Appendix F

Floodplain and Wetlands Assessment for Remedial Action at the Moab Site

F1.0 Introduction

The Moab uranium mill tailings site (Moab site) is located 3 miles northwest of Moab, Utah, on the west bank of the Colorado River. Historical processing of uranium ore at the site has resulted in a 130-acre mill tailings pile and contamination of surface water and ground water. The entire site covers approximately 439 acres, 150 of which are in the 100-year floodplains of the Colorado River and Moab Wash (an ephemeral stream that bisects the site) and the 500-year floodplain of the Colorado River. The site also contains wetlands along the border of the Colorado River (Figure F–1).

Remediation of the Moab site is mandated by the Floyd D. Spence National Defense Authorization Act, which transferred the title for the site and responsibility for cleanup to the U.S. Department of Energy (DOE). The Act also specified that the site be remediated in accordance with Title I of the Uranium Mill Tailings Radiation Control Act of 1978. Custody of the site was transferred to DOE in 2001 for remediation and long-term stewardship. Executive Order 11988, *Floodplain Management*, and Executive Order 11990, *Protection of Wetlands*, requires that each federal agency evaluate the impacts of proposed actions on floodplains and wetlands and consider flood hazards and floodplain management. Regulations in 10 CFR 1022 mandate this assessment, which includes a description of the proposed action for remediation, a description of floodplains and wetlands, a discussion of the effects on floodplains and wetlands, and a consideration of alternatives.

Pursuant to the National Environmental Policy Act of 1969 (NEPA), DOE announced its intent to prepare this environmental impact statement and published a Notice of Floodplain and Wetlands Involvement for remediation of the Moab site (67 FR 77969, December 20, 2002). This notice requested comments from the public regarding potential impacts on floodplains and wetlands associated with remediation of the Moab site.

In 10 CFR 1022.4, a floodplain is defined as "…lowlands adjoining inland or coastal waters …including at a minimum, that area inundated by a 1.0 percent or greater chance flood in any given year." The area meeting this definition is referred to as the base floodplain or the 100-year floodplain. The *critical action floodplain*, also referred to as the 500-year floodplain, is the area inundated by a flood having a 0.2 percent chance of occurring in any given year. Within this floodplain, any activity for which even a slight chance of flooding would be too great (a *critical action*) is prohibited. Because petroleum, lubricants, and other hazardous materials would be used during the construction phase of this project, both the base floodplain and the critical action floodplain are considered in this assessment.

National Flood Insurance maps have not been updated recently, do not reflect current site conditions, and do not include the 500-year floodplain boundary, so they were not used for floodplain boundaries for this assessment. Therefore, flood and rainfall data, including an extensive backwater analysis (Mussetter and Harvey 1994) were used with the U.S. Army Corps of Engineers (USACE) HEC-2 model to determine the current 100-year and 500-year floodplains at the site.

A wetland is defined in 10 CFR 1022.4 as "an area that is saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted to life in saturated soil conditions." Wetlands can serve a variety of functions in an ecosystem, including water quality preservation, flood protection, erosion control, biological productivity, and wildlife habitat. The presence of riparian vegetation such as cottonwood (*Populus* spp.), willow (*Salix* spp.), and tamarisk (*Tamarix ramosissima*) does not necessarily indicate the presence of wetlands because such plants have deep root systems that enable them also to grow in upland areas with a sufficient water table.

To gather information about other possible floodplains and wetlands in the project areas, several resources were examined:

- *U.S. Fish and Wildlife Service National Wetlands Inventory.* The inventory contained no information on wetlands in or near the sites.
- *U.S. Department of Agriculture, Natural Resources Conservation Service* (NRCS). Local offices of the NRCS have not conducted any wetland delineations near any of the sites. Current soil surveys did not indicate hydric soils at any of the locations being considered.
- *U.S. Geological Survey Topographic Maps.* Topographic maps of the areas involved were examined for evidence of springs and streams in the project area. These areas were further investigated by contacting local, state, and federal agency personnel and by making site visits when possible.

F2.0 Project Description

This section briefly describes the proposed project. For more detailed descriptions, see Chapter 2.0 of the *Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Draft Environmental Impact Statement* (DOE/EIS-0355D). Both on-site and off-site disposal alternatives are under consideration; in either case, ground water remedial action would take place at the Moab site for an estimated 75 to 80 years after remediation. The on-site disposal alternative would be completed in 7 to 8 years and would involve stabilizing the existing tailings, along with contaminated materials to be identified and removed from the remainder of the Moab site and any affected vicinity properties, at the Moab site. Alternatively, the tailings and all other contaminated materials could be transported and disposed of in an off-site cell. This alternative would be completed in an estimated 5 years and would include transportation methods of truck, rail, or slurry pipeline.

This section is divided into two parts. Section F2.1 describes the proposed on-site disposal alternative at the Moab site, including ground water remediation and vicinity properties. Section F2.2 discusses off-site disposal alternatives at Klondike Flats (approximately 18 miles northwest of Moab), Crescent Junction (approximately 30 miles northwest of Moab), and White Mesa Mill (approximately 80 miles south of Moab).

F2.1. Proposed Actions at the Moab Site—On-Site Disposal Alternative

F2.1.1 Remediation of Contaminated Materials

In areas with surface contamination, large earth-moving equipment would be used to excavate soil from the top layer. Existing contaminated vegetation, consisting mostly of tamarisk, would be cleared and chipped for disposal in the cell. Disturbed areas would be revegetated with native species.

Remediation of vicinity properties in the Moab area would include excavating and transporting contaminated materials from affected properties. Disturbed areas would be reclaimed.

F2.1.2 On-Site Disposal Cell

Construction of an on-site disposal cell would involve stabilizing and capping the tailings pile in place. The activities would take place outside wetlands and floodplains with the following exceptions. Interim storage of uncontaminated borrow materials for the disposal cell would occur within the 100-year floodplain. Storm water management measures, including the construction of berms, drainage ditches and basins, hay bales, sediment traps, and silt fence fabric, would also occur on the floodplain. Under the on-site disposal alternative, Moab Wash would be rechanneled. The wash would be moved north of its current location, away from the base of the tailings pile. It would be designed to carry runoff for an approximate 200-year flood and would discharge into the Colorado River at its historical (pre-millsite) location. To further protect the disposal cell, a buried riprap wall would be installed in the Colorado River floodplain. The wall would protect the stabilized tailings pile from river migration and erosion to meet the design life of the disposal cell. DOE would also perform additional flood analyses at Courthouse Wash to determine the best alignment and design requirements.

Long-term maintenance and monitoring of the disposal cell would include inspecting the floodplain and river boundary and the buried riprap wall.

F2.1.3 Ground Water Remediation

Ground water remediation could involve installation of up to 50 wells or 1,500 to 2,000 linear feet (ft) of shallow trenches in the floodplain to intercept contaminated ground water before discharge to the river. The wells or trenches would be installed in areas already disturbed by surface remediation.

There are several options for treating collected ground water. Evaporation ponds could be installed in the floodplain and isolated by berms from the 100-year flood level to evaporate the water, resulting in a concentrated brine or sludge for disposal. Injection of the water into a hydrologically separate deep saline aquifer is another possibility. Currently, tamarisk on the site is removing a significant quantity of ground water and plays a phytoremediation role. Similar deep-rooted plants could be placed on the floodplain after remediation. Alternatively, salt-tolerant native or agricultural plants could be irrigated for uptake.

F2.1.4 Borrow Areas

Seven proposed borrow areas for soil, sand, gravel, and rock are being investigated for the on-site disposal alternative. LeGrand Johnson and Papoose Quarry are existing commercial quarries. Floy Wash, Crescent Junction, Tenmile, Courthouse Syncline, and Blue Hills Road borrow areas would be new excavations, requiring new transportation routes. Disturbed areas would be reclaimed with native vegetation.

F2.2. Off-Site Disposal Alternative

Construction, vicinity properties remediation, and ground water remediation activities at the Moab site would be similar to those described in Section F2.1, with several changes:

- Moab Wash would not be rechanneled. It could be reconfigured with meanders to slow the water velocity and erosion potential of high flows. It would be lined with riprap and designed to carry a 200-year flood.
- Storm water management structures would be removed when remediation was complete.
- There would not be a buried riprap wall in the floodplain.
- Storage of borrow materials at the Moab site would not be necessary.
- Maintenance and monitoring of an alternative disposal cell would occur off-site.

All of the off-site alternatives would involve constructing a new disposal cell; preparing tailings for transport; transporting the tailings to the cell by rail, truck, or slurry pipeline; excavating borrow areas; and constructing borrow material transportation routes. All transportation options would require activity within the floodplain at the Moab site. Rail and truck options would require processing and/or drying areas within the floodplain. The slurry pipeline option would require the construction of temporary facilities to mix the slurry. All processing areas would be protected by berms against a 100-year flood event.

The White Mesa Mill alternative does not include rail transport because no rail lines go to that disposal location. This alternative also proposes the use of two additional borrow areas, Blanding and White Mesa Mill. If the White Mesa Mill option were chosen and a slurry pipeline were used, the pipeline would cross the 100-year floodplain at the Moab site. It would also cross the Colorado River, Matheson Wetlands Preserve, and numerous streams and dry washes. Under the Klondike Flats and Crescent Junction disposal alternatives, a slurry pipeline would not cross these areas. Floodplains and wetlands associated with individual borrow areas or transportation routes are described in Sections F3.0 and F4.0.

F3.0 Floodplain and Wetlands Descriptions

F3.1. Moab Site

The 100-year and 500-year floodplains for Moab Wash and the Colorado River occupy 150 acres, or the easternmost third of the Moab site (see Figure F–1). Floodplain alluvium consists of shallow sandy sediments and deeper gravelly sediments. Thickness of the shallow

alluvium ranges from 8 to 30 ft. Coarse sand and gravel with occasional silt and clay pockets make up the deeper alluvium layer. The water table is within 5 feet of the surface in the floodplain through most of the year (SMI 2001).

Base flow for the river ranges from 3,000 to 4,000 cubic feet per second (cfs); the average peak between April and July (based on flows from 1914 to 1999) is 22,000 cfs. The river stage increases by approximately 7 feet during average peak flow. Currently, the river accesses the floodplain at the Moab site when it reaches 48,900 cfs. Because tamarisk has stabilized the soils and flow has been altered by upstream water diversions, the floodplain is not accessed by a 5-year or less flood event. Therefore, it is not considered an active floodplain. During a 100-year flood, flow would reach 99,500 cfs (NRC 1997). The 500-year flood discharge for the river was estimated by the U.S. Geological Survey to be 123,500 cfs (Jacoby and Gonzales 1993). These discharges are based on flows at the Cisco gaging station, which is 35 miles upstream from Moab; the flows at the Cisco station are considered representative of the flows at the Moab site because there are no significant tributaries between the gage and the site. One of the highest recorded discharges of the river was in 1984, when the flow reached 70,300 cfs. This flow flooded part of Moab and rose about 4 ft above the toe of the tailings pile (NRC 1999). The U.S. Nuclear Regulatory Commission (NRC) calculated a 300,000-cfs discharge applicable to the Moab site during the probable maximum flood (PMF). This flow would correspond to a water depth of 29 feet above the toe of the tailings pile (Mussetter and Harvey 1994).

Moab Wash runs through the middle of the site to the Colorado River. The wash drains approximately 5 square miles and is located north and east of the tailings pile (NRC 1997). Its original configuration was altered during milling operations. It is an ephemeral stream with infrequent, brief runoff periods during rainstorms and snowmelt. The 100-year flow for Moab Wash is 9,480 cfs, based on precipitation of 2.6 inches in 24 hours (USACE 1995). The PMF flow for Moab Wash was estimated at approximately 16,000 cfs (NRC 1997). Practices implemented as a result of the *Moab Project Site Storm Water Pollution Prevention Plan* (DOE 2002) limit the amount of runoff entering the wash from the millsite.

Vegetation on the floodplain is dominated by tamarisk, which is dense in the areas adjacent to the river and sparse or patchy in other areas. There are approximately 50 acres of mature tamarisk, with patches of cottonwood and Russian olive at the Moab site. Milling operations and remedial activities have disturbed much of the floodplain in recent years and have limited its use by wildlife. The tamarisk areas on the floodplain are not jurisdictional wetlands.

Several areas below the tamarisk next to the Colorado River were investigated in February 2002 and were found to contain wetland plants and soils. These areas include sandbars downstream of Moab Wash that are critical habitat for sensitive fish species. Seedling tamarisk is the predominant plant in these wetland areas; other wetland plants include saltgrass *(Distichlis spicata)*, cattail *(Typha* sp.), rush (*Juncus* sp.), bulrush *(Scirpus* sp.*)*, spikerush (*Eleocharis* sp.), redroot flat sedge (*Cyperus erythrorhizos*), and sandbar willow (*Salix exigua*). Although their precise boundaries have not been formally delineated, these areas are USACE jurisdictional wetlands. Although wetland vegetation exists on the margins of a holding pond for irrigation water, this area is not a jurisdictional wetland because the water source is artificial.

The Matheson Wetlands Preserve is an 875-acre conservation area that occupies the floodplain across the river from the site. The preserve has a variety of wetland types that include emergent wetlands, shrub wetlands, cottonwood stands, and ponds. It is the only sizable wetland remaining on the Colorado River in Utah and is important in serving multiple functions, including water quality preservation, flood protection, erosion control, and biological productivity and diversity. A levee along the northwest edge of the wetland failed in 1984 and now allows water into the wetland when the flow reaches 40,000 cfs (Mussetter and Harvey 1994). This levee possibly affects flooding potential at the Moab site; if the entire levee were removed, floodwaters would inundate the Matheson Wetlands Preserve in a shorter time. Currently, floodwaters inundate the Matheson Wetlands Preserve at a lower stage than at the DOE site (40,000 cfs vs. 48,900 cfs).

In the desert environment, it is common for very small wetlands to occur at numerous seeps, springs, and areas of rainfall collection. The presence of riparian vegetation such as tamarisk, willow, or cottonwood may indicate the presence of such small wetlands, but because riparian trees and shrubs have very deep roots, they usually occur alone, without associated wetlands. Because it is difficult to locate all the small emergent wetlands throughout large geographical areas, there is incomplete knowledge regarding their location and size. Although they are very small, these wetlands have ecological importance. It is known that no such wetlands occur on the Moab site. All other areas to be remediated or disturbed by construction, including vicinity properties, would be examined thoroughly for small wetlands prior to construction. If such wetlands were found, they would be protected (Section F4.1.2).

F3.2. Klondike Flats Site

No perennial streams or rivers exist at the Klondike Flats site (Figure F–2). The site contains numerous ephemeral washes in which surface flooding occurs, but these areas are not floodplains. Northern portions of the Klondike Flats site drain into the Green River (approximately 23 river miles) via tributaries to Tenmile Wash. Southern portions of the site drain into the Colorado River (approximately 15 river miles) via Courthouse Wash. Several areas of wetland riparian vegetation are present in or near the southern portion of the Klondike Flats site. Two occur near small ephemeral reservoirs north of the site and are vegetated primarily by tamarisk. In all, 66 acres of land containing some riparian vegetation exist in five locations near the site (BLM 2003).

No wetland areas are known to exist at the Klondike Flats site. However, if the Klondike Flats disposal alternative were chosen, areas vegetated with riparian species would be investigated for any small, isolated wetlands.

F3.3. Crescent Junction Site

Although no floodplains exist at the Crescent Junction site, due to its location at the base of the Book Cliffs and adjacent to Crescent Wash, it is subject to extreme surface water flooding potential (BLM 2003).

There are no known wetlands on or near the Crescent Junction site; therefore, a map of the site is not included in this document. Three small water collection structures exist on the site, but they have no associated riparian vegetation (BLM 2003). Two other collection structures near the site are vegetated by tamarisk and grasses. Although it is unlikely that wetland areas occur in these areas or along the proposed transportation and pipeline routes, they would be thoroughly investigated for small, isolated wetlands.

F3.4. White Mesa Mill Site

The White Mesa Mill site is situated near four intermittent streams, all of which contain cottonwood and tamarisk, valuable riparian resources. Corral Creek, to the east, has a 5-square-mile drainage and is a tributary to Recapture Creek. Westwater Creek to the west drains 27 square miles into Cottonwood Creek. Both Cottonwood and Recapture Creeks flow into the San Juan River. PMF estimates for Cottonwood Creek, Westwater Creek, and Corral Creek are 66,000 cfs, 18,000 cfs, and 14,000 cfs, respectively (Dames and Moore 1978). The existing watercourses for these creeks have capacities that exceed their PMF values. The White Mesa Mill site is located beyond the floodplains of these creeks.

Water resources in and near the White Mesa Mill site have not been assessed in detail; such an assessment would be required if this alternative were chosen. Topographic maps of the area potentially indicate 10 riparian or wetland areas within the boundaries of the site, 2 of which occur within the borrow area. The following resources are known to exist:

- Perched ground water discharges in springs and seeps along Westwater Creek Canyon, Cottonwood Creek, and Corral Canyon where the Burro Canyon Formation crops out.
- Ruin Spring, approximately 2 miles southwest of the millsite, flows on a consistent basis, and riparian species (including cottonwood and tamarisk) grow near the discharge. The other springs and seeps have not been known to flow year-round, although plants such as cattails have been observed around a seep in Cottonwood Canyon.
- Two small, ephemeral catch basins are located near the millsite; these ponds are filled by the mill to provide water and habitat for local wildlife, and it is assumed that they have associated wetland vegetation.

Figure F−3 shows potential wetland and riparian areas on and near the White Mesa Mill site.

The White Mesa Mill pipeline would cross 11 perennial streams and at least 21 intermittent drainages. The perennial streams contain riparian and wetland vegetation such as cottonwoods, willows, tamarisk, and bulrush. Some of the intermittent washes also have wetland vegetation and could be considered valuable riparian resources. The pipeline would also cross the Colorado River and the Matheson Wetlands Preserve.

F3.5. Borrow Areas

F3.5.1 Areas with No Floodplains or Wetlands

Of the 10 proposed borrow areas, 5 have no associated floodplain or wetland areas: the commercial quarries (LeGrand Johnson and Papoose Quarry), and the Klondike Flats, Crescent Junction, and Blanding borrow areas. Some transportation routes to these areas may cross dry washes, and though no wetlands are known to exist, the areas would be investigated for small, isolated wetlands.

F3.5.2 Blue Hills Road Borrow Area

Near the southwest corner of this site, a small spring provides water to maintain cottonwoods and bulrush. As this small potential wetland area approaches the edge of the borrow area, the vegetation changes to more drought-tolerant species such as skunkbush and serviceberry, reflecting the drier, nonriparian conditions. Figure F–2 shows the location of the spring relative to the proposed borrow area.

F3.5.3 Courthouse Syncline Borrow Area

Courthouse Syncline borrow area contains portions of Thompson Wash and Crescent Wash. Both washes are intermittent streams that contain potential wetlands. It is unlikely that any wetlands occur in the area, but because they contain some tamarisk populations, these areas would be investigated for small, isolated wetlands.

F3.5.4 Floy Wash Borrow Area

The Floy Wash borrow area is bordered by Floy Wash, an intermittent stream that lies to the west of the proposed borrow area (Figure F–4). Though not located within a floodplain, this wash is prone to extreme surface flooding (BLM 2003).

The whole of Floy Wash has 80 acres of native and exotic riparian and wetland resources, including lentic wetlands, tamarisk, and willow areas (BLM 2003). Farther downstream, the wash supports additional riparian areas containing cottonwood, willow, bulrush, and tamarisk. The wash has been rated by BLM as a “functioning at risk” system, meaning that it fulfills some, but not all, of the definitions of a properly functioning riparian system (BLM 2002). Known lentic wetlands lie approximately 0.5 mile north and 1 mile south of the borrow area. Portions of Floy Wash and a small water impoundment structure in the southeast corner of the area contain tamarisk, but they are not likely to contain jurisdictional wetlands. However, they would be investigated for small, isolated wetlands.

F3.5.5 Tenmile Borrow Area

The Tenmile borrow area is within one-quarter mile of Tenmile Wash, an ephemeral wash system dominated by tamarisk. BLM has rated it as a non-functioning riparian system, meaning that improvements must be made to restore the riparian values of this system (BLM 2002). The channel is deeply incised with bank collapse and gullying. There are a total of 99 acres of wetland areas in the whole of Tenmile Wash, and its drainage also supports a network of 125 acres of developed cattail and bulrush wetlands downstream (BLM 2003). Such lentic wetlands are rare in desert environments. Figure F−5 shows the location of Tenmile Wash relative to the borrow area.

F3.5.6 White Mesa Borrow Area

The borrow areas associated with the White Mesa Mill site contain some drainages with riparian vegetation that may also contain associated wetlands (see Figure F−3). These would need a more detailed water resource inventory should this alternative be chosen.

F4.0 Floodplain and Wetlands Impacts

F4.1. Moab Site—On-Site Disposal Alternative

F4.1.1 Floodplains

Removal of contaminated materials during surface remediation at the Moab site may permanently lower the base elevation of the floodplain. The depth of soil removed may be greater than the 6 inches of topsoil proposed for reclamation. This would result in flooding of the site at a slightly lower river stage, increasing the capacity of the floodplain, and possibly minimally affecting flooding patterns at the Matheson Wetlands Preserve. Although the capacity of the floodplain would increase, the boundary would not change significantly.

Rechanneling Moab Wash would permanently affect features within the floodplain by changing drainage patterns and the river discharge point. Fortification of the wash with riprap to withstand 200-year flows would make it less likely to overflow or to carry sediment into the river. More water could be discharged to the river, but this would be somewhat mitigated by storm water management measures that would decrease runoff to Moab Wash. The wash would enter the river farther upstream and could change flow patterns; this could alter fish habitat and possibly affect wetlands over time. Critical fish habitat is discussed in the Biological Assessment (Appendix A1).

The buried riprap wall would permanently alter the floodplain by stabilizing soils in the floodplain.

Vegetation loss would result from remedial action. Currently, the tamarisk located on the floodplain plays a significant role in reducing the amount of ground water reaching the river. Removal of the tamarisk could cause more contaminated ground water to migrate to the river unless additional interim actions were implemented. Another effect of vegetation removal is a greater potential for erosion from the floodplain. This short-term effect would be mitigated by storm water management measures, described in Section F2.1.2. Because the area would be revegetated, these effects would be temporary.

Wastes generated from construction activities would be evaluated and managed according to the site waste management plan to ensure protection of public health, safety, and the environment. The use of petroleum, oil, lubricants, and other hazardous materials during construction would be controlled, spills would be promptly cleaned up, and any affected surface would be remediated. Fuel storage and refueling facilities would not be located in the floodplain.

With some ground water remediation strategies, trenches and/or evaporation ponds would be constructed in the floodplain. These structures would be bermed for a 100-year flood event. No long-term negative effects would be expected as a result of ground water remediation. Disturbance would take place in areas already disturbed by surface remediation. Removal of contaminated surface soils and ground water would improve water quality in the Colorado River adjacent to and downstream of the site.

Impacts to floodplains caused by vicinity property remediation would likely be short-term. Vicinity property remediation would be on a much smaller scale than at the Moab site.

The proposed floodplain actions would result in no significant effects to lives or property.

F4.1.2 Wetlands

At the Moab site and on vicinity properties, impacts to wetlands would be avoided whenever possible. Unavoidable excavation of contaminated soils along waterways would result in a temporary increase in sedimentation downstream. A temporary loss of wetland soils and vegetation would occur in all excavated wetlands, but these would be replaced during reclamation. Reclamation of wetlands would be in accordance with USACE Section 404 permitting requirements. The USACE regulates activities in wetlands and issues permits that require mitigation for any temporary or permanent disturbances. Its permitting requirements, both general and site-specific, would ensure that the size, quality, and function of wetlands are preserved.

F4.2. Off-Site Disposal–Klondike Flats

Impacts from remediation at the Moab site would be similar under the Klondike Flats off-site disposal alternative, with several changes. Because there would be no rechanneling of Moab Wash to a new location, effects associated with rechanneling would not apply. There would not be a buried riprap wall in the floodplain, and storage of materials for disposal cell construction would not be necessary. Also, effects from storm water management measures would be temporary because storm water management structures would be removed after remediation.

At the Moab site, tailings processing areas would be constructed in several locations on the floodplain during remediation. Depending on the mode of transportation, these areas would be used to dry tailings for transport or to mix tailings with water to form slurry. The tailings processing areas would be bermed to protect against a 100-year event and removed after remediation.

If the Klondike Flats site alternative were chosen, a formal survey would be undertaken to identify any small, isolated wetlands that may exist in the area. All impacts to such wetlands, including disturbance or sedimentation due to runoff, would be avoided.

No impacts to floodplains and wetlands would be expected from monitoring and maintenance of this facility.

F4.3. Off-Site Disposal–Crescent Junction

Under the Crescent Junction off-site disposal alternative, impacts at the Moab site would be the same as those described in Section F4.2. The Crescent Junction site is more susceptible to surface flooding than the Klondike Flats site, and construction of a disposal cell could add more sediment to the Crescent Wash drainage. However, because of the distance between Crescent Wash and the Colorado River, impacts to distant floodplains and wetlands would be unlikely.

There are no floodplains at the Crescent Junction site. If this alternative were chosen, areas containing riparian vegetation would be surveyed to identify any small isolated wetlands that may exist in the area. All impacts to such wetlands, including disturbance or sedimentation due to runoff, would be avoided.

No impacts to floodplains and wetlands would be expected from monitoring and maintenance of this facility.

F4.4. Off-Site Disposal–White Mesa Mill

Under the White Mesa Mill off-site disposal alternative, impacts at the Moab site would be the same as those described in Section F4.2. If a slurry pipeline were installed, it would be within the 100-year floodplain.

Construction on the White Mesa Mill site has a potential for sediment loading or surface water runoff into adjacent streams and wetlands. This effect would be temporary and would be mitigated with a storm water management system and revegetation.

The slurry pipeline transportation option would involve crossing the Colorado River and the Matheson Wetlands Preserve, along with 11 perennial streams and at least 21 intermittent drainages. There have been previous utility crossings in the Matheson Wetlands Preserve, and the pipeline for this project would follow these as closely as possible. Construction of the pipeline would involve an estimated 3,500 ft of directional drilling under the streams and wetlands. A small potential exists for leakage of drilling fluids into the ground water beneath the wetlands. Up to 1 mile of open-cut buried crossings would introduce sediment into the stream during the period of construction. To reduce sediment impacts, crossings would be constructed during low-flow periods, and sediment control measures would be implemented. Unavoidable disturbance to wetlands along waterways would be mitigated in accordance with USACE Section 404 guidelines (see Section F4.1.2).

Some of the springs or seeps adjacent to the White Mesa Mill site may be hydrologically connected to the site, and there could be a potential for ground water contamination due to spills, pipeline rupture, or other accidents. Mitigation to minimize the possibility of exposure would be implemented.

No impacts to floodplains and wetlands would be expected from monitoring and maintenance of this facility.

F4.5. Borrow Area Impacts

Removal of materials from borrow areas would involve the use of large earth-moving equipment. Borrow areas and their associated transportation routes would be chosen to avoid any impacts to wetlands, including sedimentation.

F5.0 Summary

Disturbance to floodplains at the Moab site and on any potential vicinity properties would be unavoidable where soils within the floodplains are contaminated. The ground water treatment system described in Section F2.1.3 must be located in the floodplain at the Moab site. Because of space constraints, materials must be stored within the floodplain (Section F2.1.2), and tailings processing areas (Section F2.2), excluded by berms, must be located within the floodplain boundary.

Disturbance to wetlands would be unavoidable where wetland soils are contaminated. In all other areas except in construction of a slurry pipeline to White Mesa Mill, wetlands could be avoided. Disturbance to wetlands would be unavoidable if a slurry pipeline were constructed because there is no alternative route.

The only alternative to remediation is a No Action alternative. Under this alternative, DOE would not remediate contaminated materials or ground water. No short-term or long-term site controls to protect human health or the environment would be in place. This alternative is analyzed to provide a basis for comparison to the action alternatives and is required by NEPA regulations.

F6.0 References

10 CFR 1022. U.S. Department of Energy, "Compliance with Floodplain and Wetland Environmental Review Requirements."

42 FR 26951, *Floodplain Management*, Executive Order 11988, May 24, 1977.

42 FR 26961, *Protection of Wetlands*, Executive Order 11990, May 24, 1977.

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