



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

L. Scott Baird
Executive Director

DIVISION OF WASTE MANAGEMENT
AND RADIATION CONTROL
Ty L. Howard
Director

December 6, 2019

Newspaper Agency Corporation
Legal Advertising Department
143 South Main
Salt Lake City, UT 84101
EMAIL: naclegal@utahmediagroup.com

RE: NAC Account #9001350993

Dear Sirs:

This email constitutes authorization to publish the NOTICE below in the Salt Lake Tribune and Deseret News on December 10, 2019.

Please send invoice and affidavit of publication to:

Ty L. Howard, Director
Division of Waste Management and Radiation Control
P.O. Box 144880
Salt Lake City, UT 84114-4880

Enclosure: Public Notice
Statement of Basis and Radioactive Material License

c: Jeff Coombs, EHS, Health Officer, Tooele County Health Department
Bryan Slade, Environmental Health Director, Tooele County Health Department
Donna Spangler (Email), Carlee Christoffersen (Email), Don Verbica (Email)
Tom Ball (Email), Larene Wyss (Email)
Facility File, Public Participation File, Alisa Westenskow



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

L. Scott Baird
Executive Director

DIVISION OF WASTE MANAGEMENT
AND RADIATION CONTROL
Ty L. Howard
Director

December 6, 2019

Tooele Transcript Bulletin
P.O. Box 390
Tooele, UT 84074
Email: tbp@tooeletranscript.com

Dear Sirs:

This email constitutes authorization to publish the NOTICE below in the Tooele Transcript Bulletin on December 10, 2019.

Please send invoice and affidavit of publication to:

Ty L. Howard, Director
Division of Waste Management and Radiation Control
P.O. Box 144880
Salt Lake City, Utah 84114-4880

Enclosure: Public Notice
Statement of Basis and Radioactive Material License

c: Jeff Coombs, EHS, Health Officer, Tooele County Health Department
Bryan Slade, Environmental Health Director, Tooele County Health Department
Donna Spangler (Email), Carlee Christoffersen (Email), Don Verbica (Email)
Tom Ball (Email), Larene Wyss (Email)
Facility File, Public Participation File, Alisa Westenskow

NOTICE OF PUBLIC COMMENT ON
Amendment 25 to Radioactive Material License No. UT 2300249
EnergySolutions, LLC, Clive, Tooele County, Utah

The Director of the Division of Waste Management and Radiation Control (Division) is requesting public comment regarding a proposed Licensing Action to revise the EnergySolutions' (Licensee) Low Level Radioactive Waste Radioactive Material License (RML) UT 2300249 for the Clive facilities near Clive, Tooele County, Utah.

The public comment period to receive comments on the proposed Licensing Action will commence on December 11, 2019 and end on January 28, 2020.

Documents related to this licensing action including the Statement of Basis describing the proposed changes to the RML along with a draft RML can be reviewed at the following location:

Division of Waste Management and Radiation Control
Multi Agency State Office Building
195 North 1950 West, 2nd Floor
Salt Lake City, UT 84116

For the public's convenience, an unofficial copy of the Statement of Basis along with a draft RML is available on the Internet at "<https://deq.utah.gov/waste-management-and-radiation-control/waste-management-radiation-control-public-notice>".

Written comments will be accepted if received by 5:00 p.m. on January 28, 2020 and should be submitted to the address below. Comments can also be hand delivered to the Division address above and must be received by 5:00 p.m. on January 28, 2020.

Ty L. Howard, Director
Division of Waste Management and Radiation Control
Department of Environmental Quality
P.O. Box 144880
Salt Lake City, UT 84114-4880

Comments can also be sent by electronic mail to: "dwmrcpublic@utah.gov". Comments sent in electronic format should be identified by putting the following in the subject line: Public Comment on LLRW Amendment 25. All documents included in comments should be submitted as ASCII (text) files or in pdf format.

A public hearing will be scheduled if requested, by any citizen, by December 24, 2019. The hearing, if requested, will be on Thursday, January 9, 2020 from 4:00 p.m. to 5:00 p.m. The purpose of the public hearing is to take comments from the public and to answer questions relating to the proposed revisions to EnergySolutions RML UT2300249. A Hearing Officer will manage the hearing, and the hearing will be recorded and transcribed. The public hearing will be held in the DEQ Board Room, Room 1015, at the Department of Environmental Quality, 195 North 1950 West, Salt Lake City Utah.

Interested persons must submit their questions for the public hearing to the Director by December 31, 2019. If a question relies on information that is not in the record, that information should also be provided with the question. Those who submitted questions will be allowed to follow up with additional questions based on the response provided. All questions submitted will be considered part of

the record.

After completion of the public comment period and the holding of the public hearing (if requested), the Division will analyze the information received from the public prior to final action on the proposed changes to the RML UT 2300249.

Under Utah Code Section 19-1-301.5 a person who wishes to challenge a Permit Order may only raise an issue or argument during an adjudicatory proceeding that was raised during the public comment period and was supported with sufficient information or documentation to enable the director to fully consider the substance and significance of the issue.

In compliance with the Americans with Disabilities Act, individuals with special needs (including auxiliary communicative aids and services) should contact Larene Wyss, Office of Human Resources at (801) 536-4284, Telecommunications Relay Service 711, or by email at "lwyss@utah.gov".

STATEMENT OF BASIS

for

AMENDMENT 25

Low Level Radioactive Waste Disposal Facility

EnergySolutions, LLC
299 South Main Street, Suite 1700
Salt Lake City, UT 84111

November 26, 2019

Purpose

This statement of basis establishes the foundation on which Radioactive Material License No. UT 2300249 (RML) has been recommended for amendment. Once the proposed revisions are approved the revised License will be designated as Amendment 25. These proposed revisions are the result of several requests for amendments made by EnergySolutions, LLC (ES) and an administrative update required by the License. The proposed revisions reviewed by the Division of Waste Management and Radiation Control (the Division) for Amendment 25 are listed below with several brief details.

On March 11, 2019 (CD19-0054), ES submitted a request to the Director of the Division of Waste Management and Radiation Control (Director) to amend **License Condition 15.A.** of the License for the purpose of modifying the condition to allow waste classification prior to management rather than prior to receipt of the waste. Additional information addressing this request for amendment to Condition 15.A is contained in Appendix A of this Statement of Basis.

On March 12, 2018 (CD18-0046), ES submitted a request to the Director to revise the Construction Quality Assurance / Quality Control Manual (CQA/QC Manual). The CQA/QC Manual is required by and directly linked to **License Condition 44** of the License. A minor revision to **License Condition 37.D** was also required due to a revision of Specification 83–Resin Lifts of the CQA/QC Manual. ES and the Division have proposed multiple revisions to update a document that is integral to construction operations at the Clive facility. A detailed discussion of the proposed revisions to the CQA/QC Manual is contained in Appendix B of this Statement of Basis.

On February 4, 2019 (CD19-0029), ES submitted a request to the Director to amend **License**

Conditions 10.A and 57. The request included proposed conditions and requirements necessary for the repair of railcars within Section 29 of the Clive facility, together with certain language clarifications relating to the receipt, storage, and transloading of radioactive material-related railcars in Section 29. A detailed discussion of the proposed revisions to Conditions 10.A and 57 is contained in Appendix C of this Statement of Basis.

On March 29, 2019, (CD19-0075) ES submitted a request to the Director to amend **License Condition 73.C** of the License addressing several aspects of surety. Additional information addressing this amendment to Condition 73.C is contained in Appendix D of this Statement of Basis

The aforementioned requests were reviewed by the Division and all were deemed appropriate and necessary. Several of the changes requested are considered major in nature. Therefore, the Director has determined that in accordance with Utah Administrative Code R313-17-2 a public comment period is required for these proposed license amendments.

All conclusions in this Statement of Basis, including determinations that issues have been resolved or not resolved, are tentative in that they are subject to notice and comment and reconsideration by the agency in light of comments made during the public comment period and the record as a whole. A final determination of the proposed revisions to the License and CQA/QC Manual is dependent on incorporating the outcome of the public comment period.

License Change Summary

License Condition	Minor/Major Change	Description of Changes and Bases for Changes
15.A	Minor	<p>ES is currently required to perform waste classification calculations “prior to receipt” of waste to be treated. Now the requirement allows the calculations to occur “prior to management” of the waste.</p> <p>Condition 15.A was also amended to prohibit the generation of any waste that exceeds Class A waste concentration limit, including not only Class B and Class C wastes but also Greater than Class C waste.</p>
37.D & 44	Major	<p>No text changes were made to Condition 44; however, the CQA/QC Manual referenced therein was revised. Many CQA/QC Specifications were rewritten, expanded, and/or removed to capture change and to remain relevant. License Condition 37.D was also revised due to a revision of Specification 83–Resin Lifts of the CQA/QC Manual.</p>

License Change Summary

License Condition	Minor/Major Change	Description of Changes and Bases for Changes
10.A & 57	Major	Conditions and requirements necessary for the repair of railcars within Section 29, together with certain language clarifications relating to the receipt, storage, and transloading of radioactive material-related railcars in Section 29 have been updated and clarified. The conditions, under which repairs may be undertaken within Section 29, and the required operational controls, are detailed in Condition 57. The designated Radioactive Material Area within Section 29 has been redefined and reduced in scope. A Railcar Transfer Area has been designated.
73.C	Minor	Commensurate with passage of Utah Senate bills 2015-173 and 2017-79, ES is allowed to submit surety calculations for the combined licensed facilities. Condition 73.C has to be revised each time the annual surety is approved by the Director.

Requested Changes not Incorporated

License Condition	Minor/Major Change	Description of Proposed Changes
None	NA	None

Additional Information

Additional details regarding the changes to the License are contained in the following Appendices:

Appendix A: License Condition 15.A – Waste Treatment

Appendix B: License Condition 37.D and 44 – CQA/QC Manual Revision: 28b

Appendix C: License Condition 10.A and 57 – Railcar Repairs

Appendix D: License Condition 73.C – Surety Update

Statement of Basis
RML No. UT 2300249 – Amendment 25
November 26, 2019

(Blank Page)

Appendix A

License Condition 15.A – Waste Treatment

Statement of Basis to Amend License Condition 15.A

On March 11, 2019 (CD19-0054), EnergySolutions, LLC (ES) submitted a request to the Director of the Division of Waste Management and Radiation Control (Director) to amend License Condition 15.A of the License.

The License Section and current License Condition are as follows:

WASTE TREATMENT AND PROCESSING

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

The amended License Condition is as follows:

15. A. Prior to ~~receipt~~ management of any low level radioactive or mixed wastes requiring treatment before disposal, 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 radionuclide concentrations of the resultant processed waste ~~is neither Class B nor Class C waste.~~ do not exceed Class A waste limits.

Basis for License Changes

The language change is necessary since compliance with the condition is not feasible. The “prior to receipt” requirement was placed in the license in 2003 when it was anticipated that the vacuum assisted thermal desorption process that was being introduced as a treatment methodology could concentrate the radioactivity in the remaining solids with the removal of organic liquids. The assumption, at the time, was that a treatment would consist of a known volume of waste where all necessary waste characteristics would be known prior to receipt and the information could be input into a calculation to determine the resultant waste classification following treatment. With the reality that more than one waste shipment could be treated at a time makes the requirement to perform the calculation before the receipt of the various shipments unreasonable and impractical especially if meaningful information is expected to be derived. A logical approach would be to perform the calculation prior to treatment, as has been done to this point, when all the pertinent information regarding the various waste inputs are known.

The calculation cannot be performed before receipt since the input information to perform the calculation is not known until the waste has already been received and the mix of wastes to be treated in a batch is determined. A treatment batch may consist of wastes from a number of

different shipments and different waste streams received at the facility at different time periods.

The ES is still required to perform waste calculations on wastes to be treated where the radionuclide concentrations have the potential of increasing due to the treatment process; however, these determinations are not required to be made “prior to receipt” of the waste.

In the subsequent years following 2003, inspections conducted by the Division of Radiation Control and the Division of Waste Management and Radiation Control focused on the calculations being performed before treatment took place without considering whether they were done prior to or after receipt of the waste at the ES’s site. Having done the calculations after receipt of the input wastes had no bearing on whether or not the waste could be treated and disposed.

The calculations are not time critical provided they are done prior to treatment.

The condition was also amended to safeguard against creating any waste that would exceed Class A waste concentration limits. The condition was amended since it could be inferred that Greater than Class C waste was not a concern since only Class B and Class C wastes were specified.

References

EnergySolutions, LLC. 2019. Radioactive Material License UT2300249, License Amendment Request, Classification Calculations in License Condition 15.A. CD19-0054. March 11, 2019. (DRC-2019-002361).

Appendix B

License Condition 37.D and 44 – CQA/QC Manual

Statement of Basis to Revise CQA/QC Manual Revision: 28b

On March 12, 2018 (CD18-0046), ES submitted a request to the Director to revise the 11e.(2) and LLRW Construction Quality Assurance / Quality Control Manual (CQA/QC Manual). The CQA/QC Manual is required by and directly linked to **License Condition 44** of the License. There are no text changes to License Condition 44. However, a Division change of License Condition 37.D was included based on the retention of Specification 83 of the CQA/QC Manual.

The License Section and current License Condition 37.D are as follows:

CONSTRUCION ACTIVITIES

37.D. Disposed of in accordance with the requirements of the Construction Quality Assurance/Quality Control Manual.

The proposed amended License Condition 37.D:

37.D. Only after receipt of written Director approval for each shipment and then Disposed disposed of in accordance with the requirements of the Construction Quality Assurance/Quality Control Manual.

Basis for Changes to License Condition 37.D

In initial discussions with the ES, Specification 83 of the CQA/QC manual was agreed to be removed as it had not been used in a number of years and the Division was concerned how it could be implemented safely. However, before the change was finalized, ES requested that Specification 83 be reinstated in the CQA/QC manual. The Division then proposed changing License Condition 37.D to allow Director approval for each shipment using this specification. The ES agreed.

Ion exchange resins are small particles with an electric charge and can easily stick to tyvek suites, increasing the possibility of contamination to workers. The resins are very small and can easily become airborne in the wind. The concentration of resin now received at the Clive facility can be at or near the class A limit. Therefore, it is appropriate that the Director have the ability to approve each shipment to evaluate whether the shipment destined to use the CQA/QC manual can safely be managed, that the risk to workers will be kept as low as reasonably achievable and that based on where in the embankment the resins will be placed the dose to the public before and after closure as well as dose to an inadvertent intruder will not exceed the regulatory limits.

A detailed discussion of the proposed CQA/QC Manual revisions follows after the following table of contents for Appendix B.

Contents for Appendix B

1	INTRODUCTION	1
2	CQA/QC REVISION SUBMITTAL CHRONOLOGY	2
3	REGULATORY REQUIREMENTS	3
4	REVISIONS TO CQA/QC MANUAL REVISION: 28b	4
4.1	Work Elements	4
4.1.1	Document Control (Spec. 1 – 4)	4
4.1.2	General Requirements (Spec. 5 – 23)	4
4.1.3	Foundation Preparation (Spec. 24 – 30)	6
4.1.4	Clay Liner Borrow Material (Spec. 31 – 35)	6
4.1.5	Clay Liner Test Pad (Spec. 36 – 38)	7
4.1.6	Clay Liner Placement (Spec. 39 – 55)	7
4.1.7	Waste Placement with Compactor (Spec. 56 – 70)	9
4.1.8	Waste Placement without Compactor (Spec. 71 – 100)	11
4.1.9	Containerized Waste Facility Waste Placement Test Pad (Spec. 101 – 103)	13
4.1.10	Containerized Waste Facility Waste Placement (Spec. 104 – 115)	13
4.1.11	Interim Radon Cover Placement and Monitoring (Spec. 116 – 123)	16
4.1.12	Temporary Cover Placement and Monitoring (Spec. 124 – 133)	16
4.1.13	Radon Barrier Borrow Material (Spec. 134 – 138)	17
4.1.14	Radon Barrier Test Pad (Spec. 139 – 141)	17
4.1.15	Radon Barrier Placement (Spec. 142 – 163)	18
4.1.16	Filter Zone (Spec. 164 – 168)	20
4.1.17	Sacrificial Soil Placement (Spec. 170 – 174)	21
4.1.18	Rock Erosion Barrier (Spec. 175 – 180)	21
4.1.19	Drainage Ditch Imported Borrow (Spec. 181 – 184)	22
4.1.20	Drainage Ditches (Spec. 185 – 190)	22
4.1.21	Inspection Road (Spec. 191 – 195)	23
4.1.22	Permanent Chain Link Fences (Spec. 196 – 198)	23
4.1.23	Settlement Monitoring (Spec. 199 – 204)	23
4.1.24	Annual As-Built Report (Spec. 205 – 207)	23

4.2	Tables	24
4.2.1	Table 1 – Reserved	24
4.2.2	Table 2 – Material Specifications for Portland Cement CLSM	24
4.3	Figures	24
4.3.1	Figure 1 – LARW Settlement Monuments, May 1, 2006.....	24
4.3.2	Figure 2 – Class A West Settlement Monuments, rev. 4, September 18, 2015.....	24
4.3.3	Figure 3 – Mixed Waste Settlement Monuments	24
4.3.4	Figure 4 – 11e.(2) Settlement Monuments rev.2, October 10, 2008	24
4.3.5	Figure 5 – Cross Section of 11e.(2) and Class A West Settlement Plate Monument Installation, rev. 1, August 19, 2015	24
4.3.6	Figure 6 – Reserved (rev. 26a, September 15, 2011)	24
4.3.7	Figure 7 – CWF Cell Construction Requirements, Sheet 1 of 2, Rev. 1, 10/10/07.24	
4.3.8	Figure 8 – CWF Cell Construction Requirements, Sheet 2 of 2, Rev. 0, 10/10/07.24	
4.4	Appendices	24
4.4.1	Appendix A – List of CQA/QC Documentation Forms	24
4.4.2	Appendix B – Testing Methods, rev. 6, October 11, 2010.....	24
4.4.3	Appendix C – Rock Quality Scoring	24
4.5	Closure.....	25
5	REFERENCES.....	26
6	REDLINE/STRIKE-OUT VERSION of PROPOSED REVISIONS TO CONSTRUCTION QUALITY ASSURANCE / QUALITY CONTROL MANUAL, Rev.: 28b	27

1 INTRODUCTION

As a part of the on-going Low Level Radioactive Waste (LLRW) license renewal submittal Energy *Solutions* (ES) and the Division of Waste Management and Radiation Control (the Division) have identified reasons to revise the 11e.(2) and LLRW Construction Quality Assurance / Quality Control Manual, Revision: 28b (the CQA/QC Manual). ES submitted their requests for revision in writing. The Division has reviewed the submittals pertaining to this request and resolved questions through issuance of a marked-up CQA/QC Manual and follow-up meetings to which ES has responded. At the conclusion of the interim meetings the Division has concluded that it can issue approval of the proposed revisions with reasonable confidence that the proposed CQA/QC Manual will serve to protect facility workers, members of the general public, and the environment. The Division concludes that the document will satisfy applicable regulatory requirements and meet expected standards of quality.

ES and the Division have proposed multiple revisions to update a document that is integral to construction operations at the Clive low-level and 11e.(2) radioactive waste disposal facility near Clive, Tooele County, Utah, located in Section 32, Township 1 South, Range 11 West, SLBM. The purpose of this Statement of Basis (SOB) is to describe the proposed changes to the CQA/QC Manual and to provide a basis for the Division's approval of the revisions. A redline strikeout version of the proposed CQA/QC Manual is presented in the following Section 6 to this SOB.

The pertinent Radioactive Material Licenses (RML) are No. UT 2300249 and No. UT2300478 for the LLRW and 11e.(2) facilities, respectively. No new radionuclides or changes to existing radionuclide concentrations will result from the changes proposed. Therefore, no changes to the radioactive materials licenses in this respect will be required.

A detailed discussion of the proposed revisions is contained in Section 4 of this SOB. In general terms the changes proposed for this CQA/QC Manual are identified below:

- **Specifications Rewritten to Capture Change** – Revision within the CQA/QC Manual is often to capture changes mandated by outdated procedures or technology. In this CQA/QC Manual a technology change was recognized with adoption of the Trimble CCS 900 system that replaced the manufacturer abandoned CAES system.
- **Specifications Expanded** – Several specifications were expanded to capture advanced field operations that are being used by the field crews and Quality Control/Quality Assurance to resolve out-of-specification field conditions.

- **Specifications Removed** – In a few instances a specification was removed because the associated activity is no longer relevant. For example *Specification 122–Surveys*, this specification addressed criteria for quarterly surveys of the interim rad cover that was within two feet of top of waste elevation. The intent of this specification was to minimize overbuilding the waste pile and then having to remove the overbuilt material. The annual aerial surveys and the annual report now take care of this circumstance and overbuild instances are accounted for in annual surety calculations.
- **Editorial Revisions** – There were many clerical updates and typographical fixes, including the replacement of the Division acronym DWMRC with the term Director.
- **Establish Consistency within the CQA/QC Manual** –The requirement for Director approval for various work tasks was standardized throughout the CQA/QC Manual so as to be internally consistent. The details for making a formal Request for Approval were spelled-out including the means for appropriate transmittal and the importance for a timely response by Division.
- **Future Revision of the CQA/QC Manual** – Looking ahead several topics were considered for this CQA/QC Manual, however, the inclusion of the topics was pushed forward to a subsequent revision because the specification text could not be concluded. These topics included specifications for change control and revisions for quality control within tasks associated with the Containerized Waste Facility.

2 CQA/QC REVISION SUBMITTAL CHRONOLOGY

The current accepted CQA/QC Manual is Revision: 28b, dated August 18, 2017. The initial proposed revisions to the CQA/QC Manual were submitted within letters dated March 12, 2018 (CD18-0046, DRC-2018-002421) and April 8, 2018 (CD18-0078, DRC-2018-003683). The Division responded on June 14, 2018 by issuing interim review comments within a marked-up CQA/QC Manual.

With these considerations, following the April 8, 2018 submittal, *EnergySolutions* and the Division agreed to hold comment review and resolution meetings as a means to better facilitate timely exchange of review comments and thoughts between both parties. Meetings were held at the Division’s offices on the following dates: June 14, 2018; June 26, 2018; July 5, 2018; July 14, 2018; August 2, 2018; December 14, 2018; January 16, 2019; January 24, 2019; March 13, 2019, and June 5, 2019. The Division issued an interim draft CQA/QC Manual with change tracking prior to each meeting.

3 REGULATORY REQUIREMENTS

The provisions and requirements for land disposal of low-level radioactive waste are found in the Utah Administrative Code (UAC) R313-25. There are also applicable rules and provisions relevant to 11e.(2) and LLRW facility construction quality assurance and

quality control within UAC R313. Environmental Quality, Radiation Control, including: UAC R313-12 General Provisions; and UAC R313-24 Uranium Mills and Source Material Mill Tailings Disposal Facility Requirements. These regulatory requirements provide the basis for the 11e.(2) and LLRW CQA/QC Manual. The following sections of UAC R313-25 have been referred often during preparation of this Statement of Basis.

UAC R313-25-7(2).a and UAC R313-25-7(2).b provide general information on requirements for personnel qualifications and training.

UAC R313-25-8(5) and UAC R313-8(6) call for the codes, standards, and methods of construction that shall be applied to construct the land disposal facilities.

UAC R313-25-8(10) calls for a description of quality assurance programs to be a part of the construction of land disposal facilities.

UAC R313-25-8(13) calls for a description of the administrative procedures the licensee intends to apply to control activities at the land disposal facility.

UAC R313-25-12(3) describes a requirement for issuance of license to be in accordance with the performance objectives of UAC R313-25-20.

UAC R313-25-22 calls for the protection of individuals during operations.

UAC R313 -25-25 calls for the design of the near-surface land disposal site to be designed to assure the performance objectives will be met. This section calls for the design of features to direct surface water away from the disposal units as well as minimizing to the extent possible the contact of water with the waste.

UAC R313-25-26(4) through UAC R313-25-26(11) describes regulations to be followed the waste placement operations.

UAC R313-25-33 describes the requirements of the licensee to maintain records and reports in connection with licensed activities.

UAC R313-25-34 and UAC R313-25-35 describe the authority of the Division to perform tests and inspections, respectively for the administration of the rules in UAC R313-25.

4 REVISIONS TO CQA/QC MANUAL REVISION: 28b

In general terms the changes proposed for this CQA/QC Manual are identified and discussed below.

- There have been revisions within the CQA/QC Manual to capture changes mandated by outdated procedures or technology.

- Several specifications were expanded to capture advanced field operations
- Specifications were removed because the associated activity is no longer relevant.
- There have many clerical updates and typographical fixes.
- The revised CQA/QC Manual will be identified as Revision 28c.

The following sections of this SOB endeavor to illuminate the proposed changes.

4.1 Work Elements

The CQA/QC Manual is divided into 24 Work Elements along with several tables, figures, and appendices. The number of Work Elements has not changed with these proposed revisions. The work elements are organized with the sequence of waste embankment construction activities. A description of the proposed revisions within each work element and reasoning for the change is presented in the following sections. It is also clearly stated when there were no changes proposed to a specification for this revision of the CQA/QC Manual.

4.1.1 Document Control (Spec. 1 – 4)

There were no changes to the four specifications within *Work Element–Document Control*.

Late in this CQA/QC Manual revision effort an earnest attempt was made by both EnergySolutions and the Division to articulate a new specification for change control; however, as the majority of edits for this revision were concluding there were too many issues with the change control specification yet to be resolved and continuing to ironing out the text of the specification would have held the progress of many other updates to the CQA/QC manual needed for the upcoming construction season. The Division concluded with EnergySolutions that the criteria for change control should be addressed in a subsequent update to the CQA/QC Manual.

4.1.2 General Requirements (Spec. 5 – 23)

There were no changes to *Specification 5–Scope*.

The compaction criteria of *Specification 6–Runon Control During Project* and *Specification 7–Runoff Control During Project* was clarified by inserting the phrase “a minimum of” before the text of “90 percent”. Otherwise the acceptance criteria were unnecessarily too restrictive. Several redundant words were removed from the QA column of *Specification 7–Runoff Control During Project*.

There were no changes to *Specification 8–Monthly Berm Inspection*.

The revisions to *Specification 9–Berm Maintenance* were the end result of a corrective action plan (ES, 2019) addressing the breach of a runoff berm during a 2019 spring storm

event. EnergySolutions determined that the probable root cause of the breach was that the runoff ditch had diminished capacity due to the accumulation of sediments within the ditch over time. This specification was revised to include additional requirements to maintain the berm height requirement within the ditch as described in *Specification 7–Runoff Control During Project*.

There were no changes to *Specification 10–Moving or Breaching a Runoff Control Berm*; *Specification 11–Nuclear Density/Moisture Gauge Calibration*; *Specification 12–Sampling Locations for Lots*; and *Specification 13–Test Methods*.

Specification 14–QA Auditing has been revised by adding affirmative wording to the QA column to verify that the auditor’s annual QA audit report is submitted to the Division. Also, within this initial specification and then throughout the CQA/QC Manual, usage of the acronym “DWMRC” has been replaced with the term “Director”. This revision has been made at more than 160 subsequent locations in the CQA/QC Manual. This change was necessary as the authority to regulate a low level radioactive waste facility lies with the Director.

Guidance for obtaining Director approval as specified in Specification 23 has been added to subsection 15.F of *Specification 15–Test Failure Protocol*.

A typographical error was fixed in the QC section of *Specification 16–Quality of Rock* and the timing for prequalification testing of the rock borrow sources has been included. Otherwise the specification relied on a secondary Nuclear Regulatory Commission (NRC) guidance document for timing requirements.

There were no changes to *Specification 17–QC Procedures*

A requirement for Director review and **approval** of construction phase-specific drawings has been added to *Specification 18–Preconstruction Documentation & Communication*. This revision addresses the subsequent references in the CQA/QC Manual that refer to “**approved phase specific plans**”. Requirements have been included in the QC and QA columns to obtain documentation of the Director’s review and approval. Criteria have been added to the specification that the Director approval will be obtained in accordance with Specification 23. Also, a requirement that the Director is to be invited to preconstruction meetings has been added to the specification.

There were no changes to *Specification 19–Project Manager*; *Specification 20–Native Material*; and to *Specification 21–Off-site Fill/Backfill Material*.

Consistent with the global replacement of the acronym DWMRC as described previously in Specification 14, the heading of *Specification 22–DWMRC Exemption* has been revised to ‘*Director Exemption*’.

Usage of the acronym DWMRC had to be updated in *Specification 23–DWMRC Notification*. The specification heading was changed to ‘*Director Notification and Approval*’ and in this one instance the acronym “DWMRC” for the Low-Level Radioactive Waste Section Manager has been replaced with the acronym “LLRW” in order to properly reach the intend recipient. A major change was introduced to this specification which addressed the procedure of obtaining Director approval. Text was added within this specification that describes the methodology and criteria to make a written Request for Approval (or RFA) to the Director for various work tasks included in the CQA/QC Manual. This revision was part of a broader effort within the CQA/QC Manual to update and replace text that indicated tacit or implied approval by the Director if the Director had not replied within a stated timeframe. The actuality for tacit approval made it possible that standards would not be met and therefore any instance had to be removed. There are 15 instances within the CQA/QC Manual that refer to this *Specification 23*. A definition for a Designee for Director rounded off the revisions to *Specification 23*.

4.1.3 Foundation Preparation (Spec. 24 – 30)

There were no changes to *Specification 24–Scope*; and to *Specification 25–Clearing and Grubbing*.

A minor revision to the QC column of *Specification 26–Excavation* clarified that the in-place density testing would be on the backfill.

There were no changes to *Specification 27–Scarification and Compaction*; *Specification 28–Final Grading*; and to *Specification 29–Unsuitable Material*.

A revision to the specification column of *Specification 30–Foundation Approval* clarified the dimensional or physical scope of the foundation approval by adding the term “area” in two places. The terminology “*or Designee*” has been added to the specification column to be internally consistent with the QC column of the specification. Several sentences defining a Designee have been added to the specification as this distinction had been previously undefined in the CQA/QC Manual.

4.1.4 Clay Liner Borrow Material (Spec. 31 – 35)

There were no changes to *Specification 31–Scope*; *Specification 32–Clearing and Grubbing*; and to *Specification 33–Material*.

A simple revision to the QC column of *Specification 34–Protection* clarified the scope of potentially misleading wording that could be interpreted to referring to the constructed “in place” clay liner material. This specification is addressing borrow material prior to placement as clay liner material. Previously the text of this specification referred to a disposition of the clay material that is not applicable to this specification. The

specifications for protection of constructed clay liner are a part of *Work Element - Clay Liner Placement*.

There were no changes to *Specification 35–Processing*.

4.1.5 Clay Liner Test Pad (Spec. 36 – 38)

There were no changes to *Specification 36–Scope*.

The revision of *Specification 37–Notice of Test Pad Construction* is generally the first instance addressing the topic of tacit approval within the CQA/QC Manual. The circumstances for the revision involve a specification within the CQA/QC Manual that had criteria requiring an approval response from the Director prior to proceeding past a prescribed activity hold point identified in the specification. Prior to this revision, the specification was written such that the subject activity could resume and proceed past the hold point if the Director had not responded one way or another within a specified timeframe. While the previous criteria were potentially advantageous to *EnergySolutions*, the Director found the timeframe criteria to be unreasonable and that the specifications could allow circumstances that are not adequate to protect public health and safety. The previous provisions for tacit approval have been removed at this and each of the seven other instances.

The revisions to *Specification 38–Test Pad(s)* clarified that the clay liner test pad construction procedures would be outlined in an approved test pad plan. This revision emphasizes the importance for an *approved* test plan.

Specification 38–Test Pad(s) is made up of multiple subsections. There were no changes to the subsections identified as *Specification 38.A* through *Specification 38.H*.

As described above in the revisions of *Specification 37* which addressed changes to specifications requiring Director approval, *Specification 38.I* has been revised to remove the provision allowing the subject activity to proceed past a hold point without obtaining approval from the Director.

4.1.6 Clay Liner Placement (Spec. 39 – 55)

There were no changes to *Specification 39–Scope*; and to *Specification 40–Lift Identification*.

Several moderate revisions were made to *Specification 41–Placement*. The terminology “*the same*” was replaced with the term “*equivalent*” and criteria for equipment equivalency was added to the specification to allow for alternate equipment as determined to be equivalent by a registered Utah Licensed Professional Engineer. The revision included a minimum 48 hour advance notification to obtain approval from Director prior to implementation of alternate equipment. The requirements in the QC and

QA columns to observe, document, and verify the procedures used during clay placement were clarified. And the criterion for maximum clod or rock size was moved up from *Specification 43–Lift Thickness* to this specification because these criteria are important observations to be made during clay placement.

There were no changes to *Specification 42–Lift Bonding*.

Within *Specification 43–Lift Thickness* several typographical errors were fixed in the first paragraph of the QA column. The criterion for maximum clod or rock size was moved from this specification up to *Specification 41–Placement* where the criteria are more timely and relevant. EnergySolutions requested that the requirement limiting the maximum grade pole penetration into the underlying clay liner be increased from one to six inches. The Division didn't concur with the proposed increase from one inch to six inches but a compromise was reached at three inches consistent with other clay liner defect criteria.

Some minor grammatical clarification was added to the sloping criteria in *Specification 44–Keying*.

The requirement for QA to observe at least one lift being compacted was moved up from *Specification 46–Permeability* to be correctly included within *Specification 45–Compaction*. Also, the frequency for QA observation was added to the QA section. This frequency criteria for QA observation is consistent with *Specification 46–Permeability*.

The QA section of *Specification 46–Permeability* was revised with several additions of clarifying text. The frequency of QA observation was clarified and the requirement to observe at least one lift being compacted was appropriately moved from this specification up to *Specification 45–Compaction*.

Specification 47–Liner Drying Prevention has been rewritten entirely by EnergySolutions. The previous specification simply addressed clay liner material found to be out of specification by reporting the deficient condition as a non-conformance. EnergySolutions replaced this indeterminate resolution with comprehensive requirements to repair the defective clay liner. This revision better reflects EnergySolutions actual procedures for the maintenance of clay liner material placed and the repair of clay liner that has been found to be out of specification due to drying.

There were no changes to *Specification 48–Snow Removal*.

A minor revision was introduced to a subsection of *Specification 49–Cold Weather Placement of Clay Liner*. Subsection 49.B.2 of the specification includes a required procedure to “re-roll the surface with one pass of the same type of construction equipment”. The requirement for QC personnel to observe and document this activity

was added to the QC column so that a complete quality record is maintained. Also the applicability of the specification for a soil temperature ranging between 32°F and 27°F was clarified with additional text.

A few minor revisions were introduced for *Specification 50–Spring Start-up*. Within the QC column a capitalization error was fixed and the reference to specifications found ‘above’ was replaced with the specific applicable specification numbering.

There were no changes to *Specification 51–Contamination of Clay Liner*; *Specification 52–Final Grading*; and *Specification 53–Heavy Equipment on Clay Liner*.

Usage of the acronym DWMRC had to be updated in *Specification 54–DWMRC Approval*. The specification heading was changed to ‘Director Approval’ and in eight instances ‘DWMRC’ was replaced with ‘Director’. The sequence of criteria within the QA column was revised to reflect a more logical sequence of events. Additionally, the specification was clarified such that the Director approval should be obtained “prior” to proceeding with the subsequent lifts.

Specification 55–Liner Protective Cover has been completely rewritten by EnergySolutions. The previous specification for protective cover had been interpreted to require any overbuilt underlying clay liner material had to be cut away prior to placement of liner protective cover material. This revision is now specific with acceptance criteria of the protective cover material and allows over-built clay liner material to be utilized as part of the subsequent liner protective cover. The liner protective cover is essentially considered to be contaminated material even though there is no waste in the material and moving the material was unnecessary.

4.1.7 Waste Placement with Compactor (Spec. 56 – 70)

There were no changes to *Specification 56–Scope*, and to *Specification 57–Applicability*.

A grammatical revision was introduced to this entire Work Element starting with *Specification 58–Definitions*. The acronym CAES is being replaced with the acronym CCS. As explained below the CAES software and hardware package is no longer supported by Caterpillar and Trimble’s CCS900 system has been adopted to replace CAES. This revision of the acronym occurs elsewhere in this Work Element within Specifications 58 through 70.

In March of 2016, Caterpillar informed EnergySolutions of their future intent to discontinue support of their Computer-Aided Engineering System or CAES. As approved in the specifications of *Work Element–Waste Placement with Compactor*, CAES was relied upon to track and document both compactive effort delivered by passes of a CAT 826 landfill compactor and the resultant thickness of the underlying waste lift. In near real time the CAES package would indicate to the CAT 826 equipment operator

and to Q/C personnel when a lift area had successfully satisfied preprogrammed acceptance criteria. Fortunately, *EnergySolutions* was able to obtain and perform a blind demonstration of Trimble’s CCS900 Compaction Control System (CCS) simultaneously alongside the CAES prior to Caterpillar’s discontinuance of CAES. The Trimble CCS system was able to incorporate the same computer algorithm utilized by CAES with a finer resolution of the data collection. The CCS system was demonstrated alongside the CAES to the Division and the Division found the output to be adequately comparable. As described in Specification 66 some acceptance criteria had to be adjusted to account for the higher resolution and higher quality of data from the CCS device.

The revision to *Specification 59–Liner Protection* was simple terminology usage. In the last sentence the term “*will*” was replaced with the term “*shall*”.

There were no changes to *Specification 60–Lift Identification; and Specification 61–Lift Acceptance*.

There were several procedural clarifications to the QC and QA columns of *Specification 62–Lift Thickness*. Also, *EnergySolutions* had proposed revising a portion of *Specification 62–Lift Thickness* with the deletion of the side slope thickness pixel criteria as described in the second paragraph of the QC column. Subsequent discussion during interim review meetings the request for the subject deletion was rescinded by *EnergySolutions*.

There were no changes to *Specification 63–Lift Area* and *Specification 64–Classifications*.

The revision within the Q/C column of *Specification 65–Terracing of Lifts* was simple terminology usage. In the first and second sentences the terms “*of*” and “*are*” were replaced with the terms “*between*” and “*is*”, respectively.

The CCS pixel acceptance criteria of *Specification 66–Compaction* for the CCS system has been revised from the previous 3.3 foot x 3.3 foot grid to the one-foot x one-foot grid to account for the higher resolution of data being collected by CCS. The outdated CAES methodology was no longer applicable. Clarifying text and acceptance criteria was also included to address the in-field interface between previously placed obstructions and the higher resolution of data collected by the CSS system.

The revision to subsection 67.A of the specification column of *Specification 67–Compaction without CCS* was simple terminology usage. In the first sentence the terminology “*Verbal notice*” was replaced with the affirmative term “*Notice*”. In addition this specification had multiple replacements of the acronym CAES with the acronym CCS.

There were no changes to *Specification 68-Debris Placement; Specification 69-Debris Size; and to Specification 70-Snow Removal.*

4.1.8 Waste Placement without Compactor (Spec. 71 – 100)

There were no changes to *Specification 71-Scope; Specification 72-Lift Identification; Specification 73-Lift Acceptance; Specification 74-Lift Thickness; Specification 75-Compaction; and to Specification 76-Classification.*

A minor revision to *Specification 77-Terracing of Lifts* was made to fix a typographical error.

Debris Placement (Specifications 78 through 83)

Specification 78-Debris Definition was completely rewritten using the same definitions and the specification heading was changed to ‘*Definitions*’. Contrary to the subject heading, the previous text essentially defined material other than debris. The rewritten specification now highlights definitions for six different items.

A revision to *Specification 79-Debris Placement Methods* was made to address possible timing requirements for CLSM placement as foundation material below large objects and large components. The window of time allowed for CLSM placement was reduced from 30 days to 14 days. The reduction in allowed time was made in consideration of the potential for instability once the large object has been placed on the ground.

There were no changes to *Specification 80-Debris Quantity in Soil Waste Lifts; Specification 81-Wind Dispersible Debris; and Specification 82-Debris Size.*

There were several revisions to *Specification 83-Resin Lifts*. This disposal technique for resin wastes presents potential technical issues that may require further analysis. ES does not currently employ this specification in connection with the disposal of resin wastes. Rather than remove this specification, the revisions require *EnergySolutions* to obtain prior Director approval of plans to dispose of resin wastes in accordance with this specification. Criteria have been added to the specification that Director approval will be obtained in accordance with *Specification 23*. Requirements have been added to the QA section to provide QC with Director approval documentation.

CLSM Pours (Specifications 84 through 93)

There were no changes to *Specification 84-CLSM Pyramids and to Specification 85-Director Notification of CLSM Pours.*

The first sentence of the QC column for *Specification 86-CLSM Design Specifications* has been rewritten. The new wording clarifies that testing will be done for each day’s production and the sequence of testing described. There was a possibility of

misunderstanding the frequency of testing as originally worded. Also, a typographical error was fixed in the QC column.

There are no changes to *Specification 87–CLSM Placement of Uncontainerized Debris*; and to *Specification 88–CLSM Pours with Debris-filled Containers*.

The first sentence of *Specification 89–CLSM Pours with Soil-filled Containers* has been clarified by including terminology that has been defined earlier in the CQA/QC Manual.

A few minor revisions were made within *Specification 90–CLSM Pours with Resin-filled Containers*. Text was added to confirm the applicability to resin-filled containers and that certain containers are to be pierced with ‘a minimum of’ one hole prior to CLSM placement. Text was also added to improve the filling of headspace voids of containers with diameters less than three feet with CLSM up to the highest point of a container.

There are no changes to *Specification 91–Final CLSM Pour Surface*.

There has been a minor change to *Specification 92–Proof-Roll Testing* and to the QC column to clarify that proof roll testing pressure is applied by the ‘wheel’ surface load.

The QC column of *Specification 93–Six-Inch Cap* was corrected by removing ‘Contractor’s’ from the CLSM compressive strength reporting requirement. The CLSM compressive strength test reporting can be performed by EnergySolutions or a qualified testing subcontractor

Stored Waste (Specifications 94 through 95)

The subsection heading ‘*Stored Waste (Specifications 94 through 95)*’ was added to *Work Element–Waste Placement without Compacter* for clarification purposes as the specifications transitioned from CLSM placement to the storage of waste.

There were no changes to *Specification 94–LLRW Stored Waste*.

A minor revision was made to *Specification 95–11e.(2) Stored Waste*. The last sentence of the specification limiting the duration of storage of 11e.(2) waste was deleted and the reference to RML 2300478 Condition 10.14.d has been updated to reflect the current 11e.(2) License. The condition states the maximum volume of waste that may be stored as in-cell bulk storage on site prior to disposal shall not exceed 10,000 yd³ or (7,645.55 m³) at any one time.

Cold Weather Placement (Specifications 96 through 98)

There were no changes to *Specification 96–Frozen Material*.

The first sentence of *Specification 97–Placement of Waste during Cold Weather* has been

clarified by replacing the term “*placed*” with the term “*disposed*”. This revision was to differentiate between stored waste and disposed waste.

There were no changes to *Specification 98–Snow Removal*.

Waste Placement without Compactor (continued)

There were no changes to *Specification 99–Final Grading before Temporary Cover Placement*.

As described above in the revisions of *Specification 37* which addressed changes to specifications requiring Director approval, *Specification 100–Regulatory Approval* has been revised to remove the provision allowing the subject activity to proceed past a hold point without obtaining approval from the Director.

4.1.9 Containerized Waste Facility Waste Placement Test Pad (Spec. 101 – 103)

There were no changes to *Specification 101–Scope*

As described above in the revisions of *Specification 37* which addressed changes to specifications requiring Director approval, *Specification 102–Notice of Test Pad Construction* has been revised to remove the provision allowing the subject activity to proceed past a hold point without obtaining approval from the Director.

Specification 103–Containerized Waste Placement Test Pad(s) is made up of multiple subsections. Other than a few instances where ‘*DWMRC*’ was replaced with ‘*Director*’, there were no changes to the subsections *Specification 103.A, through 103.D, and 103.F*.

Specification 103.E was clarified by inserting the term ‘*pad*’ following the word ‘*test*’ in the last sentence of the subsection. Also the terms ‘*Utah Licensed*’ were inserted before the words ‘*Professional Engineer*’.

As described above in the revisions of *Specification 37* which addressed changes to specifications requiring Director approval, *Specification 103.F* has been revised to remove the provision allowing the subject activity to proceed past a hold point without obtaining approval from the Director.

4.1.10 Containerized Waste Facility Waste Placement (Spec. 104 – 115)

There were no changes to *Specification 104–Scope*; and to *Specification 105–Lift Identification*.

The revisions to *Specification 106–Lift Acceptance* consisted of including the requirement to have a preceding Containerized Waste Facility (CWF) waste lift accepted before placing the next CWF waste lift. This requirement is consistent with waste placement with a compactor *Specification 61 -Lift Acceptance* and with waste placement

without a compactor *Specification 73–Lift Acceptance*. Requirements were added to the QC and QA columns to document, and verify that the lift acceptance procedures used during CWF waste lift placement were followed.

Specification 107–Definitions includes seven material definitions that are applicable and pertinent to the Containerized Waste Facility. The definitions of the following terms were revised as explained:

There were no changes proposed to the definition of *Backfill*.

The definition of *Backfill Cover* has been revised to require the material to not be cohesionless or in other words Backfill Cover is to consist of a cohesive soil material. The engineering of Backfill Cover is described in AMEC, 2001. Backfill cover and its cohesive nature is intended to prevent an hour glass effect if an accidental void were to develop in the lower CWF waste lift causing the sandy (cohesionless) backfill material of the upper lift to freely flow into a lower lift void resulting in unacceptable void space within the upper waste lift. This condition would then in turn result in an unacceptable performance of the waste embankment and potentially substandard cover performance. This criterion for cohesive soil material should better capture the intent of the gradation testing that had been required in *Specification 112–Backfill Cover*. There were no particle distribution criteria in *Specification 112–Backfill Cover*.

A new definition was added to define the term *Caisson*. The term caisson is used in a number of places in a context that was not consistent with a typical definition of caisson. The definition provided explains the usage of caissons in the Containerized Waste Facility to properly establish a position for the standard or large liners.

The definition of *Containerized Waste* has been revised to resolve an inconsistency with Section VIII of the Waste Characterization Plan. The last sentence discussing Certified Containerized Waste was rewritten. The terminology “*is defined as*” has been replaced with “*consists of*”. As described above the term caisson and associated defining text has been added to the list of items defined in this subsection.

There were no changes to the remaining definitions within *Specification 107–Definitions* including the definitions of *Containerized Waste Facility (CWF) Pyramid*, *Intermediate Sand*, *Lift*, and *Removable Steel Form*.

Specification 108–Containerized Waste Placement is a nine section specification. In subsection 108.A it has been clarified that CWF containers are to be spaced apart from one another by container type as illustrated in CQA/QC Manual Figures 7 & 8. Also, in the fourth paragraph of the QC column the terminology of “*by the*” was replaced with the terms “*during the*” for clarification.

EnergySolutions requested that Subsection 108.B be clarified to make a distinction that caissons without waste in them can be removed without notifying the Director. This was acceptable to the Division because the distinction between filled and unfilled caissons was previously unclear. The term “*layer*” was removed following the word ‘backfill’ because the sand backfill material surrounds each container from top to bottom as the sand mitigates the annular void space between each container rather than performing as a layer. Also text was added to the end of this subsection emphasizing that steel forms can be in contact with adjacent steel forms.

In subsection 108.C it has been clarified such that unusually shaped containers shall not be taller in height than the requirements of this specification.

There were no changes to subsection 108.D.

As has been changed in subsection 108.B, subsection 108.E has been clarified that caissons without waste in them can be removed without notifying the Director and the word “*layer*” was removed from the text.

There were no changes to subsection 108.F.

In subsection 108.G the undefined term “*Sand*” was replaced with the proper term “*Backfill*”.

There were no changes to subsection 108.H.

A revision to subsection 108.I clarified that the lot size for placing containers other than standard or large liners of ion-exchange resins could be shaped to not exceed 2500 square feet instead of a specific square shape of a 50 foot x 50 foot area. The specific square areal dimensions were not consistent with how operations occur in the landfill.

Specification 109-Pyramid Controls is an eight section specification. A minor revision has been made to subsection 109.F. Subsection 109.F has been clarified by replacing the term ‘*container*’ with the term ‘*CWF*’. Guidance was also added to refer to Specification 110 for specifications relevant to usage of CLSM as fill material.

A minor revision to the first sentence of *Specification 110–CLSM Use as Fill* was made in order to clarify the specification by replacing the term “*container*” with the term “*CWF*”. Also the referenced specifications were corrected from *Specifications 84 and 85* to *Specification 85 and 86*. The correction of this typographical error makes the document consistent with older CQA/QC Manuals when only the specification headings were referred to.

There were no changes to *Specification 111–Intermediate Sand*.

Several revisions were made to *Specification 112–Backfill Cover*. The minimum number of in-place compaction tests was revised from two to one per lift. And the criterion to perform a gradation test was removed because there are no gradation specifications other than the material must be cohesive soil material. In support of no longer requiring gradation testing the criterion of a cohesive backfill soil has been included in the definition for Backfill Cover in *Specification 107–Definitions*.

There were no changes to *Specification 113–Set Back of Waste*.

The specification column of *Specification 114–Snow Removal* has been revised with a better description of the work tasks relevant to this specification. The added work tasks were previously implied, but unnecessarily undefined.

The name of *Specification 115– Cold Weather Placement of Flowable Sand Backfill* has been renamed once again to *Specification 115–Cold Weather Placement of Backfill, Intermediate Sand, and Backfill Cover*. The purpose for the change was to use terms consistent with the Work Element and the possibility of encountering other material applicable to this specification. A few other revisions were minor and were limited to grammatical corrections.

4.1.11 Interim Radon Cover Placement and Monitoring (Spec. 116 – 123)

There were no changes to *Specification 116–Scope*; *Specification 117–Definition*; *Specification 118–Interim Rad Cover Material*; *Specification 119–Interim Rad Cover Placement*; *Specification 120–Operational Controls*; and to *Specification 121–Inspections*.

The *Specification 122–Surveys* has been deleted in its entirety and replaced with the placeholder ‘122) Reserved’. The specification addressed criteria for quarterly surveys of the interim rad cover that was within two feet of top of waste elevation. The intent of this specification was to minimize overbuilding the waste pile and then having to remove the overbuilt material. The annual aerial surveys and the annual report now take care of this circumstance and overbuild instances are accounted for in surety calculations.

The revision to *Specification 123–Removal* includes the addition of acceptance criteria for the circumstance when Interim Rad Cover is to be left in place and considered a waste lift. Prior to the addition of this criterion the situation was unspecified.

4.1.12 Temporary Cover Placement and Monitoring (Spec. 124 – 133)

There were no changes to *Specification 124–Scope*; and to *Specification 125–Temporary Cover Material*.

The revisions to *Specification 126–Temporary Cover Placement* included the addition of text on a simple procedure to key in new temporary cover placement with existing old

temporary cover. The added text is as follows: ‘*The interface between old and new cover lifts shall be compacted with a minimum of one pass*’. The specification was previously silent on the circumstance. Requirements were added to the QC column to document, and verify that the construction procedure was followed at the interface between old and new temporary cover placement.

There were no changes to *Specification 127–Pre-Final Cover Settlement Monuments*; *Specification 128–Interim Cover Settlement Monuments Placement*; and to *Specification 129–Survey Requirements*.

Specification 130–Survey Interval was revised by adding a reference to *Specification 133–Transition to Final Cover* to emphasize the frequency and criteria of pertinent surveys.

There were no changes to *Specification 131–Inspection*

The name of *Specification 132–Reporting* was renamed to *Specification 132–Annual Reporting*. The purpose for the change was to distinguish this specification from other reporting specifications.

There were no changes to *Specification 133–Transition to Final Cover*.

4.1.13 Radon Barrier Borrow Material (Spec. 134 – 138)

There were no changes to *Specification 134–Scope*; and to *Specification 135–Clearing and Grubbing*.

Within *Specification 136–Material-Natural Clay Mixture* the incorrect terminology of “*be defined*” was replaced with the more appropriate terminology “*meet the specification*”. The requirement for the borrow soil to be classified as **both** CL and ML has been corrected to state that the soil is to be classified as one or the other. Classifying the soils as both an ML and CL is not consistent with Unified Soil Classification System procedures. And the title of the Unified Soil Classification System has been corrected.

There were no changes to *Specification 137–Protection*; and to *Specification 138–Processing*.

4.1.14 Radon Barrier Test Pad (Spec. 139 – 141)

There were no changes to *Specification 139–Scope*.

As described earlier in the revisions of *Specification 37* which addressed changes to specifications requiring Director approval, *Specification 140–Notice of Test Pad Construction* has been revised to remove the provision allowing the subject activity to proceed past a hold point without obtaining approval from the Director.

A revision to the first and second paragraphs of *Specification 141–Test Pad(s)* replaced the term “*will*” with the term “*shall*”. In addition the term “*proposed*” was replaced with the terminology “*approved in the test plan*” in the first paragraph. A revision to the second paragraph of the QC column of the specification replaced the term “*lift*” with the correct term “*lot*”. These revisions were to clarify the context of the Test Pad specifications.

Specification 141–Test Pad(s) is made up of multiple subsections. There were no changes to the subsections of *Specification 141.A* through *Specification 141.F*

The revision to *Specification 141.G* clarified that the criterion for permeability is currently specified in two locations.

There were no changes to the subsection of *Specification 141.H*.

As described earlier in the revisions of *Specification 37* which addressed changes to specifications requiring Director approval, *Specification 141.I* has been revised to remove the provision allowing the subject activity to proceed past a hold point without obtaining approval from the Director.

4.1.15 Radon Barrier Placement (Spec. 142 – 163)

There were no changes to *Specification 142–Scope*; and to *Specification 143–Notice of Cover Construction*.

A few minor revisions have been made to *Specification 144–Project Area* which included a clarification to the design details as depicted on approved phase-specific plans. Emphasis was also added for ‘phase-specific’ plans at the end of the specification. Also criteria have been added to the specification that Director approval will be obtained in accordance with *Specification 23*.

There were no changes to *Specification 145–Lift Identification*.

As has been revised earlier in *Specification 41* for clay liner placement, several moderate revisions were made to *Specification 146–Placement* for radon barrier placement. The terminology “*the same*” was replaced with the term “*equivalent*” and criteria for equipment equivalency was added to the specification to allow for alternate equipment as determined by a registered Utah Licensed Professional Engineer. The revision included a minimum 48 hour advance notification to obtain approval from the Director prior to implementation of alternate equipment. Criteria have been added to the specification that Director approval will be obtained in accordance with *Specification 23*. The requirements in the QC and QA columns to observe, document, and verify the procedures used during clay placement were clarified. And the criterion for maximum clod or rock size was moved up from *Specification 148–Lift Thickness* to this specification because

these criteria are important observations to be made during radon barrier placement.

A minor grammatical change to remove a redundant word was made to *Specification 147–Lift Bonding*.

Within *Specification 148–Lift Thickness* a typographical error was fixed in the first paragraph of the specification. The incorrect term “*liner*” was replaced with the correct term of “*radon barrier*”. The criterion for maximum clod or rock size was moved from this specification up to *Specification 146–Placement*. EnergySolutions requested that the requirement for maximum allowed grade pole penetration into the underlying clay radon barrier be increased from one to six inches. The Division didn’t concur with the proposed increase from one inch to six inches but a compromise was reached at three inches. Three inches is consistent with other radon barrier defect criteria (see *Specification 154*).

There were no changes to *Specification 149–Keying-In*; *Specification 150–Compaction*; to *Specification 151–Permeability*.

Within *Specification 152–Layer Thickness* the following minor revisions were made. EnergySolutions had requested the specification be deleted in its entirety on the basis that it was redundant with the approved design plans. The Director concurred with removing the duplication of details that are specified on the approved design plans but insisted on including references to the approved design plans.

Text was added to *Specification 153–Transitions between Radon Barriers with Different Specified Permeabilities* so as to clarify the minimum and maximum acceptable thickness of the higher permeability component of the radon barrier. Late in the CQA/QC Manual revision process EnergySolutions requested an allowance to construct the sequence of higher 1×10^{-6} cm/sec permeability radon barrier material with the lower 5×10^{-8} cm/sec permeability material; however this change was not accepted during the revision review process due to the late consideration. EnergySolutions argued that there is no specified minimum permeability for the upper radon barrier material. This revision would have allowed the lower 5×10^{-8} cm/sec radon barrier material to be overbuilt and then incorporated into the 1×10^{-6} cm/sec material. The possible impacts to cover modeling were beyond the scope. However, this idea could be reconsidered during a subsequent revision to the CQA/QC Manual.

Specification 154–Radon Barrier Drying Prevention has been rewritten entirely by EnergySolutions. Text was added and/or deleted from the specification to include criteria for some unclear circumstances. The requirement to document an unacceptable condition of unfinished radon barrier with a non-conformance report was deleted in consideration that construction of the cover material has not been finish. The text of the specification addressing finished or unfinished radon barrier material found to be out of specification

was replaced entirely with more comprehensive requirements to repair the defective radon barrier material rather than just reporting the condition as a non-conformance. Also, at several locations the incorrect term “*liner*” was replaced with the correct term of “*radon barrier*” in the QC and QA sections. This revision better reflects EnergySolutions actual procedures for the maintenance radon barrier material placed and the repair of radon barrier that has been found to be out of specification due to drying.

There were no changes to *Specification 155–Snow Removal*.

The revisions to *Specification 156–Cold Weather Placement of Radon Barrier* were to simply replace an indirect call-out to a reference with a direct call-out to the intended Specification 157. Also text was added to clarify the testing lot size for radon barrier material exposed to cold weather.

The changes to *Specification 157–Spring Start-up* addressed an indirect reference to testing criteria found elsewhere in the CQA/QC Manual with specific testing criteria for spring start-up of radon barrier placement.

There were no changes to *Specification 158–Contamination of Radon Barrier*; *Specification 159–Final Grading*; *Specification 160–Erosion Control for Exposed Soil*; *Specification 161–Radiological Sampling for Exposed Soil*; and *Specification 162–Heavy Equipment on Radon Barrier*.

Usage of the acronym DWMRC had to be updated in *Specification 163–DWMRC Approval*. The specification heading was changed to ‘*Director Approval*’ and in seven instances ‘*DWMRC*’ was replaced with ‘*Director*’. Additionally, the specification was clarified such that Director approval shall be obtained “*prior*” to proceeding with the subsequent design lifts. As described earlier in the revisions of *Specification 37* which addressed changes to specifications requiring Director approval, *Specification 163* has been revised to remove the provision allowing the subject activity to proceed past a hold point without obtaining approval from the Director.

4.1.16 Filter Zone (Spec. 164 – 168)

There were no changes to *Specification 164–Scope*.

An incorrect term within the Q/C column of *Specification 165–Type B Filter Zone Permeability* has been corrected. The term “*gradation*” has been corrected to the term “*permeability*”.

There were no changes to *Specification 166–Gradation*.

Absent text was inserted into *Specification 167–Placement* to include the placement of filter zone material over both the radon barrier design layer and the sacrificial soil design

layer.

There were no changes to *Specification 168–Snow Removal*.

There have been two revisions of *Specification 169–Final Grading*. First the requirements for observing grade pole installation method have been moved from the QC column to the QA column. Second an incorrect term within the second paragraph of the Q/C column has been corrected. The term “rip-rap” has been corrected to the term “filter zone”.

4.1.17 Sacrificial Soil Placement (Spec. 170 – 174)

There were no changes to *Specification 170–Scope* and *Specification 171–Placement*.

The criteria for sacrificial soil gradation testing frequency in *Specification 172–Gradation* has been revised to be consistent with NRC guidance that is contained in NUREG-1623, Appendix F that allows for a gradation test every 10,000 yd³ instead of testing every 2,500 yd³. However, if material is transferred directly from the sacrificial soil production facility to the cell, a higher frequency of gradation testing was included to account for the need to determine acceptable gradation bands of sacrificial soil, that are a function of the underlying filter zone material, additional wording with regards to timing of gradation testing has been added.

There were no changes to *Specification 173–Snow Removal*.

A revision to *Specification 174–Final Grading* includes the addition of text to confirm not only the grade (or slope) of sacrificial soil but also the in-place thickness of the material placed. This requirement was already adequately included in the QC column.

4.1.18 Rock Erosion Barrier (Spec. 175 – 180)

There were no changes to *Specification 175–Scope*.

The text of *Specification 176–Gradation* has been revised by clarifying several terms. In the first sentence of the specification the terminology “erosion material” was added to better identify the applicable material. In the QC column the relevance of this gradation testing as opposed to rock source prequalification testing was clarified. Text was added to the QC column that the gradation testing of this specification was to occur following the gradation testing for rock quality scoring as required in *Specification 16–Quality of Rock*.

Specification 177–Placement has been revised and corrected to refer to minimum rock layer thickness designs presented in the approved engineering design drawings for the CAW and 11e.(2) embankments that are listed in the Groundwater Quality Discharge Permit UGW45005. And terminology in the QA column has been corrected from “filter

rock” to “*rock erosion*”.

There were no changes to *Specification 178–Snow Removal*.

A minor revision was made to the QC column of *Specification 179–Final Grading*; the incorrect term “*sacrificial soil*” was replaced with the correct term “*rock erosion barrier*”.

There were no changes to *Specification 180–Notice of Cover Construction*.

4.1.19 Drainage Ditch Imported Borrow (Spec. 181 – 184)

There were no changes to *Specification 181–Scope* and *Specification 182–Clearing and Grubbing*.

The QC column of *Specification 183–Material* has been revised. Within the QC column the frequency of acceptance gradation testing for the ditch imported borrow material has been reduced from every 3,000 yd³ to every 5,000 yd³ to be internally consistent with the other similar CQA/QC specifications (including *Specifications 6, 7, 33, 125, and 136*). And the text “*for use in the road*” has been deleted because this specification is applicable to constructing drainage ditches.

Revisions were made to *Specification 184–Lift Thickness* to make the specification more applicable to drainage ditch construction. In subsection 184.A the criteria requiring grade poles not be installed deeper than 1-inch was removed because ditch construction is not underlain by waste. In subsection 184.B text was added to better define the frequency of thickness acceptance testing. The frequency of measurements was previously undefined.

4.1.20 Drainage Ditches (Spec. 185 – 190)

There were no changes to *Specification 185–Scope*.

There were several revisions to *Specification 186–Excavation*. The criteria to notify the Division of a ditch diversion were revised to be less subjective. The new criteria require *EnergySolutions* to obtain the Director approval of plans to divert a drainage ditch. Criteria have been added to the specification that Director approval will be obtained in accordance with *Specification 23*. Requirements have been added to the QA section to provide QC with Director approval documentation. In the third paragraph of the specification the term “*select*” was unclear and has been replaced with a defined material type of “*drainage ditch borrow*”. To address testing requirements for small lot sizes of drainage ditch construction criteria was added requiring a minimum of one test per construction phase.

A minor revision was made to *Specification 187–Final Grading*, the term “*riprap*” was removed since it is not applicable to the next design layer of drainage ditch construction.

Riprap is underlain by filter zone material throughout the drainage ditch network.

There were no changes to *Specification 188–Filter Zone and Rock Erosion Barrier*.

As in revision to Specification 187 above, a minor revision was made to *Specification 189–Erosion Control for Exposed Soil*, the term “*riprap*” was removed since it is not applicable to drainage ditch construction.

A minor grammatical error was corrected in *Specification 190–Radiological Sampling for Exposed Soil*. The word “*this*” was added to the last sentence of subsection 190.B.

4.1.21 Inspection Road (Spec. 191 – 195)

Other than the changes to *Specification 192–Material* there were no changes to the specifications within the *Work Element–Inspection Road*.

The revisions to *Specification 192–Material* replaced the generic road base gradation table for a road base that would be readily available and manufactured according to Utah Department of Transportation (UDOT) road base specifications. The selected road base mix design would be approved by a Utah Licensed Professional Engineer.

4.1.22 Permanent Chain Link Fences (Spec. 196 – 198)

There were no changes to the specifications within the *Work Element–Permanent Chain Link Fences*.

4.1.23 Settlement Monitoring (Spec. 199 – 204)

There were no changes to *Specification 199–Scope*.

A minor revision was made to *Specification 200–Settlement Monuments*. In the second paragraph a call-out to the 11e.(2) embankment was added to the text. A call-out to the 11e.(2) embankment was absent in previous CQA/QC Manuals.

There were no changes to *Specification 201–Settlement Monument*; *Specification 202–Survey Requirements*; *Specification 203–Survey Interval*; and *Specification 204–Reporting*.

4.1.24 Annual As-Built Report (Spec. 205 – 207)

There were no changes to *Specification 205–Scope*.

The scheduling criteria were revised in *Specification 206–Aerial Survey Requirements*. The survey performance window was moved closer to the submittal date of the Annual As-Built report. The revision results in survey data that is more current to the submittal requirement of the Annual As-Built report.

A minor grammatical error was corrected in *Specification 207–Annual As-Built Volumes*. The term embankment was made plural because this specification applies more than one embankment.

4.2 Tables

4.2.1 Table 1 – Reserved

4.2.2 Table 2 – Material Specifications for Portland Cement CLSM

No change to Table 2 of CQA/QC Manual, Revision: 28b.

4.3 Figures

There are no changes proposed to the following Figure 1 through Figure 8 of CQA/QC Manual, Revision: 28b.

4.3.1 Figure 1 – LARW Settlement Monuments, May 1, 2006

4.3.2 Figure 2 – Class A West Settlement Monuments, rev. 4, September 18, 2015

4.3.3 Figure 3 – Mixed Waste Settlement Monuments

4.3.4 Figure 4 – 11e.(2) Settlement Monuments rev.2, October 10, 2008

4.3.5 Figure 5 – Cross Section of 11e.(2) and Class A West Settlement Plate Monument Installation, rev. 1, August 19, 2015

4.3.6 Figure 6 – Reserved (rev. 26a, September 15, 2011)

4.3.7 Figure 7 – CWF Cell Construction Requirements, Sheet 1 of 2, Rev. 1, 10/10/07

4.3.8 Figure 8 – CWF Cell Construction Requirements, Sheet 2 of 2, Rev. 0, 10/10/07

4.4 Appendices

4.4.1 Appendix A – List of CQA/QC Documentation Forms

No change to Appendix A of CQA/QC Manual, Revision: 28b.

4.4.2 Appendix B – Testing Methods, rev. 6, October 11, 2010

No change to Appendix B of CQA/QC Manual, Revision: 28b.

4.4.3 Appendix C – Rock Quality Scoring

No change to Appendix C of CQA/QC Manual, Revision: 28b.

4.5 Closure

This concludes the SOB for the proposed revisions to the CQA/QC Manual Revision 28b. It is the Division’s understanding that the final approved CQA/QC Manual will be designated by EnergySolutions as the *11e.(2) and LLRW Construction Quality Assurance / Quality Control Manual, Revision: 28c*.

5 REFERENCES

AMEC Earth & Environmental, Inc., Response to Interrogatory Number 2: Placement of HIC's in Caissons, Envirocare Class A Disposal Facility, Near Clive, Utah, October 1, 2001. AMEC Job No. 0-817-003313, **Task 10**.

EnergySolutions, LLC. 2019. Radioactive Material License UT2300249, Corrective Action Plan for Berm Breach NOED dated June 20, 2019. CD19-0163. July 25, 2019. (DRC-2019-007290).

EnergySolutions, LLC. 2018a. Groundwater Quality Discharge Permit No. UGW450005, Revision to Drawing 10014 C04. CD18-0078. April 8, 2018. (DRC-2018-003683).

EnergySolutions, LLC. 2018b. Radioactive Material License UT2300249, CQA/QC Manual Revision Request. CD18-0046. March 12, 2018. (DRC-2018-002421).

Johnson, T.L., "Design of Erosion Protection for Long-Term Stabilization," NUREG-1623, U.S. Nuclear Regulatory Commission, September 2002.

**6 REDLINE/STRIKE-OUT VERSION of PROPOSED REVISIONS TO
CONSTRUCTION QUALITY ASSURANCE / QUALITY CONTROL MANUAL,
Rev.: 28b**

LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Manual

LLRW and 11e.(2) CQA/QC Manual

TABLE 1 – CQA/QC ACTIVITIES

Work Elements:

Document Control	Specifications 1-4	Page 4
General Requirements	Specifications 5-23	Page 5
Foundation Preparation.....	Specifications 24-30	Page 13
Clay Liner Borrow Material	Specifications 31-35	Page 15
Clay Liner Test Pad	Specifications 36-38	Page 17
Clay Liner Placement	Specifications 39-55	Page 21
Waste Placement with Compactor.....	Specifications 56-70	Page 28
Waste Placement without Compactor.....	Specifications 71-100	Page 35
CWF Waste Placement Test Pad.....	Specifications 101-103	Page 56
CWF Waste Placement.....	Specifications 104-115	Page 59
Interim Rad Cover Placement and Monitoring....	Specifications 116-123	Page 71
Temporary Cover Placement and Monitoring	Specifications 124-133	Page 74
Radon Barrier Borrow Material.....	Specifications 134-138	Page 80
Radon Barrier Test Pad.....	Specifications 139-141	Page 82
Radon Barrier Placement.....	Specifications 142-163	Page 86
Filter Zone	Specifications 164-169	Page 95
Sacrificial Soil Placement.....	Specifications 170-174	Page 97
Rock Erosion Barrier	Specifications 175-180	Page 99
Drainage Ditch Imported Borrow	Specifications 181-184	Page 101
Drainage Ditches	Specifications 185-190	Page 103
Inspection Road	Specifications 191-195	Page 106
Permanent Chain Link Fences.....	Specifications 196-198	Page 108
Settlement Monitoring.....	Specifications 199-204	Page 112
Annual As-Built Report.....	Specifications 205-207	Page 115

TABLE 2 – MATERIAL SPECIFICATIONS FOR PORTLAND CEMENT CLSM.. Page 117

FIGURE 1 – Reserved

FIGURE 2 – Class A West Settlement Monuments, Rev. 4, April 20, 2017

FIGURE 3 – Mixed Waste Settlement Monuments, Rev. 3, April 20, 2017

FIGURE 4 – 11e.(2) Settlement Monuments, Rev. 4, August 16, 2017

FIGURE 5 – Cross Section of 11e.(2) and Class A West Settlement Plate Monument Installation, Rev. 1, August 19, 2015

FIGURE 6 – Reserved

FIGURE 7 – CWF Cell Construction Requirements, sheet 1 of 2, Rev. 1, 10/10/07

FIGURE 8 – CWF Cell Construction Requirements, sheet 2 of 2, Rev. 0, 10/10/07

Appendix A – List of CQA/QC Documentation Forms

Appendix B – Testing Methods

Appendix C – Rock Quality Scoring

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - DOCUMENT CONTROL**

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
1) SCOPE: This work element applies to all construction activities in the Class A West and 11e.(2) embankments.		
2) QC DOCUMENTATION APPROVAL: QC documentation shall be approved/rejected by the QC Supervisor and submitted to Quality Assurance.	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 Supervisor and Quality Assurance. 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.
3) QC DOCUMENTATION FILES: Original QC documents shall be maintained. A copy shall be saved into the electronic database.	After the QC documentation has been accepted by QA, a copy of the original shall be saved into the electronic database.	Periodically review the electronic database to ensure the correct documentation is being saved.
4) QA DOCUMENTATION FILES: Original QA documents shall be maintained. A copy shall be saved into the electronic database.	None	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>5) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>6) RUNON CONTROL DURING PROJECT: The perimeter berms shall be constructed to a minimum of three feet above the ground elevations (GL) shown in the engineering drawings. Berm material will be as specified in Specification 33. The first lift of material shall have an uncompacted thickness of no greater than 12 inches. There is no lift thickness specification for subsequent lifts. Elevations for the berms between the specified ground elevations shall be linearly interpreted between the shown elevations. The berms shall be a minimum of four feet wide at the top and shall be compacted to <u>a minimum of 90</u> percent of a standard Proctor.</p>	<p>Verify that the required berms have been constructed to the specified dimension. Record any findings on the Daily Construction Report. Conduct laboratory classification (ASTM D2487) and Standard Proctor tests (ASTM D698) at a rate of one test per 5,000 linear feet of berm, with a minimum of one test per berm. Conduct one density test per 300 linear feet 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.</p>	<p>Verify that berms have been tested and inspected by QC personnel and that appropriate density test have been conducted.</p>
<p>7) RUNOFF CONTROL DURING PROJECT: Berms shall be constructed around the outside Perimeter of waste placement areas to a height of three feet. This height is measured as the elevation above the as-built elevation of the liner protective cover. Berms shall be a minimum of three feet wide at the top. Berm material will be as specified in Specification 33. The first lift of material shall have an uncompacted thickness of no greater than 12 inches. There is no lift thickness specification for subsequent lifts. The berm will be constructed on top of the clay liner such that the berm is not in contact with native ground. The berm shall be constructed directly on top of clay liner or liner protective cover that has been compacted to at least 90 percent of a standard Proctor. A minimum 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 <u>a minimum of 90</u></p>	<p>Verify that the required berms have been constructed to the specified dimension. Record any findings on the Daily Construction Report. Conduct laboratory classification (ASTM D2487) and Standard Proctor tests (ASTM D698) at a rate of one test per 5,000 linear feet of berm, with a minimum of one test per berm. Conduct one density test per 300 linear feet of the first lift and subsequent lifts of the berm to ensure that the specification is met. Record density tests on the Field Density Test form.</p>	<p>Verify that the berms have been tested and inspected, and inspected to the correct criteria by QC personnel.</p> <p>Review documentation to verify that the weekly access ramp inspections have been performed.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

percent of a standard Proctor.

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. Access ramps that cross runoff berms shall be constructed and maintained to prevent such runoff from leaving the lined portion of the embankment.

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.

After the first lift of radon barrier material for an entire side slope area (i.e., from the toe of waste to the side slope breakover) has been pushed out to the design lift thickness the adjacent runoff berm for that side slope area may be removed. During placement of this first lift of radon barrier, there is no minimum offset to the runoff berm.

8) MONTHLY BERM INSPECTION: The berms are to be inspected monthly. Inspect for obvious damage to berms. Ensure berm height where roads cross berms.

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.

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 sides 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. Notify the Project Manager and review documentation to verify any noted damage and required repairs. After repairs are completed, re-inspect the berm. Continue this

Verify that the monthly berm inspections have been performed and properly documented. Verify proper installation of marker posts.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

9) **BERM MAINTENANCE:** The runoff and runoff berms shall be surveyed and improved, as required, by July-September 1 of each year.

To insure the minimum runoff berm height is maintained (per Specification 7), inspect and survey waste offsets (area between the toe of runoff berms and the toe of waste slopes), and remove any accumulated sediment, waste and/or soil materials, as required, by September 1 of each year.

process until the berm meets specification.

Survey the berms at 100 foot intervals and key points (i.e., changes in direction of the berm). Notify the Project-operations Manager of any noted damage and required repairs. After repairs are completed, re-inspect the berm. Continue this process until the berm meets specification.

Inspect and survey the runoff berms and waste offsets at 100 foot intervals and key points (i.e., changes in direction). This can be performed in conjunction with the annual berm survey. Notify the Operations Manager of areas requiring removal of accumulated materials (cleaning). After cleaning is completed, re-inspect and re-survey, as needed, the waste offset(s). Continue this process until the runoff berms/waste offsets meet specification.

Verify that the berms are surveyed and improved, as required.

Verify that waste offsets are inspected, surveyed and cleaned, as required.

10) **MOVING OR BREACHING A RUNOFF CONTROL BERM:** When moving or breaching a berm, the work must be authorized by the QC Supervisor prior to commencing work. A temporary breach of a berm may be accomplished without a temporary berm, provided the work is expected to be completed and the berm replaced the same day. A temporary berm will be designed to ensure runoff is contained within the cell and approved by the Engineering Manager.

A berm may be partially or completely breached during cover construction (e.g., one or more of the requirements in the Runoff Control During Project specification above is no longer met) as long as runoff control is maintained from potentially contaminated areas to clean areas as approved by the Engineering Manager.

Review the work to be performed. Document the approval to move or breach a berm on the Breach of Berm form.

Ensure runoff control is maintained to prevent potentially contaminated liquids running into clean areas and document on the Daily Construction Report.

Verify that the approval to move or breach a berm has been properly documented on the Breach of Berm form.

Review Daily Construction Reports to ensure proper documentation.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>11) NUCLEAR DENSITY/MOISTURE GAUGE CALIBRATION: Each nuclear density gauge shall have current calibration, performed in accordance with the manufacturer’s specifications, prior to use on the project.</p>	<p>Check calibration labels to ensure equipment is calibrated prior to using.</p>	
<p>12) SAMPLING LOCATIONS FOR LOTS: For sample locations chosen by random numbers, two random numbers shall be employed. The first number (X) shall be between zero and the largest east-west distance of the lot. The second number (Y) shall be between zero 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.</p>	<p>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.</p>	<p>Verify that the test sample locations are being chosen by random number.</p>
<p>13) TEST METHODS: All tests shall be performed in accordance with the test methods specified in Appendix B.</p>		
<p>14) QA AUDITING: EnergySolutions shall contract with an independent firm to perform an annual audit of the CQA/QC program. The auditor shall:</p> <ul style="list-style-type: none"> A. audit at least 15 percent of the CQA\QC documentation; and B. observe QC procedures for field density/moisture tests, classification tests, Proctors, permeability tests, and surveying. 	<p>Schedule times with the QA auditor to observe the specified testing. Cooperate with QA auditor in the review of QC documentation.</p>	<p>Cooperate with QA auditor in the review of QC documentation. <u>Verify that a copy of the report has been submitted to the Director.</u></p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>The audits must be coordinated so that field activities are audited. Each audit shall include observations of field activities that occur while the auditor is on-site. A copy of the auditor's report shall be submitted to the Director of the Division of Waste Management and Radiation Control DWMRC(Director).</p> <p>15) TEST FAILURE PROTOCOL: Unless otherwise specified in this Manual, any failing test shall be addressed as follows:</p> <ul style="list-style-type: none"> A. Document the failing test result in applicable QC records. B. Notify construction personnel of the failing test result and re-work as needed. C. After re-work is complete, re-test and document results. D. If the re-test results pass, approve the work. E. If the re-test results fail, require further re-work until passing results are achieved. F. Any circumstance where re-work is not desired or possible shall be documented on a Nonconformance Report (NCR). Any circumstance addressed via NCR in accordance with this specification requires DWMRCDirector notification and written approval prior to proceeding. <u>The Director approval shall be obtained in accordance with Specification 23.</u> <p>16) QUALITY OF ROCK: Applies to the following</p>	<p>Document all failing tests and corrective actions for those failures. When applicable, obtain documentation of DWMRCDirector notification.</p> <p>As described in NUREG-1623, appendix-Appendix F,</p>	<p>Ensure documentation is present for all failed tests. Review documentation and corrective actions. Notify DWMRCDirector as required. Provide QC with documentation of the DWMRCDirector notification.</p> <p>Verify the frequency of laboratory quality control tests</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>cover materials.</p> <p>11e.(2): Filter Zone, Top Rock and Side Rock.</p> <p>Class A West: Type A Filter Zone Rock, Type B Filter Zone Rock, Type A Rip Rap and Type B Rip Rap.</p> <p>The rock shall have a "Rock Quality" score of at least 50 based on the following tests: Specific Gravity (ASTM C128), Absorption (ASTM C127), Sodium Soundness (ASTM C88), and L.A. Abrasion (ASTM C131 or ASTM C535). The procedures for scoring "Rock Quality" are found in Appendix C</p>	<p>perform at least one petrographic examination for each rock source <u>prior to use</u> in accordance with ASTM C295. If a combination of limestone, sandstone, and igneous rock is found for a source, percentages of each type of material shall be determined for scoring.</p> <p>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 with a minimum of four tests per embankment. Samples may be collected at the source location or from onsite stockpiles. Record the location of all collected samples in the Sampling Log.</p>	<p>and compliance of test results.</p>
<p>17) QC PROCEDURES: Quality Control procedures to perform the actions described in this Manual are designated CL-QC-PR and maintained by document control. Other QC procedures are described in designated ASTM tests.</p>		
<p>18) PRE-CONSTRUCTION DOCUMENTATION & COMMUNICATION: Prior to each construction phase, and at the beginning of each construction season for ongoing phases, construction personnel will review construction phase-specific drawings, specifications, and procedures. A pre-construction meeting will also discuss key personnel and requirements for the construction phase. <u>The DWMRCDirector shall be invited 48 hours in advance to a pre-construction meeting.</u> The construction phase-specific drawings shall be submitted to the Division of Waste Management and Radiation Control (DWMRCDirector) <u>in accordance with Specification 23 for review and approval at least</u></p>	<p><u>Obtain documentation confirming that the construction phase-specific drawings have been approved by the Director.</u></p>	<p><u>Verify that the construction phase-specific drawings have been provided to the Director at least 30 calendar days prior to construction. Provide QC with documentation of Director approval.</u></p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

30 calendar days prior to construction. ~~The shall be invited 48 hours in advance to a pre construction meeting.~~

As waste placement is ongoing, this pre-construction documentation & communication section is not applicable to waste placement. Waste placement will be completed in accordance with this Manual and approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005.

- 19) PROJECT MANAGER:** The Project Manager shall be designated at the beginning of each construction phase. If not designated or not available, the Engineering Manager shall assume the role of the Project Manager.
- 20) NATIVE MATERIAL:** Natural soil from areas surrounding the Clive Facility. Native material may be used as fill during waste placement or in the construction of liner and cover provided the material meets project specific specifications.
- 21) OFF-SITE FILL/BACKFILL MATERIAL:** Fill or backfill material may consist of licensed waste, native material, or other materials from off-site sources.

Fill or backfill material from off-site sources shall conform to the following requirements:

- A. It shall consist of only natural soil and rock.
- B. It shall not exceed the Exempt limit of UAC R313-19-13(2)(a)(i)(B).

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

- C. It shall not contain any of the following:
1. Biodegradable materials.
 2. Hazardous waste, including but not limited to listed or characteristic waste.
 3. Material regulated by any other State or Federal regulatory program.
- D. It shall only be used in the waste portions of the Class A West or Mixed Waste embankments.
- E. The following records shall be maintained:
1. The identity / location of the source(s) of the material.
 2. The volume and weight of the material.
 3. Documentation that the material meets the prohibitions of Specification 21.C.

22) ~~DWMRC~~**DIRECTOR** EXEMPTION: Any requirement within this Manual may be exempted by the Director of the Division of Waste Management and Radiation Control ~~(DWMRC)~~. Exemptions will be confirmed in writing.

23) ~~DWMRC~~**DIRECTOR** NOTIFICATION AND APPROVAL: EnergySolutions shall simultaneously copy the DWMRC, LLRW Section Manager on all ~~ADWMRC~~Director notifications within this Manual ~~shall include a copy to the DWMRC LLRW Section Manager.~~ Unless otherwise stated in the specification all notifications will be in the form of a letter.

Request for Approval

EnergySolutions shall obtain Director approval for various work tasks included in this CQA/QC Manual. The pertinent specifications will state the

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

scope and timeframe needed for Director's approval or denial.

A written Request for Approval (RFA) shall be submitted by EnergySolutions for work tasks requiring Director approval. Email is an acceptable form of submission for RFA matters, including responses by the Division. The RFA along with supporting documentation shall be sent to the Director, with simultaneous copies sent to the LLRW Section Manager and assigned staff. The heading of the RFA shall include a reference to the Specification number, the response timeframe goal (in State business days), and a description of the activity requiring approval. Additional details of the work activity, including the basis for the requested action shall be included in the body of the RFA. The response timeframes included in this CQA/QC manual are goals for Division responses to RFAs. The Division recognizes the importance of timely responses to specific RFA matters. The Director agrees to make reasonable efforts to respond to RFAs on or before the specified timeframes. Director approval of RFA matters is not automatic. If staff has not responded within the timeframe goal, or if other circumstances exist that require the need of urgent attention, EnergySolutions may escalate the matter to the LLRW Section Manager. If the LLRW Section Manager is not responsive, EnergySolutions may escalate the matter to the Director.

Designee for Director

For purposes of this CQA/QC Manual, EnergySolutions may treat an email or letter signed by Section Staff in response to a specific

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - GENERAL REQUIREMENTS

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

| RFA as constituting formal Director approval.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - FOUNDATION PREPARATION

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>24) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>25) 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.</p>	<p>Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the Daily Construction Report.</p>	<p>Verify and document that the clearing and grubbing has been inspected by QC.</p>
<p>26) EXCAVATION: Excavation shall be made to the lines, grades, and dimensions prescribed in the approved construction phase-specific drawings. Any over excavation shall be backfilled with native materials and compacted to 95 percent of Standard Proctor. The uncompacted lift thickness shall not exceed nine inches.</p>	<p>Observe the cell excavation. Record observations and corrective actions taken (where required) on the Daily Construction Report.</p> <p>In areas of over excavation, conduct in-place density tests <u>of backfill</u> 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 (described in Specification 12).</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction. <p>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.</p>	<p>Observe 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 correctly.</p>
<p>27) SCARIFICATION AND COMPACTION: The foundation shall consist of either:</p> <p style="padding-left: 40px;">A. For in-situ sands: Inspect the surface for</p>	<p>Inspect and verify the foundation meets the compaction specifications. Record observations and corrective actions on the Daily QC Report.</p> <p>Conduct in-place density tests at a rate of one test per</p>	<p>Observe 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 correctly.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - FOUNDATION PREPARATION

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>cracks. If cracking of the surface is observed, then scarify the in-situ sands and compact to at least 95 percent of a Standard Proctor. If no cracking is observed, then scarification is not necessary prior to compacting to at least 95 percent of a Standard Proctor.</p> <p>B. For in-situ non-sandy soil: Scarify the in-situ soils to at least six inches and compact it to at least 95 percent of a Standard Proctor.</p>	<p>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 (described in Specification 12).</p> <p>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.</p>	
<p>28) FINAL GRADING: The foundation surface shall be smooth-drum rolled prior to clay liner placement. The foundation shall be free from surface debris, soft (wet) spots greater than three inches deep, and loose soil areas with a loose surface greater than three inches deep. Foundation shall be at or below design elevation.</p>	<p>Survey the foundation on a 50 foot grid and at key points (i.e. embankment break lines). Final survey measurements will be documented and provided to the QC Supervisor and Quality Assurance.</p>	<p>Review the final survey data. Verify the frequency of the survey points.</p>
<p>29) UNSUITABLE MATERIAL: Remove unsuitable material as required. Unsuitable material is non-soil material or soil which cannot be reworked to meet the compaction criteria.</p>	<p>Define areas of unsuitable material and notify the Project Manager 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.</p>	<p>Verify that the removal of unsuitable material has been properly documented.</p>
<p>30) FOUNDATION APPROVAL: Foundation <u>areas</u> shall be approved by the Engineering Manager (<u>or designee</u>). Prior to covering, the Engineering Manager (<u>or designee</u>) shall prepare a "Notice of Acceptance" indicating that the foundation <u>areas</u> meets the required specifications.</p> <p><u>The Engineering Manager may delegate Engineering Manager duties to a qualified</u></p>	<p>Accompany the Engineering Manager (<u>or designee</u>) on a walk-through of the foundation area. Obtain the Notice of Acceptance from the Engineering Manager (<u>or designee</u>) before construction of the clay liner begins.</p>	<p>Confirm that QC has obtained the Notice of Acceptance.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - FOUNDATION PREPARATION

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

designee provided that the Engineering Manager is responsible for and shall personally review, correct when necessary and approve any work performed by a subordinate or associate on the Engineering Manager's behalf in accordance with Utah Code §§ 58-22-102(16) and -603(1)(b).

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER BORROW MATERIAL

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
31) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.		
32) 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 and recorded by QC.
33) MATERIAL: Satisfactory material shall be defined as CL or 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.	Perform laboratory classification tests (ASTM D 2487) at a rate of one test per lot prior to use of material in the clay liner. A lot is defined as a maximum of 5,000 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 cannot be used.	Verify the frequency of laboratory tests and compliance of test results.
34) PROTECTION: The clay borrow material shall be handled in such a manner as to prevent contamination with radioactive waste material or other deleterious material. Acceptable clay borrow material may contain up to five percent additional rocks (less than or equal to one inch) and sand above the content found in the classification test.	Visually check clay liner materials for contamination by foreign materials. If any foreign materials are identified, the percentage of foreign material shall either be estimated in accordance with ASTM D2488 or calculated in accordance with ASTM D2487. Document findings on the Daily Construction Report. Notify the Project Manager to have operations remove or rework clays which have been contaminated above the specified requirements. Re-inspect the clay liner <u>material</u> and document corrective actions (where required) on the Daily Construction Report.	Verify that the clay liner material is being inspected for contaminants and that the inspection and corrective actions (if required) are properly documented.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER BORROW MATERIAL

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>35) PROCESSING: These procedures may be used to provide suitable material for construction of the clay liner.</p> <p>A. If used, apply deflocculant at a rate determined by the Engineering Manager (based on test pad data). If used, the choice of deflocculant and the application rate shall be verified in the Clay Liner Test Pad.</p> <p>B. Mix the deflocculant thoroughly into the soils by tilling or similar action.</p>	<p>Measure the mixing areas and verify that the application rate of the deflocculant is equal to or greater than the rate determined by the Engineering Manager. Record the size of the mixing areas and the amount of deflocculant applied on the Embankment Construction Lift Approval Form.</p> <p>Observe the mixed clay and notify the Project Manager of areas which are not adequately mixed. Re-inspect after corrected. Document observations and corrective actions, if required, on the Daily Construction Report.</p>	<p>Verify that the size of the mixing areas and the amount of deflocculant applied has been properly documented.</p> <p>Verify that the clay is being inspected correctly and the inspection documented.</p>

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER TEST PAD**

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>36) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>37) NOTICE OF TEST PAD CONSTRUCTION: <u>In accordance with Specification 23 t</u>The clay liner test pad plan shall be approved by the <u>DWMRC</u>Director. The clay liner test pad plan shall be provided to the <u>DWMRC</u>Director at least 14 calendar days prior to test pad construction. If DWMRC has not provided approval or deficiency notification prior to the end of 14 calendar days, construction may proceed as proposed in the test pad plan.</p> <p>The <u>DWMRC</u>Director shall be notified 48 hours in advance of the start-up of test pad construction.</p>	<p>Obtain documentation confirming that the test pad plan has been approved by the <u>DWMRC</u>Director or the 14 calendar day period has ended.</p> <p>Obtain documentation confirming that the <u>DWMRC</u>Director has been notified, as required.</p>	<p>Verify that the test pad has been provided to the <u>DWMRC</u>Director at least 14 calendar days prior to construction of the test pad. Provide QC with documentation of <u>DWMRC</u>Director approval or documentation that the 14 calendar day period has expired.</p> <p>Notify the <u>DWMRC</u>Director 48 hours in advance of the start-up of test pad construction. Provide QC with documentation of <u>DWMRC</u>Director notification.</p>
<p>38) TEST PAD(S): A test pad with minimum dimensions of 60 feet by 75 feet will be constructed using the procedure proposed for construction of the clay liner<u>outlined in the approved test pad plan.</u></p> <p>Prior to use of manually operated compaction equipment, a small test pad with minimum dimensions of five feet by five feet (sized appropriately for the equipment used) 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). If manually operated compaction equipment is not used on the project, a small test pad is not required.</p> <p>A new clay liner test pad shall be constructed each time there is a change in specifications,</p>	<p>Observe the construction of test pads. Measure each test pad to ensure that it is constructed to at least the size required. Record the test pad size on the Embankment Construction Lift Approval Form.</p> <p>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.</p>	<p>Observe the construction of the test pads. Verify that the test pad has been measured and is properly documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER TEST PAD

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>construction procedures, unified soil classification, or types of equipment.</p> <p>Clay liner test pads are to be constructed and tested in accordance with the following specifications:</p> <p>A. Prior to compaction, conduct at least one classification and gradation test for each test pad.</p> <p>B. 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.</p> <p>C. The clay material will have a dry clod size less than or equal to one inch.</p>	<p>Conduct classification and gradation tests (as described in Appendix B) at a rate of one of each type of test per test pad.</p> <p>Measure the lift thickness at a rate of one test per lot. Record thicknesses on the Embankment Construction Lift Approval Form.</p> <p>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 inch. Notify the Project Manager to have operations remove clods greater than one inch. Record inspection of the clod size on the Embankment Construction Lift Approval Form and re-inspect the uncompacted lift if necessary. Record any corrective actions performed on the Daily Construction Report.</p>	<p>Verify the frequency of tests and compliance of test results.</p> <p>Verify that the number of lifts and lift thicknesses has been documented. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.</p> <p>Verify that the dry clod size inspection has been performed and documented, including corrective actions as necessary.</p>
<p>D. The clay is to be placed and compacted by equipment proposed for use during construction of the clay liner.</p> <p>E. The lifts of clay shall be bonded by providing a rough upper surface on the underlying layer of clay liner. The surface should have changes</p>	<p>Record type of equipment used, and number of passes on the Embankment Construction Lift Approval Form.</p> <p>Perform a visual inspection to verify that there are adequate changes in grade. Any areas of concern shall be verified by placing a straight edge at least two feet long on the surface and counting the number of points</p>	<p>Perform a minimum of one visual inspection per test pad.</p> <p>Verify the frequency of measurements and compliance of test results.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER TEST PAD

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>in grade of approximately one inch or more at a rate of two or more per linear foot.</p>	<p>approximately one inch or more below the straight edge. Notify the Project Manager of any deficiencies. Re-inspect after the Project Manager has corrected deficiencies.</p>	
<p>F. The clay is to be compacted to at least 95 percent of a standard Proctor with moisture content between one-half a percentage point below optimum and five percentage points over optimum. Compaction of the large test pad is to be accomplished by at least four passes of suitable compaction equipment.</p>	<p>Conduct in-place moisture-density tests at a rate of one test per lot, with a minimum of three tests per lift for large test pads and one test per lift on small test pads. The test location shall be chosen on the basis of random numbers (described in Specification 12). Record the test result on the Field Density Test form.</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified moisture and compaction. b. Notify the Project Manager of lots not meeting the specified permeability to have the areas reworked. c. Retest (moisture/density and permeability) lots after rework has been completed. d. Any additional work under b. shall be included in the test pad construction method. 	<p>Verify the frequency of tests and compliance of test results.</p>
<p>G. The clay is to be constructed to provide a permeability less than or equal to 1×10^{-6} cm/sec. Permeability testing on the bottom lift will be performed at the surface. Permeability testing on the second lift will be performed greater than or equal to two inches below the surface. Permeability testing on the third lift will be performed greater than or equal to four inches below the surface.</p>	<p>Conduct in-place permeability tests at a rate of one test per lot per lift. The permeability test shall be run within five feet of the moisture-density test (see Appendix B). Record the test result on the Field Permeability Test form.</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified permeability. b. Notify the Project Manager of lots not meeting the specified permeability to have the areas reworked. c. Retest (moisture/density and permeability) lots after rework has been completed. d. Any additional work under b. shall be included in the test pad certification report. 	<p>Verify the frequency of tests and compliance of test results.</p>
<p>H. The procedures used to construct the test pad shall be reviewed and approved by a Utah</p>	<p>Provide the Utah licensed Professional Engineer with copies of the documentation for the test pad for review and approval.</p>	<p>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</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER TEST PAD

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

licensed Professional Engineer.

construction.

- I. In accordance with Specification 23 tThe test pad certification report shall be approved by the DWMRCDirector at least 14 calendar days from the time the certification report was submitted and prior to using the new test pad construction method. ~~However, if the DWMRC has not provided approval or deficiency notification prior to the end of 14 calendar days from the time the certification report was submitted, construction may proceed using the new construction method.~~

Obtain documentation confirming that the test pad certification report has been approved by the DWMRCDirector ~~or the 14 calendar day period has ended.~~

Verify that the test pad certification report has been provided to the DWMRCDirector. Provide QC with documentation of DWMRCDirector approval ~~or documentation that the 14 calendar day period has expired.~~

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>39) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>40) LIFT IDENTIFICATION: Each lift shall be given a unique lift identification number for testing and surveying purposes.</p>	<p>Assign a lift identification number to each lift. Use the lift identification number to identify all paper work for that lift.</p>	<p>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.</p>
<p>41) PLACEMENT: The clay liner will be prepared, placed, and compacted using the same equivalent type of equipment and mixing and compacting procedures that were approved in the test pad.</p> <p><u>Note: If equipment used to prepare, place, and/or compact clay liner differs by make and/or model from the equipment identified in the approved test pad, equipment equivalency shall be determined and approved by a Utah licensed Professional Engineer prior to use. The Director shall be notified at least 48 hours in advance of implementing an equipment change and the Director shall approve the equivalency determination prior to use of the equivalent equipment. The Director approval shall be obtained in accordance with Specification 23.</u></p> <p><u>See Specification 33 for material specifications unless more restrictions were implemented during the test pad. The clay material shall have a dry clod or rock size less than or equal to one inch.</u></p>	<p>Observe the clay liner placement. Record the equipment <u>and procedures</u> used to place the clay liner and any corrective actions (where required) on the Embankment Construction Lift Approval Form.</p> <p><u>Obtain documentation of equipment equivalency.</u></p> <p><u>Obtain documentation that the DWMRC Director has been notified and approved of an equipment equivalency determination.</u></p> <p><u>Inspect the loose clay material during the unloading and spreading process for each uncompacted lift to ensure any dry clods or rocks that are present are less than or equal to one inch. Notify the Project Manager to have operations remove clods or rocks greater than one inch. Record inspection of the clod or rock size on the Embankment Construction Lift Approval Form. Re-inspect and record any corrective actions performed</u></p>	<p>Verify the equipment <u>and procedures</u> used to construct the clay liner <u>has</u> been documented and that it is the same type of equipment used to construct the test pad. Verify that the clod or rock inspection has been performed and documented.</p> <p><u>Verify that use of equivalent equipment has been approved by a Utah licensed Professional Engineer.</u></p> <p><u>Notify the DWMRC Director 48 hours prior to using equipment that has been determined equivalent by a Utah licensed Professional Engineer. Provide QC with documentation of Director approval.</u></p> <p><u>Verify that the clod or rock inspection has been performed and documented.</u></p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

on the Daily Construction Report.

42) LIFT BONDING: The lifts of clay shall be bonded by providing a rough upper surface on the underlying lift. The surface should have changes in grade of approximately one inch or more at a rate of two or more per linear foot.

Perform a visual inspection to verify that there are adequate changes in grade. Any areas of concern shall be verified by placing a straight edge at least two feet long on the surface and counting the number of points approximately one inch or more below the straight edge. Notify the Project Manager of any deficiencies. Re-inspect the surface after corrective actions have been completed. Document any deficiencies and corrective actions taken on the Daily Construction Report.

Verify the frequency of measurements and compliance of test results.

43) 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.

Verify that the required grading tolerance is achieved as follows:

Observe QC personnel ~~every lift~~ 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 ~~elod size~~ inspection has been performed and documented for each uncompacted lift thickness.

A. 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 one-three inches

- 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. Visually check between poles for high or low spots.
- d. Define high out of specification areas and notify the Project Manager to rework those areas.
- e. Re-inspect areas reworked and approve areas

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>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.</p> <p style="text-align: center;">- OR -</p> <p>B. Survey to determine lift thickness using the same grid spacing described in Specification 43.A. Survey equipment shall have a tolerance no more than ± 0.1 foot.</p>	<p>meeting criteria.</p> <p>f. Continue "b" through "d" above until all areas meet criteria.</p> <p>g. Indicate areas meeting criteria on the Embankment Construction Lift Approval Form.</p> <p style="text-align: center;">- OR -</p> <p>a. Verify survey equipment is within a tolerance of ± 0.1 foot.</p> <p>b. Verify correct set-up and operation of equipment.</p> <p>c. Visually check between survey points for high or low spots.</p> <p>d. Define high out of specification areas and notify the Project Manager to rework those areas.</p> <p>e. Document survey results on a survey report.</p>	
<p>The clay material shall have a dry clod size less than or equal to one inch.</p>	<p>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 inch. Notify the Project Manager to have operations remove clods greater than one inch. Record inspection of the clod size on the Embankment Construction Lift Approval Form. Re inspect and record any corrective actions performed on the Daily Construction Report.</p>	
<p>44) 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 by one of the following two methods:</p> <p>A. Key-in vertical steps no greater than nine inches and at least twice as wide as they are high.</p> <p style="text-align: center;">- OR -</p>	<p>Verify that the new liner has been properly keyed-in to the existing liner. Record deficiencies on the Embankment Construction Lift Approval Form.</p>	<p>Verify that the keying-in of the liner has been documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>B. sloping the full thickness of old liner at a maximum slope of 5(H):1(V).</p> <p>The surface shall be maintained in accordance with Specification 47.</p>		
<p>45) COMPACTION: Clay liner material will be compacted to at least 95 percent of standard Proctor with moisture content between one-half of a percentage point below and five percentage points over optimum.</p>	<p>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. The test location shall be chosen on the basis of random numbers (described in Specification 12) and documented on the Lift Approval Form.</p> <p>Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 5,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the Sampling Log. Document results of the proctor on the Proctor Form.</p>	<p>Visually observe at least <u>one lift being compacted and one in-place moisture-density test per project area per construction season</u>. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.</p>
<p>46) PERMEABILITY: Clay liner will have an in-place permeability less than or equal to 1×10^{-6} cm/sec.</p>	<p>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 of compacted clay liner. The permeability test shall be run within five linear feet of a moisture density test location.</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified permeability. b. Notify the Project Manager of lots not meeting the specified permeability to have the areas reworked. c. Retest (moisture/density and permeability) lots after rework has been completed. d. Restore all test areas to assure no leaks. 	<p>Visually observe at least one in-place permeability test per project area <u>per construction season</u>. Verify that the tests are being performed at the correct frequency and that the documentation is being completed. Visually observe 1 lift being compacted per phase of construction every calendar year per construction season.</p>
<p>47) LINER DRYING PREVENTION: <u>Desiccation</u></p>	<p><u>Observe the liner surface for drying and document</u></p>	<p><u>Verify that the liner is being inspected correctly and the</u></p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

cracks shall not exceed one-fourth inch wide and three-inches deep in the clay liner. Areas of ~~nonconforming~~with desiccation cracks exceeding this specification shall be identified as new lots to be reworked and ~~—A nonconformance due to desiccation cracking—~~shall be reported to the Director.

To prevent the clay liner from drying one (or more) of the following methods shall be employed:

- A. Apply water to the clay liner surface on an as needed basis
- B. Cover the clay liner with nine inches of loose clay
- C. Cover the clay liner with at least one foot of loose liner protective cover material
- D. Cover the clay liner with six inches of clay compacted to a minimum of 90 percent of a standard proctor.

results on the Daily Construction Report.

Notify the Project Manager and QA of any ~~nonconforming~~—desiccation cracks larger than specification identified in the clay liner.

~~Nonconforming~~—eClay liner with larger than specification desiccation cracks shall be reworked and retested in accordance with one of the following methods:

- a. Scarify the in-place clay, moisture condition as needed, then recompact and retest the clay material in accordance with Specifications 41, 45, and 46.
- b. Excavate all ~~nonconforming~~—material that has larger than specification desiccation cracks and replace with new clay in accordance with Specifications 40 through 46.

Document methods used to prevent the clay liner from drying on the Daily Construction Report.

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 1,000 cubic yards (compacted) of a single lift. The test location shall be chosen on the basis of random numbers (described in Specification 12) and documented on the Lift Approval

inspection documented. Report discrepancies to the Director as required.

Verify methods used to prevent clay liner from drying have been documented.

Verify that density tests are being performed at the correct frequency and that the documentation is being completed

~~Verify that the liner is being inspected correctly and the inspection documented. Report discrepancies to the DWMRC as required.~~

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT**

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

Newly constructed liner will be covered in accordance with method B, C, or D above within 30 days of clay liner lift approval.

Note: Placement of the next lift of clay liner or liner protective cover meets the requirements above.

~~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 nine inches of loose clay or six inches of compacted clay. Newly constructed liner will be covered within 15 days of liner completion. Desiccation cracks larger than one fourth inch wide and three inches deep in the clay liner will be reported to the DWMRC and will be documented as a non-conformance item when discovered.~~

48) SNOW REMOVAL: When clay liner material is to be placed and the work area is covered with snow, the snow must be removed.

49) COLD WEATHER PLACEMENT OF CLAY LINER: For purposes of this 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.

Form.

Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 5,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the Sampling Log. Document results of the proctor on the Proctor Form.

Document that clay or protective cover soils have been placed over approved clay liner lifts within 30 days of lift approval.

~~Observe the liner surface for drying. Notify the Project Manager and notify QA of any desiccation cracks larger than one fourth inches wide and three inches deep in the clay liner. Retest reworked/repared areas in accordance with Specification 45. Record corrective actions taken (where required) on the Daily Construction Report.~~

Observe that snow is removed. Inspect the clay liner for damage. Notify the Project Manager of any deficiencies/damage and re-inspect areas after repairs are completed. Record these corrective actions (where required) in the Daily Construction Report.

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. Document the stopping of placement in the Daily Construction Report.

Verify that snow removal is being documented and the clay liner has been inspected.

Verify that clay liner is tested as required (and the testing documented) during cold weather conditions.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

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:

- A. 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 nine inches of loose clay or six inches of compacted clay, then the cover clay may be worked with no additional testing of the lower approved lift.
- B. 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 nine inches of loose clay or six inches of compacted clay, then:
 - 1. Perform spring start-up testing as discussed below; or
 - 2. Measure the liner/foundation temperature approximately one inch beneath the surface at a frequency of one measurement per lot (defined as no more than 100,000 square feet). If the temperature one inch beneath the surface is greater than 32°F, no additional actions are required. If the temperature one inch beneath the surface is less than 32°F and 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

Review ambient air temperature records as measured at the site meteorological station. Document status of clay liner cover placement on the Daily Construction Report. Measure the liner/foundation temperature when triggered under B.2. of this specification, at the specified frequency. 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. To ensure a stable reading, the temperature probe shall be left in place for at least two minutes prior to taking the reading.

If the initial clay 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 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 other than re-roll the surface with one pass of the same type of construction equipment; except that the lot where the initial temperature less than or equal to 27°F was measured shall be reworked regardless of resampling results.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

inch beneath the surface is less than or equal to 27°F, re-work and re-test density and permeability of the affected area after the clay temperature has risen above 27°F.

C. If more than 30 days have passed since the date of lift approval, perform spring start-up testing.

50) SPRING START-UP: See Specification 49 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 nine 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.

Spring start-up testing shall be conducted on 11e.(2) embankment lift areas S-11, R-12, L-12, H-12, and D-12 prior to and in the same calendar year as initial waste placement for each area.

Perform density and ~~Permeability~~ permeability testing at the frequencies outlined for liner construction in Specifications 43 through 46 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 nine inch increments until a passing lift is found; remove all failing lot; re-work all failing lot; 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.

Perform spring start-up testing prior to initial waste placement on 11e.(2) Embankment lift areas S-11, R-12, L-12, H-12, and D-12.

Verify spring start-up testing has been completed prior to initial waste placement on 11e.(2) Embankment lift areas S-11, R-12, L-12, H-12, and D-12.

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT**

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>51) CONTAMINATION OF CLAY LINER: The clay liner material shall not become contaminated with radioactive soils or debris during construction. The in-place clay liner material may contain up to five percent additional rocks and sand above the content found in the classification test.</p>	<p>Prior to compaction, visually check the clay liner material for contamination by foreign materials in accordance with ASTM D2488. Remove or rework clay liner material that has been contaminated above the specified requirements. Document corrective actions (when required) on the Daily Construction Report.</p>	<p>Verify that the clay liner is being inspected for contaminants and that the inspection and corrective actions (if required) are properly documented.</p>
<p>52) FINAL GRADING: Final grading shall be at or above design elevations.</p>	<p>Survey on a 50 foot grid and at key points (i.e., embankment break lines). Final survey measurements will be documented and provided to the QC Supervisor and Quality Assurance.</p>	<p>Review the final survey data. Verify the frequency of the survey points.</p>
<p>53) 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.</p>	<p>Observe work on clay liner. Notify the Project Manager of problems with equipment on the clay liner. Re-inspect problem areas once corrected. Record corrective actions taken (where required) on the Daily Construction Report.</p>	<p>Verify that the work is being inspected.</p>
<p>54) DWMRCDIRECTOR APPROVAL: <u>In accordance with Specification 23</u> The <u>DWMRCDirector</u> 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 <u>DWMRCDirector</u> prior to placement of soil material over the clay liner (waste or soil protective cover). However, <u>DWMRCDirector</u> approval of clay liner documentation is not required prior to placement of waste over the clay liner.</p>	<p>Notify Quality Assurance that the clay liner is prepared and ready for inspection by the <u>DWMRCDirector</u>. Obtain written authorization on the Liner Inspection Form from Quality Assurance that the clay liner has been inspected. Obtain documentation of <u>DWMRCDirector</u> notification from Quality Assurance.</p>	<p><u>Notify the DWMRCDirector that the clay liner is prepared and ready for inspection at least 48 hours prior to covering with soil protective cover material. Provide Obtain written DWMRCDirector approval of the clay liner prior to the placement of material over clay liner (waste or soil protective cover). Notify the DWMRC that the clay liner is prepared and ready for inspection at least 48 hours prior to covering with soil protective cover material. Provide QC with documentation of notification.</u></p>
<p>55) LINER PROTECTIVE COVER: <u>At least one foot of compacted native soils, free of debris, shall be constructed on top of the clay liner. This layer</u></p>		

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

is termed "Liner Protective Cover". Contaminated equipment may be used to place Liner Protective Cover. Liner Protective Cover shall be constructed through one, or a combination, of the following methods:

a. Clay liner placed in excess of clay liner design elevations may be considered part of the Liner Protective Cover.

b. Constructed Liner Protective Cover using native soils free of debris as follows:

a. Soil material will be placed in lifts with a compacted average thickness not exceeding 12 inches.

i. 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 three inches 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.

- OR -

Inspect, test and approve excess clay liner in accordance with Work Element "Clay Liner Placement".

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. Visually check between poles for high or low spots.

d. Define high out of specification areas and notify the Project Manager to rework those areas.

e. Re-inspect areas reworked and approve areas meeting 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 -

a. Verify survey equipment is within a tolerance of ± 0.1 foot.

b. Verify correct set-up and operation of equipment.

c. Visually check between survey points for high or

Verify that excess clay liner has been constructed and tested in accordance with Work Element "Clay Liner Placement".

Observe 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 inspection has been performed and documented for each lift.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - CLAY LINER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

ii. Survey to determine lift thickness using the same grid spacing described in Specification 43.A. Survey equipment shall have a tolerance no more than ± 0.1 foot.

b. Each lift shall be compacted to at least 90 percent of a standard Proctor. Moisture testing is not required.

low spots.

d. Define high out of specification areas and notify the Project Manager to rework those areas.

e. Document survey results on a survey report.

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 1,000 cubic yards (compacted) of a single lift. The test location shall be chosen on the basis of random numbers (described in Specification 12) and documented on the Lift Approval Form.

Proctors shall be performed at a rate of one test per borrow lot. A borrow lot is defined as 5,000 cubic yards (compacted) or less of a specific material type. Record the location of the Proctor sample on the Sampling Log. Document results of the proctor on the Proctor Form.

Verify that the tests are being performed at the correct frequency and that the documentation is being completed.

~~**Liner PROTECTIVE COVER:** At least one foot of compacted native soils, free of debris, shall be constructed on top of the clay liner. This layer is termed "Liner Protective Cover". Clay liner placed in excess of clay liner design elevations shall be considered part of the Liner Protective Cover. If needed, additional Liner Protective Cover shall be placed in accordance with the lift thickness and compaction requirements of Specifications 43 and 45 or Specifications 74 and 75. Contaminated equipment may be used to place Liner Protective Cover.~~

~~Verify and test Liner Protective Cover in accordance with the specifications for the relevant Work Element (Specifications 43 and 45 for Clay Liner Placement or Specifications 74 and 75 for Waste Placement).~~

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - WASTE PLACEMENT WITH COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>56) SCOPE: This work element applies to the Class A West, 11e.(2), and Mixed Waste embankments.</p>		
<p>57) APPLICABILITY: This work element is applicable to waste placed with the CAT 826 compactor.</p>	<p>Document equipment used for compaction on the Lift Approval Form.</p>	
<p>58) DEFINITIONS:</p> <p><u>Machine Pass</u> 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.</p> <p><u>Wheel Pass</u> 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 CAESCCS compaction tracking system reports wheel passes.</p>		
<p>59) LINER PROTECTION: The compactor shall not be operated on the surface of finished clay liner or on the surface of the Liner Protective Cover directly over the clay liner. When operating on a slope that terminates on the surface of the Liner Protective Cover, the compactor shall be operated</p>	<p>When disposal and compaction is being performed on or adjacent to the first lift above the Liner Protective Cover, observe compactor operation for protection of the liner and Liner Protective Cover. Document observations, failures, and any corrective actions on the Daily Construction Report.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - WASTE PLACEMENT WITH COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>in a manner to prevent impact to the Liner Protective Cover. When compacting near the toe of the slope, the compactor will<u>shall</u> be operated parallel to the toe of the slope.</p>		
<p>60) LIFT IDENTIFICATION: Each lift shall be given a unique lift identification number.</p>	<p>Assign a lift identification number to each lift. Use the lift identification number to identify all paperwork for that lift.</p>	<p>Verify that a unique lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paperwork for that lift.</p>
<p>61) LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded.</p>	<p>Record the date and time of lift approval on the Lift Approval Form.</p>	<p>Verify that the date and time of lift approval is recorded on the Lift Approval Form.</p>
<p>No waste material will be disposed on a lift until the prior lift is approved, except for stored waste described in Specifications 94 and 95.</p>	<p>Verify that the previous waste lift has been approved prior to waste disposal.</p>	
<p>62) LIFT THICKNESS: The waste material will be placed in lifts with a compacted average thickness not exceeding 24 inches.</p>	<p>Survey the mean elevation of the top of each lift by surveying at least five points over a 10,000 square foot area. Where practical, survey the corners and at least one spot in the middle. If the average thickness of these surveys exceeds 24 inches, notify the Project Manager <u>to have lift reworked</u>. The lift shall be re-surveyed with at least five more points per 10,000 square feet after it is reworked. Survey measurements will be documented on a survey report and forwarded to Quality Assurance. Lift thickness may also be verified via GPS.</p> <ol style="list-style-type: none"> 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. 	<p>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.</p> <p>Verify that the survey data has been received from the QC personnel <u>and that the data meets thickness specifications</u>.</p>
	<p>- OR -</p>	
	<p>Download the <u>CAESCCS</u> system report of beginning</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - WASTE PLACEMENT WITH COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	and ending lift elevations. For lifts that are not sloped, survey data may be used for beginning lift elevation. Lift thickness shall be reported using CAESCCS in accordance with current operating procedure. When calculating the average lift thickness on a side slope, no point shall be more than 2.1 feet. If CAESCCS is used to document lift thickness on the side slope, there shall be no white pixels shown in the lift. CAESCCS data may be supplemented by GPS for areas where compactor coverage is inconclusive.	
63) 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.	
64) CLASSIFICATIONS: Soil classification testing is not required for waste placed using this work element.		
65) TERRACING OF LIFTS: Lifts constructed at times more than 30 days apart from each other shall have at least one foot, measured horizontally, removed from the outer edge of the old lift (except for CLSM lifts). For compaction adjacent to CLSM surfaces, lift compaction will be conducted as close to the CLSM as the compactor can achieve.	Inspect the intersections of-between old and new lifts. Verify that the outer one foot of the old lifts are-is being removed (except for CLSM lifts). Record any problems and corrective actions taken on the Daily Construction Report.	Verify that the required inspections are being performed and documented.
66) COMPACTION WITH CAESCCS: When using the CAESCCS system, each lift and lift interface shall be compacted by at least four machine passes with the CAT 826 compactor. The lift surface shall be firm and unyielding to the compactor's weight. A minimum of 90 percent of the grid points reported for the lift by CAESCCS shall exhibit adequate compaction and machine passes. Adequate compaction as well as meeting the	Document the CAESCCS system report of compaction for each lift area. Compactive effort is reported by CAESCCS on a roughly 3.3-one foot x 3.3-one foot meter foot. Ensure that the CAESCCS reports a minimum of four machine passes (i.e., 8 wheel passes) for at least 90 percent of the grid points in the lift. Record this information on the Lift Approval Form. Perform a QC inspection of the compacted lift by	Perform a monthly assessment of the compaction documents generated by the QC technician.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - WASTE PLACEMENT WITH COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>minimum number of wheel passes is reported by <u>CAESCCS</u> when the each pixel turns green. Furthermore, a maximum of five 56 square feet of non-green pixels shall may be adjacent to each other within the lift area limits. “Adjacent” means that two pixels share a common side; pixels that share only a common corner are not adjacent to each other.</p> <p>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 <u>CAESCCS</u> system.</p> <p>B. Evaluate the lift interface when compacting adjacent to <u>an obstruction (e.g., a previously poured CSLM surface, irregular CLSM side slope, CWF caisson, etc.)</u>. Visually inspect for obstructions (e.g., CLSM surface, irregularities in CLSM side slope, etc.) that may affect compaction data. More than five 56 square feet of non-green adjacent pixels are permitted in this situation if QC visually observes and documents a minimum of six machine passes to within 12 inches of the obstruction.</p> <p>67) COMPACTION WITHOUT <u>CAESCCS</u>: If the <u>CAESCCS</u> system is not available to be used for compaction under this work element, the following requirements apply.</p> <p>A. Verbal notice <u>Notice</u> shall be provided to <u>DWMRCDirector</u> within 24 hours of beginning to approve lifts without <u>CAESCCS</u>. This notice may be provided via email.</p>	<p>observing the <u>CAESCCS</u> control screen for evidence of uniform and adequate compaction. This condition is indicated by having a minimum of 90 percent of the screen green. Evaluate <u>Visually compare</u> all <u>adjacent non-green</u> pixels <u>against the 3.3 foot by 16.5 foot and 7.5 foot by 7.5 foot area legends on the system screen that are not green</u> to ensure the maximum number of adjacent pixels is not exceeded. Print the screen <u>CCS report</u> as a color image and include with the Lift Approval Form. Record QC inspection results on the Lift Approval Form.</p> <p>Perform a visual inspection of the CLSM obstruction <u>Soil interface</u>. Identify areas of the CLSM pour obstruction that present an obstacle for the <u>CAT 826</u> compactor. Visually observe the compactor operator make a minimum of six machine passes to within 12 inches of the obstruction. Document the observations on the Lift Approval form.</p>	<p>Notify <u>DWMRCDirector</u> within 24 hours of beginning to approve lifts without <u>CAESCCS</u>. Provide QC with documentation of DRC notification.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - WASTE PLACEMENT WITH COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>B. Written notice shall be provided to DWMRCDirector no later than three calendar days (72 hours) after beginning to approve lifts without CAESCCS. The written notice shall explain why CAESCCS is down; an estimate of when CAESCCS will be back online; a map of the areas being compacted without CAESCCS; and a map of interim settlement monuments over the area being compacted without CAESCCS.</p> <p>C. Compaction without CAESCCS is limited to 10 calendar days per occurrence.</p> <p>D. Each lift and lift interface shall be compacted by at least six 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:</p> <ol style="list-style-type: none"> 1. The lift surface exhibits ruts or compression (excluding depressions caused by the tines of the compactor wheel) in excess of four inches; 2. The waste material exhibits pumping behavior, or has other indications of excess moisture content; or 3. The lift does not appear to be uniformly compacted. 	<p>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.</p> <p>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. Record any problems and corrective actions taken on the Daily Construction Report.</p> <p>Survey lift elevation and thickness in accordance with Specification 62, with the further requirement that the greater of the following number of points shall be surveyed per lift:</p>	<p>Provide written notice to DWMRCDirector no later than three calendar days after beginning to approve lifts without CAESCCS. Provide QC with a documentation of written DRC notification. Note: Verbal and written notification may be submitted by the Engineering Manager, or designee, and then provided to Quality Assurance.</p> <p>Review the compaction documents generated by the QC technician.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - WASTE PLACEMENT WITH COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	<ul style="list-style-type: none"> a. At least five points; or b. One point per 2,000 square feet of lift area. <p>Record the number of passes and visual inspection results on the Lift Approval Form.</p>	
<p>68) DEBRIS PLACEMENT: For purposes of this work element, debris is defined in Specification 78 with the exception that a large object is defined as incompressible debris exceeding the debris size requirements of Specification 69.</p> <p>Debris placed in accordance with this work element shall be limited to no more than 50 percent by volume of the compacted volume of the lift. The debris shall be uniformly distributed across the lift.</p> <p>Lifts containing materials susceptible to wind dispersal shall be covered with soil-like waste, fill material, or a commercial fixative so that these materials are secured by the end of the shift the materials were placed into the lift. "Secure" means a visual inspection to confirm that cover material has been applied to all materials susceptible to wind dispersal so that no material is obviously blowing around. Plastic, etc., may be visible at the surface.</p>	<p>Determine the volume of debris. Volume determination shall be established by either:</p> <ul style="list-style-type: none"> a. inspecting the debris on the lift and calculating the volume of debris, or b. using the manifested waste volume for shipments placed on the lift. <p>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 and debris percentage calculations on the Lift Approval Form.</p> <p>Document cover material used, location, and result of visual inspection to ensure materials are secure on the Daily Construction Report.</p>	<p>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.</p>
<p>69) DEBRIS SIZE: All incompressible debris placed in accordance with this work element shall be less than 16 inches in at least one dimension and no longer than 12 feet in any dimension.</p>	<p>Inspect debris placed in soil lifts to ensure that it meets the debris size requirements. Record the results in the Daily Construction Report.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - WASTE PLACEMENT WITH COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>70) SNOW REMOVAL: When waste material is to be placed and the work area is covered with snow and/or ice, the snow and/or ice must be removed so that no more than one quarter inch remains on the surface. Isolated individual clumps of snow and/or ice may be present, but shall be no larger than two inches in diameter.</p>	<p>Observe that snow is removed. Inspect the waste lift for damage. Notify the Project Manager of deficiencies/damage. Construction may not continue without corrective action and re-inspection of deficiencies/damage. Record corrective action (where required) in the Daily Construction Report.</p>	<p>Verify that snow removal is being performed and documented and the waste lift has been inspected.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
71) SCOPE: This work element applies to the Class A West, 11e.(2), and Mixed Waste embankments.		
72) LIFT IDENTIFICATION: Each lift shall be given a unique 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 unique lift identification number has been assigned to each lift. Verify that the lift identification number is used on all paper work for that lift.
73) 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 stored waste described in Specification 94 and 95.	Verify that the previous waste lift has been approved prior to waste disposal.	
74) LIFT THICKNESS: The waste 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 over a 10,000 square foot area. Where practical, survey the corners and at least one spot in the middle. If the average thickness of these surveys exceeds 12 inches, notify the Project Manager to have operations rework the lift. The lift shall be re-surveyed with at least five more points per 10,000 square feet after it is reworked. Survey measurements will be documented and forwarded to Quality Assurance.	Verify the frequency of measurements and compliance of test results.
75) COMPACTION: Each lift shall be compacted to 90 percent of a standard Proctor, except lifts with greater than 10 percent compressible debris, which shall be compacted to a minimum of 95 percent of a standard Proctor.	Proctors shall be performed at a rate of one test per 15,000 cubic yards (compacted) or less of a specific material type.	Verify the frequency of measurements and compliance of test results.
The moisture content of all lifts shall be equal to at least two percent and no greater than up to three 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	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

test will be performed per soil type in the lift. The test location shall be chosen on the basis of random numbers (described in Specification 12) and will be documented on the Lift Approval Form. Approve lots for compaction criteria where:

- a. material is observed to be properly compacted across the surface of the lot; and
- b. moisture/density test results meet moisture and compaction specifications.

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 and/or moisture content is less than two percent or greater than three percentage points above optimum moisture:

- a. Identify the lot(s) (including dimensions) requiring further compaction, and re-work the material. Re-test at the location previously tested. Test one more location in each re-worked lot. Identify the test location using the lot dimensions and random numbers (described in Specification 12).
 - 1) If the test results from both tests meet moisture/density requirements, approve the lot;
 - 2) If either test fails, repeat the above process until all tests at both locations meet moisture and compaction requirements.

- OR -

- b. 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

Ensure that resolution of any reworked lots are properly accomplished and documented.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	<p>tests within five feet of the original test. Note: <u>All tests are to be recorded on a Field Density Test form.</u></p> <p>If the results from both tests meet moisture/density requirements, record both tests and approve the lot.</p> <p>If either test fails to meet moisture/density specifications – and the test results were not improperly influenced as described above - follow instructions for a.2 above.</p>	
<p>76) CLASSIFICATIONS: One soil classification test shall be performed at six month intervals for each large soil waste generator.</p>	<p>Perform a soil classification test (ASTM D2487) every six months for each large soil waste generator. Perform this test at a random location as described in Specification 12. A large soil waste generator is defined as a generator 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.</p>	<p>Verify the sampling frequency is met.</p>
<p>77) TERRACING OF LIFTS: Lifts constructed at time more than 30 days apart from each other shall have at least three feet, measured horizontally, removed from the outer edge of the old lift (except for CLSM lifts).</p> <p>For lifts that interface with CLSM; in addition to the moisture-density testing of the lift, one moisture-density test shall be performed to verify requirements are met at the CLSM/soil interface. This CLSM/soil interface density test shall be performed within four feet of the CLSM/soil interface.</p>	<p>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). Document inspections on the Lift Approval Form. Record any problems on the Daily Construction Report.</p> <p>For lifts that interface with CLSM: Perform the moisture-density test in within four feet of the CLSM interface. Moisture-density testing and corrective actions, when required, shall be performed and documented in accordance with Specification 75 with the exception that an interface moisture-density test is not required for each soil type.</p>	<p>Verify that the required inspections are being performed and documented.</p> <p>Verify the frequency of measurements and compliance of test results.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

DEBRIS PLACEMENT (Specifications 78 thru 83)

78) ~~DEBRIS DEFINITIONS:~~

Compactable Soil (soil) – Any material meeting each of the following conditions:

A. material size of less than four inches (i.e. would pass through a four inch screen);

B. bulk density greater than seventy pounds per cubic foot, dry weight, in accordance with ASTM D698;

C. exhibits soil-like properties (i.e. standard tests in accordance with waste placement procedures can be performed)

Debris – Any waste material which cannot be classified as a compactable soil as defined above. Debris is classified as either compressible debris or incompressible debris.

Compressible Debris – any debris that will compress or deform under normal working pressures (e.g. plastics, thin metals, glass, etc.)

Incompressible Debris – debris consisting of stone, concrete, or solid metal that will not compress or deform under normal working pressures.

Large Object – incompressible debris exceeding the debris size requirement of Specification 82 below.

Large Component – A large object that weighs more than 100,000 pounds.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

~~For the purposes of this CQA/QC manual, debris is defined as any radioactive waste for disposal other than compactable soils. Compactable soil is defined as:~~

- ~~A. material that will pass through a four inch grizzly;~~
- ~~B. having a bulk density greater than seventy pounds per cubic foot dry weight in accordance with ASTM D698; 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 incompressible debris exceeding the debris size requirement of Specification 82. A large component is defined as a large object that weighs more than 100,000 pounds.~~

79) DEBRIS PLACEMENT METHODS: Debris may be placed in the embankment using two different methods:

- A. placement of the debris in a lift with compactable soil at a limited ratio of debris to soil as defined in Specification 80; or
- B. 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

Have the Engineering Manager perform a Large Component Engineering Review. Ensure that the

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>than 3,000 psf.</p> <p>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 placed around the large component within 30<u>14</u> calendar days of large component disposal.</p>	<p>bearing pressure at the clay liner surface meets specification for the load associated with placement of any large component.</p> <p>Document the date of large component disposal and the date of the CLSM pour and include with the Lift Approval Form.</p>	<p>If CLSM is required to meet the load specification requirement, verify the first four feet of CLSM was placed around the large component within 30 calendar days of large component disposal.</p>
<p>80) DEBRIS QUANTITY IN SOIL WASTE LIFTS: Debris that is placed in an embankment with compactable soil shall be limited to a percentage of the total volume of the waste lift, or portion of the lift designated for debris placement. Furthermore, the debris shall be uniformly distributed across the lift, or portion of the lift designated for debris placement.</p>	<p>For shipments containing debris material, determine the volume of debris for the shipments. Volume determination shall be established by either:</p> <ol style="list-style-type: none"> a. inspecting the debris in the shipment and calculating the volume of debris; or b. using the manifested waste volume. 	<p>Observe in the field that the debris calculations and estimates are being performed and properly documented.</p>
<p>For compressible debris, the volume of the debris in a lift, or portion of the lift designated for debris placement shall be limited to less than or equal to thirty percent 30 percent by volume of the calculated compacted volume of the lift, or portion of the lift designated for debris placement.</p> <p>Incompressible debris (concrete, stone, or solid metal) may be placed in a lift, or portion of the lift designated for debris placement up to 25 percent by volume of the calculated compacted volume of the lift, or portion of the lift designated for debris placement.. When combining the two types of debris in one lift, or portion of the lift designated for debris placement, the above volume limit applies and the maximum volume of all debris shall be less than or equal to 25 percent.</p>	<p>Inspect debris once it is spread out on the lift, or portion of the lift designated for debris placement prior to placement of fill material. Ensure that debris is spread out uniformly across the lift, or portion of the lift designated for debris placement and in a manner to minimize void spaces and does not exceed volume requirements. Document the debris inspection and debris percentage calculations on the Lift Approval Form.</p>	<p>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.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>81) WIND DISPERSIBLE DEBRIS: Lifts containing materials susceptible to wind dispersal shall be covered with soil-like waste fill material or a commercial fixative so that these materials are secured by the end of the shift the materials were placed into the lift. “Secure” means a visual inspection to confirm that cover material has been applied to all materials susceptible to wind dispersal so that no material is obviously blowing around (however, “secure” material may potentially be dislodged, but is required to remain within the restricted area of the facility). Plastic, etc., may be visible at the surface.</p>	<p>Perform a visual inspection to verify that lifts containing materials susceptible to wind dispersal are covered with soil-like waste fill material or a commercial fixative by the end of the shift the materials were placed into the lift. Document the inspection and any corrective actions on the Daily Construction Report.</p>	<p>Review documentation to verify that the visual observations of debris shipments are being properly performed by QC personnel.</p>
<p>82) DEBRIS SIZE: Incompressible debris placed in soil waste lifts shall be less than 10 inches in at least one dimension, and no longer than 12 feet in any dimension.</p>	<p>Inspect debris placed in soil lifts to ensure that it meets the debris size requirements. Document on the Daily Construction Report.</p>	<p>Review documentation associated with debris lifts to verify that debris inspections are being performed.</p>
<p>83) RESIN LIFTS: Unless disposed in the Containerized Waste Facility, resins shall be disposed as follows with prior Directors approval in accordance with Specification 23 for each shipment or disposed in accordance with Specification 90.</p> <p>A blending layer of native soil shall be spread across a lift prior to placement of the resin. The blending layer material shall be defined as CL based on the Unified Soil Classification system.</p> <p>Prior to spreading resins across the blending layer, there shall be no depressions or wheel ruts deeper than one inch.</p>	<p>Obtain documentation confirming that the Director has approved the plans for resin disposal in accordance with Specification 83.</p> <p>Perform laboratory classification tests (ASTM D2487) on native soil at a rate of one test per lot prior to placement of resins. A lot is defined as a maximum of 250 cubic yards (compacted) of specified material type. Record the location of the classification sample on the Sample Log.</p> <p>Prior to placement of resins, survey the blending layer and inspect the surface for depressions and wheel ruts.</p>	<p>Verify that Director approval has been obtained before disposing of resins in accordance with Specification 83. Provide QC with approval documentation.</p> <p>Review documentation associated with resin lifts to verify blending and disposal requirements are being performed.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
Resins are limited to a maximum of 10 percent, by volume, of the blending layer of lift. Prior to blending resins shall be evenly spread across the lift with no areas larger than 25 square feet without resins and resins shall be less than one inch thick at any location.	<p>Include the survey report with the Lift Approval Form. Document inspection results, discrepancies identified, and corrective actions taken on the Lift Approval form.</p> <p>Inspect the spread resin prior to tilling to ensure:</p> <ol style="list-style-type: none"> a. resin is less than one inch thick at any location on the surface of the lift and is proportioned at a maximum of 10 percent, by volume, of the compacted lift; b. resin is spread throughout the resin lift area; c. there are no areas larger than 25 square feet without resin; <p>Require additional spreading for any resin lift not meeting these specifications. Record the debris inspection on the Lift Approval Form.</p>	
Resins shall be thoroughly blended with the blending layer and covered with a minimum of two inches of clay prior to compacting. The total lift thickness (blending layer plus the clay cover) shall be limited to one foot. The clay cover must be placed by the end of each work day. The approved cover may be used as part of the blending layer for the next resin lift.	Verify resins have been thoroughly blended with the blending layer prior to placement of clay cover. Verify that a minimum of two inches of clay cover has been placed by the end of each workday and document on the Daily Construction Report. Perform moisture and density testing in accordance with Specification 75.	
The DWMRC shall be notified at least 48 hours in advance of the placement of blended materials beyond this two inch clay layer.	Obtain documentation of DWMRC notification.	Notify the DWMRC at least 48 hours in advance of the placement of blended materials beyond the two inch clay layer. Provide QC with documentation of DWMRC notification.
CLSM POURS (Specifications 84 thru 93):		
84) CLSM PYRAMID:		
A. CLSM lifts shall form a pyramid with a final maximum 3H:1V outside edge slope. Thus, with a six foot CLSM lift and six inch cap, the	Determine the location of the northwest corner and the dimensions of each lift and document on the Lift Approval Form. Use the lift location and dimensions to	Verify compliance with this specification and proper documentation of the QC requirements.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>next CLSM tier must be constructed to minimum of 19.5 feet inside the edge of the lift immediately below it.</p> <p>B. The pyramid base dimensions and maximum 3H:1V side slope requirements will control the location of all subsequent CLSM lifts throughout the full height of the embankment.</p> <p>C. Adjacent pyramids shall not be placed above any portion of previous CLSM pyramids.</p>	<p>ensure compliance with this specification. Document the dimensions of the previous CLSM lift on the Lift Approval Form. In locating a new pyramid, document on the Lift Approval Form:</p> <p>a. The pyramid base is placed on the Liner Protective Cover; or,</p> <p>b. The pyramid base has not been placed above a previously placed pyramid.</p>	
<p>CLSM Lift Preparation: The average height of each pour shall be six feet or less. Large objects taller than six feet shall be poured with the subsequent CLSM pours (in layers) until completion. The height restriction does not include the six inch cap, if applicable, or CLSM used for repairs in accordance with Specification 92a.</p>	<p>Perform an inspection of the preparation of debris for placement with CLSM. Ensure that the average formed height of the CLSM lift is less than six feet and that any large objects are localized into specific areas.</p>	<p>Review inspection documentation to verify that inspections are performed and properly documented.</p>
<p>Debris disposed with CLSM will be placed to minimize the entrapment of air in the CLSM pour.</p>	<p>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.</p>	
<p>85) DWMRCDIRECTOR NOTIFICATION FOR CLSM POURS: The DWMRCDirector 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 QC for CLSM designated on a waste lift.</p>	<p>Obtain documentation of DWMRCDirector notification.</p>	<p>Notify the DWMRCDirector at least 48 hours in advance of any CLSM pour. Provide QC with documentation of DWMRCDirector notification.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

86) CLSM DESIGN SPECIFICATIONS:

Notwithstanding the following specifications, Macro Vaults as approved by the DWMRC Director 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 Engineering Manager prior to use in the cell area and meets the material specifications provided in Table 2 “Material Specifications for Portland Cement CLSM”.
- B. The CLSM passes a Slump Test (ASTM C143), 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”.

For each day’s production, perform an initial screening test. Perform subsequent acceptance tests as required by lot size. ~~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 AB). 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, 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

Verify the frequency of measurements and compliance of test results.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	<p>upon verification that the initial load (and subsequent two loads if the initial load failed) meets mix specifications.</p> <p>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 (“Practice for Sampling Freshly Mixed CLSM”). These acceptance tests shall be performed from a composite of two samples from near the middle of the load.</p> <ol style="list-style-type: none"> 1) Accept loads that meet specification. 2) 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. 	
C. The CLSM shall have minimum 28-day strength of 150 pounds per square inch (psi) as determined by ASTM D4832. A minimum of three cylinders shall be cast for compressive strength testing.	<p>Cast a minimum of three cylinders per 2,000 cubic yards of CLSM placed, with at least one set per lift for lifts smaller than 2,000 cubic yards. Perform compressive strength testing in accordance with ASTM D4832 at 28 days to ensure the minimum strength requirements are met. This test may be performed in-house or sent off-site to an AMRL certified laboratory. If the CLSM does not meet specification, evaluate why it failed and implement corrective actions to prevent recurrence. Record the reason for the failure and the corrective action on the Lift Approval Form.</p>	<p>Verify compressive strength testing is being performed at the correct frequency.</p>
E. The CLSM shall have a wet unit weight in all cases of at least 100 lbs/ft ³ as determined by ASTM D6023 “Standard Test Method for Density (Unit Weight), Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low-Strength Material (CLSM)”.	<p>Conduct a unit weight test (ASTM D6023) in conjunction with sampling for compressive strength testing of Specification 86.C.</p>	<p>Verify unit weight testing is being performed at the correct frequency.</p>
D. A load ticket shall be furnished for each truck		<p>Verify that the load tickets have been obtained by QC personnel for each truck load of CLSM and that the</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>of CLSM to be poured.</p>	<p>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” of this Manual. 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. Document discrepancies on the Daily Construction Report.</p>	<p>load ticket has been checked against Table 2 “Material Specifications for Portland Cement CLSM”</p>
<p>87) 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.</p>	<p>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 objects 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.</p>	<p>Verify the large debris inspections have been performed and documented on the CLSM Inspection and Testing Form.</p>
<p>88) 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.</p> <p>Lids shall be removed from all box containers prior to pouring CLSM (unless a specific waste</p>	<p>Visually inspect compressible debris inside containers to ensure the debris is secured. Ensure lids are removed</p>	<p>Review inspection results to ensure that compressible debris is being properly secured and that adequate</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>stream or shipments are exempted by DWMRC Director for safety or ALARA considerations). Drum containers do not require removal of the lid. However, a drum container lid shall be pierced with a hole size of at least eight square inches (i.e., two inch by four inch) to allow flow of CLSM into the container. If any container includes compressible debris, the material shall be secured to remain inside the container. Containers that contain compressible debris shall have the lid removed or a six-inch CLSM cap shall be placed over the filled container.</p> <p>Hot particles are very small, often microscopic discrete radioactive fragments with high specific activity. Their presence or potential presence in a waste stream is documented on the waste profile record. To protect worker health and safety, waste containers containing asbestos, beryllium, DU metal or hot particles do not require in-filling of debris inside the containers to be maximized. Box lids and at least one wall shall be punctured with a minimum of two holes at least eight square inches (i.e., two inch by four inch). Containers placed in this manner shall be marked as “asbestos”, “beryllium”, “DU” or “hot particle” waste and shall have a six inch CLSM cap placed over them.</p> <p>89) CLSM POURS WITH SOIL-FILLED CONTAINERS: Containers that are filled with soil-like materials may be placed with CLSM placements or pyramids. The lid may remain on the container. However, a minimum of two holes of at least eight square inches (i.e., two inch by four inch) must be placed in the lid as required for compressible debris-filled containers in Specification 88.</p>	<p>from all box containers. If the lid shall remain on the drum container (or other waste container specifically exempted by DWMRC Director), ensure that the lid has been pierced with at least one hole for drums and two holes for boxes. Holes shall be a minimum of eight square inches (i.e., two inch by four inch). Record results on the CLSM Inspection Form.</p> <p>Ensure that containers with asbestos, beryllium, DU metal or hot particle waste are marked. Document the location of each such container within the pour on a survey report or a map of the area. Ensure that the lift is not approved without placement of a six-inch CLSM cap.</p>	<p>holes exist for containers where lids remain on the container.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>90) CLSM POURS WITH RESIN-FILLED CONTAINERS: Containers that include or are filled with ion-exchange resin materials may be placed with CLSM. Cardboard, wood, and soft plastic “supersack” containers are expressly prohibited from use as the sole container for resin disposal in CLSM.</p> <p>At least ten percent of all resin-filled containers placed in each CLSM lift area shall be tested for free liquids.</p> <p>Resin filled containers shall be clearly marked on their lids designating resins are present in the container. HIC liners are assumed to contain resins and do not need a marking.</p> <p>Prior to pouring CLSM, caps (internal access point for HICS and other liners) may be removed from liners, with steel caps exceeding 0.5 inches thickness, to fill headspace voids. For all other containers <u>with resins</u>, lids may not be removed. If not removed, lids <u>or the highest surface</u> of cylindrical containers of diameter less than three feet shall be pierced with <u>a minimum of</u> one hole of size of at least eight square inches (i.e., two inch by four inch) to allow flow of CLSM into the container headspace void. If not removed, lids or the highest surface of all containers, other than cylindrical of diameter less than three feet, shall be pierced with a minimum of two holes of size of at least eight square inches (i.e., two inch by four inch) to allow flow of CLSM into the container void space.</p> <p>When filling a container, CLSM shall not be dropped from a height exceeding 10 feet, as</p>	<p>Verify that ion-exchange resin containers are constructed of steel or poly. Document this inspection on the CLSM Inspection Form.</p> <p>Assure operations documents the results of the free liquid inspection and container numbers.</p> <p>Document that the container has been painted or marked as required.</p> <p>Document that lids have been removed or punched with the correct number and size of holes.</p> <p>Verify and document that CLSM drop height does not exceed limitation and CLSM overflow is minimized.</p>	<p>Review documentation to ensure CLSM pours have been documented according to this specification.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>measured from the point of discharge to the highest surface of the resin-filled container, and pouring methods shall minimize CLSM overflow from within the containers into the surrounding pour areas.</p> <p>CLSM poured across the top of the resin-filled containers shall not intermix with the CLSM used for filling headspace voids (e.g., CLSM used for filling headspace voids shall be allowed to harden prior to pouring across the top of the container).</p> <p>All resin-filled containers shall have a six inch CLSM cap placed over the filled container.</p> <p>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 Manual, may be used to make up the remainder of the volume of the pour.</p> <p>Except for the placement of boxes containing drums and other smaller resin-filled packages, 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.</p> <p>91) 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).</p>	<p>Verify and document that CLSM pouring methods prevent intermixing of CLSM used for filling headspace voids with CLSM used to cover the remainder of the container.</p> <p>Prior to the CLSM pour, calculate the ratio of resins to other material in the pour as follows:</p> <ol style="list-style-type: none"> a. Document the container type and volume for each container of resins in the pour; b. Document the total pour volume based on the formed area x height; c. 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. <p>Survey and document the location of resin-filled container and include with the Lift Approval Form. Verify that resin-filled containers are not placed directly above resin-filled containers in previous lifts within the CLSM pyramid.</p> <p>Visually inspect the final CLSM pour surface to ensure the area is acceptable for proof rolling.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>92) PROOF-ROLL TESTING: A proof roll test shall be performed on all CLSM lifts a minimum of three calendar days following completion of the CLSM pour and prior to placement of any 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 <u>wheel</u> surface load) driving across the entire footprint of the completed CLSM pour.</p>	<p>Inspect the entire cured CLSM pour surface. Following inspection, direct the truck (rock truck, cement truck, or other vehicle of equal or greater <u>wheel</u> surface load) across the entire CLSM pour surface. 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 one-half 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.</p> <p>Approve all lift areas not marked for repair or rework. For any areas with surface cracking or depressions with a vertical displacement of one-half inch or greater, or cracks greater than one-half inch in depth, one of the following methods shall be followed to remedy the failed area(s):</p> <ol style="list-style-type: none"> 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. With the exception of edges at the perimeter of a lift, the six-inch cap shall extend a minimum of three feet 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 was adequate. This process may also be repeated (i.e., placement of additional cap to a 12- 	<p>Review the documentation to ensure proof-roll testing is being performed and properly documented.</p> <p>Review the documentation to ensure rework, if required, has been performed and documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	inch cap) until satisfactory results are achieved.	
<p>93) SIX-INCH CAP: A six-inch cap is required as described in Specification 88 and 90. Additionally, a six inch cap may be utilized for repairs to CLSM pours that do not pass the proof-rolling test of Specification 92. Areas poured with a CLSM cap shall still require a proof-rolling test (as described in Specification 92) to verify performance of the cap. With the exception of edges at the perimeter of a lift, the six inch cap shall extend a minimum of three feet in each direction past the edge of the area that requires a cap.</p> <p>The six inch cap shall have minimum 28-day strength of 500 psi as determined by ASTM D4832. Table 2 specifications do not apply to the CLSM cap.</p>	<p>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 lift as required for determining lift thicknesses above. Document the survey on a survey report. Ensure that the thickness of the cap is six inches above all debris requiring a CLSM cap. Document the inspection and completion of the CLSM cap on the Lift Approval Form.</p> <p>Perform compressive strength testing of the CLSM used for caps at the rate of one test per 1,000 cubic yards of CLSM placed, with at least one test per lift. Test specimens/samples shall be collected in accordance with ASTM D5971. The samples shall then be tested in accordance with ASTM D4832. The test results are documented in the contractor's compressive strength report which is referenced on the Lift Approval Form. If the CLSM cap does not meet specification, evaluate why it failed and implement corrective actions to prevent recurrence. Document corrective actions on the Daily Construction Report.</p>	<p>Review the documentation associated with the CLSM cap.</p> <p>Verify that compressive strength testing is performed at a rate of one per CLSM lift. Ensure that the compressive strength of the cap is greater than or equal to 500 psi.</p>
<u>STORED WASTE (Specification 94 - 95)</u>		
<p>94) LLRW STORED 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/stored waste. In-cell bulk disposal/stored waste may be temporarily managed in piles up to twenty-five feet high on the embankment. The</p>	<p>On a monthly basis, calculate and document the volume of in-cell bulk disposal/stored waste and waste stored on the LLRW storage pads. Stop waste unloading before the volume of waste stored exceeds the volume specified in the current LLRW Surety.</p>	<p>Review documentation of in-cell bulk disposal and ensure that volumes do not exceed the current LLRW Surety.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>total volume of waste in storage shall not exceed the volume reported in the current LLRW Surety.</p> <p>Open-air storage of PCB/Radioactive waste and Dry Active Waste (DAW) is prohibited. DAW is defined in Ground Water Quality Discharge Permit UGW450005. In-cell bulk disposal of PCB and DAW shall be managed to prevent open-air storage as follows:</p> <ul style="list-style-type: none"> A. Maintained in a water-tight container; or B. Covered within 24 hours of the end of the shift that the waste was unloaded with a nominal six inches of soil or soil-like waste material that is free of PCB and DAW; or C. 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 D. The following PCB wastes do not require cover to prevent wind dispersal: <ul style="list-style-type: none"> 1. Drained equipment; 2. Large objects with inaccessible PCB contamination; or 3. 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. <p>When cover is required, document the date and shift that PCB and DAW were placed in in-cell bulk disposal/storage and the date and shift that cover was applied.</p>	<p>Obtain reports from waste disposal personnel as to the location and status of PCB and DAW in-cell bulk disposal/stored waste 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.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>95) 11e.(2) STORED 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 storage. In-cell bulk storage may be temporarily managed in piles up to twenty-five feet high on the embankment. In-cell bulk storage cannot be placed on slopes steeper than approximately 5H:1V. The volume of in-cell bulk storage shall not exceed the limit found in RML #UT 2300478, condition 10.8.e14.d. In order to prevent excess stockpiling, all bulk storage waste shall be disposed by August 1 of each year.</p>	<p>On a monthly basis, calculate and document the volume of in-cell bulk storage. Stop waste unloading before the volume of waste stored exceeds the volume specified in Condition 10.8.e14.d. of RML #UT 2300478.</p>	<p>Review documentation of in-cell bulk disposal and ensure that volumes do not exceed the License limit.</p>
<p>COLD WEATHER PLACEMENT (<u>Specifications 96 thru 98</u>)</p>		
<p>96) 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.</p>	<p>During cold weather, inspect material to be disposed directly on the clay liner. Do not allow frozen material to be disposed on the clay liner. Record corrections on the Daily Construction Report.</p>	<p>Verify that inspections for frozen material are being conducted during cold weather and that any corrective actions (if required) are properly documented.</p>
<p>97) PLACEMENT OF WASTE DURING COLD WEATHER: Waste material shall only be placed <u>disposed</u> when the required moisture and compaction can be met.</p> <p>For soil lifts:</p>	<p>a. On November 1, decrease density and moisture lot size to 750 cubic yards (compacted).</p> <p>b. On December 1, and continuing to March 1, decrease density and moisture lot size to 500 cubic yards (compacted).</p> <p>c. When two consecutive tests fail compaction</p>	<p>Verify that the testing frequency is increased at the beginning of November, and December. Verify that waste failing two consecutive compaction tests are classified as in-cell bulk disposal/storage and noted in the Daily Construction Report.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	<p>requirements due to frozen material the lift is classified as in-cell bulk disposal/storage and managed in accordance with Specification 94. This action will be noted in the Daily Construction Report.</p> <p>d. When temperatures are high enough to place the in-cell bulk disposal/storage material, place the material in accordance with Specifications 74 and 75, and in accordance with the following criteria:</p> <ol style="list-style-type: none"> 1) If more than two feet of waste was stored as in-cell bulk disposal/storage, excavate to a maximum of 12 inches above the last approved waste lift. Test and approve this in accordance with Specifications 74 and 75. 2) If less than two feet of waste was stored as in-cell bulk disposal/storage, excavate to the top of the last approved lift and re-test this lift in accordance with Specifications 74 and 75. 	
For CLSM pours:		
A. Do not pour CLSM on a frozen base.	If ambient temperatures are less than 35°F for three successive days, the pour area shall be tented and heated for 24 hours prior to pouring. The temperature inside the tented area shall be continuously monitored on the opposite end of the tent from where heat is being applied. The ambient temperature within the tented area shall be greater than 50°F for a minimum of 12 hours prior to pouring.	When required, review documentation of tenting, heating, and temperature measurements.
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	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	During freezing conditions, verify that QC personnel have performed initial sampling and testing of the CLSM to ensure flowability. Verify that the CLSM has been covered with concrete blankets or tented and

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>during the CLSM pour, the CLSM shall be sampled and an initial screening test performed as outlined (Specification 86). 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, 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).</p>	<p>criteria. This screening test includes either a Flow Consistency Test (ASTM D6103) or Efflux test (procedure given in Appendix A). The result 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.</p> <ol style="list-style-type: none"> a. 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. b. 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. <p>Perform acceptance sampling and testing from near the center of the load.</p> <ol style="list-style-type: none"> 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. 	<p>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.</p>
<p>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 square feet. 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</p>	<p>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</p>	<p>Review documentation of CLSM temperature measurements and actions taken for cold weather pouring to verify that CLSM temperatures meet specifications.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
pour, cover the CLSM with concrete blankets, or tent and heat the CLSM. Likewise, 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, the CLSM must be covered with concrete blankets, or tented and heated.	anticipated to decrease below 35°F anytime in the 24 hours following placement of the 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.	
98) SNOW REMOVAL: When waste material is to be placed and the work area is covered with snow and/or ice, the snow and/or ice must be removed so that no more than one quarter inch remains on the surface. Isolated individual clumps of snow and/or ice may be present, but shall be no larger than two inches in diameter.	Observe that snow is removed. Inspect the waste lift for damage. Notify the Project Manager of deficiencies/damage. Construction may not continue without corrective action and re-inspection of deficiencies/damage. Record corrective action (where required) in the Daily Construction Report.	Verify that snow removal is being performed and documented and the waste lift has been inspected.
99) FINAL GRADING BEFORE TEMPORARY COVER PLACEMENT: Top of waste elevations shall be at or below design elevations. Also, special attention shall be taken to emphasize complete and thorough void filling around and within any debris in the final waste lift.	Survey the top lift of waste on a 50 foot grid and at key points (i.e., embankment break lines). Final survey measurements will be documented on a survey report and provided to the QC Supervisor and Quality Assurance.	Review the final survey data. Verify the frequency of the survey points.
A visual inspection is performed at the top of waste surface. Any incompressible debris protruding greater than one-half foot above the design top of waste surface shall be compacted into the lift or removed.	Perform the visual inspection. Notify the Project Manager of any deficiencies. Document inspection results on the Daily Construction Report and re-inspect deficiencies. If satisfactory, notify QA that the surface is ready for QA inspection.	Perform a visual inspection of the final elevation surface and provide written approval.
100) REGULATORY APPROVAL: <u>In accordance with Specification 23</u> t The <u>DWMRC Director</u> shall approve the final surface before temporary cover placement. <u>A</u> 48 hour notification shall be provided to the <u>DWMRC Director</u> prior to placement of temporary cover material over the final waste surface. Energy Solutions may proceed with temporary	Obtain written authorization from Quality Assurance that the final surface has been inspected. Obtain documentation (e.g., notice of inspection, email, letter) confirming the <u>DWMRC Director</u> inspection and approval.	Notify <u>DWMRC Director</u> (by email) that the final surface is ready for inspection. Provide QC with documentation of <u>DWMRC Director</u> inspection and approval.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – WASTE PLACEMENT WITHOUT COMPACTOR

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

~~cover placement 48 hours after notification if the DWMRC has not inspected and has not notified the Quality Assurance of its intent to inspect the final surface.~~

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT TEST PAD

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>101) SCOPE: This work element applies to the Class A West embankment.</p>		
<p>102) NOTICE OF TEST PAD CONSTRUCTION: <u>In accordance with Specification 23</u> The Containerized Waste Facility Waste Placement Test Pad (CWF Test Pad) plan shall be approved by the <u>DWMRC Director</u>. The CWF Test Pad plan shall be provided to the <u>DWMRC Director</u> at least 14 calendar days prior to test pad construction. If DWMRC has not provided approval or deficiency notification prior to the end of 14 calendar days, construction may proceed as proposed in the CWF Test Pad plan.</p> <p>The <u>DWMRC Director</u> shall be notified 48 hours in advance of the start-up of test pad construction.</p>	<p>Obtain documentation confirming that the CWF Test Pad plan has been approved by the <u>DWMRC Director</u> or the 14 calendar day period has ended.</p> <p>Obtain documentation confirming that the <u>DWMRC Director</u> has been notified, as required.</p>	<p>Verify that the CWF Test Pad plan has been provided to the <u>DWMRC Director</u> at least 14 calendar days prior to construction of the test pad. Provide QC with documentation of <u>DWMRC Director</u> approval or documentation that the 14 calendar day period has expired.</p> <p>Notify the <u>DWMRC Director</u> 48 hours in advance of test pad construction. Provide QC with documentation of <u>DWMRC Director</u> notification.</p>
<p>103) CONTAINERIZED WASTE PLACEMENT TEST PAD: A test pad with a minimum area of 400 square feet will be constructed using this 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 <u>DWMRC Director</u> concurrence with the test pad plan.</p> <p>Prior to implementation of a containerized waste configuration that has not been previously approved; a waste placement test pad shall be constructed utilizing the proposed containerized</p>	<p>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.</p>	<p>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 percent of the QC documentation to verify that the tests were performed and documented correctly.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT TEST PAD

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
waste configuration.		
Test pads are to be constructed and tested in accordance with the following specifications:		
A 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 visual inspection of the constructed configuration per test pad.
B 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.	Review 100 percent of the QC documentation for the test pad.
C 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 Engineering Manager and DWMRC Director .	Record type of equipment used, and number of passes on the Daily Construction Report. Verify DWMRC Director approval has been received for equivalent equipment when used.	
D The backfill surrounding the containers shall achieve an average density of at least 85 percent 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 one percent external void space by volume of the entire test pad.	Conduct in-place moisture-density tests at a rate of at least four tests per test pad. Each 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	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT TEST PAD

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	<p>performed.</p> <p>c. Where rework and retesting is impractical, reject the test pad procedure.</p>	
E. The procedures used to construct the test pad (container type, container configuration/orientation, backfill material properties, placement and compaction methods) shall be reviewed and approved by the Engineering Manager. The test pad must be approved by a <u>Utah licensed</u> Professional Engineer.	Provide the Engineering Manager with copies of the documentation for the test pad (all documentation associated with this work element) for review and approval.	
F. <u>In accordance with Specification 23</u> the test pad certification report shall be approved by the <u>DWMRCDirector at least 14 calendar days from the time the certification report was submitted and</u> prior to using the new test pad construction method. However, if the DWMRC has not provided approval or deficiency notification prior to the end of 14 calendar days from the time the certification report was submitted, construction may proceed using the new construction method.	Obtain documentation confirming that the test pad certification report has been approved by the <u>DWMRCDirector</u> or the 14 calendar day period has ended.	Verify that the test pad certification report has been provided to the <u>DWMRCDirector</u> . Provide QC with documentation of <u>DWMRCDirector</u> approval or documentation that the 14 calendar day period has expired.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>104) SCOPE: This work element applies to the Class A West embankment.</p>		
<p>105) LIFT IDENTIFICATION: Each lift shall be given a unique lift identification number for testing and surveying purposes.</p>	<p>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.</p>	<p>The quality assurance review for waste placement specifications shall cover each specification in this work element. Review a minimum of 50 percent of the QC documentation to verify that the tests were performed and documented correctly.</p>
<p>106) LIFT ACCEPTANCE: At the time of acceptance, the date and time of lift approval shall be recorded. <u>No CWF waste material will be disposed on a new lift until the prior lift is approved, except for stored waste described in Specification 94 and 95.</u></p>	<p>The QC technician shall record the date and time of lift approval on the CWF Lift Approval Form.</p> <p><u>Verify that the previous waste lift has been approved prior to waste disposal.</u></p>	<p><u>Verify that the date and time of lift approval is recorded on the Lift Approval Form.</u></p>
<p>107) DEFINITIONS: The following terms are defined for the Containerized Waste Facility:</p> <p><u>Backfill</u> is defined as sand with a minimum of 95 percent passing the #4 sieve, a minimum of 35 percent passing the #30 sieve, and less than 10 percent passing the #200 sieve. The maximum moisture content for backfill shall be less than or equal to 4.1 percent at the time of backfill placement. This specification may be modified following successful completion of a test pad.</p> <p><u>Backfill cover</u> is defined as a minimum of one foot of soil placed over containerized waste packages after backfilling is complete. <u>Backfill cover material shall not be a cohesionless material.</u> In the case of caissons, standard liners, and large liners, the backfill cover is placed over the intermediate sand layer.</p> <p><u>Caissons are precast concrete cylinders used to</u></p>		

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

~~ensure~~provide the spacing ~~off~~or standard or large liners. Caissons are placed in an approved disposal configuration (hexagonal for example) prior to placement of liners, and can be used in either the first lift or second lift.

Containerized waste is defined as any containers of Certified Containerized Waste in accordance with applicable requirements of the Waste Characterization Plan. Certified Containerized Waste ~~is defined as consists of~~ monolithic units in the form of the following filled containers.

- A. Any DOT “Strong, Tight” Containers up to five feet tall;
- B. Standard Liners are High Integrity Containers (HICs) or other cylindrical packages up to 6.65 feet tall (up to 215 cubic feet external volume);
- C. Large Liners are HICs or other cylindrical packages up to nine feet tall (up to 331 cubic feet external volume); or
- D. Other Large Components and oversized DOT containers

Containerized Waste Facility (CWF) pyramid is limited to a maximum of two lifts of containerized waste. Containers up to five feet tall are limited to a single lift at the pyramid base. Containers greater than five feet tall are limited to two lifts. The volume of the embankment above and surrounding the pyramid shall be filled with bulk

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>waste lifts placed in accordance with the Bulk Waste Placement Work Element of this plan.</p> <p><u>Intermediate sand</u> is defined as a minimum of two feet of sand meeting gradation specifications for backfill, placed above the top of caissons, standard liners, and large liners.</p> <p><u>Lift</u> is defined as the six inch sand layer, containerized waste packages, backfill 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.</p> <p><u>Removable Steel Form</u> 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 <u>and</u> before backfill.</p>		
<p>108) CONTAINERIZED WASTE PLACEMENT:</p> <p>A. 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 CWF Test Pad. Figures 7 and 8 illustrate approved waste placement configurations. A minimum six-inch layer of loose sand shall be placed prior</p>	<p>Verify through observation and document that the appropriate container placement method and spacing is followed for the type of container stacking in each lift.</p> <p>Perform at least one gradation test per 2,500 square feet of placement area, or change in backfill material type, or change in borrow source.</p>	<p>Review the QC documentation to confirm that the appropriate container placement and backfilling method has been used and properly documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>to placement of containers. Containers shall be worked (to the extent practical) into this loose sand to minimize any voids underneath the containers. Containers shall be placed with a minimum spacingdistance 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.</p> <p>B. 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 seven feet tall. When used, removable steel forms shall be removed prior to backfill. Caissons with waste placed in them shall not be removed without prior DWMRCDirector notification. Backfill shall be placed to a minimum height of seven 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 percent 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</p>	<p>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.</p> <p>Perform moisture content testing on backfill material at least once each day backfill material is placed. 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 byduring the containerized waste placement test pad. Record type of equipment used, equipment load (if applicable), and number of passes on the CWF Lift Approval Form.</p> <p>Verify through observation and document on the CWF Lift Approval Form that standard liners are placed with the appropriate container placement method and spacing.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>minimum depth of nine feet above the container base elevation. Intermediate sand shall achieve a minimum density of 85 percent 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 four 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. <u>Removable steel forms shall be placed in approved configurations. Minimum spacing between removable steel forms is not required (steel forms can touch each other).</u></p> <p>C. Unusually shaped containers <u>(not exceeding the height requirements defined in Specification 108)</u> 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 five percent of the volume of the unusually shaped containers in the lift, unless otherwise approved by the DWMRC Director.</p> <p>D. Large components and oversized DOT</p>	<p>Verify through observation and document that the unusual containers are placed such that all significant voids can be filled.</p> <p>Verify through observation and document that the large components and oversized DOT containers are placed in accordance with an approved large component placement method.</p> <p>Verify through observation and document that large liners are placed with an approved container placement method and spacing.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

containers shall be placed and backfilled such that void spaces are filled and the bearing capacity of the embankment is not exceeded.

- E. 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 with waste placed in them shall not be removed without prior DWMRC Director 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 percent 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 11.5 feet above the container base elevation. Intermediate sand shall achieve a minimum density of at least 85 percent 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 five inches apart and no more than 11 inches apart (at the nearest point between two adjacent caissons).

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>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.</p>	<p>For large liners, document that the void space criteria is met.</p>	
<p>F. 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.</p>	<p>Document that drums have been placed as required. Document equipment used and number of passes on a Daily Construction Report.</p>	
<p>G. Drums shall be placed horizontally at least one 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. <u>Sand-Backfill</u> shall be compacted to an average standard proctor density of 85 percent with a minimum of a single pass of a hoe mounted vibratory compactor or its equivalent, prior to placement of the next layer of drums. For purposes of this specification, the “Standard I-13 Liner” and “NUHIC-55 liners” may be placed as a drum.</p>	<p>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.</p>	
<p>H. 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</p>		

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>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 two feet above the top of the caisson (measured from the lower lip of the bucket to the top of the caisson).</p>	<p>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.</p>	
<p>I. If placing ion-exchange resins in containers other than standard liners or large liners, <u>divide the lift area (e.g. box around the lift perimeter) into lots not exceeding 2500 square feet and ensure that each 50’ x 50’ lift area—lot contains no more than 25 percent resins by volume. Increase spacing of resin containers as needed to maintain this criterion.</u></p>		
<p>109) PYRAMID CONTROLS: Refer also to Figures 7 and 8. Containerized Waste Facility (CWF) Pyramid:</p> <p>A. 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.</p> <p>B. Drums and boxes less than five 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.</p> <p>C. The pyramid base dimensions and maximum 3H:1V side slope requirements will control the location of the second lift of containers.</p>	<p>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 this 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:</p> <p>a. The pyramid base is placed on the liner protective cover; or</p> <p>b. The pyramid base does not encroach the vertical limits of a previous pyramid.</p> <p>Prior to positioning the first liner in a second lift, document the location of containers in the first lift.</p>	<p>Verify compliance with this specification and proper documentation of the QC requirements on the CWF Lift Approval Form.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>D. Adjacent pyramids shall not be placed above a previous CWF pyramid.</p> <p>E. CLSM pyramids for bulk waste shall not be placed above a previous CWF pyramid.</p> <p>F. CLSM may be used for fill within the initial lift of the container-CWF pyramid (See Specification 110).</p> <p>G. The first liner placed in a second lift using this method shall be offset from liners in the lower lift.</p> <p>H. 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.</p>	<p>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.</p>	
<p>110) CLSM USE AS FILL: CLSM use as fill within the initial lift of the container-CWF pyramid shall comply with Specifications 84-85 and 8586. However, CLSM used as fill at the Containerized Waste Facility is not required to meet the compressive strength requirement of Specification 86.</p> <p>CLSM may be used for fill with up to two, five-drum pallets stacked inside a standard or large caisson. CLSM may also be used for fill with other waste containers that fit inside a standard or large caisson. The entire caisson height may be filled in a single CLSM pour.</p> <p>CLSM may also be used for fill around containers less than five feet tall around the perimeter of the</p>	<p>Obtain documentation of DWMRCDirector notification and Document CLSM mix inspections and approval in accordance with Specifications 84-85 and 8586.</p>	<p>Notify DWMRCDirector at least 48 hours in advance of CLSM use as fill. Provide QC with documentation of DWMRCDirector notification.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>CWF pyramid, so long as the 3H:1V pyramid slope is maintained. Drums placed in this manner may be oriented vertically.</p>		
<p>111) INTERMEDIATE SAND: Intermediate sand shall be placed above all caissons, standard liners, and large liners. Intermediate sand shall be placed a minimum of two feet above caissons. In the case of liners placed without caissons, intermediate sand shall be placed to an elevation of at least nine feet above the base of the container for standard liners and 11.5 feet above the base of the container for large liners.</p>	<p>Verify the mean elevation of the top of each intermediate sand lift by installing grade poles, or other methods approved by the Engineering Manager. For each lift larger than 50 feet x 50 feet, survey the corners and at least one spot in the middle. For lifts less than 50 feet x 50 feet, a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50 feet x 50 feet may be segmented to areas 50 feet x 50 feet 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 Supervisor.</p> <ol style="list-style-type: none"> 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. 	
<p>Intermediate sand shall achieve a density of at least 85 percent of a standard Proctor.</p>	<p>Perform at least one intermediate sand gradation and proctor test per 3,000 cubic yards (compacted) and anytime there is a change in material or borrow source. 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. The test location shall be chosen on the basis of random numbers (described in Specification 12). Approve lots</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	<p>when:</p> <ol style="list-style-type: none"> a. Material is observed to be properly compacted throughout the lot; and b. Density tests performed meet compaction specifications. 	
<p>112) 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.</p>	<p>Verify the mean elevation of the top of each backfill cover lift by installing grade poles, or other methods approved by the Engineering Manager. For each lift larger than 50 feet x 50 feet, survey the corners and at least one spot in the middle. For lifts less than 50 feet x 50 feet, a minimum of four grade poles, one in each direction, shall be used. Lifts larger than 50 feet x 50 feet may be segmented to areas 50 feet x 50 feet 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 Supervisor.</p> <ol style="list-style-type: none"> 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. 	<p>Review the QC documentation.</p>
<p>Backfill cover for each lift shall achieve a density of at least 95 percent of a standard Proctor.</p>	<p>Perform at least one backfill cover proctor test per 3,000 cubic yards (compacted) and anytime there is a change in material or borrow source. 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 two<u>one</u> tests will be performed per lift. The test location shall be chosen</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
	<p>on the basis of random numbers (described in Specification 12). Approve lots when:</p> <ol style="list-style-type: none"> a. Material is observed to be properly compacted throughout the lot; and b. Density tests performed meet compaction specifications. <p>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.</p>	
<p>113) 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.</p>	<p>Initial waste set back approval shall measure the setback distance around the edge of the runoff berm at 100 foot intervals and place stakes for reference. The stakes may be removed after the first lift is completed. Record the inspection of the setback on the Daily Construction Report.</p> <p>Inspect the waste setback on a monthly basis. Record findings on the Daily Construction Report.</p> <p>Require removal of any waste necessary to maintain the required set back.</p>	<p>Review the QC documentation to confirm that the monthly inspections have been performed and properly documented.</p>
<p>114) SNOW REMOVAL: When waste material, <u>backfill, intermediate sand, or backfill cover</u> is to be placed and the work area is covered with snow, the snow must be removed.</p>	<p>Observe that snow is removed. Inspect the area for damage. Notify the Project Manager of deficiencies/damage and re-inspect after deficiencies/damage are corrected. Construction may not continue without corrective action. Record corrective action (where required) in the Daily Construction Report.</p>	<p>Review the QC documentation to verify that snow removal is being performed and documented and the area has been inspected.</p>
<p>115) COLD WEATHER PLACEMENT OF <u>BACKFILL, INTERMEDIATE SAND, BACKFILL COVER, FLOWABLE SAND</u></p>	<p>When the ambient air temperature falls below 32 °F:</p> <ol style="list-style-type: none"> a. Inspect the backfill stockpile to be used that day 	<p>Review documentation and verify that the backfill stockpile is inspected, worked, and tested during cold weather conditions.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – CONTAINERIZED WASTE FACILITY WASTE PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>BACKFILL: The following requirements apply to placement of <u>backfill, intermediate sand, or backfill cover flowable sand backfill</u>—when the ambient air temperature is below 32 degrees °F:</p> <p>A. Backfill with frozen clods shall not be accepted for placement.</p> <p>B. The backfill stockpile shall be worked using heavy equipment prior to use.</p> <p>C. The minimum average spread diameter for the flowability tests shall be 8.75 inches.</p> <p>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.</p>	<p>for any visible frozen clods.</p> <p>b. Observe working of the backfill stockpile.</p> <p>c. Perform a flowability test (ASTM D6103) on material from the backfill stockpile:</p> <ol style="list-style-type: none"> 1) Collect a minimum of three representative samples from the backfill stockpile. 2) Test each sample using ASTM D6103. <p>d. Record these actions and test results on the Daily Construction Report.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – INTERIM RAD COVER PLACEMENT AND MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>116) SCOPE: This work element applies to the Class A West embankment.</p> <p>117) DEFINITION: Interim rad cover is non-waste soil used to comply with the “uncovered radioactive waste” limit at RML UT 2300249, Condition 11. This material was historically referred to as “temporary cover” or “interim temporary cover”. Waste in closed containers may be stored on interim rad cover. If bulk waste is placed or stockpiled (temporarily placed) on interim rad cover, the affected area (the area occupied by the placed or stockpiled waste) shall no longer be considered to have interim rad cover on it.</p> <p>The following areas do not count against the “uncovered radioactive waste” limit at RML Condition 11 and do not require interim rad cover to be placed over them:</p> <ul style="list-style-type: none"> A. Containerized Waste Facility B. Large Component disposal areas C. CLSM pour areas that have been poured and covered. <p>Note: Areas where debris has been staged or formed for CLSM, but have not yet been poured and covered shall be counted against the “uncovered radioactive waste” limit.</p>		
<p>118) INTERIM RAD COVER MATERIAL: Interim rad cover shall be non-waste soil that is free of debris material.</p>	<p>Visually inspect interim rad cover soil for debris and document on the Daily Construction Report.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – INTERIM RAD COVER PLACEMENT AND MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>119) INTERIM RAD COVER PLACEMENT: Interim rad cover shall be a minimum of six inches thick in order for an area to be removed from the “uncovered radioactive waste” inventory. Thickness shall be evaluated through use of grade poles or survey. Contaminated equipment may be used to place interim rad cover.</p> <p>A commercial fixative product (i.e., polymer), magnesium chloride, or non-contact water may be applied, in accordance with the manufacturer’s instructions, to the surface of the interim rad cover to aid in dust control and erosion prevention. Erosion control blankets, mats, or fiber mulch may also be used, in accordance with the manufacturer’s instructions, for erosion prevention. DWMRC Director shall be notified at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch.</p>	<p>Survey at least the perimeter of the area covered and document. Document the thickness of the cover on the Daily Construction Report.</p>	<p>Periodically observe lift approval documentation.</p>
<p>120) OPERATIONAL CONTROLS: Interim rad cover shall be fenced, roped, or otherwise marked to identify as distinct from active waste placement areas. Traffic across interim rad cover shall be minimized. Haul roads are prohibited on interim rad cover.</p>		
<p>121) INSPECTIONS: Monthly, inspect interim rad cover for the presence of erosion gullies. If the inspection indicates that waste material is exposed due to erosion, the interim rad cover shall be repaired in that area within seven calendar days.</p>	<p>Perform monthly inspections and document on the Daily Construction Report.</p>	
<p>122) RESERVED SURVEYS: Quarterly, perform an elevation survey on interim rad cover that is within two feet of the design top of debris waste elevation. Surveys shall be performed at the</p>	<p>Perform quarterly surveys and document.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – INTERIM RAD COVER PLACEMENT AND MONITORING

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

~~temporary and final settlement monument locations provided in Figure 2, within an 18 inch radius of the design monument location.~~

123) REMOVAL: Interim rad cover may be removed. Soils used as interim rad cover may be used as fill for debris wastes. If used, erosion control blankets, mats, or fiber mulch may be left in place or removed, but either way must be placed and compacted as waste. Interim rad cover left in place shall be placed in accordance with the compaction requirements of Specification 75.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – TEMPORARY COVER PLACEMENT AND MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>124) SCOPE: This work element applies to the Class A West and 11e.(2) embankments. Because there is no open cell time limit for the 11e.(2) embankment, time limits within this specification do not apply there.</p>		
<p>125) TEMPORARY COVER MATERIAL: Temporary cover shall be native CL, ML, or CL-ML soils that are free of debris that could penetrate the radon barrier.</p>	<p>Perform laboratory classification tests at a rate of one test per lot prior to use of material. A lot is defined as a maximum of 5,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the Sampling Log.</p> <p>Visually inspect temporary cover soil and verify that it is free of debris. Record results on the Lift Approval Form.</p>	
<p>126) TEMPORARY COVER PLACEMENT: Temporary cover shall be placed within 15 years of the date of initial waste placement on each lift area. Top of waste elevations and grades are defined as those found on the approved engineering design drawings listed in Groundwater Quality Discharge Permit UGW450005. DWMRCDirector shall be notified in writing (including email) at least 48 hours in advance of the start-up of temporary cover placement.</p> <p>Temporary cover shall be a minimum of 1 foot thick. Temporary cover may be over-built in order to achieve this thickness. Temporary cover shall be placed in accordance with Specifications 74 and 75.</p> <p><u>The interface between old and new cover lifts shall be compacted with a minimum of one pass.</u></p> <p>The edge of the temporary cover shall be marked</p>	<p>Obtain documentation of DWMRCDirector notification. Document lift area, location, thickness, and compaction on the Lift Approval Form.</p> <p><u>Verify the transition from old to new lifts have a minimum of one pass. Document on the lift approval form.</u></p>	<p>Notify DWMRCDirector (by email) that the final surface is ready for inspection. Provide QC with documentation of DWMRCDirector inspection and approval.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – TEMPORARY COVER PLACEMENT AND MONITORING

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

with fencing, 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 interim settlement monuments and that the haul route is marked with fencing, rope, snow fence, or equivalent markings. Temporary cover may encroach into the offset for the run-off berm.

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. Erosion control blankets, mats, or fiber mulch may also be used, in accordance with the manufacturer’s instructions, for erosion prevention.

[DWMRCDirector](#) shall be notified at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. If used, such erosion control materials shall be removed prior to radon barrier construction.

Obtain documentation of [DWMRCDirector](#) notification. Document application and removal of erosion control materials on the Daily Construction Report.

Notify [DWMRCDirector](#) at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. Provide QC with documentation of [DWMRCDirector](#) notification.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – TEMPORARY COVER PLACEMENT AND MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>127) PRE-FINAL COVER SETTLEMENT MONUMENTS: Prior to cover construction, Interim settlement monuments will be constructed on top of the waste. Interim 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 secured by the temporary cover. Each monument shall be labeled, flagged, surveyed, and documented.</p>	<p>Inspect interim cover settlement monuments for compliance with the specification prior to installation.</p>	<p>Perform a surveillance of interim settlement monument installation activities.</p>
<p>128) INTERIM SETTLEMENT MONUMENT PLACEMENT: Interim settlement monuments shall be placed as close as practical to the locations of final cover settlement monuments identified in Figures 2 and 4. In addition, Interim settlement monuments shall be placed at the locations identified as “temporary cover settlement monuments” on Figure 2 and “additional final temporary cover monuments” on Figure 4.</p>	<p>Perform and document a post-construction survey of the location of the pre-final cover settlement monuments.</p>	<p>Verify that surveys have been performed and documented.</p>
<p>129) SURVEY REQUIREMENTS: Surveys shall be performed with GPS or approved equivalent equipment. Tolerance shall be no more than ± 0.1 foot.</p>	<p>Operate survey equipment in accordance with the manufacturer’s recommendations. Verify equipment accuracy with a known benchmark.</p>	
<p>130) SURVEY INTERVAL: The interim settlement monuments shall be surveyed within 30 days of temporary cover installation. New monuments shall be surveyed again during the months of January, March, May, July, September, and November. After at least one year of data has been obtained for a monument, it shall be surveyed semi-annually during the months of May</p>	<p>Perform and document the required surveys. Provide survey data to the Engineering Manager.</p>	<p>Verify that interim settlement monument surveys are completed and documented as required.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – TEMPORARY COVER PLACEMENT AND MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>and November 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. <u>Continue surveys until the conditions of Specification 134133 are satisfied.</u></p>		
<p>131) 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 seven calendar days.</p>	<p>Perform and document monthly inspections.</p>	<p>Verify monthly inspections were completed and documented.</p>
<p>Annually by July 1 of each year, maintain the temporary cover surface. Maintenance shall consist of filling in and compacting any erosion gullies and, if necessary, re-grading to prevent ponding on the temporary cover.</p>	<p>Document maintenance activities. Document any areas requiring filling or re-grading.</p>	<p>Verify that annual temporary cover maintenance activities were completed and documented.</p>
<p>132) ANNUAL REPORTING: Survey data for interim settlement monuments shall be compiled and analyzed to evaluate total and differential settlement. This data and analysis shall be submitted to <u>DWMRCDirector</u> with the annual as-built report, <u>but no later than 21 calendar days preceding cover construction.</u></p> <p>Review and analysis of interim settlement monument data will include the following:</p> <ul style="list-style-type: none"> • A drawing identifying the location of each interim settlement monument, • Graphical or tabular presentation of the incremental settlement for each monument (how much each monument has moved since the last set of readings), • Graphical or tabular presentation of the total 		

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – TEMPORARY COVER PLACEMENT AND MONITORING

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

- settlement for each monument,
- Graphical or tabular presentation of the time rate of settlement for each monument (to include both the overall rate from the first data for the monument, and the incremental rates for each period),
- Graphical or tabular presentation of the differential settlement for each interim settlement monument with respect to the nearest adjacent interim settlement monument, and
- A discussion about the general nature of the observed settlement, and any areas of the landfill that are behaving in an anomalous manner.

133) TRANSITION TO FINAL COVER: If distortion is less than 0.007 foot/foot between adjacent interim settlement monuments, and each interim settlement monument has at least one year's monitoring data; then final cover construction may proceed. The Engineering Manager shall make this evaluation from interim settlement data. If the criteria are met, a written report shall be prepared and forwarded to [DWMRCDirector](#) at least seven calendar days prior to removing the interim settlement monuments. Final cover construction shall be completed within three years of interim settlement monument removal over that specific area.

If an area is not approved for final cover construction by the end of the 16th year of the 18-year open cell period, an analysis of projected future distortions shall be performed and submitted to the [DWMRCDirector](#). The analysis shall evaluate, at a minimum, potential settlement

Obtain documentation of [DWMRCDirector](#) notification at least seven calendar days prior to removing the interim settlement monuments.

Verify that QC has obtained documentation of [DWMRCDirector](#) notification.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – TEMPORARY COVER PLACEMENT AND MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>through the end of year 17 of the open-cell period, at a minimum. If the analysis indicates that the future distortions between any two adjacent monuments will be more than 0.007 foot/foot, then additional engineering analyses will be done and a plan to stabilize settlement prior to final cover construction provided to the DWMRCDirector. The plan to stabilize settlement shall accomplish set goals prior to the open cell time limit.</p> <p>Immediately prior to placement of the first lift of radon barrier, the interim settlement monuments shall be removed and the temporary cover surface restored.</p> <p>Top of temporary cover elevations shall be at or below design elevations. Additional clean debris-free soil material shall be placed; or excess temporary cover material shall be cut, as needed.</p> <p>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 inches and compacted to 90 percent of a standard Proctor. If an area has settled more than 12 inches, bulk waste may be placed in accordance with the applicable work elements and specifications of this manual, so long as at least 1 foot of temporary cover is in place prior to radon barrier construction.</p> <p>DWMRCDirector shall be notified at least 48 hours in advance of the start-up of temporary cover removal in previously placed areas.</p>	<p>Inspect and document that all interim settlement monuments have been removed prior to final cover construction.</p> <p>Survey and document the top of temporary cover surface on a 50 foot grid and at key points (i.e., embankment break lines) to confirm that the design elevations are not exceeded.</p> <p>Document lift thickness and compaction for any temporary cover material placed to bring the temporary cover surface to design elevations.</p> <p>Obtain documentation of DWMRCDirector notification. Document the lift area and location on the Daily Construction Report.</p>	<p>Verify that interim settlement monuments have been removed.</p> <p>Verify that the temporary cover surface does not exceed design elevations.</p> <p>Verify that documentation is complete.</p> <p>Notify DWMRCDirector at least 48 hours in advance of temporary cover removal. Provide QC with documentation of DWMRCDirector notification.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER BORROW MATERIAL

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>134) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>135) 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.</p>	<p>Inspect the area once clearing and grubbing has been completed. Record observations and corrective action (where required) on the Daily Construction Report.</p>	<p>Verify that the clearing and grubbing has been inspected and documented by QC.</p>
<p>136) MATERIAL--NATURAL CLAY MIXTURE: Satisfactory material shall be defined<u>meet the specifications</u> as CL and or ML soils based on the Unified Soil Classification <u>System</u> 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.</p>	<p>Perform laboratory classification tests (ASTM D 2487) at a rate of one test per lot prior to use of material in the radon barrier. A lot is defined as a maximum of 5,000 cubic yards (compacted) of specified material type. Record the location of the classification sample on the Sample Log.</p>	<p>Verify that the frequency of laboratory tests is in compliance with the specification.</p>
<p>137) PROTECTION: The borrow material will be handled in such manner as to prevent contamination with radioactive waste material or other deleterious material. Acceptable material may contain up to five percent additional rocks (less than or equal to one inch) and sand above the content found in the classification test.</p>	<p>Visually check radon barrier materials for contamination by foreign materials in accordance with ASTM D2488. Remove or rework clays that have been contaminated above the specified requirements. Document corrective actions (where required) on the Daily Construction Report.</p>	<p>Verify that the radon barrier is being inspected for contaminates and that the inspection and corrective actions (if required) are properly documented.</p>
<p>138) PROCESSING: These procedures may be used to provide suitable material for construction of the radon barrier.</p> <p>A. If used, apply deflocculant at a rate determined by the Engineering Manager.</p>	<p>Measure the size of the mixing areas and verify that the application rate of the deflocculant is equal to or greater than the rate determined by the Engineering Manager. Record the size of the mixing areas and the amount of deflocculant applied on the Embankment</p>	<p>Verify that the size of the mixing areas and the amount of deflocculant applied has been properly documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER BORROW MATERIAL

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
B. Mix the deflocculant thoroughly into the soils by tilling, or similar action.	<p>Construction Lift Approval Form.</p> <p>Observe the mixed clay and notify the Project Manager of areas which are adequately mixed.</p>	<p>Verify that the clay is being inspected correctly and documented by QC.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER TEST PAD

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>139) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>140) NOTICE OF TEST PAD CONSTRUCTION: <u>In accordance with Specification 23</u> The radon barrier test pad plan shall be approved by the <u>DWMRCDirector</u>. The radon barrier test pad plan shall be provided to the <u>DWMRCDirector</u> at least 14 calendar days prior to test pad construction.</p> <p>The <u>DWMRCDirector</u> shall be notified 48 hours in advance of the start-up of test pad construction.</p>	<p>Obtain documentation confirming that the test pad plan has been approved by the <u>DWMRCDirector</u>.</p> <p>Obtain documentation confirming that the <u>DWMRCDirector</u> has been notified as required.</p>	<p>Verify that the test pad plan has been provided to the <u>DWMRCDirector</u> at least 14 calendar days prior to construction of the test pad. Provide QC with documentation of <u>DWMRCDirector</u> approval.</p> <p>Notify the <u>DWMRCDirector</u> at least 48 hours in advance of the start-up of test pad construction. Provide QC with documentation of <u>DWMRCDirector</u> notification.</p>
<p>141) TEST PAD(S): A test pad with minimum dimensions of 60 feet by 75 feet <u>will-shall</u> be constructed using the procedure <u>proposed approved in the test plan</u> for construction of the radon barrier.</p> <p>Prior to use of manually operated compaction equipment, a small test pad with minimum dimensions of five feet by five feet (sized appropriately for the equipment used) <u>will-shall</u> be constructed. The purpose of this small test pad is to establish equipment and procedures for construction of radon barrier in locations where large equipment is not practical (e.g. repairs). If manually operated compaction equipment is not used on the project, a small test pad is not required.</p> <p>A new radon barrier test pad shall be constructed each time there is a change in specifications,</p>	<p>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.</p> <p>The large test pad shall be divided into three lots per lift (approximately 1,500 square feet per <u>lift/lot</u>). Each lift of the small test pad shall equal a lot.</p>	<p>Observe the construction of the test pads. Verify that the test pad has been measured and is properly documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER TEST PAD

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>construction procedures, unified soil classification, or types of equipment.</p> <p>Radon barrier test pads are to be constructed and tested in accordance with the following specifications:</p> <p>A. Prior to compaction, conduct at least one classification and gradation test for each test pad.</p> <p>B. 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.</p> <p>C. The clay material will have a dry clod size less than or equal to one inch.</p> <p>D. The clay is to be placed and compacted by equipment proposed for use during construction of the radon barrier.</p> <p>E. The lifts of clay shall be bonded by 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 or more per linear foot.</p>	<p>Conduct classification and gradation tests (as described in Appendix B) at a rate of one of each type of test per test pad.</p> <p>Measure the lift thickness at a rate of one test per lot. Record thickness on the Embankment Construction Lift Approval Form.</p> <p>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 inch. Notify the Project Manager to have operations remove clods greater than one inch. Record inspection of the dry clod size on the Embankment Construction Lift Approval Form and re-inspect the uncompacted lift if necessary. Record any corrective actions performed on the Daily Construction Report.</p> <p>Record type of equipment used, and number of passes on the Embankment Construction Lift Approval Form.</p> <p>Perform a visual inspection to verify that there are adequate changes in grade. Any areas of concern shall be verified by placing a straight edge at least two feet long on the surface and counting the number of points approximately one inch or more below the straight edge. Notify the Project Manager of any deficiencies. Re-inspect after the Project Manager has corrected</p>	<p>Verify the frequency of tests and compliance of test results.</p> <p>Verify that the number of lifts and lift thicknesses has been documented. Verify that the clod size inspection has been performed and documented for each uncompacted lift thickness.</p> <p>Verify that the dry clod size inspection has been performed and documented, including corrective actions as necessary.</p> <p>Perform a minimum of one visual inspection per test pad.</p> <p>Verify the frequency of measurements and compliance of test results.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER TEST PAD

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

F. The clay is to be compacted to at least 95 percent of a standard Proctor with moisture content between one-half a percentage point below optimum and five percentage points over optimum. Compaction of the large test pad is to be accomplished by at least four passes of suitable compaction equipment.

G. The clay is to be constructed to provide a permeability of less than or equal to the specified permeability as indicated in specification 151 and as shown on the approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005. Permeability testing on the bottom lift will be performed at the surface. Permeability on the second lift will be performed greater than or equal to two inches below the surface. Permeability on the third lift will be performed greater than or equal to four inches below the surface.

H. The procedures used to construct the test pad shall be reviewed and approved by a Utah licensed Professional Engineer.

I. In accordance with Specification 23 the

deficiencies.

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 (described in Specification 12). Record the test result on the Field Density Test form.

- a. Approve lots which meet the specified moisture and compaction.
- b. Notify the Project Manager of lots not meeting the specified moisture and compaction to have the areas reworked.
- c. Retest (moisture/density and permeability) lots after rework has been completed.
- d. Any additional work under b. shall be included in the test pad construction method.

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.

- a. Approve lots that meet the specified permeability.
- b. Notify the Project Manager of lots not meeting the specified permeability to have the areas reworked.
- c. Retest (moisture/density and permeability) lots after rework has been completed.
- d. Any additional work under b. shall be included in the test pad construction method.

Provide the Utah licensed Professional Engineer with copies of the documentation for the test pad for review and approval.

Obtain documentation confirming that the test pad certification report has been approved by the DWMRCDirector.

Review documentation and verify the frequency of tests and compliance of test results.

Verify the frequency of tests and compliance of test results.

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.

Verify that the test pad certification report has been provided to the DWMRCDirector. Provide QC with documentation of DWMRCDirector approval.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER TEST PAD

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

Approval of The test pad certification report ~~shall be approved~~ by the ~~DWMRC~~ Director shall be obtained at least 14 calendar days from the time the certification report was submitted and prior to using the new test pad construction method.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
142) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.		
143) NOTICE OF COVER CONSTRUCTION: The <u>DWMRCDirector</u> shall be notified of start-up for each phase of cover construction.	Obtain documentation of <u>DWMRCDirector</u> notification.	Notify the <u>DWMRCDirector</u> of start-up for each phase of cover construction. Provide QC documentation of <u>DWMRCDirector</u> notification.
144) PROJECT AREA: Radon barrier projects shall have a minimum total area of 300,000 square feet, unless otherwise approved in advance, in writing by <u>DWMRCDirector</u> . <u>The Director approval shall be obtained in accordance with Specification 23. Placement of radon barrier shall be made to the lines, grades, and dimensions prescribed in the approved phase-specific plans.</u> Radon barrier projects may continue over more than one construction season, so long as the specifications for cold weather placement and spring start-up are met (Specifications 156 and 157). A radon barrier project may consist of any number of lift areas. The project area shall be documented in <u>phase-specific</u> plan drawings.		
145) LIFT IDENTIFICATION: Each lift shall be given a unique lift identification number 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.
146) PLACEMENT: The radon barrier will be prepared, placed and compacted using <u>equivalentthe same</u> type of equipment and mixing and compacting procedures that were approved in the test pad (Specification 141). <u>Note:—If equipment used to prepare, place, and/or compact clay liner differs by make and/or model from the equipment identified in the approved test pad, equipment equivalency shall be determined</u>	Observe the radon barrier placement. Record the equipment <u>and procedures</u> used to place the radon barrier, along with any corrective actions (where required) on the Daily Construction Report. <u>Obtain documentation of equipment equivalency.</u>	Verify the equipment <u>and procedures</u> used to construct the radon barrier <u>has-have</u> been documented and that it is <u>an the sameequivalent</u> -type of equipment used to construct the test pad. <u>Verify that us of equivalent equipment has been approved by a Utah licensed Professional Engineer.</u>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p><u>and approved by a Utah licensed Professional Engineer prior to use. The Director shall be notified at least 48 hours in advance of implementing an equipment change and in accordance with Specification 23 the Director shall approve the equivalency determination prior to use of the equivalent equipment.</u></p> <p><u>The clay material shall have a dry clod size less than or equal to one inch.</u></p>	<p><u>Obtain documentation that the DWMRCDirector has been notified and approved of an equipment equivalency determination.</u></p> <p><u>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 inch. Notify the Project Manager to have operations remove clods greater than one inch. Record inspection of the clod size on the Embankment Construction Lift Approval Form and re-inspect the uncompacted lift. Record any corrective actions performed on the Daily Construction Report.</u></p>	<p><u>Notify the DWMRCDirector 48 hours prior to using equipment that has been determined equivalent by a Utah licensed Professional Engineer. Provide QC with documentation of Director approval.</u></p> <p><u>Verify that the clod inspection has been performed and documented.</u></p>
<p>147) LIFT BONDING: The lifts of clay shall be bonded by 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.</p>	<p>Perform a visual inspection to verify that there are adequate changes in grade. Any areas of concern shall be verified by placing a straight edge at least two feet long on the surface and counting the number of points approximately one inch or more below the straight edge. Notify the Project Manager of any deficiencies. Re-inspect the surface after corrective actions have been completed. Document any deficiencies and corrective actions taken on the Daily Construction Report.</p>	<p>Verify the frequency of measurements and compliance of test results.</p>
<p>148) 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.</p> <p>A. Thickness for the lift will be established by installing grade poles on at least a 70-foot grid and at all control points (at a minimum, each</p>	<p>Verify that the required grading tolerance is achieved as follows:</p> <ol style="list-style-type: none"> 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. Visually check between poles for high or low spots. d. Define out of specification areas and notify the Project Manager to rework those areas. 	<p>Verify the frequency of measurements and compliance of test results.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>corner of the area; also at break lines). The grade poles must not be installed deeper than one-three inches into the underlying clay liner <u>radon barrier</u>. 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.</p> <p style="text-align: center;">- OR -</p> <p>B. Survey to determine lift thickness. Survey equipment shall have a tolerance no more than ± 0.1 foot.</p>	<p>e. Review areas reworked and approve areas meeting criteria.</p> <p>f. Continue "b" through "d" above until all areas meet criteria.</p> <p>g. Indicate areas meeting criteria in the Embankment Construction Lift Approval Form.</p> <p style="text-align: center;">- OR -</p> <p>a. Verify survey equipment is within a tolerance of ± 0.1 foot,</p> <p>b. Verify correct set-up and operation of equipment,</p> <p>c. Document survey results on a survey report.</p>	
<p>The clay material shall have a dry clod size less than or equal to one inch.</p>	<p>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 inch. Notify the Project Manager to have operations remove clods greater than one inch. Record inspection of the clod size on the Embankment Construction Lift Approval Form and re inspect the uncompacted lift. Record any corrective actions performed on the Daily Construction Report.</p>	
<p>149) KEYING-IN: Segments of cell radon barrier constructed at times more than 30 days apart than each other shall be keyed-in to each other by one of the following methods:</p> <p>A. Key-in vertical steps no greater than nine inches and at least twice as wide as they are high.</p> <p style="text-align: center;">- OR -</p>	<p>Verify that the new liner has been properly keyed-in to the existing liner. Record deficiencies on the Embankment Construction Lift Approval Form.</p>	<p>Verify that the keying-in of the liner has been documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>B. Slope the full thickness of old radon barrier at a maximum slope of 5:1.</p> <p>The surface shall be maintained in accordance with Specification 154.</p>		
<p>150) COMPACTION: Radon barrier material will be compacted to at least 95 percent of standard Proctor with moisture content between one-half a percentage point below optimum and five percentage points over optimum.</p>	<p>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 500 cubic yards (compacted) of a single lift. The test location shall be chosen on the basis of random numbers (described in Specification 12).</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified moisture and compaction. b. Rework and retest lots not meeting the specified moisture or compaction. <p>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.</p>	<p>Visually observe at least one in-place moisture-density test per project area. Verify that the tests are being performed at the correct frequency and that the documentation is being completed.</p>
<p>151) PERMEABILITY: The radon barrier shall have an in-place permeability of less than or equal to 1×10^{-6} cm/sec for the bottom layer. The radon barrier shall have an in-place permeability of less than or equal to 5×10^{-8} cm/sec for the final top foot.</p>	<p>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 compacted cubic yards of 1×10^{-6} cm/sec radon barrier or 5×10^{-8} cm/sec radon barrier. The permeability test shall be run within five linear feet of a moisture-density test location.</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified permeability. b. Notify the Project Manager of lots not meeting the specified permeability to have the areas reworked. c. Retest (moisture/density and permeability) lots after rework has been completed. d. Restore all test areas to assure no leaks. 	<p>Visually observe one lift being compacted per construction season.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

152) LAYER THICKNESS: Construct the radon barrier for the CAW, and 11e.(2) embankments as shown on the approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005. For the CAW Embankment, the bottom (1×10^{-6} cm/sec permeability) layer shall be at least 1.0 foot thick. For the 11e.(2) embankment top slopes, the bottom (1×10^{-6} cm/sec permeability) layer shall be at least 3.0 feet thick. For the 11e.(2) embankment side slopes, the bottom (1×10^{-6} cm/sec permeability) layer shall be at least 2.5 feet thick. For the CAW and 11e.(2) embankments, the top (5×10^{-8} cm/sec permeability) layer shall be at least 1.0 foot thick.

153) TRANSITIONS BETWEEN RADON BARRIERS WITH DIFFERENT SPECIFIED PERMEABILITIES: The radon barrier with the higher permeability (i.e. the bottom radon barrier) shall be final graded from to no greater than design elevation and no less than 0.4 feet below design elevation. Survey on a 50 foot grid and key points (i.e., embankment break lines).

154) RADON BARRIER DRYING PREVENTION: Desiccation cracks shall not exceed one-fourth inch wide and three-inches deep in the radon barrier. Areas with desiccation cracks exceeding this specification shall be identified as new lots to be reworked and shall be reported to the Director.

Survey the radon barrier surface on a 50 foot grid and at key points. Final survey measurements will be documented and provided to the QC Supervisor and Quality Assurance.

Observe the radon barrier surface for drying and document results on the Daily Construction Report.

Notify the Project Manager and QA of any desiccation cracks larger than specification identified in the radon barrier.

Radon barrier with larger than specification desiccation cracks shall be reworked and retested in accordance with one of the following methods:

- a. Scarify the in-place clay, moisture condition as

Review the final survey data. Verify the frequency of the survey points.

Verify that the radon barrier is being inspected correctly and the inspection documented. Report discrepancies to the Director as required.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p><u>To prevent the radon barrier from drying one (or more) of the following methods shall be employed:</u></p> <p><u>A. Apply water to the radon barrier surface on an as needed basis</u></p> <p><u>B. Cover unfinished radon barrier with six inches of loose clay</u></p> <p><u>C. Cover finished radon barrier with 12 inches of the next design layer(s) or six inches of loose clay material. If clay material is used, remove loose clay prior to placing next design layer</u></p> <p><u>Unfinished or finished radon barrier will be covered in accordance with method B or C above within 30 days of the last activity for the lift.</u></p> <p>154) 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 six inches of loose clay. Finished radon barrier shall be covered with 12 inches the next design layer, or six inches of loose clay within 30 days of completion. Unfinished radon barrier shall be covered with six inches of loose clay within 30 days of the last activity for the lift. Desiccation cracks larger than one fourth inch</p>	<p><u>needed, then recompact and retest the clay material in accordance with Specifications 146, 150, and 151.</u></p> <p><u>b. Excavate all material with larger than specification desiccation cracks and replace with new clay in accordance with Specifications 145 through 151.</u></p> <p><u>Document methods used to prevent the radon barrier from drying on the Daily Construction Report.</u></p> <p><u>Document that protective measures have been placed over unfinished and finished radon barrier lifts within 30 days of the last lift activity.</u></p> <p>Observe the liner surface for drying. Notify the Project Manager of any desiccation cracks larger than one-fourth inch wide and three inches deep in the clay liner. Retest reworked/repared areas in accordance with Specification 150. Record corrective actions taken (where required) on the Daily Construction Report.</p>	<p><u>Verify that the scheduling and methods used to prevent unfinished and finished radon barrier from drying have been documented.</u></p> <p>Verify that the liner is being inspected correctly and the inspection documented. Notify the DWMRC of non-conformance items, as required.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>wide and three inches deep in the radon barrier will be reported to the DWMRC and will be documented as a non conformance item when discovered.</p> <p>155) SNOW REMOVAL: When radon barrier material is to be placed and the work area is covered with snow, the snow must be removed without damaging approved radon barrier.</p> <p>156) COLD WEATHER PLACEMENT OF RADON BARRIER: For purposes of this 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.</p> <p>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:</p> <p>A. 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 nine inches of loose clay or six inches of compacted clay, then the cover clay may be worked with no additional testing of the lower approved lift.</p> <p>B. 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 nine inches of loose clay or six inches of compacted clay, then:</p> <p>1. Perform spring start-up testing as</p>	<p>Observe that snow is removed. Inspect radon barrier for damage. Notify the Project Manager of deficiencies/damage. Re-inspect after the Project Manager has corrected deficient/damaged areas. Record corrective actions (where required) in the Daily Construction Report.</p> <p>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.</p> <p>Review ambient air temperature records as measured at the site meteorological station. Document status of radon barrier cover placement on the Daily Construction Report. Measure radon barrier temperature when triggered under B.2. of this specification at the design frequency. 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. To ensure a stable reading, the temperature probe shall be left in place for at least two minutes prior to taking the reading</p>	<p>Verify that snow removal is being documented and the radon barrier had been inspected.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

- discussed [in Specification 157](#) below; or
2. Measure the radon barrier temperature approximately one inch beneath the surface at a frequency of one measurement per lot (defined as no more than 100,000 square feet). If the temperature one 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 one inch beneath the surface is less than or equal to 27°F, re-work and re-test density and permeability of the affected area after the clay temperature has risen above 27°F.

- C. If more than 30 days have passed since the date of lift approval, perform spring start-up testing.

In addition, the final lift of 5×10^{-8} cm/sec radon barrier requires that the next design layer 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 the next design layer. This process must be repeated whenever any final surface material is not covered with the next design layer prior to overnight freezing conditions.

- 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.

Perform an additional density test and permeability test on 5×10^{-8} cm/sec final surface that has been exposed to overnight freezing conditions prior to placement of the next design layer. If passing test results are achieved, but it is not possible to cover all of the exposed radon barrier material with the next design layer prior to the end of the workday, testing must be repeated for the exposed materials at a frequency of one test per 2,000 cubic yards of exposed material. 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).

Verify that radon barrier is tested (and the testing documented) during cold weather conditions.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>157) SPRING START-UP: See Specification 156 for situations that trigger this specification.</p> <p>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 nine 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 shall be repaired by applying the same level of effort as prescribed by the approved test pad for radon barrier construction.</p>	<p>Perform density and permeability testing at the frequencies outlined for radon barrier construction above of one test per lot size of 500 or 2,000 cubic yards, respectively. 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.</p> <ol style="list-style-type: none"> 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 nine inch increments until a passing lift is found; remove all failing lots; re-work all failing lots; and re-test. <p>Document that repairs are completed to the same level of effort as required by the approved test pad for radon barrier construction.</p>	
<p>158) 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 five percent additional rocks (less than or equal to one inch) and sand above the content found in the classification test.</p>	<p>Visually check radon barrier for contamination by foreign materials in accordance with ASTM D2488. Remove or rework clays which have been contaminated above the specified requirements. Document corrective actions (where required) on the Daily Construction Report.</p>	<p>Verify that the radon barrier is being inspected for contaminants and that the inspection and corrective actions (if required) are properly documented</p>
<p>159) FINAL GRADING: Final grading shall be from design elevation to 0.2 feet above design elevation.</p>	<p>Survey the final grade surface of the radon barrier on a 50 foot grid and at key points (i.e., embankment break lines). Final survey measurements will be documented and provided to Quality Assurance.</p>	<p>Review the final survey data. Verify the frequency of the survey points.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>160) EROSION CONTROL FOR EXPOSED SOIL: If <u>DWMRC Director</u>-approved final elevation 5×10^{-8} cm/sec radon barrier soil surfaces are not covered by the next design layer within 30 days of lift approval, the following erosion control repair measures shall apply.</p> <p>Monthly, inspect exposed radon barrier soil surfaces for evidence of erosion. Rivulet or gullied areas wider than six inches or deeper than six inches require maintenance to fill the rivulet or gully and restore the area to design elevation. Soils imported as fill shall meet the requirements of Specification 136. Maintenance shall be performed within 30 calendar days when needed.</p> <p>Erosion control blankets, mats, or fiber mulch may be used, in accordance with the manufacturer's instructions, for erosion prevention.</p> <p><u>DWMRC Director</u> shall be notified at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. If used, such erosion control materials shall be removed prior to filter zone construction.</p>	<p>Perform monthly inspections. Document the inspection as well as associated maintenance activities on the Daily Construction Report.</p> <p>Obtain documentation of <u>DWMRC Director</u> notification.</p>	<p>Review documentation to verify that monthly inspections have been performed.</p> <p>Notify <u>DWMRC Director</u> at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. Provide QC with documentation of <u>DWMRC Director</u> notification.</p>
<p>161) RADIOLOGICAL SAMPLING FOR EXPOSED SOIL: If <u>DWMRC Director</u>-approved final elevation 5×10^{-8} cm/sec radon barrier soil surfaces are not covered by the next design layer within 30 days of final approval, the area shall be either:</p> <p>A. sampled and radiologically released in accordance with the Environmental Monitoring Plan; or</p>	<p>Coordinate sampling and analysis with environmental personnel. Attach a copy of the release report to the lift approval documentation.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - RADON BARRIER PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>B. have a minimum of six inches of clay removed and replaced prior to placement of the next design layer. Under this option, no environmental sampling is required.</p>		
<p>162) 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.</p>	<p>Observe work on radon barrier. Notify the Project Manager of problems with equipment on the radon barrier. Re-inspect radon barrier and record corrective actions taken (where required) on the Daily Construction Report.</p>	<p>Verify that the work is being inspected.</p>
<p>163) DWMRCDIRECTOR APPROVAL: The DWMRCDirector 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. <u>The Director approval shall be obtained in accordance with Specification 23.</u> In addition, 48 hour notification shall be provided to the DWMRCDirector prior to placement of the next design layer over the finished radon barrier. EnergySolutions may proceed with placement of the next design layer 48 hours after DWMRC notification if the DWMRC has not inspected and has not notified the Engineering Manager of its intent to inspect the radon barrier surface.</p>	<p>Notify Quality Assurance that the radon barrier is ready for inspection by the DWMRCDirector. Obtain written authorization on the <u>Liner-Radon Barrier</u> Inspection Form from Quality Assurance that the radon barrier has been inspected. Obtain documentation of DWMRCDirector notification. Confirm DWMRCDirector approval of the radon barrier documentation.</p>	<p>Provide written approval of the radon barrier. Notify the DWMRCDirector that the radon barrier is ready for inspection. Provide QC with documentation of DWMRCDirector notification.</p>

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - FILTER ZONE**

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>164) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>165) TYPE B FILTER ZONE PERMEABILITY: The type B filter zone rock on the Class A embankment will have a minimum permeability of 3.5 cm/sec.</p> <p>The filter zone rock on the 11e.(2) embankment will have a minimum hydraulic conductivity of 42 cm/sec.</p>	<p>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".</p> <p>a. Approve rock for use in the filter zone which meets the specified <u>permeability gradation</u>.</p> <p>b. Rock not meeting the specified <u>permeability gradation</u> cannot be used.</p>	<p>Verify the frequency of laboratory tests and compliance of test results.</p>
<p>166) GRADATION: Class A West and 11e.(2) embankment rock gradation shall be as specified on currently approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005.</p>	<p>For Type B filter zone rock, if material is to be stockpiled, perform gradation testing at a rate of one test per 10,000 cubic yards stockpiled. If Type B filter zone rock material is transferred directly to the cell from the production plant, perform at least one gradation test per source per day material is placed, or at least one test per 10,000 cubic yards. For Type A filter zone rock, perform gradation testing at a rate of one test per 10,000 cubic yards. For all of these, a minimum of four tests is necessary per embankment.</p> <p>In addition, perform a minimum of one test per change in soil type by ASTM D2488. Record the location of all samples in the Sampling Log.</p> <p>If any deficiencies are identified in gradation testing, notify the Project Manager to have operations rework the material. After reworking (if necessary), retest the material and record corrective actions (where required) in the Daily Construction Report.</p>	<p>Verify the frequency of laboratory quality control tests and compliance of test results.</p>
<p>167) PLACEMENT: Filter zone material will be placed over the radon barrier <u>and the sacrificial soil</u>. The thickness of the filter zone layer for the Class A West and 11e.(2) embankments shall be as</p>	<p>Observe the placement of the filter zone material. Ensure that the filter zone is uniform in appearance with no soil fines or rock concentrated in localized areas. If the filter zone is not uniform in appearance,</p>	<p>Review documentation and verify that QC personnel observe the placement of the filter zone material such that it is uniform in appearance.</p>

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - FILTER ZONE**

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>specified on currently approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005. Filter zone material shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.</p>	<p>notify the Project Manager to have operations evenly distribute the filter zone material. Re-inspect the filter zone material and record corrective actions (where required) in the Daily Construction Report.</p>	
<p>168) SNOW REMOVAL: When filter zone material is to be placed and the work area is covered with snow, the snow must be removed.</p>	<p>Observe that snow is removed. Inspect the filter zone for damage. Notify the Project Manager of any deficiencies/damage. Re-inspect the filter zone and record corrective actions (where required) in the Daily Construction Report.</p>	<p>Verify that snow removal is being documented and the filter zone has been inspected.</p>
<p>169) 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's 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 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.</p>	<p>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.</p> <p>Verify the required grade is achieved at all control points throughout the placed filter rock in the project area. Confirm that the in-place thickness of the rip rap <u>filter zone</u> material is between 90 percent and 125 percent of the design thickness. Rework and re-verify areas not meeting the specified grade. Ensure all grade poles have been removed following verification of grade. Document all inspections and corrective actions, where required, on the Daily Construction Report.</p>	<p><u>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.</u></p> <p>Review documentation for final grading.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - SACRIFICIAL SOIL PLACEMENT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>170) SCOPE: This work element applies to the Class A West embankment.</p>		
<p>171) PLACEMENT: Sacrificial soil will be placed over the filter zone as specified on currently approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005. Sacrificial soil shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.</p>	<p>Observe the placement of the sacrificial soil. Ensure that fines are not concentrated in localized areas. If fines are concentrated in localized areas, the Project Manager shall be directed to evenly distribute the fines or to remove them. Record corrective actions (where required) in the Daily Construction Report.</p>	<p>Verify that QC personnel observe the placement of the sacrificial soil such that fines are not concentrated in localized areas.</p>
<p>172) GRADATION: Gradation of the sacrificial soil shall be as specified on the currently approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005. Gradation shall be determined prior to placement of the sacrificial soil.</p>	<p>If material is to be stockpiled, perform gradation testing at a rate of one test per 2,500<u>10,000</u> 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 with no less than at least one test per 2,500<u>5,000</u> cubic yards <u>placed</u>. In addition, perform a minimum of one test per change in soil type by ASTM D 2488. <u>Confirm a new sacrificial soil material is compatible with criteria for placement over Type B filter material.</u> Record the location of all samples in the Sampling Log.</p> <ol style="list-style-type: none"> a. Approve material for use as sacrificial soil which meets the specified gradation. b. Material not meeting the specified gradation cannot be used. 	<p>Verify the frequency of laboratory tests and compliance of test results.</p>
<p>173) SNOW REMOVAL: When sacrificial soil is to be placed and the work area is covered with snow, the snow must be removed.</p>	<p>Observe that snow is removed. Notify the Project Manager of any deficiencies. Construction may not continue without taking corrective action to remove the snow. Re-inspect and record corrective actions (where required) in the Daily Construction Report.</p>	<p>Verify that snow removal is being documented as per <u>DWMRC</u> requirement.</p>
<p>174) FINAL GRADING: Thicknesses for the lift will be established by installing grade poles on at least a 50 foot grid and at all control points. The grade poles must be marked at the appropriate</p>	<p>Verify the required grade is achieved at all control points. Confirm that the in-place thickness of the sacrificial soil is between 90 percent and 125 percent of the design thickness. Notify the Project Manager of</p>	<p>Review the documentation for final grading.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - SACRIFICIAL SOIL PLACEMENT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

depth to establish grade. After the grade and thickness has been checked and approved by QC personnel, the grade poles shall be removed.

areas not meeting the specified grade. Re-verify after rework has been completed. Document all inspections and corrective actions, where required, on the Daily Construction Report.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - ROCK EROSION BARRIER

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>175) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>176) GRADATION: Gradation of the rock <u>erosion material</u> (top slope and side slope) shall be as specified on the currently approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005.</p>	<p><u>In addition to rock quality scoring, Perform-perform</u> gradation testing, in accordance with ASTM D5519 or C136, at a rate of one test per 10,000 cubic yards with a minimum of four tests per embankment. Record the location of all samples in the Sampling Log.</p> <p>If any deficiencies are identified in gradation testing, notify the Project Manager to have operations rework the material. After reworking (if necessary), retest the material and record corrective actions (where required) in the Daily Construction Report.</p>	<p>Verify the frequency of laboratory quality control tests and compliance of test results.</p>
<p>177) PLACEMENT: Rock erosion material will be placed over the filter zone. Thickness of rock erosion barrier <u>for the Class A West embankment</u> shall be <u>a minimum of 18-24 inches</u> inside the centerline of the perimeter ditch and <u>a minimum 12-18 inches</u> outside the centerline of the perimeter ditch as described in the currently approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005. <u>Thickness of rock erosion barrier for the 11e.(2) embankment shall be minimum of 18 inches inside the centerline of the perimeter ditch and a minimum 18 inches outside the centerline of the perimeter ditch as described in the currently approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005.</u> Rock erosion material shall be handled in such a manner as to prevent contamination from waste material and segregation of finer materials.</p>	<p>Observe the placement of the rock. Ensure that soil fines are not concentrated in localized areas. If soil fines are concentrated in localized areas, notify the Project Manager to have operations evenly distribute the fines or to remove them. Re-inspect after the Project Manager makes changes. Record corrective actions (where required) in the Daily Construction Report.</p>	<p>Verify that QC personnel observe the placement of the <u>filter zone rock erosion</u> material such that soil fines are not concentrated in localized areas.</p>
<p>178) SNOW REMOVAL: When rock erosion</p>	<p>Observe that snow is removed. Inspect the rock erosion</p>	<p>Verify that snow removal is being documented</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - ROCK EROSION BARRIER

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
barrier material is to be placed and the work area is covered with snow, the snow must be removed.	barrier for damage. Notify the Project Manager of any deficiencies. Re-inspect and record corrective actions (where required) in the Daily Construction Report.	DWMRC and the rock erosion barrier has been inspected.
179) FINAL GRADING: Thickness for the lift will be established by installing grade poles on at least a 70 foot grid and at all control points or by GPS survey. The grade poles shall consist of PVC pipe (approximately one-half 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. Confirm that the in-place thickness of the saerifieial soilrock erosion barrier is between 90 percent and 125 percent of the design thickness. Notify the Project Manager of areas not meeting the specified grade. Re-verify after rework has been completed. Document all inspections and corrective actions (where required) on the Daily Construction Report.	Review the documentation for final grading.
180) NOTICE OF COVER CONSTRUCTION: Provide written notice of the completion of cover construction to the DWMRCDirector within 30 days of completion of each phase of cover construction in the "cut and cover" operation.	Obtain documentation of DWMRCDirector notification.	Within 30 days of completion of each phase of cover construction, notify the DWMRCDirector of completion of cover construction. Provide QC with documentation of DWMRCDirector notification. Note: The Engineering Manager, or designee, may notify the DWMRCDirector and provide Quality Assurance documentation of the notification.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – DRAINAGE DITCH IMPORTED BORROW

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>181) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>182) 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.</p>	<p>Inspect the area once clearing and grubbing has been completed. Record observations and corrective actions (where required) on the Daily Construction Report.</p>	<p>Verify that the clearing and grubbing has been inspected by QC.</p>
<p>183) MATERIAL: The imported borrow shall be classified as CL or ML soils by ASTM D-2487.</p>	<p>Perform laboratory classification tests at a rate of one test per lot prior to use of material in the road. A lot is defined as a maximum of 3,000<u>5,000</u> cubic yards (compacted) of specified material type. Record the location of the classification sample on the Sampling Log.</p> <ol style="list-style-type: none"> a. Approve lots (which meet the specified classification) <u>for use in the road.</u> b. Lots not meeting the specified classification cannot be used. 	<p>Verify the frequency of laboratory tests and compliance of test results.</p>
<p>184) LIFT THICKNESS: Drainage ditch borrow material shall be placed in lifts with an uncompacted thickness of less than or equal to nine inches.</p> <p>A. 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.</p>	<p>Verify that the required grading is achieved as follows:</p> <ol style="list-style-type: none"> 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. Visually check between poles for high or low spots. d. Define those areas that are high out of specification and advise the Project Manager to re-work those areas. e. Review areas re-worked and approve areas meeting criteria. f. Continue “b” through “d” above until all areas meet criteria. g. Indicate areas meeting criteria in the “Embankment 	<p>Verify the frequency of measurements and compliance of test results.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – DRAINAGE DITCH IMPORTED BORROW

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

Construction Lift Approval Form”.

- OR -

- B. Survey to determine lift thickness on at least a 50-foot grid lengthwise and at all control points. Survey equipment shall have a tolerance no more than ± 0.1 foot.

- OR -

- a. Verify survey equipment is within a tolerance of ± 0.1 foot.
- b. Verify correct set-up and operation of equipment.
- c. Visually check between survey points for high or low spots.
- d. Define high out of specification areas and notify the Project Manager to rework those areas.
- e. Document survey results on a survey report.

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - DRAINAGE DITCHES**

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>185) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>186) EXCAVATION: Excavation shall be made to the lines, grades, and dimensions prescribed in the approved phase-specific plans. Temporary (operational) ditches may be constructed to these phase-specific plans. Final design grade and dimensions (as shown in the approved engineering drawings listed in Groundwater Quality Discharge Permit UGW450005) are not required to be met before final closure of the Class A West or 11e.(2) embankments.</p> <p>Prior <u>DWMRC</u> Director approval in writing must be obtained before diverting ditches from the current approved design. The purpose and duration of diversion shall be specified in any request to do so. <u>The Director approval shall be obtained in accordance with Specification 23.</u></p> <p>Any over excavation shall be backfilled with <u>select drainage ditch borrow</u> materials and compacted to 95 percent of standard Proctor. The uncompacted lift thickness shall not exceed nine inches.</p>	<p>Provide daily observation of the cell excavation. Record observations and corrective actions (where required) on the Daily Construction Report.</p> <p><u>Obtain documentation confirming that the Director has approved the plans for diverting ditches. If necessary, notify DWMRC of ditches that need to be diverted.</u></p> <p>In areas of over excavation, conduct in-place density test at a rate of one test per lot, <u>with a minimum of one test per phase</u>, and record the results on the Field Density Test form. A lot is defined as a maximum of 10,000 square feet of a <u>single</u> lift of a specified type of material. Test locations shall be chosen on the basis of random numbers (described in Specification 12).</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified compaction. b. Rework and retest lots not meeting the specified compaction. <p>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.</p>	<p>Verify daily observations and corrective actions have been documented.</p> <p>Verify that <u>DWMRC</u> Director approvals have been obtained before diverting ditches. <u>Provide QC with approval documentation.</u></p> <p>Verify the frequency of laboratory tests and compliance of test results.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - DRAINAGE DITCHES

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

187) FINAL GRADING: Smooth roll the excavated surface to prepare for filter zone ~~or riprap~~. Final grading of this surface shall be ± 0.1 of a foot.

Inspect the surface for smoothness. Survey the surface on a 50 foot grid and at key points (i.e., changes in direction of the ditch). Final survey measurements will be documented on the survey report and provided to Quality Assurance.

Review the final survey data. Verify the frequency of the survey points.

188) FILTER ZONE AND ROCK EROSION BARRIER: The filter zone and rock erosion barrier shall be constructed in accordance with Specifications 164 thru 180 as appropriate.

See Specifications 164 thru 180.

See Specifications 164 thru 180.

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - DRAINAGE DITCHES**

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

189) EROSION CONTROL FOR EXPOSED

SOIL: If reviewed and approved drainage ditch soil surfaces are not covered by filter zone ~~or riprap~~ within 30 days of lift approval, the following erosion control repair measures shall apply.

Monthly, inspect exposed drainage ditch soil surfaces for evidence of erosion. Rivulet or gullied areas wider than six inches or deeper than six inches require maintenance to fill the rivulet or gully and restore the area to design elevation. Maintenance shall be performed within 30 calendar days when needed, unless additional time is approved by [DWMRCDirector](#).

Erosion control blankets, mats, or fiber mulch may be used, in accordance with the manufacturer's instructions, for erosion prevention.

[DWMRCDirector](#) shall be notified at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. If used, such erosion control materials shall be removed prior to filter zone or riprap construction.

Perform monthly inspections. Document the inspection as well as associated maintenance activities on the Daily Construction Report.

Review documentation to verify that monthly inspections have been performed.

Obtain documentation of [DWMRCDirector](#) notification

Notify [DWMRCDirector](#) at least 48 hours prior to deployment of erosion control blankets, mats, or fiber mulch. Provide QC with documentation of [DWMRCDirector](#) notification.

**190) RADIOL
OGICAL SAMPLING FOR EXPOSED SOIL:**

If reviewed and approved drainage ditch soil surfaces are not covered by filter zone or riprap within 30 days of lift approval, the area shall either

- A. be sampled and radiologically released in accordance with the Environmental Monitoring Plan; or

Coordinate sampling and analysis with environmental personnel. Attach a copy of the release report to the lift approval documentation.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - DRAINAGE DITCHES

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

- B. have a minimum of six inches of ditch material removed and replaced prior to filter zone or riprap placement. Under [this](#) option, no environmental sampling is required.

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - INSPECTION ROAD**

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

191) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.

192) MATERIAL: The material used to construct the road shall conform to the following specification:

Sieve Size	Percent Passing
1 1/2 inch	100
3/4 inch	75-95
1/2 inch	62-82
# 4	38-58
# 16	16-36

193) 192) # 200 0-18 a relevant UDOT roadbase specification and be approved in writing by a Utah licensed pProfessional eEngineer prior to use.

194) 193) SUBSURFACE PREPARATION: The subsurface will be scarified and re-compacted to at least 95 percent of a standard proctor (ASTM D698).

195) 194) ROAD THICKNESS: The compacted road shall be 12 inches thick plus or

Obtain written material approval ~~from~~ a Utah licensed pProfessional eEngineer. Perform or obtain laboratory ~~classification tests~~gradation testing at a rate of one 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, as needed, the location of the classification sample on the Sampling Log.

- a. Approve lots which meet the specified classification.
- b. Notify the Project Manager of lots not meeting the specified classification to have the areas reworked.
- c. Retest lots after rework has been completed.

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 (described in Specification 12).

- a. Approve lots which meet the specified compaction.
- b. Notify the Project Manager of lots not meeting the specified compaction to have the areas reworked.
- c. Retest lots after rework has been completed.

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.

Measure the thickness of the road at both edges of the road at no greater than 50 foot intervals. Record the

Verify written material approval, the frequency of laboratory tests and compliance of test results.

Verify the frequency of tests and compliance of test results.

Verify the frequency of tests and compliance of test results.

**LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - INSPECTION ROAD**

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>minus 0.2 feet.</p> <p>196)195) _____ COMPACTION: The road will be compacted to at least 95 percent of standard Proctor (ASTM D698).</p>	<p>results on the Lift Approval Form.</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified thickness. b. Notify the Project Manager of lots not meeting the specified thickness to have the areas reworked. c. Retest lots after rework has been completed. <p>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 (described in Specification 12).</p> <ol style="list-style-type: none"> a. Approve lots which meet the specified compaction. b. Notify the Project Manager of lots not meeting the specified compaction to have the areas reworked. c. Retest lots after rework has been completed. <p>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.</p>	<p>Verify the frequency of tests and compliance of test results.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - PERMANENT CHAIN LINK FENCES

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>197196) SCOPE: This work element applies to the Class A West and 11e.(2) embankments.</p>		
<p>198197) 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 fences shall be chain link, six feet high, topped with three strand barbed wire, top tension wire and twisted selvedge.</p> <p>Zinc coated chain link fence shall meet the requirements of ASTM A392 with Class I coating. Aluminum Coated fence fabric shall meet the requirements of ASTM A491.</p> <p><u>Fence Fabric:</u> Fence fabric shall be made of 0.148 inch or larger diameter wire. The fabric shall have twisted selvedge.</p> <p><u>Wire and Ties:</u> 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 A116.</p> <p><u>Barbed Wire:</u> Barbed wire on zinc coated fence shall meet the requirements of ASTM A121, 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 five inch centers. When aluminum or aluminum</p>	<p>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.</p>	<p>Verify that the materials to be used in the construction of the fence have been approved and documented.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - PERMANENT CHAIN LINK FENCES

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

coated fence is used, aluminum coated barbed wire shall be used meeting the requirements of ASTM A0491. 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:

- A. Load at top: 600 lbs.
- B. Maximum Moment: 1200 ft-lbs.
- C. Maximum permanent set: 0.010 in.

"H" posts shall be coated in accordance with the requirements of ASTM A123. Pipe posts shall conform to the requirements of ASTM A120 (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 A123.

Gates: Gate posts and frames shall be constructed of the sizes shown on the approved plans for the various gate dimensions. 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 A123. Chain link fence fabric for covering the gate

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - PERMANENT CHAIN LINK FENCES

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
frames shall be the same as required for the fence. Each gate shall be furnished complete with necessary galvanized hinged, latch, and drop bar locking device for the type of gate used on the project.		
199)198) _____ 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 listed in Groundwater Quality Discharge Permit UGW450005. 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 six 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.	
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.	
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	Inspect the fencing fabric to verify that it has been installed in accordance with the specifications. Document any problems in the Daily Construction Report.	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT - PERMANENT CHAIN LINK FENCES

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

to the top rail or tension cable at approximately 24 inch intervals. The bottom edge of the fabric should be installed within one inch of the ground surface. 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.

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – SETTLEMENT MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>200199) SCOPE: This work element applies to the LARW, Class A West, 11e.(2), and Mixed Waste embankments.</p>		
<p>201200) SETTLEMENT MONUMENTS: Settlement monuments constructed before January 1, 2005 consist of #4 or greater rebar that is approximately three feet long, secured in place using a sand-cement grout. Grout shall consist of approximately 1/2 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.</p> <p>Settlement monuments constructed after January 1, 2005 shall consist of approximately four-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 six inches above the rock erosion barrier surface. The settlement plate shall be placed on top of the final approved radon barrier (Class A, <u>11e.(2)</u>, 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.</p>	<p>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.</p>	<p>Perform a surveillance of monument installation activities.</p>
<p>202201) SETTLEMENT MONUMENT PLACEMENT: Settlement monuments shall be placed at the locations identified on Figures 2, 3, and 4.</p>	<p>Perform and document a post-construction survey of the placed settlement monument.</p>	<p>Verify that surveys have been performed and documented.</p>
<p>203202) SURVEY REQUIREMENTS:</p>	<p>Calibrate and operate survey equipment in accordance</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – SETTLEMENT MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>Surveys shall be performed with GPS or approved equivalent equipment. Tolerance shall be no more than ± 0.1 feet.</p>	<p>with the manufacturer’s recommendations</p>	
<p>204)203) _____ 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 five 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.</p>	<p>Perform and document the required surveys in a survey report. Provide survey data to the Engineering Manager.</p>	<p>Verify that monument surveys are completed and documented as required.</p>
<p>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 five 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.</p>	<p>Perform and document the required surveys in a survey report. Provide survey data to the Engineering Manager.</p>	<p>Verify that new monument surveys are completed and documented as required.</p>
<p>During the annual survey, perform a visual inspection of the completed cover to evaluate potential areas of settlement that may not be captured by the settlement monument network.</p>	<p>Document observations made during the inspection, and denote areas where differential settlement may be occurring. Provide documentation to the Engineering Manager.</p>	<p>Perform a surveillance of visual inspection activities.</p>

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – SETTLEMENT MONITORING

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p> 205204) REPORTING: Settlement monitoring data shall be summarized and evaluated in the annual as-built report for each embankment.</p> <p>Calculate total and differential settlement for each settlement monument against the most recent measurement and against the baseline monument location.</p> <p>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 Engineering Manager within 30 days of measurement and discussed in the annual as-built report.</p> <p>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.</p>	<p>Provide settlement monitoring data to the Engineering Manager.</p>	

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – ANNUAL AS-BUILT REPORT

SPECIFICATION	QUALITY CONTROL	QUALITY ASSURANCE
<p>206)205) SCOPE: This work element applies to the LARW, Class A West, and 11e.(2) embankments.</p>		
<p>207)206) AERIAL SURVEY REQUIREMENTS: An aerial survey of all areas within 100 feet of Section 32 shall be performed within three months of prior to the December 1st Annual As-built Report submittal. <u>between August 15 and September 15 each year.</u></p> <p>The aerial survey shall be performed by a registered land surveyor.</p> <p>Survey control points shall be identified in the survey report.</p> <p>Survey tolerance shall not exceed ± 0.75 ft. Actual tolerance of the survey shall be stated in the report.</p>		
<p>208)207) ANNUAL AS-BUILT VOLUMES: Calculate embankment volumes from the aerial survey data using AutoCAD or approved equivalent equipment.</p> <p>As required in I.H.6 of Groundwater Quality Discharge Permit UGW450005, provide plan view and cross-sections of the as-built embankment(s) based on the aerial survey data. Include in each cross-section the profile of the maximum authorized waste elevation. Also include in each cross-section the elevation profile of the top of the uppermost approved waste lift (as of the time the lift was approved). Provide a clear key to each cross-section to define the meaning of each symbol and line used.</p>		

LLRW and 11e.(2) CQA/QC MANUAL
TABLE 1 - QA/QC ACTIVITIES
WORK ELEMENT – ANNUAL AS-BUILT REPORT

SPECIFICATION

QUALITY CONTROL

QUALITY ASSURANCE

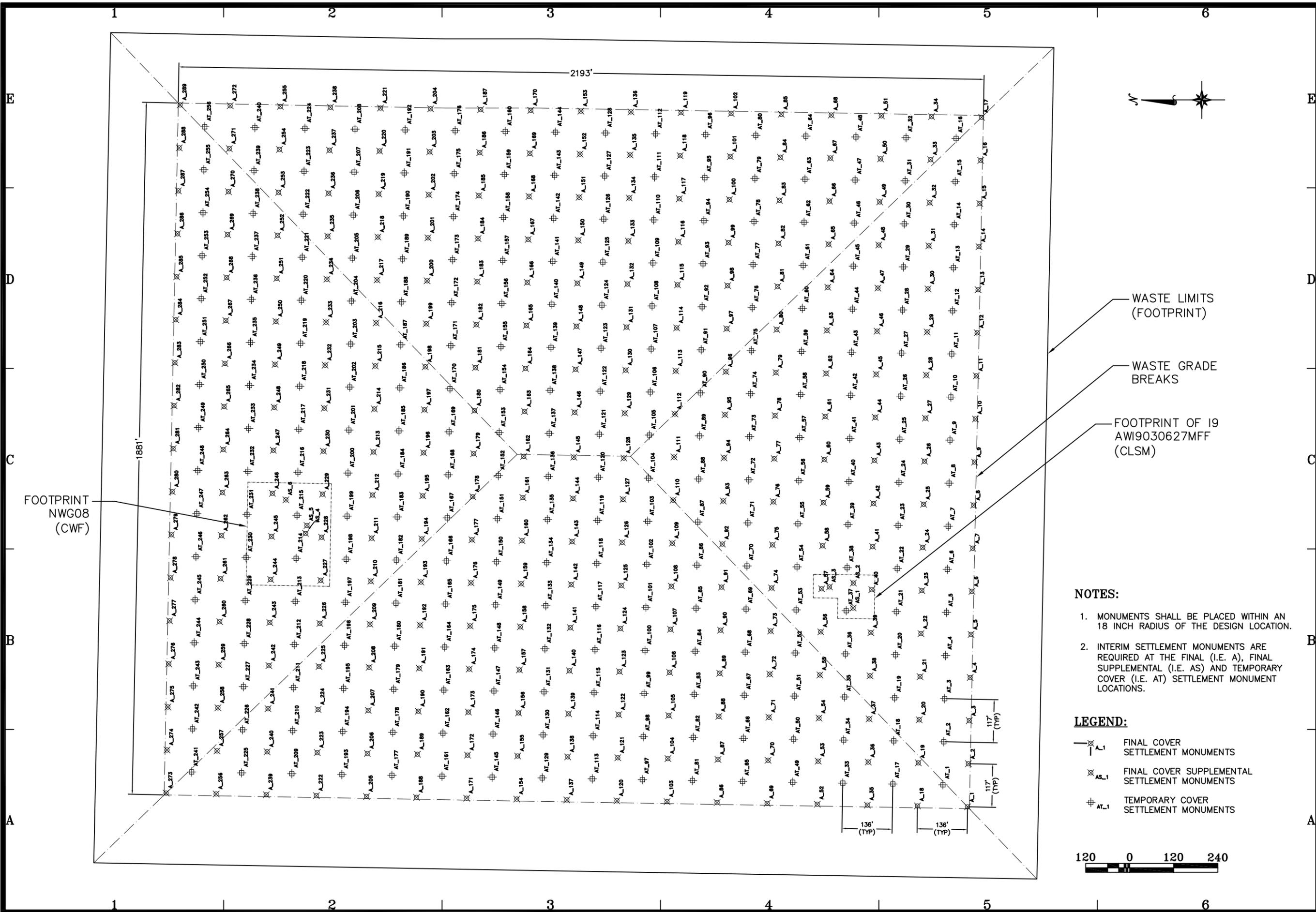
For each embankment, report the design capacity, capacity used to date, and remaining capacity, including overburden. Compare remaining capacity with the surety reserve capacity for each embankment. Report any volume of waste that is placed over the design top of waste.

LLRW and 11e.(2) CQA/QC MANUAL

TABLE 2

MATERIAL SPECIFICATIONS FOR PORTLAND CEMENT CLSM

PROPERTY	TEST METHOD	MINIMUM	MAXIMUM	FREQUENCY
WET UNIT WEIGHT	ASTM D6023	100 lbs/ft ³	None	One Test/2,000 Cubic Yards/Lift
SLUMP -OR- FLOW -OR- FLOW CONSISTENCY	EnergySolutions Slump Test (Appendix B) EnergySolutions Efflux Test (Appendix B) Flow Consistency (ASTM D6103)	Eight inches NA Eight inches	None 26 seconds None	One Test/100 Cubic Yards/Lift One Test/100 Cubic Yards/Lift One Test/100 Cubic Yards/Lift
28 DAY COMPRESSIVE STRENGTH	ASTM D4832	150 psi	None	One Test/2,000 Cubic Yards Placed at 28 days
CEMENT	None	50 lbs for each cubic yard of CLSM	None	Inspect each load ticket prior to pour
POZZOLAN	None	None	375 lbs for each cubic yard of CLSM	Inspect each load ticket prior to pour
AGGREGATE SIZE	Gradation Test Certificate from Batch Plant ASTM C117 ASTM C136	<u>Percent Passing</u> <u>Sieve</u> 100 3/8" 60 #8	<u>Percent Passing</u> <u>Sieve</u> 30 200	One certification per day if material is received from exterior batch plant or One test per stockpile if material is received from onsite batch plant. Gradation certificate shall be received by QC Technician prior to pouring any CLSM



- NOTES:**
- MONUMENTS SHALL BE PLACED WITHIN AN 18 INCH RADIUS OF THE DESIGN LOCATION.
 - INTERIM SETTLEMENT MONUMENTS ARE REQUIRED AT THE FINAL (I.E. A), FINAL SUPPLEMENTAL (I.E. AS) AND TEMPORARY COVER (I.E. AT) SETTLEMENT MONUMENT LOCATIONS.

- LEGEND:**
- ⊗ AT.1 FINAL COVER SETTLEMENT MONUMENTS
 - ⊗ AS.1 FINAL COVER SUPPLEMENTAL SETTLEMENT MONUMENTS
 - ⊕ AT.1 TEMPORARY COVER SETTLEMENT MONUMENTS

ENERGYSOLUTIONS "CLIVE" FACILITY
CLASS A WEST EMBANKMENT
SETTLEMENT MONUMENTS
CLIVE, UTAH

	REFORMATTED FIGURE AND ADDED NOTES (NO CHANGES TO MONUMENTS) DATE: 4/20/17 BY: DFB
	REVISION DATE: 9/20/11 BY: BLD

DESIGNED BY: D. BOOTH

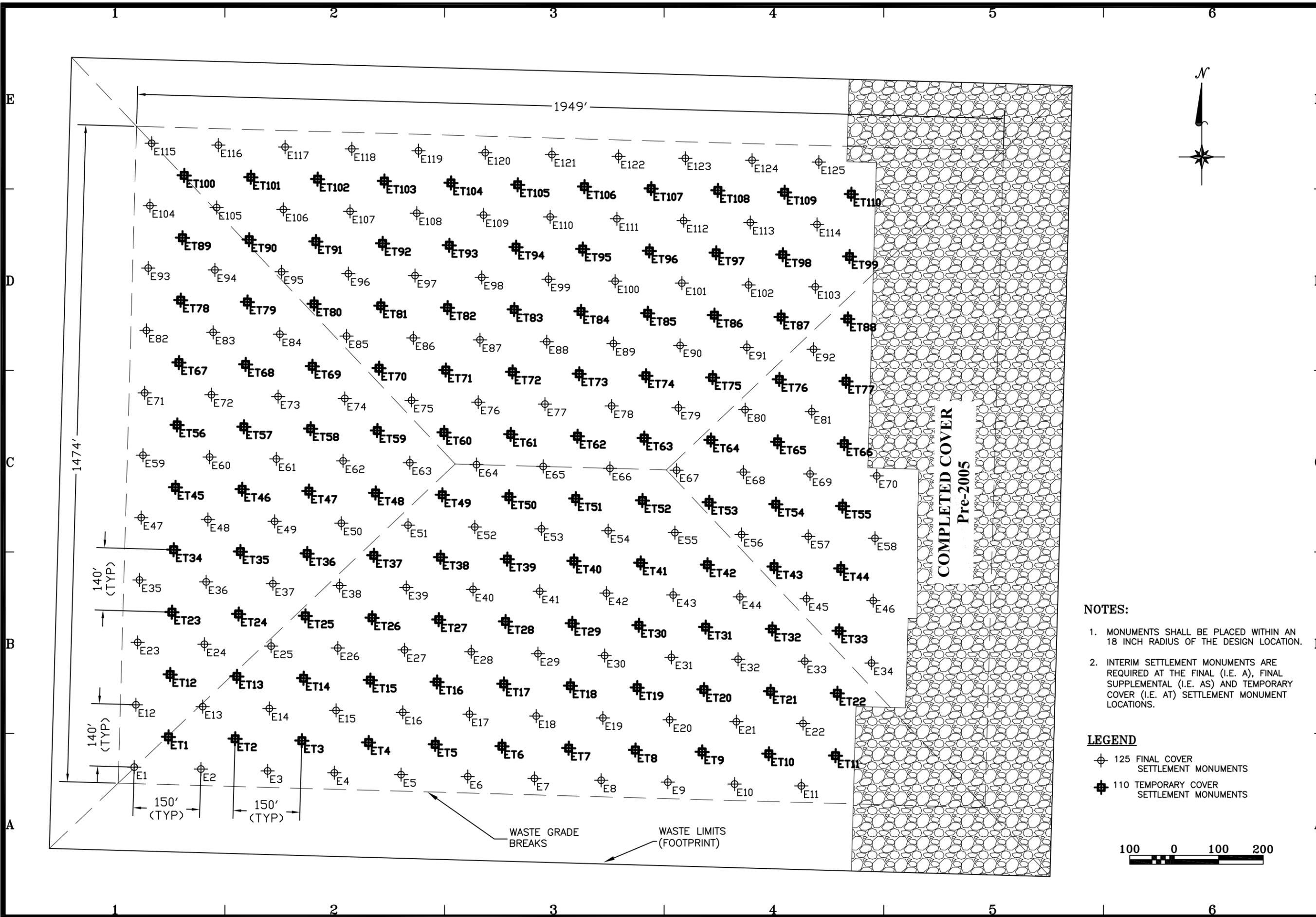
DRAWN BY: N. CLARKE

APPROVED BY: D. BOOTH

SCALE: AS NOTED

DATE: 04/20/17

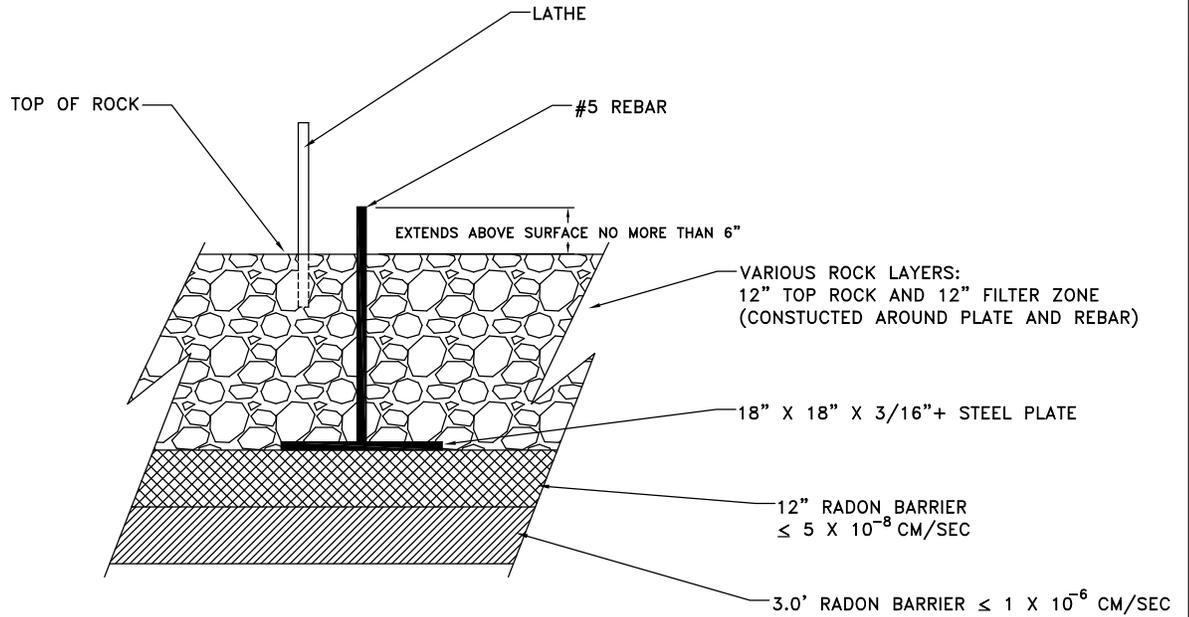
FIGURE 2



- NOTES:**
- MONUMENTS SHALL BE PLACED WITHIN AN 18 INCH RADIUS OF THE DESIGN LOCATION.
 - INTERIM SETTLEMENT MONUMENTS ARE REQUIRED AT THE FINAL (I.E. A), FINAL SUPPLEMENTAL (I.E. AS) AND TEMPORARY COVER (I.E. AT) SETTLEMENT MONUMENT LOCATIONS.

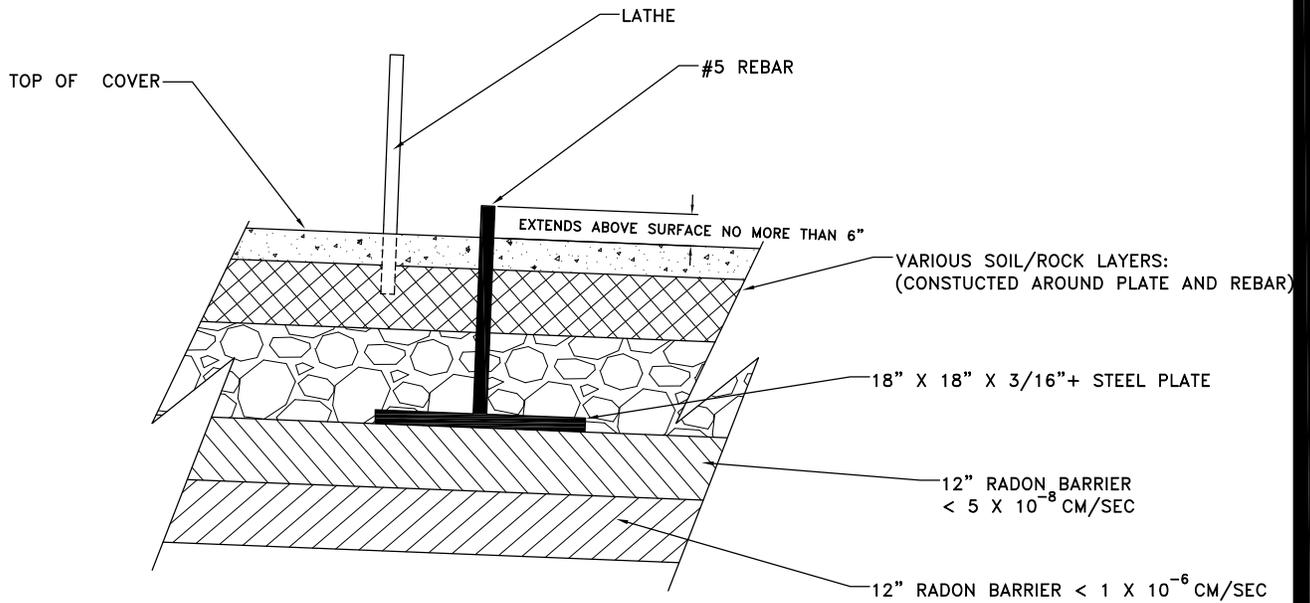
- LEGEND**
- ⊕ 125 FINAL COVER SETTLEMENT MONUMENTS
 - ⊕ 110 TEMPORARY COVER SETTLEMENT MONUMENTS

ENERGYSOLUTIONS		ENERGYSOLUTIONS "CLIVE" FACILITY	
11e.(2) EMBANKMENT		SETTLEMENT MONUMENTS	
CLIVE, UTAH			
DATE	BY	DATE	BY
8/16/17	DFB	ADDED NOTE 2	
4/20/17	DFB	REVERTED TO REVISION 1 MONUMENT PLACEMENT PLAN, REFORMATTED FIGURE	
10/10/08	BLD		
<p>DESIGNED BY: D. BOOTH</p> <p>DRAWN BY: N. CLARKE</p> <p>CHECKED BY: D. BOOTH</p> <p>SCALE: AS NOTED DATE: 04/20/17</p>			
<p>FIGURE 4</p>			



CROSS SECTION OF 11E(2) SETTLEMENT
PLATE MONUMENT INSTALLATION (TYP)

NTS

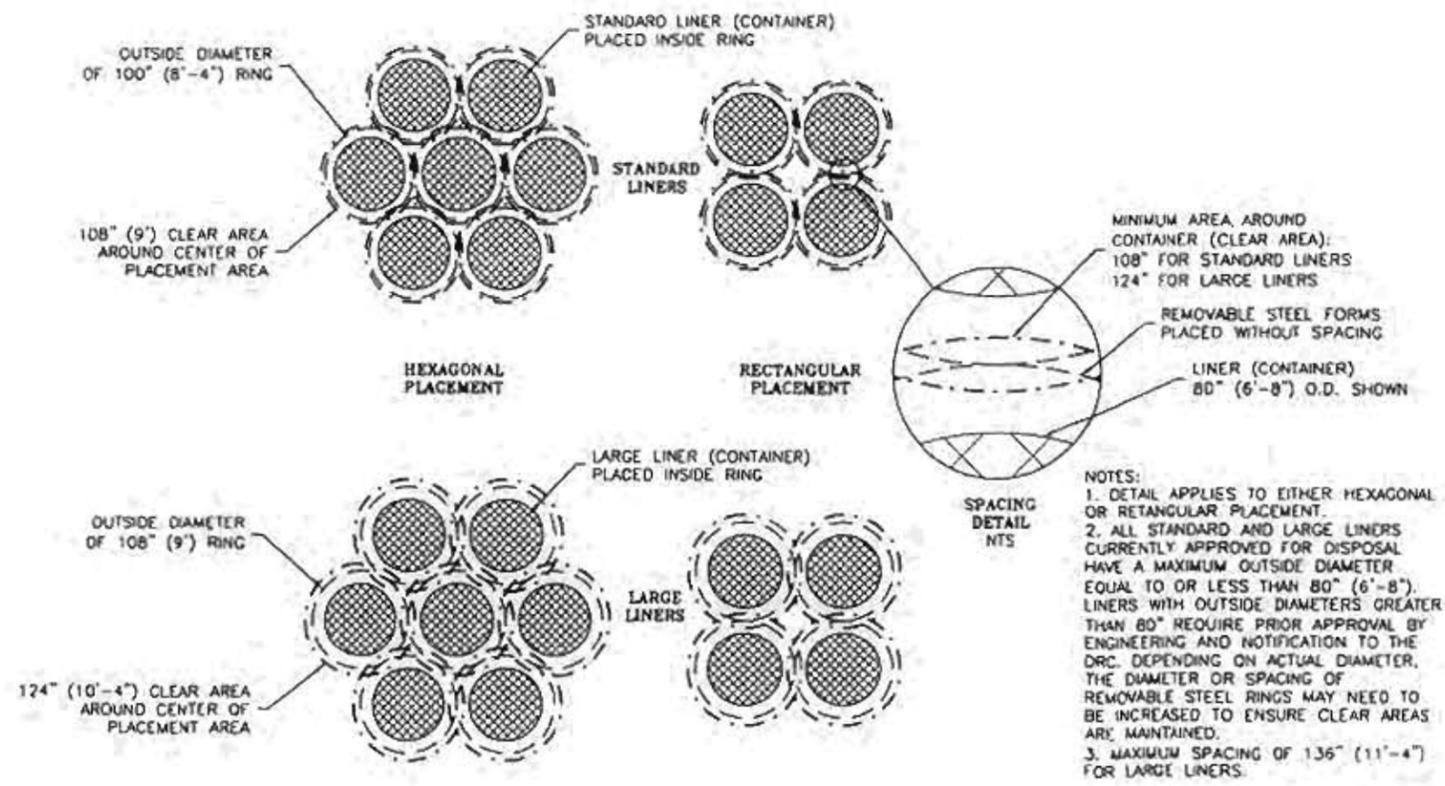
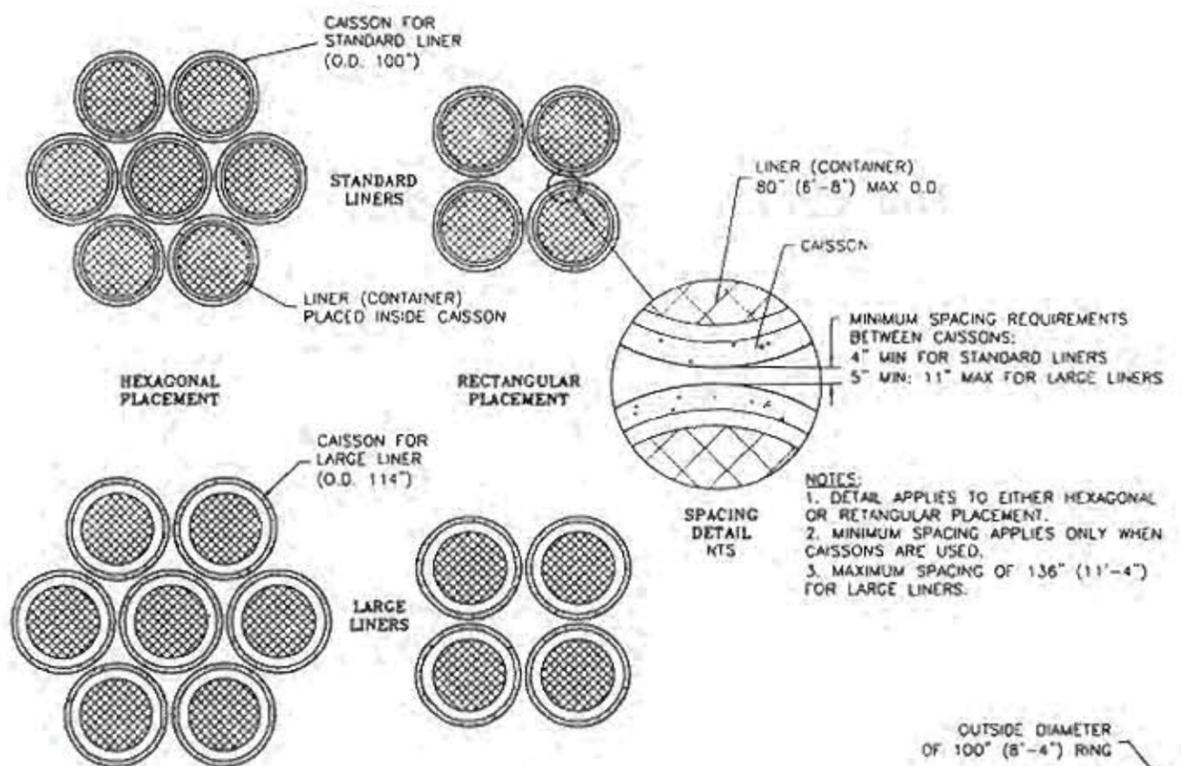


CROSS SECTION OF CLASS A WEST SETTLEMENT
PLATE MONUMENT INSTALLATION (TYP)

NTS

FIGURE 5

REVISION 1 8/19/15



10/07	DFB/DR	CON/OC	PLAN REFERENCE
DATE	BY	DESCRIPTION	OF CHANGE
ENERGYSOLUTIONS "CLIVE" FACILITY CONTAINERIZED WASTE FACILITY (CWF) CELL CONSTRUCTION REQUIREMENTS, 2 OF 2 CLIVE, UTAH			
DESIGNED BY	D. BOOTH		
CHECKED BY	C. OUTSON		
DATE	10/10/07		
FIGURE 8			

APPENDIX A

LIST of CQA/QC DOCUMENTATION FORMS

The following forms are referenced within the CQA/QC.

Daily Quality Assurance Report
Daily Construction Report
Sample Log
Lift Approval Form
Field Density Test
Field Permeability Test
Aggregate Gradation Form
Soil Classification Form
Standard Proctor Form
CLSM Inspection Form
CLSM Testing Form
Breach of Berm Form
Liner/Radon Barrier Inspection Form
Embankment Construction Lift Approval Form
CWF Lift Approval Form
Disposal Lift Survey Data Form

APPENDIX B

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 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 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 6836 Standard Test Methods for Determination of the Soil Water Characteristic Curve for Desorption Using a Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, and/or Centrifuge
- 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"

APPENDIX C

ROCK QUALITY SCORING

ROCK QUALITY SCORING

The results from the following test will be utilized in the scoring criteria:

<u>TEST</u>	<u>STANDARD DESIGNATION</u>
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 C-1 – Scoring Criteria for Rock Quality based on the results of the above tests. These scores will be multiplied by the weighing factors outlined in Table C-1 for different rock types. Table C-1 includes weighting factors for limestone, sandstone, and igneous rocks. The rock quality score is obtained by the following formula:

$$\text{ROCK QUALITY} = \frac{\text{SUM (TEST SCORE X WEIGHT FACTOR)}}{\text{MAXIMUM POSSIBLE SCORE}} \times 100$$

Table C-1. SCORING CRITERIA FOR ROCK QUALITY¹

TEST*	WEIGHTING FACTOR													
	LIME- STONE	SAND- STONE	IGN- EOUS	<u>10</u>	<u>9</u>	<u>8</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
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

* The lowest score (i.e. 0) may be substituted for results of test not performed which are required by Section III.c.

¹U.S. Nuclear Regulatory Commission, NUREG-1623, Design of Erosion Protection for Long-Term Stabilization, August, 2002, Table D-1 (p. D-30)

Appendix C

License Condition 10.A & 57 – Railcar Repairs

Statement of Basis to Amend License Condition 10.A & 57

On February 4, 2019 (CD19-0029), ES submitted a request to the Director to amend **License Conditions 10.A and 57**. The request included proposed conditions and requirements necessary for the repair of railcars within Section 29 of the Clive facility, together with certain language clarifications relating to the receipt, storage, and transloading of radioactive material-related railcars in Section 29.

The License Section and current License Condition 10.A are as follows:

SITE LOCATION

10.A. The Licensee may receive, store, transload, and dispose of licensed material at the Licensee’s facility located in Section 32 of Township 1 South and Range 11 West, SLBM, Tooele County, Utah. The Licensee may receive, transload closed packages as defined in 57.B.iii, and store licensed materials within certain portions of the Licensee’s facility located in Section 29 of Township 1 South, Range 11 West, SLBM, Tooele County, Utah, in accordance with Condition 57.

The proposed amended License Condition 10.A:

10.A. The Licensee may receive, store, transload, and dispose of licensed material at the Licensee’s facility located in Section 32 of Township 1 South and Range 11 West, SLBM, Tooele County, Utah. The Licensee may receive, survey, inspect, transload closed packages as defined in Condition 57.B.iii, perform maintenance or repairs on released railcars, and store licensed materials within certain portions of the Licensee’s facility located in Section 29 of Township 1 South, Range 11 West, SLBM, Tooele County, Utah, in accordance with Condition 57.

The License Section and current License Condition 57 are as follows:

SITE OPERATING PROCEDURES

57.A The Licensee has established, within Section 29 of Township 1 South, Range 11 West, SLBM, Tooele County, a “Section 29 Licensee Controlled Area”, as depicted on (DWG No. 0801-G06, Stamp Dated 8/9/18). The Section 29 License Control Area consists of an access-controlled area secured with a six-foot chain link fence and access gates that are controlled by the Licensee. All rail lines within the Section 29 Licensee Controlled Area are designated as a Radioactive Material Storage Area (“RMSA”) while licensed material is being stored. The RMSA is measured from the centerline of the track to a distance of no less than 10 feet in each direction. The Licensee may receive and store railcars, and may transload Closed Packages containing licensed materials within the RMSA. All

operations within the RMSA shall be subject to the applicable provisions of this Condition 57 and other relevant provisions of the License. Conveyances and packages released from Licensee’s control in accordance with Condition 27 are deemed not to contain any licensed materials and are considered “unrestricted release.” Unrestricted release conveyances and packages are not subject to the requirements of Condition 57.

- B. The following requirements shall apply to the rail shipment receipt and storage of all types of rail-delivered conveyances and closed packages within the Section 29 Licensee Controlled Area:
- i. Receipt and storage of licensed materials is limited to the RMSA portions of the Section 29 Licensee Controlled Area.
 - ii. Waste management operations are prohibited within the Section 29 Licensee Controlled Area. Conducting radiological surveys, railcar staging, storage, transloading Closed Packages, and moving and switching operations are not considered to be waste management operations.
 - iii. The Licensee may designate specific areas within the RMSA as a transloading area. Transloading areas shall be designed in accordance with best available technology and all transloading operations within the RMSA shall be conducted in a manner so as to minimize the risk of Closed Packages becoming damaged or for licensed material otherwise being released. All transloading area designations and transloading procedures shall be approved in advance by Licensee’s RSO, with such approval being documented in writing. Within any designated RMSA transloading area, the Licensee may offload and transfer (transload) undamaged, closed, rail-delivered packages containing solid licensed materials (Closed Packages) from railcars stored within any RMSA. Closed Packages may not be placed on the ground within any area in Section 29. Transloaded Closed Packages shall be moved into Section 32 by the end of the shift when the Closed Package was removed from the delivering railcar. Only equipment and procedures that are compatible with the Closed Package design shall be used for transloading.
 - iv. Ingress into and egress from the each RMSA shall be controlled to ensure only authorized personnel are granted access and to prohibit unauthorized removal of licensed material or release of radioactive contamination. The Licensee shall maintain constant surveillance and monitoring of each RMSA whenever storage or transloading of licensed materials is taking place.
 - v. At all times when storage or transloading of licensed materials is taking place within an RMSA, the boundaries of the RMSA shall be marked with conspicuous signage, as follows: “Caution, Radioactive Material Area—Radiation Work Permit Required for Entry,” with signs placed in accordance with the Licensee’s Radiation Protection Program and UAC R313-15-902.

- vi. Unescorted non-radiation workers shall not enter the RMSA. The Licensee shall provide appropriate training for all unescorted non-radiation workers entering the Clive facility Section 29 Licensee Controlled Area regarding the RMSA.
 - vii. Licensed materials stored within an RMSA shall not exceed a dose rate greater than 2 mrem per hour at 30 centimeters.
 - viii. The Licensee shall continuously monitor the fenced boundary of the Section 29 Licensee Controlled Area and the non-fenced, interior boundaries of the RMSAs and Transloading Areas, pursuant to Condition 26 and the Environmental Monitoring Plan. Results of all monitoring shall be included in the reports required by Condition 29.A.
 - ix. A radiological survey shall be conducted for workers exiting any RMSA where storage or transloading of licensed materials is taking place. The survey shall be conducted in accordance with the Licensee's Radiation Protection Program.
 - x. The Licensee shall conduct and document regular inspections of each RMSA and all licensed materials stored therein for compliance with the Utah Administrative Code and conditions of this License.
 - xi. The Licensee shall at all times maintain sufficient surety in accordance with Condition 73 to adequately cover all licensed materials, equipment, and railcars stored within the RMSA.
 - xii. By January 31st of each year, the Licensee shall submit an annual inventory report to the Director indicating the number of conveyances in storage within the RMSA during the previous calendar year, including the dates conveyances entered and were removed from the RMSA.
- C. All incoming rail shipments shall be considered in storage once the rail shipments are delivered to the Licensee's rail line and the delivering engine is decoupled. The following conditions shall apply to incoming shipments.
- i. The Licensee shall conduct a radiological survey within 96 hours of arrival of any railcars containing licensed materials. Any individual railcar or package (a) with a dose rate greater than 2 mrem per hour at 30 centimeters, or (b) showing evidence of any actual or potential release shall be moved as soon as reasonably possible to the Restricted Area (Section 32). In the event of an actual or a potential release, any impacts to the RMSA or any Transloading Area shall be surveyed, remediated, and reported to the Director within 48 hours of observation of the release.
 - ii. No incoming railcar shall be stored in the RMSA longer than 60 days from the date of its initial radiological survey (conducted in accordance with Conditions 57.C.i.).

Within seven days of making a determination that any licensed material stored within an RMSA does not meet applicable conditions or requirements for disposal, such licensed

material shall be offered for return to the generator.

D. Empty railcars may be stored in the RMSA, subject to the following conditions:

- i. Empty railcars shall be maintained in working condition.
- ii. No empty railcar shall be continuously stored in the RMSA for longer than two years.
- iii. Empty railcars shall be surveyed and the Licensee shall document that they meet DOT and License requirements. Once surveyed, empty railcars shall be offered for pick up by the local rail service within seven days of removal from the RMSA.

The proposed amended License Condition 57.

57.A. The Licensee has established, within Section 29 of Township 1 South, Range 11 West, SLBM, Tooele County, a “Section 29 Licensee Controlled Area” as depicted on (DWG No. 0801-G06, Stamp Dated ~~8/9/18~~ 10/22/2019) (Drawing). The Section 29 Licensee Controlled Area consists of an access-controlled area secured with a six-foot chain link fence and access gates that are controlled by the Licensee. ~~All rail lines within~~ Within the Section 29 Licensee Controlled Area, ~~the Licensee has designated a Railcar Transfer Area and are designated as a~~ Radioactive Material Storage Area (RMSA), as depicted in the Drawing. while licensed material is being stored. The RMSA is measured from the centerline of the track to a distance of no less than 10 feet in each direction. The Licensee may receive and store railcars, and may transload Closed Packages containing licensed materials within the RMSA. All operations within the RMSA shall be subject to the applicable provisions of this Condition 57 and other relevant provisions of the License. Conveyances and packages released from Licensee’s control in accordance with Condition 27 are deemed not to contain ~~any~~ licensed materials and are considered “unrestricted release.” ~~Unrestricted release conveyances and packages and~~ are not subject to the requirements of Condition 57.

B. The following requirements shall apply to the rail shipment, receipt, ~~and~~ storage of all types of rail-delivered conveyances and closed packages, the maintenance or repair of released railcars, and outgoing railcars that do not meet unrestricted release criteria found in Condition 27 within the Section 29 Licensee Controlled Area:

- i. Receipt of licensed material is limited to the Railcar Transfer Area. As depicted on the Drawing, the north-south railroad tracks on the east side of the Section 29 Licensee Controlled Area, is designated as the Railcar Transfer Area. All incoming rail shipments of licensed material shall be placed in the Railcar Transfer Area. Within the Railcar Transfer Area, the Licensee may perform inspections, surveys, and incidental railcar switching operations. The Licensee shall not perform maintenance and repair operations within the Railcar Transfer Area. Incoming railcars may be temporarily located in the Railcar Transfer Area for up to 10 days, unless otherwise approved by the Director. The temporary presence of licensed material within the

- Railcar Transfer Area is considered to be incidental to shipment and is not deemed to constitute “storage” within the meaning of the License.
- ii. ~~and s~~Storage of licensed materials is limited to the ~~RMSA~~ portions of the Section 29 Licensee Controlled Area. The RMA is measured from the centerline of the track to a distance of no less than 10 feet in each direction. The Licensee may receive and store railcars, perform maintenance or repairs on released railcars, and transload closed packages containing licensed material within the RMA. All operations within the RMA shall be subject to the applicable provisions of this Condition 57 and other relevant provisions of the License.
 - iii. Direct Waste management operations are prohibited within the Section 29 Licensee Controlled Area. Conducting radiological surveys, railcar staging, storage, transloading ~~c~~Closed ~~p~~Packages, maintenance or repairs on released railcars, and moving and switching operations are not considered to be direct waste management operations and may be conducted within certain portions of the Section 29 Licensee Controlled Area, in accordance with applicable conditions of the License.
 - iv. The Licensee may designate specific areas within the ~~RMSA~~ as a transloading area. Transloading areas shall be designed in accordance with best available technology and all transloading operations within the ~~RMSA~~ shall be conducted in a manner so as to minimize the risk of closed packages becoming damaged or for licensed material otherwise being released. All transloading area designations and transloading procedures and operations shall be approved in advance by Licensee’s RSO, with such approval being documented in writing as part of the permanent operating record. Within any designated ~~RMSA~~ transloading area, the Licensee may offload and transfer (transload) undamaged, closed, rail-delivered packages containing solid licensed materials (closed packages) from railcars stored within any ~~RMSA~~. Closed packages may not be placed on the ground within any area in Section 29. Transloaded closed packages shall be moved into Section 32 by the end of the shift when the closed package was removed from the delivering railcar. Only equipment and procedures that are compatible with the closed package design shall be used for transloading.
 - v. Ingress into and egress from the ~~each~~ ~~RMSA~~ shall be controlled to ensure only authorized personnel are granted access and to prohibit unauthorized removal of licensed material or release of radioactive contamination. The Licensee shall maintain constant surveillance and monitoring of all access points in the Section 29 Licensee Controlled Area each RMSA whenever receipt, storage, or transloading of licensed materials, or maintenance or repairs on released railcars is taking place.
 - vi. At all times when storage or transloading of licensed materials, or maintenance or repairs of released railcars, is taking place within an ~~RMSA~~, the boundaries of the ~~RMSA~~ shall be marked with conspicuous signage, as follows: “Caution, Radioactive Material Area—Radiation Work Permit Required for Entry,” with signs placed in accordance with the Licensee’s Radiation Protection Program and UAC R313-15-902. A radiological survey shall be conducted prior to depositing any RMA to

- demonstrate that the area no longer meets the requirements for RMA posting.
- vii. Unescorted non-radiation workers shall not enter the RMSA. The Licensee shall provide appropriate training for all unescorted non-radiation workers entering the Clive facility Section 29 Licensee Controlled Area regarding authorized visitor access roads-the RMSA.
 - viii. As provided more fully in Section C.i., below, Licensed materials located within the Railcar Transfer Area or stored within an RMSA shall not exceed a dose rate greater than 2 mrem per hour at 30 centimeters.
 - ix. The Licensee shall continuously monitor the fenced boundary of the Section 29 Licensee Controlled Area and the non-fenced, interior boundaries of the RMSAs, and Transloading Areas, and maintenance or repair areas pursuant to Condition 26 and the Environmental Monitoring Plan. Results of all monitoring shall be included in the reports required by Condition 29.A.
 - x. A radiological survey shall be conducted for of workers exiting any RMSA where storage or transloading of licensed materials, is taking place. The survey shall be conducted in accordance with the Licensee's Radiation Protection Program.
 - xi. The Licensee shall conduct and document regular inspections of each RMSA and all licensed materials stored therein for compliance with the Utah Administrative Code and conditions of this License.
 - xii. The Licensee shall at all times maintain sufficient surety in accordance with Condition 73 to adequately cover all licensed materials, equipment, and railcars stored within the RMSA.
 - xiii. By January 31st of each year, the Licensee shall submit an annual inventory report to the Director indicating the number of conveyances in storage within the RMSA during the previous calendar year, including the dates conveyances entered and were removed from the RMSA.
- C. All incoming rail shipments shall be considered Licensee controlled in storage once the rail shipments are delivered to the Licensee's rail line and the delivering engine is decoupled. The following conditions shall apply to incoming railcars containing licensed material shipments.
- i. The Licensee shall conduct a radiological survey within 96 hours of arrival of any railcars containing licensed materials. Any individual railcar or package (a) with a dose rate greater than 2 mrem per hour at 30 centimeters, or (b) showing evidence of any actual or potential release shall be moved as soon as reasonably possible to the Restricted Area (Section 32). In the event of an actual or a potential release, any impacts to the Section 29 Licensee Controlled Area RMSA or any Transloading Area shall be surveyed, remediated, and reported to the Director within 48 hours of observation of the release.
 - ii. No incoming railcar shall be stored in the RMSA longer than 60 days from the date of its initial radiological survey (conducted in accordance with Conditions 57.C.i.).

- iii. ~~Whenever the Licensee has reason to believe~~ ~~Within seven days of making a determination~~ that any Licensee-controlled licensed material ~~stored within an RMSA~~ does not meet applicable conditions or requirements for disposal, the Licensee shall provide notice to the Director, not later than 24 hours. Within 7 days after either the Licensee or the Director determines that such licensed material does not meet applicable acceptance criteria (whichever is sooner), the Licensee shall offer such licensed material ~~shall be offered~~ for return to the generator. The Licensee shall undertake all necessary measures with respect to such non-compliant licensed material until it is picked up for return to the generator.
- D. ~~The Licensee may store releasedempty~~ railcars ~~may be stored~~ in an the RMSA, subject to the following conditions:
- i. The Licensee shall maintain releasedempty railcars ~~shall be maintained~~ in working condition.
 - ii. ~~The Licensee shall not store any~~ ~~No~~ releasedempty railcar ~~shall be continuously stored~~ in the RMSA for longer than two continuous years.
 - iii. Prior to storing released railcars in the RMA, the Licensee shall survey releasedEmpty railcars ~~shall be surveyed~~ and the Licensee shall document that they meet DOT and License requirements. This documentation shall form part of the permanent operating record.
 - iv. Storage shall not include ~~Once surveyed,~~ releasedempty railcars that the Licensee has placed on a designated outbound track and has ~~shall be~~ offered for pick up by the local rail service, provided that such cars are picked up by the local rail service within seven days ~~of removal from the RMSA~~ or such additional time as the Director approves.
- E. The following requirements shall apply to any railcar maintenance or repair operations within the RMA. The Licensee may conduct maintenance or repair operations on the exterior surfaces and exterior appliances of releasedempty railcars, subject to the following conditions:
- i. All maintenance and repair procedures and operations shall be approved in advance by the Licensee's RSO, with such approval being documented in writing as part of the permanent operating record.
 - ii. All railcar maintenance and repair operations shall be conducted in a manner that minimizes the risk of environmental release of licensed material and exposure to the Licensee's employees, third-party contractors, or other persons.
 - iii. All railcar maintenance and repair operations within the Section 29 Licensee Controlled Area shall be conducted solely within an areas approved by the Licensee's RSO, which areas shall be under the exclusive use and control by a device that can be locked and unlocked only by the workers who are responsible for the maintenance or

- repair work.
- iv. The Licensee shall be solely responsible for compliance with all applicable laws, rules, and regulations relating to the maintenance and repair of railcars, including, without limitation, those rules, regulations, and standards relating to the Federal Railroad Administration, the U.S. Department of Transportation, and the Association of American Railroads.
 - v. Prior to the time that the Licensee undertakes any railcar maintenance or repair operations, the Licensee shall conduct appropriate radiological surveys to document that the railcar surface to be repaired is compliant with the applicable contamination limits set forth in Condition 27, as determined by the Licensee’s RSO.
 - vi. At all times that railcar maintenance or repair operations are being undertaken, the Licensee shall perform appropriate radiological surveys as to the Railcar Maintenance Facility, not less frequently than once per day, as determined by the Licensee’s RSO.
 - vii. The Licensee shall retain records regarding railcar maintenance or repair operations and associated radiological surveys for at least three years. Railcar maintenance records shall include, at a minimum, the railcar reporting mark and number, the railcar ownership status, a description of the maintenance or repairs undertaken (including the location of the repair and type of repair), the results achieved, and the dates of railcar acceptance and release.
 - viii. Railcar repair operations involving welding within Section 29 shall be undertaken only in the RSO-approved maintenance area under the supervision of an RST with RSO approval and appropriate monitoring.
 - ix. The following activities are prohibited within Section 29: (a) removal of gondola railcar lids; and (b) accessing the interior of gondola railcars for any purpose, including inspection, repairs, or maintenance.

Railcar Receipt, Storage, and Repairs

The ES submitted the request to the Director to amend **License Condition 57** of the License for the purposes of repairing railcars in Section 29 at the Clive facility. In this respect, this License Amendment 25 is related to License Amendment 24, where the Director approved amendments to License Conditions 10, 57, and 62 relating to the receipt, storage, and transloading of railcars containing radioactive material or having residual surface radioactivity above unrestricted release levels at the ES’s facility are acceptable practices outside of Section 32 at the ES’s facility and has designated areas where these activities can take place as formal Radioactive Material Storage Areas. In processing the License amendment request relating to the issue of railcar repairs, the Director decided to make certain changes to the wording of Condition 57 relating to the receipt, storage, and transloading matters that were addressed in License Amendment 24, in order to provide more clarity. For example, the term “Radioactive Material Storage Areas” has been changed to Radioactive Material Area to be more consistent with the Radiation Control and NRC rules and publications. These revisions are discussed in more detail below.

Basis for License Changes

License Amendment 24 represented a major amendment of Condition 57. Subsequent to the finalization of License Amendment 24, ES requested that this Condition be amended to allow ES to undertake certain repair and maintenance operations on railcars that are stored in Section 29 under the amended Condition 57. ES presented a detailed operational plan to ensure that railcar repair, maintenance, and management activities in RMAs in Section 29 are conducted in a manner that is protective of the environment and is radiologically safe for workers and the public.

The requirements governing the types of repairs and maintenance activities that are allowed, and the manner in which such operations are conducted, are designed to be flexible enough to accommodate operations and the constantly changing number of railcars yet specific and tight enough to ensure controls are effective and inspectable and enforceable.

The RMA definition has been clarified to be limited to a specific area within Section 29, whereas before all rail lines in Section 29 were designated as RMAs. Instead, a specific Railcar Transfer Area has been defined. The Railcar Transfer Area is not designated as a formal RMA. However, the substantive requirements that would apply to RMAs apply to the Railcar Transfer Area as provided in the amended language. This was done to accommodate the transfer process whereby a common carrier drops off incoming shipments and picks outgoing (released) railcars. These transfer operations are incidental to the normal shipping and receiving process. Similarly the railroad personnel are authorized to perform railcar transfer operations in the Railcar Transfer Area without an escort. For incoming shipments, the bill of lading is not fulfilled until the waste reaches the disposal facility in Section 32. For outgoing (released) railcars, these railcars have been cleaned and surveyed and demonstrated to meet applicable DOT regulations for service (e.g., restricted release). The Railcar Transfer Area, including the 10-day transfer period, are based on federal regulations relating to similar activities. *See* 40 CFR § 263.12 (relating to transfer facility requirements, providing a 10-day transfer period); 40 CFR § 262.30 (relating to packaging waste or offering hazardous waste for transportation off-site); 49 CFR §171.1(c)(4) (governing storage of a transport vehicle, freight container, or package containing hazardous material incidental to movement of a hazardous material); 49 CFR §171.8 (defining “storage incidental to movement” to include storage incidental to delivery to the final destination, including railcars stored on “private track or siding”).

Public access to the Railcar Transfer Area will be controlled and monitored. The substantive requirements established in Amendment 25 (e.g., radiation monitoring, surveying, environmental monitoring, and so forth) will still apply to the Railcar Transfer Area. As before, in all events, limits are placed on radiation dose rates emanating from railcars placed in the Railcar Transfer Area and in the RMA. Incoming railcars must be surveyed within 96 hours of arrival. Railcars must be removed from the Railcar Transfer Area within 10 days.

References

EnergySolutions, LLC. 2019a. Orton, Tim. Message to Bret Randall. October 22, 2019. Email Attachment: Section 29 Licensee Controlled Area, Site Map, Clive Utah. Scale 1"=600', Stamp dated October 22, 2019, Drawing No. 0801-G06

EnergySolutions, LLC. 2019b. Radioactive Material License UT2300249, Request for License Amendment to Allow Railcar Maintenance within Section 29. CD19-0029. February 4, 2019. (DRC-2019-001441).

Appendix D

License Condition 73.C – Surety Update

Statement of Basis to Amend License Condition 73.C

License Condition 73.C. of the LLRW Radioactive Material License (UT 2300249) lists the approved combined annual surety amount for the Clive site and the individual surety amount for the LLRW Facility. Changes to the combined surety and individual facility amounts are updated annually based on physical changes at the facility and inflation calculations. Occasionally intermediate revisions are approved by the Director.

Within earlier License Amendment 23 (dated 8/1/18, DRC-2018-004075) and the current License Amendment 24 (dated 10/18/18, DRC-2018-010114) the surety values listed in License Condition 73.C are based on the Director's approval of an ES letter dated March 26, 2018 (CD18-0060, DSHW-2018-003012). The Director's approval is summarized in a letter dated April 26, 2018 (DSHW-2018-003623).

In a letter dated December 7, 2018 (DSHW-2018-010862) the Director approved an Annual Surety update. This subject approval was an acceptance of the 2017 Annual Surety review submitted by ES on March 1, 2018 (CD18-0040, DRC-2018-002081).

Prior to issuing a license amendment to capture the 2017 Annual Surety values approved on December 7, 2018, a subsequent set of surety values would be approved by the Director. On March 29, 2019 ES submitted to the Director the 2018 Annual Surety update to the combined annual surety amount for the state-issued Part B Permit, the 11e.(2) Radioactive Material License (UT 2300478) and the LLRW Radioactive Material License (UT 2300249). The Director has approved the 2018 Annual Surety update revision with an approval letter dated October 11, 2019 (DSHW-2019-012382). These 2018 Annual Surety values are being incorporated into this License Amendment 25.

Based on a Division review of the annual update submission, Condition 73.C. of the LLRW Radioactive Material License shall be revised as indicated in the following paragraphs:

The License Section and current License Condition are as follows:

FINANCIAL ASSURANCE/CLOSURE

73.C. The combined annual surety is \$76,690,920.92 with the LLRW subtotal of \$50,005,828.16 as approved in the Director's letter dated April 26, 2018.

The amended License Condition 73.C is as follows:

73.C. The combined annual surety is ~~\$76,690,920.92~~ \$80,149,535.08 with the LLRW subtotal of ~~\$50,005,828.16~~ \$52,666,194.70 as approved in the Director’s letter dated ~~April 26, 2018~~ October 11, 2019.

References

EnergySolutions, LLC. 2019. Radioactive Material License UT2300249, Radioactive Material License UT2300478, EPA ID Number UTD982598898, 2018 Combined Surety Annual Review, Class 1 Permit Modification, and LLRW, and 11e.(2) License Amendment Requests. CD19-0075. March 29, 2019. DRC-2019-002923.

EnergySolutions, LLC. 2018a. EPA ID Number UTD982598898, Radioactive Material License UT2300249. Notification of Surety Exceedance, Combined Surety Unloaded Railcar Increase and Class 1 Permit Modification. CD18-0060. March 26, 2018. DSHW-2018-003012.

EnergySolutions, LLC. 2018b. Radioactive Material License UT2300249, Radioactive Material License UT2300478, EPA ID Number UTD982598898, 2017 Combined Surety Annual Review, Class 1 Permit Modification, and LLRW, and 11e.(2) License Amendment Request. CD18-0040. March 1, 2018. DRC-2018-002082.

Utah Department of Environmental Quality, Division of Waste Management and Radiation Control (UDEQ-DWMRC), 2019, 2018 Combined Surety Review, dated October 11, 2019. DSHW-2019-012382.

UDEQ-DWMRC, 2018a, 2017 Surety Approval. Dated December 7, 2018. DSHW-2018-010862.

UDEQ-DWMRC, 2018b, Class 1 Permit Modification Request, LLRW Storage Increase, UTD982598898. Dated April 26, 2018, DSHW-2018-003623.

**UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIAL LICENSE**

Pursuant to the Utah Code Annotated, Title 19, Chapter 6 and R313 of the Utah Administrative Code (UAC) and in reliance on statements and representations heretofore made by the licensee designated below, a license is hereby issued authorizing such licensee to transfer, receive, possess and use the radioactive material designated below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This licensee is subject to all applicable rules, and orders now or hereafter in effect and to any conditions specified below.

- | | | | |
|-------------|-------------------------------------|---|---------------------------------|
| | LICENSEE |) | 3. License Number UT 2300249 |
| | |) | Amendment # <u>2425</u> |
| 1. Name: | EnergySolutions, LLC (the Licensee) |) | ***** |
| | |) | 4. Expiration Date |
| 2. Address: | 299 South Main Street |) | January 25, 2013 |
| | Suite 1700 |) | (under timely renewal) |
| | Salt Lake City, Utah 84111 |) | ***** |
| | |) | 5. License Category – 4-a |
| | |) | In accordance with letter dated |
| | |) | January 6, 2016 this license is |
| | |) | amended in its entirety. |
| | |) |) |

6. Radioactive material (element and mass number)	7. Chemical and/or physical form	8. Maximum quantity licensee may possess at any one time
A. Any Radioactive Material including Special Nuclear Material specified in License Condition 13.A through J.	A. Notwithstanding License Conditions 9 (Authorized Use), 16 (Prohibitions and Waste Acceptance 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 CQA/QC Manual.	A. 20,000 Curies***
B. Special Nuclear Material	B. See 7.A of this license	B. As specified in License Condition 13.A through J.
C. Cesium-137	C. Sealed Source(s) evaluated as stated in UAC R313-22-210	C. Not to exceed 11 millicuries per source; Not to

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

D. Americium-241	D. Sealed Neutron Source(s) evaluated as stated in UAC R313-22-210	D. Not to exceed 51 millicuries per source; Not to exceed 6 sources total.
E. Americium-241 Americium-243 Neptunium-237 Plutonium-236 Plutonium-239 Plutonium-242 Thorium-229 Thorium-230 Uranium-232 Uranium-238 Curium-244 Hydrogen-3 Carbon-14 Iron-55 Nickel-59 Nickel-63 Technetium-99	E. Liquid	E. Not to exceed 5 microcuries total activity per isotope; Not to exceed 16 sources total.
F. Strontium-90/Yttrium-90	F. Liquid	F. Not to exceed 5 microcuries total activity
G. Americium-241	G. Sealed Source(s) evaluated as stated in UAC R313-22-210	G. Not to exceed 5 microcuries total activity
H. Thorium-230	H. Sealed Source(s) evaluated as stated in UAC R313-22-210	H. Not to exceed 48.6 microcuries total activity

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

I. Plutonium-239	I. Sealed Source(s) evaluated as stated in UAC R313-22-210	I. Not to exceed 21.9 microcuries total activity
J. Strontium-90/Yttrium-90 and Americium-241	J. Sealed Source(s) evaluated as stated in UAC R313-22-210	J. Not to exceed 8.1 millicuries per source; Not to exceed 6 sources total.
K. Am-241, Cd-109, Co-57, Te-123m, Cr-51, Sn-113, Sr-85, Cs-137, Co-60, Y-88, Th-230, Na-22, Mn-54, Eu-155 and Pb-210	K. Calibration or Reference Source(s) evaluated as stated in UAC R313-22-210	K. Not to exceed 5 microcuries per isotope; Not to exceed 25 sources total.
L. Uranium-234, Uranium-235, Uranium-238, Americium-241, and Plutonium-239	L. Calibration or Reference Source(s) evaluated as stated in UAC R313-22-210	L. Not to exceed 20 nanocuries per isotope.
M. Cobalt-60 and Cesium-137	M. Calibration or Reference Combined Source(s)	M. Not to exceed 0.4 microcuries per source; Not to exceed 6 sources total.
N. Barium-133	N. Calibration or Reference Source(s) evaluated as stated in UAC R313-22-210	N. Not to exceed 30 microcuries per source. Not to exceed 3 sources
O. Americium-241 and Europium-152	O. Calibration or Reference Combined Sources evaluated as stated in UAC R313-22-210	O. Not to exceed 2 microcuries per source; Not to exceed 4 sources total.
P. Cesium-137	P. Sealed Source(s) evaluated as stated in UAC R313-22-210	P. Not to exceed 12 millicuries per source; Not to exceed 3 sources total.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

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

9. AUTHORIZED USE:

- A. The 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.
- 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 Director of the Division of Waste Management and Radiation Control (Director), the Governor and the Legislature.
- C. The Licensee shall comply with all license conditions and shall meet all compliance schedules stipulated in the Ground Water Quality Discharge Permit, number UGW 450005 (hereafter GWQ Permit), issued by the Director.
- D. The Licensee may receive and store up to twenty (20) empty radioactive waste transportation casks under the following conditions:
- The casks are dedicated to the transportation of low level radioactive wastes.
 - Storage of the casks is confined to the Restricted Area within the area specified in License Condition 10, except when staged for return to commerce within seven days.
 - Internal contamination shall be kept minimal as practical but shall not exceed the contamination limits specified for Department of Transportation, Class 7 Hazardous Material, Radioactive Material, Excepted Package-Empty Packaging, UN2908.
 - During storage, casks shall be secured in accordance with their Department of Transportation or Nuclear Regulatory Commission approved design specifications.
- E. The Licensee may dispose of a volume of Class A Low-Level Radioactive Waste (LLRW) and Naturally Occurring and Accelerator Produced Radioactive Materials (NARM) in the Class A West disposal cell described in License Condition 40 not exceeding 8,724,097 cubic yards, and in the Mixed Waste Landfill Cell not exceeding 1,354,092 cubic yards. Together, the total aggregate volume of waste disposed of in the Class A West disposal cell and the Mixed Waste Landfill Cell shall not exceed 10.08 million cubic yards. Class A waste LLRW is defined in (UAC) R313-15-1009 and NARM at R313-12-3.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249

Amendment # 2425

- F. The Licensee shall not accept, possess, store or dispose of any radioactive waste delivered to the disposal site by any conveyance, unless the associated Uniform Low-Level Radioactive Waste Manifest has a valid Generator Site Access Permit number issued by the Director, thereon affixed.
- G. The Licensee may receive and treat radioactively contaminated aqueous liquids and liquid mercury as characterized in the waste profile only at the mixed waste facilities, provided that the waste is Class A LLRW at receipt. Treated aqueous liquids may be disposed at the Mixed Waste Facility or the LLRW Facility, in accordance with Exhibit 3 of the current Waste Characterization Plan approved by the Director. Treated (amalgamated) liquid mercury shall only be disposed at the Mixed Waste Facility.
- H. Reserved.
- I. Licensed material in License Conditions 6.C and 6.D, sealed source(s) contained in compatible portable gauging devices (registered pursuant to UAC R313-22-210 or an equivalent U.S. Nuclear Regulatory Commission or Agreement State regulation) for measuring properties of materials.
- J. Licensed material in License Conditions 6.E through 6.O, for operational checks and efficiency determinations of radiation detection instrumentation.
- K. Reserved.
- L. Licensed material in License Condition 6.P, sealed source(s) contained in MGP Instruments, Inc. Model IRD-2000 dosimeter calibrators/irradiators for tests and source checks of electronic dosimeters.

SITE LOCATION:

- 10. A. The Licensee may receive, store, transload, and dispose of licensed material at the Licensee's facility located in Section 32 of Township 1 South and Range 11 West, SLBM, Tooele County, Utah. The Licensee may receive, [survey, inspect](#), transload closed packages as defined in [Condition 57.B.iii, perform maintenance or repairs on released railcars](#) and store licensed materials within certain portions of the Licensee's facility located in Section 29 of Township 1 South, Range 11 West, SLBM, Tooele County, Utah, in accordance with Condition 57.
- 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' 51.890" N

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

Elevation	Longitude 113° 7' 28.580" W 4269.76 feet above mean sea level (amsl)
Southeast Section Corner	Latitude 40° 40' 51.879" N Longitude 113° 6' 20.011" W
Elevation	4277.27 feet-amsl
Northwest Section Corner	Latitude 40° 41' 44.098" N Longitude 113° 7' 28.654" W
Elevation	4273.06 feet-amsl
Northeast Section Corner	Latitude 40° 41' 44.086" N Longitude 113° 6' 20.109" 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 License Condition 10.B). The 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. Authorized Use of Sealed Sources.
- i. Licensed material in License Conditions 6.C and 6.D used as authorized in License Condition 9.I, and licensed materials in License Conditions 6.E through 6.P used as authorized in License Condition 9.J and identified as sealed sources may be used and stored on all property owned by the Licensee at its Clive facility. The property is located in Sections 29, 32 and in parts of Sections 28 and 33 in Township 1 South, Range 11 West and parts of Sections 4, 5 and 6 in Township 2 South, Range 11 West SLBM, Tooele County, Utah.
 - ii. Licensed material not authorized for use specified in License Conditions 9.I and 9.J or not defined as sealed sources in License Condition 9.J shall be used and stored only at the Licensee's facilities referenced in License Condition 10.B.

CONDITIONS:

11. The open cell area within the Class A West disposal embankment, where waste disposal/placement has occurred 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.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
 RADIOACTIVE MATERIALS LICENSE
 SUPPLEMENTARY SHEET**

License # UT 2300249
 Amendment # 2425

12. Pursuant to UAC R313-12-55(1), the Licensee is granted an exemption from 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 Licensee may possess Special Nuclear Material (SNM) within the restricted area of the Licensee's facility as described in License 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

<u>Column 1</u> Radionuclide	<u>Column 2</u> Maximum Concentration (pCi/g)	<u>Column 3</u> 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

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- 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 License 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 License 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 cementitious mix (Macro Mix) and thermal desorption.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

When waste is processed using the thermal desorption process, the Licensee 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. The Licensee 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.

The Licensee 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 the Licensee 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 License Conditions 13.F.1 through 13.F.4. Where generator process knowledge is used to demonstrate compliance with License Conditions 13.A, 13.B, 13.C, or 13.D, the Licensee shall review this information and determine when testing is required to provide additional information in assuring compliance with the License Conditions. The Licensee shall retain this information as required by the State of Utah to permit independent review.

At Receipt:

The Licensee 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

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

License Condition 13.A, that the measurement uncertainty does not exceed the uncertainty value in License Condition 13.A, and that the waste meets License 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. The Licensee shall notify the NRC, Region IV office within 24 hours if any of the above license 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 seven days.
- I. The Licensee shall obtain NRC approval prior to changing any activities associated with the above license conditions.
- J. Notwithstanding License Condition 13.A through 13.I, for the Containerized Waste Facility described in License Condition 40, 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 Licensee 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 State-issued Part B Permit, under EPA ID Number UTD982598898, issued and modified by the Director of the Division of Solid and Hazardous Waste.
- B. The Licensee may dispose of treated mixed waste in the Class A West disposal cell if it meets the criteria described in Exhibit 3 of the current Waste Characterization Plan.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- C. All other mixed wastes shall be disposed in the Mixed Waste Landfill Cell only.

WASTE TREATMENT AND PROCESSING:

15. A. Prior to receipt-management of any low level radioactive or mixed wastes requiring treatment before disposal, 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 radionuclide concentrations of the resultant processed waste is neither Class B nor Class C waste do not exceed Class A waste limits.
- B. Reserved.
- C. Following treatment at the Mixed Waste facility, the Licensee shall classify the resultant processed waste in accordance with UAC R313-15-1009.
- 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 UAC R313-12 shall not be accepted for disposal.
- B. In accordance with UAC R313-15-1009(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 R313-15-1009(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 R313-15-1009(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 and minimal quantities as described in License Condition 17 and in the current Waste Characterization Plan, receipt of non-aqueous liquid waste is prohibited unless specifically approved by the Director.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- ii. Treated liquid radioactive waste shall be disposed at the Mixed Waste Facility or the LLRW Facilities in accordance with Exhibit 3 of the current Waste Characterization Plan.
 - iii. Only the Director-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 be accepted for all liquid radioactive wastes, regardless of radioactivity concentrations.
- G. In accordance with UAC R313-15-1009(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. The total activity of any container shall not exceed 100 curies (3.7×10^{12} Bequerels).
- H. In accordance with UAC R313-15-1009(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:
- i. Each disposal container has been classified in accordance with UAC R313-15-1009. In addition, the Licensee shall require that all radioactive waste received for disposal meet the requirements specified in the Nuclear Regulatory Commission, "Concentration Averaging and Encapsulation Branch Technical Position," as amended.
 - ii. Each disposal container is 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" issued by the U.S. Nuclear Regulatory Commission.
 - a. When destined for the Containerized Waste Facility, the marking may be affixed to either the disposal container or transport package, in accordance with UAC R313-15-1006(4) and Section III of Appendix G of 10 CFR 20.1001 to 20.2402 (incorporated by reference).
 - iii. Each disposal container is 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.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- 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 West 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 Director.
 - 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 Director.
 - 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 Construction QA/QC Manual.

MANAGEMENT OF FREE LIQUIDS:

17. A. In accordance with UAC R313-15-1009(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.
- B. Solid waste received and containing unexpected aqueous 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.
- C. Unexpected non-aqueous free liquids less than 1% of the volume of the waste within the container shall be solidified prior to disposal.
- D. Should shipments arrive with greater than 1% unexpected free liquids (total of aqueous and non-aqueous), the Licensee shall notify the Director 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.”

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
 RADIOACTIVE MATERIALS LICENSE
 SUPPLEMENTARY SHEET**

License # UT 2300249
 Amendment # 2425

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 Radiation Safety Officer (RSO) 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:

TABLE 22-A

Type	Location	Frequency
A. Gamma Radiation Levels	1. Perimeter of Restricted Area(s)	1. Weekly
	2. Office Area (s)	
	2.a. [27] Decon Access Control Building	2.a. Weekly*
	2.b. [33] Mixed Waste Access Building	2.b. Weekly*
	2.c. [1] Accessible areas of the LARW Building	2.c. Weekly
	2.d. [1] Inaccessible area of the LARW Building	2.d. Weekly*
	2.e. [7] LLRW Operations Building	2.e. Weekly
	2.f. [100] Administration Building	2.f. Quarterly
	3. Eating/Change Area(s)	
	3.a. [27] Decon Access Control Building	3.a. Weekly*

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
 RADIOACTIVE MATERIALS LICENSE
 SUPPLEMENTARY SHEET**

License # UT 2300249
 Amendment # 2425

Type	Location	Frequency
	3.b. [33] Mixed Waste Access Building	3.b. Weekly*
	3.e. [7] LLRW Operations Building	3.e. Weekly
	3.f. [100] Administration Building	3.f. Quarterly
	4. Transport Vehicles	4. Upon vehicle arrival at site and before departure.
	5. Mixed Waste Facility	5. Weekly
	6. Decontamination facilities	
	6.a. Reserved	6.a. Reserved
	6.b. [23] Rotary Rail Wash	6.b. Weekly
	6.c. Mixed Waste Decon Pad	6.c. Weekly*
	6.d. [20] Track 4 Rail Wash	6.d. Weekly
	6.e. [21] Intermodal Wash Facility	6.e. Weekly
B. Contamination Wipes	1. Eating Area(s)/Change Area(s)	
	1.a. [27] Decon Access Control Building	1.a. Weekly*
	1.b. [33] Mixed Waste Access Building	1.b. Weekly*
	1.e. [7] LLRW Operations Building	1.e. Weekly
	1.f. [100] Administration Building	1.f. Quarterly
	2. Reserved	
	3. Office Areas(s)	
	3.a. [27] Decon Access Control Building	3.a. Weekly*
	3.b. [33] Mixed Waste Access Building	3.b. Weekly*
	3.c. [1] Accessible areas of the LARW Building	3.c. Weekly

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
 RADIOACTIVE MATERIALS LICENSE
 SUPPLEMENTARY SHEET**

License # UT 2300249
 Amendment # 2425

Type	Location	Frequency
	3.d. [1] Inaccessible area of the LARW Building	3.d. Weekly*
	3.e. [7] LLRW Operations Building	3.e. Weekly
	3.f. [100] Administration Building	3.f. Quarterly
	4. Reserved	4. Reserved
	5. Equipment/Vehicles	5. Once before release
	6. Decontamination facilities	
	6.a. Reserved	6.a. Reserved
	6.b. [23] Rotary Rail Wash	6.b. Weekly
	6.c. Mixed Waste Decon Pad	6.c. Weekly*
	6.d. [20] Track 4 Rail Wash	6.d. Weekly
	6.e. [21] Intermodal Wash Facility	6.e. Weekly
	7. Mixed Waste Facility	7. Weekly
	8. [24] Shredder Facility and control room	8. Weekly
	9. [23] Rotary Dump and control room	9. Weekly
C. Employee/Personnel	1. Skin and Personal clothing	1. Prior to exiting restricted area
D. Gamma Exposure	1. [100] Administration Bldg.(s)	1. Quarterly
E. Radon Concentration	1. [100] Administration Bldg.(s)	1. Quarterly

* When in operation/use, the survey shall be done weekly. When not in operation/use, the survey shall be done monthly. Operational status shall be documented weekly. Non-operational status is defined as no human entry other than routine health physics survey or security confirmation.

[#] Building numbers in parentheses are taken from Exhibit II-6 to the Contingency Plan provided as Attachment II-6 to the state-issued Part B Permit.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
 RADIOACTIVE MATERIALS LICENSE
 SUPPLEMENTARY SHEET**

License # UT 2300249
 Amendment # 2425

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 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 current Environmental Monitoring Plan approved by the Director.
27. Vehicles, containers, facilities, materials, equipment or other items for unrestricted use shall not be released from the Licensee's control if contamination exceeds the limits found in Table 27-A. When not released from the Licensee's control for unrestricted use, conveyances released for commercial transport of radioactive waste or materials shall comply with the requirements and applicable contamination limits set forth in 49 CFR 173 and the requirements of 10 CFR 71.5.

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 (disintegrations 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.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- 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 cm².
 - e. The amount of removable radioactive material per 100 cm² 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 one cm and 1.0 mrad/hr at one cm, respectively, measured through not more than seven mg/cm² of total absorber.
28. Within 60 days of issuance of License Amendment 23, the Licensee shall submit for Director's review and approval a Study Plan for evaluating relevant strategies for the destructive testing and analysis of the earthen components in the Cover Test Cell. The objectives of this study shall be (1) to acquire, to the extent practicable, representative, site-specific parameter data for validating the existing model for infiltration through the LARW cover system as well as for the support of future modeling of unsaturated flow through rock-cover systems used at the Clive facility, and (2) to examine the in-service physical properties of the Cover Test Cell earthen materials from the time of the Cover Test Cell's initial construction until the present and to document any changes.
- A. The Study Plan shall address in-situ and laboratory sampling and testing for determination of the Cover Test Cell's physical properties. Sampling and testing shall be conducted using, whenever possible, ASTM methods, or if not possible, alternative methods approved by the Director. Exploratory borings, trenching and/or block sampling shall be used to obtain relatively undisturbed representative samples. Sampling and testing shall occur at several locations randomly selected across the surface of the Cover Test Cell and within each earthen layer of the cover system. The Study Plan shall include a description of how the following data will, to the extent feasible, be collected:
 - i. Collection of data for in-service moisture content and dry bulk density of each soil sample.
 - ii. Characterization of grain-size distribution, porosity and residual and saturated moisture content ($\theta(r)$ and $\theta(s)$) for each soil layer in the vertical profile.
 - iii. Estimation of soil-water potential (e.g., matric potential or matric suction) as a function of moisture content for each soil layer in each vertical profile. Data shall be sufficient so that laboratory test results represent the full range of suction head vs. moisture content values potentially existing at the Clive Site. The laboratory data shall be used to create standard laboratory Soil-Water Characteristic Curves (SWCCs) or Soil Water Retention Curves (SWRCs) representing potential conditions at the facility from very wet to very dry.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- iv. Collection of data to assess saturated hydraulic conductivity and unsaturated hydraulic conductivity (as a function of moisture content) for each soil layer in each vertical profile.
 - v. Observation and characterization of changes, if any, from as-built conditions in physical properties of earthen materials.
 - vi. Estimation of the amount of heterogeneity (based on soil classification, relative compaction, etc.) within each earthen layer.
 - vii. Collection of moisture content data for the pan-lysimeter sand and gravel material located below the point of sampling in the base of the lower clay radon barrier.
 - viii. A schedule based on calendar days following plan approval for when the field and laboratory work will take place.
- B. Following Director approval of the study plan, the Licensee shall conduct the study as outlined.
- C. Within 60 days of completion of the Study, the Licensee shall submit a report documenting and evaluating the results of the Study. The Report shall contain the following elements:
- i. A description of the study report contents including all data collected such as exploration logs, field and laboratory test results, analysis and technical interpretation of data by a qualified independent expert.
 - ii. An evaluation of the field and laboratory data compared with the previous HELP model inputs. Based on this evaluation, the Licensee shall recommend and justify:
 - a. Acceptance of the previous HELP model and the cover design used for the LARW embankment, or
 - b. Potential changes to HELP-model inputs and/or other model inputs for future modeling, and/or
 - c. An outline of enhanced waste management procedures, or
 - d. A reevaluation of Embankment Cover design.
- D. If the Director determines that additional information or reevaluation is required, the Licensee shall provide all requested information and resolve all issues identified within a timeframe agreed upon by the Director and the Licensee.

REPORTING AND NOTIFICATION:

29. The Licensee shall submit the following reports and notifications to the Director:

- A. Semi-annual results from the Environmental Monitoring Program, as amended. The report(s) shall be submitted within 90 days after the expiration of each reporting period. Reporting Period shall mean:

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

First Period	January 1 to June 30
Second Period	July 1 to December 31

- B. A quarterly summary report detailing the radioisotopes, activities, weighted average concentrations, volume and tonnage for waste received 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 the passage of 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. 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.
- E. 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 Director in writing, at the earliest knowledge, that the following nuclides are scheduled for disposal: berkelium-247 and chlorine-36.
- F. For the Class A West disposal 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 Director in writing, at the earliest knowledge, that the following nuclides are scheduled for disposal: berkelium-247, calcium-41, chlorine-36, iodine-129, rhenium-187, and Technetium-99.

30. Except as provided by this License 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 years. The Licensee shall maintain

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

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 Thomas A. Brown, RSO.
32. A. The Licensee's staff shall meet the qualifications described in the current Appendix I, Organization Layout approved by the Director.
- 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 RSO 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 Director, 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 RSO, or individuals designated in writing by the RSO.
- D. The Licensee shall maintain the organizational independence of the programs that monitor and enforce employee safety, environmental protection and public safety from programs responsible for production and profitability and other influences or priorities that might compromise quality and radiation safety.
- E. The Licensee shall establish a method for any employee or contractor to anonymously submit questions, concerns, ideas or other comments regarding employee safety, environmental protection and public safety to the Corporate Radiation Safety Officer (CRSO). The method shall include documentation of all comments submitted, the Licensee's response to each comment, and a method for communicating the Licensee's response to employees and contractors.

CONSTRUCTION ACTIVITIES:

33. The Licensee shall obtain written approval from the Director 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. The Licensee shall address and resolve all concerns the Director has identified regarding clay mining activities in areas adjacent to Section 32, as provided in a February 16, 2007 letter to the Licensee, including a February 9, 2007 Round 1 Interrogatory by the URS Corporation (URS 39400018.3090). The Licensee

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

shall deliver detailed analyses, explanations, descriptions and appropriate justification to the Director no later than July 1, 2008. If the Director determines that unacceptable adverse conditions exist or might develop or evolve, the Licensee shall submit for approval a remedial action plan within 30 days of written notice of the determination by the Director. The remedial action plan shall include, among other topics, a description of proposed activities, justification that the proposed activities will be adequate to protect the facilities in Section 32 from possible impacts of clay mining and engineering design, specifications and construction of proposed remedial actions.

35. A. In accordance with UAC R313-25-8, the Licensee shall not dispose of significant quantities of concentrated depleted uranium prior to the approval by the Director of the performance assessment required in UAC R313-25-8.
- B. Performance assessment: A performance assessment, in general conformance with the approach used by the Nuclear Regulatory Commission (NRC) in SECY-08-0147, shall be submitted for Director review and approval. The performance assessment shall be revised as needed to reflect ongoing guidance and rulemaking from NRC. For purposes of this performance assessment, the compliance period will be a minimum of 10,000 years. Additional simulations shall be performed for a minimum 1,000,000-year time frame for qualitative analysis.
- C. Revised disposal embankment design: If the performance assessment specified in License Condition 35.B indicates that changes to disposal operations and cover design are necessary to ensure compliance with the requirements of 10 CFR Part 61 or UAC R313, the Licensee shall provide a revised design that meets those requirements for all wastes that have been and are reasonably anticipated to be disposed of at the facility within 180 days of Director approval of the performance assessment.
- D. Remediation: If, following the completion of the Division's review of the performance assessment described in License Condition 35.B, the disposal of DU as performed after the date of this license condition would not have met the requirements of the performance assessment, the facility will undertake remediation to ensure that the performance standards are met, or if that is not possible, shall remove the DU and transport it off-site to a licensed facility.
- E. Surety: The Licensee shall fund the surety for the remediation in License Condition 35.D. Within 30 days of the effective date of this license condition, the Licensee shall submit for Director review and approval, the surety cost estimates for remediation of existing Savannah River DU waste disposal and planned, similar large quantity DU waste disposal.
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 West disposal cell.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- 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 Director and disposed in the Containerized Waste Facility; or
 - B. Packaged in High-Integrity Containers (HIC) approved by the Director, 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 HIC approved by the Director, 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 Director under License Condition 16.M.ii or 16.M.iii in the Containerized Waste Facility; or
 - D. Only after receipt of written Director approval for each shipment, ~~Disposed-disposed~~ of in accordance with the requirements of the Construction Quality Assurance/Quality Control Manual.
38. The Licensee shall construct the Class A West disposal Cell identified in the Ground Water Quality Discharge Permit No. UGW450005 and in accordance with approved engineering design drawings "Series 10014."
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 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 configurations, backfill materials and associated placement activities, shall be those approved by the Director following specifications contained in the Work Element: Containerized Waste Facility-Waste Placement Test Pad and the Work Element Containerized Waste Facility- Waste Placement Sections of the currently approved LLRW Construction Quality Assurance/Quality Control Manual.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- 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 RSO.
- 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 three working days does not constitute storage. Areas surrounding packages in storage shall be managed in accordance with the most current version of The Licensee's Standard Operating Procedure (SOP) CL-RS-PR-150, *Posting Requirements for Radiological Hazards*.
- F. Disposal of non-containerized decomposable or compressible waste at the Containerized Waste Facility is prohibited. Such waste shall be disposed of as debris in bulk waste portions of the Class A West disposal embankment, in accordance with debris placement requirements of the currently approved LLRW and 11e.(2) CQA/QC Manual.
40. The LARW and Class A West Disposal Cells, shall be defined by the areas enclosed by the points of reference in the Ground Water Quality Discharge Permit No. UGW450005. The Containerized Waste Facility within the Class A West disposal cell shall be separated from the non-containerized area by a six-foot chain link fence on the berm around the Containerized Waste Facility perimeter area.
41. Reserved.
42. Reserved.
43. Reserved.
44. The Licensee shall fulfill all requirements and maintain compliance with all License Conditions in the LLRW and 11e.(2) CQA/QC Manual and engineering drawings currently approved by the Director.
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 Director. Said certification shall include all engineering test methods required by License Condition 44, or as directed by the Director. Certification is not required for the Director approved sealed single ring infiltrometer

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

permeability test contained in Appendix B to the LLRW and 11e.(2) CQA/QC Manual.

46. Reserved.
47. The Licensee shall not initiate disposal operations in newly excavated or newly tied-in areas until the Division has inspected and the Director 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 survey control including elevations in sufficient detail to fully describe the site. The drawings shall be developed in accordance with the standards of professional care. A drawing index shall be included that identifies drawings by discrete number. Each drawing shall include a revision block that documents the latest changes or modifications by date and includes the initials of the responsible reviewer for QA/QC tracking purposes.
- B. Drawings showing approved future designs shall be marked as "Final Drawings." Final drawings or drawings developed for construction shall be sealed by a Utah registered professional engineer. The drawings shall be developed in accordance with the standards of professional care.
- C. Within 30 days of completion of any project that requires approval by the Director, a set of "As-Built" drawings shall be submitted for review. 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" in the final entry in the revision block.

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 West Cell, 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 West Cell within 90 days as debris in accordance with requirements of the LLRW Construction

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

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 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.
- C. Equipment, vehicles and facilities, which are used for management of LLRW shall 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:

- Not to exceed 240 dpm/100cm² alpha
- Not to exceed 2,400 dpm/100cm² beta-gamma
(assuming a wipe efficiency of 0.10)

Except for transportation casks that exhibit “weeping” radioactive contamination resulting from previous use in contaminated underwater operations, which were shipped in accordance with 49 CFR 173.443(b), in this case, the removable contamination upon receipt shall not exceed:

- 2,400 dpm/100cm² alpha
- 24,000 dpm/100cm² beta-gamma
(assuming a wipe efficiency of 0.10)

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 within the area delineated in License Condition 10.B, 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. The Licensee shall apply on a biweekly basis (once every two weeks) between the first day of May and the last day of September a polymer-based stabilizer in accordance with the manufacturer’s instructions

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
 RADIOACTIVE MATERIALS LICENSE
 SUPPLEMENTARY SHEET**

License # UT 2300249
 Amendment # 2425

on all exposed contaminated cell areas and areas of waste within the Class A West disposal embankment which have been disturbed in the previous two weeks. Except when sufficient precipitation has fallen within two weeks to create ground surface conditions beyond the manufacturer's recommended specifications (the polymer-based stabilizer specifications shall be provided to the Director prior to any application thereof), the Licensee shall notify the Director's engineering staff via email when enough precipitation has fallen that is beyond manufacturer's recommended specifications and the polymer solution will not be applied.

- 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 five-minute average wind velocities exceed 35 miles per hour. When both the five-minute average and five-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 license conditions and requirements in the current Site Radiological Security Plan approved by the Division.
55. A. For the Class A West disposal cell, the Licensee shall ensure that the average concentrations of selected radionuclides do not exceed the limits stated in Table 55A.

Table 55A. Limiting Radionuclide Concentrations in Waste Disposed of in Class A West Disposal Cell.		
Radionuclide	Maximum Average Radionuclide Concentration¹ in Waste Disposed of Under Top Slope (pCi/g)	Maximum Average Radionuclide Concentration¹ in Waste Disposed of Under Side Slope (pCi/g)
berkelium-247	0.0065	0.00388
calcium-41	35,300	34.1
chlorine-36	15.9	9.72
iodine-129	---	21.9
rhenium-187	---	19,100
technetium-99	---	1,720

1. Maximum average radionuclide concentration for a radionuclide is determined as the quotient of the Total Activity (in picocuries) of that radionuclide disposed of under the respective slope and the Total Mass disposed of under the respective slope for the Active Cell (in grams) + Completed Cell (in grams).

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- B. 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:

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

- C. 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:

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

56. Containerized Class A waste shall be certified by the generator to meet the Waste Acceptance Criteria in accordance with the current Waste Characterization Plan described in License Condition 58.
57. A. The Licensee has established, within Section 29 of Township 1 South, Range 11 West, SLBM, Tooele County, a "Section 29 Licensee Controlled Area", as depicted on (DWG No. 0801-G06, Stamp Dated 8/9/1810/22/2019) (Drawing). The Section 29 Licensee Controlled Area consists of an access-controlled area secured with a six-foot chain link fence and access gates that are controlled by the Licensee. All rail lines within Within the Section 29 Licensee Controlled Area the Licensee has designated a Railcar Transfer Area and are designated as a Radioactive Material Storage Area ("RMSA"), as depicted in the Drawing, while licensed material is being stored. The RMSA is measured from the centerline of the track to a distance of no less than 10 feet in each direction. The Licensee may receive and store railcars, and may transload Closed Packages containing licensed materials within the RMSA. All operations within the RMSA shall be subject to the applicable provisions of this Condition 57 and other relevant provisions of the License. Conveyances and packages released from Licensee's control in accordance with Condition 27 are deemed not to contain any licensed materials and are considered "unrestricted release." Unrestricted release conveyances and packages and are not subject to the requirements of Condition 57.
- B. The following requirements shall apply to the rail shipment, receipt, and storage of all types of rail-delivered conveyances and closed packages, the maintenance or repair of released railcars, and outgoing railcars that do not meet unrestricted release criteria found in Condition 27, within the Section 29 Licensee Controlled Area:
- i. Receipt of licensed material is limited to the Railcar Transfer Area. As depicted on the Drawing, the north-south railroad tracks on the east side of the Section 29 Licensee Controlled Area, is designated as the Railcar Transfer Area. All incoming rail shipments of licensed material shall be placed in the Railcar Transfer Area. Within the Railcar Transfer Area, the Licensee may perform inspections, surveys, and incidental railcar switching operations. The Licensee shall not perform maintenance and repair operations within the Railcar Transfer Area. Incoming railcars may be temporarily located in the Railcar Transfer Area for up to 10 days, unless otherwise approved by

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

the Director. The temporary presence of licensed material within the Railcar Transfer Area is considered to be incidental to shipment and is not deemed to constitute "storage" within the meaning of the License.

- ~~i.ii.~~ Storage of licensed materials is limited to the RMSA portions of the Section 29 Licensee Controlled Area. The RMA is measured from the centerline of the track to a distance of no less than 10 feet in each direction. The Licensee may receive and store railcars, perform maintenance or repairs on released railcars, and transload closed packages containing licensed material within the RMA. All operations within the RMA shall be subject to the applicable provisions of this Condition 57 and other relevant provisions of the License.
- ~~ii.iii.~~ Waste management operations are prohibited within the Section 29 Licensee Controlled Area. Conducting radiological surveys, railcar staging, storage, transloading ~~C~~Closed ~~P~~Packages, maintenance or repairs on released railcars, and moving and switching operations are not considered to be direct waste management operations and may be conducted within certain portions of the Section 29 Licensee Controlled Area, in accordance with applicable conditions of the License.
- ~~iii.iv.~~ The Licensee may designate specific areas within the RMSA as a transloading area. Transloading areas shall be designed in accordance with best available technology and all transloading operations within the RMSA shall be conducted in a manner so as to minimize the risk of Closed Packages becoming damaged or for licensed material otherwise being released. All transloading area designations and transloading procedures and operations shall be approved in advance by Licensee's RSO, with such approval being documented in writing as a part of the permanent operating record. Within any designated RMSA transloading area, the Licensee may offload and transfer (transload) undamaged, closed, rail-delivered packages containing solid licensed materials (Closed Packages) from railcars stored within any RMSA. Closed Packages may not be placed on the ground within any area in Section 29. Transloaded Closed Packages shall be moved into Section 32 by the end of the shift when the Closed Package was removed from the delivering railcar. Only equipment and procedures that are compatible with the Closed Package design shall be used for transloading.
- ~~iv.v.~~ Ingress into and egress from the ~~each~~RMSA shall be controlled to ensure only authorized personnel are granted access and to prohibit unauthorized removal of licensed material or release of radioactive contamination. The Licensee shall maintain constant surveillance and monitoring of all access points in the Section 29 Licensee Controlled Area ~~each~~RMSA whenever receipt, storage, ~~or~~transloading of licensed materials or maintenance or repairs of released railcars is taking placebeing performed.
- ~~v.vi.~~ At all times when storage or transloading of licensed materials, or maintenance or repair of released railcars, is taking place within an RMSA, the boundaries of the RMSA shall be marked with conspicuous signage, as follows: "Caution, Radioactive Material Area—Radiation Work

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

Permit Required for Entry,” with signs placed in accordance with the Licensee’s Radiation Protection Program and UAC R313-15-902. A radiological survey shall be conducted prior to depositing any RMA to demonstrate that the area no longer meets the requirements RMA posting.

- ~~vi~~.vii. Unescorted non-radiation workers shall not enter the RMSA. The Licensee shall provide appropriate training for all unescorted non-radiation workers entering the Clive facility Section 29 Licensee Controlled Area regarding authorized visitor access roadsthe RMSA.
- ~~vii~~.viii. As provided more fully in Section C.i., below, licensed materials located within Railcar Transfer Area or stored within an RMSA shall not exceed a dose rate greater than 2 mrem per hour at 30 centimeters.
- ~~viii~~.ix. The Licensee shall continuously monitor the fenced boundary of the Section 29 Licensee Controlled Area and the non-fenced, interior boundaries of the RMSAs, and Transloading Areas, and maintenance or repair areas pursuant to Condition 26 and the Environmental Monitoring Plan. Results of all monitoring shall be included in the reports required by Condition 29.A.
- ~~ix~~.x. A radiological survey shall be conducted for of workers exiting any RMSA. ~~where storage or transloading of licensed materials is taking place.~~ The survey shall be conducted in accordance with the Licensee’s Radiation Protection Program.
- ~~x~~.xi. The Licensee shall conduct and document regular inspections of each RMSA and all licensed materials stored therein for compliance with the Utah Administrative Code and conditions of this License.
- ~~xi~~.xii. The Licensee shall at all times maintain sufficient surety in accordance with Condition 73 to adequately cover all licensed materials, equipment, and railcars stored within the RMSA.
- ~~xii~~.xiii. By January 31st of each year, the Licensee shall submit an annual inventory report to the Director indicating the number of conveyances in storage within the RMSA during the previous calendar year, including the dates conveyances entered and were removed from the RMSA.

C. All incoming rail shipments shall be considered in storageLicensee controlled once the rail shipments are delivered to the Licensee’s rail line and the delivering engine is decoupled. The following conditions shall apply to incoming shipmentsrailcars containing licensed material.

- i. The Licensee shall conduct a radiological survey within 96 hours of arrival of any railcars containing licensed materials. Any individual railcar or package (a) with a dose rate greater than 2

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

mrem per hour at 30 centimeters, or (b) showing evidence of any actual or potential release shall be moved as soon as reasonably possible to the Restricted Area (Section 32). In the event of an actual or a potential release, any impacts to the Section 29 Licensee Controlled Area RMSA or any Transloading Area shall be surveyed, remediated, and reported to the Director within 48 hours of observation of the release.

- ii. No incoming railcar shall be stored in the RMSA longer than 60 days from the date of its initial radiological survey (conducted in accordance with Conditions 57.C.i.).
- iii. Whenever the Licensee has reason to believe Within seven days of making a determination that any Licensee-controlled licensed material stored within an RMSA does not meet applicable conditions or requirements for disposal, the Licensee shall provide notice to the Director, not later than 24 hours. Within 7 days after either the Licensee or the Director determines that such licensed material does not meet applicable acceptance criteria (whichever is sooner), the Licensee shall offer such licensed material shall be offered for return to the generator. The Licensee shall undertake all necessary measures with respect to such non-compliant licensed material until it is picked up for return to the generator.

D. The Licensee may store released Empty railcars may be stored in an the RMSA, subject to the following conditions:

- i. The Licensee shall maintain released Empty railcars shall be maintained in working condition.
- ii. The Licensee shall not store any No released empty railcar shall be continuously stored in the RMSA for longer than two continuous years.
- iii. Prior to storing released railcars in the RMA, the Licensee shall survey released Empty railcars shall be surveyed and the Licensee shall document that they meet DOT and License requirements. This documentation shall form part of the permanent operating record.
- iii-iv. Storage shall not include One surveyed, released empty railcars that the licensee has placed on a designated outbound track and has shall be offered for pick up by the local rail service, provided that such cars are picked up by the local rail service within seven days of removal from the RMSA or such additional time as the Director approves.

E. The following requirements shall apply to any railcar maintenance or repair operations within the RMA. The Licensee may conduct maintenance or repair operations on the exterior surfaces and exterior appliances of released railcars, subject to the following conditions:

- i. All maintenance and repair procedures and operations shall be approved in advance by the Licensee's RSO, with such approval being documented in writing as part of the permanent operating record.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- ii. All railcar maintenance and repair operations shall be conducted in a manner that minimizes the risk of environmental release of licensed material and exposure to the Licensee's employees, third-party contractors, or other persons.
- iii. All railcar maintenance and repair operations within the Section 29 Licensee Controlled Area shall be conducted solely within an areas approved by the Licensee's RSO, which areas shall be under the exclusive use and control by a device that can be locked and unlocked only by the workers who are responsible for the maintenance or repair work.
- iv. The Licensee shall be solely responsible for compliance with all applicable laws, rules, and regulations relating to the maintenance and repair of railcars, including, without limitation, those rules, regulations, and standards relating to the Federal Railroad Administration, the U.S. Department of Transportation, and the Association of American Railroads.
- v. Prior to the time that the Licensee undertakes any railcar maintenance or repair operations, the Licensee shall conduct appropriate radiological surveys to document that the railcar surface to be repaired is compliant with the applicable contamination limits set forth in Condition 27, as determined by the Licensee's RSO.
- vi. At all times that railcar maintenance or repair operations are being undertaken, the Licensee shall perform appropriate radiological surveys as to the Railcar Maintenance Facility, not less frequently than once per day, as determined by the Licensee's RSO.
- vii. The Licensee shall retain records regarding railcar maintenance or repair operations and associated radiological surveys for at least three years. Railcar maintenance records shall include, at a minimum, the railcar reporting mark and number, the railcar ownership status, a description of the maintenance or repairs undertaken (including the location of the repair and type of repair), the results achieved, and the dates of railcar acceptance and release.
- viii. Railcar repair operations involving welding within Section 29 shall be undertaken only in the RSO-approved maintenance area under the supervision of an RST with RSO approval and appropriate monitoring.
- ix. The following activities are prohibited within Section 29: (a) removal of gondola railcar lids; and (b) accessing the interior of gondola railcars for any purpose, including inspection, repairs, or maintenance.

- 58. The Licensee shall fulfill and maintain compliance with all license conditions and requirements in the current Waste Characterization Plan.
- 59. Reserved.
- 60. Wind dispersed Dry Active Waste (DAW) located outside of the Contaminated Restricted Area is prohibited.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

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 as Restricted Areas, surrounded by a six-foot chain link fence, except as expressly provided in Condition 57. 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 License Conditions 65 and 66 until the Director authorizes their disposition.
68. The Licensee shall notify the Director within 24 hours followed by written notification within seven days of any waste shipment that arrives at the Licensee's property and does not comply with applicable rules or license conditions. Specifically, notifications required under this license condition shall be made for shipments that:
 - A. contain wastes prohibited under Utah Code Annotated 19-3-103.7,
 - B. contain prohibited wastes and do not meet waste acceptance requirements found in License Condition 16,
 - C. do not conform to Generator Site Access requirements found in UAC R313-26-4(5), and
 - D. contains free liquids (greater than 1% unexpected free liquids) or leaking shipment discrepancies.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

All other shipment discrepancies (i.e. DOT and waste manifest) shall be noted on the waste manifest and the waste manifest retained on site for Director review.

69. The Licensee shall not accept radioactive waste from entities not in compliance with UAC R313-15-1006.
70. The Licensee shall acknowledge receipt of the waste within one 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 Director 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.
 - A. At its election, the Licensee's annual proposed closure and post-closure costs shall be based on either:
 - i. an annual cost estimate using unit rates from the current edition of RS Means Facilities Construction Cost Data and other site-specific processes, indirect costs based on the sum of

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
 RADIOACTIVE MATERIALS LICENSE
 SUPPLEMENTARY SHEET**

License # UT 2300249
 Amendment # 2425

applicable direct costs in accordance with the indirect cost multipliers in Table 73 or others mutually agreed to by the Licensee and the Director; or

Table 73

Surety Reference No.	Description	Percentage
300	Working Conditions	5.5%
301	Mobilization/ Demobilization	4.0%
302	Contingency	15.0%
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%

- ii. an initial financial assurance determination and for each financial assurance determination every five years thereafter, a competitive site-specific estimate using a third party contractor for closure and postclosure care of the licensed facility.
 - iii. either the method in Condition 73.A.i or in Condition 73.A.ii shall be updated annually as required by Condition 73.B.
- B. The Licensee shall annually review the surety amount and basis of the surety and submit a written report of its findings by March 1 each year for Director approval. At a minimum, this annual report shall include an accounting for current site conditions and that includes an annual inflation adjustment to the financial assurance determination using the Gross Domestic Product Implicit Price Deflator of the Bureau of Economic Analysis, United States Department of Commerce, calculated by dividing the latest annual deflator by the deflator for the previous year shall be used.
- C. The combined annual surety is \$76,690,920.9280,149,535.08 with the LLRW subtotal of \$50,005,828.1652,666,194.70 as approved in the Director's letter dated April 26, 2018October 11, 2019.
- D. Electronic Format. The Licensee shall provide the report in both paper and electronic formats, as directed by the Director.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- E. Within 60 days of Director approval of said annual report, the Licensee shall submit written evidence that the surety has been adequately funded.
- F. The Licensee shall prepare and maintain current a gravel resource evaluation report on-site that quantifies the gravel reserves remaining in the Grayback Hills Gravel Pit located in Section 24 of T. 1 N., R. 12 W (SLBM). Such report shall be prepared and certified on or before December 1 of each year by a professional engineer or professional geologist currently registered in the State of Utah.
74. One year prior to the anticipated closure of the site, the Licensee shall submit for review and approval by the Director 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 copy of its financial statement for the previous year, within 30 days of its completion and certification.
76. The Licensee shall at all times comply with UAC § 19-3-106.2, Perpetual care and maintenance of commercial radioactive waste disposal facilities.
- A. The Licensee shall pay any fee imposed by the Legislative Management Committee on an owner or operator of a commercial radioactive waste treatment or disposal facility for the perpetual care and maintenance of the facility within 60 days of receipt of such notice.

SPECIAL HANDLING

77. Except while waste packages are being handled in the active areas of the Containerized Waste Facility, external gamma radiation levels shall be posted in accordance with the most current version of the Licensee's SOP CL-RS-PR-150, *Posting requirements for Radiological Hazards*.
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.
- B. As part of the ALARA review, the Licensee shall determine and record (1) estimates of the radiation dose rates for the waste container, the 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,

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

a practice run shall be conducted. The practice run shall involve shielding, containers 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 Director 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 the Director in writing 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 RSO or other qualified person designated by the RSO 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 only dispose of 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 Director.

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.

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

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- 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 three 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 Director in accordance with UAC R313-15-1208 and the source shall be removed immediately from service and decontaminated, repaired or disposed of in accordance with applicable rules. The report shall be filed within five days of the date the leak test result is known with the Division of Waste Management and 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 License 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 Radiation Safety 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 March 11, 2002). Alternatively, tests for leakage and/or contamination, including sample collection and analysis, may be performed by other persons specifically licensed by the Director, 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 Director.
- 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 Director, 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.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

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 shall 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 License Condition 32.B of this license, when the device is not in secured storage, as required by UAC R313-15-801(1)(2) and R313-19-34(9).
- C. Reserved.
- D. Any cleaning and/or maintenance of portable gauging devices 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 devices, performed by the Licensee shall only be performed in accordance with License Condition 85 and the manufacturer's instructions and recommendations.
- F. Any cleaning, maintenance or repair of portable gauging devices that requires removal of the sources/source rod shall be performed only by the manufacturer or by other persons specifically licensed by the Director, an Agreement State or the U.S. Nuclear Regulatory Commission to perform such services.

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 shall only be:
- i. installed in areas where devices can be secured and limited to individuals authorized to use devices pursuant to License Condition 86.A and License Condition 32.C.
 - ii. used by individuals who meet the qualifications of a Radiation Safety 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 devices shall only be performed by the manufacturer or persons specifically licensed by the Director, the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

D. The Licensee shall not perform calibrations for non-MGP Instrument dosimeters.

INCREASED CONTROL CONDITIONS

87. Reserved

STATE OFFICE

88. In order to facilitate the fulfillment of the Director's oversight, inspection and administrative responsibilities under the Radiation Control Act, the Utah Administrative Code and this License, the Licensee shall provide a reasonably accessible area of land, including utility hookups, for a stand-alone, state-owned modular building located on the Licensee Controlled Area in Section 29 of Township 1 South and Range 11 West, Tooele County, Utah for as long as the License is in effect. The Director shall be responsible and pay for the upkeep, maintenance and repair of the state-owned modular building. The Director shall pay Licensee just compensation for the value of the land occupied by the state-owned modular building on Licensee's property pursuant to this condition. If the Licensee and Director cannot agree on the reasonable value of the compensation, the value of the just compensation shall be determined by an independent appraisal. The Licensee and Director shall use reasonable efforts to agree on the terms of a lease agreement relating to the cost and other terms and conditions related to the Director's use the Licensee's property. Once a location for the modular building is established, the Licensee may, for just cause, change the location if the Licensee pays for all reasonable costs of relocation.

CLOSEOUT CONDITIONS

89. 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 UAC 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 2, dated June 20, 2005.

B. 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.
- (2) Letter CD04-0548, dated December 23, 2004, Revised Class A North Disposal Embankment License Amendment Request.
- (3) URS Review of Revised Class A North Embankment Amendment Request, dated December 29, 2004.
- (4) Letter CD05-0024, dated January 17, 2005, Class A North Disposal Embankment License Amendment Request Revision 2.
- (5) Letter CD05-0265, dated May 20, 2005, Revision of Appendix R, Environmental Monitoring and Surveillance Plan.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- (6) Letter CD05-0266, dated May 25, 2005, Surety Calculations for the Class A North Disposal Cell.
- (7) Memo: Treesa Parker to John Hultquist, dated May 25, 2005, proposed revisions to RML for Amendment 22
- (8) Email: Treesa Parker to Christine Hiaring, dated June 1, 2005, License Amendment 22 Minor Changes for Consistency.

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

- (1) Division letter dated November 14, 2005.

D. 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 32.A.
- (4) Letter CD05-0507, October 26, 2005, Additional information regarding proposed revisions to Appendix I, Organization and amendment of license condition 31.A,B,C, and 32.A.
- (5) Letter CD05-0453, dated September 19, 2005 Request for amendment of License 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 32.A. 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

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

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.

E. 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: 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 21.A and B and Condition 81.

F. 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.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- 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.
 - 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.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- 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.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- 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.
- G. The following documents refer to revisions made in Revision 0 of the License Renewal Application:
- (1) AGRA Earth & Environmental, Inc. 1999. Summary Seismic Stability and Deformation Analysis: Envirocare LARW Disposal Facility, Clive, Tooele County, Utah. September 1, 1999. (1998 LRA Appendix J)
 - (2) AGRA Earth & Environmental, Inc. 2000a. Evaluation of Settlement of Compressible Debris Lifts: LARW Embankments, Clive, Tooele County, Utah. June 1, 2000.
 - (3) AGRA Earth & Environmental, Inc. 2000b. Evaluation of Settlement of Incompressible Debris Lifts: LARW Embankments, Clive, Tooele County, Utah. June 1, 2000.
 - (4) AMEC Earth & Environmental, Inc. 2000a. Letter Report: Allowable Differential Settlement and Distortion of Liner and Cover Materials. October 4, 2000.
 - (5) AMEC Earth & Environmental, Inc. 2000b. Letter Report Stability Considerations: Proposed LLRW Embankment. October 25, 2000.
 - (6) AMEC Earth & Environmental, Inc. 2000c. Letter Report Stability Considerations - Addendum: Proposed LLRW Embankment. November 8, 2000.
 - (7) AMEC Earth & Environmental, Inc. 2001. Response to Interrogatory Number 2: Placement of HICs in Caissons. October 1, 2001.
 - (8) AMEC Earth & Environmental, Inc. 2002. Placement of Large Liners in Caissons. June 19, 2002.
 - (9) Bingham Environmental. 1996. Project Memorandum HEC-1 and HEC-2 Analysis, LARW Application for License Renewal, Envirocare Disposal Facility, Clive Utah. November 26, 1996. (1998 LRA Appendix KK)
 - (10) EnergySolutions (Rebecca McCloud) to Utah Division of Radiation Control (Dane Finerfrock). 2006. Correspondence concerning corporate ownership and name changes. February 6, 2006.
 - (11) EnergySolutions (Tye Rogers) to Utah Division of Radiation Control (Dane Finerfrock). 2006. Correspondence concerning corporate ownership and name changes. February 3, 2006.
 - (12) EnergySolutions LLC. 2007. "2006 Annual 083106 Rev 052107.xls" [annual surety review], Revision 22, May 21, 2007
 - (13) EnergySolutions to Utah Division of Radiation Control. 2006. Letter number CD06-0348, Radioactive Materials License No. UT2300249 – Revision to License Condition 26, Appendix R request submitted to DRC on March 17, 2006. September 1, 2006.
 - (14) Envirocare of Utah, Inc. to URS Corporation. 2005. Personal communication via electronic mail (Sean McCandless and Robert D. Baird, PE). January 27, 2005.
 - (15) Envirocare of Utah, Inc. to Utah Division of Radiation Control. 2004. Letter number CD04-0287, Updated Specific Gravity Report and Request for Eliminating Specific Gravity Monitoring. June 9, 2004.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- (16) Envirocare of Utah, Inc. to Utah Division of Radiation Control. 2005. Letter number CD05-0487, Cover Test Cell Evaporative Zone Depth (EZD) Report. October 13, 2005 June 9, 2004.
- (17) Envirocare of Utah, Inc. 2000a. Pre-Licensing Plan Approval Application for a License Amendment Allowing Disposal of Class B & C Low-Level Radioactive Waste. (revision of January 5, 2000 plan) March 15, 2000.
- (18) Envirocare of Utah, Inc. 2000b. Rock Cover Design. July 26, 2000.
- (19) Envirocare of Utah, Inc. 2001. "Clive Facility Total Ditch Flow Calculations." October 30, 2001.
- (20) Envirocare of Utah, Inc. 2003c. Application for Renewal: Radioactive License Materials License Number UT-2300249. July 2, 2003.
- (21) Envirocare of Utah, Inc. 2005d. Application for Renewal: Radioactive License Materials License Number UT-2300249, Revision 2 (including all Appendices). June 20, 2005.
- (22) Montgomery-Watson (John Pellicer and Patrick Corser) to Envirocare of Utah, Inc. (Tim Orton). 2000. Letter Report LLRW Cover Frost Penetration. March 1, 2000.
- (23) Rogers and Associates Engineering for the Utah Division of Radiation Control. 2000. Siting Evaluation Report for Proposed Disposal Under URCR R-313-25-3 of Class B & C Low Level Radioactive Waste. May 2, 2000.
- (24) Shrum, Dan to Robert D. Baird, PE, CCE (URS Corporation). 2005. Via electronic mail. February 28, 2005.
- (25) SWCA Environmental Consultants, Inc. 2000. Assessment of Vegetative Impacts on LLRW.
- (26) Tooele County Recorder. 1993. Entry No. 5489, Book 348, Page 104. March 16, 1993.
- (27) Utah Bureau of Radiation Control (Larry F. Anderson) letter to Envirocare of Utah, Inc. (Khosrow B. Semnani, President). 1987. "Radioactive Material License No. UT 2300249." November 18, 1991.
- (28) Utah Department of Environmental Quality (Diane R. Nielson, Executive Director) and Envirocare of Utah, Inc. (Khosrow B. Semnani, President). 1993. "Agreement Establishing Covenants and Restrictions." March 16, 1993.
- (29) Utah Division of Radiation Control (Dane Finerfrock) to Envirocare of Utah, Inc. (Daniel Shrum). 2007. "EnergySolutions 2006 Annual Surety Submittal, May 21, 2007 Update." June 1, 2007.
- (30) Utah Division of Radiation Control (Dane Finerfrock) to Envirocare of Utah, Inc. (Tye Rogers). 2004. "Restoration of Site Drainage." November 12, 2004.
- (31) Utah Division of Radiation Control (Dane Finerfrock) to Envirocare of Utah, Inc. (Tye Rogers). 2005a. "Response to December 4, 2004 Report - Restoration of Site Drainage: Request for Additional Information." February 23, 2005.
- (32) Utah Division of Radiation Control (Dane Finerfrock) to Envirocare of Utah, Inc. (Tye Rogers). 2005b. "Response to March 25, 2005 Envirocare Response to the February 27, 2005 DRC Request for Information - Restoration of Site Drainage." April 22, 2005.
- (33) Utah Division of Radiation Control (Dane Finerfrock) to Envirocare of Utah, Inc. (Tye Rogers). 2007. "Restoration of Grade - Round 1 Interrogatories: Notice of Upcoming Requirements and Request for Schedule." February 16, 2007.
- (34) Utah Division of Radiation Control (Loren Morton) to EnergySolutions (Tye Rogers). 2006. Correspondence regarding "DRC Response to Eight Submittals by EnergySolutions Regarding

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- Proposed Class A Combined (CAC) Disposal Cell: Request for Additional Information, Round 3 Interrogatory." March 3, 2006.
- (35) Utah Division of Radiation Control to EnergySolutions, LLC. 2006. Letter of approval of Revision 20 of the CQA/QC Manual. September 21, 2006.
- (36) Utah Division of Radiation Control (William Sinclair) to Envirocare of Utah, Inc. 2000. Correspondence concerning expectations in addressing the land ownership issue. March 6, 2000.
- (37) Utah Division of Radiation Control. 2006a. Memorandum: Analysis of the December 20, 2005 Envirocare Submittal of Settlement Monitoring Plan Update. February 2, 2006. (Johnathan P. Cook to Loren Morton)
- (38) Whetstone Associates, Inc. memorandum to Envirocare of Utah, Inc. 2000. Technical Memorandum 41010 Infiltration Through Lower Radon Barrier, Class A, B, & C Cell Cover. November 7, 2000.
- (39) Whetstone Associates, Inc. 2000a. Revised Envirocare of Utah Western LARW [Class A] Cell Infiltration and Transport Modeling. July 19, 2000.
- (39a) Whetstone Associates, Inc. memorandum to Envirocare of Utah, Inc. 2001. Technical Memorandum 4101M Results of Cf-251 Modeling for the Class A Cell, Using the 898-year Half Life, August 21, 2001.
- (40) Whetstone Associates, Inc. 2001a. "Travel Time Through Class A Cell Cover." June 22, 2001.
- (41) Whetstone Associates, Inc. 2003b. Memorandum to Dan Shrum, Envirocare of Utah, "Open Cell Modeling Results for Years 7 – 12," Technical Memorandum 4101T, August 28, 2003.
- (42) Whetstone Associates, Inc. 2004. Revised Western LARW Cell Infiltration and Transport Modeling. July 19, 2004.
- (43) Zion's Bank and Energy Solutions, LLC, 2007. Surety Details. March 27, 2007.
- (44) "Envirocare's Cover Test Cell Evaporative Zone Depth (EZD) Report", Daniel B. Shrum of Envirocare of Utah, LLC to Dane L. Finerfrock of Utah Division of Radiation Control, CD05-0487, October 13, 2005.
- (45) "Cover Test Cell Data Report Addendum: Justification to Change EZD from 18-inches to 24-inches", Envirocare of Utah, LLC, October 5, 2005.
- (46) "October 13, 2005 Envirocare Submittal Regarding Cover Test Cell Evaporative Zone Depth (EZD) Report: CAC Cell Round 2 Interrogatory", Loren B. Morton of Utah Division of Radiation Control to Daniel B. Shrum of Envirocare of Utah, LLC, November 1, 2005.
- (47) "Class A Combined Embankment Interrogatories: Clarification of Envirocare October 13, 2005 Evaporative Zone Depth Report", Daniel B. Shrum of Envirocare of Utah, LLC to Dane L. Finerfrock of Utah Division of Radiation Control, CD05-0518, November 2, 2005.
- (48) "Response to DRC Letter dated November 1, 2005 in Regards to Envirocare's October 13, 2005 Evaporative Zone Depth Report", Daniel B. Shrum of Envirocare of Utah, LLC to Dane L. Finerfrock of Utah Division of Radiation Control, CD05-0520, November 3, 2005.
- (49) "Cover Test Cell As-Built Report", Envirocare of Utah, LLC, January 24, 2002.
- (50) Appendix N, "Cover Test Cell Monitoring Report" dated June 20, 2003, Envirocare of Utah, LLC, License Renewal Application, Revision 2, dated June 20, 2005
- (51) Appendix G, "Drawings" variously dated, Envirocare of Utah, LLC, License Renewal

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- Application, Revision 2, dated June 20, 2005.
- (52) "Attachment 4: EZD Cover Test Cell Data" CD-ROM attached to "Radioactive Material License #UT2300249 and Groundwater Quality discharge Permit No. UGW450005. Class A Combined Disposal Embankment – Response to September 19, 2005 Interrogatories", Tye Rogers of Envirocare of Utah, LLC to Dane L. Finerfrock of Utah Division of Radiation Control, CD05-0574, December 16, 2005.
 - (53) "HDU Data", Mike LeBaron of Envirocare of Utah, LLC to Loren Morton of Utah Division of Radiation Control and Robert Baird of URS Corporation, e-mail dated December 19, 2005.
 - (54) "Cover Test Cell WCR Data", Mike LeBaron of Envirocare of Utah, LLC to Loren Morton of Utah Division of Radiation Control and Robert Baird of URS Corporation, e-mail dated December 20, 2005.
 - (55) "Matric Potential Conversion Factor", Mike LeBaron of Envirocare of Utah, LLC to Loren Morton of Utah Division of Radiation Control and Robert Baird of URS Corporation, e-mail dated December 21, 2005.
 - (56) "RE: Evaporative Pan Data (39400085.10300 OUT)", Mike LeBaron of Envirocare of Utah, LLC to Loren Morton of Utah Division of Radiation Control and Robert Baird of URS Corporation, e-mail dated December 22, 2005.
 - (57) "Report Combined Embankment Study: Envirocare", AMEC Earth and Environmental, Inc., December 13, 2005.
 - (58) "Geotechnical Study Increase in Height and Footprint: Envirocare LARW Facility Near Clive, Utah", AMEC Earth and Environmental, Inc., May 27, 2005.
 - (59) "Class A Disposal Cell: Containerized Waste Facility: Engineering Justification Report", Envirocare of Utah, April 12, 2001.
 - (60) "Class A Disposal Cell: Containerized Waste Facility: Engineering Justification Report: Addendum 15 Percent Void Space Criteria", Envirocare of Utah, October 2, 2001.
 - (61) "Mixed Waste Embankment Engineering Justification Report" Revision 2, Envirocare of Utah, October 20, 2001
 - (62) "Minimum Temperature Return Rates", personal communication from Jim Ashby, November 1, 2000.
 - (63) "Review of Cover Design for LARW Cell", TerraMatrix/Montgomery Watson to Envirocare of Utah, February 5, 1998.
 - (64) "Cover Test Cell As-Built Report", Envirocare of Utah, January 24, 2002.
 - (65) Letter CD02-0097, "Revised CQA/QC Manual - Containerized Waste Facility: Placement of Large Liners/HICs", Envirocare of Utah to Utah Division of Radiation Control, March 18, 2002.
 - (66) Letter CD02-0269, "Revised CQA/QC Manual - Containerized Waste Facility: Placement of Large Liners/HICs - Response to Interrogatories", Envirocare of Utah to Utah Division of Radiation Control, July 3, 2002.
 - (67) Letter CD02-0315, "Revised CQA/QC Manual - Containerized Waste Facility: Placement of Large Liners/HICs - Revised Settlement Analysis and CQA/QC Language", Envirocare of Utah to Utah Division of Radiation Control, August 7, 2002.
 - (68) Letter CD02-0339, "Revised CQA/QC Manual - Containerized Waste Facility: Placement of

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

Large Liners/HICs - Proposed Revision 15 of the LLRW CQA/QC Manual", Envirocare of Utah to Utah Division of Radiation Control, August 26, 2002.

- (69) Letter CD01-0212, "Engineering Justification Report - Waste Placement with CLSM", Envirocare of Utah to Utah Division of Radiation Control, May 16, 2001.
- (70) Letter CD01-0296, "Containerized Waste Facility - Placement of Class A Ion-Exchange Resins in Polyethylene HICs and Steel Liners", Envirocare of Utah to Utah Division of Radiation Control, July 5, 2001.

H. The following documents refer to revisions made in Amendment 1:

- (1) Letter CD07-0420, "RML UT2300249, Condition 58 –Request for Amendment to the Waste Characterization Plan, dated July 23, 2007.
- (2) Letter CD08-0078, "RML UT2300249, Condition 58 –Request for Amendment to the Waste Characterization Plan."
- (3) Letter CD08-0004, "RML UT2300249 Amendment for Calibration Sources" dated January 2, 2008.
- (4) Letter CD08-0066, "RML UT2300249; Request to amend License Condition 32" dated February 28, 2008.
- (5) Email dated February 29, 2008, from Boyd Imai to Mark Ledoux Re: Amendment Request (CD08-004).
- (6) Email dated November 23, 2007, from John Hultquist to Sean McCandless, Request for Information regarding WCP:
- (7) Letter dated March 7, 2008, Utah Division of Radiation Control (Dane Finerfrock) to EnergySolutions, LLC. (Sean McCandless). "Appendix I Organization dated February 28, 2008."
- (8) Memorandum from John Hultquist to File; dated March 11, 2008, Review of WCP revised November 9, 2007, and March 10, 2008.

I. The following documents refer to revisions made in Amendment 2:

- (1) Executive Secretary's letter dated May 16, 2008 [LA# 116-2008]

J. The following documents refer to revisions made in Amendment 3:

- (1) Letter CD08-0218, "Clive Transportation Hub" dated July 9, 2008.
- (2) Email dated July 28, 2008, from Mark Ledoux to Boyd Imai, "Clive cask hub."
- (3) Letter CD08-0339, Request to Amend License Conditions 10, 38, 43, and Table 40.A, dated October 21, 2008.
- (4) Letter CD08-0137, Request for Amendment to Condition 54, Site Radiological Security Plan, dated May 5, 2008.
- (5) Email dated May 6, 2008, from Mark Ledoux to John Hultquist, License condition 57 proposed changes.
- (6) Letter CD08-0111, RML UT2300249 License Condition 26, and RML UT2300478 License Condition 13.1.D Environmental Monitoring Plan, dated April 4, 2008
- (7) Letter CD08-0115, RML UT2300249 License Condition 26, and RML UT2300478 License Condition 13.1.D Environmental Monitoring Plan, dated April 9, 2008

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- (8) Email dated November 13, 2008, from John Hultquist to Sean McCandless, Summary of meeting regarding the Env. Monitoring Plan.
 - (9) Email dated December 11, 2008, from Sean McCandless to John Hultquist, Procedure CL-RS PR-120 Rev 2. Access Control Points, DRC Comment Rev.
 - (10) Letter CD08-0376, RML UT2300249 License Condition 26, and RML UT2300478 License Condition 13.1.D Environmental Monitoring Plan, dated November 24, 2008
 - (11) Email dated December 15, 2008, from Sean McCandless to John Hultquist, Procedure CL-RS PR-120 Rev 2. Access Control Points, Form update.
- K. The following documents refer to revisions made in Amendment 4:
- (1) Letter dated January 26, 2009, (CD09-0020) from Daniel Shrum to Dane Finerfrock; Radioactive Material License No: UT230029 and UT2300478; Revision of Appendix I, *Organization*.
 - (2) Letter dated January 28, 2009, John Hultquist to Dan Shrum, Request for Information, Revision to Appendix I *Organization* submitted January 26, 2009.
 - (3) Letter dated February 9, 2009, (CD09-0038) from Dan Shrum to Dane Finerfrock, Revision to Appendix I *Organization*. Response to Request for Information.
- L. The following documents refer to revisions made in Amendment 5:
- (1) Letter dated July 27, 2009, (CD09-0188) from Daniel Shrum to Dane Finerfrock; Radioactive Material License Number UT 2300249 - Request for Amendment.
 - (2) Letter dated May 6, 2009, (CD09-0116) from Sean McCandless to Dane Finerfrock, Radioactive Material License #UT 2300249 – Request for Amendment and Response to April 15, 2009, Request for Information.
 - (3) Letter dated May 28, 2009, Dane Finerfrock to Sean McCandless, 2009 Module 14 Engineering Inspection – Soil Lab and Testing Methods with accreditation for License Condition 45, Radioactive Materials License UT 2300249 Closeout Letter.
 - (4) Letter dated April 7, 2009, (CD09-0091) from Sean McCandless to Dane Finerfrock Radioactive Material License #UT 2300249 and Ground Water Quality Discharge Permit No. UGW450005 - Response to DRC Request for Information
 - (5) Memorandum from Dave Esser to File, dated May 21, 2009, Proposed correction to the Ground Water Quality Discharge Permit UGW45005 and Radioactive Material License UT2300249 – Amendment Review regarding section, disposal cell, and buffer zone Latitude and Longitude coordinates.
- M. The following documents refer to revisions made in Amendment 6:
- (1) Letter dated October 22, 2007, (CD07-0340) from Sean McCandless to Dane Finerfrock; Radioactive Material License Number UT 2300249 - Request for Amendment to Conditions 14.B and 16.F.ii.
 - (2) Letter dated November 20, 2007, from John Hultquist to Sean McCandless, Formerly Characteristic Hazardous Waste meeting, request to Amendment, Radioactive Material License #UT 2300249.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- (3) URS Memorandum dated December 10, 2007, Gary Merrell to Dane Finerfrock Review of Whetstone Technical Memorandum, "Formerly Characteristic Waste Modeling of Class A and Class A North Cells," from Susan Wyman to Dan Shrum, September 25, 2007.
 - (4) Letter dated January 21, 2009, (CD09-0015) from Sean McCandless to Dane Finerfrock Formerly Characteristic Waste – Response to Letter dated November 20, 2007.
 - (5) Letter dated January 21, 2009, (CD09-0014) Timothy Orton to Dennis Downs, Div. of Solid and Hazardous Waste, Class 2 Modification – Management of Wastes at the Mixed Waste Facility that will be disposed at the LLRW Facility.
 - (6) Memorandum dated February 18, 2009, from Boyd Imai to John Hultquist, EnergySolutions Amendment Request (CD07-0340).
 - (7) Memorandum dated September 21, 2009, from Boyd Imai to John Hultquist, Review; Formerly Characteristic Waste – License Amendment Request.
 - (8) Letter dated August 31, 2009, Sean McCandless to Dane Finerfrock, Radioactive Material License No. UT2300249 – Revised request for Amendment – Formerly Characteristic (LLRW Destined) Waste.
 - (9) Email dated October 15, 2009, Sean McCandless to John Hultquist, Formerly Characteristic, Attachments Revised RML 10/8/09 and WCP Revised 10/8/09.
 - (10) Memorandum dated October 19, 2009, from Boyd Imai to John Hultquist, Formerly Characteristic Wastes – Transfer to LLRW.
- N. The following documents refer to revisions made in Amendment 7:
- (1) Letter dated September 21, 2009, (CD09-0241) from Val J. Christensen to Amanda Smith; RML No. UT2300249 – Commitments Relating to Depleted Uranium Disposal.
 - (2) Letter dated October 1, 2009, (CD09-0258) from Val J. Christensen to Dane Finerfrock; RML No. UT2300249 – Commitments Relating to Depleted Uranium Disposal
 - (3) Notice of Agency Action to Consider Proposed License Condition No. 35 dated October 21, 2009.
 - (4) Email dated February 22, 2010, from Laura Lockhart to Dane Finerfrock and John Hultquist, License Condition documents –comment response document.
- O. The following document refer to revision made in Amendment 8:
- (1) Letter dated June 1, 2010, (CD10-0162) from Sean McCandless to Dane Finerfrock; RML No. UT2300249—Request for Amendment.
 - (2) Letter dated July 15, 2010, (CD10-0200) from Sean McCandless to Rusty Lundberg; RML No. UT2300249—Revision of Appendix I, *Organization*.
 - (3) Letter dated August 2, 2010, (CD10-0219) from Sean McCandless to Rusty Lundberg; RML No. UT2300249—Revision of Appendix I, *Organization*.
 - (4) Letter dated November 1, 2010, (CD10-0298) from Rick Chalk to Rusty Lundberg; 1. Radioactive Material License UT 2300249, License Condition 16.1 (sic) Letter dated November 23, 2009 to Dane Finerfrock from Mark Ledoux, CD09-0323, 2. Administrative request from DRC to EnergySolutions to amend License UT 2300249, License Conditions 6, 7, and 8.
 - (5) Email date November 18, 2010, from Thomas Brown to Boyd Imai, LC 8 E, K, M and O.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- P. The following documents refer to revision made in Amendment 9:
- (1) Letter dated December 6, 2010, (CD10-0347) from Dan B. Shrum to Rusty Lundberg; RML No. UT2300249—Amendment Request – Condition 35.B, Depleted Uranium.
 - (2) Memorandum dated December 13, 2010, from John Hultquist to File regarding Amendment request.
- Q. The following documents refer to revision made in Amendment 10:
- (1) Letter dated February 24, 2011, (CD11-0045) from Dan Shrum to Rusty Lundberg; Radioactive Material License No. UT2300249, License Condition 35.B.
 - (2) Letter dated February 24, 2011, from Rusty Lundberg to Dan Shrum Radioactive Material License No. UT2300249, License Condition 35.B Depleted Uranium Performance Assessment.
 - (3) Letter dated March 14, 2011 (CD11-0075) from Dan Shrum to Rusty Lundberg Radioactive Material License No. UT2300249, License Condition 35.B Depleted Uranium Performance Assessment.
- R. The following documents refer to revision made in Amendment 11:
- (1) Letter dated September 30, 2010, (CD10-0264) from L. Wayne Johns to Rusty Lundberg; Radioactive Material License No. UT2300249, License Condition 26, and Radioactive Material License No. UT2300478, License Condition 13.1.D Environmental Monitoring Plan.
 - (2) Letter dated October 21, 2010, (CD10-0290) from L. Wayne Johns to Rusty Lundberg; Radioactive Material License No. UT2300249, License Condition 26, and Radioactive Material License No. UT2300478, License Condition 13.1.D Environmental Monitoring Plan.
 - (3) Memorandum dated October 21, 2010, from Bill Craig to File; EnergySolutions request to change Appendix R.
 - (4) Email dated January 25, 2011, from John Hultquist (DRC) to Sean McCandless (ES) regarding draft license and statement of basis.
 - (5) Email dated January 27, 2011, from John Hultquist (DRC) to Sean McCandless (ES) responding to proposed language change to LC 60.
- S. The following documents refer to revisions made in Amendment 12:
- (1) Letter dated August 2, 2011, (CD11-0183) from Sean McCandless to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 6.E, 9 and 10.
 - (2) Letter dated August 17, 2011, (CD11-0224) from Sean McCandless to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 6.E, 9 and 10; Revised Request.
 - (3) Letter dated August 25, 2011, (CD11-0234) Sean McCandless to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 52 and 54.
 - (4) Email dated October 5, 2011, from Ryan Johnson (DRC) to Sean McCandless (ES); Request to Amend License Condition 52.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

- (5) Email dated October 5, 2011, from Ryan Johnson (DRC) to Sean McCandless (ES); Request to Amend License Condition 54.
- (6) Letter dated October 13, 2011 (CD11-0282) Sean McCandless to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 52 and 54.
- (7) Letter dated October 27, 2011, from Rusty Lundberg to Dan Shrum; Radioactive Material License No. UT2300249: Division of Radiation Control's (DRC) Response to Amend License Conditions 52 and 54, dated August 25, 2011.
- (8) Letter dated October 27, 2011, (CD11-0293) from Sean McCandless to Rusty Lundberg; Radioactive Material License No. UT2300249, Response to Inspection Report dated October 18, 2011. Radiation Safety Inspection, Containerized Waste Facility (CWF) Operations.
- (9) Letter dated November 2, 2011, (CD11-0298) from Rick Chalk to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 6.E, 9 and 10; Revised Request.
- (10) Letter dated November 7, 2011, from Rusty Lundberg to Sean McCandless; Radioactive Material License No. UT2300249: Division of Radiation Control's (DRC) Response to Amend License Conditions 39.B, dated October 27, 2011.
- (11) Email dated November 8, 2011, from Ryan Johnson (DRC) to Sean McCandless (ES); Draft Statement of Basis and Amendment #12 of Radioactive Material License UT2300249.
- (12) Letter dated November 8, 2011, (CD11-0307) from Sean McCandless to Rusty Lundberg, Radioactive Material License No. UT2300249; Revision of Appendix I, *Organization*.
- (13) Email dated November 15, 2011, from Ryan Johnson (DRC) to Sean McCandless (ES); Amendment request for LC 32.A.

T The following documents refer to revisions made in Amendment 13:

- (1) Letter dated August 2, 2011, (CD11-0183) from Sean McCandless to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 6.E, 9 and 10.
- (2) Letter dated August 17, 2011, (CD11-0224) from Sean McCandless to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 6.E, 9 and 10; Revised Request.
- (3) Letter dated November 2, 2011, (CD11-0298) from Rick Chalk to Rusty Lundberg; Radioactive Material License No. UT2300249, Request to Amend License Conditions 6.E, 9 and 10; Revised Request.
- (4) Email dated November 17, 2011, from Ryan Johnson (DRC) to Sean McCandless (ES); Amendment request to store gauges on Section 29.

U. The following documents were submitted in support of proposed Amendment #14:

- 1) AMEC Earth & Environmental, Inc. 2011. Report: Geotechnical Update Report – EnergySolutions Clive Facility Class A West Embankment, February 15, 2011

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- 2) AMEC Earth & Environmental, Inc. 2011. Cover Letter – Response to Interrogatory CAW R313-25-8(4)-16/1: Seismic Hazard Evaluation, EnergySolutions Clive Facility, Class A West Embankment, Clive, Tooele County, Utah. report: Geotechnical Update Report – EnergySolutions Clive Facility Class A West Embankment, Clive, Tooele County, Utah. October 25, 2011.
- 3) AMEC Earth & Environmental, Inc. 2011. Response to Interrogatory CAW R313-25-8(4)-16/1: Seismic Hazard Evaluation, EnergySolutions Clive Facility, Class A West Embankment, Clive, Tooele County, Utah. October 25, 2011
- 4) AMEC Earth & Environmental, Inc. 2011. Response to Interrogatory CAW R313-25-8(4)-16/2: Seismic Hazard Evaluation, EnergySolutions Clive Facility, Class A West Embankment, Clive, Tooele County, Utah. December 23, 2011.
- 5) AMEC Earth & Environmental, Inc. 2012. Report: Response to Interrogatory CAW R313-25-8(4)-16/3: Seismic Hazard Evaluation/Seismic Stability Analysis Update, EnergySolutions Clive Facility, Class A West Embankment, Clive, Tooele County, Utah. April 6, 2012.
- 6) AMEC Earth & Environmental, Inc. 2012. Addendum: Additional Cyclic Softening Analysis, EnergySolutions Clive Facility, Class A West Embankment, Clive, Tooele County, Utah. May 3, 2012.
- 7) EnergySolutions, LLC. 2011. (CD11-0123) License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter from Sean McCandless to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.
- 8) EnergySolutions, LLC. 2011. (CD11-0207) Radioactive Material License #UT2300249 and Ground Water Quality Discharge Permit No. UGW450005. Amendment and Modification Request – Class A West Embankment; Correction to Letter dated July 27, 2011, to Mr. Rusty Lundberg at Utah Division of Radiation Control.
- 9) EnergySolutions, LLC. 2011. (CD11-0295) Responses to Round 1 Interrogatories: License Amendment Request (UT2300249) for the Class A West Embankment and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control, October 28, 2011.
- 10) EnergySolutions, LLC. 2011. (CD11-0327) Supplemental Responses to Round 1 Interrogatories: License Amendment Request (UT2300249) for the Class A West Embankment, November 28, 2011 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control, November 29, 2011.
- 11) EnergySolutions, LLC. 2012. (CD12-008) Radioactive Material License #UT2300249, Class A West - Round 2 Interrogatory Response, dated January 12, 2012.
- 12) EnergySolutions, LLC. 2012. (CD12-0049) Radioactive Material License #UT2300249, Class A West - Response to Division Request and Round 3 Interrogatory dated February 23, 2012.
- 13) EnergySolutions, LLC. 2012. (CD12-0065) Radioactive Material License #UT2300249, Revised CAW Well Spacing Analysis, dated March 3, 2012.
- 14) EnergySolutions, LLC. 2012. (CD12-0075) Radioactive Material License #UT2300249 and Ground Water Quality Discharge Permit No. UGW450005, Amendment and Modification Request - Class A West Embankment: Response to Round 3 Interrogatory URCCR R313-25-7(3)-

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

04, with attachments. Letter from Tim Orton, EnergySolutions, to Mr. Rusty Lundberg, Utah Division of Radiation Control, dated March 20, 2012.

- 15) EnergySolutions, LLC. 2012. (CD12-0093) Radioactive Material License #UT2300249 - Class A West Embankment: Class A West: Round 3 Seismic Stability Response, dated April 4, 2012.
- 16) Email dated April 6, 2012, from Sean McCandless to John Hultquist and Robert Baird; Final Report for CAW Round 3 Interrogatory Response.
- 17) EnergySolutions, LLC. 2012. (CD12-0095) Radioactive Material License #UT 2300249 and Ground Water Quality Discharge Permit No. UGW450005. Amendment and Modification Request – Class A West Embankment: Complete, Electronic Submittal.
- 18) EnergySolutions, LLC. 2012. (CD12-0114) Radioactive Material License #UT2300249 - Class A West Embankment: Liquefaction Addendum, Response to DRC Comments and Suggestions and Complete Electronic Copy.
- 19) Whetstone Associates, Inc. 2011. EnergySolutions Class A West Disposal Cell Infiltration and Transport Modeling Report, April 19, 2011.
- 20) Whetstone Associates, Inc. 2011. EnergySolutions Class A West Disposal Cell Infiltration and Transport Modeling Report, November 28, 2011.
- 21) Whetstone Associates, Inc. 2012. EnergySolutions Class A West Disposal Cell Infiltration and Transport Modeling Report, February 23, 2012.
- 22) EnergySolutions, LLC. 2012. (CD12-00185) Radioactive Material License #UT2300249 and Ground Water Quality Discharge Permit No. UGW450005 - Class A West Embankment: Clay Distortion Study Plan.

V. The following documents were submitted in support of proposed Amendment #15:

- (1) Letter (CD12-0275) dated October 24, 2012, from Sean McCandless of EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material Licenses UT 2300249 and UT 2300478; Request to amend License and approve revised Appendix I, *Organization*.
- (2) Letter dated December 14, 2012, from John Hultquist of the DRC to Sean McCandless of EnergySolutions. Request for Information (RFI) for Appendix I, *Organization* Submittal dated October 24, 2012: Radioactive Material Licenses UT 2300249 & UT 2300478.
- (3) Letter (CD12-0315) dated December 19, 2012, from Sean McCandless of EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material License Nos. UT 2300249 and UT 2300478: Response to Request for Information for Appendix I, *Organization*.
- (4) Letter (CD13-0033) dated February 4, 2013, from Sean McCandless of EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material Licenses UT 2300249 and UT 2300478; Revised request to amend License and approve revised *Organization*.

W. The following documents were submitted in support of proposed Amendment #16:

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- (1) Letter (CD12-0275) dated October 24, 2012, from Sean McCandless of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material Licenses UT 2300249 and UT 2300478; Request to amend License and approve revised Appendix I, Organization.
 - (2) Letter (CD12-0296) dated November 30, 2012, from Sean McCandless of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material License No. UT 2300249; 2012 Annual Surety Update (Update).
 - (3) Letter dated March 6, 2013, from Rusty Lundberg of the DRC to Sean McCandless of *EnergySolutions*. Request for Information (RFI) 2012 Annual Surety Update: Radioactive Material Licenses UT 2300249.
 - (4) Letter (CD13-0119) dated April 25, 2013, from Sean McCandless of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material License No. UT 2300249; Annual Surety Submittal -- Response to Additional Request for Information.
 - (5) Letter (CD13-0144) dated May 16, 2013, from Sean McCandless of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material Licenses UT 2300249 Request for Administrative Corrections to Conditions 32.E and 76.
 - (6) Letter (CD13-0238) dated August 22, 2013, from Sean McCandless of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material Licenses UT 2300249; Request for Minor Modifications to Conditions 22.A. and B., 31, 39.E, and 77.
 - (7) Letter (CD13-0255) dated September 19, 2013, from Vern Rogers of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material License No. UT2300249; Revised Requests for Modifications to Conditions 22, 31, 39.E, and 77.
 - (8) Email dated October 11, 2013, from John Hultquist of the DRC to Sean McCandless of *EnergySolutions*. License Amendment 16.
 - (9) Email dated October 14, 2013, from Vern Rogers of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material License UT 2300249; Response to Proposed Amendment 16
- X. The following documents were submitted in support of proposed Amendment #17:
- (1) Letter (CD13-0267) dated September 24, 2013, from Sean McCandless of *EnergySolutions* to Rusty Lundberg of the DRC. Radioactive Material Licenses UT 2300249; Amendment Request, License Condition 68.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- (2) Letter (CD14-0017) dated January 31, 2014, from Sean McCandless of EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material Licenses UT 2300249; Amendment Request, License Condition 32.A.
- (3) Memo to EnergySolutions, LLC File Division of Radiation Control; from Connie Rauen, P.E through Ryan Johnson and John Hultquist, Licensing and Permitting Section, DRC; Licensing and Permitting Section, DRC; dated February 13, 2014; Subject: *Review of ES Radioactive Material License #UT 2300249 –Amendment Request, License Condition 32.a.*
- (4) Memo to File: Radioactive Material License (RML) UT2300249 License Amendment 17, from Ryan Johnson through Rusty Lundberg and John Hultquist; dated February 28, 2014; Subject: *Changes to License Condition 68.*
- (5) Letter (CD14-0125) dated May 28, 2014, from Sean McCandless of EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material License UT 2300249-Resquest for Minor Modification to Condition 14.A.

Y. The following documents were submitted and in support of proposed Amendment #18:

- (1) Letter (CD14-0271) dated December 10, 2014, from Vern Rogers, EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material License UT 2300249; Revision of Appendix I, *Organization.*
- (2) Email dated December 19, 2014 from John Hultquist, DRC to Vern Rogers, EnergySolutions regarding LC 32.A and currently approved Appendix I.
- (3) Email dated December 23, 2014 from Steve Gurr, EnergySolutions to John Hultquist, DRC updating revision number and date of Appendix I.
- (4) Letter (CD14-0291) dated December 30, 2014, from Vern Rogers, EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material License UT 2300249; Revision of Appendix I, *Organization – resubmission.*

Z. The following document was submitted and in support of proposed Amendment #19:

- (1) Letter (CD15-0083) dated March 31, 2015, from Vern Rogers, EnergySolutions to Rusty Lundberg of the DRC. Radioactive Material License UT2300249; Condition 75 - Extension and Category 1 - Administrative License Amendment Request.

AA. The following document was submitted or referenced and in support of proposed Amendment #20:

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249Amendment # 2425

- (1) Federal Register Volume 79 Number 133 dated July 11, 2014, Part V Department of Transportation, Pipeline and Hazardous Materials Safety Administration.
- (2) Letter (CD15-0100) dated April 15, 2015, from Vern Rogers of EnergySolutions to Rusty Lundberg of the DRC. Radioactive Materials License UT2300249; Response to Notice of Enforcement Discretion with DRC Inspection Module 11 Rev. 8, Qualifications and Training and Request to withdraw and resubmit Revised Appendix I, Organization.
- (3) Letter (CD15-0114) dated May 7, 2015, from Vern Rogers of EnergySolutions to Rusty Lundberg of the DRC. Radioactive Materials License UT2300249; Condition 57; Amendment Request.
- (4) Email from Ryan Johnson of the DRC to Vern Rogers of EnergySolutions dated May 7, 2015: Appendix I changes.
- (5) Emails between Steve Gurr of EnergySolutions and Ryan Johnson of the DRC dated from May 11, 2015 to June 1, 2015, Response to Appendix I.
- (6) Letter (CD-15-0124) dated May 20, 2015, from Vern Rogers of EnergySolutions to Rusty Lundberg of the DRC, Radioactive Materials License UT2300249; Additional Response to Questions regarding Appendix I, *Organization*.
- (7) Letter (CD15-0132) dated June 1, 2015, from Vern Rogers of EnergySolutions to Rusty Lundberg of the DRC, Radioactive Material License UT2300249; Consolidation of Amendment Requests.
- (8) Emails between Vern Rogers of EnergySolutions and Ryan Johnson of the DRC dated June 3, 2015, UT2300249-Condition 53.B.

AB. The following documents were submitted or referenced and in support of proposed Amendment #21:

- (1) Letter (CD16-0002) dated January 6, 2016, from Timothy L. Orton, P.E. to Scott T. Anderson, Radioactive Materials License UT 2300249- **Appendix F, Clive Site Radiological Security Plan** proposed revision 5 and **Appendix I, Organization** proposed revision 28.
- (2) Letter (CD16-0075) dated April 11, 2016, from Timothy L. Orton, P.E. to Scott T. Anderson, Radioactive Materials License UT 2300249- Re-submission of **Appendix F, Clive Site Radiological Security Plan** proposed revision 5 and **Appendix I, Organization Layout** proposed revision 28.
- (3) Letter (CD16-0101) dated May 16, 2016, from Timothy L. Orton, P.E. to Scott T. Anderson, Radioactive Materials License UT 2300249- Re-submission of **Appendix F, Clive Site Radiological Security Plan** proposed revision 5.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

AC. The following documents were submitted or referenced and in support of proposed Amendment #22:

- (1) Letter (CD17-0089) dated April 6, 2017, from Vern C. Rogers to Scott T. Anderson, Radioactive Material License UT2300249; **Condition 16 Amendment Request**
- (2) Letter (CD17-0101) dated April 21, 2017, from Timothy L. Orton, P.E. to Scott T. Anderson, Radioactive Material License UT2300249, CQA/QC Manual revised Figures
- (3) Letter (CD17-0108) dated May 4, 2017, from Vern C. Rogers to Scott T. Anderson, Radioactive Materials License UT2300249; **Condition 6.N, 7.N, 8.N Amendment Request**
- (4) Letter (CD17-0120) dated May 22, 2017, from Vern C. Rogers to Scott T. Anderson, Radioactive Material License UT2300249; **Condition 43 Amendment Request**
- (5) Letter (CD17-0167) dated July 20, 2017, from Vern C. Rogers to Scott T. Anderson, Radioactive Material License UT2300249; **Condition 52 Amendment Request**

AD. The following documents were submitted or referenced and in support of proposed Amendment #23:

- (1) Letter (CD16-0119), dated June 8, 2016 EnergySolutions (ES) submitted a request as a part of the RML License Renewal Application (Revision 3) to the DWMRC to amend **License Condition 41** addressing the Clay Distortion Study.
- (2) Letter (CD17-0092), dated April 6, 2017 ES submitted a request to the DWMRC to modify the Environmental Monitoring Plan (EMP), of Appendix M of the RML Application. The EMP is a requirement of **License Condition 26**.
- (3) Letter (CD17-0112), dated May 9, 2017, ES submitted requests to the DWMRC to amend **License Condition 76** addressing an aspect of surety.
- (4) Letter (CD17-0252), dated November 10, 2017, ES submitted requests to the DWMRC to amend **License Condition 73** addressing an aspect of surety.
- (5) Letter (CD18-0015), dated January 24, 2018, ES submitted a request to the DWMRC to amend **License Condition 28** addressing the Cover Test Cell in cover design modeling.
- (6) Letter (CD18-0020), dated January 24, 2018, ES submitted a request to the DWMRC to amend **License Condition 42** addressing the Evaporative Zone Depth in cover design modeling.
- (7) Letter (CD18-0028), dated February 21, 2018, ES submitted a request to the DWMRC to amend **License Condition 16.F.i** addressing non-aqueous waste.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

AE. The following documents were submitted or referenced and in support of proposed Amendment #24:

- (1) Letter (CD18-0010), dated January 22, 2018, EnergySolutions (ES) rescinding and replacing a request to amend License Conditions 10, 57, and 62 (DRC-2018-000841).
- (2) EnergySolutions, Radioactive Material Storage Area (RMSA)_Map, DWG No.: 0801-G06, Stamp Dated 8/9/18 (DRC-2018-008297).

AF. The following documents were submitted or referenced in support of proposed Amendment #25:

- (1) Letter (CD19-0054) dated March 11, 2019, EnergySolutions, LLC submitted a request to DWMRC for a license amendment to revise **License Condition 15.A**, addressing the timing of waste classification calculations. (DRC-2019-002361).
- (2) Letter (CD18-0046) dated March 12, 2018, EnergySolutions, LLC submitted a request to DWMRC to revise specifications within CQA/QC Manual Revision 28b. The CQA/QC Manual is a required document of **License Condition 44**. (DRC-2018-0022421).
- (3) Letter (CD19-0029) dated February 4, 2019. EnergySolutions, LLC submitted a request to DWMRC for a license amendment to revise **License Conditions 10.A and 57** to allow railcar maintenance and repairs within Section 29. (DRC-2019-001441).
- (4) EnergySolutions, Section 29 Licensee Controlled Area Site Map, DWG No.: 0801-G06, Rev. 2, Stamp Dated 10/22/19 (DRC-2019-015802).
- (5) Letter (CD19-0075), dated March 29, 2019, EnergySolutions, LLC submitted a request to DWMRC to amend **License Condition 73** addressing the 2018 Combined Surety Annual Review. DRC-2019-002923
- (6) Utah Department of Environmental Quality, Division of Waste Management and Radiation Control, Statement of Basis for Amendment 25, dated November 26, 2019. DRC-2019-15782.
- (7) Utah Department of Environmental Quality, Division of Waste Management and Radiation Control, (approval of) 2018 Combined Surety Review, dated October 11, 2019. DSHW-2019-012382.

**DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL
RADIOACTIVE MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License # UT 2300249
Amendment # 2425

DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL

Date

~~Scott T. Anderson~~ Tye L. Howard, Director

