RAI 5 Description of Deficiency Staff cannot confirm the value of the MILDOS default mixing height of 100 m proposed by the applicant. Basis for Request The applicant defines the mixing height as the height of the atmosphere above the ground that is well mixed due either to mechanical turbulence or convective turbulence, noting that the layer above this height is stable. Staff observes that this definition is consistent with the definition given by Holzman (refer to page 3 of EPA, 19721). On page 2-91 of the TR, the applicant stated that the MILDOS default mixing height is 100 m and used this default value in its dose calculations. However, on page 2.7 of NUREG/CR-2011, *MILDOS – A Computer Program for Calculating Environmental Radiation Doses from Uranium Recovery Operations*, US NRC1981, a default mixing height of 1000 m is recommended. Request for Additional Information Please provide the following information: A. Provide the reference for the 100 m default mixing height value, or correct the statement in the TR regarding the default value of the mixing height; and B. Revise MILDOS calculations if the default value is different than what was originally used, or demonstrate that the calculations used are conservative.	Cameco 12/23/2014 Response: No response required. In the public meeting dated September 4, 2013, NRC stated the RAI had been resolved by the revisions to Section 2.5.3.8 submitted by Cameco on June 26, 2013. This was confirmed in the NRC letter dated October 23, 2013. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 6 Description of Deficiency Staff cannot complete its evaluation of NUREG-1569, Acceptance Criterion 2.5.3(1). Basis for Request NUREG-1569, Acceptance Criterion 2.5.3(1), states, in part: "The on-site program should be designed in accordance with Regulatory Guide (RG) 3.63, 'Onsite Meteorological Measurement Program for Uranium Recovery Facilities—Data Acquisition and Reporting' (NRC, 1988)." RG 3.63 provides guidance on the siting of meteorological instruments, including the effects from, and the location of, instruments in relationship to natural or man-made obstructions. Staff has found no discussion on the characteristics of the site where the MEA meteorological instruments are, or were, located which would address the siting guidance in RG 3.63. Request for Additional Information Please provide a description of the location of the MEA meteorological instruments (topography, obstructions	Cameco 12/23/2014 Response: No response required. In the public meeting dated September 4, 2013, NRC stated the RAI had been resolved by the revisions to Section 2.5.3.7 submitted by Cameco on June 26, 2013. This was confirmed in the NRC letter dated October 23, 2013. Cameco 5/27/2014 Status: No NRC update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.

or lack thereof, etc.) consistent with RG 3.63.	
RAI 7 Description of Deficiency Staff cannot complete its evaluation of NUREG-1569, Acceptance Criterion 2.5.3(2). Basis for Request NUREG-1569, Acceptance Criterion 2.5.3(2), states, in part: "The impacts of terrain and nearby bodies of water on local meteorology are assessed, and the occurrence of locally severe weather is described and its impact considered." While staff found a discussion on severe thunderstorms in TR Section 2.5.1, staff found no discussion on any consideration of potential impacts of severe weather on MEA operations. Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 2.5.3(2), please provide a discussion on the occurrence of locally severe weather and a consideration of its impacts, or provide a location in the TR where this can be found.	Cameco 12/23/2014 Response: No response required. In the public meeting dated September 4, 2013, NRC stated the RAI had been resolved by the revisions to Section 7.5.6.1 submitted by Cameco on June 26, 2013. This was confirmed in the NRC letter dated October 23, 2013. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 8.A. Description of Deficiency Staff cannot complete its evaluation of NUREG-1569, Acceptance Criterion 2.5.3(3). Basis for Request NUREG-1569, Acceptance Criterion 2.5.3(3), states: "The meteorological data used for assessing impacts are substantiated as being representative of expected long-term conditions at and near the site." In addition, RG 3.63 provides guidance on determining the long-term representativeness of the onsite meteorological data collected over a minimum of 12 months. This includes various aspects of the National Weather Service meteorological station chosen for comparison. In TR Section 2.5.1, the applicant indicated that the Scottsbluff meteorological station was chosen as the regional station to most represent MEA meteorology. This appears to be based mainly on distance (less than 50 miles) and the availability of hourly data for the last 15 years. Request for Additional Information Please address the following issues related to determining the long-term representativeness of the MEA meteorological data: A. Consistent with RG 3.63, please provide additional information on why the Scottsbluff station was chosen to represent the vicinity of the MEA site, including geographical and topographical descriptions,	Cameco 12/23/2014 Response: In the public meeting dated September 4, 2013, NRC requested more discussion of the factors that lead to the selection of Scottsbluff over the other locations with Met stations. In addition to the revisions to Section 2.5.1 and Appendix S submitted by Cameco on June 26, 2013, further justification for selection of the Scottsbluff Met station is provided in revisions to Appendix S. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.

etc.	
RAI 8.B. The Scottsbluff station has only 15 years of data. This is not consistent with the RG 3.63 recommendation for long-term analysis (e.g., 30 years). Please provide justification for using only 15 years of data.	Cameco 12/23/2014 Reponse: In the public meeting dated September 4, 2013, NRC requested additional justification for using 15 years instead of 30 years for the long-term analysis. In addition to the new Appendix S submitted by Cameco on June 26, 2013, further justification for use of 15 years data is provided in revisions to Appendix S. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 8.C.1. TR Figures 2.5-30 and 2.5-31 provide a statistical analysis of the 15-yr and baseline-year wind speed and wind direction for the Scottsbluff meteorological station. Please provide the following information on these analyses: 1. NUREG-1475, Rev.1, *Applying Statistics*, US NRC 2011, describes linear regression as a model that relates a dependent variable to a single, or multiple, independent variable(s). Please explain the validity of the proposed linear regressions when there appears to be no independent variable and it is unclear to staff what the regression equations in Figures 2.5-30 and 2.5-31 represent.	Cameco 12/23/2014 Response: In the public meeting dated September 4, 2013, NRC expressed concern that the regression analysis failed to include both dependent and independent variables. To that end, in addition to the new Appendix S submitted by Cameco on June 26, 2013, further discussion of the regression analysis is provided in revisions to this appendix. Cameco 5/22/2014 email to NRC: "Cameco's response to RAI 8.C.1 was provided in the first paragraph of redline text in the version of Appendix S submitted in December 2013." Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 8.C.2. TR Figures 2.5-30 and 2.5-31 provide a statistical analysis of the 15-yr and baseline-year wind speed and wind direction for the Scottsbluff meteorological station. Please provide the following information on these analyses: 2. p-values for the linear regression equations presented in TR Figures 2.5-30 and 2.5-31.	Cameco 12/23/2014 Response: No response required. In the public meeting dated September 4, 2013, NRC stated the RAI had been resolved by the revisions submitted by Cameco on June 26, 2013. This was confirmed in the NRC letter dated October 23, 2013. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 12.A Description of Deficiency Staff can't complete its evaluation of NUREG-1569, Acceptance Criterion 2.9.3(1). Basis for Request 10 CFR Part 40, Appendix A, Criterion 7, requires: "At least	Cameco 12/23/2014 Response: In the public meeting dated September 4, 2013, NRC requested additional siting justification for the air monitors, specifically, consideration of where

one full year prior to any major site construction, a preoperational monitoring program must be conducted to provide complete baseline data on a milling site and its environs. Throughout the construction and operating phases of the mill, an operational monitoring program must be conducted to measure or evaluate compliance with applicable standards and regulations; to evaluate performance of control systems and procedures; to evaluate environmental impacts of operation; and to detect potential long-term effects." RG 4.14 provides guidance on preoperational environmental monitoring at uranium mills. NUREG-1569, Acceptance Criterion 2.9.3(1), states: "Monitoring programs to establish background radiological characteristics, including sampling frequency, sampling methods, and sampling location and density are established in accordance with pre-operational monitoring guidance provided in Regulatory Guide 4.14, Revision 1, Section 1.1 (NRC, 1980). Air monitoring stations are located in a manner consistent with the principal wind directions reviewed in Section 2.5 of the standard review plan." During its review, staff found multiple examples of gaps in data presentation on the proposed preoperational effluent environmental monitoring program for the MEA. Staff requires additional information on, or clarification of, noted deficiencies in the background radiological section to draw its safety conclusions. <u>Request for Additional Information</u> Please address the following issues regarding the proposed preoperational environmental monitoring program for the MEA: A. Please provide criteria consistent with RG 4.14, Regulatory Position 1.1.1, used for determining air monitoring locations, or indicate where this information can be found in the application.	maximum concentrations are expected. To that end, in addition to the revisions to Section 2.9.2.1 submitted by Cameco on June 26, 2013, further siting justification is provided in Section 2.9.2.1 as well as revisions to Figure 7.3.2 depicting the locations and the estimated doses. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/16/2014 Status: Please also see the response to RAI 37A1. Because Cameco is updating Mildos to reflect a higher flow rate, we have also instructed our contractor to assess where the highest dose may be expected. Cameco will reassess the current Monitor locations and will relocate accordingly. We expect to submit the update Mildos estimate and associated monitor locations by June 1, 2014. Cameco 5/27/2014 Status: Cameco will provide a dose estimate for ranchers using property between the monitor well ring and license boundary for grazing and haying. We will include the underlying dose assumptions, particularly the estimated annual hours ranchers will be present in that vicinity. Cameco 7/11/2014 Status: Attached please find a Mildos assessment for a 6000gpm production/1500 gpm restoration plant. Consistent with Figure 5, for operational air monitoring, Cameco will relocate air monitor station MAR-2 on Figure 2.9-2 to a location approximately 1.5 km SE of the Satellite Plant. In addition, the text in Section 7.3.3.3 of the TR has been revised to reflect the dose to a rancher if the rancher grazed cattle and cut hay approximately 1.5 km SE of the Satellite Plant. Cameco 8/5/2014 Status: No update.
RAI 12.D. <u>Description of Deficiency</u> The information provided in TR Section 2.~~6~~9 does not meet the applicable requirements of 10 CFR Part 40, using the review procedures in Section 2.6.2 and using acceptance criteria in Section 2.6.3 of NUREG-1569. <u>Request for Additional Information</u> Please address the following issues	Cameco 12/23/2013 Response: The calibration records for the first year of monitoring for air samplers are included in Appendix V-1. Cameco 8/5/2014 Status: Cameco is evaluating potential errors in the presentation of %deviation versus full scale deviation in

regarding the proposed preoperational environmental monitoring program for the MEA: D. Please provide the calibration records for the air samplers used during the first year of monitoring.	Appendix D.1 and will revise that appendix appropriately.
RAI 12.E. Description of Deficiency The information provided in TR Section 2.6 does not meet the applicable requirements of 10 CFR Part 40, using the review procedures in Section 2.6.2 and using acceptance criteria in Section 2.6.3 of NUREG-1569. Request for Additional Information Please address the following issues regarding the proposed preoperational environmental monitoring program for the MEA: E. Please provide the laboratory reports for all radiological baseline monitoring results.	Cameco 12/23/2014 Response: All of the radiological baseline monitoring results for air, surface water, groundwater, sediment and fish tissue were reported in the Cameco 6/26/2013 submittal. The laboratory analytical reports for groundwater samples were included in Appendix J. Laboratory analytical reports for air (particulates, radon and gamma), Niobrara river surface water, Niobrara River and ephemeral sediments, and Niobrara River fish tissue were not included in the 6/26/2013 submittal. Therefore, these analytical reports are now included in: Appendices U (air particulate), V-2 (radon), and V-3 (gamma); Appendix W-1 and W-2 (surface water and sediments, respectively) and Appendix X (fish tissue) of the current December 2013 submittal. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: LLDs exceedances for fish and surface water baseline sampling are being addressed by collecting a new round of data which, as described in the response to RAI 12.H. The data will be submitted in the fourth quarter of 2014. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: In Appendix U Cameco is evaluating the appropriateness of the references to waste and water sampling methods and will revise the appendix appropriately
RAI 12.F. Description of Deficiency The information provided in TR Section 2.6 does not meet the applicable requirements of 10 CFR Part 40, using the review procedures in Section 2.6.2 and using acceptance criteria in Section 2.6.3 of NUREG-1569. Request for Additional Information Please address the following issues regarding the proposed preoperational environmental monitoring program	Cameco 12/23/2014 Response: A sampling plan with details on where and how surface and subsurface soil sampling will occur will be submitted for NRC review in January 2013. Following resolution of any issues, the application will be revised to highlight the elements of that plan. Sampling will be conducted in late spring or early summer of 2014, prior to construction.

for the MEA: F. In TR Section 2.9.6, the applicant stated that transects will be made across the MEA to collect surface and subsurface soil samples in areas of the proposed well field. While general guidance in RG 4.10 was followed in preparing the proposed baseline soil sampling program, staff cannot determine that the full extent of operations within the proposed MEA will have the necessary baseline soil sampling performed to meet 10 CFR Part 40, Appendix A, Criterion 7, requirements. Please provide a more detailed description of where surface and subsurface oil sampling will be performed.	Section 2.9.6 has been revised accordingly. Cameco 5/6/2014 Status: The sampling plan was submitted as a supplemental RAI response on January 24, 2014 and is attached below for your information. Dependent on the variability detected during initial transects, the scan speed and transect spacing may be increased to utilize ATVs and up to a maximum of 50 meter spacing respectively. The gamma surveys and soil sampling will be performed in June and a report submitted by September 1, 2014. Cameco 5/16/2014 Status: Weather permitting the gamma survey will occur the week of May 26th. It takes 30 days for sample results, and our contractor expects to prepare a final report for submission in mid-July 2014. Cameco 5/27/2014 Status: The survey and sampling are underway. Cameco 7/11/2014 Status: Cameco now anticipates submission in early August. Cameco 8/5/2014 Status: No update.
RAI 12.G.1. Description of Deficiency The information provided in TR Section 2.6 does not meet the applicable requirements of 10 CFR Part 40, using the review procedures in Section 2.6.2 and using acceptance criteria in Section 2.6.3 of NUREG-1569. Request for Additional Information Please address the following issues regarding the proposed preoperational environmental monitoring program for the MEA: G. In TR Section 2.9.8, the applicant described its baseline direct radiation monitoring program. Please provide the following: (1) As noted in staff's review of the baseline soil sampling program, staff cannot determine that the full extent of operations within the proposed MEA will have the necessary baseline direct radiation monitoring performed to meet 10 CFR Part 40, Appendix A, Criterion 7, requirements. Please provide a more detailed description of where direct radiation monitoring will be performed.	Cameco 12/23/2014 Response: A sampling plan with details on where and how direct radiation monitoring will occur will be submitted for NRC review in January 2013. Following resolution of any issues, the application will be revised to highlight the elements of that plan. Sampling will be conducted in late spring or early summer of 2014, prior to construction. Section 2.9.8.1 was revised accordingly. 5/6/2014 Status: The sampling plan was submitted as a supplemental RAI response on January 24, 2014 and is attached below for your information. Dependent on the variability detected during initial transects, the scan speed and transect spacing may be increased to utilize ATVs and up to a maximum of 50 meter spacing respectively. The gamma surveys and soil sampling will be performed in June and a report submitted by September 1, 2014.

	Cameco 5/16/2014 Status: Weather permitting the gamma survey will occur the week of May 26th. It takes 30 days for sample results, and our contractor expects to prepare a final report for submission in mid-July 2014. Cameco 5/27/2014 Status: The survey and sampling are underway. Cameco 7/11/2014 Status: Cameco now anticipates submission in early August. Cameco 8/5/2014 Status: No update.
RAI 12.G.2. Description of Deficiency The information provided in TR Section 2.6 does not meet the applicable requirements of 10 CFR Part 40, using the review procedures in Section 2.6.2 and using acceptance criteria in Section 2.6.3 of NUREG-1569. Request for Additional Information Please address the following issues regarding the proposed preoperational environmental monitoring program for the MEA: G. In TR Section 2.9.8, the applicant described its baseline direct radiation monitoring program. Please provide the following: (2) In TR Section 2.9.8, the applicant stated: "The type of survey instrument and procedures would be as described below..." However, there is no text provided that addresses these issues. Please provide the type of survey instrument used for performing baseline direct radiation monitoring and the procedures used, as indicated in TR Section 2.9.8.	Cameco 12/23/2014 Response: A sampling plan with details on where and how surface and subsurface soil sampling will occur will be submitted for NRC review in January 2013. Following resolution of any issues, the application will be revised to highlight the elements of that plan. The plan will provide details on the type of instrumentation and procedures used. 5/6/2014 Status: The sampling plan was submitted as a supplemental RAI response on January 24, 2014 and is attached below for your information. Dependent on the variability detected during initial transects, the scan speed and transect spacing may be increased to utilize ATVs and up to a maximum of 50 meter spacing respectively. The gamma surveys and soil sampling will be performed in June and a report submitted by September 1, 2014. Cameco 5/16/2014 Status: Weather permitting the gamma survey will occur the week of May 26th. It takes 30 days for sample results, and our contractor expects to prepare a final report for submission in mid-July 2014. Cameco 5/27/2014 Status: The survey and sampling are underway. Cameco will be performing sampling at a 1m depth in accordance with RG 4.14, Section 1.1.4 c., at that time. Cameco 7/11/2014 Status: Cameco now anticipates submission in early August. Cameco 8/5/2014 Status: No update.

RAI 12.H. Description of Deficiency The information provided in TR Section 2.6 does not meet the applicable requirements of 10 CFR Part 40, using the review procedures in Section 2.6.2 and using acceptance criteria in Section 2.6.3 of NUREG-1569. Request for Additional Information Please address the following issues regarding the proposed preoperational environmental monitoring program for the MEA: H. RG 4.14 provides recommended values for the lower limit of detection (LLD) for radionuclides in various environmental media. The applicant provided a description of its laboratory measurements in regards to significant figures reported for environmental media measurements in TR Appendix Q. Several reported LLD values are not within RG 4.14 recommended values, even after taking into account the applicant's rationale described in TR Appendix Q (i.e., reporting LLD values with one significant figure, consistent with RG 4.14). The following examples are not consistent with RG 4.14 recommended LLD values: Reported Recommended Table 2.9-5 – Radiological Analysis for Private Water Supply Wells March 2011 Well 723, Pb-210 (pCi/L) (dissolved) 1 1.6 Table 2.9-26 – Niobrara River Dissolved Radiological Water Quality March 2011 sample at N1 for Th-230 (pCi/L) 0.2 0.3 April 2011 sample at N1 for Pb-210 (pCi/L) 1 1.6 July 2011 sample at N2 for Th-230 (pCi/L) 0.2 0.4 October 2011 sample at N1 for Th-230 (pCi/L) 0.2 0.3 Table 2.9-27 - Niobrara River Suspended Radiological Water Quality June 2011 sample at N1 for Pb-210 (pCi/L) 1	Cameco 12/23/2014 Response: *Table 2.9-5-* On June 26th Cameco provided a revised Table 2.9-5 which included another additional round of sampling for Well 723. The well was not operational in the first and second quarter of 2012 and could not be sampled. Like Well 723, Well 721 is also completed in the Brule and is across the road, several hundred feet away. Data are available from the spring of 2013 for Well 721 which provides adequate seasonal Brule characterization in this area. Cameco 5/6/2014 Status: Awaiting NRC review. *Table 2.9-26 (Table 2.9-29 in the revisions) and Table 2.9-27 (Table 2.9-30 in the revisions)-* The relocation of surface water sampling location N-2 requires 1 year of concurrent sampling at both locations. See revised Figure 2.9-1 for the schedule. Cameco 5/6/2014 Status: All baseline radiological sampling with be submitted by the fourth quarter of 2014. *Table 2.9-33 (Table 2.9-37 in the revisions)-* Additional fish tissue samples will be collected during the winter of 2013/2014 and early summer 2014. See revised Figure 2.9-1 for the schedule. Cameco 5/6/2014 Status: All baseline radiological sampling with be submitted by the fourth quarter of 2014. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update.

9 Table 2.9-33 – Total Radionuclides and Metals in Tissue of Northern Pike Ra-226 (microCi/kg) 5×10^{-8} 2×10^{-7} Th-230 (microCi/kg) 2×10^{-7} 8×10^{-6} Please provide all environmental media samples with measured values that have an LLD consistent with RG 4.14 or justification for an alternate program.	
RAI 13 Description of Deficiency Staff cannot complete its evaluation of NUREG-1569, Acceptance Criterion 2.9.3(2). Basis for Request 10 CFR Part 40, Appendix A, Criterion 7, requires: "At least one full year prior to any major site construction, a preoperational monitoring program must be conducted to provide complete baseline data on a milling site and its environs. Throughout the construction and operating phases of the mill, an operational monitoring program must be conducted to measure or evaluate compliance with applicable standards and regulations; to evaluate performance of control systems and procedures; to evaluate environmental impacts of operation; and to detect potential long-term effects." RG 4.14 provides guidance on the preoperational and operational aspects of effluent and environmental monitoring at uranium mills. NUREG-1569, Acceptance Criterion 2.9.3(2), states: "Soil sampling is conducted at both a 5-cm [2-inch] depth as described in Regulatory Guide 4.14, Section 1.1.4 (NRC, 1980) and 15 cm [6 in] for background decommissioning data." During its review, NRC staff found no 15-cm soil samples proposed in the TR. Request for Additional Information Please provide justification for not performing soil samples at 15-cm depths, or indicate where this can be found in the TR.	Cameco 12/23/2014 Response: A sampling plan with details on where and how surface and subsurface soil sampling will occur will be submitted for NRC review in January 2013. Following resolution of any issues, the application will be revised to highlight the elements of that plan. Sampling will be conducted in late spring or early summer of 2014, prior to construction. Section 2.9.6 has been revised accordingly. Cameo 5/6/2014 Status: The sampling plan was submitted on January 24, 2014 and is attached below for your information. The gamma surveys and soil sampling will be performed in June and a report submitted by September 1, 2014. Cameco 5/16/2014 Status: Weather permitting the gamma survey will occur the week of May 26th. It takes 30 days for sample results, and our contractor expects to prepare a final report for submission in mid-July 2014. Cameco 5/27/2014 Status: The survey and sampling are underway. Cameco 7/11/2014 Status: Cameco now anticipates submission in early August. Cameco 8/5/2014 Status: No update.
Section 4 - Effluent Control Systems	
RAI 20 Description of Deficiency Elevated radon progeny levels experienced at the main facility are not addressed in the Marsland application. Basis for Request NUREG-1569, Acceptance Criterion 4.1.3(3), states, in	Cameco 12/23/2014 Response: Contemporaneous with the construction and startup of the pond water treatment system in mid-2010, for the first time in several years Cameco exceeded 25

part: "The application provides a demonstration that adequate ventilation systems are planned for process buildings to avoid radon gas buildup..." Consistent with NUREG-1569, Appendix A, staff examined the historical operations at the main facility relevant to effluent control systems. As documented in the 2011 inspection report (ML11216A179), the applicant experienced elevated radon progeny levels in the Central Processing Plant. Request for Additional Information Please provide a description of efforts to determine the cause of, and mitigation efforts to reduce the elevated levels , radon progeny in the main facility as they may relate to the construction of the Marsland satellite facility. In particular, please discuss any additional efforts to maintain airborne radon progeny levels as low as is reasonably achievable (ALARA) within the Marsland satellite facility.	percent of the allowable limits for radon daughters in the CPF. Exceeding this action level triggered weekly instead of monthly radon daughter monitoring. An investigation was conducted and two potential sources were identified: the pond water treatment system and the bicarbonate mix tank. The pond water treatment area did not have hard-piped exhaust ventilation and although the bicarbonate mix tank had hard-piped exhaust ventilation that ventilation capacity was shared with other radon sources. In an effort to maintain ALARA radon progeny levels, Cameco installed independent hard-piped ventilation systems in both of these areas. This additional ventilation capacity was assessed by the report identified in RAI 19, immediately above. Since August 2012, radon progeny has not exceeded 25 percent of the allowable limit in the CPF. Although the existing MEA application already states that "separate ventilation systems will be installed for all indoor non-sealed process tanks and vessels where radon-222 or process fumes would be expected", Section 4.1.2.3 of the application has been revised to specifically identify areas where hard-piped ventilation will be required. To ensure the radon progeny levels are ALARA, Cameco is now including the bicarbonate mix tank as an example of an area requiring dedicated ventilation capacity. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 21 Description of Deficiency The applicant did not provide specific information regarding accident conditions related to the ventilation systems. In addition, it did not provide safety impacts of system failures or identify contingencies for such occurrences related to the ventilation systems. Basis for Request NUREG-1569, Acceptance Criterion 4.1.3(4), states: "The application demonstrates that the effluent control systems will limit	Cameco Response: First, some basics attributes of the ventilation system are important to this discussion. The ventilation system at the CPF and the one proposed for the MEA are not complex, and in this simplicity, the potential for significant problems are greatly reduced. Fundamentally, all ventilation fans run continuously and are

exposures under both normal and accident conditions. The application also provides information on the health and safety impacts of system failures and identifies contingencies for such occurrences. In TR Section 4.1.3, the applicant refers to its SHEQMS, Volume VIII, Emergency Manual, for responses to emergency situations that could occur at the site in the event of effluent system failures, but neither provides details on the safety impacts from these failures nor identifies contingencies for such occurrences. Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 4.1.3(4), please provide details on accident conditions related to the ventilation systems. Specifically, please provide information on the health and safety impacts of ventilation system failures and identify contingencies for such occurrences for staff to evaluate NUREG-1569, Acceptance Criterion 4.1.3(4), or indicate where this information can be found in the application.	inspected daily. Failures are rare and are readily observable. Replacement fan motors can be quickly sourced and failures can be quickly remedied. When a fan fails, or is shut down for maintenance, negative pressure remains within the building by virtue of the many other fans that continue to operate. Failure of the largest single fan (#5 Duct) at the CPF would result in only a 13 percent reduction in total capacity. SOP P.16 for the CPF addresses repair and maintenance of current ventilation systems. This SOP will be revised to also address MEA ventilation. A copy of the SOP and associated inspection form has been provided under separate cover for NRC information, under a request for confidentiality. In response to shutdown of a fan, Cameco immediately begins a process to return the fan to service. In the meantime, Cameco can respond with additional personal protective equipment, fans and by setting up radon progeny monitoring in the vicinity to detect real time radon progeny levels during the maintenance or repair process. In summary, elevated radon levels are the primary health and safety impact of ventilation system failure. Given the redundant fans and Cameco's use of additional PPE and engineering controls, the dose impacts from system failures are maintained ALARA. Section 4.1.3 of the application has been revised accordingly. Cameco 8/5/2014 Status: Consistent with the response to RAI 30 dated 5/27/2014, Cameco withdraws the non-disclosure request and asks that the documents be retained by NRC for Staff use only or destroyed. Cameco will revise the text of the application to summarize these documents in response to the RAI.
Section 5 – Operations	
RAI 26 Description of Deficiency Staff cannot complete its evaluation of	Cameco 12/23/2014 Response: In Attachment 1 please find a list

NUREG-1569, Acceptance Criterion 5.5.3(2) Basis for Request NUREG-1569, Acceptance Criterion 5.5.3(2), states: "The training program is acceptable if it meets the following criteria: It is consistent with Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure, Revision 3" (NRC, 1999). This guide provides guidance for protection of the fetus." RG 8.13, Regulatory Position C.2, provides guidance on the content of instruction concerning prenatal radiation exposure. In TR Section 5.5.1.3, the applicant discusses instructions regarding prenatal exposure risks in general, but does not provide specifics on these instructions for staff to evaluate their consistency with RG 8.13. RG 8.13, Regulatory Position C.3, provides guidance on a licensee's policy on declared pregnant women. The applicant did not provide its policy on declared pregnant women. Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 5.5.3(2), please provide the following information: 1. the content of instruction concerning prenatal radiation exposure, and 2. the applicant's policy on declared pregnant women	of topics covered in the video entitled Radiation and Pregnancy: A Decision to Declare, Radiological Testing Services, LLC, 1998. This video is currently shown to all female workers and supervisors during initial radiation training and to female workers again upon declaration. This or an equivalent instruction will be provided. In addition to the video or equivalent instruction, the female workers are provided a copy of Regulatory Guide 8.13 and its appendix which is reviewed with the trainer and any questions are answered. Receipt of prenatal radiation exposure training is documented. Please see the form in Attachment 2. Consistent with Regulatory Guide 8.13, Appendix A, it is CBR policy to accommodate pregnant workers when possible. To that end, CBR uses the following approach to address potential and actual prenatal exposure risks. CBR's policies on declared pregnant women are consistent with Regulatory Guide 8.13, Appendix A. Specifically: • Instructions o all female new hires o supervisors in charge of female workers o video instruction o provision of RG 8.13 and its appendix and review with worker o opportunity to ask questions o possible effect on job status may involve adjustment of work duties as necessary o review worker- specific exposure monitoring (e.g. dosimetry, bioassay where appropriate) following declaration • Written declaration o view video again and review RG 8.13 o review worker- specific exposure monitoring (e.g. dosimetry, bioassay where appropriate) following declaration

	• Possible effect on job status o may involve adjustment of work duties as necessary The text of Section 5.5.1.3 has been revised accordingly. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 27 Description of Deficiency The applicant did not provide details on its ventilation equipment related to minimum performance specifications and frequencies of tests and inspections. Basis for Request NUREG-1569, Acceptance Criterion 5.7.1.3 (4), states, in part: "The applicant describes minimum performance specifications for the operation of the effluent controls and the frequencies of tests and inspections to ensure proper performance to specifications..." The applicant stated in TR Section 5.7.1.1 that ventilation equipment will be inspected for proper operation as recommended in RG 3.56 and that this equipment will be inspected during radiation safety inspections as discussed in TR Section 5.3.1. Staff observes that RG 3.56 does not specifically address ventilation systems and only provides a general description of maintenance and testing, relying on manufacturer's recommendations and minimum timeframes. In addition, the applicant does not address ventilation systems operations in its radiation safety inspections discussed in TR Section 5.3.1. Request for Additional Information Please provide details on the applicant's testing, maintenance, and inspection program for ventilation systems at the Marsland satellite facility, including wellhouse ventilation units. Specifically, please provide minimum performance specifications and frequencies of tests, inspections, and maintenance activities for these ventilation systems or indicate where this information can be found in the application. Consistent with RG 3.56, please also describe any specialized training for those performing inspections on the ventilation systems.	Cameco 12/23/2014 Response: As noted above, the ventilation systems in use at the CPF are not complex. Like the CPF, the MEA ventilation system will be designed with a combination of doors, wall fans and hard-piped ventilation systems that will achieve four to five air exchanges per hour. This may be supplemented with box fans when needed. Consistent with the CPF, this will ensure reduction of radon progeny to ALARA levels. The 10 foot by 30 foot well houses are continuously ventilated using 800 CFM wall or ceiling fans. The fans are visible from the door so that operability is verified prior to entry. Daily inspections identify fans that require maintenance or have failed. Testing is not routinely performed as function is readily observable and the fans at the CPF are proven to have very long life expectancy. Specialized training is not required to assess the operational status of the ventilation units. As noted in response to RAI 27, Cameco has provided a copy of SOP P.16 and the associated inspection form as well as updates to Section 4.1.3. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: Consistent with the response to RAIs 29 and 30 dated 5/27/2014, Cameco withdraws the non-disclosure request and asks that the documents be retained by NRC for Staff use only or destroyed. Cameco will revise the text of the application to summarize these documents in response to

	the RAI. In addition, Cameco will revise the text of the application and commit to pre-operational verification of the as-constructed number of air exchanges at the Marsland satellite plant.
RAI 28 Description of Deficiency The applicant did not provide information on beta survey instruments. Basis for Request NUREG-1569, Acceptance Criterion 5.7.2.3(3), states: "Monitoring equipment is identified by type, sensitivity, calibration methods and frequency, availability, and planned use to protect health and safety. The ranges of sensitivity for the proposed external radiation monitors are consistent with those appropriate to the facility operation." In TR Section 3.3, the applicant discusses various survey equipment but does not address equipment for performing beta surveys. In TR Section 5.7.2, the applicant discusses beta surveys, but does not discuss instruments for performing these surveys. Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 5.7.2.3(3), please provide a description of beta monitoring equipment for the applicant's external radiation monitoring program identified by type, sensitivity, calibration methods and frequency, availability, and planned use to protect health and safety, or indicate where this information can be found in the application.	Cameco 12/23/2014 Response: This issue is currently being addressed in the context of Draft License Conditions to the underlying license for the Crow Butte facility. Cameco will revise the Marsland application to comport with the revisions to the underlying license prior to operations. Cameco 5/6/2014 Status: No later than May 30, 2014, Cameco will submit Marsland-specific information regarding survey instrumentation. Cameco 5/16/2014 Status: Please see the 12/23/2014 response. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: No update.
RAI 29 Description of Deficiency The applicant did not provide any specifics on its ALARA policy. Basis for Request NUREG-1569, Acceptance Criterion 5.7.2.3(7), states: "Radiation doses will be kept as low as is reasonably achievable by following Regulatory Guide 8.10 (NRC, 1977) and Regulatory Guide 8.31 (NRC, 2002b)." RG 8.10, Regulatory Position C.1.a, recommends that plant personnel should be made aware of management's commitment to keep occupational exposures ALARA and that the commitment should appear in policy statements, instructions to personnel, and similar documents. In TR Section 4.1.4, the applicant stated that it maintains a strict ALARA policy to keep exposures to all radioactive materials as low as possible as defined in SHEQMS, Volume IV, Health Physics Manual. However, the	Cameco 12/23/2014Response: CBR is providing Volume IV, SHEQMS Health Physics Manual under separate cover and under a request for confidentiality. Specifically, the management commitment to ALARA is evidenced by: • Management ALARA responsibilities are required reading during initial training, §2.5.3 • Documented annual ALARA audit §2.5.4.2 • Topic and possible test question in initial and annual radiation safety training In the interest of ALARA exposures, CBR has established action level at 25 percent of the exposure limit for:

applicant did not provide any specifics from this reference or others, such as ALARA exposure goals and action levels associated with exposures to radioactive materials. Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 5.7.2.3(7), please provide specific information on the applicant's ALARA policy statements, instructions, or other similar documents, including goals and action levels, as it relates to exposures to radioactive materials.	• Facility equipment and design, §2.5.10 • Radon progeny, §3.7 • Surface contamination control, §5.4 • Bioassay, §8.5.6 • Yellowcake slurry shipment (50 percent of action levels requires resurvey), §9.6.4.4 Cameco 5/6/2014 Status: Awaiting NRC review. Cameco does not wish that these proprietary documents be disclosed. NRC has reviewed the program repeatedly over may years and can use the inspection reports as a basis for both compliance and licensing determinations. If necessary, Cameco will withdraw the documents from ADAMs, and provide a very brief summary in lieu of disclosure. Cameco 5/27/2014 Status: Cameco withdraws the non-disclosure request and asks that the documents be retained by NRC for Staff use only or destroyed. Cameco will revise the text of the application to summarize these documents in response to the RAI. Cameco 7/11/2014 Status: The text summaries will be provided by the end of July 2014. Cameco 8/5/2014 Status: As part of the text summaries Cameco will provide an express commitment to an action level of 25 percent of the exposure limit as noted above and will incorporate relevant elements of RG 8.10.
RAI 30 Description of Deficiency Staff cannot complete its evaluation of NUREG-1569, Acceptance Criterion 5.7.2.3(5). Basis for Request NUREG-1569, Acceptance Criterion 5.7.2.3(5), states: "Plans for documentation of radiation exposures are consistent with the approach in Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data, Revision 1" (NRC, 1992b)." In TR Section 5.7.2, the applicant discusses its external radiation exposure monitoring program, but does not provide information on its documentation for external radiation exposure monitoring.	Cameco 12/23/2014 Response: CBR is providing a copy of the documentation used for radiation exposures under separate cover and under a request for confidentiality. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco does not wish that these proprietary documents be disclosed. NRC has reviewed the program repeatedly over may years and can use the inspection reports as a basis for these licensing determinations. If necessary, Cameco will withdraw the documents, and provide a summary in lieu of disclosure.

Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 5.7.2.3(5), please provide information on the applicant's documentation for external radiation exposure monitoring.	Cameco 5/27/2014 Status: Cameco withdraws the non-disclosure request and asks that the documents be retained by NRC for Staff use only or destroyed. Cameco will revise the text of the application to summarized these documents in response to the RAI. Cameco 7/11/2014 Status: The text summaries will be provided by the end of July 2014. Cameco 8/5/2014 Status: No update.
RAI 32 Description of Deficiency The applicant did not provide information on beta survey instruments. Basis for Request NUREG-1569, Acceptance Criterion 5.7.3.3(3), states: "Monitoring equipment is identified by type, sensitivity, calibration methods and frequency, availability, and planned use to protect health and safety. The ranges of sensitivity for the proposed external radiation monitors are consistent with those appropriate to the facility operation." In TR Section 3.3, the applicant discusses various survey equipment but does not address equipment for performing beta surveys. Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 5.7.3.3(3), please provide a description of beta monitoring equipment for the applicant's airborne radiation monitoring program identified by type, sensitivity, calibration methods and frequency, availability, and planned use to protect health and safety, or indicate where this information can be found in the application.	Cameco 12/23/2014Response: Please see response to RAI 28, which appears identical to RAI 32. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: Where appropriate, Cameco will provide information on monitoring equipment used for airborne beta surveys.
RAI 33 Description of Deficiency Staff cannot complete its evaluation of NUREG-1569, Acceptance Criterion 5.7.6.3(4). Basis for Request NUREG-1569, Acceptance Criterion 5.7.6.3(4), states: "Monitoring equipment by type, specification of the range, sensitivity, calibration methods and frequency, availability, and planned use is adequately described. The application demonstrates that the ranges of sensitivity for monitoring equipment will be appropriate to expected facility operation." In TR Section 5.7.6, the applicant provides a description of survey equipment to be used in its contamination control program. However, it does not address the issues related to NUREG-1569, Acceptance Criterion	Cameco 12/23/2014 Response: This issue is currently being addressed in the context of Draft License Conditions to the underlying license for the Crow Butte facility. Cameco will revise the Marsland application to comport with the revisions to the underlying license prior to operations. ~~Cameco 5/6/2014 Status: No later than May 30, 2014, Cameco will submit Marsland-specific information regarding survey instrumentation.~~ ~~Cameco 5/6/2014 Status: Cameco again proposes to resolve this in the context of the license renewal.~~

5.7.6.3(4). Request for Additional Information Please address the following issues related to the proposed survey equipment described in TR Section 5.7.6: A. Please provide the information requested in NUREG-1569, Acceptance Criterion 5.7.6.3(4). B. Staff observes that the proposed Ludlum Model 44-38 probe is rated with a beta cutoff energy of 200 keV (refer to ADAMS accession No. ML13086A183). Some of the uranium decay products have beta energies that are below this cutoff energy. Please provide information on how surface contamination with beta-emitting radionuclides will be evaluated. C. Please state whether the practice of washing the soles of shoes prior to exiting the restricted area will be used at the MEA. If this practice will be used, please demonstrate the minimum detectable concentration for contamination surveyed on the wet soles of shoes.	Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: When revisions to the Marsland application are submitted to comport with the underlying license, Cameco will include information on the range, sensitivity, calibration methods and frequency, availability and planned use equipment by type. For RAI 33 C., Cameco will provide a response independent of the underlying license activities.
RAI 34 Description of Deficiency The applicant did not address NUREG-1569, Acceptance Criterion 5.7.6.3(6). Basis for Request NUREG-1569, Acceptance Criterion 5.7.6.3(6), states: "The licensee will ensure that radioactivity on equipment or surfaces is not covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 5.7.6.3-1 of this standard review plan before application of the covering. A reasonable effort will be made to minimize the contamination before the use of any covering." Request for Additional Information Please address NUREG-1569, Acceptance Criterion 5.7.6.3(6), for operations or indicate where this can be found in the application.	Cameco 12/23/2014 Response: This issue is currently being addressed in the context of Draft License Conditions to the underlying license for the Crow Butte facility. Cameco will revise the Marsland application to comport with the revisions to the underlying license prior to operations. Cameco 5/6/2014 Status: At present, the draft license for the overlying facility includes condition 9.6. The reference in this license condition establishes a requirement identical to acceptance criteria 5.7.6.3(6). Since that license language will be directly applicable to Marsland operations, the inclusion of identical language in the application would be redundant. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: Cameco will revise the license application to expressly include a commitment to make a reasonable effort to minimize contamination before use of any covering.
RAI 35 Description of Deficiency The applicant did not address NUREG-1569, Acceptance Criterion 5.7.6.3(7).	Cameco 12/23/2014 Response: This issue is currently being addressed in the context of Draft License Conditions to the

Basis for Request NUREG-1569, Acceptance Criterion 5.7.6.3(7), states: "The radioactivity of the interior surfaces of pipes, drain lines, or duct work will be determined by making measurements at all traps and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or duct work." Request for Additional Information Please address NUREG-1569, Acceptance Criterion 5.7.6.3(7), for operations or indicate where this can be found in the application.	underlying license for the Crow Butte facility. Cameco will revise the Marsland application to comport with the revisions to the underlying license prior to operations. Cameco 5/6/2014 Status: Similar to RAI 34, the draft license for the overlying facility includes condition 9.6. The reference cited in this license condition establishes a requirement identical to acceptance criteria 5.7.6.3(7). Since that license language will be directly applicable to Marsland operations, the inclusion of identical language in the application would be redundant. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: Cameco will evaluate locations where representative measurements of contamination can be made, and revise the TR accordingly.
RAI 36 Description of Deficiency The applicant did not address NUREG-1569, Acceptance Criterion 5.7.6.3(9). Basis for Request NUREG-1569, Acceptance Criterion 5.7.6.3(9), states: "Appropriate criteria are established to relinquish possession or control of equipment or scrap having surfaces contaminated with material in excess of the limits specified in Table 5.7.6.3-1: (a) The applicant will provide detailed information describing the equipment, or scrap; the radioactive contaminants; and the nature, extent, and degree of residual surface contamination. (b) The applicant will provide a detailed health and safety analysis that reflects that the residual amounts of contaminated materials on surface areas, together with other considerations such as prospective use of the equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public. (c) The applicant includes materials created by special circumstances including, but not limited to, the razing of buildings, transfer of structures or equipment, or conversion of facilities to a long-term storage facility or to standby status." Request for Additional Information Please address NUREG-1569,	Cameco 12/23/2014 Response: This issue is currently being addressed in the context of Draft License Conditions to the underlying license for the Crow Butte facility. Cameco will revise the Marsland application to comport with the revisions to the underlying license prior to operations. Cameco 5/6/2014 Status: Similar to RAIs 34 and 35, the draft license for the overlying facility includes condition 9.6. The reference cited in this license condition establishes a requirement identical to acceptance criteria 5.7.6.3(9). Since that license language will be directly applicable to Marsland operations, the inclusion of identical language in the application would be redundant. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No update. Cameco 8/5/2014 Status: Cameco does not plan to release scrap in excess of the limits provided in Table 5.7.6.3-1. The application will be revised accordingly.

Acceptance Criterion 5.7.6.3(9), for operations or indicate where this can be found in the application.	
RAI 37.A.1 Description of Deficiency Staff cannot verify the applicant's MILDOS calculations for the maximally exposed individual and its basis for not collecting vegetation, food, and fish samples during operations for the environmental monitoring program. Basis for Request 10 CFR Part 40, Appendix A, Criterion 7, requires, in part: "...Throughout the construction and operating phases of the mill, an operational monitoring program must be conducted to measure or evaluate compliance with applicable standards and regulations; to evaluate performance of control systems and procedures; to evaluate environmental impacts of operation; and to detect potential long-term effects." 10 CFR 20.1301(a) requires, in part: "(a) Each licensee shall conduct operations so that – (1) The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year, exclusive of the dose contributions from background radiation, from any administration the individual has received, from exposure to individuals administered radioactive material and released under § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with § 20.2003..." 10 CFR 20.1302(b) requires, in part: "A licensee shall show compliance with the annual dose limit in § 20.1301 by — (1) Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit..." NUREG-1569, Acceptance Criterion 5.7.7.3(1), states: "The proposed airborne effluent and environmental monitoring program is consistent with Regulatory Guide 4.14, Sections 1.1 and 2.1 (NRC, 1980) and as low as is reasonably achievable requirements as described in Regulatory Guide 8.37, Section 3 (NRC, 1993)". RG 4.14, Section 2.1, provides guidance for conducting an operational environmental monitoring program including the collection of vegetation, food, and fish samples. Furthermore, RG 4.14 provides guidance that these media are relevant when a significant pathway to man is identified in	Cameco 12/23/2014 Response: The MILDOS model was rerun and the report was revised to eliminate the duplicate reduction in source term. Please see the revisions to Appendix M. Cameco 5/6/2014 Status: Cameco will be submitting an update to the Mildos reflecting a higher total flow rate. Please proceed with the review of this section and Appendix M as the only change will be an increase in flow and the dose estimates. We expect to provide the update no later than May 30, 2014. ~~Cameco 5/16/2014 Status: Weather permitting the gamma survey will occur the week of May 26th. It takes 30 days for sample results, and our contractor expects to prepare a final report for submission in mid-July 2014.~~ (Erroneous language deleted). Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: Attached please find a Mildos assessment for a 6000gpm production/1500 gpm restoration plant. The revised Mildos no longer includes the additional reduction in radon effluent concentration. Cameco 8/5/2014 Status: No update.

individual licensing cases. A significant pathway is defined in RG 4.14, Footnote (o) to Tables 1 and 2, when a predicted dose to an individual would exceed 5 percent of the applicable radiation protection standard. RG 3.51, Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations, provides guidance on calculating dose for individuals including ingestion of vegetables, milk and meat. <u>Request for Additional Information</u> A. In TR Sections 5.7.7.5 and 5.7.7.6, the applicant stated that it will not collect vegetation, livestock, crop, or vegetable garden samples as part of its operational environmental monitoring program based on the results of its MILDOS calculations presented in TR Appendix M. In order for staff to verify the technical bases for this approach, please address the following issues: 1. In Appendix M1, page 7 of the report by Noel Savignac, the applicant describes the MILDOS operational input data. In addition to the assumed values of one percent for the radon venting rate of the wellfields (refer to NUREG-1569, Appendix D, and TR Appendix M, Table 2 of the report by Noel Savignac) and 20 percent of the radon released from the purge water, the applicant appears to further reduce the radon effluent by applying a 25 percent (radon venting from header houses) and 75 percent (radon venting from satellite plant) proportion factor in one scenario, and a 10 percent (radon venting from header houses) and 90 percent (radon venting from satellite plant) proportion factor in another scenario. Please provide additional clarification and justification for this apparent additional reduction in radon effluent concentration over and above the MILDOS-assumed value for wellfield venting and the applicant-assumed value for purge water venting.	
37.A.2. In Appendix M2, the applicant calculates the maximum dose to man from the vegetation pathway. Please address the following issues regarding the vegetation pathway analysis:	Cameco 12/23/2014 Response: Consistent with the Powertech Dewey Burdock alternate proposal at ML11208B714, Cameco proposes to take a soil sample from each garden in the area of

	a. The applicant stated that it used the food production rate for Colorado from RG 3.51, Table 7, page 35, as Nebraska was not listed in this table. Staff observes that this tabulated data is from 1973 and that guidance on page 24 of RG 3.51 states that if other means are not available, it is acceptable to assume that regional agricultural productivity will remain in constant proportion to the U.S. population. Consistent with RG 3.51, please provide a discussion on efforts to derive site-specific (e.g., State, regional) agricultural productivity data and comparison of the tabulated agricultural productivity data with the U.S. population to derive an appropriate proportion factor. b. The applicant calculated the maximum dose to an individual using the ratios of population exposures to vegetation, milk, and meat pathway to the total population exposure times the maximum resident dose at the Marsland operation. This approach does appear to address the requirements of 10 CFR 20.1302(b), dose to an individual, or be consistent with RG 3.51, Regulatory Position C.2, which provides guidance for dose calculations for individuals. Please provide justification for applying a population exposure ratio to derive a maximum individual exposure. c. Staff observes that the maximum resident dose at the Marsland operation was calculated assuming the highest radon air concentrations during operations. For maximum total individual dose, this approach appears consistent with RG 3.51, Regulatory Position C.2 which states that the 1-yr exposure period is taken to be the year when environmental concentrations resulting from plant operations are expected to be at their highest level. However, the applicant stated that the dose from the vegetation pathway was calculated from the consumption of vegetables, meat, and/or milk that may have been impacted by the release of radon and its decay products on vegetation or forage from uranium in situ operations. Staff observes that the maximum vegetation concentrations will not necessarily occur during the same timeframe as the maximum radon air concentrations.	review and then apply concentration factors to estimate the radionuclide concentrations in vegetables. Similar to Dewey Burdock, the large quantity of vegetables required to meet LLDs would decimate each home owner's crop. The specifics of this alternate approach are presented as revisions to Section 2.9.5.2. Cameco 5/6/2014 Status: Cameco has taken and analyzed soil samples from each garden in the area of review. At present we are working with Inter Mountain Laboratories in Casper, Wyoming to develop a justification for an LLD for Polonium 210 in soil for submission and NRC written verification. We expect to submit the justification, data and analysis with no later than September 1, 2014. Cameco 5/16/2014 Status: Cameco now expects to submit the justification, data and analysis no later than June 30, 2014. Cameco 5/27/2014 Status: Cameco will respond to RAI 37.A.2. a., b., and c., individually. Cameco 7/11/2014 Status: No change. Cameco 8/5/2014 Status: No update.

Consistent with RG 3.51, please provide the exposure period resulting in the maximum radiation dose from the vegetation pathway and reanalyze the maximum individual dose from the vegetation pathway if necessary.	
37.B. In TR Section 5.7.7.6, the applicant stated that it will not collect fish samples as part of its operational environmental monitoring program based on the results of the MILDOS analysis for vegetation uptake. Staff observes that the correlation between vegetation uptake and the potential for a significant fish pathway is unclear. Consistent with RG 4.14, Section 2.1, please provide a direct dose analysis for the fish pathway to enable staff to determine if a significant pathway to man from fish exists or not.	Cameco 12/23/2014 Response: The incorrect vegetation uptake language has been removed from Section 5.7.7.6. In addition, alternative language in Section 5.7.7.6 was modified to trigger operational fish sampling if upward trends in radionuclides are observed in sediment samples as the result of surface spills at the site. This alternative approach is justified because surface water flow is absent, the distance to the Niobrara River is significant, and the absence of sufficient fish in the Niobrara River above Box Butte Reservoir for sampling. It should also be noted that the perimeter monitoring wells and excursion control practices preclude a groundwater pathway to fish in the Niobrara River. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No change. Cameco 8/5/2014 Status: Cameco will provide additional discussion.
37.C. In Appendix M1, page 15 of the report by Noel Savignac, the applicant provides the maximum occupational dose using 1500 hours onsite for a full time worker. Staff observes that a normal work week is 40 hours, resulting in a more typical 2000 hours onsite during the year. This is also the number of hours assumed for a working year in the DAC and ALI values given in 10 CFR Part 20, Appendix B (refer to the Introduction to Appendix B to Part 20). Please provide a justification for assuming 1500 hours onsite for a full time worker.	Cameco 12/23/2014 Response: The revised MILDOS-AREA assessment (Appendix M) presents the radiation doses for a 2,000-hour per year onsite full-time worker. Cameco 5/6/2014 Status: Cameco will be submitting an update to the Mildos reflecting a higher total flow rate. Please proceed with the review of this section and Appendix M as the only change will be an increase in flow and the dose estimates. We expect to provide the update no later than May 30, 2014. Cameco 5/16/2014 Status: As noted in the context of RAI 12.A., because Cameco is updating Mildos to reflect a higher flow rate, we have also instructed our contractor to assess where the highest dose may be expected. Cameco will reassess the current

	Monitor locations and will relocate accordingly. We expect to submit the update Mildos estimate and associated monitor locations by June 1, 2014. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: Attached please find a Mildos assessment for a 6000gpm production/1500 gpm restoration plant. The occupation dose rate estimates have been revised to reflect 2000 hours onsite during the year. Cameco 8/5/2014 Status: No update.
RAI 38 Description of Deficiency The applicant did not provide the criteria used for determining the proposed locations for the airborne effluent monitoring stations. Basis for Request NUREG-1569, Acceptance Criterion 5.7.7.3(2), states: "The proposed locations of the airborne effluent monitoring stations are consistent with guidance in Regulatory Guide 4.14, Sections 1.1.1 and 2.1.2 (NRC, 1980). The license applicant adequately considers site-specific aspects of climate and topography in determining the number and locations of off-site airborne monitoring stations and environmental sampling areas. The criteria used in selecting sampling locations should be given. All sampling locations should be clearly shown relative to the proposed facility, nearest residences, and population centers on topographic maps of the appropriate scale." Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 5.7.7.3(2), please provide the criteria used for determining the proposed locations for the airborne effluent monitoring stations.	Cameco 12/23/2014 Response: Please see response to RAI 12.A., above. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: Please see response to RAI 12.A., above. Cameco 8/5/2014 Status: No update.
Section 6 – Ground-water Quality Restoration, Surface Reclamation, and Facility Decommissioning	
RAI 40 Description of Deficiency The applicant did not provide a commitment to implement pre-reclamation survey programs for diversion ditches, surface impoundments, and transportation routes. Basis for Request NUREG-1569, Acceptance Criterion 6.2.3(2), states that the pre-reclamation radiological survey program survey areas should include	Cameco 12/23/2014 Response: Section 6.2, pages 6-12 and 6-13 were revised to include a commitment to implement pre-reclamation survey programs for diversion ditches, surface impoundments (if any), and transportation routes. Cameco 5/6/2014 Status: Awaiting NRC review.

diversion ditches, surface impoundments, and transportation routes. Although in Section 6.2 of the TR, the third bullet states that the applicant will do radiological survey of all facilities, equipment, and materials on the site to identify the potential for personnel exposure during decommissioning, the list does not include the areas identified as missing. Although Section 6.4.5 of the TR states the applicant will adopt survey and sample protocols on a case by case basis, this appears to only apply to temporary ditches and impoundments and appears to only address confirmation of restoration rather than pre-reclamation surveys. Request for Additional Information Please provide a commitment to implement pre-reclamation survey programs for diversion ditches, surface impoundments, and transportation routes, or identify where this commitment is already discussed.	Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No change. Cameco 8/5/2014 Status: No update.
RAI 41 Description of Deficiency In TR Section 6.4, the applicant refers to its RESRAD calculations in TR Appendix N for Marsland site-specific cleanup criteria. However, staff can't verify that the applicant utilized Marsland site-specific input data (e.g., soil type, wind speed, precipitation, etc.) for RESRAD appropriate for the site. Basis for Request NUREG-1569, Acceptance Criterion 6.4.3(1), states: "The cleanup criteria for radium in soils are met as provided in 10 CFR Part 40, Appendix A, Criterion 6(6)." This criterion states that the design requirements for longevity and control of radon releases apply to any portion of a licensed and/or disposal site unless such portion contains a concentration of radium in land, averaged over areas of 100 m2, which as a result of byproduct material, does not exceed the background level by more than: (i) 5 picocuries per gram (pCi/g) of radium-226, or, in the case of thorium byproduct material, radium-228, averaged over the first 15 cm [5.9 in.] below the surface, (ii) 15 pCi/g of radium-226, or, in the case of thorium byproduct material, radium-228, averaged over 15-cm [5.9-in.] thick layers more than 15 cm [5.9 in.] below the surface." NUREG-1569, Acceptance Criterion 6.4.3(3), states: "Acceptable cleanup criteria for uranium in soil, such as those in Appendix E of this standard	Cameco 12/23/2014 Response: A sampling plan with details on where and how Marsland site-specific cleanup criteria are to be determined will be submitted for NRC review in January 2013. Following resolution of any issues, the application will be revised to highlight the elements of that plan. Any required sampling will be conducted in late spring or early summer of 2014, prior to construction. Cameco 5/6/2014 Status: The sampling plan was submitted on January 24, 2014 and is attached below for your information. Dependent on the variability detected during initial transects, the scan speed and transect spacing may be increased to utilize ATVs and up to a maximum of 50 meter spacing respectively. The gamma surveys and soil sampling will be performed in June and a report submitted by September 1, 2014. Cameco 5/16/2014 Status: Weather permitting the gamma survey will occur the week of May 26th. It takes 30 days for sample results, and our contractor expects to prepare a final report for submission in mid-July 2014. Cameco 5/27/2014 Status: The survey and sampling are underway.

review plan, are proposed by the pplicant. This is the radium benchmark dose approach of 10 CFR Part 40, Appendix A, Criterion 6(6)." NUREG-1569, Acceptance Criterion 6.4.3(4), states: "For areas that already meet the radium cleanup criteria, but that still have elevated thorium levels, the applicant proposes an acceptable cleanup criterion for thorium-230. One acceptable criterion is a concentration that, combined with the residual concentration of radium-226, would result in the radium concentration (residual and from thorium decay) that would be present in 1,000 years meeting the radium cleanup standard." NUREG-1569, Acceptance Criterion E2.1.3(2), states, in part: "...The code/calculation input data are appropriate for the site and represent current or long-term conditions, whichever is more applicable to the time of maximum dose. When code default values are used, they are justified as appropriate (representative) for the site..." Request for Additional Information Please address the following issues related to the soil cleanup criteria for the MEA: A. In TR Section 6.4.1, the applicant stated that the ALARA goal for natural uranium in the top 15 cm soil layer is 150 pCi/g averaged over *more than* 100 m2. The averaging of radionuclides over more than 100 m2 is not consistent with the requirements of 10 CFR Part 40, Appendix A, Criterion 6(6) or NUREG-1569, Acceptance Criterion 6.4.3(1). Please provide a justification for averaging the natural uranium concentration over more than 100 m2. B. Consistent with NUREG-1569, Acceptance Criteria 6.4.3(3) and E2.1.3(2), please confirm that site-specific parameters relevant to the MEA (e.g., soil type, wind speed, precipitation, etc.) were used for the RESRAD analysis and thus deriving the radium benchmark dose. If the MEA site-specific parameters are different from what was analyzed, please provide a relevant RESRAD and radium benchmark dose analysis. C. In TR Section 6.4, the applicant refers to its analysis of Th-230 at its main facility for the Marsland analysis without assessing if this analysis is applicable to the MEA. Consistent with NUREG-1569, Acceptance Criterion 6.4.3(4), please provide a MEA site-specific discussion on Th-230, or indicate where this information can be found.	Cameco 7/11/2014 Status: Cameco now anticipates submission in early August. Cameco 8/5/2014 Status: No update.

RAI 42 Description of Deficiency In TR Section 6.4.2, the applicant provided a gamma action level of 17,900 cpm as the level corresponding to the Marsland soil cleanup criterion. In TR Appendix N, the applicant described its derivation of the gamma action level of 17,900 cpm. However, the gamma action level was derived from data at the main facility (i.e., background levels, etc.) and there is no justification addressing why this data can be applied to Marsland, an unrelated land area. Basis for Request NUREG-1569, Acceptance Criterion 6.4.3(5), states: "The survey method for verification of soil cleanup is designed to provide 95-percent confidence that the survey units meet the cleanup guidelines. Appropriate statistical tests for analysis of survey data are described in NUREG–1575, 'Multi-Agency Radiation Survey and Site Investigation Manual' (NRC, 2000)." Request for Additional Information Consistent with NUREG-1569, Acceptance Criterion 6.4.3(5), please provide a technical justification for applying a gamma action level of 17,900 cpm to the Marsland facility when data used to derive this action level is based on site-specific data for the main facility, an unrelated land area.	Cameco 12/23/2014 Response: RAI 42 - A sampling plan with details on where and how a Marsland site-specific gamma action level is to be determined will be submitted for NRC review in January 2013. Following resolution of any issues, the application will be revised to highlight the elements of that plan. Sampling will be conducted in late spring or early summer of 2014, prior to construction. Cameco 5/6/2014 Status: The sampling plan was submitted on January 24, 2014 and is attached below for your information. Dependent on the variability detected during initial transects, the scan speed and transect spacing may be increased to utilize ATVs and up to a maximum of 50 meter spacing respectively. Cameco 5/16/2014 Status: Weather permitting the gamma survey will occur the week of May 26th. It takes 30 days for sample results, and our contractor expects to prepare a final report for submission in mid-July 2014. Cameco 5/27/2014 Status: The survey and sampling are underway. Cameco 7/11/2014 Status: Cameco now anticipates submission in early August. Cameco 8/5/2014 Status: No update.
ADMINISTRATIVE ISSUES	
Section 2 – Site Characterization	
Admin §2 #1. In Section 2.1, the application states that Figure 1.7-2 shows the Restricted Areas for the current license area. This is not readily identified in Figure 1.7-2. It appears that this reference may have been intended for Figure 1.1-1 of the ER. This statement should be removed from the text or the restricted area should be identified in Figure 1.7-2 or the proper figure should be included in the TR.	Cameco 12/23/2014 Response: Figure 1.7-2 has been revised to show the Restricted Areas for the current license area. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: No change. Cameco 8/5/2014 Status: No update.
Admin §2 #7. The summer wind rose (Figure 2.5-21) appears to be composed of two separate timeframes from 2010 and 2011. Please clarify the timeframe for the summer wind rose in Figure 2.5-21.	Cameco Response: The timeframe of 9/07/2010 to 8/29/2011 for the summer wind rose was added as a notation in Figure 2.5-21. Because the monitoring year spans parts of two calendar years, the summer wind rose software program used all of the

	available summer data from both years. This turned out to be September of 2010 (beginning with the 7th), July of 2011, and August of 2011 (up to the 29th). Therefore, the summer months are extracted from the stated date range. Cameco 8/5/2014 Status: No update.
Admin §2 #12. Please confirm the TR table where the MEA site-specific meteorological station coordinates and period of operation can be found.	Cameco Response: The MEA site-specific meteorological station coordinates are provided in Table 2.5-1. The period of operation for the MEA site-specific meteorological station is provided in 2.9.2.1. Cameco 8/5/2014 Status: No update.
Admin §2 #17. Please provide a consistent description of the preoperational and operational environmental surface water monitoring plan consistent with RG 4.14. (a) TR Section 2.9.4.3 and Tables 2.9-26 and 2.9-27 indicate that surface waters will be sampled on a monthly basis. However TR Table 2.9-35 indicates that surface water samples will be performed on a quarterly and semiannual basis. (b) TR Section 5.7.8.3 indicates that operational samples will include Po-210. TR Table 5.7-1 does not include Po-210 as an analyte. (c) TR Table 5.7-1 indicates two samples will be collected from designated ephemeral drainages. This appears inconsistent with "Note a" in TR Table 2.9-35 and sample collection points in TR Figure 2.7-4.	Cameco Response: As stated in the responses for 2.17 a), b), and c), clarifications have been provided for the preoperational and operational environmental surface water monitoring plan consistent with RG 4.14. Surface water samples at N-1 and N-2 have been collected monthly for a 12-month period. This sampling also included Po-210 and Pb-210, which are required to be sampled semi-annually as per RG 4.14. Table 2.9-35 (revised to Table 2.9-41 due to table changes in Section 2.9) has been revised to be consistent with RG 4.14 preoperational monitoring requirements. Future sampling will consist of monthly sampling for suspended and dissolved natural uranium, Ra-226, and Th-230, and semi-annually for suspended and dissolved Pb-210 and Po-210. Figure 2.9-1 has been updated to present the remaining preoperational monitoring tasks. Table 5.7-1 was revised to include Po-210 as an additional analyte that will be monitored in accordance with RG 4.14 operational monitoring requirements. The description of the sampling of ephemeral drainages in Table 5.7-1 has been revised to clarify that two surface water samples (upstream and downstream) for each designated ephemeral drainage (total of three drainages, total of 6 samples) will be collected quarterly when runoff flow is available.

	Cameco 8/5/2014 Status: Cameco is revising the application as noted immediately above. In addition, we are adding a monitoring location where one of the drainages leaves the license area for a short distance and then returns. Figure 2.7-4, the text in Section 2.9.7.2 and Table 5.7-1 will be modified accordingly.
Admin §5 #3. The applicant did not provide details of its qualification program for designees approving Radiation Work Permits (RWPs) and Standing Radiation Work Permits (SRWPs) in the absence of the RSO. In TR Section 5.2.1.2, the applicant stated that qualified designees will review and approve RWPs and SRWPs in the absence of the RSO, but did not provide any description of its qualification program for such designees. Please provide a description of the qualifications of the designees that will be allowed to review and approve RWPs and SRWPs in the absence of the RSO.	Cameco 12/23/2014 Response: The minimum training requirements have been added to Section 5.4.1 in accordance with RG 8.31. Cameco 5/6/2014 Status: Awaiting NRC review. Cameco 5/27/2014 Status: Cameo will revise the application to describe the qualifications of designees. Cameco 7/11/2014 Status: Section 5.2.1.2 has been revised to reflect the qualifications for designees allowed to review and approve RWPs and SRWPs in the absence of the RSO. Cameco 8/5/2014 Status: No update.
Admin §5 #4. The applicant did not provide minimum amount of specialized training required for the RSO qualifications. License Condition 9.12 of the applicant's current license (Amendment No. 26, ADAMS accession No. ML110320358) requires the applicant to follow the guidance set forth in Regulatory Guide 8.31. NUREG-1569, Acceptance Criterion 5.4.3(1), states, in part: "The personnel meet minimum qualifications and experience for radiation safety staff that are consistent with Regulatory Guide 8.31, Section 2.4 (NRC, 2002)." In TR Section 5.4.1, the applicant discusses specialized training in general but does not specify a minimum amount of this training for the RSO qualifications. Consistent with RG 8.31, please provide a minimum amount of specialized training required for the RSO qualifications.	Cameco 12/23/2014 Response: This issue is currently being addressed in the context of Draft License Conditions to the underlying license for the Crow Butte facility. Cameco will revise the Marsland application to comport with the revisions to the underlying license prior to operations. Cameco 5/6/2014 Status: The RAI response will be provided no later than May 30, 2014. Cameco 5/27/2014 Status: No update. Cameco 7/11/2014 Status: Cameco does not expect to change the application. Reference to the RG 8.31 provides an adequate "tie down" and avoids unnecessary, identical and redundant language in the application. Cameco 8/5/2014 Status: No update.