LMS/RUL/S06178

Rulison Monitoring Plan, Revision 1

December 2019

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Contents

Figures

Table

Abbreviations

C-14	carbon-14
CDPHE	Colorado Department of Public Health and Environment
COGCC	Colorado Oil and Gas Conservation Commission
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	feet
Kr-85	krypton-85
LTHMP	Long-Term Hydrologic Monitoring Program
MDC	minimum detectable concentration
MMCF	million cubic feet

1.0 Introduction

The U.S. Department of Energy (DOE) Office of Legacy Management prepared this Monitoring Plan to document DOE's strategy of monitoring natural gas wells for any potential contamination associated with the underground nuclear test at the Rulison, Colorado, Site (Figure 1). The underground nuclear test was conducted in 1969 and has resulted in residual radionuclide contamination at the detonation depth of 8425 feet (ft). This Monitoring Plan identifies (1) the contaminants that have the greatest potential to migrate from the detonation zone, (2) the most likely transport pathways, (3) samples (natural gas or produced water) to be collected and frequency of sampling, and (4) the laboratory methods to be used, with the laboratory screening levels, action levels, and reporting requirements. The location of the Rulison site is shown in Figure 1.

Studies conducted by Desert Research Institute and DOE have used numerical models to simulate the production of natural gas from wells outside the Rulison site boundary, which is identified as Lot 11 (Figure 1). Results from these studies indicate that contamination associated with the underground nuclear test is not expected to migrate outside the Lot 11 site boundary (Cooper et al. 2007, 2009, and 2010) (DOE 2013). Ten years of monitoring data obtained from producing natural gas wells indicate that no Rulison detonation–related contamination has migrated to the sampled wells outside the site boundary. The contamination associated with the underground nuclear test is not expected to ever migrate outside the site boundary. The sampling strategy provided in this plan is designed to be protective of human health and the environment, while allowing additional data to be collected to verify that the institutional and administrative controls remain protective for the site.

1.1 Regulatory Framework

Colorado Oil and Gas Conservation Commission (COGCC) has decision authority over applications for permits to drill oil and gas wells in Colorado and Colorado Department of Public Health and Environment (CDPHE) acts as their consultant on environmental matters. The COGCC requires that operators with gas wells within approximately 2 miles of the Rulison site adhere to the COGCC's *Rulison Sampling and Analysis Plan for Operational and Environmental Radiological Monitoring Near Project Rulison Revision 4*, hereafter called the Rulison Sampling and Analysis Plan (COGCC 2017). The DOE Monitoring Plan emphasizes the sampling of wells near the site, specifically those with a bottom-hole location of 1 mile or less from the detonation, depending on the direction relative to the natural fracture trend of the producing formation. DOE's plan was developed to provide a cautious and comprehensive approach for detecting any potential contaminant migration from the Rulison test site. It also provides an independent confirmation of results from the industry sampling program while effectively increasing the sampling frequency of wells near the site in combination with the industry sampling program.

COGCC notifies DOE of any drilling permit activity within approximately 2 miles of the site. Drilling permit applications submitted for wells within a half-mile of the site require a special hearing before the commission and prior to approval.

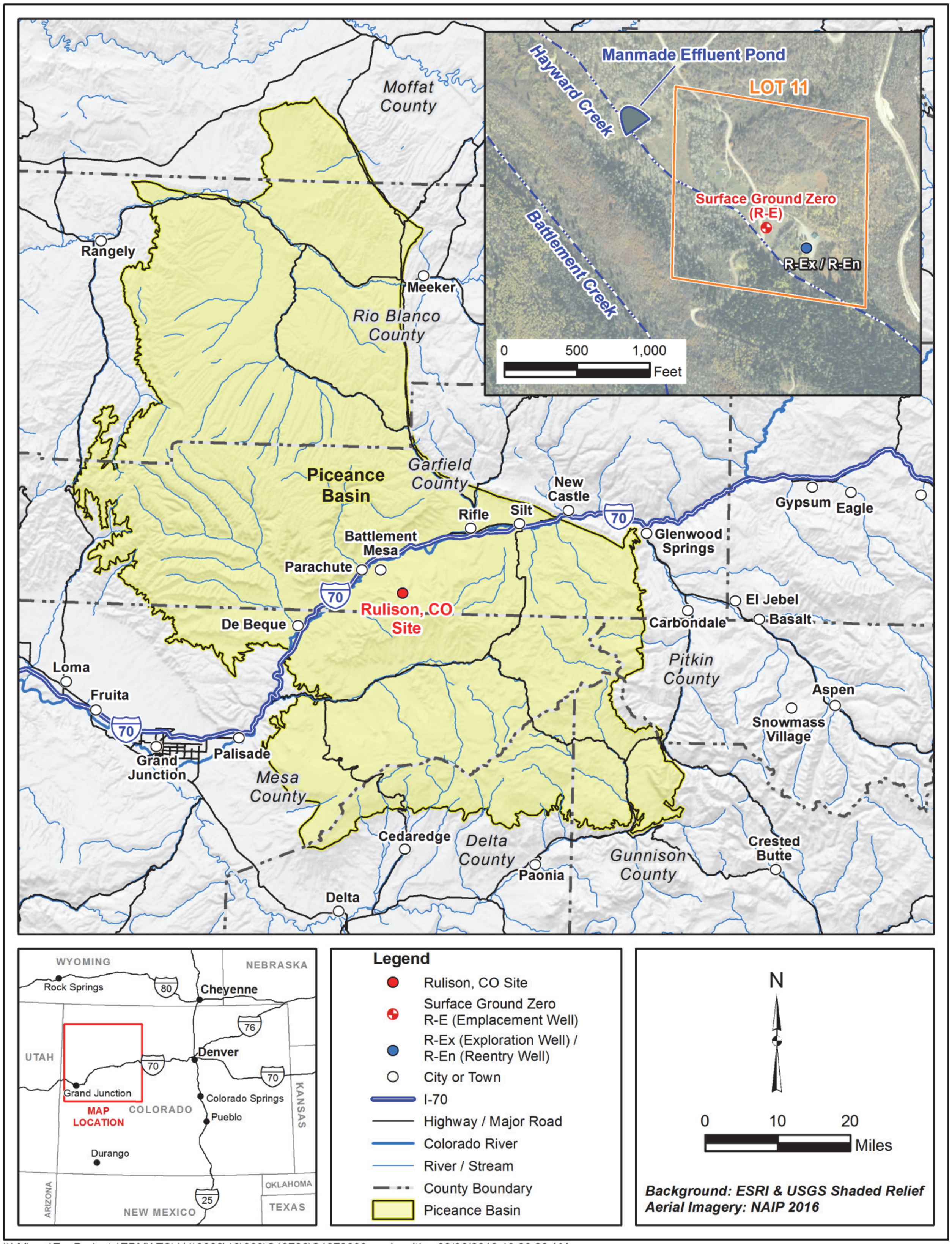

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Figure 1. Site Location Map, Rulison, Colorado, Site

2.0 Site Location and Background

The Rulison site is in the Piceance Basin of western Colorado, 40 miles northeast of Grand Junction, Colorado (Figure 1). U.S. Atomic Energy Commission (a predecessor agency to DOE) conducted the underground nuclear test in partnership with Austral Oil Company Inc. and the nuclear engineering firm CER Geonuclear Corporation. The test was called Project Rulison, and it was designed to evaluate the use of a nuclear detonation to enhance natural gas production in the low-permeability, gas-bearing sandstones of the Williams Fork Formation. This was the second natural gas stimulation experiment in the Plowshare Program, which was a program to develop peaceful uses for nuclear energy.

The nuclear device used at the Rulison site was detonated in the emplacement hole (R-E) at a depth of 8425 ft on September 10, 1969. The device had a reported yield of 40 kilotons (DOE 2015), which produced extremely high temperatures that vaporized a volume of rock, temporarily creating a cavity surrounded by a fractured area extending outward from the detonation point (AEC 1973). Shortly after the detonation, the overlying fractured rock collapsed into the void space, creating a rubble-filled collapse chimney that extends above the detonation point. The former cavity, now the lower part of the collapse chimney, and the surrounding fractured rock are together referred to as the detonation zone. A reentry well (R-En) was drilled as a sidetrack hole off the exploration well (R-Ex) into the collapse chimney and tested to evaluate the success of the detonation at improving gas production in the low-permeability sandstone reservoir. In 1976, the participating parties agreed that there would be no gas production in the future at the site, the R-En and R-Ex wells were abandoned, and a deed restriction was established for the site (Lot 11) (Figure 1). The deed restriction prohibits penetration or withdrawal of any material below 6000 ft within the boundary of Lot 11 unless authorized by the United States government. It is a legally enforceable institutional control that is designed to minimize potential exposure to any detonation-related contamination at the site.

The ability to enhance natural gas production from tight sands has become practical through advances in hydraulic fracturing technology (hydrofracturing). This technology has led to an increase in drilling activity near the Rulison site, raising concerns that contamination currently contained in the subsurface could be released through a gas well drilled too close to the site (Lot 11). As wells are drilled nearer the site, DOE has taken the approach outlined in the *Rulison Path Forward* document (DOE 2010a), which recommends a conservative, staged approach to gas development. Oil and gas operators are encouraged to drill wells in areas in which there is a lower likelihood of encountering detonation-related contamination (both distance and direction from the detonation zone are factors) and to collect data from these wells prior to drilling nearer the site's 40-acre institutional control boundary (Lot 11).

2.1 Source of Contamination

Surface and subsurface contamination resulted from the underground nuclear test at Rulison. The surface contamination was excavated and removed in 1996, and CDPHE approved closure of the surface with no further actions in 1998. Subsurface contamination remains in the detonation zone near the R-E emplacement hole, which includes the former cavity, collapse chimney, and fractured rock surrounding the former cavity. The detonation zone is contaminated by residual radioactivity, with the high-melting-point radionuclides trapped in the solidified melt rock (often referred to as melt glass due to its glassy texture) at the bottom of the former cavity (Kersting and Smith 2006). The radionuclides incorporated in the melt rock can only be released to groundwater very slowly through dissolution of the melt rock (Tompson et al. 1999, Pawloski 1999). Though dissolution of radionuclides from melt rock can represent a long-term source of subsurface contamination, dissolved-phase transport of radionuclides away from the detonation zone is considered insignificant, because the rock surrounding the former cavity and collapse chimney is unsaturated with respect to water. The presence of gas in the surrounding Williams Fork Formation also severely limits liquid movement (if present), making any solidified radionuclides that may have dissolved in the former cavity essentially immobile.

Radionuclides that can exist in the gas phase and created in significant amounts by the detonation are of primary concern because of their potential mobility. The relative permeability of the gas phase is orders of magnitude greater than that of liquids in the natural-gas-producing reservoirs of the Williams Fork Formation. The gas phase largely consists of methane with smaller amounts of ethane, propane, carbon dioxide, water vapor, and other minor constituents. Gas-phase radionuclides produced by the Rulison detonation (Reynolds 1971) in order of estimated abundance were: approximately 10,000 curies of tritium, approximately 1100 curies of krypton-85 (Kr-85), and minor amounts of argon isotopes and carbon-14 (C-14). Of these, only tritium was expected to remain in an amount large enough to pose a potential contamination problem because the other radionuclides were mostly removed by production testing, radioactive decay, or both.

2.2 Radionuclides Removed by Production Testing

Production tests were conducted on the reentry well (R-En) to evaluate the success of the detonation at improving gas production in the low-permeability sandstone reservoir. The reentry well was completed in the collapse chimney created by the detonation and produced 455 million cubic feet (MMCF) of gas in 107 days of testing that took place from October 1970 through April 1971. The produced gas was flared to the atmosphere, and samples of the produced gas and produced water (much of which was condensed water vapor) were collected and analyzed to determine the degree to which radioactivity levels changed as testing progressed. As expected, the radioactivity levels decreased throughout the testing as gas from the chimney region was produced, burned, and replenished by unaffected gas from the surrounding formation. The U.S. Environmental Protection Agency (EPA) National Environmental Respiratory Center and the Colorado Department of Public Health and Environment monitored these activities to protect workers at the site, the public, and the environment (AEC 1973).

Sample analysis indicated that approximately 1060 of the estimated 1100 curies of Kr-85 produced by the detonation were removed by the production testing (Smith 1971). The concentration of Kr-85 in the produced gas (well-mixed throughout the detonation zone due to its inert nature) was closely monitored throughout the testing to determine when radioactive gas from the detonation zone was depleted. It is estimated that after radioactive decay (Kr-85 has a half-life of 10.8 years) less than 5% of the Kr-85 not removed by the production testing would remain in 2018. Sample results also indicate that all the estimated curies of C-14 and approximately 3000 of the original 10,000 curies of tritium produced by the detonation were removed during the production testing (Smith 1971). The remaining 7000 curies of tritium would be reduced further when accounting for decay (tritium has a half-life of 12.3 years) to less than 500 curies by 2018.

Tritium was initially present during the production testing in hydrocarbons (mostly methane with lesser amounts of ethane and propane), hydrogen gas, and water (vapor and liquid). Production testing data indicate that essentially all gas-phase tritium was removed from the detonation zone. The remaining tritium is likely present in liquid water and in minerals that make up the melt rock. Tritium does not exchange with normal hydrogen atoms in hydrocarbons except at the very high temperatures that occur during and soon after the detonation. If most of the remaining tritium is in the melt rock, there is no significant source of mobile radionuclides at the site. However, if it is mostly present in liquid water, it could be a long-term source (until it decays) that can evaporate to form tritiated water vapor.

2.3 Contaminants of Concern

The primary contaminants of concern are expected to be those radionuclides that can exist in the gas phase, because in the gas phase they are much more mobile than liquids in the gas-producing reservoirs of the Williams Fork Formation. Of the radionuclides that can exist in the gas phase, tritium and Kr-85 are expected to constitute most of the radioactivity (Smith 1971). Samples collected during production testing in 1970 and 1971 indicated that almost all of the Kr-85 was removed and flared but that tritium remained (DOE 2013). Since tritium is the most abundant radionuclide remaining in the detonation zone that can be present in the gas and liquid phases, it is the main radionuclide of concern at the Rulison site.

2.4 Geologic Setting

The Williams Fork Formation of the Mesaverde Group is the primary gas-producing zone within the Piceance Basin. The Piceance Basin is a northwest-southeast-oriented structure about 100 miles long and 40–50 miles wide (Figure 2). The bedding on the western flank of the basin dips gently to the east, and the bedding on the eastern flank of the basin dips steeply to the west, causing the basin to be asymmetrical and deepest along its eastern edge, where more than 20,000 ft of sedimentary rocks were deposited. The Williams Fork Formation is encountered between the depths of approximately 6500 and 9000 ft near the site and is overlain by the Ohio Creek Conglomerate and the Wasatch and Green River formations. The Colorado River divides the Piceance Basin into a northern and southern province. The southern province, which includes the Rulison site, is marked by two significant erosional remnants, Grand Mesa and Battlement Mesa.

The Williams Fork Formation is composed of low-permeability, discontinuous, interbedded fluviodeltaic sandstones and shales. These sandstones vary in clay content; the cleaner sandstones (less clay) in the lower two-thirds of the formation are the main targets for hydrofracturing and natural gas production. Sandstones in the upper one-third of the Williams Fork are not production targets because of their higher water content, which lowers the relative permeability of the gas phase and causes water production to be excessive compared to the amount of gas that can be produced. Despite improvements in hydrofracturing technology, formation properties greatly inhibit fluid migration outside the extent of the hydrofractures. Wells near the Rulison site are being spaced relatively close (located on 10-acre centers), about 400 ft north/south and about 1300 ft east/west of adjacent wells. The east-west trend of natural fractures in the Williams Fork causes the hydrofracturing and drainage patterns to be elongated in that direction (DOE 2013). A more-detailed description of the hydrofracturing and drainage patterns at Rulison is provided in the *Modeling of Flow and Transport Induced by Gas Production Wells near the Project Rulison Site, Piceance Basin, Colorado* (DOE 2013). Figure 2 provides a cross section showing the stratigraphic units of the Piceance Basin.

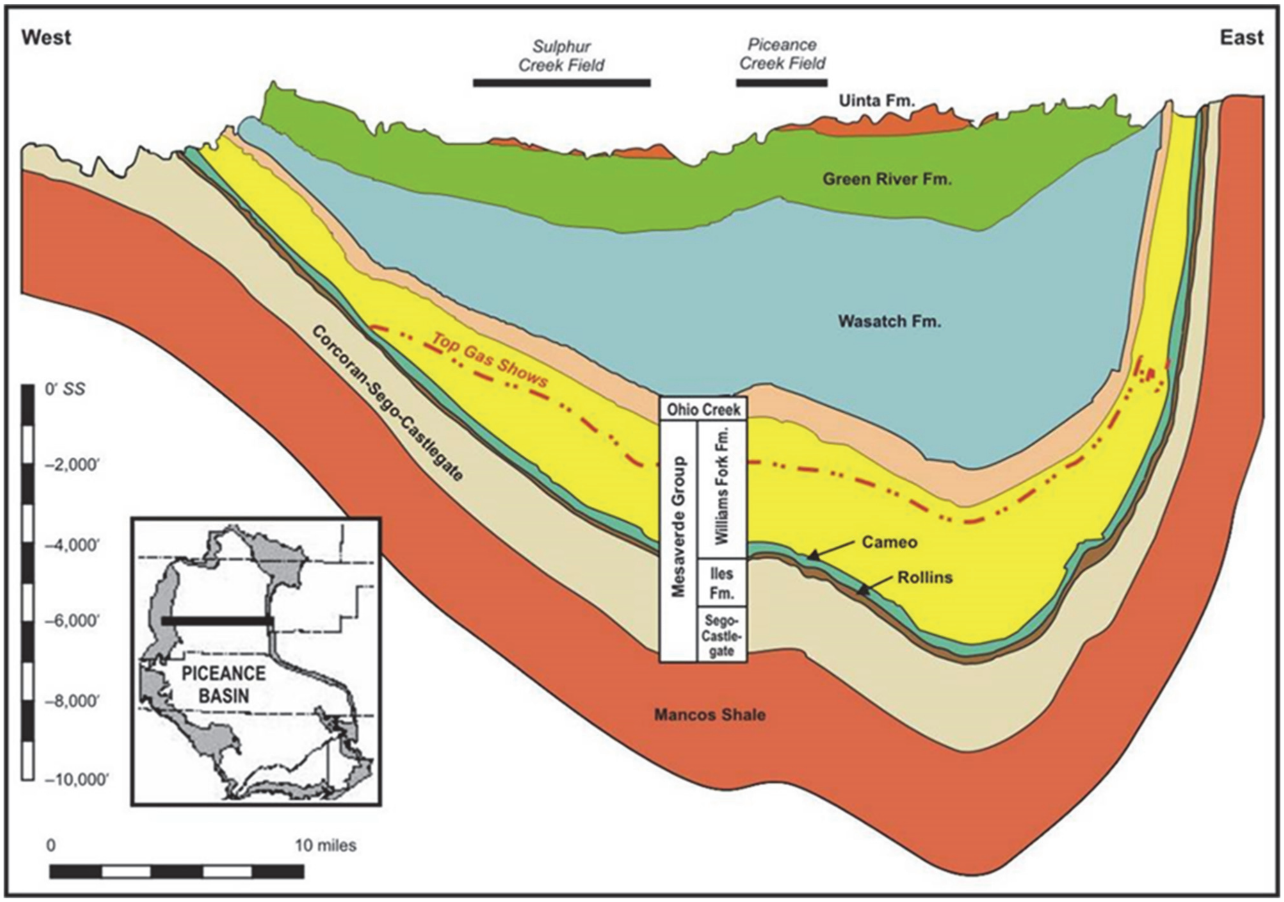

Figure 2. Piceance Basin Cross Section (modified from Yurewicz et al. 2003)

2.4.1 Site Hydrology

There are three surface water features near the site (Lot 11). They include Battlement Creek, a smaller, spring-fed tributary of Battlement Creek (locally known as Hayward Creek), and a man-made effluent pond (Figure 1). Battlement Creek is a perennial stream that flows through the southwest corner of the site and discharges to the Colorado River. The flow in Battlement Creek is regulated by Battlement Reservoir and is primarily fed by snow melt, shallow groundwater, and springs. The smaller, spring-fed tributary of Battlement Creek flows across the site east of Battlement Creek. The man-made pond covers a surface area of approximately 1 acre and is approximately 1300 ft northwest of the R-E emplacement borehole (also referred to as surface ground zero). During the surface restoration, at the request of the land owner, DOE constructed the pond from the drilling effluent pond. Battlement Creek and its tributaries flow in a generally northwesterly direction toward the Colorado River (USGS 1969).

Groundwater is encountered in the surficial deposits (shallow alluvium < 200 ft thick) near the site, with recharge to this aquifer occurring from the infiltration of snowmelt. The wells used by local residents are completed in this shallow alluvial aquifer (< 200 ft thick). The next possible groundwater source would be a few sandy zones in the lower part of the underlying Green River Formation (1700 ft thick) capable of yielding minor quantities of water. The Wasatch and Fort Union formations and Ohio Creek Conglomerate extend from a depth of approximately

1700 to 6500 ft and are generally not a source of groundwater in the Rulison area. They effectively separate the overlying water-bearing aquifers from the gas-producing zones in the Mesaverde Group.

2.5 Potential Transport Pathways

The detonation zone is in the lower part of the Williams Fork Formation, which is approximately 2500 ft thick and more than 1000 ft below the overlying Ohio Creek Formation. Upward migration of radionuclides to a depth at which they might affect public health or the environment solely by way of natural pathways (with fluids moving through pores and fractures) is extremely unlikely due to the depth of burial (8425 ft) and the low permeability of the surrounding formations, which limit fluid movement. The pores of the tight, poorly connected sandstone reservoirs of the Williams Fork contain approximately 50% gas and 50% formation water (brine) and are isolated within lower-permeability shale. The presence of commercial amounts of gas and the need to use hydraulic fracturing methods to affect even small areas (each well drains roughly a 10-acre area) support the concept of essentially no movement of fluids within a time frame of significance for tritium migration to be of concern. In the absence of wells that penetrate near the detonation zone, there is no realistic pathway for contamination to reach the surface or near-surface. As a result, the most likely transport mechanism for tritium from the detonation zone to reach the surface is as tritiated water vapor migrating with natural gas to a nearby production well. To be of concern, the well would have to be close enough to interact with a fracture from the detonation.

2.6 Shallow Groundwater and Surface Water Monitoring

EPA monitored surface water and shallow groundwater (< 200 ft below ground surface) annually at and near the site from 1972 until 2008 as part of its Long-Term Hydrologic Monitoring Program (LTHMP). In 2008, LM assumed responsibility for the sampling and conducted an evaluation of the monitoring network that consists of 13 locations (7 shallow wells < 200 ft in depth and 5 surface locations). Four of the locations (2 shallow wells < 200 ft in depth and 2 surface locations) were onsite and 9 of the locations were offsite, with the offsite locations ranging from approximately 2 to 6 miles from surface ground zero. Samples collected from these locations were analyzed for gamma-emitting radionuclides (using high-resolution gamma spectrometry), strontium-90, and tritium (using conventional and electrolytic enrichment methods). Laboratory analytical results from more than 40 years of monitoring (EPA and LM) have shown that radiological contaminants from the Rulison test have not impacted the shallow groundwater or surface water at the sampled locations. Based on the fact that no Rulison related contaminants have been detected and the lack of potential for migration from the detonation zone to the surface or near surface aquifers; DOE will be evaluating the strategy for future monitoring of the shallow groundwater and surface water near the site. Results obtained from the LTHMP have been summarized in annual groundwater monitoring reports prepared by EPA from 1972 through 2008 and LM from 2009 through 2019.

3.0 Monitoring Strategy

The monitoring strategy is designed to ensure the protection of human health and the environment. It provides guidance on sampling natural gas wells, type of samples to be collected (natural gas or produced water), laboratory analyses to be performed, frequency of sample collection, and justification for the selection of wells for sampling at the site. It also establishes screening levels or concentrations that, if exceeded in the sample results, require that samples be reanalyzed or additional sampling be done.

3.1 Natural Gas Well Monitoring

Gas wells near the site are being spaced relatively close, about 400 ft north/south and about 1300 ft east/west of adjacent wells and are expected to drain a 10-acre area (Figure 3). This is based on production data that indicate hydrofractures preferentially propagate in the direction of the formation's natural fracture trend (east–west in the Rulison area). The ovals shown on Figure 3 depict the theoretical drainage areas for the producing wells. The wells produce some liquids (produced water and hydrocarbon condensate) along with natural gas; these liquids are brought to the surface with the natural gas and are physically separated at the wellhead. The produced water is a mixture of water vapor in the natural gas that condenses at the surface, formation water, and remnant water from hydrofracturing well development. Since tritium is the main contaminant of concern and the most likely transport mechanism for tritium from the detonation zone is tritiated water vapor migrating with natural gas, the monitoring strategy will focus on the collection of samples (produced water and natural gas) from producing natural gas wells near the site.

The sampling of gas wells having bottom-hole locations within 1 mile of the detonation was initiated in 2007 and 2008, and increased in 2010 when seven new gas wells 0.75 mile west of the site began production (Figure 3). Wells having a bottom-hole location within 1 mile of the detonation site will continue be monitored, but the collection of produced water (Section 3.1.1) and natural gas (Section 3.1.2) samples will be focused on the areas depicted in Figure 3. As new wells are drilled nearer the site, wells that are effectively separated (based on expected drainage patterns) from the site by a new well or wells closer to the detonation zone will be phased out of the routine sampling as the closer well or wells are added to the monitoring network. There are currently no gas wells within a 0.5-mile radius of the site and any future permits to drill wells in this area will require a hearing with COGCC and approval by the commission prior to installation. Any changes or enhancements to the sampling strategy for wells within a 0.5-mile radius of the site will be communicated during the permit approval process. Figure 3 shows the area where natural gas wells will be sampled and the types of samples (produced water or natural gas) that will be collected.

3.1.1 Produced Water

Produced water samples will be collected from natural gas wells having a bottom-hole location or an estimated drainage area that is within the area designated for produced water sampling shown on Figure 3. Industry natural gas standards for the area require that the natural gas be 95% dry at the time it leaves the wellhead. This requires liquids (produced water and hydrocarbon condensate) brought to the surface with the natural gas to be physically

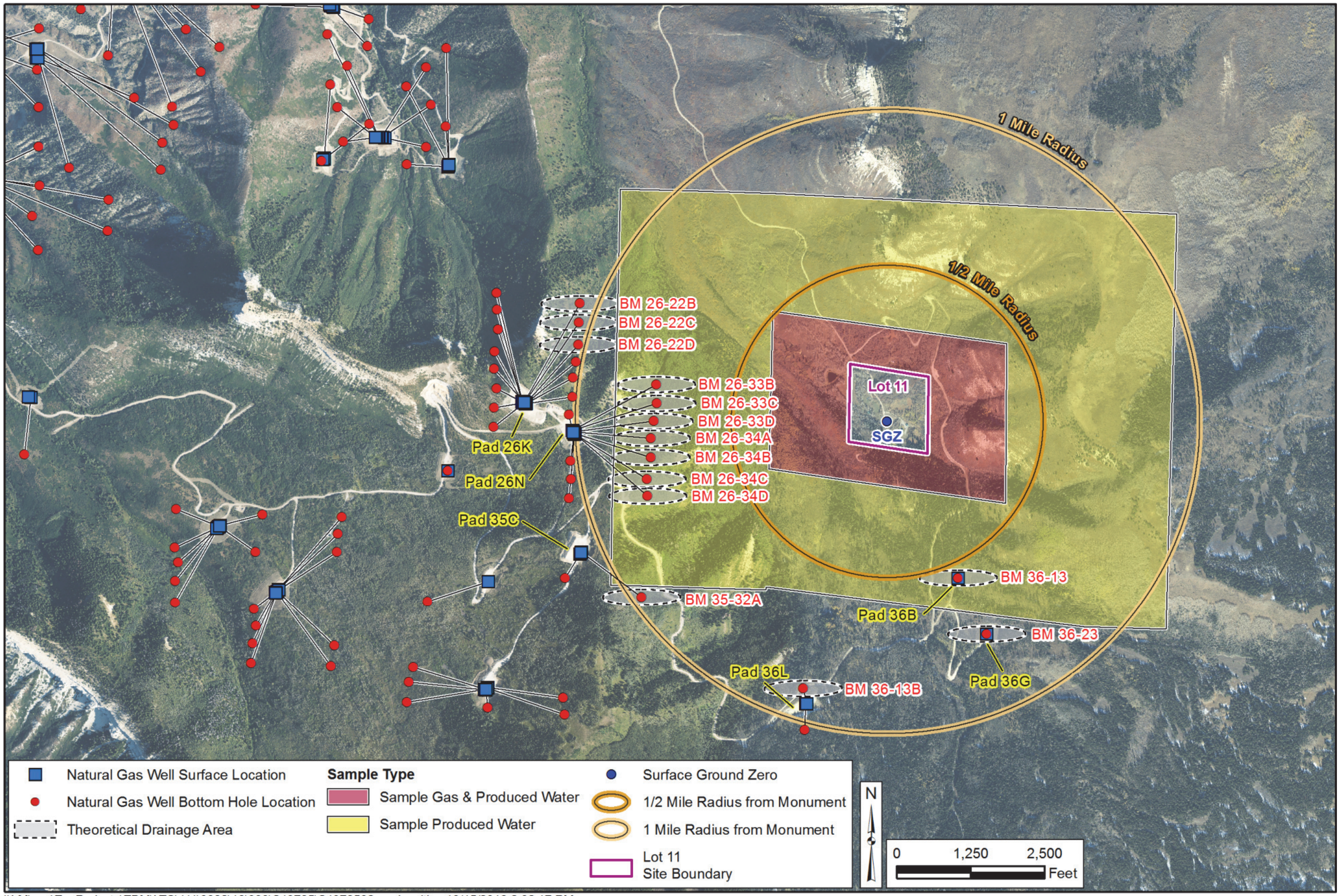

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Figure 3. Site and Sample Location Map, Rulison, Colorado, Site

separated (dried) at the wellhead. DOE will work with the gas well operator to collect samples of the produced water from the gas–liquid separator and/or accumulation tank. The produced water samples will be analyzed for tritium, the main radionuclide of concern at the Rulison site. Additional samples may be collected and analyzed if tritium is detected above the screening level or action level (Table 1). Table 1 provides the laboratory analytical methods and laboratory detection limits, with the screening levels and action levels for the site.

3.1.2 Natural Gas

Natural gas samples will be collected from producing natural gas wells having a bottom-hole location or an estimated drainage area that is within the area designated for natural gas sampling shown on Figure 3. The primary components of natural gas that can contain tritium are methane and water vapor. The tritium present as tritiated methane was believed to be depleted as concentrations decreased during production testing of the reentry well, which removed and flared two chimney volumes of gas from the detonation zone. Tritium present as tritiated water vapor can effectively be monitored by analyzing produced water samples. Natural gas will be sampled and analyzed to confirm that no tritiated methane, if present, is migrating from the detonation zone. Table 1 provides the laboratory analytical methods and laboratory detection limits, with the screening levels and action levels for the site.

Table 1. Rulison Area Natural Gas and Produced Water Sample Screening Levels

Analyte	Sample Matrix	Laboratory Method	Laboratory Detection Limit	Screening Level	Action Level
Tritium	Natural gas	Lab Specific	10 TU[a]	100 TU[a]	200 TU[a]
			32 pCi/L	320 pCi/L	640 pCi/L
	Produced water	EPA 906.0	400 pCi/L	1000 pCi/L	15,000 pCi/L[b]

Notes:
[a] A tritium unit (TU) is equal to 3.19 picocuries per liter (pCi/L) in water at a standard temperature (0 °C) and pressure (1 atmosphere).
[b] The EPA standard for tritium in drinking water is 20,000 pCi/L

Abbreviations:
pCi/L = picocuries per liter
TU = tritium unit (1 tritium atom in 1 × 10^{18} hydrogen atoms)

3.1.3 Other Fluids and Solids

The drill cuttings and fluids used during drilling and hydrofracturing are being sampled and analyzed under the industry Sampling and Analysis Plan. DOE recognizes the importance of this sampling to document the presence or lack of contaminants at a newly drilled location and to document that fluids introduced by drilling and completion processes do not introduce radionuclides that could give a false indication of test-related contaminants. DOE does not currently plan to replicate the industry sampling during well installation.

3.2 Gas Well Sampling Frequency

The sampling frequency for wells near the site is based on the wells' cumulative natural gas production. Production rates are initially high, approximately 50 MMCF/month at the start, declining to approximately 15 MMCF/month by the end of the first year of operation. Production rates typically decline to approximately 5 MMCF/month by the end of the second year (Figure 4). It is conceptualized that natural gas entering the well early in the production cycle is not only from the zone near the well, but also from the more permeable hydrofractures that propagated relatively far from the well along the more permeable preexisting fractures of the natural fracture trend. Production in the latter stages of the well's production cycle is then dominated by gas migrating relatively short distances from the rock matrix to the more permeable preexisting fractures of the natural fracture trend.

The sampling frequency established by DOE provides for more frequent sampling when a well is initially brought online and less frequent later in the production life of the well. This provides more sampling during the period when the area of influence of the well is expanding rapidly and less sampling when the extent of the area of influence has stabilized. Sampling every 50 MMCF to 100 MMCF would be equivalent to quarterly sampling during the well's first year of operation, semiannually during the well's second year of operation, and annually during the well's third and fourth years of operation. The frequency would decrease to biannually during the well's remaining years of operation, with adjustments for extended shut-in periods. The recommended sampling frequencies are provided as a guideline to optimize sampling of multiple wells at different times in their production life; actual sampling may be conducted more or less frequently depending on weather conditions, the operational status of the well, number of wells to be sampled, and coordination with industry sampling. Figure 4 shows a typical cumulative production curve for a natural gas well near the site with the planned sampling events plotted on the production curve.

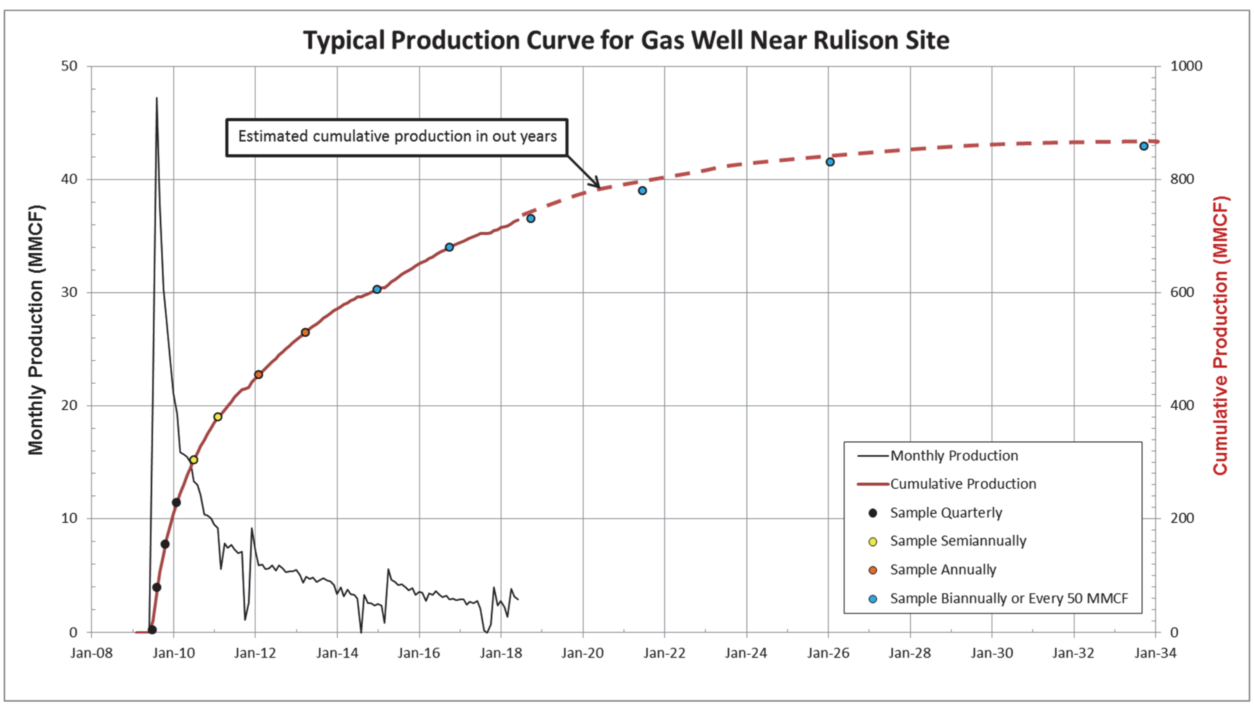

Figure 4. Typical Production Curve for Natural Gas Well Near Rulison Site

3.3 Laboratory Analyses and Data Validation

The analytical laboratory will use accepted procedures that are based on the specified methods to analyze the samples (natural gas and produced water) for tritium (Table 1). The required minimum detectable concentration (MDC) for the specified laboratory method is provided in Table 1. Commercial laboratories provide analytical services in accordance with the *Department of Defense (DoD) Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories* (updated annually) to ensure that data are of known, documented quality (DoD/DOE 2017). The QSM provides specific technical requirements, clarifies DOE requirements, and conforms to DOE Order 414.1C, *Quality Assurance*. The QSM is based on Volume 1 of The NELAC Institute Standards (September 2009), which incorporates International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) Standard 17025:2005(E), *General requirements for the competence of testing and calibration laboratories*. The QSM provides a framework for performing, controlling, documenting, and reporting laboratory analyses (DoD/DOE 2017). The laboratory results will be validated in accordance with the Section 8.0, "Standard Practice for Validation of Environmental Data," in the *Environmental Procedures Catalog* (LMS/POL/S04325). Table 1 provides the laboratory analytical methods and laboratory MDCs, with the screening levels and action levels for the site.

3.4 Screening Levels and Action Levels

The screening levels and action levels for the site have been revised using information obtained from the *Screening Assessment of Potential Human-Health Risk from Future Natural-Gas Drilling Near Project Rulison in Western Colorado* prepared by Desert Research Institute (Daniels and Chapman 2012). They are concentrations that have been agreed to with COGCC and that if exceeded would not necessarily indicate an impact to human health or the environment, but would indicate that additional evaluation is necessary or would require a response. Responses may include verification sampling, stakeholder notification, or implementation of corrective measures. The COGCC will be notified if a verified sample result has exceeded a screening level or action level. Any corrective measures will be discussed and agreed to with the COGCC prior to implementation.

3.5 Data Evaluation and Reporting

Data collected under the DOE and industry sampling plans will be evaluated as it becomes available. Results from DOE sampling will be included in gas well monitoring reports, provided to stakeholders, and maintained on the DOE Office of Legacy Management website (https://www.lm.doe.gov/rulison/Sites.aspx). Industry sample results are available at the COGCC website (http://cogcc.state.co.us/library.html#/areareports) under Piceance Basin, Project Rulison. Additional data and information acquired about future wells drilled near the site (e.g., geophysical logs, production histories, or unexpected interactions between wells) will be used to evaluate the current site conceptual model.

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