DOE–EM/GJRAC2209

Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project
Annual Site Environmental Report for Calendar Year 2015

Revision 0

September 2016

U.S. Department of Energy

Office of Environmental Management

Prepared by the Remedial Action Contractor under contract number DE-DT0002936
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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Review and Approval

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Revision History

Revision Number	Date	Reason for Revision
0	September 2016	Initial issue.

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Acronyms and Abbreviations

ACM	asbestos-containing material
ALARA	as low as reasonably achievable
ASER	Annual Site Environmental Report
BLM	Bureau of Land Management
BO	Biological Opinion
CA	Contamination Area
CFR	Code of Federal Regulations
DCS	derived concentration standard
DOE	U.S. Department of Energy
DOE O	DOE Order
EMS	Environmental Management System
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
IA	interim action
ISMS	Integrated Safety Management System
lb	pounds
MEI	maximally exposed individual
mg/L	milligrams per liter
mrem	millirems
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
RAC	Remedial Action Contractor
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
UDOT	Utah Department of Transportation
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
yr	year

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 2015. This report includes 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 summarizes results of monitoring data and compliance information for 2015. This report was prepared in accordance with the requirements of DOE Order (O) 231.1B Admin Chg 1, "Environment, Safety and Health Reporting," DOE O 458.1 Admin Chg 3, "Radiation Protection of the Public and the Environment," and supplemental guidance from DOE Headquarters.

Major site activities in 2015 included 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 mitigative measures to address the rockfall on November 18, 2014, site maintenance, waste management, pollution prevention, and environmental compliance monitoring.

Major Site Activities for 2015

- Shipping and disposal of about 651,540 tons of RRM were performed; the total to date through December 2015 was more than 7.96 million tons shipped.
- In the fall of 2015, a ditch and concrete block wall were constructed on the southern end of the rail bench at the Moab site to protect workers from potential rockfalls.
- Due to significant corrosion on the inside of container sidewalls from the RRM, a major effort was initiated late in the year to weld steel panels over thinning ones on the outside of containers.
- Approximately 10.5 million gallons of contaminated ground water were extracted, and about 27,810 pounds (lb) of ammonia and 230 lb of uranium were eliminated through evaporation on the tailings pile. Approximately 6.9 million gallons of freshwater were injected in wells along the Colorado River to further reduce the contaminant impacts on the river.
- Operations were conducted without a recordable injury, 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 and 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 2015. There were no unplanned radiological releases, and doses to the public and maximally exposed individuals (MEIs) were below DOE limits.

EMS

DOE established a series of orders directing each DOE site to implement sound stewardship practices that protect natural and cultural resources. These orders require 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 minimize wastes. DOE's EMS integrates key elements into the core functions of the contractors' Integrated Safety Management System (ISMS) 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 or 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 control permits 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 (renewed in 2015) and by USACE through Section 404 Permits. The Project sites are designated 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 promulgated in 40 CFR 192.	DOE has excavated and disposed of approximately 50 percent of the total RRM in compliance with 40 CFR 192. Also, almost 228 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.
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 local emergency response departments.

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

Federal or State Requirement*	What it Covers	Implementation Status
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. Critical fish habitat was protected by interception of contaminated ground water and injection of freshwater in wells near the Colorado River.
NEPA	Project evaluation of environmental impacts.	The Project prepared a Supplement Analysis in 2015 to evaluate information in the FEIS in light of new rockfall analyses and determined that the FEIS remains adequate to continue rail operations.
Hazardous Waste	RRM is covered under UMTRCA and used oil, batteries, fluorescent bulbs, and ballasts under state regulations.	No hazardous waste was generated in 2015, used oil was recycled, and fluorescent bulbs and batteries were treated as universal waste.
National Historic Preservation Act	Project evaluation of impacts on and mitigation of historic sites.	No impacts or mitigation were noted in 2015. 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; FEIS = Final Environmental Impact Statement; NEPA = National Environmental Policy Act; UMTRCA = Uranium Mill Tailings Radiation Control Act; USACE = U.S. Army Corps of Engineers

40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings"
*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* and in the public reading room in the Grand County Library in 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 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 Scope

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

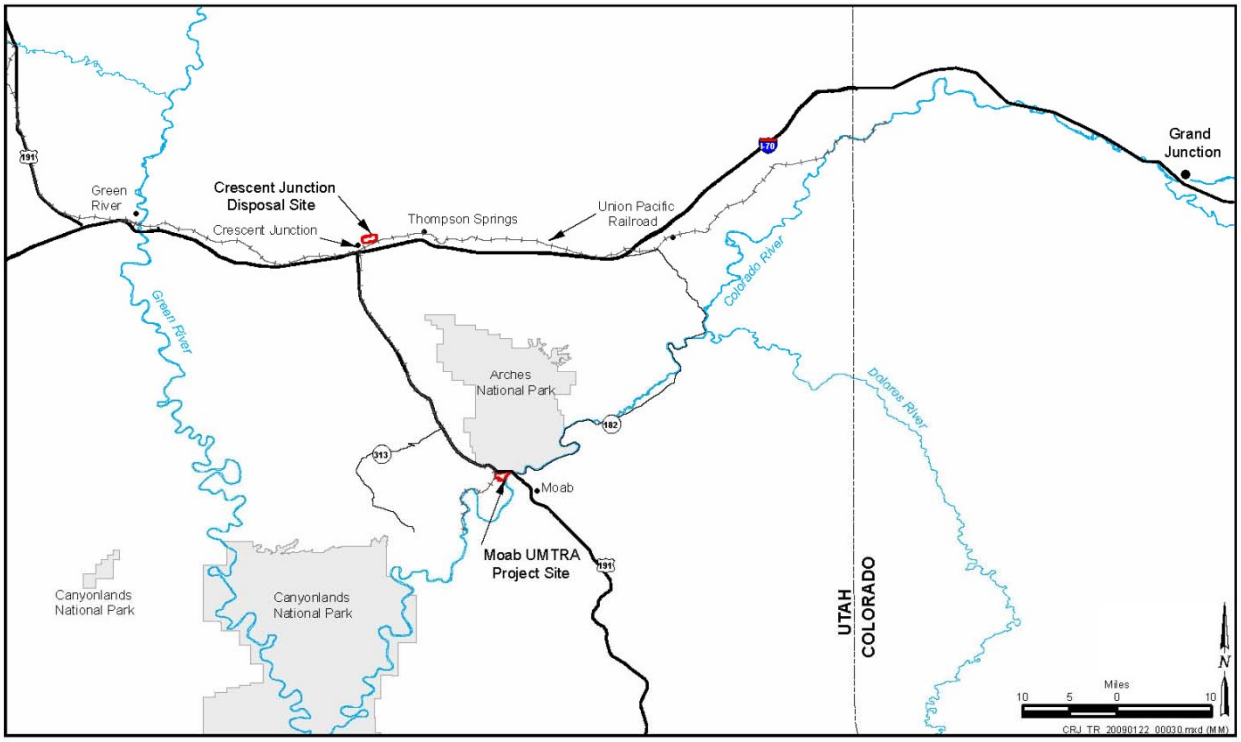

Figure 1. Location of Moab and Crescent Junction Sites

1.2 Site Locations

The Moab site is located about 3 miles northwest of Moab in Grand County 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. 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 north 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.

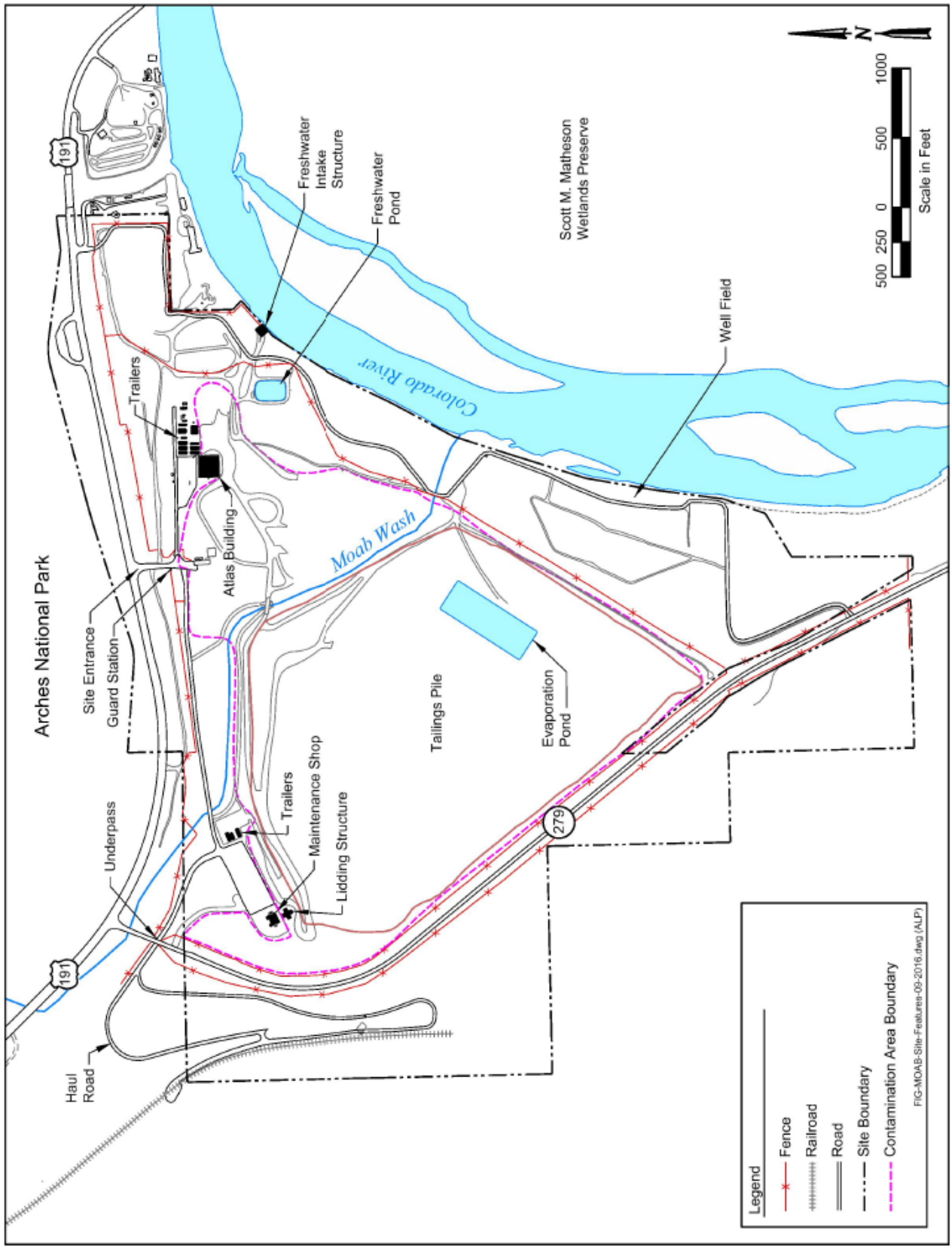

Figure 2. Moab Site Features

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 it 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 (beginning in 2009) withdrawal near Crescent Junction for the disposal cell and surrounding support area.

1.3 Area Demographics

Moab is the Grand County government seat and the principal city of southeastern Utah. The population of Moab is about 5,235. In addition to Moab, the communities of Crescent Junction and Thompson Springs, also in Grand County, are affected by the relocation of RRM to the Crescent Junction site. The population of Grand County is about 9,500. 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 31 percent of Grand County's employment; government and administration account for 28 percent; trade, transportation, and utilities account for 26 percent; and education, health, and social services account for the remaining 15 percent.

1.4 Environmental Setting

The Moab mill operated under various private owners from 1956 through 1984. The tailings created by the milling operations were pumped to an unlined impoundment in the western portion of the property. The tailings accumulated over time, forming a pile up to 90 feet thick. When processing operations ceased, an estimated 16 million tons (12 million cubic yards) of RRM were present in the pile, which occupies about 130 acres at the site. An interim cover was placed on the pile in 1995. The eastern toe of the pile lies 750 feet from the Colorado River.

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, DOE instituted environmental and administrative controls at the Moab site, including storm water management, dust suppression, site access restrictions, and chemical management. In addition, DOE implemented an IA ground water remediation system to protect 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 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) (FEIS) that presents the preferred alternatives for relocating RRM from the Moab site and vicinity properties to Crescent Junction for permanent disposal using predominantly rail transportation and active ground water remediation at the Moab site.

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 basis for that decision. In February 2008, the ROD was amended to allow more truck transport. In 2015, DOE published the *Moab UMTRA Project Supplement Analysis for the Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement* (DOE/EIS-0355 SA-2) to evaluate information in the FEIS in light of new rockfall analyses and determined that the FEIS remains adequate to continue rail operations.

1.5 Primary Operations and Project Activities

Primary operations and Project activities include the following:

- Excavating and conditioning RRM at the Moab site.
- Transporting RRM to Crescent Junction by rail.
- Excavating the disposal cell.
- Placing and compacting material from the Moab site and vicinity properties in the cell.
- Placing interim and final cell cover layers.
- Operating an IA ground water remediation system at the Moab site, including ground water extraction and freshwater injection.
- Monitoring radioactive and non-radioactive materials in air, soil, ground water, and surface water.
- Maintaining site infrastructure and grounds, including revegetating disturbed areas.
- Maintaining access control.

2.0 Compliance Summary

2.1 Compliance Status

The Project is committed to protecting the environment while conducting its mission and operated without any notices of environmental violations during 2015.

2.1.1 Environmental Restoration and Waste Management

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

DOE O 231.1B Admin Chg 1, "Environmental, Safety and Health Reporting"

DOE O 231.1B requires 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 or semi-annual reports. Monitoring results indicated Project impacts were limited to DOE properties, and the public was not exposed to radiation above public dose limits. During 2015, there were no effluent releases.

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 have emergency planning and notifications in place to protect the public in the event of a release of extremely hazardous substances.

DOE reviews chemical inventories and activities at the Moab and Crescent Junction sites annually to determine if any relevant reporting is required. During 2015, diesel, used oil, and propane were stored at the sites in amounts exceeding the 10,000-lb threshold identified in Title 40 Code of Federal Regulations Part 370.10 (40 CFR 370.10), "Who must comply with the hazardous chemical reporting requirements of this part?" Tier II Emergency and Hazardous Chemical Inventory reports were submitted as required to the Utah State Emergency Response Commission, the Moab Local Emergency Planning Committee, and the local emergency response organizations.

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 proper management of non-hazardous and hazardous solid waste from 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. During 2015, no RCRA wastes were generated; however, the Project does maintain a Conditionally Exempt Small Quantity Generator status.

NEPA

Remedial actions performed pursuant to UMTRCA are considered major federal actions subject to the requirements of NEPA. The Council on Environmental Quality regulations to implement NEPA are codified at 40 CFR 1500, "Purpose, Policy, and Mandate." In compliance with 40 CFR 1507.3, "Council on Environmental Quality, Agency Procedures," DOE established its NEPA procedures 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 UMTRCA Title 1 processing sites. The ROD for ground water published in 1997 implemented a framework to select the appropriate compliance strategy for ground water remediation at each Title I site. The framework satisfies the requirements of the Floyd D. Spence Act by selecting a ground water compliance strategy for the Moab site.

In 2005, DOE issued the final ROD for the Moab site described in Section 1.4. In October 2015, DOE issued a Supplement Analysis, also described in Section 1.4. During 2015, 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 the U.S. Environmental Protection Agency (EPA) with authority to require testing of any chemical substances entering the environment and to regulate their production, sale, and management as a waste, when 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 an ACM landfill in the RRM pile. PCB-contaminated materials, such as discarded electrical transformers, may also have been disposed of in the pile. ACM may also be present in on-site utilities, and PCB wastes may be present in fluorescent light ballasts in the remaining mill 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 2015, no mercury or PCBs required management at the Moab site. No ACM, mercury, or PCBs exist at the Crescent Junction site, so 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 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. During 2015, a certified applicator was used to apply general use herbicides and insecticides at the Moab and Crescent Junction sites 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 from undue risk from radiation. Radiation protection for workers is covered in 10 CFR 835, "Occupational Radiation Protection." 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 off-site locations where RRM was used as construction material or fill. UMTRCA also required the promulgation of cleanup standards (now codified by EPA at 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings") and assigned the NRC to oversee the cleanup and issue licenses for the completed disposal cells.

RRM, specifically defined at 40 CFR 192.01, "Definitions," is waste that DOE determines radioactive and related to the milling process. RRM requiring cleanup at the Moab site includes uranium mill tailings, contaminated soil, debris from dismantling the mill buildings and associated structures, equipment, remnants of processing ponds, disposal trenches, and other wastes. 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. During 2015, the Project remediated RRM in the form of mill tailings, contaminated soil, mill debris, and contaminated ground water.

Although the milling process recovered about 95 percent of the uranium, the RRM contains several other naturally occurring radioactive elements, including thorium, radium, polonium, and radon. RRM at the Moab site contains contaminants in concentrations that could be hazardous to the environment and public health and that exceed EPA standards. Remediation of the Moab site and disposal at the Crescent Junction site are conducted in compliance with these standards.

DOE manages RRM 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 stored at the Moab site were considered RRM and 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 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, the 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 2015 are further discussed 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 state issued fugitive dust control permits for the Moab and Crescent Junction sites. To comply with Utah Administrative Code (UAC) R307-309-6, "Fugitive Dust Control," the Project prepared fugitive dust control plans for both sites.

Most of the surface area consists of exposed, unprotected soils and sand at the Moab and Crescent Junction sites. Vegetation is relatively sparse and offers little protection or stabilization to the sites' disturbed and natural soils. Consequently, controlling windblown sand, soil, and dust is a recognized concern.

During 2015, DOE diligently monitored fugitive dust emissions and implemented the controls outlined in the fugitive dust control plans to the greatest extent practicable. In 2015, DOE applied more than 20 million gallons of water to the RRM at Moab and Crescent Junction and unpaved haul and access roads to stabilize areas susceptible to wind erosion. In addition, DOE restricted travel in off-road areas of the sites and limited vehicular speed to minimize generation of fugitive dust. DOE also continued seeding and mulching disturbed areas to establish vegetative cover to control fugitive 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 impacts on the quality of United States surface waters.

The federal discharge requirements are implemented by the Utah Pollutant Discharge Elimination System (UPDES), an equivalent state system.

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 Site Storm Water Pollution Prevention Plan* (DOE-EM/GJ1238).

Table 1. Permits/Agreements Active in 2015 for the Moab Project

Permits/Agreements	Issuing Agency	No. of Permits
UPDES Storm Water General Permits: Moab UTR359185 Crescent Junction UTR359187	State of Utah, Department of Environmental Quality, Division of Water Quality	2
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 Application 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 rights-of-way and encroachment permits for roads, pipelines, and gates	State of Utah, U.S. DOT	8
Special Permit SP-14283 for DOE to transport RRM and party status for the RAC	U.S. DOT	1
Hazardous Materials Certificate of Registration	U.S. DOT	1
Fugitive Dust Control Permits: Moab DAQC-626-2002 Crescent Junction DAQC-1110-2006	State of Utah, Department of Environmental Quality	2
Section 404 Nationwide General Permits for Green River pump station, water pipelines, Moab Wash, and off-pile area	USACE	4

DOT = Department of Transportation; RAC = Remedial Action Contractor

These plans outline the engineering controls and best management practices DOE has implemented to control and minimize storm water discharges from the sites. Copies of the plans and the storm water permits are maintained at each respective site. To ensure continued compliance with the plans, DOE conducts at least one storm water inspection every 14 days and documents the inspection results on a site-specific checklist. During 2015, no discharges were noted under UPDES.

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 both sites 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 the Safe Drinking Water Act (42 USC 300f) 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. During 2015, a Temporary Change Application was received from the 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 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. The FEIS included a Biological Assessment and a Biological Opinion (BO) written by FWS. DOE strives to meet the required habitat protective measures stated in 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). There are four endangered fish species present in the Colorado River: Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub. Pikeminnow and razorback sucker are found near the Moab site, but during 2015, side channel monitoring did not detect impacts on fish.

There is one endangered avian species, the southwestern willow flycatcher, that may inhabit tamarisk areas on or near the Moab site, but it has never been observed. There are no endangered species near the Crescent Junction site.

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

In 2015, an annual cultural resource inventory was performed at the Crescent Junction site for Native American art sites in accordance with the applicable memorandum of agreement. Annual reports for Moab and Crescent Junction sites were submitted to UDOT, BLM, and the state of Utah as required by the memoranda of agreement documenting no additional impacts or mitigation were noted in 2015.

Migratory Bird Treaty Act
To ensure compliance with the Migratory Bird Treaty Act (16 USC 703), 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 later removed from the threatened list.

During 2015, no endangered, threatened, or candidate species were noted on the Moab or Crescent Junction sites.

Burrowing owls, a Utah sensitive species, were identified in 2014 at the Crescent Junction site, but none were noted in 2015. A large number of prairie dog burrows are present; these are associated with raptor 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 Wetland 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 2015 were limited to planting and seeding desirable native species, irrigating, and weed control. Minor erosion control actions (e.g., installation of rock riprap in lower Moab Wash) were taken in 2015 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 2015 with the potential to positively affect jurisdictional wetlands included storm water controls, revegetation, and erosion control. These activities caused no adverse impact to the jurisdictional wetlands. 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.

2.1.6 DOE O 436.1, "Departmental Sustainability"
DOE O 436.1 requires all DOE sites to implement sound stewardship practices protective of the air, water, land, and other natural resources impacted by DOE operations; it also requires DOE sites to cost effectively meet or exceed compliance with applicable environmental, public health, and resource protection laws, regulations, and DOE requirements. During 2015, the Project provided annual reporting through its Site Sustainability Plan, which identified the mandated greenhouse gas reduction targets and sustainability goals in compliance with DOE O 436.1. The order further states each site is to implement an EMS. Section 3.0 provides details of the Moab Project EMS.

2.2 Other Major Environmental Issues and Actions

DOE uses external and internal audits, surveillances, and management assessments to evaluate environmental compliance and implement corrective actions. The Project Quality Assurance (QA) organization performed and/or coordinated internal and external assessments in 2015 to verify system descriptions and compliance with internal procedures. No major issues or actions were identified in 2015.

2.3 Continuous Release Reporting

Not applicable to the Project.

2.4 Unplanned Releases

No unplanned releases occurred in 2015.

2.5 Summary of Permits

Table 1 shows the permits and agreements that were active for the Project during 2015.

3.0 EMS

As with most federal agencies, DOE's EMS is based on the standard elements identified in the International Organization for Standardization's Standard 14001, "Environmental management systems." The EMS integrates these elements into the core functions of the contractors' ISMS, 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 minimize wastes. To implement a comprehensive EMS for the Project in accordance with DOE O 436.1, the Project issued the *Moab UMTRA Project Environmental Management System Manual* (DOE-EM/GJ1630).

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 last solution after other options have been considered. Pollution prevention is also achieved through environmentally preferred purchasing.

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. Equipment and supplies excess to other federal agencies are procured whenever possible rather than purchasing new items. Due to these efforts, a cost avoidance of approximately $38,500 (at acquisition) was realized by the Project, and these materials were potentially removed from the waste stream in fiscal year (FY) 2015.

Reuse and Recycling
Day-to-day site work and operations are routinely evaluated, especially by employees in the field, to identify pollution prevention and waste minimization opportunities. Site staff accurately measure and document waste generation, pollution prevention, and waste minimization activities. All work locations provide employees with both local and centralized recycling stations, and employees are encouraged to use them for appropriate materials. Seventy-five percent of all used oil is shipped to a recycling vendor. Two-sided copying using 100 percent recycled paper is used where equipment technology supports it.

Electronic equipment and batteries are recycled through vendors to divert waste. Approximately $600 worth of supplies and equipment, excess to the Project, were sold through General Services Administration or re-utilized by another agency, keeping it out of the waste stream.

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 less adverse or even beneficial effects on the environment. 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.

Waste Management
During 2015, 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.

There was a 28 percent increase in off-site non-hazardous solid waste disposal in FY2015 from FY2014; however, there was a 57 percent reduction since FY2010. Non-hazardous solid waste diverted in FY2015 consisted of commonly recycled items (e.g., computers, batteries, aluminum cans, plastic bottles, paper, cardboard) and composted materials.

3.1.2 Energy Efficiency
The Project currently participates in the Blue Sky Renewable Energy Program and purchased 14.7 percent renewable energy in FY2015. As a result, the Remedial Action Contractor (RAC) and the Project have received Champion Partner and EPA Green Power Partner designations. In addition, the sites have four meteorological stations (one off site), a sand filter system, and a disposal cell operations monitoring system that are powered by solar panels.

3.1.3 Climate Change Resilience
In FY2012, the Project worked with USACE and FWS to gain support for the creation of wetland plant communities by re-contouring a remediated area of the Moab site adjacent to the Colorado River. This re-contouring promotes more varied vegetation growth, and river water that tops the western bank brings soil nutrients to inundated areas of the site.

In response to President Obama's June 2014 memorandum, "Sustainable Practices for Designed Landscapes and Supporting Pollinators on Federal Landscapes," the Project worked with a local pollinator group to host two beehives in a revegetation area of the Moab site. An observed increase in plant growth and blossoming plants may be attributed to the added pollinators.

The sites actively control water levels in the freshwater and retention ponds, reducing the Project's vulnerability during drought conditions. Waste storage areas have been designed in a conservative manner to better withstand beyond-design-basis storms. The Project also ceased operations for 2 weeks at the end of December 2015, reducing energy demands at one of the coldest times of the year.

4.0 Environmental Radiological Protection Program and Dose Assessment

4.1 Radiological Discharges and Doses

This section presents results of the calculated radiation dose to the public from Project operations in 2015. The dose the public receives is calculated based on MEI data. The DOE public dose limit is 100 millirems/year (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).

The calculated dose includes exposure from natural background sources and are in addition to exposures from consumer products and medical sources. A summary of the public radiation dose applicable to both the Moab and Crescent Junction sites compared to the DOE public dose limit is shown in Table 2. The public and MEIs receive only a background dose of 2 mrem/yr based on Project monitoring results.

Table 2. Moab Project Public[1] Radiation Dose for 2015

Pathway	Maximum Annual Dose to MEIs 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	2 (0.02)	2	less than 0.005	~10,300	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	2 (0.02)	2	less than 0.005	~10,300	less than 0.005

bkgd = background; km = kilometers; mSv = milliseivert; rem = roentgen equivalent man
[1]Public dose and MEI dose are equivalent for this evaluation.

4.2 Clearance of Property Containing RRM

Remediation of Moab site contaminated soils not associated with the RRM pile (off-pile areas) and of vicinity properties is part of the Project scope to reduce potential health and environmental risks from historical uranium ore processing at the site. In 2015, DOE did not perform any off-pile or vicinity property remediation and, therefore, did not contribute to the annual estimated public dose.

4.3 Radiation Protection of Biota

DOE O 458.1 requires 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. Moab RRM contains low levels of radioactivity, and the chemical composition (salt and pH) of the RRM limits vegetative growth.

The level of Project activities near 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 RRM at the Project sites is indistinguishable from naturally occurring radioactive material found in the surrounding environment; therefore, the Project does not currently nor does it plan to monitor the effects of radiological doses to biota. Biota monitoring for non-radiological effects is discussed in Section 2.1.5.

4.4 Unplanned Radiological Releases

There were no unplanned radiological releases in 2015.

4.5 Environmental Radiological Monitoring

Environmental radiological protection goals are described in the *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJRAC1434) and the *Moab UMTRA Project Environmental Air Monitoring Program and Mitigation of Public Exposure* (DOE-EM/GJRAC1988). These plans document DOE strategy and objectives for monitoring various airborne contaminants and evaluate public radiological exposure.

This section describes the Environmental Air Monitoring Program elements. Environmental air monitoring data are compiled and published in quarterly reports. These reports compare monitoring data to exposure limits established in DOE O 458.1 and are posted on the DOE Project website at *www.gjem.energy.gov/moab* and available in the public reading room.

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 and assess the potential for radiation dose to members of the public that could result from site operations. The Project's air monitoring network measures atmospheric radon, direct gamma radiation, and airborne radioparticulate matter at 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 of airborne contaminants would be detected before they reached the public to enable DOE to quantify any public exposures that may be associated with Project activities. Table 3 summarizes the types of data collected (parameters) at each monitoring location. Monitoring locations for Moab are shown in Figures 3 and 4 and for Crescent Junction in Figure 5.

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	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
0127	BLM property (~¾-mile south of millsite)	Rn, G
0128	BLM 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		
0301, 0302, 0303, 0304	Crescent Junction on-site locations	Rn, G
0305	Crescent Junction off-site location	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

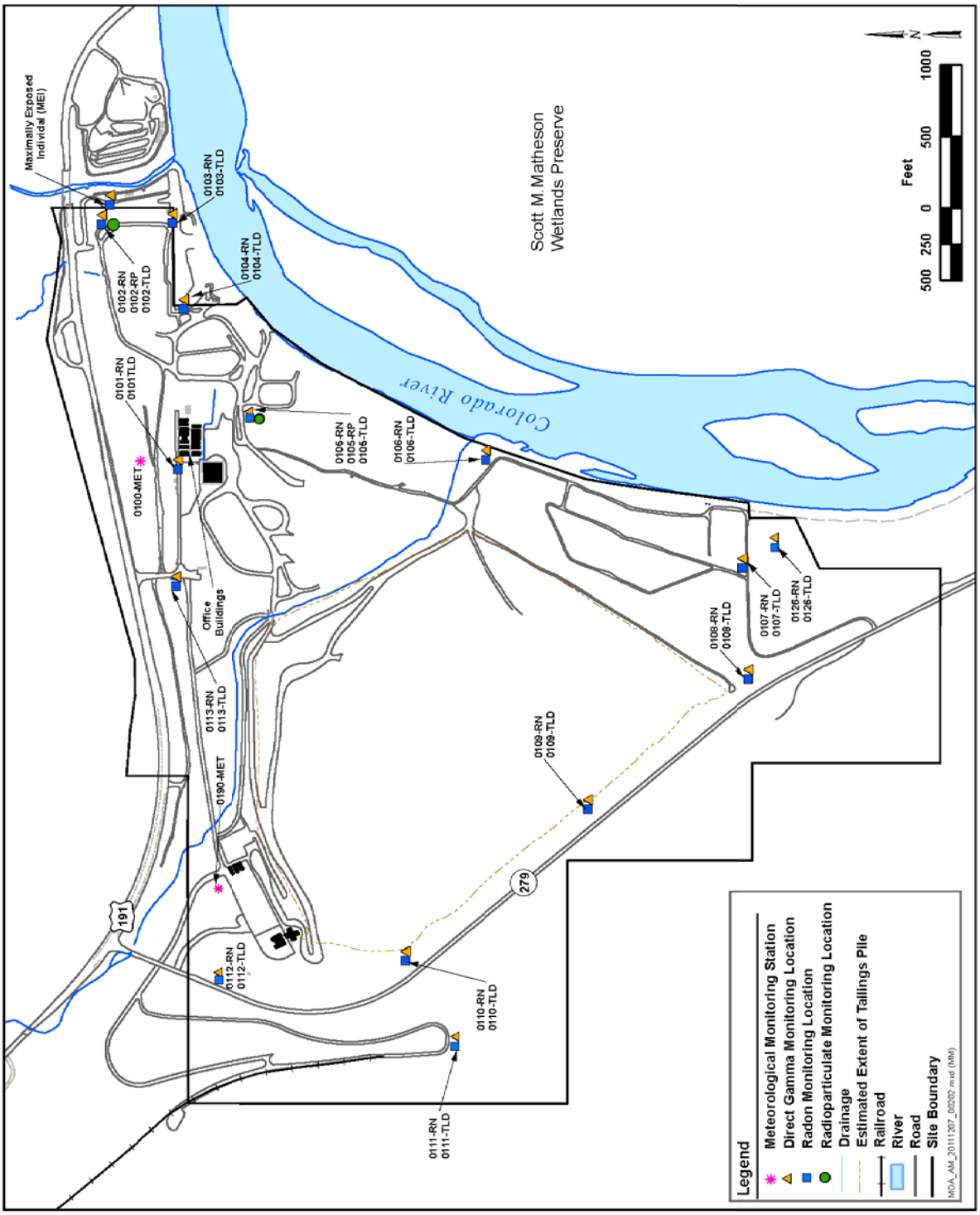

Figure 3. Moab On-site and MEI Environmental Air Monitoring Locations

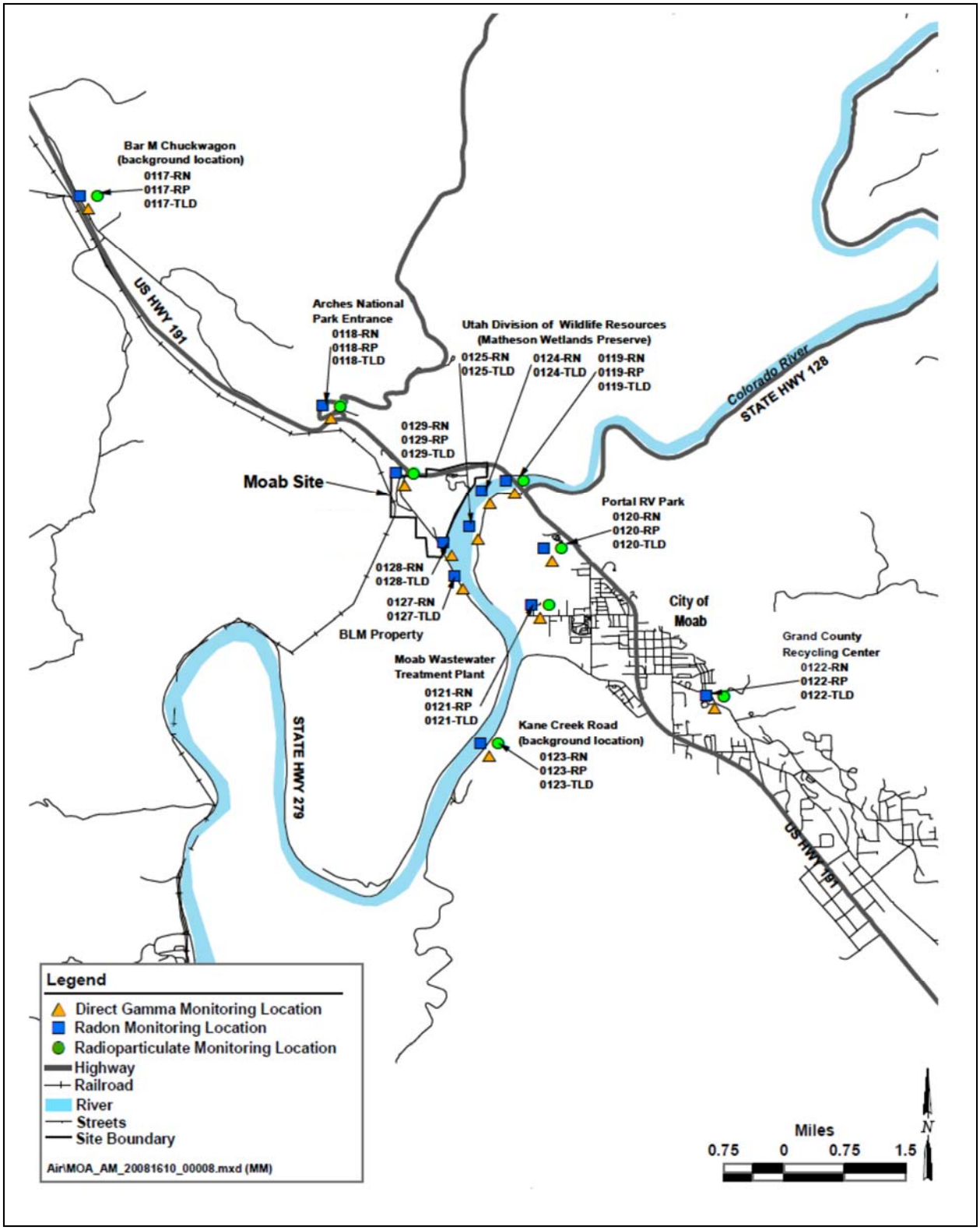

Figure 4. Moab Off-site Environmental Air Monitoring Locations

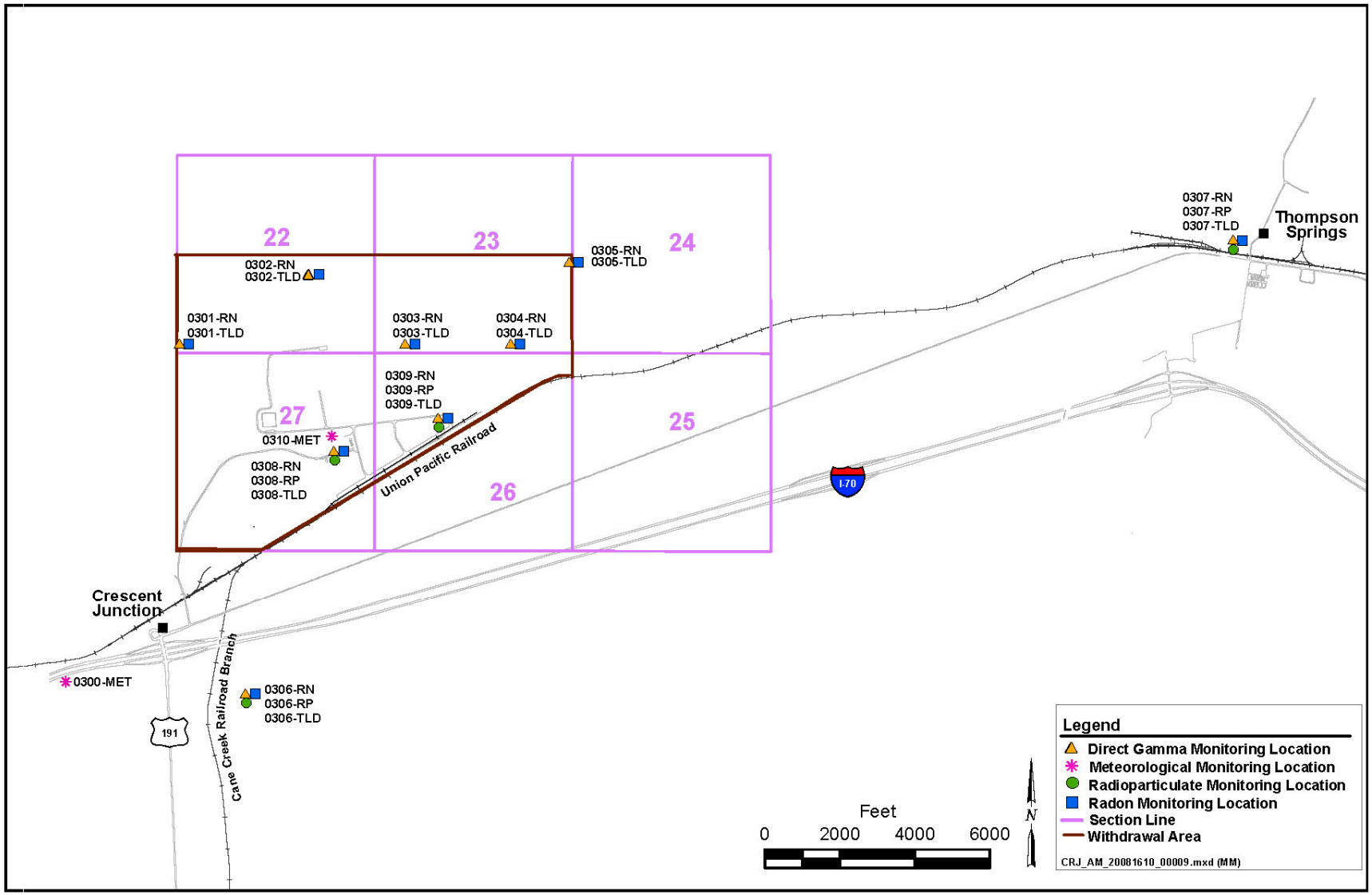

Figure 5. Crescent Junction Site Environmental Air Monitoring Locations

Background monitoring locations were 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 air quality conditions against which monitoring data may be compared.

MEI locations (see Figure 3 for the Moab site and Figure 5, location 306, for the Crescent Junction site) have special significance with respect to environmental monitoring. They represent the members of the public who would potentially receive 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

DOE O 458.1 established a limit of 3.0 picocuries per liter (pCi/L) above background for radon concentrations that is used at DOE's property boundary at each site. The background radon concentration in the Moab area was established as 0.7 pCi/L; therefore, the limit at the Moab site boundary is 3.7 pCi/L.

The background radon concentration in the Crescent Junction area was established as 0.9 pCi/L; therefore, the limit at the Crescent Junction site boundary is 3.9 pCi/L.

During 2015, atmospheric radon was measured at 36 locations (20 on site, 14 off site, and two MEIs) using alpha-sensitive detectors (e.g., radon cups). Radon cups were exposed for a period of approximately 3 months. On collection, the radon cups were sent to an off-site laboratory for analysis.

The actual duration of radon cup exposure was used to prorate the analytical data to determine the quarterly radon concentration for each location. Quarterly and annual radon concentrations for all 36 locations are shown in Table 4.

There was no annual radon exceedance at the Moab or Crescent Junction site. The 2015 radon monitoring data collected at the MEI locations were consistently below the 3.7 pCi/L and 3.9 pCi/L limits for Moab and Crescent Junction, respectively. Based on these data, radon emissions from RRM are not affecting the public.

The red curve shown on Figure 6 represents the quarterly average of radon data from station locations 0104, 0105, 0106, 0107, 0108, and 0113 at the Moab site from 2002 through 2015. The radon limit and the trend at the MEI location are shown for comparison purposes. This figure illustrates that the long-term radon concentration trend at these locations is decreasing.

Table 4. Summary of Atmospheric Radon and Gamma Monitoring Data for the Moab and Crescent Junction Sites for 2015

Station Number	1st Quarter 2015		2nd Quarter 2015		3rd Quarter 2015		4th Quarter 2015		2015 Annual	
	Radon pCi/L	Gamma mrem	Radon pCi/L	Gamma mrem	Radon pCi/L	Gamma mrem	Radon pCi/L	Gamma mrem	Avg Radon pCi/L	Gamma mrem
On-site Locations										
0101	3.7	35.6	0.9	36.5	2.5	45.1	2.6	45.3	2.4	162.5
0102	1.6	21.8	0.4	23.4	1.1	19.9	1.0	27.6	1.0	92.7
0103	2.3	25.9	0.4	22.0	1.3	23.4	1.7	25.1	1.4	96.5
0104	2.5	25.8	0.7	22.2	1.6	24.4	1.9	26.6	1.7	99.1
0105	3.1	22.7	1.0	20.3	1.8	20.9	2.2	26.1	2.0	90.1
0106	4.4	29.6	0.9	30.1	2.0	28.2	2.8	33.7	2.5	121.6
0107	3.9	28.2	1.4	23.9	2.2	25.4	2.6	28.2	2.5	105.7
0108	3.4	33.9	1.7	39.0	3.5	33.3	2.9	45.3	2.9	151.6
0109	1.7	146.1	1.4	108.9	2.3	154.4	1.9	133.3	1.8	542.7
0110	1.7	78.8	1.1	89.7	2.7	83.3	1.5	106.7	1.8	358.4
0111	0.8	37.9	0.6	37.9	1.4	39.6	0.6	43.4	0.9	158.9
0112	2.0	54.9	1.0	50.8	3.0	55.8	2.7	61.0	2.2	222.6
0113	3.0	37.4	1.6	40.7	3.5	34.9	3.5	45.6	2.9	158.6
0126	2.4	29.5	0.8	25.9	1.7	26.7	2.2	29.6	1.8	111.7
0301	0.8	27.6	0.4	23.8	1.0	25.7	0.4	26.1	0.7	103.3
0302	1.0	21.5	0.7	21.1	1.2	20.6	0.9	23.2	1.0	86.4
0303	1.5	32.0	1.4	25.8	1.3	31.5	1.1	29.5	1.3	118.8
0304	0.8	29.5	0.8	21.0	1.2	27.1	0.8	23.0	0.9	100.6
0308	1.9	28.2	1.4	22.7	2.3	26.8	1.4	26.0	1.8	103.7
0309	0.9	22.4	0.8	22.2	1.4	20.4	1.2	25.1	1.1	90.1
Off-site Locations										
0117	0.7	29.2	0.4	22.4	0.7	26.1	0.3	24.1	0.5	101.7
0118	0.4	23.1	0.4	23.9	0.9	21.7	0.7	25.7	0.6	94.5
0119	0.8	18.3	0.4	20.7	1.5	17.2	0.5	22.1	0.8	78.3
0120	0.5	23.0	0.4	20.3	0.7	20.5	0.3	23.7	0.5	87.4
0121	0.6	22.7	0.4	21.5	0.8	20.1	0.3	22.9	0.5	87.1
0122	0.3	23.0	0.4	19.7	0.7	20.4	0.3	20.9	0.4	84.0
0123	0.3	21.8	0.4	18.2	0.7	20.5	0.3	18.7	0.4	79.2
0124	1.4	28.6	0.5	24.3	1.3	25.3	0.9	26.5	1.0	104.7
0125	1.7	31.8	0.8	28.8	1.8	27.1	0.8	30.0	1.3	117.7
0127	1.1	24.7	0.5	26.2	1.0	23.4	0.8	26.7	0.9	100.9
0128	3.3	26.7	0.8	26.8	1.9	25.5	2.6	26.7	2.2	105.7
0129	1.8	26.8	1.0	32.5	2.9	25.4	2.2	34.0	2.0	118.7
MEI Moab	1.6	22.8	0.4	20.6	1.1	18.1	1.0	22.2	1.0	83.7
0305	1.9	29.9	0.5	25.7	1.3	27.6	0.6	28.3	1.1	111.5
MEI CJ	0.9	30.0	0.4	22.6	1.1	28.1	0.7	24.0	0.8	104.7
0307	0.6	26.0	0.4	25.1	1.1	24.3	0.5	27.8	0.7	103.2

CJ = Crescent Junction

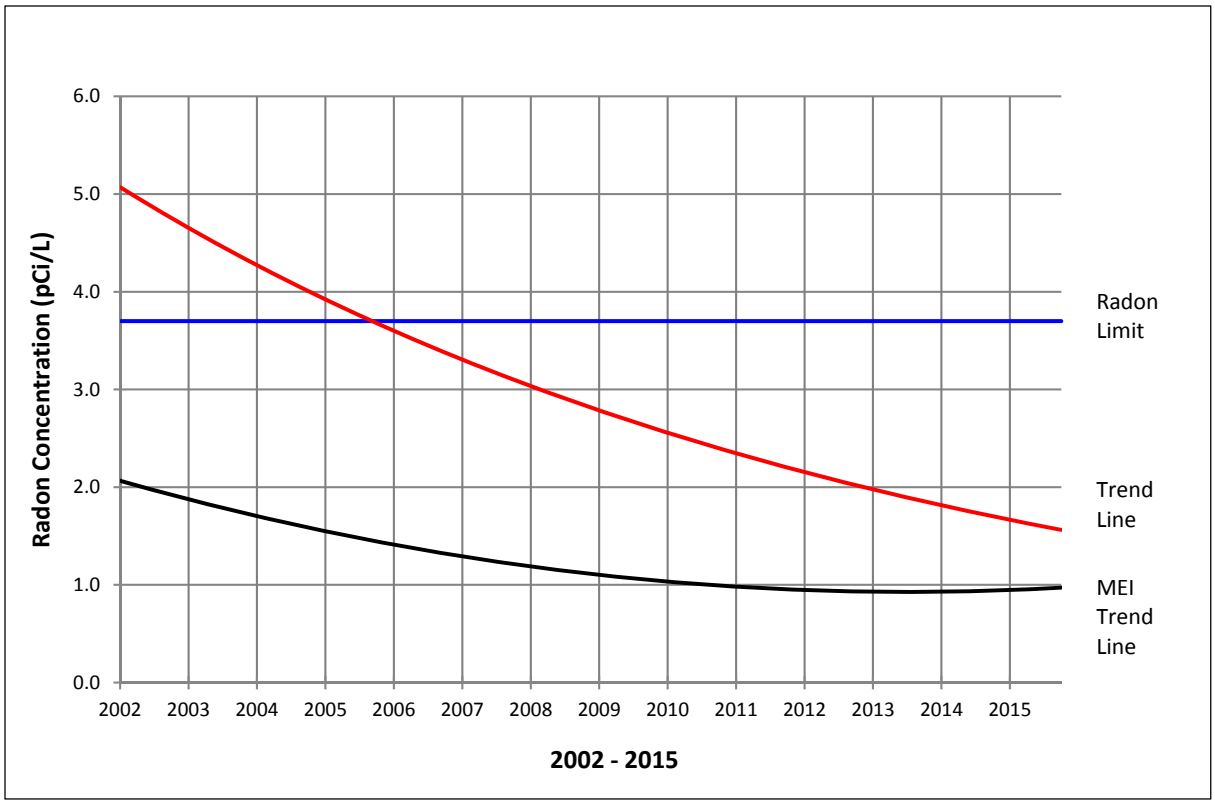

Figure 6. Long-term Radon Concentration Trend

4.5.2 Direct Gamma Radiation

As uranium decays, several of the decay products emit gamma radiation. RRM at the Moab site is a source of direct gamma radiation. Gamma radiation has sufficient energy to penetrate body tissues; therefore, protection from elevated exposure levels is of utmost importance to DOE. DOE O 458.1 establishes a public dose limit of 100 mrem/yr above background at the site boundary.

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 requirements with respect to protection of members of the public from undue risk of radiation.

DOE determined the background direct gamma radiation dose is 82 mrem/yr in the Moab area and 92.5 mrem/yr in the Crescent Junction area; therefore, the public dose limit is 182 mrem/yr at Moab and 192.5 mrem/yr at Crescent Junction.

During 2015, direct gamma radiation was measured at 36 locations (20 on site, 14 off site, and two MEIs) using thermoluminescent dosimeters that are exposed for a period of approximately 3 months. On collection, the dosimeters were sent to an off-site laboratory for analysis. The analytical data were prorated to a standard 91-day quarter. Quarterly and annual direct gamma radiation data results for all locations are shown in Table 4.

During 2015, direct gamma radiation measurements exceeded the DOE annual limit at three Moab on-site stations (0109, 0110, and 0112); this is not unexpected due to the large volume of RRM at the Moab site and its associated gamma activity.

None of the off-site stations exceeded the annual limit; therefore, these on-site exceedances did not result in unacceptable public exposure.

Figure 7 shows annual results of direct gamma from 2002 through 2015 at Moab stations 0109 and 0112 near the RRM pile and at off-site background station 0117 and the MEI. The results from station 0109 indicate the gamma at this location is consistently above the DOE public dose limit of 182 mrem/yr.

Results of station 0112 have been above the limit since 2012. These two locations indicate RRM pile influence within the DOE property, as expected. The background and MEI locations have not exceeded the annual public dose limit indicating the RRM pile is not affecting the public. There have been no exceedances at the Crescent Junction site since 2006 when DOE began collecting data.

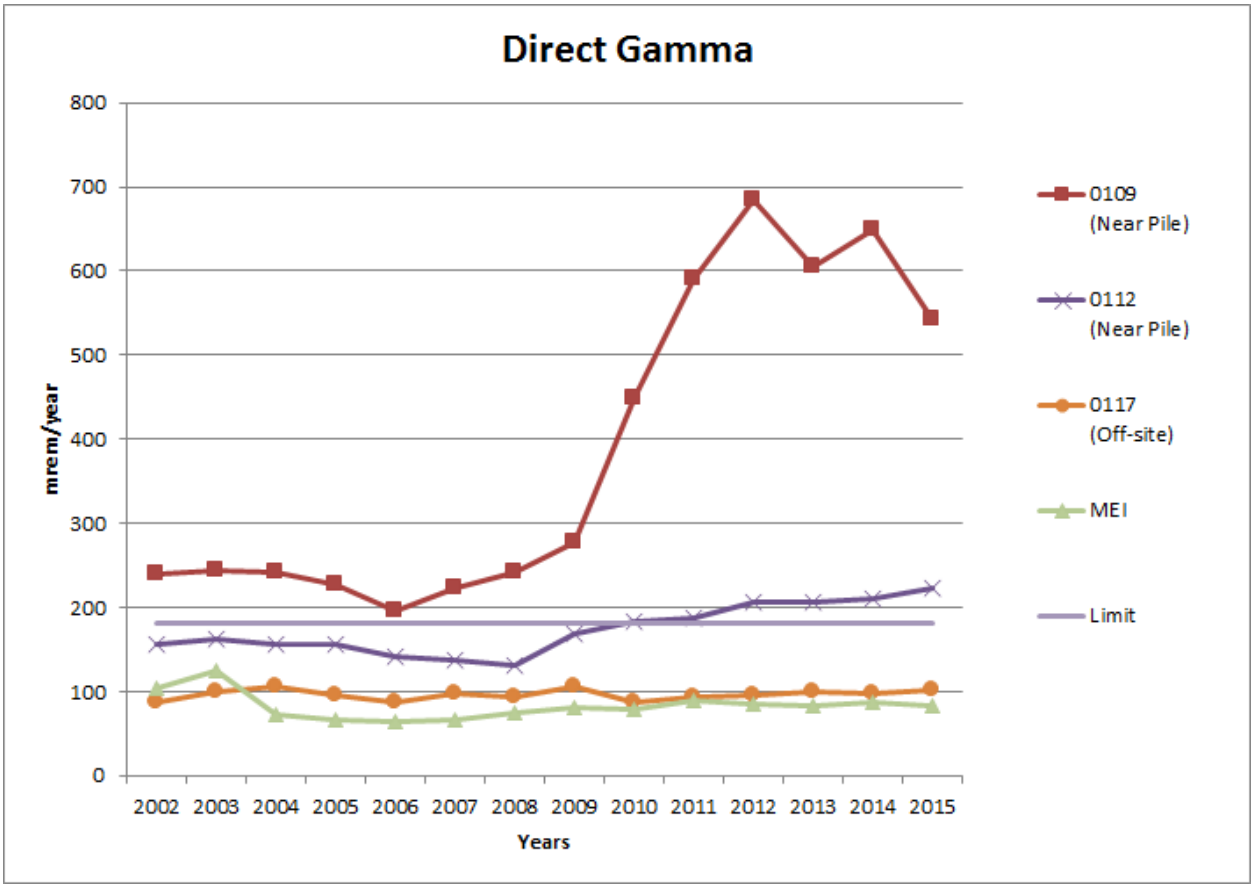

Figure 7. Annual Direct Gamma Results at Select Monitoring Stations from 2002 through 2015

4.5.3 Airborne Radioparticulates

Radioparticulate data collection is of particular interest to DOE because these data provide information relative to the dose the public may be receiving from inhalation of radioactive particulate matter. In 2015, air samplers operated continuously at four on-site locations and 10 off-site locations at Moab and Crescent Junction, including the Crescent Junction MEI location.

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 458.1 provides guidance for the use of derived concentration standard (DCS) values for radioisotopes to determine acceptable exposure limits. A DCS represents the concentration from a specified radionuclide that would, if inhaled, 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 DCS values for the radionuclides included in the Environmental Air Monitoring Program are shown in Table 5.

Table 5. Summary of DCS Values for Airborne Radionuclides Monitored at the Moab and Crescent Junction Sites for 2015

Radionuclide	DCS (µCi/mL)
Total Uranium	4.7E-13
Thorium-230	9.4E-14
Radium-226	4.0E-13
Polonium-210	8.7E-13

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

The quarterly results and annual averages for airborne radioparticulate concentrations did not exceed the DCS values at any location for either site during 2015 (see Table 6).

Table 6. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2015

Station Number	Isotope	1st Quarter 2015 (µCi/mL)	2nd Quarter 2015 (µCi/mL)	3rd Quarter 2015 (µCi/mL)	4th Quarter 2015 (µCi/mL)	Annual Average (µCi/mL)	Annual 2015 Dose mrem/yr
Moab On-site Locations							
0102-RP	Uranium	9.7E-17	1.5E-16	1.7E-16	1.3E-16	1.4E-16	0.94
	Thorium-230	9.9E-17	7.4E-17	1.2E-16	7.0E-17	9.1E-17	
	Radium-226	1.1E-16	1.1E-16	1.0E-16	7.2E-17	1.0E-16	
	Polonium-210	1.4E-14	3.2E-15	4.4E-15	6.1E-15	7.0E-15	
0105-RP	Uranium	1.3E-16	1.6E-16	2.7E-16	1.6E-16	1.8E-16	1.27
	Thorium-230	2.4E-16	1.4E-16	3.5E-16	1.7E-16	2.2E-16	
	Radium-226	1.8E-16	8.7E-17	3.3E-16	9.3E-17	1.7E-16	
	Polonium-210	1.1E-14	3.1E-15	4.6E-15	8.4E-15	6.9E-15	

Table 6. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2015 (continued)

Station Number	Isotope	1st Quarter 2015 (µCi/mL)	2nd Quarter 2015 (µCi/mL)	3rd Quarter 2015 (µCi/mL)	4th Quarter 2015 (µCi/mL)	Annual Average (µCi/mL)	Annual 2015 Dose mrem/yr
Moab Off-site Locations							
0117-RP	Uranium	8.8E-17	1.2E-16	1.6E-16	1.5E-16	1.3E-16	0.67
	Thorium-230	4.9E-17	5.9E-17	5.2E-17	8.8E-17	6.2E-17	
	Radium-226	1.2E-16	4.3E-17	8.3E-17	8.0E-17	8.1E-17	
	Polonium-210	7.8E-15	2.5E-15	3.7E-15	5.9E-15	5.0E-15	
0118-RP	Uranium	9.6E-17	1.3E-16	2.0E-16	1.3E-16	1.4E-16	1.01
	Thorium-230	1.1E-16	1.5E-16	2.1E-16	9.5E-17	1.4E-16	
	Radium-226	1.8E-16	1.1E-16	2.1E-16	1.1E-16	1.5E-16	
	Polonium-210	1.1E-14	2.9E-15	4.4E-15	7.2E-15	6.3E-15	
0119-RP	Uranium	6.9E-17	1.1E-16	1.4E-16	1.8E-16	1.2E-16	0.86
	Thorium-230	1.1E-16	1.5E-16	2.1E-16	9.5E-17	1.4E-16	
	Radium-226	3.7E-17	1.1E-16	1.2E-16	4.6E-17	7.7E-17	
	Polonium-210	7.5E-15	2.9E-15	3.0E-15	6.0E-15	4.9E-15	
0120-RP	Uranium	9.5E-17	1.3E-16	1.6E-16	1.3E-16	1.3E-16	0.72
	Thorium-230	3.8E-17	6.7E-17	8.4E-17	5.4E-17	6.1E-17	
	Radium-226	1.1E-16	3.3E-17	1.4E-16	6.9E-17	8.9E-17	
	Polonium-210	1.0E-14	2.9E-15	3.8E-15	5.5E-15	5.6E-15	
0121-RP	Uranium	8.6E-17	1.5E-16	1.7E-16	1.2E-16	1.3E-16	0.73
	Thorium-230	8.5E-17	1.1E-16	9.2E-17	4.1E-17	8.1E-17	
	Radium-226	1.2E-16	7.8E-17	1.6E-16	8.9E-17	1.1E-16	
	Polonium-210	9.3E-15	3.0E-15	3.8E-15	5.3E-15	5.4E-15	
0122-RP	Uranium	8.2E-17	1.2E-16	1.5E-16	1.3E-16	1.2E-16	0.61
	Thorium-230	3.4E-17	5.0E-17	6.3E-17	5.7E-17	5.1E-17	
	Radium-226	1.1E-16	4.7E-17	4.4E-17	6.4E-17	6.5E-17	
	Polonium-210	7.5E-15	3.0E-15	3.1E-15	5.0E-15	4.7E-15	
0123-RP	Uranium	9.4E-17	1.3E-16	1.4E-16	1.3E-16	1.2E-16	0.78
	Thorium-230	6.8E-17	6.2E-17	1.1E-16	6.8E-17	7.6E-17	
	Radium-226	9.5E-17	4.2E-17	7.6E-17	1.1E-16	8.1E-17	
	Polonium-210	1.0E-14	3.3E-15	3.5E-15	6.3E-15	5.8E-15	
0129-RP	Uranium	1.1E-16	2.4E-16	4.4E-16	2.0E-16	2.5E-16	2.17
	Thorium-230	3.4E-16	5.6E-16	1.1E-15	3.6E-16	6.0E-16	
	Radium-226	1.7E-16	4.2E-16	8.8E-16	3.3E-16	4.5E-16	
	Polonium-210	8.3E-15	3.5E-15	5.5E-15	7.1E-15	6.1E-15	
Crescent Junction On-site Locations							
0308-RP	Uranium	8.2E-17	1.0E-16	1.4E-16	1.4E-16	1.2E-16	0.85
	Thorium-230	1.8E-16	1.2E-16	1.4E-16	1.1E-16	1.4E-16	
	Radium-226	2.0E-16	5.9E-17	8.2E-17	1.4E-16	1.2E-16	
	Polonium-210	7.2E-15	2.9E-15	4.2E-15	5.6E-15	5.0E-15	

Table 6. Summary of Radioparticulate Air Monitoring Data for the Moab and Crescent Junction Sites for 2015 (continued)

Station Number	Isotope	1st Quarter 2015 (µCi/mL)	2nd Quarter 2015 (µCi/mL)	3rd Quarter 2015 (µCi/mL)	4th Quarter 2015 (µCi/mL)	Annual Average (µCi/mL)	Annual 2015 Dose mrem/yr
Crescent Junction On-site Locations (continued)							
0309-RP	Uranium	8.2E-17	1.2E-16	1.5E-16	1.5E-16	1.3E-16	0.97
	Thorium-230	1.9E-16	1.2E-16	2.2E-16	2.4E-16	1.9E-16	
	Radium-226	3.0E-17	1.1E-16	1.5E-16	2.5E-16	1.4E-16	
	Polonium-210	7.1E-15	2.8E-15	4.1E-15	5.1E-15	4.8E-15	
Crescent Junction Off-site Locations							
MEI (0306-RP)	Uranium	8.0E-17	1.0E-16	1.2E-16	1.2E-16	1.1E-16	0.67
	Thorium-230	6.4E-17	3.8E-17	4.2E-17	6.1E-17	5.1E-17	
	Radium-226	3.0E-17	8.9E-17	1.1E-16	4.7E-17	7.0E-17	
	Polonium-210	8.3E-15	3.6E-15	3.4E-15	5.9E-15	5.3E-15	
0307-RP	Uranium	7.2E-17	1.1E-16	1.3E-16	1.3E-16	1.1E-16	0.62
	Thorium-230	3.9E-17	2.5E-17	9.3E-17	6.6E-17	5.6E-17	
	Radium-226	1.1E-16	1.1E-16	1.6E-17	7.2E-17	7.6E-17	
	Polonium-210	6.8E-15	2.8E-15	3.7E-15	5.6E-15	4.7E-15	

µCi/mL = microcuries per milliliter
Uranium shown is total uranium.

These data demonstrate emissions of airborne radioparticulate matter were consistently two to four orders of magnitude below their respective DCS values as they have been since DOE began its monitoring. DOE O 458.1 requires the public radiological dose resulting from the total of the airborne emissions at each location to be less than less than 10 mrem/yr. Table 6 shows the annual dose at each location was lower than this limit; therefore, there was no unacceptable public exposure in 2015.

5.0 Environmental Non-radiological Program Information

5.1 Meteorological Monitoring

DOE operates 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 stations 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 2015 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 2015

Month	Temperature (ºF)		Wind Speed (mph)		Precipitation (inches)
	Max Temp	Min Temp	Avg	Peak Gust	
January	58.9	14.8	2.3	19.4	1.04
February	72.1	24.7	2.9	34.7	0.17
March	83.9	25.4	3.2	34.8	0.33
April	84.9	30.4	4.7	47.6	1.53
May	97.3	41.4	4.5	42.0	1.09
June	107.3	53.5	3.9	30.3	1.41
July	103.5	59.4	4.5	39.3	1.24
August	104.9	57.2	3.7	45.3	0.38
September	98.5	48.6	3.3	39.2	1.27
October	94.6	37.8	3.0	42.1	2.03
November	75.7	20.7	3.4	39.9	1.29
December	52.5	11.5	2.8	27.9	0.53
Total Adjusted with Manual Gauge					**12.31**
10-Year Average Precipitation					**8.34**

6.0 Ground Water Protection Program

The ground water beneath the Moab site has been contaminated by former uranium milling operations. Ammonia and uranium are the primary contaminants of concern. The main objectives of the Ground Water Program are to reduce the ammonia and uranium contaminant mass and to protect young-of-year endangered fish species in suitable habitats of the Colorado River from site contaminants. The suitable habitat is protected through ground water extraction near the RRM pile, freshwater injection along the riverbank, and river water diversion directly to the habitat area.

Figure 8 shows the ammonia and uranium plumes and surface water sampling locations at the site in 2015. The ammonia concentration is highest at the toe of the RRM pile, and the uranium concentration is highest at the toe of the RRM pile and near the vicinity of the former uranium mill, just northeast of the pile. Monitoring results show that the extent of contaminant plumes has not changed significantly in the past 5 years. Ground water flow is toward the southeast, discharging to the Colorado River.

6.1 Ground Water

Eight extraction wells and 10 injection wells were used to minimize contaminant discharge to the Colorado River in 2015. Extracted ground water was pumped to an evaporation pond on top of the RRM pile, where it was eliminated. Extraction was ceased in September in preparation for removal of the pond in 2016. Samples were collected from these wells to assess IA performance. Site-wide sampling events were initiated in May and December to assess contaminant plumes. Ground water samples were analyzed for ammonia and uranium. Data results from sampling events are available on the Project website at *www.gjem.energy.gov/moab* and in the public reading room.

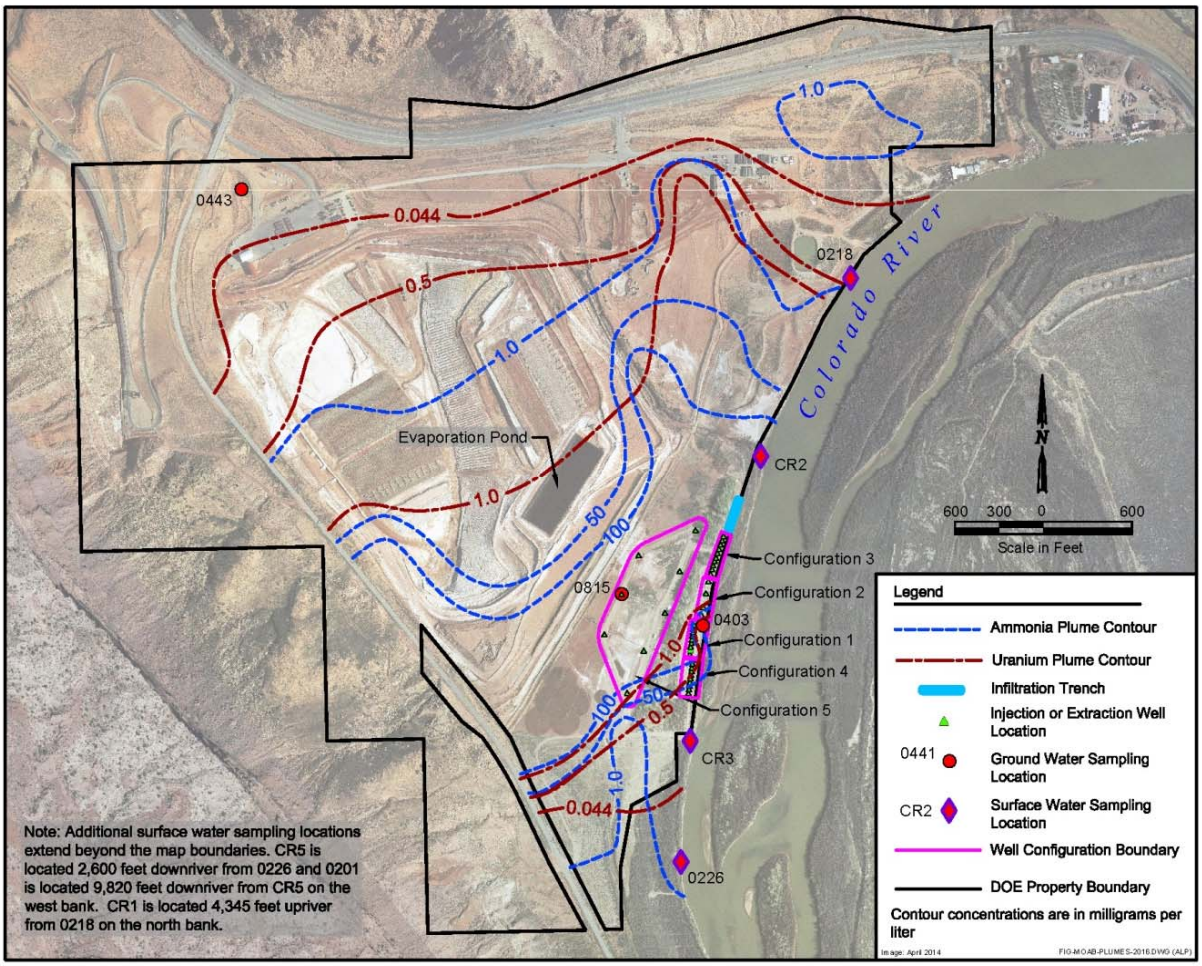

Figure 8. Ammonia and Uranium Plume Contours and Select Sampling Locations

Ground water at the Moab site meets the criteria of limited-use ground water due to the natural salt content; therefore, it is not a current or potential source of drinking water.

Table 8 shows the ammonia and uranium concentrations over the past 5 years at representative well locations 0443, an observation well upgradient of the tailings pile; 0815, an extraction well downgradient of the tailings pile; and 0403, an observation well near the river bank (see Figure 8 for well locations). Well 0443 is not affected by contamination in the RRM pile and shows consistent ammonia and uranium results that are at the detection limit or representative of natural concentrations.

Well 0815 has been affected by the RRM pile. Ammonia concentrations in this well have fluctuated over the past 5 years. These results indicate that the concentration has not decreased during this time; however, because of the large volume of contaminated ground water, this is not unexpected. The uranium concentrations in this well are substantially above the water quality standard of 0.044 mg/L and have also remained consistent over the 5-year period.

Table 8. Sampling Results over Past 5-Year Period from Representative Ground Water Wells

Year	Well 0443 (73 ft bgs)		Well 0815 (22 - 52 ft bgs)		Well 0403 (18 ft bgs)	
	Ammonia Total as N (mg/L)	U (mg/L)	Ammonia Total as N (mg/L)	U (mg/L)	Ammonia Total as N (mg/L)	U (mg/L)
2011	0.1*	0.011	300	3.7	3	0.6
2012	NS	NS	190	3.0	69	0.94
2013	0.1*	0.010	270	3.3	26	0.91
2014	0.1*	0.011	350	3.1	24	0.34
2015	0.1*	0.013	190	3.3	56	0.43

bgs = below ground surface; NS = not sampled; U = uranium
* = at detection limit

Well 0403 is near the Colorado River and shows the effects of IA activities both for ammonia and uranium. The concentrations at this well are fairly consistent over the 5-year period; however, the much lower ammonia concentration observed in 2011 was likely due to high river flow for much of the previous spring and summer.

Approximately 10.5 million gallons of ground water were extracted in 2015, with about 27,810 lb of ammonia and 230 lb of uranium removed. A total of almost 228 million gallons have been extracted since initial implementation of the system through the end of 2015, including more than 862,400 lb of ammonia and 4,500 lb of uranium.

Approximately 6.9 million gallons of freshwater were injected in 2015. Injection occurred from January through April and from August through December 2015. The purpose of injection is to create a hydrologic barrier between the RRM pile and side 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 near peak flow (June) and base flow (December) conditions in 2015.

Samples were collected on site, upriver, and downriver (Figure 8). A total of 11 surface water samples were collected in 2015. Table 9 shows the ammonia concentration at each of the locations and the corresponding EPA acute and chronic criteria. Results from all of the sample locations were below these criteria.

In 2015, no suitable habitat formed adjacent to the Moab site; if one had formed, surface water diversion would have been used to dilute ammonia concentrations exceeding acute or chronic criteria.

Table 9. Surface Water Sampling Locations During 2015 with Ammonia Concentrations Compared to EPA Acute and Chronic Criteria

Location	Date	Ammonia Total as N (mg/L)	EPA - Acute Total as N (mg/L)[1]	EPA - Chronic Total as N (mg/L)[2]
0201	06/24/15	<0.1	8.8	0.83
0218	06/24/15	<0.1	7.3	0.71
0226	07/08/15	<0.1	8.8	0.68
CR1	06/24/15	0.29	31	1.8
CR2	06/24/15	<0.1	11	0.84
CR3	06/24/15	<0.1	7.3	0.71
CR5	06/24/15	<0.1	8.8	0.78
0201	12/29/15	<0.1	27	3.8
0218	12/28/15	0.16	21	3.2
CR1	12/28/15	<0.1	31	4.0

[1]EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table N.4,
[2]Temperature and pH-Dependent Values, Acute Concentration of Total Ammonia as N (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 receipt of analytical data that meet Environmental Air Monitoring Program and Ground Water Program requirements by subcontracting analytical services to qualified laboratories.

The subcontracted laboratories are qualified under the DOE Environmental Management Consolidated Audit Program, the National Environmental Laboratory Accreditation Program, the Utah Department of Health Environmental Laboratory 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

All documentation created as a result of compliance with this ASER is considered Project record and will be managed in accordance with the *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545), which follows DOE orders, policies, and regulations for retention and maintenance of records.

8.0 References

10 CFR 835 (Code of Federal Regulations), "Occupational Radiation Protection."

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

10 CFR 1022 (Code of Federal Regulations), "Compliance with Floodplain and Wetland 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 370.10 (Code of Federal Regulations), "Who must comply with the hazardous chemical reporting requirements of this part?"

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), 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).

DOE (U.S. Department of Energy), *Moab UMTRA Project Crescent Junction Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1238).

DOE (U.S. Department of Energy), *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJRAC1434).

DOE (U.S. Department of Energy), *Moab UMTRA Project Environmental Air Monitoring Program and Mitigation of Public Exposure* (DOE-EM/GJRAC1988).

DOE (U.S. Department of Energy), *Moab UMTRA Project Environmental Management System Manual* (DOE-EM/GJ1630).

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

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

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).

DOE (U.S. Department of Energy), *Moab UMTRA Project Supplement Analysis for the Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement* (DOE/EIS-0355 SA-2).

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

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

DOE (U.S. Department of Energy) Order 231.1B Admin Chg 1, "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 Admin Chg 3, "Radiation Protection of the Public and the Environment."

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).

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."

ISO (International Organization for Standardization) Standard 14001, "Environmental management systems."

Memorandum, "Sustainable Practices for Designed Landscapes and Supporting Pollinators on Federal Landscapes," Obama, June 2014.

Public Law 89-665, National Historic Preservation Act of 1966.

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

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

UAC R307-309-6 (Utah Administrative Code), "Fugitive Dust Control."

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