UTAH DIVISION OF RADIATION CONTROL: ENERGY*SOLUTIONS'* CLIVE LLRW DISPOSAL FACILITY;

LICENSE AMENDMENT REQUEST; CLASS A WEST EMBANKMENT

ROUND 1 INTERROGATORIES

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ABBREVIATIONS AND ACRONYMS

2005 LRA	License Renewal Application dated June 20, 2005
BAT	best available technology
CAWLAR	Class A West Embankment License Amendment Request dated May 2, 2011
CLSM	controlled low-strength material
cm/d	centimeters per day
cm/yr	centimeters per year
CQA/QC	Construction Quality Assurance/Quality Control
ft	foot
gm/cm^3	grams per cubic centimeter
GWPL	groundwater protection limit
GWQDP	Groundwater Discharge Quality Permit
HELP	Hydrologic Evaluation of Landfill Performance
in/yr	inches per year
km	kilometer
LARW	low-activity radioactive waste
LLRW	low-level radioactive waste
M	magnitude
m/yr	meters per year
m^3/yr	cubic meters per year
MCE	maximum credible earthquake
mph	miles per hour
NGA	new generation attenuation
NSHM	National Seismic Hazard Maps
NOAA	National Oceanic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
NRCS	Natural Resource Conservation Service
PEER	Pacific Earthquake Engineering Research
PMF	Probable Maximum Flood
UAC	Utah Code Annotated

US	United States
USGS	US Geological Survey
yr	year

INTERROGATORY CAW R313-25-6(3)-01/1: DESCRIPTION OF FACILITY

PRELIMINARY FINDING:

Refer to R313-25-6(3). A description of:

(a) the location of the proposed disposal site;
(b) the general character of the proposed activities;
(c) the types and quantities of waste to be received, possessed, and disposed of;
(d) plans for use of the land disposal facility for purposes other than disposal of wastes;
(e) the proposed facilities and equipment

INTERROGATORY STATEMENT:

Refer to Sections1.2.2.12 and 3.3.1.6 of the Class A West (CAW) Embankment License Amendment Request (LAR):

1. *Provide the updated site layout, referred to as "Figure 1" and revise references to the Figure 1 actually provided "MicroShield® Case Title – Class A West Cover".*
2. *Describe the proposed use of concrete (CLSM) in the CAW and explain any differences from its previously approved use in the Class A and Class A North embankments.*

BASIS FOR INTERROGATORY:

1. *The Figure 1 provided in the narrative is not the Figure 1 cited in Section 1.2.2.12. Please provide the correct figure in a scale and at a level of detail to allow a clear understanding of the current configuration of the overall facility.*
2. *It is unclear whether or how the use of CLSM in the proposed CAW embankment will differ from its approved use in the Class A and Class A North embankments. This matter should be clarified.*

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

INTERROGATORY CAWR313-25-7(1)-02/1: SPECIFIC TECHNICAL INFORMATION – GROUNDWATER ELEVATION VALUE(S) USED IN ANALYSES

PRELIMINARY FINDING:

Refer to R313-25-7. The application shall include certain technical information….
(1) A description of the natural and demographic disposal site characteristics shall be based on and determined by disposal site selection and characterization activities. The description shall include geologic, geochemical, geotechnical, hydrologic, ecologic, archaeologic, meteorologic, climatologic, and biotic features of the disposal site and vicinity.

INTERROGATORY STATEMENT:

Refer to Sections 2.4.2 and 3.1.1 of the Class A West (CAW) Embankment License Amendment request (LAR)*: Please provide a clear reference or documentation for the statement that the highest recorded elevation of the upper unconfined aquifer is 4255 feet above sea level. Describe how the historical groundwater data set from which this value was derived (and other historical groundwater elevation information, as applicable) were considered when selecting groundwater elevation data used in analyses (geotechnical stability analysis, contaminant transport analysis) that were performed by Energy Solutions and included in the CAW LAR and its attachments (see also Interrogatories R313-25-8(4)-06/1: Technical Analyses – Infiltration and Transport Modeling: Climate Conditions, Engineered Barrier Conditions, and Vertical Transport Distance and R313-25-8(4)-07/1 Technical Analysis-Groundwater Depth in Geotechnical Stability Analysis below). Explain and justify differences between assumed elevation values used in different analyses and the historically highest groundwater elevation value mentioned in Section 3.1.1 of the CAW LAR.*

BASIS FOR INTERROGATORY

Section 3.1.1 of the CAW LAR indicates that the highest recorded (groundwater) elevation for the upper, unconfined aquifer is 4,255 feet above mean sea level". A clear description is needed of what this recorded elevation value represents (e.g., where is the location that this elevation was observed in relation to the proposed CAW Embankment footprint; when was this elevation observed and what were the circumstances at the time this measurement was made; how did this groundwater elevation compare to groundwater levels in other surrounding locations at the time of measurement, etc…).The reference source for this information needs to be clearly stated. The relationship of the historical groundwater data from which this value was derived (and other historical groundwater elevation information as applicable) and groundwater elevation values that were used in analyses (geotechnical stability analysis, contaminant transport analysis) that were performed by Energy Solutions and included in the CAW LAR and its attachments needs to be provided (see also Interrogatories R313-25-8(4)-06/1: Technical Analyses – Infiltration and Transport Modeling: Climate Conditions, Engineered Barrier Conditions, and Vertical transport

Distance and R313-25-8(4)-07/1 Technical Analysis-Groundwater Depth in Geotechnical Stability Analysis below). Reasons for differences between assumed elevation values used in different analyses and the historically highest groundwater elevation value referenced in Section 3.1.1 of the CAW LAR should be explained and justified.

REFERENCES:

EnergySolutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011, including Attachment 5 (Section 2.2.3 of "Geotechnical Update Report", AMEC, February 15, 2011) and Section 3.2 of the Whetstone Associates CAW Cell Infiltration and Transport Modeling Report, April 19, 2011.

INTERROGATORY CAW R313-25-7(2)-03/1: SPECIFIC TECHNICAL INFORMATION – BUFFER ZONE

PRELIMINARY FINDING:

Refer to R313-25-25(8).A buffer zone of land shall be maintained between any buried waste and the disposal site boundary and beneath the disposed waste. The buffer zone shall be of adequate dimensions to carry out environmental monitoring activities specified in R313-25-26(4) and take mitigative measures if needed.

INTERROGATORY STATEMENT:

Refer to Sections1.2.2.2 and 4.3.6 of the Class A West (CAW) Embankment License Amendment Request (LAR):

1. *Please explain how EnergySolutions allowed the buffer zone east of the Class A embankment to be constructed so that less than 94 feet were provided. Identify the root causes of this discrepancy. Explain what actions will be or have been taken to ensure that similar discrepancies in other locations do not occur in the future.*

2. *Describe in detail how waste disposal has encroached upon the bounds of buffer zones defined by Tables 3 and 7 of the Groundwater Quality Discharge Permit. Provide detail demonstrating how the configuration of the constructed disposal unit departs from the proposed and approved configuration.*

3. *Justify the statement that "This discrepancy in the buffer zone for the eastern waste limit of the Class A embankment does not compromise the facility's ability to comply with the well network early warning requirement at Part I.F.1(f) of the GWQPD." Present evidence to demonstrate that the ability "to carry out environmental monitoring activities . . . and take mitigative measures if needed" is preserved, despite this discrepancy, as required by R313-25-25(8). That is, present evidence to demonstrate that adequate time exists, not only to detect a contaminant release, but also to take mitigative measures throughout the entire buffer zone east of the Class A embankment, if they were required. In providing this evidence, identify and discuss what mitigative measures could be implemented timely to preclude release of contaminant through the buffer zones.*

4. *Provide a drawing(s) clearly showing the locations of ". . . the closest edge of any embankment (i.e., toe of waste) and the outside site boundary or property line." Ensure that other symbols do not obscure the symbol denoting the outside site boundary or property line. Indicate on the drawing(s) the minimum distances between the toe of waste for each embankment (whether existing or proposed) and the outside site boundary or property line. If any such minimum distance is less than 300 feet, identify what actions will be taken to remedy the discrepancy and to preclude occurrence of similar situations in the future. Provide evidence to demonstrate that adequate time exists, not only to detect a contaminant release, but also to take mitigative measures, if they are required.*

Provide similar drawings to demonstrate that the width of no buffer zone between disposal embankments, other than those east of the Class A embankment, is less than 94 feet.

5. *Correctly state the dimension of the buffer zones surrounding the CAW.*

6. *Please correctly label the exterior boundaries of the CAW waste limits and break-lines on drawing sheet C05, and redraw as needed.*

BASIS FOR INTERROGATORY:

1. *A thorough evaluation of how previous commitments have been violated is required. The root causes, changes needed to ensure that such events will not in the future cause a similar discrepancy, and actions necessary to mitigate effects of the discrepancy must be identified.*

2. *The nature of the buffer zone encroachment is not and must be specified.*

3. *Detailed evaluations must be submitted to demonstrate the effect this discrepancy will have on the ability to monitor releases of radioactive contaminants from the Class A embankment and to take remedial action before it is released from the facility. These evaluations should compare potential responses under original authorized conditions to potential responses under actual discrepant conditions.*

4. *The existence of the discrepancy reported in Section 1.2.2.2 raises concerns that the extent of buffer zones in other locations might not satisfy regulatory intent and license conditions. A thorough evaluation of both internal and boundary buffer zones is required at address these concerns.*

5. *The discussion of buffer zones in Section 4.3.6 is too casual and imprecise to contribute to the basis for the requested licensing action. The narrative provided must be accurate and most likely cannot be made with a single sentence.*

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

INTERROGATORY CAW R313-25-7(3)-04/1: SPECIFIC TECHNICAL INFORMATION – DESIGN CRITERION FOR DISTORTION OF LINER AND CLAY COVER COMPONENTS

PRELIMINARY FINDING:

Refer to R313-25-7. The application shall include certain technical information….
(3) Descriptions of the principal design criteria and their relationship to the performance objectives.

INTERROGATORY STATEMENT:

Refer to Table 3-2 and Sections 1, 4, and 5 of Attachment 5 (Geotechnical Update Report, EnergySolutions Clive Facility Class A West Embankment, Clive, Toole County, Utah, February 15, 2011) to the Class A West (CAW) Embankment License Amendment request (LAR):*Please provide additional documentary evidence (beyond that presented in a letter report from October 2000 [AMEC 2000] and referenced in analyses that were performed in 2005 ([AMEC 2005]), if such evidence is available and applicable, of the basis for choosing 0.02 as the design criterion for evaluating allowable distortion of the liner and clay components of the CAW Embankment cover. Demonstrate whether, based upon a reasonable degree of research of more recent published literature and guidance pertaining to the matter of recommended allowable angular distortions for compacted clay engineered barriers, any revision is warranted to the maximum allowable angular distortion criterion value of 0.02 that was used in analyses done to support this CAW LAR. To the extent applicable, include consideration of how this criterion value relates to criteria typically used for other types of structures. Justify whether the choice of 0.02 continues to be appropriate for evaluating the compacted clay components in the CAW Embankment with respect to protecting the integrity of both the liner and the clay components of the embankment cover from potential future differential settlement-induced damage. Verify that this criterion value remains consistent with current engineering practices for compacted clay layers or similar structures. Present information and revised analyses or findings, if applicable, based on considering any revised distortion criterion value that may be recommended.*

BASIS FOR INTERROGATORY

The assumption of a maximum allowable angular distortion criterion of 0.02 is important when evaluating the performance of compacted clay barrier components of CAW Embankment. Engineering reviews conducted to develop the allowable distortion criterion value of 0.02 were last completed in 2000. The technical appropriateness of this criterion value for continued application to the cover performance evaluation should be verified through an updated review of the literature as standard periodic engineering review exercise.

REFERENCES:

AMEC 2000. AMEC Earth & Environmental, Inc. Letter of Allowable Differential Settlement and Distortion of Liner and Cover Materials – New LARW and Proposed LLRW Embankments, October 4, 2000.

AMEC 2005. Combined Embankment Study, Envirocare, Toole County, Utah. December 13, 2005.

EnergySolutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011, including Attachment 5 (Section 1, 4, and 5 of "Geotechnical Update Report", AMEC, February 15, 2011).

INTERROGATORY CAW R313-25-7(7)-05/1: SPECIFIC TECHNICAL INFORMATION -- CLOSURE PLAN

PRELIMINARY FINDING:

Refer to R313-25-7. The application shall include certain technical information….
(7) A description of the disposal site closure plan, including those design features which are intended to facilitate disposal site closures and to eliminate the need for active maintenance after closure.

INTERROGATORY STATEMENT:

Refer to Sections 1.3.1, 1.3.2, and 1.3.3, 3.1.6, 3.2.6, 3.3.1.6, 4.3.5, and 5.0 of the Class A West (CAW) Embankment License Amendment request (LAR), and Attachment 1 (Proposed Amendments ["RML Revisions and GWQDP Revisions"]), and Attachment 2 ("CAW License-Permit Drawings") of the CAW LAR*:*

1. *Provide information on proposed staging of closure of the embankment in closure phases, as applicable. Provide a schedule for commencing and completing each identified phase of closure. Demonstrate that the timing of any such phase of final closure will be integrated with timing of settlement monitoring activities and with distortion analysis determinations based on acquired settlement monitoring data for any areas to be closed. Provide information that adequately demonstrates that the proposed plan for phased closure and for integrating the various closed phases will result in an effective, continuous closure cover and drainage system installation. Evaluate and address the need for further revisions, if any, to RML and/or GWQDP conditions, as appropriate.*

Refer to Section 2.5.4 of the Class A West (CAW) Embankment License Amendment Request (LAR):

2. *Please provide fully checked and QA'd analyses of clay borrow and rock borrow (also referred to as "erosion materials" in Table 2.2) volumes, with references to engineering drawings as needed to establish the inputs for each calculation.*

3. *Please provide affirmative evidence that adequate supplies of clay borrow and rock borrow materials will be available at a unit cost no greater than that assumed in closure cost estimates, to accomplish closure activities (insofar as these materials are involved) at a cost no greater than estimated is surety cost estimates. Identify each source beyond those already owned by or under contract to EnergySolutions.*

BASIS FOR INTERROGATORY:

1. *Section 1.3.2 of the CAW LAR indicates that "EnergySolutions estimates that disposal operations in the CAW Embankment may continue for up to 20 years", and Section 1.3.1.*

indicates that (closure)"cover construction is expected to begin no later than 2016 for the area comprising the southeast corner of the Class A Embankment". However, no closure plan, drawings, or closure-related details showing the proposed timing and phasing of closure of the embankment are provided in the CAW LAR and no CAW Embankment-specific schedule for completing different phases of the closure or final closure of the embankment is provided. Drawings and details need to be provided regarding the proposed plan for phased closure and plan to integrate the various closed phases into an effective, continuous closure cover and drainage system installation. A plan and schedule for completing these activities is needed so that the adequacy of the closure plan can be assessed, its consistency with other plans and procedures (e.g., see also Interrogatory CAW R313-25-7(10)-01/1: Specific Technical Information – Construction Quality Assurance/Quality Control Manual below regarding the need to provide a revised CQA/QC Manual that incorporates the applicable elements of CAW Embankment closure) can be determined, and the adequacy of the financial surety to cover the increased costs associated with closure of the CWA Embankment can be evaluated.

Section 5.0 of the CAW LAR indicates that closure of the CAW Embankment "is executed on a continuous basis, with cover construction completed within a relatively short time after a section of the embankment reaches its design limit of waste placement" and states that Energy Solutions "will submit a detailed site decontamination and decommissioning plan to the Executive Secretary at least 1 year prior to the anticipated closure of the site, in accordance with Condition 74 of the RML". More specific information needs to be provided on the proposed timeframes for completing closure of sections (phases) of the embankment. RML Condition 74 does not specifically address phased closure activities that may occur for the larger CAW Embankment. The proposed revisions to the Radioactive Materials License and the Groundwater Quality Discharge Permit (GWQDP) provided in Attachment 2 to the CAW LAR should be modified and/or expanded, as appropriate, to account for any changes anticipated to be required to account for the preliminary closure plan and closure schedule (e.g., open cell time limitation prescribed in Part I.E of the GWQDP; timing of submittal of site decontamination and decommissioning plan in Condition 74 of the RML, etc…).

2. *Ensuring availability of adequate supplies of the raw materials needed to close the proposed CAW embankment is essential to approving the requested licensing action. Details of the volume calculations must be provided to allow the Division's reviewers to independently judge the adequacy of the projected volumes.*

3. *Assurance must be provided that the required materials are actually available from known sources and that the available materials are of appropriate character to allow their use in closing the proposed CAW embankment.*

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

EnergySolutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011, including Attachment 1 – "RML Revisions".

INTERROGATORY CAW R313-25-7(9)-06/1: SPECIFIC TECHNICAL INFORMATION – QUANTITIES OF RADIOACTIVE MATERIALS

PRELIMINARY FINDING:

Refer to R313-25-7(9). The application shall include certain technical information. The following information is needed to determine whether or not the applicant can meet the performance objectives and the applicable technical requirements of R313-25: Descriptions of the kind, amount, classification and specifications of the radioactive material proposed to be received, possessed, and disposed of at the land disposal facility.

INTERROGATORY STATEMENT:

Refer to Sections 6.1.1 and 7.2 of the Class A West (CAW) Embankment License Amendment Request (LAR):

(1) Correctly state in Section 6.1.1 the nature and extent of the change in quantities of waste expected to be disposed of in the proposed CAW.
(2) Correctly state in Section 7.2 the increase in quantity of LLRW to be disposed of in the proposed CAW and the effects such increases will have on the need for radiation protection.

Refer to Attachment 3 to the Class A West (CAW) Embankment License Amendment Request (LAR):

(3) Please explain why many of the radionuclide concentrations in the modeling report (Whetstone 2011) are below the Class A upper limits.

BASIS FOR INTERROGATORY:

1. *The statement in Section 6.1.1 that no change in type of waste is expected is inadequate to address the quantity of waste expected to be disposed in the proposed CAW embankment. The details of the calculations necessary to project volumes of waste expected to be disposed of in the proposed CAW embankment must be provided.*
2. *The statement that the types and quantities of waste expected for disposal is clearly mistaken and must be revised.*
3. *The infiltration and transport modeling report (Whetstone 2011) claims that radionuclides were modeled at concentrations equal to the Class A upper limits. In fact, many of the concentrations appear to have been modeled at concentrations below the Class A limits. Therefore, compliance with the GWPLs cannot be ensured for waste with radionuclides at the Class A limits. Table 1 compares the Class A limiting concentrations with the modeled concentrations from Table 22 of the Whetstone report. Many of the modeled concentrations from Whetstone Table 22 are below the Class A limits. Therefore, the conclusion that all Class A wastes will meet the GWPLs is not supported.*

Table 1. Comparison of Modeled Radionuclide Concentrations and Class A Limits.		
Radionuclide	**Class A Upper Limits from UAC R313-15-1008 (Ci/m^3)**	**Modeled Concentrations from Table 22 of Whetstone 2011(Ci/m^3)**
H-3	40	27.75
Co-60	700	488.4
Ni-63	3.5	2.442
Sr-90	0.04	0.02775
Cs-137	1	0.6993
All radionuclides with less than 5-year half-life	700	488.4
Tc-99	0.3	0.208
I-129	0.008	0.00555
Pu-244	10[1]	0.5[1]

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

Whetstone 2011. Whetstone Associates, "EnergySolutions Class A West Disposal Cell Infiltration and Transport Modeling Report," Whetstone Associates, Document 4104K.110419, April 19, 2011.

[1]Units are nanocuries per gram.

INTERROGATORY CAW R313-25-7(10)-07/1: SPECIFIC TECHNICAL INFORMATION – CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL MANUAL

PRELIMINARY FINDING:

Refer to R313-25-7. The application shall include certain technical information…. (10)Descriptions of quality assurance programs, tailored to low-level waste disposal, including audit and managerial controls, for the determination of natural disposal site characteristics and for quality control during the design, construction, operation, and closure of the land disposal facility and the receipt, handling, and emplacement of waste.

INTERROGATORY STATEMENT:

Refer to Sections 1.3, 3.1.6, 3.2.6, 3.3.1.6 of the Class A West (CAW) Embankment License Amendment request (LAR), and Attachment 1 (Proposed Amendments ["RML Revisions and GWQDP Revisions"]) of the CAW LAR*: Please provide revised and additional information in the CAW LAR and a revised version of Attachment 1 to the CAW LAR, as appropriate, to address specific procedures, methods, testing frequencies, and/or schedules for completing testing or other activities that apply to CQA/QC activities that would be performed at the proposed CAW Embankment. Provide a revised Construction Quality Assurance/Quality Control (CQA/QC) Manual that incorporates changes to all Work Elements of the currently approved CQA/QC Manual, as needed, to address these procedures, methods, schedules, etc…Include revised information pertaining to: (1) open-cell timeframe for the CAW Embankment; (2) proposed timetables for placing Temporary Cover and for completing related settlement monitoring and distortion analyses (e.g., by phase/area) at the CAW Embankment, if applicable; (3) schedules for conducting CQA/QC activities in conjunction with any proposed phasing/staging of partial closure activities that would be performed at the CAW Embankment; and (4) other items as needed. Provide information demonstrating that any proposed staging for phased closure of the CAW Embankment will be integrated with timing of settlement monitoring activities and with distortion analysis determinations in any areas to be closed.*

BASIS FOR INTERROGATORY

Energy *Solutions should revise and update the currently approved CQA/QC Manual (*Energy*Solutions 2009) to reflect any unique and/or specific CQA/QC requirements, activities, timetables, etc… that would apply to the operation, monitoring, and closure of the proposed CAW Embankment .An example Work Element of the CQA/QC Manual that should be considered and revised is the "Work Element – Temporary Cover Placement and Monitoring". Other Work Elements in the CQA/QC Manual that refer to the Class A and Class A North embankments but do not refer to the CAW embankment should also be revised.*

Additionally, Energy*Solutions should clearly identify, evaluate, and discuss all particular features, attributes, etc… of the proposed CAW Embankment that might impact one or more items or conditions in the currently approved Radioactive Materials License and/or Groundwater Quality Discharge Permit (GWQDP). For example, one such item is the open cell time limitation prescribed in Part I.E of the GWQDP. The proposed revisions to the Radioactive Materials License provided in Attachment 2 to the CAW LAR should be modified, if appropriate, to account for such proposed additional modifications, if any, with detailed supporting rationale provided for such additional modifications. The Revised CQA/QC Manual should be provided as part of this additional supporting information, to allow for a more complete review of the CAW LAR and proposed set of license and permit revisions.*

REFERENCES:

Energy*Solutions, LLC 2009. LLRW and 11e.(2) Construction Quality Assurance/Quality Control (CQA/QC) Manual, Rev. 24c. August 24, 2009.*

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011, including Attachment 1 – "RML Revisions".*

INTERROGATORY CAW R313-25-8(1)-08/1: TECHNICAL ANALYSES; RELEASES OF RADIOACTIVITY

PRELIMINARY FINDING:

Refer to R313-25-8(1). Analyses demonstrating that the general population will be protected from releases of radioactivity shall consider the pathways of air, soil, ground water, surface water, plant uptake, and exhumation by burrowing animals. The analyses shall clearly identify and differentiate between the roles performed by the natural disposal site characteristics and design features in isolating and segregating the wastes. The analyses shall clearly demonstrate a reasonable assurance that the exposures to humans from the release of radioactivity will not exceed the limits set forth in R313-25-19.

INTERROGATORY STATEMENT:

Refer to Sections 6.1.3 and 6.1.5 of the Class A West (CAW) Embankment License Amendment Request (LAR):

1. *Summarize the results from Attachment 3 that justify the statement that the need to limit concentrations of several nuclides is eliminated. Ensure that the summary is nuclide-specific and addresses the radiological, physical, and chemical properties of the waste. Discuss the meaning of these summary results and show how the conclusion is reached.*
2. *Please state both the GW protection standard and the calculated maximum concentration for all radionuclides of concern in this table. Quantify the extent of change from values previously reported and those now reported. Explain why these changes occurred. What is the sensitivity of these results to assumed and estimated values?*

Refer to Section 6.1.5 of and Attachment 3 to the Class A West (CAW) Embankment License Amendment Request (LAR):

3. *Please explain the modeling results that indicate that the top slope infiltration rate (0.238 cm/yr) leads to earlier peak concentrations at the water table than the higher side slope infiltration rate (0.335 cm/yr). Also explain why the time to exceed the GWPLs at the water table is shorter for the lower infiltration top-slope case than for the side-slope case.*
4. *Please explain the modeling results for the compliance monitoring well that show the top slope infiltration rate (0.238 cm/yr) leads to earlier times to exceed the GWPLs than the higher side slope infiltration rate (0.335 cm/yr).*

BASIS FOR INTERROGATORY:

1. *The results referenced in the CAW LAR should be summarized in the request document and their implications explained. The summary should be nuclide-specific and should address the radiological, physical, and chemical properties of the waste*
2. *The results summarized in the CAW LAR present only a partial picture and do not allow the reader any sense of perspective.*
3. *Tables 33 and 36 of the Whetstone modeling report (Whetstone 2011) show the times of peak concentrations and the times to exceed the GWPLs for the top slope and side slope*

simulations. In all cases, the top-slope infiltration rate is associated with earlier arrival times and higher concentrations. This is counter-intuitive because of the top slope infiltration rate is lower and would be expected to yield longer travel times than the side-slope case.

4. *Table 39 shows the times to exceed the GWPLs for three selected radionuclides. In two of the three cases, the times to exceed the GWPLs are shorter for the top slope infiltration rate than for the higher side slope infiltration rate. This is unexpected because the top slope has a lower infiltration rate and is farther from the compliance well than the side slope area. The top slope would be expected to have a longer transit time because of its lower infiltration rate and its greater distance to the compliance well.*

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

Whetstone 2011. Whetstone Associates, "EnergySolutions Class A West Disposal Cell Infiltration and Transport Modeling Report," Whetstone Associates, Document 4104K.110419, April 19, 2011.

INTERROGATORY CAW R313-25-8(2)-09/1: TECHNICAL ANALYSES; PROTECTION OF INADVERTENT INTRUDERS

PRELIMINARY FINDING:

Refer to R313-25-8(2). Analyses of the protection of inadvertent intruders shall demonstrate a reasonable assurance that the waste classification and segregation requirements will be met and that adequate barriers to inadvertent intrusion will be provided.

INTERROGATORY STATEMENT:

Refer to Section 6.2 of the Class A West (CAW) Embankment License Amendment Request (LAR): *Please provide a dose analysis for an inadvertent intruder scenario.*

BASIS FOR INTERROGATORY:

Waste concentrations at the upper limit of Class A have not been evaluated for intruder protection. The Class A West License Amendment Request does not discuss inadvertent intruder protection. Section 6.2 (Intruder Protection) of the amendment request discusses only doses during operations and doses to the general public following closure; no inadvertent intruder scenarios are addressed. Similarly, Section 3.2.8 indicates the cover system will serve as a long-term intruder barrier, but does not provide an intruder analysis. See NUREG/CR-4370 (NRC 1986) for assumptions to characterize an acceptable intruder scenario.

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

NRC 1986.U.S. Nuclear Regulatory Commission, "Update of Part 61 Impacts Analysis Methodology," NUREG/CR-4370, January 1986.

NRC 2000.A Performance Assessment Methodology for Low-Level Radioactive Waste Disposal Facilities," NUREG-1573, October 2000.

INTERROGATORY CAW R313-25-8(4)-10/1: TECHNICAL ANALYSIS – DESIGN SAFETY FACTORS

PRELIMINARY FINDING:

Refer to R313-25-8(4). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:

Refer to Sections 3.0, 3.1.7 and Tables 3-2 and 3-4 of the Class A West (CAW) Embankment License Amendment request (LAR), and Drawings 10014 C01 and 10014 C04 of the CAW LAR:

1. *Please provide a clear, consistent, and appropriately referenced discussion of the approach used for selecting various minimum acceptable safety factors for evaluating the adequacy of design of different elements of the CAW Embankment. Indicate how different minimum acceptable safety factors apply to different design features based on the precise characteristics of the materials that comprise them, the intended use of those materials and the features, and established and accepted Best Practices and published standards or guidelines, etc… Indicate, if applicable, that in no case was a minimum safety factor of less than 1.0 assumed for the design of any principal design feature or principal design aspect, or justify why a minimum safety factor of 1.0 would be adequate for design. Rectify discrepancies that currently exist in Table 3-4 with respect to Safety factors listed as having been calculated for certain features (e.g., Static Safety Factor ≥ 2.1 vs. ≥ 2.3 for "Waste Placement and Backfill"). Clearly reference guidelines and standards that support the minimum safety factors that were used to which the computed factors of safety were compared when evaluating adequacy of the design feature and design criteria. Explain the appropriateness of computed factors of safety and their physical significance in the context of the analysis methods used. Explain the effects of assumptions inherent in the method of analysis used on the resulting margins of safety.*
2. *Provide revised Tables 3-2 and 3-4 to include revised safety factor information and/or revised values under the "Design Criteria" column (Table 3-2) and "Design Criteria", "Projected Performance", and "Safety Factor" columns (Table 3-4) that: (1) are consistent throughout the tables; and (2) contain or clearly reference, in all cases, explanatory text describing what each calculated safety factor value (Table 3-4) represents, both in terms of the specific parameters included in the safety factor ratio and the physical meaning/significance associated with each resulting safety factor value presented; and (3) provide information that is currently missing (e.g., empty cells in*

Table 3-4 under "Safety Factor" column for the Required Function "Ensure Structural Stability" of the "Cover" Principal Design Feature. Provide additional explanation(s) in the CAW LAR text as necessary to describe the safety factor information provided in Tables 3-2 and 3-4.

BASIS FOR INTERROGATORY

Section 3.1.7 of the CAW LAR contains a statement that design criteria for the various elements of the liner, waste placement, and cover have been set to incorporate a factor of safety of at least 1.0 against failure under normal, abnormal, and accident conditions. A factor of safety of 1.0 is not considered to be conservative for safeguarding against the potential failure of such facility elements, since it requires precise knowledge of the materials in question, allows for no variations to occur in the characteristics of those materials, does not incorporate any safety margin, etc…) with respect to the design of the facility features or aspects.

Minimum design safety factors listed in Table 3-4 are no lower than 1.2, and no safety factor calculated for any design feature or aspect is listed as being less than 1.03 (safety factor against frost penetration), rather than the value of 1.0 described in the CAW PALR text.

The physical significance or relevancy of some safety factor values presented in the Table 3-4 is currently unclear.

Information for some safety factors is missing from Table 3-4 (e.g., there is no information given in the "Safety Factor" column for the Required Function "Ensure Structural Stability" of the "Cover" Principal Design Feature).

The text of the CAW LAR and Tables 3-2 and Table 3.4 need to be revised and clarified to adequately and accurately describe and present appropriate supporting rationale related to selection of the appropriate minimum safety factors for the different design elements and to present the correct calculated safety factor values. NUREG-1199 (NRC 1991), Design Manuals DM-7.01 and DM-7.02 (NAVFAC 1986a, 1986b), and other documents provide guidance on appropriate safety factors and margins of safety for various types of structures and analyses.

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

NAVFAC (Naval Facilities Engineering Command) 1986a. Soil Mechanics Design Manual DM-7.01. Alexandria, Virginia. September 1986.

NAVFAC (Naval Facilities Engineering Command) 1986b. Foundations and Earth Structures Design Manual DM-7.02. Alexandria, Virginia. September 1986.

NRC (U.S. Nuclear Regulatory Commission) 1991.NUREG-1199. Rev 2, Standard Format and Content of a License Application for a Low-Level Radioactive Waste Disposal Facility Safety Analysis Report. Office of Nuclear Material Safety and Safeguards, Rev. 2, U.S. NRC, Washington, DC. January 1991.

ROCK COVER DESIGN AND ROCK COVER DESIGN CALCULATIONS/ ANALYSES

PRELIMINARY FINDING:

Refer to R313-25-8(4). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:

1. **Refer to Sections 3.0, 3.1.2, 3.2.2, and Tables 3-2 through 3-4 of the Class A West (CAW) Embankment License Amendment Request (LAR), and Drawings 10014 C01 and 10014 C04 of the CAW LAR:** *To account for the longer topslope and sideslope lengths of the proposed CAW Embankment compared to those in the current Class A and Class A North Embankment, the LLRW Embankment, and the "Western LARW Cell", and to account for information contained in recently published studies on the performance of rounded riprap vs. angular riprap under overtopping conditions, please provide a revised set of Rock Cover Design Calculations that are specific to the currently proposed cover system for the Class A West Embankment that demonstrate conformance of the CAW Embankment cover system design with applicable design criteria contained in NUREG-1623 (NRC 2002) and NUREG/CR-4620 (Nelson et al. 1986) and in documents referenced therein and in other recently issued, relevant information (e.g., Abt et al. 2008; Tamagni 2010) that builds on the guidance provided in NUREG-1623 and NUREG/CR-4620. Provide updated calculations that:*

   Clearly describe the degree of roundness or angularity and the coefficient of uniformity of the rock materials (esp. for round-shaped riprap) to be used in constructing the riprap and granular filter layer material layers in the CAW Embankment cover as shown on Drawings 10014 C01 and 10014 C04 of the CAW LAR

   Explicitly and quantitatively account for the specific dimensions, slope inclinations, and granular size, angularity or roundness, as applicable, and coefficient of uniformity of any round-shaped materials to be used in these proposed cover system layers. Demonstrate that the most appropriate methodology (e.g., Leps 1973; Abt et al. 1991) is used for estimating interstitial velocities within the Type A Filter Zone layer for assessing the potential for internal erosion (e.g., erosion of the underlying sacrificial soil layer materials) that considers the final proposed gradation of the Type A Filter Zone layer material (e.g., that may categorize the material as a rock fill material rather than an earthen fill material (based on criteria presented in Leps 1973 as discussed in Nelson et al. 1986 and referenced in Section 2.1 of Appendix D of NUREG-1623 (NRC 2002))

Demonstrate that the most appropriate methodology (e.g., Equation D-1 in Appendix D of NRC 2002 rather than Equation 4.44 of Nelson et al. 1986) is used for estimating the time of concentration for use in estimating the rainfall intensity and rainfall depths for the proposed final rock riprap layer material, and
Discuss and justify the need to oversize rock to be used for constructing the riprap layer based on its degree of roundness, taking into account recently published information.

2. **Refer to 3.0, 3.1.2, 3.2.2, and Tables 3-2 through 3-4 of the Class A West (CAW) Embankment License Amendment Request (LAR), and Drawing 10014 C04 of the CAW LAR:**
   - *Please provide additional information to justify the adequacy of the proposed thickness of 6 inches for the Type A Filter Zone Layer underlying the proposed 18-inch-thick riprap layer in the CAW Embankment cover. Discuss and justify the proposed 6 inch-thickness relative to the criteria provided in NUREG/CR-4620 (Nelson et al. 1986) that such a filter "should not be less than 6 to 9 inches thick**…[with] filter thicknesses one-half the riprap layer thickness recommended**".*
   - *Revise the design of the ditch outer slope (Detail 3 on Sheet C04) to be compatible with the specified gradation of the Type A riprap materials and to be consistent with guidance provided in NUREG-1623 (NRC 2002). Revise the design of the sideslope (detail 1), top slope (detail 2), and shoulder (detail 4) and the ditch outer slope (detail 3) to be consistent with guidance provided in NUREG-1623 (NRC 2002). Detail 3 shows a 12-inch thick layer of "Type A" riprap on the ditch outer slopes whereas the D_{100} of the Type A Riprap is specified to be 16 inches. Details 1, 2, 3, and 4 show a 6-inch-thick "Type A" filter zone layer on the cover sideslope, top slope, ditch outer slope, and shoulder, respectively, where the D_{100} of the "Type A filter zone" material is specified to be 6 inches. Revise the design of these layers as needed (or, alternatively, provide justification to support otherwise) to be consistent with NRC 2002 guidance (Section 3.2.4 of Appendix F) which recommends that: (1) no individual piece of riprap be greater in size than 90 percent of the riprap layer thickness; (2) filter zone material used as bedding material beneath a riprap layer typically have a D_{100} of approximately 3 inches; and (3) Riprap having a D_{100} of 16 inches (i.e., the proposed "Type A Riprap" for the CAW Embankment) be instead referred to as a "Type D" riprap rather than as a "Type A" riprap.*

BASIS FOR INTERROGATORY

Drawing 10014 C01 of the CAW LAR depicts cover limiting dimensions and/or slope inclinations that differ from either of two previous Rock Cover Design Calculations (Envirocare of Utah, Inc. 2000; undated) that were submitted by Energy*Solutions in July 2011 (via email messages from Sean McCandless and from Michael LeBaron on July 22, 2011) that were previously prepared by Envirocare of Utah, Inc. for the Western LAWR Cell and the proposed Class B & C LLRW Embankment. Therefore, there are no calculations available that clearly and transparently demonstrate that the proposed CAW*

cover system complies with applicable long-term erosion protection criteria. A revised set of calculations is needed to reflect the currently proposed cover design dimensions and configuration and to demonstrate compliance with all applicable erosion protection guidelines.

Guidance provided in NUREG/CR-4620 and NUREG-1623 and documents referenced therein (e.g., Leps 1973 and Abt et al. 1991) suggest that, based on its proposed gradation (see Drawing C10014 C04), the proposed Type A Filter Zone layer should be treated as a rockfill layer, rather than an earthen fill layer, when evaluating interstitial velocities within that layer (according to Table 3.3 in the CAW LAR, it appears that the percentage of particles in Type A filter material smaller than one inch would be less than 30%). The fundamental methodology for this type of material involves the assumption of turbulent flow (rather than laminar flow) through the layer.

Computational analysis methods (e.g., Safety Factors Method) applicable for sizing rock riprap consider the angle of repose of the rock and stability coefficients for different angles of repose for various granular materials. The angle of repose varies with mean rock size and rock shape (round, angular, etc…). Alternative computational methods that may be applicable (e.g., Abt and Johnson 1991) were developed based on flume studies for angular rock riprap layer systems. NUREG-1623 indicate that if rounded rather than angular rock is used, some increase in the average size of rock in the riprap may be necessary. The rock cover design calculations submitted by Energy*Solutions in July 2011 did not discuss the roundness or angularity of the rock in the proposed riprap layer and did not discuss or address the need, if any, for oversizing of rock to account for roundness, if applicable*

Section 4.8.2 of NUREG/CR-4620 and Section 2.2 of NRC 2002 describe appropriate methodologies for estimating the time of concentration for rock-covered slopes. As described above, no rock cover design calculations specifically supporting the proposed CAW cover system were provided for review; however, the two previous sets of Rock Cover Design Calculations (Envirocare of Utah, Inc. 2000a;b) that were submitted by Energy*Solutions in July 2011 that were previously prepared for the Western LARW Cell and the proposed Class B & C LLRW Embankment appeared to use an equation for determining the time of concentration for design of the rock cover that appears to be more appropriate for small drainage basins than for rock-covered slopes.*

All applicable NUREG/CR-4620 criteria for filter layer design should be addressed in the CAW LAR.

Relevant guidance provided in recently published information (e.g., Abt et al. 2008; Tamagni 2010) needs to be considered in the rock cover design for the CAW Embankment, for certain slopes, where round-shaped riprap is proposed for use as erosion protection material (e.g., recent published guidance applicable for slopes ranging from 10 and 40 % in inclination needs to be considered and accounted for).

REFERENCES:

Abt, S.R, Huff, J.F., and Whittler, R.J. 1991."Estimating Flow through Riprap", Journal of Hydraulic Engineering, Vol. 117, No. 5.

Abt, S.R., and Johnson, T.L. 1991. "Riprap Design for Overtopping Flow", Journal of Hydraulic Engineering, Vol. 117, No. 8.

Abt, S.R., Thornton, C.I., Gallegos, H.A., and Ullmann, C.M. 2008. "Round-Shaped Riprap Stabilization in Overtopping Flow", Journal of Hydraulic Engineering, Vol. 134, No. 8, pp. 1035-1041.

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

Envirocare of Utah, Inc. 2000. "Rock Cover Design Calculations" [prepared for the proposed Class B & C Disposal Cell, aka LLRW Embankment]". November 3, 2000. Received via email from EnergySolutions *on July 21, 2011.*

Envirocare of Utah, Inc.(undated). "Rock Cover Design Calculations" [prepared for the Western LARW Cell]. Undated document received via email from EnergySolutions *on July 22, 2011.*

Leps, T.M., 1973. Flow through Rockfill, in Embankment Dam Engineering, John Wiley and Sons.

Nelson, J.D., Abt, S.R., Volpe, R.L., van Zyl, D., Hinkle, N.E., and Staub, W.P. 1986. Methodologies for Evaluating Long-Term Stabilization Designs of Uranium Mill Tailings Impoundments. NUREG/CR-4620. June 1986.

NRC (U.S. Nuclear Regulatory Commission) 2002. "Design of Erosion Protection for Long Term Stability", NUREG-1623, September 2002.

Stephenson, D., 1979. Rockfill in Hydraulic Engineering, Developments in Geotechnical Engineering, 27, Elsevier Scientific Publishing Company, pp. 50-60.

Tamagni, S. 2010. "Discussion of "Round-Shaped Riprap Stabilization in Overtopping Flow" by Steven R. Abt, Christopher I Thornton, Humberto A. Gallegos, and Craig M. Ullmann". Journal of Hydraulic Engineering, March 2010, pp. 190-191

INTERROGATORY CAW R313-25-8(4)-12/1: TECHNICAL ANALYSIS - FILTER STABILITY/ FILTER PERMEABILITY CRITERIA

PRELIMINARY FINDING:

Refer to R313-25-8(4). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:

Refer to Sections 3.0, 3.1.2, 3.2.2, and Tables 3-2 through 3-4 of the Class A West (CAW) Embankment License Amendment Request (LAR), Attachment 3 (Class A West Disposal Cell Infiltration and Transport Report, April 19, 2011), to the CAW LAR, and Drawing 10014 C04 of the CAW LAR:

1. *To account for the longer topslope and sideslope lengths of the proposed CAW Embankment compared to those in the current Class A and Class A North Embankment, the LLRW Embankment, and the "Western LARW Cell", and to account for changes in cover material characteristics, as applicable, resulting from additional analyses performed in response to other interrogatory items in these Round 1 Interrogatories (e.g., see also Interrogatory CAW R313-25-8(4)-11/1: Technical Analysis - Rock Cover Design and rock cover design Calculations/ Analyses), provide an appropriate calculation to demonstrate that any granular layers in the proposed final cover system that have a relatively high assumed steady-state saturated hydraulic conductivity (permeability) value or for which infiltration simulation results suggest that the layer is acting as a lateral drainage layer satisfy pertinent filter design criteria (e.g., Bertram 1940; NRCS 1994[e.g., Table 26-3]). Include in the calculation applicable filter design criteria related to permeability for ensuring that the layer(s) will retain sufficient permeability over the long term following facility closure and stabilization to prevent development of large seepage forces and hydrostatic pressures in the layer(s).*
2. *Provide a set of calculations to demonstrate, for the proposed final layer materials and material properties for the cover system layers that final gradations proposed for the various adjacent layers meet all applicable published recommended filter stability requirements. Include consideration of filter criteria for preventing migration of granular materials into an adjacent coarser grained granular layer (e.g., Nelson et al. 1986, Equation 4.35); for preventing piping of finer grained cohesionless soil particles into an adjacent coarser-grained material layer (e.g., Cedegren 1989, Equation 5.3); and for preventing erosion of a finer-grained material layer from occurring over the long term as a result of flows in an adjacent coarser (filter zone) layer (e.g., Nelson et al.*

1986, Equation 4.36). Include consideration of different specific filter stability criteria (e.g., NRCS 1994, Tables 26-1 and 26-2) for determining the maximum allowable D_{15} of a granular filter layer material for preventing erosion of any adjacent layer (e.g., sacrificial soil layer) consisting of fine-grained/finer-grained particles, as a function of soil type. Account for changes, if any, in any proposed material gradations that may result from analyses performed in response to other interrogatory items in these Round 1 Interrogatories, as appropriate.

BASIS FOR INTERROGATORY

No filter design calculations supporting the specific proposed CAW cover system were provided for review. Changes in characteristics of materials in one or more of the cover system layers that might result based on additional calculations/analyses performed in response to items in these Round 1 Interrogatories could dictate that updated filter analysis calculations be completed. Changes that might occur in characteristics of the rock and/or soil materials used to construct the cover components for the CAW Embankment due to any changes in material properties at the soil and/or rock borrow sources (see also Interrogatory R313-25-8(4)-02/1: Technical Analysis - Rock Cover Design Calculations/ Analyses)owing to the increased volume and extent of excavations at the borrow sources should also be considered and factored into updated filter analysis calculations as appropriate. Filter stability criteria calculations should be provided that account for the specific granular and soil materials, including material gradations, anticipated to be used in the final cover system construction.

A pertinent filter permeability criterion (e.g., Bertram 1940; NRCS 1994[e.g., Table 26-3]) appears to be important to the design of the Type A Filter Zone and Type B filter zone layers for the CAW Embankment but has not been addressed in filter calculations performed in previous filter calculations for the Class A and Class A North Embankments that were recently submitted by Energy*Solutions for review (see discussion under "Basis for Interrogatory" for Interrogatory CAW R313-25-8(4)-11/1: Technical Analysis - Rock Cover Design Calculations/Analyses above).). (These filter permeability criteria may be especially important for the CAW Embankment given its much longer topslope lengths compared to those of the Class A and Class North Embankments). Filter criteria calculations previously prepared by EnergySolutions (e.g., EnergySolutions2005) did not address these relevant filter permeability criteria. An applicable filter permeability design criterion (requiring that the ratio of the $D_{15}$of the granular filter material be ≥ 4 times the $D_{15}$of the base layer material, but with the $D_{15}$of the granular filter material being greater than 0.1 mm) is designed to ensure that granular filter layers retain sufficient permeability following their installation to prevent accumulation of large seepage forces and hydrostatic pressures in the layers over the long term. The relatively high values of permeability assumed for both the Type A and Type B Filter Zone in the April 19, 2011 Infiltration and Transport Report (see Table 8)and the HELP model simulation results indicating that at least one of these layers (Type B Filter layer) is acting a lateral drainage layer, require that these layers retain relatively high level of permeability throughout the cover system's performance period. Appropriate calculations need to be provided that demonstrate that these*

components of the proposed cover system design will comply with pertinent permeability criteria for these two layers.

REFERENCES:

Bertram, G.E. 1940. An Experimental Investigation of Protective Filters. Graduate School of Engineering, Harvard University, Cambridge, Massachusetts. Soil Mechanics Series No. 7. pp. 1-21.

Cedegren.H.R. 1989. Seepage, Drainage, and Flow Nets. 3rd Edition. John Wiley $ & Sons, Inc., New York, NY.

*Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.

Nelson, J.D., Abt, S.R., Volpe, R.L., vanZyl, D., Hinkle, N.E., and Staub, W.P. 1986. Methodologies for Evaluating Long-Term Stabilization Designs of Uranium Mill Tailings Impoundments. NUREG/CR-4620; ORNL/TM-10067. June 1986.

NRC 2002. U.S. Nuclear Regulatory Commission, "Design of Erosion Protection for Long-Term Stability", NUREG-1623, September 2002.

NRCS (Natural Resources Conservation Service) 1994. U.S. Department of Agriculture, Part 633, National Engineering Handbook, Chapter 26: Gradation Design of Sand and Gravel Filters. October 1994.

Sherard, J.L., Dunnigan, L.P., and Talbot, J.R. 1984. "Basic Properties of Sand and Gravel Filters", in Journal of Geotechnical Engineering, Engineering Division, ASCE, Volume 110, No. 6, June 1984.

U.S Department of the Army Corps of Engineers 1953.Filter Experiments and Design Criteria. U.S. Waterways Experiment Station, Vicksburg, Mississippi.52 pp.

UFC (Unified Facilities Criteria) 2004.Dewatering and Groundwater Control. UFC 3-220-05. January 16, 2004.

U.S Department of the Army Corps of Engineers 1986. Seepage Analysis and Control for Dams. Office of the Chief of Engineers. Engineering Manual EM-1110-2-1901. September 30, 1986.

INTERROGATORY CAW R313-25-8(4)-13/1: TECHNICAL ANALYSES-PERIMETER DRAINAGE DITCH CALCULATIONS

PRELIMINARY FINDING:

Refer to R313-25-8(4). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:

Refer To Sections 3.0, 3.1.5, 3.2.5, and Tables 3-2 through 3-4 of the Class A West (CAW) Embankment License Amendment Request (LAR), Attachment 4 (Clive Facility Total Ditch Flow Calculations) to the CAW LAR, and Drawing 10014 C03 of the CAW LAR:

1. *Please provide a revised "Clive Facility Total Ditch Flow Calculations" package that calculates the 25-year and 100-year peak flow rates using the Rational Method or another standard engineering methodology. If the Rational Method is used please follow standard methodology:*
    a. *The rational formula is correctly referenced on Page 28 of 30 as Q=CiA*
    b. *Delineate watershed area (A); this seems to have been calculated correctly in Section 5 but for the Rational Method the area (A) should use acres for units instead of square feet.*
    c. *Calculate the time of concentration for each watershed using any of the standard time of concentration methods applicable.*
    d. *Using the time of concentration and the recurrence interval (i.e. 25-year or 100-year). Look up the intensity on a table, interpolate values as necessary. NOAA Atlas 14 intensity values can be found using the latitude and longitude for the site at this website http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ut. The units for intensity for this method are inches/hour. Use NOAA Atlas 14 as the reference source since NOAA Atlas 14 supersedes and replaces NOAA Atlas 2.*
    e. *The C value can be looked up in a table as was done on Page 8 of 30.*

2. *Please provide a revised "Clive Facility Total Ditch Flow Calculations" package that calculates the capacity of the ditches to safely pass the 25-year and 100-year peak flow rates using the Manning's Equation or another standard methodology. Use the correct trapezoidal geometry of the ditch including the 15.3' minimum bottom width referenced on Drawing 10014-C03. Check the water surface elevations and freeboard in the ditches around the 90 degree bends, water may superelevate and increase water surface elevations. Please provide a determination of the required riprap sizes for the drainage ditches, completed in accordance with the methods recommended in NUREG-1623 (NRC*

2002). Provide calculations that demonstrate that rock sizes in the rock riprap materials lining the perimeter drainage ditches will be adequate to withstand anticipated peak flood-flow-induced shear stresses. Provide information that demonstrates that the specific rock riprap materials proposed for use in the drainage ditches and in any other "critical areas" as defined in Section 7.2 of Appendix D of NUREG-1623 will satisfy minimum recommended rock quality criteria for such materials (refer also to Items 2 and 3 in Interrogatory CAW R313-25-7(7)-05/1: Specific Technical Information -- Closure Plan with regard to rock borrow sources).

3. *Please provide information that supports the appropriateness of using the Abt et al. 1988 equation in Section 1 for computation of the Manning's n value for the various ditches (for comparing with the literature-based value of n chosen for use in this calculation package) and using Eq. 4.44 from NUREG/CR-4620 (Nelson et al. 1986) for calculating the time of concentration (t_c) values in Section 7 (Peak Run-off Rate) for the different sections of the various embankment ditches. Alternatively, provide revised calculations using recommended alternative methods.*

4. *Please provide information demonstrating that rock riprap sizes at ditch corners will be adequate to withstand possibly higher peak flood flow-induced shear forces that may occur at those locations, as per the guidance provided in NUREG-1623.*
5. *Please provide a revised Drawing 10014 C03, as required, showing the final riprap size requirements for the perimeter ditches.*

6. *In Section 3.2.5, please correct what appears to be a typographical error (reference to Attachment 45) or provide Attachment 45. Explain why the values reported for the <u>Class A embankment</u> are relevant to the request to construct and operate the CAW.*

BASIS FOR INTERROGATORY

NOAA Atlas 2 has been superseded by NOAA Atlas 14, Vol. 1 (NOAA 2006), with Atlas 2 being officially removed from circulation and use. The ditch flow calculations need to be revised (or supplemented) to reflect the results of use of information and/or data from NOAA Atlas 14. Vol. 1 as opposed to NOAA Atlas 2.

In Section 1 of the "Clive Facility Total Ditch Flow Calculations" ditch capacities are evaluated. The triangular "V" ditch is compared to a trapezoidal ditch with only a one foot bottom width; however, the ditch has a minimum bottom width of 15.3' as referenced on Drawing 10014-C03. This could have significant impact on calculations for the ditch capacity, velocity and shear stress on the riprap.

The "Clive Facility Total Ditch Flow Calculations" include both storage and conveyance calculations but there is no explanation why storage calculations are necessary to conclude the ditch systems are satisfactorily designed to handle the flows associated with the normal and abnormal storm events during operations. Storage calculations are not required to reach the conclusion.

Section 2 of the "Clive Facility Total Ditch Flow Calculations" incorrectly calculates a storm distribution table and it appears this table is used as an intensity table in subsequent Rational Method calculations.

Section 4 of the "Clive Facility Total Ditch Flow Calculations" unnecessarily calculates ditch volumes. To evaluate the ditch ability to safely pass the 100-year storm events the Manning's Equation is adequate.

Section 5 of the "Clive Facility Total Ditch Flow Calculations" appears to use a methodology to determine ditch volume capacities that is not valid. The peak flow/capacity calculations appear to use the Rational Method. The intensity values in the Q=CiA calculations appear to be depths instead of intensities. Units are not consistent.

The "Clive Facility Total Ditch Flow Calculations" evaluate the capacity of the perimeter ditches for containing expected flows; however, there are no calculations demonstrating that the rock sizes for the rock layers lining the drainage ditches will be adequate to withstand anticipated peak shear stresses from expected flood flows (along the ditch lengths and at ditch corners). Section 3 of Appendix D of NUREG-1623 (NRC 2002) provides guidance for completing such calculations. Information has not been provided to demonstrate that rock derived from rock borrow sources that will be developed (e.g., further excavated and/or expanded) to supply necessary additional volume and/or larger-sized rock for lining the perimeter drainage ditches, and other critical areas, as applicable, for the CAW Embankment, will satisfy minimum rock quality criteria recommended in NUREG-1623 for rock used in such areas.

Justification should be provided that supports (1) the use of the Abt et al. 1988 equation in Section 1 for computation of the Manning's n value for the various ditches (for comparing with the literature-based value of n chosen for use in this calculation package); and (2) the use of the equation chosen for calculating time of concentration values in Section 7 of the "Clive Facility Total Ditch Flow Calculations" package for the various ditch sections. Section 3.1 of NUREG-1623 (NRC 2002) indicates that the Abt et al. 1988 equation for calculating n (used in Section 1 of this calculation package) is suited for cases where the flow depth is small relative to the riprap size. NUREG/CR-4620 (Section 4.8.2) indicates that the time of concentration formula given in Eqn. 4.44 of NUREG/CR-4620 (used in Section 7 of this calculation package) was developed for small drainage basins and not for rock-covered slopes. Additional explanation and supporting information should be provided to justify the use of these equations in this calculation package, for example, as opposed to using a different method for determining n (e.g., Army Corps of Engineers 1994), using Eqn. 4.45 in NUREG/CR-4620, or some other acceptable method in Section 7 of the calculation package, etc….

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

NOAA (National Oceanic and Atmospheric Administration) 2006. Precipitation-Frequency Atlas of the United States: Volume 1 Version 4.0: Semiarid Southwest (Arizona, Southeast California, Nevada, New Mexico, Utah). U.S. Department of Commerce, NOAA, National Weather Service, Silver Spring, MD 2004 (Revised 2006). URL: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ut.

NRC (U.S. Nuclear Regulatory Commission) 2002. "Design of Erosion Protection for Long Term Stability", NUREG-1623, September 2002.

U.S. Army Corps of Engineers 1994."Hydraulic Design of Flood Control Channels", EM 1110-2-1601, Change 1, Office of the Chief Engineers, Washington, DC.

INTERROGATORY CAW R313-25-8(4)-14/1: TECHNICAL ANALYSES – INFILTRATION AND TRANSPORT MODELING: CLIMATE CONDITIONS, ENGINEERED BARRIER CONDITIONS, AND VERTICAL TRANSPORT DISTANCE

PRELIMINARY FINDING:

Refer to R313-25-8(5). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:

Reference Sections 3.1.1, 3.1.2, 3.2.1, and 3.2.2 and Tables 3.2 through 3.4 of the CAW LAR, and Section3.2 and Table 14 of the April 19, 2011 (Whetstone Associates 2011) CAW Cell Infiltration and Transport Modeling Report:

1. *Provide additional information and rationale to support the selection of a range of climate conditions (e.g., precipitation conditions) to demonstrate that the climatic regime(s) used for modeling infiltration through the cover system bounds the range of uncertainties associated with potential climatic conditions that may occur over the CAW Embankment's performance period. Provide a revised vertical fate and transport discussion and findings as needed based on the final selected range of climate conditions. Include sensitivity analyses, as appropriate, to demonstrate the sensitivity of infiltration results to changes in the input climate parameters.*

2. *Provide a discussion, with supporting rationale, regarding potentially degraded conditions in the engineered barrier(s), including the radon barrier layer, in the CAW Embankment cover system that are important to the long-term performance of the CAW Embankment. Provide results of infiltration performance analyses incorporating such degraded conditions into the modeling simulations. Alternatively, provide detailed justification why consideration of such degraded engineered barrier conditions in the infiltration simulations is not required.*

3. *Provide an explanation, with supporting rationale, for selecting an appropriately conservative (i.e. shallow) average elevation of the groundwater surface beneath the CAW Embankment footprint for use in the infiltration and transport calculations/modeling. Demonstrate how historical fluctuations in the freshwater head levels in groundwater, in response to historical changes in weather conditions, were taken into consideration in the selection of the groundwater elevation used for calculating the vertical distance between*

the base of the clay liner and the groundwater surface (See also Interrogatory R313-25-7(1)-01/1: Specific Technical Information – Groundwater Elevation Value(s) used in Analyses, and Interrogatory R313-25-8(4)-07/1: Technical Analyses – Groundwater Depth in Geotechnical Stability Analysis). Provide information on the relationship of changes in climate conditions (e.g., precipitation levels) to groundwater recharge and resulting groundwater elevations over the same periods of time in the area of the CAW cell. Demonstrate that the average groundwater elevation selected is representative of anticipated future conditions during the required performance period of the CAW Embankment and/or provide a range of average groundwater elevation values that bounds the range of uncertainties associated with potential groundwater fluctuations over the performance period. Provide a revised vertical fate and transport discussion and findings as needed based on the final selected average groundwater elevation. Include sensitivity analyses, as appropriate, to demonstrate the sensitivity of transport results (e.g., travel time) to changes in the average groundwater elevation.

4.

BASIS FOR INTERROGATORY:

The Whetstone Associates (2011) Infiltration and Transport Modeling Report Section 3.2 and Table 14(UNSAT-H Node Geometry) present and describe a calculation of the thickness of the unsaturated Unit 3 Sand below the CAW cell that uses groundwater elevation data from August 2010 in wells in the area of the CAW cell footprint. No weather data are provided for Calendar Year 2010 for context. Additionally, in general, there is no analysis or discussion of the relationship between historical changes in weather conditions (e.g., average annual precipitation levels, seasonal fluctuations in precipitation, etc...) and groundwater levels in the CAW cell area. A previous infiltration and transport analysis done for the proposed Combined Class Cell (Whetstone Associates 2005) used an average groundwater elevation groundwater based on groundwater data from February 2004 for calculating the vertical transport distance which differed by 0.8 ft from the August 2010 average elevation value. Figure 2 and Table 3 of the Whetstone Associates (2011) Infiltration and Transport Modeling Report indicate that significantly higher precipitation levels have occurred during some years relative to others (e.g., 1997 and 1998 [136 % and 160 % , respectively, of the 17-year annual average precipitation for the 1992-2009 period]) and significant fluctuations in monthly precipitation have also occurred during several months during a 17-year-long period (1992 through 2009) at Clive. Figure 3 indicates that, for the 17-year period between 1992 and 2009, the average monthly precipitation level at Clive exceeded, in some cases (January, February, March, April, June) and was lower, in some cases, than at Dugway, Utah, where a considerably longer (60-year) climate record exists.

Sections 1.2 and 3.2.1 of NUREG-1573 (NRC 2000) specifies that weather conditions should be taken into consideration in performance assessments for low level radioactive waste disposal facilities. In particular, Section 3.2.1indicates that "a key aspect of an LLW performance assessment is determining how variations in precipitation result in varying rates of percolation into disposal units and of recharge to the water table. The NRC's Performance Assessment Working Group

recommends using historical and current weather data, and other site information (e.g., field tests) to establish a broad range of infiltration rates that may be used to simulate both wetter and drier conditions than the current average. Sensitivity analyses performed as part of the LLW performance assessment will provide some insight into the effects that such variations could have on the dose calculations…"

Sections 3.2.2 and 3.3.4 of NUREG-1573 (NRC 2000) indicate that potentially degraded conditions in engineered barrier components of the closure cover system should be declared and taken into account when estimating the long-term performance of a reclaimed facility such as the closed CAW Embankment. Section 3.2.2 of NUREG-1573 indicates that " given natural forces likely to cause unavoidable and unpredictable deterioration of physical barriers, no compelling evidence was found [by NRC's Performance Assessment Working Group] to suggest that physical barriers, such as natural covers and reinforced concrete vaults, will perform at anticipated design levels, indefinitely." That section further recommends that an applicant assign and justify the credit given to engineered barrier performance, and indicates that "in the degraded condition, at the end of its intended service life, an engineered barrier (e.g., reinforced concrete vault, engineered subsurface drainage system, etc.) can still perform a function, but the (diminished) function would be established by the applicant based on the assumed properties of its constituent materials…In general, the parameter values for hydraulic conductivity and other physicochemical properties of [each] engineered barrier used in the performance assessment should represent its changed/degraded condition."

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

NRC 2000.NUREG-1573.A Performance Assessment Methodology for Low-Level Radioactive Waste Disposal Facilities - Recommendations of NRC's Performance Assessment Working Group. Division of Waste Management Office of Nuclear Material Safety and Safeguards. U.S. Nuclear Regulatory Commission, Washington, DC. October 2000.

Whetstone Associates 2005.Envirocare of Utah Class A Combined (CAC) Disposal Cell Infiltration and Transport Modeling Report, November 2005.

Whetstone Associates 2011.EnergySolutions Class A West Disposal Cell Infiltration and Transport Modeling Report, April 19, 2011.

INTERROGATORY CAW R313-25-8(4)-15/1: TECHNICAL ANALYSES – GROUNDWATER DEPTH IN GEOTECHNICAL STABILITY ANALYSIS

PRELIMINARY FINDING:

Refer to R313-25-8(5). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:
Reference Sections 3.1.1 of the CAW LAR, and Section 2.2.3 of Attachment 5 (Geotechnical Update Report, EnergySolutions Clive Facility Class A West Embankment (AMEC 2011):
Please provide the following:

1. *Provide a revised stability analysis as needed to reflect the results of additional evaluations and analyses performed in response to other interrogatory items in these Round 1 Interrogatories (see Interrogatories used in and R313-25-8(4)-06/1: Technical Analyses – Infiltration and Transport Modeling: Climate Conditions, Engineered Barrier Conditions, and Vertical Transport Distance). Demonstrate that the average groundwater elevation selected for use in this analysis is representative of anticipated future conditions during the required performance period of the CAW Embankment and/or provide a range of average groundwater elevation values that bounds the range of uncertainties associated with potential groundwater fluctuations over the performance period. Provide a revised stability analysis as needed based on the final selected average groundwater elevation. Include sensitivity analyses, as appropriate, to demonstrate the sensitivity of the stability analysis results to changes in the average groundwater elevation.*

BASIS FOR INTERROGATORY:
See the discussion under Basis for Interrogatory under Interrogatories used in and R313-25-8(4)-06/1: Technical Analyses – Infiltration and Transport Modeling: Climate Conditions, Engineered Barrier Conditions, and Vertical Transport Distance.

REFERENCES:

EnergySolutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011, including Attachment 5, "Geotechnical Update Report, EnergySolutions Clive Facility Class A West Embankment" (AMEC 2011).

INTERROGATORY CAW R313-25-8(4)-16/1: SEISMIC HAZARD EVALUATION / SEISMIC STABILITY ANALYSIS UPDATE

PRELIMINARY FINDING:

Refer to R313-25-8(5). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:

1. **Refer to Sections 2.3.2, 3.1.3, 3.2.3, and 6.3.2 of the Class A West (CAW) Embankment License Amendment Request (LAR); Sections 2.1, 3.3, 4.5, and 5 of Attachment 5 (Geotechnical Update Report, EnergySolutions Clive Facility Class A West Embankment, Clive, Toole County, Utah, February 15, 2011) to the CAW LAR; and Appendix A (Update of Seismic Design Parameters for Envirocare of Utah Facility) to Attachment 5**:

   Please update the information, analyses, and results related to the selection of appropriate seismic design criteria, the seismic hazard evaluation, and seismic stability analysis results as presented in these CAW LAR sections and Attachment 5 and Appendix A to relevant information contained in several updated published articles and reports regarding seismic hazard evaluation methodologies, fault data, ground-motion prediction models (including Next Generation of Attenuation [NGA] relations), and other parameters that are relevant the analyses presented and described in Attachment 5 and Appendix A thereto. See "Basis for Interrogatory" below for a further discussion of selected relevant updated information that should be reviewed and applied as appropriate to the subject CAW LAR evaluations and analyses.

   Please provide a description of the location(s) and characteristics of any recently discovered faults in the region, such as the Carrington fault, that were not considered in the AMEC 2011 Geotechnical Update Report, and discuss the affect, if any, of such fault(s) on the updated seismic hazard evaluation results.

2. **Refer to Sections 2.1, 2.2, and Appendix A of Attachment 5 (Geotechnical Update Report, EnergySolutions Clive Facility Class A West Embankment, Clive, Toole County, Utah, February 15, 2011) to the CAW LAR; and Appendix A (Update of Seismic Design Parameters for Envirocare of Utah Facility) to Attachment 5**:

- *Please also revise Attachment 5 of the Geotechnical Update Report, EnergySolutions Clive Facility Class A West Embankment, Clive, Toole County, Utah, February 15, 2011 to reflect the following apparent errors and/or inconsistencies:*
  - ✓ *In reference to page 5, paragraph 2, last line states "recurrence interval". Please change to "return period".*
  - ✓ *Page 7, paragraph 1, line 7, please revise "20,000 years" to "30,000 years"*
  - ✓ *Page 7, paragraph 1, line 9, states that the deposits of Unit 1 are "pre-Pleistocene". These deposits are not pre-Pleistocene and are likely associated with or are contemporaneous with the Little Valley Lake Cycle. Please correct as appropriate*
  - ✓ *Notable references are missing from the reference list for this section. Please provide any missing references as necessary (e.g., Doelling et al., 1994, Panckow and Pechmann, 2004; and Swan et al., 2004)*
  - ✓ *In reference to Appendix A, page A-2, paragraph 1, the use of "line sources" should be referred to as "planes", since the USGS models faults as planes*
  - ✓ *In Appendix A, revise Table A-2 or paragraph 3 on page A-7 or both to make them consistent. Several of the magnitude and ground motion values stated in the text do not match those listed in Table A-2 (e.g., M 7.1 for Skull Valley fault in text versus M 6.5 and M 6.8 in the table).*

BASIS FOR INTERROGATORY:

The updated deterministic and probabilistic seismic hazard analyses described in Attachment 5 of the CAW LAR and Appendix A thereto present an approach to assessing ground shaking hazard at a site that is outdated and relies upon an outdated version of the USGS National Seismic Hazard Maps (NSHM) and published articles and reports that contain information that has been updated and in some cases has been superseded by newer published information. The analysts have not attempted to update the information, analyses, and results to reflect the more current information. Important references have not been evaluated and/or they are not cited.

For example, the recently discovered Carrington fault, which lies within the southwest arm of Great Salt Lake and is within 50 km of the proposed site, is not included in the analysis. Dinter and Pechmann (2005) first identified the Carrington fault based on offsets observed in high-resolution seismic reflection profiles in the Great Salt Lake. This northeast-striking, down-to-the-northwest normal fault is northwest of Carrington Island. An associated fault scarp visible on a recent bathymetry map of Great Salt Lake (Baskin and Allen, 2005), is about 28 km long. This scarp is as high as 1.5 m, and likely has experienced Holocene surface-faulting, with rates similar to the Antelope and Fremont Island segments of the Great Salt Lake fault, although absolute event ages remain uncertain (Frances et al. 2011).

In addition, the Pacific Earthquake Engineering Research (PEER) Center Next Generation of Attenuation (NGA) ground motion prediction models (released in 2007 and 2008) were not used in the hazard analyses. The NGA models represent the state-of-the-art in ground motion

prediction particularly for normal faults and hanging wall effects and thus need to be used in any current hazard analyses. The models used in the AMEC analyses are outdated and need to be replaced by the NGA models because of the significant differences between the NGA models and earlier ground motion prediction models. This recommendation is for both the deterministic and probabilistic seismic hazard analyses. If the NGA models are used, the 1D site response analysis may not need to be performed or it needs to be refined. A Vs30 for either the ground surface or for the bedrock beneath the site will need to be estimated. The Vs30 of 760 m/sec is probably not appropriate for Utah bedrock based on data that can be found on the Utah Geological Survey's website.

The ground motion parameter considered in the AMEC analyses is peak ground acceleration (PGA). It is not clear why this is the sole parameter to be considered in downstream analyses. To define the controlling deterministic earthquake, state-of-the-art analyses consider the response spectra to ensure that there are not exceedances at other spectral periods. Also, the ground motions from each ground motion prediction model should be averaged in a deterministic analysis to incorporate the epistemic uncertainty in these models. Evaluations based on a single model need not be performed.

The 2002 and 2003 USGS seismic hazard evaluations described and referenced in Appendix A to Attachment 5 of the CAW LAR were also updated in 2008. An updated document and associated updated USGS maps (e.g, Petersen et al. 2008) and/or updated fault data, as applicable, need to be considered and referenced. It needs to be demonstrated whether this updated information would affect any results provided and described in the LAR, Attachment 5 or Appendix A.

In the probabilistic seismic hazard analysis (PSHA) that was performed using EZFRISK to estimate the hazard from background earthquakes, events are assumed to occur uniformly throughout the site region. The process used by the USGS is to assume that the historical seismicity may be stationary in time and so Gaussian smoothing is performed rather than assuming uniformity across the region. The comparison of the PGA of 0.24g with the PSHA is meaningless since the PGA value is derived from the Skull Valley fault and the PSHA is for background earthquakes.

Certain specific changes are needed to the current document to correct for misuse of terminology and/or rectify inaccurate descriptions and inconsistencies in the documents.

REFERENCES:

AMEC Earth & Environmental, Inc. 2005. Geotechnical Study Increase in Height and Footprint Envirocare LARW Facility Near Clive, Utah, dated May 27, 2005. (Appendix A of Combined Class A [CAC] Amendment Request [AR]).

Baskin, R.L. and Allen, D.V., 2005. Bathymetric map of the south part of Great Salt Lake, Utah: U.S. Geological Survey Scientific Investigations Maps 2894 (URL: http://pubs.usgs.gov/sim/2005/2894/PDF/SIM2894.PDF).

Dinter, D.A. and Pechmann, J.C. (2005).Paleoseismology of the East Great Salt Lake fault, NEHRP Final Technical Report (Phase 2), Project Number 00HQGR0099, Wash., DC.

Dinter, D.A. and Pechmann, J.C. (2010).Paleoseismology of the East Great Salt Lake fault NEHRP Final Technical Report (Phase 3), USGS.Project 00HQGR0099, Wash. D.C.

Francis, M., Yeh, H., Dinter, D., Thio, H.K., and Olig, S., 2011, Tsunami andSseicheRisk Framework for the Great Salt Lake, ASCE Proceedings of the 2011 Solutions to Coastal Disasters Conference, doi:10.1061/41185(417)34,http://link.aip.org/link/?ASC/417/34.

EnergySolutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.

Panckow, K.L. and Pechmann, J.C. 2004. The SEA99 Ground-Motion Predictive Relations for Extensional Tectonic Regimes: Revisions and a New Peak Ground Velocity Relation. ERRATUM, Bulletin of the Seismological Society of America, Vol. 94, No. 1, pp. 341-348.

Petersen, Mark D., Frankel, Arthur D., Harmsen, Stephen C., Mueller, Charles S., Haller, Kathleen M., Wheeler, Russell L., Wesson, Robert L., Zeng, Yuehua, Boyd, Oliver S., Perkins, David M., Luco, Nicolas, Field, Edward H., Wills, Chris J., and Rukstales, Kenneth S., 2008. Documentation for the 2008 Update of the United States National Seismic Hazard Maps.U.S. Department of the Interior, U.S Geologic Survey Open-File Report 2008-1128, 128 pp.

Risk Engineering, Inc. 2011. EZ-FRISK® Software for Earthquake ground Motion Estimation. URL: http://www.ez-frisk.com/Tech/SeismicHazard/AtnEqnDB.html. Website accessed July 26, 2011.

INTERROGATORY CAW R313-25-24(1 THROUGH 3)-17/1: DISPOSAL SITE DESIGN FOR NEAR-SURFACE DISPOSAL - LINER DESIGN AND CONSTRUCTION

PRELIMINARY FINDING:

Refer to R313-25-24(1) through (3):

(1) Site design features shall be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure.

(2) The disposal site design and operation shall be compatible with the disposal site closure and stabilization plan and lead to disposal site closure that provides reasonable assurance that the performance objectives will be met.

(3) The disposal site shall be designed to complement and improve, where appropriate, the ability of the disposal site's natural characteristics to assure that the performance objectives will be met.

INTERROGATORY STATEMENT:

Refer to Section 1.3.1 of the CAW LAR and Drawings 10014 C01, 10014 C02 and 10014 C09 of the CAW LAR*:* Provide details defining how the liners under the Class A and Class A North Embankments will be joined , for both the clay subliner and the clay liner protective cover layers. Using engineering drawings, show limits and dimensions of existing liners and limits and dimensions of the proposed extended liner section between the existing embankments and north of the Class A North embankment. Define work processes that will be implemented in preparing the new liner location and in constructing the extended liner section and completing connections to the existing liners. Provide information on procedures and equipment to be used for removing overlying material as needed to uncover the existing liners, criteria that will be used to determine whether over excavation of any portion of the existing liners would be required prior to constructing the connecting liner extension and whether overlapping of compact clay layer material will be required at the liner junctures, information on proposed verification/testing methods to be used to demonstrate that the extended liner section has been bonded effectively and continuously to the existing liners to meet specified permeability requirements along the length and margins of the liner connections, and procedures and equipment to be used for covering and protection of the connected liner sections until covered by additional materials. . Provide additional information regarding the staging of and timeframes for placing protective cover materials over joined liner sections in proximity to ongoing waste disposal operations. Revise the CQA/CQC Manual as needed to incorporate additional information developed regarding the joining of these liner and liner protection systems.

BASIS FOR INTERROGATORY:

Details pertaining to the design and procedures to be used for constructing the liner extension and for connecting this liner section to the existing clay liners in the Class A and Class A North

Embankments are not provided. Additional details are required to allow proper evaluation of the ability of the connected liner to meet required performance objectives (e.g., to promote runoff of all water accumulating on the liner surface during operations.

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

INTERROGATORY CAW R313-25-24(5)-18/1: DISPOSAL SITE DESIGN FOR NEAR-SURFACE DISPOSAL - DRAINAGE JUNCTURE AND DRAINAGE OUTLET DESIGN FOR PERIMETER DRAINAGE DITCH SYSTEM

PRELIMINARY FINDING:

Refer to R313-25-24(5). Surface features shall direct surface water drainage away from disposal units at velocities and gradients which will not result in erosion that will require ongoing active maintenance in the future.

INTERROGATORY STATEMENT:

Refer to Attachment 4 (Clive Facility Total Ditch Flow Calculations) to the CAW LAR, and Drawing 10014 C01 of The CAW LAR:

1. *Please provide information and calculations that demonstrate that the surface water in the perimeter drainages surrounding the CAW Embankment will be conveyed and merge with the surface water flows in the 11e.(2) drainage ditch at the location shown on Drawing 10014 C01, and that surface water conveyed by the entire conceptual perimeter drainage ditch system shown in Figure 1 of the Clive Facility Total Perimeter Ditch Flow Capacity" calculation package will be discharged in such a way that during operations, and after closure, discharge velocities and gradients will not cause excessive erosion to the drainage system components, or otherwise result in erosion that would require ongoing active maintenance in the future.*

2. *Please provide detailed drawings (plan sections and details) showing the design of the drainage juncture at the southeast corner of* CAW *Embankment and the design of the ultimate drainage outlet (drainage culvert, discharge apron, etc...) at the point of discharge of the perimeter drainage ditch system. Demonstrate that the ditch design ensures that any concentrated, severe peak storm-induced flows from runoff from the CAW Embankment will be accommodated by the receiving 11.e(2) ditch segment without damage to these ditch systems. Demonstrate that an appropriately sized culvert (if required) and appropriately designed rock discharge apron are included at the ultimate outlet of the entire drainage system to prevent damage to the native ground surface and the outlet structures through scour, long-term headward gullying, or other erosion processes.*

BASIS FOR INTERROGATORY:

At the juncture of the CAW Embankment drainage ditch system and at the outlet of the entire perimeter drainage ditch system, it has not been clearly demonstrated that surface water flow will be conveyed or discharged in a manner that will not cause excessive erosion to the drainage system components, or otherwise result in erosion that would require ongoing active maintenance in the future. No drawings, design details, or calculations have been provided to address these flow convergence and flow discharge outlet locations. Sections 3.2.3 and 4 of Appendix D of NUREG-1623(NRC 2002) provides guidance for designing channel areas where shear stresses may occur and for designing diversion channel discharge aprons to minimize potential for excessive erosion and resulting damage to the drainage system and adjacent natural soils that could eventually cause damage to one or more of the reclaimed disposal cells.

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

NRC (U.S. Nuclear Regulatory Commission) 2002. "Design of Erosion Protection for Long Term Stability", NUREG-1623, September 2002.

INTERROGATORY CAW R313-25-25(6)-19/1: RADIATION DOSE RATE AT THE SURFACE OF THE COVER

PRELIMINARY FINDING:

Refer to R313-25-25(6). Waste shall be placed and covered in a manner that limits the radiation dose rate at the surface of the cover to levels that at a minimum will permit the licensee to comply with all provisions of R313-15-105 at the time the license is transferred pursuant to R313-25-16.

INTERROGATORY STATEMENT:

Refer to Section 3.1.9 and Figure 1 of the Class A West (CAW) Embankment License Amendment Request (LAR):

1. *Confirm/revise and provide justification for the following parameter values used in MicroShield analyses:*
   - *Height and radius of 55-gallon drum*
   - *Dose points X, Y, and Z*
   - *Source dimension of 7.589 ft^3*
   - *Composition of Shield 3 (being clay and rock and not concrete as indicated)*
2. *Justify the choice of 11 Ci of Co-60 as the radioactive inventory of the 55-gallon drum modeled in the case reported.*
3. *Identify source conditions that would be required to produce MicroShield-projected dose rates at the cover surface that exceed stated regulatory limits.*
4. *Submit details of MicroShield analyses (revised, if necessary), including determinations of input parameter values.*

BASIS FOR INTERROGATORY:

1. *Some values differ from standard values (e.g., dimensions of 55-gallon drum per ANSI MH2); for others, the origin of the reported value is not apparent or the value differs from what would be expected.*
2. *If a 55-gallon drum were received at its Class A concentration limit for Co-60, its Co-60 inventory could be as large as 145 Ci, or about 13 times greater than modeled in the reported case.*
3. *It appears that the projected dose rate is so low that no reasonable possibility exists that could cause the dose rate at the cover surface to exceed regulatory limit. However, knowing what conditions would be required to create excessive dose rates is useful information and provides confidence that doses to post-closure workers and potential "intruder explorers: following the institutional control period will indeed be acceptably low.*
4. *The determination of input parameter values should be documented, reported, and observable by independent reviewers.*

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

INTERROGATORY CAW R313-25-26(1)-20/1: ENVIRONMENTAL MONITORING

PRELIMINARY FINDING:

Refer to R313-25-26(1). During the land disposal facility site construction and operation, the licensee shall maintain an environmental monitoring program. Measurements and observations shall be made and recorded to provide data to evaluate the potential health and environmental impacts during both the construction and the operation of the facility and to enable the evaluation of long-term effects and need for mitigative measures. The monitoring system shall be capable of providing early warning of releases of waste from the disposal site before they leave the site boundary.

INTERROGATORY STATEMENT:

Refer to Sections4.4.3 and 7.3.4 of the Class A West (CAW) Embankment License Amendment Request (LAR):

1. *Justify the assertion that no additional monitoring of airborne radioactive materials is required to ensure adequate protection against the increased volume of LLRW proposed to be disposed of.*

2. *Update the Environmental Monitoring Plan (or Program) to reflect changes that will result from granting the requested CAW amendment request.*

BASIS FOR INTERROGATORY:

1. *It is not immediately apparent that dust or radon releases from the increased disposal area that will result from approval of the CAW license amendment request will be adequately monitored by the existing network of air samplers. Additional description and justification should be provided to support this statement. Alternatively, additional air samplers should be provided and justification submitted for the Division's review.*

2. *Documentation defining the environmental monitoring plan/program must be updated to address all new or revised monitoring locations, media, monitors, analytes, and sampling frequencies.*

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

INTERROGATORY CAW R313-25-26 (2 AND 3)-21/1: TECHNICAL ANALYSES - HORIZONTAL TRANSPORT AND WELL SPACING ANALYSIS INPUT PARAMETERS

PRELIMINARY FINDING:

Refer to R313-25-26(2). During the land disposal facility site construction and operation, the licensee shall maintain an environmental monitoring program. Measurements and observations shall be made and recorded to provide data to evaluate the potential health and environmental impacts during both the construction and the operation of the facility and to enable the evaluation of long-term effects and need for mitigative measures. The monitoring system shall be capable of providing early warning of releases of waste from the disposal site before they leave the site boundary.

Refer to R313-25-26(3). After the disposal site is closed, the licensee responsible for post-operational surveillance of the disposal site shall maintain a monitoring system based on the operating history and the closure and stabilization of the disposal site. The monitoring system shall be capable of providing early warning of releases of waste from the disposal site before they leave the site boundary.

INTERROGATORY STATEMENT:

Refer to Sections 2.2, 3.1.1, and 4.4.3of the Class A West (CAW) Embankment License Amendment Request (LAR); Sections 3.5 and 6.2 of the April 19, 2011 (Whetstone Associates 2011) CAW Cell Infiltration and Transport Modeling Report,and Sections 3.1, 3.2, and 3.3 and Figure 1 of Attachment 6 (Clive Facility Well Spacing Evaluation Class A West Embankment, April 28, 2011) to the CAW LAR:

1. *Provide information to justify the use of a 90 % confidence level hydraulic conductivity value in the MEMO Model in the Well Spacing Evaluation Report that is based on slug test data from wells that are completed (only) in the Unit 2 clay, in contrast to using a 90% confidence level hydraulic conductivity value in the horizontal transport analysis section of the Whetstone Associates (2011) CAW Cell Infiltration and Transport Modeling Report that is based on slug test data from well completed in the Unit 3 Sand. Also provide information to the explain and justify the difference between each of these derived 90 % hydraulic conductivity values and the 90% confidence level aggregate hydraulic conductivity value that was used in a prior analysis (Whetstone Associates 2009 Well Spacing Evaluation for the* Energy*Solutions Class North Embankment) that was based on slug test data from wells completed in both the Unit 3 Sand and the Unit 2 Clay. Indicate, if applicable, why different assumptions would be warranted in these three different analyses, or alternatively, revise the two current analyses to use a consistent methodology and consistent assumptions, and provide justification for the final selected approach and*

final adopted hydraulic conductivity input value (or different values, if justified)for use in the analyses. Include a summary of monitoring well completion details, information on the distribution of hydrogeologic units in relation to the expected groundwater flow paths involved in the analyses, and other information as needed to support and justify the appropriateness of the final hydraulic conductivity model input data.

2. *Provide a revised Well Spacing Evaluation Report and/or revised CAW Cell Infiltration and Transport Modeling Report, as appropriate, reflecting use of the final selected approach and final adopted hydraulic conductivity input value(s).*

3. *Provide a revised approach for estimating longitudinal dispersivity that is more in keeping with supporting information and available published data and interpretations. Derive, defend, and incorporate a revised longitudinal dispersivity (and revised transverse dispersivity) value into the well spacing evaluation. Alternatively, provide sensitivity analyses that incorporate a range of possible α_x and transverse dispersivity values, to bound the uncertainties associated with the methodology used for estimating the α_x parameter for use in the well spacing evaluation, to assess the sensitivity of the modeling results to changes in these dispersivity values.*

4. *Provide rationale for assuming a single location below the center of the top slope of the CAW Embankment for determining the distance to the nearest compliance well as a basis for estimating an appropriate value of longitudinal dispersivity for the well spacing evaluation. Demonstrate that why such an assumption would be conservative, e.g., rather than assuming another potential origin points within the CAW Embankment footprint for a potential release that would be located closer to the compliance monitoring wells and consequently exhibit less dispersion at the locations of some or all compliance monitoring wells. Demonstrate that the well spacing analysis approach and assumptions result in a reasonably representative estimation of α_x and transverse dispersivity values for assessing the adequacy of the well spacing intervals.*

BASIS FOR INTERROGATORY:

In the three different reports/analyses discussed in Item 1 above, three different 90% confidence level hydraulic conductivity values were/are derived based on three different sets of assumptions regarding which hydrogeologic unit or hydrogeologic units should be considered. No rationale are provided in any of the three cited reports or analyses for including one or the other unit or both units in the calculation of the 90 % confidence level hydraulic conductivity value for use in further analyses. No explanations are provided as to why one approach is used over another instead of using a consistent approach for all three of the analyses described.

Gelhar et al. (1992) is cited as a basis for estimating longitudinal dispersivity as a function of scale (distance traversed in the hydrogeologic system). The data compiled by Gelhar et al. 1992 data indicate a general trend of increasing longitudinal dispersivity (α_x)with observation scale;

however, the authors classified the dispersivity data into three reliability classes: low, intermediate, and high. Figure 1 below shows the compiled dispersivity data and indicates the assessed reliability of the data. The longitudinal dispersivity ranged from 10^{-1} to 10^{5} m based on the data reviewed by the authors, but the largest scale for high reliability data was only about 250 m (about 800 feet). The authors indicated that it is not appropriate to represent the longitudinal dispersivity data by a single universal line. Gelhar et al. 1992 indicated that reanalysis of data from several of the field sites showed that improved interpretations most often lead to smaller dispersivities. Overall, Gelhar et al. concluded that longitudinal dispersivities in the lower part of the indicated range are more likely to be realistic for field situations. This suggests that, for conservative species, a longitudinal dispersivity of the order of meters may be a reasonable estimate for saturated media domains that are a couple of hundred meters in scale.

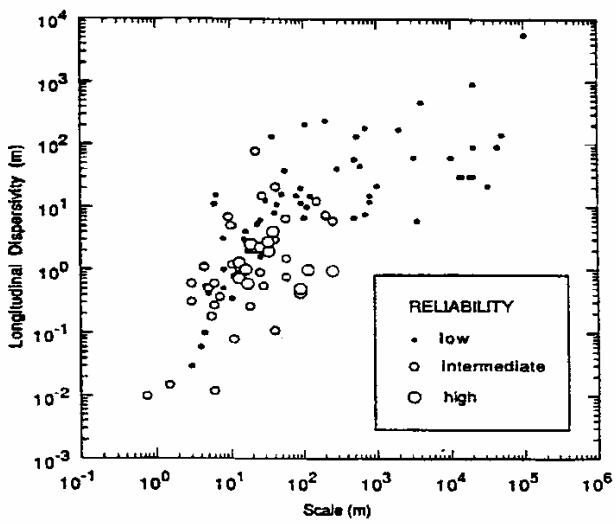

Figure 1.Longitudinal dispersivity in saturated media as a function of overall problem scale with data classified by reliability (afterGelhar et al. 1992).

In Section 3.3.2 of the Well Spacing Evaluation, the longitudinal dispersivity of the aquifer beneath the CAW Embankment was set at 129.1 ft (39 m), based on an assumption that it could be approximated at 10% of 1,291 ft (393 m), which is the average of :1) the distance from the center of the top sloe of the CAW Embankment to the east line of compliance wells, and (2) the distance from the center of the top sloe of the CAW Embankment to the north line of compliance wells. (Transverse dispersivity was then, in turn, set at 10% of this longitudinal dispersivity value). Because this distance scale exceeds the scale of data reliability as discussed by Gelhar et al. 1992, Energy*Solutions should revise the approach for estimating longitudinal dispersivity and derive and incorporate a revised longitudinal dispersivity (and revised transverse dispersivity) value into the evaluation. Alternatively, ES should conduct additional sensitivity analyses to incorporate a range of possible α_x andtransverse dispersivityvalues, to bound the*

uncertainties associated with the methodology used for estimating the α_x parameter for use in the well spacing evaluation, to assess the sensitivity of the modeling results to changes in these dispersivity values. Rationale for assuming a single location at the center of the top slope of the CAW Embankment for estimating the distance to the nearest compliance well (e.g., for a hypothetical release from the CAW Embankment) should also be provided, since additional contaminant release locations closer to the compliance wells are possible and the width of the dispersion pattern at the compliance well locations that would be associated with a "mini-plume" from such potential release points would be narrower than in a mini-plume that originated at the center of the CAW Embankment.

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

Gelhar, L. W., C. Welty, and K. R. Rehfeldt. 1992. A critical review of data on field-scale dispersion in aquifers. Water Resources Research, 28:1955-1974.

Whetstone Associates 2009. Well Spacing Evaluation, Energy*Solutions Class A North Embankment, March 12, 2009.*

Whetstone Associates 2011.EnergySolutions Class A West Disposal Cell Infiltration and Transport Modeling Report, April 19, 2011.

INTERROGATORY CAW R313-25-33(1)-22/1: RECORDS

PRELIMINARY FINDING:

Refer to R313-25033(1). Licensees shall maintain records and make reports in connection with the licensed activities as may be required by the conditions of the license or by the rules and orders of the Executive Secretary.

INTERROGATORY STATEMENT:

Refer to Section 4.2 of the Class A West (CAW) Embankment License Amendment Request (LAR):*Explain how the management of waste-related data for waste disposed of in the CAW will differ from that of waste disposed of in the Class A and Class A North embankments.*

BASIS FOR INTERROGATORY:

Any differences between record keeping proposed for waste disposed of in the CAW embankment must be identified. If no such differences are planned, that statement should be made.

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

INTERROGATORY CAW R317-6-6.4-23/1: ISSUANCE OF DISCHARGE PERMIT: BEST AVAILABLE TECHNOLOGIES - MONITORING WELLS REQUIRING ABANDONMENT AND DECOMMISSIONING AND LYSIMETERS PROPOSED FOR ABANDONMENT

PRELIMINARY FINDING:

Refer to R317-6-6.4(A). The Executive Secretary may issue a ground water discharge permit for a new facility if the Executive Secretary determines, after reviewing the information provided under R317-6-6.3, that: …2. the monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements; 3. the applicant is using best available technology to minimize the discharge of any pollutant;…".

INTERROGATORY STATEMENT:

1. **Refer to Section 4.4.3 of the Class A West (CAW) Embankment License Amendment Request (LAR) and Drawing10014 U02 of the CAW LAR:** *Drawing 10014 U02 indicates that the locations of several existing monitoring wells (e.g., GW-81, -82, -83, -84, -85, -86, -109, -110, -111, -112, -137, -138, -140, and -141) would be covered by CAW Embankment (and also covered by waste). Please submit a well plugging and abandonment (well decommissioning) plan and well decommissioning schedule for sealing and decommissioning all existing monitoring wells prior to construction of the CAW over them. Include information demonstrating that the plugging/sealing or other well abandonment technologies used to plug and decommission these wells represent BATs and will not compromise the long-term performance requirements for the CAW.*
2. **Refer to Section 4.4.3 of the Class A West (CAW) Embankment License Amendment Request (LAR) and Drawing 10014 C01 of the CAW LAR:** *Drawing 10014 C01 indicates that four existing or currently planned lysimeters (CL-W2, CL-W3, CL-W4, and CL-N5) beneath the Class A and Class A North Embankments are proposed to be abandoned (as they would be covered by CAW Embankment, and also covered by waste). Please provide additional information and details regarding systems and measures that* Energy*Solutions proposes to implement to retain the ability to acquire data that would have been provided by these four lysimeters if they were not abandoned. Demonstrate that the level and quality of vadose zone data will be equivalent to that obtainable from these four lysimeters once such systems and measures have been implemented. Demonstrate that the systems and measures to be employed, if different than those current or planned, satisfy criteria for best available technologies for this type of monitoring.*

BASIS FOR INTERROGATORY:

The Licensee needs to provide a plan and schedule for plugging and abandonment (decommissioning) of all existing wells that would be covered by the proposed CAW. If not properly decommissioned/plugged, the wells could provide a vertical pathway for escape of contaminants from the CAW or otherwise interfere with construction of the CAW. Specifications for plugging and decommissioning these wells need to be provided to ensure effective decommissioning of the wells. Information needs to be provided that demonstrates that the well sealing and decommissioning activities will meet the BAT design and performance requirements of Parts 1.D and 1.E and the compliance monitoring requirements of Part 1.F of the Ground Water Discharge Permit, Permit No. UGW450005.

Four current or proposed lysimeters to be installed under the Class A and Class A North Embankments are proposed to be abandoned; however, no equivalent replacement monitoring devices or other equivalent vadose zone monitoring systems or measures are proposed to take their place. These types of devices/systems provide an important means of detecting early evidence of potential releases from the proposed CAW Embankment. Energy*Solutions has not provided information to address or otherwise support this change in the monitoring system design in the proposed Class A and Class A North/CAW Embankment area.*

REFERENCES:

Energy*Solutions, LLC. 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

"Ground Water Discharge Permit UGW450005", Department of Environmental Quality, Utah Water Quality Board, held by Energy*Solutions, LLC, July 29, 2010.*