

EA and SOWP Comments

This document covers Knight Piésold's technical comments to the Environmental Assessment of Ground Water Compliance at the Shiprock Uranium Mill Tailings Site (EA) and the Shiprock Site Observational Work Plan (SOWP). The major areas of concern include the following:

1. The contaminant sources on site may not be properly defined. In particular, the disposal cell and the residual vadose zone soil contamination need to be redefined in the conceptual model and the transport model.
2. The documents contain no compliance plan, making it difficult to ascertain if regulatory guidelines are being met.
3. The results of the risk assessment are not linked to the establishment of the remedial goals
4. The current design of the evaporation pond may pose environmental risks due to their size and the aerial dispersion of liquid contaminants and evaporates.

General Comments:

1. The flow from the dewatering of the disposal cell (Component #3, page 4-47) is the most important number in the report. Please elaborate on the method used to determine the 5.9 inches/year number. Is it a value required to hold the "mound" in the MODFLOW model? Is it based on other values? In the opinion of Knight Piésold, the cell drainage number is essential to the entire remedial plan. Rigorous techniques can be used to ascertain the dewatering of tailings, and detailed calculations should be used to give more scientific validity to the claim that the extraction system will dewater the terrace in 5 to 7 years. Our experience has shown that tailings dewatering without the aid of active or passive drainage systems can be a very slow process.
2. Conversations with the Navajo Nation indicated that sequestering the flow from well 648 may be very unpopular with locals who use the water for irrigation.
3. The previous consultant expressed concerns that the east terrace was not originally dry. We understand that this concept cannot be directly proven, but we understand that the extraction system will be run until the terrace is dry. The only remaining issue is if it will naturally stay dry. Therefore, we assume that the DOE's long-term monitoring will verify that the site remains dry after remediation has been completed. The DOE should also put a land use restriction on the area to ensure that it does not, at some time in the distant future, receive large quantities of irrigation water that may increase infiltration and remobilize contamination.

4. Is there a preferential pathway for the salt deposits to ecoreceptors? Do fauna use salt deposits as saltlicks?
5. The spray evaporation system may be critically undersized. Retention ponds with hazardous material must be properly designed with sufficient freeboard to support the volume from a 100-year storm. If the evaporation pond overtops, the environmental consequences would be severe. Therefore, the DOE needs to conduct the proper study to ensure that the ponds are safe.
6. Considering the windy conditions prevalent in the Four Corners region, meteorological data should be evaluated to see if the evaporation system can be run the required 78 percent of the time without running the system in conditions that could spread contamination.
7. Knight Piésold is very concerned with the potential recontamination issues associated with the spray evaporation system. Studies need to be conducted to ensure that the system will not spread contamination and that the evaporates will not pose a health risk to human and environmental health.
8. The compliance strategy for the floodplain, east and west terraces needs to include more specific information regarding the basis for the overall groundwater compliance program. For example, information regarding the rationale for selecting the location and number of background wells and point of compliance wells where groundwater protection standards will be applied need to be identified. This information would be best summarized from key portions of the Groundwater Compliance Action Plan.

Specific Comments, Environmental Assessment:

Executive Summary

Please mention in the Executive Summary that the success of the treatment system is dependent on the rapid dewatering of the disposal cell. This caveat is essential information and must be properly communicated and explained.

Table 1

An additional column titled "Remediation Goal" should be added to Table 1. Summary of Compliance Strategies to address compliance of the proposed cleanup strategies with contaminant groundwater protection levels (40CFR Part 192), risk-based levels (derived from the baseline risk assessment) or background levels. In addition, these same remediation goals should

be incorporated into the groundwater compliance selection framework process as depicted in Figures 4–6.

Table 2

Groundwater Constituents and EPA Maximum Concentration Limits needs to be modified to include remediation goals for both human health and ecological receptors. We would suggest preparing two tables; one listing constituents for human health and one listing constituents for ecological risk based on receptor type. Remediation goals for human health would be the groundwater protection levels in 40CFR Part 192, and remediation goals for ecological receptors should be back-calculated 95%UCLM values based on an HQ of 1.0 as determined in the baseline risk assessment.

Section 1.5

Please implement a monitoring plan to ensure that the interim actions are still in place and are sufficient. People and animals will go to great lengths to get additional water, and occasional inspections can ensure that the systems receive the necessary repairs.

Section 3.2.1

Please present any calculations used to design the 100-foot buffer zone around the pond. We are very concerned about the windborne transport of contaminants from the evaporation system and need further evidence to prove that the contamination will remain in place.

Section 3.4, Paragraph 2

The no-action alternative for the west terrace must be dependent on the dewatering of the east terrace. Please state this in section 3.4.

Section 3.2

Section 3.2.1 Active Remediation Phase

This section states that alternate concentration limits for uranium and nitrate may be developed should it be determined that these constituents are leaching from the Mancos Shale in the irrigated area of the west terrace to the floodplain. Prior to initiating a lengthy ACL petition process, DOE should try to determine background nitrate and uranium concentrations contributed to floodplain compliance monitoring wells from the west terrace. Background levels for these constituents would therefore become groundwater protection levels and remediation goals.

This section states that cleanup objective for manganese is the maximum background concentration detected. The rationale for choosing the maximum value over other statistical data should be discussed.

This section refers to natural flushing to reduce contaminant concentrations to acceptable levels within 100 years. The rationale for choosing 100 years as an acceptable remediation timeframe needs to be discussed.

Section 4.3.2

Please show the capture zones associated with the floodplain pumping. Although the compliance requirements do not call for plume-capture, a map of simulated drawdowns could support the claim that the extraction system is removing contaminant mass.

Section 4.4

Concentrations of COCs in the soils of the floodplain are significantly higher than background. The flushing of these soils will supply contaminants to the aquifer. Therefore, when modeling, a reasonable contaminant source zone should be applied in areas of high soil contamination, particularly at the base of the escarpment. The column tests should be sufficient to quantify this input.

Section 4.8 Ecological Risk

This section concludes that livestock should not be at risk if allowed to graze on the floodplain based on the results of forage sampling in June 2000. These risks (HQ calculations) are summarized in Table B-4 in Appendix B of the EA. On page B-5 of Appendix B, DOE states that they used the mean value for non-saltgrass samples to calculate risk because insufficient non-saltgrass samples were available to calculate a 95%UCLM value. It is usually common practice in risk assessment methodology to use a maximum concentration value when a 95%UCLM cannot be calculated rather than a mean value. DOE should modify the appendix to reflect a change in risk from non-saltgrass uptake.

SOWP Comments:

Figure 4-49, Pages 4-55 and -56

A considerable portion of the floodplain flushing comes from the San Juan River adding water in the thin southern portion. Please add to the report a discussion of river stage to further support your theory that this section of the floodplain is gaining from the river. The location of the disposal cell, the escarpment, and the strong (40-foot) gradients down the escarpment may support the theory that the entire floodplain discharges to the river, thus removing a significant mechanism for flushing.

Page 4-53

The value used for precipitation infiltration may be a bit high considering the considerable gap between precipitation and potential evapotranspiration. Typical infiltration values for arid climates are between 1 percent and 10 percent of precipitation. Please cite a reference for your much higher approximation of 30 percent.

Page 4-56

It is assumed that the total flow from well 648 enters the aquifer. Please explain why this number was not adjusted to account for the evapotranspiration present in the wash and in the wetland.

Page 4-73

The change in units to ft^3/year is confusing; please keep units consistent.

Page 4-74

Is the value of 4.4 inches per year supported by the literature? If so, please site a source.

Page 4-78

Considering that no point-of-compliance is stated, is the surface water sample at location 940 in violation because the concentration is above the MCL for uranium? Or is the point-of-compliance the receptors downstream? In an NPDES permit, the point-of-compliance is the point of discharge (i.e., Station 940). If this is the case, we recommend an interim control to prevent this violation from occurring in the future.

Page 4-85

For escarpment seeps, the mean is higher than the UCL95 for nitrate. Please fix this error.

Page 4-152

Concentrations of sulfate and uranium are very high in the soils and salts above the confluence of the well 648 inputs in Bob Lee Wash (sample point 880). We understand that the terrace system will be dewatered, but we are concerned that surface water from storm events could mobilize considerable contamination, thus hitting the floodplain with a slug of COCs.

Page 4-199

If an R_d (contaminant sorption coefficient) has already been determined, what is the applicability of the leaching test for the floodplain? It appears that the transport model with an R_d will control the flushing behavior in your model, and on the terrace dewatering is the chosen remedial method.

Page 4-216

No discussion is made of the Mancos Shale as a source of nitrate. If there is any justification for active remediation of the west terrace, it will be based on the very high nitrate concentrations that have migrated northwest from the raffinate ponds. Figure 4-38 clearly shows that nitrates have come from the plant and have migrated beneath Highway 666 and toward well 0833. With continued migration to the northwest, this nitrate plume could reach the Shiprock High School well or the seep in the First Wash. Please further explain the fate and transport of the west terrace nitrate plume and present information to justify the no-action alternative for this COC.

Page 4-221

Are there any studies to verify the porosity of 0.3? It is at the high end of alluvial materials.

Page 4-235

The model simulation of current nitrate concentrations has much lower concentrations than the field data. The discrepancy, especially in the floodplain, could greatly influence the simulation of flushing. For the simulation to be accurate, it must start with the correct value for contaminant mass in the aquifer; otherwise, the simulation favors unrealistically fast remediation.

Page 4-239

The model simulation of current uranium concentrations is far below the field values. See comment above.

Section 6.1 Human Health Risks

This section should include a general discussion and reference to a human health conceptual site model figure that would help the reader better understand complete exposure pathways. In addition, the conceptual model should include plausible exposure pathways associated with the operation of the evaporation system. A quantitative risk assessment for the evaporation treatment system exposure scenario should also be added as an update to the BLRA to assess the impact to downwind human receptors.

Section 6.1.1 Floodplain Groundwater

Based on the 1994 BLRA results, this section notes that carcinogenic risks calculated for adult exposure to arsenic exceeded the upper bound of EPA's acceptable risk range of 1E-04 by one order of magnitude. In the BLRA update (Section 6.1.2.1), it is stated that arsenic was screened out as a COPC due to more recent groundwater analysis at or below the detection limit. From a risk perspective standpoint, it is generally common practice to compare risk relative to a 1E-06 point of departure as noted in EPA's National Contingency Plan that also refers to the 1E-04 to 1E-06 acceptable risk range. Using 1E-06 as a base for comparison, arsenic cancer risk in 1994 would have been 3 orders of magnitude higher than acceptable risk. The updated BLRA should provide the documentation to justify why arsenic risk in floodplain groundwater has been reduced by 1 to 3 orders of magnitude from 1995 to 1998 – 2000 and therefore eliminated as a COPC. Also, the BLRA would more complete if DOE listed the specific criteria for COPC elimination in the BLRA.

Section 6.1.2 BLRA Update

Knight Piesold is in agreement with the calculation of exposure point concentrations based on 95%UCLM values. This is the common practice as referenced in EPA Risk Assessment Guidance and represents the reasonable maximum exposure (RME). However, this BLRA also states that "if the maximum concentration of a constituent was much higher than the rest of the measured values, a more representative calculation is also provided." Furthermore, it is stated that "maximum surface water concentrations are used to provide worst-case risk estimates for these possible exposures." These statements should be further clarified, as they seem to be inconsistent with the calculation of RME using 95% UCLM statistics.

Section 6.1.3.2 Terrace Groundwater

Comparison of cancer and non-cancer risks should be based on 95% UCLM values rather than comparison to mean concentrations. Again the point of reference for risk comparison should be the lower end of the risk range at 1.0E-06.

Section 6.2.3.11 Ecological Risk Summary

This section presents an HQ categorization of ecological risks ranging from none, low, medium-low, medium, high and very high. DOE should provide the rationale and a reference to this method of categorizing HQ risk.

We agree that in many cases, the HQ calculations in the ecological risk assessment overestimate risk due to use of conservative toxicity benchmark values such as water quality criteria and NOAELS. However, usually a discussion of the conservatism's used in the quantitative risk assessment are provided in the Uncertainty Section of a BLRA. Since EPA risk assessment guidance considers an HQ value greater than 1.0 as the reference point for potential adverse ecological effects, we believe the categorization of HQs in this section is somewhat misleading. For example, a COPC with an HQ between 10 and 100 times greater than an HQ of 1.0 is considered as medium-low risk. The DOE should consider revising Table 6-53 to include the numerical HQ values calculated for aquatic organisms, benthic organisms, upland plants, wetland plants, terrestrial wildlife, livestock and wetland wildlife. The conservative nature of the exposure assumptions and benchmark toxicity values used in the HQ calculations should be discussed in an Uncertainty section that could be added to the BLRA.