DOE–EM/GJ2102

Office of Environmental Management – Grand Junction

MOAB UTAH
UMTRA Project

Moab UMTRA Project Annual Site Environmental Report for Calendar Year 2012

September 2013

U.S. Department of Energy

Office of Environmental Management

Prepared by the Remedial Action Contractor Under DOE Contract No. DE-DT0002936
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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Revision 0

Review and Approval

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Moab Federal Project Director

Revision History

Revision No.	Date	Reason/Basis for Revision
0	September 2013	Initial issue.

Contents

Figures

Tables

Acronyms and Abbreviations

ACM	asbestos-containing material
ALARA	as low as reasonably achievable
ASER	Annual Site Environmental Report
BLM	Bureau of Land Management
BMPA	Best Management Practice Area
BO	Biological Opinion
CA	Contamination Area
CFR	Code of Federal Regulations
DCG	derived concentration guide
DOE	U.S. Department of Energy
DOE O	DOE Order
DOT	Department of Transportation
EIS	Environmental Impact Statement
EMS	Environmental Management System
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FWS	U.S. Fish and Wildlife Service
IA	interim action
lb	pounds
MEI	maximally exposed individual
mrem/yr	millirems per year
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RRM	residual radioactive material
SR-279	State Route 279
TSCA	Toxic Substances Control Act
UAC	Utah Administrative Code
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act
UPDES	Utah Pollutant Discharge Elimination System
US-191	U.S. Highway 191
USACE	U.S. Army Corps of Engineers
USC	United States Code

Executive Summary

This Annual Site Environmental Report (ASER) presents information pertaining to environmental activities conducted for the U.S. Department of Energy (DOE) under the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project during 2012. This report includes Moab UMTRA Project activities conducted at either the Moab site located near Moab, Utah, or the Crescent Junction, Utah, disposal site, located approximately 30 miles north of the Moab site.

The purpose of the ASER is to summarize major site programs, environmental performance measures, and the status of the Environmental Management System (EMS). The ASER is a key component of DOE efforts to keep the public informed of environmental conditions at DOE sites. Consequently, this report contains monitoring data and compliance information for 2012. Although several DOE orders cited in this ASER have since been replaced or modified, this document was prepared pursuant to the orders that were contractually applicable during 2012. This report was prepared in accordance with the requirements of DOE Order (O) 231.1B, "Environment, Safety, and Health Reporting," DOE O 458.1, Change 2, "Radiation Protection of the Public and the Environment;" DOE O 5400.5, Chapter III, "Derived Concentration Guides for Air and Water;" and supplemental guidance from DOE Headquarters.

Major site activities in 2012 included the excavation and shipment of residual radioactive material (RRM) from the Moab site, operation of the interim action (IA) ground water remediation system at the Moab site, and disposal of RRM at the Crescent Junction site. Other activities included revegetation and maintenance of site vegetation, site management, security, maintenance, waste management, pollution prevention, and environmental compliance monitoring.

Major Site Activities for 2012

- Shipping and disposal of more than 896,000 tons of RRM was performed; the total to date through December 2012 is more than 5.7 million tons shipped.
- Interim cover material was placed on about 200,000 square feet or 4.6 acres of tailings in the disposal cell. Phase 1 of the disposal cell is at full capacity, with approximately 5 million tons of RRM placed.
- Two vicinity properties were remediated.
- Approximately 16.6 million gallons of contaminated ground water were extracted, and almost 54,600 pounds (lb) of ammonia and 420 lb of uranium were eliminated through evaporation. Approximately 8.6 million gallons of freshwater were injected in wells along the Colorado River to reduce the contaminant discharge to the river.
- Operations were conducted without an environmental notice of violation or an unplanned environmental release.

Environmental Radiological Protection Program

The Moab Project monitors emissions and effluents to meet environmental compliance requirements and determines actions to protect the environment. The environmental air-monitoring network consists of on-site, off-site, and background sampling locations. DOE's environmental air-monitoring strategy targets concentrations of radon-222, exposure levels to direct gamma radiation, and airborne radioparticulates. More than 300 radon and direct gamma samples and more than 700 radioparticulate samples were collected and analyzed in 2012.

There were no radiological unplanned releases, and doses to the public and maximally exposed individual (MEI) were well below DOE guidelines with MEI, general population, and background doses all at less than 10 millirems per year (mrem/yr).

Environmental Management System

DOE established a series of orders directing each DOE site to implement sound stewardship practices that are protective of natural and cultural resources. These orders require the implementation of an EMS, a Sustainability Plan, radiation protection of the public, and radioactive waste management. The Moab Project's EMS is a structured process for reducing the environmental consequences of Project activities to maximize beneficial use of finite resources and to minimize wastes. DOE's EMS integrates key elements into the core functions of the contractors' Integrated Safety Management System to ensure continuous EMS improvement.

Compliance with State and Federal Regulations

The Moab Project must operate in compliance with various federal environmental statutes, some of which are enforced at the state level through permits. Table ES-1 summarizes principle regulatory requirements and the status of implementation of each one for the Moab Project.

Table ES-1. Principle Regulatory Requirements and Status for the Moab Project

Federal and State Requirement*	What it Covers	Implementation Status
Clean Air Act	Requirements for facility air quality and air emissions.	The Project is in full compliance with air permits and reporting requirements. The Clean Air Act is enforced at the state level through Fugitive Dust Permits, which have been obtained for Moab and Crescent Junction.
Clean Water Act	Requirements for water quality and discharges.	The Clean Water Act is enforced by the state through Storm Water Permits and by USACE through Section 404 Permits. The Project sites are designed as non-discharging facilities and are in compliance with state storm water and dredge-and-fill (Section 404) permits.
UMTRCA	Title I of UMTRCA requires DOE to establish a remedial action program and authorizes DOE to stabilize, dispose of, and control RRM, including contaminated ground water, in accordance with cleanup standards, which were promulgated in 40 CFR 192.	DOE has excavated and disposed of approximately 36 percent of the total RRM in compliance with 40 CFR 192. Also, approximately 188.6 million gallons of contaminated ground water have been extracted and eliminated through evaporation.
U.S. DOT Special Permit	Authorizes the transportation in commerce of uranium mill tailings and debris with low levels of radiation.	The Project is in compliance with the Special Permit.
EMS	Continuous set of processes and practices undertaken to enable the Project to achieve environmental missions and goals.	The Project is in compliance with its EMS.

Table ES-1. Principle Regulatory Requirements and Status for the Moab Project (continued)

Federal and State*	What it Covers	Implementation Status
Emergency Planning and Community Right-to-Know Act	Public's right to know about chemicals released into the community.	The Project had no reportable leaks, spills, or other releases of chemicals into the environment. Chemical inventory reports were submitted to the state and the Grand County Fire Chief.
Endangered Species Act and Migratory Bird Treaty Act	Protection of rare species of plants and animals and their habitat.	The Project reviewed work activities for potential impacts on threatened or endangered species and protected migratory birds. Fish habitat was protected by interception and dilution of contaminated ground water.
NEPA	Project evaluation of environmental impacts.	A NEPA checklist was performed by the RAC, and an adequacy review was performed by DOE EMCBC NEPA Compliance Officer for a maintenance road and biking/walking trail; at the Moab site. No significant impacts were identified..
National Historic Preservation Act	Project evaluation of impacts and mitigation to historic sites.	No additional impacts or mitigation were noted in 2012. Per the memoranda of agreements, annual reports were submitted to the BLM, Utah DOT, and state of Utah.

BLM = Bureau of Land Management; CFR= Code of Federal Regulations; DOT= Department of Transportation; EMCBC = Environmental Management Consolidated Business Center; NEPA = National Environmental Policy Act; RAC = Remedial Action Contractor; UMTRCA = Uranium Mill Tailings Radiation Control Act; USACE = U.S. Army Corps of Engineers

*RRM is exempt from the Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulations; no RCRA, TSCA , or CERCLA wastes have been created from current operations.

Document Distribution

This document may be viewed in its entirety on the DOE Moab UMTRA Project website at www/gjem.energy.gov/moab. Hard copies may be obtained by contacting Mr. Donald Metzler, Moab Federal Project Director, at (970) 257-2115 or at the address below.

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Comments or questions regarding this document may also be directed to the Moab Project toll-free telephone number at (800) 637-4575. Members of the public who wish to comment on this document or who have questions are encouraged to contact DOE at the above phone number or by email at moabcomments@gjem.doe.gov.

1.0 Introduction

1.1 Project Mission

The mission of the Moab Project is to relocate mill tailings and other contaminated materials, known as RRM, from a former uranium ore-processing facility (millsite) and from off-site properties known as vicinity properties in Moab, Utah, to an engineered disposal cell constructed near Crescent Junction, Utah (see Figure 1). The materials are being transported primarily by rail. The scope also includes active remediation of ground water at the millsite (Moab site). The Project is managed by the DOE Office of Environmental Management, located in Grand Junction, Colorado.

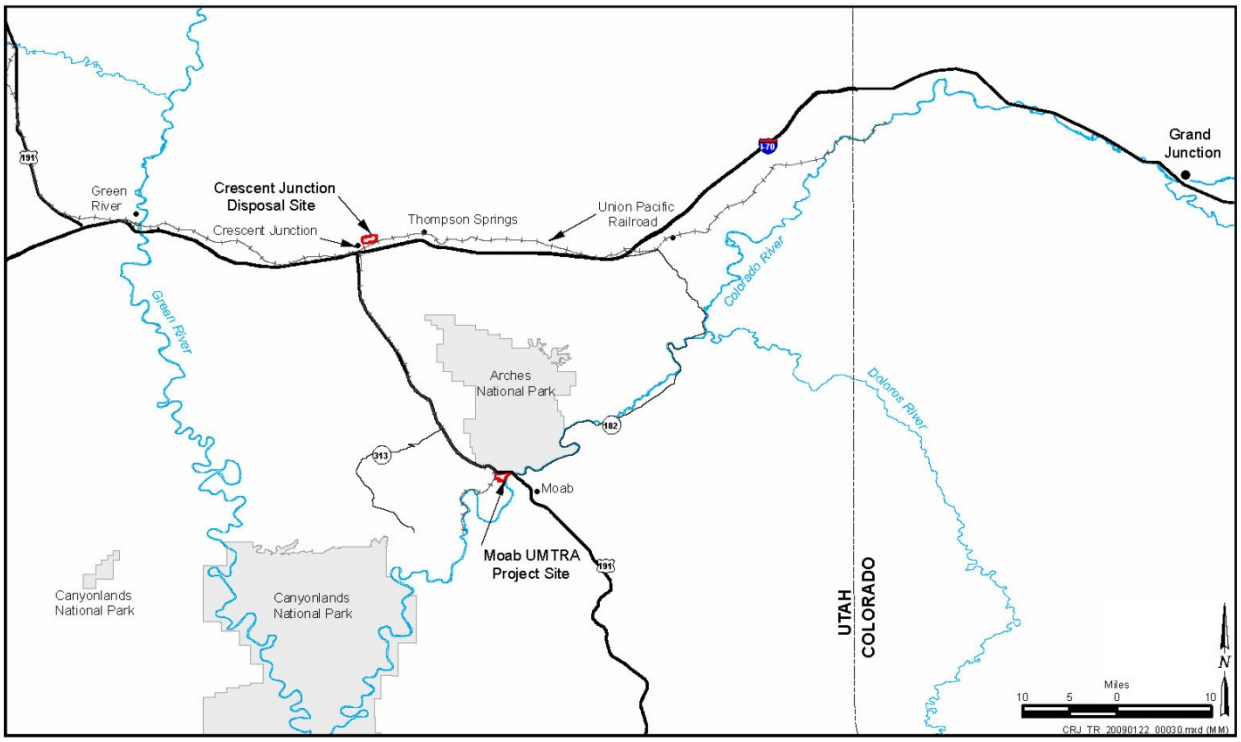

Figure 1. Location of Moab and Crescent Junction Sites

1.2 Site Locations

The Moab site is located about 3 miles northwest of Moab in Grand County, Utah, and lies on the western bank of the Colorado River at the confluence with the Moab Wash. The 480-acre site is bordered on the north and southwest by sandstone cliffs. The Colorado River forms the eastern boundary of the site. U.S. Highway 191 (US-191) parallels the northern site boundary, and State Route (SR)-279 transects the western portion of the property. The Union Pacific Railroad traverses a small section of the site west and uphill of SR-279, then enters a tunnel; the track terminates several miles southwest of the site. Arches National Park has a common property boundary with the Moab site on the northern side of US-191, and the park entrance is located less than 1 mile northwest of the site. Figure 2 shows Moab site features, including the site boundary, structures, tailings pile, roads, and rail line.

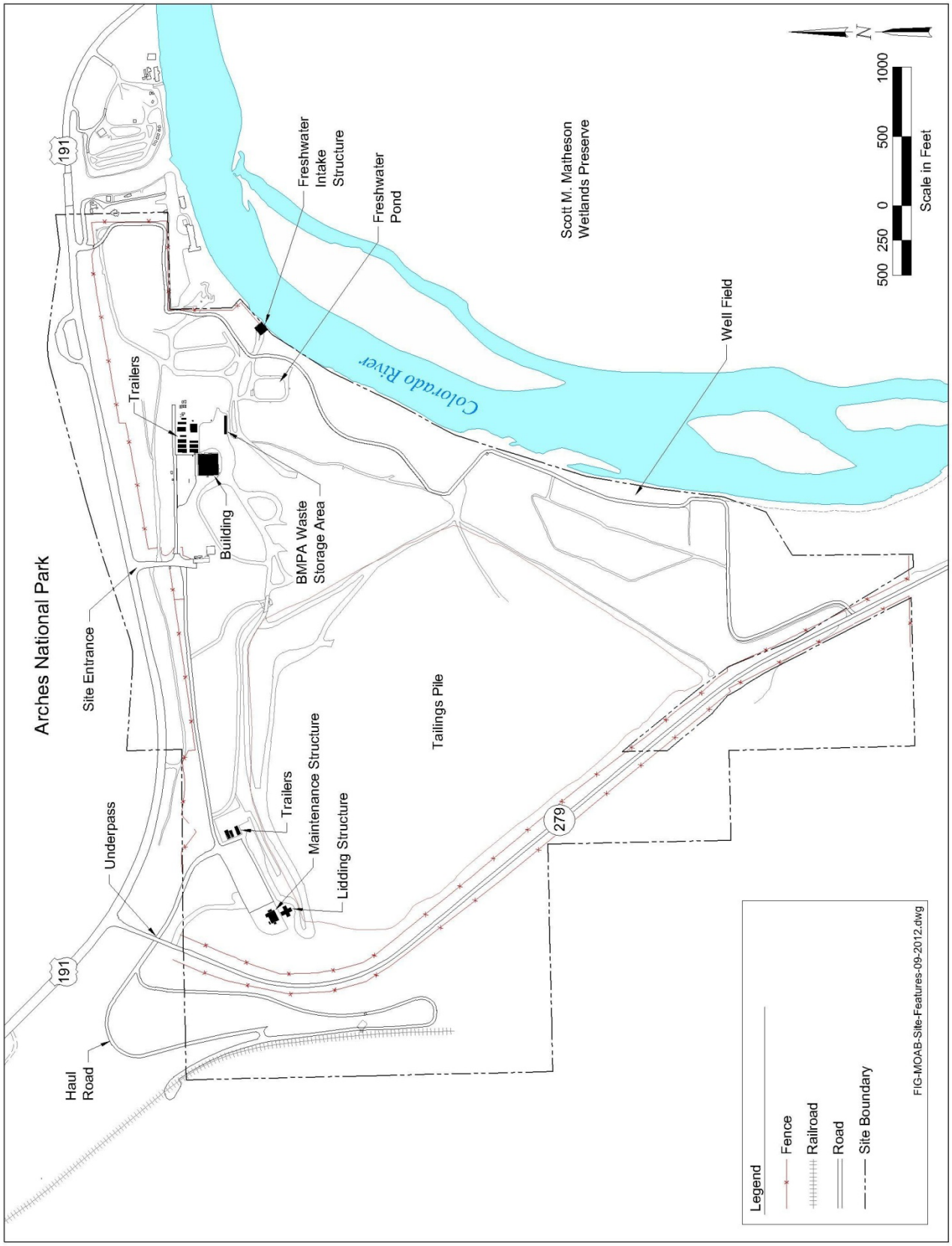

Figure 2. Moab Site Features

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The Crescent Junction site is located northeast of the junction of Interstate 70 and US-191, approximately 30 miles north of the Moab site, and is the location for disposal of the Moab site RRM. Through a series of temporary withdrawals of public domain land and a permanent land transfer by the Department of the Interior, DOE currently owns 500 acres of land and has another 936 acres in a 20-year withdrawal near Crescent Junction for the disposal cell and surrounding support area. The locations of the Moab and Crescent Junction sites are shown in Figure 1.

1.3 Area Demographics

Moab is the Grand County government seat and the principal city of southeastern Utah. The population of Moab is about 5,100. In addition to Moab, the communities of Crescent Junction and Thompson Springs, which are also in Grand County, are affected by the relocation of RRM to the Crescent Junction site for permanent disposal. The population of Grand County is about 9,300. Grand County's major economic base is tourism. Southeastern Utah has the nation's largest concentration of national and state parks, monuments, and recreation areas. Leisure and hospitality industries account for about a third of Grand County's employment, government accounts for one fifth, and trade, transportation, and utilities account for almost another fifth.

1.4 Environmental Setting

The Moab mill operated under various private owners from 1956 through 1984. The milling operations created process-related wastes and tailings, a radioactive, sand-like material, collectively known as RRM. The tailings were pumped to an unlined impoundment in the western portion of the property that accumulated over time, forming a pile more than 80 feet thick. When the processing operations ceased, an estimated 16 million tons (12 million cubic yards) of RRM was present in the pile, which occupies about 130 acres at the site. The southern toe of the pile lies 750 feet from the Colorado River.

Although the milling process recovered about 95 percent of the uranium, the tailings contain several naturally occurring radioactive elements, including uranium, thorium, radium, polonium, and radon. The tailings at the Moab site contain contaminants in concentrations that could be hazardous to the environment and public health and could exceed the U.S. Environmental Protection Agency (EPA) standards in Title 40 Code of Federal Regulations Part 192 (40 CFR 192), "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

With the enactment of the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Public Law 106-398), ownership and cleanup responsibility for the site were transferred to DOE. The legislation stipulated that the Moab site undergo remediation as a Title I site under Title 42 United States Code Section 7901 (42 USC 7901), the Uranium Mill Tailings Radiation Control Act (UMTRCA). The site is regulated by the U.S. Nuclear Regulatory Commission (NRC).

To minimize potential adverse effects to human health and the environment, former site operators, custodians, and DOE instituted environmental and administrative controls at the Moab site.

Controls have included placement of an interim cover on the tailings pile, pile dewatering, storm-water management, dust suppression, site access restrictions, and legacy chemicals management. In addition, DOE implemented an IA ground water remediation system to protect potential suitable habitat areas in the Colorado River adjacent to the site and to remove contaminant mass, mostly ammonia and uranium, from the ground water system.

DOE developed an Environmental Impact Statement (EIS) to fulfill the National Environmental Policy Act (NEPA) (42 USC 4321) requirement of considering the full range of reasonable alternatives and associated environmental effects of significant federal actions. In July 2005, DOE published the *Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement* (DOE/EIS-0355) that presents the preferred alternatives of active ground water remediation and off-site disposal of the RRM at the Crescent Junction disposal site using predominantly rail transportation. The preferred alternatives included cleanup and reclamation of the former millsite property and vicinity properties.

DOE issued the *Record of Decision for the Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah* (ROD) in September 2005. The ROD detailed the selection of the preferred alternatives and the basis for that decision. In February 2008, the ROD was amended to allow more truck transport, and in 2009 a NEPA checklist was performed to evaluate the increased shipment of tailings resulting from the American Recovery and Reinvestment Act of 2009 (Public Law 111-5) funding.

1.5 Primary Operations and Project Activities

Primary operations and Project activities include:

- Excavation and conditioning of RRM at the Moab site.
- Transport of RRM to Crescent Junction by rail.
- Excavation of the disposal cell and placement and compaction of material from the Moab site and vicinity properties in the cell.
- Placement of interim and final cell cover layers.
- Operation of an IA ground water system at the Moab site, including ground water extraction, freshwater injection, and evaporation.
- Monitoring of radioactive and non-radioactive materials in air, soil, ground water, and surface water.
- Site maintenance, including revegetation.
- Site security and access control.

2.0 Compliance Summary

2.1 Compliance Status

The Project is committed to protecting the environment while conducting its mission of removal of RRM and placement in the disposal cell. The Moab and Crescent Junction sites operated during 2012 without any notices of environmental violations.

2.1.1 Environmental Restoration and Waste Management

Project environmental restoration and waste-management statutes and regulations are discussed below.

DOE O 231.1B, "Environmental, Safety, and Health Reporting"

DOE O 231.1B requires the timely collection and reporting of information on environmental issues that could adversely affect the health and safety of the public and the environment. Specifically, the order requires the Project to publish an ASER with the following objectives.

- Characterize site environmental management performance, including effluent releases and environmental monitoring.
- Estimate radiological releases to the public.
- Confirm compliance with environmental standards and requirements.
- Highlight significant programs and efforts, including environmental performance indicators and/or programs.

The Project was in compliance with all federal and state regulatory requirements and complied with DOE O 231.1B by collecting environmental data and reporting results in quarterly reports. Monitoring results indicated Project impacts were limited to the DOE properties, and the public was not exposed to radiation above public dose limits. There were no effluent releases in 2012.

DOE Order 436.1, "Departmental Sustainability"

DOE O 436.1 requires all DOE sites to implement sound stewardship practices that are protective of the air, water, land, and other natural resources impacted by DOE operations and requires DOE sites to cost effectively meet or exceed compliance with applicable environmental, public health, and resources protection laws, regulations, and DOE requirements. The order further states each site is to implement an EMS. Section 3.0 provides details of the Moab Project EMS.

Superfund Amendments and Reauthorization Act and Executive Order 12856

The Superfund Amendments and Reauthorization Act, an amendment to the Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601); the Emergency Planning and Community Right-to-Know Act of 1986 (42 USC 11000); and Executive Order (EO) 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," established requirements for industry and the government to provide the public with information about the hazardous and toxic chemicals in their communities and to do emergency planning and notifications to protect the public in the event of a release of extremely hazardous substances.

DOE reviews the chemical inventories and activities at the Moab and Crescent Junction sites annually to determine if any relevant reporting is required. During 2012, three hazardous chemicals were stored at the Moab and Crescent Junction sites in amounts exceeding the threshold planning quantity as established in 40 CFR 370.20(b), "SARA Tier II and MSDS Report Threshholds," for diesel, used oil, and propane. Tier Two Emergency and Hazardous Chemical Inventory reports were submitted as required to the Utah Emergency Response Commission, the Moab Emergency Planning Committee, and the Moab Fire Department.

Resource Conservation and Recovery Act
The Resource Conservation and Recovery Act (RCRA) (42 USC 6901), established in 1976 and subsequently amended several times, is the nation's primary law governing the proper management of non-hazardous and hazardous solid waste from the point of generation to final disposal.

All waste generated within the Moab site's Contamination Area (CA) is considered RRM, the cleanup and management of which is regulated by UMTRCA, not RCRA. However, waste generated outside the CA is considered non-RRM and, therefore, can be regulated by RCRA. No RCRA wastes were generated in 2012.

NEPA
Remedial actions performed pursuant to UMTRCA are considered major federal actions that are subject to the requirements of NEPA. The Council on Environmental Quality regulations to implement NEPA are codified in 40 CFR 1500, "Purpose, Policy, and Mandate." These regulations require each federal agency to develop its own implementing procedures (i.e., 40 CFR 1507.3, "Council on Environmental Quality, Agency Procedures"). DOE-related NEPA regulations are established in 10 CFR 1021, "National Environmental Policy Act Implementing Procedures."

In December 1996, DOE issued the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (DOE/EIS-0198) that analyzed the potential impacts of implementing alternatives for ground water compliance at the designated processing sites. The applicable standards are determined on a site-specific basis. The ROD for ground water published in 1997 implemented a framework to select the appropriate compliance strategies for ground water remediation at Title I sites. The framework satisfies the requirements of the Floyd D. Spence Act in the selection of a ground water compliance strategy for the Moab site.

In 2005, DOE issued the final ROD for the Moab site, as described in Section 1.4.

In 2012, site operations were conducted in accordance with DOE and Council on Environmental Quality NEPA regulations.

Toxic Substances Control Act
The Toxic Substances Control Act (TSCA) (15 USC 2601) was enacted in 1976 to regulate the manufacturing and distribution of certain chemical substances. TSCA provides EPA with authority to require testing of any chemical substances entering the environment and to regulate their production, sale, and management as a waste, where necessary. TSCA specifically addresses the use and management of asbestos and polychlorinated biphenyls (PCBs).

Historical records indicate various types of asbestos-containing material (ACM) including pipes, insulation, siding, roofing, and floor tiles from the former millsite structures were disposed of in the Moab tailings pile. PCB-contaminated materials, such as discarded electrical transformers, may also have been disposed of in the tailings pile. ACM is suspected to be present in the remaining on-site millsite building and utilities, and PCB wastes may be present in fluorescent light ballasts in this building. Any ACM, mercury, or PCBs that remain within the site's CA are considered RRM and are, therefore, subject to UMTRCA regulation, not TSCA regulation. During 2012, no ACM, mercury, or PCBs required management at the Moab site. No ACM, mercury, or PCBs exist at the Crescent Junction site; therefore, no management of these materials is necessary.

Federal Insecticide, Fungicide, and Rodenticide Act
The Federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136) governs the use, storage, registration, and disposal of pesticides. This act categorizes pesticides as either "restricted use" or "general use."

The EPA may classify a pesticide as restricted use if it is determined that substantial adverse effects to the applicator or environment may occur without additional regulatory restrictions, or unreasonable harm to humans or the environment may occur, even if the pesticide is used as directed by the label instructions. Restricted-use pesticides must be used or applied only by a certified private or commercial applicator or under the direct supervision of a certified applicator. A certified applicator was utilized to apply general-use herbicides and insecticides at the Moab and Crescent Junction sites in 2012 to control noxious weeds.

2.1.2 Radiation Protection

DOE O 458.1 is the key DOE order regarding radiation protection for the Project. The purpose of DOE O 458.1 is to establish standards and requirements for DOE operations with respect to protection of members of the public and the environment against undue risk from radiation. The primary federal law governing site cleanup and disposal for the Moab Project is UMTRCA.

UMTRCA
In 1978, Congress passed UMTRCA in response to public concern regarding potential health hazards of long-term exposure to radiation from RRM. Title I of UMTRCA requires DOE to establish a remedial action program and authorizes DOE to stabilize, dispose of, and control RRM at 24 uranium ore-processing sites and associated vicinity properties. Vicinity properties are locations where RRM was used as construction material or fill before the hazards associated with this material were known. UMTRCA also required the promulgation of cleanup standards (now codified at 40 CFR 192 by EPA) and assigned the NRC to oversee the cleanup and issue licenses for the completed disposal cells. Remediation of the Moab site and disposal at the Crescent Junction site are conducted in compliance with these standards.

RRM, specifically defined at 40 CFR 192.01(a), is waste that DOE determines to be radioactive and related to the milling process. Although the milling process recovered about 95 percent of the uranium, the RRM contains several naturally occurring radioactive elements, including uranium, thorium, radium, and polonium. RRM at the Moab site contains contaminants in concentrations that could be hazardous to the environment and public health and that exceed the EPA standards.

RRM generally refers to uranium-mill tailings, but may also consist of contaminated soil, debris, equipment, and other wastes. Other contaminated materials requiring cleanup at the Moab site include debris from dismantling of the mill buildings and associated structures, remnants of ponds used during ore-processing activities, disposal trenches, other locations used during mill operations, and buried septic tanks that are assumed to be contaminated.

Contaminated ground water beneath the Moab site is also considered RRM. For the purposes of this document, "contaminant" or "contamination" refers to RRM unless otherwise specified.

UMTRCA and, by association, the Floyd D. Spence Act are the primary regulatory drivers for the Moab and Crescent Junction sites because RRM is the predominant waste. During 2012, RRM, in the form of contaminated soil and associated materials and contaminated ground water, were remediated and managed in accordance with EPA standards.

DOE manages RRM that is combined with hazardous or toxic components in a manner that is protective of human health and the environment as a best management practice. For example, certain legacy chemicals and industrial products that were stored at the Moab site were considered RRM and were managed in a safe manner that protected site workers and the environment.

Floyd D. Spence Act
The Moab site was originally subject to Title II of UMTRCA, because it was an active uranium-processing site when the legislation was passed, and it was regulated under an NRC license. The Floyd D. Spence Act amended UMTRCA to include the Moab site as a designated processing site for remediation under Title I. This legislation specified that the NRC license for the radioactive materials at the Moab site be terminated and the title and responsibility for cleanup be transferred to the Secretary of Energy.

2.1.3 Air Quality and Protection

The applicability of 42 USC 7401, Clean Air Act, to Project air quality and protection is discussed below. The Environmental Air Monitoring Program for the Project and results of data collected in 2012 are discussed further in Section 4.0.

National Emission Standards for Hazardous Air Pollutants
Regulatory requirements associated with the Clean Air Act establish emission standards for hazardous air pollutants associated with various industrial processes codified at 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants" (NESHAP). The Project is not required to report under the NESHAP program as there are no NESHAP-regulated air emissions associated with the Moab and Crescent Junction sites.

Fugitive Dust-control Plans
The state of Utah has primacy for the Clean Air Act regarding control of fugitive or airborne dust, and the Project has prepared fugitive dust-control plans for the Moab and Crescent Junction sites. The state of Utah has issued fugitive dust-control permits for both sites.

Most of the surface area consists of exposed, unprotected soils and sand at the Moab and Crescent Junction sites. Vegetation at the Moab and Crescent Junction sites are relatively sparse and offers little protection or stabilization to the site's disturbed and natural soils. Consequently, controlling windblown sand, soil, and dust is a recognized concern. In Utah, federal Clean Air Act requirements are implemented by an equivalent set of state regulations. To comply with Utah Administrative Code (UAC) R307-309-6, "Fugitive Dust Control," DOE prepared the *Moab UMTRA Project Moab Project Site Fugitive Dust Control Plan* (DOE-EM/GJRAC2072) and the *Moab UMTRA Project Crescent Junction Site Fugitive Dust Control Plan* (DOE-EM/GJ1235).

During 2012, DOE diligently monitored fugitive dust emissions and implemented the controls outlined in the fugitive dust-control plans to the greatest extent practicable. In 2012, DOE applied more than 17 million gallons of water to the RRM at Moab and Crescent Junction and unpaved haul and access roads in an effort to stabilize areas that are susceptible to wind erosion. In addition, DOE restricts travel in off-road areas of the sites and limits vehicular speed to minimize the generation of fugitive dust.

As areas are remediated or disturbed, DOE seeds and mulches the areas to establish vegetative cover to control windblown dust.

2.1.4 Water Quality and Protection

Project efforts regarding water quality and protection are discussed below.

Clean Water Act/National Pollutant Discharge Elimination System

Under 33 USC 1251, the Clean Water Act, the National Pollutant Discharge Elimination System was designed to regulate and control pollutants from industrial wastewater and storm-water discharges, both of which can have negative effects on the quality of surface waters of the United States. The federal discharge requirements are implemented by an equivalent state system known as the Utah Pollutant Discharge Elimination System (UPDES).

As required by the Clean Water Act, the Project obtained UPDES Storm Water General Permits for Storm Water Discharges Associated with Construction Activity at the Moab and Crescent Junction sites (see Table 1). As required by the permits, DOE prepared and implemented the *Moab UMTRA Project Moab Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1475) and the *Moab UMTRA Project Crescent Junction Disposal Site Storm Water Pollution Prevention Plan* (DOE-EM/GJ1238) that outline the engineering controls and best management practices that DOE has implemented to control and minimize storm-water discharges from the sites. Copies of the plan and the storm-water discharge permit are maintained at each respective site. To ensure continued compliance with the plans, DOE conducts at least two storm-water inspections per month and documents the inspection results on a site-specific checklist. No discharges were noted under UPDES during 2012.

There are no sewer effluent discharge points associated with Moab or Crescent Junction site operations. DOE installed on-site sewer storage (pumped as needed) and leach-field systems at Moab and Crescent Junction and constructed a domestic waterline to the Crescent Junction site. Bottled water is provided for Moab and Crescent Junction on-site drinking water needs. Municipal water is trucked to the Moab site for other domestic requirements.

Safe Drinking Water Act

The provisions of 42 USC 300f, the Safe Drinking Water Act, are not directly relevant to the Moab or Crescent Junction sites, because neither ground water nor surface water at or near the sites is used as a public drinking water supply. DOE did not engage in any activities that affected drinking water supply sources. Remediation wells are designated as a temporary withdrawal point; therefore, a Temporary Change Application was received from the State of Utah Department of Natural Resources, Division of Water Rights (see Table 1).

Table 1. Permits/Agreements Active in 2012 for the Moab Project

Permits/Agreements	Issuing Agency	No. of Permits
UPDES Storm Water Discharge Permit for Moab (permit number UTR359185)	State of Utah, Department of Environmental Quality, Division of Water Quality	1
UPDES Storm Water Discharge Permit for Crescent Junction (permit number UTR359187)	State of Utah, Department of Environmental Quality, Division of Water Quality	1
Streambank Alteration Permits for the Colorado and Green River intake structures and for structures and well field to support the IA ground water remediation system	State of Utah, Department of Natural Resources, Division of Water Rights	5
Temporary Change A pplication to change points of diversion to support ground water actions and a non-use application to extract water from the Colorado River	State of Utah, Department of Natural Resources, Division of Water Rights	2
Highway right-of-way encroachment permits to conduct surveys, perform remediation, and install pipelines	State of Utah, U.S. DOT	8
Special Permit SP-14283 for DOE to transport RRM and party status for the Remedial Action Contractor	U.S. DOT	1
Hazardous Materials Certificate of Registration	U.S. DOT	1
Fugitive Dust Control Authorization Letters: Moab DAQC-626-2002 Crescent Junction DAQC-1110-2006	State of Utah, Department of Environmental Quality	2
404 Nationwide General Permits for Green River pump station, water pipelines, Moab Wash, and off-pile area	USACE	4

DOT = Department of Transportation; USACE = U.S. Army Corps of Engineers

2.1.5 Other Environmental Statutes

The applicability of various environmental statutes to the Project is discussed below.

Endangered Species Act

The Endangered Species Act (16 USC 1531) requires federal agencies to consult with the U.S. Fish and Wildlife Service (FWS) before conducting any ground-disturbing activities that may impact protected species (threatened or endangered) or their habitat.

There are four endangered fish species present in the Colorado River: Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub. The pikeminnow and razorback sucker are found near the Moab site, and 2012 back-water monitoring did not detect impacts to fish.

There is one endangered avian species, the southwestern willow flycatcher, that may inhabit tamarisk areas on or near the site. There are no endangered species near the Crescent Junction site.

The final EIS included a Biological Assessment and a Biological Opinion (BO) that evaluated potential impacts of the proposed actions to protected species that may be present. DOE continues to meet the required habitat-protective measures stated in the BO. DOE requested a water-depletion allowance of 235 acre-feet per year from the FWS for use of Colorado River water to meet Project needs.

As required by the BO, DOE monitors Moab site-related impacts on fish, and as necessary, samples biota in accordance with the *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830).

National Historic Preservation Act
Memoranda of agreement are in place among DOE, the State Historic Preservation Office, the Utah Department of Transportation (DOT), and the Bureau of Land Management (BLM) for protection of cultural and historic resources at the Project sites.

In 2012, an annual cultural resource inventory was performed at the Crescent Junction site for Native American art sites per the applicable memorandum of agreement. Annual reports for Moab and Crescent Junction sites were submitted to BLM, Utah DOT, and the state of Utah as required by the memoranda of agreement documenting that no additional impacts or mitigation were noted in 2012.

Migratory Bird Treaty Act
To ensure compliance with 16 USC 703, the Migratory Bird Treaty Act, the presence of migratory birds was evaluated in the Biological Assessment. The BO concurred that the potential migratory bird species that may inhabit the Moab and Crescent Junction sites included the bald eagle (threatened), the southwestern willow flycatcher (endangered), and the yellow-billed cuckoo (candidate species). The bald eagle was removed from the threatened list. No endangered, threatened, or candidate species were noted on the Moab or Crescent Junction sites in 2012.

At the Crescent Junction site, the burrowing owl, a Utah sensitive species, was identified as potentially present; however, none were observed in 2012. A large number of prairie-dog burrows are present; these burrows are associated with burrowing owl habitat. Hawks are known to hunt in the Crescent Junction site area; however, no nests are known to be present.

Floodplain Management
DOE's implementing regulations in 10 CFR 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements," identify the requirements of EO 11988, "Floodplain Management," for actions that may affect floodplains. Portions of the Moab site fall within the 100-year floodplain of the Colorado River.

Activities conducted in the floodplain during 2012 were limited to revegetation. Revegetation activities included planting and seeding of desirable native species, irrigation to promote vegetation, and weed control. Minor erosion-control actions were taken in 2012 to prevent transportation of sediment to the river.

Protection of Wetlands
DOE regulation 10 CFR 1022 implements the requirements of EO 11990, "Protection of Wetlands," for actions that may affect wetlands. Jurisdictional wetlands were delineated at the Moab site in 2004 and verified by the U.S. Army Corps of Engineers (USACE) in 2005.

Project activities performed in 2012 with the potential to affect jurisdictional wetlands included construction that disturbed upland soils, storm-water controls, revegetation, and erosion control. There was no adverse impact to the jurisdictional wetlands from these activities.

All of these activities were authorized under the USACE 404 permitting program or by the state of Utah's Streambank Alteration Permit Program (see Table 1) through a cooperative agreement with USACE. Required monitoring continued in 2012.

2.1.6 DOE Order 436.1, "Departmental Sustainability"

DOE O 436.1 incorporates and implements the requirements of EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," 10 CFR 1021, "National Environmental Policy Act Implementing Procedures," the Energy Independence and Security Act of 2007 (Public Law 110-140), the Energy Policy Acts of 1992 (Public Law 102-486) and 2005 (Public Law 109-58), and other related statutes, administrative and secretarial mandates, and priorities.

The Project provides annual reporting through its *Moab UMTRA Project Site Sustainability Plan* (DOE-EM/GJ1952) that identifies the mandated greenhouse gas-reduction targets and sustainability goals in compliance with DOE O 436.1.

2.2 Other Major Environmental Issues and Actions

DOE uses external and internal audits, surveillances, and management assessments to evaluate environmental compliance and to implement corrective actions. The Project Quality Assurance (QA) organization performed and/or coordinated internal and external assessments in 2012 to verify system descriptions and compliance with internal procedures. No major issues or actions were identified in 2012.

2.3 Continuous-release Reporting

Not applicable to the Project.

2.4 Unplanned Releases

No unplanned releases occurred in 2012.

2.5 Summary of Permits

Table 1 shows the permits and agreements that were active for the Project during 2012.

3.0 Environmental Management System

As with most federal agencies, DOE's EMS is based on the standard elements identified in International Organization for Standardization ISO 14001, "Environmental Management Systems." The EMS integrates these elements into the core functions of the contractors' Integrated Safety Management System Program, which follows the "Plan-Do-Check-Act" cycle to ensure continuous improvement.

The Project's EMS is a structured process for reducing the environmental consequences of Project activities to maximize beneficial use of finite resources and to minimize wastes. In an effort to implement a comprehensive EMS for the Project in accordance with DOE O 436.1, the *Moab UMTRA Project Environmental Management Program Manual* (DOE-EM/GJ1630) was issued as one element of the EMS.

3.1 Environmental Initiatives

3.1.1 Pollution Prevention

Pollution prevention is part of the waste-management strategy for the Project. Operations are evaluated to identify technically and economically feasible opportunities for source reduction, recycling, decontamination, or treatment. Disposal is the final solution after other options have been considered. Pollution prevention is also achieved through environmentally preferred purchasing.

Reuse and Recycling

In 2012, approximately 1,800 lb of paper, 1,600 lb of plastic, 850 lb of aluminum cans, and 4,500 gallons of used oil were collected from the Project sites and the Grand Junction office for recycling. Automotive and rechargeable batteries, toner cartridges, and power strips were also recycled. All of these recycled materials were non-radioactive.

Environmentally Preferable Purchasing

The preferred procurement process favors the acquisition of environmentally preferable products and services. This may entail purchasing materials with recycled content or materials or services that have a less adverse or even beneficial effect on the environment. The Moab Project was one of only four DOE sites that received a Gold-level designation for priority product/green buy purchases made in fiscal year 2012. The Project routinely adds language to contracts that specifies a preference for the use of recycled or otherwise recovered materials and removes language that prohibits the use of recycled materials.

In addition, the Project participates in the Blue Sky Renewable Energy Program by buying 10 percent renewable energy. As a result, the Remedial Action Contractor and the Project have received Blue Sky Champion Partner and EPA Green Power Partner designations.

Energy Efficiency

The Project's recently constructed facilities were designed to be energy efficient and to comply with the Secretary of Energy's energy initiatives for real property. The Moab and Crescent Junction sites receive power from overhead lines through the Rocky Mountain Power distribution system.

Source Reduction

Source reduction generally means any change in products, services, or actions that reduce, eliminate, or prevent the amount or toxicity of waste being generated. The Project sites achieve source reduction primarily by using work practices that minimize the amount of radioactive waste generated. The "as low as reasonably achievable" (ALARA) principle is emphasized to keep materials from becoming radioactively contaminated. An example of source reduction at the Crescent Junction site during 2012 was the use of washable coveralls for personnel entering the CA versus Tyvek coveralls that must be disposed of in the cell after use.

3.2 Waste Management

During 2012, DOE conducted operations consistent with the *Moab UMTRA Project Waste Management Plan* (DOE-EM/GJ1633). Formal training in the requirements of this plan was provided to Project staff and subcontractors.

4.0 Environmental Radiological Protection Program and Dose Assessment

4.1 Radiological Discharges and Doses

This section presents the results of the calculated dose to Project employees, public, and biota from Project operations in 2012 and reports if the dose is below specified limits. The calculated public dose is received near the Project boundaries.

The DOE dose limit to a member of the public is 100 mrem/yr received through all pathways (i.e., all ways in which a person can be exposed to radiation, such as inhalation, ingestion, and direct radiation). Furthermore, doses to members of the public must be reduced to low levels consistent with a documented ALARA process and generally should not exceed a dose constraint of one-quarter of the primary dose limit, or 25 mrem/year (yr). The dose received from airborne emissions of radionuclides is further restricted by the EPA effective dose equivalent of 10 mrem/yr. These doses are in addition to exposures from natural background, consumer products, and medical sources.

A summary of the public radiation dose, which is applicable to both the Moab and Crescent Junction sites, is shown in Table 2. The public and MEI receive only a background dose based on Project monitoring results.

Table 2. Moab Project Public Radiation Dose for 2012

Pathway	Maximum Dose to MEI in mrem (mSv)	% of DOE 100 mrem/yr Limit	Estimated Population Dose in person-rem	Population Within 80 km (~50 miles)	Estimated Bkgd Radiation Population Dose in person-rem
Air	12 (0.12)	12	less than 0.005	~10,000	less than 0.005
Water	N/A	N/A	N/A	N/A	N/A
Other Pathways	N/A	N/A	N/A	N/A	N/A
All Pathways	12 (0.12)	12	less than 0.005	N/A	less than 0.005

Bkgd = background; km = kilometers; mSv = milliseivert; N/A = not applicable; rem = roentgen equivalent man

4.2 Clearance of Property Containing Residual Radioactive Material

To support remediation of the Moab site, DOE assessed Moab site soils not associated with the RRM pile for radiological contamination. Remediation of off-pile areas is part of DOE's cleanup strategy and one of the ongoing measures to address contamination resulting from historical uranium ore processing at the site to reduce potential health and environmental risks. In 2012, DOE did not perform additional off-pile remediation, but did perform remediation on two vicinity properties.

4.3 Radiation Protection of Biota

4.3.1 Dose Limits for Protection of Biota and Methods of Demonstrating Compliance

DOE O 458.1 requires the protection of populations of aquatic animals and terrestrial plants and animals in local ecosystems from adverse effects due to radiation and radioactive material released from DOE operations. The Moab RRM contains low levels of radioactivity, and the chemical composition of the RRM limits vegetative growth. The level of Project activities near the RRM is not conducive for fauna migratory patterns, nor does it promote habitat formation in these areas. The estimated contribution to radiological dose to biota from the RRM at the Project sites is indistinguishable from the naturally occurring radioactive material found in the surrounding environment. Therefore, the Project does not currently monitor the effects of radiological doses to biota. Biota monitoring for non-radiological effects is discussed in Section 2.1.5.

4.3.2 Evaluating Dose to Biota

Based on the radiological makeup of the RRM and the very low concentration of radionuclides, no future evaluations of dose to biota are planned.

4.4 Unplanned Radiological Releases

There were no unplanned radiological releases in 2012.

4.5 Environmental Radiological Monitoring

Radiological protection is in part gained through the Environmental Air Monitoring Program, which is described in the *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJRAC1434). This plan documents DOE's strategy for monitoring various airborne contaminants, including monitoring goals and objectives, and includes evaluation of public radiological exposure. This section provides descriptions of the Environmental Air Monitoring Program elements. Environmental air monitoring data are compiled and published in quarterly environmental air-monitoring reports. These reports compare monitoring data to exposure limits and guidelines and are posted on the DOE Project website at www.gjem.energy.gov/moab.

Before the start of tailings removal and disposal operations, DOE initiated environmental air monitoring at the Moab and Crescent Junction sites to collect baseline data, assess the potential for radiation dose to members of the public that could result from site operations, and demonstrate compliance with applicable radon concentration guidelines established by DOE order.

DOE established the air-monitoring network for the Project to measure atmospheric radon, airborne radioparticulate matter, and direct gamma radiation at various on-site, off-site, and background locations. The monitoring network was established after considering prevailing wind directions and the proximity of each site to the general population. Some off-site monitoring stations were located where emissions or releases of airborne contaminants would be detected before they reached the public. This location strategy enables DOE to quantify any public exposures that may be associated with Project activities. Table 3 summarizes the types of data collected at the various monitoring locations for Moab and Crescent Junction. Monitoring locations for Moab are shown in Figures 3 and 4 and for Crescent Junction in Figure 5.

Background-monitoring locations have been established that are sufficiently removed from the Moab and Crescent Junction sites, so the air quality is not influenced by airborne contaminants associated with operations. Background-monitoring locations provide baseline ambient air-quality conditions against which site-monitoring data may be compared. MEI locations (see Figure 3 for the Moab site and Figure 5 for the Crescent Junction site) have special significance with respect to environmental monitoring, because they represent the members of the public potentially receiving the largest dose from all sources of radionuclide emissions combined and are considered the worst-case exposure scenario for a continuously occupied residential property. The MEI locations are the closest inhabited private property to each site.

4.5.1 Atmospheric Radon

During 2012, DOE continued its Environmental Air Monitoring Program to measure radon emissions at various locations on the millsite property boundary, around the Moab community, and at and around the Crescent Junction site. DOE O 458.1 provides radon guidelines for all DOE facilities, operations, and activities and offers a conservative goal with respect to controlling radon emissions at the Project sites while remediation of the RRM and placement in the disposal cell are ongoing.

DOE O 458.1 established an indoor guideline for radon-222 (the major radon isotope) concentrations, and this guideline is used at DOE's property boundary at each site and at off-site locations. The guideline or goal is less than 3.0 picocuries per liter (pCi/L) above the background concentration.

Based on data from 2003 through 2008, the background concentration of radon-222 in the Moab area was established as 0.7 pCi/L; therefore, the guideline for radon-222 emissions at the Moab site is 3.7 pCi/L. Based on data from 2006 to 2009, the background concentration of radon-222 in the Crescent Junction area was established as 0.9 pCi/L; therefore, the guideline for radon-222 emissions at the Crescent Junction site is 3.9 pCi/L.

During 2012, atmospheric radon was measured at 36 locations (20 on site, 14 off site, and two MEIs) using alpha-sensitive detectors (i.e., radon cups). Radon cups were exposed for a period of approximately 3 months (a quarterly exposure). On collection, the radon cups were sent to an off-site laboratory for analysis. Analytical results were typically received from the laboratory within 30 days. Radon monitoring data results for all on-site, off-site, and MEI locations are shown in Table 4.

Table 3. Summary of Parameters Measured at Environmental Air-monitoring Locations for the Moab and Crescent Junction Sites

Monitoring Station	Location	Parameter
Moab On-site Locations		
0101	Office area	Rn, G
0102	Perimeter	Rn, G, RP
0103	Perimeter	Rn, G
0104	Perimeter	Rn, G
0105	Perimeter	Rn, G, RP
0106	Perimeter	Rn, G
0107	Perimeter	Rn, G
0108	Perimeter	Rn, G
0109	Perimeter	Rn, G
0110	Perimeter	Rn, G
0111	Perimeter	Rn, G
0112	Perimeter	Rn, G
0113	Perimeter	Rn, G
0126	Private property (~¼-mile south of millsite)	Rn, G
Moab Off-site Locations		
0117	Bar-M Chuckwagon (background location, ~5½ miles north of millsite)	Rn, G, RP
0118	Arches National Park entrance	Rn, G, RP
0119	Utah Division of Wildlife Resources (Matheson Wetlands Preserve)	Rn, G, RP
0120	Portal RV Park	Rn, G, RP
0121	Moab Wastewater Treatment Plant	Rn, G, RP
0122	Grand County Recycling Center	Rn, G, RP
0123	Kane Creek Road (background location, ~2¾ miles south of millsite)	Rn, G, RP
0124	Utah Division of Wildlife Resources (Matheson Wetlands Preserve)	Rn, G
0125	Utah Division of Wildlife Resources (Matheson Wetlands Preserve)	Rn, G
0127	Private property (~¾-mile south of millsite)	Rn, G
0128	Private property ($^{1}/_{10}$-mile south of millsite)	Rn, G
0129	BLM property (~200 yards northwest of millsite)	Rn, G, RP
MEI	Near northeastern property boundary	Rn, G
Crescent Junction Locations		
0305	Crescent Junction off-site location	Rn, G
0301, 0302, 0303, 0304	Crescent Junction on-site locations	Rn, G
MEI (0306)	Residence (~½-mile south of disposal cell)	Rn, G, RP
0307	Crescent Junction off-site location	Rn, G, RP
0308	Crescent Junction on-site location	Rn, G, RP
0309	Crescent Junction on-site location	Rn, G, RP

G = gamma; Rn = atmospheric radon; RP = radioparticulate

Table 4. Summary of Atmospheric Radon and Gamma-monitoring Data for the Moab and Crescent Junction Sites for 2012

Station Number	1st Quarter 2012		2nd Quarter 2012		3rd Quarter 2012		4th Quarter 2012		2012 Annual	
	Radon pCi/L	Gamma mrem/91 d*	Radon pCi/L	Gamma mrem/91 d*	Radon pCi/L	Gamma mrem/91 d*	Radon pCi/L	Gamma mrem/91 d*	Avg Radon pCi/L	Gamma mrem
On-site Locations										
0101	2.4	38.2	1.5	36.6	1.4	36.2	2.8	43.8	2.0	154.8
0102	1.4	26.6	0.6	25.5	0.6	22.3	1.4	30.7	1.0	105.1
0103	1.6	25.9	0.6	23.9	0.7	21.9	2.3	28.8	1.3	100.5
0104	2.0	29.7	1.3	27.8	0.9	25.2	2.4	34.6	1.7	117.3
0105	2.5	26.9	1.8	25.4	0.9	22.9	3.2	31.5	2.1	106.7
0106	3.8	37.4	1.4	38.3	1.5	34.0	3.5	44.5	2.6	154.2
0107	4.1	31.5	2.0	31.7	1.2	27.6	3.3	36.9	2.7	127.7
0108	2.8	44.1	2.1	43.8	2.3	42.2	3.4	52.0	2.7	182.1
0109	2.6	161.0	2.5	164.6	1.8	177.7	3.3	182.1	2.6	685.4
0110	1.5	94.4	1.5	92.6	1.6	99.2	1.5	100.8	1.5	387.0
0111	0.7	40.0	0.6	36.4	0.9	39.3	0.6	41.8	0.7	157.5
0112	1.9	51.3	1.5	50.6	1.3	48.7	2.2	56.7	1.7	207.3
0113	2.2	31.4	2.0	34.0	1.6	30.2	4.0	40.1	2.5	135.7
0126	2.3	27.7	1.5	29.1	1.1	26.0	2.6	33.0	1.9	115.8
0301	NDA	NDA	0.5	23.2	0.7	23.5	0.7	25.5	0.6	72.2
0302	0.6	24.4	0.8	24.1	0.4	24.4	0.7	27.1	0.6	100.0
0303	1.0	26.8	0.6	25.5	0.4	27.6	0.9	28.9	0.7	108.8
0304	0.9	27.8	0.6	23.3	0.6	28.7	0.9	26.8	0.8	106.6
0308	1.1	22.6	1.1	23.2	1.0	23.9	2.2	27.2	1.4	96.9
0309	1.2	23.1	0.7	25.5	0.6	24.1	1.2	27.8	0.9	100.5
Off-site Locations										
0117	0.7	24.5	0.4	23.6	0.3	21.9	0.6	26.0	0.5	96.0
0118	0.6	22.6	0.3	23.0	0.4	20.3	0.4	27.0	0.4	92.9
0119	0.7	21.9	0.4	25.0	0.4	18.7	0.8	27.8	0.6	93.4
0120	0.4	20.8	0.3	24.0	0.3	18.1	0.7	27.6	0.4	90.5
0121	0.6	22.6	0.3	23.2	0.3	19.5	0.8	26.4	0.5	91.7
0122	0.4	21.4	0.4	21.2	0.3	18.2	0.3	23.8	0.4	84.6
0123	0.7	21.3	0.3	21.4	0.3	18.9	0.4	23.4	0.4	85.0
0124	1.5	26.7	0.8	28.1	0.7	23.4	1.7	31.8	1.2	110.0
0125	1.9	29.9	0.9	32.4	0.7	27.0	1.6	35.0	1.3	124.3
0127	1.1	25.6	0.3	27.3	0.6	23.6	1.2	31.5	0.8	108.0
0128	2.4	27.9	1.1	24.7	1.1	23.0	2.4	28.5	1.8	104.1
0129	1.6	28.1	1.2	28.9	1.5	25.6	2.6	31.5	1.7	114.1
MEI (Moab)	1.2	21.9	0.8	20.6	0.6	18.6	2.0	23.5	1.2	84.6
0305	1.1	29.5	1.2	26.3	0.8	29.7	1.1	29.6	1.1	115.1
MEI (CJ)	0.4	27.1	0.3	25.5	0.4	27.9	0.8	28.3	0.5	108.8
0307	0.5	28.3	0.4	27.2	0.3	29.6	0.7	29.6	0.5	114.7

Avg = average; CJ = Crescent Junction; NDA = no data available.
*mrem value is prorated to a 91-day exposure period.

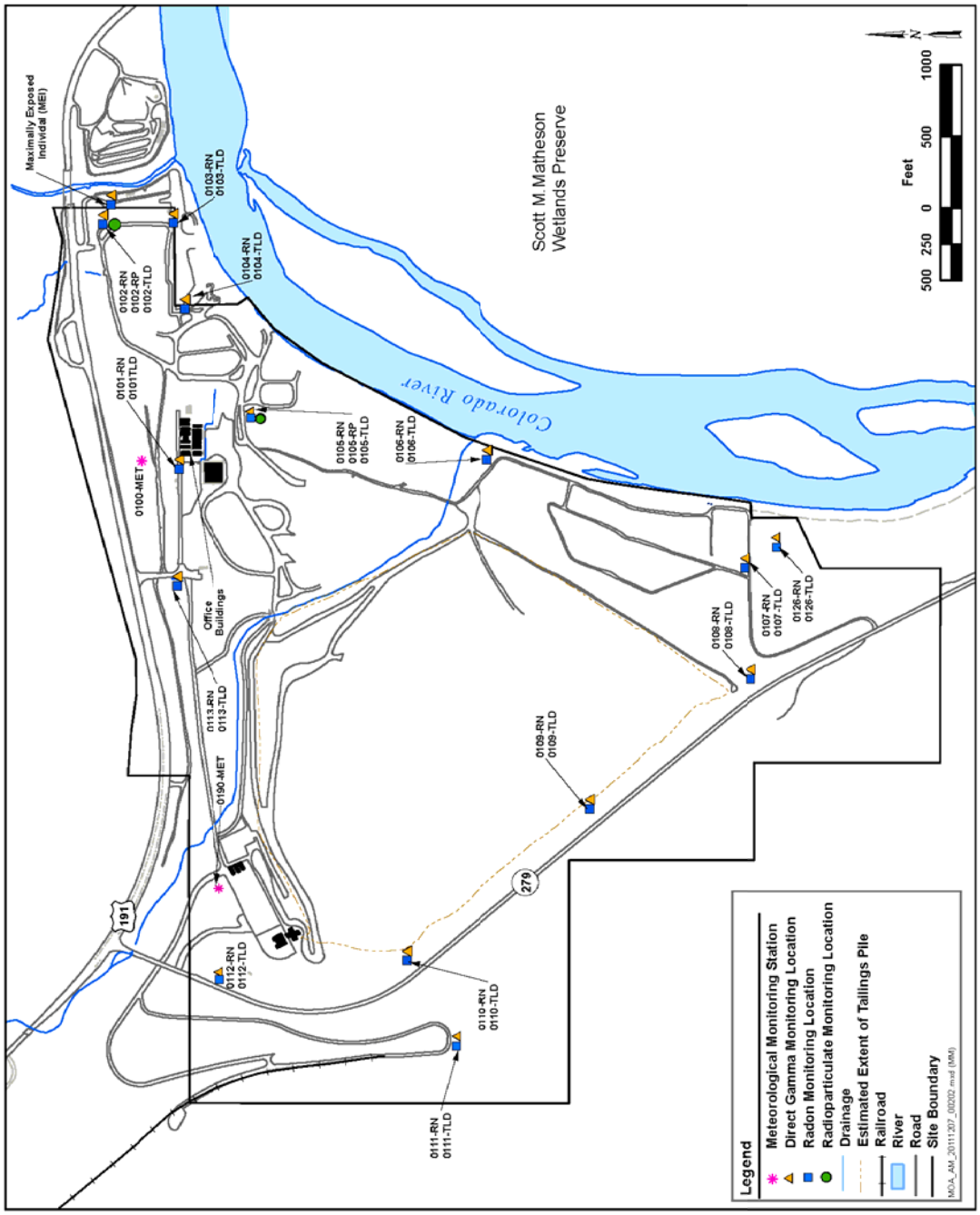

Figure 3. Moab On-site and MEI Environmental Air-monitoring Locations

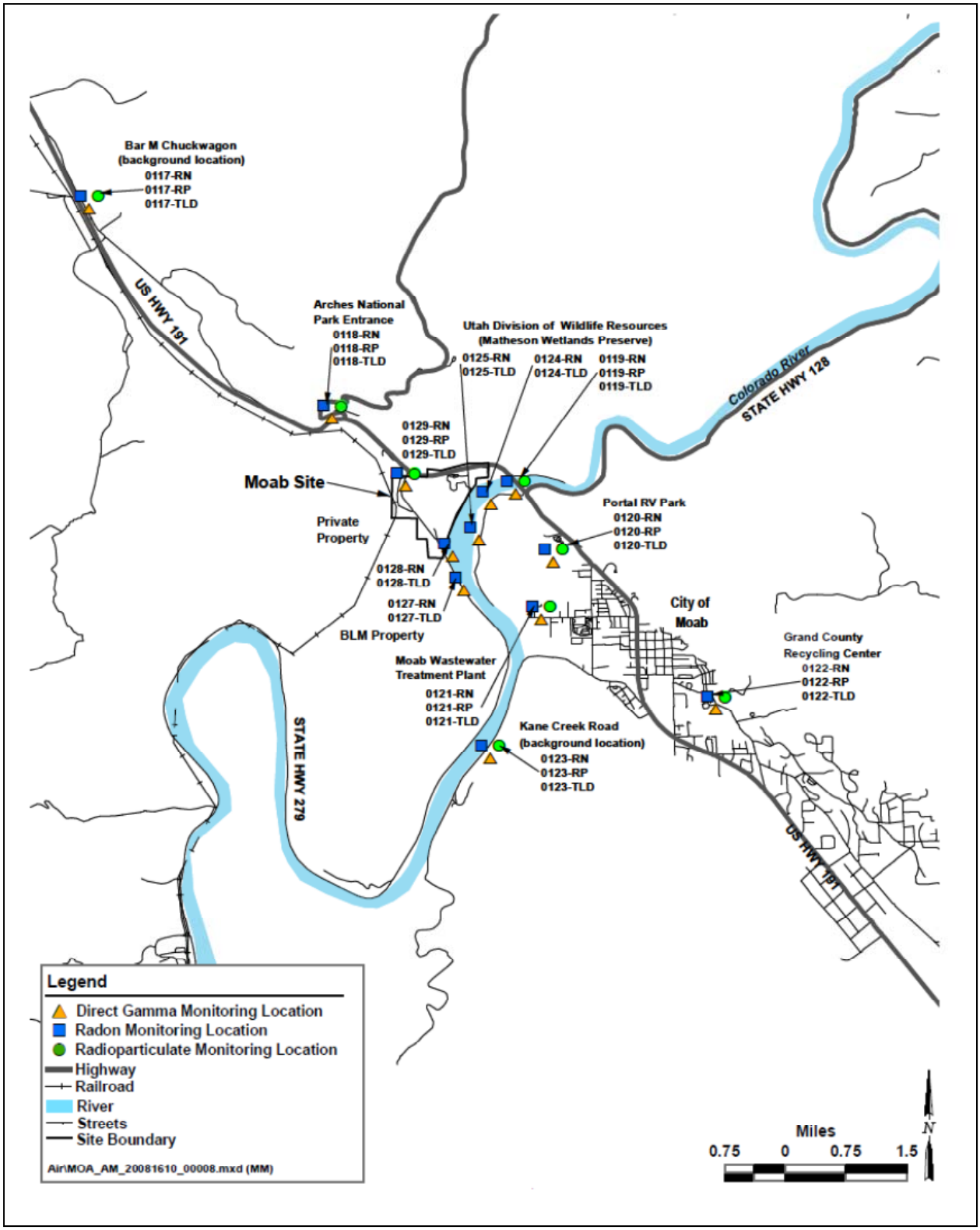

Figure 4. Moab Off-site Environmental Air-monitoring Locations

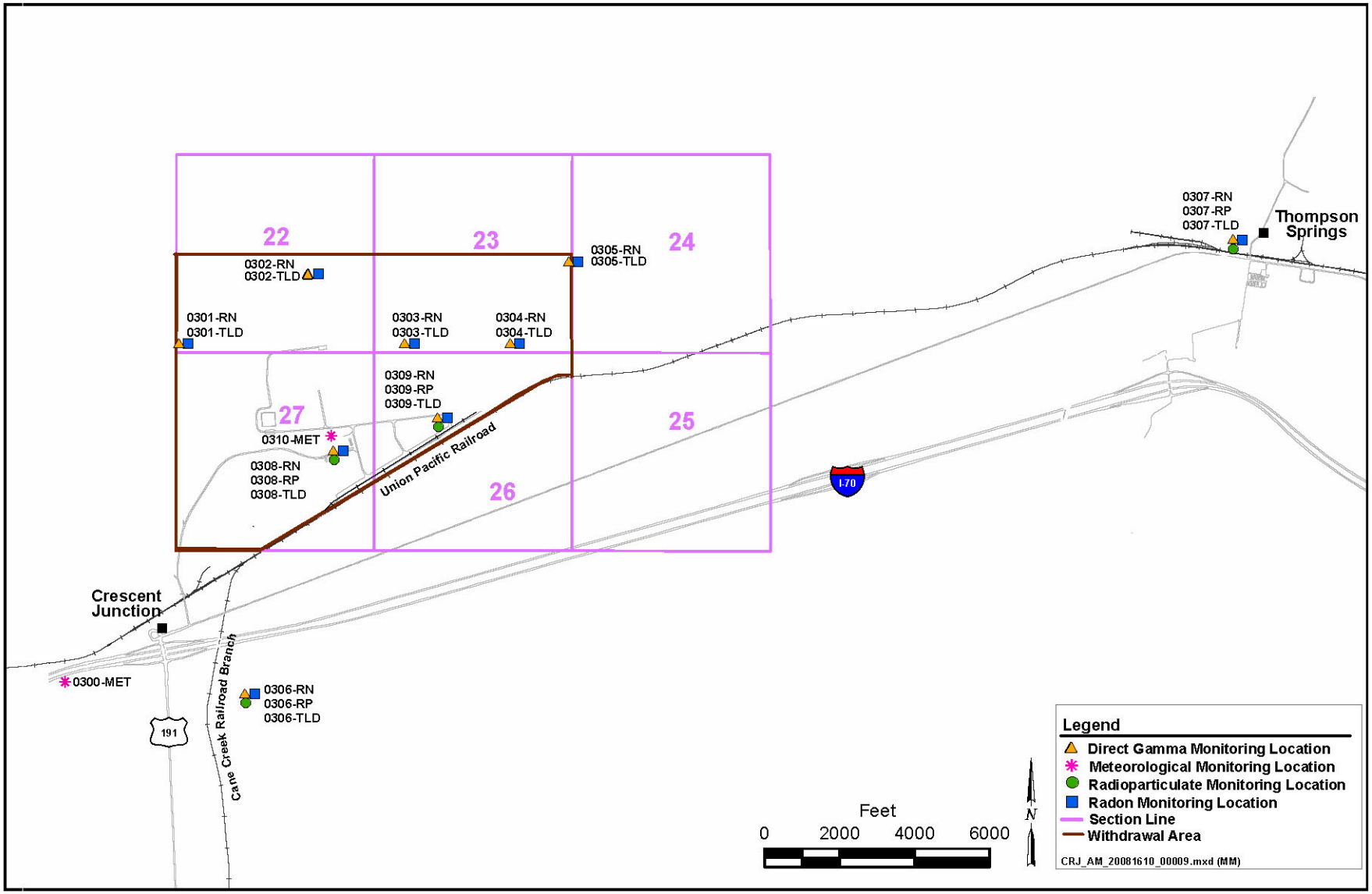

Figure 5. Crescent Junction Site Environmental Air-monitoring Locations

During 2012, the atmospheric radon concentration did not exceed the annual guideline at any location. Higher winter radon concentrations were noted at four Moab on-site locations (station numbers 0106, 0107, 0108, and 0109) on vacant land (Table 4). However, data indicate off-site radon concentrations attenuate to near background levels within ¼-mile beyond the Moab site boundary. Because the tailings pile does not have an engineered radon barrier, and the existing interim cover is not designed to control radon flux, it is not surprising that radon concentrations become elevated at locations at or near the Moab site perimeter.

There was no radon exceedance at the Crescent Junction site. The 2012 radon-monitoring data collected at the MEI locations were consistently below the 3.7 pCi/L and 3.9 pCi/L guidelines for Moab and Crescent Junction, respectively. Based on these data, radon emissions from the RRM are not affecting the general population.

4.5.2 Direct Gamma Radiation

The RRM at the Moab site is a source of direct gamma radiation. As uranium decays, several of the decay products emit gamma radiation. Gamma radiation has sufficient energy to penetrate body tissues; therefore, protection against elevated exposure levels is of utmost importance to DOE. DOE public dose limits applicable to the Project are outlined in DOE O 458.1. DOE also complies with the state of Utah radiation-protection requirements codified at UAC R313-15-301, "Standards for Protection Against Radiation, Dose Limits for Individual Members of the Public." These regulations establish standards and requirements for DOE operations with respect to protection of members of the public and environment against undue risk from radiation.

DOE O 458.1 establishes a public dose limit of 100 mrem/yr above naturally occurring gamma levels or background. DOE has determined that the background direct gamma radiation dose is approximately 81 mrem/yr in the Moab area and 92.5 mrem/yr in the Crescent Junction area. These values were derived by averaging monitoring data collected at background-monitoring locations in each area. Therefore, the DOE dose limit for direct gamma radiation at the site boundary (and at any off-site location) is approximately 181 mrem/yr at Moab and 192.5 mrem/yr at Crescent Junction.

During 2012, direct gamma radiation was measured at 36 locations (20 on-site, 14 off-site, and two MEIs) using TLDs that are exposed for a period of approximately 3 months (a quarterly exposure). On collection, the dosimeters are sent to an off-site laboratory for analysis. Analytical results are typically received from the laboratory within 30 days. Direct gamma radiation data results for all on-site, off-site, and MEI locations are shown in Table 4.

During 2012, direct gamma radiation measurements exceeded the DOE annual limit at four on-site locations (0108, 0109, 0110, and 0112); this is not unexpected due to the large volume of RRM at the Moab site and its associated gamma activity. In general, 2012 results were slightly higher than 2011 at the Moab site. None of the off-site locations exceeded the annual limit; therefore, these on-site exceedances did not result in unacceptable public exposure. There were no exceedances at the Crescent Junction site. The total gamma radiation dose at the MEI locations was 84.6 mrem/yr and 108.8 mrem/yr for the Moab and Crescent Junction sites, respectively; both doses were substantially below the limit for each site. Based on the levels of direct gamma radiation, these emissions are not affecting the general population in or near Moab or Crescent Junction.

4.5.3 Airborne Radioparticulates

Radioparticulate-data collection is of particular interest to DOE because these data provide information relative to the dose that the public may be receiving from the inhalation of radioactive particulate matter. In 2012, air samplers operated continuously at four on-site locations and 10 off-site locations at Moab and Crescent Junction, including both MEI locations. Air filters were collected weekly and submitted as a composite sample on a quarterly basis. The filters were then analyzed for specific radionuclides that are common constituents of RRM, including total uranium, thorium-230, radium-226, and polonium-210. DOE O 5400.5, Chapter III, explains the use of derived concentration guide (DCG) values for radioisotopes to determine acceptable exposure limits. A DCG represents the concentration from a specified radionuclide that would cause a member of the public residing at the point of collection to receive a dose of 100 mrem/yr. Exposures above this limit are considered unacceptable. The DCG values for the radionuclides included in the Project monitoring program are shown in Table 5.

The quarterly results and annual averages for airborne radioparticulate concentrations did not exceed the DCG values for any of the on-site or off-site locations for either Moab or Crescent Junction during 2012 (see Table 5). These data demonstrate that emissions of airborne radioparticulate matter were consistently two to four orders of magnitude below their respective DCG values and therefore do not exceed levels or concentrations that would result in an unacceptable public exposure. The radioparticulate results have consistently been below the DCGs since the DOE assumed ownership of both sites. DOE O 5400.5 requires that the radiological dose resulting from the total of the airborne emissions at each location is less than 10 mrem/yr. Table 6 shows that the annual dose at each location was lower than this airborne limit.

Table 5. Summary of DCGs for Inhaled Air Radionuclides Monitored at the Moab and Crescent Junction Sites for 2012

Radionuclide	DCG (µCi/mL)
Total Uranium	2.0E-12
Thorium-230	4.0E-14
Radium-226	1.0E-12
Polonium-210	1.0E-12

E = numerical value is to be multiplied by exponent (e.g., 1.8E-4 = 0.00018);
µCi/mL = microcuries per milliliter

4.6 Best Management Practice Area

The Best Management Practice Area (BMPA) is a dedicated area within the CA at the Moab site that is designed to safely store and isolate waste materials, chemicals, equipment, or soil that require further characterization or for which a disposal strategy has not yet been selected. The area is located about 300 feet southeast of the office buildings (see Figure 3). It measures approximately 14 by 8 feet, is surrounded by a 2-foot-high earthen berm, and is lined with 30-millimeter plastic sheeting. Once adequate characterization data are obtained and a disposal strategy is selected, wastes are removed from the BMPA. Once adequate characterization data are obtained and a disposal strategy is selected, wastes are removed from the BMPA. No wastes were stored, added or removed in 2012.

Table 6. Summary of Radioparticulate Air-monitoring Data for the Moab and Crescent Junction Sites for 2012

Moab Station Number	Isotope	1st Quarter 2012 (µCi/mL)	2nd Quarter 2012 (µCi/mL)	3rd Quarter 2012 (µCi/mL)	4th Quarter 2012 (µCi/mL)	Annual Average (µCi/mL)	Annual 2012 Dose mrem/yr
On-site Locations							
0102-RP	Uranium	1.4E-16	2.2E-16	1.7E-16	1.5E-16	1.70E-16	1.14
	Thorium-230	1.4E-16	1.4E-16	1.7E-17	1.4E-16	1.48E-16	
	Radium-226	8.8E-17	1.4E-16	4.4E-17	2.1E-16	1.21E-16	
	Polonium-210	1.0E-14	4.9E-15	6.0E-15	9.3E-15	7.55E-15	
0105-RP	Uranium	1.7E-16	2.5E-16	2.4E-16	2.2E-16	2.20E-16	1.69
	Thorium-230	2.7E-16	3.2E-16	3.7E-16	3.6E-16	3.30E-16	
	Radium-226	1.8E-16	2.0E-16	2.7E-16	2.3E-16	2.20E-16	
	Polonium-210	1.1E-14	6.2E-15	6.3E-15	9.8E-15	8.33E-15	
Off-site Locations							
0117-RP	Uranium	1.1E-16	1.9E-16	1.5E-16	1.6E-16	1.53E-16	0.86
	Thorium-230	7.4E-17	1.1E-16	1.1E-16	6.5E-17	8.98E-17	
	Radium-226	2.6E-17	1.2E-16	6.9E-17	4.2E-17	6.43E-17	
	Polonium-210	7.9E-15	4.1E-15	6.2E-15	6.6E-15	6.20E-15	
0118-RP	Uranium	1.6E-16	2.4E-16	1.7E-16	1.5E-16	1.80E-16	1.33
	Thorium-230	3.1E-16	2.6E-16	2.6E-16	1.8E-16	2.52E-16	
	Radium-226	8.4E-17	2.8E-16	5.6E-16	9.8E-17	2.56E-16	
	Polonium-210	8.7E-15	4.7E-15	6.3E-15	6.8E-15	6.63E-15	
0119-RP	Uranium	1.2E-16	1.6E-16	1.5E-16	1.4E-16	1.43E-16	1.19
	Thorium-230	8.3E-17	2.6E-16	2.6E-16	1.8E-16	1.96E-16	
	Radium-226	7.5E-17	1.4E-16	6.8E-17	6.5E-17	8.70E-17	
	Polonium-210	9.4E-15	3.9E-15	6.3E-15	7.7E-15	6.83E-15	
0120-RP	Uranium	1.2E-16	2.0E-16	1.6E-16	1.5E-16	1.58E-16	0.80
	Thorium-230	8.3E-17	1.2E-16	1.1E-16	7.7E-17	9.75E-17	
	Radium-226	6.8E-17	8.2E-17	2.9E-17	8.8E-17	6.68E-17	
	Polonium-210	6.9E-15	3.7E-15	5.3E-15	5.9E-15	5.45E-15	
0121-RP	Uranium	1.2E-16	1.8E-16	1.7E-16	1.5E-16	1.55E-16	0.86
	Thorium-230	7.3E-17	1.3E-16	1.3E-16	6.4E-17	9.93E-17	
	Radium-226	1.1E-16	1.2E-16	1.1E-16	6.0E-17	1.00E-16	
	Polonium-210	7.7E-15	4.3E-15	5.9E-15	5.7E-15	5.90E-15	
0122-RP	Uranium	1.2E-16	1.8E-16	1.3E-16	1.4E-16	1.43E-16	0.84
	Thorium-230	2.7E-17	8.7E-17	1.2E-16	1.1E-16	8.60E-17	
	Radium-226	1.1E-17	1.4E-16	2.8E-17	7.3E-17	6.30E-17	
	Polonium-210	8.0E-15	4.6E-15	5.9E-15	6.0E-15	6.13E-15	
0123-RP	Uranium	1.2E-16	1.8E-16	1.4E-16	1.2E-16	1.40E-16	0.89
	Thorium-230	6.9E-17	1.1E-16	8.5E-17	1.1E-16	9.35E-17	
	Radium-226	8.4E-18	9.6E-17	5.0E-17	4.9E-17	5.09E-17	
	Polonium-210	8.5E-15	4.3E-15	6.0E-15	6.8E-15	6.40E-15	

Table 6. Summary of Radioparticulate Air-monitoring Data for the Moab and Crescent Junction Sites for 2012 (continued)

Moab Station Number	Isotope	1st Quarter 2012 (µCi/mL)	2nd Quarter 2012 (µCi/mL)	3rd Quarter 2012 (µCi/mL)	4th Quarter 2012 (µCi/mL)	Annual Average (µCi/mL)	Annual 2012 Dose mrem/yr
Off-site Locations *(continued)*							
0129-RP	Uranium	2.8E-16	4.5E-16	2.8E-16	2.4E-16	3.13E-16	3.63
	Thorium-230	1.2E-15	1.4E-15	1.0E-15	7.6E-16	1.09E-15	
	Radium-226	1.0E-16	9.4E-16	6.3E-16	3.1E-16	4.95E-16	
	Polonium-210	9.6E-15	6.3E-15	7.9E-15	9.9E-15	8.43E-15	
Crescent Junction Station Number	**Isotope**	**1st Quarter 2012 (µCi/mL)**	**2nd Quarter 2012 (µCi/mL)**	**3rd Quarter 2012 (µCi/mL)**	**4th Quarter 2012 (µCi/mL)**	**Annual Average (µCi/mL)**	**Annual 2012 Dose mrem/yr**
On-site Locations							
0308-RP	Uranium	1.5E-16	1.4E-16	1.7E-16	1.1E-16	1.43E-16	1.27
	Thorium-230	3.1E-16	1.3E-16	3.3E-16	4.6E-17	2.04E-16	
	Radium-226	1.5E-16	1.1E-16	1.6E-16	1.1E-16	1.33E-16	
	Polonium-210	8.7E-15	4.1E-15	7.2E-15	6.3E-15	6.58E-15	
0309-RP	Uranium	1.2E-16	1.2E-16	1.4E-16	1.5E-16	1.33E-16	1.49
	Thorium-230	2.2E-16	1.3E-16	1.8E-16	2.4E-16	1.93E-16	
	Radium-226	6.7E-17	1.3E-16	6.0E-17	9.5E-17	8.80E-17	
	Polonium-210	6.9E-15	1.1E-14	1.1E-14	1.1E-14	9.98E-15	
Off-site Locations							
MEI (0306-RP)	Uranium	1.1E-16	1.3E-16	1.3E-16	1.2E-16	1.23E-16	0.75
	Thorium-230	6.3E-17	7.5E-17	5.7E-17	7.6E-16	2.39E-16	
	Radium-226	3.6E-17	2.2E-17	3.8E-17	8.8E-17	4.60E-17	
	Polonium-210	6.4E-15	4.1E-15	6.4E-15	6.3E-15	5.80E-15	
0307-RP	Uranium	1.1E-16	1.6E-16	1.5E-16	1.1E-16	1.33E-16	0.71
	Thorium-230	5.8E-17	8.0E-17	7.3E-17	6.1E-17	6.80E-17	
	Radium-226	1.3E-16	6.5E-17	3.0E-17	6.7E-17	7.30E-17	
	Polonium-210	6.5E-15	3.8E-15	6.1E-15	5.2E-15	5.40E-15	

µCi/mL = microcuries per milliliter

5.0 Environmental Non-radiological Program Information

5.1 Meteorological Monitoring

DOE has installed two meteorological monitoring stations at the Moab site and two at or near the Crescent Junction site (see Figures 3 and 5, respectively). Meteorological monitoring is an important element in the design of environmental monitoring networks. Not only do these data enable DOE to monitor site-specific climatic conditions and events, they also provide a valuable resource for assessing impacts resulting from any unplanned release of airborne contamination.

Meteorological parameters monitored at the Moab and Crescent Junction sites include air temperature, relative humidity, solar radiation, wind speed, wind direction, and precipitation.

Table 7 summarizes 2012 meteorological data for temperature, wind speed, and precipitation for the Moab site; these data are similar to the Crescent Junction site.

Table 7. Meteorological Data Summary for the Moab Site for 2012

Month	Temperature (ºF)		Wind Speed (mph)		Precipitation (inches)
	Max Temp	Min Temp	Avg	Peak Gust	
January	62.3	12.0	2.4	33.9	0.20
February	65.3	21.6	3.2	34.2	0.40
March	83.8	23.9	4.8	44.9	0.16
April	94.4	31.4	4.8	51.3	0.49
May	96.7	44.9	5.2	54.5	0.00
June	106.7	53.2	4.8	41.4	0.00
July	105.1	63.2	4.4	41.0	0.57
August	104.7	59.5	3.5	45.0	0.81
September	96.8	48.8	3.2	16.7	0.23
October	90.4	28.5	3.0	41.5	0.73
November	75.3	22.9	2.4	37.8	0.11
December	65.0	7.0	3.4	28.5	0.65
Total Adjusted with Manual Gauge					**4.35**

Avg = average; °F = degrees Fahrenheit; max = maximum; min = minimum; mph = miles per hour; temp = temperature

6.0 Ground Water Protection Program

The ground water beneath the Moab site has been contaminated from former uranium-milling operations. Ammonia and uranium are the primary contaminants of concern. The Colorado River is protected through ground water extraction and freshwater injection along the riverbank. Additionally, when suitable habitat areas form, river water may be diverted into the backwater channel to reduce ammonia concentrations. Locations of select monitoring and extraction/injection wells at the Moab site are shown in Figure 6. The locations where surface water sampling was conducted during 2012 are shown in Figure 7. Monitoring results show that the contaminant plumes of ammonia and uranium did not expand in 2012.

6.1 Ground Water

Eight extraction wells and 10 injection wells were used to minimize contaminant discharge to the Colorado River in 2012. Samples were collected from the IA ground water system wells that operated during the year. Site-wide sampling was conducted in June and November/December. Ground water samples were analyzed for the site-related analytes, ammonia and uranium. In addition, dissolved oxygen, oxidation reduction potential, pH, specific conductance, temperature, and turbidity were measured in the field at all locations. Data results from sampling events are available on the Moab UMTRA Project website at www.gjem.energy.gov/moab.

Approximately 16.6 million gallons of ground water were extracted in 2012, with more than 54,600 lb of ammonia and 420 lb of uranium removed. A total of about 188.6 million gallons had

been extracted since initial implementation of the system through the end of 2012, including more than 756,600 lb of ammonia and 3,660 lb of uranium.

Approximately 8.6 million gallons of freshwater were injected in 2012. Injection occurred from mid-February through mid-June 2012 and again from mid-October through December 2012. The purpose of injection is to create a hydrologic barrier between the RRM pile and the backwater channels in the river.

6.2 Surface Water

The Colorado River is the principle surface water feature and forms the eastern boundary of the Moab site. Ammonia is of concern because of its toxicity to aquatic life. Surface water samples were collected for laboratory analysis at peak- flow and base-flow conditions in 2012. Samples were collected on site, upriver, and downriver (Figure 7). All ammonia concentrations associated with these surface water samples were below the acute Ambient Water Quality Criteria. With the exception of one sample collected from CR3, all samples were also below the chronic criteria (Table 8). The sample from location CR3, which exceeded the criteria, was not in a suitable habitat. A suitable habitat is characterized by fairly shallow, low-velocity, backwater channels that are closed off from the main channel on the upriver side that may develop between the peak spring runoff flow through September.

Table 8. Surface Water Locations with Ammonia Concentrations Compared to Ambient Water-quality Criteria During 2012

Location	Date	Ammonia Total as N (mg/L)	State/Federal AWQC – Acute Total as N (mg/L)	State/Federal AWQC – Chronic Total as N (mg/L)
0218	06/07/12	<0.1	2.14	0.67
0226	06/14/12	0.15	1.23	0.36
0228	06/14/12	<0.1	1.04	0.31
CR1	06/07/12	<0.1	2.59	0.91
CR2	06/07/12	<0.1	1.77	0.50
CR3	06/12/12	<0.68	2.14	0.59
CR5	06/07/12	<0.1	2.14	0.67
0218	11/27/12	<0.1	2.14	1.09
0226	12/05/12	<0.1	1.47	0.08
CR1	11/27/12	<0.1	3.15	1.52
CR2	11/28/12	<0.1	2.59	1.29
CR3	12/06/12	0.4	3.15	1.79
CR5	11/27/12	<0.1	2.14	1.09

AWQC = ambient water quality criteria; mg/L = milligrams per liter

7.0 Quality Assurance

The Project has a QA Program that provides a structured approach for the application of QA principles to work performed on the Project and which is based on applicable DOE orders and other federal requirements. The QA Program is implemented with contractor-specific plans, which ensure environmental data collected are valid and traceable.

Figure 6. Locations of Select Monitoring and Extraction/Injection Wells at the Moab Site

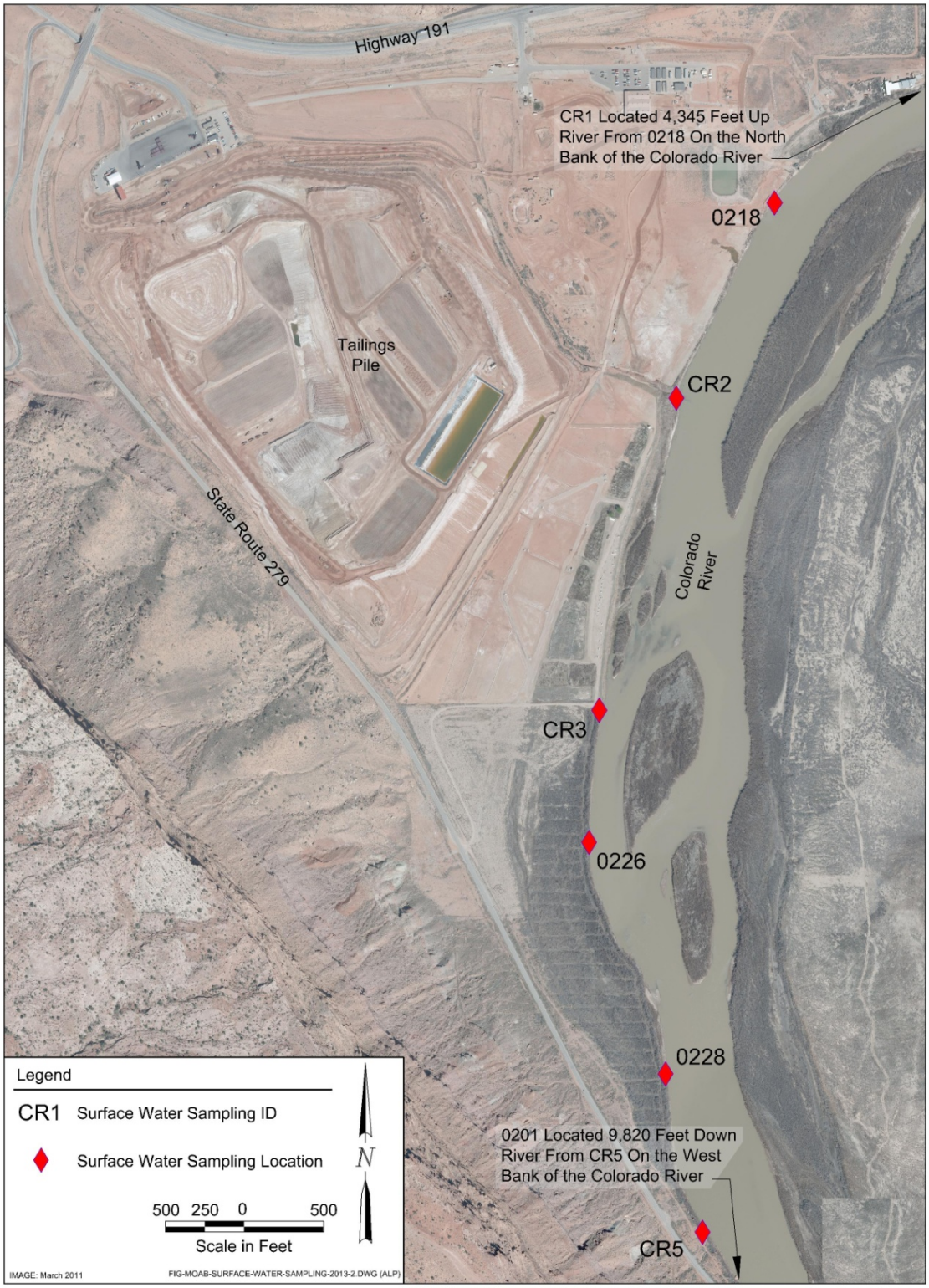

Figure 7. Surface Water Sampling Locations During 2012

7.1 Laboratory Analysis

The Project ensures the receipt of analytical data that meet Environmental Monitoring Program requirements by subcontracting analytical services to qualified laboratories. The subcontract laboratories are qualified under the Environmental Management Consolidated Audit Program, Utah Certification, and through participation in proficiency testing programs. The quality of the data received from the laboratories is evaluated through a formal data-validation process.

7.2 Records Management

Project records are created both on paper and electronically in a retrievable format. Electronically created records will be converted to paper before being transferred to a federal record center for long-term storage. Records are protected against deterioration, damage, and loss. Records generated in support of environmental monitoring are managed according to the *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545).

8.0 References

10 CFR 1021 (Code of Federal Regulations), "National Environmental Policy Act Implementing Procedures."

10 CFR 1022 (Code of Federal Regulations), "Compliance with Floodplain and Wetlands Environmental Review Requirements."

40 CFR 61 (Code of Federal Regulations), "National Emission Standards for Hazardous Air Pollutants."

40 CFR 192 (Code of Federal Regulations), "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

40 CFR 370.20(b) (Code of Federal Regulations), "SARA Tier II and MSDS Report Threshholds."

40 CFR 1500 (Code of Federal Regulations), "Purpose, Policy, and Mandate."

40 CFR 1507.3 (Code of Federal Regulations), "Council on Environmental Quality Agency Procedures."

7 USC 136 (United States Code), Federal Insecticide, Fungicide, and Rodenticide Act.

15 USC 2601 (United States Code), Toxic Substances Control Act.

16 USC 703 (United States Code), Migratory Bird Treaty Act.

16 USC 1531 (United States Code), Endangered Species Act.

42 USC 300f (United States Code), Safe Drinking Water Act.

42 USC 4321 (United States Code), National Environmental Policy Act.

42 USC 6901 (United States Code), Resource Conservation and Recovery Act.

42 USC 7401 (United States Code), Clean Air Act.

42 USC 7901 (United States Code), Uranium Mill Tailings Radiation Control Act.

42 USC 9601 (United States Code), Comprehensive Environmental Response, Compensation, and Liability Act.

42 USC 11000 (United States Code), Emergency Planning and Community Right-to-Know Act.

DOE (U.S. Department of Energy), *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (DOE/EIS-0198), December 1996.

DOE (U.S. Department of Energy), *Moab UMTRA Project Crescent Junction Site Fugitive Dust Control Plan* (DOE-EM/GJ1235), July 2006.

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DOE (U.S. Department of Energy), *Moab UMTRA Project Moab Project Site Fugitive Dust Control Plan* (DOE-EM/GJRAC2072), March 2002

DOE (U.S. Department of Energy), *Moab UMTRA Project Moab Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1475), December 2012.

DOE (U.S. Department of Energy), *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545), November 2012.

DOE (U.S. Department of Energy), *Moab UMTRA Project Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement* (DOE/EIS-0355), July 2005.

DOE (U.S. Department of Energy), *Moab UMTRA Project Site Sustainability Plan* (DOE-EM/GJ1952), November 2012.

DOE (U.S. Department of Energy), *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830), July 2012.

DOE (U.S. Department of Energy), *Moab UMTRA Project Waste Management Plan* (DOE-EM/GJ1633), July 2008.

DOE (U.S. Department of Energy), *Record of Decision for the Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah*, September 2005.

DOE (U.S. Department of Energy) Order 231.1B, “Environment, Safety, and Health Reporting.”

DOE (U.S. Department of Energy) Order 436.1, “Departmental Sustainability.”

DOE (U.S. Department of Energy) Order 458.1, Change 2, “Radiation Protection of the Public and the Environment.”

DOE (U.S. Department of Energy) Order 5400.5, Chapter III, “Derived Concentration Guides for Air and Water.”

Executive Order 11990, “Protection of Wetlands.”

Executive Order 11988, “Floodplain Management.”

Executive Order 12856, “Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements.”

Executive Order 13423, “Strengthening Federal Environmental, Energy, and Transportation Management.”

Executive Order 13514, “Federal Leadership in Environmental, Energy, and Economic Performance.”

International Organization for Standardization 14001, “Environmental Management. System”

Public Law 102-486, “Energy Policy Act of 1992.”

Public Law 106-398, “Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001.”

Public Law 109-58, Energy Policy Act of 2005.

Public Law 110-140, Energy Independence and Security Act of 2007.

Public Law 111-5, American Recovery and Reinvestment Act of 2009.

UAC R307-309-6 (Utah Administrative Code), “Fugitive Dust Control Plan.”

UAC R313-15-301 (Utah Administrative Code), “Standards for Protection Against Radiation, Dose Limits for Individual Members of the Public.”