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4.1 Site Characterization			
Knowledge of the site is needed to evaluate the existing and potential contamination. This characterization information shall include a description of activities and physical properties that may affect water resources at the mill site.	(1) Description of the site that is sufficient to assess the environmental impact the former mill site may have on the surrounding area; the populations that may be affected by such impacts; and meteorological conditions that may act to transport contaminants off site.	An acceptable site description will contain the following specific information: (a) A site history that includes:	1.2.4 Description of Operations 1.2.5 Mill Decommissioning Also see ER Figure 1-4
		(i) A list of the known leaching solutions and other chemicals used in the milling process and their relative quantities in mill wastes. The list should also identify any constituent listed in 10 CFR Part 40, Appendix A, Criterion 13, that may have been disposed of in the tailings pile.	1.2.4.1 Mill Operations Appendix 2.2-A (ID of Hazardous Constituents)
		(ii) A description of the wastes generated at the site during milling operations, waste discharge locations, types of retaining structures used (e.g., tailings piles, ponds, landfills), quantities of waste generated, and a chronology of waste management practices.	1.2.4 Description of Operations 1.2.5 Mill Decommissioning Table 4.1-2 (Summary of Groundwater Restoration Corrective Action System Performance) Table 4.2-4 (Summary of Total Water Collection, Injection and Waste Water Production Rates and Volumes) Figure 4.1-1 (Summary Timeline of Groundwater Corrective Action Systems)
		(iii) A summary of the known impacts of the site activities on the hydrologic system and background water quality.	1.3 Extent of Ground-Water Contamination Env. Report 4.4 Water Resources Impacts
		(iv) If applicable, descriptions of any human activities or natural processes unrelated to the milling operation that may have altered the hydrogeologic system. Such human activities include ground-water use, crop irrigation, mine dewatering, ore storage, municipal waste land filling, oil and gas development, or exploratory drilling. Natural processes include geothermal springs, natural concentration of soluble salts by evaporation, erosion processes, and ground-water/surface-water interactions.	1.2.2.9.2.1 Background Groundwater Quality
		(b) Information pertaining to surrounding land and water uses that includes:	1.2.2.1 Land Use/Land Cover 1.2.2.2 Population and Demographics 1.2.2.9. Water Quality and Water Use
		(i) A general overview of water uses, locations, quantities of water available, and the potential uses to which the quality of water is suited	1.2.2.9.3 Groundwater Use 4.4.1.1 Current and Projected Future Water Demand Appendix 4.4-A Future Water Use Demand Basis of Estimate Figure 1.2-57 (Private Well Permits near GRP) Env. Report Section 3.4.3 Hydrogeology Env. Report Section 3.5 Water Resources

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		(ii) Definitions of the class-of-use category for each water source (e.g., drinking water, agricultural, livestock, limited use).	No class-of-use definitions by State, Standards identified in Table 1.1-1
		(iii) Identification of potential receptors of present or future ground-water or surface-water contamination.	Section 3.4.2 Pathway and Receptor Characterization
		(iv) Descriptions of non-mill-related human activities or natural processes that may affect water quality or water uses (e.g., oil and gas development, municipal waste landfills, crop irrigation, drought, and erosion). Human water consumption is not the only water use that must be considered in the review. Any use that may bring someone into contact with the contaminated water must be considered when evaluating health hazards. For example, non-potable, radon-contaminated water piped to a public lavatory could pose a substantial health hazard.	1.2.2.1 Land Use/Land Cover
		(c) Sufficient meteorological data for the region, including rainfall, temperature, humidity and evaporation data in sufficient detail to assess projected water infiltration through the disposal cell. Monthly averages are an acceptable means of presenting general meteorological conditions; however, the reviewer shall ensure that extreme weather conditions are adequately described.	1.2.2.3 Meteorology, Climatology and Air Quality Table 1.2-5 Grants-Milan Municipal Airport Monthly and Annual Temperature and Precipitation Table 1.2-6 2020 GRP Meteorological Data Figure 1.2-6 Class A Pan Evaporation at Laguna, New Mexico 1914-2005 Figure 1.2-7 Daytime Wind Rose Figure 1.2-8 Nighttime Wind Rose Env. Report Section 3.7 Meteorology, Climatology and Air Quality
	(2) The ground-water and surface-water hydrology is described adequately to support modeling predictions of likely contaminant migration paths; selection of monitor well locations; and, when ground-water contamination exists, selection of a restoration strategy.	(a) A description of hydrogeologic units that may affect transport of contaminants away from the site via ground-water pathways, including:	1.2.2.6.2 Local Geology and Hydrogeology 1.2.2.7.2 Local Groundwater Hydrology
		(i) Hydrostratigraphic cross sections and maps are included to delineate the geometry, lateral extent, thickness, and rock or sediment type of all potentially affected aquifers and confining zones beneath the processing and disposal sites.	Figures 1.2-17 through 1.2-35
		(ii) The hydrogeologic units that constitute the uppermost aquifer (where regulatory compliance will be evaluated) are identified.	1.2.2.6.2 Local Geology and Hydrogeology 1.2.2.7.2 Local Groundwater Hydrology

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		(iii) If local perched aquifers are found at the site, their presence is noted. Any saturated zone created by uranium or thorium recovery operations would not be considered an aquifer unless the zone is or potentially is: (1) hydraulically interconnected to a natural aquifer, (2) capable of discharge to surface water, or (3) reasonably accessible because of migration beyond the vertical projection of the boundary of the land transferred for long-term government ownership and care in accordance with 10 CFR Part 40, Appendix A, Criterion 11.	No perched Aquifers Limited Perched zone under Large Tailings Pile (See Section 4.1.1.1 Tailings Dewatering)
		(iv) Unsaturated zones, through which contaminants may be conveyed to the water-bearing units, are described.	1.2.5.4 Seepage Impacted Area
		(v) Information is presented on geologic characteristics that may affect ground-water flow beneath the former mill site.	1.2.2.6 Geology 1.2.2.7 Hydrology
		(vi) Hydraulic-head contour maps, of both local and regional scale, for the uppermost aquifer and any units connected hydraulically beneath the site are sufficient to determine hydraulic gradients, ground-water flow direction, and proximity to offsite ground-water users.	Figures 1.2-29 through 1.2-35
		(b) Estimations of hydraulic and transport properties of the underlying aquifer:	3.1.1.4 Aquifer Physical Properties Included by reference: HMC, 1981; HMC, 1996. (see Appendix 1.2-C which Electronic files of referenced materials) Appendix 3.1-A Model Calibration Report
		(i) Hydraulic conductivity and storage coefficients are determined by conducting aquifer pump tests on several wells at the site.	3.1.1.4 Aquifer Physical Properties Included by reference: HMC, 1981; HMC, 1996. (see Appendix 1.2-C which Electronic files of referenced materials) Appendix 3.1-A Model Calibration Report
		(ii) Horizontal components of hydraulic gradient are estimated by measurement of the distance between contour intervals on hydraulic head contour maps. Vertical components of hydraulic gradient are estimated from head measurements in different aquifers or at different depths in the same aquifer.	Figures 1.2-29 through 1.2-35
		(iii) Generally, analyses considering steady-state conditions are acceptable unless site conditions indicate otherwise. If transient conditions are modeled, storage coefficients estimated from standard tests indicated in (i) above are used.	3.1 Transport and Pathway Assessment 3.3 Transport Model Calibration Results Included by reference: HMC, 1981; HMC, 1996. (see Appendix 1.2-C which Electronic files of referenced materials) Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report

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		(iv) If contaminant transport is modeled, then longitudinal and transverse dispersivity values are either obtained from a tracer test or conservative values based on published literature are used.	Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report
		(c) Estimation of ground-water/surface-water interactions at sites with nearby streams, rivers, or lakes. The locations of surface-water bodies that are connected to the site groundwater flow system are identified.	No perennial surface water bodies, no groundwater discharges to surface waters. Groundwater recharge from infiltration only. Appendix 3.1-A Model Calibration Report (See Appendix Section 3.4.1-Recharge) Appendix 4.2-B Predictive Modeling Report (See Appendix Section 4.4 Groundwater Recharge Sensitivity; Section 5.1.1 Uranium Bounding Case Setup)
	(3) Geochemical conditions and water quality are characterized sufficiently to:	(a) Identify the constituents of concern. Any chemical or radiological constituent that is reasonably expected to be in or derived from the tailings is a potential constituent of concern.	Section 1.5.1 Groundwater Constituents Section 2.2 Constituents of Concern Appendix 2.2-A Identification of Constituents
		If there is no record of organic compounds used in the process, screening tests for volatile and semi-volatile organic compounds are performed to confirm the absence of organic compounds in the tailings and groundwater.	Section 2.2 Constituents of Concern Appendix 2.2-A Identification of Hazardous Constituents
		(b) Present a determination of background (baseline) water quality.	Background water quality already defined by condition 35B SUA-1471. Per Amendment 39. 1.2.2.9.2.1 Background Groundwater Quality Table 1.1-1 Summary of Current Groundwater Protection Standards, Applicable Standards and Other Reasonable and Potentially Appropriate Criteria Detailed Statistics included by reference: (see Appendix 1.2-C, which includes Electronic files of referenced materials) HMC 2003a; 2003b; HMC and Hydro-Engineering 2003; HMC 2005a; HMC 2005b; HMC 2006; NRC, 2006-Env. Assessment for Amendment 39.
		(i) Maps are of sufficient detail and legibility to show the background monitoring locations.	Included by reference: (see Appendix 1.2-C, which include Electronic files of referenced materials) HMC, 2021: 2020 Annual Monitoring Report; Figure 4.1-1.
		(ii) Descriptions of sampling methods, monitoring devices, and quality assurance practices are provided.	Section 1.2.2.9 Water Quality and Water Use

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		(iii) When they exist, zones of differing background water quality are delineated. The possible causes of these differing water quality zones are discussed (e.g., changes from geochemically oxidizing to reducing zones in the aquifer; changes in rock type across a fault boundary).	1.2.2.9.2.1 Background Groundwater Quality.
		(iv) A table for each zone of distinct water quality, listing summary statistics (i.e., mean, standard deviation, and number of samples) for baseline water quality sampling for each constituent of concern, is provided.	Table 1.1-1 Current Groundwater Protection Standards, Other Agency Standards, and Screening Criteria Summary Statistics included by reference
		(v) It is unlikely that mills in existence prior to the groundwater compliance provisions of 10 CFR Part 40, Appendix A, will have one full year of monthly baseline data from a pre-operational monitoring program. Alternatively, background water quality may already be defined by a condition in the license. If this is the case, background limits for a ground-water protection standard have already been identified, and the reviewer should rely on those along with any constituents and standards listed in Criterion 5(c) as the regulatory limits applicable to this site.	SUA-1471, LC 35B, Amendment 39. NRC, 2006-Env. Assessment for Amendment 39. EPA, 2005-EPA approval of background
		(c) Confirm the proper use of statistical techniques for assessing water quality.	Detailed Statistics included by reference: (see Appendix 1.2-C, which includes Electronic files of referenced materials) HMC 2003a; 2003b; HMC and Hydro-Engineering 2003; HMC 2005a; HMC 2005b; HMC 2006; NRC, 2006-Env. Assessment for Amendment 39.
		(d) Define the extent of contamination. Typically delineated in three dimensions It may not be necessary to sample all hazardous constituents to delineate the extent of contamination. Two or three indicator parameters (e.g., total dissolved solids, and chloride) might be selected. These indicators should be conservative—meaning that they are neither reactive, nor are they easily sorbed to soil—so that they provide a good indication of the maximum extent of contamination.	1.3 Extent of Groundwater Contamination
		The reviewer shall verify that the licensee has presented the following information to support determining the extent of contamination.	
		(i) A map or maps showing the distribution of surface wastes and contaminated materials at and near the site.	Figures 1.2-1, 1.2-43
		(ii) A map or maps showing the approximate shape and extent of ground-water contamination (e.g., concentration contour maps for indicator parameters in ground water).	Figures 1.3-1 through 1.3-35 included by reference: HMC, 2021-Annual Performance Monitoring Report. (see Appendix 1.2-C, which include electronic files of referenced materials)

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		(iii) Identification of any offsite sources of water contamination or other factors that may have a bearing on observed water quality.	1.2.2.9.2.1 Background Groundwater
		(e) Properly estimate the source term.	Section 2.1 Source and Contamination Characterization
		Location and rate of entry into the subsurface. source term is determined based on the chemical properties of the leachate and the rate at which leachate is released from the disposal area. The level of review given to source term calculations is commensurate with the overall importance of source term estimations to the selection of the restoration strategy.	2.1.1.2 Large Tailings Pile Pore Water Geochemical Characterization 2.1.1.3 Large Tailings Pile Seepage Rates Characterization 2.1.1.4 Large Tailings Pile Rebound Evaluation 2.1.1.5 Bounding Source Large Tailings Pile Source Term Estimation 2.1.4 Tailings Impacted Alluvium - Secondary Source Figures 2.1-3 through 2.1-11 included by reference: Hydro-Engineering, 2020a; Hydro-Engineering, 2020b (see Appendix 1.2-C, which include electronic files of referenced materials)
		(i) All facilities from which leakage can occur are identified. Leaking constituents are identified based on the nature of the processing fluids. The volume of leakage is estimated in a realistic yet conservative manner. (ii) When geochemical models are used to predict the fate and transport of existing contamination where the original source has been eliminated, the distribution of each hazardous constituent in place is taken as the source term.	Section 2.1 Source and Contamination Characterization. Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report
		(f) Characterize the subsurface geochemical properties. Aquifer geochemistry data are adequate to model the attenuation of contaminants. The values of the geochemical parameters used in transport models are justified. Acceptable parameter estimation methods are direct measurement, use of a conservative bounding estimate, reference to literature values for similar aquifer conditions, and laboratory studies of aquifer materials.	1.3.2.6 Geochemistry (groundwater) 1.3.2.6.5 Conceptual Geochemical Model 3.1.3.1 Transport Parameter Development Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report included by reference: WME, 2020a, 2020b, 2020c, 2021. (see Appendix 1.2-C, which include electronic files of referenced materials)

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		(g) Identify contaminant attenuation mechanisms. values of sorption coefficients are based on the nature of the constituent and site-specific geochemical conditions. Attenuation from geochemical or biochemical equilibrium reactions is estimated by use of acceptable modeling software packages Monitoring data are used to assess attenuation of contaminants.	1.3.2.6 Geochemistry (groundwater) 1.3.2.6.5 Conceptual Geochemical Model 3.1.3.1 Transport Parameter Development Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report included by reference: WME, 2020a, 2020b, 2020c, 2021. (see Appendix 1.2-C, which include electronic files of referenced materials)
4.3.3.1 HAZARD ASSESSMENT			
Identifies all potential constituents of concern at a site. A potential constituent of concern is any compound that may be in or could be derived from the uranium mill tailings at a licensed site. A non-inclusive list of constituents of concern is in 10 CFR Part 40, Appendix A, Criterion 13.	(1) The source term for all constituents of concern is adequately characterized	Provides relevant information about the facility including:	
		(a) the mechanical and chemical processes used to recover the uranium,	1.2 Facility Description 1.2.4 Mill Operations
		(b) the types and quantities of the reagents used in milling,	1.2.4 Mill Operations
		(c) the physical and chemical composition of the uranium-bearing ore, and	1.2.4 Mill Operations included by reference: WME, 2020c (see Appendix 1.2-C which include electronic files of referenced materials)
		(d) the historical and current waste and tailings management practices.	1.2.4.2 Tailings Operations
		physical and chemical composition of the tailings	2.1 Source and Contamination Characterization; including the following: 2.1.1.1 Large Tailings Pile Tailings Solids Characterization 2.1.1.2 Large Tailings Pile Pore Water Geochemical Characterization 2.1.1.4 Large Tailings Pile Rebound Evaluation 2.1.1.5 Bounding Source Large Tailings Pile Source Term Estimation Included by reference WME, 2020a, 2020b, 2020c. (see Appendix 1.2-C, which include electronic files of referenced materials)
		type and distribution of existing contaminants, such as:	
		the location of waste discharge points	1.2.3 Facility Layout 1.2.4 Description of Operations 1.2.5 Mill Decommissioning

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		retaining structures for wastes	1.2 Facility Description 1.2.4 Mill Operations 1.2.5 Mill Decommissioning
		waste constituents	2.2 Constituents of Concern Appendix 2.2-A Identification of Constituents
		reliable estimates of the release rates of hazardous constituents	2.1.1.3 Large Tailings Pile Seepage Rates Characterization 2.1.4 Tailings Impacted Alluvium - Secondary Source Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report
	The extent of existing and potential future ground-water contamination is determined		1.3 Extent of Groundwater Contamination
	(2) The assessment identifies and evaluates the risks and hazards presented by the identified constituents of concern, including the human cancer risk caused by exposure to radioactive and non-radioactive constituents of concern, along with other health hazards that may be caused by the chemical toxicity of those constituents.		
		The human cancer risk should be evaluated for individual constituents, including radioactive and carcinogenic chemicals, and compared with the maximum permitted risk level.	3.5 Human Exposure Potential from Hazardous Constituents at Modeled Concentration Appendix 3.5-A Human Exposure Potential from COCs at Unit Concentrations
		The health effects of non-radioactive and non-carcinogenic constituents that are chemically toxic will be evaluated considering their risk-specific dose levels. (acceptable hazard index must be less than one)	3.5 Human Exposure Potential from Hazardous Constituents at Modeled Concentration Appendix 3.5-A Human Exposure Potential from COCs at Unit Concentrations
		The following additional information on constituent properties is provided, as applicable:	
		(a) density, solubility, valence state, vapor pressure, viscosity, and partitioning coefficient;	Not provided or specifically relevant to assessment of transport or health risks for the identified constituents.
		(b) presence and effects of complexing ligands and chelating agents that may enhance constituent mobility;	1.3.2.6 Geochemistry (groundwater) 1.3.2.6.5 Conceptual Geochemical Model 3.1.3.1 Transport Parameter Development
		(c) potential for a constituent to degrade because of biological, chemical, and physical processes; and	

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		(d) constituent attenuation properties, considering such processes as ion exchange, sorption, precipitation, dissolution, and ultrafiltration.	Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report included by reference: WME, 2020a, 2020b, 2020c, 2021. (see Appendix 1.2-C, which include electronic files of referenced materials) No degradation of hazardous constituents expected for the identified, metals, radionuclides and non-metals species.
	(3) The assessment provides a reasonably conservative or best estimate of the potential health effects caused by human exposure to the hazardous constituent.	The potential health effects for each constituent with a proposed alternate concentration limit must be identified, and related to appropriate exposure limits and dose-response relationships from available literature or databases. *Sources of exposure limit and dose-response information include the EPA's maximum concentration limits for drinking water, reference doses, or risk-specific doses.*	3.4 Human Exposure Potential 3.5 Human Exposure Potential from Constituents at Modeled Concentration Appendix 3.5-A Human Exposure Potential from COCs at Unit Concentrations
		The reference dose and risk-specific dose assessment assume a human mass of 70 kg [154 lb] and consumption of 2 liters of water per day [0.53 gal/day].	3.5 Human Exposure Potential Unit Concentrations
		The exposure analysis should distinguish between threshold (toxic) and non-threshold (carcinogenic) effects associated with human exposure, as well as teratogenic, fetotoxic, mutagenic, and synergistic effects.	3.5.1 Dose and Risk from Radionuclides in Groundwater at the Point of Exposure (carcinogenic) 3.5.3 Dose and Risk from Arsenic in Groundwater at the Point of Exposure 3.5.4 Summary of Potential Carcinogenic Risks 3.5.5 Risk of Systemic Effects (toxologic)
	(4) The assessment identifies and evaluates the risks posed by the hazardous constituents to environmental populations.	Adverse effects on aquatic and terrestrial wildlife, plants, agricultural crops, livestock, and physical structures should be considered. Examples of these adverse effects are:	
		(a) contaminant-induced changes in the biota,	3.6 Environmental Exposure Potential Addressed through the use of ecological screening levels.
		(b) loss or reduction of unique or critical habitats, and	
		(c) jeopardy to endangered or threatened species.	
		identifies any **acute and sub-chronic effects** on environmental populations caused by exposure to the hazardous constituents.	
		Bioaccumulation and food chain interactions are considered when evaluating adverse effects.	
		A comparison of the estimated constituent concentrations to the appropriate federal or State water-quality criteria should be part of the evaluation of potential effects on aquatic wildlife.	No aquatic receptors.
4.3.3.2 EXPOSURE ASSESSMENT			

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The purpose of the exposure assessment is to evaluate the potential harm to human health and the environment from the hazards identified in the hazard assessment.	(1) Evaluates the pathways the hazardous constituents will likely follow and the concentration or dose those constituents will likely produce at the location where humans or environmental populations could be reasonably exposed. All likely pathways that could transport significant amounts of hazardous constituents in the ground water and hydraulically connected surface water should be identified and evaluated. The hazardous constituent concentrations and projected distributions for each pathway should be best estimates or reasonably conservative representations of the constituent transport, including: rate extent direction	Pathway evaluation provides projected contaminant distributions, including contaminant transport, degradation, and attenuation mechanisms between the point of compliance and the point of exposure. The evaluation generally provides information on:	3.1 Transport and Pathway Assessment 3.3 Transport Model Calibration Results Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report
		(a) site hydrogeologic characteristics, including ground-water flow direction and rates;	1.2.2.7 Hydrology 1.2.2.8 Hydrostratigraphic Conceptual Model 1.3 Extent of Ground-Water Contamination 3.1.1.4 Aquifer Physical Properties Appendix 3.1-A Model Calibration Report Included by reference: HMC, 1981; HMC, 1996. See Appendix 1.2-C, which includes electronic files of referenced materials.
		(b) background water quality; and	1.2.2.9.2.1 Background Groundwater Quality Detailed Statistics included by reference: (see Appendix 1.2-C, which includes Electronic files of referenced materials) HMC 2003a; 2003b; HMC and Hydro-Engineering 2003; HMC 2005a; HMC 2005b; HMC 2006; NRC, 2006-Env. Assessment for Amendment 39. Table 1.1-1 Summary of Current Groundwater Protection Standards, Applicable Standards and Other Reasonable and Potentially Appropriate Criteria

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		(c) estimated transport rates, geochemical attenuation, and concentrations of hazardous constituents in the groundwater and hydraulically connected surface water.	1.2.2.7 Hydrology 3.1.1 Model Development 1.3.2.6 Geochemistry (groundwater) 1.3.2.6.5 Conceptual Geochemical Model 3.1.3.1 Transport Parameter Development Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report included by reference: WME, 2020a, 2020b, 2020c, 2021. (see Appendix 1.2-C which include electronic files of referenced materials) 1.3 Extent of Ground-Water Contamination Appendix 4.2-B Predictive Modeling Report
	(2) Pathway evaluation provides the spatial distribution of the various hazardous constituents of existing contaminant plumes. This information can be used to calibrate contaminant fate and transport models in the exposure assessment and also identifies the components of the source term that have already been released from the tailings.	Projections should be calibrated on the basis of site-specific information.	3.1 Transport and Pathway Assessment Appendix 3.1-A Model Calibration Report Appendix 4.2-B Predictive Modeling Report
		The contaminant extent characterization includes:	
		(a) the type and distribution of hazardous constituents in the groundwater and the source(s) of the contamination;	1.3 Extent of Ground-Water Contamination 2.2 Constituents of Concern Appendix 2.2-A Identification of Hazardous Constituents 2.1 Source and Contamination Characterization
		(b) the monitoring program used to delineate and characterize hazardous constituent distribution; and	1.3.1 Summary (Extent of Groundwater Contamination) included by reference: HMC 2021- Annual Performance Report (see Appendix 1.2-C which include electronic files of referenced materials
		(c) supporting documentation of the sampling, laboratory analysis, and quality assurance programs that show the fulfillment of the site monitoring programs.	1.2.2.9.2 Groundwater Quality

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	(3) Human exposure evaluation considers two potential exposure pathways: (a) ingestion of contaminated water and (b) ingestion of contaminated foods. Other pathways that may impact human health, such as dermal contact and inhalation, are also to be considered, but need not always be assessed, unless it is determined that these exposures could result in significant hazards to human health or the environment.	Site-specific water uses are determined on the basis of the following considerations:	
		(a) ground-water quality in the site area and present water uses;	1.2.2.9.2.1 Background Groundwater Quality 1.2.2.9.3 Groundwater Use Appendix 4.4-A Future Water Use Demand Basis of Estimate
		(b) statutory or legal constraints and institutional controls on water use in the site area;	1.2.2.9.3 Groundwater Use 1.2.1 Licenses, Permits, And Other Environmental Requirements
		(c) federal, state, or other ground-water classification criteria and guidelines;	1.2.1 Licenses, Permits, And Other Environmental Requirements Table 1.1-1
		(d) applicable water-use criteria, standards, and guidelines; and	
		(e) availability and characteristics of alternate water supplies.	4.4.1.2 Availability of Alternate Water Supplies Figure 1.2-57 Figure 2.3 in Appendix 4.2-B Predictive Modeling Report
		Exposure determinations should consider existing and potential water uses. Potential uses include those that are reasonably expected to occur (i.e., anticipated use) and uses that are compatible with the untreated background water quality (i.e., possible use). Past water uses may be included as existing or potential uses. Water resource classification of existing and potential water use should include:	3.6 Environmental Exposure Potential Addressed through the use of ecological screening levels.
		(a) domestic and municipal drinking water use;	1.2.2.9 Groundwater Use Figure 1.2-57 Appendix 4.4-A Future Water Use Demand Basis of Estimate
		(b) fish and wildlife propagation,	No aquatic receptors, Addressed through the use of ecological screening levels.
		(c) special ecological community uses: and	
		(d) industrial, agricultural, and recreational uses.	1.2.2.1 Land Use 1.2.2.9 Groundwater Use
		The classification of existing and potential water uses at the facility should be consistent with federal, state, and local water use inventories.	1.2.2.9 Groundwater Use
		Cumulative effects of human exposure and the combined effects from both radiological and non-radiological constituents should be considered.	3.5 Human Exposure Potential from Hazardous Constituents at Modeled Concentration

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	(4) Potential responses of environmental or non-human populations to the various hazardous constituents are evaluated if such populations can realistically be exposed to contaminated ground water or hydraulically connected surface water. Terrestrial and aquatic wildlife, plants, livestock, and crops are included in this evaluation. *Alternatively, the evaluation may demonstrate that environmental hazards are not anticipated, because exposure will not occur.*	A detailed environmental exposure evaluation should be performed in the absence of available information that could readily be used to show there will be no substantial environmental impacts caused by ground-water contamination from the site. The evaluation should provide:	3.6 Environmental Exposure Potential Addressed through the use of ecological screening levels.
		(a) inventories of potentially exposed environmental populations;	1.2.2.4 Ecology 3.6 Environmental Exposure Potential Environmental Report (ER): ER Section 3.5 Ecological Resources ER Appendix A - United States Fish and Wildlife Service Species List Included by Reference: HDR, 2020 (See Appendix 1.2-C which includes electronic files of referen,ed materials
		(b) recommended tolerance or exposure limits;	3.6.1.2 Radioecological Screening Levels
		(c) contaminant interactions and their cumulative effects on exposed populations;	
		(d) projected responses of environmental populations that result from exposure to hazardous constituents; and	
		(e) anticipated changes in populations, independent of the hazardous constituent exposure.	3.6.3 Summary of Ecological Effects
		The potential for adverse effects should also be described, such as (a) contamination-induced biotic changes; (b) loss or reduction of unique or critical habitats; and (c) jeopardizing endangered species	
		Aquatic wildlife effects are evaluated by comparing estimated constituent concentrations with federal and state water quality criteria. Terrestrial wildlife exposure to constituents through direct exposure and food-web interactions should be considered.	No aquatic receptors
		Agricultural effects from both direct and indirect exposure pathways, crop impacts, reduced productivity, and bioaccumulation of constituents should be considered. Reasonably conservative estimates of constituent concentrations are compared with federal and state water quality criteria to estimate agricultural effects associated with constituent exposure.	3.4.2.2.2 Resident Ingestion of Well-Irrigated Vegetables No shallow groundwater
		Crop exposures through contaminated soil, shallow ground-water uptake, and irrigation, should be assessed	
		Livestock exposure through direct ingestion of contaminated water and indirect exposure through grazing should be assessed	1.2.2.9.3 Groundwater Use No permitted stock watering

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	(5) Points of exposure are identified. A point of exposure is any location where people, wildlife, or other species could reasonably be exposed to hazardous constituents from ground water contaminated by uranium mill tailings. For example, the point(s) of exposure may be represented by one or more domestic wells that might withdraw contaminated ground water; or it may be represented by springs, rivers, streams, or lakes into which contaminated ground water might discharge. The point of exposure is used to assess the potential hazard(s) to human health and the environment and effects on the ground-water resource.		1.5.2 Proposed Points of Compliance and Points of Exposure 4.3.2.1.1 Points of Exposure 5.1.2 Points of Exposure
	(6) The likelihood of human and environmental exposure is determined. The probability of human and environmental exposure is often difficult to establish quantitatively. Consequently, defensible qualitative estimates of the exposure likelihood are often necessary. These can be characterized as either: (a) Reasonably likely—when exposure has or could have occurred in the past, or available information indicates that exposure to contamination may reasonably occur during the contamination period. (b) Reasonably unlikely—when exposure could have occurred in the past, but will probably not occur in the future, either because initial incentives for water use have been removed, or because available information indicates that no incentives for water use are currently identifiable, based on foreseeable technological developments.		3.4.2.2 Exposure Pathways
	(7) Exposure impacts are adequately evaluated through time. It is acceptable to project impacts at the point of exposure during a 1,000-year time frame.		3.5 Human Exposure Potential from Constituents at Modeled Concentration Appendix 4.4-B Technical Memorandum: Calculation of present worth of averted dose from corrective action alternatives
4.3.3.3 CORRECTIVE ACTION ASSESSMENT			

NUREG-1620 SECTION	ACCEPTANCE CRITERIA	SUB CRITERIA	HMC ACL SECTION
Past, current, and proposed practicable corrective actions are identified and evaluated against the costs and benefits associated with implementing each corrective action alternative. The corrective action assessment should demonstrate that the proposed alternate concentration limit is as low as is reasonably achievable, considering practicable corrective actions, as required by 10 CFR Part 40 Appendix A, Criterion 5B(6).	A ground-water corrective action assessment typically (a) identifies several practicable corrective action alternatives; (b) assesses the technical feasibility, costs, and benefits of each alternative; and (c) selects an appropriate corrective action for achieving compliance with the ground-water protection standards established at the site. The corrective action assessment should include the following:		4.1 Previous And Current Corrective Action Programs 4.2 Potential Corrective Action Alternatives 4.3 Analysis And Comparison Of Corrective Action Alternatives 4.4 Costs and Benefits of Corrective Action Alternatives 4.5 ALARA Demonstration
	(1) A complete range of realistic and reasonable corrective action alternatives for achieving compliance with the ground-water standards currently in the license and the proposed alternate concentration limit is described and evaluated.	The description of each alternative should be conceptual in nature, but contain sufficient detail so the reviewer can independently verify the reasonableness of each corrective action measure. sufficient detail for completing a coarse cost estimate of each alternative for the cost and benefit analysis.	4.2 Potential Corrective Action Alternatives Appendix 4.3-B Cost Bases of Corrective Action Alternatives
		Past and current corrective actions: site-specific operational and monitoring data should be included to show the effectiveness of those measures.	4.1 Previous And Current Corrective Action Programs
		Include projections of the hazardous constituent concentrations that each corrective action would likely produce at specific times at the point of compliance and the point of exposure.	4.3 Analysis And Comparison Of Corrective Action Alternatives Appendix 4.2-B Predictive Modeling Report
	(2) The direct benefits of implementing the corrective actions have been determined by estimating the current and projected resource value of the pre-contaminated groundwater. Estimates of pre-contaminated groundwater value should be based on water rights, availability of alternate water supplies, and forecasted water use demands. The indirect benefits are determined by assessing the avoidance of adverse health effects from exposure to contaminated water, the prevention of land value depreciation, and any benefits accrued from performing the corrective action, including timeliness of remediation.	Reviewer should verify the water yields; costs for developing alternate water supply sources; legal, statutory, or other administrative constraints on the use and development of the water resources	Tables 4.2-3, 4.2-4 Appendix 4.3-B Cost Bases of Corrective Action Alternatives 1.2.2.9.3 Groundwater Use 1.2.1 Licenses, Permits, And Other Environmental Requirements Table 1.1-1
	(3) The **costs** associated with performing a corrective action alternative to achieve the target concentrations include	(a) the capital costs for designing, and constructing the alternative;	Table 4.4-6 Appendix 4.3-A Cost Bases of Corrective Action Alternatives
		(b) operation and maintenance costs;	
		(c) costs associated with demonstrating compliance with the standards; and	
		(d) decommissioning costs after the corrective action is completed.	

NUREG-1620 SECTION	ACCEPTANCE CRITERIA	SUB CRITERIA	HMC ACL SECTION
	(4) The "as low as is reasonably achievable" analysis is performed on target concentration levels that are at or below the limit determined to be protective of human health and the environment. At least three target concentration levels that can reasonably be attained by the practicable corrective actions should be evaluated.	The goals should be: (a) meaningfully different, (b) reasonably attainable by practicable corrective action, and (c) at or below the levels identified in the hazard assessment.	4.2.1 Technical Approach 4.2.2 Groundwater Corrective Action Objectives 4.2.3 Identification of Practicable Corrective Actions 4.2.4 Development of Corrective Action Alternatives
		The ALARA analysis typically considers:	4.4 Costs and Benefits of Corrective Action Alternatives 4.5 ALARA Demonstration Table 4.4-6
		(a) the direct and indirect benefits of implementing each corrective action to achieve the target concentration levels;	
		(b) the costs of performing the corrective action to achieve the target concentrations; and	
		(c) a determination whether any of the evaluated corrective action alternatives will reduce contaminant levels below the proposed ACLs, considering the benefits and costs of implementing the alternative.	
		Provide a comparison among the costs associated with performing the various corrective action alternatives to achieve the target concentrations, the value of the pre-contaminated ground-water resource, and the benefits of achieving each target concentration.	
		Qualitative costs and benefits should also be discussed, such as environmental degradation or enhancement, and should be weighed in the decision.	
		ALARA analysis for non-radiological constituents should be similar to the ALARA analysis for radiological constituents except a "dollar per person-rem avoided" value would not be calculated.	All non-radiological hazardous constituents are below the lowest protective standard at the POE under the proposed action. These are non-carcinogenic "threshold" constituents, which have no known or demonstrable incremental health benefit from reduction below the protective standards. Arsenic is reduced to levels indistinguishable from background at the POE. Therefore, no ALARA analysis is warranted on these non-radiological constituents.
4.3.3.4 EXAMINATION OF THE COMPLIANCE MONITORING PROGRAM	Compliance monitoring program should monitor all groundwater exposure pathways to assure that any potential exceedances of the proposed alternate concentration limit will be detected before the license is terminated.	The compliance monitoring well locations should include some locations between the point of compliance and the points of exposure assure the identified aquifer attenuation mechanisms are reducing the hazardous constituent concentrations to the predicted levels.	5.2 Proposed Implementation and Groundwater Monitoring Measures Table 5.2-1 Groundwater Compliance Monitoring Plan Summary Appendix 5.2-A Groundwater Compliance Monitoring Plan
		The applicable MCL, background concentration, or other maximum permissible limit (ACL) should be used as the compliance monitoring limit for wells at the points of exposure, in those cases where compliance monitoring is conducted at the points of exposure.	5.1.4 Calculation of Proposed ACLs Table 1.1-1