Response to New Mexico Environment Department and U.S. Environmental Protection Agency Comments on Pajarito Plateau Site-Specific Water Quality Copper Criteria Demonstration, Dated March 31, 2023

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) and U.S. Environmental Protection Agency's (EPA's) comments are included verbatim. The U.S. Department of Energy (DOE) Environmental Management Los Alamos Field Office responses follow each NMED and EPA comment.

NMED GENERAL COMMENTS AND ACKNOWLEDGEMENTS

NMED Comment

1. ***In Section 2.4, the Department appreciates N3B's expanded discussion on the current National Pollutant Discharge Elimination System ("NPDES") Individual Permit ("IP") target action levels, multi- sector general permit ("MSGP") benchmarks, and water quality-based effluent limits ("WQBELs") for copper applicable to LANL's NPDES discharges, and any reported exceedances.***

DOE Response

1. Comment acknowledged; thank you.

NMED Comment

2. ***In Section 3.4.1, the Department appreciates the additional information provided regarding sampling and how the Biotic Ligand Model ("BLM") input values were determined. Additionally, the Department appreciates the explanation of how a combination of estimated and default values were used in the BLM, rather than using direct measurements.***

DOE Response

2. Comments acknowledged; thank you.

NMED Comment

3. ***In Section 3.4.1, the Department appreciates the expanded explanation regarding sampling.***

DOE Response

3. Comment acknowledged; thank you.

NMED Comment

4. ***In Section 5.4.2, the Department appreciates N3B's inclusion of figures comparing chronic exceedance ratios in addition to acute.***

DOE Response

4. Comment acknowledged; thank you.

NMED Comment

5. In Section 5.5, the Department appreciates the additional information provided by N3B comparing the current hardness-based acute and chronic criteria that provides some insight on the percentage of sampled waters that may have criteria less stringent than the current hardness-based criteria.

DOE Response

5. Comment acknowledged; thank you.

NMED Comment

6. In Section 5.3, the Department appreciates that additional information in Table 5-3 and discussion of sensitivity. The Department recommends expanding further on the exclusion of potassium given the positive correlation with the model outputs.

DOE Response

6. Comment acknowledged; thank you. A brief discussion of potassium has been included in section 5.3 to explain why it was not ultimately included in the multiple linear regressions (MLRs).

NMED Comment

7. In Section 5.1, the Department appreciates the inclusion of a table with sampling locations. The Department requests that this table provide latitude and longitude in decimal degrees rather than what appears to be National Marine Electronics Association ("NMEA") Global Positioning System ("GPS") Units, which must be converted manually to useable coordinates.

DOE Response

7. Although section 5.1 does not provide coordinates for individual sampling locations, the coordinates are included in Appendix A. The X/Y coordinates were reported using the North America Datum of 1983 (NAD83) New Mexico State Plane Central system (in U.S. ft), which is how coordinates are stored in the Los Alamos National Laboratory's (LANL's) Intellus and EIM (Environmental Information Management) databases. This has been clarified in the table heading of Appendix A.

NMED Comment

8. In Section 5.1, the Department appreciates the additions regarding Data Quality Objectives and Data Quality Assurances.

DOE Response

8. Comment acknowledged; thank you.

NMED Comment

9. In Section 6.2 and Appendix A, the Department appreciates the inclusion of N3B's proposed language in 20.6.4 NMAC and list of surface waters and designated uses. However, the Department requests the table in Appendix A, as well as narrative portions in the Demonstration, reflect the current references to 20.6.4 NMAC (effective date 09.24.2022).

DOE Response

9. References to 20.6.4 New Mexico Administrative Code (NMAC) have been updated, as requested.

NMED Comment

10. In Appendix A, the Department appreciates the inclusion of the supporting data, which provides the extent of seasonality in the dataset used to develop the proposed copper criteria.

DOE Response

10. Comment acknowledged; thank you.

NMED Comment

11. In Appendix C, Footnote 1 states that a draft work plan was provided to the Department on July 7, 2020; however, the Department was given an explicit request from N3B and Triad, during a meeting in July 2020, to refrain from reviewing until such a time that Triad had time to review and concur with the proposal. This permission was not provided to NMED until September 2020. Please change the date from July 7, 2020 to September 9, 2020.

DOE Response

11. The noted date has been revised.

NMED Comment

12. In Table C1 of Appendix C, N3B states the responses to NMED and EPA's comments on the work plan and the final draft Demonstration were sent on June 11, 2021 and August 20, 2021, respectively. However, both documents were provided to NMED on July 28, 2021. N3B later sent a corrected Demonstration to NMED/EPA on August 20, 2021. Additionally, N3B's response to comments was dated April 18, 2022, not April 15, 2022, as provided in Table C1. The Department requests that N3B correct these dates referenced in Appendix C.

DOE Response

12. The June 11, 2021, date has been revised to June 28, 2021. However, the August 20, 2021, date does not appear in Table C1. The date reported was already June 28, 2021; therefore, that date was not changed. The April 18, 2022, date is now reflected in the table. The table has otherwise been updated to be current, with approximate unfinished dates.

NMED Comment

13. EPA's 2007 BLM vs. MLR:

The Department urges N3B to clearly identify throughout the Demonstration that the proposed Site-Specific Water Quality Criteria ("SSWQC") are not simply based on EPA 304(a) criteria[2] [EPA. 2007. Recommended Aquatic Life Ambient Freshwater Quality Criteria for Copper using a Biotic Ligand Model ("BLM")]. The method described in the Demonstration is not EPA's BLM and therefore is not the approach referenced in 20.6.4.10(F)(4)(c) NMAC. N3B is proposing a multiple linear regression ("MLR") translation of EPA's BLM approach. The Department does not find any issue with an alternative method to derive copper criteria if it is defensible and based on scientific evidence.

The Demonstration begins with a simplified version of the BLM (not EPA recommended), includes stormwater data (vs. only ambient data as described in EPA's 2007 BLM), and derives copper criteria using a MLR (not a BLM). The Department recognizes that EPA is working towards MLR-derived criteria for some metals, including copper, but until these have been adopted as recommended CWA 304(a) criteria. Any proposed site-specific criteria using MLR requires an independent demonstration of defensibility based on scientific evidence. The continued iteration throughout the Demonstration that N3B is using EPA's 2007 BLM is a misrepresentation of the method and analysis.

DOE Response

13. While DOE and Newport News Nuclear BWXT-Los Alamos, LLC (N3B) agree that the MLR is not equivalent to EPA's 2007 biotic ligand model (BLM), the selected MLR approach is implicitly based on the BLM. Derivation of the MLRs involved running the site-specific dataset from the Pajarito Plateau through the BLM to generate BLM criteria. Then, MLR analysis identified three toxicity-modifying parameters that had the most significant effect on BLM criteria, explaining approximately 98% of the variance in BLM criteria over the ambient water chemistry range. Thus, the MLR equation uses pH, hardness, and dissolved organic carbon (DOC) to generate BLM-based criteria with a high degree of accuracy. Therefore, the magnitudes of the proposed criteria are inherently based on the EPA 2007 BLM, given that the criterion was the independent variable in the MLR approach.

    The demonstration begins with the full version of the BLM, which is the EPA recommended method. NMED is correct that the subsequent MLR derivation steps result in criteria that are not directly equivalent to the Clean Water Act (CWA) 304(a) criteria, but as noted above and shown in the "Demonstration Report for Copper Site-Specific Criteria for Surface Waters on the Pajarito Plateau" (hereafter, the Demonstration Report), the resulting criteria are highly comparable to the CWA 304(a) criteria (adjusted $R^2 = 0.98$). The text has been clarified throughout.

NMED Comment

14. Dissolved Organic Carbon ("DOC") and Total Organic Carbon ("TOC"):

The Department has found the Demonstration's references for estimating the percent humic acid from DOC satisfactory. The Department recognizes that EPA's 2007 BLM discusses that the conversion of TOC to DOC can be done using a conversion factor based on DOC:TOC ratio. In the Demonstration, N3B and Windward Environmental note that a total of 124 DOC values were estimated from available TOC data because DOC data were not collected during these sampling events.

However, the Department has concerns regarding data quality of the underlying TOC and DOC datasets and estimating DOC from available TOC data as described in the Demonstration. N3B and Windward Environmental note that "…more than one-half of the available data indicate that DOC exceeds TOC, which is conceptually impossible" (N3B response page, B-4). Therefore, N3B and Windward Environmental removed these data from the calculation of the DOC:TOC ratio and conversion factor, but did not remove these data from the entire MLR development process. The Department questions why these suspect DOC and TOC values were not rejected during the data verification and validation process and completely removed from all analyses related to this demonstration. N3B and Windward Environmental note that "[t]his appears to be a consistent analytical uncertainty" but do not provide any information from the analytical laboratory to support this statement. To fully address these DOC and TOC data quality concerns, the Department recommends using verified and validated DOC data only where DOC values are less than TOC values.

DOE Response

14. LANL total organic carbon (TOC) data are generated analytically by measuring carbon in an unfiltered sample, which differs from other DOC/TOC methods where TOC is calculated as the sum of DOC and particulate organic carbon (POC). While the latter method will never result in DOC values that exceed TOC values, the former method is consistent with how Los Alamos National Laboratory (LANL) measures other analytes in surface waters, including total metals, polychlorinated biphenyls. DOE's and N3B's effort to use LANL's existing TOC data to calculate a DOC:TOC ratio was intended to enhance the site-specificity of the MLR dataset. DOE and N3B took the conservative step of removing all samples where DOC exceeds TOC to account for analytical variability/uncertainty and minimize bias, and DOE and N3B confirmed that the calculated DOC:TOC ratio was reasonable by comparing it to literature-based values (e.g., EPA 2007). The selected method of limiting the DOC and TOC data to samples where DOC ≤ TOC resulted in a median DOC:TOC ratio of 0.86, which is virtually identical to EPA's nationwide average (0.857) from the Cu BLM guidance (EPA 2007). EPA's comment #4 cites its BLM guidance document as a reasonable source for a DOC:TOC ratio; thus, the ratio in the demonstration report is supported by the literature and EPA.

    With regard to removing data, DOE and N3B want to clarify that the DOC and TOC data were generated using LANL's standard sampling and analytical procedures, and data were subjected to normal quality assurance (QA)/quality control (QC) and validation. The DOC and TOC data were not flagged as problematic, and as such, they are high-quality data and should not be excluded. All analytical data are subject to some degree of uncertainty and variability regardless of the laboratory or parameter; this does not invalidate all chemistry data.

    To be responsive to NMED's comment, DOE has revised the discussion of DOC:TOC in the Demonstration Report to clarify and further substantiate the selected approach and resulting DOC:TOC value.

NMED Comment

15. Use of stormwater data to develop the criteria:

It is the Department's understanding that the EPA 2007 BLM guidance was primarily intended for use in perennial streams under stable conditions (i.e., equilibrium). Given 73% of the data used for the development of these site-specific criteria are from storm events, it is important to understand if the use of stormwater data in the models may skew the proposed criteria. N3B commented that, "EPA's BLM-based criteria apply regardless of flow conditions or hydrologic regimes." The Department

requests N3B include supporting evidence in the Demonstration to support the appropriateness of using stormwater data to develop the proposed criteria.

DOE Response

15. The EPA 2007 BLM guidance reflects EPA's current national copper criteria, which is recommended for all types of hydrologic regimes and surface flows, including storm flows. The EPA 2007 copper criteria are designed for protection against both short-term (acute) and long-term (chronic) effects on freshwater aquatic life. Most studies that formed the basis of the copper BLM measured acute endpoints following aquatic life exposure to copper over short periods. The acute copper BLM criteria are appropriate for storm flows given the short-term (acute) exposures that occur during episodic storm flows, particularly in ephemeral and intermittent waters.

    In 2017, EPA funded a study conducted by the National Academies of Sciences (NAS) aimed at improving stormwater management under the Multi-Sector General Permit (MSGP) program (NAS 2019). That study recommended use of the latest aquatic life criteria for copper (i.e., the BLM) for setting stormwater benchmarks that are protective of aquatic life during short-term, intermittent exposure in stormwater.

    Based on the NAS (2019) recommendations, the EPA (2021) MSGP revised the copper benchmarks for stormwater using the EPA 2007 copper BLM. The EPA 2021 MSGP also allows operators to derive facility-specific stormwater benchmarks for copper using the copper BLM and representative ambient water chemistry data (e.g., the BLM parameter inputs).

    Given that the copper BLM provides both acute and chronic criteria and the NAS (2019) and EPA (2021) recommend the copper BLM for deriving stormwater benchmarks, it is a scientifically defensible approach for setting site-specific copper criteria. The number of ambient surface water samples in the Pajarito Plateau dataset from storm-flow monitoring reflects the site-specific hydrologic regime because most of the drainages do not flow or contain water except during or immediately following storm events.

    As part of the detailed analyses described in Appendix B to the Demonstration Report, DOE and N3B evaluated the importance of hydrologic regime on model development. The goal was to determine whether including different types of hydrologic categories (i.e., ephemeral, intermittent, and perennial) in the MLR significantly and meaningfully improved predictions of BLM criteria. Specifically, section B4.2 describes the outcome of this modeling exercise. While including these categories improved model fit (i.e., higher R^2), the improvement was insubstantial. For example, Table B5 shows the model parameters and R^2 (0.982) for a version of the MLR (referred to in section B4.2 as "Model 4") that includes unique intercepts for hydrologic categories. The proposed MLR (referred to in section B4.2 as "Model 5") excluded the hydrology categories, resulting in an $R^2 = 0.980$. This corresponds to a loss of 0.2% accuracy, which shows how little the hydrologic categories contribute to the MLR when DOC, hardness, and pH are also considered. Therefore, DOE and N3B present site-specific evidence that the MLR performs very well regardless of a stream's hydrologic regime.

NMED Comment

16. Appendix C Public Involvement Plan

To improve the Public Involvement Plan, the Department recommends N3B consider the following:

- *Provide additional outreach with Tribes and Stakeholders prior to public notice under this Public Involvement Plan given that Tribes and Stakeholders have added investment and potential impact from an action amending state water quality standards.*
- *Identify which local newspaper(s) will be used to distribute notification of the draft Demonstration.*
- *Notify the public of the Demonstration through a listserv (or equivalent) distribution mechanism given the general public will not be aware, unless through reading the newspaper, that there is a draft technical demonstration posing to amend state water quality standards.*

DOE Response

16. The public involvement plan has been revised as requested by NMED.

EPA COMMENTS

EPA Comment

1. The biotic ligand model (BLM) has been EPA's nationally recommended freshwater aquatic life criteria for copper under Clean Water Act Section 304(a) since 2007. The BLM version used as the basis for EPA's 2007 copper criteria was version 2.2.3. The BLM reflects the latest scientific knowledge on copper bioavailability and toxicity with which to develop protective copper criteria. EPA recommends that states adopt the BLM as statewide copper criteria, but also supports site-specific application on a case-by-case basis.

DOE Response

1. Comment is addressed to NMED. DOE and N3B appreciate EPA's statement that it "recommends that states adopt the BLM as statewide copper criteria, but also supports site-specific application on a case-by-case basis."

EPA Comment

2. EPA's water quality standards regulations at 40 CFR 131.11 provide that states should establish numeric criteria based on "(i) 304(a) Guidance; or (ii) 304(a) Guidance modified to reflect site- specific conditions; or (iii) Other scientifically defensible methods." Because the BLM reflects the latest scientific knowledge on copper bioavailability and toxicity, EPA uses the copper BLM to evaluate the protectiveness of copper criteria, including site-specific criteria, that are developed based on 131.11(b)(1)(iii) "other scientifically defensible methods."

DOE Response

2. Comment acknowledged.

EPA Comment

3. Data gathered to support development of alternative copper criteria at a site using a method like the copper BLM that accounts for site-specific characteristics should consider special circumstances that may affect copper toxicity throughout the expected range of receiving water conditions, considering both spatial and temporal variability. In this instance, since water chemistry data from a subset of the waterbodies to which the draft copper criteria are proposed to apply was used to develop the criteria, the supporting information for the criteria should clearly demonstrate that water chemistry data used to develop the criteria capture the full range of spatial variability in water chemistry of all waterbodies in the proposed action area. The supporting documentation should also demonstrate that data used to develop the proposed criteria are representative of the full range of temporal variability in receiving water chemistry conditions in these waterbodies, including both stormwater and, where applicable, baseflow conditions.

DOE Response

3. Section 5.1 of the report describes the full extent of water quality data measured in Pajarito Plateau waters. Water chemistry spanned the full range of the BLM's prescribed range (Table 5-2), with 14 of 531 samples being removed for extending beyond that range. Samples were excluded only to prevent potential BLM extrapolations when preparing the output dataset for MLR development. Figure 5-6 also provides a visualization of the ranges of MLR input and output data using 10th and 90th percentiles as reasonable bounds for MLR inputs. The MLR and BLM are very similar throughout the range of inputs even at the relative extremes of distributions.

   Table 6-1 describes the spatial extent for applying the MLR. Samples were collected from these waterbodies, including the reaches themselves and upstream and downstream reaches.

   Temporal variability is described by Figure 5-1, which illustrates when and where surface water samples were collected for BLM analysis between 2005 and 2019. Many of the watersheds were consistently sampled over that time except for low-sample periods, 2005–2006 and 2011–2012. Sampling was less frequent in Ancho, Chaquehui, Rito de Frijoles, and Jemez River watersheds, and all but Frijoles were sampled over multiple years. Therefore, temporal variability in water chemistry is well captured by the MLR.

EPA Comment

4. Accurate characterization of the input variables is also crucial to ensuring the resulting copper criteria protect aquatic life. Dissolved organic carbon (DOC) and pH have the greatest effect on the BLM results. When only total organic carbon (TOC) data are available, the proportion of organic carbon expected to be dissolved in surface waters should be estimated and used to scale the measured TOC value to DOC. The selected TOC to DOC conversion must be based on a scientifically sound rationale that should be explained in the public record for the criteria revision. A number of scientifically defensible options are available for the conversion, including using data from USGS' National Stream Quality Accounting Network (NASQAN) or Appendix C-2 of EPA's 2007 criteria document. The most conservative approach

would likely be to select the ratio resulting in the lowest DOC values, since lower DOC values result in lower (i.e. more stringent) BLM model outputs. EPA most recently addressed this issue of TOC to DOC conversions in its Draft Technical Support Document: Implementing the 2018 Recommended Aquatic Life Water Quality Criteria for Aluminum.

DOE Response

4. DOE and N3B agree with EPA's comment; the use of a TOC-to-DOC conversion factor is scientifically based and defensible. DOE and N3B's approach was both empirical and statistical in that the TOC and DOC were compared where both data were measured in site-specific samples, and then a conversion factor was derived mathematically. The value that was calculated in this way (0.86 or 86%) was then compared with several of EPA's recommended values and found to be quite similar. For example, the New Mexico stream-specific conversion factor is 81.5%, and the nationwide mean is 85.7% (EPA 2007), within rounding error of the selected value. While the lower New Mexico value reported in Appendix C-2 of EPA 2007 would also be defensible and is lower than the calculated value, the dataset suggests that the higher conversion factor is warranted (and supported by EPA's nationwide dataset). As such, DOE believes that the selected value is both scientifically defensible and reasonably conservative.

EPA Comment

5. In 2017 EPA entered into a Cooperative Research and Development Agreement (CRADA) with eight metals associations to collaborate in developing a simplified modeling approach that can predict the bioavailability and toxicity of metals, including copper, in the aquatic environment using the most current science. In its Phase 1 report, EPA found that the empirically-based multiple linear regression (MLR) models performed at least as well as the mechanistically-based BLM and stated that EPA intends to use MLR models as the overarching metals bioavailability- modeling approach with pH, hardness, and DOC as the core set of toxicity modifying factors to consider in model development. EPA is beginning work on development of MLR-based nationally recommended criteria for metals, including copper. Criteria development is expected to take several years. At this time, the copper BLM continues to reflect the best available science for protecting aquatic life from the toxic effects of copper, and EPA will continue to use the copper BLM to evaluate the protectiveness of submitted copper criteria.

DOE Response

5. Comment acknowledged; thank you. The core set of toxicity modifying parameters determined to be most important in accurately generating BLM criteria in the current MLR analysis (pH, hardness, and DOC) is consistent with EPA's findings from Phase 1 of the Cooperative Research and Development Agreement (CRADA) and other scientific literature on copper toxicity (Brix et al. 2017).

REFERENCES

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EPA (U.S. Environmental Protection Agency), February 2007. “Aquatic Life Ambient Freshwater Quality Criteria - Copper, 2007 Revision,” EPA-822-R-07-001, Office of Water, Office of Science and Technology, Washington, D.C. (EPA 2007)

EPA (U.S. Environmental Protection Agency), September 2021.“United States Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activity Fact Sheet.” (EPA 2021)

National Academies of Sciences, Engineering, and Medicine, 2019. *Improving the EPA Multi-Sector General Permit for Industrial Stormwater Discharge*”, The National Academies Press, Washington, D.C. (NAS 2019)