LMS/GSB/S06433-0.0

Long-Term Surveillance and Maintenance Plan for the Gasbuggy, New Mexico, Site

October 2018

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Abbreviations

AEC	U.S. Atomic Energy Commission
BLM	U.S. Bureau of Land Management
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
EM	Office of Environmental Management
EPA	U.S. Environmental Protection Agency
EPNG	El Paso Natural Gas Company
ft	feet
IC	institutional control
LM	Office of Legacy Management
LTHMP	Long-Term Hydrologic Monitoring Program
LTS&M	long-term surveillance and maintenance
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MOU	Memorandum of Understanding
NMED	New Mexico Environment Department
OCD	Oil Conservation Division
PLO	Public Land Order
TPHs	total petroleum hydrocarbons
USFS	U.S. Forest Service
VRP	Voluntary Remediation Program

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1.0 Introduction

In 1967, the U.S. Atomic Energy Commission (AEC) detonated a nuclear device 4227 feet (ft) below ground surface at the Gasbuggy, New Mexico, Site to fracture the low-permeability natural-gas-bearing formation in an effort to improve gas production. The 640-acre site is within lands administered by the U.S. Forest Service (USFS), Carson National Forest, Jicarilla Ranger District. The U.S. Department of Energy (DOE) conducts environmental monitoring to verify that any detonation-related contaminants are not migrating offsite and will maintain institutional controls (ICs) to protect the public and the environment. Monitoring consists of sampling existing gas wells and sampling of new gas wells (as described in Section 4.4, "Environmental Monitoring"). Historical monitoring to date has not detected detonation-related contaminants at any sampling location. ICs prohibit subsurface excavations and drilling near the Gasbuggy detonation point. The DOE Office of Legacy Management (LM) has been assigned the responsibility for the long-term stewardship of the Gasbuggy site. This document describes DOE's surveillance, maintenance, and other commitments. These long-term surveillance and maintenance (LTS&M) obligations are listed in Table 1.

Five holes were drilled at the site: the emplacement hole and four instrument and monitoring holes. In addition, an existing onsite El Paso Natural Gas Company (EPNG) well (EPNG 10-36) was used for monitoring the test. The 29-kiloton-yield nuclear device was placed in a 17.5-inch well bore at 4227 ft below ground surface, approximately 40 ft below the Pictured Cliffs/Lewis Shale stratigraphic contact.

AEC decommissioned Project Gasbuggy in 1978. Structures and equipment used for the six production tests were decontaminated and removed, liquid radioactive waste was injected into the cavity formed by the nuclear explosion, and solid radioactive waste was disposed of at the Nevada National Security Site (formerly called the Nevada Test Site). All of the Gasbuggy site wells were plugged and abandoned with the exception of well EPNG 10-36, which was left open as a monitoring location until it was plugged and abandoned in 2003. Soil sampling was done in 1978, 1986, 2000, and 2002. Cultural resource, endangered and sensitive species, floodplain, and wetlands surveys were done in 1993.

The final surface remediation was completed in September 2004. The negotiated threshold for the removal of total petroleum hydrocarbons (TPHs) was 100 parts per million. The Surface Closure Report was submitted to the New Mexico Environment Department (NMED) in 2005 with the recommendation to release the surface for unrestricted use (DOE 2005).

The U.S. Environmental Protection Agency (EPA) Radiation and Indoor Environments National Laboratory, through an interagency agreement with DOE, began a Long-Term Hydrologic Monitoring Program (LTHMP) in 1972. The LTHMP monitoring network consisted of sampling surface water springs, steams and ponds, and water supply wells used to water livestock. In 2007, DOE assumed the responsibility for and continued the LTHMP. There have been no detonation-derived contaminants detected at any of the LTHMP sampling locations.

Table 1 Gasbuggy LTS&M Obligations

Activity
1. **Gas Well Sampling:** Sample produced water from wells 30-039-07525, 30-039-21620, and 30-039-21647 every 5 years, and from any new gas wells drilled within a 1.5-mile radius. Sampling frequency will vary, depending on produced gas rate.
2. **Site Inspections:** Conducted contemporaneously with sampling event.
3. **Other Obligations:** Abide by obligations listed in the 2016 Memorandum of Understanding between DOE, the U.S. Bureau of Land Management, and USFS (see Appendix B).

2.0 Gasbuggy Site

2.1 Location and Legal Description

The Gasbuggy site encompasses 640 acres of land owned by the U.S. government, specifically described as Section 36, Township 29 North, Range 4 West, New Mexico Principal Meridian, of Rio Arriba County, in north-central New Mexico (Figure 1). The southwest quarter of Section 36 is the location of the emplacement well and is the area of primary interest to DOE.

The nearest population center is Dulce, New Mexico, 12 miles to the northeast. Farmington, New Mexico, is 55 miles to the west. The site is accessed from U.S. Highway 64 via USFS roads.

2.2 Land Ownership and Restriction

In March 1967, the AEC assistant general manager for operations requested that the U.S. Department of the Interior (DOI), through the U.S. Bureau of Land Management (BLM), withdraw from all forms of appropriation under public land laws 640 acres of land in the Carson National Forest to conduct the Project Gasbuggy experiment. The request was granted on June 22, 1967, and published in Volume 32 *Federal Register* pages 9166–9167 on June 28, 1967. The withdrawal was granted under Public Land Order (PLO) 4232. Appendix A provides the *Federal Register* notice.

The land withdrawn was described as Township 29 North, Range 4 West, Section 36, New Mexico Principal Meridian. The PLO states that the land is withdrawn "subject to valid existing rights and the provisions of existing withdrawals." These withdrawals include "public land laws, including the mining laws (30 USC., Ch.2), and the mineral leasing laws . . . ." This withdrawal did not include oil and gas leasing rights, which BLM reserved for itself.

The withdrawal further states that the PLO will not alter the surface jurisdiction of the U.S. Department of Agriculture, as administered by USFS—specifically the Jicarilla Ranger District in Bloomfield, New Mexico. The PLO states that the memorandum of understanding (MOU) between AEC and the U.S. Department of Agriculture, signed on March 23, 1967, governs the terms and conditions of AEC's use of the USFS lands. The MOU between DOE, BLM, and USFS, is renewed every 5 years and it is included in Appendix B.

To conduct Project Gasbuggy, in 1967, AEC, DOI, and EPNG entered into a contract to share the responsibilities for conducting the test. In that contract, EPNG granted its operating rights and real property interests in the quarter section containing the emplacement well (SW¼, Section 36) to the federal government (Figure 2). In addition, the parties to the contract recognized that contamination could exist after the detonation, and the contract gave the government perpetual and sole authority over EPNG's real property interests in the SW¼, Section 36, to provide control as necessary for safety considerations. The rights can only be terminated or relinquished by the U.S. government, in writing. The contract grants all rights for the quarter section to the U.S. government and, therefore, established enforceable ICs for that acreage. Appendix C summarizes AEC's rights under the contract.

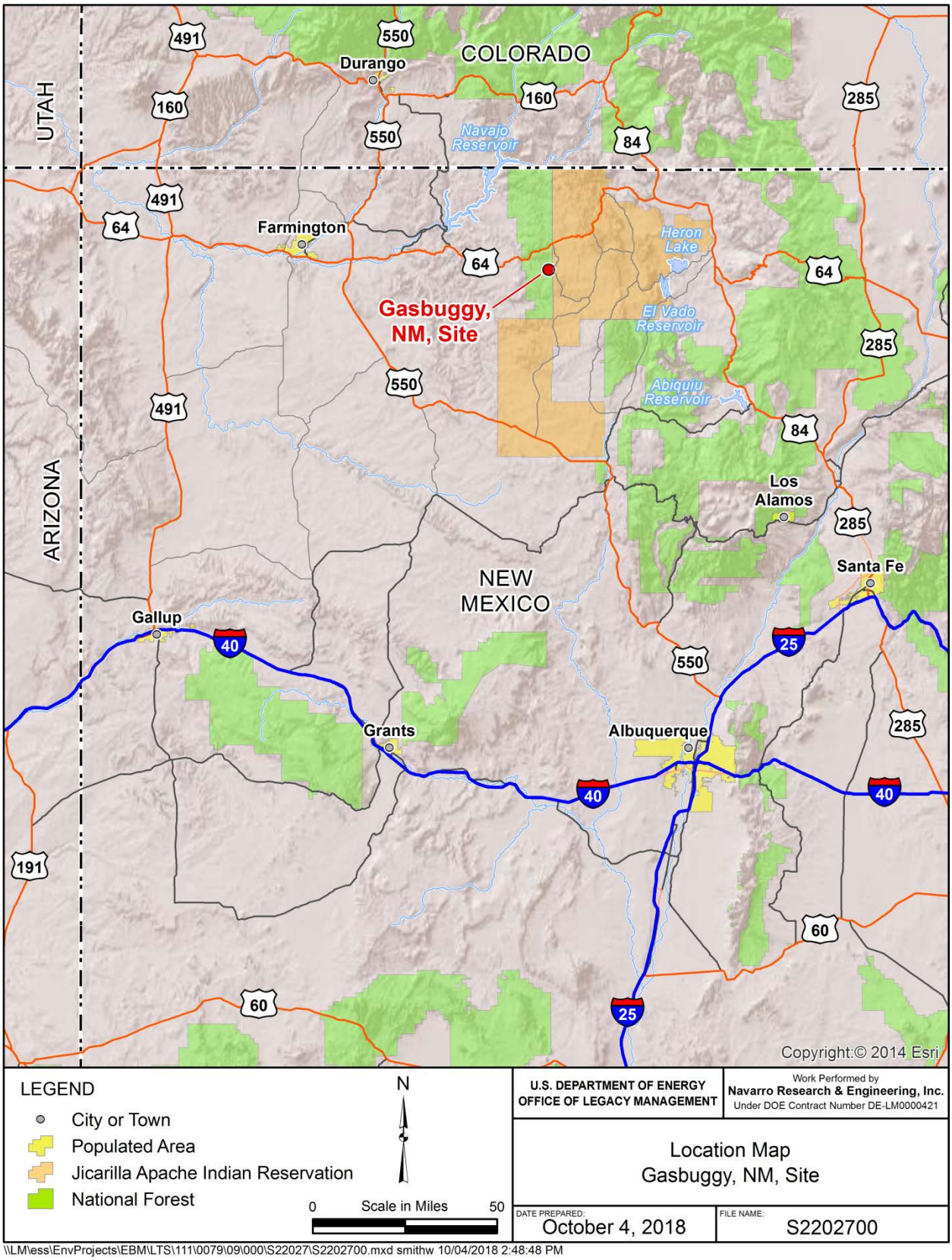

Figure 1. Regional Location Map for the Gasbuggy, New Mexico, Site

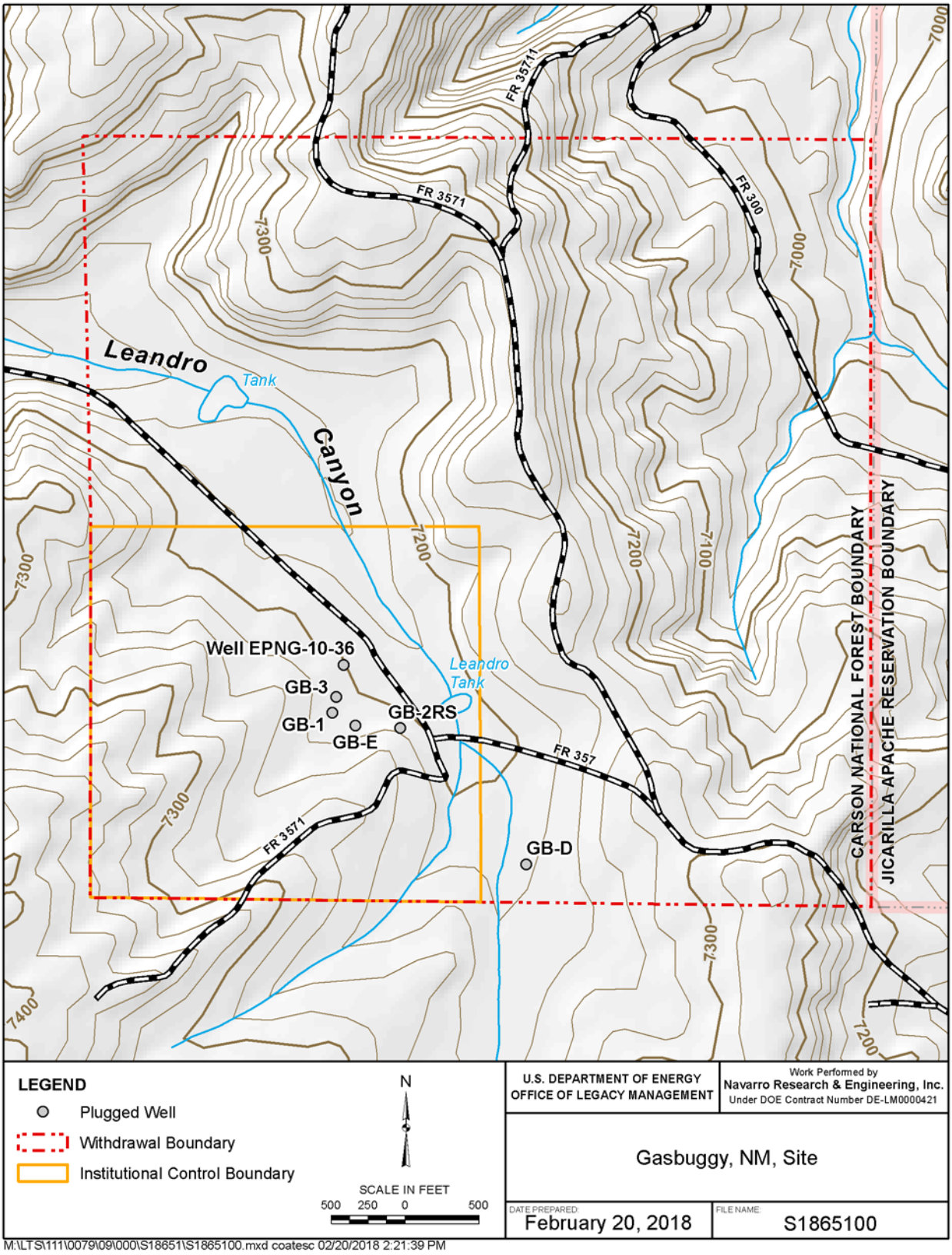

Figure 2. Withdrawal and IC Boundary, and Plugged Wells at the Gasbuggy Site

At the time of the withdrawal, no attempt was made to obtain the remaining subsurface mineral and oil and gas rights, or to terminate the leases associated with the N½ or the SE¼ of the withdrawn Section 36. Therefore, all existing leases valid at the time of the withdrawal are still in effect, and lessees may exercise the rights the leases provide. The monument emplaced at the site states the current subsurface restrictions. In summary, the inscription states that no subsurface intrusion within a radius of 100 ft from the emplacement well to a true vertical depth of 1500 ft, and no subsurface intrusion within a radius of 600 ft from the emplacement well to a true vertical depth between 1500 ft and 4500 ft, may occur without the permission of the U.S. government.

2.3 Surface Interests

In accordance with PLO 4232, the U.S. Department of Agriculture (through USFS) maintains jurisdiction over surface activities. USFS requires permits for installations on or improvements to the land. All structures and facilities associated with Project Gasbuggy have been removed. A monument exists at the emplacement well location, noting drilling restrictions.

There is a USFS grazing allotment granted for the Gasbuggy site area. It allows grazing in winter months only (typically November through April).

Road J-10 on the Jicarilla Apache Reservation is the most direct route to access sampling locations. DOE coordinates with the Jicarilla Apache Nation on a sampling-event basis to use Road J-10.

2.4 Water, Minerals, and Oil and Gas

2.4.1 Water

According to USFS, all subsurface water rights are vested with USFS. In December 2017, a complete data search of the New Mexico State engineer's office's water-rights database showed no groundwater extraction wells in the immediate vicinity of the site. The closest water user to the site is the grazing allottee who drilled a well approximately 3 miles southwest of the Gasbuggy site.

2.4.2 Minerals

In February 1967, staff members from the Nevada Operations Office searched Rio Arriba County records and found no evidence of mining or mineral claims on what would become the Gasbuggy site. The withdrawal for the site contained a withdrawal from mining and mineral leasing laws. Current master title plats for the area show no mineral leases for the site or for the sections surrounding it.

2.4.3 Oil and Gas

At the time of the withdrawal, BLM maintained federal ownership of the oil and gas resources, and BLM still maintains the right to lease these resources. Basic information on the other leases in the area of interest is available on the BLM website on serial title pages. These documents on the leases show the leaseholders, associated interests, and (sometimes) the operating-interest

leaseholder. They do not show information on individual wells. That information is available on the State of New Mexico Oil Conservation Division (OCD) website.

Current BLM oil and gas plats show active leases for all sections to the north, west, and south of the site. These leases predate the withdrawal of Section 36, and the lessees can pursue their rights under their lease agreements.

2.5 Site History

2.5.1 Operations

Project Gasbuggy was the first of three United States underground nuclear experiments for the stimulation of low-productivity natural gas reservoirs. On December 10, 1967, the device was detonated 4227 ft below ground surface at the Pictured Cliffs Sandstone /Lewis Shale stratigraphic contact. The other two sites are the Project Rulison site and the Project Rio Blanco site, both in Colorado.

There were several phases of AEC/DOE Office of Environmental Management (EM) activities at the emplacement well area. Pre-detonation activities included construction and drilling in 1967. Post detonation activities included reentry into several of the project wells in late 1967 and throughout 1968; gas production experiments from 1968 to 1973; and pressure monitoring until 1976.

A natural gas production well at the site, EPNG 10-36, had been in production for approximately 10 years prior to Gasbuggy activities. EPNG 10-36 was converted to a groundwater monitoring well in the Ojo Alamo Aquifer in 1968 (AEC 1971) and was purchased from EPNG by DOE in 1978.

The emplacement well area also included five other wells. Two test wells, designated wells GB-1 and GB-2, were drilled before the nuclear detonation to test the geologic formations. Well GB-2 was reentered after the detonation and renamed well GB-2RS (the “R” stands for “Reentry”). A third well (GB-E) was used as the emplacement well for the nuclear device. This well was also reentered after the detonation and was renamed well GB-ER. A fourth well (GB-3) was drilled after the detonation to investigate impacts on the geologic formations. Well GB-D was drilled to monitor ground motion during the detonation.

2.5.2 Site-Restoration Activities

Site-restoration activities were conducted over a 6-week period in August and September 1978. Restoration activities included the following: (1) well plugging and abandonment; (2) the decontamination, transport, and disposal of equipment; (3) the packaging, transport, and disposal of solid and liquid waste, including injection of liquid radioactive waste into the cavity formed by the nuclear explosion ; (4) land surface restoration; and (5) final status sampling and analysis. None of the soil samples collected during the 1978 restoration activities exceeded established release criteria for radioactive contamination; therefore, no soil was remediated. No radioactive waste, other than the liquid waste injected into the cavity, was buried onsite (DOE 1983). Upon completion of restoration activities, soil samples were collected, and radiological surveys were completed for the emplacement well area. The area was then reshaped, graded, and seeded (DOE 1983). Remaining surface features include earthen berms, abandoned well markers, concrete pads, and a pipe stanchion.

Drilling operations conducted in preparation for the test in 1967 included the construction and use of multiple mud pits at the Gasbuggy site. The practice of mixing diesel fuel with the drilling fluids was common during that era and was implemented at several of the test wells, resulting in petroleum-contaminated mud in pits that were eventually buried in place. As a result, additional Gasbuggy site corrective actions focusing on soil contamination within the shallow subsurface—the unsaturated drilling mud and soil within 30 ft of the ground surface—were developed. Petroleum-contaminated material was identified and delineated during site-characterization activities in 2000 and 2002.

Recommendations based on the site-characterization activities included corrective action to achieve clean closure by removing petroleum-contaminated drilling mud and soil from the shallow subsurface. The State of New Mexico OCD established cleanup level of 100 milligrams per kilogram (mg/kg) of TPHs was used as the corrective action cleanup criterion.

The corrective actions included excavating mud pits, disposing of contaminated material, backfilling excavated pits, reseeding the disturbed areas, and completing an as-built site survey.

These corrective actions were completed in 2004 (DOE 2005). The successful completion of the corrective actions facilitates the future clean closure of the site surface under the New Mexico Voluntary Remediation Program (VRP).

2.5.3 Postdecommissioning Activities

Post-decommissioning field activities have been limited to the monitoring of groundwater, surface water, natural gas, and produced water associated with the natural gas.

Other activities included an evaluation of the LTHMP (DOE 2009) and development of the *Gasbuggy Site Assessment and Risk Evaluation* (DOE 2011). DOE has continued to work with the Jicarilla Apache Tribal staff regarding Gasbuggy site activities, site management, and monitoring results. Also, a numerical model was constructed and implemented (Cooper and Chatman 2015) to simulate the potential movement of detonation-derived radionuclides. The MOU between DOE, BLM, and USFS defines roles and responsibilities for the three agencies (Appendix B). The specific actions that DOE shall do are:

- Provide notice to the BLM Farmington Field Office and the Forest Service of the sampling schedule at least one month prior to the sampling event.
- Provide sample analysis results to the BLM Farmington Field Office and Forest Service.
- Be entirely responsible for the prevention and mitigation of radioactive contamination resulting from project Gasbuggy wherever such contamination may occur on Carson National Forest.
- In cooperation with BLM Farmington Field Office, the Forest Service, and the affected oil and gas operator, develops mitigation measures should sampling results identify possible health, safety, and welfare impacts directly resulting from Gasbuggy activity. Mitigation measures will be determined on a site-specific, case-by-case basis.
- Have 30 days to respond to any Notice of Staking and Application for Permit to Drill notifications provided by the BLM Farmington Field Office.

There are other general terms and conditions in the MOU that are agreed to by all parties and are explained in the MOU.

2.5.3.1 Gasbuggy Site Assessment and Risk Evaluation

The *Gasbuggy Site Assessment and Risk Evaluation* (DOE 2011) identifies nearby natural gas production wells as having the greatest potential for bringing detonation-derived contaminants to the ground surface. Tritium is the most mobile radionuclide that was produced in significant quantities by the detonation, making it the most probable contaminant that could result in an exposure. Three exposure scenarios addressing contamination in gas wells were considered in the risk evaluation: a gas well worker during gas-well-drilling operations, a gas well worker conducting routine maintenance, and a residential exposure. The residential scenario was considered for comparative purposes even though there are no permanent residences on National Forest lands at the Gasbuggy site.

Tritium decays by low-energy beta-particle emission that cannot penetrate human skin. Therefore, tritium must be internalized to present an exposure risk. The two pathways for internalizing tritium are inhalation and ingestion. Since the natural gas directly affected by the detonation (tritiated methane) was flared off during the post detonation production tests (DOE 2011), it is assumed that any tritium encountered through present-day drilling activities would be in the form of tritiated water, either as liquid water or as water vapor that is produced along with the natural gas.

Because the water produced by a natural gas well is never used for drinking, only inhalation was considered a feasible pathway and was examined. The risk evaluation determined tritium-in-air concentrations that would result in radiation doses that exceeded the EPA-established incremental lifetime cancer risk increase probability of 10^{-6} (one in 1 million). To achieve these exposures, various relative humidity conditions and consequent evaporation rates were considered to provide for the vaporization and subsequent inhalation of tritium-bearing produced water at a natural gas well head.

The worst-case exposure scenario for a gas worker required a tritium-in-produced-water concentration of 227,000 picocuries per liter to result in an unacceptable incremental cancer risk increase. Tritium has not been detected in gas well monitoring to date.

2.5.3.2 Radionuclide Transport Model

An analysis was done in 2014 to develop a model that could be used to support strategic planning for long-term surveillance and maintenance of the Gasbuggy site (Cooper and Chapman 2015). The first specific objective was to understand the present-day likely extent of tritium in the subsurface around the Gasbuggy test location. This was met by estimating the distance tritium has migrated from the chimney in the 47 years since the detonation. A conceptual flow and transport model around the emplacement hole (GB-ER) was developed to investigate tritium transport rates in the subsurface. The conceptual model was implemented into the TOUGH2 computer program, which is capable of simulating (radioactively) decaying tritium migrating advectively and diffusively in both gas (in this case as water vapor mixed with methane) and aqueous phases (liquid water). Model results indicated that after 47 years, tritium had diffused in the gas phase 110 meters from the detonation. Tritiated water is able to exchange

phases from a liquid phase to a gas phase, and back again, but the faster-diffusing gas phase (several orders of magnitude) is responsible for most of the tritium transport away from the chimney.

The second specific objective was to examine how close new natural gas wells could be drilled and extract gas from the Pictured Cliffs Sandstone without producing tritium from the Gasbuggy site. The model simulated a single producing gas well, located 340 meters from the detonation point, along the direction of maximum principal stress (which trends northeast). Fluid flow is enhanced in the maximum principal stress direction as a result of well stimulation techniques such as hydraulic fracturing. The hypothetical gas well produced 2.3 billion cubic ft of gas over 30 years from a 10-meter interval located in the middle of the Pictured Cliffs Sandstone, at nearly the same elevation as the detonation point. The results showed that the drainage radius (i.e., pressure change caused by producing hypothetical well) would reach the chimney within the first few years of production, but that the gas-phase velocities would be insufficient to allow tritium to reach the hypothetical well. Currently, the closest producing gas well is approximately 1600 meters from the Gasbuggy site.

DOE controls the subsurface mineral rights in the SW¼ of Section 36. The shortest distance from the Gasbuggy emplacement well to the IC boundary is approximately 800 ft to the east. The detonation point is not centered in the quarter section, so the distance to the IC boundary is longer in other directions. Based on the simulation of tritium diffusion since the nuclear test, tritium from Gasbuggy is currently contained within the IC boundary. Forecasting migration that could be affected by future nearby oil and gas extraction activities is subject not only to the uncertainties of the modeling process, but also to uncertainty about what activities will take place and when. For the simulated conditions of a well 1115 ft from the nuclear test, beginning production now, tritium could migrate close to the boundary of the controlled quarter section after 30 years of production (specifically, within 30 ft in the shortest [eastward] direction, though that is not aligned with the direction of maximum principal stress). This suggests that stewardship of the Gasbuggy site will require continued vigilance to ensure that tritium is not removed from the quarter section by nearby oil and gas extraction activities. It is important to note that tritium migration is defined here as a mass-fraction concentration above background, and does not necessarily represent a level that could present a risk to health or the environment.

Though the analysis presented here suggests a production well can be located at a distance of 1115 ft or greater without causing migration of tritium beyond the control area, there are uncertainties associated with the numerical model that are important to take into account. Many of these uncertainties were addressed in the model by using conservative assumptions that have the effect of allowing more tritium transport than is likely to occur, but the importance of other uncertainties is not clear. Any numerical model of flow and transport processes in the subsurface has inherent uncertainty due to the inability to observe and measure the spatially varying formation and fluid properties. There are additional uncertainties regarding the distribution of fractures and radionuclides from the Gasbuggy test, and the effect of production testing conducted from the chimney. In addition, there are obvious uncertainties regarding where a future production well might be located with respect to the Gasbuggy test and the principal stress direction, how it will be completed (particularly relative to the detonation elevation), how it will be stimulated (e.g., hydro-fracturing), how production will occur, and whether or not there are additional wells in production nearby. The timing of future production is important to an impact analysis because tritium continues to be removed by radioactive decay, which means that production wells drilled later in time are less likely to encounter tritium. These uncertainties in

parameters and processes translate into an uncertainty in the tritium transport distance for the production scenario, and these uncertainties should be remembered when considering the model results for stewardship decisions.

Effort was made to ensure that the modeling was conservative, using parameter values that promote tritium transport. The subsurface formations affected by the Gasbuggy test, the Lewis Shale and Pictured Cliffs Sandstone, were formed during large transgressive and regressive marine cycles, leading to more uniform (and more predictable) flow and transport properties than other, more complex sedimentary environments such as streams or deltas. Fracture properties within these formations, however, are poorly understood, and their geometry and flow properties are complicated. Recognizing this uncertainty, parameter values for permeability, porosity, and tortuosity of the fractured zones were selected to favor transport of tritium toward the producing well.

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3.0 Gasbuggy Site Conditions

3.1 Geology and Hydrology

The Gasbuggy site lies within the San Juan Structural Basin, a northwest-trending depression along the eastern edge of the Colorado Plateau. The basin is bounded on the north by the San Juan Mountains, on the east by the Sierra Nacimiento Mountains, on the west by the Chuska Mountains, and on the south by the Zuni Mountains. At the center of the trough-like basin, the sedimentary rocks are as thick as 14,000 ft. The beds dip from the margin of the basin toward the deepest portion of the basin. Outcrops of Jurassic and Cretaceous rocks rim the basin and are prevalent to the south and west. Faulting occurs in portions of the basin, with displacements up to thousands of feet (New Mexico 2003). Stone et al. (1983) describe the depositional sequence of the basin.

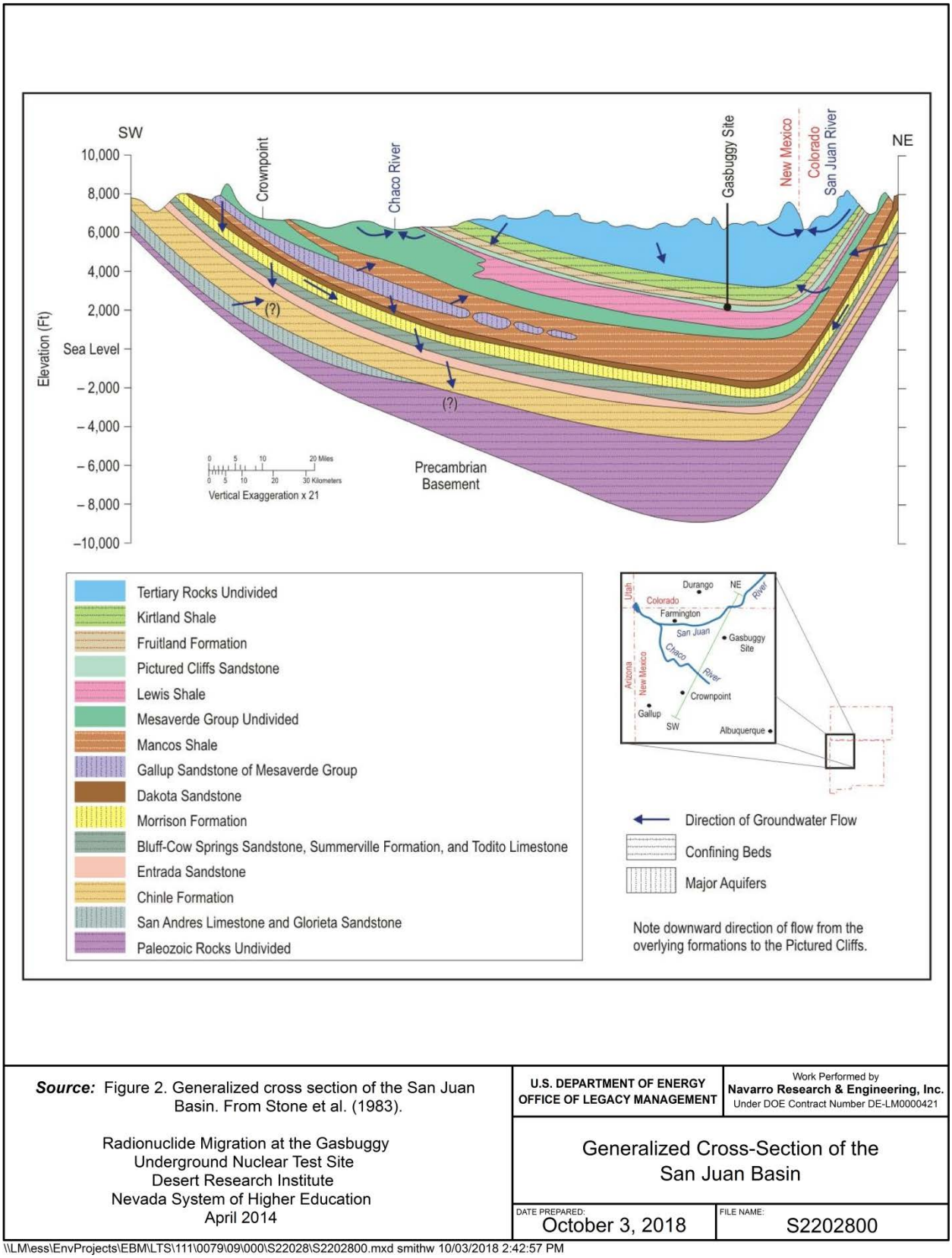
The mineral-rich environment of the San Juan Basin was the primary factor in its selection as a site for the Gasbuggy test. Oil, gas, uranium, and coal have all been extracted from the basin. In areas where the energy resources are present, groundwater is saline. Figure 3 is a generalized geologic cross section of the San Juan Basin. Figure 4 is a cross section across the Gasbuggy site.

Recent alluvium is restricted to valleys along the major stream and tributary channels. The San Jose Formation, a course grained arkosic sandstone interbedded with mudstone, crops out throughout much of the central portion of the basin and is present near the Gasbuggy site. Its thickness ranges from 200 ft in the southwestern portion of the basin to 2700 ft near Gobernador, NM, west of the Gasbuggy site.

Underlying the San Jose Formation is the Nacimiento (Animas equivalent) Formation, both of which are typical continental floodplain deposits. The Nacimiento is interbedded black mudstone with white sandstone at the base, while sandstone and mudstone beds dominate the upper portion. The sandstone units are prevalent in forming the distinct slopes of this formation. At the Gasbuggy site, the formation is represented by a 3500 ft sequence of fine- to medium-grained, locally conglomeratic sandstone interbedded with claystone and sandy shale.

The Ojo Alamo Sandstone is composed of conglomeratic sandstones, sandstones, and shale common in basin sedimentary deposits. The conglomerate pebbles lie in thin, discontinuous stringers and in poorly sorted beds up to 10 ft thick in the northwestern portion of the area. At the Gasbuggy site, the formation is light gray medium- to fine-grained sandstone with minor shale interbeds and is 180 ft thick.

The Kirtland Shale overlies the Fruitland Formation and has been a significant petroleum play in the basin. Although the Kirtland Shale was originally described by Brown (1910) as part of the Ojo Alamo Sandstone, it is commonly lumped with the Fruitland Formation because of its similar hydrologic properties. The boundaries of these two formations are not clearly defined, and the descriptions are incomplete; however, investigators agree that the carbonaceous shale and the coal are within the Fruitland Formation. Both formations consist of fine-grained sands, sandy shale, shale, and clayey sandstone sequences. At the Gasbuggy site, these formations together are 260 ft thick and consist of gray to dark-green shale and siltstone interbedded with thin, very-fine-grained sandstone (Figure 4).



Source: Figure 2. Generalized cross section of the San Juan Basin. From Stone et al. (1983).

Radionuclide Migration at the Gasbuggy Underground Nuclear Test Site
Desert Research Institute
Nevada System of Higher Education
April 2014

U.S. DEPARTMENT OF ENERGY
OFFICE OF LEGACY MANAGEMENT

Work Performed by
Navarro Research & Engineering, Inc.
Under DOE Contract Number DE-LM0000421

Generalized Cross-Section of the San Juan Basin

DATE PREPARED: October 3, 2018

FILE NAME: S2202800

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Figure 3. Generalized Geologic Cross Section of the San Juan Basin, New Mexico

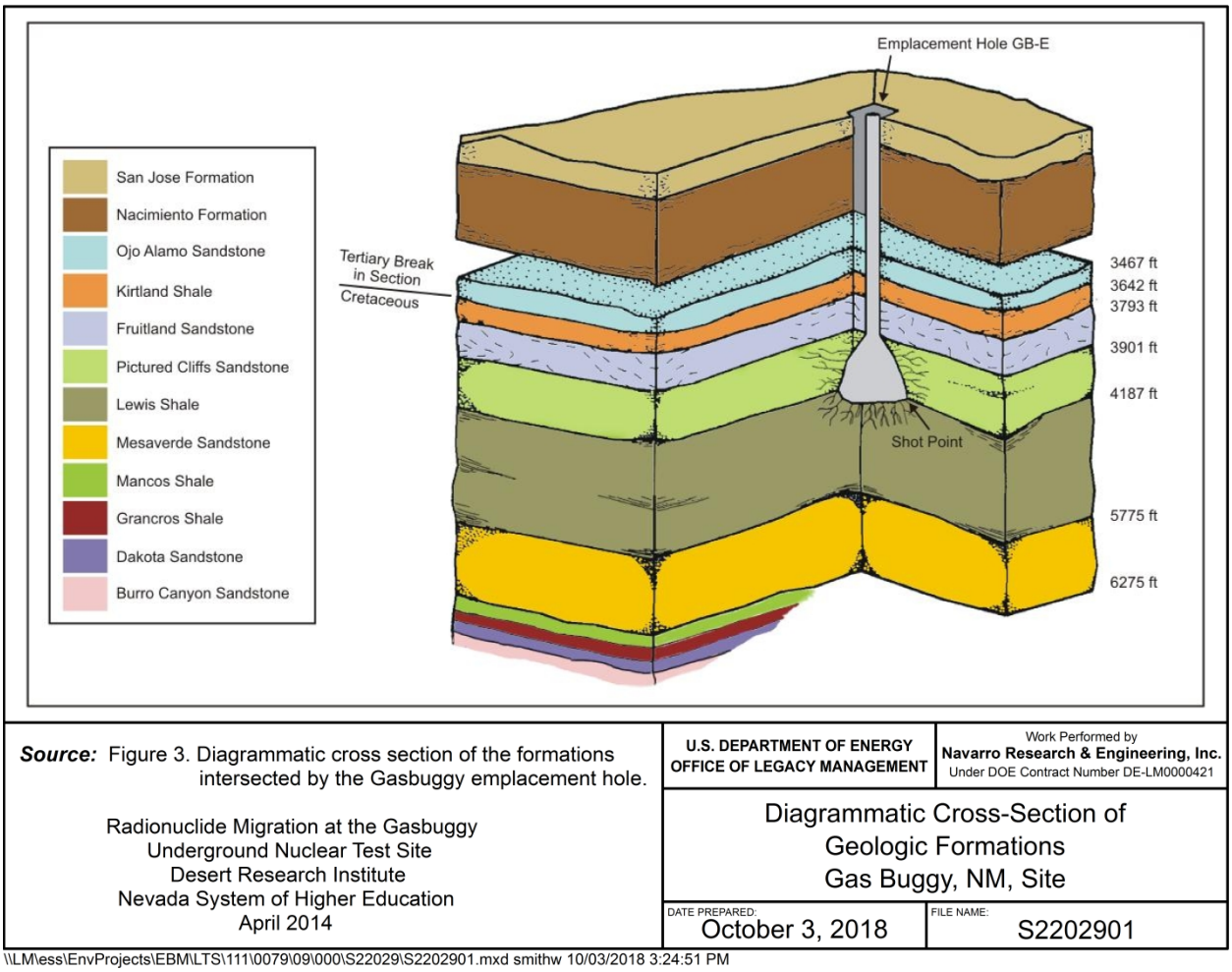

Figure 4. Gasbuggy Site Cross Section

The Pictured Cliffs Sandstone is the latest marine sandstone represented in the basin. The unit was named for the pictographs on the cliff forming arkosic outcrops. Thickness ranges from 25 to 290 ft across the basin. Interbedded sandstone and mudstone mark the contact between the Pictured Cliffs and the Lewis Shale. The formation at the site is a light gray, very-fine-grained to fine-grained sandstone interbedded with dark sandy shale 290 ft thick. Gas production from the Pictured Cliffs is characterized by flow along natural joints, fractures, and bedding planes. Flow in the rock matrix is much slower than in the joints and fractures due to the low permeability of the rock matrix.

The Pictured Cliffs intertongues with the underlying Lewis Shale. The Lewis Shale is a gray to black shale interbedded with sandy limestone, sandstone, and bentonite.

3.2 Surface Water

The Continental Divide crosses the San Juan Basin and separates the Rio Grande and Colorado River drainages. The San Juan River flows into New Mexico from Colorado and exits New Mexico into Utah. Surface water near the Gasbuggy site flows toward the San Juan River. Spring water is from the San Jose Formation, which crops out across the area.

3.3 Groundwater

The San Juan Basin structure and geology control groundwater conditions within the basin. The San Juan Hydrologic Unit Regional Water Plan prepared by the State of New Mexico has a comprehensive discussion of the area's groundwater resources (New Mexico 2003).

The New Mexico groundwater protection regulations specify that all groundwater in the state that has an existing total dissolved solids concentration less than 10,000 milligrams per liter (mg/L) must be protected for present or potential future use as domestic and agricultural water supply (Benjamin and Belluck 1994). For reference, the EPA secondary drinking water standard for total dissolved solids is 500 mg/L. The San Jose, Nacimiento, and Ojo Alamo Formations (Figure 4) are aquifers containing groundwater that the State considers "acceptable and retrievable" (New Mexico 2003).

The Fruitland and Kirtland Formations were unsaturated at Gasbuggy GB-1 when this well was drilled, and the Pictured Cliffs Formation yielded a very small amount of water. The San Juan Hydrologic Unit Regional Water Plan does not discuss the Pictured Cliffs Sandstone as an aquifer.

Groundwater flow from the Gasbuggy site is believed to be to the west-northwest to discharge points along the San Juan River (Mercer 1970). At the site, hydraulic head values decrease with depth, indicating a potential for downward flow (Sokol 1970).

Water supply wells in the general area tap both the alluvium and the underlying Tertiary sandstones at depths between 54 and 229 ft (Mercer 1968).

3.4 Environmental Setting

The Gasbuggy site is in the northeast portion of the San Juan Basin, a structural feature of the Colorado Plateau Province covering northwestern New Mexico and southwestern Colorado. Canyon and plateau topography typical of the Colorado Plateau Province surrounds the Gasbuggy site. Elevations range from 6800 to 7500 ft in the surrounding area, and from 7000 to 7300 ft in the immediate test area (DOE 1988). The emplacement well area is at an elevation of 7211 ft above sea level (DOE 1983). Figure 2 shows the topography of the Project Gasbuggy location and immediate surrounding area.

The Gasbuggy site lies within the Cold Temperate climatic zone. Three basic vegetation communities (i.e., forest, scrubland, and grassland) are represented at the site. The forest community is classified as Rocky Mountain Montane Conifer Forest, which is dominated by Ponderosa pine. This community is typically found along the steeper slopes of the site, forming a band around the drainage areas. The scrubland community is Great Basin Montane Scrub and is found along hilltops, above the forest. Although classified as a scrubland, this community may support Ponderosa and Pinyon pines. The grassland community is further subdivided into two distinct series: the Great Basin Shrub-Grassland, Sagebrush Grass Series, and the Great Basin Shrub-Grassland, Wheatgrass Series (DOE 1993a).

3.4.1 Surface Water, Wetlands, and Floodplains

The Gasbuggy site has no naturally standing water, streams, springs, or seeps. A survey of state wetland inventories and the flood insurance map for Rio Arriba County did not indicate either wetland or floodplain areas at the Gasbuggy site (DOE 1993b).

3.4.2 Biological Survey

A biological survey was completed on September 7, 2000. A detailed report on the survey's findings was prepared and will be kept in the project files. The report concluded that "no effect will occur to any U.S. Fish and Wildlife Service (USFWS) threatened endangered, proposed candidate, or species of concern as a result of environmental studies taking place at the Gasbuggy Site. No effect will occur to State of New Mexico threatened, endangered, or species of concern or USFS sensitive species as a result of environmental studies at the Gasbuggy Site" (TRC 2000a). This survey was conducted prior to and in support of the 2004 remedial activities and is discussed here for reference.

3.5 Cultural Resources Survey

A contractor on the USFS Jicarilla Ranger district list of archeological permittees completed a cultural resources survey on September 22, 2000. A detailed report on the survey's findings was prepared and will be kept in the project files. The survey identified three "isolated occurrences" and one newly recorded "site." Isolated occurrences are archaeological manifestations offering limited information because they lack identifiable cultural context. Sites, generally speaking, are larger in size and extent. The "site" was recorded on the ridge to the south of the Control Point area, which is more than 2 miles southwest of the emplacement well area and no longer part of the Gasbuggy site (TRC 2000b). This survey was conducted prior to and in support of the 2004 remedial activities and is discussed here for reference.

3.6 Surface and Near-Surface Conditions

The surface and near-surface at the Gasbuggy site is considered to be the land surface and the shallow subsurface to a depth of approximately 30 ft below ground surface. The remedy selected was removal of contaminated soil (drilling mud) to prevent migration to shallow groundwater. The State of New Mexico OCD established a cleanup level of 100 mg/kg for TPHs (DOE 2004).

The surface remedial work is complete. Remediation of the surface resulted in the removal of 5562 cubic yards of contaminated soil from mud pits and importing clean fill, mixing the clean fill with existing overburden, and backfilling (DOE 2005).

The Surface Closure Report (DOE 2005) recommendations (paraphrased) are:

- Complete the application for admission of the site into the New Mexico Voluntary Remediation Program (VRP).
- Work within the New Mexico VRP to complete all required public participation activities.
- Require no further corrective actions for the surface and shallow subsurface (down to 30 ft below ground surface).

- Place no restrictions on the surface.
- Request a certificate of completion for the Gasbuggy site when all NMED comments on the Surface Closure Report are addressed and all VRP required documentation is filed.

3.6.1 Fence, Gates, and Signs

The fences, gates, and signs at the Gasbuggy site are the property and responsibility of USFS. Therefore, DOE has no inspection or maintenance obligations associated with those site features.

3.6.2 Monitoring Wells

There are no onsite monitoring wells at the Gasbuggy site. All wells (historically sampled) are offsite and owned and maintained by parties other than DOE. DOE obtains permission from the well owners to acquire samples.

3.6.3 Emplacement Well Monument

Figure 5 shows the emplacement well monument. The inscription on the monument is as follows:

Project Gasbuggy

Nuclear Explosive Emplacement/Reentry Well (GB-ER)

Site of the first United States underground nuclear experiment for the stimulation of low productivity natural gas reservoir. A 29-kiloton nuclear explosive was detonated at a depth of 4,227 feet below this surface location on December 10, 1967.

No excavation, drilling, and/or removal of subsurface materials to a true vertical depth of 1,500 feet is permitted within a radius of 100 feet of this surface location, nor any similar excavation, drilling, and/or removal of subsurface materials between the true vertical depths of 1,500 feet and 4,500 feet is permitted within a 600 foot radius of this surface location in the SE quarter of the SW quarter of Section 36, T 29 N, R 4 W, New Mexico Principal Meridian, Rio Arriba County, New Mexico, without U.S. Government permission.

United States Department of Energy
November 1978

DOE owns and maintains the emplacement well monument.

3.6.4 Site Roads

USFS owns and maintains roads that access the Gasbuggy site from U.S. Highway 64.

3.6.5 Surface Water

There are no perennial surface water bodies on the Gasbuggy site. Surface water locations (historically sampled) are all offsite. DOE obtains permission from landowners to acquire surface water samples.

Figure 5. The Emplacement Well Monument

3.7 Subsurface Conditions

"Subsurface" generally means a depth below 30 ft; specifically, the depth ranging from 30 ft below ground surface to below the detonation point of 4227 ft below ground surface to approximately 4500 ft below ground surface. The subsurface features are the four site wells (GB-1, GB-2RS, GB-3, and GB-D), the nuclear device emplacement shaft (GB-ER), the commercial partner's well (EPNG-10-36), and the deep test cavity/chimney below the emplacement well area. The relative locations of these wells are shown in Figure 2. These wells are plugged and abandoned.

There is no feasible remedy for the contamination in the cavity, in the chimney of rubble above and in the cavity, and in fracturing in the formation surrounding the nuclear explosion.

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4.0 Gasbuggy Long-Term Surveillance and Maintenance

This LTS&M Plan implements the long-term stewardship program for the Gasbuggy site. LM will maintain protectiveness at the Gasbuggy site through a combination of government ownership, inspections, interface with USFS, interface with BLM, interface with the Jicarilla Apache Nation, recordkeeping, gas well and or water well sampling, maintenance of ICs, and stakeholder communications.

4.1 Inspections

4.1.1 Frequency

A site inspection will be performed in conjunction with the periodic sampling events. Section 4.4, "Environmental Monitoring," includes details regarding sampling events.

The goal of inspection is to verify that the ICs have not been violated and to determine if maintenance or additional inspections are needed to protect human health and the environment.

Since DOE does not own the surface rights at Gasbuggy, the inspection is limited to verifying that the emplacement well monument is in acceptable condition and that the ICs intended to prevent subsurface access continue to function.

4.1.2 Procedure

DOE will notify USFS, BLM, the Jicarilla Apache Nation, and appropriate stakeholders of an inspection at least 30 days before the scheduled inspection date.

Inspectors will look for evidence of unauthorized subsurface intrusion and determine if site controls are adequate. Land use patterns and changes near the site should be noted as a predictor of future changes and intrusion potential. Significant changes within these areas could include erosion and natural resource development (e.g., drilling).

Photographs will be taken as necessary to document observations such as evidence of vandalism, changed conditions, or maintenance needs. Inspectors will record photograph information on a photograph log, which becomes part of the site record maintained at the LM office at Grand Junction, Colorado.

4.1.3 Personnel

Inspectors will be members of the sampling team. At least one member of the sampling team will have previously been on a sampling and inspection trip for the Gasbuggy site.

4.1.4 Reporting

Results of site inspections and monitoring will be reported in the site inspection, sampling, and analysis results report. The report will address inspection observations, maintenance, and monitoring results since the previous report. LM will post the final report on its Web page for the Gasbuggy site at http://www.lm.doe.gov/gasbuggy/Sites.aspx and also submit paper copies to the

Jicarilla Apache Nation, USFS, BLM, NMED, OCD, and gas producers whose gas wells were sampled as part of the Gasbuggy environmental monitoring program.

4.2 Unscheduled Inspections

Unscheduled inspections are conducted in response to threatening or unusual site conditions.

4.2.1 Criteria for Unscheduled or Follow-Up Inspections

LM may conduct a follow-up inspection if:

- A condition is identified during the routine site inspection or other site visit that requires personnel with specific expertise to return to the site to evaluate the condition, or
- A citizen; a subcontractor; or a federal, state, or local agency notifies DOE that conditions at the site have substantially changed.

Once a condition or concern is identified at the site, DOE will evaluate the information and decide whether to respond with a follow-up inspection. DOE may request the assistance of local authorities to confirm the seriousness of a condition at the site before scheduling a follow-up inspection or initiating action. Local stakeholder agencies will be notified after the condition is verified with follow-up action considerations.

Specific conditions that may necessitate a follow-up inspection include unauthorized intrusion; violation of an IC; vandalism; or the need to revisit the site to evaluate, define, or conduct additional maintenance tasks. Conditions that may require a more immediate follow-up inspection include the disclosure of human activity that threatens site integrity. DOE will evaluate risk when scheduling a follow-up inspection. The urgency of the follow-up inspection will be judged in proportion to the seriousness of the condition.

In the event of an incident or activity that threatens or compromises ICs or poses a risk of exposure to, or release of, known contaminants, DOE will do all of the following:

- Notify USFS, BLM, NMED, and the Jicarilla Apache Nation
- Begin the occurrence notification process (DOE Order 232.2A, *Occurrence Reporting and Processing of Operations Information*)
- Respond with an immediate follow-up inspection, if appropriate
- Commence emergency measures to contain or prevent the release of harmful constituents from the Gasbuggy site

The public is encouraged to use the 24-hour numbers (970-248-6070 or toll-free 877-695-5322) of the LM office at Grand Junction to request information about the site or to notify DOE of concerns.

4.2.2 Follow-Up Inspection Reporting

Results of follow-up inspections will be included in the annual inspection, sampling, and analysis results report (see Section 4.1.4 of this document). Separate reports will not be prepared unless DOE determines it advisable to notify outside agencies of a situation that remains uncorrected at the site.

If rapid follow-up is required for serious reasons or emergency conditions, DOE will immediately notify USFS, BLM, NMED, and the Jicarilla Apache Nation of the planned inspection or action and subsequently publish a preliminary report of the inspection or action.

4.3 Site Maintenance

The emplacement well monument is the only site asset owned by DOE. DOE will maintain the emplacement well monument as needed.

4.4 Environmental Monitoring

Table 2 lists the Gasbuggy sampling locations and analytes.

Table 2 Sampling Locations and Analytes

Sample Location	Sample Medium	Analytes
30-039-07525	Produced water	Tritium
30-039-21620	Produced water	Tritium
30-039-21647	Produced water	Tritium

4.4.1 Natural Gas Produced Water Sampling

Natural gas and the associated produced water have been sampled from seven gas wells (near the Gasbuggy site) completed in the Pictured Cliffs Formation (Figure 6). Sampling was conducted annually from 2009 to 2014. Natural gas samples were analyzed for tritium and carbon-14; produced water from the gas bearing zone was sampled for tritium, gross alpha and beta, and gamma spectroscopy. No detonation-related contaminants were detected in any sample. Because there have been no detonation-related contaminants detected, DOE conducted an evaluation of the gas well sampling strategy and presented that evaluation in *Sampling Recommendations for Gas Wells near the Gasbuggy, New Mexico, Site* (DOE 2015). This evaluation concluded that the annual sampling frequency of the seven wells should be revised based on proximity and the amount of the cumulative gas produced over time. Based on the evaluation (well proximity and gas production rate), DOE will sample three of the original seven wells every 5 years (Table 2). This confirmation sampling is justified to ensure that this potential contaminant transport path remains unaffected by detonation related contaminants.

An underground nuclear detonation produces a number of radionuclides. Radionuclides with properties that make them essentially immobile in this geologic environment are of less concern than those that are more mobile. Isotopes of uranium, plutonium, cesium, and strontium are essentially immobile in the geologic environment surrounding the Gasbuggy detonation zone because they are entrained in the solidified melt rock, limiting their dissolution into formation water which has limited mobility.

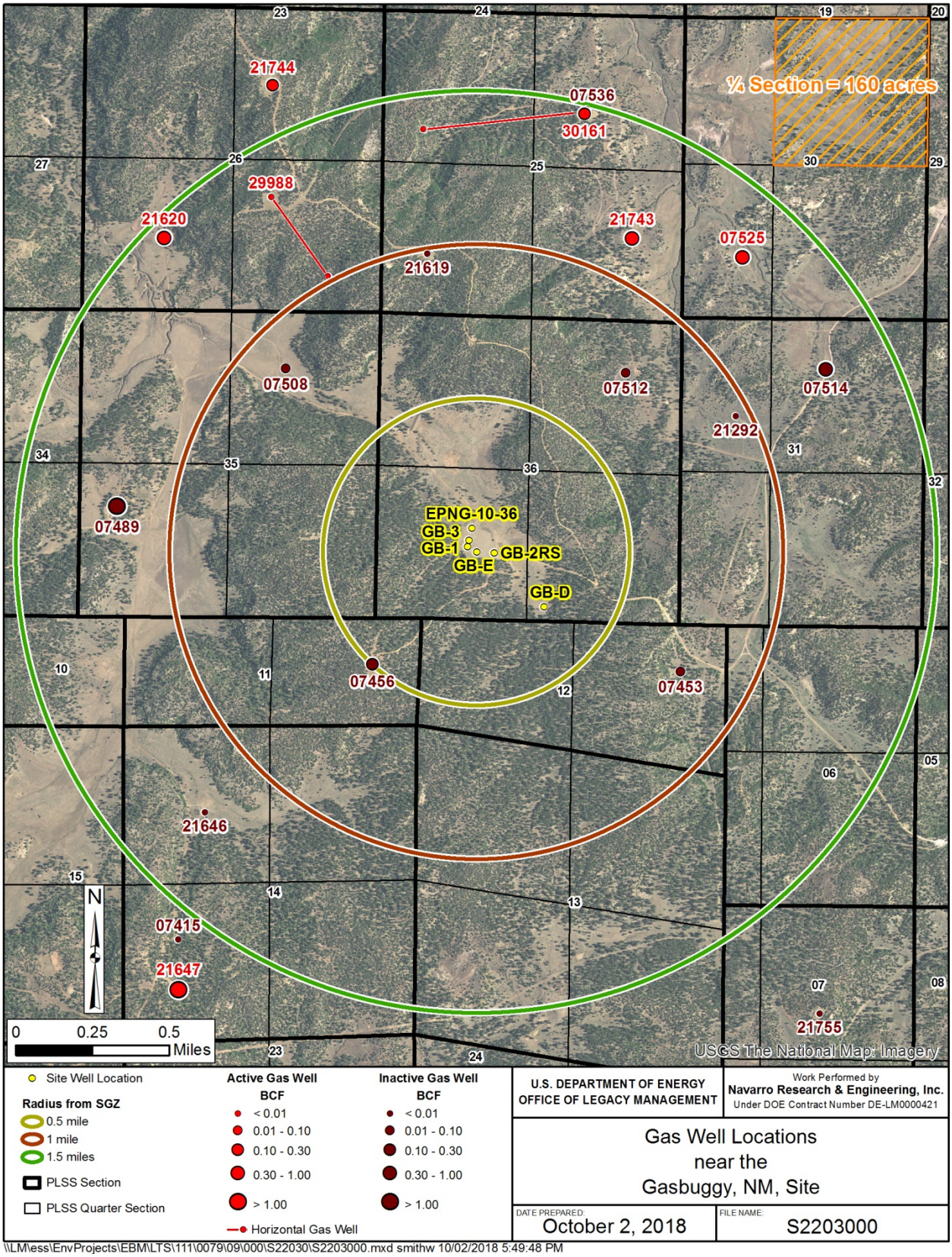

Figure 6. Natural Gas Wells in the Pictured Cliffs Formation, Gasbuggy, New Mexico, Site

Certain radionuclides can exist in the more mobile gas phase, have relatively long half-lives, and were created in significant amounts by the detonation. Both tritium (an isotope of hydrogen) and krypton-85 are radionuclides of concern because of their persistence in the subsurface and their potential mobility. Krypton-85 is primarily a gas and was removed during production testing of the reentry well. The declining concentration of krypton-85 was used in natural gas stimulation tests as an indicator of when contaminated gas in the chimney was removed and being replenished by uncontaminated gas from the adjacent formation. Tritium that substitutes for normal hydrogen atoms in tritiated hydrogen gas and tritiated methane was also removed during production testing. The remaining tritium produced by the detonation is present as tritiated water molecules (THO instead of H_2O) in both water vapor and liquid water. As the high temperatures cooled immediately after the detonation, steam in the chimney condensed to liquid water. The reentry well production testing removed the gas phase from the detonation zone, including tritiated water vapor; but the majority of tritium remained in the chimney as liquid water. The tritiated water exchanges readily between liquid water and water vapor, providing a source of mobile tritium at the Gasbuggy site.

Flow and the potential for contaminant transport are different for a low permeability, gas-bearing reservoir than they are for water-bearing aquifers. A gas reservoir is a multiphase system with porosity occupied by a combination of gas and aqueous phases. At the Gasbuggy site, it is estimated that the pore space is occupied by approximately 50% liquids and 50% gas. The relative permeability of the gas phase is about four orders of magnitude greater than that of liquids in these natural gas-producing reservoirs. For contaminants to migrate any appreciable distance, they have to be in the gas phase. Because tritium remains in significant quantities and can exist in the gas phase, tritium (as tritiated water) is considered the principal contaminant of concern. Although tritiated methane was also produced during the detonation, most was vented from the blast cavity and flared during production testing.

If tritium is detected at a sampling location, DOE will resample the location to verify the results. If the results are verified, DOE will conduct an evaluation of the situation to determine the best course of action.

4.4.2 Groundwater and Surface Water Monitoring

DOE initiated the sampling of groundwater and surface water near the Gasbuggy site in 1972, which the EPA implemented as part of the LTHMP. DOE assumed responsibility for the annual sampling in 2008 and continued the sampling until 2014. This program was initiated to annually check for detonation-related contaminants in wells and surface water locations that are relatively near the Gasbuggy site. Results of this sampling program have demonstrated that detonation-related contaminants have not been detected at any sampled location.

Because detonation-related contaminants had not been detected, DOE decided to revisit the historical monitoring program to assess its effectiveness regarding contaminant detection. This evaluation considered feasible pathways for contaminant migration from the detonation site to the surrounding environment. Results of this evaluation have shown that the historical sampling locations are not likely contaminant migration pathways.

The absence of detonation-related contaminants at the sampling locations results from a combination of factors that include the depth below ground surface of the detonation point (4227 ft) compared to the depth of the sampling points (75 to 230 ft), the low permeability of the intervening geologic formations, and the lateral distance between the water wells and the detonation. Also, regional groundwater elevation evaluations have determined that there is a downward hydraulic gradient in the Gasbuggy area (Sokol 1970). Therefore, DOE has decided to suspend all sampling of historic groundwater and surface water locations.

If new groundwater wells are installed in the area of interest around the Gasbuggy site, DOE may conduct sampling and analysis of water produced from those wells.

4.5 Gasbuggy ICs

ICs for the Gasbuggy site are a combination of federal ownership, land withdrawal, a notice of restrictions regarding subsurface penetration shown on the emplacement well monument, notification agreements with BLM and USFS as defined in the MOU, and DOE control over all subsurface interests in the SW¼ of Section 36. Inspectors will ensure that the ICs continue to be effective by verifying that the restrictions are observed. Land ownership and use restrictions are covered in detail in Section 2.2 of this document.

4.6 Records and Data Management

To support post-remediation maintenance of the Gasbuggy Site, LM maintains records at their office in Grand Junction, Colorado and at the LM Business Center (LMBC) in Morgantown, West Virginia. These records contain critical information required to protect human health and the environment, manage land and assets, protect the legal interests of DOE and the public, and mitigate community impacts resulting from the cleanup of legacy waste. Site historical records about the environmental remediation and stewardship are included in the collection. All LM records will be managed in accordance with applicable requirements.

4.7 Health and Safety

Health and safety requirements and procedures for surveillance and maintenance activities are consistent with DOE orders, federal regulations, and applicable codes and standards. Specifically, an established job safety analysis for environmental monitoring/maintenance and a procedure for natural gas sampling will be followed to address and mitigate hazards associated with field activities.

5.0 Specific Site Reference Information

5.1 Internet Access

LM will maintain a Web page for the Gasbuggy site. Key documents will be available on the LM website at https://www.lm.doe.gov/gasbuggy/Sites.aspx.

5.2 News Releases and Editorials

LM will issue news releases and community advisories to announce public meetings regarding LM documents or activities as required.

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6.0 References

36 CFR 1220–1239 (Chapter 12, Subchapter B). National Archives and Records Administration, "Records Management," *Code of Federal Regulations*.

44 USC 2901–2911. "Records Management by the Archivist of the United States and by the Administrator of General Services, *United States Code*.

44 USC 3101–3107. "Records Management by Federal Agencies," *United States Code*.

44 USC 3301–3315. "Disposal of Records," *United States Code*.

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DOE (U.S. Department of Energy), 2015. *Sampling Recommendations for Gas Wells near the Gasbuggy, New Mexico, Site*, LMS/GSB/S13165, Office of Legacy Management, August.

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TRC, 2000a. *Biological Assessment and Evaluation, Gasbuggy Site, Carson National Forest, Rio Arriba County, New Mexico*, prepared by N.F. Kasting, Albuquerque, New Mexico.

TRC, 2000b. *Cultural Resources Survey of Four Operational Areas for the Gasbuggy Site, Carson National Forest, Rio Arriba County, New Mexico*, 1993-02-64C, prepared by J.C. Acklen, Albuquerque, New Mexico.

Appendix A

Gasbuggy Site Withdrawal Public Land Order

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§ 5–1.5004–4 Instructions.

See § 5–1.1003.

§ 5–1.5005 Synopsis of contract awards.

§ 5–1.5005–1 Submission.

Reports of contract awards shall be submitted to the Department of Commerce in accordance with § 5–1.1004.

§ 5–1.5005–2 Form.

This report shall be prepared on Optional Form 10, U.S. Government Memorandum.

§ 5–1.5005–3 Reports control.

Reports Control Symbol COM–9 has been assigned to this reporting requirement.

§ 5–1.5005–4 Instructions.

See § 5–1.1005–4.

§ 5–1.5006 Consolidated List of Administrative Debarments by Executive Agencies.

See § 5–1.607–51.

§ 5–1.5008 Report on preference procurement in labor surplus areas.

§ 5–1.5008–1 Submission.

(a) This § 5–1.5008 provides instructions which implement the reporting requirements prescribed by § 1–1.807 of this title.

(b) Reports shall be prepared by each service and staff office in the Central Office and in the regional offices. Regional office service and staff office reports shall be forwarded to the Regional Director of Administration who shall consolidate them and submit the consolidated report to the Central Office. (The Regional Administrator shall be furnished an information copy of the report.) Central Office service and staff office reports shall be submitted on an individual basis.

(c) Reports shall be submitted to reach the Central Office, Accounting Division, Office of Finance, Office of Administration, within 30 working days after the close of each calendar quarter.

§ 5–1.5008–2 Form.

No form has been prescribed for this report.

§ 5–1.5008–3 Reports control.

Reports Control Symbol GS–34–OA has been assigned to this reporting requirement.

§ 5–1.5008–4 Instructions.

Reports shall be prepared and submitted in accordance with the instructions in § 1–1.807 of this title and this § 5–1.5008.

§ 5–1.5009 Report of identical bids.

§ 5–1.5009–1 Submission.

Reports of identical bids shall be submitted to the Attorney General in accordance with Subpart 1–1.16 of this title.

§ 5–1.5009–2 Form.

Form DJ–1500, Identical Bid Report for Procurement (illustrated in § 1–16.903–DJ1500 of this title), shall be used when submitting this report.

§ 5–1.5009–3 Reports control.

Reports Control Symbol DJ–1 has been assigned to this reporting requirement.

§ 5–1.5009–4 Instructions.

See § 1–1.1603 of this title.

§ 5–1.5010 Notice of award of contracts subject to the Walsh-Healey Public Contracts Act.

§ 5–1.5010–1 Submission.

Notice of award of contracts subject to the Walsh-Healey Public Contracts Act shall be submitted to the Department of Labor, Wage and Hour and Public Contracts Divisions, Washington, D.C. 20212.

§ 5–1.5010–2 Form.

This report shall be prepared on Standard Form 99, Notice of Award of Contract.

§ 5–1.5010–3 Reports control.

Reports Control Symbol LAB–1 has been assigned to this reporting requirement.

§ 5–1.5010–4 Instructions.

See § 5–12.603 of this chapter.

§ 5–1.5011 Report of transactions of Board of Contract Appeals.

§ 5–1.5011–1 Submission.

This report shall be submitted annually to the Administrator by the Board of Contract Appeals.

§ 5–1.5011–2 Form.

No form has been prescribed for this report.

§ 5–1.5011–3 Reports control.

Reports Control Symbol OA–19 is required for this report.

§ 5–1.5011–4 Instructions.

See § 5–60.105 of this chapter.

Effective date. These regulations are effective upon publication in the FEDERAL REGISTER.

Dated: June 21, 1967.

J. E. MOODY,
Acting Administrator for General Services.

[F.R. Doc. 67–7352; Filed, June 27, 1967; 8:45 a.m.]

Title 43—PUBLIC LANDS: INTERIOR

Chapter II—Bureau of Land Management, Department of the Interior

APPENDIX—PUBLIC LAND ORDERS

[Public Land Order 4231]

[Riverside 272]

CALIFORNIA

Revocation of National Forest Administrative Site Withdrawal

By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952 (17 F.R. 4831), it is ordered as follows:

1. The departmental order of January 18, 1907, withdrawing national forest lands as administrative sites, is hereby revoked so far as it affects the following described land:

SAN BERNARDINO MERIDIAN

LOS PADRES NATIONAL FOREST

T. 5 N., R. 23 W.,
Sec. 35, E½SW¼.

The area described contains 80 acres in Ventura County.

2. At 10 a.m. on July 28, 1967, the land shall be open to such forms of disposition as may by law be made of national forest lands.

HARRY R. ANDERSON,
Assistant Secretary of the Interior.

JUNE 22, 1967.

[F.R. Doc. 67–7353; Filed, June 27, 1967; 8:45 a.m.]

[Public Land Order 4232]

[New Mexico 1999]

NEW MEXICO Gasbuggy

Withdrawal for Underground Atomic Energy Experiment

By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952 (17 F.R. 4831), it is ordered as follows:

1. Subject to valid existing rights and the provisions of existing withdrawals, the following described lands, which are under the jurisdiction of the Secretary of Agriculture, are hereby withdrawn from all forms of appropriation under the public land laws, including the mining laws (30 U.S.C., Ch. 2), and the mineral leasing laws, and reserved for use of the Atomic Energy Commission for experimental purposes (Project Gasbuggy):

NEW MEXICO PRINCIPAL MERIDIAN

CARSON NATIONAL FOREST

T. 29 N., R. 4 W.,
Sec. 36.

The area described contains 640 acres in Rio Arriba County.

2. The withdrawal made by this order does not alter the applicability of those public land laws governing the use of the national forest lands under lease, license, or permit, or governing the disposal of their mineral or vegetative resources other than under the mining and mineral leasing laws. However, leases, licenses or permits will be issued only if the Atomic Energy Commission finds that the proposed use of the lands will not interfere with the proper conduct of its experiments.

3. The withdrawal made by this order does not alter the jurisdiction of the Secretary of Agriculture over the national forest lands for purposes other than for Project Gasbuggy. The terms and conditions for utilization of the national forest lands by the Atomic Energy Commission will be governed by the Memorandum of Understanding of March 23, 1967, between the Department of Agriculture and the Atomic Energy

Commission, as may be amended and supplemented.

HARRY R. ANDERSON,
Assistant Secretary of the Interior.

JUNE 22, 1967.

[F.R. Doc. 67-7254; Filed, June 27, 1967; 8:45 a.m.]

[Public Land Order 4233]

[Oregon 956]

OREGON

Partial Revocation of Stock Driveway Withdrawal

By virtue of the authority contained in section 10 of the act of December 29, 1916 (39 Stat. 865; 43 U.S.C. 300), as amended, it is ordered as follows:

1. Public Land Order No. 1967 of September 1, 1959, withdrawing lands for stock driveway purposes, is hereby revoked so far as it affects the following described lands:

WILLAMETTE MERIDIAN

T. 33 S., R. 18 E.,
Sec. 7, S½SW¼NE¼, S½SE¼NW¼, NE¼SW¼, and NW¼SE¼.

The areas described aggregate approximately 120 acres in Lake County.

The lands are located about 5 miles northwest of the town of Paisley. Topography is moderate north slopes. Soils are silty loam with a mixture of rock and gravel. Vegetative cover consists of big sage, bluebunch wheatgrass, Sandberg's bluegrass, and other native shrubs, forbs, and grasses.

2. At 10 a.m. on July 28, 1967, the lands shall be open to operation of the public land laws generally, subject to valid existing rights, the provisions of existing withdrawals, and the requirements of applicable law. All valid applications received at or prior to 10 a.m. on July 28, 1967, shall be considered as simultaneously filed at that time. Those received thereafter shall be considered in the order of filing.

The lands have been open to applications and offers under the mineral leasing laws, and to location under the United States mining laws, subject to the regulations in 43 CFR 3400.3.

The State of Oregon has waived the preference right of application granted to certain States by R.S. 2276, as amended (43 U.S.C. 852).

Inquiries concerning the lands should be addressed to the Manager, Land Office, Bureau of Land Management, Portland, Oregon.

HARRY R. ANDERSON,
Assistant Secretary of the Interior.

JUNE 22, 1967.

[F.R. Doc. 67-7255; Filed, June 27, 1967; 8:46 a.m.]

[Public Land Order 4234]

[Fairbanks 036266]

ALASKA

Withdrawal for Administrative Site

By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952 (17 F.R. 4831), it is ordered as follows:

1. Subject to valid existing rights, the following described lands are hereby withdrawn from all forms of appropriation under the public land laws, including the mining laws (30 U.S.C., Ch. 2), but not from leasing under the mineral leasing laws, and reserved for the General Services Administration as an administrative site:

TRACT 1

U.S. Survey No. 4404, containing 38.20 acres.

TRACT 2

A strip of land extending 250 feet on each side of the centerline of the Alaska Highway from U.S. Survey No. 4404 southeasterly to the United States-Canada international line. Containing 17.20 acres.

The areas described aggregate 55.40 acres.

2. Public Land Order No. 386 of July 31, 1947, is hereby revoked so far as it affects the above described lands.

3. The withdrawal made by this order does not alter the applicability of the public land laws governing the use of the public lands under lease, license or permit, or governing the disposal of their mineral or vegetative resources other than under the mining laws.

HARRY R. ANDERSON,
Assistant Secretary of the Interior.

JUNE 22, 1967.

[F.R. Doc. 67-7256; Filed, June 27, 1967; 8:46 a.m.]

[Public Land Order 4235]

[Montana 489]

MONTANA

Partial Revocation of National Forest Administrative Site Withdrawal

By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952 (17 F.R. 4831), it is ordered as follows:

1. The departmental order of February 17, 1908, withdrawing national forest lands as an administrative site, is hereby revoked so far as it affects the following described lands:

KOOTENAI NATIONAL FOREST

PRINCIPAL MERIDIAN

Fortine Creek Administrative Site

T. 34 N., R. 25 W.,
Sec. 19, SE¼SE¼SW¼;
Sec. 30, NW¼NW¼NE¼ and NE¼NE¼NW¼.

The areas described aggregate 30 acres in Lincoln County.

2. At 10 a.m. on July 28, 1967, the lands shall be open to such forms of disposition as may by law be made of national forest lands.

HARRY R. ANDERSON,
Assistant Secretary of the Interior.

JUNE 22, 1967.

[F.R. Doc. 67-7257; Filed, June 27, 1967; 8:46 a.m.]

Title 45—PUBLIC WELFARE

Subtitle A—Department of Health, Education, and Welfare, General Administration

PART 14—MINIMUM STANDARDS OF OPERATION FOR STATE AGENCIES FOR SURPLUS PROPERTY

Part 14 of Title 45 CFR is hereby amended to read as follows:

Sec.
14.1 Definitions.
14.2 Basic policy.
14.3 Geographic scope.
14.4 Organization.
14.5 Plan of Operation.
14.6 Books and records.
14.7 Service charges and funds.
14.8 Audits.
14.9 Handling of property.
14.10 Eligibility.
14.11 Utilization and compliance responsibility.
14.12 Assistance to the Department.
14.13 Nonconformance.
14.14 Amendments.

AUTHORITY: The provisions of this Part 14 issued under sec. 203, 63 Stat. 385; sec. 4, 64 Stat. 579; 69 Stat. 53; 70 Stat. 493; 40 U.S.C. 484(j); 44 CFR 55.35.

§ 14.1 Definitions.

(a) "Accountability" means the obligation imposed by law or lawful order of regulation on a State agency or individual(s) for keeping accurate records of property and/or funds. The person having this obligation may or may not have actual possession of the property or funds. Accountability is concerned primarily with records, while responsibility is concerned primarily with custody, care, and safekeeping.

(b) "Act" means the Federal Property and Administrative Services Act of 1949, Public Law 152, 81st Congress (63 Stat. 377), as amended (40 U.S.C. 471 et. seq.). Terms defined in the Act and not defined in this section shall have in this part the meaning given to them in the Act.

(c) "Department" means the Department of Health, Education, and Welfare.

(d) "Donable property" means surplus equipment, materials, books, or other supplies under the control of any executive agency (including surplus property in working capital funds established pursuant to 10 U.S.C. 2208 or in similar management-type funds) except:

(1) Such property as may be specified from time to time by the Administrator of General Services;

(2) Surplus agricultural commodities, food, and cotton or woolen goods determined from time to time by the Secretary of Agriculture to be commodities requiring special handling in order to assist him in carrying out his responsibilities with respect to price support or stabilization;

(3) Property in trust funds.

(e) "Need" means a requirement for anything usable and necessary by eligible applicants in the conduct of educational, public health, or civil defense activities.

Appendix B

Gasbuggy Site 2016 Memorandum of Understanding

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FS Agreement No. 16-MU-11030200-002

MEMORANDUM OF UNDERSTANDING
between the
U.S. DEPARTMENT OF ENERGY
OFFICE OF LEGACY MANAGEMENT
and the
USDI, BUREAU OF LAND MANAGEMENT
FARMINGTON FIELD OFFICE
and the
USDA, FOREST SERVICE
CARSON NATIONAL FOREST

This MEMORANDUM OF UNDERSTANDING (MOU) is hereby made and entered into by and between the U.S. Department of Energy, Office of Legacy Management, hereinafter referred to as "DOE" and the U.S. Department of the Interior (USDI), Bureau of Land Management, Farmington Field Office, hereinafter referred to as "BLM" and the U.S. Department of Agriculture (USDA), Forest Service, Carson National Forest, hereinafter referred to as the "U.S. Forest Service."

Title: Gasbuggy Site – Underground Nuclear Site Long-term Monitoring

BACKGROUND:

Property Description:
The Gasbuggy Site is in northwestern New Mexico in Rio Arriba County, approximately 55 miles east of the city of Farmington, New Mexico, and approximately 12 miles southwest of Dulce, New Mexico, in the Carson National Forest. The Gasbuggy Site consists of 640 acres withdrawn under Public Land Order (PLO) 4232 (Sec. 36, T. 29N., R. 4W. NMPM). On December 10, 1967, the U.S. Atomic Energy Commission (AEC), a predecessor agency of DOE, detonated a 29-kiloton-yield nuclear device 4,240 feet below ground surface. The detonation was known as Project Gasbuggy. Project Gasbuggy was the first natural gas reservoir stimulation project in the Plowshare Program.

Current Site Status:
It is understood that the withdrawal of the Gasbuggy Site, as stated in PLO 4232, remains in force because monitoring and use restrictions are still required on the withdrawn property. The withdrawal notice states that the PLO will not alter the surface jurisdiction of the Secretary of Agriculture, as administered by the Forest Service. PLO 4232 states that the terms and conditions of AEC's use of the Forest Service lands will be governed by the Memorandum of Understanding between AEC and USDA. PLO 4232 further states that the withdrawn lands are subject to valid existing rights. BLM retains oil and gas administration responsibilities for any preexisting oil and gas leases.

Institutional Controls
DOE, through AEC, via contract AT (04-3) -711, has been granted control of oil and gas leases, easements, conveyances, contract, or any other source whatsoever, in and to all rights

and interest from the surface of the earth to a depth of 500 feet below the base of the Pictured Cliffs Formation as to the SW 1/4 of Section 36, T. 29N., R 4W, NMPM.

In addition to the institutional control provided by the land withdrawal specified in PLO 4232, DOE requires notification from BLM of any Notices of Staking (NOSs) and Applications for Permit to Drill (APDs) for oil and gas. DOE will contact the appropriate surface management agency for the status of any proposed water wells annually. The lands subject to these conditions are defined as the "area of review" and are described as follows: Sections 25, 26, 35, and 36, T. 29N., R. 4W.; Sections 30 and 31, T.29N., R.3W.; Sections 11, 12, 13, and 14, T. 28N., *R4W.*; and Section 6, T., 28N., R. 3W., all in Rio Arriba County, New Mexico, NMPM.

A subset of lands within the area of review is defined as the "area of interest." Under the National Environmental Policy Act (NEPA), the area of interest may require further environmental analysis prior to gas well drilling. The area of interest is shown on the attached map and is described as follows:

Section 36 and the east 1/2 of Section 35, T. 29N, R. 4W; and Section 12 and the east 1/2 of Section 11, T. 28N, R. 4W, all in Rio Arriba County, New Mexico, NMPM.

Access for Monitoring

DOE requires access to Carson National Forest lands for sampling purposes. In cooperation with the appropriate oil and gas operator, DOE may conduct sampling of produced natural gas and any associated water in existing or future wells within the above described lands defined as the area of review. In cooperation with the appropriate surface management agency, DOE may also sample water from springs and water wells, should any be developed in the area of interest at the Gasbuggy Site. DOE may also need to develop its own wells for environmental sampling, analysis, or remediation if it determines they are necessary.

PURPOSE:

The purpose of this MOU is to document the cooperation among the parties to outline roles and responsibilities addressing the withdrawn land, communication, and institutional controls, to ensure continued protectiveness at the Gasbuggy Site. Guiding documents include the Federal Land Policy and Management Act of 1976, PLO 4232, NEPA, Executive Order 10355, and Contract No. AT (04-3) - 711 between AEC, the U.S. Department of the Interior, and the El Paso Natural Gas Company, dated January 31, 1967.

In consideration of the above premises, the parties hereto agree to the following:

I. THE BLM SHALL:

A. Notify DOE of any NOS or APD within the area of review specified under the institutional controls under this MOU.
B. Notify DOE of directional or horizontal drilling applications that originate outside of the specified area of review but that have end-hole completions within the specified area of review.
C. Include in the APD approval the right for DOE to acquire gas and produced water samples as a permit condition for wells in the area of review.

D. Include in the APD approval the right for DOE to acquire drilling fluid and hydraulic fracturing fluid samples during the well drilling and development phase for wells drilled in the area of review.
E. In accordance with NEPA, provide DOE with the opportunity for cooperating agency status for NEPA evaluations of proposed gas drilling locations within the area of interest, should the BLM Farmington Field Office decide to conduct a NEPA review.

II. THE DOE SHALL:

A. Provide notice to the BLM Farmington Field Office and the Forest Service of the sampling schedule at least 1 month prior to the sampling event.
B. Provide sample analysis results to the BLM Farmington Field Office and the Forest Service.
C. Be entirely responsible for the prevention and mitigation of radioactive contamination resulting from Project Gasbuggy wherever such contamination may occur on Carson National Forest.
D. In cooperation with the BLM Farmington Field Office, the Forest Service, and the affected oil and gas operator, develop mitigation measures should sampling results identify possible health, safety, and welfare impacts directly resulting from Gasbuggy activity. Mitigation measures will be determined on a site-specific, case-by-case basis.
E. Have 30 days to respond to any NOS and APD notifications provided by the BLM Farmington Field Office.

III. THE U.S. FOREST SERVICE SHALL:

A. Provide DOE surface access to gas wells, springs, and water wells (if any are developed) for sampling purposes.
B. Allow no subsurface intrusion within a radius of 100 feet from surface ground zero to a true vertical depth of 1,500 feet and no subsurface intrusion within a radius of 600 feet from surface ground zero to a true vertical depth between 1,500 feet and 4,500 feet, as stated on the Gasbuggy Site monument.
C. Give DOE the authority to conduct subsurface and surface investigations that DOE determined to be necessary as part of managing the Gasbuggy Site, within the areas described in item B above, subject to complying with normal Forest Service processes.
D. In accordance with NEPA, provide DOE with the opportunity for cooperating agency status for NEPA evaluations of proposed gas drilling locations within the area of interest.

IV. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND AMONG THE PARTIES THAT:

A. This MOU sets forth the general process by which the parties anticipate coordinating the Gasbuggy Project. This MOU does not identify specific projects for funding or obligating any monies for projects.

B. PRINCIPAL CONTACTS. Individuals listed below are authorized to act in their respective areas for matters related to this agreement.

DOE Cooperator Program Contact
Jalena Dayvault, Gasbuggy Site Manager
DOE Office of Legacy Management
2597 Legacy Way
Grand Junction, CO 81503
Phone: 970-248-6016
E-mail: Jalena.Dayvault@lm.doe.gov

DOE Cooperator Admin. Contact
Jalena Dayvault, Gasbuggy Site Manager
DOE Office of Legacy Management
2597 Legacy Way
Grand Junction, CO 81503
Phone: 970-248-6016
E-mail: Jalena.Dayvault@lm.doe.gov

BLM Cooperator Program Contact
Charles Harraden
BLM Farmington Field Office
6251 College Blvd., Suite A
Farmington, NM 87402
Phone: 505-564-7739
Fax: 505-564-7608
E-mail: charrade@blm.gov

BLM Cooperator Admin. Contact
Vicki Switzer
BLM Farmington Field Office
6251 College Blvd., Suite A
Farmington, NM 87402
Phone: 505-599-8920
Fax: 505-599-8997
E-mail: vicki_switzer@blm.gov

U.S. Forest Service Program Contact
Jon J. Miller
Jicarilla Ranger District
1110 Rio Vista Lane, Unit #2
Bloomfield, NM 87413
Phone: 505-632-2956
Fax: 505-632-3173
E-mail: jjmiller@fs.fed.us

U.S. Forest Service Admin. Contact
Kileen B. Mitchell
Carson National Forest
208 Cruz Alta Road
Taos, NM 87571
Phone: 575-758-6296
Fax: 575-758-6213
E-mail: kileenbmitchell@fs.fed.us

C. NOTICES. Any communication affecting the operations covered by this agreement given by the U.S. Forest Service, DOE, or BLM is sufficient only if in writing and delivered in person, mailed, or transmitted electronically by e-mail or fax, as follows:

To the Forest Service program contact, at the address specified in this MOU.

To the BLM Farmington Field Office and DOE at the addresses shown in the MOU or such other address designated within the MOU.

Notices are effective when delivered in accordance with this provision, or on the effective date of the notice, whichever is later.

D. PARTICIPATION IN SIMILAR ACTIVITIES. This MOU in no way restricts the U.S. Forest Service, the DOE or the BLM from participating in similar activities with other public or private agencies, organizations, and individuals.

E. NONBINDING AGREEMENT. This MOU creates no right, benefit, or trust responsibility, substantive or procedural, enforceable by law or equity. The parties shall manage their respective resources and activities in a separate, coordinated and mutually beneficial manner to meet the purpose(s) of this MOU. Nothing in this MOU authorizes any of the parties to obligate or transfer anything of value.

Specific, prospective projects or activities that involve the transfer of funds, services, property, and/or anything of value to a party requires the execution of separate agreements and are contingent upon numerous factors, including, as applicable, but not limited to: agency availability of appropriated funds and other resources; cooperator availability of funds and other resources; agency and cooperator administrative and legal requirements (including agency authorization by statute); etc. This MOU neither provides, nor meets these criteria. If the parties elect to enter into an obligation agreement that involves the transfer of funds, services, property, and/or anything of value to a party, then the applicable criteria must be met. Additionally, under a prospective agreement, each party operates under its own laws, regulations, and/or policies, and any Forest Service obligation is subject to the availability of appropriated funds and other resources. The negotiation, execution, and administration of these prospective agreements must comply with all applicable law

Nothing in this MOU is intended to alter, limit, or expand the agencies' statutory and regulatory authority.

F. FREEDOM OF INFORMATION ACT (FOIA). Public access to MOU or agreement records must not be limited, except when such records must be kept confidential and would have been exempted from disclosure pursuant to Freedom of Information regulations (5 U.S.C. 552).

G. TEXT MESSAGING WHILE DRIVING. In accordance with Executive Order (EO) 13513, "Federal Leadership on Reducing Text Messaging While Driving," any and all text messaging by Federal employees is banned: a) while driving a Government owned vehicle (GOV) or driving a privately owned vehicle (POV) while on official Government business; or b) using any electronic equipment supplied by the Government when driving any vehicle at any time. All cooperators, their employees, volunteers, and contractors are encouraged to adopt and enforce policies that ban text messaging when driving company owned, leased or rented vehicles, POVs or GOVs when driving while on official Government business or when performing any work for or on behalf of the Government.

H. TERMINATION. This MOU may be terminated upon 30 calendar days' written notice by any party. In the event of termination of this MOU, project/program contacts for DOE, BLM, and the U.S. Forest Service will meet to discuss future management of the location covered by this MOU.

I. MODIFICATIONS. Modifications within the scope of this MOU must be made by mutual consent of the parties, by the issuance of a written modification signed and dated by all properly authorized, signatory officials, prior to any changes being performed. Requests for modification should be made, in writing, at least 30 days prior to implementation of the requested change.

J. COMMENCEMENT/EXPIRATION DATE. This MOU is executed as of the date of the last signature and is effective through **January 31, 2021,** at which time it will expire, unless

extended by an executed modification, signed and dated by all properly authorized, signatory officials.

K. AUTHORIZED REPRESENTATIVES. By signature below, each party certifies that the individuals listed in this document as representatives of the individual parties are authorized to act in their respective areas for matters related to this MOU. In witness whereof, the parties hereto have executed this MOU as of the last date written below.

[redacted] 6/7, 2016

TANIA SMITH-TAYLOR, Director — Date
Legacy Management, Office of Site Operations

[redacted] 7/22/16

VICTORIA BARR, District Manager — Date
USDI, Bureau of Land Management

[redacted] May 16/2016

JAMES D. DURAN, Forest Supervisor — Date
Carson National Forest

The authority and format of this agreement have been reviewed and approved for signature.

[redacted] 5/11/2016

KILEEN B. MITCHELL — Date
U.S. Forest Service Grants Management Specialist
[redacted]

Burden Statement

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0217. The time required to complete this information collection is estimated to average 3 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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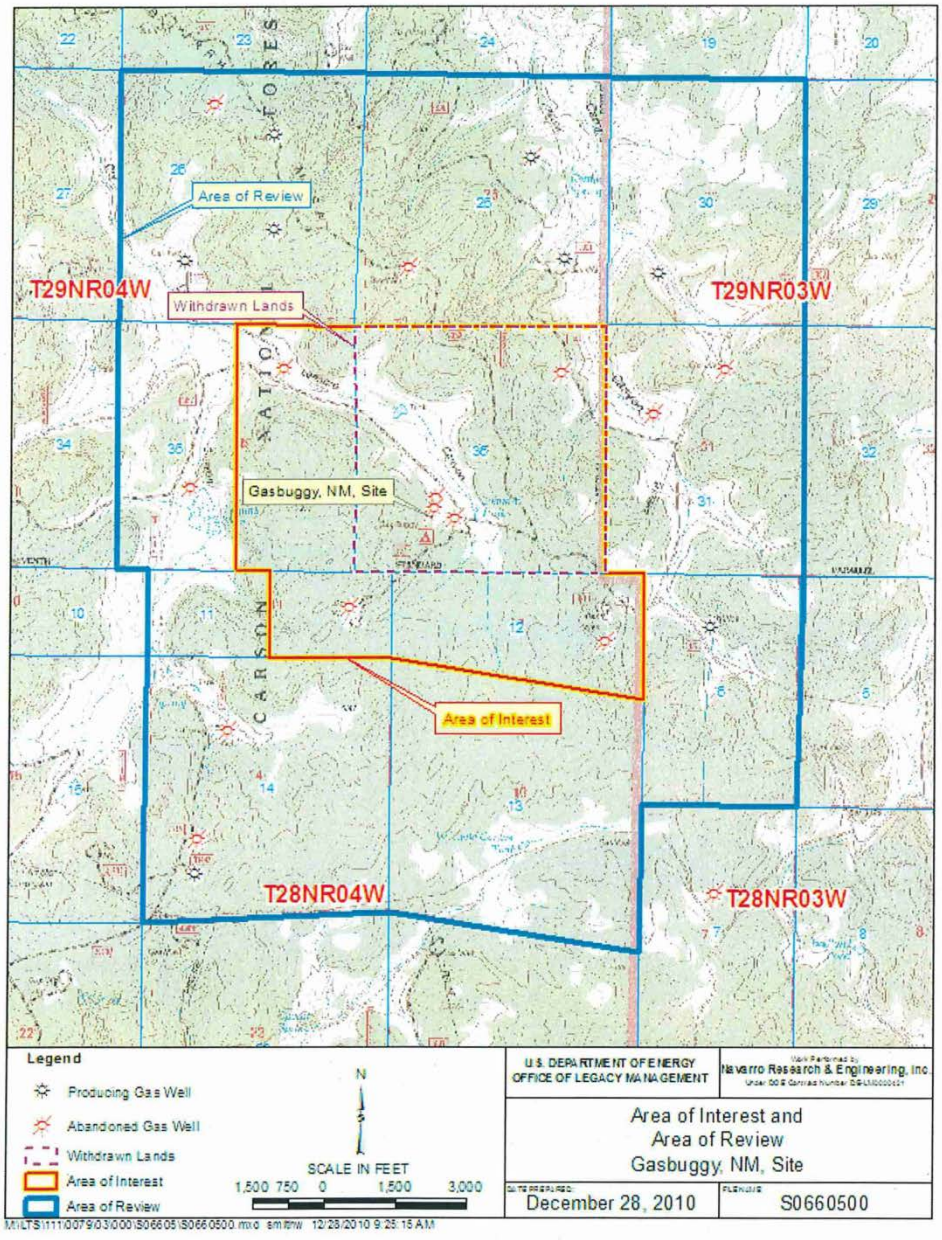
To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call toll free (866) 632-9992 (voice). TDD users can contact USDA through local relay or the Federal relay at (800) 877-8339 (TDD) or (866) 377-8642 (relay voice). USDA is an equal opportunity provider and employer.


Area of Review
T29NR04W
Withdrawn Lands
T29NR03W
Gasbuggy, NM, Site
Area of Interest
T28NR04W
T28NR03W
Legend
Producing Gas Well
Abandoned Gas Well
Withdrawn Lands
Area of Interest
Area of Review
N
SCALE IN FEET
1,500 750 0 1,500 3,000
U.S. DEPARTMENT OF ENERGY
OFFICE OF LEGACY MANAGEMENT
Navarro Research & Engineering, Inc
Area of Interest and
Area of Review
Gasbuggy, NM, Site
December 28, 2010
S0660500
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Appendix C

Summary of Real Property Rights Contractually Granted to AEC

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Real Property Rights Granted to the Atomic Energy Commission at the Gasbuggy site via Contract with El Paso Natural Gas Company

On January 31, 1967 the Atomic Energy Commission (AEC), the Department of the Interior (DOI), and the El Paso Natural Gas Company (EPNG) entered into a contract (contract no. AT (04-3)-711) that set forth the terms and conditions for the Gasbuggy test, which was a cooperative effort between the AEC, DOI, and EPNG. As part of the contract, EPNG granted the AEC significant authority over the real property and oil and gas rights held by EPNG at the test site, further described below.

Article II, section (a) grants the AEC (the Government) full use of all of EPNG's (the Company) "operating rights derived through oil and gas leases, easements, conveyances, contract or any other source whatever, in and to all rights and interest from the surface of the earth to a depth of 500 feet below the base of the Pictured Cliffs Formation as to the SW ¼ of Section 36, Township 29 North, Range 4 West, N.M.P.M., Rio Arriba County, New Mexico." Article II, section (a) further states "Such rights as the Government acquires under the foregoing shall remain in the Government until such time as the Government advises the Company in writing that it no longer desires such rights…" LM has no record of such a letter relinquishing these rights.

Article XV of the same contract states the following: In recognition of the fact…"that special safety considerations may exist after detonation of the nuclear explosive, the Company agrees that it shall follow all regulations, rules and directions of the Commission in regard thereto. Furthermore, it agrees that the Commission may exercise such control to effectuate such regulations, rules and directions of the Commission as it in its sole discretion deems appropriate over the Company's real property interests. *This obligation shall survive expiration or termination of this contract and shall cease only upon written notice by the Commission"* (italics added). Article XV further states that this obligation shall be binding upon EPNG's successors. LM has no record of such a letter relinquishing these rights.

In summary, the combination of the withdrawal of section 36 and the rights granted to the Government per the above paragraphs over the southwest quarter of section 36, provide LM with enforceable property rights and control over a significant portion of the test area.

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