License Application (LA)

RAI LA-1: Justify the absence of a time limit for a canister to be returned to the nuclear plant of origin, or other facility licensed to perform fuel loading procedures, in Appendix A to the proposed Materials License, “Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility.”

Sections 5.5.5.b.1 and 5.5.5.b.2 (Page 5-5) of Appendix A to the proposed Materials License do not provide a time limit for the return of a canister to the nuclear plant of origin, or other facility licensed to perform fuel loading procedures, if the canister does not pass the Krypton-85 test or helium leak test acceptance criterion and cannot be stored at the HI-STORE CIS Facility. If a time limit for the return of a non-compliant canister is not specified, the application should discuss how storage of this canister for an indefinite period is considered and accounted for in the site’s safety analyses (e.g. normal and accident doses due to confinement and shielding, thermal time limits) and operating procedures.

This information is needed to determine compliance with 10 CFR 72.24(g) and 72.44(c)(1).

Holtec Response

It should be noted that from confinement and thermal perspectives there is no limit on the time to return a canister that has failed the Krypton-85 test or helium leak test acceptance criteria to the nuclear plant of origin or other facility licensed to perform fuel loading/unloading for the following reasons:

1. The annulus between loaded canister and transport cask cavity wall is helium backfilled to required specifications per Section 10.3.3 of the HI-STORE CIS SAR following leakage testing. This returns the loaded transport cask to its analyzed conditions at the HI-STORE CIS Facility per HI-STORE SAR Chapter 6, which are bounded by the analyzed transport ambient conditions (site normal ambient temperatures in Table 2.7.1 of the HI-STORE SAR are less than the analyzed transport ambient temperature in Section 3.0 of the HI-STAR 190 SAR (38^{o}C/100^{o}F)). Therefore, all components remain below their analyzed temperatures regardless how long the canister remains inside the transportation cask.

2. The HI-STAR 190 cask cavity walls (including baseplate and welds) and lid define the confinement/containment boundary. The integrity of the containment boundary of the HI-STAR 190 cask is maintained leaktight under conditions analyzed at the HI-STORE CIS Facility without any time based restrictions.

However, from a shielding perspective, the limiting factors are the occupational dose limits and controlled area boundary dose limits. The occupational dose limits per 10 CFR 20.1201(a)(1) are the more limiting of:

a. The total effective dose equivalent being equal to 5 rem/year; or

b. The sum deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rem/year.

The radiation protection staff at the HI-STORE facility shall ensure via work scheduling and ALARA practices, including radiation monitoring, that the occupational dose limits are met by workers as described in Section 5.5.2 of the Technical Specifications.

The controlled area boundary dose limit is 25 mrem/year per 10 CFR 72.104. As noted in Table 7.4.3 of the HI-STORE SAR, at design basis loading (500 Loaded HI-STORM UMAX VVMs), the annual dose at the controlled area boundary 400 meters from the storage pad is 1.93 mrem per year at an occupancy of 2000 hours per year, which is less than 8% of the 10 CFR 72.104 limit.

If a canister fails the Krypton-85 test or helium leak test, it shall remain in the sealed HI-STAR 190 transportation cask in the rail spur staging area south of the Cask Transfer Building (CTB), until it is returned to the originating site or other facility licensed to perform fuel loading procedures.. The HI-STORE CISF shall set a time limit for returning the canister by using measured dose rates from the loaded transportation overpack and ensuring the annual dose rates for the facility are maintained below 10 CFR 72.104 limits, including contribution from any non-accepted canisters within transportation overpacks. This calculation will determine how long the canister may be stored and maintain the dose rates within regulatory limits.

While in the staging area, the loaded HI-STAR 190 cask shall be in the horizontal configuration with impact limiters installed. Section 10.3.3.1 of the HI-STORE SAR has been updated to include use of the rail spur staging area in procedures for canisters that do not pass the Krypton-85 test or helium leak test. Section 5.5.5.b.3 has been added to Appendix A of the proposed Materials License, and states that loaded HI-STAR 190 casks containing canisters that do not pass the Krypton-85 test or helium leak test may be staged at the HI-STORE CISF prior to returning to the site of origin or other facility licensed to perform fuel loading procedures, provided the 10 CFR 72.104 limits for the site.

RAI LA-2: Justify why Section 5.5.1, “Radioactive Effluent Control Program,” of Appendix A to the proposed Materials License, “Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility,” does not contain references or similar language to that provided in Section 5.5.5, “Canister Acceptance Program,” of Appendix A to the proposed Materials License.

Section 5.5.5 of Appendix A to the proposed Materials License should also be referenced or included in Section 5.5.1 of Appendix A because the canister acceptance program testing in Section 5.5.5, supports the radioactive effluent control program.

This information is needed to determine compliance with 10 CFR 72.24(g) 72.44(c)(3)(ii), and 72.128(a)(1).

Holtec Response

Section 5.5.1 “Radioactive Effluent Control Program” of Appendix A has been updated to state that upon arrival of canisters in transport casks, acceptance tests are performed on the loaded transport casks in accordance with Section 5.5.5.b “Canister Acceptance Program” of Appendix A to verify the ANSI N14.5 leaktight criterion of the canister is maintained post-transportation.

RAI LA-3: Provide a description of the Technical Specification bases control program for the HI-STORE Consolidated Interim Storage (CIS) Facility.

The Technical Specification bases control program provides a means for processing changes to the bases of the Technical Specifications, and ensures the bases are maintained consistent with the HI-STORE SAR. This information was not included in Appendix A to the proposed Materials License for the HI-STORE CIS facility.

This information is needed to determine compliance with 10 CFR 72.26.

Holtec Response

Technical Specification bases control program for the HI-STORE CIS has been added as Section 5.5.6 of Appendix A to the proposed Materials License.

Safety Analysis Report (SAR), Chapter 9, "Confinement Evaluation"

RAI 9-1: Include the references from Table 9.0.1, "Material Incorporated by Reference in this Chapter," of the HI-STORE SAR in Chapter 19, "Consolidated References," of the HI-STORE SAR.

Although references 1.0.7, 7.1.1, 7.1.2, 7.1.3, and 7.1.4 were included in Table 9.0.1 of the HISTORE SAR, the references were not included in Chapter 19 of the HI-STORE SAR. When using incorporation by reference, the references should be included as part of the consolidated references in the HI-STORE SAR.

This information is needed to determine compliance with 72.24(c)(3), and relevant to 10 CFR 72.18.

Holtec Response

The references in Table 9.0.1 have been replaced with references in Chapter 19 as noted in the table below.

Previous Reference	Current Reference in Chapter 19
1.0.7	1.3.7
7.1.1, 7.1.2, 7.1.3, 7.1.4	8.0.1 (FW Amendment 0 SER), 8.0.2 (FW Amendment 1 SER), 8.0.3 (FW Amendment 2 SER)

RAI 9-2: Clarify the content in Table 9.0.1, "Material Incorporated by Reference in this Chapter," of the HI-STORE SAR.

Table 9.0.1 states, "SAR HI-STORM FW amendment 0 References [7.1.1, 7.1.2, 7.1.3, 7.1.4]," under the heading, "NRC approval of material incorporated by reference." This heading description does not match the specific documents referenced in the table. When using incorporation by reference, the application should provide accurate and specific references to the NRC documents cited, including the correct amendment numbers.

This information is needed to determine compliance with 72.24(c)(3), and relevant to 10 CFR 72.18.

Holtec Response

Table 9.0.1 has been revised to state that NRC approval is via the SERs for HI-STORM FW Amendments 0, 1 and 2 with appropriate references in Chapter 19 as noted in the response to RAI 9-1.

RAI 9-3: Clarify the content in Section 9.2.2, "Operational Activities," (Page 9-7) of the HI-STORE SAR.

Section 9.2.2 of the HI-STORE SAR should consistently address off-normal conditions, in addition to the normal, off-normal and accident conditions while on-site prior to, or during receipt inspection. This was not clearly addressed in the following sentence from Section 9.2.2 of HI-STORE SAR and the text below is underlined for added emphasis.

> *"Hence once the canisters have passed the receipt inspection, also discussed in Subsection 9.2.1, there is* <u>*no credible normal or accident situation*</u> *that could challenge the integrity of the canister confinement integrity and result in a release of any radioactivity."*

A normal, off-normal, or accident condition(s) that could challenge the integrity of the canister confinement while on-site prior to, or during, receipt inspection, should also be described in the HI-STORE SAR. Note that the statement in Section 9.2.2 is contradictory to Section 9.2.1, "Storage Systems," (Page 9-4) which states:

> *"All normal, off-normal and accident conditions relevant to confinement integrity for which the canister is certified in the HI-STORM UMAX docket are equal to or less severe at the HI-STORE facility. Therefore, there are no new conditions for the HI-STORE CIS facility that would requirement additional confinement analyses."*

This information is needed to determine compliance with 10 CFR 72.11(a).

Holtec Response

Section 9.2.2 has been revised to state that "no credible normal, <u>off-normal</u> or accident <u>conditions</u>" could challenge the integrity of the canister confinement integrity and result in a release of any radioactivity.

RAI 9-4: Clarify the statements made in HI-STORE SAR Sections 9.2.1, "Storage Systems," 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," and Table 10.3.2, "Canister Leakage Test Performance Specifications," with respect to describing the leak testing.

Section 9.2.1 (Page 9-5) of the HI-STORE SAR should accurately describe the leakage rate testing that is described in Section 10.3.3.1 and Table 10.3.2 of the HI-STORE SAR. The leakage rate testing described in Section 9.2.1 of the HI-STORE SAR describes leakage rate testing only on the redundant closure ring.

> *"Although the HI-STORM UMAX confinement boundary includes the MPC lid to shell weld, this weld is covered with a redundant closure ring. Therefore, the leak testing described is performed only on that redundant closure ring of the confinement boundary."*

The leak testing described in Section 10.3.3.1 and Table 10.3.2 of the HI-STORE SAR is performed on the assembled lid to shell weld and the redundant closure ring together.

This information is needed to determine compliance with 10 CFR 72.11(a).

Holtec Response:

Leakage testing is performed on the entire loaded MPC in the transport cask. The assembled lid to shell weld and the redundant closure ring weld are tested together, with the status of the combination providing reasonable assurance of the status of the lid to shell weld, since storage conditions have been demonstrated to pose no challenge to the confinement boundary. The wording in Chapter 9 has been updated accordingly.

RAI 9-5: Provide justification that the confinement boundary integrity is maintained after transport operations.

Section 9.2.1, "Storage Systems," of the HI-STORE SAR (Page 9-5), states:

> *"During transportation to the HI-STORE, canister transportation operations are bounded by the HI-STAR 190 SAR. Adherence to these criteria demonstrates confinement safety prior to receipt at the HI-STORE."*

It is not clear what specific analysis of the canister in the HI-STAR 190 demonstrates confinement safety and therefore provides assurance that the confinement boundary integrity is maintained during transport to the HI-STORE CIS Facility. Specific sections of the HI-STAR 190 SAR and/or HI-STAR 190 SER could be referenced, if appropriate, or additional analysis could be provided. The justification provided should demonstrate the analysis is bounding for all contents (e.g. both high and low burnup fuel).

This information is needed to determine compliance with 10 CFR 72.128(a)(3).

Holtec Response

The referenced text in Section 9.2.1 of the HI-STORE SAR has been updated to reference Chapter 4 (Sections 4.5 – 4.7) of the HI-STAR 190 SAR for the transportation containment evaluation, which demonstrates that the MPC meets the code-allowable stress limits during normal and hypothetical accident conditions of transportation. Additional defense in depth confirmation of the canister confinement system is provided via the leakage testing upon arrival at the HI-STORE CIS Facility.

RAI 9-6: Justify why the following statements from Section 9.2.1, "Storage Systems," of the HI-STORE SAR are not discussed or identified in Sections 5.4.e, "Design control and facility change or modification," and 5.4.I, "Records management," of Appendix A, "Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility," to the proposed Materials License.

> a. *"The canister records must be provided to the HI-STORE facility personnel prior to shipment of a canister." (Page 9-5)*
>
> b. *"These records must be reviewed and any applicable 10 CFR 72.48 screenings or evaluations written against the canister's original licensing basis evaluated against the HI-STORE site specific license to determine if a change requiring NRC approval is necessary." (Page 9-5)*

Because these statements identify actions that support design control, facility change or modifications, and records management activities, similar provisions should also be identified in Appendix A to the proposed Materials License for the HI-STORE CIS facility.

This information is needed to determine compliance with 10 CFR 72.24(g), and 72.44(c)(5).

Holtec Response

Section 5.5.5 (Canister Records) to Appendix A of the proposed Materials License has been updated to include requirements for canister records prior to shipment of a canister to the HI-STORE CIS Facility, including 10 CFR 72.48 screenings or evaluations written against the canister's original licensing basis evaluated against the HI-STORE site licensing basis.

Safety Analysis Report (SAR), Chapter 10, "Conduct of Operations Evaluation"

RAI 10-1: Clarify the reference air leakage rate acceptance criterion and leakage rate test sensitivity in Table 10.3.2, "Canister Leakage Test Performance Specifications," of the HI-STORE SAR to be consistent with ANSI N14.5-2014, "American National Standard for Radioactive Materials – Leakage Tests on Packages for Shipment."

Table 10.3.2 of the HI-STORE SAR describes the, "Reference air leakage rate (LR) acceptance criterion," as "2x10-7 ref-cm3/s air (leaktight as defined by ANSI N14.5-2014 [10.3.3], using helium as tracer gas)." The numerical value of leaktight (2x10-7 ref-cm3/s air) in Table 10.3.2 is not correct.

The definition of leaktight in ANSI N14.5-2014 is, "The degree of package containment that, in a practical sense, precludes any significant release of radioactive materials. This degree of containment is achieved by demonstration of a leakage rate less than or equal to 1x10-7 refcm3/s of air at an upstream pressure of 1 atmosphere (atm) absolute (abs), and a downstream pressure of 0.01 atm abs or less."

Table 10.3.2 of the HI-STORE SAR describes the, "Leakage rate test sensitivity," as, "1x10-7 refcm3/s air (1/2 of the leakage rate acceptance criterion per ANSI N14.5-2014 [10.3.3], using helium as tracer gas." As described in ANSI N14.5-2014, the leakage rate test procedure shall have a sensitivity less than or equal to one-half the reference air leakage rate; therefore the leakage rate test sensitivity should be corrected based on the definition of leaktight in ANSI N14.5-2014.

This information is needed to determine compliance with 10 CFR 72.24(g) 72.4(c)(3)(ii), and 72.128(a)(1).

Holtec Response

Holtec agrees that the definition of leaktight in the ANSI N14.5-2014 leak testing standard is as stated above. Per Section 6.3.2 of the standard, the reference air leakage rate is therefore equivalent to the defined leaktight criterion of $1x10^{-7}$ $refcm^3/s$ of air at an upstream pressure of 1 atmosphere (atm) absolute (abs), and a downstream pressure of 0.01 atm abs or less. As stated in Section 8.3 of the standard, if the leakage rate testing procedure requires the use of a tracer gas (helium, as specified in Table 10.3.2 of the SAR), the allowable leakage rate of the tracer gas is determined by adjusting for the relationship between the leakage rates for different gases at different pressure/temperature conditions. As documented in the calculation of B.15.13 Example 13 of the standard, the equivalent leakage rate of helium is $1.85x10^{-7}$ $refcm^3/s$. Holtec has rounded this upward in the Table to $2x10^{-7}$ $refcm^3/s$ of helium, based on similar rounding assumptions in ANSI N14.5-1997. However, to definitively provide an acceptable reference leakage rate that meets the leaktight definition of ANSI N14.5-2014, the value is changed to $1.85x10^{-7}$ $refcm^3/s$ in Table 10.3.2.

Similarly, the test sensitivity of $1x10^{-7}$ $refcm^3/s$ of helium is changed to $9.2x10^{-8}$ $refcm^3/s$ in Table 10.3.2, which is less than one-half of the reference leakage rate for testing with helium.

In Table 10.3.2, incorrect references to "air" are also changed to "helium" where appropriate, to specify that the reference leakage rate is based on the use of helium as the tracer gas. See table below (changes highlighted).

Table 10.3.2 Canister Leakage Test Performance Specifications	
Reference Helium Leakage Rate (L_R) Acceptance Criterion	1.85×10^{-7} ref-cm³/s helium (Leaktight as defined by ANSI N14.5-2014[10.3.3], using helium as tracer gas)
Leakage Rate Test Sensitivity	9.2×10^{-8} ref-cm³/s helium (½ of the leakage rate acceptance criterion per ANSI N14.5-2014 [10.3.3], using helium as tracer gas)
Type of Leakage Rate Test	A.5.4, per ANSI N14.5 [10.3.3], App. A
Instrument used	Helium mass spectrometer

RAI 10-2: Clarify Step 12 of Section 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," of the HI-STORE SAR. In addition, clarify Section 5.5.5.b.2 of Appendix A to the proposed Materials License, "Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility," and clarify the use of, "N14.5-2014."

Step 12 describes that leakage rate testing procedures shall be approved by an ASNT Level III specialist. Step 12 of Section 10.3.3.1 of the HI-STORE SAR does not specify that the written leakage rate testing procedures shall be developed and approved by personnel certified by the ASNT as a Level III examiner for leakage testing, as indicated by industry standards.

The ANSI/ASNT CP-189-2006, "Standard for Qualification and Certification of Nondestructive Testing Personnel," provides the minimum training, education, and experience requirements for nondestructive testing personnel. This Standard states that a nondestructive testing personnel Level III examiner has the qualifications to develop and approve written instructions for conducting the leak testing.

Step 12 of Section 10.3.3.1 of the HI-STORE SAR does not specify that the personnel performing leakage rate testing shall be qualified and certified in accordance with the Holtec QA program and Recommended Practice No. SNT-TC-1A.

This Recommended Practice recognizes that the effectiveness of NDT applications depends on the capabilities of the personnel who are responsible for, and perform, NDT. This Recommended Practice also establishes guidelines for the qualification and certification of NDT personnel whose specific jobs require appropriate knowledge of the technical principles underlying the nondestructive tests they perform, witness, monitor, or evaluate.

Table 10.3.2 of the HI-STORE SAR should be captured in Section 5.5.5.b.2 of Appendix A to proposed Materials License to completely describe the leakage rate testing performed on each canister during the receipt inspection. In addition, "N14.5-2014," does not accurately refer to, "ANSI N14.5-2014."

Holtec Response

The following changes are made to address RAI 10-2:

1) Step 12 of Section 10.3.3.1 is revised as follows, to clarify leak testing requirements (changes are highlighted):

12. The mass spectrometer leak test apparatus is attached to the sampling equipment connector and a leak test of the MPC is performed. Leakage rate testing is performed per procedures written and approved in accordance with the requirements of ANSI N14.5-2014 [10.3.3]. All testing is performed by personnel qualified in accordance with the Holtec QA program and certified in accordance with Recommended Practice No. SNT-TC-1A [10.3.2]. The written and approved test procedures shall clearly define the test equipment arrangement. Leakage rate testing procedures shall be approved by personnel certified by the ASNT as a Level III examiner for leakage testing. The applicable recommended guidelines of Recommended Practice No. SNT-TC-1A [10.3.2] shall be considered as minimum requirements. Canister leakage test specifications are listed in Table 10.3.2. If a canister leak is detected, the canister transfer operations are terminated and site management is informed for disposition.

2) Section 5.5.5.b.2 of Appendix A to the proposed Material License is revised as follows, to refer to Table 5.1 to specify leak testing methods and acceptance criteria, and to change “N14.5-2014” to “ANSI N14.5-2014” (changes are highlighted).

2. After passing the Krypton-85 test, each canister shall be subjected to a helium leak test in accordance with ANSI N14.5-2014. Leak testing methods and acceptance criteria are specified in Table 5.1. Canisters that fail to meet the acceptance criteria shall not be stored at HI-STORE and are shipped to the nuclear plant of origin or other facility licensed to perform fuel loading procedures.

3) Table 5.1 is added, as follows. Table 5.1 captures the leak test method and acceptance criteria from Table 10.3.2 of the SAR.

Table 5.1 **Canister Leakage Test Performance Specifications**	
Reference Helium Leakage Rate (L_R) Acceptance Criterion	1.85x10^{-7} ref-cm^3/s helium (Leaktight as defined by ANSI N14.5-2014[10.3.3], using helium as tracer gas)
Leakage Rate Test Sensitivity	9.2x10^{-8} ref-cm^3/s helium (½ of the leakage rate acceptance criterion per ANSI N14.5-2014 [10.3.3], using helium as tracer gas)
Type of Leakage Rate Test	A.5.4, per ANSI N14.5 [10.3.3], App. A
Instrument used	Helium mass spectrometer

RAI 10-3: Ensure accuracy and consistency when using, "HI-STAR," in Chapter 10, "Conduct of Operations Evaluation," of the HI-STORE SAR, and in Sections 4.2.6.4 and 5.5.5.b.1 of Appendix A to the proposed Materials License, "Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility."

The HI-STAR 190 is the transportation package, as described in Chapter 1, "General Description," (Page 1-22) of the HI-STORE SAR, therefore, Chapter 10 of the HI-STORE SAR should clearly describe the use of the, "HI-STAR 190," rather than, "[…] HI-STAR […]." Section 4.2.1, "Storage Systems," of Appendix A to the proposed Materials License (Page 4-1) should clearly describe the use of the, "HI-STAR 190," rather than, "[…] a 10 CFR 71 certified shipping package." Sections 4.2.6.4 and 5.5.5.b.1 of Appendix A to Materials License No. SNM-1051 (Pages 4-3 and 5-5) should also clearly describe the use of the, "HI-STAR 190," rather than, "[…] loaded Transport Cask […]."

This information is needed to determine compliance with 10 CFR 72.11(a).

Holtec Response

Holtec agrees that the transportation package shall be more clearly specified as the HI-STAR 190, as suggested. The following changes are made:

1) All instances in Chapter 10 changed from "HI-STAR" to "HI-STAR 190".

2) In Section 4.2.1 of Appendix A to the proposed Material License, "10 CFR 71 certified shipping package" is changed to "HI-STAR 190".

3) In Section 4.2.6.4 of Appendix A to the proposed Material License, "transport cask" is changed to "HI-STAR 190".

4) In Section 5.5.5.b.1 of Appendix A to the proposed Material License, “transport cask” is changed to “HI-STAR 190” in four places.

RAI 10-4: Specify the types of canister integrity testing in Section 10.2.2.1, “Pre-operational Testing of Equipment,” of the HI-STORE SAR.

It is not clear if the canister integrity testing in Section 10.2.2.1 of the HI-STORE SAR includes the HI-STAR 190 cavity gas sampling for Krypton-85, HI-STAR 190 cavity evacuation, flushing, and potential backfill, and MPC leakage rate testing while in the HI-STAR 190.

This information is needed to determine compliance with 10 CFR 72.24(p).

Holtec Response

Canister integrity testing refers to functionally testing all of the operations required for testing the integrity of the MPC, including the installation of Krypton-85 sampling equipment, the performance of sampling operations, the evacuation and flushing of the shipping cask, and the actual performance of canister leak testing operations. The description of “canister integrity testing” in Operation 3 of Section 10.2.2.1 has been expanded, as shown below, to include this information (changes are highlighted).

3. Canister integrity testing, including cavity gas sampling for Krypton-85, cavity evacuation, flushing and potential backfill, and MPC leakage testing while in the HI-STAR 190.

RAI 10-5: Provide additional description for the leakage rate test equipment validation described in Section 10.2.2.3, “Other Testing,” of the HI-STORE SAR.

Section 10.2.2.3 of the HI-STORE SAR describes that leak test equipment used for sampling the HI-STAR transportation annulus will be calibrated using a suitable reference concentration of Krypton-85 gas. It is not clear how a suitable reference concentration compares to the Krypton-85 acceptance criterion provided in Table 10.3.3, “Acceptance Criteria for Testing of Shipping Cask Gas Sample,” or if the suitable reference concentration is determined by qualified personnel. In addition, calibration of the leak test equipment for helium should also be described in Section 10.2.2.3 of the HI-STORE SAR.

This information is needed to determine compliance with 10 CFR 72.24(e) and 72.128(a)(1).

Holtec Response

To provide additional information on the basis for calibration acceptance criterion and qualification, the third paragraph of Section 10.2.2.3 is revised as follows (changes highlighted).

Sampling equipment validation: Equipment used for sampling gas from the HI-STAR 190 transport cask annulus will be calibrated by qualified personnel using a NIST-traceable validation source in accordance with NRC Regulatory Guide 1.21 [10.2.1]. Equipment will be functionally tested to both ensure repeatable operation and evaluate, and improve, the efficiency of the sampling operations.

NRC Regulatory Guide 1.21 is also added to the References in Chapter 19 of the SAR.

Requirements for calibration of leak test equipment are added to Subsection 10.2.2.3 as follows.

> Leak test equipment calibration: Equipment used for leak testing will be calibrated per the requirements of ANSI N14.5-2014 [10.3.3] before and after leak test measurements.

RAI 10-6: Clarify Section 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," steps 4 and 5 of the HI-STORE SAR.

Section 10.3.3.1, step 3 of the HI-STORE SAR states:

> *"The HI-STAR transportation package is moved into the CTB." Section 10.3.3.1, step 4 of the HI-STORE SAR describes, "The personnel barrier, if used is removed […]"*

In addition, Section 10.3.3.1, step 5 of the HI-STORE SAR describes:

> *"The HI-STAR shipment personnel barrier and tie-downs are removed."*

It is not clear if the removal of the personnel barriers in steps 4 and 5 is redundant, or if there are two different personnel barriers.

This information is needed to determine compliance with 10 CFR 72.11(a).

Holtec Response

The HI-STAR 190 package has only a single personnel barrier. Step 5 of Section 10.3.3.1 incorrectly, and redundantly, includes removal of the personnel barrier which has already been performed in Step 4. Step 5 of the SAR is therefore revised to consist of only removal of the tie-downs and radial spacers.

NOTE: Also, the term "radial spacers" in Step 5 is revised to state "radial shims", for better agreement with the terminology used in the HI-STAR 190 SAR. This change is editorial only, and does not reflect any change to the design or operations. Revised Step 5 is shown below (changes highlighted).

> 5. The HI-STAR 190 tie-downs are removed. The radial shims are removed from the top and bottom of the cask.

RAI 10-7: Clarify the following statements related to fission gas sampling, specifically Krypton-85, in Section 9.2.2, "Operational Activities," and Section 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," step 10 of the HI-STORE SAR. The HI-STORE SAR text is underlined below for emphasis.

Section 9.2.2 (Page 9-6) of the HI-STORE SAR describes:

> *"One of the vent/drain ports of the transportation cask is opened to allow access to the small free volume between the canister and the cask."*

Section 10.3.3.1, step 10 of the HI-STORE SAR describes:

"As a safety precaution, the HI-STAR closure lid access port cover is removed and sampling equipment is attached to test for the presence of Krypton-85."

Neither statement specifies if the vent port or drain port of the HI-STAR 190 is used. It is not clear whether both the vent and drain port of the HI-STAR 190 could provide an adequate sample of Krypton-85 considering that attached to the drain port is a drain tube that extends to the bottom of the package, therefore the sample is coming from the bottom of the HI-STAR 190. Sampling from the vent port, where the sample is coming from the top of the HI-STAR 190, may not allow for circulation of the higher density Krypton-85 gas (i.e. heavier gas).

This information is needed to determine compliance with 10 CFR 72.24(e), 72.44(c)(ii), and 72.128(a)(1).

Holtec Response

Section 9.2.2 erroneously implies that there are multiple ports in the HI-STAR 190 transportation cask. However, there is only a single access port, located in the cask closure lid. During shipment, the single port is oriented at the lowest location of the cask, which will be in a horizontal orientation. Sampling from this port in this orientation therefore ensures that any Krypton-85 gas will be detected regardless off the amount of mixing within the annulus between the MPC and transportation cask ID, due to the higher density of the Krypton-85 gas. The sentence referred to in the RAI from Section 9.2.2 is therefore changed as follows (changes highlighted).

- The transportation cask's closure lid access port is opened to allow access to the small free volume between the canister and the cask. For this activity, the port is covered by appropriate means, so that in the unlikely event that the volume would contain any radioactive material, it would not be released into the local work area (transfer building), but appropriately collected.

No revision to the sentence referred to in the RAI from Section 10.3.3.1 is required, as it correctly implies that there is only a single access port in the HI-STAR 190 transportation cask.

RAI 10-8: Clarify the following statements related to testing for fission products in Section 9.2.2, "Operational Activities," and Section 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," steps 11 and 12 of the HI-STORE SAR.

Section 9.2.2 (Pages 9-6 and 9-7) of the HI-STORE SAR describes:

"The gas extracted from the volume during the evacuation and helium testing is also collected and tested for any fission products before being released."

Section 10.3.3.1, steps 11 and 12 of the HI-STORE SAR do not describe testing the gas extracted from the volume between the HI-STAR 190 and the MPC for fission products. The specific fission products tested should be provided in Section 10.3.3.1, steps 11 and 12 of the HI-STORE SAR.

This information is needed to determine compliance with 10 CFR 72.24(e), 72.44(c)(ii), and 72.128(a)(1).

Holtec Response

Section 9.2.2 incorrectly states that the gas used to flush the HI-STAR 190 should be tested for fission products prior to release. Such testing is not required, as a negative result during initial testing for Kr-85 ensures that no detectable Kr-85 will be found in any subsequent gas releases, due to the significant additional dilution that will occur during backfill and flushing. The acceptance for the initial Kr-85 testing is based on occupational derived air concentration limits for Krypton-85 of Appendix B to 10 CFR Part 20. All subsequent gas releases are ensured to be below this criteria.

To correct this, the sentence referred to in the RAI from Section 9.2.2 of the SAR is deleted. In addition, the bullet that following this sentence in Section 9.2.2 of the SAR is revised as follows to remove reference to this unnecessary testing for fission gases (deletions only, therefore no highlighting).

- If the leak tightness of the canister cannot be ascertained the port will be resealed and the cask will be classified as “not acceptable”. For further processing of casks that are not acceptable see Subsection 10.3.3.

During the course of preparing this RAI response, it was noted that Step 11 of Subsection 10.3.3.1 refers to “removal” of the sampling equipment used to test for the presence of Kr-85 gas in Step 10 prior to performing flushing and canister leakage testing. For operational efficiency, this wording is excessively restrictive. “Removed” is therefore changed to “isolated” to more clearly reflect the intended operation.

<u>Safety Analysis Report (SAR), Chapter 17, "Material Considerations"</u>

RAI 17-4: Provide justification for performing only visual examinations for the transfer cask and canister transfer facility welds that are fabricated in accordance with American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section III, Subsection NF.

SAR Section 1.5, Drawing No. 10868, "HI-TRAC CS," and Drawing No. 10895, "Canister Transfer Facility," indicate that the welds performed in accordance with ASME Code Section III Subsection NF are only visually examined. However, the ASME Code requires additional nondestructive examinations for welding of several types of components, such as primary members of Class 1, 2, and metal containment supports. The staff requires additional information regarding the specific Code criteria used in the design of the transfer cask in order to evaluate the adequacy of the welding inspections. If the welding inspections are not performed in accordance with the Code, provide a justification for performing only visual examinations.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3).

Holtec Response

The structural components of HI-TRAC CS and the CTF are designed to Section III, Subsection NF, Class 3 of the ASME Code. All welds have a groove depth or throat dimension less than 1". Per paragraph NF-5230 of the Code, the welds therefore require only visual inspection. This is consistent with the approach to previous HI-TRACs, overpacks and structurally similar components described in the HI-STORM 100 FSAR (USNRC Docket No. 72-1014) and the HI-STORM FW FSAR (USNRC Docket No. 72-1032), which have been previously reviewed and approved by the USNRC.

To provide clarification in the SAR, Subsection 4.3.3.1 of Chapter 4 is revised to add a reference to the "Class 3" designation for the HI-TRAC CS design. Subsection 4.3.5.1 of Chapter 4 is similarly revised for the CTF design.

RAI 17-9: Clarify the required density of the concrete and soil used in the shielding evaluation.

The SAR contains inconsistencies and unclear terminology regarding the referenced values of concrete and soil density, as follows:

- The drawing for the VVM states that the plenum shield concrete shall have a minimum dry density as specified for the closure lid in Table 2.3.2 of the HI-STORM UMAX FSAR. However, the minimum density of the closure lid in that table differs from the specified density of the plenum shield concrete in Table 7.3.1 of the HI-STORE SAR.

- Section 7.3.1 of the HI-STORE SAR states that the shielding material properties (other than that for the transfer cask) are provided in Table 5.3.2 of the HI-STORM UMAX SAR. However, Table 5.3.2, "Composition of the Materials in the HI-STORM FW System," does not address the subgrade requirements unique to the underground system. The staff notes that the HI-STORM UMAX FSAR, Table 2.3.2 has density requirements for the subgrade that are used in the shielding analysis.

- In Table 7.3.1 of the HI-STORE SAR, it is unclear what the word “Ground” refers to in the “HI-TRAC CS Concrete” line item.

- In Table 7.3.1 of the HI-STORE SAR, it is unclear if the word “Ground” under the “Soil” line item is intended to refer to all subgrades, or just that between the ISFSI pad and support foundation pad. The staff notes that the HI-STORM UMAX FSAR has different density requirements for the subgrade at the pad and the subgrade adjacent to the pad (referred to as Space A and Space B, respectively, in Figure 2.4.4 of the HI-STORM UMAX FSAR and 4.3.1 of the HI-STORE SAR).

This information is required to demonstrate compliance with 10 CFR 72.24(d) and (e).

Holtec Response

Chapter 7 of the HI-STORE FSAR and Chapter 5 of the UMAX FSAR provide details of compositions and densities used in the shielding analyses and in general are meant to provide a realistic to slightly conservative shielding model for calculating dose rates at various locations outside the UMAX. The four bullets in RAI 17-9 have been lettered [a] through [d], to facilitate a clear response to each bullet point.

[a]. Using a slightly lower concrete density for the plenum shield concrete than what is specified in the HI-STORM UMAX FSAR Table 2.3.2 and Drawing 10875R0 (HI-STORE FSAR Section 1.5 Licensing Drawings) in the shielding MCNP model is slightly conservative. The density used in the shielding model is accurately documented in Table 7.3.1.

[b]. The first paragraph of Section 7.3.1 discusses the composition and material properties of the HI-STORM UMAX system and the second paragraph discusses the composition and material properties of the HI-TRAC CS. Both paragraphs mention Table 7.3.1 for the composition and material properties used in HI-STORE site-specific analyses. In Section 5.3 of the HI-STORM UMAX FSAR it is mentioned that “The actual density [of soil and concrete] will be considered for site specific [shielding] calculations.” The density and composition of the soil/subgrade/ground in the HI-STORM UMAX FSAR Shielding Chapter 5 and/or the HI-STORE FSAR Shielding Chapter 7 models either match the values in the HI-STORM UMAX FSAR Table 2.3.2, or are selected to be slightly conservative from a shielding perspective, or conform to site-specific considerations.

[c]. The word “Ground” in the “HI-TRAC CS Concrete” row of Table 7.3.1 refers to the concrete ground below the HI-TRAC CS (See Figure 7.4.1). This is intended to be a generic concrete ground surface that is modeled since there is some radiation scattering/deflection on this surface which can impact dose rates especially at the Bottom Duct locations 0.5 meters to 2 meters from the HI-TRAC CS (Table 7.4.1). This concrete ground surface would be present below the HI-TRAC CS in the Canister Transfer Building, the haul path, and the ISFSI.

[d]. A soil density of 1.7 g/cm3 was used at or below the level of the bottom of the VVM, which includes the area at or below the elevation of the Support Foundation Pad (Includes Space C in Figure 2.4.4 of the HI-STORM UMAX FSAR). Otherwise, a density of 1.92 g/cm3 is used in the

area adjacent to the sides of the VVM and along the soil ground surface adjacent to the ISFSI pad (Space A and Space B of Figure 2.4.4 of the HI-STORM UMAX FSAR). A density of 1.92 g/cm3 in Space B is a reasonable site specific value to use for the soil. In the HI-STORE UMAX Version C MCNP Shielding model, the Space B soil is more than a couple meters horizontal distance from the edge of the HI-STORM UMAX lid, so in this case, using a slightly greater soil density than actual is slightly conservative from a shielding perspective due to slightly greater deflection and scattering off a slightly denser soil surface for dose locations 10 m to 1000 m (Table 7.4.3) from the nearest loaded HI-STORM UMAX VVM.

RAI 17-12: Provide additional information to justify the statements in HI-STORE SAR Chapter 18 that the halide content in the air at the HI-STORE site is negligible with respect to the potential to cause stress corrosion cracking of stainless steel.

HI-STORE SAR Section 18.3 states that “the halide content in the air is negligible.” SAR Section 18.4 states that the air contains a “minuscule concentration of halides” and that the relative humidity in the high desert of southeastern New Mexico is low, making the delivery of salts to the canister surface less effective.

The staff notes that it does not appear that the above conclusions in HI-STORE SAR Chapter 18 are supported by local the area information provided in SAR Chapter 2 and the Environmental Report, as follows:

- SAR Chapter 2 describes the area around the site as containing several playas, or transitory shallow lakes, that contain accumulations of halite (sodium chloride) and gypsum. The SAR also states that the surrounding area historically has been mined for potash. The staff notes that sylvinite, a mixture of sylvite (potassium chloride) and halite, is the typical potash ore mined in the Carlsbad Potash District in southeastern New Mexico (Barker and Austin, 1993). Magnesium-containing minerals, such as langbeinite (potassium magnesium sulfate) and carnallite (potassium magnesium chloride) are also common to the area.

- Section 3.5.1 of the Environmental Report notes the high salinity conditions in the local playas, which includes Laguna Gatuna and Laguna Plata within two miles of the site.

- In contrast to the statement in SAR Section 18.4, low levels of relative humidity are typically associated with a greater degree of dust transport in semi-arid climates (Csavina et al., 2014).

- SAR Section 2.1.2 states that soil samples at the HI-STORE site had chloride concentrations of 26-43,000 mg/kg, although the SAR concludes that the high chloride measurements were due to sampling in areas previously used for oilfield disposal.

The staff requires additional justification for why the salts that are known to be present in the surrounding area would not be expected to be transported to the canisters, and why elevated salt concentrations in the soil were necessarily attributed to the oil field rather than the naturally occurring salt deposits in the region and high salinity of the local playas.

This information is required to demonstrate compliance with 10 CFR 72.122(b)(1).

References:

J.M. Barker and G.S. Austin, "Economic Geology of the Carlsbad Potash District, New Mexico," Carlsbad Region (New Mexico and West Texas), Love, D. W.; Hawley, J. W.; Kues, B. S.; Austin, G. S.; Lucas, S. G.; [eds.], New Mexico Geological Society 44th Annual Fall Field Conference Guidebook, 1993, pp. 283-291 [available at http://nmgs.nmt.edu/publications/guidebooks/44].

Csavina, J., J. Field, O. Felix, A Corral-Avitia, A. Saez, and E. Betterton, "Effect of Wind Speed and Relative Humidity on Atmospheric Dust Concentrations in Semi-Arid Climates," Science of the Total Environment, Vol. 487, pp. 82-90, 2014 [available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4072227/]

Holtec Response

The salts in the surrounding area are not expected to be transported to the canisters due to the design of the system. The canisters are stored within vaults, surrounded by a large amount of solid subgrade. Each canister is also surrounded by a steel CEC, which prevents intrusion through the subgrade to the canister. It should also be noted that although it is not anticipated that significant amount of salts will be transported to the canisters, Holtec has still implemented a full aging management program, as described in Chapter 18. This program involves canister inspections over the life of the canisters. This program will monitor the condition of the canisters for all degradation mechanisms and take corrective actions as necessary.

The elevated salt concentrations in the soil were attributed to the oil field based on the discussion in Reference (ELEA 2007) of the Environmental Report, Section 2.11.4.1, which shows the location of those soil samples as areas where brine was used in the oil field.

RAI 17-13: Clarify the coating requirements in the drawings and provide additional information in the SAR on the functions and materials for the coatings used at the HI-STORE CIS Facility.

HI-STORE SAR Section 17.2 states that acceptance criteria for materials subject to long-term storage include ensuring that coatings remain intact and adherent. In addition, SAR Sections 17.7 and 17.11 describe the role of coatings to prevent corrosion of all exposed carbon steel surfaces. However, the staff notes that most of the drawings for carbon steel components do not specify the use of coatings and the maintenance activities described in SAR Table 10.3.1 refer to coating inspections for only a portion of the carbon steel components. As a result, it is unclear to the staff whether coatings are considered necessary to prevent the degradation of ITS SCCs.

Clarify the functions, materials, and maintenance activities for all coatings used at the HI-STORE CIS Facility, addressing (but not necessarily limited to):

- Clarify coating requirements in all drawings.

- Provide specific information on coating materials (i.e., chemistry and proprietary coating names). SAR Section 17.7 states that steel surfaces, except the exterior of the canister enclosure container, are coated with the same or equivalent preservative as used in the HI-STORM FW and HI-STORM 100 overpacks. However, that information is not incorporated by reference into the HI-STORE SAR. The SAR also does not define which specific Keeler and Long coating is acceptable for the canister enclosure container. The HI-STORE SAR should provide details on coatings to be used at the HI-STORE CIS Facility or incorporate by reference such information.

- Revise SAR Table 10.3.1 to describe coating maintenance activities for all carbon steel surfaces where coatings are credited for preventing the degradation of ITS SCCs.

- Clarify SAR Section 17.6, which states that coatings will be used for bolts if the ambient environment is aggressive. For the ITS bolts at the HI-STORE CIS Facility, clarify whether the environment is considered aggressive, and if so, provide coating requirements.

- Describe the VVM divider shell coating material referenced in VVM drawing 10875, which is stated to be necessary to meet emissivity requirements.

- Describe the coating used on the ISFSI concrete surrounding the VVMs. SAR Section 18.3 states that this coating will prevent spalling of the concrete.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3) and 72.122(b)(1).

Holtec Response

Coatings are considered necessary to prevent the degradation of ITS SCCs, and are therefore regularly inspected. The following responses address the specific bullets of this RAI, in order of presentation:

1) For convenience, all coating requirements are fully defined in the SAR. Drawings therefore do not include requirements for coating.

2) To incorporate coating requirements by reference, Section 17.7 is revised as shown below, to incorporate coatings defined as acceptable from the HI-STORM FW FSAR (third sentence, as highlighted).

> All VVM components are protected from galvanic corrosion by appropriate designs. Except for the CEC exterior surfaces (exterior CEC surface coating requirements discussed separately), all carbon steel surfaces of the VVM are lined and coated with the same or equivalent surface preservative that is used in the aboveground HI-STORM FW and HI-STORM 100 overpacks. Acceptable coatings are fully characterized in the HI-STORM FW FSAR [1.3.7] in Paragraph 8.7.2 and Appendix 8.A, which are incorporated herein by reference [see Table 17.0.2]. The same is true for all the other ITS SSCs and care is taken to avoid the formation of corrosion products by deposition of appropriate coatings, as necessary. The pre-approved surface preservative is a proven zinc-rich inorganic/metallic (may also be an organic zinc rich coating) material that protects galvanically and has self-healing characteristics for added protection. The coating also meets the emissivity requirements of Table 4.2.4 of [1.0.6], which is incorporated by reference into Section 6.4.1 of this FSAR, for the interior surface of the CEC divider shell. All exposed surfaces interior to the VVM are accessible for the reapplication of surface preservative, if necessary.

Table 17.0.2 is also revised to incorporate Section 8.7.2 and Appendix 8.A by reference from the HI-STORM FW FSAR (addition is highlighted):

Table 17.0.2: Material Incorporated By Reference				
Information Incorporated by Reference	**Source of the Information**	**NRC Approval of Material Incorporated by Reference**	**Location in this SAR where Material is Incorporated**	**Technical Justification of Applicability to HI-STORE**
Fuel Integrity Evaluation	Section 8.13 of [1.3.7]	SER HI-STORM FW Amendments 0, 1, and 2 References [8.0.1, 8.0.2, 8.0.3]	Section 17.12	The fuel remains in seal welded canisters, with lower temperatures and pressures than originally licensed, therefore the fuel integrity evaluation is still applicable.
Examination and Testing	Section 8.13 of [1.0.6],	SER HI-STORM UMAX Amendments 0, 1, and 2 References [7.0.1, 7.0.2, 7.0.3]	Section 17.12	The canisters to be stored at the HI-STORE facility must fully meet the fabrication examination and testing requirements that are in the HI-STORM UMAX FSAR.
Acceptable Coatings	Section 8.7.2 and Appendix 8.A of [1.3.7]	SER HI-STORM FW Amendments 0, 1, and 2 References [8.0.1, 8.0.2, 8.0.3]	Section 17.7	Surface preservative requirements are identical to those defined for HI-STORM FW system; coatings defined for the HI-STORM FW system are therefore applicable.

The specific reference to the Keeler & Long polyamide-epoxy coating is removed from this SAR, as the use of this coating is not required. The third paragraph of Subsection 17.7.1 is therefore deleted.

3) The following changes are made to Table 10.3.1 to better describe all coating maintenance activities for all carbon steel surfaces where coatings are credited for preventing the degradation of ITS SCCs.

Activity #1 is revised as shown below (changes are highlighted):

1.	Visual Inspection of CEC Cavity	Prior to MPC installation	To ensure that VVM internal components are properly aligned, the surface preservatives on all exposed surfaces are undamaged (including Divider Shell), the insulation on the Divider Shell is undamaged and the cavity is free of visible foreign material.

Activity #12 is revised as shown below (changes are highlighted):

12.	Visual Inspection of CTF	Prior to each handling campaign	Verify flow passages are free of significant foreign material. Verify surface coatings of accessible surfaces of CTF are intact

4) The environment at the HI-STORE site is not considered to be aggressive. Therefore, the last sentence of the second paragraph of Section 17.6 is deleted.

5) The required properties for the divider shell coating material are incorporated from Table 4.2.4 (as stated on drawing 10875) of the HI-STORM UMAX FSAR, and are referenced in Subsection

6.4.1 of this SAR. As listed in Table 4.2.4 of the HI-STORM UMAX FSAR, the only required property of the paint surface is its emissivity. All coating requirements of Section 17.7 of this SAR are also applicable. To clarify this, a statement to this effect is added to Section 17.7 (second to last sentence, as shown in 2nd response to this RAI, as highlighted).

6) SAR Section 18.3 refers to the use of a penetrating, water-repellent sealant (such as OKON S-20) to prevent water infiltration that may contribute to spalling of the concrete due to freeze/thaw cycles. Such a coating does not provide protection against concrete spalling caused by mechanical means. The second paragraph of Section 18.3.iv is revised as follows to better describe the function of the concrete surface coating (changes highlighted).

> Likewise spalling of the ISFSI concrete surface around the VVM due to freeze/thaw cycles following water infiltration is prevented by keeping the surface coating in good condition through preventive maintenance.

RAI 17-14: Clarify the details of the VVM maintenance activities. The staff notes that some portions of the HI-STORE SAR descriptions of the VVM maintenance activities are unclear with respect to inspection details:

- For the annual VVM in-service inspection for long-term degradation, neither SAR Section 10.3.4 nor Table 10.3.1 explicitly state how many VVMs will be inspected. SAR Section 10.3.4 (though not Table 10.3.1) states the 5-year inspection will be performed on one VVM, but the sampling for the annual inspection is not described.

- SAR Section 10.3.4 states that inspection activities include those for cavity enclosure container (CEC) wall thinning. It is not clear how the proposed borescope inspection will measure wall thinning, especially for thinning occurring from the outside surface of the CEC shell in contact with the subgrade.

- It is not clear what is considered an accessible area for the annual visual inspections. SAR Section 10.3.4 states that the “more thorough” 5-year inspection will use remote devices, such as a borescope; however, no similar description is provided for the annual visual inspection. As a result, it is unclear to the staff whether the annual inspections are simply “walk-downs” of the VVMs or a more-focused remote inspection capable of identifying degradation of the interior of the cavity enclosure container.

In order to allow the staff to evaluate the adequacy of the VVM inspections, provide clarifying details to address the above issues related to maintenance.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

Holtec Response

Yearly in-service inspection will be performed on every loaded HI-STORM UMAX VVM. For clarity, the third paragraph of Section 3.4 is revised to remove any description of the scope of the yearly in-service scope and five-year inspections. The scope and frequency of these inspection are now defined entirely in Table 10.3.1. Revised paragraph is shown below, with highlighted revisions:

> In-service inspection shall be performed by visual inspection of accessible areas of the HI-STORM UMAX VVM. Additional in-service inspection activities will be performed to visually inspect for interior and below-grade degradation. The frequency and scope of these visual in-service inspections are described in Table 10.3.1. Acceptance criteria for visual inspections shall be based on confirmation that the components continue to meet the licensing basis design requirements.

Activity #8 of Table 10.3.1 is revised as shown below, with highlighted additions, to indicate that in-service inspections are performed on all loaded VVMs.

8.	VVM In-Service Inspection	Annually, for all loaded VVMs	Ensure that the vent screen assembly fasteners or weldments remain coated with preservative, the screen is present and undamaged, all visible external surfaces are free from significant corrosion and identification markings remain legible.

Activity #10 of Table 10.3.1 is revised as shown below, with highlighted additions, to consolidate the scope and frequency of these inspections within the table.

10.	Additional VVM In-Service Inspection for Long-Term Interior and Below-grade Degradation	Every five years. The oldest VVM or VVM considered to be most vulnerable to corrosion degradation shall be selected for inspection.	Visual inspection of accessible exterior and interior surfaces of the VVM to determine the general condition of the system and assess long-term degradation. Condition of surface coatings, divider shell insulation and internal passages shall be evaluated and corrected as needed. Inspection and removal of accumulated foreign material, if any, shall be performed if required. CEC interior surfaces shall be inspected for corrosion and visible wall thinning. VVM may be inspected using remote devices such as a borescope.

The potential for CEC wall thinning will be assessed by visual inspection for any corrosion and/or pitting on the interior surfaces of the CEC. As stated in Section 17.7 of this SAR, the CEC is surrounded by a non-aggressive "free-flow" concrete around the structure, isolating it from any possible aggressive corrosion agents in the native soil. As stated in Subsection 17.7.1, the CEC exterior coating is suitable for immersion or below-grade service. Because the CEC is a buried structure, degradation of the coating due to abrasion or other external contact during the life of the CEC is not feasible. Thus, inspection of the

CEC internal surface serves as a viable method for determining the potential for any wall thinning due to localized CEC corrosion.

RAI 17-22: Provide additional details on the areas that will be visually inspected as part of the HI-TRAC CS transfer cask maintenance program prior to each handling campaign.

Table 10.3.1 of the HI-STORE SAR states that, prior to each handling campaign, surface coatings will be verified to be intact, shield gates will be confirmed to be operational, and trunnions will be inspected for indications of overstress, such as cracking.

In order to allow the staff to evaluate the efficacy of the transfer cask maintenance program, provide additional information in Table 10.3.1 regarding:

- The specific subcomponents or areas that are included in the visual inspection for coating integrity, including whether the transfer cask cavity (inside surface) is inspected;
- Clarification of whether the bottom lid bolts and bolt holes are inspected (as stated in SAR Section 10.3.4.1), and;
- The technical basis for using visual inspections to identifying trunnion cracking. ASME Code Section V, "Nondestructive Examination," Table A-110, "Imperfection vs Type of NDE Method," states that fatigue cracks can be detected by most liquid penetrant and magnetic particle techniques. However, for visual examinations, the Code states that "special techniques, conditions, and/or personnel qualifications are required to detect this imperfection."

This information is required to demonstrate compliance with 10 CFR 72.120(a).

Holtec Response

All carbon steel components that comprise the HI-TRAC will be coated to prevent corrosion, and the coating will be inspected as part of maintenance activities. Activity #11 of Table 10.3.1 of the SAR (Visual Inspection of HI-TRAC CS) is therefore revised as follows to better specify the surfaces to be inspected. A requirement to inspect stud threads is also added. Changes are shown highlighted.

11.	Visual Inspection of HI-TRAC CS	Prior to each handling campaign	Verify surface coatings of interior and exterior surfaces of the cask (including internal hole surfaces, etc.) and all shield gate components are intact. Verify shield gate operation mechanism appears undamaged and functional. Inspect tie-down stud threads for damage or wear. Lifting trunnions shall be inspected for indications of overstress such as cracking, deformation or wear marks.

The trunnion inspection specified in Activity #11 of Table 10.3.1 is a pre-use inspection of the general condition of the trunnions, and therefore does not invoke any special qualifications or techniques for the visual examination. Due to the critical nature of the upper trunnions for lifting the HI-TRAC CS, maintenance per the requirements of ANSI 14.6, which includes requirements for post-load test inspections, are applicable to the HI-TRAC CS trunnions. For clarity, this is added as Activity #13 of Table 10.3.1, as shown below.

13.	Testing and Inspection of HI-TRAC CS Upper Trunnions	Per requirements of ANSI 14.6 [1.2.4].	Verify continuing compliance with ANSI 14.6 [1.2.4]. Identify cracks and/or permanent deformation indicating a need for trunnion replacement.

RAI 17-23: Provide additional details on areas that will be visually inspected on the HI-TRAC CS transfer cask as part of the HI-TRAC CS AMP in Holtec Report No. HI-2167378 and justify the use of visual inspections to identify trunnion cracks.

Holtec Report No. HI-2167378 states that all accessible painted surfaces will be inspected for corrosion and paint degradation and the water jacket will be inspected for leaks. SAR Section 18.6 and Report No. HI-2167378 also state that visual inspections will be used to identify trunnion cracks.

In order to allow the staff to evaluate the efficacy of the HI-TRAC CS AMP, clarify the following:

- If the transfer cask cavity (inside surface) is considered an “accessible” painted surface. If not, state how the degradation of these surfaces will be monitored.
- Clarify the reference to a water jacket; transfer cask drawing no. 10868 does not include a water jacket.
- (Similar to RAI 17-21 for transfer cask maintenance) The technical basis for using visual inspections to identifying trunnion cracking.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

Holtec Response

The following changes are made to the HI-TRAC CS AMP in Holtec Report No. HI-2167378:

1) The inside surface of the HI-TRAC CS is considered an “accessible” surface. The HI-TRAC CS AMP in report HI-2167378 is therefore revised to state the following (addition in **BOLD**):

    - All accessible painted surfaces, **which includes the inside surface of the cask cavity,** will be inspected for corrosion and chipped, cracked or blistered paint.

2) As noted, the HI-TRAC CS design does not include a water jacket. The incorrect reference to inspecting the water jacket for leaks is removed from the HI-TRAC CS AMP in report HI-2167378.

3) Similar to the response to RAI 17-22, the visual inspection of the general condition of the trunnions does not invoke any special qualifications or techniques. Maintenance per the requirements of ANSI 14.6, which includes requirements for testing to verify continuing compliance, are relied upon to detect any trunnion defects.

RAI 17-24: In SAR Table 10.3.1, provide additional information regarding the maintenance requirements, if applicable, for the special lifting devices, CTB crane, canister transfer facility (CTF), CTF floor slab, and transport cask tilt frame.

SAR Table 10.3.1 provides the maintenance activities at the HI-STORE CIS Facility; however, it is missing information found elsewhere in the SAR for maintenance of the special lifting devices, CTB crane, CTF, CTF floor slab, and transport cask tilt frame. Update the table to provide the scope, inspection method, frequency (or applicable standard) for the maintenance activities.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

Holtec Response

Table 10.3.1 is revised as shown below to add Activities 14 through 17.

14.	Testing and Inspection of Special Lifting Devices	Per requirements of ANSI 14.6 [1.2.4].	Verify continuing compliance with ANSI 14.6 [1.2.4]
15.	CTB Crane Maintenance	Annually	Maintenance per requirements of ASME B30.2 [4.5.11] and manufacturer's recommendations
16.	CTF Floor Slab Inspection	Annually	Visual inspection of all accessible surfaces for cracking, loss of material, permeability and integrity.
17.	Transport Cask Tilt Frame Inspection	Annually	Visual inspection of all accessible surfaces for corrosion and integrity, including evaluation of dents, scratches, gouges or other damage.

RAI 17-27: Clarify the maintenance activities for the cask transfer building crane.

HI-STORE SAR Section 10.3.7 states that crane systems designed to ASME NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," shall be maintained per the requirements of that standard.

The staff notes that, as stated in ASME NOG-1 Nonmandatory Appendix C, this standard is a design standard and does not address operation and maintenance.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

Holtec Response

Holtec agrees that ASME NOG-1 is a design standard, and does not address operation and maintenance. Subsection 10.3.7 is therefore revised as follows, to provide necessary requirements and guidance for crane maintenance (changes highlighted)

10.3.7 Maintenance Programs for ITS Crane Systems

Maintenance, inspection and testing of crane systems designed to ASME NOG-1 [3.0.1] shall per the requirements of ASME B30.2 [4.5.11] and manufacturer's recommendations.

HI-STORE CIS Environmental Report (ER)

Transportation (TR):

RAI ER-TR-1: Provide input and output files for the incident-free transportation dose and risk calculations in the ER that were conducted with both RADTRAN and TRAGIS codes.

This information is needed to conduct a detailed evaluation of the calculations. The provisions of 10 CFR 51.45(c) require that analyses in environmental reports be quantitative to the fullest extent practicable and contain sufficient data to aid the NRC in its development of an independent analysis.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

To clarify the statements in the ER related to RADTRAN and TRAGIS, the incident-free radiological transportation analysis tiers from the analysis prepared for the proposed WCS CISF in Andrews County, Texas [TR-1-1]. That analysis utilized RADTRAN, but it was not re-run for the HI-STORE ER, so there are no input and output files.

Based on the calculations performed in the WCS ER, the maximum dose for one shipment was estimated at 1.79 x 10^{-3} mrem. This value was then used to calculate environmental impacts for transporting canisters. The numbers from the WCS ER are shown below, and were scaled based on the increased number of canisters at the HI-STORE facility (2.5 times), as shown. The facilities are very close in location and so the comparison is appropriate.

Parameter	**WCS (from [TR-1-1], Table 4.2-4)**	**HI-STORE**
Number of Canisters Transported Annually	200	500
Maine Yankee to CISF Collective Dose (person-rem)	37	92.5
SONGS to CISF Collective Dose (person-rem)	8.9	22.3
CISF to Yucca Mountain Collective Dose (person-rem)	23	57.5

References:
[TR-1-1] Waste Control Specialists (WCS). “WCS Consolidated Interim Spent Fuel Storage Facility Environmental Report.” May 2016.

RAI ER-TR-2: Provide post-processing dose calculation spreadsheets for the incident-free transportation dose and risk calculations.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

As stated in the response to ER-TR-1, the dose evaluation was performed by a scaled analysis from the WCS evaluation, and as such there are no post-processing spreadsheets related to the evaluation.

RAI ER-TR-3: Provide a description of the measures, if any are known, that reactor licensees would take to mitigate the potential consequences of accidents along routes for shipping SNF to the CISF.

ER Section 4.9.3.1 provides a description of what DOE would do if they were the shipper (e.g., emergency response training to states and other local stakeholders) but does not provide comparable information for a licensee-shipper.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

Holtec and any licensee-shipper would:

- Utilize transportation casks licensed by the NRC pursuant to 10 CFR Part 71; and
- Coordinate shipments with Federal agencies, such as the U.S. Department of Transportation (DOT), U.S. Department of Homeland Security, EPA, and the Federal Emergency Management Agency (FEMA), and potentially affected states and applicable state agencies.

This information will be added to the ER, Section 4.9.3.1.

Public and Occupational Health (POH)

RAI ER-POH-1: Describe the methods used in ER Section 4.12.2.1 to calculate the dose (2.5 mrem/year) to the maximally exposed individual.

The ER references the SAR for dose calculations; however, in a review of the SAR, the NRC staff could not readily find any documentation of a maximally exposed individual public dose calculation resulting in a 2.5 mrem/yr dose.

Furthermore, the ER states that the maximally exposed public individual is based on "full-time occupancy" at a fence line distance of 100 meters [328 feet] from the storage pads. However, the (non-proprietary) SAR does not describe a maximally exposed individual dose calculation but reports maximum occupancy (8,760 hours/yr) dose rates with distance (SAR Table 7.4.3) from 500 loaded storage casks at 100 meters [328 feet] as 540 mrem/yr. SAR Table 7.4.3 reports a 2.86 mrem/yr dose at 500 meters [1,640 feet] from storage modules. At 2,000 hr/yr occupancy (typical full time worker) and 100 meter distance, SAR Table 7.4.3 still reports a dose of 123 mrem/yr. Based on the cited information in the SAR, it is not clear how the ER maximally exposed individual dose of 2.5 mrem/yr at 328 feet was calculated.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

ER Section 4.12.2.1 is corrected to align with HI-STORE FSAR Chapter 7 (Shielding). The dose rate of 2.5 mrem/year has been deleted, and instead Table 7.4.3 is referenced.

The Maximally Exposed Individual distance is corrected from 328 feet (100 meters) to 1312 feet (400 meters) to match the Controlled Area Boundary distance in Table 1.0.1 in the HI-STORE FSAR. In Section 4.12.2.3, the Maximally Exposed Individual distance is also corrected.

The dose rate for the nearest resident is updated to be assumed to be at the maximum distance in Table 7.4.3 (1000 meters), which is still well below the 10CFR72.104(a) limit of 25 mrem/year whole body dose to any real individual.

Table 4.12.3 in the ER is also corrected to reflect the above-mentioned changes for MEI annual dose exposure and Nearest resident annual dose exposure.

RAI ER-POH-2: Clarify the scope of the proposed radiological environmental monitoring program (REMP) summarized in ER Section 4.12.3, including whether it addresses determining the site-specific background radiation at the site prior to the start of operations.

The ER summary describes the REMP only in the context of operations and states that the REMP will sample "media and effluents, including gases and vapor, air particulates, soil, sediment, fauna, vegetation, surface water, waste waters, and groundwater." The applicant should confirm and clarify what "media and effluents" and "waste waters" will be sampled, how samples will be analyzed, and whether pre-operational measures would be taken to establish baseline or background measures in various media. The

ER also refers to national average (not site-specific) information in describing background radiation, but provides no information about the natural background radiation at the proposed site. The applicant should also clarify whether any pre-construction rail spur soil sampling would be conducted to establish a baseline for eventual comparison with decommissioning measurements.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

The REMP will be initiated at least one year prior to CISF operations. The early initiation of the REMP will provide assurance that a sufficient environmental baseline has been established for the CISF before the arrival of the first cask shipment. The baseline will be established as follows:

- Soil samples will be collected and analyzed for the presence of radiological constituents in areas where radiological operations will occur (e.g, rail cask transfer station, rail spur, Cask Transfer Building, and the HI-STORM UMAX storage pad and the immediate surrounding area around the pad.

- Surface water samples will be collected and analyzed for the presence of radiological constituents in Laguna Gatuna and Laguna Plata.

- Groundwater samples will be collected and analyzed for the presence of radiological constituents near the Cask Transfer Building, and the HI-STORM UMAX storage pad and the immediate surrounding area around the pad.

- Vegetation will be collected and analyzed for the presence of radiological constituents in areas where radiological operations will occur (e.g, Cask Transfer Building, and the HI-STORM UMAX storage pad).

- Background radiation measurements would be taken at various locations near the Holtec site, including the Cask Transfer Building and the HI-STORM UMAX storage pad and fence line.

This information has been added to the ER, Section 4.12.3.

RAI ER-WM-2: Provide additional information about the local municipal landfills and the anticipated destination for Low-Level Radioactive Waste (LLRW), including the currently projected operational life of these facilities.

There is no discussion in the license application regarding the destination of LLRW, which is necessary to determine impacts on the waste management resources available.

This information is necessary to determine compliance with 10 CFR 51.45(b).

Holtec Response

As discussed in Section 4.11.3 of the ER, there are two options for disposal of the LLRW: (1) the WCS LLRW disposal facility in Andrews, Texas, and (2) the Energy*Solutions* LLRW disposal facility in Clive, Utah. The WCS LLRW disposal facility is licensed by the Texas Commission on Environmental Quality and the current license will expire on September 10, 2024. Per the license, the WCS disposal facility is authorized to receive dry packaged LLRW with a total volume not to exceed 9,000,000 cubic feet. The Energy*Solutions* LLRW disposal facility is licensed by the Utah Department of Environmental Quality and the current license will expire on November 13, 2027. Per the license, the Energy*Solutions* disposal facility is authorized to receive dry packaged LLRW with a total volume not to exceed 5,048,965 cubic yards.

The CISF is not expected to generate any amount of LLRW that would challenge the ability to be disposed of at those sites. It is expected that these facilities would receive license amendments at the appropriate time to extend their operating lifetimes beyond the current license expiration dates.

With regard to municipal landfills, there are three facilities that have permits from the state of New Mexico to handle non-hazardous waste. Two are permitted municipal landfills and the third is an industrial waste landfill. The Sandpoint Landfill is 25 miles west of the Site and serves Eddy County. The service area covers 4,200 square miles and has a population of 49,000. The County and the City of Carlsbad jointly own the Landfill, which is operated by Waste Connections, Inc. The City of Artesia operates a transfer station, as does the County at the Village of Loving. Commercial collection services are available to most county residents living outside the incorporated areas of the county. The Lea County Solid Waste Authority has a service area that covers 4,400 square miles and has a population of 55,800. The Lea County Solid Waste Authority consists of Lea County and all of the incorporated municipalities in the County. Commercial collection service is available to County residents living outside of the incorporated areas. The Authority's landfill is east of Eunice New Mexico, opened in July 1999 and is operated by Waste Connection, Inc. Lea Land, Inc. operates an industrial waste landfill three miles from the Site. The landfill is permitted to take non-hazardous industrial waste under a permit issued by NMED. According to the operator, the Lea Land landfill has plenty of available capacity and is projected to remain open for 40 years.

RAI ER-CB-1: Clarify the source for the spent nuclear fuel (SNF) transportation cost estimate and describe the types of costs incorporated into this cost estimate.

In the environmental report (ER) Tables 9.2.1, 9.2.2, 9.2.3, and 9.2.6, the applicant cites a Government Accounting Office report (GAO, 2014) as the source for the $26,000 per MTU cost estimate for transporting SNF. The ER does not include a description of the types of costs incorporated into this cost estimate (e.g., capital equipment, such as rail cars). The applicant should clarify which sections of the referenced GAO report includes this information and provide that to staff, or provide a verifiable alternate information source.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

Holtec determined that the GAO report (GAO 2014) cited in the ER represented the best available data for estimating spent fuel transportation costs. Table 7 of Appendix II in the GAO report provides details regarding the cost information. With regard to the $26,000 per MTU cost estimate, the cost does not account for capital costs such as transportation casks or transportation infrastructure (although it should be noted that the GAO report did assume that no new rail construction will be required). For 70,000 MTU, GAO estimated that 133 transportation casks will be required at a cost of $4.5 million (plus or minus 10 percent). That cost is inconsequential to the results presented in the Holtec cost-benefit analysis and thus, was not included. Holtec did not include any costs related to transportation infrastructure, as Holtec decided that infrastructure costs for rail lines that are not exclusively to be used for spent fuel transportation should not be included in the cost-benefit analysis.

Reference:
GAO 2014 U.S. Government Accountability Office. *Spent Nuclear Fuel Management: Outreach Needed to Help Gain Public Acceptance for Federal Activities that Address Liability*. Report GAO-15-141. United States Government Accountability Office: Washington, D.C. October 2014.

RAI ER-CB-3: Clarify or provide additional details of the timing assumptions made for activities contained in the description of proposed action and no-action alternative including:

- Shipment from generation sites to the CIS Facility;
- SNF transportation from the CIS Facility to the repository;
- Construction of three new reactor site independent spent fuel storage installations (ISFSIs).

The cost estimates in ER Tables 9.2.1, 9.2.2, 9.2.3, and 9.2.6 are discounted, which requires specifying the timing (i.e., the specific years) in which various activities occur. However, that information is not included in the report. ER Chapter 9 identifies both 2048 and 2060 as possible dates for the opening of a repository but is unclear which year was used in the discounting calculations. It is also unclear whether the proposed action includes SNF transport from the CIS Facility to a repository within the initial 40-year license period. In addition, for the purpose of cost benefit analysis discounting, ER Chapter 9 did not specify the dates for the construction of the three new reactor site ISFSIs that are assumed to be needed under the noaction alternative. This information is needed regarding when activities are projected to occur in order to support the NRC staff’s understanding of how the discounting calculations were performed and for evaluation of cost and benefits of the proposed action and no-action alternative.

This information is necessary to determine compliance with 10 CFR 51.45(b) and (c).

Holtec Response

The following timing assumptions were made in the cost-benefit analysis, and have been added to the ER Section 9.1:

- Shipment from generation sites to the CIS Facility dates assumes that SNF is shipped to the CISF starting in 2023, with 500 canisters shipped annually until 2042
- SNF transportation from the CISF to the repository would occur in 2060.
- Construction of three new reactor site ISFSIs would occur in approximately 2022.

RAI ER-CB-4: Clarify how the annual and cumulative storage costs for Scenario 1 in ER Chapter 9 were calculated.

Table 9.2.1 of the ER specifies three different annual storage estimates ($77, $135, and $375 million) and ER Section 9.2.1 estimates cumulative storage cost for operating sites at $60 million. However, there is no supporting information for these estimates. Background information regarding the details of calculations is required to support its analysis of costs associated with the no-action alternative in the EIS. The applicant should ensure that assumptions made for these estimates are consistent with the information provided in response to RAIs ER-CB-2 and ER-CB-3.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

Table 9.2.1 of the ER specifies three different annual storage estimates ($77, $135, and $375 million) to reflect the differences in Phase 1 storage costs (which is based on 5,000 MTU of storage) and Phase 1-20 storage costs (which is based on 100,000 MTU of storage) for Scenario 1 of the No Action Alternative. Scenario 1 assumes that all SNF becomes stranded by 2040, at which time the annual operation and maintenance costs for SNF storage would rise from $60 million to approximately $375 million at today's costs. The rationale for the three different annual storage estimates ($77, $135, and $375 million) is explained in more detail below:

1. Table 9.2.1: Annual storage costs for Phase 1 quantities of SNF (e.g., 5,000 MTU) would be $77 million based on the following rationale:

    - 3,000 MTU of stranded SNF would continue to be stored at a cost of $75 million per year as described in Section 9.2.1 of the ER (BRC 2012, Section 5.2.1 provides the reference for this estimate);
    - 2,000 MTU of non-stranded SNF would continue to be stored at a cost of $2 million per year as described in Section 9.2.1 of the ER (this assumes 1 MTU of SNF would be stored at two operating sites, with a cost of $1 million per site per the discussion in Section 9.2.1 of the ER) (BRC 2012, Section 5.2.1 provides the reference for this estimate).

    <u>Added together, the total annual cost for the No Action Alternative Phase 1 would be: $75 million + $2 million = $77 million in today's dollars.</u>

2. Table 9.2.1: Annual storage costs for Phase 1-20 quantities of SNF (e.g., 100,000 MTU) would be $135 million from 2020 until 2040 based on the following: 3,000 MTU of stranded SNF would be stored at a cost of $75 million per year as described in Section 9.2.1 of the ER (BRC 2012, Section 5.2.1 provides the reference for this estimate) plus $60 million for the continued storage of all other non-stranded SNF.

    <u>Added together, the total annual cost for the No Action Alternative Phase 1-20 for the years 2020-2040 would be: $75 million + $60 million = $135 million in today's dollars.</u>

3. Table 9.2.1: Annual storage costs for Phase 1-20 quantities of SNF (e.g., 100,000 MTU) would be $375 million from 2041 until 2060 based on the following: because all SNF is assumed to become stranded by 2040, the annual storage costs at each reactor site would rise from $1 million to a range of $4.5-$8 million (the midpoint is $6.25 million).

   For approximately 60 sites that would store stranded SNF, the annual cost would be $6.25 x 60 = $375 million in today's dollars.

RAI ER-CB-5: Provide details of the calculations and assumptions made for the construction costs in ER Table 9.2.4 and the operation and maintenance costs in ER Table 9.2.5.

ER Section 9.2.2 does not provide details concerning the estimated construction costs or operation and maintenance costs for the CIS Facility. Instead, the ER cites the 2017 Data Call (Appendix G to the ER) as the source of the information in ER Table 9.2.4 and Table 9.2.5. The staff requests more detail concerning the calculation of these costs. The staff notes that the cost estimates provided in the "HI-STORE CIS Facility Financial Assurance & Project Life Cycle Cost Estimate" (Holtec, 2017a) and the "Holtec International & Eddy Lea Energy Alliance (ELEA) CIS Facility – Decommissioning Cost Estimate and Funding Plan" (Holtec, 2017b) provide an example of the appropriate level of detail that the applicant should provide to justify the construction, operation, and maintenance costs assumptions for the cost benefit analyses in the ER. This information is necessary to determine compliance with 10 CFR 51.45(c).

References:

1. BRC. "Blue Ribbon Commission on America's Nuclear Future - Report to the Secretary of Energy." ML120970375. Washington, D.C. 2012

2. Government Accountability Office. "Spent Nuclear Fuel Management: Outreach Needed to Help Gain Public Acceptance for Federal Activities that Address Liability". Report GAO-15-141. United States Government Accountability Office: Washington, D.C. October 2014.

3. Holtec International. "HI-STORE CIS Facility Financial Assurance & Project Life Cycle Cost Estimates." ML18058A608. Marlton, N.J. 2017. (Holtec, 2017a)

4. Holtec International. "Holtec International & Eddy Lea Energy Alliance (ELEA) CIS Facility – Decommissioning Cost Estimate and Funding Plan" ML18058A607. Marlton, N.J. (Holtec, 2017b).

Holtec Response

Additional information has been added throughout Chapter 9 of the Environmental Report (HI-2167521). Tables 9.2.4 and 9.2.5 were expanded to provide further detail on operation and maintenance (O&M) costs. Please note the significant changes in Table 9.2.5 which illustrate actual estimated costs for O&M. The value shown in the previous revision was based off estimated costs provided by an existing, decommissioned nuclear power plant. The values now shown in Table 9.2.5 are prorated based off the value that was provided in the 2017 data call and more adequately represent expected costs for HI-STORE CISF. With these updated values, summary information shown in Table 9.2.6 was also changed.

Additionally, because of these changes, Holtec Report HI-2177593 (Financial Assurance Plan) has also been updated to maintain consistency between similar cost values found in both documents.

Air Quality (AQ)

RAI ER-AQ-1: Provide the detailed information (e.g., calculations, inputs, sources, activities, and parameters) used to generate each of the emission inventories in ER Tables 4.6.1 to 4.6.4.

ER Section 4.6 provides a limited description of how the emission inventories were calculated. Detailed information is needed for NRC to independently verify the emission inventories.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Holtec Response

Excel spreadsheets attached to this letter provides the detailed information (e.g., calculations, inputs, sources, activities, and parameters) used to generate each of the emission inventories in ER Tables 4.6.1 to 4.6.4. In the process of providing the requested information, it was determined that the formatting in Tables 4.6.1 to 4.6.4 was corrupted and the column headers had mistakenly shifted. The correct column headers for Tables 4.6.1 to 4.6.4 are presented below, and the ER has been updated accordingly. The "red" column headers show the correct header for each table column. This correction to the table headers does not affect any of the conclusions presented in the ER.

Table 4.6.1. TOTAL CONSTRUCTION EMISSIONS – POUNDS PER HOUR

Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2e	PM
Construction Equipment	2.70	6.06	0.01	0.21	0.21	0.73	1,056.87	<0.01
Construction Worker Commuting	0.31	0.03	<0.01	<0.01	<0.01	0.03	55.17	<0.01
Material Delivery	0.77	2.12	<0.01	0.10	0.09	0.18	421.11	<0.01
Earthmoving Activities	<0.01	<0.01	<0.01	0.97	0.10	<0.01	<0.01	<0.01
Road Emissions	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.24
Cement Plant	<0.01	<0.01	<0.01	2.63	0.43	<0.01	<0.01	8.82
Other VOC (Paint and Fuel)	<0.01	<0.01	<0.01	<0.01	<0.01	8.30	<0.01	<0.01
Total	**3.78**	**8.21**	**0.01**	**3.95**	**0.83**	**9.24**	**1,533.15**	**9.06**

Table 4.6.2. TOTAL CONSTRUCTION EMISSIONS – TONS PER YEAR

Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2e	PM
Construction Equipment	2.53	5.67	0.01	0.20	0.20	0.68	990.71	<0.01
Construction Worker Commuting	3.99	0.39	0.01	0.06	0.04	0.43	717.22	<0.01
Material Delivery	1.40	3.87	0.01	0.19	0.16	0.33	768.53	<0.01
Earthmoving Activities	<0.01	<0.01	<0.01	1.52	0.15	<0.01	<0.01	<0.01
Road Emissions	<0.01	<0.01	<0.01	0.06	0.01	<0.01	<0.01	0.52
Cement Plant	<0.01	<0.01	<0.01	2.63	0.43	<0.01	<0.01	8.82
Other VOC (Paint and Fuel)	<0.01	<0.01	<0.01	<0.01	<0.01	3.41	<0.01	<0.01

Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2e	PM
Total	**7.92**	**9.94**	**0.02**	**4.66**	**0.99**	**4.85**	**2,476.45**	**9.34**

Table 4.6.3. CONCURRENT OPERATION AND PHASED CONSTRUCTION EMISSIONS - POUNDS PER HOUR

Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2e	PM
Worker Commuting	0.31	0.03	<0.01	<0.01	<0.01	0.03	55.17	<0.01
Deliveries	0.77	2.12	<0.01	0.10	0.09	0.18	421.11	<0.01
Road Emissions	<0.01	<0.01	<0.01	0.05	0.01	<0.01	<0.01	0.50
Ongoing Construction	0.57	1.23	<0.01	0.59	0.12	1.39	229.97	1.36
Total	**1.64**	**3.38**	**<0.01**	**0.75**	**0.22**	**1.60**	**706.25**	**1.86**

Table 4.6.4. CONCURRENT OPERATION AND PHASED CONSTRUCTION EMISSIONS – TONS PER YEAR

Source	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2e	PM
Worker Commuting	5.60	0.55	0.01	0.08	0.05	0.61	1006.86	<0.01
Deliveries	2.80	7.75	0.01	0.38	0.32	0.65	1537.06	<0.01
Road Emissions	<0.01	<0.01	<0.01	0.12	0.01	<0.01	<0.01	1.09
Ongoing Construction	1.19	1.49	<0.01	0.70	0.15	0.73	371.47	1.40
Total	**9.59**	**9.79**	**0.02**	**1.28**	**0.39**	**1.26**	**2,543.92**	**1.09**

Cultural Resources (CR)

RAI ER-CR-1: Provide the geographic information systems (GIS) data input files used to generate the cultural resources graphics.

The GIS files will be used to generate maps and delineate the direct and indirect area of potential effect (APE). Delineation of the APE is necessary as part of the National Historic Preservation Act of 1966 (NHPA) Section 106 review.

This information is necessary to determine compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

Holtec Response

GIS data collected for the project including APE is attached to this letter.

RAI ER-CR-2: Provide the following information regarding the information in the Cultural Resources Survey (Appendix C of the ER):

1. Provide brief descriptions and data on previous surveys within the project area;

2. Provide National Register of Historic Places (NRHP) eligibility recommendations for previously recorded sites and State Historic Preservation Officer concurrence for any site within or adjacent to the project area; 3. Include a brief description of the isolated finds in Appendix C-Chapter 5, and references to Table B.1;

4. Include references in site descriptions to maps, tables, and site forms showing site location, feature, and artifact data contained in appendices;

5. Include imagery of select artifacts from eligible sites;

6. Add the legal location description for each site;

7. Provide supporting imagery or reference for site integrity discussions;

8. Include length of HCPI 42195 within the Project Area;

9. Provide additional discussion on background for eligibility statements and criteria used to make eligibility recommendations;

10. Provide background for research potential, if identified;

11. Provide background for prehistoric sites with diagnostic artifacts, faunal, or floral remains containing potential to address questions of wild plant and animal resource use and seasonality;

12. Fix typos throughout report and provide an updated version.

This information is needed to identify and assess impacts to historic properties, and determine compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

Holtec Response

1. Provide brief descriptions and data on previous surveys within the project area;

Response: Section 3.7.4 of the ER details previous cultural resource investigations in the Project area. Table 3.7.1 identifies each investigation. There have been 91 cultural resource investigations within the APEs (Table 3.7.1), with portions of 12 investigations extending into the APE of direct impacts. The records search provide that 42 cultural resources have been previously identified within the APEs (Table 3.7.2), with two of them intersecting the APE of direct impacts. These two sites consist of a prehistoric artifact scatter and a historical-period rail line segment; both of undetermined NRHP eligibility status. Of the 40 cultural resources identified within the indirect APE, 14 are eligible for listing in the NRHP, seven are not eligible for listing in the NRHP, 18 have an undetermined NRHP status, and one site has no NRHP status.

2. Provide National Register of Historic Places (NRHP) eligibility recommendations for previously recorded sites and State Historic Preservation Officer concurrence for any site within or adjacent to the project area; Include a brief description of the isolated finds in Appendix C- Chapter 5, and references to Table B.1;

Response: SRI documented a total of two archaeological sites and two historical-period linear resources within the Holtec CISF survey area. One of the archaeological sites had previously been documented (LA

89676). One of the historical-period linear resources had also previously been documented (HCPI 42196, previously recorded as LA 149299). Thus, the new discoveries were one archaeological site (LA 187010) and one historical-period linear resource (HCPI 42195). Both of the archaeological sites are recommended *eligible* for listing in the National Register of Historic Places (NRHP). Both of the historical-period linear resources are recommended *not eligible* for listing. New Mexico SHPO concurrence based on consultation conducted by SRI is provided along with this report addendum.

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

3. *Include a brief description of the isolated finds in Appendix C- Chapter 5, and references to Table B.1;*

Response: Appendix C provides information in reference to features and shovel test locations documented at the archaeological sites and in association with historic-built environment. Isolates

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

4. Include references in site descriptions to maps, tables, and site forms showing site location, feature, and artifact data contained in appendices;

Response:

The introduction to Appendix C provides Figures 1.1 and 1.2 that show the site information.

5. Include imagery of select artifacts from eligible sites;

Response: Photographic documentation is not required for undiagnostic artifacts, according to BLM regulations (BLM-CFO 2012), which only require photographs of diagnostic projectile points associated with lithic assemblages per the Procedures for Performing Cultural Resource Fieldwork on Public Lands in the Area of New Mexico BLM Responsibilities. None of the artifacts contained at any of the documented sites are diagnostic to any specific time period. [redacted] It is not standard practice to photograph lithic debris or undiagnostic tools, and not a requirement by BLM or New Mexico SHPO (New Mexico Administrative Code, 4.10.15 Standards for Survey).

6. Add the legal location description for each site;

Response:

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

7. Provide supporting imagery or reference for site integrity discussions;

Response: Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

8. Include length of HCPI 42195 within the Project Area;

Response: [redacted]

9. Provide additional discussion on background for eligibility statements and criteria used to make eligibility recommendations;

Response: Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

10. Provide background for research potential, if identified;

Response: SRI used the Southeastern New Mexico Regional Research Design (RRD) (Hogan 2006) developed by the Bureau of Land Management, Carlsbad Field Office (BLM CFO 2012) as the basis for defining research potential in the Project Area:

The following prehistoric research domains will be addressed in order to support and justify your recommendations. The permitee must correlate a site assemblage to these research domains, a discussion detailing the research value of the site, what analysis can be conducted, what potential information a site possesses and how it contributes to the research domains in the RRD. Cite references to support your discussion. These research domains can be found in Chapter 4 of Hogan's RRD for Southeastern New Mexico (2006: pp. 4-58, 4-49, 4-60) and are:

1) Chronology and Culture History (C14 dateable features, Culturally/Temporally Diagnostic artifacts or features);
2) Subsistence Strategies (Artifact assemblage, feature assemblage, faunal remains, spatial location on landscape);
3) Settlement System/Mobility Strategies (Spatial location of site, presence of non-local artifacts or materials);
4) Paleo-Indian (Diagnostic artifact assemblage);
5) Archaic (Diagnostic artifact assemblage with dateable feature or depositional potential);
6) Ceramic (Diagnostic artifact assemblage with dateable feature or depositional potential);
7) Protohistoric (Diagnostic assemblage).

Additionally, eligibility recommendations concerning historic properties need to be well supported with documentation that addresses criteria A, B, and C of the NRHP. Criterion D can be applied but is not a stand-alone justification for an eligible recommendation. Historic records, such as, the General Land Office (GLO) records should be utilized to support all eligibility recommendations. Addressing these domains when drafting a NRHP recommendation will contribute greatly to furthering research in southeastern New Mexico. Sites with significant data potential will be readily identified and steps can be taken to protect and preserve these assemblages until research projects can be developed.

11. Provide background for prehistoric sites with diagnostic artifacts, faunal, or floral remains containing potential to address questions of wild plant and animal resource use and seasonality;

Response: Contains information protected under 10 CFR 2.390(a)(3) and Section 304 of the National Historic Preservation Act

12. Fix typos throughout report and provide an updated version.

This information is needed to identify and assess impacts to historic properties, and determine compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

Response: Typos have been fixed throughout the report and are marked by revision bars.

References for RAI ER-CR 2:

BLM CFO 2012 — Bureau of Land Management, Carlsbad Field Office. 2012 *Standards for Survey Site Evaluation and Reporting for the CFO*. Revised 11/21/2016.

Hogan 2006 — Hogan, Patrick F. 2006 *Development of Southeastern New Mexico Regional Research Design and Cultural Resource Management Strategy*. Report No. 185-849. Office of Contract Archeology, University of New Mexico, Albuquerque. Submitted to the U.S. Department of the Interior, Bureau of Land Management, New Mexico State Office, Santa Fe.

RAI ER-CR-3: Provide cultural survey information for the areas that will be disturbed by all future construction and operational phases of the project, including the railroad spur. Also, include cultural survey information for appropriate buffer areas adjacent to disturbed areas.

This information is needed to identify and assess impacts to historic properties, and determine compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

Holtec Response

Figures in Appendix C of the ER depict areas surveyed for cultural resources, and Figures 1 and 2 above show these areas. More than 290 acres were surveyed. Phase 1 construction would disturb approximately 119.4 acres. The cultural resource survey was conducted on all areas that could be disturbed during Phase 1, including the rail spur and the access road. The linear corridors conservatively included a 50-foot-wide rail spur measuring 7.45 miles in length and a 30-foot-wide access road measuring 1.6 miles in length. This addressed potential buffer areas.

Construction of Phases 2-20 would occur in 20 phases over approximately 20 years and would require an additional 210.6 acres of land (some of which would be undisturbed within the protected area). When the cultural resource survey was performed (December 2016), the full build-out of the Holtec CISF was estimated to require 290 acres of land (some of which would be undisturbed within the protected area), and this represents the land that was ultimately surveyed. The total land requirement of Phases 1-20 is currently estimated to be approximately 330 acres (some of which would be undisturbed, but would be within the protected area). No additional cultural resource surveys are planned; however, Holtec may perform additional cultural resource surveys of any Phase 2 areas that were not previously surveyed at the appropriate time.