October 29, 2014

Mr. Mark Kautsky, Site Manager
U.S. Department of Energy
2597 B 3/4 Road
Grand Junction, CO 81503

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF REVIEW OF U.S. DEPARTMENT OF ENERGY REPORT ENTITLED "ANNUAL PERFORMANCE REPORT APRIL 2012 THROUGH MARCH 2013 FOR THE SHIPROCK, NEW MEXICO, SITE" (DOCKET WM-00058)

Dear Mr. Kautsky:

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the U.S. Department of Energy (DOE) report entitled "Annual Performance Report April 2012, Through March 2013, for the Shiprock, New Mexico, Site" dated November 2013. Based on our review of the 2013 annual performance report the NRC staff has the following comments:

1. To help overall understanding, inclusion of cross-sections of the terrace and floodplain and the approximate contours of the piezometric surface of the terrace would be beneficial.
2. With the drop in the terrace water table elevation, a greater percentage of the contaminated water will be found in the weathered Mancos Shale. Greater emphasis on this unit would be beneficial. For example, a comparison of screen interval depths in relationship to their location within the weathered Mancos Shale would indicate how well this unit is being monitored.

In addition, we have the following observations:

1. The information in the figures and tables of this report show how effective Trench 1 and Trench 2 are in extracting contaminants from the floodplain alluvium that were discharged from the weathered Mancos Shale underneath.
2. The floodplain plumes for uranium, sulfate, and selenium seem to indicate that an above average concentration of these contaminants is discharging from the weathered Mancos Shale near sample location 0779 in a similar manner as depicted in Figure 8 in the "Evaluation of the Trench 2 Groundwater Remediation System at the Shiprock, New Mexico, Legacy Management Site" from March 2009. In that figure, fractures in the weathered Mancos Shale beneath the floodplain alluvium are discharging contaminated water into the alluvium. It is possible that the area around sample location 0779 has a higher concentration of such fractures.
3. Some of the implemented refinements to the compliance strategy for the terrace recommended in the "Refinement of Conceptual Model and Recommendations for Improving Remediation Efficiency at the Shiprock, New Mexico, Site" from July 2005 appear to have improved the pumping rates. The newer wells, i.e., 1093R, 1095, and 1096, were installed using a casing-advance drilling method and have

better production than the other extraction wells except for wells 818, and 1078, (the latter well is partly in the weathered Mancos Shale and lies in the west terrace).

4. Contaminated ground water in the terrace exists in the alluvium, the weathered Mancos Shale, and the unweathered Mancos Shale. This report states that ground water is known to occur in the weathered shale and, in some areas, flows through deeper portions of the shale, within its fractures and along bedding surfaces. In addition, the "Optimization of Sampling at the Shiprock, New Mexico, Site" from March 2013, states that the although flow in the escarpment wall seeps has diminished over the past 10 years, available data indicate that contaminated ground water continues to discharge directly to the floodplain alluvial aquifer. The conceptual model for the terrace ground water system appears to include vertical movement of contaminated ground water from the terrace alluvium through the weathered Mancos Shale into fractures and bedding surfaces of the unweathered Mancos Shale and finally to discharge into the floodplain alluvium or the San Juan River directly. Although the NRC staff is not disputing the basic premise of this conceptual model, little information has been presented to support it. No downward vertical gradient in the terrace ground water system has been demonstrated, for example, with data from a piezometer nest composed of two or more piezometers installed side by side at the same location. No approximation is given on the expected downward rate of flow or specific discharge.
5. Little information has been presented on possible horizontal movement within the terrace ground water system and how this compares with the downward vertical velocity. The "Final Ground Water Compliance Action Plan for Remediation at the Shiprock, New Mexico, UMTRA Site" from July 2002 included approximate contours of piezometric surfaces for both floodplain and the terrace ground water systems (Figure 2-3). The contours would indicate water movement in a northwest direction, or in other words, movement of water from the east terrace to the west terrace. One of the purposes of the active remediation is to hydraulically cut off the recharge from the east terrace to the west terrace. Although the "2010 Review and Evaluation of the Shiprock Remediation Strategy" from January 2011, shows a decrease in the ground water elevations in terrace alluvium wells (Figure 5), no piezometric surface has been shown for the terrace since 2002. The steeper drop in the west terrace water table elevation (probably due to the cessation of irrigation over a larger part of the west terrace) compared to the east terrace water table elevation would suggest an increase in the horizontal gradient between the two, and, therefore, an increase in the specific discharge from east to west. However, it is difficult to determine if this is the case, since little information on hydraulic conductivities and gradients has been presented and a current water table map is not available.
6. It is not clear if the hydraulic connection between the east terrace and the west terrace has been cut. It is difficult to determine from the reports if the screened interval of current monitoring wells in the terrace are sufficiently deep to show if the hydraulic connection exists or not. As previously stated, the contaminated ground water in the terrace exists in the alluvium, the weathered Mancos Shale, and the unweathered Mancos Shale. However, it appears as if most of the screened intervals of the wells are located exclusively in the alluvium or in the lower alluvium and upper weathered Mancos Shale. West of U.S. Highway 491, only three wells exist sufficiently deep to monitor the upper weathered Mancos Shale. Contaminated water would occur at least as far down as the lower boundary of the weathered Mancos Shale, but the interface between the weathered and unweathered shale in not known, and it is therefore difficult to determine whether the hydraulic connection within the weathered Mancos Shale has been cut.

A better basis for the terrace ground water flow and transport conceptual model will contribute to appropriate and beneficial decisions being made in the future.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice" a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions concerning the NRC comments please feel free to contact me at 301-415-6749 or at Dominick.Orlando@nrc.gov.

Sincerely,

/RA/

Dominick Orlando, Senior Project Manager
Materials Decommissioning Branch
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: WM-00058

Shiprock dist. List

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