

STATE OF NEW MEXICO
BEFORE THE WATER QUALITY CONTROL COMMISSION



IN THE MATTER OF:

**THE PETITION FOR ALTERNATIVE ABATEMENT
STANDARDS FOR THE FORMER ST. ANTHONY
MINE, CIBOLA COUNTY IN THE STATE OF NEW
MEXICO**

WQCC 16-05 (A)

PROPOSED FINDINGS OF FACT, CONCLUSIONS OF LAW, AND FINAL ORDER

FINDINGS OF FACT

A. United Nuclear Corporations' ("UNC") Petition for Alternative Abatement Standards.

1. UNC's Petition provided the information required under subsection 20.6.2.4103.F(2) NMAC of the abatement regulations and subsection 20.6.2.1210.A. *See* UNC Ex. 1, pp. 4-6; Ardito Tr. 30; NMED Ex. 1, pp. 5-7; Vollbrecht Tr. 197-199.

2. UNC has proposed Alternative Abatement Standards for the following constituents for the St. Anthony Mine Site ("Site"):

| | | |
|----|--|--------------|
| a. | Uranium | 12.4 mg/L |
| b. | Radium (combined radium 226 and radium 228) | 2913 pCi/L |
| c. | Fluoride | 10.7 mg/L |
| d. | Sulfate | 77,000 mg/L |
| e. | Total Dissolved Solids | 113,000 mg/L |
| f. | Boron | 5.05 mg/L |
| g. | Chloride | 908 mg/L |

See UNC Ex. 1, p. 5, Table 1; UNC Ex. 1, p. 23, Table 3; Kostedt Tr. 56, 61-70; UNC Ex. 8d; NMED Ex. 1, p. 11.

3. The affected area for the proposed Alternative Abatement Standards covers approximately 1,072 acres and the latitude and longitude of the four corners of the affected property are: northeast corner, 35.17 degrees north and -107.32 degrees west; the northeast corner 35.17 degrees north and -107.29 degrees west; the southeast corner, 35.15 degrees north and -107.29 degrees west; and the southwest corner 35.15 degrees north and -107.32 degrees west. *See* UNC Ex. 1, p. 2; UNC Ex. 2; UNC Ex. 11; Ardito Tr. 136; NMED Ex. 1, p. 11.

4. UNC presented witnesses who were qualified as experts in the fields of hydrogeology, applied geochemistry, environmental engineering, groundwater flow and transport modeling and unsaturated flow transport modeling to support its Petition for Alternative Abatement Standards. *See* Ardito Tr. 25; Kostedt Tr. 56; Sigda Tr. 81; UNC Exs. 5, 7 and 9.

5. UNC, the New Mexico Environment Department (“NMED”) and the Pueblo of Laguna entered into a stipulation requesting that the Water Quality Control Commission include certain monitoring requirements in any order the Commission may issue adopting the Alternative Abatement Standards sought by Petitioner, UNC. *See* Hughes Tr. 14; Joint Motion attached as Exhibit A.

B. The Site:

6. UNC operated the St. Anthony Mine pursuant to a mining lease with the Cebolleta Land Grant from approximately 1975 to 1981. *See* UNC Ex. 1, p. 2; Ardito Tr. 28-29; UNC Ex. 4c; UNC Ex. 4, p. 1; NMED Ex. 1, p. 2.

7. The Site consists of two open pits, overburden piles and two underground mines. *See* UNC Ex. 1, p. 3; Ardito Tr. 27; UNC Ex. 4c; UNC Exs. 6e-6g.

8. The Site remains in the same condition as it was at the time of the lease termination. UNC left the open pits uncovered pursuant to the terms of the lease with the Cebolleta Land Grant. *See* UNC Ex. 1, p. 3; Ardito Tr. 29; UNC Ex. 4a, UNC, Ex. 4, p. 2.

9. The uranium ore bodies that were mined by UNC and the associated uranium mineralized zones occur within the Jackpile sandstone of the Morrison Formation. *See* UNC Ex. 1, p. 3; Ardito Tr. 31.

10. Naturally-occurring, uranium-rich mineralized zones in the Jackpile sandstone influence groundwater chemistry by releasing uranium, radium and other constituents as is currently observed in Site monitoring wells. *See* UNC Ex. 1, pp. 12-14; UNC Ex. 1, p. 14, Table 2; Ardito Tr. 33-34, 126-127; Vollbrecht Tr. 179-180, 190, UNC Ex. 6a, 6b, 6c, 6j; NMED Ex. 3; UNC Ex. 6, p. 3.

11. The large open pit (“Large Pit”) was the only pit to intersect groundwater within the Jackpile sandstone formation and perennially contains standing water. Currently, the Large Pit captures groundwater in the Jackpile sandstone via a cone of depression that has developed in response to the evaporation of water from the Large Pit. *See* UNC Ex. 1, pp. 4, 18-19; UNC Ex. 4, p. 2; UNC Ex. 10, p. 2.

12. The preferred reclamation alternative of partial backfilling the Large Pit will cause the Large Pit to no longer capture mineral-concentrated water from within the Jackpile sandstone formation. *See* UNC Ex. 1, p. 22; Sigda Tr. 90-91; UNC Ex. 10, p. 3.

13. In general, the water quality in the Jackpile sandstone is not drinking water quality due to the presence of mineralized zones throughout the area. Groundwater quality at the Site exceeds certain Water Quality Control Commission standards due to the presence of the ore deposits and the mineralized zones in the Jackpile sandstone. *See* UNC Ex. 1, p. 5; Ardito Tr. 34-

35, 126-127; UNC Ex. 6b, 6c and 6j; Vollbrecht Tr. 184, 190; UNC Ex. 4, pp. 2-3; UNC Ex. 6, p. 3.

14. Current water supply wells in the area surrounding the Site are upgradient, drilled into formations deeper than the Jackpile sandstone, and are not located within the area for which the Alternative Abatements Standards are being sought. *See* UNC Ex. 1, pp. 11-12; Ardito Tr. 42-44, 161-162; Sigda Tr. 159-160; UNC Ex. 6h.

C. Regulatory Compliance:

15. The Site is subject to the 1993 New Mexico Mining Act and the surface reclamation regulations of the Mining Act. *See* Ardito Tr. 29; Vollbrecht Tr. 183-184.

16. The Site is also subject to the Water Quality Act, which protects all groundwater with a concentration of total dissolved solids that is less than 10,000 milligrams per liter. *See* Vollbrecht Tr. 188.

17. NMED sent a letter to UNC in January 2002 indicating that UNC is a “responsible person” as defined in 20.6.2.7.KK NMAC, and that an abatement plan was required for the St. Anthony Mine Site. *See* NMED Ex. 4, Vollbrecht Tr. 181.

18. UNC is required to complete an abatement process for the Site in accordance with the Water Quality Control Commission Abatement Regulations, 20.6.2.4103 NMAC through 20.6.2.4114 NMAC. The Site has been under abatement since 2004. UNC has completed Stage 1 and Stage 2 of the Abatement Regulations. *See* UNC Ex. 1, p. 3; Ardito Tr. 30; NMED Ex. 1, p. 5.

19. UNC submitted a Stage 1 Abatement Plan Proposal to NMED on May 10, 2002. The Stage 1 Investigation Report was approved by NMED in July 2008. *See* UNC Ex. 6d; Vollbrecht Tr. 182; Ardito Tr. 37.

20. In order to meet the requirements of the Stage 1 Abatement Plan to define site conditions and select and design an effective abatement option, UNC and its consultant, Intera:

- a. Installed monitor wells;
- b. Conducted aquifer tests of bedrock wells;
- c. Surveyed all monitor wells and elevations of groundwater in the pits for development of a potentiometric surface;
- d. Quarterly sampled water from Site wells and the Large Pit;
- e. Sampled surface water in Meyer Draw; characterized the overburden pile;
- f. Core sampled the Large Pit walls;
- g. Characterized overburden piles; and
- h. Evaluated Site receptors.

See UNC Ex. 12a, UNC Ex. 12b; Ardito Tr. 35-37; UNC Ex. 6, pp. 4-5.

21. The Stage 1 Abatement Plan field investigation and data analysis resulted in the following conclusions:

- a. There are no perennial streams near the Site; therefore, surface water impacts were evaluated from the perspective of erosion or runoff of material from the Site to Meyer Draw and no impacts were identified;
- b. There is no evidence of impacts to alluvial groundwater from Site runoff to Meyer Draw; groundwater quality in the down gradient shallow alluvial well did not show evidence of impacts caused by mining activities;
- c. The chemical characteristics of water samples from the Small Pit indicate that this water is predominately of meteoric origin; therefore, the water periodically observed to be present in the Small Pit is the result of direct precipitation, runoff, and low infiltration rates;
- d. Concentrations of regulated constituents in water samples from the Large Pit have significantly increased over time because of evapo-concentration and secondary mineralization due to weathering of ore material in the Large Pit walls;
- e. The Large Pit is acting as a hydraulic sink driven by the process of evaporation where surrounding groundwater flows towards the Large Pit, and therefore impacted water in the Large Pit is contained onsite;
- f. Surface water quality of the Large Pit is poor; however, as stated above, the Large Pit acts as a hydraulic sink, mitigating any potential impact to groundwater receptors; and
- g. There are currently no water supply receptors with the potential to be impacted in the vicinity of the Site.

See Ardito Tr. 44-45; UNC Ex. 6, p. 5.

22. Under all considered remedial actions for the Site, groundwater quality in the Jackpile sandstone would exceed Water Quality Control Commission standards. *See Ardito Tr. 34-35.*

23. The Stage 2 Abatement Plan proposal, conditionally approved by NMED on March 13, 2009, described the process for identifying and selecting a preferred abatement option for managing the groundwater in the Large Pit and a preliminary list of possible abatement alternatives for the Site. *See Ardito Tr. 45; UNC Ex. 6, pp. 5-6.*

24. UNC involved area stakeholders in a Multiple Accounts Analysis (“MAA”) process to consider many abatement alternatives for the Site to balance the various stakeholder goals and objectives to reach an agreement to close the Site. *See Ardito Tr. 47; UNC Ex. 6, p. 6; UNC Ex. 4, p. 4; UNC Ex. 12e; NMED Ex. 1, pp. 3-4.*

25. UNC and other stakeholders including the Cebolleta Land Grant, Laguna Pueblo, NMED, the New Mexico Energy, Minerals and Natural Resources Department’s Mining and Minerals Division (“MMD”) and the New Mexico Game and Fish Department (“Stakeholders”) worked together over a two-year period with 14 meetings and a site visit to analyze various remediation and abatement alternatives available for the Site using the MAA process. *See Ardito Tr. 47-50; UNC Ex. 6, pp. 6-7; UNC Ex. 12e; UNC Ex. 12f; UNC Ex. 4, p. 4; NMED Ex. 1, p. 4.*

26. The evaluation of remedial and abatement alternatives focused on three key remediation goals: (1) preventing exposure to water in the Large Pit, (2) reducing the risk of future groundwater impact, and (3) stabilizing groundwater conditions for the long term. *See* Ardito Tr. 48-50; UNC Ex. 12e; UNC Ex. 4, pp. 3-4.

27. The MAA process provided a systematic process to select among multiple remediation approaches and resulted in two categories, backfill alternatives and no backfill alternatives. The parties agreed additional hydrologic and geochemical modeling was necessary to decide between the backfill and no backfill alternatives. *See* Ardito Tr. 51; UNC Ex. 12f; UNC Ex. 6, pp. 8-9; UNC Ex. 4, pp. 4-5.

28. The second phase of the site characterization and analysis was designed to complete the following:

- Increase the understanding of the Jackpile sandstone groundwater flow directions, discharge points, and discharge rates to provide the basis for predictive groundwater modeling;
- Complete predictive groundwater modeling to more definitely evaluate groundwater pathways before and after backfilling;
- Complete additional characterization of the current water quality conditions for both the water in the Large Pit and groundwater, as well as the primary and secondary mineralization in the ore deposit and Large Pit to provide the basis for geochemical modeling; and perform geochemical modeling to determine achievable constituents of potential concern associated with naturally mineralized zones and secondary mineralization in the Large Pit to establish achievable Alternative Abatement Standards that meet the requirements of 6.20.2.4103.F NMAC.

See Ardito Tr. 52; UNC Ex. 12g; UNC Ex. 6, pp. 8-9.

29. As required by 20.6.2.4106.E(3) NMAC, the Stage 2 Abatement Plan must describe and justify a single preferred abatement option. *See* UNC Ex. 4, p. 5; UNC Ex. 12d.

30. Based upon the additional field investigations, geochemical bench scale studies, hydrologic modeling and geochemical modeling, the preferred reclamation and abatement alternative was determined to be partial Large Pit backfill with geochemical stabilization of sediments. *See* UNC Ex. 6, p. 9; Ardito Tr. 51, 133; Vollbrecht Tr. 182-183; NMED Ex. 5; UNC Ex. 4, p. 5; NMED Ex. 1, p. 4.

31. The partial Large Pit backfill with geochemical stabilization was the selected preferred abatement option, as influenced by several key factors:

- Backfilling of the Large Pit is preferred by all stakeholders *assuming there are no impacts to human health or the environment.*
- Groundwater in the Jackpile sandstone will not migrate offsite even after the Large Pit is backfilled and regional groundwater gradients are re-established.

- There is no complete groundwater pathway for migration of groundwater in the Jackpile sandstone to reach an existing receptor. A search of the New Mexico Office of the State Engineer's Waters Database of water supply wells within a five-mile radius of the Site revealed six records with location and well construction information. Of these six records, two water supply wells are found within a two-mile radius of the Site, and four others are located between three and five miles from the Site. All wells in the Waters Database within five miles of the Site are located upgradient of the Site and in an area where the Dakota Sandstone is saturated. The Dakota Sandstone is the shallowest aquifer used as a 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 drinking water quality due to the presence of mineralized zones throughout the area.
- Geochemical stabilization will prevent migration of the most hazardous constituents of potential concern (uranium and radium) beyond the immediate vicinity of the Large Pit following backfill.

See Ardito Tr. 50; UNC Ex. 6, p. 8-9; UNC Ex. 4, pp. 5-6.

32. The final Stage 2 Abatement Plan was conditionally approved by NMED on August 25, 2015. *See* UNC Ex. 6k; Ardito Tr. 130.

33. UNC's Stage 2 Abatement Plan approval by the NMED contained three conditions:

- a. That the pit backfill be done in a manner that did not put impacted material in a zone that would be below the water table;
- b. That the surface be regraded and recontoured in a way that would allow for positive drainage; and
- c. That there be a minimum of three feet of unimpacted material at the top surface of the Large Pit.

See Vollbrecht Tr. 185; UNC Ex. 6k.

D. Need for Alternative Abatement Standards for the Site:

34. The preferred abatement option and reclamation alternative of partial backfill of the Large Pit will result in the evaporative sink effect no longer containing groundwater flow. Partial backfill of the Large Pit will remove the mining-induced controls on such flow, which will then become controlled by other natural conditions. *See* UNC Ex. 1, p. 22; UNC Ex. 10, p. 3; Sigda Tr. 90-91.

35. After partial backfill is completed, groundwater flow direction will change due to loss of the evaporative sink in the Large Pit and may cause concentrations of constituents of concern to increase. *See* UNC Ex. 1, p. 17; UNC Ex. 4, p. 8; UNC Ex. 10g; Sigda Tr. 107-110.

36. Partial backfill of the Large Pit will cause the Large Pit water to be a potential source of groundwater impacts as evapo-concentrated water will migrate away from the Large Pit

once pre-mining hydraulic gradients are re-established. *See* UNC Ex. 1, pp. 12-13; UNC Ex. 4, p. 5; Sigda Tr. 119.

37. The constituents for which Alternative Abatement Standards are sought by UNC exceed Water Quality Control Commission Standards due to the presence of ore deposits and mineralization in the water-bearing Jackpile sandstone formation, as well as evapo-concentration and secondary mineralization effecting Large Pit water quality after mining activities at the Site ceased. *See* Ardito Tr. 34-35, 126-127; UNC Ex. 6b and 6j; Vollbrecht Tr. 184, 190; UNC Ex. 4, pp. 2-3; UNC Ex. 6, p. 3.

38. Given the widespread and irregular distribution of the naturally-occurring mineralized zones throughout the Jackpile sandstone at the Site, broad application of immobilization techniques outside the Large Pit would not be practical to remove constituents of potential concern. *See* Kostedt Tr. 59; NMED Ex. 1, p. 7.

39. Because the Site is host to uranium ore bodies, it is technically infeasible to design a reclamation alternative to comply with Water Quality Control Commission standards. *See* Ardito Tr. 51, 166-168; Vollbrecht Tr. 131.

40. Every monitor well inside or outside of the influence of the Large Pit exceeded groundwater quality standards for one or more constituents of potential concern over the course of monitoring. *See* Ardito Tr. 127; UNC Ex. 6j.

41. Secondary minerals formed over time in the Large Pit side walls will come into contact with groundwater migrating through the backfilled Large Pit area and these minerals will dissolve into groundwater providing another source of water quality impacts. *See* UNC Ex. 1, p. 13; Ardito Tr. 33-34; UNC Ex. 6c.

42. To accomplish the preferred remediation and abatement alternative of backfilling the Large Pit, UNC will require Alternative Abatement Standards. Approval of Alternative Abatement Standards for the Site is a necessary precursor for finalizing the St. Anthony Mine Closure Plan to achieve the appropriate reclamation of the Site. *See* UNC Ex. 1, p. 6; Ardito Tr. 135; NMED Ex. 5; NMED Ex. 1, p. 4.

E. Analysis to Support UNC's Proposed Alternative Abatement Standards:

43. The Alternative Abatement Standards proposed by UNC are:

| <u>COPC</u> | <u>Proposed AAS</u> |
|------------------------|---------------------|
| Uranium | 12.4 mg/L |
| 226 RA + 228 RA | 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 |

See UNC Ex. 1, p. 23, Table 3; UNC Ex. 6, p. 11; UNC Ex. 8d; NMED Ex. 1 p. 11.

44. UNC's Petition for Alternative Abatement Standards is supported by bench scale studies, extensive hydrologic and geochemical modeling and a thorough understanding of the Site gained through the development of Stage 1 and Stage 2 Abatement Plans. The proposed Alternative Abatement Standards were determined using treatability studies, material characterization and geochemical modeling. Geochemical modeling was used to evaluate each proposed Alternative Abatement Standard constituent to quantify the maximum possible concentration. *See* UNC Ex. 8, pp. 2-3; UNC Ex. 8a; Kostedt Tr. 57.

45. Materials from the Large Pit and drill core samples from upgradient monitor wells were collected and characterized to determine their impact on Jackpile sandstone groundwater chemistry. The material characterization process identified boron, chloride, sulfate, fluoride, ^{226}Ra + ^{228}Ra , TDS and uranium as constituents of potential concern. *See* UNC Ex. 8, p. 4; UNC Ex. 8a; UNC Ex. 6c; Ardito Tr. 33-34; Kostedt Tr. 58.

46. For uranium, the geochemical model predicted a range of concentrations between 0.69 mg/l and 12.4 mg/l. The upper concentration was defined by silica saturation with crystalline silica, which generated a concentration of 12.4 mg/l which is achievable as an Alternative Abatement Standard for uranium. *See* UNC Ex. 1, p. 17; Kostedt Tr. 62-63 and 155-157; UNC Ex. 6, pp. 6-7; UNC Ex. 8b.

47. Uranophane was considered by UNC's expert consultant as the most appropriate mineral to use in determining the uranium concentration at the Site for the geochemical model. *See* UNC Ex. 1, p. 12; UNC Ex. 8, p. 7; Kostedt Tr. 64-65.

48. The Alternative Abatement Standard for radium of 2914 pCi/L was based on barite solid solution yield values of 940 and 2914 pCi/L. The high modeled concentration of radium is based on the presence of barium which indicates that this is the most probable controlling mineral phase. *See* UNC Ex. 1, p. 17; UNC Ex. 6, pp. 8-9; UNC Ex. 8c; Kostedt Tr. 65-67 and 156-157.

49. While sampling of the Large Pit water obtained uranium concentrations as high as 17 mg/l, the use of sodium tripolyphosphate on Large Pit water will be effective to reduce the required Alternative Abatement Standard for uranium to 12.4 mg/l. *See* Kostedt Tr. 63, 68 and 173-174; UNC Ex. 8, p. 9.

50. The Alternative Abatement Standards for sulfate, chloride, total dissolved solids and boron were determined by estimating the evapoconcentration of each constituent far enough into the future to account for the time between calculation of the proposed Alternative Abatement Standard and completion of partial backfill when water will no longer evaporate from the Large Pit. *See* UNC Ex. 1, p. 18; UNC Ex. 8, p. 10; Kostedt Tr. 69-70; UNC Ex. 8d.

51. The Alternative Abatement Standard for fluoride was based on an equilibrium calculation to determine the maximum concentration of fluoride that occurs in contact with a mineral called fluorite, which is calcium fluorite. The concentration of fluorite is higher where the concentration of calcium is the lowest level observed at the Site. *See* UNC Ex. 1, p. 18; UNC Ex. 8, p. 10; Kostedt Tr. 70, 156-157; UNC Ex. 8d.

52. The geochemical modeling results established that the concentrations of constituents of potential concern proposed for the Alternative Abatement Standards are the

maximum concentrations that may be detected in groundwater migrating from the Site after partial backfill of the Large Pit. *See* UNC Ex. 6, p. 11, Table 3; UNC Ex. 8b; Kostedt Tr. 58-61, 72-73; NMED Ex. 1, p. 8.

53. The high modeled concentrations of constituents of potential concern in groundwater result from secondary mineralization caused by weathering in the Large Pit and evapo-concentration of the Large Pit water in combination with groundwater migration through the mineralized zones in the Jackpile sandstone. *See* UNC Ex. 6, p. 12; Ardito Tr. 45.

54. The proposed Alternative Abatement Standards are conservative, technically feasible, and are the maximum concentrations of the constituents of potential concern that are expected to occur at the Site. *See* UNC Ex. 1, pp. 7, 21; Kostedt Tr. 73, 155-157; Ardito Tr. 127.

55. Using the data collected from the Site and nearby mines, UNC's consultant, Intera, developed a conceptual model ("Conceptual Model") of the Site's hydrology, and a numerical model ("Numerical Model") for groundwater flow under current and post-closure conditions. *See* Sigda Tr. 82-106; UNC Exs. 10a-10h; UNC Ex. 10, pp. 3-4, 10-11.

56. The Conceptual Model focuses on the Site's geologic structure and composition, the hydraulic properties, and how much water enters the subsurface, moves through it as groundwater, and leaves it as stream flow, evaporation, or transpiration. Sigda Tr. 82-106; UNC Ex. 10, pp. 3-4; UNC Exs. 10a-10h UNC Ex. 10, pp. 4-10; Ardito Tr. 37-38; UNC Ex. 12c.

57. The Conceptual Model for the Site established: the geologic units of importance; the parameters for groundwater moving through the Jackpile sandstone under current conditions; the fact that the Jackpile sandstone recharge area is to the north and west; the water balance for the Large Pit; and the predicted and observed groundwater heads for current conditions. *See* Sigda Tr. 106-108; UNC Exs. 10a-10g; UNC Ex. 10, pp. 3-10.

58. Based on the foundation of the Conceptual Model, the Numerical Model was built and used to predict groundwater flow patterns and rates across the Site under post-reclamation backfill conditions. *See* Sigda Tr. 106-121; UNC Exs. 10g-10j; UNC Ex. 10, p. 10; UNC Ex. 6i; UNC Ex. 10.

59. The Numerical Model establishes that when the Large Pit at the Site is backfilled, groundwater from the Site will flow towards Meyer Draw where it is consumed by evapotranspiration. *See* Sigda Tr. 111; UNC Ex. 10h; UNC Ex. 10, p. 9.

60. Under the Intera Numerical Model's most conservative estimates of the porosity and hydraulic conductivity of the Jackpile sandstone, the groundwater from the area of the backfilled Large Pit at the Site will take over 400 years to reach Meyer Draw. *See* Sigda Tr. 112-113; UNC Ex. 10h; UNC Ex. 10, p. 21.

61. Once groundwater reaches Meyer Draw, transpiration from tamarisk trees will act to remove this water from the system before it enters the drainage. Expected transpiration is 1.8 gpm, double the expected discharge rate from the Jackpile sandstone within the subcrop to Meyer Draw. This indicates that tamarisk transpiration is sufficient to capture all groundwater that will

migrate from the area of the Large Pit and Small Pit to Meyer Draw. *See* UNC Ex. 10, pp. 18-21; Sigda Tr. 252.

62. The Intra Numerical Model was subject to numerous sensitivity analyses. In all sensitivity analyses, including those based on elimination of Tamarisk transpiration, the groundwater particles in the Jackpile sandstone remained on site. *See* Sigda Tr. 114-116; UNC Ex. 10, pp. 18-20.

63. The groundwater modeling establishes that groundwater in the Jackpile sandstone will not migrate beyond the proposed boundary for the Alternative Abatement Standards after the Large Pit is backfilled and regional groundwater gradients are reestablished. *See* UNC Ex. 1, pp. 22-23; Ardito Tr. 133-134; UNC Ex. 6, p. 13; Vollbrecht Tr. 186, 194.

64. The fact that the Large Pit water has reduced in size during recent drought conditions at the Site will have no bearing on the need for Alternative Abatement Standards at the Site because after closure and partial backfilling, the Large Pit will become a through flow system and the amount of water in the Large Pit is irrelevant to post-closure conditions. *See* Sigda Tr. 118-119, 253.

65. The Multicultural Alliance for a Safe Environment (“MASE”) testimony challenged the Intra calculation of the percentage of precipitation that would produce runoff into the Large Pit, relying on a 1950’s study. However, the percentage of runoff used for Intra’s calculations relied on site-specific data of current Pit conditions. Using the one percent figure of precipitation rather than the fifteen percent figure would not obviate the need for Alternative Abatement Standards at the Site. Finally, the runoff coefficient and amount of precipitation flowing into the Large Pit is irrelevant when the Large Pit is backfilled because there will be zero recharge. *See* Sigda Tr. 117, 118, 250-253.

66. MMD and NMED support the approval of UNC’s Petition for Alternative Abatement Standards. *See* Vollbrecht Tr. 183-188; NMED Ex. 1; NMED Ex. 5.

67. Upon Water Quality Control Commission approval of UNC’s Petition for Alternative Abatement Standards, the Mining and Minerals Division will require UNC to submit a detailed closure plan for the Site pursuant to the New Mexico Mining Act. This plan would be subject to review by NMED and a determination that environmental standards will be met, as well as public review and comment. *See* Ardito Tr. 138-140; Vollbrecht Tr. 183, 184-185; NMED Ex. 5.

68. The proposed Alternative Abatement Standards are warranted based on the results of the hydrologic and geochemical modeling and the extensive Site characterization activities. *See* UNC Ex. 1, p. 26; Sigda Tr. 120-121, 253; Kostedt Tr. 72-73; UNC Ex. 8, p. 11.

F. 4103 Criterion for Alternative Abatement Standards.

69. Criterion 1 of 20.6.2.4103.F(1) NMAC that compliance with Abatement Standards is technically or economically infeasible by the maximum use of technology or there is no reasonable relationship between the economic and social costs and benefits is met because the Jackpile sandstone is an ore-bearing formation and there are no viable alternatives to achieve Water

Quality Control Commission standards at the Site. *See* UNC Ex. 1, pp. 6-7; UNC Ex. 6, pp. 10, 12-13; Ardito Tr. 130-131; UNC Ex. 12h; Vollbrecht Tr. 189-190; UNC Ex. 4, p. 7; NMED Ex. 1, p. 7.

70. The only way Water Quality Control Commission Standards could be met at the Site is through removing the minerals that adversely impact the quality of water by their association and contact with groundwater. It is not technically feasible or desirable to remove the entire mineral deposit and the associated groundwater that would also have to be removed. *See* UNC Ex. 1, pp. 6-7, 20; UNC Ex. 4, p. 7; UNC Ex. 6, p. 13; Ardito Tr. 131; UNC Ex. 12h; Vollbrecht Tr. 131.

71. Criterion 2 of 20.6.2.4103.F(1) NMAC that the proposed Alternative Abatement Standards are technically achievable and cost benefit justifiable is met because the proposed Alternative Abatement Standards are based on the highest predicted concentrations that could occur after backfilling the Large Pit. *See* UNC Ex. 1, p. 7; UNC Ex. 6, pp. 10, 12-13; Ardito Tr. 131-132; Vollbrecht Tr. 190-193; UNC Ex. 4, p. 7; UNC Ex. 12h; NMED, Ex. 1, p. 8.

72. While an operator may apply for a waiver for backfilling an open pit pursuant to 19.10.5.507.B NMAC, it is unlikely that UNC could meet the criteria to be granted a waiver. *See* UNC Ex. 1, p. 6; UNC Ex. 6, p. 13; Vollbrecht Tr. 192-193; NMED Ex. 5; NMED Ex. 1, p. 4.

73. Criterion 3 of 20.6.2.4103.F(1) NMAC that compliance with the proposed Alternative Abatement Standards will not create a present or future hazard to public health or undue damage to property is met because there is no complete pathway for migration of constituents of potential concern in groundwater to a receptor and a drilling prohibition by the New Mexico Office of the State Engineer will be implemented. *See* UNC Ex. 1, pp. 7-8; UNC Ex. 4, p. 8; UNC Ex. 6, pp. 10, 13-14; Ardito Tr. 133-134; Vollbrecht Tr. 186, 193-195; UNC Ex. 12h.

74. Predictive groundwater modeling and site investigation have established that constituents of potential concern will not migrate off the Site. *See* UNC Ex. 1, pp. 7-8; UNC Ex. 6, pp. 13-14; Ardito Tr. 133-134; Vollbrecht Tr. 194.

75. Evapotranspiration from the Jackpile sandstone subcrop will capture groundwater that migrates through the area for which Alternative Abatement Standards are sought after the Large Pit is backfilled. *See* UNC Ex. 1, pp. 5, 7, 19.

76. Water quality in the Jackpile sandstone in the vicinity of the Site is not drinking water quality due to the presence of mineralized zones throughout the area. *See* Ardito Tr. 50; UNC Ex. 6, p. 8-9; UNC Ex. 4, pp. 5-6; Vollbrecht Tr. 190.

77. The Cebolleta Land Grant has indicated it has no foreseeable future use of groundwater at the Site. *See* UNC Ex. 1, pp. 7, 20; Ardito Tr. 133; Vollbrecht Tr. 193-194 NMED, Ex. 1, p. 9.

78. Water Quality Control Commission approval of UNC's Alternative Abatement Standards Petition would constitute the necessary government action for NMED to petition the Office of the State Engineer under 19.27.5.13.A NMAC to issue an order prohibiting construction

of any wells in the area for which the Alternative Abatement Standards are sought. *See* UNC Ex. 1, pp. 8, 20; Ardito Tr. 137; Vollbrecht Tr. 195-196; UNC Ex. 2; NMED, Ex. 1, p. 10.

CONCLUSIONS OF LAW

1. The New Mexico Water Quality Act authorizes the Water Quality Control Commission to require persons to abate water pollution in the state. NMSA 1978 § 74-6-4E.
2. The New Mexico Water Quality Act authorizes the Water Quality Control Commission to grant a variance from any regulation of the Commission, including the requirement to achieve the standards set forth in 20.6.2.4103.A NMAC and 20.6.2.4103.B NMAC. NMSA 1978 § 74-6-4h and 20.6.2.4103.F NMAC.
3. The Water Quality Control Commission has jurisdiction over the subject matter of the Petition and the parties to this proceeding, and has authority to issue or deny Alternative Abatement Standards based upon information submitted in a petition and relevant information received during the public hearing. NMSA 1978, § 74-6-4 and 20.6.2.4103 NMAC.
4. A responsible person, after submitting a Stage 2 abatement plan, may file a petition seeking approval of Alternative Abatement Standards for the standards set forth in 20.6.2.4103.A and 20.6.2.4103.B, 20.6.2.4103.F(1) NMAC.
5. UNC's Petition complies with all requirements of the Act and the Regulations. The proposed Petition for Alternative Abatement Standards complies with the regulatory requirements of 20.2.6.4103.F(2) and 20.6.2.1210 NMAC.
6. NMED complied with its requirements in filing a timely response in support of UNC's Petition for Alternative Abatement Standards. 20.2.6.4103 NMAC and 20.1.3.300.A(3) NMAC.
7. Notice of the public hearing was given as required by Subsection C of 20.1.3.17 NMAC.
8. The public hearing on UNC's Petition for Alternative Abatement Standards was conducted in accordance with the requirements and procedures contained in Subsections A-H of 20.1.3.17 NMAC and 20.1.4 NMAC.
9. The public was given a reasonable opportunity to present technical and non-technical testimony and to cross-examine each witness presenting testimony. 20.1.3.17.E and F NMAC.
10. The public process for review of the UNC Petition for Alternative Abatement Standards complied with all applicable requirements of 20.1.3.17 NMAC.
11. UNC bears the burden of proving that its Petition for Alternative Abatement Standards should be approved and not denied. 20.1.3.17.H NMAC and 20.1.4.400.A(1) NMAC.

12. In administrative hearings under the Water Quality Act, the standard of proof is a preponderance of the evidence. 20.1.3.17.H NMAC and 20.1.4.400.A(3) NMAC.

13. Section 19.10.5.507.A NMAC of the New Mexico Mining Act Rules states that the permit area will be reclaimed to a condition that allows for re-establishment of a self-sustaining ecosystem appropriate to the surrounding area following mine closure.

14. The granting of UNC's Petition for Alternative Abatement Standards is a necessary precursor to backfilling the St. Anthony Large Pit and re-establishment of a self-sustaining ecosystem.

15. While an operator may apply for a waiver for open pits from the requirement of achieving re-establishment of a self-sustaining ecosystem pursuant to the New Mexico Mining Act Rules, it is unlikely UNC can meet the criteria to be granted such a waiver. 19.10.507.B NMAC.

16. MASE did not present adequate evidence to support a denial of the proposed Alternative Abatement Standards. Neither did MASE explain how its claims would be more protective of groundwater or return the Site to a self-sustaining ecosystem.

17. UNC and NMED presented sufficient evidence to rebut the claims raised by MASE.

18. The evidence presented and findings of fact establish that UNC meets Criterion 1 of Section 20.6.2.4103.F(1) NMAC as compliance with the Abatement Standards is technically or economically infeasible by maximum use of technology and there is no reasonable relationship between the economic and social costs and benefits associated with attainment of the standards set forth in Section 20.6.2.4103 NMAC.

19. The evidence presented and findings of fact establish that UNC meets Criterion 2 of Section 20.6.2.4103.F(1) NMAC as the proposed Alternative Abatement Standards are technically achievable and the cost benefit justifiable.

20. The evidence presented and findings of fact establish that UNC meets Criterion 3 of Section 20.6.2.4103.F(1) NMAC as compliance with the proposed Alternative Abatement Standards will not create a present or future hazard to public health or undue damage to property.

21. Water Quality Control Commission approval of UNC's Petition for Alternative Abatement Standards would constitute the necessary government action for NMED to petition the Office of the New Mexico State Engineer to issue an order imposing drilling restrictions including prohibiting construction of any water wells in the area for which the St. Anthony Alternative Abatement Standards are sought in accordance with Section 19.27.5.13.A NMAC.

22. In its Petition, pre-hearing declarations and exhibits, and at the public hearing, UNC demonstrated by a preponderance of the evidence that the Alternative Abatement Standards should be approved.

23. UNC has met its burden of proof that its Petition for Alternative Abatement Standards should be approved.

ORDER

Based upon these Findings of Fact and Conclusions of Law, by a 6 to 0 vote, a quorum of the Commission renders the following decision and order.

IT IS THEREFORE ORDERED that:


1. The Joint Motion attached hereto as Exhibit A between UNC, NMED and Laguna Pueblo regarding certain monitoring requirements shall be incorporated in the Water Quality Control Commission's order approving Alternative Abatement Standards for the St. Anthony Site.

2. UNC's Petition for Alternative Abatement Standards meets the regulatory requirements for the issuance of Alternative Abatement Standards and should be approved.

3. The Alternative Abatement Standards approved for the St. Anthony Mine Site shall be:

- | | |
|---|--------------|
| a. Uranium | 12.4 mg/L |
| b. Radium (combined radium 226 and radium 228) | 2913 pCi/L |
| c. Boron | 5.05 mg/L |
| d. Sulfate | 77,000 mg/L |
| e. Total Dissolved Solids | 113,000 mg/L |
| f. Chloride | 908 mg/L |
| g. Fluoride | 10.7 mg/L |

4. As soon as practicable upon issuance of this Order, Petitioner and the Department shall take the necessary steps to implement the institutional controls proposed in the Petition, namely the State Engineer well restriction order and the closure plan pursuant to the New Mexico Mining Act.


Larry Dominguez, Chair
Water Quality Control Commission

9-29-17
Date

**STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION**



**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)

**UNITED NUCLEAR CORPORATION,
Petitioner**

**JOINT MOTION TO INCLUDE CERTAIN MONITORING REQUIREMENTS IN
ALTERNATIVE ABATEMENT STANDARDS ORDER**

Petitioner United Nuclear Corporation (“UNC”), the New Mexico Environment Department (“NMED”), and Intervenor Pueblo of Laguna (“Laguna”), by and through their counsel, hereby jointly move the Water Quality Control Commission to require, as part of any order it issues approving Alternative Abatement Standards at the St. Anthony Mine, that UNC cause certain monitoring to be conducted, the specifics of which and the grounds therefor are as follows:

1. UNC seeks an order from the Water Quality Control Commission (“WQCC”) in this proceeding approving alternative abatement standards (“AAS”) for certain specified contaminants of particular concern (“COPCs”) in the groundwater in the vicinity of the former St. Anthony Mine (the “Mine”), situated on the Cebolleta Land Grant in Cibola County, New Mexico, immediately north of Laguna’s lands.

2. The primary justification for the AAS, according to UNC’s petition and the testimony and exhibits it proposes to present in this proceeding, is that the concentrations of COPCs in the groundwater in the immediate vicinity of the Mine are and will continue to be well above

otherwise applicable WQCC standards, due to the highly mineralized quality of the Jackpile Sandstone, the primary (or possibly only) water-bearing formation in the vicinity of the Mine, and due to evapoconcentration and geochemical processes resulting from the mine operation, and that it is technologically and economically infeasible to bring the groundwater into line with those otherwise applicable standards.

3. NMED supports UNC's petition.

4. UNC will present expert testimony supporting its position that, in general, once its proposed reclamation plan (consisting primarily of backfilling the Mine's large pit) is completed, groundwater subject to the AAS would take nearly 400 years to reach the nearest surface drainage downgradient from the pit, an arroyo known as Meyer Draw, and that any such water that reached Meyer Draw would soon evaporate or be lost to evapotranspiration by tamarisk and other plants in Meyer Draw.

5. In the course of the studies that led to the preparation of the reclamation plan and the proposal for the AAS, UNC or its contractor drilled several monitoring wells in the vicinity of the Mine, including three wells, designated in exhibits submitted in this proceeding by UNC as "MW-11," "MW-12A," and "MW-12B," that are situated just north of the Laguna boundary and two of which are in or very close to Meyer Draw.

5. Laguna takes no position on the merits of UNC's petition, but does not oppose it, and agrees to the granting of AAS for the area of the Mine and its immediate surroundings, as shown by UNC's exhibits, but Laguna seeks assurance that its lands will not become contaminated by COPCs from the Mine vicinity. Its assent to the granting of UNC's petition is therefore given solely on the condition that certain monitoring requirements be part of any order approving the

AAS, as set forth herein, and UNC and NMED agree that the monitoring proposed by Laguna is reasonable and warranted, and should be included in an order granting the relief sought in the petition.

6. Specifically, UNC, NMED and Laguna agree to the following terms, to be included in any order of the WQCC granting the petition, in whole or in part, in this proceeding:

A. No less than annually, in late summer or early fall, for as long as any monitoring of the site is required by NMED or WQCC, UNC shall cause wells MW-11, MW-12A and MW-12B to be monitored, for a determination whether any of them contains water.

B. In the event water is found in any of those wells, a properly collected sample of such water from each such well will be tested for the presence of COPCs by a qualified independent testing laboratory.

C. A report on each year's monitoring, including detailed results of any analysis carried out under paragraph B, above, shall be filed with NMED, and Laguna will receive a copy of each such report.

7. Laguna agrees that it will, on reasonable written request to the Office of the Pueblo Secretary, provide access over and across its lands to UNC or its contractor for the purpose of conducting the monitoring of wells MW-11, MW-12A and MW-12B, as set forth in the terms of this stipulation and an order of the WQCC.

8. UNC and NMED agree that in the event a monitoring report filed with NMED as set forth at paragraph 6(C), above, shows the presence of COPCs at concentrations in excess of the applicable WQCC standards, neither of them will oppose an application by Laguna to reopen this proceeding, to determine whether additional measures should be taken to address the situation,

and if so, what measures are warranted.

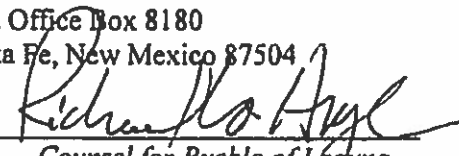
9. In the event Laguna wishes to conduct its own monitoring of wells MW-11, MW-12A or MW-12B, UNC will, on reasonable request, accommodate such monitoring, by allowing qualified Laguna persons or contractors access to the wells and any necessary assistance in the monitoring process.

WHEREFORE, UNC, NMED and Laguna jointly move the WQCC that any order granting UNC's petition include, at a minimum, the terms set forth in paragraphs 6 through 9, above.

Respectfully submitted,

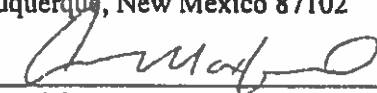
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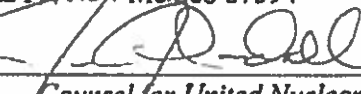
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CERTIFICATE OF SERVICE

I hereby certify that a copy of the **Proposed Findings of Fact, Conclusions of Law, and Final Order** was sent via email on October 2, 2017 and by First Class U.S. Mail on October 3, 2017:

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