



Department of Energy

Washington, DC 20585

May 4, 2021

Mr. Kurt Vollbrecht, Manager
New Mexico Environment Department
Mining Environmental Compliance Section
New Mexico Environment Department
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Subject: Response to New Mexico Environment Department Staff Review of U.S. Department of Energy's 2017 Uranium Plumes in the San Andres-Glorieta and Alluvial Aquifers at the Bluewater, New Mexico, Disposal Site, NRC Docket No. 040-08902

Dear Mr. Vollbrecht:

Thank you for the ongoing discussion New Mexico Environment Department (NMED) has had with the U.S. Department of Energy (DOE) Office of Legacy Management (LM) regarding NMED's concerns as identified in the October 15, 2019 letter¹ (enclosed) documenting their review and response to the *2017 Uranium Plumes in the San Andres-Glorieta and Alluvial Aquifers at the Bluewater, New Mexico, Disposal Site*². LM appreciates the positive feedback received from NMED and their candor in discussing these issues important to both NMED and LM. We are pleased to have reached resolution on the regulatory jurisdiction for offsite groundwater contamination at the Bluewater site, that such contamination is exempt from New Mexico State regulation for the reasons outlined below. LM is also ready to establish a path forward with NMED to have offsite monitoring wells installed. LM hopes to continue this collaborative relationship moving forward. Below is the letter as discussed in draft providing LM's position and specifically responding to NMED's concerns.

LM notes the New Mexico regulations for groundwater and surface water protection (NMAC 20.6.2) definition of "water contaminant" under the state's Clean Water Act equivalent specifically excludes by-product material³ (as does Environmental Protection Agency's (EPA) Clean Water Act).

¹ Vollbrecht, 2019. Kurt Vollbrecht, Manager, Mining Environmental Compliance Section, Groundwater Quality Bureau, New Mexico Environment Department, letter (about NMED comment on Review of 2017 Uranium Plumes in the San Andres-Glorieta and Alluvial Aquifers at the Bluewater, New Mexico, Disposal Site -February 2019) to Bernadette Tsosie, Project Manager, Office of Legacy Management, U.S. Department of Energy, October 15.

² DOE (U.S. Department of Energy), 2019. *2017 Uranium Plumes in the San Andres-Glorieta and Alluvial Aquifers at the Bluewater, New Mexico, Disposal Site*, Office of Legacy Management, LMS/BLU/S19565, February.

³ Per NMAC 20.6.2 "'**water contaminant**' means any substance that could alter if discharged or spilled the physical, chemical, biological or radiological qualities of water; "water contaminant" does not mean source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954;"



Byproduct material is the source of the groundwater contamination at the Bluewater site. This would appear to exempt the groundwater contamination at Bluewater from New Mexico jurisdiction. Because the source of the contamination is classified as byproduct material, whether contamination is onsite or offsite is irrelevant to these questions.

Furthermore, New Mexico exempts sites from abatement plan requirements (e.g., Stage 1 and Stage 2) if groundwater is addressed under the authority of the (Nuclear Regulatory Commission (NRC) or DOE pursuant to the Atomic Energy Act (AEA) (NMAC 20.6.2.4105A.(4)). DOE's long-term custody of the Bluewater site (including matters concerning groundwater) is conducted according to Chapter 8, Section 83 of the AEA (42 U.S.C. § 2113) and under the regulatory authority of NRC; consequently, LM believes the groundwater is exempt from the New Mexico abatement requirements.

The LM view is, if byproduct contamination of groundwater at the Bluewater site is exempt from State regulation, and if the State rules do not apply, then the byproduct contamination in the groundwater is solely regulated by the NRC under the AEA. LM acknowledges NMED's concerns and would like to continue to assist through the cooperative agreement between NMED and LM.

NMED's general comments and LM's response are listed below:

A) *Comment:* NMED is concerned that the full nature and extent of the groundwater plume within the San Andres-Glorieta (SAG) aquifer has not been defined. Their concern is informed by the lack of a comprehensive monitoring well network and the questionable construction of the wells evaluated for this Report. Although NMED appreciates DOE efforts to collect opportunistic samples from available wells, groundwater investigations are more effectively conducted using a set of wells that have been carefully located and constructed with the appropriate data objectives in mind. Many of the wells used for this study were not constructed with the intent of monitoring groundwater quality, and existing well spacing results in gaps in coverage.

Response: As identified in the report, LM acknowledges the full nature and extent of the groundwater plume, as defined by the State of New Mexico uranium groundwater standard and EPA uranium drinking water standard, within the (SAG) aquifer has not been defined. LM appreciates NMED's continued participation in offsite well sampling through the cooperative agreement and acknowledges the role it plays in addressing community concerns. LM acknowledges that many of these wells were not constructed with the intent of monitoring groundwater quality and that existing well spacing results in gaps in coverage. As previously discussed between LM and NMED, LM would like to

expand the cooperative agreement to provide funding for NMED to have additional offsite monitoring wells installed as requested by NMED. Continued planning between NMED and LM is necessary to continue this effort. The wells that are present were placed according to plans acceptable to NRC.

- B) *Comment:* NMED is concerned that the groundwater investigation did not consider potential contaminants of concern other than uranium. Have previous investigations been conducted by DOE, NRC, or other entities that demonstrated that other contaminants associated with the Bluewater site (e.g., selenium, molybdenum, nitrate, total dissolved solids, sulfate) have not migrated outside the DOE Site Boundary? Other contaminants may move through the aquifer at different rates than uranium and, therefore, may be impacting a larger portion of the aquifer.

Response: The focus of the 2017 *Uranium Plumes in the San Andres-Glorieta and Alluvial Aquifers at the Bluewater, New Mexico, Disposal Site* was on uranium as the main contaminant of concern. The August 2020 report titled *Evaluating the Influence of High Production Pumping Wells on Impacted Groundwater at the Bluewater, New Mexico, Disposal Site* provides additional statistical analysis for sulfate and total dissolved solids as well as a compilation of onsite data for molybdenum, nitrate, and selenium.

- C) *Comment:* While NMED understands that the nearest drinking water well completed in the SAG is approximately two miles south of the estimated limits of the Bluewater Disposal Site SAG uranium groundwater plume, all groundwater in the state of New Mexico is protectable for current and reasonably foreseeable future use. An approach that simply monitors groundwater pollution in a limited set of wells in the hope that it never reaches a private or public supply well is contrary to the New Mexico Water Quality Act and the WQCC Regulations. Under New Mexico law, groundwater pollution is required to be abated to meet applicable standards regardless of whether an existing drinking water well is impacted.

Response: LM recognizes the need to protect groundwater in the state of New Mexico, however LM's role at the Bluewater site is that of long-term care custodian. Remediation of the site and its associated groundwater impacts as well as determination of protective standards was conducted under the specific license with ARCO as accepted by its regulator NRC. NRC approved the current groundwater standards⁴ in February 1996 and amended the ARCO's license accordingly.

⁴ NRC (U.S. Nuclear Regulatory Commission), 1996. Hoseeph Holonich, Chief, Uranium Recovery Branch, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, letter (Subject: Approval of Groundwater Alternate Concentration Limits, Amendment 30 to Source Material License SUA-1470, to Mr. R. S. Ziegler, Project Manager, Atlantic Richfield Company, February 22.

These standards were subsequently incorporated into LM's long-term surveillance plan (LTSP)⁵ for the site, which NRC accepted. At the time of the ARCO license amendment and NRC's acceptance of the DOE LTSP, the offsite contamination had already occurred. The standards incorporated into these documents were determined to be protective. They also followed New Mexico standards in effect at that time (including the uranium standard of 5 mg/L). The State of New Mexico held a discharge permit with ARCO which NMED closed out. While LM recognizes the State has since revised the uranium standard, as stated previously, LM notes that the New Mexico regulations for groundwater and surface water protection (NMAC 20.6.2) excludes byproduct material, which is the source of the groundwater contamination at the Bluewater site. This would appear to exempt the groundwater contamination sourced from byproduct material at Bluewater from New Mexico jurisdiction. Because the source of the contamination is classified as byproduct material, whether contamination is onsite or offsite is irrelevant to these questions.

Furthermore, New Mexico exempts sites from abatement plan requirements (e.g., Stage 1 and Stage 2) if groundwater is addressed under the authority of the NRC or DOE pursuant to the Atomic Energy Act (AEA) (NMAC 20.6.2.4105A.(4)). DOE's long-term custody of the Bluewater site (including matters concerning groundwater) is conducted according to Chapter 8, Section 83 of the AEA (42 U.S.C. § 2113) and under the regulatory authority of NRC; consequently, LM's position is that the groundwater is exempt from the New Mexico abatement requirements.

Finally, in addition to the above concerns, both NRC and ARCO agreed in May of 1990 that continued pumping by ARCO would not reduce concentrations of the constituents in ground water at the point of compliance, that concentrations in ground water are As Low As reasonably Achievable (ALARA). Further it was determined by NRC, that concentrations now and in the future at potential points of exposure posed no substantive hazard to human health and the environment, and that ARCO should proceed with the submittal of an ACL Petition. This was after examination of performance monitoring data which indicated that there was no reduction of hazardous constituents in the ground water due to pumping. A statistical evaluation confirmed these observations. The conclusion was there was no solution more effective. DOE is the current caretaker of the site but was not the operator, nor was DOE involved at the ARCO/NRC decision process. Those decisions and operations led to the current LTSP. DOE will continue to fulfill its caretaker obligations under the current LTSP.

- D) *Comment:* The "site-specific health-based concentration limit" of 0.44 mg/L uranium established for point of exposure wells associated with the Bluewater Disposal Site is

⁵ US Department of Energy, 1997. *Long-Term Surveillance Plan for the DOE Bluewater (UMTRCA Title II) Disposal Site near Grants, New Mexico*, Grand Junction Office, Grand Junction, Colorado, July.

significantly higher than the Environmental Protection Agency health-based Maximum Contaminant Level for drinking water systems of 0.03 mg/L total uranium, as well as the New Mexico WQCC health-based groundwater standard, which is 0.03 mg/L dissolved uranium. A concentration limit above 0.03 mg/L of uranium creates a direct health risk for New Mexico residents and visitors and is contrary to well-established State law.

Response: LM recognizes that the “site-specific health-based concentration limit” of 0.44 mg/L uranium established for point of exposure wells associated with the Bluewater Disposal Site is significantly higher than the Environmental Protection Agency health-based Maximum Contaminant Level for drinking water systems of 0.03 mg/L total uranium, as well as the New Mexico Water Quality Control Commission health-based groundwater standard, which is 0.03 mg/L dissolved uranium. The “site-specific health-based concentration limit” of 0.44 mg/L was not established by LM, rather the site’s specific licensee ARCO. LM is the long-term care custodian of the site and is charged with maintaining the site in a condition determined to be protective by the NRC. The “site-specific health-based concentration limit” was accepted by NRC as being protective of human health. Below is an excerpt of NRC’s acceptance letter:

“ARCO was directed to propose a health-based value for uranium and to demonstrate that the proposed value is protective of human health and the environment at the POE locations. ARCO has now supplied information to support the 300 pCi/L (0.44 mg/l) health basis limit at the POEs. Based on the initial application, ARCO was requested to supply an updated analysis of the lifetime risk to an individual, data supporting the claim of reducing concentrations at the POEs, and a determination that the 300 pCi/L limit is as low as reasonably achievable.

ARCO's analysis results in a lifetime risk to an individual of 1.0×10^{-4} . ARCO used an EPA slope risk factor of $7.35 \times 10^{-10}/\text{Bq}$. A ground water concentration of 300 pCi/L would result in a lifetime risk of 1.0×10^{-4} , if the exposed individual is present for 30 years. This is equal to NRC's Technical Position on Alternative Concentration Limits for Title II Uranium Mills risk limit, and the Environmental Protection Agency's upper risk limit on acceptable protection of ground water.

The current concentration in the San Andres aquifer at the POE well (I(SG)) is approximately 270 pCi/L. ARCO has supplied data which indicate that concentrations at the POE are gradually decreasing with time. Based on a conservative estimate of future POE concentrations and a linear decrease, ARCO estimates that the POE uranium concentration in this aquifer will be less than 150 pCi/L in 30 years.

Based on this information, the health basis for the proposed alternate concentration limit for uranium is protective of human health and the environment. The POE concentration presents no substantial health risk to an individual.”⁶

Uranium concentrations in I(SG) have decreased over the past 23 years, concentrations in I(SG) are now approximately 0.3 mg/L (204 pCi/L). As you know, DOE was not the generator of the groundwater contamination. Given LM’s role as long-term care custodian and not the agency determining the protectiveness of remediation or groundwater standards, LM defers additional concerns regarding the protectiveness of the “site-specific health-based concentration limit” of 0.44 mg/L uranium to NRC and/or the former operator.

NMED’s specific comments and LM’s response are listed below:

1. *Comment:* Section 2.1, Figure 7, and Figure 8: Interpretations on the behavior of the faults acting as barriers to ground water flow are conjectural given the limited number of monitoring wells, the distance between the wells, and distance from the wells to the faults. While there is evidence that suggests that the East-West fault serves to limit flow across the fault, the elevated uranium concentrations south of the East-West fault indicate there is flow across the fault within the DOE Site Boundary, although the boundary effect appears to diminish with distance eastward from the disposal cell. Paired wells placed as close as practicable on either side of the fault(s) would provide a better understanding of the behavior of the fault(s) with respect to groundwater flow.

In addition, although NMED is in agreement that groundwater withdrawals can dramatically effect groundwater elevations and that active pumping wells should not be used to determine a potentiometric surface, groundwater elevation maps should be constructed using all available water level data from wells known to be completed within the SAG. DOE compared groundwater flow directions for 2012 and 2017 using a different set of wells, including fewer wells in 2017 which results in low confidence regarding overall trends in groundwater flow direction. This reinforces our general comment above, regarding DOE's reliance on supply wells for characterization of the nature and extent of uranium contamination in groundwater.

Response: LM assumes that the main focus of this comment is in reference to the East-West fault and not the Ambrosia Lake fault. That being said, NMED is correct in stating that the nature of flow through these fault zones can be better characterized. LM also acknowledges that a level of conjecture was used to tie the potentiometric lines into the East-West fault which insinuates an influence from the faults on head potential. LM also agrees with NMED that the elevated levels of uranium south of

⁶ NRC (U.S. Nuclear Regulatory Commission), 1996. Hoseeph Holonich, Chief, Uranium Recovery Branch, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, letter (Subject: Approval of Groundwater Alternate Concentration Limits, Amendment 30 to Source Material License SUA 1470, to Mr. R. S. Ziegler, Project Manager, Atlantic Richfield Company, February 22.

the East-West fault may suggest there is flow across the fault within the DOE site boundary. The following sentence in Section 2.1, paragraph 3 indicates LM's stance on the influence of the East-West and Ambrosia Lake faults on groundwater flow at the site:

“This head difference could reflect the East-West Fault's capacity to act as a *partial* barrier to groundwater flow in the SAG (DOE 2014).”

The words worth highlighting in the preceding sentence are “could” and “partial”. LM does not insinuate these fault zones act as a no-flow boundary, especially regarding contaminant transport.

Regarding NMED's comment in the second paragraph of Comment 1, LM acknowledges the water level data set used to develop the 2012 and 2017 potentiometric surface was different. LM used the available 2017 data for wells believed to be completed in the SAG aquifer, which was fewer than those in 2012 due to well integrity and access issues, which NMED is aware of. LM would prefer to use a consistent set of monitoring wells to evaluate overall trends in groundwater flow directions. However, although LM does agree that additional monitoring wells offsite would allow the collection of more routine water levels, the water level data from monitoring wells would be influenced from nearby pumping; thus, continuing to make interpretation of flow directions in offsite areas challenging.

2. *Comment:* Section 2.2, Figure 9: The discussion of well 928 and the timing of impacts from the Chinle Aquifer suggests this data should not be used for comparative purposes when evaluating the possible movement of the plume to the east. Additional wells are needed to better define the eastern extent of the contamination in the SAG.

Using analytical data collected from different wells over a time frame exceeding 5-years, as was done in creating Figure 9, is not an appropriate approach for determining the extent of groundwater impacts.

Response: LM agrees that using five years of analytical data to create a plume interpolation is not ideal. However, it should be noted that Figure 9 was derived from the 2014 Site Status Report. Dashed lines are used in Figure 9 in the area east of the Bluewater site boundary to indicate the interpretation of the plume to the east is approximate. LM agrees that additional wells would better define the eastern edge of the plume and references the response to General Comment A regarding installation of such wells.

3. *Comment:* Page 19 & 20, Table 1: NMED notes various inconsistencies in the data used by DOE (e.g., construction information, installation information, sample dates, and analytes}. It does not appear that DOE has conducted an evaluation that

compares various well construction methods and subsequent zones from where groundwater is drawn to water quality results.

In addition, Table 1 does not specify whether the laboratory results displayed are for total or dissolved uranium.

Response: LM acknowledges the various sample dates for wells used to develop both the 2014 and 2017 uranium plumes. LM's evaluation of plume extents is ongoing, and future evaluations will improve by using consistent sampling dates for water quality measurements. However, LM requests additional clarification regarding NMED's reference to the inconsistencies in the construction information, installation information, and analytes in Table 1. LM interprets the construction information and installation information inconsistencies that NMED is referring to as the variations in total depth and screened intervals reported in the table. As NMED is aware, various well completion depths and screened intervals are expected because the depth of the SAG aquifer is variable across the region ranging from 0 feet below ground surface (bgs) to over 1000 feet bgs.

Furthermore, NMED is correct in that LM has not conducted an evaluation that compares well construction methods and subsequent zones from where groundwater is drawn to water quality results. NMED is aware of this and has been assisting LM in compiling known information for offsite wells monitored by NMED to identify unknowns. As a first step to identifying what is known about each offsite well sampled by NMED and establish consistencies, a cross-walk was developed and provided in Appendix A as part of the *2017 Uranium Plume Report*. LM is willing to request additional funding through the cooperative agreement to assist NMED's efforts.

Laboratory results for all samples collected by LM were total uranium. Uranium concentrations from other sources listed in Table 1 were either total or dissolved fractions, whichever was higher.

4. *Comment:* Page 21, discussion of well 928: As stated in our previous comments, additional wells are necessary to better define the eastern extent of groundwater impacts from the Bluewater site.

Response: As stated in the response to General Comment A, LM agrees that additional wells would better define the eastern edge of the plume. As previously discussed between LM and NMED, LM would like to expand the cooperative agreement to provide funding for NMED to have additional offsite monitoring wells installed to address these issues. Continued planning between NMED and LM is necessary to continue this effort.

5. *Comment:* Section 2.4: NMED notes that uranium concentrations have increased in three SAG wells (14(SG), 18(SG), 13(SG)) located along the southern DOE Site

Boundary. Additional wells are necessary to determine the extent of groundwater impacts in the SAG south of the site boundary. The Report does not include data for the Bluewater Village supply well located southeast of well 14(SG) on the 2017 plume map (Figure 12). Data from this well was provided on the 2013 plume map (Figure 9).

Response: In addition to the response to Specific Comment 4, LM agrees the southern extent of the plume in the SAG also could be better delineated by installation of additional offsite monitoring wells. The Bluewater Village supply well located southwest of well 14(SG) was not sampled as part of the 2017 effort.

6. *Comment:* Page 25, Figure 12: NMED has sampled multiple SAG wells under the cooperative agreement between DOE and NMED for a more comprehensive list of constituents. In particular, wells BSAG-13 and BSAG-9 provide information relative to defining the SAG plume. The dissolved uranium concentration for BSAG-13 was 0.027 mg/L in 2018, an increase over the concentration of 0.020 mg/L in 2017. BSAG-9 had a dissolved uranium concentration of 0.0086 mg/L in 2018, an increase over the concentration of 0.00786 mg/L in 2017. Inclusion of these wells could help to define the northeastern limit for the SAG plume.

Response: Data from BSAG-9 and BSAG-13 were not included because there was evidence that these wells may not be completed in the SAG aquifer. The recent well integrity report developed by NMED supports this finding.

7. *Comment:* Page 29, Section 3.1: The Report does not explain the basis for the following statement: “The alluvial aquifer outside the groundwater contours is interpreted to be mostly unsaturated.”

Response: The paleochannel described in the report and shown in Figure 6 cuts into the bedrock formations at the base of the San Mateo Creek alluvial aquifer. This paleochannel is believed to be where most of the groundwater occurs in the alluvial aquifer. The base of the alluvial aquifer in areas outside of where the paleochannel is mapped is higher in elevation and subsequently higher than the top of the water table in the paleochannel. The alluvial aquifer outside of the groundwater contours is interpreted to be this area where the base aquifer is above the water table elevation and therefore unsaturated.

8. *Comment:* Page 29 & Figure 18: The Report does not explain the basis for truncating the alluvial plume at well 649 since there are apparently no monitoring wells south of this location.

Response: Based on the groundwater contours in Figure 17, well 649 is interpreted to be downgradient of wells 650 and nearly downgradient of 553. Based on this interpretation, the downgradient edge of the plume would be between wells 553 and 649. LM’s evaluation of the plume extents in this area is ongoing and will continue to update NMED as the assessment is updated accordingly.

LM appreciates NMED's emphasis on collaboration and looks forward to continued collaboration with NMED. LM recognizes NMED's concern regarding the timeline for installing additional wells and is willing to assist NMED to have offsite monitoring wells installed in a timely manner.

LM agrees that further collaboration among NMED and the appropriate federal agencies, including NRC, is necessary to ensure protection of human health and the environment.

LM's mission is to fulfill the DOE's post-closure responsibilities. LM appreciates NMED's positive collaboration in the cooperative agreement and technical expertise in ensuring this mission is achieved at the Bluewater site. We are glad to have resolved the off-site groundwater jurisdiction and look forward to working on developing a path forward on the groundwater off-site wells installation.

Please contact me at (970) 248-6550 or Bernadette.Tsosie@lm.doe.gov, if you have any questions. Please address any correspondence to:

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Sincerely,

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Bluewater Site Manager

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Enclosure

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