 7, 2006.

(3) Rotary Dump Facility
a. CD05-0564, "Request to Construct – Rotary Dump," December 12, 2005.
b. CD05-0570, "Request to Construct Rotary Dump 00 Submittal of Dose Assessment," December 16, 2005.
c. CD06-0086, "Request to Construct Rotary Dump Facility – Response to Round 1 Interrogatory", March 2, 2006.
d. ASTM F-1417, "ASTM Method F 1417-92," March 29, 2006.
e. CD06-0147, "Request to Construct Rotary Dump Facility – Revised Drawings," April 10, 2006.
f. CD06-0210, "Request to Construct Rotary Dump Facility – Response to Round 2 Interrogatory," May 25, 2006.
g. CD06-0211, "Request to Construct Rotary Dump Facility – Response to Round 4B Interrogatory", May 25, 2006.
h. CD06-0226, "Request to Construct Rotary Dump Facility – Response to Round 2B Interrogatories," June 8, 2006.
i. CD06-0234, "Requests to Construct Shredder and Rotary Dump Facilities – Revised Wastewater Management Process," June 19, 2006.

(4) Intermodal Container Wash Building
a. CD05-0291a, "Radioactive Materials License No. UT 2300249 (RML) and Groundwater Quality Discharge Permit UGW450005 (GWQDP). Request to Construct Intermodal Container Wash Building and Access Control Building," June 9, 2005.
b. CD05-0388, "Request to Construct Intermodal Container Wash Building – Revised Design and Supplemental Information," August 8, 2005.
c. CD05-0432, "Request to Construct Intermodal Container Wash Building – Revised Design and Interrogatory Response," September 1, 2005.
d. CD06-0110, "MARSSIM Release for New Intermodal Container Wash Facility," March 22, 2006.
e. CD06-0206, "Radioactive Material License UT 2300249 and Groundwater Quality Discharge Permit No UGW450005 Intermodal Container Wash Building – Request to Operate," May 22, 2006.
f. "EnergySolutions LLC Low-Level Radioactive Waste Closure & Post-Closure Trust License UT 2300249 Trust #16673400," June 29, 2006.
g. CD06-0259, "Groundwater Quality Discharge Permit (GWDP) No UGW450005 Intermodal Container Wash Building – Revised Appendix J and K," July 10, 2006.

(5) Decontamination Access Control Building
   a. CD05-0291b, "Radioactive Materials License No. UT 2300249 (RML) and Groundwater Quality Discharge Permit UGW450005 (GWQDP). Request to Construct Intermodal Container Wash Building and Access Control Building," June 9, 2005.
   b. CD05-0367, "MARSSIM Release of New Boxwash Access Control", July 26, 2005.
   c. CD06-0139, "Radioactive Material License UT 2300249 and Groundwater Discharge Quality Permit (GWDP) No UGW450005 Decontamination Access Control Building – Request to Operate", April 6, 2006.
   d. "EnergySolutions LLC Low-Level Radioactive Waste Closure & Post-Closure Trust License UT 2300249 Trust #16673400," June 29, 2006.
   e. CD06-0245, "Groundwater Discharge Quality Permit (GWDP) No UGW450005 Decontamination Access Control Building – Revised Appendix J and K and Drawing No 05015-S100," June 30, 2006.

(6) East Side Drainage Project
   a. CD06-0175, "Request to Construct East Side Drainage and Gray Water System Modifications," May 1, 2005.
   b. CD06-0244, "East Side Drainage and Gray Water System Modifications – Response to DRC Review," June 30, 2006.
   c. CD06-0293, "Groundwater Discharge Quality Permit No UGW450005 East Side Drainage and Gray Water System – Revised Design and BAT Plans," August 4, 2006.
   d. CD06-0327, "Groundwater Discharge Quality Permit No UGW450005 East Side Drainage and Gray Water System – Revised Appendix J BAT Performance Monitoring Plan and Appendix K BAT Contingency Plan," August 23, 2006.
   e. CD06-0328, "Groundwater Discharge Quality Permit No UGW450005 East Side Drainage and Gray Water System – Revised Drawings," August 24, 2006.

DD. The following documents refer to revisions made in Amendment 22F:
   a. CD08-0008, "Request to Construct Class A South Disposal Cell," January 4, 2008.

UTAH RADIATION CONTROL BOARD

Dane L. Finerfrock, Executive Secretary   Date

ATTACHMENT 1 b

Permit No. UGW450005

STATE OF UTAH

DIVISION OF WATER QUALITY

UTAH WATER QUALITY BOARD

P.O. BOX 16690

SALT LAKE CITY, UTAH 84116-0690

Ground Water Quality Discharge Permit

In compliance with the provisions of the
Utah Water Quality Act, Title 19, Chapter 5, Utah Code Annotated 1953, as amended,

EnergySolutions, LLC
423 West 300 South, Suite 200
Salt Lake City, Utah 84101

hereafter referred to as the "Permittee", is granted a Ground Water Quality Discharge Permit for a Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility in accordance with conditions set forth herein. This facility currently consists of four separate operable units: a Low-Activity Radioactive Waste (LARW) cell, an 11e.(2) Cell, a Mixed Waste cell, and a Class A cell, which are located at approximately latitude 40° 41' 18" North, longitude 113° 06' 54" West.

This modified Ground Water Quality Discharge Permit amends and supersedes all other Ground Water Discharge permits for this facility issued previously.

This modified permit shall become effective on September 6, 2007.

This permit and the authorization to operate shall expire at midnight, **March 1, 2005.**

Co-Executive Secretary
Water Quality Board

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I. SPECIFIC CONDITIONS

A. Ground Water Classification

Based on ground water quality data submitted by the permit applicant, ground water in the vicinity of the site is defined as Class IV, saline ground water.

B. Background Ground Water Quality

1. Background Quality from Existing Monitoring Wells

   Based on ground water quality samples collected through May 1998, the upper boundary of background ground water quality is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well as determined by the Executive Secretary.

   Based on prior waste disposal practices, the background ground water quality level for PCBs shall be below the Practical Quantitation Limit (PQL) identified in the currently approved Appendix I.

2. Determination and Revision of Background Ground Water Quality

   After submittal of additional ground water quality data, background ground water quality values may be revised by the Executive Secretary.

C. Ground Water Protection Levels

1. Ground Water Protection Levels, LARW Cell, Class A Cell, ~~and~~ Class A North Cell, and Class A South portion of the Class A South/11e.(2) Cell

   Based on the types of wastes to be received for disposal in the low-activity radioactive waste (LARW) facility, which include naturally occurring radioactive materials (NORM) and Class A low-level radioactive waste (LLRW), an evaluation of indicator isotopes and their mobility, and the Ground Water Quality Standards (GWQS); ground water protection levels (GWPL) are defined as either the GWQS or the Background Concentration, whichever is greater, as listed in Tables 1A and 1B of this Permit. In all cases, ground water quality in any compliance monitoring well at the LARW cell, Class A cell, ~~and~~ Class A North cell, and Class A South portion of the Class A South/11e.(2) cell shall comply with the GWPLs found in Table 1A, unless other GWPLs have been cited on a well and contaminant-specific basis in Table 1B, below.

2. Ground Water Protection Levels, 11e.(2) portion of the Class A South/11e.(2) Cell

   Based on the types of waste to be disposed of in the 11e.(2) portion of the Class A South/11e.(2) cell~~s~~, an evaluation of the Ground Water Quality Standards; GWPLs for inorganic, dissolved metals, and organic parameters are defined as either the GWQS or the Background Concentration, whichever is greater, as listed in Tables 1C and 1D of this Permit. In all cases, ground water quality in any compliance monitoring well at the 11e.(2) portion of the Class A South/11e.(2) Disposal cell~~s~~ shall comply with the GWPLs found in Table 1C, unless other

GWPLs have been cited on a well and contaminant-specific basis in Table 1D, below.

3. Revision of Ground Water Protection Levels

After submittal of additional ground water quality data, the ground water protection levels may be revised by the Executive Secretary.

Table 1A: Ground Water Protection Levels (GWPL) – Universal to All LARW, Class A, ~~and~~ Class A North, and Class A South Wells

Parameter	GWPL [1]	Parameter	GWPL [1]
Field and Inorganic Parameters (mg/l)		*Radiologic Parameters – Alpha Emitters [9] (pCi/l)*	
Cyanide	0.2	Adjusted Gross Alpha [10]	15
Fluoride	4.0	Neptunium-237 [11]	7
Total Nitrate/Nitrite (as N)	10.0	Strontium-90	42
pH (units)	6.5 – 8.5	Thorium-230	83
Dissolved Metals (mg/l)		Thorium-232	92
Arsenic	NA [2]	Uranium-233	26
Barium	2.0	Uranium-234	26
Beryllium [3]	0.004	Uranium-235	27
Cadmium	0.005	Uranium-236	27
Chromium	0.1	Uranium-238	26
Copper	1.3	*Radiologic Parameters – Beta/Gamma Emitters [12] (pCi/l)*	
Lead	0.015	Carbon-14	3,200
Mercury	0.002	Iodine-129 [13]	21
Molybdenum	NA [2]	Technetium-99	3,790
Nickel [3]	0.10	Tritium	60,900
Selenium	0.05		
Silver	0.1	*Combined Radiologic Parameters (pCi/l)*	
Uranium – total [4]	0.03	Radium-226 + Radium-228 [14]	5
Zinc	5.0		
Organic Parameters (mg/l)			
Acetone [5]	0.7	1,2-Dichloroethane	0.005
2-Butanone [5]	4.2	Methylene Chloride [7]	0.005
Carbon Disulfide [5]	0.7	1,1,2-Trichloroethane [8]	0.005
Chloroform [6]	0.08	Vinyl Chloride	0.002

1. All ground water protection levels (GWPLs) derived from Ground Water Quality Standards (GWQS, see UAC R317-6-2), except as noted.
2. Due to naturally elevated concentrations of arsenic and molybdenum in the Class IV saline aquifer at Clive, Utah, these constituents are poor indicators of cell leakage and therefore will not be used as compliance parameters with ground water protection levels. However, the Permittee will continue to sample, analyze, and report arsenic and molybdenum data in all compliance monitoring wells at Permit and License renewal as a best management practice.
3. Beryllium and Nickel GWQS derived from EPA drinking water Maximum Contaminant Levels (MCL), as published in the July 17, 1992 Federal Register, Vol. 57, No. 138, pp. 31776 – 31849, Table 1.

4. Total uranium GWQS of 0.03 mg/l from EPA final MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).
5. GWQS for acetone, 2-Butanone, and carbon disulfide determined by DWQ staff from reference doses available in the technical literature, see August 8, 1994 DWQ Staff Report: Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels, Envirocare of Utah Inc., Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility, near Clive, Tooele County, Utah, p. 3.
6. GWQS for chloroform derived from a 1998 EPA final drinking water MCL for total trihalomethane compounds in "Drinking Water Standards and Health Advisories", EPA 822-B-00-001, Summer 2000.
7. GWQS for methylene chloride derived from EPA drinking water MCL (ibid.).
8. GWQS for 1,1, 2-Trichloroethane from final EPA MCL in "Drinking Water Regulations and Health Advisories", EPA 822-B-96-002, October 1996.
9. All GWPL values for alpha-emitting radionuclides based on 1E-4 lifetime cancer mortality risk concentration levels provided in 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078-9, 33100-3, and Appendix C).
10. Adjusted Gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.
11. Neptunium-237, as determined by Total Radioactive Neptunium, EPA Method 907.0.
12. All GWPL values for beta/gamma emitting radionuclide parameters based on a 4 millirem/year equivalent dosage, as per 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078, 33103, and Appendix B).
13. Iodine-129, as determined by Total Radioactive Iodine, EPA Method 902.0.
14. GWQS of 5 pCi/l for combined radium-226 + radium-228 from final EPA MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).

Table 1B: Ground Water Protection Level Exceptions[1] – LARW, Class A, ~~and~~ Class A North, and Class A South Wells

Well ID	Parameter	GWPL [2]	Well ID	Parameter	GWPL [2]
Inorganic/Metal Parameters (mg/l)					
GW-20	Fluoride	4.1	GW-95	Uranium – total	0.037
GW-29	Fluoride	4.5	GW-100	Uranium – total	0.138
GW-93	Uranium – total	0.031	P3-95 SWC	Uranium – total	0.180
GW-94	Uranium – total	0.032			
Radiologic Parameters (pCi/l)					
GW-16R	Gross Alpha [3]	65	GW-89	Gross Alpha [3]	150
				Ra-226+Ra-228	5.36
GW-20	Gross Alpha [3]	197	GW-90	Gross Alpha [3]	129
	Ra-226+Ra-228	5.41		Ra-226+Ra-228	5.92
GW-22	Gross Alpha [3]	280	GW-91	Gross Alpha [3]	43
	Ra-226+Ra-228	5.28		Ra-226+Ra-228	6.44
			GW-92	Gross Alpha [3]	209
GW-23	Gross Alpha [3]	186	GW-93	Gross Alpha [3]	143
GW-24	Gross Alpha [3]	406		Ra-226+Ra-228	5.54
	Ra-226+Ra-228	5.71	GW-94	Gross Alpha [3]	185
GW-29	Gross Alpha [3]	190			
	Ra-226+Ra-228	6.19	GW-95	Gross Alpha [3]	185
GW-56R	Gross Alpha [3]	53	GW-99	Gross Alpha [3]	209
	Ra-226+Ra-228	5.51		Ra-226+Ra-228	5.88
GW-64	Gross Alpha [3]	79			
	Ra-226+Ra-228	5.63	GW-100	Gross Alpha [3]	348
GW-77	Gross Alpha [3]	67		Uranium-234	71
	Ra-226+Ra-228	5.46		Uranium-238	43
I-2-30	Gross Alpha [3]	114			
			GW-101	Gross Alpha [3]	210
GW-81	Gross Alpha [3]	196			
			GW-102	Gross Alpha [3]	185
GW-82	Gross Alpha [3]	466	GW-103	Gross Alpha [3]	42
			GW-104	Gross Alpha [3]	133
GW-83	Gross Alpha [3]	198	GW-105	Gross Alpha [3]	85
				Ra-226+Ra-228	5.18
GW-84	Gross Alpha [3]	187	P3-95 NEC	Gross Alpha [3]	117
	Ra-226+Ra-228	7.12	P3-95 SWC	Gross Alpha [3]	87
GW-85	Gross Alpha [3]	218		Uranium-234	48
	Ra-226+Ra-228	9.14		Uranium-238	79
GW-86	Gross Alpha [3]	348		Ra-226+Ra-228	7.63
	Ra-226+Ra-228	6.20	P3-97 NEC	Gross Alpha [3]	111
GW-88	Gross Alpha [3]	539			
	Ra-226+Ra-228	7.78			

1. Table 1B exceptions constitute specific wells and parameters determined to have natural background ground water quality concentrations above GWQS, or as otherwise specified below. Background concentration is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well.
2. The number of significant figures used for all GWPLs determined by laboratory results previously reported by the Permittee.
3. Adjusted Gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.
4. Iodine-129, as determined by Total Radioactive Iodine, EPA Method 902.0.

Table 1C: Ground Water Protection Levels – Universal for all 11e.(2) Wells

Parameter	GWPL (1)	Parameter	GWPL (1)
Field and Inorganic Parameters (2) (mg/l)		*Organic Parameters – Specific to 11e.(2) (mg/l)*	
Cyanide	0.2	Acetone (5)	0.7
Fluoride	4.0	2-Butanone (5)	4.2
Total Nitrate/Nitrite (as N)	10.0	Carbon Disulfide (5)	0.7
pH (units)	6.5 – 8.5	Chloroform (6)	0.08
Dissolved Metals (2) (mg/l)		1,2-Dichloroethane	0.005
Arsenic	NA (3)	Methylene Chloride (7)	0.005
Barium	2.0	Naphthalene (8)	0.02
Beryllium (4)	0.004	Diethyl Phthalate (9)	5.0
Cadmium	0.005	2-Methylnaphthalene (10)	0.004
Chromium	0.1		
Copper	1.3		
Lead	0.015		
Mercury	0.002		
Molybdenum	NA (3)		
Nickel (4)	0.10		
Selenium	0.05		
Silver	0.1		
Uranium – total	0.03		
Zinc	5.0		

1. All field, inorganic, dissolved metals, and organic indicator organic parameters and corresponding GWPLs for the 11e.(2) wells are equivalent to those for the LARW wells in Table 1A, above.
2. All ground water protection levels (GWPL) derived from Ground Water Quality Standards (GWQS, see UAC R317-6-2), except as noted.
3. Due to naturally elevated concentrations of arsenic and molybdenum in the Class IV saline aquifer at Clive, Utah, these constituents are poor indicators of cell leakage and therefore will not be used as compliance parameters with ground water protection levels. However, the Permittee will continue to sample, analyze, and report arsenic and molybdenum data in all compliance monitoring wells at Permit and License renewal as a best management practice.
4. Beryllium and Nickel GWQS derived from EPA drinking water Maximum Contaminant Levels (MCL), as published in the July 17, 1992 Federal Register, Vol. 57, No. 138, pp. 31776 – 31849, Table 1.
5. GWQS for acetone, 2-Butanone, and carbon disulfide determined by DWQ staff from reference doses available in the technical literature, see August 8, 1994 DWQ Staff Report: Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels, Envirocare of Utah Inc., Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility, near Clive, Tooele County, Utah, p. 3.
6. GWQS for chloroform derived from a 1998 EPA final drinking water MCL for total trihalomethane compounds in "Drinking Water Standards and Health Advisories", EPA 822-B-00-001, Summer 2000.
7. GWQS for methylene chloride derived from EPA drinking water MCL (ibid.).
8. Naphthalene GWQS derived from final EPA drinking water LHA (ibid.).
9. GWQS for diethyl phthalate based on draft EPA drinking water LHA (ibid.).
10. GWQS for 2-methylnaphthalene could not be located or determined, thanks to a lack of reference dosage information in the technical literature. Consequently, a detection monitoring approach has been taken and the GWPL set equal to the minimum achievable detection limit for the compound as a result of matrix interferences from high TDS content of Clive ground water. As health-based risk or other reference dosage information becomes available, the Executive Secretary may modify the Permit and set a GWQS for 2-methlynaphthalene.

Table 1D: Ground Water Protection Level Exceptions [1] – 11e.(2) Wells

Well ID	Parameter	GWPL [2]	Well ID	Parameter	GWPL [2]
Inorganic/Metal Parameters (mg/l)					
GW-19A	Fluoride	5.8	GW-27	Fluoride	4.5
GW-20	Fluoride	4.1		Uranium – total	0.040
GW-25	Fluoride	4.4	GW-28	Fluoride	4.2
	Uranium – total	0.141	GW-29	Fluoride	4.5
GW-26	Fluoride	4.8	GW-36	Uranium – total	0.057
	Uranium – total	0.033	GW-58	Uranium – total	0.039

~~1~~1. Table 1D exceptions constitute specific wells and parameters determined to have natural background ground water quality concentrations above GWQS, or as otherwise specified below. Background concentration is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well.

2. The number of significant figures used for all GWPLs determined by laboratory results previously reported by the Permittee.

Table 1E: Ground Water Protection Levels Universal to All Mixed Waste Wells

Parameter	GWPL	Parameter	GWPL
Dissolved Metals (mg/l)			
Uranium – total [1]	0.03		
Radiologic Parameters (pCi/l)			
Alpha Emitters [2]		*Beta/Gamma Emitters* [5]	
Adjusted Gross Alpha [3]	15	Carbon-14	3,200
Neptunium-237 [4]	7	Iodine-129 [7]	21
Strontium-90	42	Technetium-99	3,790
Thorium-230	83	Tritium	60,900
Thorium-232	92		
Uranium-233	26		
Uranium-234	26	*Combined Radiologic Parameters (pCi/l)*	
Uranium-235	27	Radium-226 + Radium-228 [8]	5
Uranium-236	27		
Uranium-238	26		

~~1~~1. Total uranium GWQS of 0.03 mg/l from EPA final MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).

2. All GWPL values for alpha-emitting radionuclides based on 1E-4 lifetime cancer mortality risk concentration levels provided in 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078-9, 33100-3, and Appendix C).

3. Adjusted Gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.

4. Neptunium-237, as determined by Total Radioactive Neptunium, EPA Method 907.0.

5. All GWPL values for beta/gamma emitting radionuclide parameters based on a 4 millirem/year equivalent dosage, as per 1991 EPA draft MCL values for drinking water (July 18, 1991 Federal Register, Vol. 56, No. 138, pp. 33078, 33103, and Appendix B).

6. Iodine-129, as determined by Total Radioactive Iodine, EPA Method 902.0.

7. GWQS of 5 pCi/l for combined radium-226 + radium-228 from final EPA MCL in National Primary Drinking Water Regulations Final Rule for Radionuclides (December 7, 2000 Federal Register, Vol. 65, No. 236, p. 76708).

Table 1F: Ground Water Protection Level Exceptions [1] – Mixed Waste Wells

Well ID	Parameter	GWPL [2]	Well ID	Parameter	GWPL [2]
Radiologic Parameters (pCi/l)					
GW-41	Gross alpha [3]	288	GW-119	Gross alpha [3]	60
	Ra-226+Ra-228	8.07		Ra-226+Ra-228	5.03
GW-42	Gross alpha [3]	128	GW-120	Gross alpha [3]	64
	Ra-226+Ra-228	6.88		Ra-226+Ra-228	5.1
GW-66	Gross alpha [3]	129	GW-121	Gross alpha [3]	56
GW-67	Gross alpha [3]	83		Ra-226+Ra-228	5.42
			GW-122	Gross alpha [3]	52
GW-68	Gross alpha [3]	287			
			GW-123R	Gross alpha [3]	47
GW-69	Gross alpha [3]	94		Ra-226+Ra-228	5.91
	Ra-226+Ra-228	7.17			
			GW-124	Gross alpha [3]	57
GW-70	Gross alpha [3]	141			
			I-1-30	Gross alpha [3]	158
GW-118	Gross alpha [3]	55			

1. Table 1F exceptions constitute specific wells and parameters determined to have natural background ground water quality concentrations above GWQS, or as otherwise specified below. Background concentration is defined as the mean concentration plus the second standard deviation for any contaminant in any individual well.
2. The number of significant figures used for all GWPLs determined by laboratory results previously reported by the Permittee.
3. Adjusted gross alpha activity excludes radon, radium-226, and uranium alpha particle activity. Gross alpha activity to be determined by co-precipitation, EPA Method 00-02.

D. Best Available Technology (BAT) Design Standard

1. Discharge Technology Performance Criteria

   Best available technology for the facility will incorporate discharge technology based on the use of earthen materials in both the bottom liner and final cover. However, under no circumstances shall the facility cause ground water at the compliance monitoring wells (Part I.F.1) to exceed the ground water protection levels in Part I.C for the following minimum periods of time:

Disposal Cell	Contaminant Group	Performance Standard*
LARW, Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2)	Heavy metals Inorganics Organics Mobile and non-mobile Radionuclides	200 years 200 years 200 years 500 years
11e.(2) portion of the Class A South/11e.(2)	Heavy metals Inorganics Organics	200 years 200 years 200 years
Mixed Waste	Mobile and non-mobile	500 years

* Said performance standards shall be measured from the following initial startup dates: 1988 [LARW Cell], 1992 [Mixed Waste Cell], 1994 [11e.(2) Cells], 2000 [Class A Cell]

If after review of any environmental monitoring data collected at the facility, the Executive Secretary determines that the ground water protection levels in Part I.C of the Permit may be exceeded at the compliance monitoring wells before completion of the above-minimum time periods, said potential shall constitute a violation of the Best Available Technology requirements of this Permit.

2. Final Authorized LARW Cell Engineering Design and Specifications

The best available technology design standard shall be defined by, and construction of the LARW facilities shall conform to the engineering plans summarized in Table 2A, below, and the specifications listed in the approved ~~LARW~~ LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Plan (Radioactive Materials License No. 2300249 (the License), Condition 44):

For the LARW cell, this engineering design includes, but is not limited to, the following elements:

a) Cover System – shall include the following materials or as specified by the approved CQA/QC Plan (Radioactive Materials License, Condition 44), from the top down:

1) An 18-inch thick erosion barrier consisting of a 1.25-inch, or greater, average diameter rock material over the top-slope area, and a 4.5-inch, or greater average diameter rock material over the side-slope area, as specified on the approved engineering drawing number 9407-4, Revision S2, dated and submitted on October 15, 1999,

2) A 6-inch thick upper filter zone consisting of sandy gravel material,

3) A 12-inch compacted thickness of sacrificial soil with a minimum Residual Moisture Content of 3.5% (by weight). Such Residual Moisture Content shall be the asymptotic value measured by ASTM Methods D-3152 and D-2325 at soil tensions above 15 bars,

4) A 6-inch lower filter zone consisting of sandy gravel material with a minimum permeability of 3.5 cm/sec,

Particle Size Distribution	Particle Size		
	Upper (Type A) Filter	Sacrificial Soil	Lower (Type B) Filter
D_{100}	≤ 6.0 inch	≤ 0.75 inch	≤ 1.5 inch
D_{70}	≤ 3.0 inch	n/a	n/a
D_{60}	n/a	≥ 0.375 inch	n/a
D_{50}	≤ 1.57 inch (40 mm)	n/a	n/a
D_{40}	n/a	n/a	≥ 0.375 inch
D_{35}	n/a	≥ No. 4 sieve (4.75 mm)	n/a
D_{15}	≤ 0.85 inch (22 mm)	≥ No. 200 sieve (0.074 mm)	n/a
D_{10}	≥ No. 10 sieve (2.0 mm)	n/a	≥ No. 4 sieve
D_5	≥ No. 200 sieve (0.074 mm)	n/a	n/a

5) A 2-foot thick clay radon barrier measured vertically. Said radon barrier will be divided into two layers:

   i) An upper layer, 1 foot thick, with a field hydraulic conductivity of 5.0E-8 cm/sec or less, and

   ii) A lower layer, 1 foot thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less.

   Top slope of the embankment shall be between 2% and 4%, as specified on the approved engineering drawings, and side slopes shall be no steeper than approximately 5:1. The outside toe of the clay radon barrier/liner shall extend outward and beyond the outermost edge of the waste layer and shall merge with the bottom clay liner.

b) Waste Layer – the waste layer shall not exceed a final thickness of 43 feet above the top of the bottom clay liner.

c) Clay Bottom Liner – the bottom clay liner shall be constructed below natural grade on slopes no greater than 0.12% north to south and 0.2% east to west. Final grade and elevation for the base of the clay liner will comply with the approved engineering design (Table 2A). This liner will be constructed after excavation of the site to the total design depth, followed by placement of imported clay materials, which meet the approved specifications for material and construction. The new clay liner shall be graded to prevent the accumulation of leachate over the existing 1-foot thick clay liner. The clay liner shall be a minimum of 2 feet thick, measured perpendicular to the slope, constructed in accordance with the approved ~~LARW~~ LLRW and 11e.(2) CQA/QC Plan (Radioactive Materials License, Condition 44), and have a field hydraulic conductivity of 1.0E-6 cm/sec or less.

Table 2A: Approved LARW Cell Engineering Design Drawings

Drawing	Last Revision Date	Subject
9407-2, Rev. E	July 28, 1998	LARW Disposal Cell – Cell Location and Excavation Limits
9407-4, Rev. T	May 16, 2003	LARW Disposal Cell – LARW Cell Closure
9407-4A, Rev. L	May 16, 2003	LARW Disposal Cell – LARW Cell Closure
9407-4B, Rev. J	May 16, 2003	LARW Disposal Cell – LARW Cell Closure
9407-5, Rev. J	February 4, 1999	LARW Disposal Cell – Site Layout
9407-6, Rev. E	July 28, 1998	LARW Disposal Cell – Site Layout
9407-7, Rev. A	June 27, 1994	Drainage Plan – Plan View
9407-7A, Rev. A	June 27, 1994	Drainage Plan – Details
9407-8, Rev. C	October 16, 1998	LARW Disposal Cell Wedge Expansion Cross Section
03046-VO1, Rev. 0	May 16, 2003	LARW Disposal Cell – Radon Barrier Design Section Details
03046-VO1, Rev. 0	May 16, 2003	LARW Disposal Cell – Radon Barrier Design Sections and Details
03046A-VO1 Rev. -	August 1, 2003	LARW Disposal Cell Closure – Plan and Details
03046A-VO2 Rev. 1	August 1, 2005	LARW Disposal Cell Closure – Sections and Details
03046A-VO3 Rev. -	August 1, 2003	LARW Disposal Cell – Radon Barrier Redesign Sections and Details

Table 2A: Approved LARW Cell Engineering Design Drawings

Drawing	Last Revision Date	Subject
03046A-VO4 Rev. -	August 1, 2003	LARW Disposal Cell – Radon Barrier Redesign Sections and Details
03046A-VO5 Rev. -	August 1, 2003	LARW Disposal Cell – Radon Barrier Redesign Section and Details
L9	July 21, 1993	Fence Details
Page 1	March 10, 1994	LARW Bulk Storage Pad Repair: Plan View, As-Built
Page 2	March 10, 1994	LARW Bulk Storage Pad Repair: Details – As-Built
9412-1, Rev. A	December 5, 1994	LARW Bulk Storage Pad French Drain Addition Plan View and Sections, As-Built
9514-1, Rev. B	December 19, 1998	LARW Disposal Facility Container Storage Pad: Plan, Sections, and Details; As-Built

3. 11e.(2) Disposal Cell Design

The best available technology design standard shall be defined by, and construction of the 11e.(2) cells shall conform to the approved engineering design summarized in Table 2B, below, and the specifications listed in the currently approved LLRW and 11e.(2) Construction QA/QC Plan (Radioactive Material License. Condition 44)~~for 11e.(2) Facility in Appendix D of this Permit~~.

Table 2B: Approved 11e.(2) Cell Engineering Design Drawings

Drawing	Last Revision Date	Subject
07021-G1	1/4/08	Class A South 11e.(2) Disposal Cell - Project Title Sheet
07021-U1	1/4/08	Class A South/11e.(2) Disposal Cell-Buffer Zone
07021-U2	1/4/08	Class A South/11e.(2) Disposal Cell Waste Limits - Latitudes & Longitudes
07021-U3	1/4/08	Class A South/11e.(2) Disposal Cell Environmental Monitoring
07021-V1	1/4/08	Class A South/11e.(2) Disposal Cell Layout
07021-V2	1/4/08	Class A South/11e.(2) Disposal Cell Cover Layout
07021-V3	1/4/08	Class A South/11e.(2) Disposal Cell Cross Sections 1 of 2
07021-V4	1/4/08	Class A South/11e.(2) Disposal Cell Cross Sections 2 of 2
07021-V5	1/4/08	Class A South/11e.(2) Disposal Cell Construction Details 1 of 2
07021-V6	1/4/08	Class A South/11e.(2) Disposal Cell Construction Details 2 of 2
07021-V7	1/4/08	Class A South/11e.(2) Disposal Cell Cover Cross Sections and Gradations
07021-V8	1/4/08	Collection Lysimeters Details
~~9420-4, Rev. F~~	~~March 4, 2002~~	~~11e.(2) Disposal Cell, Layout~~
~~9420-5, Rev. D~~	~~February 21, 2002~~	~~11e.(2) Disposal Cell, Cross Sections~~
~~9420-6, Rev. D~~	~~December 21, 2002~~	~~11e.(2) Disposal Cell, Ditch Cross Sections~~

Said 11e.(2) cell engineering design shall include, but is not limited to, the following elements:

a) Cover System – shall include the following materials, as described from the top down:

1) Top-slope Area – the top-slope shall consist of the following materials, from the top down:

i) Riprap Erosion Barrier – a 12-inch thick layer of rock armor material with a particle size ranging from 0.75 to 4.50 inches in diameter with an average diameter between 1.125 and 3.0 inches.

~~iii)~~ii)Filter Zone – a single 12-inch thick layer of granular material with a particle size ranging from 0.3125 to 3.0 inches in diameter (coarse sand to fine cobble) and a minimum hydraulic conductivity of 42 cm/sec.

iii) Upper Radon Barrier – a layer of clay material at least 12 inches thick with a field hydraulic conductivity of 5.0E-8 cm/sec or less.

iv) Lower Radon Barrier – a layer of clay material at least 3 feet thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less.

The minimum slope for top-slope areas shall be 2.0~~2.1~~%.

2) Side-slope Area – the side-slope area shall consist of the following materials, from the top down:

~~i)~~i) Riprap Erosion Barrier – an 18-inch thick layer of rock armor material with a particle size ranging from 2.0 to 16.0 inches in diameter with an average diameter between 4.5 and 8.0 inches.

~~ii)~~ii) Filter Zone – a single 12-inch thick layer of granular material with a particle size ranging from 0.3125 to 3.0 inches in diameter (coarse sand to fine cobble) and a minimum hydraulic conductivity of 42 cm/sec.

~~iii)~~iii) Upper Radon Barrier – a layer of clay material at least 12 inches thick with a field hydraulic conductivity of 5.0E-8 cm/sec or less.

~~iv)~~iv) Lower Radon Barrier - a layer of clay material at least 2.5 feet thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less.

The minimum slope for side-slope areas shall be 20%.

b) 11e.(2) Waste Layer – the 11e.(2) waste shall not exceed a final thickness of 47 feet above the bottom clay liner.

c) Bottom Clay Liner – the clay liner will be constructed only after excavation of the site to the total design depth, followed by placement of imported clay materials which meet the approved specifications for material and construction. The clay liner shall be a minimum of 2 feet thick, measured perpendicular to the slope, and have a field hydraulic conductivity of 1.0E-6 cm/sec or less.

4. Final Authorized Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) Cell Engineering Design and Specifications

The best available technology design standard shall be defined by, and construction of the Class A, ~~and~~ Class A North, and Class A South facilities shall conform to the engineering plans summarized in Table 2C, below, and the specifications listed in the approved LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Plan (Radioactive Materials License, Condition 44):

For the Class A, ~~and~~ Class A North, and Class A South cells, this engineering design includes, but is not limited to, the following elements:

a) Cover System – top-slope and side-slope areas shall include the following materials or as specified by the approved LLRW and 11e.(2) CQA/QC Plan (Radioactive Materials License, Condition 44), from the top down:

1) An 18-inch thick erosion barrier consisting of a 1.25-inch, or greater, average diameter rock material over the top-slope area, and a 4.5-inch, or greater average diameter rock material over the side-slope area, as specified on the approved engineering drawing number 9821-01,

2) A 6-inch thick upper (Type A) filter zone consisting of sandy gravel material,

3) A 12-inch compacted thickness of sacrificial soil with a minimum Residual Moisture Content of 3.5 % (by weight). Such Residual Moisture Content shall be the asymptotic value measured by ASTM Methods D-3152 and D-2325 at soil tensions above 15 bars,

4) A 6-inch lower (Type B) filter zone consisting of sandy gravel material with a minimum permeability of 3.5 cm/sec, with the exception of the Class A South side slope where the Type B filter zone shall be 18-inches thick,

Material gradation of the sacrificial soil layer and upper and lower filters shall comply with the following requirements:

Particle Size Distribution	Particle Size		
	Upper (Type A) Filter	Sacrificial Soil	Lower (Type B) Filter
D_{100}	≤6.0 inch	≤0.75 inch	≤ 1.5 inch
D_{70}	≤3.0 inch	n/a	n/a
D_{60}	n/a	≥0.375 inch	n/a
D_{50}	≤1.57 inch (40 mm)	n/a	n/a
D_{40}	n/a	n/a	≥ 0.375 inch
D_{35}	n/a	≥No. 4 sieve (4.75 mm)	n/a
D_{15}	≤0.85 inch (22 mm)	≥No. 200 sieve (0.074 mm)	n/a
D_{10}	≥No. 10 sieve (2.0 mm)	n/a	≥ No. 4 sieve
D_5	≥No. 200 sieve (0.074 mm)	n/a	n/a

5) A 2-foot thick clay radon barrier measured vertically. Said radon barrier will be divided into two layers:

i) an upper layer, 1 foot thick, with a field hydraulic conductivity of 5.0E-8 cm/sec or less, and

ii) a lower layer, 1 foot thick with a field hydraulic conductivity of 1.0E-6 cm/sec or less.

Top slope of the embankment shall be between 2% and 4%, as specified on the approved engineering drawings, and side slopes shall be no steeper than approximately 5:1. The outside toe of the clay radon barrier/liner shall extend outward and beyond the outermost edge of the waste layer and shall merge with the bottom clay liner.

b) Waste Layer – the waste layer shall not exceed a final thickness of 54 feet above the top of the bottom clay liner.

c) Clay Bottom Liner – the bottom clay liner shall be constructed below natural grade on slopes no greater than 0.12% north to south and 0.2% east to west. Final grade and elevation for the base of the clay liner will comply with the approved engineering design (Table 2C). This liner will be constructed after excavation of the site to the total design depth, followed by placement of imported clay materials, which meet the approved specifications for material and construction. The new clay liner shall be graded to prevent the accumulation of leachate over the existing 1-foot thick clay liner. The clay liner shall be a minimum of 2 feet thick, measured perpendicular to the slope, constructed in accordance with the approved LLRW and 11e.(2) CQA/QC Plan (Radioactive Materials License, Condition 44), and have a field hydraulic conductivity of 1.0E-6 cm/sec or less.

Table 2C: Approved Class A, ~~and~~ Class A North, and Class A South Cell Engineering Design Drawings

Drawing	Last Revision	Subject
Class A Disposal Embankment		
9821-01, Rev. I	5/20/05	Class A Disposal Cell – Layout Plan and Cover Details
9821-02, Rev. C	3/22/02	Class A Disposal Cell – Cross Sections
9821-03, Rev. B	3/22/02	Class A Disposal Cell – Ditch Details
9821-04, Rev. A	7/25/00	Class A Disposal Cell – Updated Drainage System
Class A North Disposal Embankment		
04080-G01 Rev. 1	5/19/05	Class A North Disposal Cell – Layout Plan and Cover Details
04080-C02 Rev. 2	5/19/05	Class A North Disposal Cell – Cross Sections
04080-C03 Rev. 1	5/19/05	Class A North Disposal Cell – Ditch Details
Class A South Disposal Embankment		
07021-G1	1/4/08	Class A South/11e.(2) Disposal Cell – Project Title Sheet
07021-U1	1/4/08	Class A South/11e.(2) Disposal Cell-Buffer Zone
07021-U2	1/4/08	Class A South/11e.(2) Disposal Cell Waste Limits – Latitudes & Longitudes
07021-U3	1/4/08	Class A South/11e.(2) Disposal Cell Environmental Monitoring
07021-V1	1/4/08	Class A South/11e.(2) Disposal Cell Layout
07021-V2	1/4/08	Class A South/11e.(2) Disposal Cell Cover Layout
07021-V3	1/4/08	Class A South/11e.(2) Disposal Cell Cross Sections 1 of 2

07021-V4	1/4/08	Class A South/11e.(2) Disposal Cell Cross Sections 2 of 2
07021-V5	1/4/08	Class A South/11e.(2) Disposal Cell Construction Details 1 of 2
07021-V6	1/4/08	Class A South/11e.(2) Disposal Cell Construction Details 2 of 2
07021-V7	1/4/08	Class A South/11e.(2) Disposal Cell Cover Cross Sections and Gradations
07021-V8	1/4/08	Collection Lysimeters Details

~~Final Authorized Class A South/11e.(2) Transition Zone Engineering Design and Specifications~~

~~The best available technology design standard shall be defined by, and construction of the Class A South/11e.(2) Transition Zone shall conform to the the specifications listed in the approved LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Plan (Radioactive Materials License, Condition 44):~~

~~a) For the Class A South/11e.(2) Transition Zone top slope, the engineering design shall include, but is not limited to, the following elements:~~

~~i) a minimum 6-foot wide barrier of clay material compacted to a minimum of 95% of a Standard Proctor between the waste types from the liner to the top of waste. The clay material shall be of the same material type as that of the temporary cover material.~~

~~ii) The compacted clay layer shall increase in height from the face of waste within the 11e.(2) cell to the face of waste within the Class A South cell. This will allow for the radon barrier of the Class A South cell to join the radon barrier within the upper 2 feet of the 11e.(2) radon barrier.~~

~~b) For the Class A South side slope of the Transition Zone, the engineering design shall include, but is not limited to, the following elements:~~

~~i) a minimum 6-foot wide barrier of clay material compacted to a minimum of 95% of a Standard Proctor between the waste types from the liner to the top of waste. The clay material shall be of the same material type as that of the temporary cover material.~~

~~ii) The compacted clay layer shall increase in height from the face of waste within the 11e.(2) cell to the face of waste within the South Class A cell. This will allow for the radon barrier of the South Class A cell to join the radon barrier within the upper 2 feet of the 11e.(2) cover.~~

5. Disposal Cell Location Restrictions

The LARW, 11e.(2) portion of the Class A South/11e.(2), Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) disposal cells shall be restricted to the following locations in Section 32, Township 1 South, Range 11 West, SLBM, as specified on the currently approved engineering plans, drawings, and the approximate Latitude and Longitude Coordinates provided in Table 3 below:

Table 3: Authorized LARW, 11e.(2), Class A, ~~and~~ Class A North, and Class A South
Disposal Cell Locations

Disposal Cell	Edge of Waste Position	Coordinates	
		Latitude	Longitude
LARW	NW Corner	40° 41' 10.851418" N	113° 6' 50.846182" W
	SW Corner	40° 40' 52.379041" N	113° 6' 51.184491" W
	SE Corner	40° 40' 52.230624" N	113° 6' 36.713462" W
	NE Corner	40° 41' 10.700524" N	113° 6' 36.372920" W
11e.(2)	NW Corner	40° 41' 12.531691" N	113° 7' 24.037415" W
	SW Corner	40° 40' 55.004159" N	113° 7' 24.684273" W
	SE Corner	40° 40' 54.379460" N	113° 6' 55.514932" W
	NE Corner	40° 41' 11.913013" N	113° 6' 54.859752" W
Class A	NW Corner	40° 41' 28.004487" N	113° 7' 23.847971" W
	SW Corner	40° 41' 14.175042" N	113° 7' 24.153414" W
	SE Corner	40° 41' 13.717662" N	113° 6' 54.827468" W
	NE Corner	40° 41' 27.547403" N	113° 6' 54.521700" W
Class A North	NW Corner	40° 41' 38.80171" N	113° 7' 24.05346" W
	SW Corner	40° 41' 30.12912" N	113° 7' 24.25350" W
	SE Corner	40° 41' 29.74829" N	113° 6' 55.82096" W
	NE Corner	40° 41' 38.42078" N	113° 6' 55.62003" W
Class A South	NW Corner	40°41'12.531691"N	113°7'24.037415"W
	SW Corner	40°41'55.004159"N	113°7'24.684273"W
	SE Corner	40°41'54.607958"N	113°7'5.135960"W
	NE Corner	40°41'12.138756"N	113°7'4.494419"W

This description does not include the Mixed Waste facility, located east of the LARW Cell, which is authorized under a separate RCRA permit from the Utah Division of Solid and Hazardous Waste.

6. Definition of LARW Waste

For purposes of this Permit, Low-Activity Radioactive Waste (LARW) is defined as radioactive wastes, which meet the definition of Class A Low-Level Radioactive Waste (LLRW) under the Utah Radiation Control Rules, UAC R313-15-1008, or are defined as Naturally Occurring and Accelerator Produced Radioactive Materials under the Utah Radiation Control Rules, UAC R313-12-3.

7. Definition of Mobile Waste

Any waste containing any of the following isotopes shall be considered a mobile waste and subject to special provisions or requirements under this Permit: aluminum-26, berkelium-247, calcium-41, californium-249, californium-250, carbon-14, chlorine-36, iodine-129, neptunium-237, rhenium-187, sodium-22, technetium-99, terbium-157, terbium-158, or tritium.

8. Definition of PCB/Radioactive Waste

For purposes of this Permit, PCB/Radioactive Waste to be accepted for disposal shall meet the criteria specified in R315-315-7(2)(a) or (3)(b)(i-vi) of the rules designated for disposal in a municipal or non-municipal non-hazardous landfill.

9. Definition of 11e.(2) Waste

For purposes of this Permit, 11e.(2) Waste is defined as "... tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content", as defined in Section 11e.(2) of the U.S. Atomic Energy Act of 1954, as amended.

10. Collection Lysimeters for Future Construction at the Class A, ~~and~~ Class A North, and Class A South Cells

Future construction of the clay bottom liner of Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) Cells shall include the installation of collection lysimeters below the bottom clay liner, in accordance with the CQA Plan for Collection Lysimeter Construction currently approved by the Executive Secretary and included herein as Appendix C. The Permittee shall also comply with the currently approved Operation, Maintenance and Closure Plan for Collection Lysimeters, also included herein as Appendix C. In addition, the Permittee shall comply with the following requirements:

a) Collection Lysimeter "As-Built" Report – within 30 days of completion of the construction of each lysimeter, the Permittee shall submit an "As-Built" Report for Executive Secretary approval.

b) Future Collection Lysimeter Construction Notification – the Permittee shall submit a notice of construction of additional lysimeters in the Class A, ~~and~~ Class A North, Class A South portion of the Class A South/11e.(2) Cells. Said notice shall be submitted at least one week prior to construction in order to allow the Executive Secretary to inspect lysimeter construction.

c) Future Collection Lysimeter Construction – in addition to any design or construction requirements found in the currently approved Appendix C, the Permittee shall construct all future collection lysimeters in a manner that will allow the lysimeter to be operated in compliance with all performance standards mandated by Part I.E.11 or monitoring requirements dictated by Part I.F.6 of this Permit. Any changes to the approved design or construction specifications in Appendix C shall require prior Executive Secretary approval.

11. Future Modification of Disposal Cell Engineering Design or Specifications

Any change in the approved engineering design or specifications which causes a significant adverse effect to the infiltration performance of a disposal cell shall require prior submittal and Executive Secretary approval of infiltration and contaminant transport analysis of the proposed change. Said changes must be submitted to the Executive Secretary as a written request with the revised engineering drawings, specifications, ground water flow and contaminant transport models, or any other documentation deemed necessary by the Executive Secretary, at least 180 days prior to the effective date desired by the Permittee.

12. Final Authorized Engineering Design and Specifications for Waste and Wastewater Related Facilities

Best available technology design standards for related facilities at the disposal site shall be defined by, and construction conform to the engineering plans and specifications summarized in Table 5, below and other requirements contained in an approved ~~LLRW and 11e.(2)~~ Construction QA/QC Plan.

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title
Track 2 Railcar Decontamination Pad	9513-1, Rev. B	May 26, 1996	Plan, Section, and Details
Track 4 Railcar Decontamination Pad	T-100, Rev. 3	Aug. 14, 1999	Foundation
	T-101, Rev. 3	Aug. 16, 1999	Foundation Details
	9906-02, Rev. H	Feb. 26, 2007	Wash Water System As-Built
	9906-02A, Rev. H	Feb. 26, 2007	Wash Water System As-Built
Class A Containerized Waste Facility Evaporation Basin	03040-V01	May 20, 2003	Site Location Map
	03040-V02	May 20, 2003	Plan and Section
Class A North Containerized Waste Facility and Large Component Area Evaporation Basin	0408-C05-C06	October 20, 2004	Plan and Section
1995 Evaporation Pond	9718-1, Rev. B	Aug. 17, 1998	Facility Layout
	9504-3, Rev. E	Oct. 28, 1999	Storage Pond
	9504-3A, Rev. A	Oct. 28, 1999	Leak Detection System Details, As-Built
	9504-4, Rev. E	Oct. 28, 1999	Facility Details
	9718-4, Rev. A	Aug. 17, 1998	Piping Diagrams and Pump Station
1997 Evaporation Pond	9718-1, Rev. B	Aug. 17, 1998	Facility Layout
	9718-2, Rev. D	Feb. 25, 1999	Evaporation and Storage Pond
	9718-2a, Rev. B	Feb. 25, 1999	Leak Detection System Details. As-Built
	9718-3, Rev. -	Sept. 17, 1997	Details
	9718-4, Rev. A	Aug. 17, 1998	Piping Diagrams and Pump Station
2000 Evaporation Pond	0009-00, Rev. A	July 10, 2000	Site Plan and Facility Layout
	0009-01, Rev. C	Jan. 29, 2001	Plan View

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title
	0009-02, Rev. A	Jan. 29, 2001	Cross Sections
	0009-03, Rev. B	Jan. 29, 2001	Details
	0009-04, Rev. A	Jan. 29, 2001	Sump/Side Slope Cross-Section
	0009-05, Rev. A	Jan. 29, 2001	Leak Detection Details
Mixed Waste Evaporation Pond	9802-1, Rev. D	Dec. 22, 1999	Facility Layout
	9802-2, Rev. F	Dec. 22, 1999	Water Storage Facility
	9802-3, Rev. D	Dec. 22, 1999	Facility Details As-Built
	9802-4, Rev. B	Dec. 4, 1998	Water Storage Facility
	9802-5, Rev. A	Dec. 22, 1999	Leak Detection System Details, As-Built
	9803-2, Rev. -	Feb. 11, 1998	Storage Pad Drain Line As-Built
Box Washing Facility	9621-1, Rev. C	July 20, 1998	Site Plan As-Built Drawing
	9621-2, Rev. B	July 20, 1998	Foundation Plan As-Built Drawing
	9621-3, Rev. B	July 20, 1998	Elevation Views As-Built Drawing
	9621-4, Rev. B	July 20, 1998	Elevation Views As-Built Drawing
	9621-5, Rev. B	July 20, 1998	Wall Detail As-Built Drawing
	9621-6, Rev. F	May 17, 2000	As-Built Plan, Settlement Basin Retrofit
	9621-7, Rev. E	May 17, 2000	As-Built Cross Sections, Basin Retrofit
Intermodal Unloading Facility	9705-1, Rev. A	July 31, 1998	Plan View
	9705-2, Rev. A	July 31, 1998	Cross Section Drawings
	9813-01, Rev. A	July 31, 1998	Layout
	9813-02, Rev. A	July 31, 1998	Layout (and Details)
	9301-1, Rev. K	Sept. 23, 1998	Site Plan and Facility Layout
Railcar Rollover Facility	0221-01	March 26, 2002	Site Layout and Drain Line
	0221-02	March 26, 2002	Fabric Cover Frame Layout
	0221-03	March 26, 2002	Rollover Cover South Elevation
	0221-04, Rev. A	April 24, 2002	Cover Run-off Collection and Drainage
Rail Digging Facility	0107-01, Rev. B	April 25, 2002	Site Layout
	0107-02, Rev. B	April 19, 2002	Digging Track Plan
	0107-03, Rev. B	April 12, 2002	Track and Pad Details
	0107-04A, Rev. A	April 25, 2002	Excavator Ramp
Container Storage Pad	9514-1, Rev. B	Dec. 19, 1998	Plan, Sections and Details
East Truck Unloading Facility	05023-C301, Rev. 4	Sept. 22, 2005	Cross Sections
	05023-C401, Rev. 5	Dec. 12, 2005	Truck Unloading Area Plan View
	05023-C402, Rev. 5	De. 12, 2005	Truck Unloading Dock Plan View
	05023-C403, Rev. 5	Dec. 12, 2005	Enlarged Dock Plan View
	05023-C501, Rev. 5	Dec. 12, 2005	Truck Unloading Area Details
	05023-C502, Rev. 4	Dec. 12, 2005	Truck Dock Details
	05023-C503, Rev. 4	Dec. 12, 2005	Truck Dock Details
	05023-S1, Rev. 1	Sept. 22, 2005	Concrete Container Holding Pad Safety Protection
Shredder Facility[1]	05056-F13, Rev._	09/30/06	Shredder Facility; Outfeed Pad Plan and Pad Details (As-Constructed)
	05056-F13A, Rev._	09/30/06	Shredder Facility; Shredder Pad Plan (As-Constructed)
	05056-F13B, Rev._	09/30/06	Shredder Facility; Shredder Pad Details (As-Constructed)
	05056-L1, Rev. 6	09/06	Shredder Facility; Site Layout Plan (As-Built)
	05056-L2, Rev. 2	08/06	Shredder Facility; Containment Pad Water Management Layout Plan

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title
	05056-C1, Rev. 10	09/06	Shredding Facility; Operating Pad Layout (As-Built)
	05056-C6, Rev. 4	09/06	Shredding Facility; Operating Pad – Sections and Details (As-Built)
	05056-C7, Rev. 6	09/06	Shredding Facility; Catch Basin and Manhole Layouts (As-Built)
	05056-C8, Rev. 1	08/06	Shredding Facility; Drainage System Details
	05056-F1 thru -F14	Various	Details
Rotary Dump Facility[1]	05006-C1, Rev. 2	April 26, 2006	Heater Building; Plan sheet
	05006-C2, Rev. 4	June 12, 2006	Rotary Dump Building; Plan Sheet
	05006-C3, Rev. -	February 8, 2006	Wash Building; Plan Sheet
	05006-C5, Rev. 2	April 26, 2006	Rotary Dump Building; Section A-A
	05006-C6, Rev. 1	February 27, 2006	Rotary Dump Building; Section B-B
	05006-C12, Rev. -	April 26, 2006	Heater Building; Drainage Details and Sections
	05006-C7, Rev. -	February 8, 2006	Rotary Dump Building; Section C-C
	05006-C8, Rev. -	February 8, 2006	Rail Car Wash Building; Section D-D
	05006-C9, Rev. -	February 8, 2006	Wash Building, Drainage Plan Sheet
	05006-F1, Rev. 1	March 17, 2006	Rotary Dump Facility; Heater, Rotary and Wash Buildings foundation Plan and Details
	05006-F2, Rev. 2	April 26, 2006	Rotary Dump Facility; Heater Building Foundation Plan and Details
	05006-F10, Rev. 2	April 18, 2006	Rotary Dump Facility; Rotary Dumper Building Foundation Plan and Details
	05006-F13, Rev. 2	April 12, 2006	Rotary Dump Facility; Rotary Dumper Building Foundation Plan and Details
	05006-F25, Rev. 2	June 12, 2006	Rotary Dump Facility; Rotary Dumper Building Foundation Plan and Details
	05006-F26, Rev. 2	June 12, 2006	Rotary Dump Facility; Rotary Dumper Building Foundation Plan and Details
	05006-F27, Rev. 2	March 20, 3006	Rotary Dump Facility; Rotary Dumper Building Foundation Plan and Details
	05006-V1, Rev. 1	06/06 [sic]	Rotary Dump Facility; Water Supply and Waste Water Flow Diagram
	05006-SL100. Rev. 5	June 12, 2006	Rotary Dump Building; Sediment Basin Liner Plan
	05006-SL101. Rev. 5	June 13, 2006	Rotary Dump Building; Sediment Basin Liner Sections
	05006-SL102. Rev. 5	June 13, 2006	Rotary Dump Building; Sediment Basin Liner Section
Intermodal Container Wash Building	05008-G1, Rev. 1	August 8, 2005	Intermodal Container Wash Building; Map Layout and Index
	05008-C100, Rev. 1	August 8, 2005	Intermodal Container Wash Building; Facility Location Map
	05008-C101, Rev. 1	August 8, 2005	Intermodal Container Wash Building; Plan Sheet
	05008-C102, Rev. 1	August 8, 2005	Intermodal Container Wash Building; Section A-A
	05008-C103, Rev. 1	August 8, 2005	Intermodal Container Wash Building; Section B-B

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title
	05008-SL100, Rev. 3	September 1, 2005	Intermodal Container Wash Building; Sediment Basin Liner Plan
	05008-SL101, Rev. 3	September 1, 2005	Intermodal Container Wash Building; Sediment Basin Liner Section A-A
	05008-SL102, Rev. 3	September 1, 2005	Intermodal Container Wash Building; Sediment Basin Liner Section B-B
Decontamination Access Control Building	05015-G001, Rev. 1	February 23, 2006	Access Control Building: Map Layout and Index
	05015-C100, Rev. 1	February 23, 2006	Access Control Building; Facilities Location Map
	05015-C101, Rev. 2	February 23, 2006	Access Control Building; Floor Plan
	05015-C102, Rev. 2	February 23, 2006	Access Control Building; Elevations
	05015-C103, Rev. 3	February 23, 2006	Access Control Building, Typical Sections
	05015-C104, Rev. 0	February 23, 2006	Access Control Building, Site Layout and Gray Water Tank and Pipe
	05015-S100, Rev. 1	February 23, 2006	Access Control Building, 1000 Gallon Gray Water Tank
	05015-M100, Rev. 1	February 23, 2006	Access Control Building, Mechanical HVAC Plan
	05015-M101, Rev. 1	February 23, 2006	Access Control Building, Mechanical HVAC Details
	05015-P100, Rev. 1	February 23, 2006	Access Control Building, Plumbing Plan
	05015-P101, Rev. 1	February 23, 2006	Access Control Building, Plumbing Details
East Side Drainage and Gray Water System Modifications	06007-G1, Rev. 5	2/26/07	East Side Drainage, Map Layout and Index
	06007-G2, Rev. 4	2/26/07	East Side Drainage, Notes and Specifications
	06007-C1, Rev. 5	2/26/07	East Side Drainage. General Site Plan
	06007-C2, Rev. 5	2/26/07	East Side Drainage, Storm Water Drainage Plan
	06007-C3, Rev. 5	2/26/07	East Side Drainage, Internal Container Wash Facility Gray Water System Plan
	06007-C4, Rev. 4	2/26/07	East Side Drainage, Decon Access Control Gray Water System
	06007-D1, Rev. 4	2/26/07	East Side Drainage, Section and Details
	06007-P1, Rev. 4	2/26/07	East Side Drainage, Pipelines #4 and #5 Alignments and Profiles
	06007-SL1, Rev. 3	3/14/07	East Side Drainage, Storm Water Lift Sump Plan
	06007-SL2, Rev. 3	3/14/07	East Side Drainage, Storm Water Lift Sump Section
	06007-SL3, Rev. 3	3/14/07	East Side Drainage, Storm Water Lift Sump Section
	06007-V1, Rev. 3	2/26/07	East Side Drainage, Storm Water and Waste Flow Diagram
	06007-P2, Rev. 1	4/5/07	Pipeline 4A and 5A Extension into the 1997 Pond
Northwest Corner Evaporation Pond	06021-G1	TBD	Northwest Corner Pond; Title Sheet
	06021-C1	TBD	Northwest Corner Pond; General Site Plan and Profile
	06021-C2	TBD	Northwest Corner Pond; Pond Plan View
	06021-C3	TBD	Northwest Corner Pond; Sections and Details

Table 5: Approved Engineering Design Drawings for Waste/Wastewater Related Facilities

Related Facility	Drawing No.	Last Revision	Subject / Title
	06021-C4	TBD	Northwest Corner Pond; Sections and Details
	06021-C5	TBD	Northwest Corner Pond; Sump Plan, Sections, and Details
	06021-C6	TBD	Northwest Corner Pond; Leak Detection System Sections and Details
	06021-C7	TBD	Northwest Corner Pond; Leak Detection System Sections and Details

~~1~~1. Drawings cited do not include numerous drawings that present information not directly related to waste or waste water containment. Drawings listed are Executive Secretary approved design drawings, which will be replaced later by final As-Built drawings after approval of the required As-Built Reports.

2. TBD = to be determined after submittal and approval of the required As-Built drawings.

13. Authorized Mixed Waste Cell Engineering Design and Specifications

The best available technology standards for the Mixed Waste Cell shall be defined by those requirements mandated by the Utah Division of Solid and Hazardous Waste State-issued Part B Permit, issued November 30, 1990 (as amended), hereafter State-issued Part B Permit. All Mixed Waste Cell engineering design and specifications shall comply with State-issued Permit, Module V.

E. BAT Performance and Best Management Practice Standards

1. Waste Restrictions

a) Reserved.

b) 11e.(2) Waste – any change effecting the non-radiologic content of the waste to be disposed of in the 11e.(2) portion of the Class A South/11e.(2) Cells, including additional types or concentrations of non-radiologic contaminants, above and beyond those defined in Table 6 below, shall require prior approval from the Executive Secretary, after submittal of satisfactory technical justification to demonstrate that the requirements of Part I.D.1 of this Permit will be met.

c) Solid Waste Landfill Equivalency – PCB/Radioactive Waste as defined in the currently approved Appendix 1 shall only be disposed of as designated in Appendix I.

d) Mixed Waste, Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) Cells – waste to be disposed of in the Mixed Waste, Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) Cells shall be limited to wastes which meet the definition of Class A Low-Level Radioactive Waste (LLRW) under the Utah Radiation Control Rules, UAC R313-15-1008, or are defined as Naturally Occurring and Accelerator Produced Radioactive Materials under the Utah Radiation Control Rules, UAC R313-12-3.

2. Prohibited Wastes

a) Hazardous Waste – the disposal of hazardous waste as defined by the Utah Hazardous Waste Management Rules (UAC R315-2-3) is prohibited in the LARW, Class A, Class A North, and Class A South/~~and~~ 11e.(2) Disposal Cells. The disposal of any LARW, Class A, or 11e.(2) waste that exceeds the regulatory concentration levels of the Toxic Characteristic Leaching Procedure (TCLP) as defined in 40 CFR Part 261 Subpart C, Table 1 is prohibited, unless specifically authorized in Table 6A or 6B, below. Waste samples shall be collected in accordance with the currently approved Waste Characterization Plan (Radioactive Materials License, Condition 58) or the Procedure for Certification of 11e.(2) Waste in the currently approved Appendix E of this Permit, and analyzed for those exclusive parameters listed in Table 6A and 6B, below and for PCB/Radioactive Waste, the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I. Leachate concentrations from the TCLP test shall not exceed the maximum allowable concentrations in Table 6A and 6B, below. The Permittee may use the results of Total analyses to determine whether a TCLP limit may be exceeded by dividing the total analytical result by 15 and comparing the quotient against the TCLP limit to determine if the waste is hazardous.

Table 6A: Maximum Allowable Concentrations in LARW and Class A Waste

Parameter	TCLP Leachate Concentrations (mg/l)		Total Waste Concentration (mg/kg)
Metals	**Regulatory**	**Maximum**	
Arsenic	5.0	NCLS [1]	NCLS
Barium	100.0	NCLS	NCLS
Cadmium	1.0	NCLS	NCLS
Chromium	5.0	NCLS	NCLS
Copper	n/a	NCLS	NCLS
Lead	5.0	NCLS	NCLS
Mercury	0.2	NCLS	NCLS
Selenium	1.0	NCLS	NCLS
Silver	5.0	NCLS	NCLS
Zinc	n/a	9,670	967

1I. NCLS = no concentration limit specified.

The disposal of any waste that exceeds the Maximum Allowable TCLP Leachate Concentration or Total Waste Concentration in Table 6A or Table 6B is prohibited without prior written approval from the Executive Secretary. The disposal of any LARW or 11e.(2) Waste which exceeds the TCLP regulatory concentrations for organic compounds identified in 40 CFR 261.24, Table 1, is expressly prohibited without prior written approval from the Executive Secretary.

Table 6B: Maximum Allowable Concentrations in 11e.(2) Waste

Parameter	TCLP Leachate Regulatory Limit (mg/l)	Total Waste Concentration (mg/kg)
Volatile Organic Compounds		
Acetone	n/a	10.0
2-Butanone	200.0	10.0
Carbon Disulfide	n/a	10.0
Chloroform	6.0	10.0
1,1-Dichloroethane	0.5	10.0
Diethyl Phthalate	n/a	80.0
Methylene Chloride	n/a	70.0
2-Methylnaphthalene	n/a	80.0
Naphthalene	n/a	80.0
1,1,2-Trichloroethane	n/a	7.27
Vinyl Chloride	0.2	0.66

b) Liquid Waste – acceptance of liquids and liquid content of all wastes shall be in accordance with the Radioactive Materials License.

c) Chelating Agents – the disposal of any waste containing chelating agents shall be limited to the Mixed Waste Cell and is prohibited in the LARW, Class A, Class A North, and Class A South/~~and 1~~1e.(2) Disposal Cells. The disposal of any waste in the Mixed Waste Cell containing chelating agents in excess of 22% by weight is prohibited.

3. Failure to Construct as per Approval

Failure to construct any portion of the facility in compliance with the approved engineering design and specifications or in a manner inconsistent with the applicable LLRW and 11e.(2) CQA/QC Plan (Radioactive Materials License UT 2300249, Condition 44 ~~or currently approved Appendix D of this Permit~~) shall be cause for the Executive Secretary to require excavation of the materials and remedial construction, retrofit of the embankment or any other mitigative action to prevent the release of pollutants to soil or ground water.

4. Unsaturated Soil Moisture Content Monitoring

The Permittee shall conduct soil moisture content monitoring to verify performance of the engineered containment systems for the LARW, ~~11e.(2),~~ Class A, ~~and~~ Class A North, and Class A South/11e.(2) Disposal Cells. This monitoring shall consist of instrumentation, as approved by the Executive Secretary, installed in the Cover Test Cell.

This instrumentation and required monitoring shall be used by the Executive Secretary to observe any trend in soil moisture content which may indicate failure of the containment system to control the contaminants disposed of in the embankment. All monitoring shall be conducted in compliance with the currently approved Water Monitoring Quality Assurance Plan provided in Appendix B of this Permit. The Permittee shall maintain and replace all soil moisture instrumentation as directed by the Executive Secretary.

The Executive Secretary reserves the right to require similar soil moisture content monitoring in the radon barrier at the 11e.(2) Cell. The Permittee shall install and make operational any soil moisture instrumentation in compliance with the schedule to be determined by the Executive Secretary.

5. Installation of Additional Vadose Zone Monitoring

Upon any exceedance of the ground water protection levels in leachate which accumulates in the collection lysimeters at the LARW, Class A, ~~or~~ Class A North, or Class A South portion of the Class A South/11e.(2) Cells required by Part I.D.11 or I.F.6 of this Permit or upon any increasing soil moisture trend in the Unit 3 sand, as determined by the Executive Secretary, the Permittee shall:

a) Submit a plan for the installation of vadose zone monitoring devices at the perimeter of the disposal cell(s) in question within 30 days of discovery for Executive Secretary approval. These devices may include suction lysimeters, observation wells, or other devices in accordance with applicable EPA or NRC guidance.

b) Install and make fully operational the vadose zone monitoring equipment within 30 days and using the same infiltration model used by ABC and Whetstone Associates for the LARW and Class A Cells, respectively, of Executive Secretary approval.

6. Open Cell Time Limitation

For each open portion of any disposal cell, the radon barrier shall be constructed and completed in accordance with the approved engineering plans and specifications (Part I.D.2, 3, and 4) within 12 years of the date of initial placement of the first lift of any LLRW waste in that portion of the open cell. Any modification of this 12-year limitation shall require submittal of ground water flow and contaminant transport modeling of open cell conditions or other technical information as necessary, and prior Executive Secretary approval. Said modeling report or other studies must be submitted in their entirety to the Executive Secretary 180 days prior to the expiration date of the respective 12-year open cell time limit. Failure to secure Executive Secretary approval prior to expiration of the 12-year deadline shall not be cause for the Permittee to postpone construction of the cover of any cell in accordance with the currently approved engineering design and specifications in Part I.D.2 or 3 or 4 of this Permit.

7. General Stormwater Management Requirements

The Permittee shall not begin pumpage or remove stormwater that falls inside the restricted area that has not contacted the waste (i.e., non-contact stormwater) before beginning removal of contact stormwater. The Permittee shall contain all stormwater runoff at the Class A, Class A North, and Class A South/ ~~and~~ 11e.(2) Disposal Cells which has contacted the waste (i.e., contact stormwater), including runoff from:

~~a)~~c) Waste disposed in excavated, below grade, areas of the Class A, Class A North, and Class A South/ ~~and~~ 11e.(2) Disposal Cells, and

~~b)~~d) Waste stored on unexcavated portions of the 11e.(2) portion of the Class A South/11e.(2) Disposal Cells.

Said containment inside the Class A, Class A North, Class A South/~~and~~ 11e.(2) Cells shall include control and maintenance of the storm water runoff over a clay liner which has been constructed in compliance with an applicable LLRW and 11e.(2) Construction Quality Assurance/Quality Control Plan. Removal and disposal of contact stormwater shall comply with the following requirements:

~~c)~~e) Within 24 hours of discovery of an accumulation of contact stormwater, the Permittee shall immediately begin pumpage and removal of said wastewater in compliance with the following priority schedule, ranked from highest to lowest priority:

1) Contact stormwater inside the footprint of the Class A, Class A North, and Class A South/~~and~~ 11e.(2) Disposal Cells,

2) Contact stormwater at the Rollover Facility, and

3) Contact stormwater at the Intermodal Unloading Facility.

The Permittee shall pump and remove contact stormwater in an uninterrupted manner until it is completely removed from said location. Under no circumstance will the Permittee begin pumpage and removal of contact stormwater at a lower priority location without first completing removal at all higher priority location(s).

~~d)~~f) All contact stormwater accumulated and pumped shall be disposed of in the evaporation ponds only as explicitly approved by the Executive Secretary. However, contact stormwater from the Class A, Class A North, and Class A South/~~and~~ 11e.(2) disposal cells may be used for minimal engineering and dust control purposes on the waste in the Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) disposal cells. Contact stormwater from the Class A, ~~or~~ Class A South portion of the Class A South/11e.(2), or Class A North disposal cell shall not be used for any purpose in the 11e.(2) portion of the Class A South/11e.(2) disposal cell.

~~e)~~g) Class A Containerized Waste Facility Evaporation Basin – precipitation that falls on the Class A Containerized Waste Facility shall be allowed to accumulate in an engineered evaporation basin constructed behind the containerized waste facility in accordance with the following conditions:

1) The evaporation basin shall be constructed in accordance with the design specifications in engineering drawings listed in Table 5 and the requirements of the currently approved Construction Project Plan for the LLRW Embankment.

2) Fluid head in the evaporation basin shall not exceed a 1-foot level above the lowest point of the bottom clay liner of the basin. The occurrence of fluid levels above this 1-foot maximum allowable head limit shall constitute a violation of this Permit.

3) The Permittee shall ensure that the physical integrity of the clay liner is not compromised by desiccation or freeze/thaw cycles by implementing quality assurance/quality control requirements in the currently approved Construction Project Plan for the LLRW Embankment.

f)h) Class A North Containerized Waste Facility and Large Component Evaporation Basin – precipitation that falls on the Class A North Containerized Waste Facility and Large Component Area shall be allowed to accumulate in an engineered evaporation basin constructed in accordance with the following conditions:

1) The evaporation basin shall be constructed in accordance with the design specifications in engineering drawings listed in Table 5 for the Class A North Embankment and the requirements of the currently approved Construction Project Plan for the LLRW Embankment.

2) Fluid head in the evaporation basin shall not exceed a 1-foot level above the lowest point of the bottom clay liner of the basin. The occurrence of fluid levels above this 1-foot maximum allowable head limit shall constitute a violation of this Permit.

3) The Permittee shall ensure that the physical integrity of the clay liner is not compromised by desiccation or freeze/thaw cycles by implementing quality assurance/quality control requirements in the currently approved Construction Project Plan for the LLRW Embankment.

8. 11e.(2) Waste Management Requirements

The Permittee shall manage the 11e.(2) Waste and related activities at the facility in accordance with all applicable requirements of the currently approved Radioactive Materials License for the following activities and procedures:

a) Spill response and prevention

b) Runon and runoff containment

c) Decontamination of vehicles, equipment, and containers

d) Unloading procedures

e) Waste storage time limits

f) Stormwater/wastewater collection and disposal

g) Leaking waste shipments

In addition, the Permittee shall manage 11e.(2) waste storage and handling in compliance with the containment and spill prevention requirements of Part I.E.10.a of this Permit.

9. 11e.(2) Waste Storage

Storage of 11e.(2) waste at the facility shall be explicitly limited to areas within the confines of the 11e.(2) portion of the Class A South/11e.(2) Disposal Cells having completed and approved clay liner.

10. LARW, Class A, ~~and~~ Class A North, and Class A South ~~Cell~~ Waste Management Performance Requirements

The Permittee shall operate and maintain all facilities in compliance with the following performance requirements:

a) Contaminant Containment and Spill Prevention – the Permittee shall manage all site operations to:

1) Prevent contact of wastes with the ground surface.

2) Prevent spills of wastes or liquids contained therein from any contact with the ground surface or ground water.

3) Prevent contact of surface water or stormwater run-on with the waste.

4) Control any runoff, which may have contacted the waste from subsequent contact with the ground surface or ground water by means of approved engineering containment. Any accumulations of such contact runoff or leachates shall be immediately removed and placed for evaporation disposal in the approved evaporation ponds.

5) Prevent wind dispersal of wastes.

6) Minimize the time any waste is held in temporary storage without disposal in the embankment. In no case shall any waste be stored beyond 365 days after date of waste entry into the controlled area.

7) Identify all wastes held in storage by use of clear and legible placards, signs, or labels which identify the generator, waste stream number and dates that said waste or waste container both entered the controlled area and was placed into temporary storage.

8) Maintain all waste containers in a closed, strong tight and watertight condition.

9) Open-air storage of PCB/Radioactive waste is prohibited. PCB/Radioactive waste located within a disposal cell must be covered at the end of the working day with soil or non-PCB soil-like waste material, or other cover systems (i.e., tarps) to prevent wind dispersal.

10) All containers in storage shall be inspected daily.

11) Waste in bags shall be managed as bulk waste.

b) Containerized Waste Storage Pad – the Permittee shall operate and maintain waste containers and the asphalt surface of the Containerized Waste Storage Pad so as to prevent the discharge of stormwater or leachate to subsurface soils or ground water, by completing the following actions. Also, for PCB/Radioactive Waste, the currently approved Plan for the Management of

Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I as applicable:

1) Repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas found in the asphalt surface as soon as possible after discovery.

2) Fill any areas of subsidence and return the asphalt surface to its original design grade permeability, and appearance, in order to prevent the impoundment of any storm water or leachate on the pad as soon as possible after discovery.

3) Prevent contact of waste with precipitation or stormwater by maintaining all containers in a closed and watertight condition.

4) Manage leaking containers in accordance with the Waste Characterization Plan and Radioactive Materials License.

5) Adequately operate and maintain the stormwater collection sump, pump, and pipeage to ensure containment and conveyance of stormwaters to the approved evaporation ponds-. Under no circumstances are stormwaters to be maintained in the collection sump for more than 72 hours at any time.

c) Management and Temporary Storage of Mobile Waste

1) All temporary storage of mobile waste, as defined by Part I.D.7 of this Permit, shall be limited to only the Containerized Waste Storage Pad.

2) Open-air storage of mobile waste is expressly prohibited.

d) Prohibition and Restrictions for Dry Active Waste Storage – dry active waste is defined as contaminated materials without soil-like texture or characteristics, and have a dry weight density of 70 pounds per cubic foot or less (e.g., contaminated paper, plastic, personal protective equipment, cloth, or other similar soft-type debris). Open-air storage of dry active waste is prohibited at the facility. All temporary storage of dry active waste shall be conducted either inside buildings or in watertight containers at the Containerized Waste Storage Pad. Dry active waste located within a disposal cell must be covered at the end of the working day with soil or soil-like waste material to prevent wind dispersal.

e) Intermodal Unloading Facility – the Permittee shall operate and maintain the LARW Intermodal Unloading Facility to provide free draining conditions on both the unloading pad and in the stormwater drainage pipeline system.

f) Containerized Waste Management – the following locations are approved for management and storage of Class A waste received in containers (does NOT include waste received for disposal in the Containerized Class A Facility):

- Containerized Waste Storage Pad
- Intermodal Unloading Facility

- Railcar Rollover Facility
- East Truck Unloading Facility
- Decontamination Facilities (Box Wash, Rail Car Wash Track #2 and #4)
- Class A Disposal Cells
- Shredder Facility
- Rotary Dump Facility

g) Bulk Waste Management – the following locations are approved for management and storage of bulk Class A waste:

- Intermodal Unloading Facility
- Railcar Rollover Facility
- East Truck Unloading Facility (raised dock area excluded)
- Decontamination Facilities (Box Wash, Rail Car Wash Track #2 and #4)
- Class A Disposal Cells
- Rail Digging Facility (bulk waste transfer only, waste storage prohibited)
- Shredder Facility in accordance with requirements in the currently approved Appendices I and J
- Rotary Dump Facility

11. LARW, Class A, Class A North, Class A South portion of the Class A South/11e.(2) Cell Collection Lysimeters: Operation, Maintenance and Annual Inspection

The Permittee shall operate and maintain all collection lysimeters in compliance with the currently approved Appendix C of this Permit. Said operation shall include at least an annual video log inspection of each collection lysimeter constructed at the LARW, Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) Cells. Each video inspection shall log the entire length of the drainage pipe to ensure proper operation and free drainage of each collection lysimeter. Failure to satisfactorily complete an annual video log inspection or a determination that free draining conditions no longer exist in a collection lysimeter shall constitute failure to maintain best available technology pursuant to Part I.G.4 of this Permit. Such failures shall be reported to the Executive Secretary in accordance with the requirements of Part I.H.10 of this Permit.

12. Stormwater Drainage Works Performance Criteria

All stormwater drainage works constructed and operated at the LARW, Class A, Class A North, and Class A South/ ~~and~~ 11e.(2) facilities shall be performed in accordance with the following criteria:

~~a)~~h) Seepage Control to Prevent Ground Water Mounding – all drainage works at the facility shall be constructed of either low-permeability clay liner materials or of an impermeable man-made conveyance in order to control and prevent any alteration of local natural ground water hydraulic gradients or velocities. This infiltration control shall address seepage during periods of storm water storage in the drainage system.

~~b)~~i) Free Drainage – all stormwater drainage works shall be free draining and under gravity conditions shall convey stormwater from the contributing facilities to an off-site location.

~~c)~~j) Temporary Stormwater Drainage Works – plans and specifications for any temporary stormwater drainage works shall be submitted for Executive Secretary review and approval prior to installation. As-Built reports shall be submitted for Executive Secretary approval within 30 days following installation. Prior to site closure, the Permittee shall remove all temporary stormwater drainage works (e.g., drainage grates, piping, ditches, etc. not approved under Part I.D.4) as part of the site Decontamination and Decommissioning Plan required under Radioactive Materials License, Condition 74.

13. 11e.(2) Clay Layer Approval

Before placement of overlying materials, the Permittee shall secure Executive Secretary approval of construction of final clay liner and radon barrier layers at the 11e.(2) portion of the Class A South/11e.(2) Cell.

14. Wastewater Management Requirements

The Permittee shall operate and maintain all wastewater storage, treatment, and disposal facilities in accordance with Best Available Technology requirements approved by the Executive Secretary, as follows:

~~a)~~k) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Ponds – the Permittee shall operate and maintain the 1995, 1997, 2000 , and Northwest Corner evaporation ponds and the Mixed Waste evaporation pond to prevent release of fluids to subsurface soils or groundwater, in accordance with the following requirements:

1) Leak Detection System Pumping and Monitoring Equipment Continuous Operation – the Permittee shall provide continuous operation of the leak detection system pumping and monitoring equipment, including, but not limited to, the submersible pump, pump controller, head/pressure transducer, and flow meter equipment approved by the Executive Secretary. Failure of any pumping or monitoring equipment not repaired and made fully operational within 24 hours of discovery shall constitute failure of Best Available Technology and a violation of this Permit.

2) Maximum Allowable Daily Leakage Volumes – the Permittee shall measure the daily volume of all fluids pumped from the respective leak detection systems of the 1995, 1997, 2000, Mixed Waste, and

Northwest Corner evaporation ponds. Under no circumstance shall the daily leak detection system flow volume, as determined pursuant to Part I.F. a.3, exceed the following limits:

i)	1995 Evaporation Pond:	162 gallons/day
ii)	1997 Evaporation Pond:	171 gallons/day
iii)	Mixed Waste Evaporation Pond:	171 gallons/day
iv)	2000 Evaporation Pond:	382 gallons/day
v)	Northwest Corner Evaporation Pond:	326 gallons/day

Daily leak detection system flow volumes in excess of these limits shall constitute failure of Best Available Technology and a violation of this Permit.

3) Maximum Allowable Head – the Permittee shall measure fluid head in the respective leak detection sumps of the 1995, 1997, 2000, the Mixed Waste, and Northwest Corner evaporation ponds by use of pressure transducer equipment approved by the Executive Secretary. Under no circumstance shall fluid head in the leak detection system sump exceed a 1-foot level above the lowest point in the lower flexible membrane liner. The occurrence of leak detection system fluid levels above this 1-foot limit shall constitute failure of Best Available Technology and a violation of this Permit.

4) 2-foot Minimum Vertical Freeboard Criteria – the Permittee shall operate and maintain at least 24 inches of vertical freeboard in the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds to ensure total containment of fluids. This vertical distance shall be determined by use of a gauging station approved by the Executive Secretary. If at any time the Permittee operates the pond with less than 24 inches of vertical freeboard, such operation shall constitute failure of Best Available Technology and a violation of this Permit.

5) PCB Monitoring – the Permittee shall monitor for PCBs according to the requirements of this Permit, or its appendices, or as required by the Executive Secretary.

~~b)~~l) Box-Washing Facility – the Permittee shall operate and maintain the Box-Washing Facility to ensure:

1) Free draining conditions exist across the floor to the wastewater collection sumps.

2) The integrity of the concrete working surface to prevent discharge.

3) Water level is maintained below the collection sump grate.

4) Maintenance of a freeboard in each concrete wastewater storage tank (at or below three fourths full).

~~e)~~m) Rail Car Wash Facilities – the Permittee shall operate and maintain the new Rail Car Wash Facility on Track No. 4 and the old Rail Car Wash Facility on Track No. 2 in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

15. Filter Construction Settlement Performance Standards

Cover system filter placement shall begin only after the Permittee demonstrates that 95% of the maximum consolidation has been achieved at the upper surface of the radon barrier. Any filter construction undertaken without this demonstration and prior Executive Secretary approval shall constitute a violation of this Permit.

16. Mixed Waste Cell BAT Performance and Best Management Practice Standards

Performance and best management practice standards for waste storage, and stormwater and wastewater storage, treatment, and disposal at the Mixed Waste Cell shall be defined by requirements mandated by the State-issued Part B Permit.

17. Railcar Rollover Facility BAT Performance and Best Management Practice Standards

The Permittee shall operate and maintain the railcar rollover facility to ensure the physical integrity and the asphalt ramps and concrete bay to prevent discharge to the subsurface. Daily inspections shall be documented to ensure compliance with the stormwater management requirements in Part I.E.7c.2.

On an annual basis during the second quarter of each year, the Permittee shall remove all waste from the facility, pressure wash all surfaces to remove all foreign material, and inspect the entire concrete bay and asphalt ramps of the rollover facility. The Permittee shall repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas prior to resuming use of the facility. The Permittee shall submit a written notice of inspection to the Executive Secretary at least one week prior to the annual inspection to allow the Executive Secretary the opportunity to have a DRC representative present.

18. Evaluation of Effect of Proposed Pumping Well(s)

The Permittee will evaluate the effect of any proposed pumping well at the facility on the local ground water flow field and ground water monitoring. This evaluation will be undertaken with the use of analytical or numeric ground water flow models, which conform to the guidance provided to the Permittee by the Bureau of Radiation Control in the November 26, 1990 Notice of Deficiency, Comment WPC-1 K. The Permittee will submit the results of this evaluation and receive Executive Secretary approval before any construction of the withdrawal well.

19. Management of 2000 Evaporation Pond Waste Material

The Permittee shall dispose of all waste material generated during the everyday use and operation of the pond in the Class A, ~~or~~ Class A North, or Class A South portion of the Class A South/11e.(2) Cell only. Waste material includes, but is not limited to: sludge, soil contaminated from spills or releases, miscellaneous debris, and material or equipment repaired or replaced such as synthetic liner, pumps, piping, cables, floats, etc. All material associated with the final demolition of the pond, including underlying contaminated soil, must be disposed of in the Class A, ~~or~~ Class A North, or Class A South portion of the Class A South/11e.(2) Cell and is expressly prohibited from disposal in the 11e.(2) portion of the Class A South/11e.(2) cell.

20. Shredder Facility

The Permittee shall operate and maintain the Shredder Facility:

a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

b) To ensure the physical integrity of all concrete surfaces to prevent discharge to subsurface soils or ground water.

c) On an annual basis during the second quarter of each year, the Permittee shall remove all waste from the Shredder Facility, pressure wash all surfaces to remove all foreign material, and inspect all concrete surfaces. The Permittee shall repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas prior to resuming use of the facility. At least one week prior to the annual inspection the Permittee will submit written notice to allow the Executive Secretary the opportunity to have a DRC representative present.

d) To ensure that free draining conditions over the entire concrete pad to each of the seven catch basins, and to ensure the water level in each catch basin is below its respective grate.

e) To ensure wastewater level in Manhole #1 is maintained at or below the invert to the outlet pipe, and free draining conditions exist in the conveyance pipe to the Rotary Dump Sediment Basin.

21. Rotary Dump Facility

The Permittee shall operate and maintain the Rotary Dump Facility: Intermodal Container Wash Building – the Permittee shall operate and maintain the Intermodal Container Wash Building:

a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

b) To ensure the physical integrity of all concrete surfaces to prevent discharge to subsurface soils or ground water.

c) On an annual basis during the second quarter of each year, the Permittee shall remove all waste from the Rotary Dump Facility and pressure wash all surfaces to remove all foreign material, and inspect all surface areas of the concrete access drives and concrete floor of the Rotary Dump Building. The

Permittee shall repair or otherwise seal and render impermeable any and all cracks, ruptures, damage, or porous areas prior to resuming use of the facility. At least one week prior to the annual inspection, the Permittee shall submit written notice to allow the Executive Secretary the opportunity to have a DRC representative present.

d) To ensure that free draining conditions exist in all wastewater transfer pipes without release or discharge to subsurface soils or ground water.

e) To ensure the leak detection annulus of the sediment basin is free of fluids.

f) To ensure the water level in the sediment basin is below the level of the grate covering the pump sump.

g) The dual-walled pipe used to transfer fluids from the sediment basin is free draining, and the leak detection annulus within the secondary pipe is free of fluids.

22. <u>Intermodal Container Wash Building</u>

The Permittee shall operate and maintain the Intermodal Container Wash Building:

a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

b) To ensure free draining conditions exist:

   i) Within each wash bay and trench drain to the sediment basin, and

   ~~ii)~~i) From each boot wash station to the sediment basin.

c) To ensure the integrity of all concrete surfaces to prevent discharge of waste water to subsurface soils or ground water.

d) To ensure the sediment basin provides a total containment system and does not cause a direct or in-direct discharge to subsurface soils or ground water.

e) To ensure the water level in the sediment basin is always maintained below the grate located over the pump sump.

f) To ensure the leak detection annulus of the sediment basin is free of liquids.

g) To ensure the dual-walled pipe used to transfer fluids from the sediment basin is free draining, and the leak detection annulus within the secondary pipe is free of fluids.

23. <u>Decontamination Access Control Building</u>

The Permittee shall operate and maintain the Decontamination Access Control Building:

a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

b) To ensure free draining conditions exist from the bootwash and all graywater lines (i.e., eyewash, emergency shower, respirator wash sink, etc.) to the underground wastewater collection tank located outside the southeast corner of the building.

c) To ensure the dual-walled leak detection annulus of the wastewater collection tank is maintained free of fluids.

d) To ensure the fluid level in the wastewater collection tank is maintained below the invert of the inlet pipe.

e) To ensure the dual-walled piping from the wastewater collection tank to the 1997 Evaporation Pond via the East Side Drainage System is free draining and the leak detection annulus within the secondary pipe remains free of fluids.

24. East Side Drainage Project

The Permittee shall operate and maintain the East Side Drainage Project:

a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively, of the Permit.

b) To ensure the leak detection annulus of the dual-walled piping system is always maintained free of fluids, including the drip pans found inside manholes #1 and #2.

c) To ensure the fluid level in the 11 stormwater catch basins is always maintained below the level of their respective outlet pipes.

d) To ensure the stormwater, graywater, and wastewater piping throughout the entire East Side Drainage Project remains free draining at all times.

e) To ensure the fluid level in the stormwater lift sump is always maintained below the level of the inlet piping.

F. Compliance Monitoring

1. Compliance Monitoring Wells

Ground water monitoring wells used as compliance monitoring points shall meet the following requirements:

a) LARW, Class A, Class A North, Class A South, and 11e.(2) Compliance Monitoring Wells – the following wells shall be sampled and analyzed for purposes of compliance monitoring:

1) LARW Cell – existing wells GW-128, GW-16R, GW-20, GW-22, GW-23, GW-24, GW-29, GW-56R, GW-64, GW-77, GW-103, GW-104, and GW-105.

2) 11e.(2) portion of the Class A South/11e.(2) Cell – existing wells GW-1, GW-2, GW-3, GW-4, GW-93, GW-92, ~~GW-19A,~~ GW-20, GW-24,

b) To ensure free draining conditions exist from the bootwash and all graywater lines (i.e., eyewash, emergency shower, respirator wash sink, etc.) to the underground wastewater collection tank located outside the southeast corner of the building.

c) To ensure the dual-walled leak detection annulus of the wastewater collection tank is maintained free of fluids.

d) To ensure the fluid level in the wastewater collection tank is maintained below the invert of the inlet pipe.

e) To ensure the dual-walled piping from the wastewater collection tank to the 1997 Evaporation Pond via the East Side Drainage System is free draining and the leak detection annulus within the secondary pipe remains free of fluids.

24. East Side Drainage Project

The Permittee shall operate and maintain the East Side Drainage Project:

a) In accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively, of the Permit.

b) To ensure the leak detection annulus of the dual-walled piping system is always maintained free of fluids, including the drip pans found inside manholes #1 and #2.

c) To ensure the fluid level in the 11 stormwater catch basins is always maintained below the level of their respective outlet pipes.

d) To ensure the stormwater, graywater, and wastewater piping throughout the entire East Side Drainage Project remains free draining at all times.

e) To ensure the fluid level in the stormwater lift sump is always maintained below the level of the inlet piping.

F. Compliance Monitoring

1. Compliance Monitoring Wells

Ground water monitoring wells used as compliance monitoring points shall meet the following requirements:

a) LARW, Class A, Class A North, Class A South, and 11e.(2) Compliance Monitoring Wells – the following wells shall be sampled and analyzed for purposes of compliance monitoring:

1) LARW Cell – existing wells GW-128, GW-16R, GW-20, GW-22, GW-23, GW-24, GW-29, GW-56R, GW-64, GW-77, GW-103, GW-104, and GW-105.

2) 11e.(2) portion of the Class A South/11e.(2) Cell – existing wells GW-1, GW-2, GW-3, GW-4, GW-93, GW-92, ~~GW-19A.~~ GW-20, GW-24,

~~GW-25, GW-26, GW-27, GW-28,~~ GW-29, ~~GW-36, GW-37*, GW-38R*, GW-57, GW-58,~~ GW-60, ~~GW-63,~~ GW-126, and GW-127.

~~* Wells 37 and 38R shall be monitored only for ground water elevations.~~

3) Class A Cell – existing wells GW-81, GW-82, GW-83, GW-84, GW-85, GW-86, GW-88, GW-89, GW-90, GW-91, GW-92, GW-93, GW-94, GW-95, GW-99, GW-100, GW-101, and GW-102.

4) Class A North Cell – existing wells GW-106, GW-107, GW-108, GW-109, GW-110, GW-111, GW-112, GW-113, GW-114, GW-115, GW-116, GW-117, and GW-125.

5) Class A South portion of the Class A South/11e.(2) Cell- existing wells GW-25, GW-26, GW-27, GW-57, GW-28, GW-58, GW-19A, GW-63, GW-1, GW-2, GW-3, GW-4, GW-93, and GW-92.

b) Mixed Waste Cell Compliance Monitoring Wells (radiologic contaminants only) – including wells defined on drawing 0201-KO6 Rev. B, dated January 6, 2003, shall be sampled and analyzed for purposes of compliance monitoring, as follows: GW-41, GW-42, GW-67, GW-68, GW-69, GW-70, GW-118, GW-119, GW-120. GW-121, GW-122, GW-123R, GW-124, and I-1-30.

c) Evaporation Pond Monitoring Wells – monitoring wells P3-95 NEC, P3-95 SWC, P3-97 NEC, and P3-97 NECR shall be sampled and analyzed for purposes of compliance monitoring for the 1995 and 1997 Ponds, well GW-66R shall be sampled and analyzed for purposes of compliance monitoring for the Mixed Waste Pond, and wells GW-19A, GW-36, and GW-58 shall be sampled and analyzed for purposes of compliance monitoring for the 2000 Evaporation Pond in addition to the 11e.(2) portion of the Class A South/11e.(2) cell. Monitoring well GW-129 shall be sampled and analyzed for purposes of compliance monitoring for the Northwest Corner Evaporation Pond.

d) Well Construction Criteria – any ground water monitoring well used as a compliance monitoring point shall be:

1) Located hydrologically downgradient of waste disposal,

2) Completed exclusively in the uppermost aquifer,

3) Located as close as practicable to the waste and no more than 90 feet from edge of waste,

4) Constructed in conformance to guidelines found in the EPA RCRA Ground Water Monitoring Technical Enforcement Guidance Document, 1986, OSWER-9950.1.

e) Well Network Early Warning Requirement – any network of ground water monitoring wells used as points of compliance shall be adequately constructed, both in location and spacing, to provide early warning of a contaminant release from a waste embankment before the contaminant leaves the embankment's 100-foot wide buffer zone, as defined in Table 7, below. For purposes of this Permit, early warning shall be provided by a compliance monitoring well network with an inter-well spacing distance to be approved by the Executive Secretary.

f) Buffer-Zone Requirements – waste disposal is prohibited inside the buffer zone, as described in Tables 3 and 7 of this Permit.

Table 7: Buffer Zone Boundary Locations

Disposal Cell	Edge of Buffer Zone Position	Coordinates	
		Latitude	Longitude
LARW	NW Corner	40° 41' 11.839937" N	113° 6' 52.144756" W
	SW Corner	40° 40' 51.390522" N	113° 6' 52.483065" W
	SE Corner	40° 40' 51.242105" N	113° 6' 35.313888" W
	NE Corner	40° 41' 11.689043" N	113° 6' 35.074346" W
Class A	NW Corner	40° 41' 28.993053" N	113° 7' 25.146795" W
	SW Corner	40° 41' 13.186476" N	113° 7' 25.452238" W
	SE Corner	40° 41' 12.729096" N	113° 6' 53.528644" W
	NE Corner	40° 41' 28.535969" N	113° 6' 53.222876" W
Class A North	NW Corner	40° 41' 39.45503" N	113° 7' 24.88218" W
	SW Corner	40° 41' 29.49834" N	113° 7' 25.11180" W
	SE Corner	40° 41' 29.09492" N	113° 6' 54.99235" W
	NE Corner	40° 41' 39.05149" N	113° 6' 54.76161" W
Class A South portion of the Class A South/11e.(2)	NW Corner	40° 41' 13.520469" N	113° 7' 25.336344" W
	SW Corner	40° 40' 54.015381" N	113° 7' 25.983192" W
	SE Corner	40° 40' 53.624289" N	113° 7' 8.390974" W
	NE Corner	40° 41' 13.134998" N	113° 7' 7.749387" W
11e.(2) portion of the Class A South/11e.(2)	NW Corner	40° 41' 13.134998" N~~40° 41' 13.520469" N~~	113° 7' ~~25.336344~~7.749387" W
	SW Corner	40° 40' ~~54.015381~~53.624289" N	113° 7' ~~25.983192~~8.390974" W
	SE Corner	40° 40' 53.390682" N	113° 6' 54.216013" W
	NE Corner	40° 41' 12.901791" N	113° 6' 53.560833" W

g) Protection of Monitoring Network – all compliance monitoring wells must be protected from damage due to surface vehicular traffic or contamination due to surface spills. All monitoring wells shall be maintained in full operational condition for the life of this Permit.

The criteria for determining full operational condition are:

1) Accessibility – each well must be accessible for sampling and shall not be located in an area of standing water.

2) Casing Measuring Point – each well shall have a permanent surveyed reference point such as the top of the protective casing.

3) Physical Integrity – any physical disturbance to any well, which may alter the surveyed water level measuring point, is prohibited. In

addition, all wells shall have an adequate surface seal around the well casing to prevent surface or storm water from entering the well.

4) Chemical Integrity – all well and sampling materials shall be constructed of inert materials to prevent the introduction of contaminants from leaching or corrosion.

5) Silt Content – if the measured water column of any well is less than 90% of the theoretical water column, the monitoring well shall be redeveloped prior to sampling.

Any well that becomes damaged beyond repair or is rendered unusable for any reason will be replaced by the Permittee within 90 days or as directed by the Executive Secretary.

2. BAT Compliance Monitoring Points

The Permittee shall inspect, sample, analyze, or otherwise monitor other points of compliance in order to confirm compliance with this Permit. These points or instruments shall include:

a) East Truck Unloading Area – including monitoring of free draining conditions to the stormwater collection troughs, water level in the collection troughs, and physical condition/integrity of all exposed asphalt and concrete surfaces.

b) LARW, Class A, ~~and~~ Class A North, and Class A South Cell Collection Lysimeters – all collection lysimeters constructed at the LARW, Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) Cells in accordance with the requirements of Part I.D.10 of this Permit.

c) LARW Containerized Waste Storage Pad – including monitoring of water in the stormwater collection sump and physical condition of containers on the pad.

d) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation ponds – including monitoring of: 1) vertical freeboard at the water level gauging stations approved by the Executive Secretary, 2) operational status and required BAT performance parameters of all leak detection pump-back system equipment, including but not limited to, leak detection system pump, head pressure transducer, and flow meters required by Part I.E.14.a.2 of this Permit and approved by the Executive Secretary.

e) Intermodal Unloading Facility – including monitoring of free draining conditions at both the unloading pad and throughout the length of the contact stormwater drainage discharge pipeline that discharges to the 1995 and 1997 evaporation ponds.

f) Box-Washing Facility – including monitoring of free draining conditions, physical condition and integrity of concrete floor and floor sumps, sump pump in floor sump is operational, free drainage is maintained through the pipeline discharging wastewater into the concrete holding tanks, and water level in concrete holding tanks is maintained at or below three-quarters full.

g) Track No. 4 and Track No. 2 Rail Car Wash Facilities – including monitoring of free draining conditions and physical condition and integrity of rail bay concrete floor, floor sumps, conveyance pipe, Collected Water Receiver Tank, Filtered Water Storage Tank, and concrete secondary containment vault.

h) Rail Digging Facility – including monitoring of free draining conditions to the concrete collection basins and throughout the drainage system after the collection basins, and physical integrity of the asphalt and concrete surfaces.

i) Shredder Facility – including monitoring to determine:

   1) Free draining conditions throughout the concrete surfaces to the seven catch basins,

   2) Physical integrity of all concrete surfaces,

   3) Water level at each catch basin and manhole, and

   4) Free draining conditions of all wastewater transfer piping.

j) Rotary Dump Facility – including monitoring to determine:

   1) Free draining conditions, physical condition, and integrity of all concrete surfaces,

   2) Presence or absence of fluids in the Sediment Basin leak detection annulus,

   3) Water level in the sediment basin,

   4) Free draining conditions in all wastewater transfer piping, and

   5) Presence or absence of fluids in the leak detection annulus within the secondary pipe of all dual-walled wastewater transfer piping systems.

k) Intermodal Container Wash Building – including monitoring to determine:

   1) Free draining conditions, physical condition, and integrity of concrete floor and floor trenches,

   2) Presence or absence of fluids in the sediment basin leak detection annulus,

   3) Fluid level in the sediment basin, and

   4) Presence or absence of fluids in the leak detection annulus within the secondary pipe of all dual-walled wastewater transfer piping systems.

l) Decontamination Access Control Building – including monitoring to determine:

   1) Free draining conditions in all wastewater transfer piping,

   2) Presence or absence of fluids in the gray water collection tank leak detection annulus,

   3) Water level in the gray water collection tank, and

4) Presence or absence of fluids in the leak detection annulus within the secondary pipe of all dual-walled wastewater transfer piping systems.

m) East Side Drainage Project – including monitoring to determine the presence or absence of fluids in the leak detection annulus within the secondary piping of all dual-wall wastewater transfer systems. All dual-walled pressurized pipe connected to the East Side Drainage Project, that does not gravity drain to a leak detection port, including both primary and secondary piping, shall be pressure tested annually by an independent Professional Engineer registered in the State of Utah.

3. Future Modification of Compliance Monitoring Systems or Equipment

If at any time the Executive Secretary determines that additional systems, mechanisms or instruments are necessary to monitor ground water quality or Best Available Technology compliance at the facility, the Permittee shall submit within 30 days of receipt of notification, a plan and compliance schedule to modify the compliance monitoring equipment, for Executive Secretary approval. Any failure to construct the required compliance monitoring system or equipment in accordance with the approved plan and schedule shall constitute a violation of this Permit.

4. Compliance Monitoring Period

Monitoring shall commence upon issuance of this Permit, or upon:

a) Completion of each collection lysimeter in accordance with Part I.D.11 of this Permit and

b) Completion of the soil moisture instrumentation required by Part I.E.4.

Thereafter, compliance monitoring shall continue through the life of the Permit.

5. Monitoring Requirements and Frequency

Measurements or analysis done for monitoring will be conducted in compliance with the requirements below, and reported to the Executive Secretary as per the requirements of Part I.H.

a) Water Level Measurements – water level measurements shall be made monthly in each monitoring well and piezometer. Measurements made in conjunction with semiannual ground water sampling shall be completed prior to any collection of ground water samples in accordance with the currently approved Water Monitoring Quality Assurance Plan in Appendix B of this Permit. These measurements will be made from a permanent single reference point clearly demarcated on the top of the well or surface casing. Measurements will be made to the nearest 0.01 feet.

b) Specific Gravity Measurements – ground water-specific gravity measurements shall be made semiannually in each monitoring well and piezometer in conjunction with each semiannual ground water quality sampling event.

c) Ground Water and Pore Water Quality Sampling and Analysis – except for arsenic and molybdenum, grab samples of ground water from compliance monitoring wells and pore water from lysimeters (as available) will be collected for chemical analysis on a semiannual basis, in conformance with Part II.A and B and the currently approved Water Monitoring Quality Assurance Plan in Appendix B of this Permit. Arsenic 5 years at License and Permit renewal.

1) Ground/Pore Water Analytical Methods – methods used to analyze ground water samples must comply with the following:

i) Are methods cited in UAC R317-6-6.3A(13) or have been approved by the Executive Secretary in the currently approved Water Monitoring Quality Assurance Plan, Appendix B of this Permit, and

ii) Have detection limits which do not exceed the Ground Water Quality Standards or Protection Levels listed in Tables 1A and 1C of this Permit.

2) Analysis Parameters – the following analyses will be conducted on all samples collected for ground water monitoring:

i) Field Parameters – dissolved oxygen, pH, temperature, specific gravity, and specific conductance.

~~iii)~~ii) Laboratory Parameters – including:

- General Inorganic Parameters: Chloride, Sulfate, Carbonate, Bicarbonate, Sodium, Potassium, Magnesium, Calcium, bromide, iron, and total anions and cations
- Total PCBs if requested by the Executive Secretary according to the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I
- General Radiologic Parameters: potassium-40, gross beta
- All Protection Level Parameters – individual analysis for all parameters found in Part I.C, Tables 1A, 1B, 1C, 1D, 1E, and 1F of this Permit
- Radiologic Parameters for Wells at the 11e.(2) Cells, including: radium-226, radium-228, thorium-230, thorium-232, and total uranium

3) Arsenic and Molybdenum – arsenic and molybdenum samples will be collected for chemical analysis every 5 years at License and Permit renewal.

6. Suction and Collection Lysimeter Sampling

Suction and collection lysimeter sampling shall be conducted in compliance with the currently approved Water Monitoring Quality Assurance Plan approved by the Executive Secretary, as provided in Appendix B of this Permit. Sample analysis shall conform to the requirements of Part I.F.5(c) of this Permit.

For collection lysimeters water quality samples shall be collected within 24 hours of initial discovery of fluid. The priority of sample parameters shall conform to the currently approved Appendix C of this Permit, with special emphasis on selection of mobile and predominant contaminants found within the capture area of the lysimeter.

7. Modification of Monitoring or Analysis Parameters

If at any time the Executive Secretary determines the monitoring or analysis parameters to be inadequate, the Permittee shall modify all required monitoring parameters immediately after receipt of written notification from the Executive Secretary. Upon any change in the approved waste parameters defined in Conditions 6, 7, and 8 of the Utah Radioactive Materials License UT 2300249, dated September 10, 1993, the Permittee shall revise the currently approved Water Monitoring Quality Assurance Plan in Appendix B.

8. Waste Characterization Monitoring

a) LARW and Class A Waste – all LARW and Class A waste received by the Permittee shall be fully characterized to determine its chemical and radiological constituents and the presence and concentration of any chelating agents both before shipment and emplacement for disposal, in accordance with the requirements of the currently approved Waste Characterization Plan in the Radioactive Materials License UT 2300249, Condition 58 and for PCB/Radioactive Waste, in the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I. Said waste characterization shall include sampling and analysis of all contaminants authorized by Part I.E.1 and of those prohibited by Part I.E.2 of this Permit.

b) 11e.(2) Waste – all 11e(2) Waste received by the Permittee shall be fully characterized both before shipment and after arrival at the facility to identify any new non-radiologic contaminants not authorized by this Permit by Parts I.C.1 and I.F.5.b.2. Said waste characterization shall include sampling and analysis of all non-radiologic contaminants prohibited by Part I.E.2 of this Permit.

The Permittee shall maintain records of all LARW, Class A, and 11e.(2) Waste sampling and analysis on site.

9. Waste Liquid Content Monitoring

All wastes received shall be tested in a representative manner by the Paint Filter Liquids Test in accordance with the currently approved LLRW Waste Characterization Plan in the Radioactive Materials License, Condition 58. In accordance with UAC R323-15-1008(2)(a)(iv), solid waste received for disposal shall contain as little free-standing and non-corrosive liquid as reasonably achievable, but shall contain no more free liquids than 1% of the volume of the waste. In the event that solid waste is received or observed to contain free liquids in excess of 1% by volume, the Licensee/Permittee shall immediately notify the Division of Radiation Control that the shipment(s) failed the requirements for acceptance.

10. Post-Closure Monitoring

Post-closure monitoring shall conform to the requirements of the currently approved Post-Closure Monitoring Plan in Appendix F of this Permit.

11. On-Site Meteorological Monitoring

The Permittee shall provide continuous monitoring of the following minimum meteorological parameters for the standard meteorological year of October 1 through September 30, in accordance with the currently approved Weather Station Monitoring Plan found in Appendix G of this Permit:

a) Wind direction and speed

b) Temperature

c) Daily Precipitation

d) Pan evaporation

The Permittee shall maintain records of this monitoring on site. The Permittee shall submit an annual meteorological report for the facility in compliance with the requirements of Part I.H.10 of this Permit. The objective of this report shall be to show that the meteorological assumptions made in the infiltration and unsaturated zone modeling used to support issuance of the Permit were conservative or representative of the actual conditions at the site. In addition, and in conjunction with an application for permit renewal, 180 days before expiration of the Permit, the Permittee shall submit a summary report of all meteorological data collected since issuance of the last Permit (minimum of 4 years of data). Said report shall compare the data observed against regional normal values, as available, and provide summary statistics of all meteorological data collected.

12. Containerized Waste Storage Area: Leakage/Spill Monitoring and BAT Status

The Permittee shall conduct daily inspections of the containerized waste storage area in order to remediate any container leakage or spillage in accordance with the currently approved BAT Performance Monitoring Plan in Appendix J of this Permit, and for PCB/Radioactive Waste, in the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I. Said inspections shall also evaluate compliance with the Best Available Technology requirements of Part I.E.10 of this Permit. The Permittee shall maintain a written record of these inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

13. Evaporation Ponds Monitoring

a) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Pond Daily Monitoring – the Permittee shall conduct daily inspections of the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds to determine compliance with the Best Available Technology requirements of Part I.E.14.a of this Permit, including:

1) Measurement of pond water level, relative to pond spillway centerline, to determine pond freeboard.

2) Determination of operational status of leak detection system pump, pump controller, head/pressure transducer, and flow meter equipment.

3) Measurement of daily leak detection system flow volume. For BAT compliance monitoring purposes for the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds, the Permittee shall calculate an average daily leakage volume across a consecutive 6-day period. The Permittee shall perform this calculation for each evaporation pond weekly.

4) Measurement of daily leak detection system head. For BAT compliance monitoring purposes for the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds, the Permittee shall determine the maximum head limit to be measured by the approved head/pressure transducer construction that complies with the 1-foot BAT head performance standard of Part I.E.14.a.3. On a daily basis, the Permittee shall compare the daily measured head against the maximum head limit for each evaporation pond.

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

b) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Pond Leak Detection System Pump Tests – the Permittee shall conduct a pump test of the evaporation pond's leak detection sump within 5 days of discovery that the average daily leak detection system flow volume (Part I.F.1.a.3) exceeds the following limits:

1)	1995 Evaporation Pond:	155 gallons/day
2)	1997 Evaporation Pond:	160 gallons/day
3)	Mixed Waste Evaporation Pond:	160 gallons/day
4)	2000 Evaporation Pond:	355 gallons/day
5)	Northwest Corner Evaporation Pond:	300 gallons/day

Said pump test shall comply with the currently approved BAT Contingency Plan in Appendix K of this Permit.

c) Semiannual Monitoring – on a semiannual basis, the Permittee shall:

1) Collect water quality samples from fluids stored in the approved evaporation ponds.

2) Analyze said water samples for all ground water quality protection level parameters defined in Part I.F.5.b.2 Table 1A, above, including a complete gamma spectroscopic analysis.

Sampling and analyses at all evaporation ponds shall comply with the currently approved Water Monitoring Quality Assurance Plan in Appendix B of this Permit.

d) Annual Pump Inspection – on an annual basis, the Permittee shall remove the submersible pump from the leak detection system of the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds and check both the winding resistance and insulation resistance. If either the winding resistance or insulation resistance is outside of the manufacturer specifications, the pump will be replaced and/or repaired with a pump that satisfies all manufacturer specifications within 24 hours. Within 30 days of completing the annual pump inspection, a bor-o-scope video inspection shall be performed to ensure the pump was correctly reinstalled.

14. Confined Aquifer Head Monitoring

The Permittee shall conduct monthly monitoring of water levels and semiannual specific gravity measurements in the following wells completed in the deep confined aquifer: I-1-100, I-3-100, GW-19B, and GW-27D. Semiannual water levels and specific gravity measurements shall be made in conjunction with the semiannual ground water quality sampling events.

15. Mixed Waste Leachate Monitoring

On a semiannual basis, the Permittee shall collect representative samples of leachate from the Mixed Waste Cell leachate collection system (upper leachate collection access pipe) and analyze for radioactive contaminants. Said radioactive contaminants shall include:

a) All Ground Water Protection Level Parameters found in Tables 1E and 1F of this Permit

b) A complete gamma spectroscopic analysis to determine all other gamma-emitting radioisotopes that may be present

16. Intermodal Unloading Facility Monitoring

The Permittee shall conduct daily monitoring of the Intermodal Unloading Facility to determine and ensure free draining conditions exist both on the unloading pad and across the contact stormwater drainage pipeline that discharges to the 1995 and 1997 evaporation ponds. The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

17. Box-Washing Facility Monitoring

The Permittee shall conduct daily monitoring of the Box-Washing facility to demonstrate compliance with the Best Available Technology requirements of Part I.E.14.b of this Permit, including:

a) Free draining conditions

b) Physical integrity of concrete surfaces

c) Wastewater catch basin (sump) water level

d) Water level in wastewater storage tanks

e) Absence of discharge to the ground or ground water

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

18. Rail Car Wash Facility Monitoring

The Permittee shall conduct daily monitoring of the Track No. 4 and Track No. 2 Rail Car Wash facilities to demonstrate compliance with the Best Available Technology requirements of Part I.E.14.d of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit.

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

19. Railcar Rollover Facility Monitoring

The Permittee shall conduct daily monitoring of the Railcar Rollover Facility to demonstrate compliance with the BAT Performance and Best Management Practice Standards of Parts I.E.7 and I.E.17 of the Permit in accordance with the currently approved BAT Performance Monitoring Plan and Contingency Plan in Appendices J and K, respectively, of this Permit.

20. Open Cell Time Limit Monitoring

The Permittee shall demonstrate compliance with the open cell time limitation requirements of Part I.E.6 of this Permit by observing and recording the following dates of completion for each working area in the LARW cell:

a) Initial placement of waste on the first lift on the clay liner

b) Completion of construction of the clay radon barrier

The Permittee shall maintain written records of this monitoring on site. All monitoring records shall comply with the requirements of Part II.G of this Permit.

21. PCB Monitoring

The Permittee shall monitor for PCBs in accordance with the requirements of this Permit or its appendices, or as requested by the Executive

22. BAT Performance Monitoring Plan

The Permittee shall demonstrate compliance with the BAT requirements and performance standards and Best Management Practices in Parts I.D and I.E of this Permit by implementing the most current BAT Performance Monitoring Plan approved by the Executive Secretary and provided in Appendix J of this Permit.

23. BAT Contingency Plan

In the event that BAT failure occurs at any facility, the Permittee shall implement the most current BAT Contingency Plan approved by the Executive Secretary and provided in Appendix K of this Permit to regain the BAT requirements and performance standards and Best Management Practices specified in Parts I.D and I.E of this Permit.

24. Stormwater Monitoring

The Permittee shall demonstrate compliance with stormwater removal requirements of Part I.E.7 of this Permit by maintaining daily written records for the following stormwater management activities:

a) Date, time, and location of discovery of stormwater accumulation
b) Date and time when stormwater removal activities were initiated at each location
c) Date and time when stormwater removal was completed at each location
d) First and last name(s) of all personnel involved with stormwater removal activities
e) Unique identity of locations of where stormwater was removed
f) Type of stormwater removed: contact or non-contact stormwater
g) Identify equipment used to remove contact and non-contact stormwater
h) Volumes of stormwater removed at each location
i) Location(s) where stormwater was disposed

25. Shredder Facility

The Permittee shall conduct daily monitoring of the Shredder Facility to demonstrate compliance with the Best Available Technology requirements of Part I.E.20 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K of this Permit, respectively, including:

a) Free draining conditions
b) Physical integrity of concrete surfaces
c) Absence of discharge to the ground or ground water

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

26. Rotary Dump Facility

The Permittee shall conduct daily monitoring of the Rotary Dump Facility to demonstrate compliance with the Best Available Technology requirements of Part I.E.21 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K of this Permit, respectively, including:

a) Free draining conditions

b) Physical integrity of concrete surfaces

c) Water level in Sediment Basin sump

d) Presence of fluids in the Sediment Basin leak detection system

e) Absence of discharge to the ground or ground water

f) Absence of fluid in annular space between the primary and secondary pipes of the leak detection system for pressurized pipes

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

27. Intermodal Container Wash Building

The Permittee shall conduct daily monitoring of the Intermodal Container Wash Building to demonstrate compliance with the Best Available Technology requirements of Part I.E.22 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit, including:

a) Free draining conditions,

b) Physical integrity of concrete surfaces,

c) Water level in Settlement Basin,

d) Presence of fluids in the settlement basin leak detection system, and

e) Absence of discharge to the ground or ground water.

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

28. Decontamination Access Control Building

The Permittee shall conduct daily monitoring of the Decontamination Access Control Building to demonstrate compliance with the Best Available Technology requirements of Part I.E.23 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit, including:

a) Free draining conditions in all wastewater transfer piping,

b) Water level in the gray water collection tank,

c) Presence of fluids in the gray water collection tank leak detection annulus, and

d) Absence of discharge to the ground or ground water,

The Permittee shall maintain written records of the findings of these daily inspections on site. All daily inspection records shall comply with the requirements of Part II.G of this Permit.

29. East Side Drainage Project

The Permittee shall conduct daily monitoring of the East Side Drainage Project to demonstrate compliance with the Best Available Technology requirements of Part I.E.24 of this Permit in accordance with the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan in Appendices J and K, respectively of this Permit, including:

a) Free draining conditions in all wastewater transfer piping,

b) Absence of fluids in the leak detection annulus within the secondary pipe of the dual-walled piping system, and

c) Absence of discharge to the ground or ground water.

G. Non-Compliance Status. Ground Water Monitoring and Best Available Technology

1. Noncompliance with the Ground Water Protection Levels

Noncompliance with the ground water protection levels in Part I.C, Tables 1A, 1B, 1C, 1D, 1E, and 1F as applied to the compliance monitoring wells defined in Part I.F.1 of this Permit shall be defined as follows:

a) Monitoring for probable out-of-compliance shall be defined as any one sample in excess of the protection level in Tables 1A, 1B, 1C, 1D, 1E, or 1F of this Permit for any parameter from the same compliance monitoring well.

b) Out-of-Compliance Status –defined as two (2) consecutive samples in excess of the protection level in Tables 1A, 1B, 1C, 1D, 1E, or 1F of this Permit for any parameter from the same compliance monitoring well.

c) Other Methods to Determine Ground Water Quality Compliance Status – at the discretion of the Executive Secretary, other methods may be employed to determine the compliance status of the facility with respect to ground water quality data, including:

1) Trend and/or Spatial Analysis – analysis of any contaminant concentration trend through time in a single compliance monitoring point, and /or spatial analysis of the same from any group of compliance monitoring points.

2) EPA RCRA Statistical Methods – other applicable statistical methods may be used to determine out-of-compliance status, as defined in the EPA document "Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities", February 1989, or as amended.

2. Requirements for Ground Water Monitoring for Probable Out-of-Compliance Status

The Permittee shall evaluate the results of each round of ground water sampling and analysis to determine existence of monitoring for probable out-of-compliance status as defined in Part I.G.1(a) of this Permit. Upon any determination that probable out-of-compliance status exists, the Permittee shall:

a) Notify the Executive Secretary of the probable out-of-compliance (POOC) status within 30 days of the initial detection. In addition, the Permittee shall submit a written report describing all POOC wells and parameters with the associated semiannual ground water monitoring report, which is due on either March 1 or September 1.

b) Immediately implement a schedule of quarterly ground water sampling and analysis for the well(s)/parameter(s) of concern, consistent with the requirements Part I.F.5(b) and the currently approved Water Monitoring Quality Assurance Plan, Appendix B of this Permit. This quarterly sampling will continue until the compliance status can be determined by the Executive Secretary. Reports of the results of this sampling will be submitted to the Executive Secretary no later than 90 days from the submittal of the associated semiannual monitoring report, or no later than June 1 or December 1.

3. Requirements for Ground Water Out-of-Compliance Status

a) Notification and Accelerated Monitoring – the Permittee shall evaluate the results of each round of ground water sampling and analysis to determine existence of out-of-compliance status as defined in Part I.G.1(b) of this Permit. Upon any determination that an out-of-compliance status exists the Permittee shall:

1) Verbally notify the Executive Secretary of the out-of-compliance status within 24 hours, and provide written notice within 5 days of the detection and

2) Immediately implement an accelerated schedule of monthly ground water monitoring of the monitoring wells of concern for the parameters in question. This monitoring shall continue for at least 2 months or until the facility is brought into compliance, as determined by the Executive Secretary. At the discretion of the Executive Secretary, the Permittee may be required to sample and analyze for additional inorganic, organic, or radiochemical parameters in order to determine the compliance status of the facility. Reports of the results of this sampling will be submitted to the Executive Secretary as soon as they are available, but not later than 45 days from each date of sampling.

b) Source and Contamination Assessment Study Plan – within 30 days of the verbal notice to the Executive Secretary required in Part I.G.3(a) of this

Permit, the Permittee shall submit for Executive Secretary approval an assessment study plan and compliance schedule for:

1) Assessment of the source or cause of the contamination and determination of steps necessary to correct the source.

2) Assessment of the extent of the ground water contamination and any potential dispersion.

3) Evaluation of potential remedial actions to restore and maintain ground water quality and ensure that the ground water standards will not be exceeded at the compliance monitoring wells, and best available technology will be reestablished.

c) Contingency Plan – in the event that Out-of-Compliance status is determined as per Part I.G.1(b) or (c), and upon written notification from the Executive Secretary, the Permittee shall immediately implement the currently approved Contingency Plan in Appendix A of this Permit.

4. <u>Definition and Requirements for Failure to Maintain Best Available Technology</u>

a) Definition of Failure to Maintain Best Available Technology (BAT) Requirements – any violation of the BAT Design Standards in Part I.D, including design, design specifications, or construction requirements shall constitute failure to meet the best available technology requirements of this Permit. Any violation of the BAT Performance Standards in Parts I.D.1 or I.E shall also constitute failure to meet the best available technology requirements of this Permit.

b) Requirements for Failure to Maintain Best Available Technology – in the event that the Permittee fails to maintain best available technology in accordance with Parts I.D and I.E, above, the Permittee shall:

1) Notify the Executive Secretary verbally within 24 hours of discovery of the BAT failure, and provide written notice within 5 days of discovery.

2) Submit within 5 days of discovery a complete written description of:

i) The cause of the BAT failure,

<u>ii)</u> Any measures taken by the Permittee to mitigate the BAT failure,

iii) Time frame of the discovery of the BAT failure and any mitigation measures were implemented, and

iv) Evidence to demonstrate that any discharge or potential discharge caused by the BAT failure did not and will not result in a violation of UAC 19-5-107.

c) BAT Contingency Plan – in the event that Out-of-Compliance status is determined as per Part I.G.4(a) or by daily implementation of the currently approved BAT Performance Monitoring Plan in Appendix J of this Permit, the Permittee shall immediately implement the currently approved BAT Contingency Plan in Appendix K of this Permit.

5. Affirmative Defense Relevant to Best Available Technology Failures

   In the event that a compliance action is initiated against the Permittee for violation of Permit conditions relating to best available technology, the Permittee may affirmatively defend against that action by demonstrating the following:

   a) The Permittee submitted notification according to UAC R317-6-6.13,

   b) The failure was not intentional or caused by the Permittee's negligence, either in action or in failure to act,

   c) The Permittee has taken adequate measures to meet permit conditions in a timely manner or has submitted to the Executive Secretary, for Executive Secretary approval, an adequate plan and schedule for meeting permit conditions, and

   d) The provisions of UAC 19-5-107 have not been violated.

H. Reporting Requirements

Notwithstanding any other environmental monitoring and reporting required by the Radioactive Materials License, the Permittee shall submit the following reporting information.

1. Semiannual Monitoring

   Monitoring required in Part I.F of this Permit, shall be reported according to the following schedule, unless modified by the Executive Secretary:

Half	Report Due On
1st (January thru June)	September 1
2nd (July thru December)	March 1

2. Water Level Measurements

   The Permittee shall comply with the following ground water water level reporting requirements:

   a) General Requirements – monthly water level measurements from all ground water monitoring wells will be reported semiannually in both measured depth to ground water and saline ground water elevations above mean sea level. In addition, semiannual freshwater equivalent head elevations will be reported for each well and will be derived from semiannual ground water specific gravity measurements made in that well during each semiannual sampling event.

   b) Maps and Diagrams Format – distribution of freshwater equivalent head will be summarized on a semiannual basis in the form of:

      1) Potentiometric maps of the uppermost aquifer for each semiannual sampling event and

      2) Vertical diagrams or cross-sections for each nested well group illustrating water level elevations in both the shallow and confined

aquifers (I-1-30 / I-1-100, I-3-30 / I-3-100, GW-19A / GW-19B, and GW-27D).

Said potentiometric maps, diagrams, cross-sections, and data will be submitted with the semiannual monitoring reports required by Part I.H.1.

c) Horizontal Hydraulic Gradient Reporting – on a monthly basis the Permittee shall calculate and provide:

1) A site-wide summary of maximum, minimum, and average horizontal hydraulic gradient for all wells located in Section 32 based on saline ground water elevations. Transects for each of the maximum, minimum, and average gradient locations shall be indicated on the monthly equipotential maps required by Part I.H.2.b and

2) Individual disposal cell summary of maximum, minimum, and average horizontal hydraulic gradient based on saline ground water elevations for the Class A, Class A North, Class A South portion of the Class A South/11e.(2), LARW, 11e.(2) portion of the Class A South/11e.(2), and Mixed Waste disposal facilities. Determination of these individual hydraulic gradients shall be made after division of each disposal cell into smaller sub-areas for purposes of hydraulic gradient comparisons through time, as approved by the Executive Secretary. On an individual cell basis, the Permittee shall indicate those cell sub-areas where the said monthly maximum, minimum, and average hydraulic gradients occurred.

In the event that the horizontal hydraulic gradient of any subarea exceeds the cell-specific Permit limit specified below, the Permittee shall report this exceedance and identify the sub-area in which the exceedance occurred with submission of the semiannual ground water monitoring report required by Part I.H.1 of this Permit.

Disposal Cell	Horizontal Hydraulic Gradient Limit
Class A	1.00E-3
Class A North	1.00E-3
Class A South portion	3.29E-3
LARW	9.67E-4
Mixed Waste	9.67E-4
11e.(2) portion	3.29E-3

3. Ground Water and Pore Water Quality Sampling

Reporting will include:

a) Field Data Sheets – or copies thereof, including the field measurements, required in Part I.F.5(b)(2) of this Permit, and other pertinent field data, such as:

1) Ground Water Monitoring – well name/number, date and time, names of sampling crew, type of sampling pump or bail, measured casing

volume, volume of water purged before sampling, volume of water collected for analysis.

2) Suction Lysimeter/Soil Moisture Monitoring – lysimeter name/number, date and time, names of sampling crew, type of sampling equipment, vacuum applied and duration of application, volume of sample collected, resistivity reading and corresponding moisture content from soil moisture instrumentation.

b) Results of Ground Water, Pore Water, and Surface Water Analysis – including date sampled, date received; and the results of analysis for each parameter, including: value or concentration, units of measurement, reporting limit (minimum detection limit for the examination), analytical method, the date of the analysis, counting error for each radiochemical analysis, and total anions and cations for each inorganic analysis.

c) Quality Assurance Evaluation – with every sampling report the Permittee shall include a quality assurance evaluation of the reported ground water and pore water data. Said report shall evaluate the sample collection techniques, sample handling and preservation, and analytical methods used in sampling with the objective of verifying the accuracy of the compliance monitoring results.

d) Electronic Data Files and Format – in addition to written results required for every sampling report, the Permittee shall provide an electronic copy of all laboratory results for ground water, pore water, and surface water quality sampling. Said electronic files shall consist of a Comma Separated Values (CSV) file format, or as otherwise approved by the Executive Secretary.

4. Spill Reporting

The Permittee shall report as per UAC 19-5-114 and for PCB/Radioactive Waste, the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I, any spill or leakage of waste or waste liquids which come in contact with native soil or ground water in compliance with Part II.I of this Permit. For spills of solid waste greater than 100 kg, the spill must be reported to the Division of Radiation Control within 5 business days of discovery.

5. Post-Closure Monitoring

Reporting of post-closure monitoring shall comply with the requirements of the currently approved Post-Closure Monitoring Plan in Appendix F of this Permit.

6. Annual "As-Built" Report

The Permittee shall submit an annual "As-Built" Report to document construction of the Class A, ~~and~~ Class A North, and Class A South portion of the Class A South/11e.(2) Disposal cells in compliance with the currently approved design and specifications and LLRW and 11e.(2) Construction Quality Assurance/Quality Control Plan (Radioactive Materials License, Condition 44). The Permittee shall also submit an annual "As-Built" Report to document construction of the 11e.(2) cells in compliance the currently approved design and specifications and LLRW and 11e.(2) Construction Quality Assurance/Quality Control Plan ~~authorized by Part I.D and the currently approved Appendix D of this Permit~~. These reports will be submitted for the Executive Secretary's approval on or before March 31 of each calendar year. This report shall include engineering plans and cross-sections to document the construction. Said plans shall be based on an elevation survey, conducted and certified by a Utah licensed land surveyor, of all pertinent elements of construction at the facility.

7. Waste Characterization Reporting

   In the event that a new contaminant is detected in any waste at the facility, which has not been authorized by Part I.E.1, or if concentrations of approved contaminants are detected above the limits established in Part I.E.2 of this Permit, the Permittee shall notify the Executive Secretary in writing within 5 working days from the date of discovery.

8. Collection Lysimeter Reporting

   The Permittee shall provide a verbal report to the Executive Secretary within 24 hours of discovery of the presence of any fluid in the standpipe of the collection lysimeters. The Permittee shall provide a written report of the incident to the Executive Secretary within 5 working days of discovery. The Permittee shall provide a report of the annual video log survey of the lysimeter's drainpipe, as required by the currently approved Appendix C of this Permit, on or before December 31 of each calendar year.

9. Reporting of Mechanical Problems or Discharge System Failures

   The Permittee shall verbally notify the Executive Secretary within 24 hours of initial discovery of any mechanical or discharge system failure that could affect the chemical characteristics or volume of the discharge. The Permittee shall submit a written report of the failure within 5 days of said failure.

10. Meteorological Reporting

    On or before January 1 of each calendar year, the Permittee shall submit an annual meteorological report for the previous meteorological year (October 1 to September 30) for Executive Secretary approval.

11. Containerized Waste Storage Area Reporting

    The Permittee shall report the following events in accordance with the requirements of Part I.E.10:

    a) Failure of sump pump or other equipment to provide removal of stormwater and free and uninterrupted drainage of the pad, and

    b) Any container spill or leakage that may have caused a release to the subsurface soils or ground water via cracks or other damage to the asphalt surface.

12. Evaporation Ponds Reporting

a) Semiannual Water Quality Sampling – semiannual water quality samples collected and analyzed, and pond volume measurements and calculations made in compliance with Part I.F.13 shall be reported in conjunction with the ground water quality monitoring report required by Part I.H.1 of this Permit.

b) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Pond Daily Monitoring – the Permittee shall report results of daily monitoring for the 1995, 1997, 2000, Mixed Waste, and Northwest Corner evaporation ponds as follows:

1) BAT Failure Reporting – the Permittee shall report the following monitoring requirements pursuant to Part I.G.4.b:

a) Failure to maintain the 24-inch vertical freeboard requirement of Part I.E.14.a.4,

b) Failure of operational status for leak detection system pump, pump controller, head/pressure transducer, and/or flow meter equipment, pursuant to Part I.E.14.a.1,

c) Daily average leak detection pumpage volumes in excess of the volume monitoring thresholds established in Part I.F.14.b, or the BAT performance standards listed in Part I.E.14.a.2, and

d) Daily leak detection sump head values in excess of the BAT performance standards established pursuant to Part I.E.14.a.3.

2) Leak Detection System Pump Test Reporting – within 15 calendar days of completion of any leak detection system pump test required by Part I.F.14.b of this Permit, the Permittee shall submit a written report for Executive Secretary approval to document equipment, methods, and results of said pump test.

c) Annual Pump Inspection – results of the annual pump inspection and bor-o-scope video inspection conducted in accordance with Part I.F.13.d shall be submitted for the Executive Secretary's approval as part of the second quarter BAT Quarterly Monitoring Report.

13. Annual Ground Water Usage Report

On or before March 1 of each calendar year the Permittee shall survey and report the location of all ground water withdrawals within at least a 1-mile radius of the facility boundary. The purpose of this report will be to locate all points near the facility where ground water is pumped or otherwise removed for any consumptive use, including domestic, agricultural, or industrial purposes. This report shall include a survey of water right appropriations found in the area of interest, identify the owners thereof, and disclose the physical location and depths of all such ground water withdrawals.

14. 11e.(2) Construction Notification

In coordination with requirements of Part I.E.13, the Permittee shall provide a minimum 48-hour notice and opportunity for the Executive Secretary to inspect clay liner and radon barrier construction at the 11e.(2) cell.

15. Mixed Waste Cell Leachate Reporting

The Permittee shall report the results of Mixed Waste Leachate water quality sampling and analysis required by Part I.F.15 of this Permit with the semiannual ground water monitoring reports required by Parts I.H.1 and I.H.3.

16. BAT Non-Compliance Reporting Requirements

For all facilities subject to requirements under the currently approved BAT Performance Monitoring Plan and BAT Contingency Plan (Appendix J and K, respectively) the Permittee shall provide verbal notification to the Executive Secretary of any BAT failures that are not corrected within 24 hours. All such verbal notifications shall be followed-up with a written notification within 5 business days.

17. Reserved.

18. Reserved.

19. Railcar Rollover Facility Reporting

The Permittee shall submit the daily inspection results required in Part I.E.7c.2 with each Quarterly BAT Monitoring Report. The annual inspection and repair activities required under Part I.E.17 shall be submitted with the Second Quarterly BAT Monitoring Report of each calendar year. The annual inspection report shall document all inspection and repair activities including photographs of the condition of the surfaces both before and after repairs.

20. BAT Quarterly Monitoring Report

The Permittee shall submit a quarterly BAT monitoring report to document compliance with the BAT performance standards mandated by Part I.E of this Permit. The report shall provide results, calculations, and evaluations of daily BAT monitoring data required in Part I.F of this Permit, including but not limited to the following:

a) 1995, 1997, 2000, Mixed Waste, and Northwest Corner Evaporation Ponds – the BAT quarterly monitoring report shall:

   1) Include a quality assurance evaluation of all daily leak detection system flow volume and head data collected,

   2) Include results of daily flow and head monitoring of the leak detection sump at each pond,

   3) Include results of weekly calculation of daily average flow volumes from the leak detection sump at each pond, pursuant to Part I.F.13.a.3 of this Permit,

4) Evaluate any apparent trends in daily flow and head monitoring with respect to the pond's ability to comply with the BAT performance standards mandated by Part I.E.14 of this Permit.

b) Stormwater Management – the BAT quarterly report shall include:

1) Date, time, and location of discovery of stormwater accumulation,

2) Date and time when stormwater removal was initiated at each location,

3) Date and time when stormwater removal was completed at each location, and

4) Volumes of stormwater removed at each location.

Daily Reports will include:

1) First and last name(s) of all personnel involved with stormwater removal activities,

2) Unique identity of locations of where stormwater was removed,

3) Type of stormwater removed: contact or non-contact stormwater,

4) Identify equipment used to remove contact and non-contact stormwater, and

5) Location(s) where stormwater was disposed.

c) Reporting Schedule – the BAT Quarterly Monitoring Report shall be submitted for Executive Secretary approval in accordance with the following schedule:

Quarter	Report Due On
1st (January, February, March)	May 1
2nd (April, May, June)	August 1
3rd (July, August, September*)	November 1
4th (October, November, December)	February 1

* Third Quarter Report shall include results of the required annual pressure tests for dual-walled pipe as identified in Part I.F.2.m.

21. PCB Reporting

The Permittee shall submit to the Executive Secretary the following:

a) Reports as required in the currently approved Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs), Appendix I,

b) Routine reports in accordance with the Permittee's Radioactive Materials License UT 2300249, and

c) Non-compliance reporting as required by this Permit.

22. Comprehensive Ground Water Quality Evaluation Report

180 days prior to Permit expiration, the Permittee shall submit for Executive Secretary approval a comprehensive ground water quality evaluation report for the site. In submittal of this report, the Permittee shall present a complete and

thorough evaluation of all ground water and vadose zone water quality data available for the LARW, 11e.(2), and Mixed Waste facilities. Said report shall be similar to the October 18, 1999 Comprehensive Ground Water Quality Evaluation Report and shall include but not be limited to:

a) Graphs of temporal concentration trends for all compliance monitoring parameters and wells across the entire period of record, and an evaluation of parameter temporal relationships,

b) Number of water quality data available for each compliance parameter for each well,

c) Statistical tests of normality for each compliance parameter water quality data population, including univariate tests or equivalent,

d) Calculation of mean concentration and standard deviation on direct concentration values; for water quality parameter populations that fail the normality test, provide mean concentrations and standard deviations on transformed values that are normally distributed,

e) Calculation of mean concentration plus the second standard deviation for comparison with existing ground water protection levels to identify parameters that warrant an evaluation for ground water protection level adjustments based on natural variations in background concentrations, and

f) Isoconcentration maps of spatial concentration trends across Section 32 and an evaluation of facies and spatial relationships of water quality parameters that warrant an evaluation for ground water protection level adjustments based on section e) above.

23. Reserved.

24. Revised Hydrogeologic Report

180 days prior to Permit expiration, the Permittee shall submit for Executive Secretary approval a revised hydrogeologic report for the disposal facility and surrounding area. In submittal of this report the Permittee shall provide a comprehensive and thorough description of hydrogeologic conditions at the facility current through the time of report submittal. This report will include an updated evaluation and reinterpretation of the site hydrogeology using all available data including new or additional data acquired since Executive Secretary approval of the last revised hydrogeologic report dated January 20, 2000.

I. Compliance Schedule

1. Ground Water Institutional Control Plan

The Permittee shall submit a ground water institutional control plan for Executive Secretary approval at the time the site Decontamination and Decommissioning Plan required under Radioactive Materials License Condition 74 is submitted. In submittal of this plan the Permittee shall eliminate future inadvertent intrusion into potentially contaminated ground water at the disposal facilities and subsequent routes of exposure to the public and the environment. Said plan shall include at least one of the options listed in the July 27, 1998 Utah Division of Radiation Control Request for Information.

2. Background Ground Water Quality Report for Class A North and 2000 Pond Compliance Wells.

In conjunction with the Semiannual Ground Water Monitoring Report for the second half of 2006 (due on March 1, 2007), the Permittee shall submit for Executive Secretary approval a background ground water quality report for the following Class A North and 2000 Pond compliance monitoring wells for the parameters of gross alpha, radium-226, and radium-228:

GW-106	GW-110	GW-114	GW-125
GW-107	GW-111	GW-115	GW-19A
GW-108	GW-112	GW-116	GW-36
GW-109	GW-113	GW-117	GW-58

At a minimum, this report shall include:

a) Graphs of temporal concentration trends in each well for each monitoring constituent with an evaluation of seasonal and analytical variations,

b) Normality testing along with a discussion of those data points, if any, that are outliers and justification of why the outliers should or should not be culled from the population prior to performing statistical calculations,

c) Calculation of mean concentration and standard deviation for each constituent in each well, and

d) Calculation of mean concentration plus two (2) standard deviations for each constituent in each well.

After review and approval of this report, the Executive Secretary may reopen this Permit and revise ground water protection levels for the Class A North cell and/or 2000 Pond compliance wells. The Executive Secretary anticipates the background concentrations for gross alpha as well as the sum of radium-226 and radium-228 may be greater than their respective ground water protection levels. As a result, compliance monitoring for these parameters will not commence in the Class A North cell or 2000 Pond compliance wells until the Executive Secretary has incorporated approved ground water protection levels into the Permit. In the interim, ground water samples for gross alpha, radium-226, and radium-228 will be collected and reported from the Class A North cell and 2000 Pond compliance wells on the same frequency as all other compliance ground water parameters to build a larger data population with which to calculate background values.

3. Shredder Facility and PCBs

Prior to operation of the Shredder Facility to process wastes containing polychlorinated biphenyls (PCBs), the Permittee shall submit a revised Plan for the Management of Waste Containing Polychlorinated Biphenyls (Appendix I), and receive Executive Secretary approval.

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling

Samples taken in compliance with the monitoring requirements established under Part I shall be representative of the monitored activity. Failure by the Permittee to conduct all ground water and pore water sampling in compliance with the currently approved Ground Water Monitoring Quality Assurance/Quality Control Plan in Appendix B of this Permit shall be considered a failure to monitor and may subject the Permittee to enforcement action.

B. Analytical Procedures

Water sample analysis must be conducted according to test procedures specified under UAC R317-6-6.3(L), unless other test procedures have been specified in this Permit. All sample analysis shall be performed by laboratories certified by the State Health Laboratory, or otherwise after prior written approval by the Executive Secretary.

C. Penalties for Tampering

The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this Permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. Reporting of Monitoring Results

Monitoring results obtained during each reporting period specified in the Permit, shall be submitted to the Executive Secretary, Utah Division of Water Quality at the following address no later than the 15th day of the month following the completed reporting period:

Utah Department of Environmental Quality
Division of Radiation Control
168 North 1950 West
P.O. Box 144850
Salt Lake City, Utah 84114-4850
Attention: Ground Water Quality Program

E. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this Permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by this Permit, using approved test procedures as specified in this Permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted. Such increased frequency shall also be indicated.

G. Records Contents

Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements,
2. The individual(s) who performed the sampling or measurements,
3. The date(s) and time(s) analyses were performed,
4. The individual(s) who performed the analyses,
5. The analytical techniques or methods used, and
6. The results of such analyses.

H. Retention of Records

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all reports required by this Permit, and records of all data used to complete the application for this Permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Executive Secretary at any time.

I. Twenty-Four Hour Notice of Noncompliance Reporting

1. The Permittee shall verbally report any noncompliance which may endanger public health or the environment as soon as possible, but no later than 24 hours from the time the Permittee first became aware of the circumstances. The report shall be made to the Utah Department of Environmental Quality 24-hour number, (801) 536-4123, or to the Division of Water Quality, Ground Water Protection Section at (801) 538-6146, during normal business hours (8:00 am – 5:00 pm Mountain Time).
2. A written submission shall also be provided to the Executive Secretary within 5 days of the time that the Permittee becomes aware of the circumstances. The written submission shall contain:
   a) A description of the noncompliance and its cause,
   b) The period of noncompliance, including exact dates and times,
   c) The estimated time noncompliance is expected to continue if it has not been corrected, and
   d) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
3. Reports shall be submitted to the addresses in Part II.D, Reporting of Monitoring Results.

J. Other Noncompliance Reporting

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D are submitted.

K. Inspection and Entry

The Permittee shall allow the Executive Secretary or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the Permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;
3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and
4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

L. Monitoring Well "As-Built" Reports

In the event that additional ground water monitoring wells are required by the Executive Secretary, diagrams and description describing the final completion of the monitoring wells shall be submitted within 30 days of construction of each well. These reports will include:

1. Casing: depth, diameter, type of material, type of joints.
2. Screen: length, depth interval, diameter, material type, slot size.
3. Sand Pack: depth interval, material type and grain size.
4. Annular Seals: depth interval, material type.
5. Surface Casing(s) and Cap: depth, diameter, material type.
6. Survey Coordinates and Elevation: ground surface and elevation of water level measuring point in feet above mean sea level, measured to 0.01 of a foot. Said coordinates and elevation shall be conducted and certified by a Utah Licensed Land Surveyor.
7. Results of slug tests to determine local aquifer permeability in the vicinity of the well. Said tests shall conform with ASTM Method 4044-91. Test results and data analysis thereof shall be submitted for Executive Secretary approval.

M. Plugging and Abandonment Reports

Within 30 days of completion of plugging and abandonment of any environmental measurement system or instrument, including but not limited to ground water monitoring wells, piezometers, soil tensiometers or moisture instrumentation, or any other stationary device to make environmental measurements, the Permittee shall submit an "As-Plugged" report for Executive Secretary approval. Failure to comply with any condition of said approval shall constitute a violation of this Permit.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply

The Permittee must comply with all conditions of this Permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The Permittee shall give advance notice to the Executive Secretary of the Water Quality Board of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions

The Act provides that any person who violates a permit condition implementing provisions of the Act is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions is subject to a fine not exceeding $25,000 per day of violation. Any person convicted under Section 19-5-115(2) of the Act a second time shall be punished by a fine not exceeding $50,000 per day. Nothing in this Permit shall be construed to relieve the Permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit.

D. Duty to Mitigate

The Permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this Permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Failure to maintain all treatment and control systems in fully functional operating order or condition at the facility is a violation of this Permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of the Permit.

IV. GENERAL REQUIREMENTS

A. Prior Approval

Pursuant to UAC R317-6-6.1.A, the Permittee may not construct, install, or operate waste or wastewater storage, treatment, or disposal facilities, or any other facility that discharges or may discharge pollutants that may move directly or indirectly into ground water without a ground water discharge permit from the Executive Secretary. Pursuant to UAC R317-6-6.3.J, the Permittee shall submit engineering plans, specifications, and plans for operation and maintenance of a proposed facility prior to Executive Secretary approval.

B. Planned Changes

The Permittee shall give notice to the Executive Secretary as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required when the alteration or addition could significantly change the nature of the facility or increase the quantity of pollutants discharged.

C. Modification of Approved Engineering Design, Specifications, or Construction

Any modification to the approved engineering design, specifications, or construction of the facility cited in this Permit shall require prior Executive Secretary approval. Said facilities shall include, but are not limited to:

1. Waste and Wastewater Disposal and Containment Facilities – including all related engineering containment such as liner, cover, and drainage systems,
2. Waste and Wastewater Handling and Storage Facilities – used to handle, manage or store wastes prior to permanent disposal,
3. Decontamination Facilities – used to decontaminate equipment used in the transportation or disposal of waste, and
4. Environmental Monitoring Systems and Equipment – including ground water monitoring wells, piezometers, meteorological monitoring equipment, soil moisture and lysimeter instrumentation, or any other permanent system, mechanism, or instrument to make environmental measurements required by this Permit.

D. Anticipated Noncompliance

The Permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

E. Permit Actions

This Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

F. Duty to Reapply

If the Permittee wishes to continue an activity regulated by this Permit after the expiration date of this Permit, the Permittee must apply for and obtain a permit renewal or extension. The application should be submitted at least 180 days before the expiration date of this Permit.

G. Duty to Provide Information

The Permittee shall furnish to the Executive Secretary, within a reasonable time, any information which the Executive Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this Permit. The Permittee shall also furnish to the Executive Secretary, upon request, copies of records required to be kept by this Permit.

H. Other Information

When the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Executive Secretary, it shall promptly submit such facts or information.

I. Signatory Requirements

All applications, reports or information submitted to the Executive Secretary shall be signed and certified.

1. All permit applications shall be signed as follows:
    a) For a corporation: by a responsible corporate officer.
    b) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.
    c) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
2. All reports required by the permit and other information requested by the Executive Secretary shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
    a) The authorization is made in writing by a person described above and submitted to the Executive Secretary, and,
    b) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)
3. Changes to Authorization. If an authorization under Part IV.I.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.I.2 must be

submitted to the Executive Secretary prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

J. Penalties for Falsification of Reports

The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this Permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

K. Availability of Reports

Except for data determined to be confidential by the Permittee, all reports prepared in accordance with the terms of this Permit shall be available for public inspection at the offices of the Executive Secretary. As required by the Act, permit applications, permits, effluent data, and ground water quality data shall not be considered confidential.

L. Property Rights

The issuance of this Permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

M. Severability

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this Permit, shall not be affected thereby.

N. Transfers

This Permit may be automatically transferred to a new Permittee if:

1. The current Permittee notifies the Executive Secretary at least 30 days in advance of the proposed transfer date;
2. The notice includes a written agreement between the existing and new Permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Executive Secretary does not notify the existing Permittee and the proposed new Permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

O. State Laws

Nothing in this Permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, penalties established pursuant to any applicable state law or regulation under authority preserved by Section 19-5-117 of the Act.

P. Reopener Provision

This Permit may be reopened and modified, following proper administrative procedures, to include the appropriate limitations and compliance schedule, if necessary, if one or more of the following events occur:

1. If new ground water standards are adopted by the Board, the Permit may be reopened and modified to extend the terms of the Permit or to include pollutants covered by new standards. The Permittee may apply for a variance under the conditions outlined in R317-6.4(D)
2. Changes have been determined in background ground water quality.
3. Determination by the Executive Secretary that changes are necessary in either the Permit or the facility to protect human health or the environment.

APPENDIX A:

Contingency Plan
for
Exceedances of Ground Water Protection Levels

SUBMITTED: August 5, 1991

APPROVED: September 24, 1991

RETITLED: June 30, 1999

APPENDIX B:

Water Monitoring Quality Assurance Plan

APPROVED: December 5, 1991

LATEST REVISION: February 14, 2005

APPENDIX C:

Construction Quality Assurance Plan
for
Collection Lysimeter Construction
and Operation, Maintenance, and Closure Plans
for
Collection Lysimeters and Related Approvals

SUBMITTED: September 16, 1992 and October 21, 1992, respectively

APPROVED: September 21, 1992 and November 27, 1992, respectively

REVISED: January 9, 2004

~~APPENDIX D:~~

~~Construction QA/QC Plan~~
~~for~~
~~11e.(2) Facility~~

~~SUBMITTED: February 16, 1994~~

~~APPROVED: March 24, 1994~~

~~REVISED: February 26, 2004~~

APPENDIX E:

Procedure for Certification of 11e.(2) Material

REVISED: March 1994

APPENDIX F:

Post-Closure Monitoring Plan
for
LARW and 11e.(2) Disposal Cells

APPROVED: September 13, 1994

REVISED: January 18, 2000

APPENDIX G:

Weather Station Monitoring Plan

APPROVED: September 14, 1994
REVISED: October 17, 2005

APPENDIX I:

Plan for the Management of Waste Containing Polychlorinated Biphenyls (PCBs)

APPROVED: October 20, 1999

LATEST REVISION: July 12, 2005

APPENDIX J:

Best Available Technology (BAT) Performance Monitoring Plan

APPROVED: October 15, 1999

LATEST REVISION: October 26, 2005

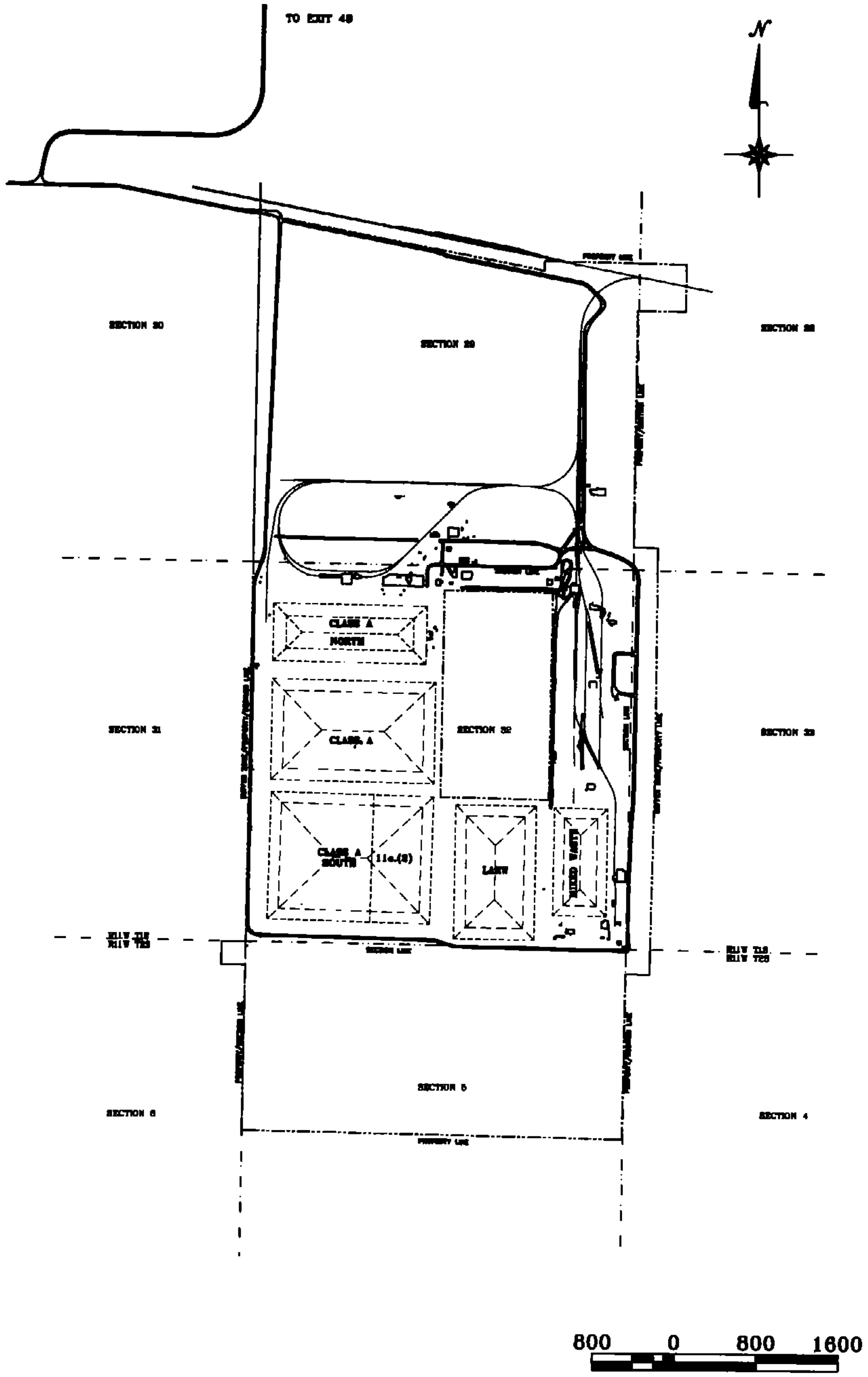
APPENDIX K:

Best Available Technology (BAT) Contingency Plan

APPROVED: October 15, 1999

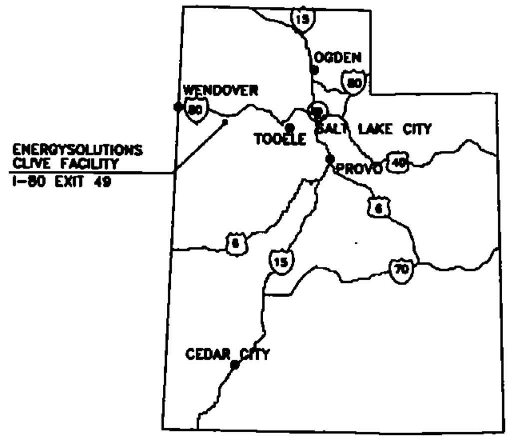
LATEST REVISION: October 26, 2005

ATTACHMENT 2



CLASS A SOUTH/11e.(2) DISPOSAL CELL

DWG. NO.	DESCRIPTION
07021–G1	PROJECT TITLE SHEET
07021–U1	DISPOSAL CELL BUFFER ZONE
07021–U2	DISPOSAL CELL WASTE LIMITS–LATITUDES & LONGITUDES
07021–U3	DISPOSAL CELL ENVIRONMENTAL MONITORING
07021–V1	CELL LAYOUT
07021–V2	CELL COVER LAYOUT
07021–V3	CELL CROSS SECTIONS 1 OF 2
07021–V4	CELL CROSS SECTIONS 2 OF 2
07021–V5	CELL CONSTRUCTION DETAILS 1 OF 2
07021–V6	CELL CONSTRUCTION DETAILS 2 OF 2
07021–V7	COVER CROSS SECTIONS AND GRADATIONS
07021–V8	COLLECTION LYSIMETERS DETAILS



UTAH
VICINITY MAP

LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F BOOTH
1/4/08
STATE OF UTAH

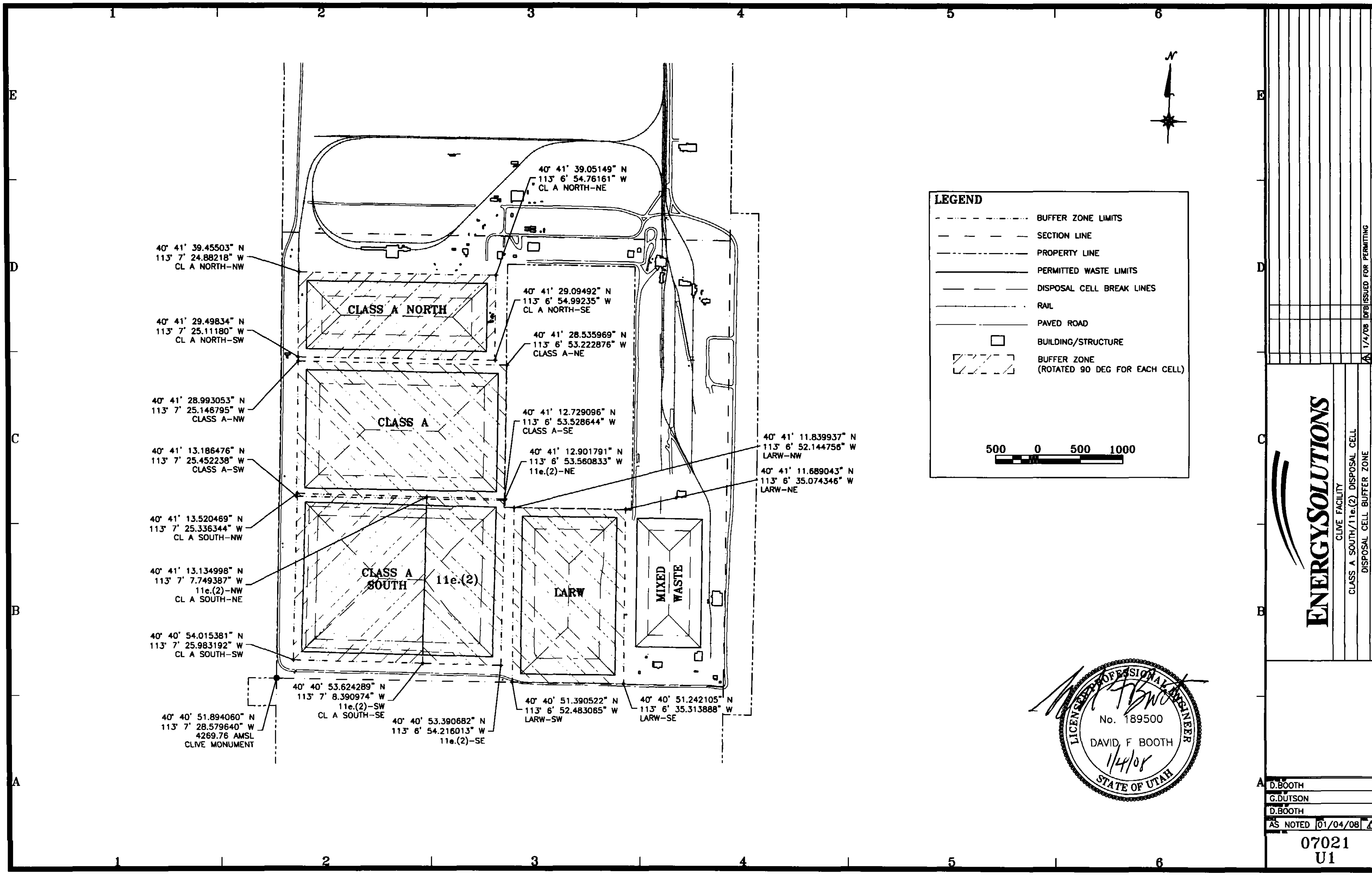
DATE	BY	DESCRIPTION OF CHANGE
1/4/08	DFB	ISSUED FOR PERMITTING

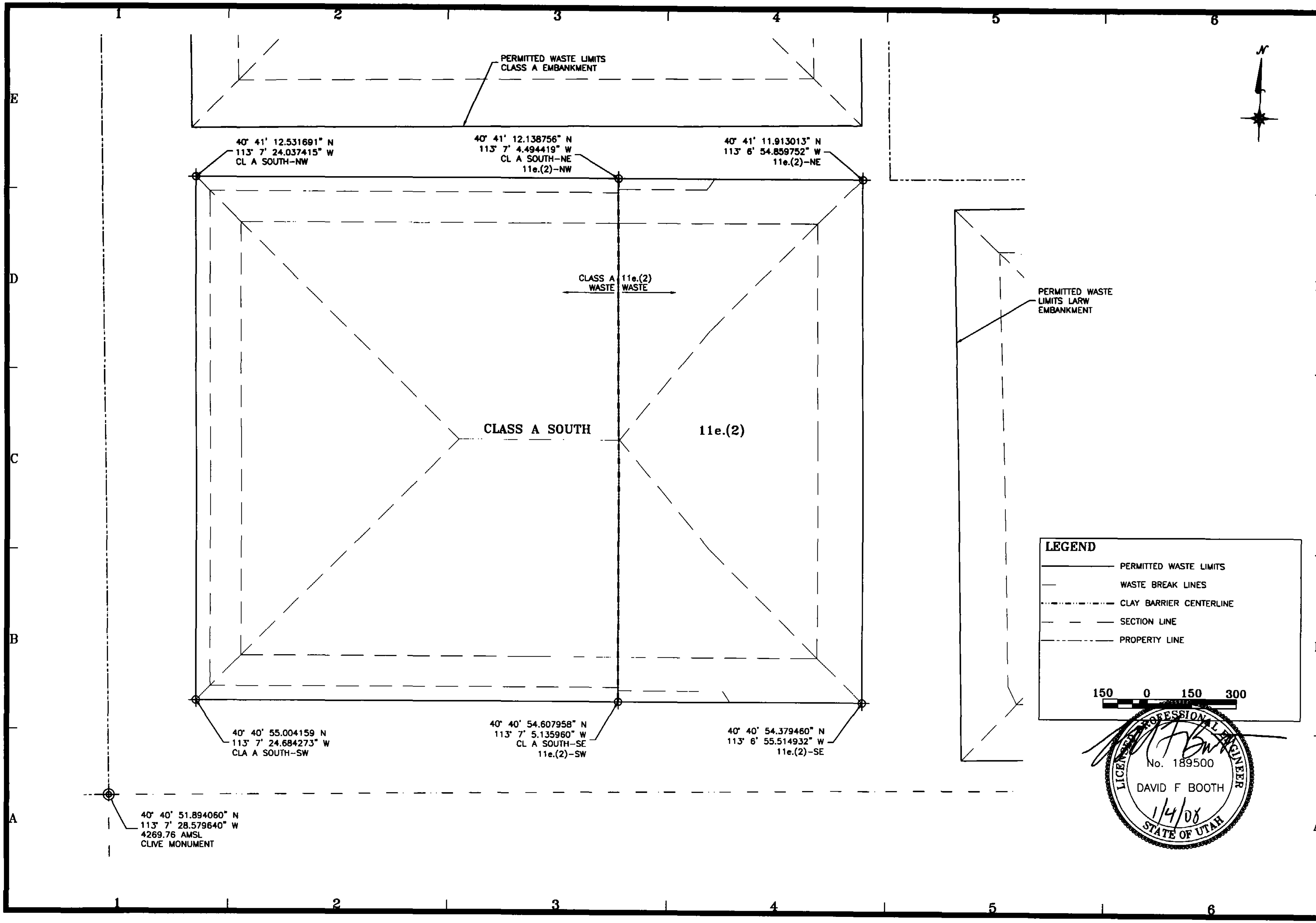
ENERGYSOLUTIONS

CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
PROJECT TITLE SHEET
CLIVE UTAH

D.BOOTH
G.DUTSON
D.BOOTH
AS NOTED 01/04/08

07021
G1


CLASS A NORTH
CLASS A
CLASS A SOUTH
11e.(2)
LARW
MIXED WASTE
40° 41' 39.05149" N
113° 6' 54.76161" W
CL A NORTH-NE
40° 41' 39.45503" N
113° 7' 24.88218" W
CL A NORTH-NW
40° 41' 29.09492" N
113° 6' 54.99235" W
CL A NORTH-SE
40° 41' 29.49834" N
113° 7' 25.11180" W
CL A NORTH-SW
40° 41' 28.535969" N
113° 6' 53.222876" W
CLASS A-NE
40° 41' 28.993053" N
113° 7' 25.146795" W
CLASS A-NW
40° 41' 12.729096" N
113° 6' 53.528644" W
CLASS A-SE
40° 41' 13.186476" N
113° 7' 25.452238" W
CLASS A-SW
40° 41' 12.901791" N
113° 6' 53.560833" W
11e.(2)-NE
40° 41' 11.839937" N
113° 6' 52.144756" W
LARW-NW
40° 41' 11.689043" N
113° 6' 35.074346" W
LARW-NE
40° 41' 13.520469" N
113° 7' 25.336344" W
CL A SOUTH-NW
40° 41' 13.134998" N
113° 7' 7.749387" W
11e.(2)-NW
CL A SOUTH-NE
40° 40' 54.015381" N
113° 7' 25.983192" W
CL A SOUTH-SW
40° 40' 53.624289" N
113° 7' 8.390974" W
11e.(2)-SW
CL A SOUTH-SE
40° 40' 53.390682" N
113° 6' 54.216013" W
11e.(2)-SE
40° 40' 51.390522" N
113° 6' 52.483065" W
LARW-SW
40° 40' 51.242105" N
113° 6' 35.313888" W
LARW-SE
40° 40' 51.894060" N
113° 7' 28.579640" W
4269.76 AMSL
CLIVE MONUMENT
N
LEGEND
BUFFER ZONE LIMITS
SECTION LINE
PROPERTY LINE
PERMITTED WASTE LIMITS
DISPOSAL CELL BREAK LINES
RAIL
PAVED ROAD
BUILDING/STRUCTURE
BUFFER ZONE
(ROTATED 90 DEG FOR EACH CELL)
500 0 500 1000
LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F. BOOTH
1/4/08
STATE OF UTAH
ENERGYSOLUTIONS
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
DISPOSAL CELL BUFFER ZONE
1/4/08 DFB ISSUED FOR PERMITTING
D.BOOTH
G.DUTSON
D.BOOTH
AS NOTED 01/04/08
07021
U1



ENERGYSOLUTIONS

CLIVE FACILITY

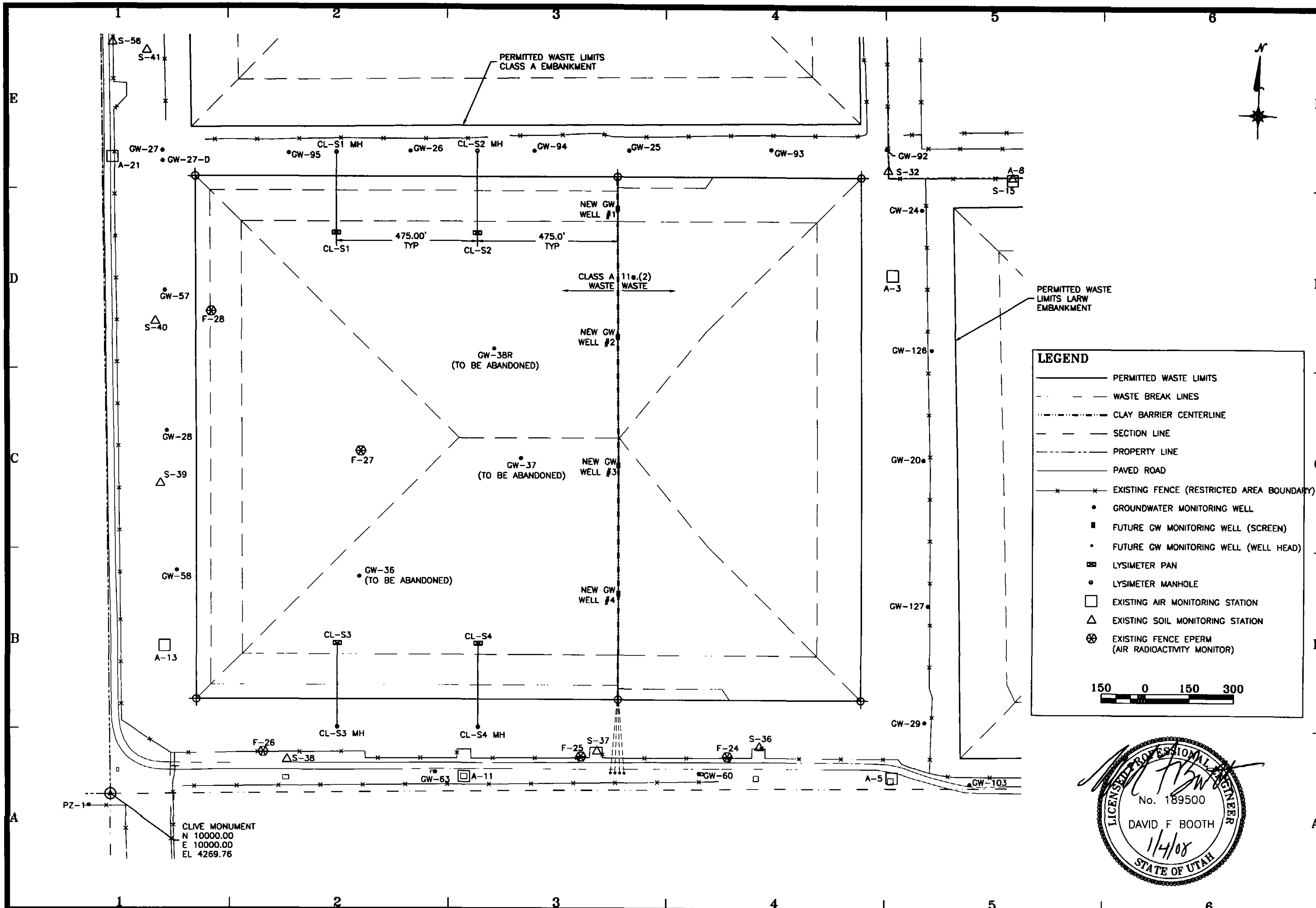
CLASS A SOUTH/11e.(2) DISPOSAL CELL

DISPOSAL CELL WASTE LIMITS-LATITUDES & LONGITUDES

A	1/4/08	DFB	ISSUED FOR PERMITTING

D.BOOTH
G.DUTSON
D.BOOTH
AS SHOWN 01/04/08

07021
U2



LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F BOOTH
1/4/08
STATE OF UTAH

ENERGYSOLUTIONS

CLIVE FACILITY

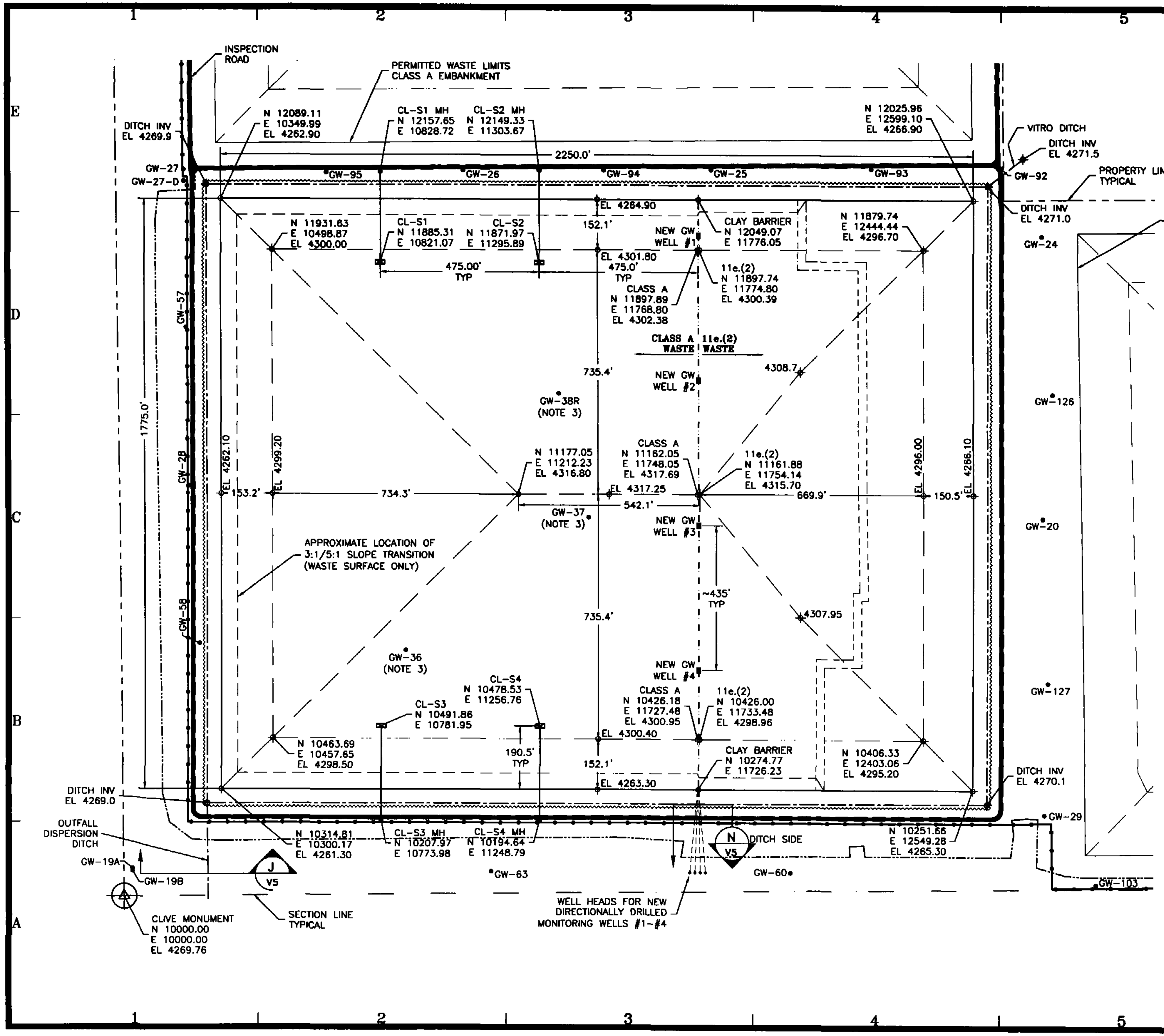
CLASS A SOUTH/11e.(2) DISPOSAL CELL

DISPOSAL CELL ENVIRONMENTAL MONITORING

A	1/4/08	DFB	ISSUED FOR PERMITTING

D.BOOTH
G.DUTSON
D.BOOTH
AS SHOWN 01/04/08 A

07021
U3



LEGEND

- PERMITTED WASTE LIMITS
- CLAY BARRIER CENTERLINE
- INSPECTION ROAD
- WASTE BREAK LINES
- LINER LIMITS (MINIMUM)
- DRAINAGE DITCH CENTERLINE
- 11e.(2) COVER TRANSITION
- RUNON BERM CENTERLINE
- SECTION LINE
- PROPERTY LINE
- CLOSURE FENCE
- GROUNDWATER MONITORING WELL
- FUTURE GW MONITORING WELL (SCREEN)
- FUTURE GW MONITORING WELL (WELL HEAD)
- LYSIMETER PAN
- LYSIMETER MANHOLE

150 0 150 300

NOTES

1. ALL ELEVATIONS SHOWN ARE FOR TOP OF WASTE UNLESS OTHERWISE NOTED.
2. COORDINATES ARE BASED ON THE CLIVE MONUMENT.
3. THESE WELLS WILL BE ABANDONED PRIOR TO CONSTRUCTION OF CELL LINER.
4. INSPECTION ROAD AND DITCH CENTERLINE TO BE DETERMINED AT TIME OF COVER CONSTRUCTION.
5. LYSIMETER PAN AND MANHOLE ELEVATIONS WILL BE DETERMINED AT TIME OF LINER CONSTRUCTION.

LICENSED PROFESSIONAL ENGINEER No. 189500 DAVID F BOOTH 1/4/08 STATE OF UTAH

1/4/08 DFB ISSUED FOR PERMITTING

ENERGYSOLUTIONS

CLIVE FACILITY

CLASS A SOUTH/11e.(2) DISPOSAL CELL

CELL LAYOUT

D.BOOTH

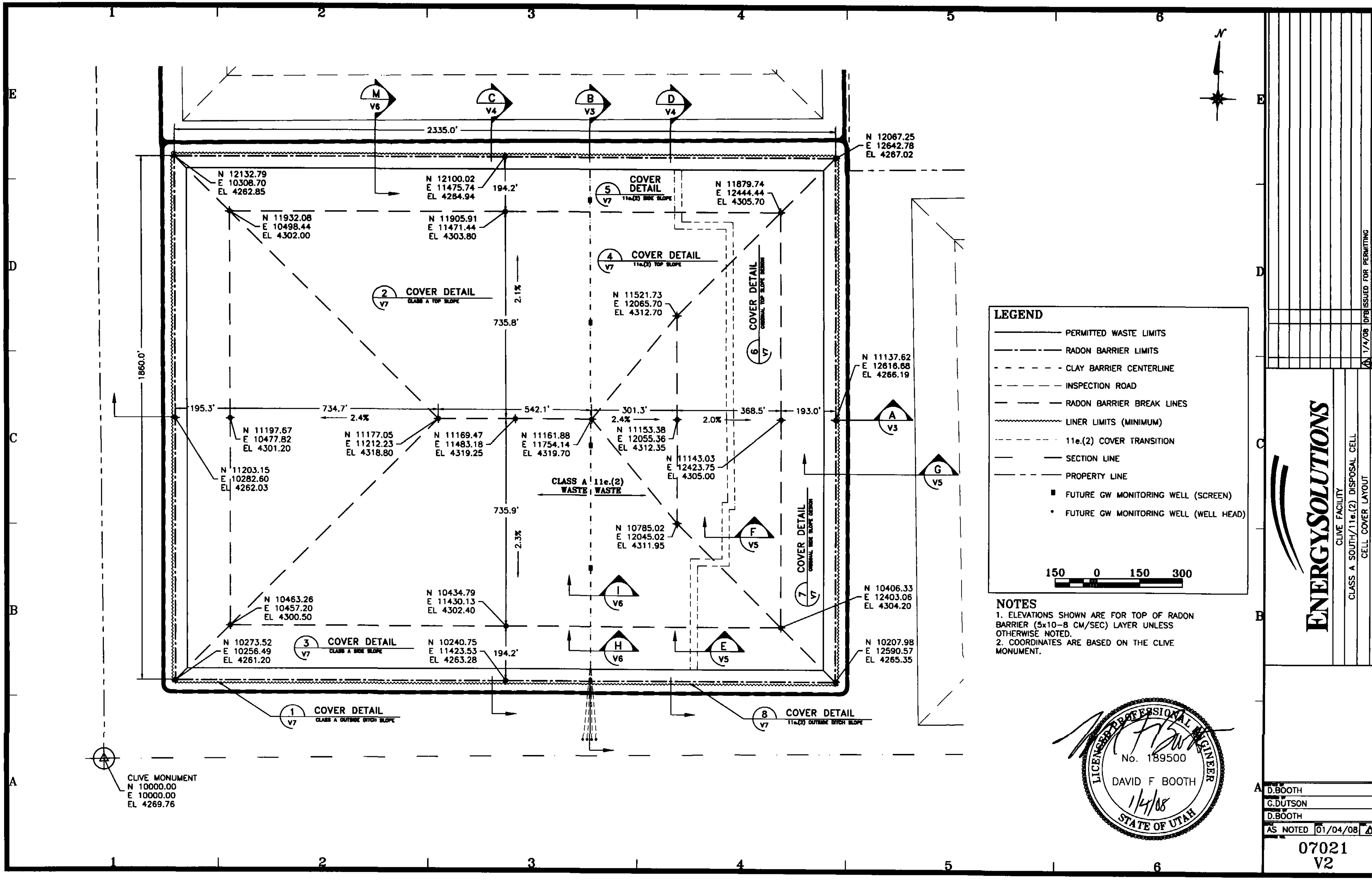
G.DUTSON

D.BOOTH

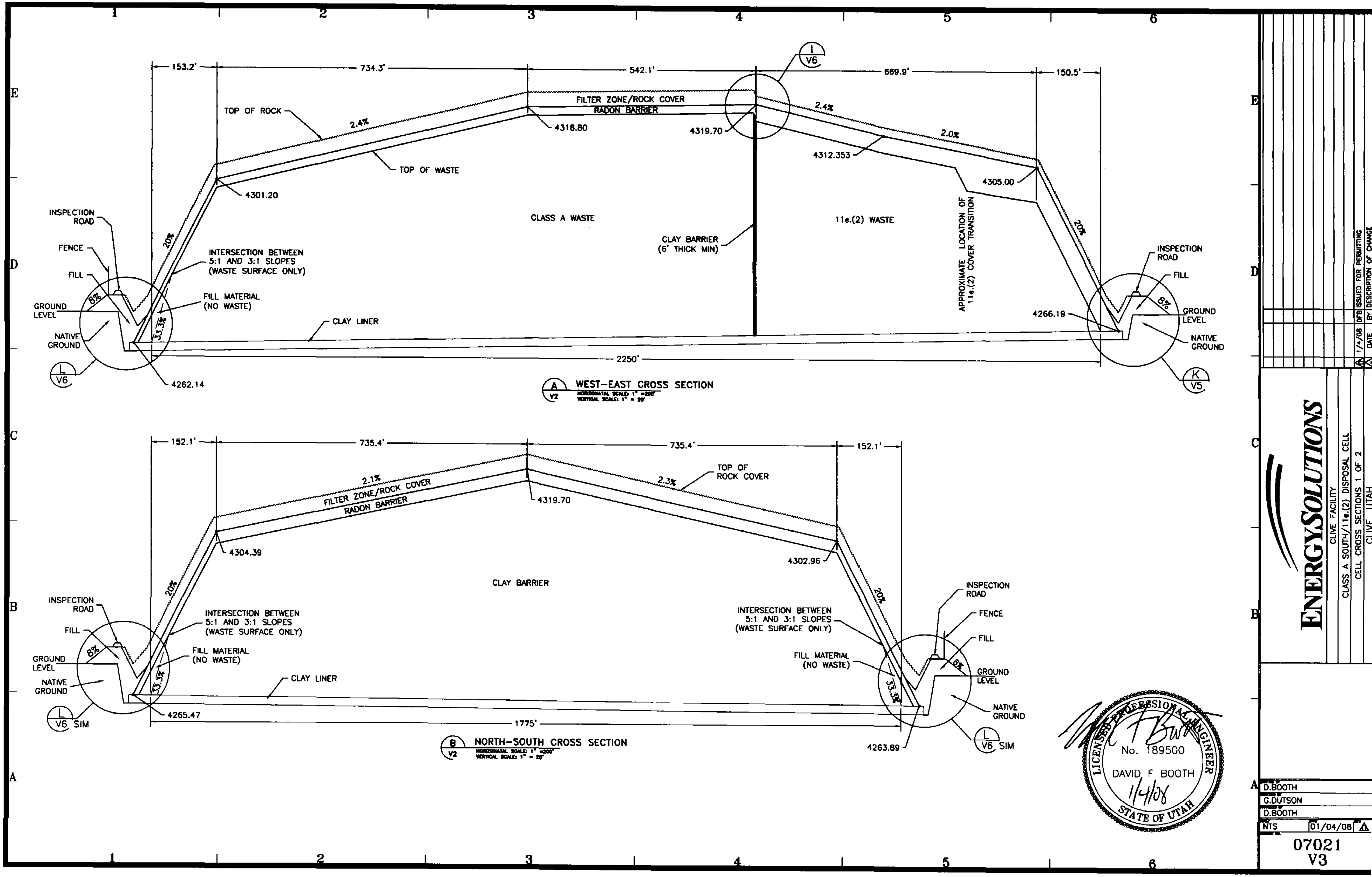
AS NOTED 01/04/08

07021

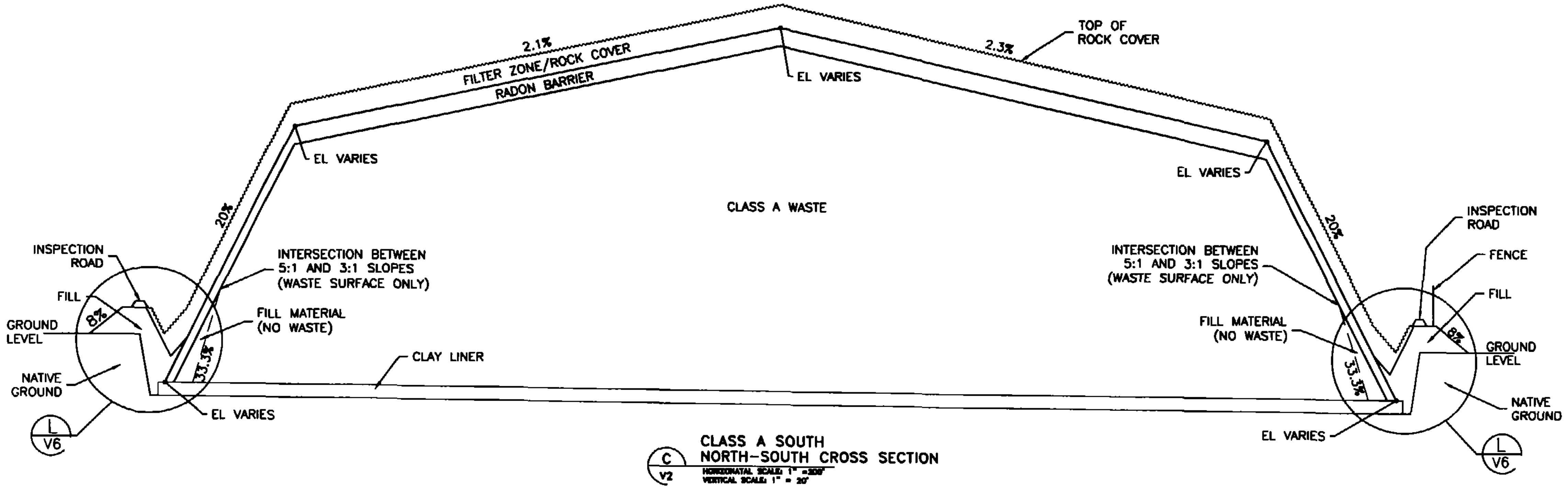
V1



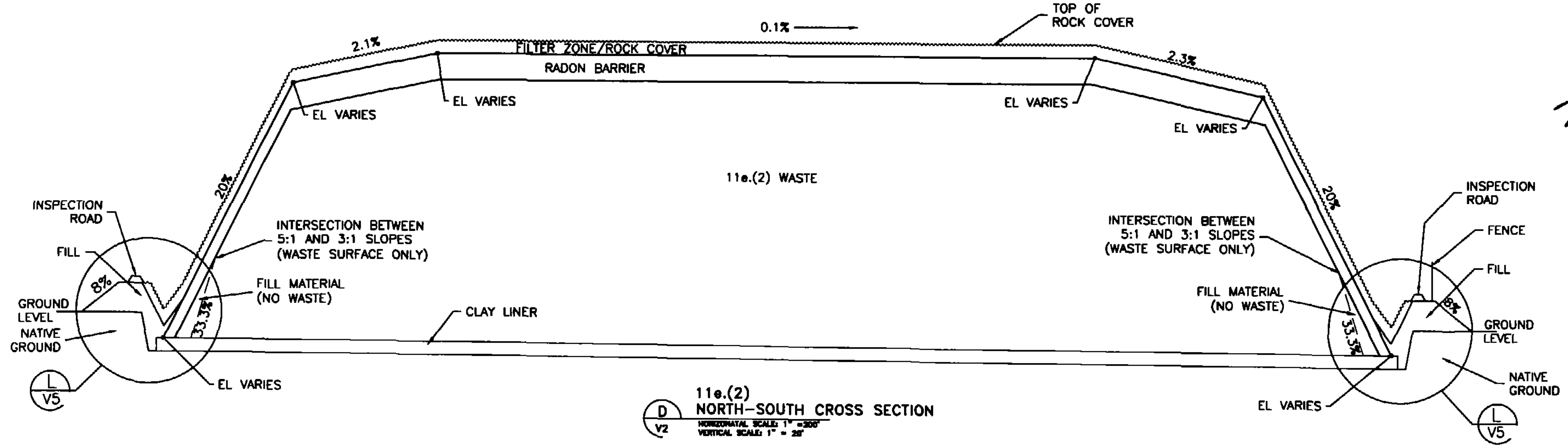
2335.0'
N 12067.25
E 12642.78
EL 4267.02
N 12132.79
E 10308.70
EL 4262.85
N 12100.02
E 11475.74
EL 4284.94
194.2'
COVER DETAIL
N 11879.74
E 12444.44
EL 4305.70
N 11932.08
E 10498.44
EL 4302.00
N 11905.91
E 11471.44
EL 4303.80
COVER DETAIL
COVER DETAIL
CLASS A TOP SLOPE
2.1%
735.8'
N 11521.73
E 12065.70
EL 4312.70
COVER DETAIL
1860.0'
N 11137.62
E 12616.68
EL 4266.19
195.3'
734.7'
2.4%
542.1'
301.3'
2.4%
2.0%
368.5'
193.0'
N 11197.67
E 10477.82
EL 4301.20
N 11177.05
E 11212.23
EL 4318.80
N 11169.47
E 11483.18
EL 4319.25
N 11161.88
E 11754.14
EL 4319.70
N 11153.38
E 12055.36
EL 4312.35
N 11143.03
E 12423.75
EL 4305.00
N 11203.15
E 10282.60
EL 4262.03
CLASS A WASTE
11e.(2) WASTE
735.9'
2.3%
N 10785.02
E 12045.02
EL 4311.95
COVER DETAIL
N 10463.26
E 10457.20
EL 4300.50
N 10434.79
E 11430.13
EL 4302.40
N 10406.33
E 12403.06
EL 4304.20
N 10273.52
E 10256.49
EL 4261.20
COVER DETAIL
CLASS A SIDE SLOPE
N 10240.75
E 11423.53
EL 4263.28
194.2'
N 10207.98
E 12590.57
EL 4265.35
COVER DETAIL
CLASS A OUTSIDE DITCH SLOPE
COVER DETAIL
11e.(2) OUTSIDE DITCH SLOPE
CLIVE MONUMENT
N 10000.00
E 10000.00
EL 4269.76
LEGEND
PERMITTED WASTE LIMITS
RADON BARRIER LIMITS
CLAY BARRIER CENTERLINE
INSPECTION ROAD
RADON BARRIER BREAK LINES
LINER LIMITS (MINIMUM)
11e.(2) COVER TRANSITION
SECTION LINE
PROPERTY LINE
FUTURE GW MONITORING WELL (SCREEN)
FUTURE GW MONITORING WELL (WELL HEAD)
150 0 150 300
NOTES
1. ELEVATIONS SHOWN ARE FOR TOP OF RADON BARRIER (5x10-8 CM/SEC) LAYER UNLESS OTHERWISE NOTED.
2. COORDINATES ARE BASED ON THE CLIVE MONUMENT.
LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F BOOTH
1/4/08
STATE OF UTAH
ENERGYSOLUTIONS
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
CELL COVER LAYOUT
1/4/08 DFB ISSUED FOR PERMITTING
D.BOOTH
G.DUTSON
D.BOOTH
AS NOTED 01/04/08
07021
V2



153.2'
734.3'
542.1'
669.9'
150.5'
FILTER ZONE/ROCK COVER
RADON BARRIER
TOP OF ROCK
2.4%
2.4%
2.0%
4318.80
4319.70
4312.353
TOP OF WASTE
4301.20
4305.00
CLASS A WASTE
11e.(2) WASTE
APPROXIMATE LOCATION OF 11e.(2) COVER TRANSITION
CLAY BARRIER (6' THICK MIN)
INSPECTION ROAD
FENCE
FILL
GROUND LEVEL
NATIVE GROUND
20%
8%
33.3%
INTERSECTION BETWEEN 5:1 AND 3:1 SLOPES (WASTE SURFACE ONLY)
FILL MATERIAL (NO WASTE)
CLAY LINER
4266.19
2250'
4262.14
L V6
K V5
I V6
A V2 WEST-EAST CROSS SECTION
152.1'
735.4'
735.4'
152.1'
2.1%
2.3%
TOP OF ROCK COVER
4319.70
4304.39
4302.96
CLAY BARRIER
4265.47
1775'
4263.89
L V6 SIM
B V2 NORTH-SOUTH CROSS SECTION
LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F BOOTH
1/4/08
STATE OF UTAH
1/4/08 DFB ISSUED FOR PERMITTING
DATE BY DESCRIPTION OF CHANGE
ENERGYSOLUTIONS
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
CELL CROSS SECTIONS 1 OF 2
CLIVE, UTAH
D.BOOTH
G.DUTSON
D.BOOTH
NTS 01/04/08
07021
V3



C
V2
CLASS A SOUTH
NORTH–SOUTH CROSS SECTION
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 20'



D
V2
11e.(2)
NORTH–SOUTH CROSS SECTION
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 20'

LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F BOOTH
1/4/08
STATE OF UTAH

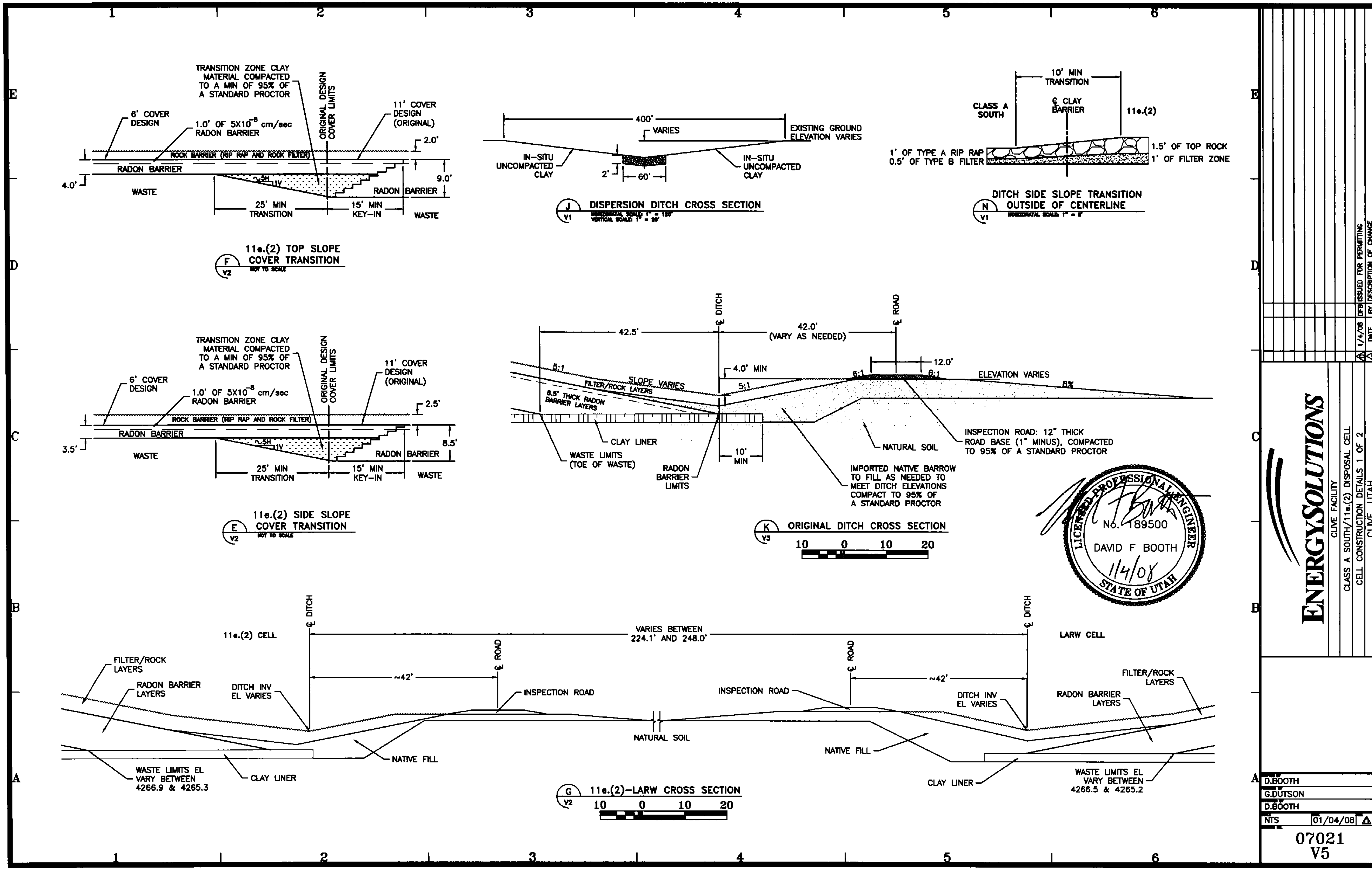
DATE	BY	DESCRIPTION OF CHANGE
1/4/08	DFB	ISSUED FOR PERMITTING

ENERGYSOLUTIONS

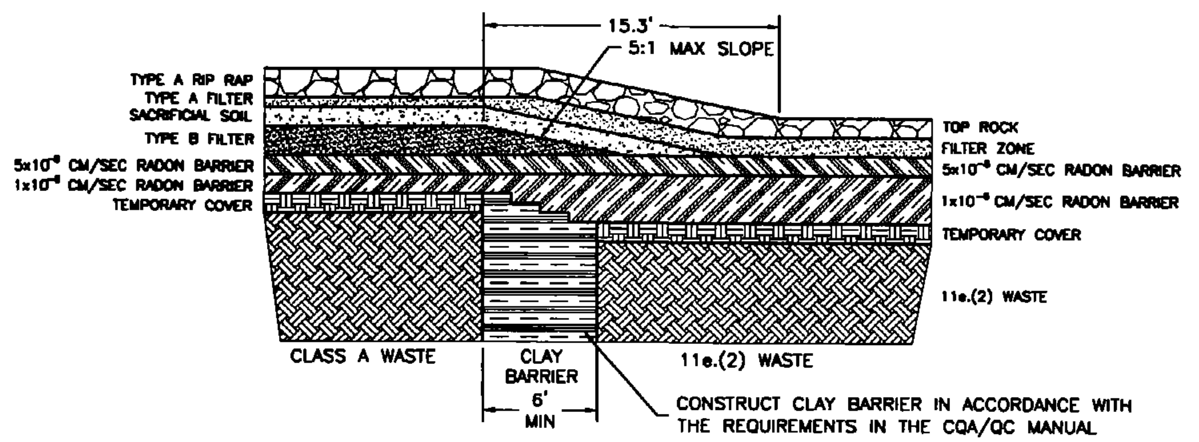
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
CELL CROSS SECTIONS 2 OF 2
CLIVE, UTAH

D.BOOTH
G.DUTSON
D.BOOTH
NTS 01/04/08

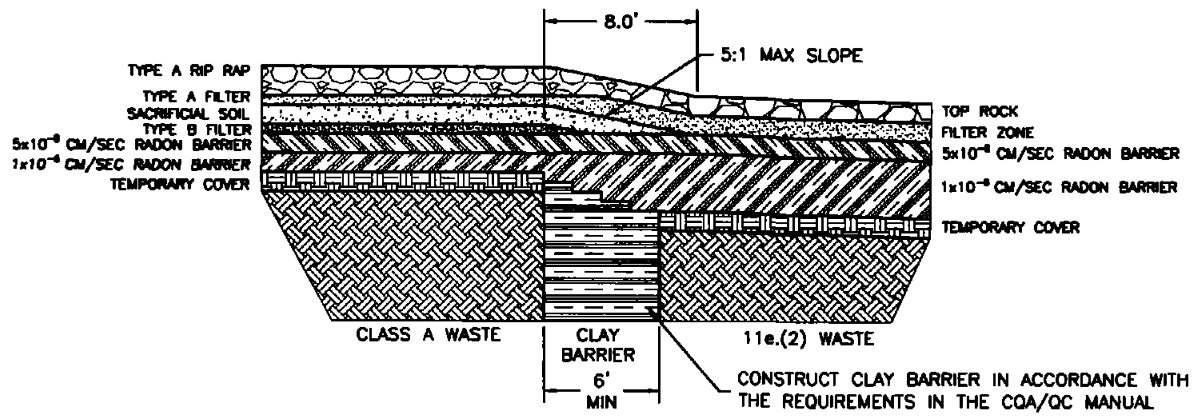
07021
V4



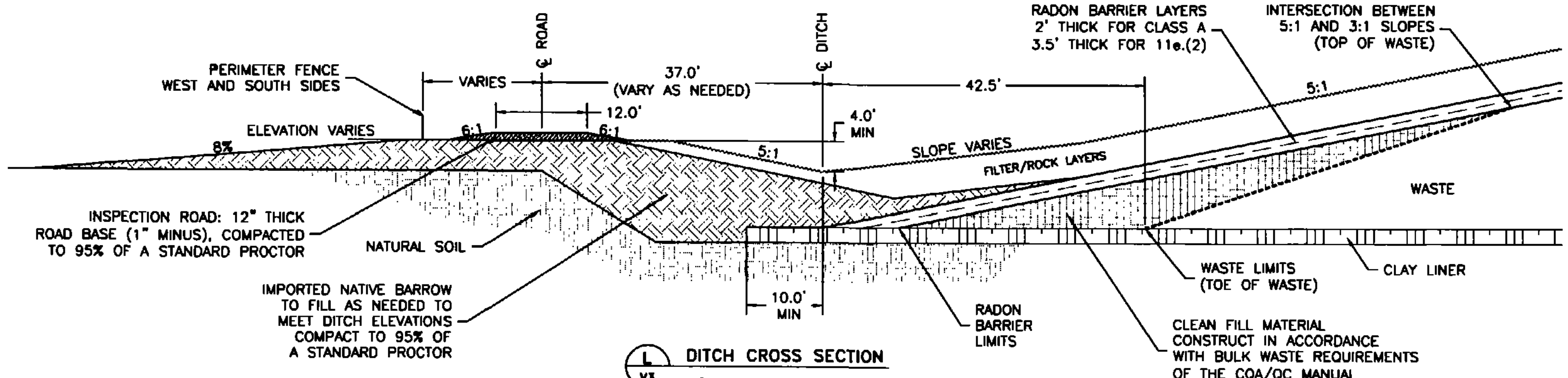
TRANSITION ZONE CLAY MATERIAL COMPACTED TO A MIN OF 95% OF A STANDARD PROCTOR
ORIGINAL DESIGN COVER LIMITS
6' COVER DESIGN
1.0' OF 5X10-8 cm/sec RADON BARRIER
11' COVER DESIGN (ORIGINAL)
ROCK BARRIER (RIP RAP AND ROCK FILTER)
RADON BARRIER
WASTE
25' MIN TRANSITION
15' MIN KEY-IN
11e.(2) TOP SLOPE COVER TRANSITION
NOT TO SCALE
400'
VARIES
EXISTING GROUND ELEVATION VARIES
IN-SITU UNCOMPACTED CLAY
DISPERSION DITCH CROSS SECTION
10' MIN TRANSITION
CLASS A SOUTH
℄ CLAY BARRIER
1' OF TYPE A RIP RAP
0.5' OF TYPE B FILTER
1.5' OF TOP ROCK
1' OF FILTER ZONE
DITCH SIDE SLOPE TRANSITION OUTSIDE OF CENTERLINE
11e.(2) SIDE SLOPE COVER TRANSITION
℄ DITCH
℄ ROAD
42.5'
42.0' (VARY AS NEEDED)
4.0' MIN
12.0'
ELEVATION VARIES
SLOPE VARIES
FILTER/ROCK LAYERS
8.5' THICK RADON BARRIER LAYERS
CLAY LINER
WASTE LIMITS (TOE OF WASTE)
RADON BARRIER LIMITS
10' MIN
NATURAL SOIL
INSPECTION ROAD: 12" THICK ROAD BASE (1" MINUS), COMPACTED TO 95% OF A STANDARD PROCTOR
IMPORTED NATIVE BARROW TO FILL AS NEEDED TO MEET DITCH ELEVATIONS COMPACT TO 95% OF A STANDARD PROCTOR
ORIGINAL DITCH CROSS SECTION
LICENSED PROFESSIONAL ENGINEER No. 189500 DAVID F BOOTH 1/4/08 STATE OF UTAH
11e.(2) CELL
VARIES BETWEEN 224.1' AND 248.0'
LARW CELL
INSPECTION ROAD
DITCH INV EL VARIES
NATIVE FILL
WASTE LIMITS EL VARY BETWEEN 4266.9 & 4265.3
WASTE LIMITS EL VARY BETWEEN 4266.5 & 4265.2
11e.(2)-LARW CROSS SECTION
ENERGYSOLUTIONS
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
CELL CONSTRUCTION DETAILS 1 OF 2
1/4/08 DFB ISSUED FOR PERMITTING
D.BOOTH
G.DUTSON
D.BOOTH
NTS 01/04/08
07021 V5



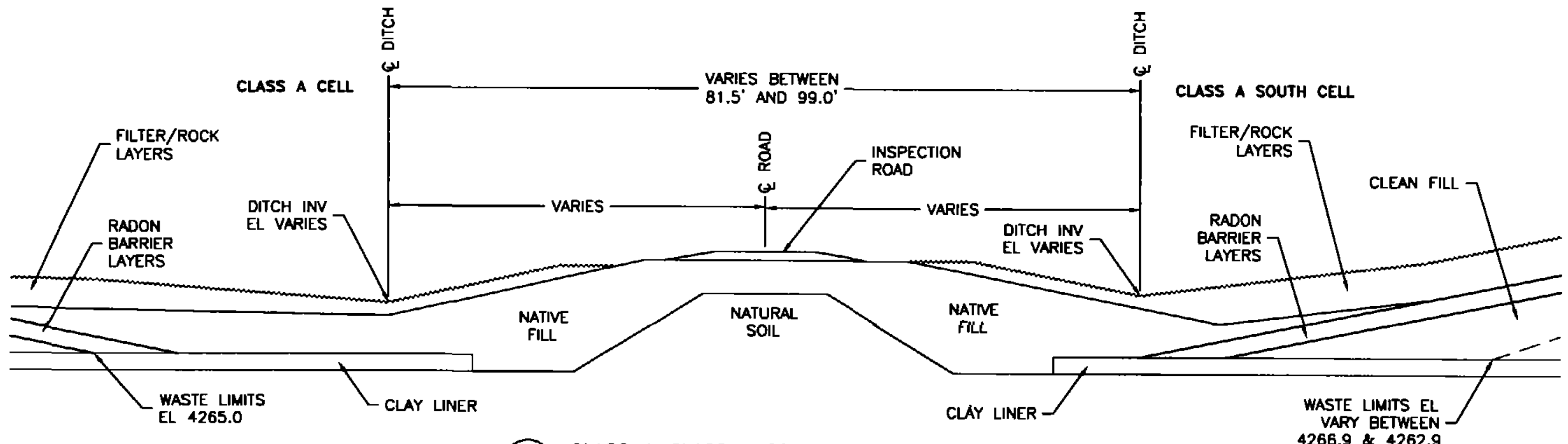
H V2 SIDE SLOPE COVER TRANSITION @ CLAY BARRIER
SCALE: 1" =10'



I V2 TOP SLOPE COVER TRANSITION @ CLAY BARRIER
SCALE: 1" =10'



L V3 DITCH CROSS SECTION
10 0 10 20



M V2 CLASS A-CLASS A SOUTH CROSS SECTION
10 0 10 20

NOTE: CLASS A-11e.(2) CROSS SECTION IS SIMILAR.

LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F BOOTH
1/4/08
STATE OF UTAH

ENERGYSOLUTIONS
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
CELL CONSTRUCTION DETAILS 2 OF 2
CLIVE, UTAH

A	1/4/08	DFB	ISSUED FOR PERMITTING
	DATE	BY	DESCRIPTION OF CHANGE

D.BOOTH
G.DUTSON
D.BOOTH
NTS 01/04/08 A
07021
V6

11e.(2) COVER DESIGNS

ROCK
12" THICK TOP ROCK
12" THICK FILTER ZONE
CLAY
12" OF 5 X 10^{-8} CM/SEC RADON BARRIER
3' OF 1 X 10^{-8} CM/SEC RADON BARRIER

4 / V2 — 11e.(2) TOP SLOPES

ROCK
18" THICK SIDE ROCK
12" THICK FILTER ZONE
CLAY
12" OF 5 X 10^{-8} CM/SEC RADON BARRIER
2.5' OF 1 X 10^{-8} CM/SEC RADON BARRIER

5 / V2 — 11e.(2) SIDE SLOPES

ROCK
12" THICK TOP ROCK
12" THICK FILTER ZONE
CLAY
12" OF 5 X 10^{-8} CM/SEC RADON BARRIER
8' OF 1 X 10^{-8} CM/SEC RADON BARRIER

6 / V2 — 11e.(2) TOP SLOPES
ORIGINAL DESIGN

ROCK
18" THICK SIDE ROCK
12" THICK FILTER ZONE
CLAY
12" OF 5 X 10^{-8} CM/SEC RADON BARRIER
7.5' OF 1 X 10^{-8} CM/SEC RADON BARRIER

7 / V2 — 11e.(2) SIDE SLOPES
ORIGINAL DESIGN

ROCK
18" THICK SIDE ROCK
12" THICK FILTER ZONE
NATURAL GROUND OR IMPORTED NATIVE BARROW MATERIAL

8 / V2 — PERIMETER DITCH
OUTSIDE SLOPE ONLY

GRADATIONS – ASTM C-136

TOP ROCK
- D_{100} 2-1/2 TO 4-1/2 INCHES
- D_{50} 1-1/8 TO 3 INCHES
- D_{15} 3/4 TO 1-1/2 INCHES

SIDE ROCK
- D_{100} 12 TO 16 INCHES
- D_{85} 8 TO 12 INCHES
- D_{50} 4-1/2 TO 8 INCHES
- D_{15} 2 TO 4 INCHES

FILTER ZONE
- D_{100} = 1.5 TO 3. 0 INCHES
- D_{85} = 1.0 TO 2.5 INCHES
- D_{50} = 0.75 TO 2.0 INCHES
- D_{15} = 0.3.125 TO 0.625 INCHES
- D_{10} >= #10 SIEVE (2.0 mm)
- D_5 >= #200 SEIVE (0.074 mm)

CLASS A SOUTH COVER DESIGNS

12" THICK TYPE A RIP RAP
6" THICK TYPE A FILTER ZONE
NATURAL GROUND OR IMPORTED NATIVE BARROW MATERIAL

1 / V2 — PERIMETER DITCH
OUTSIDE SLOPE ONLY

ROCK
18" THICK TYPE B RIP RAP
6" THICK TYPE A FILTER ZONE
12" THICK SACRIFICIAL SOIL
6" THICK TYPE B FILTER ZONE
CLAY
12" OF 5 X 10^{-6} CM/SEC RADON BARRIER
12" OF 1 X 10^{-6} CM/SEC RADON BARRIER

2 / V2 — CLASS A SOUTH TOP SLOPES

ROCK
18" THICK TYPE A RIP RAP
6" THICK TYPE A FILTER ZONE
12" THICK SACRIFICIAL SOIL
18" THICK TYPE B FILTER ZONE
CLAY
12" OF 5 X 10^{-6} CM/SEC RADON BARRIER
12" OF 1 X 10^{-6} CM/SEC RADON BARRIER

3 / V2 — CLASS A SOUTH SIDE SLOPES

GRADATIONS – ASTM C-136

TYPE A RIP RAP
- D_{100} <= 16 INCH
- D_{90} <= 12 INCH
- D50 >= 4-1/2 INCH
- D10 >= 2 INCH
- D5 >= NO. 200 SIEVE

TYPE B RIP RAP
- D_{100} <= 4-1/2 INCH
- D_{50} >= 1-1/4 INCH
- D10 >= 3/4 INCH
- D5 >= NO. 200 SIEVE

TYPE A FILTER ZONE
- D_{100} <= 6 INCH
- D_{70} <= 3 INCH
- D50 <= 1.57 INCH (40 mm)
- D15 <= .85 INCH (22 mm)
- D10 >= NO. 10 SIEVE (2mm)
- D5 >= NO. 200 SIEVE

TYPE B FILTER & SACRIFICIAL SOIL

TYPE B FILTER & SACRIFICAIL SOIL MATERIAL GRADATIONS ARE DETERMINED BY THE FOLLOWING SPECIFICATION:

$\frac{\text{D15 (MAX) FILTER}}{\text{D85 (MIN) SOIL}}$ MUST BE < 5

$\frac{\text{D50 (MAX) FILTER}}{\text{D50 (MIN) SOIL}}$ MUST BE ≤ 25

TYPE B FILTER MIN PERMEABILITY = 3.5 cm/sec

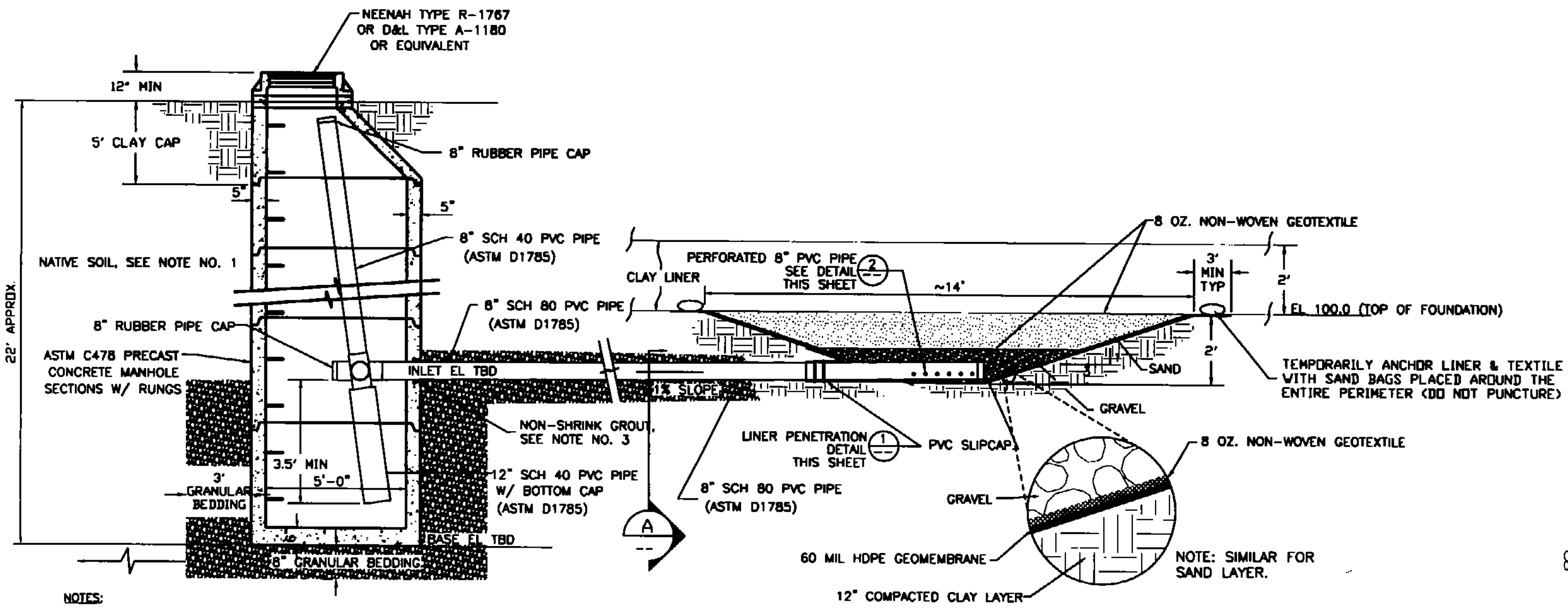
SACRIFICIAL SOIL MIN MOISTURE @ 15 atm = 3.5%

LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F BOOTH
1/4/08
STATE OF UTAH

DATE	BY	DESCRIPTION OF CHANGE
1/4/08	DFB	ISSUED FOR PERMITTING

ENERGYSOLUTIONS
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
COVER CROSS SECTIONS AND GRADATIONS
CLIVE, UTAH

D.BOOTH
G.DUTSON
D.BOOTH
NTS 01/04/08
07021
V7

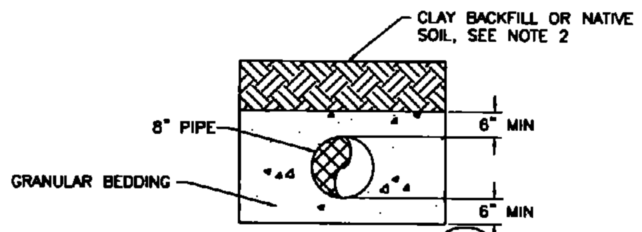


NOTES:

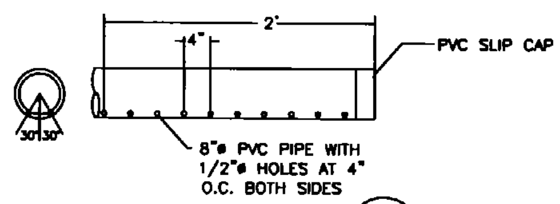
1. BACKFILL AROUND THE LOWER MANHOLE SECTIONS AND LYSIMETER PIPE SHALL CONSIST OF GRANULAR BEDDING MATERIAL. A 3 FOOT COLUMN OF GRANULAR BEDDING SHALL EXTEND UP TO THE INLET ELEVATION OF THE LYSIMETER PIPE. BACKFILL FOR THE REMAINING MANHOLE SECTIONS MAY CONSIST OF GRANULAR BEDDING MATERIAL OR NATIVE SOIL AT ≥90% OF THE STANDARD PROCTOR, EXCEPT THE FOR THE FINAL 5 FEET OF BACKFILL WHICH SHALL BE CLAY AT ≥90% OF THE STANDARD PROCTOR.
2. GRANULAR BEDDING MATERIAL SHALL BE USED TO BACKFILL THE PIPE TRENCH TO A MINIMUM OF 6 INCHES ABOVE THE PIPE. THE REMAINING TRENCH BACKFILL MAY CONSIST OF GRANULAR BEDDING MATERIAL OR NATIVE SOIL AT ≥90% OF THE STANDARD PROCTOR.
3. SEAL PIPE PENETRATION ON MANHOLE SECTION ON THE INSIDE AND OUTSIDE WITH A RUBBER BOOT AND SS STRAP AND/OR NON-SHRINK GROUT.

MANHOLE DETAIL
NOT TO SCALE

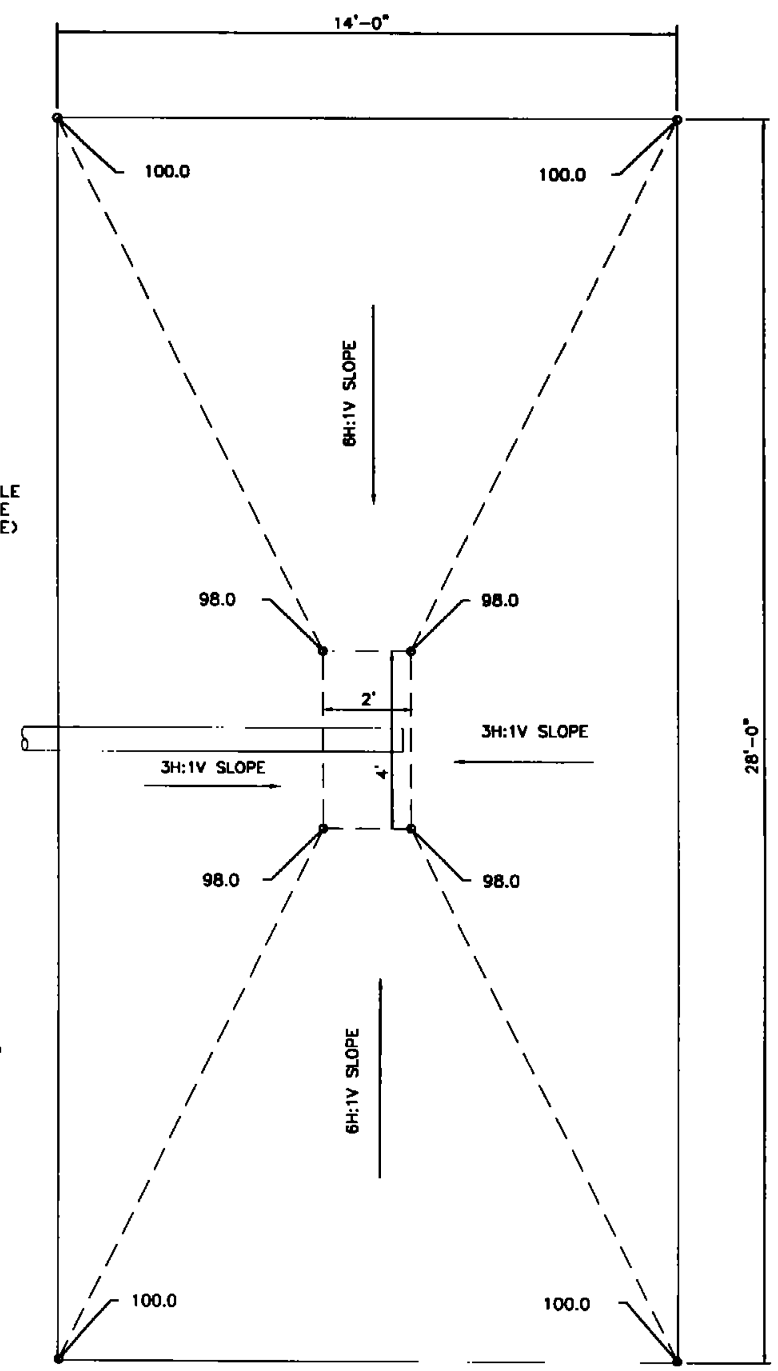
COLLECTION LYSIMETER SUMP DETAIL
NOT TO SCALE



SECTION A
NOT TO SCALE

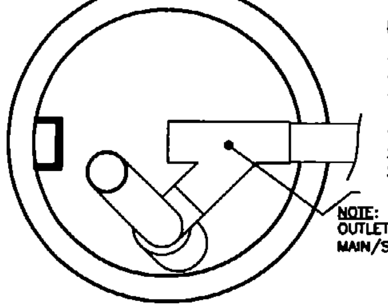


PERFORATION DETAILS 2
NOT TO SCALE



NOTE: LISTED ELEVATIONS ARE FOR REFERENCE ONLY AND REPRESENT TOP OF FOUNDATION. CONSTRUCTION ELEVATIONS ARE BASED ON TOP OF CLAY LAYER ELEVATIONS AND WILL BE DETERMINED PRIOR TO CONSTRUCTION OF THE LYSIMETER(S).

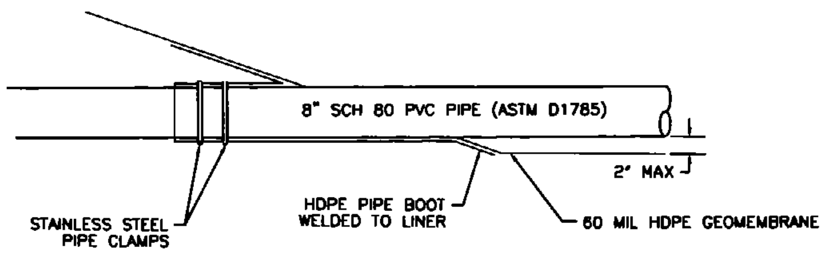
COLLECTION LYSIMETER – PLAN VIEW
4 0 4 8



MANHOLE PIPING SCHEDULE (SCH 40 PVC)
1 – 12"ø x 3.5' RESERVOIR PIPE
1 – 12"ø PVC PIPE CAP
1 – 8"ø x 12"ø REDUCER
1 – 8"ø 3-SOCKET TEE
1 – 8"ø 3-SOCKET WYE
1 – 8"ø x ±16' RISER
2 – 8"ø x RUBBER CAPS
2 – 8"ø x STAINLESS STEEL STRAPS

NOTE: ROTATE WYE SO THAT 45° OUTLET TO TEE IS LOWER THAN MAIN/STRAIGHT OUTLET

MANHOLE PIPING DETAIL
NOT TO SCALE



LINER PENETRATION DETAIL 1
NOT TO SCALE

LICENSED PROFESSIONAL ENGINEER
No. 189500
DAVID F. BOOTH
1/4/08
STATE OF UTAH

NOTE: SEE ALSO GWQDP APPENDIX C, CQA PLAN FOR COLLECTION LYSIMETERS.

DATE	BY	DESCRIPTION OF CHANGE
1/4/08	DFB	ISSUED FOR PERMITTING

ENERGYSOLUTIONS
CLIVE FACILITY
CLASS A SOUTH/11e.(2) DISPOSAL CELL
COLLECTION LYSIMETERS DETAILS
CLIVE, UTAH

D.SQUIRES
G.DUTSON
D. BOOTH
AS NOTED 01/04/08
07021
V8

ATTACHMENT 3

LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Manual

TABLE 1 – CQA/QC ACTIVITIES

Work Elements:

TABLE 2 – MATERIAL PROPERTIES FOR PORTLAND CEMENT CLSM

TABLE 3 – MATERIAL PROPERTIES FOR FLY ASH CLSM

FIGURE 1 – LARW Settlement Monuments, May 1, 2006
FIGURE 2 – Class A Settlement Monuments, rev. 1, July 5, 2007
FIGURE 3 – Mixed Waste Settlement Monuments, May 1, 2006

WORK ELEMENT - DOCUMENT CONTROL

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to all construction activities in the Class A, Class A North, and <u>Class A South/</u>11e.(2) embankments.		
QC DOCUMENTATION APPROVAL: QC documentation shall be approved/rejected by the QC Officer and submitted to the Construction QA Officer. The Construction QA Officer shall approve/reject the documentation.	Sign the reports indicating documentation is adequate, correct, and has been accepted by QC. Provide QA with copies of the documentation and obtain their signature on the documentation indicating QA acceptance. Ensure that corrective actions required by QA personnel are accomplished.	Review the documentation generated by QC. Report deficiencies to the QC officer and the Construction QA Officer. Verify that corrective action has been taken (where required) and recorded on the QC documentation. Countersign reports indicating documentation is adequate, correct, and has been accepted by QA. Record findings on the "Daily Quality Assurance Report".
QC DOCUMENTATION FILES: Original QC documents shall be maintained at the site. A copy of the original shall be forwarded to Energy*Solutions*' main office.	After the QC documentation has been accepted by QA, submit a copy of the original to the main office for filing. Maintain the originals of all QC documentation in the site engineering file.	Periodically review the site engineering files to ensure the correct documentation is being retained by QC personnel.
QA DOCUMENTATION FILES: Original QA documents shall be maintained at the site. A copy of the original shall be forwarded to Energy*Solutions*' main office.	None	Submit a copy of the original to the main office for filing. Maintain the originals of all QA documentation in the site QA file.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
RUNON CONTROL DURING PROJECT: The perimeter berms shall be constructed to a minimum of 3 feet above the ground elevations (GL) shown in the engineering drawings. The first lift of material shall have an uncompacted thickness of no greater than 12 inches. Elevations for the berms between the specified ground elevations shall be linearly interpreted between the shown elevations. The berms shall be a minimum of 10 feet at the top and shall be compacted to 90 percent of a standard Proctor.	Verify that the required berms have been constructed to the specified dimension. Record any findings on the "Daily Construction Report". Spot check the density of the first lift and subsequent lifts of the berm to ensure that it meets specifications. Record density tests on the "Field Density Test" form.	Verify that berms have been inspected by QC personnel.
RUNOFF CONTROL DURING PROJECT: Berms shall be constructed around the outside edge of the clay liner to a height of 3 feet. This height is measured as the elevation above the design elevation of the clay liner; or as the elevation above the design elevation of debris-free zone soils placed on top of the clay liner, whichever is higher. Berms shall be a minimum of 3 feet wide at the top. The first lift of material shall have an uncompacted thickness of no greater than 12 inches. The berm will be constructed on top of the clay liner such that the berm is not in contact with native ground. A distance of 10 feet shall be maintained between the toe of the berm and the toe of the waste. The berms shall be compacted to 90 percent of a standard Proctor.	Verify that the required berms have been constructed to the specified dimension. Record any findings on the "Daily Construction Report". Spot check the density of the first lift and subsequent lifts of the berm to ensure that it meets specifications. Record density tests on the "Field Density Test" form.	Verify that the berms have been inspected by QC personnel.
Contact water shall be controlled inside the runoff control berm system. Contact water is defined as any storm water that falls within the runoff berm system in the active, unfinished portions of the embankment.	Inspect the access ramps that cross runoff berms on a weekly basis for the presence of runoff control channels and document the inspection on the "Daily Construction Report".	Verify that the weekly access ramp inspections have been performed and documented.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
Access ramps that cross runoff berms shall be constructed to prevent such runoff from leaving the lined portion of the embankment.		
Fences or other barriers will be installed at the active cell boundary, (the run-off berm and near the radon barrier/waste interface) The barriers will be "chicken-wire", snow-fence, chain-link fence, or herculite (or other materials similar to herculite) secured to "T" posts.	Verify fences are installed around the active cell boundary and near the radon barrier/waste interface and document the inspection on the "Daily Construction Report".	Verify that fences are in place and have been inspected by QC personnel.
Storm runoff for up to a 10-year, 24-hour event that runs off from those portions of the embankment that have been completed to final cover design shall be managed and controlled to prevent such runoff from contacting contaminated waste material in the active unfinished portions of the embankment.		
MONTHLY BERM INSPECTION: The berms and fences are to be inspected monthly. Inspect for obvious damage to berms and fences. Ensure berm height where roads cross berms.	Inspect the berm on a monthly basis and document the inspection and any corrective actions taken (if required) on the "Daily Construction Report". Marker posts indicating the required berm height should be placed at both side of a road at the point where the road crosses the berm. This is to aid in identifying damage to the berm due to road traffic. Repair any noted damage of berm or wind dispersal fences and fill low spots to meet the design height.	Verify that the monthly berm inspections have been performed and properly documented. Verify proper installation of marker posts and wind dispersal fences or other barriers.
BERM MAINTENANCE: The runon and runoff berms shall be surveyed and improved, as required, by July 1 of each year.	Survey the berms at 100 foot intervals and key points. Repair any noted damage and fill low spots to meet the design height.	Verify that the berms are surveyed and improved, as required.
MOVING OR BREACHING A BERM: When moving or breaching a berm, the work must be authorized by the QC officer prior to commencing	Review the work to be performed. Document the approval to move or breach a berm on the "Breach of Berm" Form.	Verify that the approval to move or breach a berm has been properly documented.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
work. A temporary breach of a berm may be accomplished without a temporary berm, provided the work may be completed and the berm replaced the same day. A temporary berm will have the same specifications as a permanent berm.		
NUCLEAR DENSITY/MOISTURE GAUGE CALIBRATION: To ensure proper calibration, a sand-cone density test shall be performed jointly with five percent of the nuclear density test. The frequency of sand-cone tests shall be reduced to two percent of the nuclear density tests for the clay liner or radon barrier to minimize the damage to these low permeability layers from the sand-cone test. Holes in the clay liner and radon barrier created by the nuclear density gauge shall be filled with dry bentonite. To ensure proper calibration, an oven-drying test shall be performed jointly with five percent of the nuclear moisture tests.	Perform sand-cone density tests and oven-drying tests to calibrate the nuclear moisture/density gauge. Review the results with the Construction QA Officer. When performing the sand-cone density test or the oven-drying test to calibrate the nuclear moisture/density gauge, the data obtained from the sand-cone density test or the oven-drying test takes precedence over the data obtained from the nuclear moisture/density gauge.	Review the results with the QC officer. Verify that the data obtained from the sand-cone density tests and oven-drying tests (when performed) are used in the calculations for ultimate acceptance of the tested media.
SAMPLING LOCATIONS FOR LOTS: For sample location chosen by random numbers, two random numbers shall be employed. The first number (X) shall be between 0 and the largest east-west distance of the lot. The second number (Y) shall be between 0 and the largest north-south distance of the lot. The test location will be located at X feet east and Y feet south of the north-west corner of the lot. For a linear lot (e.g. the intersection of lifts), a single random number shall be generated. For borrow sources which consist of multiple lots which will be sampled by a single test pit, the test pit shall be located by two random numbers as outlined above and will be the same for all lots.	Generate random numbers for each lot by using a calculator or computer with a random number generator. Locate the test location within five feet of the location specified by the random numbers. If the sample location is outside the lot, generate two new random numbers.	Verify that the test methods are being chosen by random number.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
TEST METHODS: All tests shall be performed in accordance with the test methods specified in Appendix B.	Use the test methods in Appendix B to perform the require testing.	Verify that the test methods being use to conduct the tests are the methods specified in Appendix B.
QA AUDITING: Energy*Solutions* shall contract with an independent firm to perform an annual audit of the CQA/QC. The auditor shall: a) audit at least 15% of the CQA\QC documentation; and b) observe QC procedures for field density/moisture tests, classification tests, Proctors, permeability tests, and surveying. A copy of the auditors report shall be submitted to the DRC.	Schedule times with the QA auditor to observe the specified testing. Cooperate with QA auditor in the review of QC documentation.	Cooperate with QA auditor in the review of QC documentation.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be excavated for construction of cells. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.	Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the "Daily Construction Report".	Verify that the clearing and grubbing has been inspected by QC.
EXCAVATION: Excavation shall be made to the lines, grades, and dimensions prescribed in the approved plans. Any over excavation shall be backfilled with select materials and compacted to 95 percent of Standard Proctor. The uncompacted lift thickness shall not exceed 9 inches.	Observe the cell excavation. Record observations and corrective actions taken (where required) on the "Daily Construction Report". In areas of over excavation, conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as a maximum of 10,000 square feet of a lift of a specified type of material. Test locations shall be chosen on the basis of random numbers. a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction. Proctors shall be performed at a rate of one test per 100,000 square feet for each material type. At least one proctor shall be performed for each material type. Record the location of the sample on the "Sampling Log".	Observe, at a minimum, five percent of the tests performed by QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
SCARIFICATION AND COMPACTION: The foundation shall consist of either: a. scarifying the in-situ clays to at least six inches and compacting it to at	Observe the foundation. Record observations and corrective actions on the "Daily QC Report".	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
least 95 percent of a standard proctor or; b. inspecting the in-situ sands and if cracking of the surface is observed, then scarify the in-situ sands to at least six inches and compact it to at least 95 percent of a standard proctor, or, if no cracking is observed, then compact the in-situ sands to at least 95 percent of a standard proctor without prior scarification.	Conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as a maximum of 10,000 square feet of a 6 inch lift of a specified type of material. Test locations shall be chosen on the basis of random numbers. a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction. Proctors shall be performed at a rate of one test per 100,000 square feet for each material type. At least one proctor shall be performed for each material type. Record the location of the sample on the "Sampling Log".	Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
FINAL GRADING: The foundation for the clay liner shall be fairly smooth and free from clods, rocks, soft spots, wet areas, etc. Foundation elevations shall be at grade or below grade.	Survey the foundation on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer. a. Indicate where the foundation meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.
UNSUITABLE MATERIAL: Remove unsuitable material as required. Unsuitable material is non-soil material or soil which cannot be reworked to meet the compaction criteria.	Define areas of unsuitable material and advise the contractor that such areas must be removed. Observe the areas once the unsuitable material has been removed. Report corrective actions (where required) on the "Daily Construction Report".	Verify that the removal of unsuitable material has been properly documented.
FOUNDATION APPROVAL: Foundation to be approved by Construction QA Officer.	Obtain the "Notice of Acceptance" from the Construction QA Officer before construction of the clay liner begins.	Provide a "Notice of Acceptance" to the QC officer indicating that the foundation meet the required specifications.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be used for borrow. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.	Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the "Daily Construction Report".	Verify that the clearing and grubbing has been inspected by QC.
MATERIAL: Satisfactory material shall be defined as CL and ML soils based on the Unified Soil Classification with at least 85 percent passing the No. 200 sieve (silt and clay), a plasticity index (PI) between 10 and 25, and a liquid limit (LL) between 30 and 50. The clay shall also have a dry clod size less than or equal to 1 inch.	Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the clay liner. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log". a. Approve lots (which meet the specified classification) for use in the clay liner. b. Lots not meeting the specified classification can not be used.	Verify the frequency of laboratory tests and compliance of test results.
PROTECTION: The clay borrow material shall be handled in such a manner as to prevent contamination with radioactive waste material or other deleterious material. The in-place clay may contain up to 5 percent additional rocks and sand above the content found in the classification test.	Visually check clay liner materials for contamination by foreign materials. Remove clays which have been contaminated above the specified requirements. Document corrective actions (where required) on the "Daily Construction Report".	Verify that the clay liner is being inspected for contaminates and that corrective actions (if required) are properly documented.
PROCESSING: These procedures may be used to provide suitable material for construction of the clay liner. 1. Apply deflocculant at a rate determined by the	Measure the mixing areas and verify that the application rate of the deflocculant is equal to or greater than the rate determined by the production engineer. Record the size of the mixing areas and the amount of deflocculant applied on the "Embankment	Verify that the size of the mixing areas and the amount of deflocculant applied have been properly documented.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
production engineer	Construction Lift Approval Form".	
2. Mix the deflocculant thoroughly into the soils by tilling or similar action.	Observe the mixed clay and advise the contractor of areas which are adequately mixed.	Verify that the clay is being inspected by QC.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
NOTICE OF TEST PAD CONSTRUCTION: The test pad plan shall be approved by the DRC prior to the test pad construction. The DRC shall be notified 48 hours in advance of the start-up of test pad construction.	Obtain documentation confirming that the test pad plan has been approved by the DRC. Verify that the DRC has been notified, as required.	Verify that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.
TEST PAD: An approximately 60 feet by 75 feet large test pad will be constructed using the procedure proposed for construction of the clay liner. A small test pad with minimum dimensions of 5 feet by 5 feet will be constructed. The purpose of this small test pad is to establish equipment and procedures for construction of clay liner in locations where large equipment is not practical (e.g. repairs). A new test pad shall be constructed each time there is a change in specifications, construction procedures, types of equipment, unified soil classification, or QC testing equipment or procedure. Test pads are to be constructed and tested in accordance with the following specifications:	Observe the construction of test pads. Measure test pads to ensure that they are constructed to the size indicated. Record the test pad size on the "Embankment Construction Lift Approval Form". The large test pad shall be divided into three lots per lift (approximately 1,500 square feet per lot). Each lift of the small test pad shall equal a lot.	Observe the construction of the test pads. Verify that the test pad has been measured and is properly documented.
1. Place the clay in at least three lifts with the first lift uncompacted thickness not exceeding twelve inches. Remaining lifts shall have a loose material thickness not exceeding nine inches for each lift. The clay material will be inspected for dry clod size during placement of each lift of clay liner.	Measure the lift thickness at a rate of 1 test per lot. Record thicknesses on the "Embankment Construction Lift Approval Form". Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods that are present are less than or	Verify that the number of lifts and lift thicknesses have been documented. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	equal to one (1) inch. Record inspection of the clod size on the "Embankment Construction Lift Approval Form".	
2. The clay is to be placed and compacted by equipment proposed for use during construction of the clay liner.	Verify with the contractor that the same or similar type equipment and compaction efforts will be used in the cell for construction of the clay liner. Record type of equipment used, and number of passes on the "Embankment Construction Lift Approval Form".	Verify equipment used and the number of passes made in preparing the test pad are those to be used during the construction of the clay liner.
3. The lifts of clay shall be bonded by: a) providing a rough upper surface on the underlying layer of clay liner. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot; **- OR -** b) by compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness.	Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge. **- OR -** Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.	Verify the frequency of measurements and compliance of test results.
4. The clay is to be compacted to at least 95 percent of a standard Proctor with a moisture content of optimum to 5 percent over optimum. Compaction of the large test pad is to be accomplished by at least four passes of suitable compaction equipment.	Conduct in-place moisture-density tests at a rate of one test per lot. The test location shall be chosen on the basis of random numbers. Record the test result on the "Field Density Test" form. a. Approve lots which meet the specified moisture and compaction. b. Rework and retest lots not meeting the specified moisture or compaction. c. Any additional work under b. shall be included in the test pad construction method.	Verify the frequency of tests and compliance of test results.
5. The clay is to be constructed to provide a permeability less than or equal to 1 x 10^{-6} cm/sec. Permeability testing on the bottom lift will be performed at the surface. Permeability on the second	Conduct in-place permeability tests at a rate of one test per lot per lift. The permeability test shall be run in close proximity to the moisture-density test. Record the test result on the "Field Permeability Test" form.	Verify the frequency of tests and compliance of test results.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
lift will be performed ≥ 2" below the surface. Permeability on the third lift will be performed ≥ 4" below the surface.	a. Approve lots which meet the specified permeability. b. Rework and retest lots not meeting the specified permeability c. Any additional work under b. shall be included in the test pad construction method.	
6. At least one PI, LL, and gradation test shall be conducted for each test pad.	Conduct PI, LL, and gradation tests at a rate of one of each type of test per test pad.	Verify that the PI, LL, and gradation tests have been conducted and documented.
7. The procedures used to construct the test pad shall be reviewed and approved by the certifying engineer. The test must be approved by a Professional Engineer.	Provide the certifying engineer with copies of the documentation for the test pad for review and approval.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during clay liner construction.
8. The procedures used to construct the test pad shall be reviewed and approved by the DRC prior to using the new test pad construction method.	Obtain documentation confirming the DRC approval of the test pad.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during clay liner construction.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.	Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift.	Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.
PLACEMENT: The clay liner will be prepared, placed, and compacted using the same type of equipment and mixing and compacting procedures that were approved in the test pad.	Observe the clay liner placement. Record the equipment used to place the clay liner and any corrective actions (where required) on the "Embankment Construction Lift Approval Form".	Verify the equipment used to construct the clay liner has been documented and that it is the same type of equipment used to construct the test pad.
LIFT BONDING: The lifts of clay shall be bonded by: 1) providing a rough upper surface on the underlying layer of clay liner. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot; **- OR -** 2) by compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness.	Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge. **- OR -** Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.	Verify the frequency of measurements and compliance of test results.
LIFT THICKNESS: The first lift of material shall have an uncompacted thickness of no greater than 12 inches. For the remaining lifts, the loose lift thickness shall not exceed the lesser of the lift thickness used to construct the test pad or nine inches. Thickness for the lift will be established by installing grade poles on at least a 70-foot grid and at all control points. The grade poles must not be installed deeper than 1 inch into the underlying clay liner. The grade poles must be marked at the appropriate depth to establish the grade. After the grade for the lift has been checked	Verify that the required grading tolerance is achieved as follows: a. Ensure that the required frequency for placement of grade poles has been met. b. Compare soil level with the marked level on the grade poles. c. Use a string line where necessary between poles to check for high or low spots. d. Define high out of specification areas and advise the contractor to rework those areas. e. Review areas reworked and approve areas meeting	Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.

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and approved by QC personnel, the grade poles shall be removed. The clay material will be inspected for dry clod size during placement of each lift of clay liner.	criteria. f. Continue "b" through "d" above until all areas meet criteria. g. Indicate areas meeting criteria on the "Embankment Construction Lift Approval Form". **- OR -** Dig a hole and measure the loose lift thickness at a rate of one per lot. A lot is defined as 10,000 square feet of a single lift and record on the "Lift Approval Form". The location of the measurement shall be chosen on the basis of random numbers. a. Approve lots which meet the specified lift thickness. b. If the thickness is greater than the specified thickness, measure the thickness at four points (north, east, south, and west) within ten feet of the first measurement. Average the five measurements together. c. Approve lifts with an average less than or equal to the specified lift thickness. d. Rework and retest lots with an average lift thickness greater than the specified lift thickness. Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods that are present are less than or equal to one (1) inch. Record inspection of the clod size on the "Embankment Construction Lift Approval Form".	
KEYING-IN: Segments of cell clay liner constructed at times more than 30 days apart from each other shall be keyed-in to each other at vertical steps no greater than nine inches and at least twice as wide as they are high.	Verify that the new liner has been properly keyed-in to the existing liner. Record deficiencies on the "Embankment Construction Lift Approval Form".	Verify that the keying-in of the liner has been documented.

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COMPACTION: Clay liner material will be compacted to at least 95 percent of standard Proctor with a moisture content between optimum and 5 percent over optimum.	Conduct in-place moisture-density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 200 cubic yards (compacted) of a single lift. The test location shall be chosen on the basis of random numbers. a. Approve lots which meet the specified moisture and compaction. b. Rework and retest lots not meeting the specified moisture or compaction. Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log".	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
PERMEABILITY: Clay liner will have an in-place permeability less than or equal to 1×10^{-6} cm/sec.	Conduct in-place permeability tests at a rate of one test per lot and record the results on the "Field Permeability Test" form. A lot is defined as 2,000 cubic yards (compacted) of clay liner. The permeability test shall be run in close proximity to a moisture density test location. a. Approve lots which meet the specified permeability. b. Rework and retest lots not meeting the specified permeability. c. Restore all test areas to assure no leaks.	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
LINER DRYING PREVENTION: To prevent the clay liner from drying, water will be applied to the clay surface on an as needed basis or the liner will be covered with six inches of loose clay or 12 inches of loose waste. Newly constructed liner will be covered with six inches of loose clay or 12 inches of loose	Observe the liner surface for drying. Advise the contractor of any deficiencies. Record corrective actions taken (where required) on the "Daily Construction Report".	Verify that the liner is being inspected.

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waste within 15 days of liner completion. Desiccation cracks larger than one-fourth inch wide and one-inch deep in the clay liner will be reported to the DRC and will be documented as a non-conformance item when discovered.		
SNOW REMOVAL: When clay liner material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue without taking corrective action to remove the snow. Record these corrective actions (where required) in the "Daily Construction Report".	Verify that snow removal is being documented.
COLD WEATHER PLACEMENT OF CLAY LINER: For purposes of this CQA/QC Manual, "frozen" is defined as a soil temperature of less than or equal to 27°F. Clay liner shall not be placed above frozen material. In addition, no frozen material shall be processed or placed.	As needed, observe the area where clay liner is to be placed. If frozen material is observed, cease placement of clay liner. If frozen material is suspected, measure soil temperature. Record the stopping of placement in the "Daily Construction Report."	Verify that clay liner is tested during cold weather conditions.
If the air temperature has dropped below 32°F since the last lift of clay liner was approved, one of the following three scenarios apply: (1) If less than 30 days have passed since the date of lift approval and the last lift of clay liner has been covered since the approval date with at least 9 inches of loose clay or 6 inches of compacted clay, then the cover clay may be worked with no additional testing of the lower approved lift. (2) If less than 30 days have passed since the date of lift approval and the last lift of clay liner has not been covered with at least 9 inches of loose clay or 6 inches of compacted clay, then: (a) Perform spring start-up testing as discussed below; or (b) Monitor the liner/foundation temperature	Review ambient air temperature records as measured at the site meteorological station. Document status of clay liner cover placement on the "Daily Construction Report." Monitor liner/foundation temperature when triggered under 2.(b). Clay temperature shall be measured between 6:00 am and 8:00 am on the day that clay liner will be placed. Temperature measurements shall include a location that is most likely to be coldest; i.e., if there is a portion of the liner that is shaded or at a low point. Temperature monitoring frequency shall be at least one point per 100,000 square feet or one point per contiguous project area, whichever is smaller. If the initial clay temperature measurement is less than or equal to 27°F, the affected area may be resampled	

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approximately 1 inch beneath the surface. If the temperature 1 inch beneath the surface is greater than 27°F, re-roll the surface with one pass of the same type of construction equipment (i.e., a compactor for intermediate lifts or a smooth drum roller for the final surface) and continue with liner construction. If the temperature 1 inch beneath the surface is less than or equal to 27°F, re-work and re-test the affected area after the clay temperature has risen above 27°F. A) (3) If more than 30 days have passed since the date of lift approval, perform spring start-up testing.	before 8:30 am the same day as follows: a. Measure the liner/foundation temperature at a frequency of one measurement per lot (defined as no more than 10,000 square feet). b. Lots where the temperature is greater than 27°F do not require rework; except that the lot where the initial temperature less than or equal to 27°F was measured shall be reworked regardless of resampling results. A)	
SPRING START-UP: See "Cold Weather Placement of Clay Liner" above for situations that trigger this specification. For spring start-up testing, the surface lift is treated as protective cover, regardless of whether it was an approved lift of clay liner at one time or not. Excavate 9 inches below the clay surface and re-test for density and permeability. Excavation for testing purposes may consist of removing the protective cover lift; or may be performed by 'potholing' only at the testing locations. Areas that have been 'potholed' for permeability testing shall be repaired by applying the same level of effort as prescribed by the approved test pad for liner construction.	Perform density and permeability testing at the frequencies outlined for liner construction above. This testing may be performed outside of the approved lift area so long as the area tested is representative of the clay in the approved lift area (i.e., was constructed at the same time and with the same method). Moisture testing is not required for spring start-up. a. Approve lots that meet specification. The protective cover lift may then be worked in place and tested to become the next lift of clay liner. b. For lots that do not meet specification, test the surface at successively deeper 9 inch increments until a passing lift is found; remove all failing lifts; re-work all failing areas; and re-test. Document that repairs are completed to the same level of effort as required by the approved test pad for clay liner construction.	
CONTAMINATION OF CLAY LINER: The clay liner material shall not become contaminated with	Visually check clay liner for contamination by foreign materials. Remove clays which have been	Verify that removal of contaminated material has been properly documented.

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radioactive soils or debris during construction. The in-place clay may contain up to 5 percent additional rocks and sand above the content found in the classification test.	contaminated above the specified requirements.	
FINAL GRADING: Final grading shall be from grade to above grade. Survey on a 50 ft grid and key points to verify the minimum design liner thickness requirement is met.	Survey the foundation on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer. a. Indicate where the clay liner meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.
HEAVY EQUIPMENT ON CLAY LINER: Heavy equipment travel will be minimized on top of the finished clay liner. Heavy equipment will not be operated on saturated clay liner.	Observe the work procedures of the contractor. Advise the contractor of problems with equipment on the clay liner. Record corrective actions taken (where required) on the "Daily Construction Report".	Verify that the contractors work procedures are being inspected.
DRC APPROVAL: The DRC shall approve documentation associated with completed clay liner. Documentation shall include all QC and QA records associated with clay liner construction, as well as photographs of the completed liner surface. In addition, 48 hour notification shall be provided to the DRC prior to placement of soil material over the clay liner (waste or soil protective cover). However, DRC approval of clay liner documentation is not required prior to placement of waste material over the clay liner.	Notify the Construction QA Officer that the clay liner is prepared and ready for inspection by the DRC. Obtain written authorization on the "Liner Inspection Form" from the Construction QA Officer that the clay liner has been inspected. Obtain documentation confirming the DRC approval of the clay liner documentation.	Provide written approval of the clay liner prior to the placement of material over clay liner (waste or soil protective cover). Notify the DRC that the clay liner is prepared and ready for inspection at least 48 hours prior to covering with soil material.
QUALITY ASSURANCE SAMPLING: Assurance samples for clay liner materials tests are to be obtained at the following minimum frequency:	Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log" and moisture-density test on the "Density Testing Log". Promptly report result of QC	Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of QA and QC test results can be made.

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1. In-place moisture-density tests (ASTM D6938): 1 per 50,000 cubic yards (compacted). 2. Moisture/density relationship testing (ASTM D698): 1 per 50,000 cubic yards (compacted). 3. Classification tests (ASTM D2487, D1140, and D4318): 1 per 50,000 cubic yards (compacted). A minimum of one of each of the above tests is required for each year that clay liner is placed.	testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.	The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation is not adequate, new QC and QA samples shall be taken immediately. The Construction QA Officer, in consultation with the QC officer, shall then evaluate the accuracy of the QC sampling and testing and, if necessary, provide for improved sampling and testing procedures and closer inspection and control. Record findings of the quality assurance sampling in the "Daily QA Report".

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
APPLICABILITY: This work element is applicable to waste placed with the CAT 826 compactor. With prior DRC approval, this work element may be implemented by equipment demonstrated to perform equivalent to the CAT 826 compactor.	Document equipment used for compaction on the Lift Approval Form.	
DEFINITIONS: Machine Pass is defined as movement of the compactor across an area of the lift in any direction, which also meets compaction criteria calculated by an algorithm in the compactor's system. For example, movement of the compactor from south to north across the lift, which also meets compaction criteria calculated by an algorithm in the compactor's system, constitutes one machine pass; the return trip from north to south, which also meets compaction criteria calculated by an algorithm in the compactor's system, constitutes a second pass. Wheel Pass is defined as movement of any of the compactor's drums across an area of the lift, which also meets compaction criteria calculated by an algorithm in the compactor's system. Since there are forward and rear drums on the CAT 826 compactor, each machine pass constitutes two wheel passes. The CAES compaction tracking system reports wheel passes.		
LINER PROTECTION: The compactor shall not be operated on the surface of finished clay liner or on the surface of the debris free zone directly over the clay	When disposal and compaction is being performed on or adjacent to the first lift above the debris free zone, observe compactor operation for protection of the	

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liner. The compactor may not be used to compact the first lift of waste above the debris free zone. When operating on a slope that terminates on the surface of the first lift of waste above the debris free zone, the compactor shall be operated in a manner to prevent impact to the debris free zone.	liner and debris free zone. Document observations on the Daily Construction Report.	
LIFT IDENTIFICATION: Each lift shall be given a discrete designation.	Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift. Summarize all lifts on the lift summary form or master sheet.	Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.
LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded.	Record the date and time of lift approval on the lift approval form.	Verify that the date and time of lift approval is recorded on the lift approval form.
No waste material will be disposed on a lift until the prior lift is approved, except for management of in-cell bulk disposal	Verify that the previous waste lift has been approved prior to waste disposal.	
LIFT THICKNESS: The waste material will be placed in lifts with a compacted average thickness not exceeding 24 inches.	Survey the mean elevation of the top of each lift by surveying at least five points and taking the average. Where practical, survey the corners and at least one spot in the middle. Survey measurements will be documented and forwarded to the Construction QA Officer. Lift thickness may also be verified via GPS. a. Approve lifts with an average less than or equal to the specified lift thickness. b. Remove excess material from the thicker areas of the lift if the average lift thickness is greater than 24 inches, and re-compact lift in the areas where wastes are removed. OR Download the CAES system report of beginning and ending lift elevations. For lifts that are not sloped,	Perform a monthly assessment of the survey documentation performed by the QC personnel to ensure that the measurements and observations are being performed correctly. Verify that the surveys are being performed at the correct frequency and that the documentation is being completed. Verify that the survey data has been received from the QC personnel.

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	survey data may be used for beginning lift elevation. Lift thickness shall be reported using CAES in accordance with operating procedure ENG 3.8. When calculating the average lift thickness on a side slope, no point shall be more than 2.1'. If CAES is used to document lift thickness on the side slope, there shall be no white pixels shown in the lift.	
LIFT AREA: Identify the dimensions and the location of the northwest corner of the lift. There is no minimum lift area for this work element.	Locate the northwest corner of each lift, and document the location and lift dimensions.	
CLASSIFICATIONS: Soil classification testing is not required for waste placed using this work element.		
TERRACING OF LIFTS: As new lifts are placed next to old lifts, at least one foot, measured horizontally, shall be removed from the outer edge of the old lift (except for CLSM lifts).	Inspect the intersections of old and new lifts. Verify that the outer one foot of the old lifts are being removed (except for CLSM lifts). Record any problems on the "Daily Construction Report".	Verify that the required inspections are being performed.
COMPACTION WITH CAES: When using the CAES system, each lift and lift interface shall be compacted by at least 4 machine passes with the CAT 826 compactor. The lift surface shall be firm and unyielding to the compactor's weight. A minimum of 80% of the grid points reported for the lift by CAES shall exhibit adequate compaction. Adequate compaction as well as meeting the minimum number of wheel passes is reported by CAES when the pixel turns green. a. Additional compaction may be required if, after the minimum number of passes is complete, the minimum percentage of grid points do not exhibit adequate compaction, as reported by the CAES	Document the CAES system report of compaction for each lift area. Compactive effort is reported by CAES on a roughly 3.3' x 3.3' grid; with each on-screen pixel representing one square meter. Ensure that the CAES reports a minimum of 4 machine passes (i.e., 8 wheel passes) for at least 80% of the grid points in the lift, as detailed in operating procedure ENG 3.8. Record this information on the Lift Approval Form. Perform a QC inspection of the compacted lift by observing the CAES control screen for evidence of uniform and adequate compaction. This condition is indicated by having a majority of the screen light green, with only isolated pixels in other colors. Print the screen as a color image and include with the lift approval form. Record QC inspection results on the	Perform a monthly assessment of the compaction documents generated by the QC technician.

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system.	Lift Approval Form.	
COMPACTION WITHOUT CAES: If the CAES system is not available to be used for compaction under this work element, the following requirements apply.	Document that the minimum number of passes is completed for each lift area. Passes shall be counted by the QC technician or by using a GPS unit communicating with the GPS unit on the compactor.	Perform a monthly assessment of the compaction documents generated by the QC technician.
1. Verbal notice shall be provided to DRC within 24 hours of beginning to approve lifts without CAES. This notice may be provided via email. 2. Written notice shall be provided to DRC no later than 3 calendar days (72 hours) after beginning to approve lifts without CAES. The written notice shall explain why CAES is down; an estimate of when CAES will be back online; a map of the areas being compacted without CAES; and a map of pre-final cover settlement monitoring points over the area being compacted without CAES. 3. Compaction without CAES is limited to 10 calendar days per occurrence.	Perform a visual inspection of the compacted lift surface. If rutting or other indications of inadequate compaction are present, direct the equipment operator to complete additional passes until the situation is corrected. If additional passes are unable to correct the situation, moisture adjustment or other corrective actions may be needed and the lift shall not be approved until these actions are completed. Survey lift elevation and thickness in accordance with the specification "Lift Thickness" above, with the further requirement that the greater of the following number of points shall be surveyed per lift: a. At least 5 points; or b. One point per 2,000 square feet of lift area.	
Each lift and lift interface shall be compacted by at least 6 machine passes with the CAT 826 compactor. The lift surface shall be firm and unyielding to the compactor's weight. Additional compaction may be required if, after the minimum number of passes is complete, any of the following are observed: a. The lift surface exhibits ruts or compression (excluding depressions caused by the tines of the compactor wheel) in excess of four inches; b. The waste material exhibits pumping behavior, or has other indications of excess moisture content; or c. The lift does not appear to be uniformly compacted.	Record number of passes and visual inspection results on the Lift Approval Form.	

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DEBRIS PLACEMENT WITH THE COMPACTOR: For purposes of this work element, debris shall be defined as provided in the work element "Waste Placement", below.	Determine the volume of debris. Volume determination shall be established by either: a) inspecting the debris on the lift and calculating the quantity of debris, or b) using the manifested waste volume for shipments placed on the lift.	
Debris placed in accordance with this work element shall be limited to no more than 50% by volume of the compacted volume of the lift. The debris shall be uniformly distributed across the lift. Lifts containing materials susceptible to wind dispersal shall be covered so that these materials are secured by the end of the shift the materials were placed into the lift.	Inspect debris once it is spread out on the lift and prior to placement of fill material. Ensure that debris is spread out uniformly across the lift and in a manner to minimize void spaces and does not exceed volume requirements. Document the debris inspection on the Lift Approval Form. Record the debris fill calculations and estimates on the Lift Approval Form.	Observe in the field that the debris calculations and estimates are being performed and properly documented. Review documentation to verify that the visual observations of debris shipments are being properly performed by QC personnel or that the manifested volume of waste is used to calculate the volume of fill material required.
DEBRIS SIZE: All debris placed in accordance with this work element shall be less than 10 inches in at least one dimension and no longer than 12 feet in any dimension.	Inspect debris placed in soil lifts to ensure that it meets the debris size requirements.	

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.	Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift. Summarize all lifts on the lift summary form.	Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.
LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded.	The QC technician shall record the date and time of lift approval on the lift approval form.	Verify that the date and time of lift approval is recorded on the lift approval form.
No waste material will be disposed on a lift until the prior lift is approved, except for management of in-cell bulk disposal	Verify that the previous waste lift has been approved prior to waste disposal.	
LIFT THICKNESS: The radioactive disposal material will be placed in lifts with a compacted average thickness not exceeding 12 inches (except CLSM lifts).	Survey the mean elevation of the top of each lift by surveying at least five points and taking the average. Where practical, survey the corners and at least one spot in the middle. Survey measurements will be documented and forwarded to the Construction QA Officer. a. Approve lifts with an average less than or equal to the specified lift thickness. b. Remove excess material and retest lots with an average lift thickness greater than the specified lift thickness.	Observe, at a minimum, five percent of the surveys performed by the QC personnel to ensure that the measurements and observations are being performed correctly. Verify that the surveys are being performed at the correct frequency and that the documentation is being completed. Verify that the survey data has been received from the QC personnel.
LIFT AREA: The lift area shall be at least 10,000 square feet except CLSM, Containerized Waste Facility, and Mixed Waste lifts. Identify the dimensions and the location of the northwest corner of the lift.	Locate the northwest corner of each active lift, and determine the dimension. a. Allow placement to continue on any lift that meets the lift area requirement. b. Stop placement on any lift which does not meet the lift area requirements. c. The Construction QA Officer may grant a waiver, for up to five percent of the lifts, if it is deemed	Verify that the lift area meets the lift area requirements.

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	impracticable to place at the specified lift area (e.g. a narrow lift on the outside edge of the cell). Insufficient material from a specific generator does not constitute grounds for a waiver.	
COMPACTION: Each lift shall be compacted to 90 percent of a standard Proctor, except lifts with greater than ten (10%) compressible debris, which shall be compacted to a minimum of 95 percent of a standard Proctor. The moisture content of all lifts shall be equal to at least 2 percent and no greater than up to 3 percentage points above the optimum moisture (except for CLSM lifts).	Except for CLSM lifts, conduct in-place moisture-density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 1,000 cubic yards (compacted) of a single lift. At least one test will be performed per lift. At least one test will be performed per soil type in the lift. The test location shall be chosen on the basis of random numbers. Approve lots when: a. Material is observed to be properly compacted throughout the lot; b. Moisture/density tests performed meet moisture and compaction specifications.	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that field moisture/density tests are being performed at the correct frequency and that the documentation is being completed.
	Outliers shall be resolved according to the following: a. For lot sections where the material is observed to not be properly compacted throughout the entire lot: 1) Identify the section requiring further compaction and rework the material until it is observed to be adequately compacted; 2) Perform moisture/density testing as outlined above. b. For lots where the dry density reading from a nuclear gauge moisture/density test is less than or equal to the required percentage of the standard Proctor: 1) Identify the section(s) of the lot (including dimensions) requiring further compaction, and re-work the material. Re-test at the location previously tested. Test one more location in the re-worked lot section. Identify	Ensure that resolution of any outliers is properly accomplished and documented.

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	the test location using the lot section dimensions and random numbers. - If the test results from both tests meet moisture/density requirements, approve the lot; - If either test fails, repeat the above process until all tests meet moisture and compacting requirements. **- OR -** 2) If the lot is observed by the QC Technician to be adequately compacted, investigate the reason for the low density reading. If it is determined that the test results were improperly influenced (e.g. debris directly beneath the gauge), take two more density tests within 5 feet of the original test. **NOTE: All tests are to be recorded.** - If the results from both tests are above the required compaction requirements, record both tests and approve the lot. If either test fails to meet moisture/density specifications – and the test results were not improperly influenced as described above - follow instructions for a.1 above.	
	Proctors shall be performed at a rate of one test per 15,000 cubic yards (compacted) or less of a specific material type.	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that proctor tests are being performed at the correct frequency for each specific material type and that the documentation is being completed properly.
CLASSIFICATIONS: One soil classification test shall be performed at six month intervals for each large soil waste generator.	Perform a soil classification test (ASTM D2487) every six months for each large soil waste generator. A large soil waste generator is defined as a generator	Verify the frequency of laboratory tests.

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	disposing of at least 30,000 cubic yards (compacted) *of compactable soil in a given calendar year. Record* the location of the classification sample on the "Sampling Log".	
TERRACING OF LIFTS: As new lifts are placed next to old lifts, at least three feet, measured horizontally, shall be removed from the outer edge of the old lift (except for CLSM lifts).	Inspect the intersections of old and new lifts. Verify that the outer three feet of the old lifts are being removed (except for CLSM lifts). Record any problems on the "Daily Construction Report".	Verify that the required inspections are being performed.
INTERSECTION OF LIFTS: In addition to the density testing of the lift, an average of one density test per three lifts shall be performed at the old/new-lift interfaces. For lifts intersecting with CLSM lifts, the interface density testing is performed on the non-CLSM lift within 2 feet of the CLSM interface.	Conduct in-place moisture-density tests at an average rate of one test per three lifts and record the results on the "Field Density Test" form. For each lift random numbers between 0 and 1 shall be generated. If the random number is 0.65 or greater, then a moisture-density test is required on the lift interface between the new lift and old lift. On lifts requiring an interface test, the test location shall be chosen on the basis of a random number. For intersections with CLSM, perform a density test on the non-CLSM portions of the intersection within 2 feet of the CLSM interface. a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction.	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests are being performed correctly. Verify that tests are performed at the correct frequency and the documentation has been completed.

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DEBRIS PLACEMENT		
DEBRIS DEFINITION: For the purposes of this CQA/QC project plan, debris is defined as any radioactive waste for disposal other than compactable soils. Compactable soil is defined as: (a) having a graded material that will pass through a four inch grizzly; (b) as having a bulk density greater than seventy pounds per cubic foot dry weight in accordance with ASTM D-698; and (c) having soil-like properties (i.e., standard tests in accordance with waste placement procedures can be performed. Additionally, debris shall be classified as either incompressible debris (i.e. concrete, stone, or solid metal) or compressible debris (all other debris types). A large object is defined as any debris that does not have at least one dimension less than 10-inches or that has any dimension in excess of 12-feet. A large component is defined as a large object that weighs more than 100,000 pounds.	No action required.	No action required.
DEBRIS PLACEMENT METHODS: Debris may be placed in the embankment using two different methods: 1) placement of the debris in a lift with compactable soil at a limited ratio of debris to soil, or 2) placement of the debris in a lift and in-filling the debris with Controlled Low Strength Material (CLSM).		
For placement of large components, the maximum allowable load on the clay liner surface must be less than 3000 psf.	Perform a Large Component Engineering Review. Ensure that the bearing pressure at the clay liner surface meets specification for the load associated with placement of any large component.	
When CLSM is required as structural fill in the Large Component Engineering Review in order to meet the load specification, the first 4 feet of CLSM shall be	Document the following on the Lift Approval Form:	

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placed around the large component within 30 calendar days of large component disposal.	1. Date of large component disposal and date of CLSM pour.	
DEBRIS FREE ZONE: The Debris Free Zones are defined as the first one foot of the waste embankment above the clay liner, and the last one foot of the waste embankment below the radon barrier. The materials that make up the Debris Free Zones shall be native soils that are free of debris material.	Visually inspect the soil material used for the Debris Free Zone and verify that it is free of debris. Record results on the "Lift Approval Form".	Review documentation to ensure that inspections have been performed.
DEBRIS QUANTITY IN SOIL WASTE LIFTS: Debris that is placed in the embankment with compactable soil shall be limited to a portion of the total volume of the waste lot. Furthermore, the debris shall be uniformly distributed across the lot. Lifts containing materials susceptible to wind dispersal shall be covered with soil-like waste or fill material so that materials susceptible to wind dispersal are secured by the end of each working day.	For shipments containing debris material, determine the volume of debris for the shipments. Volume determination shall be established by either a) inspecting the debris in the shipment and calculating the quantity of debris, or b) using the manifested waste volume. Visually inspect lifts containing materials susceptible to wind dispersal are covered with soil-like waste or fill material by the end of each working day.	Observe in the field that the debris calculations and estimates are being performed and properly documented. Review documentation to verify that the visual observations of debris shipments are being properly performed by QC personnel or that the manifested volume of waste is used to calculate the volume of fill material required.
A lot is defined as an area for the placement of waste from a single generator. The volume of a lot is limited to one thousand (1000) cubic yards for testing purposes. A lift is defined as one or more lots which are compacted and tested together to meet lift placement requirements. Debris lift fill will be controlled by the volume of uncompacted fill added to the lift. For compressible debris, the volume of the debris in a lot shall be limited to less than or equal to thirty percent (30%) by volume of the calculated compacted volume of the lot.	Inspect debris once it is spread out on the lot and prior to placement of fill material. Ensure that debris is spread out uniformly across the lot and in a manner to minimize void spaces and does not exceed volume requirements. Document the debris inspection on the "Lift Approval Form." Record the debris fill calculations and estimates on the "Lift Approval Form".	

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Incompressible debris (concrete, stone, or solid metal) may be placed in a lot up to twenty-five percent by volume of the uncompacted lot. When combining the two types of debris in one lot, the above volume limit applies and the maximum volume of all debris shall be less than or equal to 25 percent. At least one moisture/density test shall be performed per soil type in the lift.		
DEBRIS SIZE: All debris placed in soil waste lifts shall be less than ten (10) inches in at least one dimension, and no longer than twelve (12) feet in any dimension.	Inspect debris placed in soil lifts to ensure that it meets the debris size requirements.	Review documentation associated with debris lifts to verify that debris inspections are being performed.
RESIN LIFTS: Unless disposed in the Containerized Waste Facility, resins shall be disposed as follows or in accordance with the specification "CLSM Pours with Resin-Filled Containers" below. For resin lifts, resins will be less than one inch thick, at any location on the surface of the lift, prior to tilling. Ion Exchange Resin (IER) must be blended with native clay that meets the CL classification in a minimum ratio of 1:9 (one part IER to nine parts CL clay) on a volumetric basis. This native clay shall be tested by ASTM method D-2487 at a rate of one test every 250 cubic yards. Blending of IER must take place where native soil has been placed and approved by the Construction Quality Control Officer (CQCO) as a marker layer over the previous lift. The CQCO may approve the 6-inch fill cover for the 10% debris lifts as the bottom marker layer provided verification of the following: 10% debris is placed in previous lifts; and cover fill is	For resin lifts, inspect the spread resin prior to tilling to ensure: a) resin is less than one inch thick at any location on the surface of the lift; b) resin is spread throughout the resin lift area; c) there are no areas larger than 25 ft^2 without resin; d) there are no depressions or wheel ruts deeper than one inch. e) verify native clay meets CL classification and is blended at a 9 to 1 ratio. f) Verify a minimum of 2-inches of native soil cover must be placed by the end of each workday. Require additional spreading for any resin lift not meeting these specifications. Record the debris inspection on the Lift Approval Form.	Review documentation associated with resin lifts to verify blending and disposal requirements are being performed.

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native soil that is distinguishable from the previous lift and resin clay. Exposed synthetic soils can be compacted, tested and approved prior to placement of at least 2-inches of native soil cover. A minimum of 2-inches of native soil cover must be placed by the end of each workday. The minimum 2-inch native soil cover may be used to blend the resin in the next lift.	Notify DRC during normal working hours of placement of blended materials at least 24 hours prior to covering beyond this 2" clay layer in order to allow inspection and sampling of placed blended materials.	
CLSM POURS:		
CLSM PYRAMID: 1) Stacked CLSM lifts shall form a pyramid with a maximum 3H:1V outside edge slope. Thus, with a four foot (4') box and six inch (6") cap, the next stacked CLSM lift must be constructed to minimum of 13.5 feet inside the edge of the lower lift. 2) The pyramid base dimensions and maximum 3H:1V side slope requirements will control the location of all subsequent stacked CLSM lifts throughout the full height of the embankment. 3) Adjacent pyramids shall not be placed above any portion of previous CLSM pyramids.	Determine the location of the northwest corner and the dimensions of each lift and document on the EC-1904 form. Use the lift location and dimensions to ensure compliance with the CLSM pyramid specification. Document the dimensions of the previous CLSM lift on the EC-1904 form diagram. In locating a new pyramid, document on the EC-1904 Form: a) The pyramid base is placed on the two-foot debris free zone; or, b) The pyramid base has not been placed above a previously placed pyramid	Verify compliance with the CLSM pyramid specification and proper documentation of the QC requirements.
CLSM Lift Preparation: The height of each pour shall be limited to the height of one layer of boxes plus six (6) inches. Large objects taller than a layer of boxes shall be poured with the subsequent CLSM pours (in layers) until completion. Debris disposed with CLSM will be placed to minimize the entrapment of air in the CLSM pour.	Perform an inspection of the preparation of debris for placement with CLSM. Ensure that the formed height of the CLSM lift is less than the height of one layer of boxes plus 6 inches and that any large objects are localized into specific areas. Also, ensure that debris is placed in a manner to minimize the possible entrapment of air during the CLSM pour and to allow maximum in-filling of the debris. Document the inspection on the CLSM Inspection Form.	Review inspection documentation to ensure that inspections are performed and properly documented.

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DRC NOTIFICATION FOR CLSM POURS: The DRC shall be notified at least 48 hours in advance of any CLSM pour. A CLSM pour will be defined as a formed area approved and documented by Engineering for CLSM designated on a waste lift.	Verify that the DRC has been notified at least 48 hours in advance of any CLSM pour. Document DRC notification on the "Daily Construction Report".	Verify that the DRC has been notified at least 48 hours in advance of any CLSM pour.
PORTLAND CEMENT OR FLY ASH CLSM DESIGN SPECIFICATIONS: Notwithstanding the following specifications, Macro Vaults as approved by the Division of Solid and Hazardous Waste in the Mixed Waste Landfill Cell are considered large objects that do not require CLSM. Macro Vaults shall not be proof rolled.		
CLSM shall have the following characteristics: a) The design mix is approved by the production engineer prior to use in the cell area and meets the material specifications provided in Table 2 or Table 3 of this Attachment II-A. b) The CLSM passes a Slump Test (procedure provided in Appendix B of this manual), Flow Consistency Test (ASTM D6103) or Efflux test (procedure provided in Appendix B of this manual), as applicable. Passing criteria for each test is specified in Table 2 "Material Specifications for Portland Cement CLSM" or Table 3 "Material Specifications for Fly Ash CLSM" of this Attachment II-A. c) The CLSM shall have a wet unit weight in all cases of at least 100 lbs/ft^3 as determined by ASTM D6023 (Unit Weight, Yield, Cement Content, and Air Content (Gravimetric) of CLSM).	Two types of tests will be performed to ensure that the CLSM meets the design specifications: initial screening tests and lot acceptance tests. The results of these tests and corrective actions, if any, shall be documented on the CLSM Testing Form. a. Initial screening tests shall be performed on the first load of CLSM for each day that CLSM is poured. This screening test shall be performed from the "front end" of the load. The initial screening test includes either a Flow Consistency Test (ASTM D6103) or Efflux test (procedure given in Appendix A), as well as a unit weight test (ASTM D6023). The results from this initial screening test shall indicate whether or not any adjustments need to be made at the batch plant to ensure loads meet design specifications. b. If adjustments are made to the load to produce a product that passes the testing requirements,	Observe, at a minimum, five percent of the tests performed by QC personnel on the CLSM to ensure that the tests and observations are being performed correctly. Verify that the required testing has been performed and properly documented.

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	perform initial screening testing on the subsequent two loads to verify that the batch plant adjustments are sufficient c. CLSM pouring shall only be authorized to proceed upon verification that the initial load (and subsequent two loads if the initial load failed) meets mix specifications. d. Acceptance tests shall be performed at a rate of one test per lot, with a minimum of one acceptance test performed for each CLSM pour. A lot is defined as 100 cubic yards of CLSM. Sampling for acceptance tests shall be performed in accordance with ASTM D5971 (Sampling Freshly Mixed CLSM). These acceptance tests shall be performed from a composite of two samples from near the middle of the load. a. Accept loads that meet specification. b. For loads with unsatisfactory results, accept the first part of the load and reject the remainder, or modify the load and/or pour techniques and retest.	
d) The CLSM shall have a minimum 28-day strength of 150 pounds per square inch (psi) as determined by ASTM D4832. A minimum of 3 cylinders shall be cast for compressive strength testing.	Cast a minimum of 3 cylinders per 2000 cubic yards of CLSM placed. Perform compressive strength testing in accordance with ASTM D4832 at 28 days to ensure the minimum strength requirements are met. If the CLSM cap does not meet specification, evaluate why it failed and implement corrective actions to prevent recurrence.	Ensure compressive strength testing is being performed at the correct frequency.
e) A load ticket shall be furnished for each truck of CLSM to be poured.	Obtain the load ticket for each truck load of CLSM and ensure the load meets the mix specifications provided in Table 2 "Material Specifications for Portland Cement CLSM" or Table 3 "Material Specifications for Fly Ash CLSM" of this Attachment	Verify that the load tickets have been obtained by QC personnel for each truck load of CLSM and that the load ticket has been checked against Table 2 "Material Specifications for Portland Cement CLSM" or Table 3 "Material Specifications for Fly Ash CLSM".

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	II-A. Reject any loads not meeting the mix specifications. Include the load ticket with the Lift Approval Form for the CLSM lift. During each CLSM pour, a QC Technician shall be present at or near the pour at all times and shall visually observe pour activities.	
CLSM PLACEMENT OF UNCONTAINERIZED DEBRIS: Debris shall be placed to minimize the entrapment of air in the CLSM pour. To accomplish this, any plastic caps, wrappings, or other obstructions placed on pipes, valves, and other debris objects shall be cut or removed prior to pouring CLSM. The uncontainerized debris shall be spread horizontally across the lift. Any compressible debris in the lift shall be secured to ensure proper disposal and cover with CLSM. Any wood materials shall be spread throughout the lift to prevent localized stacking or concentration of wood materials.	Visually inspect the debris pour to ensure that the CLSM can flow throughout all uncontainerized debris in the waste matrix. Inspect pipes, valves, and other debris object and ensure that sufficient access exists for CLSM to enter the debris interior and fill voids. Verify that all compressible debris is properly secured. Ensure that wood materials are spread throughout the lift and not stacked or nested together.	Verify the large debris inspections have been performed and documented on the CLSM Inspection and Testing Form.
CLSM POURS WITH DEBRIS-FILLED CONTAINERS: In-filling of debris inside containers with CLSM shall be maximized. A minimum of two holes shall be punched into the bottom of one of the walls of each box container to allow for flow throughout the container. Containers filled with primarily wood materials shall not be disposed with CLSM, and must be emptied and spread out prior to placement.		
Lids shall be removed from all box containers prior to pouring CLSM (unless a specific waste stream or shipments are exempted by UDRC for safety or ALARA considerations). Drum containers do not require removal of the lid. However, a drum	Visually inspect compressible debris inside containers to ensure the debris is secured. Ensure lids are removed from all box containers. If the lid shall remain on the drum container (or other waste container specifically exempted by UDRC), ensure	Review inspection results to ensure that compressible debris is being properly secured and that adequate holes exist for containers where lids remain on the container.

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container lid shall be pierced with a hole size of at least 2" X 4" to allow flow of CLSM into the container. If any container includes compressible debris, the material shall be secured to remain inside the container. Drum containers that contain compressible debris shall have the lid removed or a six-inch CLSM cap shall be placed over the filled container.	that the lid has been pierced with the proper size and number of holes. Record results on the CLSM Inspection Form. If the lid remains on the drum container, ensure that the required number and size of holes exist in the lid. A flowability test is not required on containers filled with soil or fine-grained materials.	
CLSM POURS WITH SOIL-FILLED CONTAINERS: Containers that are filled with soil-like materials may be placed with CLSM. The lid may remain on the container. However, holes must be placed in the lid as required for compressible debris-filled containers above.		
CLSM POURS WITH RESIN-FILLED CONTAINERS: Containers that include or are filled with ion-exchange resin materials may be placed with CLSM. Only watertight steel or poly containers are permitted for resin disposal in CLSM. Cardboard, wood, and soft plastic "supersack" containers are expressly prohibited from use as the sole container for resin disposal in CLSM.	Verify that ion-exchange resin containers are constructed of steel or poly. Document this inspection on the CLSM Inspection Form.	
Each container shall be inspected for headspace void and have any headspace void filled with an inert material. Provide a minimum of 24 hours notice to DRC prior to filling headspace void and sealing containers. CLSM and other concrete products are expressly prohibited for use filling this headspace void. After filling the headspace void, the lid shall be replaced on the container and latched, banded, or otherwise secured. The container shall be watertight to minimized potential CLSM contact with ion-	Verify that DRC has been notified at least 24 hours prior to the following activities. Inspect each container of ion-exchange resins for headspace void. Document the material used to fill any headspace voids. Document that the lid has been replaced and secured on the container. Document that the container is inherently watertight (i.e., a drum with the ring secured around the lid) or has been rendered watertight (i.e., a steel box with a flexible gasket in place before the lid is secured or that has been	

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exchange resins. Paint or mark the word "RESIN" on all 4 sides and the lid of each container when void filling and sealing operations are complete.	otherwise sealed). Document that the container has been painted or marked as required.	
The total waste resin volume shall be limited to no more than 25 percent of the total volume of the CLSM pour. Other wastes meeting the criteria for CLSM disposal as outlined in this CQA/QC Plan may be used to make up the remainder of the volume of the pour.	Prior to the CLSM pour, calculate the ratio of resins to other material in the pour as follows: (1) Document the container type and volume for each container of resins in the pour; (2) Document the total pour volume based on the formed area x height; (3) Resin volume divided by total volume x 100 = resin percentage. Container volume may be calculated from the nominal capacity or from manifested volume of resins in the container.	
Containers of ion-exchange resins shall not be placed directly adjacent to each other within the CLSM pour. Containers of ion-exchange resins shall not be placed directly above containers of ion-exchange resins in previous lifts within the CLSM pyramid.	Survey and document the location of each resin-filled container on the CLSM Inspection Form. Verify that each resin-filled container is not placed directly above resin-filled containers in previous lifts within the CLSM pyramid.	
CLSM pours with resin-filled containers are subject to all CLSM pyramid controls under the specification "CLSM Pyramid" above.		
FINAL CLSM POUR SURFACE: The final CLSM surface will be a horizontal plane with no exposed debris that impedes contact with the surface area during proof rolling. (with the exception of large objects that require multiple pours to completely dispose with CLSM).	Visually inspect the final CLSM pour surface to ensure the area is acceptable for proof rolling.	Review the documentation to ensure proof-roll testing is being performed and properly documented.
PROOF-ROLL TESTING: A proof roll test shall be performed on all CLSM lifts a minimum of 3 calendar days following completion of the CLSM pour and prior to placement of any	Inspect the entire cured CLSM pour surface. Following inspection, direct the truck (rock truck, cement truck, or other vehicle of equal or greater surface load) across the entire CLSM pour surface.	Review the documentation to ensure rework, if required, has been performed and documented

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additional waste lifts on top of the completed pour. The test shall consist of a loaded truck (rock truck, cement truck, or other vehicle of equal or greater surface load) driving across the entire footprint of the completed CLSM pour.	Inspect the surface during rolling for any cracking or depressions resulting from the proof-rolling. Identify any surface cracks or depressions with a vertical displacement of ½-inch or greater, or cracks greater than ½-inch in depth. Mark these areas for repair or re-work. Document observations on the Lift Approval Form. Approve all lift areas not marked for repair or rework. For any areas with surface cracking or depressions with a vertical displacement of ½-inch or greater, or cracks greater than ½-inch in depth, one of the following methods shall be followed to remedy the failed area(s): a. The area may be compacted and then re-poured. Following three days from the re-pour, perform another proof-roll test to evaluate if the repair was adequate; or b. Remove the CLSM and debris from the marked area and replace it with debris and CLSM. Following three days from the re-pour, perform another proof-roll test of the area to evaluate if the repair was adequate. Repeat this process until satisfactory results are achieved; or c. Place a six-inch CLSM cap over the pour lift area after the area in question has been compacted. The six-inch cap shall extend a minimum of three feet (3') past the damaged areas created during proof rolling in each direction. Following a minimum of three calendar days, perform a proof roll test of the six-inch cap area to evaluate if the cap	

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	was adequate. This process may also be repeated (i.e., placement of additional cap to a 12-inch cap) until satisfactory results are achieved.	
SIX-INCH CAP: All containers filled with compressible debris that do not have the lids removed shall have a six inch CLSM cap poured over the top of the containers prior to proof rolling. In addition, any CLSM pours that have areas which did not pass the proof-rolling test may have a CLSM cap placed over those areas. Areas poured with a CLSM cap shall still require a proof-rolling test (as described above) to verify adequacy of the cap. The six inch cap shall extend a minimum of three feet in each direction past the edge of the container area that requires a cap.	Visually inspect the CLSM pour area and identify the highest elevations of debris that requires a six-inch cap. Survey and document these designated elevations on the CLSM Inspection Form. Following completion of the six-inch cap, perform a final survey of the entire lift as required for determining lift thicknesses above. Ensure that the thickness of the cap is six inches above all debris requiring a CLSM cap and that the cap extends three feet in each direction past the edge of the area that requires the cap. Document the inspection and completion of the CLSM cap on the Lift Approval Form.	Review the documentation associated with the CLSM cap.
The minimum compressive strength of the CLSM cap shall be 500 psi. Table 2 and Table 3 specifications do not apply to the CLSM cap.	Perform compressive strength testing of the CLSM used for caps at the rate of 1 test per CLSM lift. Test specimens/samples shall be collected in accordance with ASTM D5971 (Sampling Freshly Mixed CLSM). The samples shall then be tested in accordance with ASTM D4832 (Preparation and Testing of CLSM Test Cylinders). If the CLSM cap does not meet specification, evaluate why it failed and implement corrective actions to prevent recurrence.	Verify that compressive strength testing is performed at a rate of 1 per CLSM lift. Ensure that the compressive strength of the cap is greater than or equal to 500 psi.
IN-CELL BULK DISPOSAL: For both LLRW and 11e.(2) waste: Any waste material taken to the disposal cell but not spread out (for lifts placed with compactable soil) or set into a CLSM lift area for forming (for debris to be placed using CLSM) shall be considered in-cell bulk disposal. In-cell bulk disposal may be temporarily managed in piles up to twenty-	On a monthly basis, calculate and document the volume of in-cell bulk disposal and waste stored on the LLRW storage pads. Stop waste unloading before the volume of waste stored exceeds the volume specified in the trust agreement.	Review documentation of in-cell bulk disposal and ensure that volumes do not exceed the trust agreement.

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five feet high on the embankment. For 11e.(2) waste: In-cell bulk disposal cannot be placed on slopes steeper than approximately 5H:1V. The volume of in-cell bulk disposal shall not exceed 8.418×10^4 m^3 or 1.10×10^5 yd^3 (2.97×10^6 ft^3). ~~All 11e.(2) in-cell bulk placement material shall be placed to final specifications by August 1 of each year.~~		
Open-air storage of PCB/Radioactive waste and Dry Active Waste (DAW) is prohibited. DAW is defined in condition I.E.10.(d) of the Ground Water Quality Discharge Permit. In-cell bulk disposal of PCB and DAW shall be managed to prevent open-air storage as follows: 1. Maintained in a water-tight container; or 2. Covered within 24 hours of the end of the shift that the waste was unloaded with a nominal 6" of soil or soil-like waste material that is free of PCB and DAW; or 3. Covered within 24 hours of the end of the shift that the waste was unloaded with a commercial fixative to prevent wind dispersal and leachate generation, applied in accordance with the manufacturer's instructions; or 4. The following PCB wastes do not require cover to prevent wind dispersal: a. Drained equipment; b. Large objects with inaccessible PCB contamination; or c. PCB bulk product waste (as defined in 40 CFR 761.62(b)(1)(i)) with a bulk density greater than 70 pounds per cubic foot. When cover is required, maintain documentation of the date and shift that PCB and DAW were placed in in-cell bulk disposal and of the date and shift that	Obtain reports from waste disposal personnel as to the location and status of PCB and DAW in-cell bulk disposal at the beginning of each shift. When material requiring cover has been placed into in-cell bulk disposal during the preceding shift, track placement of the specified cover material. Document completion of cover within the required timeframe on the Daily Construction Report.	

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cover was applied.		
The volume of in-cell bulk disposal plus the volume of waste stored at the LLRW container storage pads (e.g. LLRW bulk storage pad, LLRW container storage pad, etc.) shall not exceed the volume allowed in the trust agreement.		
COLD WEATHER PLACEMENT;		
FROZEN MATERIAL: No frozen material shall be disposed directly on or within 24 inches of the clay liner. Frozen material is defined as material which cannot meet the compaction requirements because of frozen water mixed within the material.	During cold weather, inspect waste to be disposed directly on the clay liner. Do not allow waste containing frozen material to be disposed on the clay liner. Record corrections on the "Daily Construction Report".	Verify that inspections for frozen material are being conducted during cold weather and that any corrective actions (if required) are properly documented.
PLACEMENT OF WASTE DURING COLD WEATHER: Waste material shall only be placed when the required moisture and compaction can be met.	1. For soil lifts: a) On November 1, decrease density and moisture lot size to 750 cubic yards (compacted). b) On December 1, and continuing to March 1, decrease density and moisture lot size to 500 cubic yards (compacted). c) Stop placement of waste on a lift when two consecutive tests fail compaction requirements due to frozen material. The first "unapproved" lift is classified as in-cell bulk disposal. d) When temperatures are high enough to place the in-cell bulk disposal material, place the material in accordance with lift thickness and compaction requirements specified for waste lifts above. a) If more than 2 feet of waste was stored as in-cell bulk disposal, excavate to a maximum of 12 inches	1. For soil lifts: Verify that the testing frequency is increased at the beginning of November, and December. Verify that work stops on a lift after the failure of two consecutive compaction test and that the lift is surveyed before the placement of in-cell bulk disposal.

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	above the last approved waste lift. Test and approve this in accordance with lift thickness and compaction requirements given above. b) If less than 2 feet of in-cell bulk waste was disposed over the last approved lift, excavate to the top of the last approved lift and re-test this lift in accordance with lift thickness and compaction requirements specified above.	
For CLSM pours:	2. For CLSM pours:	2. For CLSM pours:
a) Do not pour CLSM on a frozen soil base.	a) If the CLSM is to be poured on a soil base, perform a soil density test on adjacent material prior to the pour to determine if the underlying soil is frozen. If the soil is found to be frozen do not allow placement of material.	a) Review documentation of soil base testing verify that CLSM is not to be poured on a frozen soil base. During freezing conditions, verify that QC personnel have performed initial sampling and testing of the CLSM to ensure flowability ensured that the CLSM has been covered with concrete blankets or tented and heated, where required. Verify that QC personnel have periodically checked the temperature of the CLSM and recorded the results on the "CLSM Inspection and Testing Form".
b) If the ambient air temperature is forecast to drop below 5°F anytime during the CLSM pour, CLSM shall not be poured. When the ambient or expected air temperature will fall below 35°F anytime during the CLSM pour, the CLSM shall be sampled and an initial screening test performed as outlined under CLSM Design Specifications above. This initial sample may be used to prompt an adjustment of the load water content or temperature, modify the pour techniques, motivate rescheduling of the pour event,	b) When the ambient or expected air temperature will fall below 35°F anytime during the CLSM pour, perform an initial screening test of the CLSM immediately before pouring to ensure that it meets the flowability criteria. This screening test includes either a Flow Consistency Test (ASTM D6103) or Efflux test (procedure given in Appendix A), as well as a unit weight test (ASTM D6023). The result from this initial screening test shall indicate whether or not any adjustments need to be made at the batch plant to	b) Review documentation of screening tests to ensure that CLSM met flowability specifications during cold weather.

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etc., but should not be considered acceptance sampling and testing. Acceptance sampling and testing should be obtained in accordance with ASTM D5971 (Sampling Freshly Mixed CLSM).	ensure loads meet design specifications. 1) If adjustments are made to the load to produce a product that passes the testing requirements, perform initial screening testing on the subsequent two loads to verify that batch plant adjustments are sufficient. 2) CLSM pouring shall only be authorized to proceed upon verification that the initial load (and subsequent two loads if the initial load failed) meets mix specifications. Perform acceptance sampling and testing from near the center of the load. a. Accept loads which meet specification. b. For loads with unsatisfactory results, accept the first part of the load and reject the remainder, or modify the load and/or pour techniques and retest. Record the results on the "CLSM Inspection and Testing" forms.	
c. Unless the ambient air temperature is at least 35°F and rising, measures must be taken to ensure the CLSM temperature does not fall below 40°F. To ensure this occurs and therefore the CLSM can adequately cure prior to exposure to freezing temperatures, the following should occur: Limit the pour to a surface area of no more than 4,800 ft^2. Heat the CLSM prior to pouring (as possible). Cover, or tent and heat, the CLSM directly following pouring (i.e. - pour one truck load, cover or tent the in-place material, then pour the next truck load). Following completion of the pour, cover the CLSM with concrete blankets, or tent and heat the CLSM. Likewise, if following placement, the ambient air	c) When the ambient air temperature decreases to below 35°F, ensure the CLSM temperature does not fall below 40°F. Measure and record the temperature of each CLSM load prior to introduction to the cell. Ensure the freshly poured CLSM is covered or tented and heated in a timely manner. Measure and record the temperature of the in-place CLSM every two hours during pouring, at the end of the work shift and at the beginning of the next work shift. Temperature results of pour temperatures shall be recorded on the "CLSM Inspection and Testing" forms. If, following placement, the ambient air temperature decreases below 35°F, or is anticipated to decrease below 35°F anytime in the 24 hours following placement of the	c) Review documentation of CLSM temperature measurements and actions taken for cold weather pouring to verify that CLSM temperatures meet specifications.

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temperature decreases below 35°F, or is anticipated to decrease below 35°F anytime in the 24 hours following placement, the CLSM must be covered with concrete blankets, or tented and heated.	CLSM, verify that concrete blankets or tenting and heating has been employed to ensure the CLSM is maintained greater than 40°F. Record the results of the inspection on the "CLSM Inspection and Testing" forms.	
SNOW REMOVAL: When waste material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of deficiencies. Construction may not continue without corrective action. Record corrective action (where required) in the "Daily Construction Report".	Verify that snow removal is being performed and documented.
FINAL GRADING: Top of waste elevations shall be at grade or below grade.	Survey the top lift of waste on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC and Construction QA Officers. a. Indicate where the waste meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.

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SCOPE: This work element applies to the Class A and Class A North embankments. This work element also applies to the Class A South portion of the Class A South/11e.(2) embankment.		
NOTICE OF TEST PAD CONSTRUCTION: The test pad plan shall be approved by the DRC prior to the test pad construction. The DRC shall be notified 48 hours in advance of the start-up of test pad construction.	Obtain documentation confirming that the test pad plan has been approved by the DRC. Notify the DRC 48-hours in advance of test pad construction.	Verify that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.
CONTAINERIZED WASTE PLACEMENT TEST PAD: A test pad with a minimum area of 400 ft^2 will be constructed using the procedure (container or large component type, container configuration, backfill material properties, placement and compaction methods) proposed for construction of the waste lifts. The test pad shall be representative of anticipated field placement conditions and of dimensions suitable to the equipment to be used for production. The minimum area of the test pad may be reduced with DRC concurrence with the test pad plan. Prior to implementation, within the Containerized Waste Facility, of a containerized waste configuration that has not been previously approved, a waste placement test pad shall be constructed utilizing the proposed containerized waste configuration. Test pads are to be constructed and tested in accordance with the following specifications:	Observe the construction of test pads. Measure test pads to ensure that they are constructed to the size indicated. Record the test pad size on the "Daily Construction Report".	Daily, observe the construction of the test pads. The Quality Assurance review for test pad specifications shall cover each specification in this work element. Review 100% of the QC documentation to verify that the tests were performed and documented correctly.
1. Construct the proposed configuration of containerized waste in the test pad area.	Document the constructed configuration of containers in the test pad on the "Daily Construction Report."	Perform a minimum of one (1) QA visual inspection of the resulting waste form per test pad.

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2. At least one Proctor (or relative density) and classification test shall be conducted on the backfill material for each test pad.	Conduct the required proctor (or relative density) and classification (PL, LL, and gradation) tests.	
3. Backfill shall be placed over and between the waste packages in a manner that encourages flow into void spaces. The backfill is to be placed and compacted by equipment and methods proposed for use during construction of the waste lifts. Other equivalent equipment may be used for placement or compaction of backfill with approval from the Director of Engineering and DRC.	Record type of equipment used, and number of passes on the "Daily Construction Report". Verify DRC approval has been received for equivalent equipment when used.	
4. The backfill surrounding the containers shall achieve an average density of at least 85% standard proctor or 55-percent relative density for drum configurations, or an average density of at least 80-percent standard proctor or 50-percent relative density around B-12 or B-25 boxes, HICs, cask liners, large components, or container overpack configurations. The completed test pad shall have no greater than 1% external void space by volume of the entire test pad.	Conduct direct or indirect in-place moisture-density tests at a rate of at least four tests per test pad. The test location shall be chosen to verify backfill compaction throughout the test pad. Record the test result on the "Field Density Test" form. Inspect the constructed test pad for void spaces surrounding the containers. Observe destructive testing of the test pad and measure external void spaces found in the backfill in accordance with the "Containerized Waste Facility Waste Placement Test Pad Destructive Testing" method in Appendix B. a. Approve test pads which meet the specified compaction, and minimize void space conditions. b. Rework and retest test pads not meeting the specified moisture or compaction or minimize void space conditions. Document all rework that was performed. c. Where rework and retesting is impractical, reject the test pad procedure.	
5. The procedures used to construct the test pad (container type, container configuration/orientation,	Provide the Director of Engineering with copies of the documentation for the test pad for review and	

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backfill material properties, placement and compaction methods) shall be reviewed and approved by the Director of Engineering. The test must be approved by a Professional Engineer.	approval.	
6. The procedures used to construct the test pad shall be reviewed and approved by the DRC prior to using the new test pad construction method.	Obtain documentation confirming DRC approval of the test pad.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during backfill construction.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A and Class A North embankments. This work element also applies to the Class A South portion of the Class A South/11e.(2) embankment.		
LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.	Assign a lift identification number to each lift. Use the lift identification number to identify all paperwork for that lift. Summarize all lifts on the lift summary form.	The Quality Assurance review for waste placement specifications shall cover each specification in this work element. Review a minimum of 50.0% of the QC documentation to verify that the tests were performed and documented correctly.
LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded.	The QC technician shall record the date and time of lift approval on the CWF Lift Approval Form	
DEFINITIONS: For the purpose of this CQA/QC project plan, the following terms are defined: Backfill is defined as poorly graded type SP or well graded type SW sand with a minimum of 95% passing the #4 sieve, a minimum of 35% passing the #30 sieve, and less than 5% passing the #200 sieve. The maximum moisture content for backfill shall be less than or equal to 4.1% at the time of backfill placement. This specification may be modified following successful completion and DRC approval of a test pad. Backfill cover is defined as a minimum of one foot of soil placed over containerized waste packages after backfilling is complete. In the case of standard liners and large liners, the placement sequence is: (1) backfill between the waste forms; (2) intermediate sand; (3) backfill cover. Containerized waste is defined as any containers of Certified Containerized Waste in accordance with	No action required.	No action required.

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applicable requirements of the Waste Characterization Plan. Certified Containerized Waste is defined as monolithic units in the form of the following filled containers. 1. Any DOT "Strong, Tight" Containers up to 5 feet tall 2. Standard Liners are High Integrity Containers (HICs) or other packages between 5 and 6.65 feet tall (up to 215 cubic feet external volume) 3. Large Liners are HICs or other packages between 6.65 and 9 feet tall (between 215 and 331 cubic feet external volume) 4. Other Large Components and oversized DOT containers (larger than 331 cubic feet) Containerized Waste Facility (CWF) pyramid is limited to a maximum of two lifts of containerized waste. Containers up to 5 feet tall are limited to a single lift at the pyramid base. Containers greater than 5 feet tall are limited to two lifts. The volume of the embankment above and surrounding the pyramid shall be filled with bulk waste lifts placed in accordance with the Bulk Waste Placement Work Element of this plan. Intermediate sand is defined as a minimum of 2 feet of sand meeting gradation specifications for backfill, placed above the top of caissons used for placement of cylindrical containers greater than 5 feet tall. In the case of containers placed using removable steel forms, intermediate sand shall be placed to an elevation at least 9 feet above the base of the container for standard liners and 11.5 feet above the base of the container for large liners. Lift is defined as containerized waste packages, backfill		

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between packages, intermediate sand (when applicable), and the backfill cover layer. A containerized waste placement lift may contain one layer of containers or more than one stacked layer of containers, depending on the container type and height. Removable Steel Form is a circular steel form used to ensure the spacing of standard or large liners. Removable steel forms are placed in an approved disposal configuration (hexagonal for example) prior to placement of liners. Removable steel forms can be used in either the first lift or second lift in place of caissons. All removable steel forms shall be pulled after liner placement and before backfill.		
CONTAINERIZED WASTE PLACEMENT: 1) All containers shall be placed in accordance with an approved container placement method. Containers shall be placed in a configuration that has been approved through the successful completion of a waste placement test pad. Figures 7 and 8 illustrate approved waste placement configurations. A minimum 6-inch layer of loose sand shall be placed prior to placement of containers. Containers shall be worked into this loose sand to minimize any voids underneath the containers. Containers shall be placed with a minimum distance as specified by individual container type below. Backfill shall be placed over and between the containers in accordance with the approved container placement method for the type of container being placed. The containerized waste placement backfill soil properties shall be tested once per 2,500 square feet of placement area or once per lift.	1) Verify through observation and document that the appropriate container placement method and spacing is followed for the type of container stacking in each lift. Perform at least one moisture content and classification (PL, LL, and gradation) test per 2,500 square feet of placement area, or change in backfill material type, or change in borrow source. Conduct an inspection of the container placement configuration prior to commencement of backfill placement. This inspection shall document that an approved configuration has been utilized for the container types present. Observe placement and compaction of the backfill to ensure that type of equipment, equipment load (if applicable), and number of passes meet the specifications approved by the containerized waste placement test pad. Record type of equipment used,	1) Review the QC documentation to confirm that the appropriate container placement and backfilling method has been used and properly documented.

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	equipment load (if applicable), and number of passes on the CWF Lift Approval Form.	
2) Standard Liners shall be placed as follows. Spacing and backfill of standard liners may be facilitated by the use of concrete caissons or removable steel forms; use of caissons or removable steel forms is not required. Caissons or other forms shall not exceed 7 feet tall. When used, removable steel forms shall be removed prior to backfill. Caissons shall not be removed without prior DRC notification. Backfill shall be placed to a minimum height of 7 feet above the container base elevation by dropping from the bucket of a front-end loader or equivalent around and above the container (whether in a caisson or not). Backfill shall achieve a minimum density of at least 80% of a standard Proctor, as demonstrated by the approved test pad(s). The backfill layer shall be covered by an intermediate sand layer to a minimum depth of 2 feet above the top of the caisson (9 feet above the container base elevation). Intermediate sand shall achieve a minimum density of 85% of a standard Proctor. The backfill cover layer is then placed above the intermediate sand layer. Caissons shall be placed in a hexagonal or other approved (through a test pad) configuration, such as rectangular, that meets the following criteria. Caissons with an outer diameter of 100 inches shall be placed a minimum of 4 inches apart. If no caisson is used, or if a caisson or other form of smaller outer diameter is used, the container shall be placed as if the 100-inch diameter caisson were there for spacing purposes; i.e., within a minimum area of 108-inch diameter centered around the container, no other caisson or container shall intrude.	2) Verify through observation and document on the CWF Lift Approval Form that standard liners are placed with the appropriate container placement method and spacing. Conduct in-place density tests at the surface of the intermediate sand layer at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 10,000 square feet of a single lift. At least two tests will be performed per lift. The test location shall be chosen on the basis of random numbers. Approve lots when: a. Material is observed to be properly compacted throughout the lot; b. Density tests performed meet compaction specifications. Verify the mean elevation of the top of each intermediate sand lift by installing grade poles, or other methods approved by the Site Engineer. For each lift larger than 50' x 50', survey the corners and at least one spot in the middle. For lifts less than 50' x 50', a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50' x 50' may be segmented to areas 50' x 50' or less and elevation verified with the use of grade poles. The use of grade poles to verify the compacted thickness of the intermediate sand material shall be verified as part of the test pad for intermediate sand. Thickness measurements of the compacted intermediate sand will be documented and forwarded to the Construction QC Officer. a. Approve lifts with an average compacted	

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	intermediate sand thickness greater than or equal to the specified compacted intermediate sand thickness. b. Add intermediate sand and retest lots with an average compacted intermediate sand lift thickness less than the specified compacted intermediate sand lift thickness.	
3) Unusually shaped containers shall be placed and backfilled in a manner that allows void spaces to be filled. In no case shall unusually shaped containers be placed such that a significant amount of external void space cannot be filled. A significant amount of external void space for unusually shaped containers is 5 percent of the volume of the unusually shaped containers in the lift, unless otherwise approved by the Division.	3) Verify through observation and document that the unusual containers are placed such that all significant voids can be filled.	
4) Large components and oversized DOT containers shall be placed and backfilled such that void spaces are filled and the bearing capacity of the embankment is not exceeded.	4) Verify through observation and document that the large components and oversized DOT containers are placed in accordance with an approved large component placement method.	
5) Large Liners shall be placed as follows. Spacing and backfill of large liners may be facilitated by the use of concrete caissons or removable steel forms; use of caissons or removable steel forms is not required. Caissons or other forms shall not exceed 9.5 feet tall. When used, removable steel forms shall be removed prior to backfill. Caissons shall not be removed without prior DRC notification. Backfill shall be placed to a minimum height of 9.5 feet above the container base elevation by dropping from the bucket of a front-end loader or equivalent around and above the container (whether in a caisson or not). Backfill shall achieve a minimum density of at least 80% of a standard Proctor, as demonstrated by the approved test pad(s). The backfill layer shall be covered by an intermediate sand	5) Verify through observation and document that large liners are placed with an approved container placement method and spacing. Conduct in-place density tests at the surface of the intermediate sand layer at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 10,000 square feet of a single lift. At least two tests will be performed per lift. The test location shall be chosen on the basis of random numbers. Approve lots when: a. Material is observed to be properly compacted throughout the lot; b. Density tests performed meet compaction specifications.	

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layer to a minimum depth of 2 feet above the top of the caisson (11.5 feet above the container base elevation). Intermediate sand shall achieve a minimum density of at least 85% of a standard Proctor. The backfill cover layer is then placed above the intermediate sand layer. Caissons shall be placed in a hexagonal or other approved (through a test pad) configuration, such as rectangular, that meets the following criteria. Caissons with an outer diameter of 114 inches shall be placed a minimum of 5 inches apart and no more than 11 inches apart (at the nearest point between two adjacent caissons). If no caisson is used, or if a caisson or other form of smaller outer diameter is used, the container shall be placed as if the 114-inch diameter caisson were there for spacing purposes; i.e., within a minimum area of 124-inch diameter centered around the container, no other caisson or container shall intrude and adjacent caissons shall be within a maximum area of 136-inch diameter.	Verify the mean elevation of the top of each intermediate sand lift by installing grade poles, or other methods approved by the Site Engineer. For each lift larger than 50' x 50', survey the corners and at least one spot located near the center. For lifts less than 50' x 50', a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50' x 50' may be segmented to areas 50' x 50' or less and elevation verified with the use of grade poles. The use of grade poles to verify the compacted thickness of the intermediate sand material shall be verified as part of the test pad for intermediate sand. Thickness measurements of the compacted intermediate sand will be documented and forwarded to the Construction QC Officer. a. Approve lifts with an average compacted intermediate sand thickness greater than or equal to the specified compacted intermediate sand thickness. b. Add intermediate sand and retest lots with an average compacted intermediate sand lift thickness less than the specified compacted intermediate sand lift thickness.	
6) Large Liners shall meet the following void space criteria: void spaces within the waste and between the waste and its packaging shall be reduced to the extent practicable, but in no case shall less than 90 percent of the capacity of the container be filled.	6) For large liners, document that the void space criteria is met.	
7) Drums shall be placed horizontally at least 1 inch apart in a single layer. There shall be no continuous contact between drums. Forklifts may be used for drum placement provided that protective measures are taken to prevent damage to the drums. The forklift tines shall not come into direct contact with the drums. Sand shall be compacted to an average standard proctor density of 85% with a minimum of a single pass of a hoe mounted	7) Document that drums have been placed as required. Document equipment used and number of passes.	

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vibratory compactor or its equivalent, prior to placement of the next layer of drums.		
8) When backfilling between standard or large caissons placed in a hexagonal pattern, the following controls apply as demonstrated in the "Test Pad Report for the Containerized Waste Facility Tri-Arc Test Pad Plan, Revised Plan" dated September 18, 2007. The loader or other equipment shall have a bucket of at least 25 cubic foot capacity and the bucket shall be totally filled. Dump the backfill sand from a height of approximately 2 feet above the top of the caisson (measured from the lower lip of the bucket to the top of the caisson).	8) Document that the bucket used to place backfill sand meets or exceeds the minimum capacity. Observe sand dumping operations for compliance with the specification. Document on the Daily Construction Report.	
9) If placing ion-exchange resins in containers other than standard liners or large liners, ensure that each 50' x 50' lift area contains no more than 25% resins by volume. Increase spacing of resin containers as needed to maintain this criteria.	9) Calculate the ratio of resins to other material (soil, non-resin wastes) in the lift based on manifested resin volume and actual lift dimensions. Nominal container capacity may be used instead of manifested volume. Resin volume divided by total volume x 100 = resin percentage. Document on the CWF Lift Approval Form.	
PYRAMID CONTROLS: Refer also to Figure 7. Containerized Waste Facility (CWF) Pyramid: 1) Containerized waste lifts shall form a pyramid with a maximum 3H:1V outside edge slope. The slope shall be measured to the top of the backfill cover above containers in the lift. 2) Drums and boxes less than 5 feet tall are limited to a single lift on the lower layer of the CWF pyramid. Standard and large liners are limited to two lifts. 3) The pyramid base dimensions and maximum 3H:1V side slope requirements will control the location of the second lift of containers. 4) Adjacent pyramids shall not be placed above a previous CWF pyramid. 5) CLSM pyramids for bulk waste shall not be placed above a previous CWF pyramid. 6) CLSM may	Determine the location of the northwest corner and the dimensions of each lift and document on the CWF Lift Approval Form. Use the lift location and dimensions to ensure compliance with the containerized waste facility pyramid specification. As each lift of backfill cover is placed, survey and document that the corners of the lift meet the 3H:1V slope. If applicable, document the dimensions of the previous containerized waste facility lift on the CWF Lift Approval Form. In locating a new pyramid, document on the CWF Lift Approval Form: a) The pyramid base is placed on the debris-free zone; or b) The pyramid base does not encroach the vertical limits of a previous pyramid.	Verify compliance with the containerized waste facility pyramid specification and proper documentation of the QC requirements.

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be used for fill (for any larger debris and oversized DOT containers) within the initial lift of the container pyramid. 7) The first liner placed in a second lift using this method shall be offset from liners in the lower lift. 8) Large Liners placed in the upper lift of the Containerized Waste Facility shall be placed at least 75 feet from the outer perimeter of the lower lift.	Prior to positioning the first liner in a second lift, document the location of containers in the first lift. Ensure that the first liner placed in the second lift is offset so that it is not directly above any single liner in the lower lift. Document that large liners placed in the upper lift meet the setback criteria.	
BACKFILL COVER: After backfilling of voids between containers is complete and intermediate sand is placed (as needed), each lift of containerized waste shall be covered by at least one foot of compacted backfill cover material.	1. For containerized waste lifts: Verify the mean elevation of the top of each backfill cover lift by installing grade poles, or other methods approved by the Site Engineer. For each lift larger than 50' x 50', survey the corners and at least one spot in the middle. For lifts less than 50' x 50', a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50' x 50' may be segmented to areas 50' x 50' or less and elevation verified with the use of grade poles. The use of grade poles to verify the compacted thickness of the backfill cover material shall be verified as part of the test pad for backfill cover. Thickness measurements of the compacted backfill cover will be documented and forwarded to the Construction QC Officer. a. Approve lifts with an average compacted backfill cover thickness greater than or equal to the specified compacted backfill cover thickness. b. Add backfill and retest lots with an average compacted backfill cover lift thickness less than the specified compacted backfill cover lift thickness.	Review the QC documentation.
Backfill cover for each lift shall achieve a density of at least 95 percent of a standard Proctor.	Conduct in-place density tests at the surface of the backfill cover at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 10,000 square feet of a single lift. At least	

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	two tests will be performed per lift. The test location shall be chosen on the basis of random numbers. Approve lots when: a. Material is observed to be properly compacted throughout the lot; b. Density tests performed meet compaction specifications. Perform a laboratory classification test on the backfill cover material at a rate of one test per 3,000 cubic yards (compacted), or change in backfill cover material type, or change in borrow source. The sample for this test will be taken from the backfill cover stockpile.	
SET BACK OF WASTE: Maintain a distance of at least 10 feet between the inside toe of the runoff berm and the outside toe of the waste containers.	Initial waste set back approval shall measure the set back distance around the edge of the runoff berm at 100 foot intervals. Record the inspection of the setback on the "Daily Construction Report". Inspect the waste setback on a monthly basis. Record findings on the "Daily Construction Report". Require removal of any waste necessary to maintain the required set back.	Review the QC documentation to confirm that the monthly inspections have been performed and properly documented.
SNOW REMOVAL: When waste material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of deficiencies. Construction may not continue without corrective action. Record corrective action (where required) in the "Daily Construction Report".	Review the QC documentation to verify that snow removal is being performed and documented.
Cold Weather Placement of Backfill: The following requirements apply to placement of flowable sand backfill when the ambient air temperature is below 32 degrees Fahrenheit: a. Backfill with frozen clods shall not be accepted for placement. b. The backfill stockpile shall be worked using heavy	When the ambient air temperature falls below 32 degrees Fahrenheit: a. Inspect the backfill stockpile to be used that day for any visible frozen clods. b. Observe working of the backfill stockpile. c. Perform a flowability test (ASTM D6103) on	Verify that the backfill stockpile is inspected, worked, and tested during cold weather conditions.

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equipment prior to use. c. The minimum average spread diameter for the flowability tests shall be 8.75". d. If backfill is observed to have frozen clods or does not meet the flowability specification, the backfill stockpile may be re-worked. Each inspection and test shall be repeated for re-worked material.	material from the backfill stockpile: 1) Collect a minimum of three representative samples from the backfill stockpile. 2) Test each sample using ASTM D6103. d. Record these actions and test results on the "Daily Construction Report."	
FINAL GRADING: Top of waste elevations shall be at grade or below grade.	Survey the top lift of waste on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the Director of Engineering and Construction QA Officer. a. Indicate where the waste meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Clay Barrier constructed in the Class A South/11e.(2) embankment.		
CLAY BARRIER CONSTRUCTION: Clay Barrier shall be constructed concurrently with the adjoining waste lifts and to the dimensions indicated on drawing 07021-V1.		
RUNOFF CONTROL: Clay Barrier and adjacent waste lifts shall be contoured and/or bermed so that runoff from Class A waste does not flow into 11e.(2) waste. Runoff from 11e.(2) waste is permitted to flow into Class A waste areas.	During times that clay barrier and adjacent lifts are under active construction, inspect the cell for compliance with this specification daily. Record observations on the Daily Construction Report. During times that clay barrier and adjacent lifts are not being actively worked, inspect the cell for compliance with this specification at least once per week. Record observations on the Daily Construction Report.	
CLAY BARRIER MATERIAL: Satisfactory material shall be defined as CL or CL-ML soils based on the Unified Soil Classification System.	Perform laboratory classification tests (ASTM D 2487) and a standard proctor (ASTM D 698) at a rate of 1 test per lot. A lot is defined as 5,000 cubic yards of specified material. Record the location of the proctor and classification sample on the "Sampling Log."	
CLAY LINER - CLAY BARRIER INTERFACE: The clay liner protective cover shall be removed. Clay Barrier shall be placed at the clay liner surface as defined by the as built record. Any over-excavation of the clay liner shall be considered clay liner damage and shall be repaired in compliance with the appropriate test pad procedure.	Observe protective cover removal. Record observations and corrective actions taken (where required) on the "Daily Construction Report". Document the elevation of the exposed clay liner surface as compared to the as built record on the "Lift Approval Form".	

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LIFT THICKNESS: Barrier material shall be placed in lifts with a compacted lift thickness not exceeding 12 inches.	Survey the average elevation of the barrier lift at 100-foot intervals and key points.	
COMPACTION: Barrier shall be compacted to a minimum of 90 percent of a standard proctor and with a moisture content between ±5 percentage points of the optimum moisture. Lifts shall be compacted with a pad-foot type compactor/roller.	Conduct in-place density tests (ASTM D 6938) at a rate of one test per lot, per lift, and record the results on the "Field Density Test" form. A lot is defined as a maximum of 150 linear feet of placed barrier material. Test locations shall be chosen on the basis of random numbers. Approve lots that meet the specified compaction. Lots that fail shall be reworked and retested until required specifications have been met.	
LIFT BONDING: No smooth surfaces shall exist between lifts. The surface resulting from compaction by the pad foot compactor shall be acceptable. If necessary, roughen the surface to have changes in grade of approximately one inch or more at a rate of two per linear foot prior to placing the next lift.	Verify that the surface of the previously compacted barrier lift has been roughened as required. Record observations on the "Daily Construction Report."	
UNSUITABLE MATERIAL: Remove unsuitable material, if any is encountered. Unsuitable material is defined as frozen material, rocks, debris, waste material or material not meeting the CL or CL-ML classification.	Define areas of unsuitable material and direct its removal. Observe the areas once the unsuitable material has been removed. Report corrective action on the "Daily Construction Report." Notify the Project Engineer and QA of any unsuitable material.	
FINAL GRADING: The barrier shall be completed to the top of waste grade through the temporary cover.	Survey the clay barrier surface jointly with the top of waste survey. Final survey measurements shall be documented. a. Indicate where the clay barrier meets design lines and grades. b. Rework and resurvey areas not meeting the specified grade until the area is approved.	

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
TEMPORARY COVER MATERIAL: Temporary cover shall be native soils that are free of debris material.	Visually inspect temporary cover soil and verify that it is free of debris. Record results on the Lift Approval Form.	
TEMPORARY COVER PLACEMENT: Temporary cover shall be placed within 60 days of surveying the design top of debris waste elevations and grades for each lot.	Document lift area, location, thickness, and compaction on the Lift Approval Form	Periodically observe lift approval documentation.
Temporary cover shall perform as the Debris Free Zone specified under Work Element - Waste Placement, above. Temporary cover shall be placed in accordance with the lift thickness and compaction requirements specified under Work Element - Waste Placement, above.		
The edge of the temporary cover shall be marked with fencing and rope, snow fence, or equivalent marking to prevent heavy equipment travel on the temporary cover surface. Haul routes may traverse temporary cover, provided that the haul route does not travel over any pre-final cover settlement monuments and that the haul route is marked with fencing and rope, snow fence, or equivalent markings.		
A commercial fixative product, magnesium chloride, or clean water may be applied to the surface of the temporary cover to aid in dust control and erosion prevention. Contaminated water shall not be used for dust suppression on temporary cover.		

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
PRE-FINAL COVER SETTLEMENT MONUMENTS: Pre-final cover settlement monuments shall consist of approximately 18-inch long #5 or greater rebar that is welded to a metal plate. The metal plate shall be approximately 18 inches square with a thickness of 3/16 inch to 1/4 inch. The metal plate shall be placed on the top of waste surface and then secured by the temporary cover as it is placed. Each monument shall be labeled, flagged, and documented on a reference drawing.	Inspect pre-final cover settlement monuments for compliance with the specification prior to installation.	Perform a surveillance of monument installation activities.
PRE-FINAL COVER SETTLEMENT MONUMENT PLACEMENT: Pre-final cover settlement monuments shall be placed as close as practical to the locations of final cover settlement monuments identified in Figures 2, 4, and 6. In addition, *pre-final cover settlement* monuments shall be placed at the locations identified as "additional final temporary cover monuments" on Figures 2, 4, and 6.	Perform and document a post-construction survey of the pre-final cover settlement monuments.	Verify that surveys have been performed.
SURVEY REQUIREMENTS: Surveys shall be performed with GPS or approved equivalent equipment. Tolerance shall be no more than ± *0.1 foot.*	Calibrate and operate survey equipment in accordance with the manufacturer's recommendations.	
SURVEY INTERVAL: The pre-final cover settlement monuments shall be surveyed within 30 days of temporary cover installation. New monuments shall be surveyed again at 2, 4, 8, and 12 *months* (± *10 calendar* days); then semi-annually until final cover construction begins. Weather conditions at the time of the survey and a discussion of the potential for frost to be present shall be documented in the survey report.	Perform and document the required surveys. Provide survey data to the Director of Engineering.	Verify that monument surveys are completed as required.

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INSPECTIONS: Monthly, inspect temporary cover for the presence of erosion gullies. If the inspection indicates that waste material is exposed due to erosion, the temporary cover shall be repaired in that area within 5 working days.	Perform and document monthly inspections.	
Semi-annually, maintain the temporary cover surface. Maintenance shall consist of filling in any erosion gullies and, if necessary, re-grading to prevent ponding on the temporary cover.	Document semi-annual maintenance activities. Document any areas requiring filling or re-grading.	
REPORTING: Survey data for pre-final cover settlement monuments shall be compiled and analyzed to evaluate total and differential settlement. This data and analysis shall be submitted to DRC with the annual as-built report.		
Review and analysis of settlement monitoring data will include the following: • A drawing identifying the location of each point. • Graphical or tabular presentation of the incremental settlement for each point (how much each point has moved since the last set of readings), • Graphical or tabular presentation of the total settlement for each point, • Graphical or tabular presentation of the time rate of settlement for each point (to include both the overall rate from the first data for the point, and the incremental rates for each period), • Graphical or tabular presentation of the differential settlement for each point with respect to the nearest adjacent points, and • A discussion about the general nature of the observed settlement, and any areas of the landfill that are behaving in an anomalous manner.		

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TRANSITION TO FINAL COVER: If distortion is less than 0.007 foot/foot for all of the grid points in a given area, and each grid point has at least one year's monitoring data; then final cover construction may proceed. Once an area is approved, final cover construction shall be completed within 3 years of this determination.	The Director of Engineering shall evaluate pre-final cover settlement data for each area of cover construction to determine distortion between all adjacent points in that area. If the criteria are met, a written report shall be prepared and forwarded to DRC at least 7 calendar days prior to removing the pre-final cover settlement monuments.	
If an area is not approved for final cover construction by the beginning of the 10^{th} year of the 12-year open cell period, an analysis of projected future distortions shall be performed and submitted to DRC. If the analysis indicates that the future distortions between any two adjacent points will be more than 0.01 foot/foot, then surcharging over the area(s) in question will be required to stabilize settlement prior to final cover construction.	The Director of Engineering shall perform the analysis of projected future distortions. The analysis shall be submitted no later than the start of the 10^{th} year since waste placement began in the oldest lift area subject to analysis.	
Immediately prior to placement of the first lift of radon barrier, the pre-final cover settlement monuments shall be removed and the temporary cover surface restored.	Inspect and document that all pre-final cover settlement monuments have been removed prior to final cover construction.	Verify that pre-final cover settlement monuments have been removed and that the temporary cover surface meets design top of waste grades and elevations.
Additional clean debris-free soil material shall be placed as needed to return the area for final cover construction to the original top of waste design grades and elevations. When placing clean debris-free soil material for this purpose, the soil shall be placed in lifts with a compacted average thickness not exceeding 12" and compacted to 90% of a standard Proctor. If an area has settled more than 12", bulk waste may be placed in accordance with the applicable work elements and specifications of this manual, so long as the debris-free zone specification is met at the design top of waste elevations.	Survey and document the temporary cover surface to confirm that the top of waste design grades and elevations are achieved. Document lift thickness and compaction for any debris-free soil material placed to bring the temporary cover surface to the design top of waste grades and elevations.	

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be used for borrow. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.	Inspect the area once clearing and grubbing has been completed. Record observations and corrective action (where required) on the "Daily Construction Report".	Verify that the clearing and grubbing has been inspected by QC.
MATERIAL--NATURAL CLAY MIXTURE: Satisfactory material shall be defined as CL and ML soils based on the Unified Soil Classification with at least 85 percent passing the No. 200 sieve (silt and clay), a plasticity index (PI) between 10 and 25, and a liquid limit (LL) between 30 and 50. The clay shall also have a dry clod size less than or equal to 1 inch.	Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the radon barrier. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log". a. Approve lots (which meet the specified classification) for use in the radon barrier. b. Lots not meeting the specified classification can not be used.	Verify the frequency of laboratory tests and compliance of test results.
PROTECTION: The borrow material will be handled in such manner as to prevent contamination with radioactive waste material or other deleterious material. The in-place material may contain up to 5 percent additional rocks and sand above the content found in the classification test.	Visually check radon barrier materials for contamination by foreign materials. Remove clays that have been contaminated above the specified requirements. Document corrective actions (where required) on the "Daily Construction Report".	Verify that the radon barrier is being inspected for contaminates and that corrective actions (if required) are properly documented.
PROCESSING: These procedures may be used to provide suitable material for construction of the radon barrier. 1. Apply deflocculant at a rate determined by the production engineer.	Measure the mixing areas and verify that the application rate of the deflocculant is equal to or	Verify that the size of the mixing areas and the amount of deflocculant applied have been properly

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	greater than the rate determined by the production engineer. Record the size of the mixing areas and the amount of deflocculant applied on the "Embankment Construction Lift Approval Form".	documented.
2. Mix the deflocculant thoroughly into the soils by tilling, or similar action.	Observe the mixed clay and advise the contractor of areas which are adequately mixed.	Verify that the clay is being inspected by QC.

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11c.(2) embankments.		
NOTICE OF TEST PAD CONSTRUCTION: The test pad plan shall be approved by the DRC prior to test pad construction. The DRC shall be notified 48 hours in advance of the start-up of test pad construction.	Obtain documentation confirming that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.	Verify that the test pad plan has been approved by the DRC. Verify that the DRC has been notified as required.
TEST PAD: An approximately 60 feet by 75 feet large test pad will be constructed using the procedure proposed for construction of the radon barrier when using heavy equipment for compaction. An approximately 5 feet by 5 feet small test pad will be constructed using the procedure proposed for construction of the radon barrier when using hand compaction equipment.	Observe the construction of test pads. Measure test pads to ensure that they are constructed to the size indicated. Record the test pad size on the "Embankment Construction Lift Approval Form". The large test pad shall be divided into three lots per lift (approximately 1,500 square feet per lift). Each lift of the small test pad shall equal a lot.	Observe the construction of the test pads. Verify that the test pad has been measured and is properly documented.
A new test pad shall be constructed each time there is a significant change in specifications, construction procedures, types of equipment, unified soil classification, QC testing equipment or procedure. A new test pad must be constructed each time there is a change in the grade or source of bentonite.		
Test pads are to be constructed and tested in accordance with the following specifications:		
1. Place the clay in at least three lifts with the first lift uncompacted thickness not exceeding twelve inches. Remaining lifts shall have a loose material thickness not exceeding nine inches for each lift. The clay material will be inspected for dry clod size during placement of each lift of radon	Measure the lift thickness at a rate of 1 test per lot. Record thickness on the "Embankment Construction Lift Approval Form". Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to	Verify that the number of lifts and lift thicknesses have been documented. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.

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barrier.	ensure any dry clods that are present are less than or equal to one (1) inch. Record inspection of the dry clod size on the "Embankment Construction Lift Approval Form".	
2. The clay is to be placed and compacted by equipment proposed for use during construction of the radon barrier.	Verify with the contractor that the same or similar type equipment and compaction efforts will be used in the cell for construction of the radon barrier. Record type of equipment used, and number of passes on the "Embankment Construction Lift Approval Form".	Verify equipment used and the number of passes made in preparing the test pad are those to be used during the construction of the radon barrier.
3. The lifts of clay shall be bonded by: a) Providing a rough upper surface on the underlying layer of radon barrier. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot; **- OR -** b) By compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness.	Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge. **- OR -** Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.	Verify the frequency of measurements and compliance of test results.
4. The clay is to be compacted to at least 95 percent of a standard Proctor with a moisture content of optimum to 5 percent over optimum. Compaction of the large test pad is to be accomplished by at least four passes of suitable compaction equipment.	Conduct in-place moisture-density tests at a rate of one test per lot per lift. The test location shall be chosen on the basis of random numbers. Record the test result on the "Field Density Test" form. a. Approve lots which meet the specified moisture and compaction. b. Rework and retest lots not meeting the specified moisture or compaction. c. Any additional work under b. shall be included in the test pad construction method	Verify the frequency of tests and compliance of test results.
5. The clay is to be constructed to provide a permeability of less than or equal to the specified permeability as shown on the approved engineering drawings. Permeability testing on the bottom lift will	Conduct in-place permeability tests at a rate of one test per lot per lift. The permeability test shall be run in close proximity to the moisture-density test. Record the test result on the "Field Permeability Test" form.	Verify the frequency of tests and compliance of test results.

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be performed at the surface. Permeability on the second lift will be performed ≥ 2" below the surface. Permeability on the third lift will be performed ≥ 4" below the surface.	a. Approve lots that meet the specified permeability. b. Rework and retest lots not meeting the specified permeability c. Any additional work under b. shall be included in the test pad construction method	
6. At least one PI, LL, and gradation tests shall be conducted for each test pad.	Conduct PI, LL, and gradation tests at a rate of one of each type of test per test pad.	Verify that the PI, LL, and gradation tests have been conducted and documented.
7. The procedures used to construct the test pad shall be reviewed and approved by the certifying engineer. The test must be approved by a Professional Engineer.	Provide the certifying engineer with copies of the documentation for the test pad for review and approval.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during radon barrier construction.
8. The procedures used to construct the test pad shall be reviewed and approved by the DRC prior to using the new test pad construction method.	Obtain documentation confirming the DRC approval of the test pad.	Verify that proper approval has been obtained for the test pad and that the necessary construction procedure documents are in place for use during radon barrier construction.

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
NOTICE OF COVER CONSTRUCTION: The DRC shall be notified of the cessation of waste placement and the start-up of cover construction for each phase of the "cut and cover" operation.	Verify that the DRC has been notified of the anticipated cessation of waste placement and the start-up of cover construction, prior to the placement of radon barrier.	Verify that the DRC has been notified of the anticipated cessation of waste placement and the start-up of cover construction, prior to the placement of radon barrier.
LIFT IDENTIFICATION: Each lift shall be given a discrete designation for testing and surveying purposes.	Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift.	Verify that a lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.
PLACEMENT: The radon barrier will be prepared, placed and compacted using the same type of equipment and mixing and compacting procedures that were approved in the test pad.	Observe the radon barrier placement. Record the equipment used to place the radon barrier, along with any corrective actions (where required) on the "Daily Construction Report".	Verify the equipment used to construct the radon barrier has been documented and that it is the same type of equipment used to construct the test pad.
LIFT BONDING: The lifts of clay shall be bonded by: 1) Providing a rough upper surface on the underlying layer of radon barrier. The surface should have changes in grade of approximately one inch or more at a rate of two per linear foot; - OR - 2) By compacting with a sheepsfoot with feet approximately two inches longer than the lift thickness.	Verify that there are adequate changes in grade by placing a straight edge at least two feet long on the surface. Count the number of points approximately one inch or more below the straight edge. - OR - Verify that the feet on the sheepsfoot compactor are approximately two inches longer than the lift thickness.	Verify the frequency of measurements and compliance of test results.
LIFT THICKNESS: The first lift of material shall have an uncompacted thickness of no greater than 12 inches. For the remaining lifts, the loose lift thickness shall not exceed the lesser of the lift thickness used to construct the test pad or nine inches. Thickness for the lift will be established by installing grade poles on at least a 70-foot grid and at all control points. The	Verify that the required grading tolerance is achieved as follows: a. Ensure that the required frequency for placement of grade poles has been met. b. Compare soil level with the marked level on the grade poles. c. Use a string line where necessary between poles to	Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed. Verify that the clod size inspection has been performed and

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grade poles must not be installed deeper than 1 inch into the underlying clay liner. The grade poles must be marked at the appropriate depth to establish the grade. After the grade for the lift has been checked and approved by QC personnel, the grade poles shall be removed. The clay material will be inspected for dry clod size during placement of each lift of radon barrier.	check for high or low spots. d. Define out of specification areas and advise the contractor to rework those areas. e. Review areas reworked and approve areas meeting criteria. f. Continue "b" through "d" above until all areas meet criteria. g. Indicate areas meeting criteria in the "Embankment Construction Lift Approval Form". **- OR -** Dig a hole and measure the loose lift thickness at a rate of one per lot. A lot is defined as 10,000 square feet of a single lift and record on the "Lift Approval Form". The location of the measurement shall be chosen on the basis of random numbers. a. Approve lots which meet the specified lift thickness. b. If the thickness is greater than the specified thickness, measure the thickness at four points (north, east, south, and west) within ten feet of the first measurement. Average the five measurements together. c. Approve lifts with an average less than or equal to the specified lift thickness. d. Rework and retest lots with an average lift thickness greater than the specified lift thickness. Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods that are present are less than or equal to one (1) inch. Record inspection of the clod size on the "Embankment Construction Lift Approval Form".	documented for each uncompacted lift.
KEYING-IN: Segments of cell radon barrier constructed at times more than 30 days apart than	Verify that the new liner has been properly keyed-in to the existing liner. Record deficiencies on the	Verify that the keying-in of the liner has been documented.

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each other shall be keyed-in to each other at vertical steps no greater than nine inches and at least twice as wide as they are high.	"Embankment Construction Lift Approval Form".	
COMPACTION: Radon barrier material will be compacted to at least 95 percent of standard Proctor with a moisture content between optimum and 5 percent over optimum.	Conduct in-place moisture-density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 200 cubic yards (compacted) of a single lift. The test location shall be chosen on the basis of random numbers. a. Approve lots which meet the specified moisture and compaction. b. Rework and retest lots not meeting the specified moisture or compaction. Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log".	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
PERMEABILITY: The radon barrier shall have an in-place permeability of less than or equal to 1 x 10^{-6} cm/sec for the bottom layer. The radon barrier shall have an in-place permeability of less than or equal to 5 x 10^{8} cm/sec for the final top foot.	Conduct in-place permeability tests at a rate of one test per lot and record the results on the "Field Permeability Test" form. A lot is defined as 2,000 cubic yards (compacted) of 1 x 10^{-6} cm/sec or 200 cubic yards (compacted) of 5 x 10^{-8} cm/sec radon barrier. The permeability test shall be run in close proximity to a moisture-density test location. a. Approve lots that meet the specified permeability. b. Rework and retest lots not meeting the specified permeability. c. Restore all test areas with the approved construction method.	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
LAYER THICKNESS: For the LLRW embankment, the bottom (1 x 10^{6} cm/sec permeability) layer shall		

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be at least 1.0 feet thick. For the 11c.(2) embankment top slopes, the bottom (1 x 10^{-6} cm/sec permeability) layer shall be at least 3.0 feet thick. For the 11c.(2) embankment side slopes, the bottom (1 x 10^{-6} cm/sec permeability) layer shall be at least 2.5 feet thick. For the LLRW and 11e.(2) embankments, the top (5 x 10^{-8} cm/sec permeability) layer shall be at least 1.0 feet thick.		
LINER TRANSITIONS BETWEEN RADON BARRIER WITH DIFFERENT SPECIFIED PERMEABILITIES: The radon barrier with the higher permeability (i.e. the bottom radon barrier) shall be final graded from grade to 0.4 feet below grade design grade. Survey on a 50 ft grid and key points.	Survey the radon barrier surface on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC Officer and Construction QA Officer. a. Indicate where the radon barrier meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.
RADON BARRIER DRYING PREVENTION: To prevent the radon barrier from drying, water will be applied to the clay surface on an as needed basis or the radon barrier will be covered with 6 inches of loose clay. Finished radon barrier shall be covered with 12 inches of filter zone, sacrificial soil layer, or 6 inches of loose clay within 30 days of completion. Unfinished radon barrier shall be covered with 6 inches of loose clay within 30 days of the last activity for the lift. Desiccation cracks larger than one-fourth inch wide and one-inch deep in the radon barrier will be reported to the DRC and will be documented as a non-conformance item when discovered.	Observe the liner surface for drying. Advise contractor of any deficiencies. Record corrective actions taken (where required) on the "Daily Construction Report".	Verify that the liner is being inspected.
SNOW REMOVAL: When radon barrier material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of deficiencies. Construction may not continue without taking corrective actions to remove the snow. Record corrective actions (where required) in the	Verify that snow removal is being documented.

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	"Daily Construction Report".	
COLD WEATHER PLACEMENT OF RADON BARRIER: For purposes of this CQA/QC Manual, "frozen" is defined as a soil temperature of less than or equal to 27°F. Radon barrier shall not be placed above frozen material. In addition, no frozen material shall be processed or placed.	As needed, observe the area where radon barrier is to be placed. If frozen material is observed, cease placement of radon barrier. If frozen material is suspected, measure soil temperature. Record the stopping of placement in the "Daily Construction Report."	Verify that radon barrier is tested during cold weather conditions.
If the air temperature has dropped below 32°F since the last lift of radon barrier was approved, one of the following three scenarios apply: (1) If less than 30 days have passed since the date of lift approval and the last lift of radon barrier has been covered since the approval date with at least 9 inches of loose clay or 6 inches of compacted clay, then the cover clay may be worked with no additional testing of the lower approved lift. (2) If less than 30 days have passed since the date of lift approval and the last lift of radon barrier has not been covered with at least 9 inches of loose clay or 6 inches of compacted clay, then: (a) Perform spring start-up testing as discussed below; or (b) Monitor the radon barrier temperature approximately 1 inch beneath the surface. If the temperature 1 inch beneath the surface is greater than 27°F, re-roll the surface with one pass of the same type of construction equipment (i.e., a compactor for intermediate lifts or a smooth drum roller for the final surface) and continue with radon barrier construction. If the temperature 1 inch beneath the surface is less than or equal to 27°F, re-work and re-test the affected area after the clay temperature has risen above 27°F. (3) If more than 30 days have passed since the date of lift approval, perform spring start-up testing.	Review ambient air temperature records as measured at the site meteorological station. Document status of radon barrier cover placement on the "Daily Construction Report." Monitor radon barrier temperature when triggered under 2.(b). Clay temperature shall be measured between 6:00 am and 8:00 am on the day that radon barrier will be placed. Temperature measurements shall include a location that is most likely to be coldest; i.e., if there is a portion of the radon barrier that is shaded or at a low point. Temperature monitoring frequency shall be at least one point per 100,000 square feet or one point per contiguous project area, whichever is smaller. If the initial radon barrier temperature measurement is less than or equal to 27°F, the affected area may be resampled before 8:30 am the same day as follows: a. Measure the radon barrier temperature at a frequency of one measurement per lot (defined as no more than 10,000 square feet). b. Lots where the temperature is greater than 27°F do not require rework; except that the lot where the initial temperature less than or equal to 27°F was measured shall be reworked regardless of resampling results.	

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In addition, the final lift of 5 X 10^{-8} cm/sec radon barrier requires that the Type B filter zone and sacrificial soil be placed over the radon barrier prior to the end of the work day when ambient temperatures will drop below 32 degrees Fahrenheit. If this protective cover is not applied prior to freezing conditions, an additional density test and permeability test shall be performed directly prior to covering the radon barrier final surface with filter zone and sacrificial soil. This process must be repeated whenever any final surface material is not covered with the filter zone and sacrificial soil prior to overnight freezing conditions.	Perform an additional density test and permeability test on 5 x 10^{8} cm/sec final surface that has been exposed to overnight freezing conditions prior to placement of the Type B filter zone and sacrificial soil material. If passing test results are achieved, but it is not possible to cover all of the exposed radon barrier material with filter zone and sacrificial soil prior to the end of the workday, testing must be repeated for the exposed materials. This testing may be performed outside of the approved lift area so long as the area tested is representative of the clay in the approved lift area (i.e., was constructed at the same time and with the same method).	
SPRING START-UP: See "Cold Weather Placement of Radon Barrier" above for situations that trigger this specification. For spring start-up testing, the surface lift is treated as protective cover, regardless of whether it was an approved lift of radon barrier at one time or not. Excavate 9 inches below the clay surface and re-test for density and permeability. Excavation for testing purposes may consist of removing the protective cover lift; or may be performed by 'potholing' only at the testing locations. Areas that have been 'potholed' for permeability testing shall be repaired by applying the same level of effort as prescribed by the approved test pad for radon barrier construction.	Perform density and permeability testing at the frequencies outlined for radon barrier construction above. This testing may be performed outside of the approved lift area so long as the area tested is representative of the clay in the approved lift area (i.e., was constructed at the same time and with the same method). Moisture testing is not required for spring start-up. a. Approve lots that meet specification. The protective cover lift may be worked in place and tested to become the next lift of radon barrier. b. For lots that do not meet specification, test the surface at successively deeper 9 inch increments until a passing lift is found; remove all failing lifts; re-work all failing areas; and re-test. Document that repairs are completed to the same level of effort as required by the approved test pad for radon barrier construction.	

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CONTAMINATION OF RADON BARRIER: The radon barrier material shall not become contaminated with radioactive soils or debris during construction. The in-place clay may contain up to 5 percent additional rocks and sand above the content found in the classification test.	Visually check radon barrier for contamination by foreign materials. Remove clays which have been contaminated above the specified requirements.	Verify that removal of contaminated material has been properly documented.
FINAL GRADING: Final grading shall be from grade to 0.2 feet above grade. Survey on a 50 ft grid and key points. Upon completion, the surface shall be rolled with a smooth drum roller.	Survey the foundation on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer. a. Indicate where the radon barrier meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.
HEAVY EQUIPMENT ON RADON BARRIER: Heavy equipment travel will be minimized on top of the finished radon barrier. Heavy equipment will not be operated on saturated radon barrier.	Observe the work procedures of the contractor. Advise contractor of problems with equipment on the radon barrier. Record corrective actions taken (where required) on the "Daily Construction Report".	Verify that the contractors work procedures are being inspected.
QUALITY ASSURANCE SAMPLING: Assurance samples for radon barrier materials tests are to be obtained at the following minimum frequency: 1. In-place moisture-density tests (ASTM D6938): 1 per 50,000 cubic yards. 2. Moisture/density relationship testing (ASTM D698): 1 per 50,000 cubic yards. 3. Classification tests (ASTM D2487, D1140, and D4318): 1 per 50,000 cubic yards.	Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log" and moisture-density test on the "Density Testing Log". Promptly report result of QC testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.	Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of QA and QC test results can be made. The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation is not adequate, new *QC* and *QA samples* shall be taken immediately. The construction QA Officer, in consultation with *the QC officer, shall then* evaluate the accuracy of the QC sampling and testing and, if necessary, provide for improved sampling and

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A minimum of one of each of the above tests is required for each year that radon barrier is placed.		testing procedures and closer inspection and control. Record findings of quality assurance sampling in the "Daily QA Report".
DRC APPROVAL: The DRC shall approve documentation associated with completed radon barrier. Documentation shall include all QC and QA records associated with construction, as well as photographs of the completed surface. In addition, 48 hour notification shall be provided to the DRC prior to placement of filter zone material over the finished radon barrier. Energy*Solutions* may proceed with filter zone placement 48 hours after DRC notification if the DRC has not inspected and has not notified the Director of Engineering of its intent to inspect the radon barrier surface.	Notify the Construction QA Officer that the radon barrier is ready for inspection by the DRC. Obtain written authorization on the "Liner Inspection Form" from the Construction QA Officer that the radon barrier has been inspected. Obtain documentation confirming the DRC approval of the radon barrier documentation.	Provide written approval of the radon barrier. Notify DRC that the radon barrier is ready for inspection.

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SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
QUALITY OF ROCK: The rock shall have a "Rock Quality" score of at least 50 based on the following tests: Specific Gravity (ASTM C-128), Absorption (ASTM C-127), Sodium Soundness (ASTM C-88), and L.A. Abrasion (ASTM C-131 or ASTM C-535). The procedures for scoring "Rock Quality" are found in Appendix C.	Perform Na soundness, LA abrasion, absorption, and specific gravity testing at a rate of one set of tests per 10,000 cubic yards of rock. Record the location of all collected samples in the "Sampling Log". a. Approve rock for use in the filter zone which meet the specifications for rock quality. b. Rock not meeting the specifications for rock quality can not be used.	Verify the frequency of laboratory tests and compliance of test results.
TYPE B FILTER ZONE PERMEABILITY: The type B filter zone rock on the Class A and Class A North embankments will have a minimum permeability of 3.5 cm per second. The filter zone rock on the 11e.(2) embankment will have a minimum hydraulic conductivity of 42 cm/sec.	Perform permeability testing at a rate of one test per 10,000 cubic yards placed. Record the location of all samples in the "Sampling Log". a. Approve rock for use in the filter zone which meet the specified gradation. b. Rock not meeting the specified gradation can not be used.	Verify the frequency of laboratory tests and compliance of test results.
GRADATION: LLRW embankment rock gradation shall be as specified on the currently approved engineering drawing series 9821, ~~and~~ 04080, and 07021. 11e.(2) embankment rock gradation shall be as specified on the currently approved engineering drawing series 07021 ~~9420-4~~.	For Type B filter zone rock, if material is to be stockpiled, perform gradation testing at a rate of one test per 2,500 cubic yard stockpile. If Type B filter zone rock material is transferred directly to the cell from the production plant, perform at least one test per source per day material is placed, or at least one test per 2,500 cubic yards. For Type A filter zone rock, perform gradation testing at a rate of one test per 10,000 cubic yards. In addition, perform a minimum of one test per change in soil type by ASTM D 2488. Record the location of all samples in the "Sampling Log". a. Approve rock for use in the filter zone which meet the specified gradation.	Verify the frequency of laboratory tests and compliance of test results.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	b. Rock not meeting the specified gradation can not be used.	
PLACEMENT: Filter zone material will be placed over the radon barrier. The thickness of the filter zone layer for the LLRW embankments shall be as specified on the currently approved engineering drawing series 9821, ~~and~~ 04080, and 07021. The thickness of the filter zone layer for the 11e.(2) embankment shall be as specified on the currently approved engineering drawing series 07021 ~~9420-4, 9420-5, and 9420-6~~. Filter zone material shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.	Observe the placement of the filter zone material. Ensure that soil fines are not concentrated in localized areas. If soil fines are concentrated in localized areas, the contractor shall be directed to evenly distribute the fines or to remove them. Record corrective actions (where required) in the "Daily Construction Report".	Verify that QC personnel observe the placement of the filter zone material such that soil fines are not concentrated in localized areas.
SNOW REMOVAL: When filter zone material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue without taking corrective actions to remove the snow. Record corrective actions (where required) in the "Daily Construction Report".	Verify that snow removal is being documented.
FINAL GRADING: Thickness for the lift will be established by installing grade poles on at least a 50' grid and at all control points. The grade poles shall consist of PVC pipe (approximately ½-inch diameter) with surveyors ribbon (or other distinguishable markings) attached to the appropriate lift thickness. The poles shall be held in place by placing the filter rock adjacent to the base of the grade pole to secure it in a vertical position (long axis of the grade pole perpendicular to the radon barrier surface). With the grade pole marked at the appropriate thickness and secured at the appropriate locations, the filter rock may be placed throughout the project area. The base	Verify that the grade poles are marked at the appropriate depth to establish grade for the layer that will be placed. Observe the installation of some of the grade poles to ensure that the installation method has been followed and verify that the grade poles have not penetrated or damaged the surface of the radon barrier. Verify the required grade is achieved at all control points throughout the placed filter rock in the project area. Rework and re-verify areas not meeting the specified grade. Ensure all grade poles have been removed following verification of grade. Document	Review documentation for final grading.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
of the grade poles shall rest on the surface of the radon barrier and therefore will not damage the radon barrier surface. After the grade has been checked and approved by QC personnel, the grade poles shall be removed from the filter zone placed directly above the radon barrier.	all inspections and corrective actions, where required, on the "Daily Construction Report".	
QUALITY ASSURANCE SAMPLING: Assurance samples for filter zone materials tests are to be obtained at the following minimum frequency: 1. Na soundness tests (ASTM C88): 1 per 100,000 cubic yards. 2. LA abrasion tests (ASTM C131): 1 per 100,000 cubic yards. 3. Absorption tests (ASTM C128): 1 per 100,000 cubic yards. 4. Specific gravity tests ASTM C127): 1 per 100,000 cubic yards. 5. Gradation tests (ASTM C136): 1 per 100,000 cubic yards. A minimum of one of each of the above tests is required for each year that filter zone is placed.	Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log". Promptly report result of QC testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.	Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of QA and QC test results can be made. The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation is not adequate, new QC and QA samples shall be taken immediately. The Construction QA Officer, in consultation with the QC officer, shall then evaluate the accuracy of the QC sampling and testing and, if necessary, provide for improved sampling and testing procedures and closer inspection and control. Record findings of the quality assurance sampling in the "Daily QA Report".

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - SACRIFICIAL SOIL PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, and Class A North embankments. This work element also applies to the Class A portion of the Class A South/11e.(2) embankment.		
PLACEMENT: Sacrificial soil will be placed over the filter zone as specified on currently approved engineering drawing series 9821, ~~and~~ 04080, and 07021. Sacrificial soil shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.	Observe the placement of the sacrificial soil. Ensure that fines are not concentrated in localized areas. If fines are concentrated in localized areas, the contractor shall be directed to evenly distribute the fines or to remove them. Record corrective actions (where required) in the "Daily Construction Report".	Verify that QC personnel observe the placement of the sacrificial soil such that fines are not concentrated in localized areas.
GRADATION: Gradation of the sacrificial soil shall be as specified on the currently approved engineering drawing series 9821, ~~and~~ 04080, and 07021.	If material is to be stockpiled, perform gradation testing at a rate of one test per 2,500 cubic yard stockpile. If material is transferred directly to the cell from the production plant, perform at least one test per source per day material is placed, or at least one test per 2,500 cubic yards. In addition, perform a minimum of one test per change in soil type by ASTM D 2488. Record the location of all samples in the "Sampling Log". a. Approve material for use as sacrificial soil which meet the specified gradation. b. Material not meeting the specified gradation can not be used.	Verify the frequency of laboratory tests and compliance of test results.
SNOW REMOVAL: When sacrificial soil is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue without taking corrective action to remove the snow. Record corrective actions (where required) in the "Daily Construction Report".	Verify that snow removal is being documented as per DRC requirement.
FINAL GRADING: Thicknesses for the lift will be established by installing grade poles on at least a 50' grid and at all control points. The grade poles must be	Verify the required grade is achieved at all control points. Rework and re-verify areas not meeting the specified grade.	Review the documentation for final grading.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
marked at the appropriate depth to establish grade. After the grade has been checked and approved by QC personnel, the grade poles shall be removed.		

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
QUALITY OF ROCK: The rock shall have a "Rock Quality" score of at least 50 based on the following tests: Specific Gravity (ASTM C-128), Absorption (ASTM C-127), Sodium Soundness (ASTM C-88), and L.A. Abrasion (ASTM C-131 or ASTM C-535). The procedures for scoring "Rock Quality" are found in Appendix C.	Record the location of all collected samples in the "Sampling Log". Test rock at a rate of one set of test for every 10,000 cubic yards of rock. a. Approve rock for use in the rock erosion barrier which meet the specifications for rock quality. b. Rock not meeting the specifications for rock quality can not be used.	Verify the frequency of laboratory tests and compliance of test results.
GRADATION: Gradation of the rock for the LLRW embankments shall be as specified on the currently approved engineering drawing series 9821, ~~and~~ 04080, and 07021. Gradation of the rock for the 11e.(2) embankment shall be as specified on the currently approved engineering drawing series 07021 ~~9420-4~~.	Perform gradation testing, in accordance with ASTM D-5519, at a rate of one test per 10,000 cubic yards. Record the location of all samples in the "Sampling Log". a. Approve rock for use in the rock erosion barrier which meet the specified gradation. b. Rock not meeting the specified gradation can not be used.	Verify the frequency of laboratory tests and compliance of test results.
PLACEMENT: Rock erosion material will be placed over the filter zone. Thickness of rock erosion barrier shall be 18 inches inside the centerline of the perimeter ditch and 12 inches outside the centerline of the perimeter ditch. Rock erosion material shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.	Observe the placement of the filter zone material. Ensure that soil fines are not concentrated in localized areas. If soil fines are concentrated in localized areas, the contractor shall be directed to evenly distribute the fines or to remove them. Record corrective actions (where required) in the "Daily Construction Report".	Verify that QC personnel observe the placement of the filter zone material such that soil fines are not concentrated in localized areas.
SNOW REMOVAL: When rock erosion barrier material is to be placed and the work area is covered with snow, the snow must be removed.	Observe that snow is removed. Advise the contractor of any deficiencies. Construction may not continue without taking corrective action to remove the snow. Record corrective actions (where required) in the "Daily Construction Report".	Verify that snow removal is being documented as per DRC requirement.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
FINAL GRADING: Thickness for the lift will be established by installing grade poles on at least a 50' grid and at all control points. The grade poles shall consist of PVC pipe (approximately ½-inch diameter) with surveyor ribbon (or other distinguishable markings). The grade poles must be marked at the appropriate depth to establish grade. After the grade has been checked and approved by QC personnel, the grade poles shall be removed.	Verify the required grade is achieved at all control points. Rework and re-verify areas not meeting the specified grade. Document all inspections and corrective actions, where required, on the "Daily Construction Report".	Review the documentation for final grading.
NOTICE OF COVER CONSTRUCTION: Provide written notice of the completion of cover construction to the DRC within 30 days of completion of each phase of cover construction in the "cut and cover" operation.	Verify the DRC has been notified of completion of cover construction within 30 days of completion of each phase of cover construction.	Verify the DRC has been notified of completion of cover construction within 30 days of completion of each phase of cover construction.
QUALITY ASSURANCE SAMPLING: Assurance samples for rock erosion barrier materials tests are to be obtained at the following minimum frequency: 1. Na soundness tests (ASTM C88): 1 per 100,000 cubic yards. 2. LA abrasion tests (ASTM C131): 1 per 100,000 cubic yards. 3. Absorption tests (ASTM C128): 1 per 100,000 cubic yards. 4. Specific gravity tests ASTM C127): 1 per 100,000 cubic yards. 5. Gradation tests (ASTM C136): 1 per 100,000 cubic yards. A minimum of one of each of the above tests is	Coordinate with QA personnel in obtaining the quality assurance samples. Record the samples on the "Sample Log". Promptly report result of QC testing to Construction QA Officer so that a comparison of QA and QC testing results can be made.	Conduct or coordinate quality assurance sampling and testing in accordance with the designated frequencies. Obtain test results of QC samples so that a comparison of QA and QC test result can be made. The Construction QA Officer, in consultation with the QC officer, shall be responsible for determining the adequacy of correlation and documentation of the rationale used to determine adequacy. If the correlation is not adequate, new QC and QA samples shall be taken immediately. The Construction QA Officer, in consultation with the QC officer, shall then evaluate the accuracy of the QC sampling and testing and, if necessary, provide for improved sampling and testing procedures and closer inspection and control. Record findings of the quality assurance sampling in the "Daily QA Report".

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
required for each year that erosion barrier is placed. Samples should be tested at a different laboratory than the QC samples.		

WORK ELEMENT - DRAINAGE DITCH IMPORTED BORROW

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class _A_ South/11e.(2) embankments.		
CLEARING AND GRUBBING: Remove vegetation, debris, organic, or deleterious material from areas to be used for borrow. Grubbing depth will depend on the type of vegetation, debris, organic, or deleterious material on the site. If the area is free of these materials then no clearing and grubbing will be necessary.	Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the "Daily Construction Report".	Verify that the clearing and grubbing has been inspected by QC.
MATERIAL: The imported borrow shall be classified as CL or ML soils by ASTM D-2487.	Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the road. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log". a. Approve lots (which meet the specified classification) for use in the road. b. Lots not meeting the specified classification can not be used.	Verify the frequency of laboratory tests and compliance of test results.
LIFT THICKNESS: Drainage ditch borrow material shall be placed in lifts with an uncompacted thickness of less than or equal to 9 inches. Thickness for the lift will be established by installing grade poles on at least a 50-foot grid lengthwise and at all control points. The grade poles must not be installed deeper than 1 inch into the underlying clay liner. The grade poles must be marked at the appropriate depth to establish the grade. After the grade has been checked and approved by QC personnel, the grade poles shall be removed.	Verify that the required grading is achieved as follows: a. Ensure that the required frequency for placement of grade poles has been met. b. Compare soil level with the marked level on the grade poles. c. Use a string line where necessary between poles to check for high or low spots. d. Define those areas that are high out of specification and advise the contractor to re-work those areas. e. Review areas re-worked and approve areas meeting criteria.	Observe, at a minimum, five percent of the measurements performed by QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the documentation is being completed.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	f. Continue b through d above until all areas meet criteria. g. Indicate areas meeting criteria in the "Embankment Construction Lift Approval Form".	

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
EXCAVATION: Excavation shall be made to the lines, grades, and dimensions prescribed in the approved plans. Any over excavation shall be backfilled with select materials and compacted to 95 percent of standard Proctor. The uncompacted lift thickness shall not exceed 9 inches.	Provide daily observation of the cell excavation. Record observations and corrective actions (where required) on the "Daily Construction Report". In areas of over excavation, conduct in-place density test at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as a maximum of 10,000 square feet of a lift of a specified type of material. Test locations shall be chosen on the basis of random numbers. a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction. Proctors shall be performed at a rate of one test per 100,000 square feet for each material type. At least one proctor shall be performed for each material type. Record the location of the sample on the "Sampling Log".	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
FINAL GRADING: Smooth roll the excavated surface of prepare for filter zone. Final grading of this surface shall be ± 0.1 of a foot.	Inspect the surface for smoothness. Survey the surface on a 50 ft grid and at key points. Final survey measurements will be documented and provided to the QC officer and Construction QA Officer. a. Indicate where the surface meets design line and grade. b. Rework and resurvey areas not meeting the specified grade.	Review the final survey data. Verify the frequency of the survey points.
FILTER ZONE AND ROCK EROSION BARRIER: The filter zone and rock erosion barrier	See work elements "Filter Zone" and "Rock Erosion Barrier".	See work elements "Filter Zone" and "Rock Erosion Barrier".

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
shall be constructed in accordance with the specifications outlined under work elements "Filter Zone" and "Rock Erosion Barrier".		

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
MATERIAL: The material used to construct the road shall conform to the following specification: Sieve Size — % Passing 1-1/2" — 100 3/4" — 75-95 1/2" — 62-82 # 4 — 38-58 # 16 — 16-36 # 200 — 0-18	Perform laboratory classification tests at a rate of 1 test per lot prior to use of material in the road. A lot is defined as a maximum of 3,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the "Sampling Log". a. Approve lots (which meet the specified classification) for use in the road. b. Lots not meeting the specified classification can not be used.	Verify the frequency of laboratory tests and compliance of test results.
SUBSURFACE PREPARATION: The subsurface will be scarified and re-compacted to at least 95 percent of a standard proctor (ASTM D-698).	Conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 200 cubic yards (compacted) of material. The test location shall be chosen on the basis of random numbers. a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction. Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log".	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.
ROAD THICKNESS: The compacted road shall be 12 inches thick plus or minus 0.2 feet.	Measure the thickness of the road at both edges of the road at no greater than 50 foot intervals. Record the results on the "Lift Approval Form". a. Approve section of the road which meet the specified thickness.	Observe, at a minimum, five percent of the measurements performed by the QC personnel to ensure that the measurements are being performed correctly. Verify that the measurements are being performed at the correct frequency and that the

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	b. Rework and retest sections not meeting the required thickness.	documentation is being completed.
COMPACTION: The road will be compacted to at least 95 percent of standard Proctor (ASTM D-698).	Conduct in-place density tests at a rate of one test per lot and record the results on the "Field Density Test" form. A lot is defined as 200 cubic yards (compacted) of material. The test location shall be chosen on the basis of random numbers. a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction. Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 3,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the "Sampling Log".	Observe, at a minimum, five percent of the tests performed by the QC personnel to ensure that the tests and observations are being performed correctly. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
MATERIALS: All burial embankments and waste storage areas, including immediately adjacent drainage structures, shall be controlled areas, surrounded by six foot high, chain link fence. All permanent fence shall be chain link, six feet high, topped with three strand barbed wire, top tension wire and twisted selvedge.	Obtain a copy of the manufacture's specification for the materials to be used in the construction of the fence. Verify that the materials meet the required specifications. Document materials acceptance on the "Daily Construction Report".	Verify that the materials to be used in the construction of the fence have been approved.
Zinc coated chain link fence shall meet the requirements of ASTM A-392 with Class I coating. Aluminum Coated fence fabric shall meet the requirements of ASTM A-491.		
Fence Fabric: Fence fabric shall be made of 0.148 inch or larger diameter wire. The fabric shall have twisted selvedge.		
Wire and Ties: Tension wires shall be 0.177 inch or larger diameter spiral type. Ring ties for tying fabric to supporting members shall be made of 0.148 inch or larger diameter wire. Wire ties for tying fabric to support members shall be made of 0.12 inch or larger diameter wire. Ties to line posts shall be made of 0.192 inch or larger diameter wire. All wire shall have Class II coating as specified by ASTM A-116.		
Barbed Wire: Barbed wire on zinc coated fence shall meet the requirements of ASTM A-121, including a Class I zinc coating. Barbed wire shall be made of 0.099 inch or larger diameter wire with 0.080 inch or larger diameter wire four point barbs on 5 inch		

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
centers. When aluminum or aluminum coated fence is used, aluminum coated barbed ware shall be used meeting the requirements of ASTM A-0491. The support arm on the fence for the barbed wire shall be capable of supporting a 200 pound vertical load at the end of the arm without permanent deflection. Posts: Line posts may be "H" section or pipe. The minimum strength requirements are as follows: 1. Load at top: 600 lbs. 2. Maximum Moment: 1200 ft-lbs. 3. Maximum permanent set: 0.010 in. "H" posts shall be coated in accordance with the requirements of ASTM A-123. Pipe posts shall conform to the requirements of ASTM A-120 (Schedule 40) for zinc coated pipe. All pipe posts shall be fitted with a weather resistant tip, designed to fit securely over the post, and carry an apron around the outside of the post. Fittings: Fittings shall be malleable cast iron or pressed steel and be coated in accordance to ASTM A-123. Gates: Gate posts and frames shall be constructed of the sizes shown on the approved plans for the various gate dimension. The corners of the gate frame shall be fastened together with pressed steel or malleable iron corner ells riveted or welded in accordance with the plans. Welded steel gate frames shall be galvanized after fabrication in accordance with the provision of ASTM A-123. Chain link fence fabric for covering the gate frames shall be the same as required for the fence. Each gate shall be furnished complete with necessary galvanized hinged, latch, and drop bar		

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
locking device for the type of gate used on the project.		
INSTALLATION: The steel posts shall be set true to line and grade in concrete bases. The distances between posts shall be uniform and not exceeding 10 feet. Fence corners and ends shall be constructed in accordance with Detail A on sheet L9 of the approved engineering drawings. Gates shall be constructed in accordance with Detail B on sheet L9 of the approved engineering drawings.	Verify that the fence is constructed in the location shown on the plans and in accordance with sheet L9. Document any problems in the "Daily Construction Report".	Verify that the fence has been inspected and problems have been properly documented.
A minimum of 6 inches of concrete shall be provided below the bottom of each post. End posts, pull posts, corner posts, and gate posts shall have a concrete base at least 12 inches in diameter. Bases for line posts shall be at least 10 inches in diameter.	Spot check the depth and diameter of the post holes to verify that the holes meet the required specification. Document any problems in the "Daily Construction Report".	Verify that the fence has been inspected and problems have been properly documented.
Pull posts shall be provided at 500 feet maximum intervals. Changes in line of 30 degrees or more shall be considered as corners.	Inspect the fence for proper placement of pull and corner posts. Document any problems in the "Daily Construction Report".	Verify that the fence has been inspected and problems have been properly documented.
The fabric shall be stretched taut, and securely fastened to the posts. Fastening to end, gate, corner, and pull posts shall be with stretcher bars and metal bands, spaced at one foot intervals. The fabric shall be cut and each span fastened independently at all pull and corner posts. Fastening to line posts shall be with tie wire, metal bands, or other approved method at 14 inch intervals. The top edge of fabric shall be attached to the top rail or tension cable at approximately 24 inch intervals. The bottom tension wire is required and shall be attached to the fabric with tie wires at 24 inch intervals and shall be secured to the end or pull posts with brace bands.	Inspect the fencing fabric to verify that it has been installed in accordance with the specifications. Document any problems in the "Daily Construction Report".	Verify that the fence has been inspected and problems have been properly documented.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
SCOPE: This work element applies to the Class A, Class A North, and Class A South/11e.(2) embankments.		
SETTLEMENT MONUMENTS: Settlement monuments constructed before January 1, 2005 consist of #4 or greater rebar that is approximately 3 feet long, secured in place using a sand-cement grout. Grout shall consist of approximately 0.5 cubic foot of low slump fiber reinforced grout per monument. The top of the rebar shall be placed roughly even with the top of the riprap rock. Each monument shall be permanently labeled, flagged, and documented on a reference drawing.		
Settlement monuments constructed after January 1, 2005 shall consist of approximately 4-foot long #5 or greater rebar that is welded to a metal plate. The metal plate shall be approximately 18 inches square with a thickness of 3/16 inch to 1/4 inch. The rebar shall be sized to extend no more than 6 inches above the rock erosion barrier surface. The settlement plate shall be placed on top of the final approved radon barrier (Class A and LARW cells) or on top of the final approved geosynthetics layer (Mixed Waste) and then secured by the rock cover layers as they are built. Each monument shall be permanently labeled, flagged, and documented on a reference drawing.	Inspect settlement monuments for compliance with the specification prior to installation. Observe installation to ensure that the radon barrier or geosynthetic layer is not damaged.	Perform a surveillance of monument installation activities.
SETTLEMENT MONUMENT PLACEMENT: Settlement monuments constructed prior to January 1, 2005 are set at 100- and 200-foot grids, as indicated on Figure 1.		
Settlement monuments constructed after January 1,	Perform and document a post-construction survey of	Verify that surveys have been performed.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
2005 on the LARW, Class A, and Mixed Waste embankments shall be placed at the locations identified on Figures 1, 2, and 3 respectively.	the placed settlement monument.	
SURVEY REQUIREMENTS: Surveys shall be performed with GPS or approved equivalent equipment. Tolerance shall be no more than ± 0.1 feet.	Calibrate and operate survey equipment in accordance with the manufacturer's recommendations	
SURVEY INTERVAL: Settlement monuments constructed before January 1, 2005 shall be surveyed prior to grouting and again afterwards within 30 days of grouting for coordinate verification. Annual surveys of the existing monuments shall continue for a minimum of 5 years from the date of grouting. In cases where monuments are reset, measurements shall continue at the specified frequency continuing from the last reliable measurement. Weather conditions at the time of the survey and a discussion of the potential for frost to be present shall be documented in the survey report.	Perform and document the required surveys. Provide survey data to the Director of Engineering.	Verify that monument surveys are completed as required.
Settlement monuments constructed after January 1, 2005 shall be set and surveyed for initial location within 30 days of the completion of final cover construction. New monuments shall be surveyed again at 2, 4, and 12 months (± 10 calendar days) after the initial survey. Thereafter, monuments shall be surveyed once annually between October 1 and December 31 until a minimum of 5 years after initial placement. Weather conditions at the time of the survey and a discussion of the potential for frost to be present shall be documented in the survey report.	Perform and document the required surveys. Provide survey data to the Director of Engineering.	Verify that new monument surveys are completed as required.
During the annual survey, perform a visual inspection	Document observations made during the inspection,	Perform a surveillance of visual inspection activities.

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
of the completed cover to evaluate potential areas of settlement that may not be captured by the settlement monument network.	and denote areas where differential settlement may be occurring. Provide documentation to the Director of Engineering.	
REPORTING: Settlement monitoring data shall be summarized and evaluated in the annual as-built report for each embankment.	Provide settlement monitoring data to the Director of Engineering.	
Calculate total and differential settlement for each settlement monument against the most recent measurement and against the baseline monument location.		
Total settlement of more than 1.5 feet at any settlement monument or differential settlement of more than 1.0 percent slope between adjacent monuments shall be reported to and evaluated by the Director of Engineering within 30 days of measurement and discussed in the annual as-built report.		
Any failure in the settlement monuments shall be documented. A replacement monument shall be reset as close as possible to the previous location, surveyed, and documented.		

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
AERIAL SURVEY REQUIREMENTS: An aerial survey of the disposal cells and permitted area shall be performed between August 15 and September 15 each year. The aerial survey shall be performed by a registered land surveyor. Survey control points shall be identified in the survey report. Survey tolerance shall not exceed $\pm$ 0.75 ft. **ANNUAL AS-BUILT VOLUMES:** Calculate embankment volumes from the aerial survey data using AutoCAD or approved equivalent equipment. Provide plan view and cross-sections of the as-built embankment based on the aerial survey data. For each embankment, report the embankment design capacity, capacity used to date, and remaining capacity. Compare remaining capacity with the surety reserve capacity for each embankment.	Review the aerial survey report for compliance with this specification.	

TABLE 2

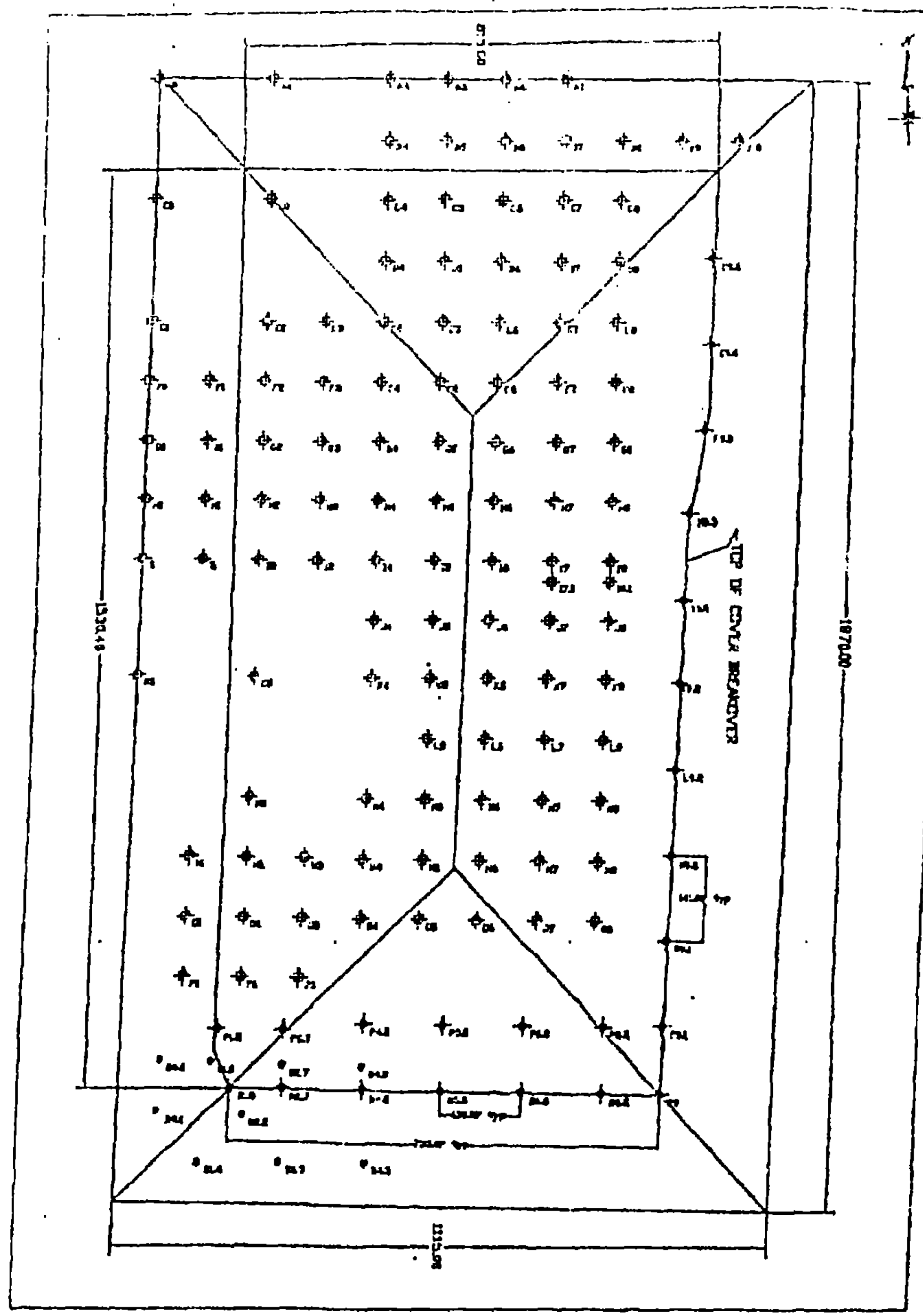
MATERIAL SPECIFICATIONS FOR PORTLAND CEMENT CLSM

PROPERTY	TEST METHOD	MINIMUM	MAXIMUM	FREQUENCY
WET UNIT WEIGHT	ASTM D6023	100 lbs/ft^3	None	1 Test/100 Cubic Yards/Lift
SLUMP	Energy*Solutions* Slump Test (Appendix B)	8 inches	None	1 Test/100 Cubic Yards/Lift
-OR-				
FLOW	Energy*Solutions* Efflux Test (Appendix B)	NA	26 seconds	1 Test/100 Cubic Yards/Lift
-OR-				
FLOW CONSISTENCY	Flow Consistency (ASTM D6103)	8 inches	None	1 Test/100 Cubic Yards/Lift
28 DAY COMPRESSIVE STRENGTH	ASTM D4832	150 psi	None	1 Test/2000 Cubic Yards Placed at 28 days
CEMENT	None	50 lbs for each cubic yard of CLSM	75 lbs for each cubic yard of CLSM	Inspect each load ticket prior to pour
POZZOLAN	None	300 lbs for each cubic yard of CLSM	375 lbs for each cubic yard of CLSM	Inspect each load ticket prior to pour
AGGREGATE SIZE	Gradation Test Certificate from Batch Plant	<u>Percent Passing</u> <u>Sieve</u> 100 3/8" 60 #8	<u>Percent Passing</u> <u>Sieve</u> 30 100	1 Test/Pour day if material is received form exterior batch plant or 1 certification/stockpile if material is received from site batch plant. **Gradation certificate shall be received by QC Technician prior to pouring any CLSM**

TABLE 3

MATERIAL SPECIFICATIONS FOR FLY ASH CLSM

PROPERTY	TEST METHOD	MINIMUM	MAXIMUM	FREQUENCY
WET UNIT WEIGHT	ASTM D6023	100 lbs/ft^3	None	1 Test/100 Cubic Yards/Lift
FLOWABILITY	ASTM D6103	NA	11-inch spread	1 Test/100 Cubic Yards/Lift
28 DAY COMPRESSIVE STRENGTH	ASTM D4832	150 psi	None	1 Test/2000 Cubic Yards Placed at 7 days 1 Test/2000 Cubic Yards Placed at 28 days
TYPE F FLY ASH	None	40.5% of design mix	50.5% of design mix	Inspect each load ticket prior to pour
TYPE C FLY ASH	None	25.1% of design mix	35.1% of design mix	Inspect each load ticket prior to pour
WATER	None	23.0% of design mix	25.4% of design mix	Inspect each load ticket prior to pour
ACTIVATORS	None	0.19% of design mix	0.21% of design mix	Inspect each load ticket prior to pour



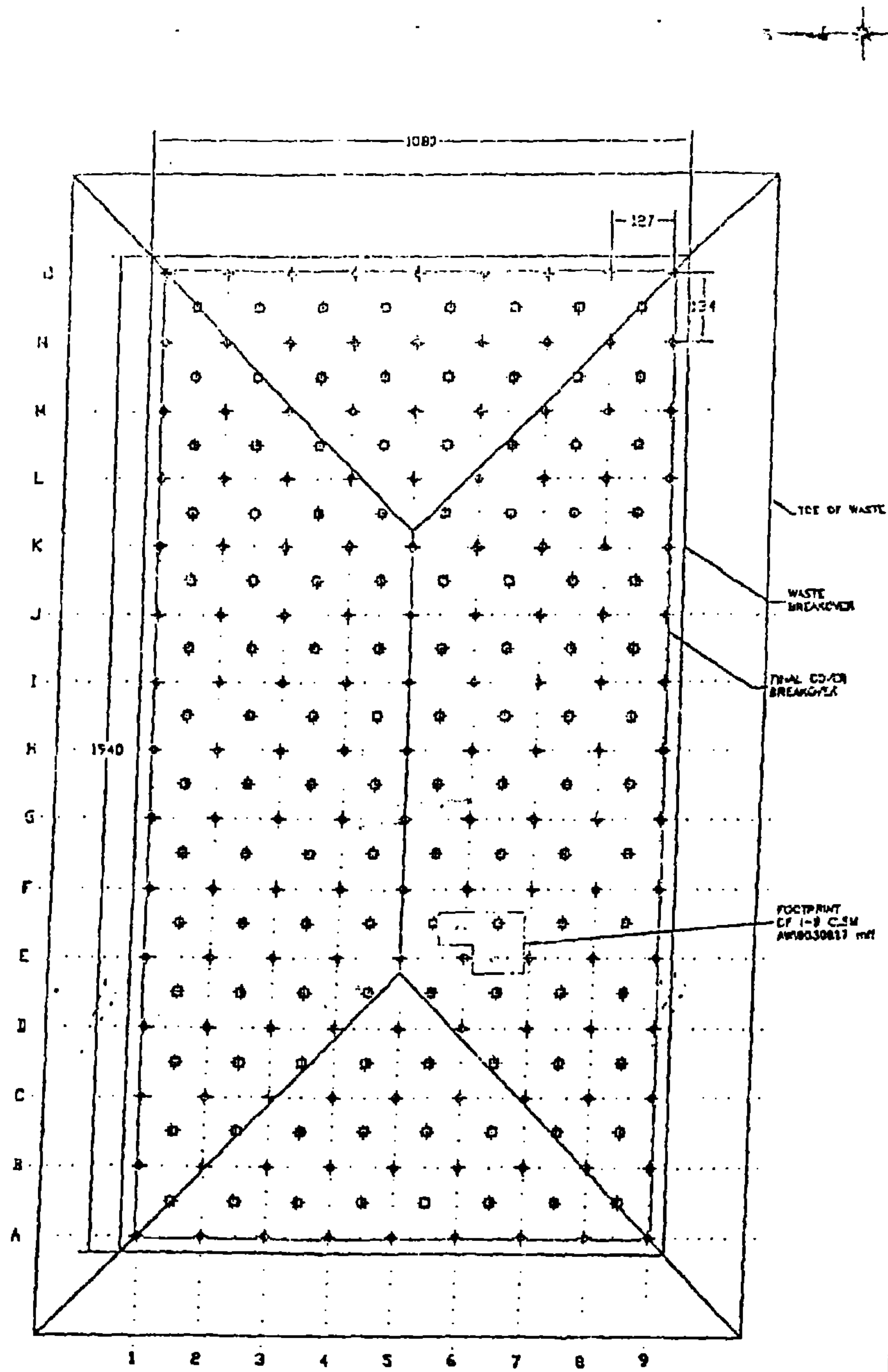
LARW SETTLEMENT MONUMENTS

LEGEND
- ✦ NEW MONUMENTS
- ⊕ EXISTING MONUMENTS
- • SUPPLEMENTAL MONUMENTS ADDED PER LETTER DATED 10/1/04

Figure 1

REVISED May 1, 2006

ENERGYSOLUTIONS



CLASS A SETTLEMENT MONUMENTS

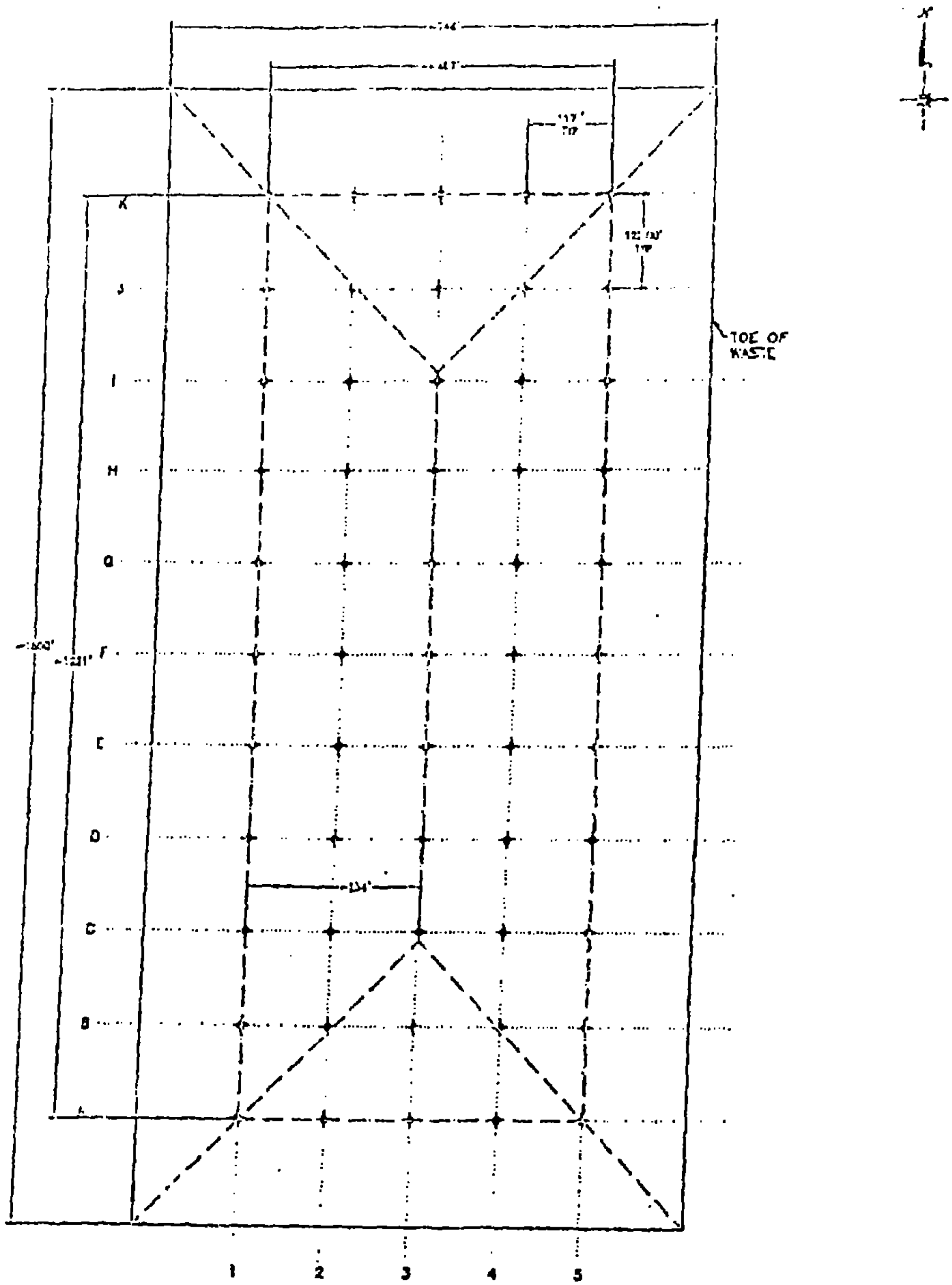
Monuments shall be placed within a 18" radius of design location

LEGEND
- 135 MONUMENTS
- 112 ADDITIONAL FINAL TEMPORARY COVER MONUMENTS

100 0 100 200

FIGURE 2
REVISION 1
JULY 5, 2007

ENERGYSOLUTIONS

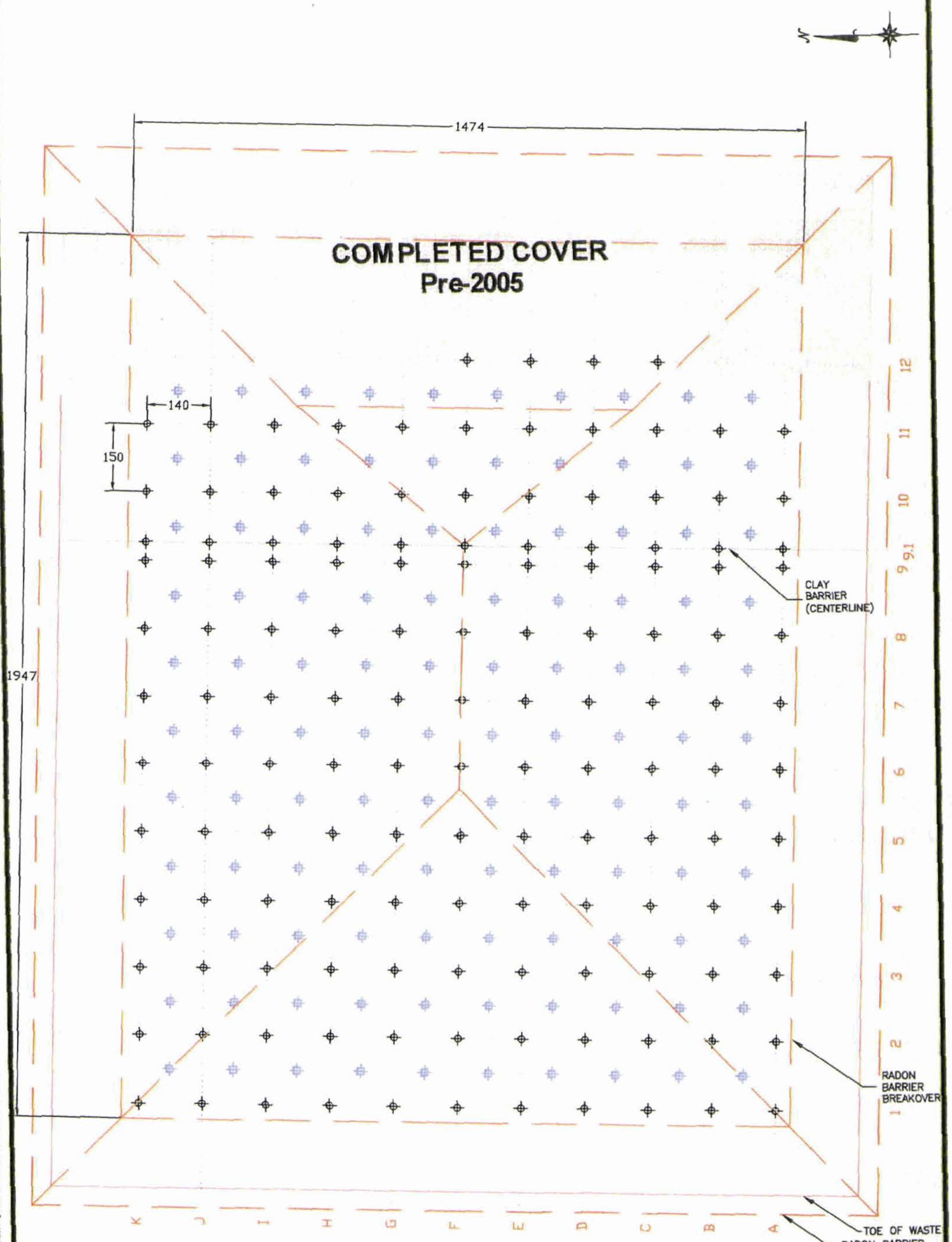


MIXED WASTE SETTLEMENT MONUMENTS

FIGURE 3
Revised May 1, 2005

LEGEND
✦ NEW MONUMENTS

ENERGYSOLUTIONS



CLASS A SOUTH SETTLEMENT MONUMENTS

Formerly 11e.(2) SETTLEMENT MONUMENTS (FIGURE 4)

Monuments shall be placed within a 18" radius of design location

LEGEND

136 MONUMENTS

110 ADDITIONAL FINAL TEMPORARY COVER MONUMENTS

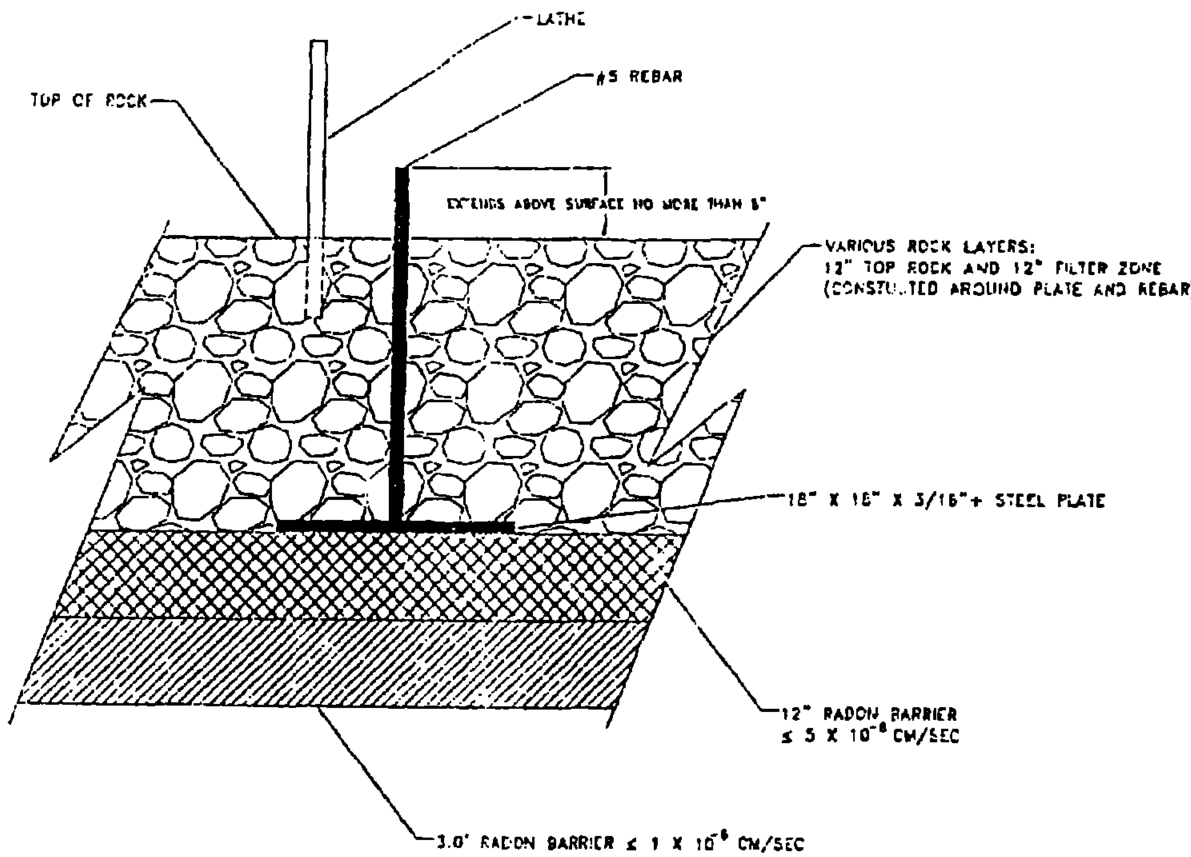
100 0 100 200

FIGURE 4

REVISION 0

December 4, 2007

ENERGYSOLUTIONS



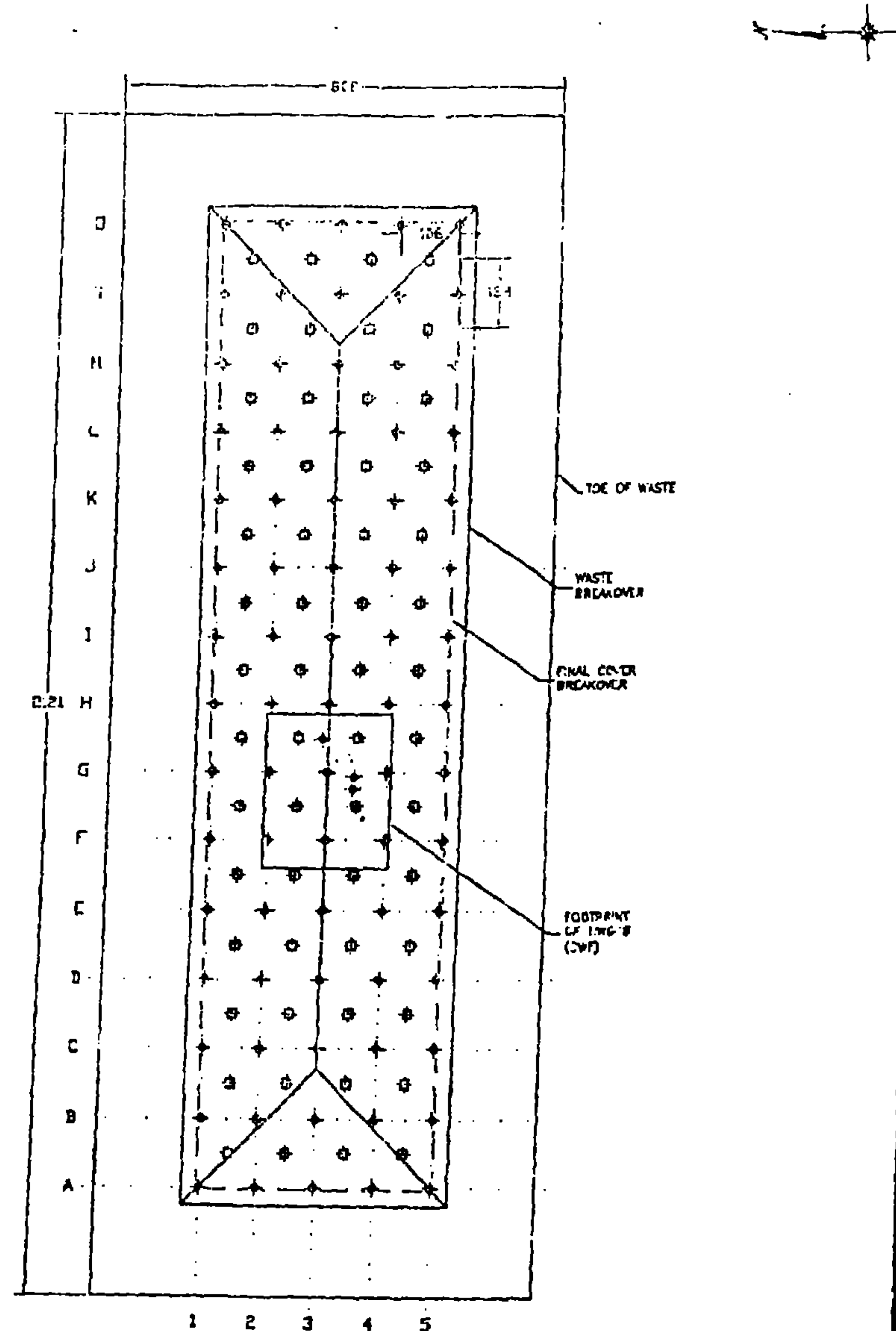
CROSS SECTION OF 11E(2) SETTLEMENT
PLATE MONUMENT INSTALLATION (TYP)

NTS

FIGURE 5

REVISION 0 2/16/07

ENERGYSOLUTIONS



CLASS A NORTH SETTLEMENT MONUMENTS

Monuments shall be placed within a 18" radius of design location

LEGEND
- ✦ 75 MONUMENTS
- ✦ 56 ADDITIONAL FINAL TEMPORARY COVER MONUMENTS
- ✦ 3 ADDITIONAL (CWF) FINAL TEMPORARY COVER MONUMENTS

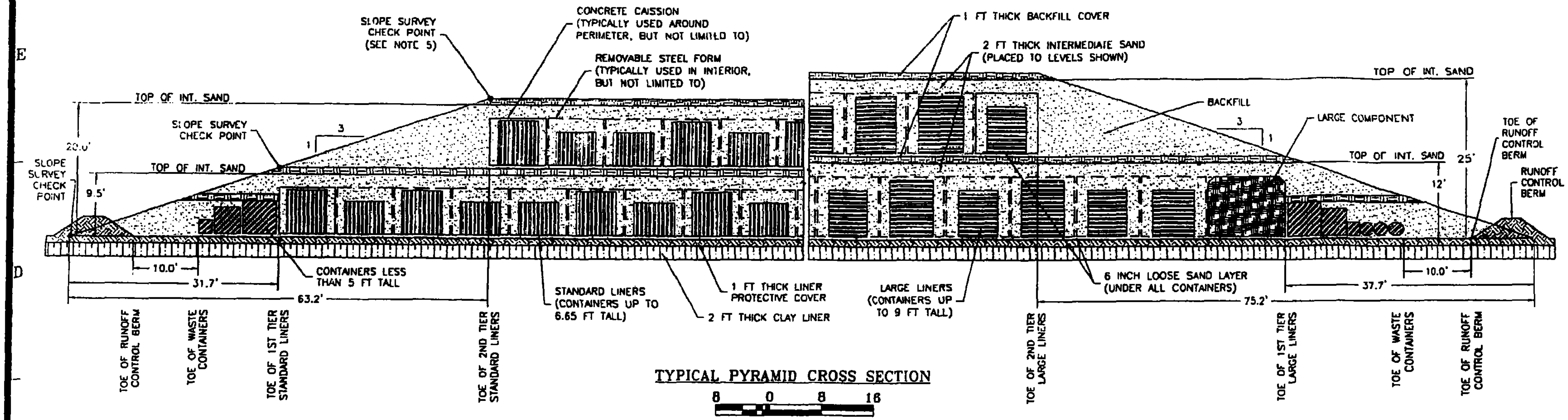
100 0 100 200

FIGURE 6

REVISION 0

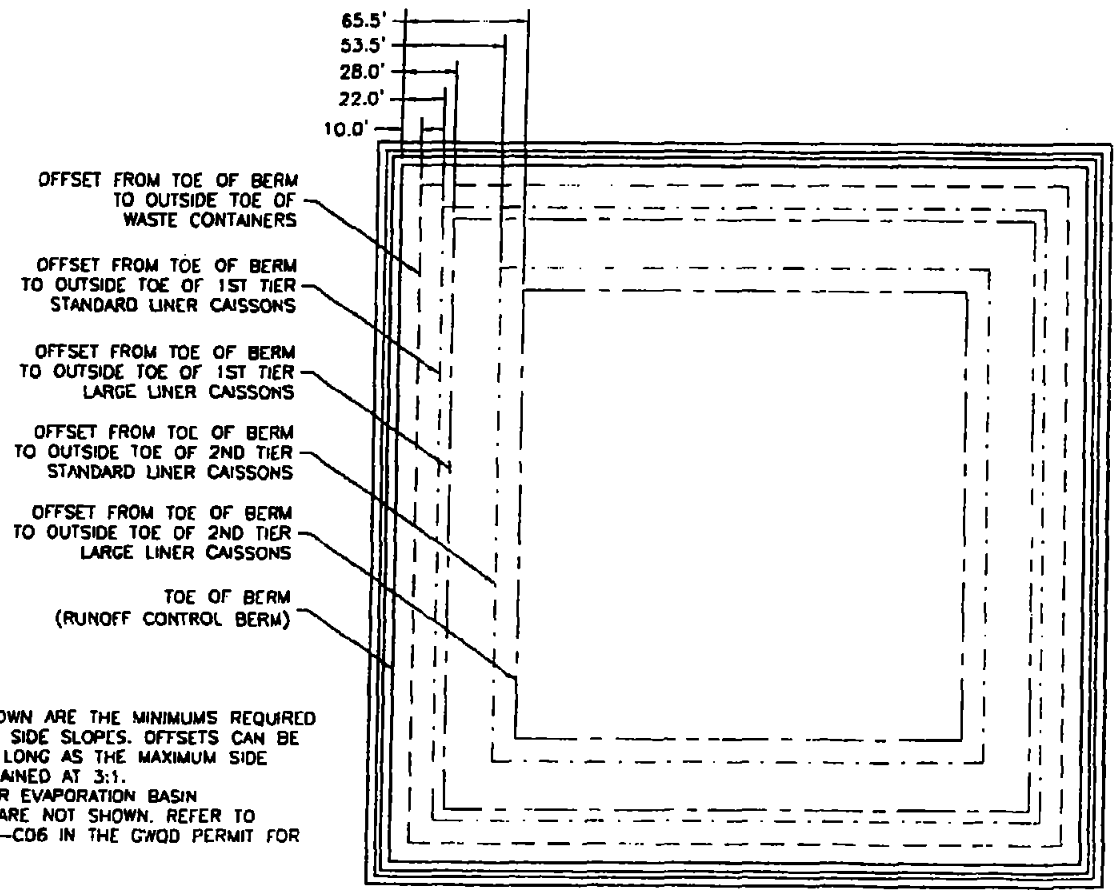
JULY 5, 2007

ENERGYSOLUTIONS



TYPICAL PYRAMID CROSS SECTION

NOTES:
1. DISTANCES AND THICKNESSES SHOWN ARE MINIMUM REQUIREMENTS.
2. LARGE LINERS CAN BE PLACED IN THE SECOND LIFT ABOVE STANDARD LINERS AND VICE-VERSA, AS LONG AS PYRAMID, BACKFILL, INTERMEDIATE SAND AND BACKFILL COVER MINIMUM REQUIREMENTS ARE MET.
3. STAGGER 2ND TIER LINERS OVER 1ST TIER LINERS.
4. REMOVE, IF NEEDED, RUNOFF CONTROL BERM PRIOR TO COMPLETION OF BACKFILL COVER CONSTRUCTION.
5. SIDE SLOPE (3:1) IS VERIFIED BY GPS SURVEY, TYPICALLY AT OR NEAR THE " SLOPE SURVEY CHECK POINTS" SHOWN.
6. REFER TO THE COA/QC PLAN FOR BACKFILL, INTERMEDIATE SAND AND BACKFILL COVER MATERIAL AND PLACEMENT SPECIFICATIONS.



NOTE:
1. OFFSETS SHOWN ARE THE MINIMUMS REQUIRED TO ASSURE 3:1 SIDE SLOPES. OFFSETS CAN BE INCREASED, SO LONG AS THE MAXIMUM SIDE SLOPE IS MAINTAINED AT 3:1.
2. STORM WATER EVAPORATION BASIN REQUIREMENTS ARE NOT SHOWN. REFER TO DRAWING 04080-C06 IN THE GWQD PERMIT FOR REQUIREMENTS.

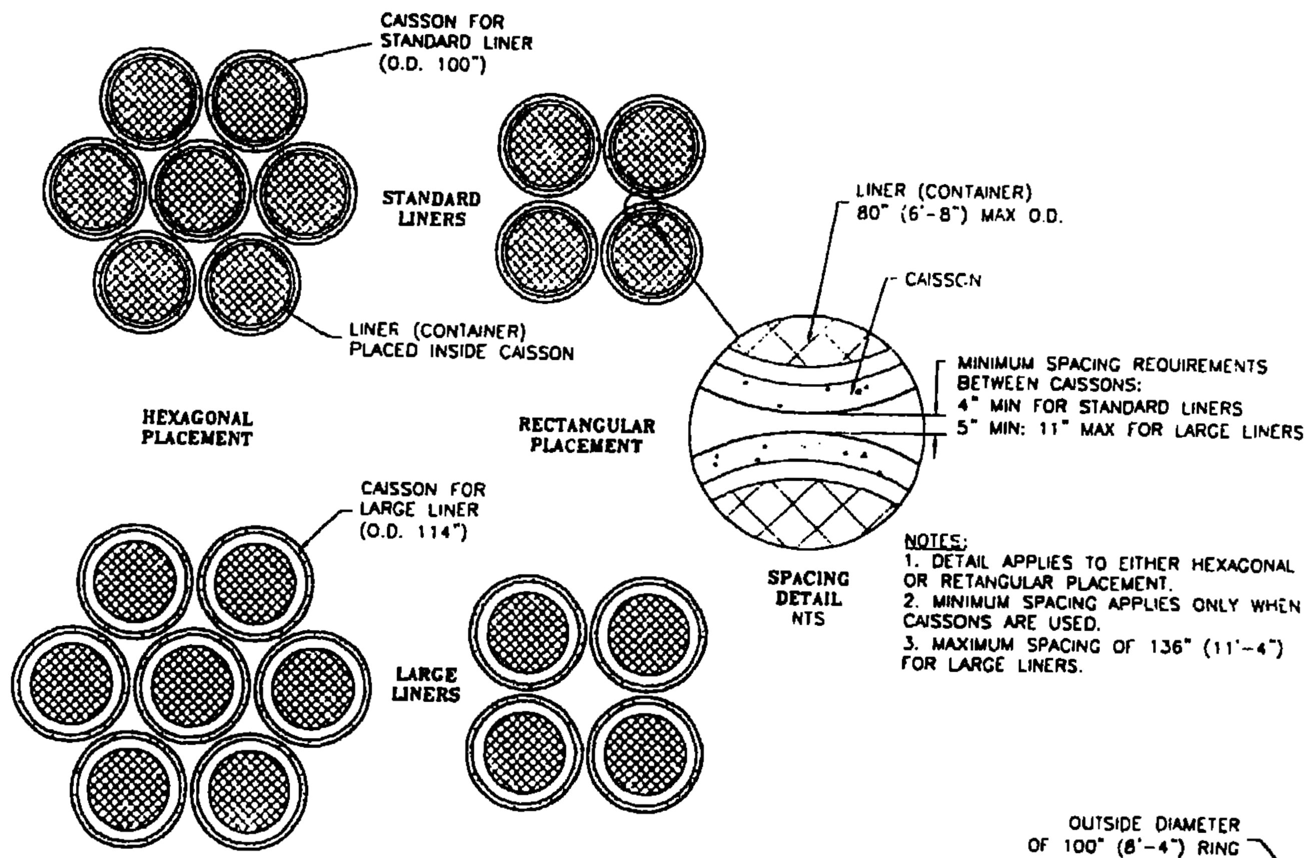
TYPICAL CELL PLAN VIEW
NTS

10/07	DFB	COA/QC PLAN REFERENCE - ADDED NOTES AND REMOVED BACKFILL COVER FROM SIDE SLOPES
10/07	DFB	FOR COA/QC PLAN REFERENCE
DATE	BY	DESCRIPTION OF CHANGE

ENERGYSOLUTIONS
ENERGYSOLUTIONS "CLIVE" FACILITY
CONTAINERIZED WASTE FACILITY (CWF)
CELL CONSTRUCTION REQUIREMENTS, 1 OF 2
CLIVE, UTAH

D.BOOTH
G.DUTSON
D.BOOTH
AS NOTED 10/10/07

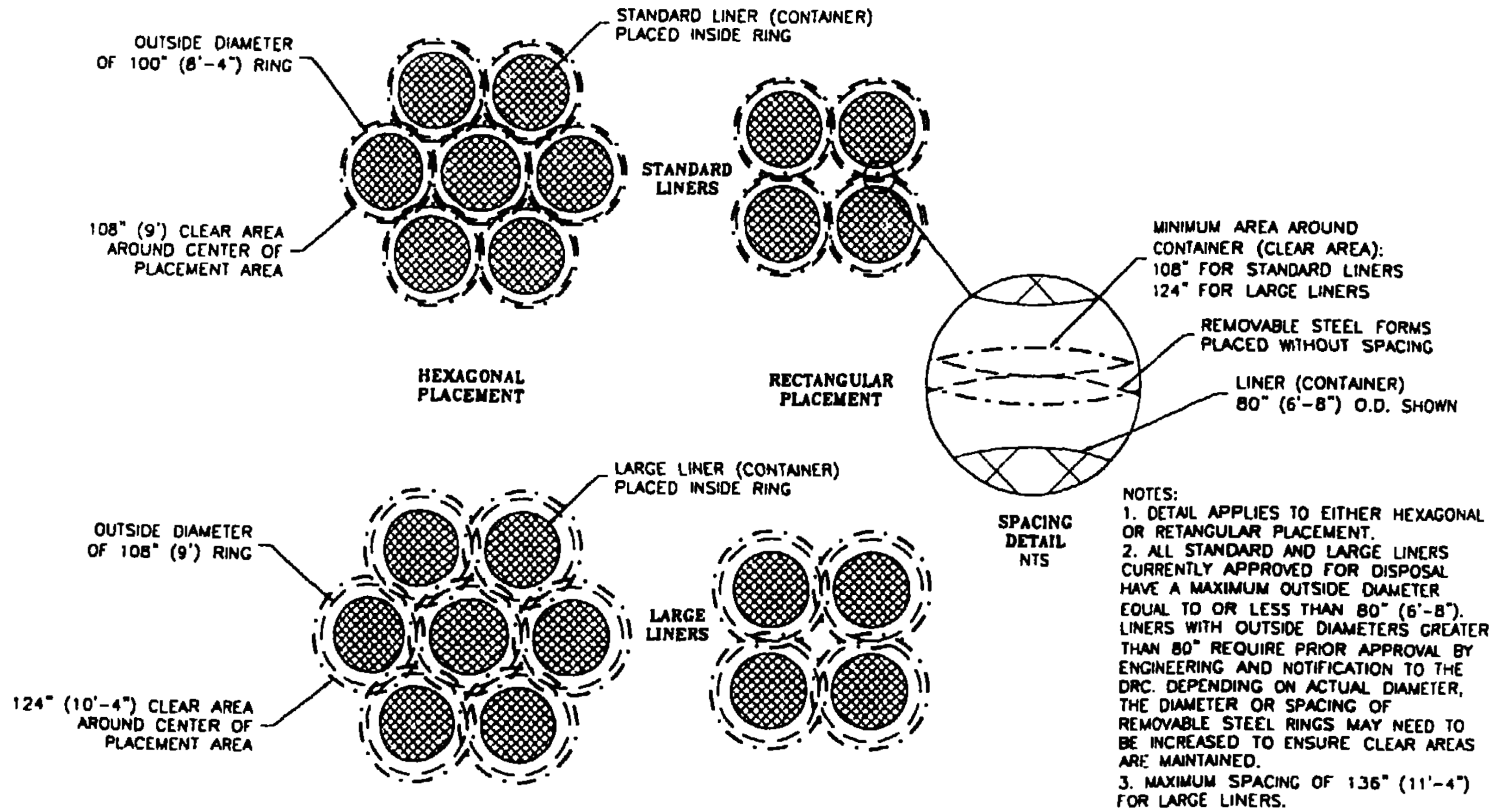
FIGURE 7



NOTES:
1. DETAIL APPLIES TO EITHER HEXAGONAL OR RETANGULAR PLACEMENT.
2. MINIMUM SPACING APPLIES ONLY WHEN CAISSONS ARE USED.
3. MAXIMUM SPACING OF 136" (11'-4") FOR LARGE LINERS.

CAISSON/LINER PLACEMENT REQUIREMENTS

8 0 8 16



NOTES:
1. DETAIL APPLIES TO EITHER HEXAGONAL OR RETANGULAR PLACEMENT.
2. ALL STANDARD AND LARGE LINERS CURRENTLY APPROVED FOR DISPOSAL HAVE A MAXIMUM OUTSIDE DIAMETER EQUAL TO OR LESS THAN 80" (6'-8"). LINERS WITH OUTSIDE DIAMETERS GREATER THAN 80" REQUIRE PRIOR APPROVAL BY ENGINEERING AND NOTIFICATION TO THE DRC. DEPENDING ON ACTUAL DIAMETER, THE DIAMETER OR SPACING OF REMOVABLE STEEL RINGS MAY NEED TO BE INCREASED TO ENSURE CLEAR AREAS ARE MAINTAINED.
3. MAXIMUM SPACING OF 136" (11'-4") FOR LARGE LINERS.

REMOVABLE STEEL FORM/LINER PLACEMENT REQUIREMENTS

8 0 8 16

ENERGYSOLUTIONS

D.BOOTH
G.DUTSON
D.BOOTH
AS NOTED 10/10

FIGURE

DIVIDER PAGE

APPENDIX A

CQA/QC DOCUMENTATION FORMS

EC-1901	Daily Quality Assurance Report
EC-1902	Daily Construction Report
EC-1903	Sampling Log
EC-1904	Lift Approval Form
EC-1905	Field Density Test
EC-1906	Field Permeability Test
EC-1907	Aggregate Gradation Form
EC-1908	Soil Classification Form
EC-1909	Standard Proctor Form
EC-98181	CLSM Inspection Form
EC-1923	CLSM Testing Form
EC-1911	Breach of Berm Form
EC-1912	Liner/Radon Barrier Inspection Form
EC-98252	Embankment Construction Lift Approval Form
EC-98225	CWF Lift Approval Form
EC-98039	Disposal Lift Survey Data Form

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EC-190
rev 3

DAILY QUALITY ASSURANCE REPORT

PROJECT: MW ____________ 11e(2) ____________ LLRW ____________ OTHER ____________

DATE: ____________

QUALITY ASSURANCE ACTIVITIES: ____________

PROBLEMS NOTED: ____________

PROBLEM RESOLUTIONS: ____________

QA OFFICER APPROVAL

DATE

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Re

DAILY CONSTRUCTION REPORT

PROJECT: CAN ____ MW ____ He (2) ____ CLASS A ____ OTHER ____

DATE: ____ ____

WEATHER: Fair ____ Cloudy: ____ Warm: ____ Rain: ____ Snow: ____ Wind: ____ Other: ____

CONSTRUCTION OPERATIONS: Waste Placement ____ Cell Excavation ____ Clay Liner ____
Radon Barrier ____ Rock Placement ____ Other ____

PERSONNEL ON SITE: Operations ____ Others ____

EQUIPMENT USED:

Rock trucks ____ Track hoes ____ Loaders ____ Dozers ____
Locomotives ____ Forklifts ____ Graders ____ Backhoes ____
Sheepsfoot ____ Scrapers ____ Tillers ____ Rollers ____
CAT 815 ____ Water trucks ____ CAT 826 ____ Other ____

DAILY PROGRESS MEETING: Yes ____ No ____

LIFTS TESTED: ____

LIFTS APPROVED: ____

EXPLANATIONS:

FIELD ENGINEER/INSPECTOR ____

QC OFFICER APPROVAL ____ DATE ____ QA OFFICER APPROVAL ____ DATE ____

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SAMPLING LOG

PROJECT: ____CAN ____MW ____11e.(2) ____CLASS A OTHER________________
DATE:________________

INDICATE LOCATION AND NUMBER OF SAMPLE ON MAP

SAMPLE NUMBER:________________ MATERIAL TYPE: SOIL________ ROCK ________
LOCATION:____

TEST(S) TO BE PERFORMED: SAMPLED BY:________________
PROCTOR:________ CLASSIFICATION:________ LABORATORY PERMEABILITY:________
NA SOUNDNESS:________ LA ABRASION:________ ABSORPTION:________
SPECIFIC GRAVITY:________ GRADATION:________
COMMENTS:____

SAMPLE NUMBER:________________ MATERIAL TYPE: SOIL________ ROCK ________
LOCATION:____

TEST(S) TO BE PERFORMED: SAMPLED BY:________________
PROCTOR:________ CLASSIFICATION:________ LABORATORY PERMEABILITY:________
NA SOUNDNESS:________ LA ABRASION:________ ABSORPTION:________
SPECIFIC GRAVITY:________ GRADATION:________
COMMENTS:____

SAMPLE NUMBER:________________ MATERIAL TYPE: SOIL________ ROCK ________
LOCATION:____

TEST(S) TO BE PERFORMED: SAMPLED BY:________________
PROCTOR:________ CLASSIFICATION:________ LABORATORY PERMEABILITY:________
NA SOUNDNESS:________ LA ABRASION:________ ABSORPTION:________
SPECIFIC GRAVITY:________ GRADATION:________
COMMENTS:____

________________ ________ ________________ ________
QC OFFICER APPROVAL DATE QA OFFICER APPROVAL DATE

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LIFT APPROVAL FORM

PROJECT: ______ CAN ______ MW ______ 11e.(2) ______ CLASS A OTHER ______

NW CORNER DATE: ______

	P 1 ______ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P 2 ______ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P 3 ______ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P 4 ______ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P 5 ______ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: ______ NW CORNER ______ INTERFACE RANDOM #: ______

WASTE GENERATOR ID NUMBER(S): ______

THICKNESS: UNC: ______ COM: ______ ELEV: ______ Debris Insp. By: ______ Date: ______ Time: ______

DEBRIS CALCULATIONS:

KEYING IN NOTES: N E S W ______ DENSITY TESTS ID # (S): ______

COMMENTS:

LIFT APPROVED BY: ______ DATE: ______ TIME: ______

QC OFFICER APPROVAL ______ DATE ______ QA OFFICER APPROVAL ______ DATE ______

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RANDOM NUMBER CONTINUATION SHEET

Date: ______________

Lift ID: ______________________ NW Corner ________

P6 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P14 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P22 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____
P7 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P15 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P23 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____
P8 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P16 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P24 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____
P9 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P17 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P25 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____
P10 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P18 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P26 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____
P11 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P19 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P27 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____
P12 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P20 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P27 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____
P13 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P21 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____	P29 ______ EW: ____ X ____ = ____ NS: ____ X ____ = ____

COMMENTS:

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FIELD DENSITY TEST

PROJECT: ____ CAN ____ MW ____ 11e.(2) ____ CLASS A OTHER __________

LIFT IDENTIFICATION: __________ DATE: __________

TEST ID NUMBER(S): __________

TEST LOCATION: __________ TEST METHOD: ____ D1556 ____ D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model ________ Gauge Serial # ________

Last Calibration Date: ________

Daily Standard Counts:

Density ________ Moisture ________

____ *Method A (Direct Transmission)* or ____ *Method B (Backscatter)*

Depth Setting ____ *(inches)* Count Time ____ *(minutes)*

Moisture Count ________ Density Count ________

Wet Density (ρ_m) ______ *(lbs/ft^3)* Dry Density ______ *(lbs/ft^3)*

Moisture Density ______ *(lbs/ft^3)* Moisture Fraction ______ *(%)*

MOISTURE DETERMINATION

____ ASTM D2216 @ 110° C or ____ ASTM D4643

Container ID __________

Mass of container & wet specimen (M_{cws})		g
Mass of container & dry specimen (M_{cds})		g
Mass of water (M_w) $M_w = M_{cws} - M_{cds}$		g
Mass of container (M_c)		g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$		g
Moisture content (w) $w = (M_w / M_s) \times 100$		%

Dry Density ($\rho_d = (100 \times \rho_m)/(100 + w)$)

ρd = (100 x ____)/ (100 + ____ = ________ lbs/ft^3

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

Percent Compaction = ρ_d / $\gamma_d max$ x 100

____ / ____ x 100 = ________ %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus ____ Calibrated Vol. *(lbs/ft^3)* ____

Bulk Density of sand (ρ_1) ______ g/cm^3 ______ lbs/ft

Mass of Sand to Fill Cone & Plate (M_2) ______ g

Mass of bottle & cone before filling cone, plate & hole		g
Mass of bottle & cone after filling cone, plate & hole		g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container		g
Mass of container		g
Mass of wet soil (M_3)		g

Test Hole Volume
$V = (M_1 - M_2) / \rho_1$ ______ cm^3

Dry Mass of soil
$M_4 = 100\, M_3 / (w + 100)$ ______ g

Wet Denisty
$\rho_m = (M_3 / V) \times 62.43$ ______ lbs/ft^3

Dry Denisty
$\rho_d = M_4 / V$ ______ g/cm^3

Dry Unit Weight
$\gamma_d = \rho_d \times 62.43$ ______ lbs/ft^3

Soil Description: __________

Proctor ID: __________

____ ASTM D698 or ____ ASTM D1557

Maximum Dry Density ($\gamma_d max$) ________ (lbs/ft^3)

Optimum Moisture (w_{opt}) ________ (%)

Required Moisture: ______ % to ______ %

Required Percent Compaction: ________ (%)

Comments:

TEST RESULTS:

____ Pass Date: ______

____ Failed Moisture

____ Failed Compaction Time: ______

By: __________ / __________
(print) (signature)

QC OFFICER APPROVAL ________ DATE ________ QA OFFICER APPROVAL ________ DATE ________

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FIELD PERMEABILITY TEST

PROJECT: ______ CAN ______ MW ______ 11e.(2) ______ CLASS A ______ OTHER ______

Test Location: ______________________ Elevation/Lift ______________ Lot No. ______

TESTING DATA: TESTED BY: ______________________

Soil Saturation Start: Date: ________ Time: ________ Max. Dry Density ________ pc

Soil Saturation Finish: Date: ________ Time: ________ Opt. Moisture ________ %

Depth of Wet Front Measurements: 1) ______ 2) ______ 3) ______ Density test # ______________

Average Depth of Wet Front (L) ____________ cm Dry Density ______________ pcf

Radius of Measuring Tube (Rt) ____________ cm Moisture content ______________ %

Radius of Permeameter Ring (Rr) ____________ cm Compaction ______________ %

Height of Water, (Ht) ____________ cm

Soil/Water temp, in ring, after test ____________ °C (N/R for 11e(2))

$$\frac{dH}{dT} = \frac{\text{Change in Head (cm)}}{\text{Time (minutes)}} = \underline{\qquad\qquad} \frac{\text{cm}}{\text{min}}$$

(dH/dT) = ________
Based on linear regression

R = ____________ (From Figure 1) *(R = 1.000 for 11e(2))

$$K_s = \left[\frac{(2)\quad(dH/dT)\quad(L)}{(60)\,((Ht)+(0.5)(L))}\right]\left[\frac{(Rt)2}{(Rr)2}\right] \times (R)$$

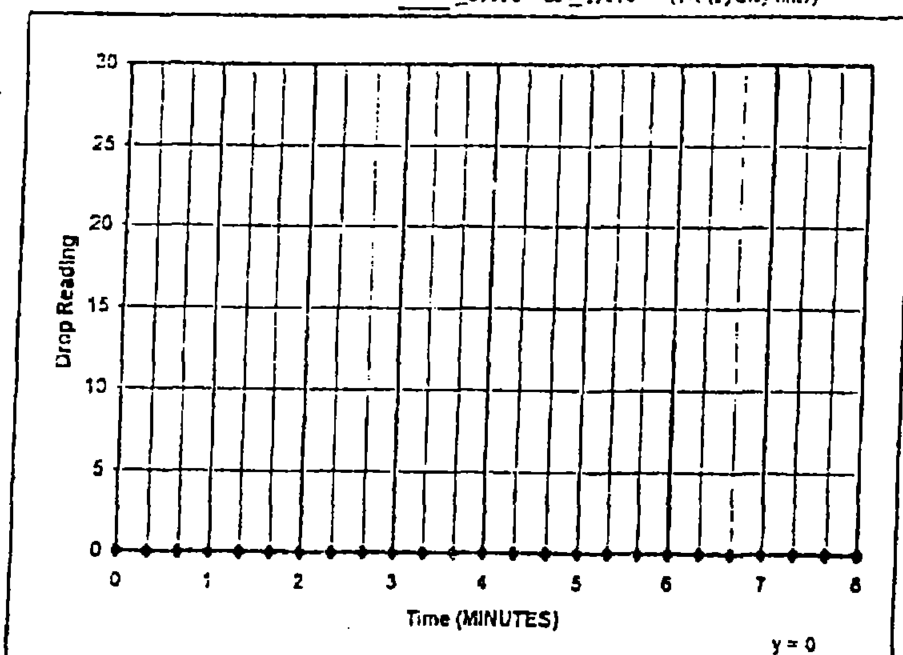
$$K_s = \left[\frac{(2)(\qquad\qquad)\,(\qquad)}{(60)((\qquad\qquad)+(0.5)(\qquad))}\right]\left[\frac{(\qquad\qquad)^2}{(\qquad\qquad)^2}\right] \times$$

K_s = ______________ cm/sec **Required Permeability:** ____ $\leq 1X10^{-6}$ ____ $\leq 5X10^{-8}$ ____ $\leq 1X10^{-7}$

____ $\leq 5X10^{-7}$ & $\geq 1X10^{-7}$ (11e (2) Clay Liner)

Timed Water Drop Reading

min.		min.	
0:00	____	4:20	____
0:20	____	4:40	____
0:40	____	5:00	____
1:00	____	5:20	____
1:20	____	5:40	____
1:40	____	6:00	____
2:00	____	6:20	____
2:20	____	6:40	____
2:40	____	7:00	____
3:00	____	7:20	____
3:20	____	7:40	____
3:40	____	8:00	____
4:00	____		



Required Permeability:

____

Actual Permeability:

____

Soil/Water Temp (°C)	C[illegible] Fa[illegible]
0	1.[illegible]
1	1.7
2	1.6
3	1.6
4	1.5
5	1.5
6	1.4
7	1.4
8	1.3
9	1.3
10	1.30
11	1.2
12	1.2
13	1.1
14	1.16
15	1.13
16	1.10
17	1.07
18	1.05
19	1.02
20	1.00
21	0.97
22	0.95
23	0.931
24	0.910
25	0.889
26	0.869
27	0.850
28	0.832
29	0.814
30	0.797
31	0.780
32	0.764
33	0.749
34	0.733
35	0.719
36	0.705
37	0.692
38	0.678
39	0.665
40	0.653

Figure 1

Test Results: **Pass** **Fail** **By** ______________________ **Date** __________

______________________ QC OFFICER APPROVAL ______________ DATE ______________________ QA APPROVAL ______________ DATE

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AGGREGATE GRADATION FORM

PROJECT: _____ CAN _____ MW _____ 11e.(2) _____ CLASS A OTHER ____________

SAMPLE NAME: ______________________ DATE: __________

GRADATION AS RECEIVED			
SCREEN SIZE	WEIGHT DRY	PERCENT RETAINED	PERCENT PASSING
16"			
12"			
10"			
8"			
6"			
4 1/2"			
4"			
3"			
2"			
1 1/2"			
1"			
3 / 4"			
1 / 2"			
3 / 8"			
#4			
-#4			
TOTAL DRY MASS			
#8			
#10			
#16			
#30			
#40			
#50			
#100			
#200			
-#200			
TOTAL MASS			

QUALITY OF ROCK DETERMINATION		
TEST	VALUE	WEIGHTED SCORE
SPECIFIC GRAVITY (SSD)		
ABSORPTION		
SODIUM SOUNDNESS		
L.A. ABRASION		

GRADATION TEST RESULTS	
PERCENT GRAVEL	
PERCENT SAND	
PERCENT FINE SAND	
PERCENT SILT & CLAY	
D_{100} =	D_{50} =
D_{85} =	D_{70} =
D_{50} =	D_{15} =
D_{10} =	D_{5} =

QUALITY SCORE =

ROCK PERMEABILITY =

NOTES:

TEST RESULTS: PASS FAIL By: ______________________ Date ________

______________ QC OFFICER APPROVAL ______ DATE ______________ QA OFFICER APPPOVAL ______ DATE

ENERGYSOLUTIONS

SOIL CLASSIFICATION FORM

PROJECT: _____ CAN _____ MW _____ 11e.(2) _____ CLASS A Other __________

SAMPLE NAME: ______________________ DATE: __________

GRADATION AS RECEIVED				AS TESTED MOISTURE DETERMINATION		
SCREEN SIZE	WEIGHT DRY (g)	PERCENT RETAINED	PERCENT PASSING		-#4	-#4
3"				CONTAINER & WT. AGGREGATE (g)		
1-1/2"				CONTAINER & DRY AGGREGATE		
1"				CONTAINER MASS (g)		
3/4"				PERCENT MOISTURE		
3/8"				GRADATION TEST		
#4				PERCENT GRAVEL		
-#4			X	PERCENT SAND		
TOTAL DRY MASS			X	PERCENT FINE SAND		
#8				PERCENT SILT & CLAY		
#16				ATTERBERG LIMITS		
#30				LIQUID LIMIT		
#40				PLASTIC LIMIT		
#100				PLASTIC INDEX		
#200				CLASSIFICATION		
-#200			X	Notes:		
TOTAL MASS			X			

TEST RESULTS: PASS FAIL By: ______________________ Date __________

__________ QC OFFICER APPROVAL __________ DATE __________ QA OFFICER APPROVAL __________ DATE

STANDARD PROCTOR FORM

(Calculations)

PROJECT: ___ CAN ___ MW ___ 11E.(2) ___ CLASS A OTHER ______

SAMPLE NAME: ______ DATE: ______

ASTM D-698 METHOD: A B C Estimated Specific Gravity = ____ (G

Type of Rammer: ______ Preparation Method: ____ As Received Water Content ____ %

Test Number	1	2	3	4	5	6	7
Water Added							
Cylinder & Soil Wt.							
Cylinder Wt.							
Wet Soil Wt.							
Wet Density (lbs/ft^3)							

ASTM D2216 *(110° C ± 5° C)*

Container Number							
Container & Wet Soil Weight (g)							
Container & Dry Soil Weight (g)							
Water Weight (g)							
Container & Dry Soil Weight (g)							
Container Weight (g)							
Dry Soil Weight							
Moisture Content (% of Dry Weight)							
Dry Density (lbs/ft^3)							

$$\text{Wet Density} = \frac{\text{Wet Soil Weight}}{\text{Volume of the mold}} \qquad \text{Dry Density} = \frac{\text{Wet Density} \times 100}{100 + \%\ \text{moisture}}$$

TESTED BY: ______ DATE: ______

QC OFFICER APPROVAL ______ DATE ______ QA OFFICER APPROVAL ______ DATE ______

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STANDARD PROCTOR FORM

(Graph)

PROJECT: ____ CAN ____ MW ____ 11E.(2) ____ CLASS A OTHER ____________

SAMPLE NAME: ______________________________ DATE: ____________

ASTM D-698 METHOD: A B C P_C = ____ % P_F = ____ %

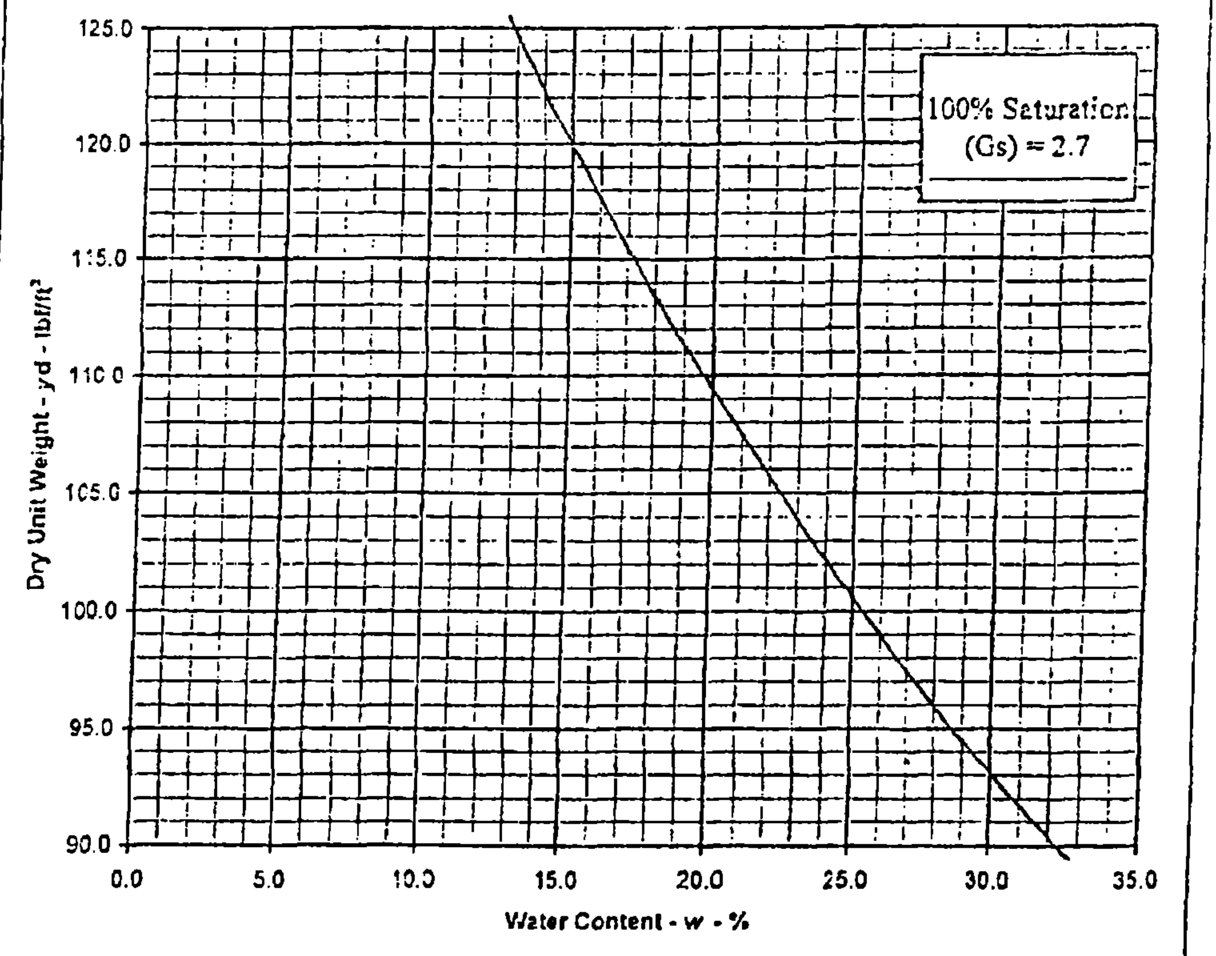
STANDARD MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): ________ lbf/ft^3

STANDARD OPTIMUM WATER CONTENT (Std-w_{opt}): ________ %

OVERSIZED CORRECTION

CORR. MAX. DRY UNIT WEIGHT (Std-$\gamma_{d,max}$): ________ lbf/ft^3

CORR. OPTIMUM WATER CONTENT (Std-w_{opt}): ________ %



TESTED BY: ______________________________ DATE: ____________

QC OFFICER APPROVAL ____ DATE ____ QA OFFICER APPROVAL ____ DATE ____

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CLSM INSPECTION FORM

PROJECT:____CAN ____MW ____11e.(2) ____CLASS A OTHER (specify) ____________

Lift Identification________________________________ Date:______________

TYPES OF DEBRIS TO BE POURED (circle):

Uncontainerized Debris   Debris-Filled Containers (excluding drums)   Debris-Filled Drums

Resin-Filled Containers   Soil-Filled or Fines-Filled Containers   Other specify)________________

GENERAL:

___________ The height of the pour is ≤ the height of one layer of boxes plus six inches (6").

___________ Compressible debris has been secured (i.e., using incompressible debris) to prevent floating.

___________ Engineering review has been performed for objects greater than 100,000 lbs (attached).

___________ Are there any special design mix specifications for this pour? (If yes, see attached Engineering Review)

___________ A gradation has been performed for the CLSM sand stockpile (at least monthly).

INSPECT FOR VOIDS/ACCESSIBILITY:

___________ Any wrapping/plastic has been removed from all openings to allow the CLSM to flow into all void spaces.

___________ Debris has been placed in a manner to allow flow throughout pour area and prevent nesting, voids, or only partial fill of internal voids of individual debris.

___________ Any pieces of debris with internal voids that cannot be filled readily with CLSM have been inspected and approved by the Site Engineer, if any.

___________ Pour area is free from collapsed soil around the perimeter of the formed pour.

___________ Base of pour is sufficiently compacted and free of loose soil.

UNCONTAINERIZED DEBRIS:

___________ Wood has been spread out throughout to prevent localized stacking or concentration of wood debris.

DEBRIS-FILLED CONTAINERS (excluding drums):

___________ Containers have had their lids removed (unless exempted by DRC for ALARA reasons).

___________ All containers have a minimum of two holes at the bottom of the container.

___________ Any densely packed containers that potentially will not allow CLSM to flow throughout the container have had flowability tests performed on them.

Flowability results: ____

____

____

___________ Containers have been filled to minimize quantity of CLSM required.

___________ Containers that contain primarily wood have been removed.

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CLSM INSPECTION FORM (continued)

DEBRIS-FILLED DRUMS:

____________ Lids have been removed or a hole pierced into the lid with a minimum dimension of 2" X 4" to allow flow into the container.

____________ Any drums containing compressible debris with the lids remaining have been segregated and formed to allow required 6" CLSM cap.

RESIN-FILLED CONTAINERS

____________ Containers are only constructed of steel or poly.

____________ 24-hr advance notification for filling head space voids made to DRC on ____________.

____________ Head space of containers has been filled with inert material. *(CLSM shall not be used to fill headspace void.)*

Head space void has been filled with ______________________________.

____________ Lids have been replaced on the container and latched, banded, or otherwise secured.

____________ The container is watertight. (i.e., secured ring around the lid of a drum, a flexible gasket placed between the lid and the container, or is otherwise sealed).

____________ Containers have been clearly marked "RESIN" on lids and sides to identify resin-filled containers in the pour and prevent operators from punching holes in the containers.

____________ Resin-filled containers have **not** been placed directly adjacent to each other within the CLSM pour.

____________ Volume of resins have been calculated and determined to be ≤ 25 % of the total volume of the CLSM pour. Total volume of resins (R) = ____________ ft^3. Estimated volume of the CLSM pour (V) = ____________ ft^3. (R / V) x 100 = ____________%.

(If the completed total volume of the CLSM pour is ≤ the estimated volume of the CLSM pour, the percentage of resins shall be recalculated on the Lift Approval Form to ensure that the volume of resins is ≤ 25 % of the total volume of the CLSM pour.)

____________ Containers have been surveyed (attach survey report).

____________ Containers have **not** been placed directly above resin-filled containers in previous lifts within the CLSM pyramid (provide locations of previously poured resin-filled containers directly below this CLSM pour area on the attached survey report, if any).

SOIL-FILLED OR FINES-FILLED CONTAINERS

____________ Containers with compressible debris have ≤ 10 % of the volume of the filled container and the total debris quantity is ≤ 25 % of the volume of the filled container.

____________ Lids have been removed or a hole pierced into the lid with a minimum dimension of 2" X 4" to allow flow into the container.

____________ Any soil-filled containers containing compressible debris with the lids remaining have been segregated and formed to allow required 6" CLSM cap.

____________ Containers that cannot be entirely in-filled with CLSM have been removed or dumped out in a compactable soil lift.

CLSM INSPECTION FORM (continued)

MISCELLANEOUS

____________ Photos taken of CLSM pour (attached).

48-hr Advanced Notification of the CLSM Pour Made to DRC on ________________________.

CLSM pour started on ________________________________.

COMMENTS

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____________________	______	____________________	______
QC Inspector Approval	Date	QC Officer Approval	Date

CLSM TESTING FORM

PROJECT: _____CAN _____MTV _____He.(C) _____CLASS A OTHER (specify) __________

Lift Identification__________ Sample ID__________ Date:__________

_______ Initial Screening Test or _______ Load Acceptance Test

Design Mix Number__________ Load Number__________

Ambient Temperature__________ Sample Temperature__________ Water Added On-Site__________

UNIT WEIGHT TEST *(ASTM D6023)*

Volume of Measure (V)__________ Weight of Measure (W)__________

Start Time of Test__________ Time of weight measurement__________

Weight of Measure with CLSM (MC) __________g or lbs CLSM Weight (WC) = [MC - W] = __________g or lb

CLSM Unit Weight = [WC / V] = __________lb/ft^3 QC Technician__________

FLOW CONSISTENCY TEST *(ASTM D6103)*

Time Sample Taken __________ Start Time of Test __________

QC Technician __________

First Measurement (F) __________ Second Measurement (S) __________ Average Measurement [(F+S)/2] __________

COLD WEATHER REQUIREMENTS (if less than 35° F ambient temp)

__________ Moisture/density test performed on adjacent soil (for soil base pour area)

__________ CLSM heated to above 50 degrees F

__________ Sufficient tenting/coverings available to completely cover and keep CLSM above 40° F

Initial temperature of in-place CLSM: __________ Time: __________

Subsequent measurements of CLSM

Temperature __________ Time: __________ Temperature __________ Time: __________

Temperature __________ Time: __________ Temperature __________ Time: __________

__________ CLSM pour is adequately tented and heated or covered with concrete blankets to keep CLSM warm.

Final 24-hr Measurement of CLSM

Temperature: __________ Time: __________ For CLSM Placed on: __________

COMMENTS/EXPLANATIONS:__________

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QC OFFICER APPROVAL __________ DATE __________ QA APPROVAL __________ DATE __________

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BREACH OF BERM

PROJECT: ___CAN ___MW ___11e.(2) ___CLASS A OTHER__________

LOCATION OF BERM:________________________________

____

Sketch location (if needed)

TYPE OF BREACH:

______ Permanent removal of berm, or

______ Temporary removal of berm

ACTION:

______ New and / or temporary berms have been inspected and permission is granted to breach the berm.

______ The breach and repair of the berm will be accomplished during one shift; therefore, no temporary berms are required. Permission is granted to breach the berm for one shift on ________________.
Date

______ Permission to breach the berm is denied because ________________

____

________________________ ________________________
QC OFFICER APPROVAL Date

ENERGYSOLUTIONS

LINER / RADON BARRIER INSPECTION FORM

PROJECT: CAN_____ CLASS A_____ MW____ 11e(2)_____ Other (Specify)_______________

LOCATION OF LINER / RADON BARRIER: ______________________________

____

COMMENTS: ____

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_____________________ _____________
EnergySolutions Date

COMMENTS: ____

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_____________________ _____________
DRC Date

EnergySolutions

EC
Re

EMBANKMENT CONSTRUCTION
LIFT APPROVAL FORM

PROJECT: ______ CAN ______ MW ______ 11e.(2) ______ CLASS A OTHER ______

WORK ELEMENT: __ FOUNDATION ____ CLAY LINER ____ RADON BARRIER OTHER ______

NW CORNER: ______________ DATE: ______________

	P 1 ______
	EW: ____ X ____ = ____
	NS: ____ X ____ = ____
	P 2 ______
	EW: ____ X ____ = ____
	NS: ____ X ____ = ____
	P 3 ______
	EW: ____ X ____ = ____
	NS: ____ X ____ = ____
	P 4 ______
	EW: ____ X ____ = ____
	NS: ____ X ____ = ____
	P 5 ______
	EW: ____ X ____ = ____
	NS: ____ X ____ = ____
	Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: ______________ UNC. THICKNESS: ______ Constructed Per Test Pad #: ______

Lift Bonding inspections (change in grade of at least 1" - two per linear foot): By: ______ Date: ______ Time: ______

Grade Pole Inspections (at least a 70 foot grid & all control points): By: ______ Date: ______ Time: ______

Dry Clod Size Inspection (Less than or equal to 1"): By: ______ Date: ______ Time: ______

Equipment Used for Compaction & # of Passes: ______________

# of Deflocculant Bags: _____ Size of Mixing Area: ______ On-Cell / Off-Cell # Passes with Tiller: ______

KEYING IN NOTES: N E S W ______ DENSITY TESTS ID # (S): ______

PERMEABILITY TESTS LOT # (S): ______ SANDCONE TEST LOT # (S): ______

COMMENTS:

____

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LIFT APPROVED BY: ______________ DATE: ______________ TIME: ______

______________ ______ ______________ ______

QC OFFICER APPROVAL DATE QA OFFICER APPROVAL DATE

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EC-
Rev

CWF LIFT APPROVAL FORM

PROJECT: ______CAN ______CLASS A OTHER (specify) ____________

NW CORNER DATE: ____________

	P1 ____________ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P2 ____________ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P3 ____________ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P4 ____________ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	P5 ____________ EW: ______ X ______ = ______ NS: ______ X ______ = ______
	Page 2 attached: Y N

IDENTIFY LIFT CONFIGURATION ABOVE

LIFT ID: ____________ NW CORNER: ____________ BASE LIFT ELEVATION: ____________

WASTE GENERATOR ID NUMBER(S): ____________

TOTAL ACTIVE PLACEMENT AREA SINCE LAST MOISTURE/DENSITY TEST: ____________

NEW ACTIVE PLACEMENT AREA (INCLUDING THIS LIFT): ____________

Loose 6" Sand Inspection Results (including initials/date): ____________

Container Placement Inspection Results (including initials date): ____________

Moisture content testing for backfill performed each day of backfilling and meets requirements (attach results). Inspector: ____________

Backfilled Containers Inspection Results (including initials/date): ____________

Backfill Inspection Results following Consolildation/Vibration (including initials/date): ____________

Observation Results from Compaction of Intermediate Sand (including initials/date): ____________

INTERMEDIATE SAND THICKNESS: ____________ BACKFILL COVER THICKESS: ____________

Observation Results from Compaction of Backfill Cover (including initials/date): ____________

DENSITY TESTS ID # (S): ____________

COMMENTS: ____________

LIFT APPROVED BY: ____________ DATE: ____________ TIME: ____________

QC OFFICER APPROVAL ____ DATE ____ QA OFFICER APPROVAL ____ DATE ____

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DISPOSAL LIFT SURVEY DATA FORM

Compacted Survey

Lift Number: ______________________ Date ______________________

Benchmark Elevation: ______________
Backsight Reading: ______________
Instrument Elevation: ______________
X Average: ______________
Lift Surface Elevation: ______________
Last Lift Elevation: ______________
Lift Thickness: ______________
Benchmark Closure Reading: ______________

Surveyed by: ______________________

Date: ______________

Verified by[1]: ______________________

Date: ______________

Indicate survey points as X

Compacted Survey

Lift Number: ______________________ Date ______________________

Benchmark Elevation: ______________
Backsight Reading: ______________
Instrument Elevation: ______________
X Average: ______________
Lift Surface Elevation: ______________
Last Lift Elevation: ______________
Lift Thickness: ______________
Benchmark Closure Reading: ______________

Surveyed by: ______________________

Date: ______________

Verified by[1]: ______________________

Date: ______________

Indicate survey points as X

Comments: ____

____

____

[1]Note: Survey data is to be reviewed at least weekly to verify the accuracy of any calculations performed. Verification may not be performed by the same individual who performed the original survey.

DIVIDER PAGE

TESTING METHODS

ASTM C 88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregate by Washing
ASTM C 127	Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	Standard Test Method for Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 535	Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 702	Standard Practice for Reducing Field Samples of Aggregate to Testing Size
ASTM C 939	Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
ASTM D 75	Standard Practice for Sampling Aggregates
ASTM D 422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
ASTM D 1140	Standard Test Method for Amount of Material in Soils Finer than the No. 200 (74-µm)
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1587	Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes

ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2325	Standard Test Method for Capillary-Moisture Relationships for Coarse- and Medium-Textured Soils by Porous-Plate Apparatus
ASTM D 2434	Standard Test Method for Permeability of Granular Soils (Constant Head)
ASTM D 2487	Standard Practice for Standard Classification of Soils for Engineering Purposes (Unified Soils Classification System)
ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 3152	Standard Test Method for Capillary-Moisture Relationships for Fine-Textured Soils by Pressure-Membrane Apparatus
ASTM D 4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method
ASTM D 4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D 4959	Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating
ASTM D 5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5519	Standard Test Method for Particle Size Analysis of Natural and Man-Made Riprap Materials
ASTM D 6023	Standard Test Method for Unit Weight, Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low Strength Material (CLSM)
ASTM D 6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Soil Science Society of America, Methods of Soil Analysis: Part 1, (MOSA) Chapter 26, "Water Retention: Laboratory Methods," A. Klute

"Procedures for Sealed Single Ring Infiltrometer Field Permeability Test"

"Efflux Test"

"Slump Test"

"Containerized Waste Facility Waste Placement Test Pad Destructive Testing"

PROCEDURES FOR SEALED SINGLE RING INFILTROMETER FIELD PERMEABILITY TEST

The sealed single ring infiltrometer testing procedure for field permeability testing is as follows:

1. Equipment

   a. Metal Ring – With a minimum area of 1294 cm^2. The bottom of the ring is beveled for a cutting edge. A flange welded to the top of the metal ring is provided to allow connection of a lid.
   b. Lid – Cover for the metal ring. Provided with a gasket to seal the cover to the ring flange. Also provided with a nipple to connect a water supply hose and a vent valve.
   c. Water Reservoir – Supplies water for the saturation portion of the test. Connects to the lid and the readout tube.
   d. Readout Tube – Approximately .32 cm diameter to measure the flow of water into the system.
   e. Stand – Method to support the water reservoir and the readout tube.
   f. Static Weight Penetrometer – The probe construction will be a stainless steel rod with a quarter (1/4) inch nominal diameter and a flat tip. The probe will have a weight such that the minimum tip pressure is one hundred pounds per square inch (100 psi).

2. Testing Procedure

   a. Metal rings with a minimum radius of 20.3 cm will be utilized for permeability testing during test pad construction.
   b. Prepare the area to be tested by smoothing the ground surface and removing any loose or disturbed soil.
   c. Place the metal ring on the area prepared. Push the metal ring at least 15.2 cm into the soil.
   d. Remove any soil disturbed from inside the metal ring by the insertion process.
   e. Seal the inside of the metal ring by compacting the soil immediately adjacent to the ring.
   f. Place a small plate on the soil surface and pour water over the plate into the ring, filling the ring with water to within approximately 1.3 cm of the top of the ring.
   g. Place the lid on the ring and seal with clamps or other devices.
   h. Connect the water reservoir and readout tube to the lid and set on support stand.
   i. Fill the system with water, filling the ring, reservoir and all hoses.
   j. Secure the reservoir at least 91.4 cm above the ring.

k. Allow the water to permeate into the soil for a minimum of 4 hours (For test pads only: Minimum 0.76 cm wet front depth for each wet front depth test. The average wet front depth for all nine SSRI tests performed for each test pad must be at least 0.86 cm).

l. Fill the readout tube with water and secure the readout tube so that the water level in the tube is approximately 152.4 cm above the ring. Allow the readings to stabilize prior to starting the test. The water level shall be greater than or equal to 121.9 cm when the test starts. Record the initial height of the water above the soil surface inside the ring.

m. Record the water level in the readout tube every 20 seconds for 8 minutes. Plot the water drop over time.

n. Dismantle the system and measure the temperature at the soil-water interface (inside the ring, measured in °C). The appropriate Temperature Correction Factor shall be identified from Figure 1 of Envirocare's Field Permeability Test Form EC-1906, or from Table 1 of ASTM D 5084. Then measure the depth that the water penetrated into the soil, using the static weight penetrometer. The average of at least three wet front depth tests shall be used for calculating the water penetration depth.

o. Calculate the Change in Head during the test based on a linear interpretation of the plotted results. None of the full 8 minutes of the plotted test results can deviate significantly from the linear interpretation.

p. Calculate the permeability.

3. Documentation

Record the following items: (Record all length measurements in cm)

a. Date and time soil saturation began and when permeability test readings were taken.
b. Test location and elevation.
c. Timed water drop readings.
d. Height of water at beginning of readings.
e. Size of ring and readout tube (if required).
f. Soil-water interface temperature.
g. Average depth of wet front.
h. Plot of water level drop with time.
i. Plot the linear interpretation of water level drop with time. (The entire 8 minutes must approximately correspond to linear interpretation)
j. Calculated permeability.

EFFLUX TEST

1. Equipment needed:

   a. Flow cone - Cone with a 7 inch top diameter, 12 inch height, volume for CLSM fill of 1725 cm^3, and a discharge tube at the bottom. The cone must also have a point gage to measure the height of grout in the cone.
   b. Receiving container - A container of at least 2000 cm^3 volume.
   c. Ring stand - Firm stand or other similar device capable of supporting the flow cone in a vertical, steady position over the receiving container.
   d. Level
   e. Watch
   f. Stop Watch (if watch does not include a stop watch function with .2 accuracy)
   g. Scoop
   h. Pen
   i. Thermometer
   j. Beaker of 2000 ml volume or greater

2. Procedure

   a. Mount the flow cone firmly so it is free of vibration.
   b. Close the outlet of the discharge tube with a finger or stopper.
   c. Fill the cone with 1725 cm^3 of water and adjust the point gage to indicate the level of the water surface. Then allow the water to drain.
   d. Obtain a sample of CLSM from the mix and record the time.
   e. Close the outlet of the discharge tube with a finger or stopper and fill the cone until the CLSM surface rises to contact the point gage.
   f. Start the stop watch and simultaneously remove the finger or stopper.
   g. Stop the watch at the first break in the continuous flow of CLSM from the discharge tube, then look into the cone;

      1) if light is visible, the time indicated by the stop watch is the efflux of the grout.

      2) if light is not visible, the flow cone test is invalid and must be repeated. Adjust the load mix's water/cement ratio (if necessary) and/or cement additive (admix) concentration. Repeat the test beginning with step 2.d and/or adjust the load mix until a valid test is performed and record the indicated value as the efflux time.

      Note: If after three tests a valid test has still not been performed, the flow cone test is not applicable for grout of this consistency and the slump test may then be used as an indicator of flowability.

3. Documentation

   a. Date and the time the sample was taken from the mix.
   b. Sample ID number and lift the CLSM will be placed in.
   c. The design mix number and load number.
   d. CLSM temperature.
   e. Ambient temperature
   f. Starting time for the test performed.
   g. Efflux time from a passing test or justification for why the flow cone test cannot be used for the CLSM.

SLUMP TEST

1. Equipment needed:

   a. Mold - Shall be in the form of a cone with an 8 in. base diameter, 4 in. top diameter, and 12 in. height (dimensions according to ASTM C 143-90a).
   b. Tamping Rod - Rod with dimensions according to ASTM C 143-90a.
   c. Measuring device
   d. Pen
   e. Shovel or scoop
   f. Watch
   g. Thermometer

2. Testing Procedure:

   a. Obtain a sample from the CLSM to be poured.
   b. Dampen the mold and place it on a flat, moist, rigid surface.
   c. Hold the mold firmly in place by standing on the two foot pieces.
   d. Fill the mold one-third full and rod the CLSM with 25 strokes of the tamping rod. Distribute the strokes uniformly over the entire layer.
   e. Create another layer by adding CLSM until the mold is approximately 2/3 full and rod the layer throughout its depth so that the strokes just penetrate into the underlying layer.
   f. Complete the final layer by filling the cone above the top rim and rod the final layer as outlined above, making sure the CLSM does not fall below the rim. If the CLSM does fall below the top rim, add additional fill and re-rod the final layer.
   g. Strike off the top surface of the CLSM with the tamping rod until flush.
   h. Remove the mold immediately from the CLSM by raising it vertically in a smooth, uninterrupted motion (avoid any lateral or twisting motion). The time elapsed for cone removal should be approximately 5 seconds.
   i. Immediately place the cone next to the CLSM and measure the vertical difference between the top of the mold and the top center of the displaced CLSM. The measured difference is the slump of the CLSM.

3. Documentation

   Record the following items:

   a. Date and the time the sample was taken from the mix.
   b. Sample ID number and lift the CLSM will be placed in.
   c. The design mix number and load number.
   d. CLSM temperature.
   e. Starting time for the test performed.
   f. Slump, in terms of inches, to the nearest 1/4 inch.

Test Method

Containerized Waste Facility Waste Placement Test Pad Destructive Testing

1. Equipment Needed
   a) Balance
   b) Density cylinders
   c) Shovel or scoop
   d) Pen
   e) Watch
   f) Tape measure
   g) Ruler
   h) Oven
   i) Moisture content dishes
   j) Moisture sample plastic bags

2. Procedure
   a) Weigh empty density cylinders and record volume. Assign a unique ID number to each cylinder.
   b) Place at least four cylinders within the test pad during test pad construction. Cylinder placement shall be chosen to ensure representative sampling of the backfill density. Record the location of each density cylinder.
   c) Complete construction of the backfill test pad in accordance with the CQA Plan and the test pad construction plan.
   d) Accurately measure the dimensions (H x W x L) of the backfill test pad. Calculate the total volume of the backfill test pad. Do not include the backfill soil cover in this volume.
   e) Complete construction of the backfill cover test lift in accordance with the CQA Plan and the backfill cover test lift construction plan.
   f) Deconstruct the backfill test pad and backfill cover test lift:
      i. Carefully remove framing on one face of the test pad.
      ii. Closely observe the test pad and note any voids created during form removal or subsequent container removal (that is, flowable backfill moving into the newly-created open space as the form is removed). Estimate from the visual observation the length, width, and depth of these voids. Record these dimensions and the location.
      iii. Inspect the exposed backfill for voids within the test pad. Measure each external void and record the location, average length, average width, and average depth.
      iv. Carefully remove any loose material in order to inspect the base of the containers.
      v. Inspect backfill surrounding the base of the containers for voids. Measure each external void and record the location, average length, average width, and average depth.
      vi. Carefully remove a single container from one end of the exposed row. Repeat steps ii. through v. above.

vii. Systematically working across the row, remove each container and repeat steps ii. through v. above.

viii. Repeat steps ii. through vii. for each row in the test pad.

ix. Using the measured average void length, width and depth, calculate the volume of each external void identified within the test pad.

x. Sum all measured external voids to determine the total external void volume within the test pad.

xi. Calculate the external void percentage by dividing the total external void volume by the total test pad volume recorded in c) above.

g) Density cylinders:

i. At the location of each density cylinder, carefully expose the cylinder.

ii. Strike off excess material from the top of the cylinder so that the backfill is flush with the top surface of the density cylinder.

iii. Clean excess material from the exterior of the density cylinder.

iv. Identify and record the ID number of the cylinder.

v. Measure the total weight of the density cylinder and backfill.

vi. Determine the net weight of the backfill by subtracting the container weight from the total weight.

vii. Calculate the total unit weight by dividing the net weight of the backfill by the known volume of the density cylinder.

viii. Perform an oven dry back moisture test on a representative sample from each density cylinder in accordance with ASTM D-2216.

ix. Calculate the dry unit weight by dividing the total unit weight by one plus the moisture content.

x. Repeat steps i. through vii. for each density cylinder.

xi. Calculate the average dry unit weight of the test pad backfill by summing the dry unit weight of each density cylinder in the test pad and dividing by the number of density cylinders.

xii. Calculate the average percent compaction in comparison to a standard proctor or relative density by taking the average dry unit weight recorded in viii) above and dividing it by the maximum dry density (from a standard proctor) or the maximum relative density of the backfill and multiple by 100 to convert to percent compaction.

3. Documentation

Record the following information:

a) Date and time destructive testing begins
b) Total volume of the backfill test pad
c) Total volume of voids in the backfill test pad
d) Total percentage of voids in the backfill test pad
e) Average unit weight of the backfill
f) Average percent compaction of the backfill
g) Maximum moisture content of the backfill
h) Photograph representative steps of testing

DIVIDER PAGE

APPENDIX C

ROCK QUALITY SCORING

ROCK QUALITY SCORING

The results from the following test will be utilize in the scoring criteria:

TEST	STANDARD DESIGNATION
Specific Gravity	ASTM C-128
Absorption (%)	ASTM C-127
Sodium Soundness (%)	ASTM C-88
L.A. Abrasion (%)	ASTM C-131 & ASTM C-535

Each test will be given a score of 0 (lowest) to 10 (highest) from Table D-1 - Scoring Criteria for Rock Quality based on the results of the above tests. These scores will be multiplied by the weighting factors outlined in Table D-1 for different rock types. Table D-1 includes weighting factors for limestone, sandstone, and igneous rocks. The rock quality score is obtained by the following formula:

$$\text{ROCK QUALITY} = \frac{\text{SUM (TEST SCORE X WEIGHT FACTOR)}}{\text{MAXIMUM POSSIBLE SCORE}} \text{ X } 100$$

SCORING CRITERIA FOR ROCK QUALITY[1]

TEST*	WEIGHTING FACTOR LIME-STONE	SAND-STONE	IGN-EOUS	SCORE 10	9	8	7	6	5	4	3	2	1	0
Specific Gravity	12	6	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.30	2.25
Absorption (%)	13	5	2	.1	.3	.5	.67	.83	1.0	1.5	2.0	2.5	3.0	3.5
Sodium Soundness (%)	4	3	11	1.0	3.0	5.0	6.7	8.3	10.0	12.5	15.0	20.0	25.0	30.0
L.A. Abrasion (%)	1	8	1	1.0	3.0	5.0	6.7	8.3	10.0	12.5	15.0	20.0	25.0	30.0
Schmidt Hammer	11	13	3	70.0	65.0	60.0	54.0	47.0	40.0	32.0	24.0	16.0	8.0	0.0
Tensile Strength (psi)	6	4	10	1400	1200	1000	833	666	500	400	300	[illegible]	100	0.0

* The lowest score (i.e. 0) may be substituted for results of test not preformed which are required by Section III.c.

[1] U.S. Nuclear Regulatory Commission, Staff Technical Position - Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, U.S. Nuclear Regulatory Commission, Washington, D.C., August, 1990, p D-27.

ATTACHMENT 4

Energy*Solutions* Class A South Cell Infiltration and Transport Modeling", December 7, 2007

Located Within Supplementary Binder