5.0 Recommendations

The floodplain extraction system appears to be functioning as expected. The addition of the two trenches at the base of the escarpment enhances the removal of contaminant mass from groundwater in the alluvium. Based on the current status of remediation progress and findings of more recent investigations (DOE 2009; DOE 2011d), DOE recommends the following activities to improve the performance and evaluation of the Shiprock remediation system and to minimize potential risks to human health and the environment:

- Continued assessment of floodplain-wide flow and transport processes is warranted (studies are in progress). Supporting modeling will be used to address key issues regarding management of the alluvial aquifer, including (1) the capacity of groundwater extraction components to prevent contaminant discharge to the river; (2) optimal pumping cycles for Trench 1 and Trench 2; (3) the relative benefits of a third trench between Trench 1 and the well 1089 area (see below); and (4) the likely floodplain impacts of terminating flows from artesian well 0648.
- The objective of the recent Trench 1 evaluation was not only to assess the performance of the system, but also to determine if additions or modifications to the remediation system would be beneficial (DOE 2011d). Based on the findings of this study, DOE may explore the feasibility of installing another collection drain in the central area of the floodplain between the Trench 1 and the 1089 areas near well 0798.
- Additional studies in the well 1089 area may be useful to improve estimates of local aquifer hydraulic properties (e.g., hydraulic conductivity), evaluate differences in pumping rates between the vertical extraction wells 1089 and 1104, and evaluate groundwater interaction (including water exchange) with the San Juan River.
- The terrace extraction system is operating adequately, and groundwater levels are gradually declining. Therefore, no additions to the terrace system are recommended at this time (see DOE 2010a). However, as discussed in Section 1.1 and in the recent strategy evaluation (DOE 2010a), the compliance strategy for the terrace needs to be updated. DOE is proposing active remediation as the interim remediation strategy for the entire terrace. Therefore, in future annual reports, it may be prudent to focus not just on groundwater elevation changes (decreases), but on contamination trends as well (e.g., factors underlying COC increases in some terrace wells).
- Continued monitoring of the fluid level in the evaporation pond is recommended, along with periodic cessation of pumping as necessary to maintain sufficient freeboard. However, efforts to enhance evaporation rates (e.g., additional drip lines or spray systems) may be warranted. Also, given that the remediation system has been operating over 8 years, the longevity of the pond liner—and the remediation infrastructure as a whole—may soon warrant evaluation and/or necessary upgrades.
- To mitigate potential ecological risks associated with the pond, in June 2010 DOE began adding dye to the evaporation pond to block sunlight as a way to kill algae and thus remove a potential food source for birds. This has been effective in reducing the algae, and DOE recommends that this practice continue.
- Develop a specific plan for phytoremediation pending analysis of overall findings and data when pilot studies end (in progress).

- The recently issued investigation of Many Devils Wash (DOE 2011c) identified a channel that could be a pathway for groundwater to migrate from a tributary southeast of the wash (Tributary 1, off of East Fork) northward to the knickpoint seeps. However, additional investigation is needed and is planned for late 2011.
- Probably the most prevailing issue in Many Devils Wash is defining the source of the contamination (see DOE 2011b, DOE 2011c). Ultimately, irrespective of the origin of contamination in Many Devils Wash (whether naturally occurring, mill-related, or a combination of both), DOE will continue to focus on ways to minimize exposures and risks to contaminants in the wash as well as other areas of the site. DOE continues to underscore the importance of institutional controls and seeks cooperation and assistance from NNEPA and Navajo UMTRA on this issue.