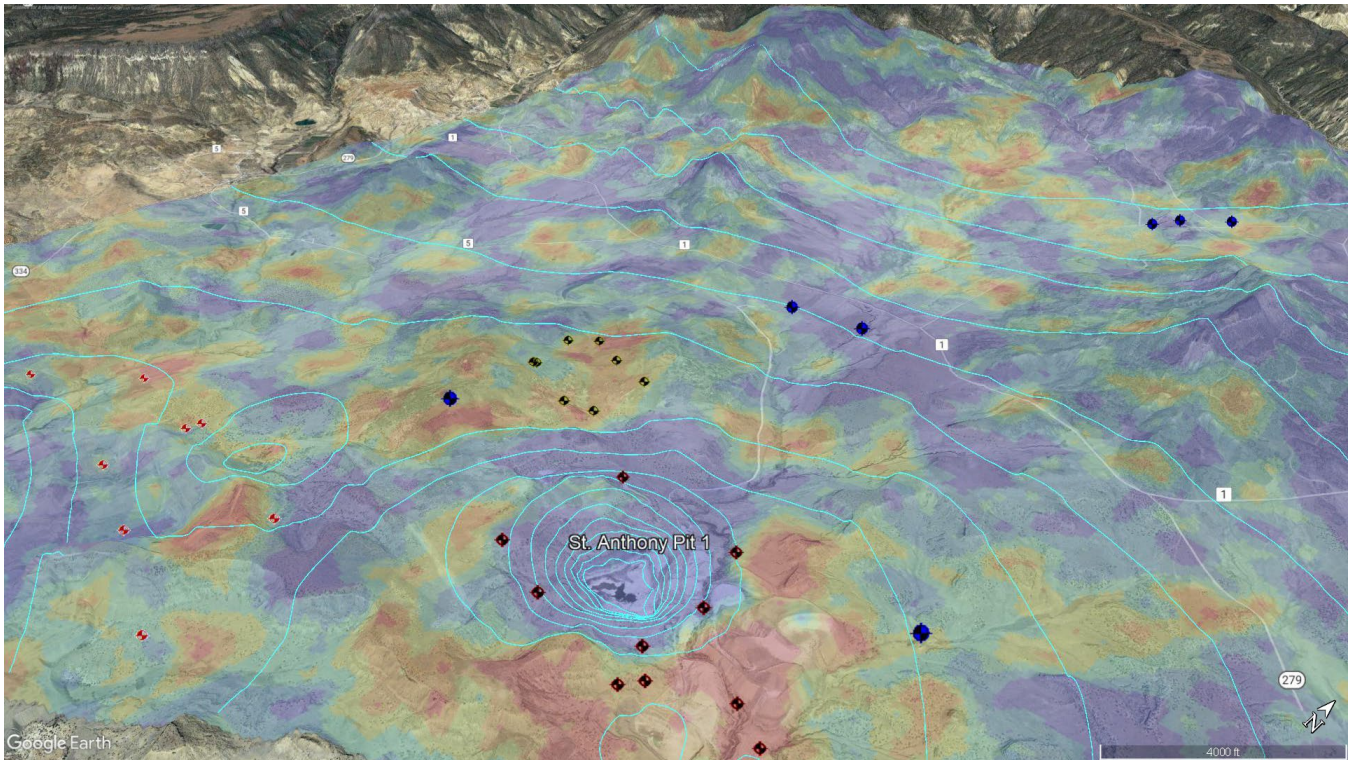
Stage 2 Abatement Plan Modification

St. Anthony Mine Site

Cibola County, New Mexico, USA



Prepared for

United Nuclear Corporation

Prepared by

INTERA Incorporated

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Attachment B New Mexico Office of the State Engineer Well Restriction Order (OSE, 2018)

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Attachment D Stantec Memo Re: Evaluation of Constructing a Hydraulic Barrier to Prevent Vertical Groundwater Migration in St. Anthony Pit 1 (Stantec, 2021)

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Attachment I Private Water Exemption Supporting Documentation

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Acronyms and Abbreviations

AAS	Alternative Abatement Standard
COPC	contaminant of potential concern
ET	evapotranspiration
final CCOP	final closure-closeout plan
GWQB	Ground Water Quality Bureau
INTERA	INTERA Incorporated
Jackpile – Dakota Contact	Jackpile Sandstone-Dakota Sandstone contact
mg/L	milligrams per liter
MMD	Mining and Minerals Division, New Mexico Environment Department
NMAC	New Mexico Administrative Code
NMED	New Mexico Environmental Department
OSE	Office of the State Engineer
Site	the former St. Anthony Mine Site
Stage 1 Plan	final Stage 1 Abatement Plan (MWH, 2002)
2015 Stage 2 Plan	the conditionally approved Stage 2 Abatement Plan (INTERA, 2015)
Stage 2 Plan Modification	this Stage 2 Abatement Plan Modification and associated attachments
SPLP	Synthetic Precipitation Leaching Procedure
STPP	apatite/phosphate
TDS	total dissolved solids
UNC	United Nuclear Corporation
WQCC	New Mexico Water Quality Control Commission

1.0 Introduction

On behalf of United Nuclear Corporation (UNC), INTERA Incorporated (INTERA) respectfully submits this modification (Stage 2 Plan Modification) of the Stage 2 Abatement Plan (INTERA, 2015 – Stage 2 Plan) for the former St. Anthony Mine Site (Site). The conditionally approved 2015 Stage 2 Plan contemplated a partial pit backfill at an elevation that would have eliminated the existing hydraulic sink that captures naturally poor-quality water within Pit 1, also referred to as the Large Pit. As proposed, the resulting creation of a flow-through hydraulic system would have permitted the migration of poor-quality water into the Jackpile Sandstone outside of the Large Pit, necessitating the development and approval of alternative abatement standards (AASs) for the Jackpile Sandstone, which were approved by the New Mexico Water Quality Control Commission (WQCC) in 2017. The 2015 Stage 2 Plan was identified as the preferred alternative and AASs were conditionally approved in the related WQCC Order (WQCC, 2017; provided as Attachment A), to the extent that they would not adversely impact human health or the environment.

Following approval of the AASs, advanced engineering and design analyses were undertaken and identified that the 2015 Stage 2 Plan would create an artificial pathway for poor-quality water to migrate into the Dakota Sandstone as the water table rebounds, and no technically feasible means of preventing this migration exist. Since the Dakota Sandstone serves as an irrigation and drinking water source outside the former St. Anthony Mine, the 2015 Stage 2 Plan, without modification, presents an unacceptable and uncontrollable environmental risk.

To prevent uncontrolled migration of water into the Dakota Sandstone and the resulting adverse impact to human health and the environment, UNC proposes to modify the 2015 Stage 2 Plan with the submission of this Stage 2 Plan Modification. Consistent with another highly ranked alternative in the 2015 Stage 2 Plan, this Stage 2 Plan Modification will retain, and enhance, the existing hydraulic sink by reducing the partial backfill elevation proposed in the 2015 Stage 2 Plan to a level below the Jackpile Sandstone–Dakota Sandstone contact (Jackpile-Dakota Contact) and establish an evapotranspiration (ET) cover to reduce the volume and duration of water expression in the Large Pit.

This Stage 2 Plan Modification provides Site background, discusses the environmental risk presented by the 2015 Stage 2 Plan, and describes the Stage 2 Plan Modification and its suitability for resolving environmental risk and abating mining-related water quality concerns. Attachments include the detailed documents supporting this Stage 2 Plan Modification.

1.1 Background

The Site is located in Cibola County, New Mexico; a remote, sparsely populated area on the Cebolleta Land Grant approximately 40 miles west of Albuquerque and 4.6 miles southeast of Seboyeta. UNC operated the St. Anthony Mine from 1975 to 1981. In 1986, at the conclusion of its lease, UNC returned the St. Anthony Mine to the Cebolleta Land Grant. UNC is currently developing a final closure-closeout plan (Final CCOP) consistent with the Mining Act, the Water Quality Act, and applicable regulations.

The Jackpile Sandstone unit of the Morrison Formation is the ore-bearing unit that was mined at the Site. The Jackpile Sandstone contains uranium ore, numerous mineralized zones, and groundwater constituents associated with the ore deposit. Therefore, the Jackpile Sandstone in the area of the Site naturally exceeds WQCC Standards for some regulated constituents.

In 2002, the Ground Water Quality Bureau (GWQB) for the New Mexico Environmental Department (NMED) required UNC to submit an abatement plan under New Mexico Administrative Code (NMAC) 20.6.2.4103. In 2008, UNC submitted a final Stage 1 Abatement Plan (MWH, 2002 - Stage 1 Plan). The Stage 1 Plan was intended to "determine the presence of water pollution, its potential to migrate offsite or to combine with other waters, and, if necessary, to provide data necessary to select and design an effective abatement option" (INTERA, 2008).

The Stage 1 investigation (INTERA, 2008) included a groundwater impacts analysis intended to evaluate the potential for mining to have adversely impacted the groundwater within the ore-bearing aquifer. To complete this evaluation, water samples were collected from areas hydraulically upgradient from the mine and in an undisturbed ore body (MW-5 and MW-8) and areas downgradient from the mine (MW-4). Since monitoring wells MW-5 and MW-8 were installed within undisturbed areas of the ore body, they represent background water quality for the ore body.

The Stage 1 Plan recommended:

- Additional data collection;
- Stabilization and runoff control of mine material piles outside of the Large Pit; and
- Completion of a Stage 2 Plan, if appropriate, for the water in the Large Pit, taking into consideration environmental benefits, risks, and costs in relation to current conditions in which the pit acts as a hydraulic sink controlling groundwater flow toward it.

The Stage 1 investigation (INTERA, 2008) concluded, *inter alia*, the following:

- There are no perennial streams near the Site; therefore, surface water impacts were evaluated from the perspective of erosion control or runoff of materials from the Site to Meyer Draw and no impacts were identified;
- There is no evidence of impacts to alluvial groundwater from the Site runoff to Meyer Draw; groundwater quality in the downgradient shallow alluvial well did not show evidence of impacts caused by mining activities;
- Concentrations of regulated constituents in water samples from the Large Pit have significantly increased over time due to evapoconcentration;
- The Large Pit acts as a hydraulic sink driven by the process of evaporation where groundwater flows towards the Large Pit and therefore impacted water in the Large Pit is contained on-site;
- The most mineralized water quality at the Site is present in wells drilled into the undisturbed ore body, MW-5 and MW-8;

- Groundwater quality contains naturally occurring dissolved constituents related to the uranium ore body in the Jackpile;
- [T]here are no groundwater impacts above background in the vicinity of the Site;
- [W]ater quality of the Large Pit is degraded; however, as stated above, the Large Pit acts as a hydraulic sink, mitigating any potential impact to groundwater receptors; and
- There are currently no water supply receptors with the potential to be impacted in the vicinity of the Site (INTERA, 2008).[1]

In 2015, UNC submitted the 2015 Stage 2 Plan that evaluated numerous alternatives against three key goals: (1) preventing exposure to water in the Large Pit; (2) reducing the risk of future groundwater impacts; and (3) stabilizing groundwater conditions long term. The alternatives included:

- A no-action alternative (Alternative A);
- Alternatives involving a pit waiver and engineering controls or geochemical stabilization (Alternatives B and C),
- Partial backfilling above the projected post-closure groundwater elevation without and with geochemical stabilization (Alternatives D and E, respectively);
- Water treatment or isolation of existing water and sediments (Alternatives F through H); and
- Partial backfill below the projected future groundwater elevation and creation of an enhanced ET cap to retain the hydraulic sink (Alternative I).

The 2015 Stage 2 Plan selected Alternative E — partial backfill with application of apatite/phosphate (STPP) to the existing water and sediments prior to partial backfilling to a level above the projected post-closure groundwater elevation — as the preferred alternative. Alternative E was preferred but only insofar as it presented no adverse impacts to human health or the environment and prevented migration of groundwater off-site or to existing receptors (WQCC, 2017). Alternatives that would retain the hydrologic sink – Alternatives A or B – were also highly ranked approaches.

The 2015 Stage 2 Plan also presented the need for AASs. AASs were sought for certain constituents of potential concern (COPCs) because the presence of uranium ore bodies within the Jackpile made it technically infeasible to immobilize or remove all COPCs and comply with WQCC Standards within the Site. To select the COPCs for which AASs would be obtained, a comprehensive screening and analysis procedure was performed. All water samples contained in the St. Anthony Mine database, including groundwater, pit sediment pore water, pit water, surface water, and leachate extracted via Synthetic Precipitation Leaching Procedure (SPLP), were queried and compared against WQCC

[1] As described in more detail later in this Stage 2 Plan Modification, a risk of impact to water supply receptors exists if the backfill level exceeds the Jackpile-Dakota Contact.

Standards for groundwater where total dissolved solids (TDS) concentration is 10,000 milligrams per liter (mg/L) or less.

As detailed by INTERA (2015), "Any analyte with a measured concentration, Method Detection Limit, or Lower Limit of Detection that exceeded the respective WQCC Standard was flagged as a preliminary COPC subject to further screening." The screening compared (1) groundwater samples, (2) Pit Water samples, and (3) pH-adjusted SPLP samples corrected for acidification effects to the WQCC Standards to select boron, chloride, fluoride, radium (226Ra + 228Ra), sulfate, TDS, and uranium as the COPCs for which AASs would be requested. (INTERA, 2015). While other compounds in some groundwater samples were detected above the WQCC Standards (e.g. copper and manganese), concentrations are attributable to mineralization in the Jackpile sandstone and not to the St. Anthony Mine.

The 2015 Stage 2 Plan was noticed for public comment and, on May 12, 2015, NMED conditionally approved the 2015 Stage 2 Plan. NMED's conditions included a restriction on placement of mine-impacted material below the water table and required "a minimum of 3 feet of unimpacted material at the surface, […] contoured to promote positive drainage away from the backfilled pit" (NMED, 2015). On December 16, 2016, UNC petitioned the WQCC for AASs. The petition described the naturally occurring mineralization in groundwater; proposed and justified the need for the AASs; and evaluated groundwater pathways and potential exposure (INTERA, 2016).

On September 29, 2017, following a hearing before the WQCC, the WQCC approved the proposed AASs (Attachment A). The WQCC Order memorialized the key factors for selecting Alternative E as the preferred alternative as follows:

- It is assumed that with the preferred alternative *there are no impacts to human health or the environment.*
- The absence of a complete groundwater pathway for migration of groundwater in the Jackpile Sandstone to reach an existing receptor. Wells identified within a 5-mile radius of the Site are located upgradient and in an area where the Dakota Sandstone is saturated. The Dakota Sandstone is the shallowest aquifer used for drinking water supply in the area; however, in the vicinity of the Site, it is not water-bearing.
- Water quality in the Jackpile Sandstone in the vicinity of the Site is not of drinking water quality due to the presence of mineralized zones throughout the area (WQCC, 2017).

The WQCC ordered, among other things, that:

1. Monitoring requirements agreed to among UNC, NMED, and the Laguna Pueblo be incorporated into the AAS approval;
2. The proposed AASs satisfied the regulatory requirements for approval of the AASs and should be approved;

3. The AASs approved for St. Anthony Mine Site shall be:

Table 1. Alternative Abatement Standards at the St. Anthony Mine Site.

COPC	Approved AAS
Uranium	12.9 mg/L
226Ra + 228Ra	2913 pCi/L
Fluoride	10.7 mg/L
Sulfate	77,000 mg/L
Total Dissolved Solids	113,000 mg/L
Boron	5.05 mg/L
Chloride	908 mg/L

Notes:
AAS = Alternative Abatement Standard
COPC = constituent of potential concern
mg/L = milligrams per liter
pCi/L = picocuries per liter

4. UNC "implement the institutional controls proposed in [its petition for AASs], namely the [Office of the State Engineer (OSE)] well restriction order and the closure plan pursuant to the New Mexico Mining Act."

On January 12, 2018, the OSE issued a well restriction order to implement the institutional control contemplated by the WQCC Order (Attachment B).

2.0 Environmental Risk Presented by the 2015 Stage 2 Plan

Following the WQCC approval of the AASs, UNC performed supplemental investigations to obtain radiological, agronomic, and geotechnical information required for the final CCOP; advanced detailed engineering assessments; and performed updated cost analyses. In March 2019, UNC submitted an updated CCOP (Stantec, 2019) to implement the 2015 Stage 2 Plan. Based on the additional engineering associated with the 2019 CCOP, UNC determined that backfilling the Large Pit above the estimated future groundwater level would result in the potentiometric surface rising above the Jackpile-Dakota Contact. UNC informed NMED of this conclusion and expressed concern that this rebound could allow poor-quality water to enter the Dakota Sandstone. On August 16, 2019, NMED informed UNC that "[a]s proposed, the 2019 [CCOP] does not meet the criteria included within the NMED approved Stage 2 Abatement Plan" and invited UNC to provide an alternative engineering design to address the inconsistencies (NMED, 2022).

UNC retained INTERA to evaluate the question of whether backfilling the Large Pit to a level above the elevation of the Jackpile-Dakota Contact would create a pathway for naturally poor-quality groundwater within the Jackpile Sandstone to migrate into the overlying Dakota Sandstone in such a way as to potentially impact the Dakota aquifer. INTERA's analysis incorporated results from flux calculations with modeling results involving groundwater flow models and a probabilistic groundwater uncertainty analysis.[2] Based on this work, INTERA concluded that, unless adequately confined, groundwater rebound would exceed the Jackpile-Dakota Contact and allow poor-quality water to saturate the Dakota and likely migrate to nearby receptors. INTERA's technical memorandum evaluating this issue is attached as Attachment C (INTERA, 2021).

UNC also retained Stantec to evaluate the feasibility of creating a hydraulic barrier below the Jackpile-Dakota Contact to isolate the Dakota Sandstone from the Jackpile Sandstone and prevent the vertical migration of water from the Jackpile Sandstone to the Dakota Sandstone. Stantec concluded that creating such a hydraulic barrier would be technically infeasible and unprecedented, having found no example of such a barrier ever having been constructed, let alone one that successfully achieved a sufficiently low permeability to prevent migration of groundwater within a backfilled pit. Stantec also concluded that the historic mining practices at the Site (drilling and blasting) and weathering of the remaining rock created a damage zone extending as much as 225 feet into the pit walls. Even if a horizontal hydraulic barrier could be constructed, this damage zone contains fractures and other preferential pathways that would permit groundwater migration. Due to the presence of this damage zone, confining the Jackpile Sandstone within the pit would serve only to drive water upward into the Dakota Sandstone elsewhere. Thus, Stantec concluded that it is not technically feasible to prevent upward migration of poor-quality water into the Dakota Sandstone if the backfill elevation exceeds the Jackpile-Dakota Contact. Stantec's technical memorandum evaluating this issue is attached as Attachment D (Stantec, 2021).

On November 9, 2021, UNC submitted these technical memoranda by INTERA and Stantec to NMED and the Mining and Mineral Division (MMD). At the same time, UNC also submitted a review and

[2] The groundwater flow model and probabilistic groundwater uncertainty analysis have been developed and updated by INTERA. They have been used to support abatement plan work at the St. Anthony Mine and J.J. Mine.

assessment by Dr. Leslie Smith (Professor Emeritus, University of British Columbia) of INTERA's and Stantec's technical memoranda. Dr. Smith agreed with INTERA's conclusions that groundwater rebound would drive poor-quality water into the Dakota that would then migrate toward a region where the Dakota Sandstone is saturated. Dr. Smith also concurred with Stantec's assessment that attempting to construct a hydraulic barrier in the pit would be both technically infeasible and unprecedented. Dr. Smith's peer review is attached as Attachment E.

Migration of poor-quality water, whether naturally occurring within the Jackpile Sandstone, ET-concentrated within the pit, or a combination of both, does not align with the Stage 2 Abatement goals of reducing risk of future groundwater impacts or achieving long-term stabilization of groundwater conditions. Nor does allowing the saturation of a formation used in the area as a water resource align with the WQCC's finding that the partial backfill approach utilized in the 2015 Stage 2 Plan was the preferred approach as their approval was conditioned upon *"no impacts to human health or the environment*." Since the uncontrollable risk of migration of poor-quality water into the Dakota Sandstone is an unacceptable risk that cannot be mitigated with a reasonable degree of certainty, a modification to the proposed backfill elevation in the 2015 Stage 2 Plan is necessary.

3.0 Stage 2 Plan Modification

To prevent the migration of poor-quality water into the Dakota Sandstone, UNC is proposing a Stage 2 Plan Modification that reduces the final backfill elevation to a level below the Jackpile-Dakota Contact. The following provides a summary of the Stage 2 Plan Modification.

The Stage 2 Plan Modification includes regrading and covering several waste piles in-place (Piles 1, 2, 3, 4, 5, and Topsoil/Overburden). The Large Pit infill piles will be moved to the bottom of the Large Pit and covered. The remaining waste piles and excavated areas outside of the Large Pit will be hauled and placed into Pit 2 and covered with soil. The Stage 2 Plan Modification also includes STPP stabilization of existing sediments and water in the Large Pit; highwall stabilization; fencing and signage; revegetation; and stormwater controls.

The Stage 2 Plan Modification for the Large Pit is intended to achieve the following hydrologic objectives:

1. Maintain the pit's long-term capture of local groundwater (acting as a hydraulic sink) so that groundwater only flows into the pit and does not flow out of the pit.
2. Reduce runoff inflow from the watershed surrounding the pit.
3. Minimize duration of expressed water through ET.

The Stage 2 Plan Modification closure design will enhance the Large Pit's long-term behavior as a hydraulic sink. The hydraulic sink will capture groundwater influenced by the naturally occurring mineralized zones and ore body within the Site as well as mine-related materials placed as backfill within the Large Pit. The hydraulic sink will also prevent such groundwater, solutes, and expressed water from migrating from the pit. The Large Pit will continue to act as a hydraulic sink for groundwater because the design keeps the partial backfill elevation below the Jackpile-Dakota Contact.

After implementation of the Stage 2 Plan Modification, the extent and duration of expressed water in the Large Pit is expected to be significantly smaller than under current conditions. Inflow from runoff will be reduced significantly by the construction of channels that will intercept and divert rainfall-driven flows from the catchment area surrounding the Large Pit. Regrading the Large Pit and establishing vegetation on the pit cover material is expected to significantly increase water loss through ET. Seasonal variations in expressed water, with extended dry periods, are expected to occur.

Vegetation communities expected to establish on the Large Pit cover are upland, surface water modified, or groundwater dependent. Upland communities are characterized by a mix of cool- and warm-season grasses with shrubs. Surface water modified communities occur in low-lying depressions where precipitation collects and is characterized by elevated biomass of cool-season grasses. The groundwater-dependent ecosystem is comprised of phreatophyte with groundwater within the rooting zone. Typically, species like willow, rubber rabbitbrush, and tamarisk dominate these communities in the region. These revegetation communities are commonly observed on

reclaimed mined land in the region. Specialized reclamation techniques will be used to target each community.

The material in the Large Pit infill piles currently located within the Large Pit will be excavated and placed in the bottom of the pit and up to approximately 18 feet. The loose material removed during stability enhancements from the highwall will be placed over the infill material. An unimpacted soil cover with a minimum thickness of 2 feet will be placed on top of the infill and highwall materials for revegetation. Soil will be excavated from nearby borrows and used as cover soil in the Large Pit. The proposed grading plan and cross-section for the Large Pit are shown on Drawing 8 of the 30% CCOP (Attachment F). INTERA is continuing to evaluate the grading of the Large Pit to optimize ET.

A geotechnical assessment of the existing conditions of the highwall is being conducted to gain a better understanding of the highwall integrity and potential for instability. Data gaps have been identified to complete this work and Stantec is addressing these data gaps by conducting a background study and a field study with survey, to be followed with data processing and analysis in support of a future geotechnical design for the Large Pit. The desktop study includes review of the available geotechnical information, including drill hole and test pit data, historical studies relating to hydrogeology and geotechnics, and aerial imagery to identify site-specific and regional drivers of instability. The field study will include a Site visit by Stantec geotechnical engineers to (1) complete a detailed geological field map of the slope; (2) perform high-resolution surveys to complete digital photogrammetry and Light Detection and Ranging (LiDAR) measurement of the highwall; and (3) complete the installation of borings and analysis of samples to obtain structural data pertaining to the highwall. The geotechnical mapping and photogrammetry survey data will be processed and analyzed using the ShapeMetrixUAV software to generate a 3-dimensional image of the rock slope. Stantec will use the structural data to assess the rock mass and complete a kinematic analysis to identify potential failure modes and perform a slope stability analysis. Options for reclaiming surfaces of the Large Pit highwall will be developed using a risk-based approach focused on long-term stability.

4.0 Suitability of Stage 2 Plan Modification

The Stage 2 Plan Modification protects against environmental risk, addresses the key goals of the 2015 Stage 2 Plan, and retains the AASs.

4.1 Protect Against Environmental Risk

The Stage 2 Plan Modification eliminates the risk of an artificial gradient that would promote the migration of poor-quality water into the Dakota Sandstone. Reducing the final backfill elevation below the Jackpile-Dakota Contact ensures that water within the Large Pit will be unable to migrate into the Dakota Sandstone. Keeping the final backfill elevation as low as possible promotes ET, which further promotes the hydraulic sink in the Large Pit and ensures that water within the Large Pit will either evaporate or remain contained within it. A hydrologic particle-tracking exercise as part of INTERA's comprehensive Uncertainty Analysis demonstrates that Pit 1 groundwater will be retained within the pit boundary for at least 200 years following reclamation for each of three modeled pumping scenarios utilizing the modified design (INTERA, 2022). INTERA's Uncertainty Analysis is attached as Attachment G.

The smaller area and intermittent nature of expressed water in the Large Pit reduces the limited risk of human or wildlife exposure created by current conditions. Residual exposure risk (if any) presented by future expressed water will be managed through engineering controls. The engineering controls will be selected after a study of the effectiveness, durability, and consequences of various options and will likely include fencing, netting, bird balls, or other options.

4.2 Address the Key Goals of the Stage 2 Plan

The Stage 2 Plan Modification accomplishes the three primary abatement goals of the 2015 Stage 2 Plan: (1) preventing exposure to water in the Large Pit through fencing and restricting access to the Large Pit; (2) reducing the risk of future groundwater impact; and (3) stabilizing groundwater conditions long term. The Stage 2 Plan Modification combines elements from the prior preferred alternative (Alternative E), a highly ranked alternative (Alternative B), and another prior proposed alternative (Alternative I) to accomplish these goals.

Currently, the water in the Large Pit contains higher concentrations of dissolved constituents than local groundwater because of the evapoconcentration process that has occurred over the last 30 years. Under the Stage 2 Plan Modification, the partial backfilling of the pit and cover system will minimize this water to infrequent minor expressions. Before backfilling, STPP will be applied to the current water to immobilize certain constituents, most notably uranium and radium, by forming low-solubility solids that serve as a long-term sink for these constituents. A pilot study of STPP application at the Site in 2019 demonstrated a decrease in the concentrations of uranium and radium by 83% and 77% respectively (INTERA, 2020a - Attachment H).

Preliminary water balance modeling of the Large Pit indicates that the expressed water is expected to be smaller in volume, surface area, and duration than the current water because of decreased

inflow from runoff and increased outflow through transpiration (INTERA, 2020b). Modeling has demonstrated that even under conservative conditions (i.e., unsustainable groundwater pumping to the full extent of nearby, allocated, groundwater rights) expressed water will not flow to the surrounding backfill, nor will groundwater or expressed surface water flow out of the Large Pit (INTERA, 2022; Attachment G). Moreover, because the final backfill elevation will remain well below the lip of the Large Pit, it is hydrologically isolated from nearby arroyos.

The U.S. Army Corps of Engineers determined that the current water in the Large Pit is not a Water of the United States. *See* Attachment I1.[3] Accordingly, the future expressed water satisfies the criteria for a "private water" under the New Mexico Water Quality Act (N.M. STAT. ANN. § 74-6-2(H) (West) and is exempt from NMED regulation. As illustrated in Attachment I2, the water that will express at some future time is contained wholly within the Large Pit, which is located wholly on private land. The isolation of future expressed water in the Large Pit and maintenance of the hydraulic sink ensures that any mine-influenced water, such as groundwater that flows through the consolidated materials in the Large Pit, will remain within the Large Pit. Engineering controls will further prevent any residual exposure risk presented by future expressed water.

4.3 Retention of Alternative Abatement Standards

As discussed above in Section 1.1, AASs were sought for certain COPCs because the presence of uranium ore bodies within the Site made it technically infeasible to immobilize or remove COPCs outside of the Large Pit and comply with WQCC Standards within the Site. (WQCC, 2017). Material characterization, treatability studies, and extensive hydrologic and geochemical modeling supported the AASs for the COPCs (WQCC, 2017). The Stage 2 Plan Modification does not alter these findings, even though the hydraulic sink proposed by the Stage 2 Plan Modification prevents migration of water and solutes way from the Pit.

Since WQCC approval of the AASs, UNC has completed 9 rounds of groundwater sampling from 13 wells. The results from these sampling events (Attachment J) have been below applicable WQCC Standards or the AASs with the exception of the results discussed below.

The results from MW-9 exceeded WQCC Standards for aluminum, iron, manganese, and lead in various sampling events during this period. However, groundwater samples from this well have had high turbidity, and in 2020 INTERA detected bentonite plug material in the well, indicating a possible breach in the well casing. In November 2020, after extensive redevelopment, the well was resampled and the concentrations of aluminum, iron, manganese, and lead were all below applicable WQCC Standards. In 2021, MW-9 was abandoned and a new well (MW-9R) was installed.

MW-9R was sampled on February 22, 2022. Results from the latest sampling of monitoring well MW-9 and MW-9R are provided in the following table. Groundwater monitoring results for COPCs identified in MW-9 are all below WQCC Standards with the exception of manganese which is slightly higher. The exceedances observed in groundwater samples from MW-9 were associated with the

3 Given the isolated nature of the Large Pit, and the absence of any hydrologic connection to surface aquatic features, UNC anticipates that any water which expresses in the future will likewise be exempt from classification as a Water of the United States.

high turbidity (sediments) in this compromised monitoring well. Manganese is a naturally occurring metal and is associated with the uranium ore deposits occurring within the Jackpile sediments.

Table 2. MW-9 and MW-9R February 2022 Sampling Results.

Well ID	Sample Date	Concentration (mg/L)			
		Aluminum	Iron	Lead	Manganese
NMWQCC Standard (mg/L)		**5.00**	**1**	**0.015**	**0.2**
MW-9	5/10/2018	0.23	0.35	0.008	0.022
	8/24/2018	1.45	**2.37**	0.0042	0.063
	11/14/2018	**6.90**	**11.9**	**0.015**	**0.21**
	2/5/2019	4.44	**12.1**	**0.0217**	**0.26**
	5/30/2019	**13.70**	**70.2**	**0.0696**	**1.63**
	8/16/2019	1.59	0.71	0.0007	0.03
	12/11/2019	2.30	**7.45**	0.0123	0.17
	3/4/2020	**5.53**	**13.3**	**0.0302**	**0.49**
	11/12/2020	0.173 B	0.268	0.021 B	0.00044 B
MW-9 R	2/22/2022	<0.05	<0.06	<0.0001	0.027

B = values between Method Detection Limit and Practical Quantitation Limit.

INTERA reviewed the results to evaluate if additional compounds had concentrations above the WQCC Standards in all three sample types described above (groundwater, pit water, and pH-adjusted SPLP samples) and to determine if they satisfy the selection criteria for AASs at the Site. Some additional constituents in groundwater sample results were above the WQCC Standards. Because these constituents were not above WQCC Standards in all three sample selection criteria, they do not satisfy the 2015 Stage 2 Plan requirements for requesting additional AASs at the Site.

4.4 Monitoring Requirements and Institutional Controls

The WQCC Order required UNC to implement certain monitoring requirements and proceed with implementing institutional controls such as an OSE well restriction order (Attachment B) and a closure plan pursuant to the Mining Act (WQCC, 2017).

The monitoring requirements incorporated into the WQCC Order obligated UNC to monitor, at least annually in late summer or early fall, MW-11, MW-12A, and MW-12B for the presence of water and, if water is present, collect samples for analysis of COPCs by a qualified independent testing laboratory. In addition, UNC is to file a report on each year's monitoring, including sample results (if any), and provide a copy to the Pueblo of Laguna. To date, only MW-11 has contained water and samples revealed variable levels of manganese and iron above WQCC Standards. Iron and manganese are naturally occurring constituents associated with the mineralized Jackpile and correlate with

dissolved solids present in the groundwater samples after filtering. As described earlier, total dissolved solids (TDS) present in wells, including in former well MW-9 can affect sample results (Table 2). Additionally, geochemical conditions in the ore-bearing Jackpile include both oxidizing groundwater and solid humate in the formation. These conditions can result in increased concentrations of naturally occurring constituents near the deposits. Given the complicated geochemical conditions at the Site, the focus of groundwater monitoring for evaluating the effectiveness of the reclamation should be on water level monitoring to ensure the hydraulic sink is maintained.

Following completion of the abatement process, quarterly water level elevations will be collected from the current monitoring well network to confirm the hydraulic sink is present throughout the AAS boundary. Demonstrating that the hydraulic sink is maintained throughout the AAS boundary will confirm that groundwater continues to move inward to Pit 1 and is not migrating outside the boundary. In addition, groundwater samples will be collected from MW-11, MW-12A, and MW-12B on an annual basis if water is present in the well. The monitoring and sampling will continue until NMED concludes abatement is complete in accordance with 2.6.2.4103. Quarterly reports will be submitted to NMED through the duration of the monitoring activities. These reports will include the results of quarterly groundwater level measurements and annual groundwater sampling.

The OSE well restriction order (Attachment B) is in effect, and it is anticipated to remain in effect for the foreseeable future. Upon approval of this modification request, and agreement with the MMD as to the concepts presented in the 30% CCOP (Attachment F), UNC will advance the 30% CCOP to a final CCOP. Once the final CCOP is approved by MMD, and following public comment, implementation of the final CCOP will initiate reclamation of the St. Anthony Mine in accordance with the Mining Act.

5.0 Modification Request

As discussed above, without modification, the 2015 Stage 2 Plan presents an unacceptable and uncontrollable environmental risk. To prevent this risk, UNC has proposed this Stage 2 Plan Modification. The Stage 2 Plan Modification is a hybrid of alternatives studied in connection with the 2015 Stage 2 Plan and includes a partial backfilling of the Large Pit below the Jackpile-Dakota Contact Surface, with geochemical stabilization of uranium and radium and an ET cover. The Stage 2 Plan Modification maintains the existing hydraulic sink to provide long-term protection against migration of poor-quality groundwater and will facilitate final reclamation of St. Anthony under the Mining Act.

Accordingly, UNC respectfully requests that NMED accept this Stage 2 Plan Modification. As part of the modification approval, UNC also requests that NMED withdraw its prior conditions that "(1) no mine materials be placed below the water table; and (2) the backfill elevation promote "positive drainage." These conditions are at odds with the Stage 2 Plan Modification, which uses a hydraulic sink to control risks of future groundwater impacts and promotes long-term stabilization of groundwater conditions at the St. Anthony Mine Site.

6.0 References

INTERA Incorporated (INTERA). 2008. Stage 1 Abatement Plan Investigation Report, St. Anthony Mine Site, Cebolleta, New Mexico. Prepared for New Mexico Environment Department, on behalf of United Nuclear Corporation. May 19.

_____. 2015. St. Anthony Mine Stage 2 Abatement Plan, Cibola County, New Mexico. Submitted to the New Mexico Environment Department on behalf of United Nuclear Corporation. February 9.

_____. 2016. Petition for Alternative Abatement Standards. Prepared for United Nuclear Corporation. December 16. Submitted as Exhibit A in In the Matter of the Petition for Alternative Abatement Standards for the Former St. Anthony Mine, Cibola County, New Mexico. No. WQCC 16-05 (A), Petition for Alternative Abatement Standards and Request for Hearing. December 16.

_____. 2020a. St. Anthony Mine Pit 1 Sodium Tripolyphosphate Pilot Test Results, Cibola County, New Mexico. Prepared for United Nuclear Corporation. Submitted to the New Mexico Environment Department. December.

_____. 2020b. Presentation: Status Update on Closure Design. Presented by INTERA Incorporated with United Nuclear Corporation and Stantec. Presented to the New Mexico Environment Department and NMED Mining and Minerals Division. December 10.

_____. 2021. Re: Pit 1 Backfill at St. Anthony Mine, Groundwater Rebound in the Jackpile Sandstone and Flow into the Dakota Sandstone. Submitted to United Nuclear Corporation. November 5.

_____. 2022. Draft Uncertainty Analysis for Retention of Groundwater in Pit 1, St. Anthony Uranium Mine Cibola County, New Mexico, USA. June 23.

Montgomery Watson Harza (MWH). 2002. St. Anthony Mine Site Stage 1 Abatement Plan. Prepared by Montgomery Watson Harza, Albuquerque, New Mexico. August.

New Mexico Environment Department. 2015. Re: St. Anthony mine-New Mexico Environment Department conditional approval for "St. Anthony mine Stage 2 abatement plan, Cibola County, New Mexico" (modified February 9, 2015). Letter from Phyllis Bustamante, Acting Chief Ground Water Quality Bureau New Mexico Environment Department to Larry Bush, President United Nuclear Corporation. May 7.

_____. 2022. Letter re: Response to November 9, 2021 Letter, St Anthony Mine, Cibola County. Letter from Joe Fox, Acting Program Manager, New Mexico Environment Department, and Holland Shepherd, Program Manager of the New Mexico Environment Department Mining and Minerals Division, to Lance Hauer, Legacy Site Team leader, GE Global Operations. January 6.

Office of the State Engineer, New Mexico. 2018. State Engineer Order in the Matter of New Ground Water Appropriations and Applications to Transfer Water Rights to Existing Ground Water

Wells in A Certain Area of Cibola County within the Rio Grande Underground Basin. January 12.

Stantec. 2019. St. Anthony Mine Closeout Plan. Prepared for United Nuclear Corporation and General Electric. Updated March 29, 2019.

Stantec. 2021. Memorandum Re: Evaluation of Constructing a Hydraulic Barrier to Prevent Vertical Groundwater Migration in St. Anthony Pit 1. Submitted to United Nuclear Corporation. November 4.

Water Quality Control Commission (WQCC), New Mexico Environment Department. 2017. Response to Petition for Alternative Abatement Standards. In the Matter of the Petition for Alternative Abatement Standards for the Former St. Anthony Mine, Cibola County, New Mexico. No. WQCC 16-05 (A).