DOE–EM/GJ2058

Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project Annual Site Environmental Report for Calendar Year 2011

September 2012

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

Edward B. Baker — 9-26-12
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In concurrence:

Donald R. Metzler — September 27, 2012
Moab Federal Project Director — Date

Revision History

Revision No.	Date	Reason/Basis for Revision
0	September 2012	Initial issue.

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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
EPA	U.S. Environmental Protection Agency
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
TLD	thermoluminescent dosimeter
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
USFWS	U.S. Fish and Wildlife Service

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 2011. This report includes Moab UMTRA Project activities conducted at either the Moab site located near Moab, Utah, or the Crescent Junction, Utah, 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 2011. Although several DOE orders referenced in this ASER have since been replaced or modified, this document was prepared pursuant to the orders that were contractually applicable during 2011. This report was prepared in accordance with the requirements of DOE Order (O) 231.1B, "Environment, Safety, and Health Reporting," DOE O 5400.5, "Radiation Protection of the Public and the Environment," and supplemental guidance from DOE Headquarters.

Major site activities in 2011 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 non-pile soils remediation, site management, security, maintenance, waste management, pollution prevention, and environmental compliance monitoring.

Major Site Activities for 2011

- Shipping and disposal of more than 1.9 million tons of RRM was performed; the total to date through December 2011 is 4.8 million tons.
- Construction of the second phase of the disposal cell was completed in December 2011, with more than 1.7 million cubic yards excavated. The final cell cover was placed on approximately 27 acres (two-thirds) of the first phase of the disposal cell.
- Approximately 9.8 million gallons of contaminated ground water was extracted and eliminated through evaporation, and 11 million gallons of freshwater was injected in wells along the Colorado River bank to reduce the contaminant discharge to the river.

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, airborne particulates, and exposure levels to direct gamma radiation. More than 300 radon and direct gamma samples and more than 700 radioparticulate samples were collected and analyzed in 2011.
- There were no radiological 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 12 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 one-third of the total RRM in compliance with 40 CFR 192. Also, approximately 178 million gallons of contaminated ground water has 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.
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.

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

Federal and State*	What it Covers	Status
Endangered Species Act and Migratory Bird Treaty Act	Protection of rare species of plants and animals and their habitat	The Project reviewed all work activities for potential impacts to threatened or endangered species, and protected migratory birds. Fish habitat was protected by interception of contaminated ground water.
NEPA	Project evaluation of environmental impacts	No additional NEPA action was performed in 2011.
National Historic Preservation Act	Project evaluation of impacts and mitigation to historic sites	No additional impacts or mitigation were noted in 2011. 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; NEPA = National Environmental Policy Act; 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 also may 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).

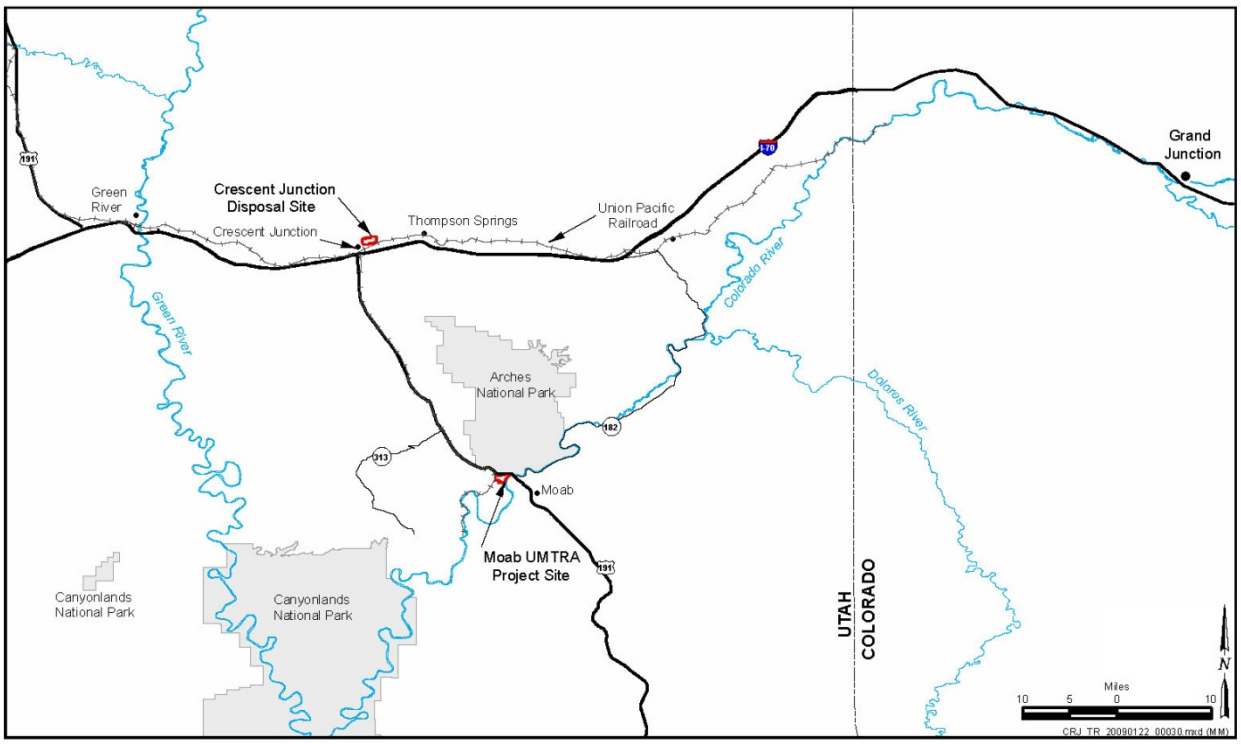

Figure 1. Location of Moab and Crescent Junction Sites

1.2 Site Locations

The Moab site is located about 3 miles northwest of the city 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.

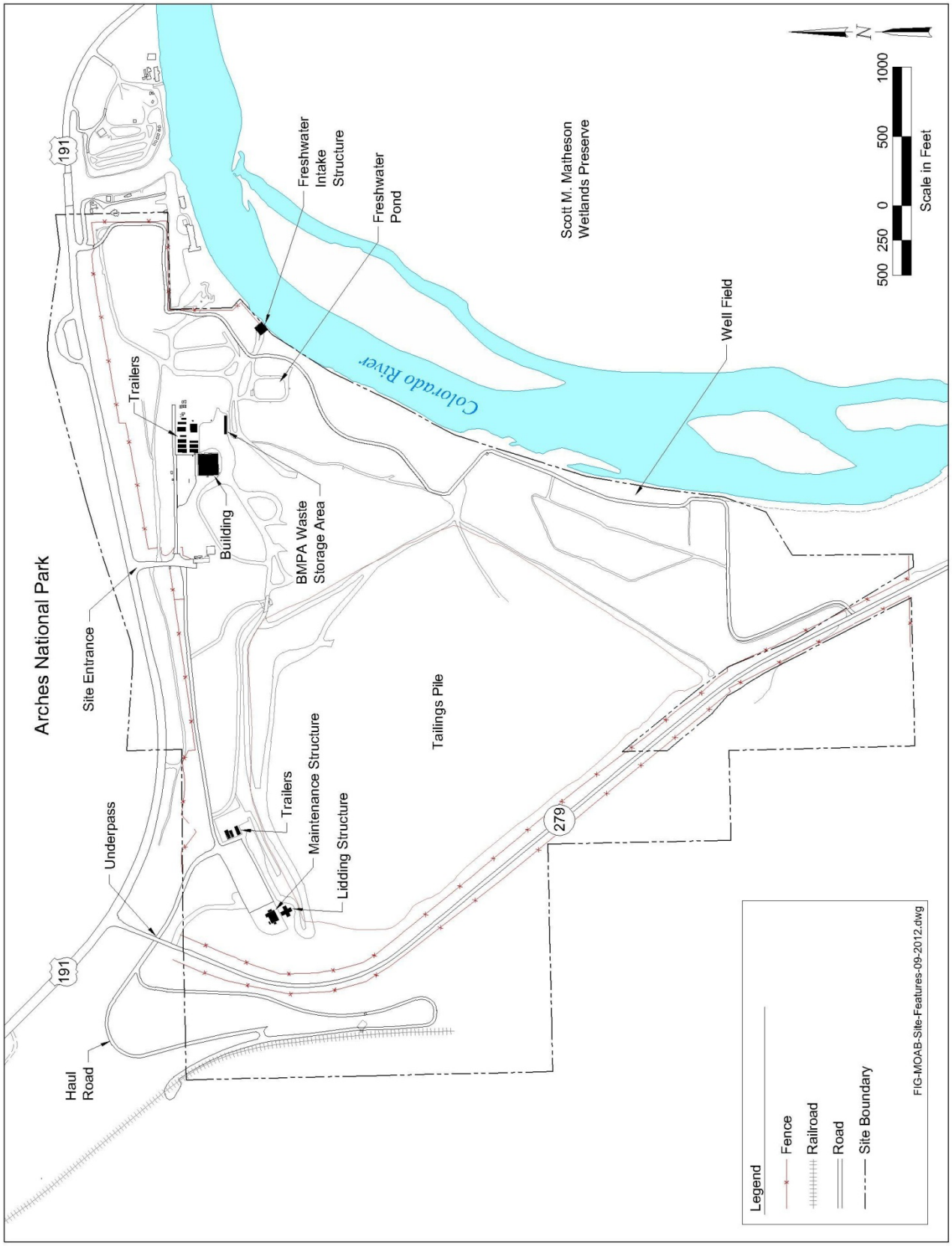

Figure 2. Moab Site Features

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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 uranium mill tailings. 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.

The Project is managed by the DOE Office of Environmental Management, located in Grand Junction, Colorado.

1.3 Area Demographics

Moab is the Grand County government seat and the principal city of southeastern Utah. The population of Moab is about 4,800. 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 8,500. 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 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 a 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 the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (EIS) (DOE/EIS-0198) to fulfill 42 USC 4321, the "National Environmental Policy Act" (NEPA) requirement of considering the full range of reasonable alternatives and associated environmental effects of significant federal actions. In July 2005, DOE published *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) (6450-01-P) 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" (Public Law 111-5) funding.

1.5 Primary Operations and Project Activities

Primary operations and Project activities include:

- Excavation and conditioning of uranium mill tailings and other contaminated materials for transport to the Crescent Junction site.
- Transport of the materials 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 a ground water IA system at the Moab site, including ground water extraction, freshwater injection, and operation of an evaporation pond.
- 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 2011 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 annual site environmental report 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 2011.

DOE Order 450.1A, Environmental Protection Program

DOE O 450.1A 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 by which DOE cost effectively meets or exceeds 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 program. Section 3.0 will provide details of the EMS program.

Superfund Amendments and Reauthorization Act/Executive Order 12856

The "Superfund Amendments and Reauthorization Act" (42 USC 9601), the "Emergency Planning and Community Right-to-Know Act of 1986" (42 USC 11000), and Executive Order 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 2011, three hazardous chemicals were stored at the Moab and Crescent Junction sites in amounts exceeding the threshold planning quantity as established in Section 312 of 42 USC 9601: 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 2011.

NEPA
Remedial actions performed pursuant to UMTRCA are considered to be 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 EIS to analyze 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 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 2011, site operations including the IA ground water remediation system 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 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 2011, 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." 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 at the Moab and Crescent Junction sites in 2011 to control noxious weeds.

2.1.2 Radiation Protection

DOE O 5400.5 is the key DOE order regarding radiation protection for the Project. The purpose of DOE O 5400.5 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) and assigned 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 96 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 and its implementing regulations, are the primary regulatory drivers for the Moab and Crescent Junction sites because RRM is the predominant waste. During 2011, RRM, in the form of contaminated soil and associated materials and contaminated ground water, were remediated and managed in accordance with EPA standards.

RRM may also be combined with hazardous or toxic components related to the milling process. 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 2011 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 at the Moab and Crescent Junction sites consists of exposed, unprotected soils and sand. Vegetation at the Moab site is relatively sparse and offers little protection or stabilization to the site's sandy 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* (GJO-2002-301-TAR) in 2002. In 2006, a similar plan, the *Moab UMTRA Project Crescent Junction Site Fugitive Dust Control Plan* (DOE-EM/GJ1235) was prepared for the disposal site.

During 2011, DOE diligently monitored fugitive dust emissions and implemented the controls outlined in the fugitive dust control plans to the greatest extent practicable. In 2011, DOE applied approximately five 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. Approximately 20 acres were revegetated in 2011, including off-pile remediated areas.

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 for 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 the UPDES during 2011.

There is no sewer effluent discharge points associated with Moab or Crescent Junction site operations. DOE installed on-site sewer collection 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. City 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).

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 United States Fish and Wildlife Service (USFWS) 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.

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 USFWS for use of the Colorado River water to meet Project needs.

Table 1. Permits/Agreements Active in 2011 for the Moab UMTRA Project

Permits/Agreements	Issuing Agency	No. of Permits
Moab UPDES Storm Water Discharge Permit (permit number UTR359185)	State of Utah, Department of Environmental Quality, Division of Water Quality	1
Crescent Junction UPDES Storm Water Discharge Permit (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
Water rights applications 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	3
Highway right-of-way encroachment permits to conduct surveys, perform remediation, and pipelines	State of Utah, U.S. DOT	8
Special Permit SP-14283 for DOE to transport RRM and party status for the Remedial Action Contract	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

As required by the BO, DOE developed a biota monitoring plan to evaluate Moab site-related impacts on fish. As necessary, DOE samples biota in accordance with the *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830). Due to above-average river flow in 2011, no suitable habitats formed adjacent to the IA well field; therefore, no biota samples were collected.

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 2011, an annual cultural resource inventory was performed at the Crescent Junction site for Indian 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 2011.

Migratory Bird Treaty Act
To ensure compliance with 16 USC 703, the "Migratory Bird Treaty Act," the presence of migratory birds in the Moab area was evaluated in the Biological Assessment. The BO concurred that the potential migratory bird species that may inhabit the Moab site area included the bald eagle (threatened), the southwestern willow flycatcher (endangered), and the yellow-billed cuckoo (candidate species).

Surveys were conducted to locate the southwestern willow flycatcher before vegetation removal. However, none were found to be present at the Moab site in 2011. No endangered, threatened, or candidate species have been noted on the Moab site.

At the Crescent Junction site, the burrowing owl, a Utah sensitive species, was identified as potentially present; however, none were observed in 2011. 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 Executive Order 11988, "Floodplain Management," for actions that may affect floodplains. Portions of the Moab site fall within the 100-year and 500-year floodplains as described in the *Moab UMTRA Project Floodplain and Wetlands Assessment for Additional Interim Actions at the Moab Project Site* (DOE-EM/GJ805).

Activities conducted in the floodplain during 2011 included soils remediation and 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 2011 to prevent transportation of sediment to the river. A joint U.S. Army Corps of Engineers (USACE) and Utah State 404 Permit (see Table 1) was obtained to remediate contaminated soil in the floodplain along the lower portion of the Moab Wash and along the Colorado River from the pump inlet to the Moab Wash; this remediation was completed in 2011.

Protection of Wetlands
DOE regulation 10 CFR 1022 implements the requirements of Executive Order 11990, "Protection of Wetlands," for actions that may affect wetlands. Jurisdictional wetlands were delineated at the Moab site in 2004 and verified by USACE in 2005.

Project activities performed in 2011 with the potential to affect jurisdictional wetlands included construction that disturbed upland soils, storm water controls, revegetation, and erosion control.

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 2011.

2.1.6 Executive Orders 13423 and 13514

Specific national goals related to improving energy, water, and fuel efficiency and using environmentally preferable products and services are stated in Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management."

In October 2009, the Secretary of Energy indicated that DOE would exceed the goals established in Executive Order 13423 by applying Leadership in Energy and Environmental Design criteria established by the United States Green Buildings Council. 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 Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," (see Table 2).

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 surveillances and management assessments in 2011 to verify system descriptions and compliance with internal procedures. Mitigation and compliance requirements in the BO and ROD are tracked for compliance.

2.3 Continuous Release Reporting

Not applicable to the Project.

2.4 Unplanned Releases

No unplanned releases occurred in 2011.

2.5 Summary of Permits

Table ES-1 shows the permits and agreements that were active for the Project during 2011.

Table 2. Summary of Selected Project DOE Environmental Management Sustainability Goals, Status, and Planned Actions and Contribution

DOE EM Goal	Performance Status	Planned Actions and Contribution
7.5% of annual electricity consumption from renewable sources by FY2013 and thereafter (5% FY2010 – FY2012).	The Project currently participates in the Blue Sky Renewable Energy Program by buying 10% renewable energy, thus exceeding the 7.5% DOE goal.	The Project plans to continue its commitment to participate in the Blue Sky Renewable Energy Program by buying 10% renewable energy, thus exceeding the 7.5% DOE goal.
Reduce fleet inventory by 35% within the next 3 years relative to an F2005 baseline.	The Project will have turned in four vehicles by the end of FY2012, meeting the 15% reduction goal for FY2012.	The Project plans to reduce its fleet by 10% in FY2013 and FY2014 to meet the requirement to reduce its fleet by 35% over the next 3 years.
13% Scope 3 greenhouse gas reduction by FY2020 from an FY2008 baseline.	FY2009 was the first operational year for the Project. After the American Recovery and Reinvestment Act funding was expended, Moab and Crescent Junction site operations were reduced to a single shift, 5 days per week for the remainder of 2011. As a result, Scope 3 commuter miles were reduced by 5%, and air travel was reduced by 20% when compared to FY2010.	Beginning in FY2012, it is expected that the Project will reduce its greenhouse gas emissions by 13% and will remain at those reduced levels through FY2020 due to funding reductions.
Divert at least 50% of non-hazardous solid waste, excluding construction and demolition debris, by FY2015.	There was no non-hazardous solid waste diverted with the exception of commonly recycled items (e.g., batteries, fluorescent light bulbs, aluminum cans, plastic bottles, paper).	Due to the remote location of the site, diversion options are not available.
Electronic Stewardship - 100% of eligible personal computers, laptops, and monitors with power management actively implemented and in use by FY2012.	All electronic purchases made in FY2011 met the requirements with the exception of five computer monitors.	The project will continue to replace existing electronic equipment with equipment that meets the sustainable procurement criteria as soon as it becomes available. Virtual servers will be the predominant server technology purchased in the future.

3.0 EMS

As with most federal agencies, DOE's EMS is based on the standard elements identified in International Organization for Standardization 14001, "Environmental Management System Standard." 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 450.1A, the *Moab UMTRA Project Environmental Management Program Manual* (DOE-EM/GJ1630) was issued in October 2011 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 2011, approximately 1,900 pounds (lb) of paper, 2,000 lb of plastic, 900 lb of aluminum cans, and 7,500 gallon 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 Technical Assistance Contractor 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.

3.2 Waste Management

During 2011, 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 the Project employees, public, and biota from the Project operations in 2011 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 "as low as reasonably achievable" (ALARA) process and generally should not exceed a dose constraint of one-quarter of the primary dose limit, or 25 mrem/hour. The dose received from airborne emissions of radionuclides is further restricted by the EPA) dose standard 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 3. The public and MEI receive only a background dose based on Project monitoring results.

Table 3. Moab Project Public Radiation Dose for 2011

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

4.1.1 Employee Monitoring Program

An Employee Monitoring Program is conducted to ensure safe working conditions are maintained and to limit exposures to ALARA levels. On-site radiation readings are higher than off-site locations; therefore, the CA workers represent the highest potentially exposed individuals.

External radiation monitoring of employees who enter the CA is performed using a thermoluminescent dosimeter (TLD) that is analyzed quarterly. Personal electronic dosimeters are also used to give real-time monitoring of the workers in the CA.

The TLD monitoring results were well below the ALARA goal of 700 mrem/yr in 2011. The highest individual radiological worker dose was 348 mrem/yr in 2011, compared to 271 mrem/yr in 2010.

The Project's ALARA goal for individual exposure includes external and internal exposure. This goal is very conservative when compared to the DOE exposure limit of 2,000 mrem/yr and the NRC limit of 5,000 mrem/yr. Radiation exposure results to date indicate that with proper personal protective equipment and by limiting the exposure period, employees can safely work inside the CA. Employees will continue to be carefully monitored to ensure safe working conditions are maintained.

4.2 Clearance of Property Containing RRM

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 early 2011, DOE completed remediation on a 17-acre off-pile area north of the Moab Wash.

4.3 Radiation Protection of Biota

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

DOE O 5400.5 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 or discharges in 2011.

4.5 Environmental Radiological Monitoring

Radiological protection is provided 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.

During 2002, DOE initiated environmental air monitoring at the Moab site to assess the potential for radiation dose to members of the public that could result from site operations and to demonstrate compliance with applicable radon concentration guidelines established by DOE O 5400.5.
In late 2005, air monitoring was also initiated at the Crescent Junction site to collect baseline data before disposal operations began in April 2009.

Table 4. 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
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
0126	Private property (~¼-mile south of millsite)	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 North East property boundary	Rn, G
Crescent Junction Locations		
0305	Crescent Junction off-site locations	Rn, G
0301, 0302, 0303, 0304	Crescent Junction on-site locations	Rn, G
MEI (0306)	Residence (~½-mile south of disposal cell) (0306)	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.

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 such that 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 4 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 such that 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 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 to be 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 2011, DOE continued its environmental air monitoring program at the Moab and Crescent Junction sites 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 5400.5 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 pile and placement in the disposal cell are ongoing.

DOE O 5400.5 established an indoor guideline for radon-222 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 2011, atmospheric radon was measured at 36 locations (19 on site, 15 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 5.

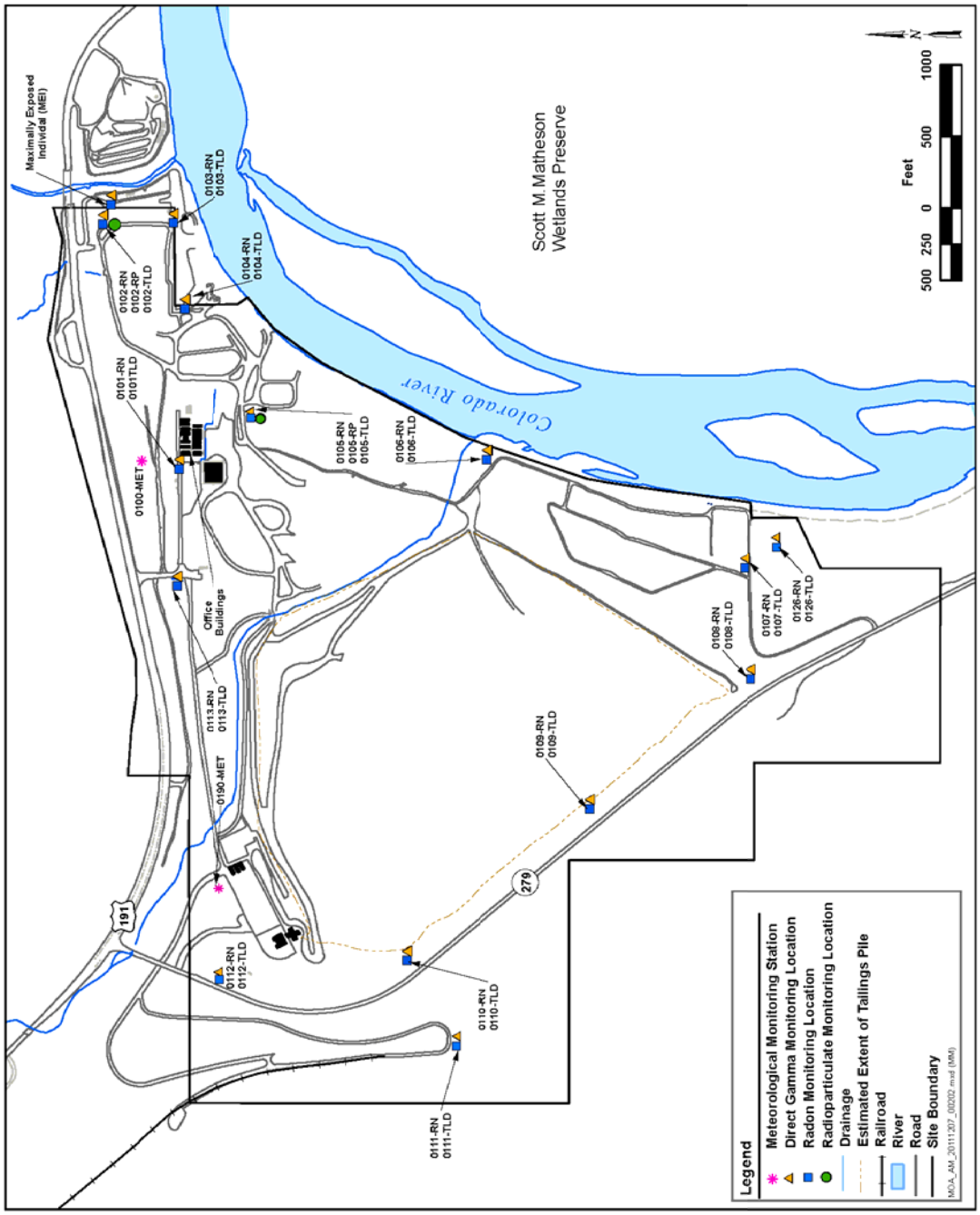

Figure 3. Moab On-Site and MEI Environmental Air Monitoring Locations

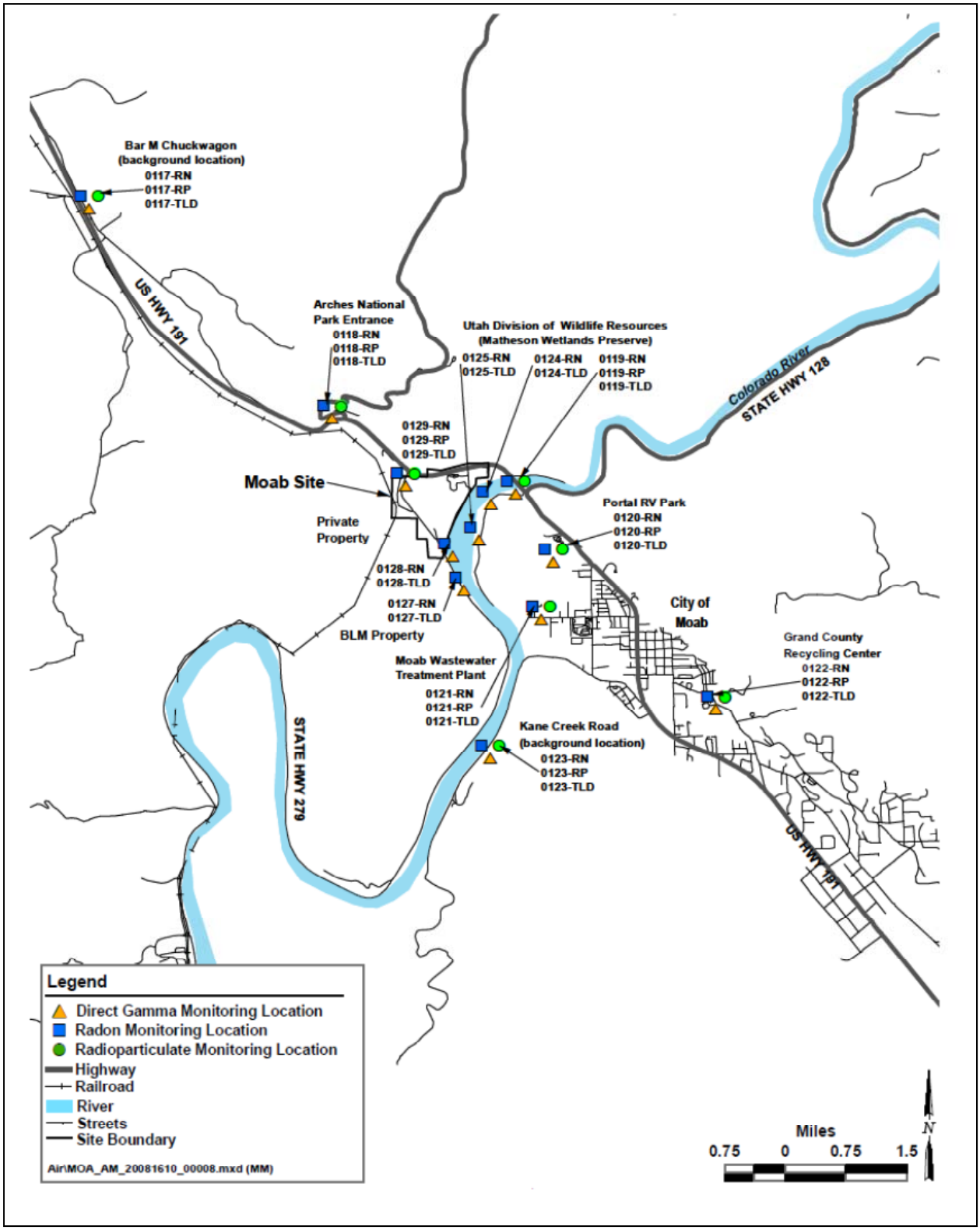

Figure 4. Moab Off-Site Environmental Air Monitoring Locations

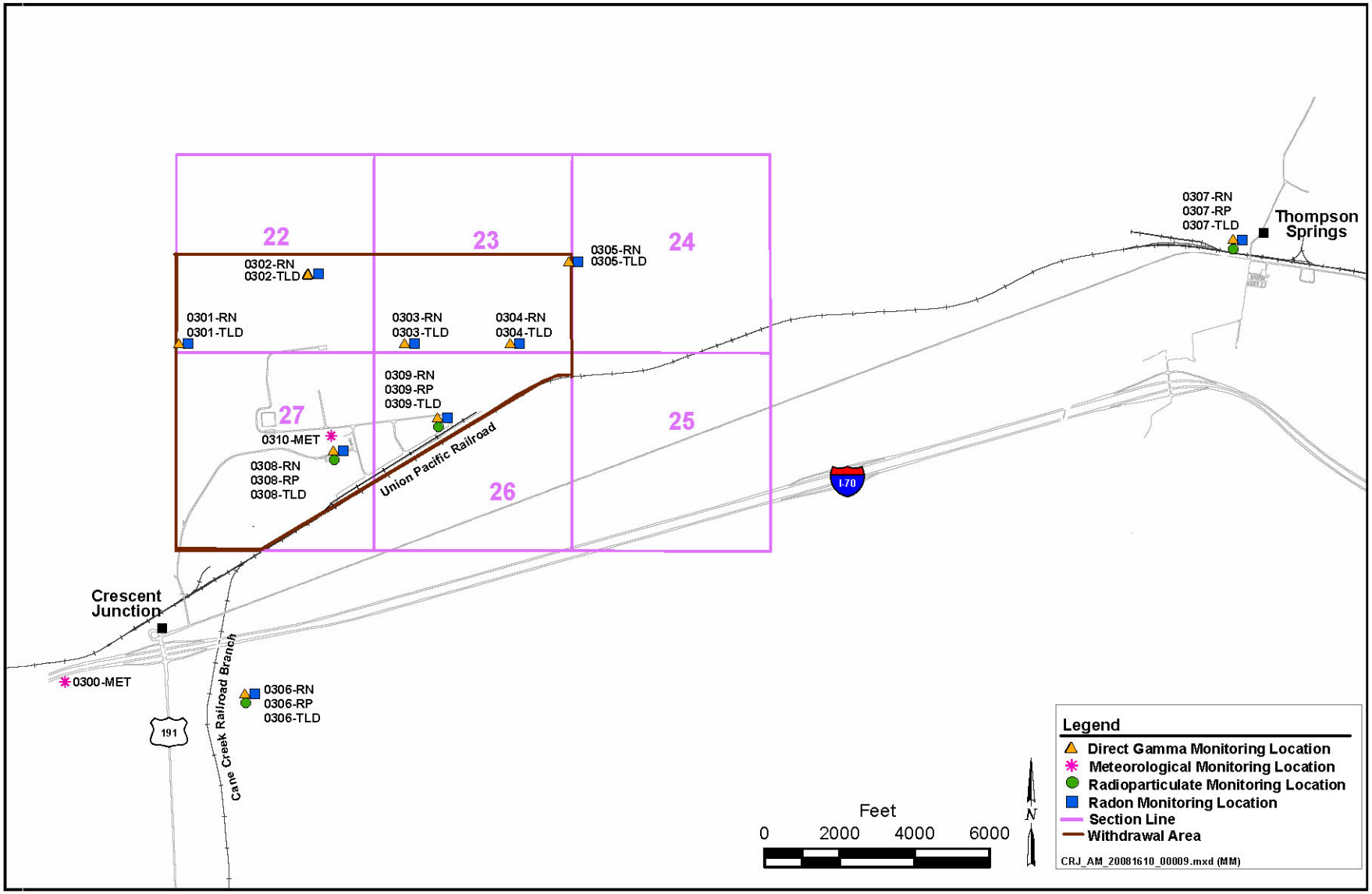

Figure 5. Crescent Junction Site Environmental Air Monitoring Locations

Table 5. Summary of Atmospheric Radon and Gamma Monitoring Data for the Moab and Crescent Junction Sites for 2011

Station Number	1st Quarter 2011		2nd Quarter 2011		3rd Quarter 2011		4th Quarter 2011		2011 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*	Radon pCi/L	Gamma mrem/91 d*
On-Site Locations										
0101	1.8	36.3	0.7	32.0	1.9	37.8	2.6	37.9	1.8	144
0102	0.7	25.6	0.6	23.1	0.5	23.2	1.5	27.7	0.83	99.6
0103	1.0	26.2	0.5	21.5	0.7	24.0	1.8	26.2	1	97.9
0104	1.4	29.2	NDA	25.5	0.9	28.3	2.8	30.6	1.7	113.6
0105	1.4	25.9	2.0	25.4	1.3	24.4	2.8	28.4	1.9	104.1
0106	2.8	36.9	1.4	34.6	1.8	35.7	3.9	41.8	2.5	149
0107	1.9	30.0	1.4	28.8	1.6	27.9	4	34.7	2.2	121.4
0108	1.4	40.6	1.6	40.0	2.7	40.0	3.8	47.6	2.3	168.2
0109	1.0	119.2	3.9	144.9	2.8	*157.1*	*2.9*	169.4	2.7	590.6
0110	1.2	85.7	1.2	81.2	1.2	94.4	2	89.4	1.4	350.7
0111	0.7	37.5	1.1	32.8	1.0	38.5	1	35.2	1	144
0112	1.0	46.5	1.2	43.5	1.8	48.3	2.3	49.8	1.6	188.1
0113	1.9	30.2	1.7	30.6	2.4	29.0	3.4	33.7	2.4	123.5
0301	0.7	24.7	0.5	26.9	<0.4	19.9	0.9	24.7	0.6	96.2
0302	0.7	23.0	0.6	29.9	0.5	21.1	1.0	25.7	0.7	99.7
0303	0.4	24.8	0.6	30.0	0.4	23.2	0.8	28	0.6	104
0304	0.7	26.5	0.7	28.1	0.8	24.6	0.6	25.6	0.7	104.8
0308	0.8	21.9	1.1	28.5	1.7	20.7	1.6	25.4	1.3	96.5
0309	0.7	22.7	0.8	29.3	0.5	20.8	1.2	27.0	0.8	99.8
Off-Site Locations										
0117	<0.3	24.3	0.4	21.3	0.4	23.6	0.4	23.8	0.4	93
0118	0.4	23.1	0.4	21.8	0.4	20.8	0.8	24.7	0.5	90.4
0119	0.6	23.2	0.3	22.4	0.5	19.1	1.0	25.6	0.6	90.3
0120	0.3	21.9	<0.3	22.1	<0.4	18.8	0.7	24.9	0.4	87.7
0121	0.6	24.1	0.4	21.0	0.4	20.0	0.5	24.3	0.5	89.4
0122	<0.3	22.8	<0.3	18.6	<0.4	19.7	0.4	22.2	0.4	83.3
0123	<0.3	23.0	<0.3	19.2	<0.4	20.1	0.5	21.7	0.4	84
0124	0.9	26.3	0.6	25.7	0.4	23.4	1.4	30.0	0.8	105.4
0125	1.2	30.1	1.0	29.3	0.9	27.4	1.8	33.5	1.2	120.3
0126	1.2	27.3	0.7	22.7	1.1	24.6	2.7	29.5	1.4	104.1
0127	0.7	26.7	0.3	23.8	0.4	23.3	1.2	27.4	0.7	101.2
0128	1.5	28.1	1.3	22.1	1.0	25.5	3.0	27.5	1.7	103.2
0129	1.1	26.8	1.0	25.5	1.8	24.9	2.0	29.2	1.5	106.4
MEI (Moab)	<0.3	23.0	0.4	19.2	0.8	19.4	1.5	22.3	0.8	88.8
0305	0.4	26.8	0.6	30.2	0.4	25.9	1.0	27.3	0.6	110.2
MEI (CJ)	0.4	26.4	0.4	30.0	<0.4	23.9	0.6	27.5	0.5	107.8
0307	0.5	27.0	0.3	32.2	<0.4	24.6	1.0	28.3	0.6	112.1

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

During 2011, the atmospheric radon concentration did not exceed the annual guideline at any location. Elevated winter time radon concentration was noted at four Moab on-site locations (station numbers 106, 107, 108, and 109) on vacant land (Table 5). 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 2011 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 stored at the Moab site are not affecting the general population.

4.5.2 Direct Gamma Radiation

The RRM stockpiled 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 5400.5. 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 (and DOE contractors) with respect to protection of members of the public and environment against undue risk from radiation.

DOE O 5400.5 establishes a 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 2011, direct gamma radiation was measured at 36 locations (19 on site, 15 off site, and two MEI) using TLDs that are exposed for a period of approximately 3 months (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 5.

During 2011, direct gamma radiation measurements exceeded the DOE annual guideline at three on-site locations (0109, 0110, and 0112); this is not unexpected due to the large volume of uranium RRM stockpiled at the Moab site and their associated gamma activity. There were no exceedances at the Crescent Junction site. The total gamma radiation dose at the MEI locations was 88.8 mrem/yr and 107.8 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

Collection of radioparticulate data are of particular interest to DOE because this data provide information relative to the dose that the public may be receiving from the inhalation of radioactive particulate matter. In 2011, air samplers operated continuously at four on-site locations, and 10 off-site locations at Moab and Crescent Junction, including the Moab and Crescent Junction 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 radium-226, thorium-230, polonium-210, and total uranium.

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 6.

The 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 2011 (see Table 6). 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. DOE O 5400.5 also requires that the radiological dose resulting from the airborne emissions at each location is less than 10 mrem/yr, and Table 7 shows that the annual dose at each location was lower than this airborne limit.

Table 6. Summary of DCGs for Inhaled Air Radionuclides Monitored at the Moab and Crescent Junction Sites for 2011

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

E = numerical value is to be multiplied by exponent (1.8E-4 =n 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 2). It measures approximately 14 feet 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.

Table 7. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2011

Moab Station Number	Isotope	1st Quarter 2011 (µCi/mL)	2nd Quarter 2011 (µCi/mL)	3rd Quarter 2011 (µCi/mL)	4th Quarter 2011 (µCi/mL)	Annual Average (µCi/mL)	Annual 2011 Dose mrem/yr
On-Site Locations							
0102-RP	Uranium	1.8E-16	2.30E-16	1.5E-16	1.20E-16	1.7E-16	1.19
	Thorium-230	2.8E-16	2.40E-16	2.2E-16	1.30E-16	2.2E-16	
	Radium-226	1.2E-16	9.10E-17	6.4E-17	6.20E-17	8.4E-17	
	Polonium-210	1.1E-14	9.10E-17	4.8E-15	9.10E-15	6.20E-15	
0105-RP	Uranium	4.2E-16	4.90E-16	3.0E-16	1.8E-16	3.5E-16	2.59
	Thorium-230	1.0E-15	9.00E-16	5.8E-16	3.0E-16	7.00E-16	
	Radium-226	2.5E-16	5.80E-16	3.0E-16	1.2E-16	3.1E-16	
	Polonium-210	1.1E-14	5.50E-15	5.9E-15	9.9E-15	8.2E-15	
Off-Site Locations							
0117-RP	Uranium	9.6E-17	1.70E-16	1.3E-16	1.5E-16	1.4E-16	0.80
	Thorium-230	6.5E-17	8.50E-17	6.8E-17	3.7E-17	6.4E-17	
	Radium-226	6.8E-17	1.20E-16	5.6E-17	4.0E-17	7.2E-17	
	Polonium-210	9.6E-15	4.50E-15	4.4E-15	6.5E-15	6.2E-15	
0118-RP	Uranium	1.6E-16	2.50E-16	1.6E-16	1.1E-16	1.7E-16	1.72
	Thorium-230	2.9E-16	7.00E-16	4.3E-16	1.6E-16	3.9E-16	
	Radium-226	2.2E-16	4.80E-16	2.8E-16	1.2E-16	2.7E-16	
	Polonium-210	1.1E-14	5.20E-15	4.7E-15	7.1E-15	7.0E-15	
0119-RP	Uranium	1.5E-16	1.70E-16	1.4E-16	1.3E-16	1.5E-16	1.09
	Thorium-230	1.7E-16	1.70E-16	1.9E-16	9.4E-17	1.6E-16	
	Radium-226	1.3E-16	2.10E-16	1.3E-16	2.0E-17	1.2E-16	
	Polonium-210	1.0E-14	4.80E-15	4.5E-15	8.0E-15	6.80E-15	
0120-RP	Uranium	1.4E-16	1.80E-16	1.5E-16	1.1E-16	1.5E-16	0.89
	Thorium-230	9.6E-17	1.70E-16	1.3E-16	6.7E-17	1.1E-16	
	Radium-226	1.1E-16	7.20E-17	2.1E-16	5.0E-17	1.1E-16	
	Polonium-210	9.3E-15	4.00E-15	3.6E-15	6.2E-15	5.8E-15	
0121-RP	Uranium	1.30E-16	1.70E-16	1.3E-16	1.1E-16	1.4E-16	1.01
	Thorium-230	1.5E-16	1.80E-16	1.7E-16	7.0E-17	1.4E-16	
	Radium-226	7.6E-17	1.40E-16	4.6E-17	9.5E-17	9.0E-17	
	Polonium-210	9.6E-15	4.60E-15	4.2E-15	7.0E-15	6.3E-15	
0122-RP	Uranium	1.2E-16	1.50E-16	1.4E-16	1.0E-16	1.3E-16	0.83
	Thorium-230	7.2E-17	1.20E-16	1.6E-16	4.0E-17	9.80E-17	
	Radium-226	1.9E-16	1.90E-16	1.1E-16	1.2E-16	1.5E-16	
	Polonium-210	7.2E-15	4.50E-15	4.4E-15	6.4E-15	5.6E-15	
0123-RP	Uranium	1.2E-16	1.60E-16	1.2E-16	9.6E-17	1.2E-16	0.92
	Thorium-230	6.9E-17	1.50E-16	9.9E-17	3.1E-17	8.8E-17	
	Radium-226	7.5E-17	1.30E-16	1.8E-16	4.6E-17	1.1E-16	
	Polonium-210	1.0E-14	5.00E-15	4.5E-15	7.8E-15	6.9E-15	

Table 7. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2011 (continued)

Moab Station Number	Isotope	1st Quarter 2011 (µCi/mL)	2nd Quarter 2011 (µCi/mL)	3rd Quarter 2011 (µCi/mL)	4th Quarter 2011 (µCi/mL)	Annual Average (µCi/mL)	Annual 2011 Dose mrem/yr
Off-Site Locations *(continued)*							
0129-RP	Uranium	3.2E-16	5.20E-16	4.2E-16	2.3E-16	3.7E-16	4.56
	Thorium-230	8.7E-16	2.30E-15	1.9E-15	7.9E-16	1.5E-15	
	Radium-226	5.3E-16	2.60E-15	6.7E-16	5.3E-17	9.6E-16	
	Polonium-210	8.6E-15	6.30E-15	6.9E-15	9.4E-15	7.8E-15	
Crescent Junction Station Number	**Isotope**	**1st Quarter 2011 (µCi/mL)**	**2nd Quarter 2011 (µCi/mL)**	**3rd Quarter 2011 (µCi/mL)**	**4th Quarter 2011 (µCi/mL)**	**Annual Average (µCi/mL)**	**Annual 2011 Dose mrem/yr**
On-Site Locations							
0308-RP	Uranium	4.2E-16	6.10E-16	1.7E-16	1.5E-16	3.4E-16	0.82
	Thorium-230	1.3E-15	2.80E-15	4.8E-16	2.7E-16	1.2E-15	
	Radium-226	6.8E-16	2.60E-15	2.8E-16	1.1E-16	9.2E-16	
	Polonium-210	9.5E-15	8.20E-15	4.6E-15	6.7E-15	7.2E-15	
0309-RP	Uranium	1.7E-16	2.60E-16	1.3E-16	1.1E-16	1.7E-16	0.74
	Thorium-230	3.0E-16	8.40E-16	2.3E-16	1.0E-16	3.7E-16	
	Radium-226	1.4E-16	6.70E-16	4.9E-17	9.8E-17	2.4E-16	
	Polonium-210	8.1E-15	5.30E-15	4.2E-15	7.1E-15	6.2E-15	
Off-Site Locations							
MEI (0306-RP)	Uranium	1.1E-16	1.20E-16	1.1E-16	8.1E-17	1.0E-16	3.86
	Thorium-230	8.5E-17	1.10E-16	4.6E-17	4.6E-17	7.1E-17	
	Radium-226	1.3E-16	1.50E-16	4.8E-17	8.6E-17	1.0E-16	
	Polonium-210	8.9E-15	5.10E-15	4.2E-15	6.8E-15	6.2E-15	
0307-RP	Uranium	1.1E-16	1.40E-16	1.2E-16	7.7E-17	1.1E-16	1.57
	Thorium-230	5.8E-17	1.00E-16	1.1E-16	4.0E-17	7.7E-17	
	Radium-226	3.8E-17	9.50E-17	9.0E-17	2.9E-17	6.3E-17	
	Polonium-210	8.0E-15	4.10E-15	3.6E-15	5.9E-15	5.4E-15	

µCi/mL = microcuries per milliliter

4.7 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 primarily achieve source reduction by using work practices that minimize the amount of radioactive waste that is generated. The ALARA principle is emphasized to keep materials from becoming radioactively contaminated. An example of source reduction at the Project sites during 2011 was the use of a non-hazardous, environmentally friendly product to wash greasy engine parts and equipment instead of the hazardous chemical solvents that are typically used for such purposes.

Using administrative controls, such as establishing radioactive materials areas, limiting the use of materials in the CA (especially hazardous materials such as chemicals), and segregating radioactive waste from non-radioactive waste, reduces the volume of radioactive waste generated. Certain materials that must be taken into the CA can be protected from becoming radioactively contaminated. Decontamination is performed if warranted, feasible, and cost-effective.

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 8 summarizes 2011 meteorological data for temperature, wind speed, and precipitation for the Moab site; these data are similar to the Crescent Junction site.

Table 8. Meteorological Data Summary for the Moab Site for 2011

Month	Temperature (degrees F)		Wind Speed (mph)		Precipitation* (inches)
	Max Temp.	Min Temp.	Avg.	Peak Gust	
January	55.3	-2.2	2.0	26.0	0.10
February	64.5	6.3	4.2	45.0	0.23
March	76.6	28.6	4.2	44.5	0.14
April	82.3	30.6	5.5	53.3	1.02
May	89.0	37.3	5.0	54.8	0.92
June	102.4	47.7	4.6	50.1	0.42
July	105.5	61.9	3.9	44.1	1.60
August	106.5	60.8	3.5	51.4	0.35
September	98.0	49.3	3.2	47.2	0.54
October	89.8	30.8	3.1	45.6	0.64
November	69.9	23.9	3.5	43.2	0.69
December	51.4	14.2	2.3	32.3	0.55
***Total Adjusted with Manual Gauge**					**7.20**

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, and, due to naturally high salinity, the ground water at and in the vicinity of the site is not usable. Ammonia and uranium are the primary contaminants of concern. The Colorado River is protected through an IA system, which includes ground water extraction near the toe of the RRM pile, 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 2011 are shown in Figure 7. Monitoring results show that the contaminant plumes of ammonia and uranium did not expand in 2011.

6.1 Ground Water

Eight extraction wells and 10 injection wells were used to minimize contaminant discharge to the Colorado River in 2011. Samples were collected from the IA ground water system wells that operated during the year. Site-wide sampling was conducted in May and November.

Approximately 9.8 million gallons of ground water was extracted in 2011, with 37,625 lb of ammonia and 230 lbs of uranium removed. A total of about 172 million gallons had been extracted since initial implementation of the system through the end of 2011, including more than 700,000 lb of ammonia and 3,235 lb of uranium. Approximately 11 million gallons of freshwater was injected in 2011. Injection occurred from March until early May 2011 and again from August until December 2011. The purpose of injection is to create a hydrologic barrier between the RRM pile and the backwater channels in the river. With the above-average spring runoff, injection was not necessary from May through August when the river water flooded the well field.

Ground water samples were analyzed for the site-related analytes ammonia, uranium, and total dissolved solids. Samples from a few selected locations were also analyzed for selenium and copper. 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.

6.2 Surface Water

The Colorado River is the principle surface water feature and forms the eastern boundary of the Moab site. A suitable habitat is characterized by fairly shallow, low-velocity backwater channels that are closed off from the main channel on the upriver side. Ammonia is of concern because of its toxicity to aquatic life. A suitable habitat area did not form adjacent to the site in 2011 because of the above-average river flow that lasted from May until December. Surface water samples were collected at peak flow and base flow conditions in 2011, and all ammonia sample results were below the acute and chronic criteria (Table 9). The samples were collected on site, upriver, and downriver (Figure 7).

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

Figure 7. 2011 Surface Water Sampling Locations

Table 9. Surface Water Locations with Ammonia Concentrations Compared to Ambient Water Quality Criteria During 2011

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)
0274	7/13/11	0.021	14.4	2.86
CR1	7/13/11	0.1	17.0	3.18
CR5	7/13/11	0.1	10.1	2.24
0201	12/7/11	0.1	9.65	3.58
0218	12/7/11	0.1	11.4	3.98
0228	12/8/11	0.17	5.62	2.43
CR1	12/7/11	0.1	3.15	1.52
CR3	12/8/11	0.1	5.62	2.43
CR5	12/7/11	0.1	11.4	3.98

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

7.0 QA

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.

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 subject to the requirements of 36 CFR 1220-1234, "Federal Records; General," and 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."

36 CFR 1220-1234 (Code of Federal Regulations), "Federal Records; General."

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 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."

33 USC 1251 (United States Code), "Clean Water 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), "Superfund Amendments and Reauthorization Act."

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

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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 Moab Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1475), February 2012.

DOE (U.S. Department of Energy). *Moab UMTRA Project Site Sustainability Plan* (DOE-EM/GJ1952), January 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* (6450-01-P), September 2005.

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

DOE (U.S. Department of Energy) Order 450.1A, "Environmental Protection Program."

DOE (U.S. Department of Energy) Order 5400.5, "Radiation Protection of the Public and the Environment."

"American Recovery and Reinvestment Act" (Public Law 111-5).

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."

Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Public Law 106-398).

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