Site Characterization Work Plan

San Juan River Gas Plant
Kirtland, San Juan County, New Mexico

Prepared for

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Contents

Acronyms and Abbreviations

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAS	Chemical Abstract Service
CCI	Castleton Commodities International, LLC
CO_3	carbonate
COC	chemicals of concern
DPT	direct push technology
EPNG	El Paso Natural Gas Company, LLC
^oF	degrees Fahrenheit
ft	feet
HCO_3	bicarbonate
HSP	Health and Safety Plan
IDW	investigation derived waste
JHA	Job Hazard Analysis
MCL	maximum contaminant level
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
MS/MSD	matrix spike/matrix spike duplicate
MW	monitoring well
NA	not applicable
NMOCD	New Mexico Oil Conservation Division
NMOSE	New Mexico Office of the State Engineer
NMWQCC	New Mexico Water Quality Control Commission
O&M	operations and maintenance
ORC	oxygen release compound
PVC	polyvinyl chloride
RSL	Regional Screening Level
SJRP	San Juan River Plant
SW	sparge well
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency

VOCs	volatile organic compounds

1 Introduction

This Site Characterization Work Plan is prepared to describe activities to identify the nature and extent of environmental impacts at the San Juan River Gas Plant (SJRP) that resulted from historical operations. The work will incorporate and utilize data gathered during the previously completed document review, meetings and discussions with the El Paso Natural Gas, LLC (EPNG) project manager, the current conceptual site model, and site visit conducted on August 28, 2013. Investigation of both soil and groundwater is proposed.

1.1 Site Location

The SJRP is located in San Juan County, Township 29N, Range 15W, Section 1, near Kirtland, New Mexico. The SJRP processes natural gas collected from production wells located in the San Juan Basin of New Mexico and southern Utah. The site is a 630-acre facility that contains gas processing facilities, two raw water ponds (now closed), three wastewater evaporation ponds (now closed), a sulfur recovery plant, water and hydrocarbon tanks, a pigging station, flare pits, and several 16- to 24-inch diameter natural gas pipelines that cross the facility. Surrounding land use includes recreation (golf course) to the south, commercial and residential to the east and south, and coal mining operations to the west. The SJRP site is shown on Figure 1.

1.2 Summary of Previous Investigations and Removal Actions

In 1985, the New Mexico Oil Conservation Division (NMOCD) issued a directive for oil and gas producers to cease discharging production fluids to unlined surface impoundments (pits) located in the groundwater recharge areas of the San Juan Basin and major river drainages to the San Juan, Animas, and La Plata Rivers. Once discharge had ceased, producers were required to investigate and remediate soil and groundwater contamination caused by these pits. In response, a number of investigations and removal actions have been completed at the SJRP. Removal actions at the SJRP have been completed under the NMOCD *Guidelines for Remediation of Leaks, Spills and Releases* (1993).

- Several investigations were conducted between 1985 and 1995, including installation of 24 monitoring wells (MW).
- In 1992, approximately 18,200 cubic yards of contaminated material were removed from the north flare pit and approximately 3,520 cubic yards of contaminated material from the south flare pit and landfarmed on the southwest portion of the site. On June 29, 1993, NMOCD granted closure of the flare pits, with the condition that designated monitoring wells located down gradient of each former pit location be sampled on an annual basis.
- Between 1995 and 1996, the former wastewater evaporation ponds were capped and closed.
- In 1995, 17 monitoring wells were abandoned (E-1B, E-1A, E-3, E-9, E-10, E-11, MW-1, MW-2, MW-3, P-2, P-5, P-6, P-7, P-8, P-9, P-10, P-12), 2 wells were upgraded (MW-2 and MW-4), and 5 new wells were installed (MW-5, MW-6, MW-7, MW-8, and MW-9).
- On June 17, 1997, NMOCD granted closure of the soil landfarms.
- In January 2001, a groundwater remediation work plan was submitted to the NMOCD to address elevated benzene concentrations detected in monitoring wells MW-8 and MW-9. The work plan included provisions to install an air sparging system consisting of two air sparging wells; one injection point located within 10 feet of each monitoring well.
- The air sparging system air injection wells (sparge well [SW]-8 and SW-9) were installed in October, 2001. A pre-pilot air sparging test was conducted at both wells in November 2001. Results from this test indicated good communication between SW-9 and MW-9 but poor communication between SW-8 and MW-8. As a result of poor communication between SW-8 and MW-8, an oxygen release compound (ORC) sock consisting of magnesium peroxide, was recommended for remediation in this area. The ORC sock was installed in MW-8 in mid-November, 2001.

- With the exception of a 48-hour shutdown prior to the four-week sampling event in December, 2001, the air sparging system operated continuously from mid-November, 2001 to mid-January, 2002. The air sparging pilot test culminated with a sampling event in late January, 2002. An additional sampling event was performed in mid-late February, 2002, to evaluate the potential for contaminant concentration rebound following a four-week shutdown.
- From February 2002 through December 2002, the air sparging system was placed into continuous operation following the pilot test. Site activities during that time included operation and maintenance (O&M) of the air sparge system and site-wide annual groundwater monitoring.
- During 2003, site activities included periodic O&M of the air sparging system, replacement of ORC socks at MW-8, quarterly sampling of MW-8 and MW-9, and site-wide annual groundwater monitoring.
- Based on benzene, toluene, ethylbenzene and total xylenes (BTEX) concentrations below New Mexico Water Quality Control Commission (NMWQCC) standards, the air sparging system was shut down in February 2004 to assess static groundwater conditions at the site. From 2004 through 2006, site activities included replacement of ORC socks at MW-8, quarterly sampling of MW-8 and MW-9, and site-wide annual groundwater monitoring.
- The air sparge system has remained turned off since system shut down in 2004. Site activities up to 2011 included quarterly sampling of MW-8 through 2010, when the well went dry, and MW-9 through 2011, annual site-wide annual groundwater monitoring, and annual replacement of the ORC socks in MW-8 through 2010.
- A Stage I Abatement Plan was submitted to NMOCD in November 2005 to investigate hydrocarbon impacts encountered in groundwater at MW-5, near the Praxair evaporation pond at the SJRP. The source of the hydrocarbons was unknown. NMOCD approval was received on January 23, 2006 to begin investigative actions. The investigation was completed in February 2006 and consisted of drilling and sampling borings using direct push technology (DPT). Drill tool refusal occurred in hard shale, siltstone, a silty-sand mix and sandstone at interval depths of 8-15 feet, which was short of the planned investigation depth of roughly 22 feet below ground surface (ft bgs). The lithology generally changed from a clay soil near the surface to alternating weathered shale and sandstone. Total BTEX concentrations were detected at five of 15 soil borings, in 10 of 39 samples. Detected total BTEX concentrations ranged from 0.1J milligrams per kilogram (mg/kg) in the 13 to 14 ft bgs sample at GPH-11 to 813 mg/kg in the 11.5 to 12.5 ft bgs sample at GPH-8. Three of the detected concentrations were found between 10 and 12.5 ft bgs at GPH-6, GPH-8, and GPH-10. Additionally, total BTEX concentrations were detected in all four soil samples collected at GPH-6 which is located to the northeast of the Former Raw Water Pond. Results of this investigation recommended that further investigation be conducted via hollow-stem auger, due to the limited effectiveness of DPT at the site.
- In May 2007, monitoring well MW-7, which was located immediately adjacent to the Praxair facility, was plugged and abandoned at Praxair's request, in order to facilitate new process construction.
- During the May 2008 sampling event, field personnel noted that monitoring well MW-5 had been destroyed in conjunction with subsurface coal mining activities by BHT Billiton, Ltd. Destruction of the well is believed to have occurred between February and May 2008.
- The 2011 environmental program at the SJRP consisted of the continuation of dissolved-phase hydrocarbon remediation (using oxygen enhancement) and sitewide groundwater monitoring. The groundwater monitoring program included sitewide annual groundwater sampling and quarterly gauging. On August 31, 2011, monitoring wells MW-4, MW-6, MW-9, and MW-2 were sampled for BTEX compounds, NMWQCC metals, total dissolved solids (TDS), alkalinity, nitrate/nitrite, chloride, and sulfate. MW-8 was reported as dry during this sampling event. Quarterly groundwater sampling for BTEX was completed at monitoring well MW-9 in February, May, August, and November 2011 to evaluate the effectiveness of previous and ongoing hydrocarbon remediation activities in this area. Historically, MW-8 was also sampled quarterly, but in 2011 this well was dry.
- In 2011, NMWQCC groundwater exceedances included benzene (0.113 milligrams per liter [mg/L]) concentrations at MW-9, cadmium (0.0131 mg/L), selenium (0.351 mg/L) and nitrate (92.2 mg/L)

concentrations at MW-6, selenium (0.122 mg/L) and nitrate (16.7 mg/L) concentrations at MW-2. Other secondary standard exceedances for aluminum, cobalt, iron, manganese, nickel, chloride, sulfate, and TDS were observed in the wells. The TDS concentrations at MW-6, MW-8, and MW-9 were reported above 10,000 mg/L. Background TDS in groundwater appears to be between 2,775 and 4,500 mg/L. However, background for surface water (Stevens Arroyo) to the west, reportedly exceeds 10,000 mg/L TDS. The concentrations of the various general chemistry inorganics and metals were similar to previous years' results (Montgomery Watson Harza [MWH], 2012).

- In 2013, annual groundwater samples were collected in December. Sitewide groundwater elevation measurements were collected from monitoring wells MW-2, MW-4, MW-6, MW-8, and MW-9. Groundwater samples were collected from each of the five monitoring wells. NMWQCC exceedances included benzene (0.186 mg/L) in MW-9 and other metals and inorganic constituents in each of the five wells (CH2M, 2014).
- In 2014, annual groundwater samples were collected in December. Sitewide groundwater elevation measurements were collected from monitoring wells MW-2, MW-4, MW-6, MW-8, and MW-9. Groundwater samples were collected from each of the five monitoring wells. NMWQCC exceedances included benzene (0.0461 mg/L) in MW-9 and other metals and inorganic constituents in each of the five wells (CH2M, 2015).
- In 2015, annual groundwater samples were collected in December. Sitewide groundwater elevation measurements were collected from monitoring wells MW-2, MW-4, MW-6, MW-8, and MW-9. Groundwater samples were collected from each of the five monitoring wells. NMWQCC exceedances included benzene (0.104 mg/L) in MW-9 and other metals and inorganic constituents in each of the five wells (CH2M, 2016).

1.3 Current Regulatory Status

EPNG is responsible for remediation of environmental conditions identified prior to the sale of the facility to Western Gas Resources in 1992. There is no Discharge Permit for this facility associated with the historical El Paso Energy environmental liabilities. In May 2014, Western Gas Resources sold the facility to Castleton Commodities International, LLC (CCI), and the SJRP is currently operated by CCI.

In November 2005, a Stage I Abatement Plan was submitted to NMOCD to investigate hydrocarbon impacts encountered in groundwater near the Praxair evaporation pond at the SJRP. Approval of this abatement plan was received from NMOCD on January 23, 2006, and the investigation was performed in February 2006. Results of the initial investigation were detailed in the Stage I Interim Report submitted by March 28, 2006. Revisions to the work plan for additional investigation included in the Stage I Interim Report were submitted on September 28, 2006.

2 Current Site Activities

Current environmental activities are being conducted by EPNG. Numerous phases of investigation, monitoring, remediation, and reporting have been conducted over the last 20 years at this site. Site investigations, groundwater and product monitoring, and remediation activities are being performed under various letters, reports, and work plans from EPNG with approvals from NMOCD.

Groundwater sampling is conducted annually in December. Results are compared to the NMWQCC groundwater standards. The most recent annual groundwater monitoring was completed in December 2015 (CH2M, 2016).

2.1 Current Site Monitoring Infrastructure

Based on a review of available monitoring reports and site visit, there are five existing wells that were recently used to monitor shallow groundwater at the SJRP (Table2-1).

Table 2-1. Summary of Existing Monitoring Well Information for the San Juan River Plant

Well Identification	Comments
MW-2	Located furthest southwest and downgradient of former South Flare Pit Within limits of former landfarm No BTEX exceedances between 2001 – 2015 Aluminum exceedances 2007 – 2013 Iron exceedances 2001 – 2013 Selenium exceedances 2001 – 2015 Chloride, Nitrate+Nitrite, Sulfate, and TDS exceedances 2001 – 2015
MW-4	Southwest and downgradient of former South Flare Pit Within limits of former landfarm No BTEX exceedances between 2001 – 2015 Aluminum exceedances in 2001, 2003, 2007, and 2008 Cobalt exceedances between 2001 – 2013 Iron exceedances between 2001 – 2015 Manganese exceedances between 2001 – 2015 Nickel exceedances between 2001 – 2013 Chloride exceedances 2003 - 2007 & 2009 – 2015 Sulfate and TDS exceedances 2001 – 2015
MW-6	Upgradient monitoring well for main plant area Proximal monitoring well located south of former evaporation pond #2 No BTEX exceedances between 2001 – 2015 Aluminum exceedances 2001 – 2015 Cadmium exceedances 2001 – 2005 & 2010 – 2013 Cobalt exceedances between 2001 – 2015 Iron exceedances in 2001, 2003, 2007, & 2009 – 2011 Manganese exceedances between 2001 – 2015 Nickel exceedances between 2001 – 2005 & 2009 – 2013, & 2015 Selenium exceedances 2001 – 2015 Chloride, Nitrate+Nitrite, Sulfate, and TDS exceedances 2001 – 2015
MW-8	Located furthest northwest and downgradient of former evaporation ponds and downgradient of former condensate burn area

Table 2-1. Summary of Existing Monitoring Well Information for the San Juan River Plant (continued)

Well Identification	Comments
MW-8	Aluminum exceedances between 2009 – 2010 Chromium exceedance in 2002 Cobalt exceedance in 2003 Iron exceedances between 2001 – 2003 & 2008 – 2010, & 2015 Manganese exceedances between 1999 – 2000 & 2001 & 2003 – 2013, & 2015 Nickel exceedance in 2002 As of December 2015, TDS exceedances Historical B, E, X exceedances Chloride and sulfate exceedances between 1999-2005 & 2013 & 2015
MW-9	Northwest and downgradient of former evaporation ponds; downgradient of former condensate burn area Benzene exceedances between 1998 – 2015 Iron exceedances between 1999 - 2001 & 2003 – 2015 Manganese exceedances between 1999 – 2015 Aluminum exceedances 2001 – 2015 Iron exceedances in 2001, 2003, & 2005 – 2014 Nickel exceedances between 2001 – 2015 Chloride, Sulfate, and TDS exceedances 2001 – 2015 Cobalt exceedances between 2001-2015

3 Site Physical Setting

The SJRP is located on the eastern Colorado Plateau with an average elevation of 5,180 feet. The climate in the vicinity of the SJRP is semi-arid. The area can experience hot summers and cold winters with low precipitation throughout the year. The average annual snowfall is 10.9 inches and the average annual rainfall is 7.8 inches. The highest average temperatures occur in July (93 degrees Fahrenheit [^{o}F]) and the lowest average temperatures occur in January (16.8^{o}F).

The following description of site geology and hydrogeology is based on reports prepared by Philip Environmental in 1998 (Philip Environmental, 1998) and the DPT investigation performed in February 2006.

Based on drilling logs from 1995 and prior activities, the soils consist of fine sand to fine sandy clay, with some gravel and cobbles. The soil samples from borings located in the valley or alluvial fans (such as P-10, P-7, P-9, MW-5, MW-8 and MW-9) consist of fine sand to clay. The soil samples from the borings located on the mesas, plateaus and terraces consist of fine sand with some gravel and cobble layers and some unconsolidated sandstone and shales.

The uppermost and most prevalent lithology at the site is comprised of alluvial sediments, which consist of fluvial deposits and, to a lesser extent, terrace deposits of gravel and cobbles. Beneath the alluvium are the consolidated sedimentary units of the Kirtland Shale Formation, which includes both shales and sandstone members. The portion of the site to the north of the plant is underlain by a shale member of the Kirtland Formation. The plant and the flare hill are underlain by a sandstone member of the Kirtland Formation. During remediation of the south flare pit in September 1992, a distinct clay layer was encountered at a depth of approximately 15 feet below the original bottom of the pit.

During the 2006 DPT investigation, refusal was met in hard shale, siltstone, a silty sand mix, and sandstone at interval depths of 8 to 15 ft bgs. Lithology generally changed from a clay soil near the surface to alternating weathered shale and sandstone. This interpretation was considered consistent with previous assessments of the geology, and it was reported that the majority of the soil borings likely met refusal in the Kirtland Formation.

Regional groundwater flow in the San Juan Basin is from the topographically high outcrop areas around the edges of the basin, towards the lower outcrop areas. The San Juan River Valley is indicated as the main discharge area of the San Juan Basin (Stone, et al., 1983). The San Juan River is located approximately two miles to the south of the SJRP site. The results of potentiometric surface measurements collected in 2011 indicate a groundwater flow divide just north of the plant that directs flow to the southwest through the southern portion of the site, and to the northwest through the northern portion of the site, including the Praxair pond area, towards the coal mining operation.

4 Data Gaps and Proposed Site Characterization Activities

Table 4-1 provides a summary of data gaps identified at the SJRP site and corresponding site characterization activities proposed to address data gaps. These locations have been selected to delineate known areas of contamination. The results of these site characterization activities will guide potential investigation of additional delineation locations and other potential sources, if identified.

Table 4-1. Summary of Data Gaps and Proposed Site Characterization Activities

Identified Data Gap	Proposed Site Characterization Activities
Presence of BTEX in deep soils and groundwater in the vicinity of the Praxair evaporation pond	- Drill and sample seven soil borings in the vicinity of previous borings GPH-6, GPH-8, GPH-9 and GPH-10 northeast of the Praxair pond using hollow stem auger drilling techniques to evaluate potential BTEX in deeper soils that could not be accessed during the 2006 direct push sampling investigation. - Complete three of the soil borings between the pond and the former condensate burn area as monitoring wells to evaluate petroleum hydrocarbon concentrations in groundwater and groundwater elevation in this area.
Uncertainty regarding the presence of soil contamination at the Former Condensate Burn Area.	- Drill and sample eighteen soil borings in the vicinity of and topographically downgradient of the Former Condensate Burn Area for the presence of hydrocarbon contamination. - Complete three of the soil borings in the Former Condensate Burn Area as monitoring wells to evaluate petroleum hydrocarbon concentrations and groundwater elevation in this area.
Loss of groundwater elevation measurements and groundwater chemicals of concern (COC) data in the vicinity of MW-5, which was destroyed in 2008.	- The remains of MW-5 will be searched for and abandoned if found; although it appears that the well was destroyed during large scale regrading of this area and it is unlikely to be found. No action to replace former monitoring well MW-5 is proposed at this time, pending the results of the new monitoring wells at the Praxair pond and Former Condensate Burn Area.
Uncertainty regarding the source of hydrocarbon (BTEX) contamination in Praxair monitoring wells.	- Include existing Praxair wells MW-1, MW-2, and MW-4 in the post-drilling sampling event and consider inclusion in the annual site-wide groundwater monitoring and sampling program.
Lack of data regarding background TDS concentrations and uncertainty regarding TDS impacts to groundwater samples.	- Discuss TDS issue with NMOCD regulator to understand their requirements for aquifers with >10,000 mg/L TDS - Potentially: Sample shallow domestic wells, Sample water in Stevens Arroyo, Sample water in the Former Seep Pond

Table 4-1. Summary of Data Gaps and Proposed Site Characterization Activities (continued)

Identified Data Gap	Proposed Site Characterization Activities
Uncertainty regarding groundwater flow and communication between perched zones and the aquifer and hydrogeologic impacts of adjacent coal mine.	- Conduct and evaluate annual sitewide groundwater elevation measurements.

5 Site Characterization Field Activities

5.1 Notifications and Site Access

CCI is the current site operator. They will be informed of the planned drilling program to confirm that there are no concerns with the proposed work locations. Although the proposed drilling locations are outside of active operations areas, should conflicts with facility operations be identified, attempts will be made to move the proposed drilling location to a technically sound alternate location that is agreeable to all parties. Proposed drilling locations are presented in Figure 2.

Prior to the start of field operations, the NMOCD Environmental Bureau will be notified of the planned investigation activities and abandonment of an existing monitoring well. This notice will be provided at least four weeks prior to the start of field operations to allow for NMOCD response.

Prior to the abandonment of an existing monitoring well, a Well Plugging Plan of Operations will be filed with the New Mexico Office of the State Engineer (NMOSE). The NMOSE will review and approve the Plan.

Prior to the installation of any new monitoring wells, well permits will be obtained from the NMOSE. The Plan and well permit processes should be initiated no less than 30 days prior to the anticipated start of field operations.

Investigation of the Praxair groundwater monitoring wells is proposed in this Work Plan; an access agreement between Praxair and EPNG will be required prior to initiation of field activities.

5.2 Site Preparation

Health and Safety Plan

The existing Health and Safety Plan (HSP) for the SJRP site will be modified to define the procedures and requirements for the health and safety of CH2M staff and visitors when they are physically on the work site. The site includes the project area and associated oil and gas processing infrastructure, and support facilities thereon, as applicable. The HSP has been developed in conformance with Occupational Safety and Health Administration Code of Federal Regulations 1910.120 to describe methods to be used to minimize risk resulting from environmental conditions and incorporate system safety design requirements into all phases of the work by eliminating hazards where feasible. The HSP adopts, by reference and as appropriate, the Standards of Practice in the CH2M Corporate Health and Safety Program and Contractor Safety guidelines.

The HSP developed for the groundwater monitoring activities will be amended to describe the procedures for additional site characterization activities to include hollow-stem auger drilling operations, installation of soil borings and collection of soil samples for field screening and laboratory analysis, potential abandonment of one monitoring well, installation of new monitoring wells, location and elevation surveys of soil borings, monitoring wells, and other site features.

- All site operations will be coordinated with the EPNG project manager and SJRP field operations personnel.
- Copies of up to date Safety Data Sheets (formerly called Material Safety Data Sheets) for all chemicals expected to be encountered at the SJRP site will be maintained onsite in a location where employees may easily access it for reference.
- The HSP will include a Vehicular Traffic Control Plan as an appendix. This document will be provided to EPNG. This document will include the location of all project deliveries, and equipment staging areas.
- All CH2M and subcontractor vehicles will contain a first aid kit equipped with bloodborne pathogen protection kits.
- All CH2M heavy equipment operators will be trained and qualified in compliance with ISNetworld Safety Program.

- All CH2M and subcontractor personnel will be required to don hardhat, safety glasses, fluorescent-color safety vests, hearing protection, steel-toed boots and fire-retardant clothing while working at the SJRP site.
- A daily Job Hazard Analysis (JHA) will be developed to review procedural methods and uncover hazards prior to starting up an operation. The JHA is used to address issues that may have developed after the start of the operation or a change in personnel during the operation. Once the hazards of an operation are known, proper solutions or controls can be developed to eliminate the potential for injury.
- All CH2M and subcontractor personnel will be required to review the Kinder Morgan Contractor Environmental /Safety Manual, dated and sign the site Safety Policy document.
- All personnel will complete the CH2M site-specific training before the start of fieldwork. This training will include a discussion of site entry/exit procedures, locations of support facilities, and potential site hazards.

Site Layout

Locations of planned soil borings and monitoring wells will be staked with wood lath and flagged with fluorescent survey ribbon. Plans for ingress and egress to work locations will be addressed in accordance with the Vehicular Traffic Control Plan. A portable toilet will be staged in the vicinity of the work area for use by site workers.

Also, the location of the equipment staging area, including vehicle parking area, and equipment decontamination area will be established.

Vegetation Clearance

To access some of the proposed soil boring and well installation locations, vegetation clearance may be required. Vegetation will be cleared to a height between three and six inches above the ground surface using man-portable weed-whackers. Vegetation clearance will be limited to cutting of brush, vines, small trees and tree limbs that would directly impede the movement of the drill rig, service vehicles and site personnel. Cut vegetation will be moved from the work areas so as not to impede field activities.

Utilities Clearance

Subsurface utility clearance will occur at soil boring and monitoring well installation locations. The general areas to be cleared will be clearly marked, and will include a 50-foot radius surrounding each proposed boring/well installation location. Utilities will be located and marked prior to drilling activities. Underground utilities will be marked as appropriate for each utility, (e.g.; electrical, gas, water or communication). Markings will be clearly visible with spray paint and/or pin flags capable of withstanding inclement weather and normal wear.

If a proposed soil boring or monitoring well is located at or near subsurface utilities, the location will be moved a sufficient distance away, and utilities clearance completed again to retain the 50-foot radius surrounding each proposed boring/well installation location.

5.3 Well Abandonment

The remains of monitoring well MW-5, if found, will be abandoned due to damage. Monitoring well MW-5, if found, will be abandoned by backfilling the well casing and screen with a cement-bentonite grout slurry consisting of 95% Portland cement and 5% sodium bentonite. The grout will be emplaced in the polyvinyl chloride (PVC) screen and casing using a tremie pipe. The entire surface components (i.e., well pad, protective casing, PVC casing) of the wells will be demolished and removed and the upper three feet of the well will be filled with a Portland cement plug. The cement plug will be finished flush with the ground surface.

5.4 Drill and Sample Soil Borings

Soil borings will be drilled and sampled to characterize remaining volatile organic compounds (VOCs) including BTEX, total petroleum hydrocarbons (TPH), and other COCs, and to provide information regarding the necessary actions for site closure. Figure 2 shows the proposed locations of soil borings.

Praxair Pond Area

- Seven soil borings will be drilled and sampled at in the vicinity of the previous Geoprobe soil borings GPH-6, GPH-8, GPH-9 and GPH-10 at the Praxair pond using hollow stem auger drilling techniques to evaluate potential BTEX, TPH, and metals in deeper soils that could not be accessed due to refusal during the 2006 DPT investigation. The borings are expected to be drilled and sampled to a depth of 90 feet bgs.

Former Condensate Burn Area

- Eighteen soil borings will be drilled and sampled at locations in the vicinity of the former condensate burn area to evaluate potential BTEX, TPH, and metals in soils. The borings are expected to be drilled and sampled to 60 feet bgs.

Soil borings will be completed using hollow-stem auger drilling techniques. Soil samples will be collected using a procedure that allows for undisturbed soil cores to be continuously obtained for logging, screening, and sampling. All boreholes will be advanced into the top of the sandstone unit to ensure that competent bedrock can be identified and penetrated when encountered during drilling. The drilling method may switch to downhole rotary methods, using the augers as a surface casing if needed, to penetrate into the underlying competent bedrock if contamination is indicated to be present at that depth.

Soil samples for laboratory analysis will be collected every ten feet from the soil boring to the depth in which the boring is terminated. Sample collection intervals will be modified in the field based on observations including staining, odors, or headspace readings. Collected soil samples will be immediately placed into a laboratory-certified clean glass jars. If required, additional soil or sediment will be collected in a plastic bag for lithologic description and headspace reading. Each sample will be described using the Unified Soil Classification System (ASTM International D-1452, D-2487, and D-2488). A photoionization detector will be used to indicate the presence of VOCs in the soil by measuring the VOCs in the headspace of the bag.

Once the sample is collected, the sample container will be capped. The exterior of each sample container will be wiped clean of dirt and moisture using a paper towel. The sample will be properly labeled and logged onto chain-of-custody and field sampling form. A custody seal may be placed on the sample container or the insulated shipping package. The sample will be placed in an insulated container maintained at 4 degrees Celsius prior to being submitted to a laboratory for analysis.

Soil samples will be analyzed via the following:

- Total petroleum hydrocarbons using United States Environmental Protection Agency (USEPA) Method 8015 Modified for gasoline, diesel, and motor oil range organics
- BTEX using USEPA SW-846 Method 8260B
- NMWQCC metals including arsenic, barium, aluminum, boron, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, and selenium using USEPA SW 846 Method 6010B

Should unknown materials or discolored soils be discovered during soil boring activities, the need to evaluate additional COCs will be discussed with EPNG and may warrant the collection of additional soil samples.

Six of the soil borings are planned to be completed as monitoring wells, following the procedures described in Section 5.5. For soil borings that will not be completed as monitoring wells, at the conclusion of drilling and soil sampling, each soil boring will be backfilled using a cement-bentonite grout slurry consisting of 95% Portland cement and 5% sodium bentonite. The grout will be emplaced in the borehole using a tremie pipe and the augers will be removed from the borehole as the grout is being placed.

Once final soil sample results are received from the analytical laboratory, CH2M will perform data quality assessment, or validation, on 100 percent of the samples analyzed. The analytical data will be reviewed and validated by CH2M chemists, in accordance with the following documents:

- Test Methods for Evaluating Solid Wastes, SW-846, Revision V (USEPA, 2015)
- National Functional Guidelines for Evaluating Organic Data Review (USEPA, 2014)

Sample results will be subject to a Level IV data review that includes an evaluation of the following quality control parameters:

- Data Completeness
- Holding Times and Preservation
- Calibrations
- Blank Analysis Results
- Analytical reporting limits, method detection limits, and limits of detection
- Surrogate Recoveries
- Laboratory Control Sample Results
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results
- Field Duplicates
- Laboratory Spike Results
- Sample Result Verification
- Overall Assessment

A data validation memorandum will be prepared that summarizes the results of the data review. The report will be appended to the Site Characterization Report.

5.5 Monitoring Well Installation

Soil borings for monitoring well installation will be drilled and sampled in accordance with the procedures described in Section 5.4 minus the backfilling procedures. Monitoring wells will be constructed so that the screened interval intersects the top of shallow groundwater, as determined from examination of soil boring samples. Each 4-inch diameter PVC well will be equipped with a maximum length of 35 ft of 0.010-inch mill slot screen. Approximately 10 feet of screen will be installed above the top of shallow groundwater to allow for possible potentiometric surface fluctuations.

The proposed wells to be installed include the following and are shown on Figure 2:

- MW-11 through MW-13 – new wells between Praxair pond and Former Condensate Burn Area
- MW-14 through MW-16 – new wells at the Former Condensate Burn Area

The new monitoring wells will be constructed as follows:

- Schedule 40 PVC 4-inch blank casing – land surface to top of the screen interval.
- Schedule 40 PVC 4-inch 0.010-inch mill slot screen – a maximum screen length of 35 feet set approximately 10 feet above the top of noted saturated conditions in borings.
- Sand pack material properties will be selected to match screen slot size and will be installed in the annular space surrounding the well screen to approximately 1 foot above the top of the screen. The well screen will be swabbed during placement of the sand pack to settle the sand until the sand is 1 foot above the top of the screen. A 1-foot-thick hydrated bentonite chip or pellet seal will be installed above the sand pack, followed by bentonite slurry grout to approximately 1 foot bgs. Above-ground wellheads will be constructed at each location, and will consist of a 5-foot-tall (approximately 3 feet of which will remain above ground) 8-inch-diameter steel wellhead protective casing set in a 3-foot by 3-foot by 6-inch-thick concrete pad. Four protective bollards will be installed at each wellhead. Wellhead completions will have a unique well identification number/name inscribed in the concrete pad or permanently affixed to the well. The wells will be secured with keyed locks.

Following monitoring well installation, all new wells will be developed by swabbing, bailing, and purging until field measurement of turbidity stabilizes, or until 5 casing volumes have been removed, whichever is less. Development water will be containerized in the onsite temporary storage.

Upon completion of well development, HydraSleeve samplers will be set in each well, including the existing wells. Groundwater samples will be collected from the new wells no sooner than 72 hours following the completion of well development.

5.6 Decontamination

The drilling rig and support equipment will arrive at the site clean and ready for drilling activities. Decontamination of augers, drilling rods, casings, downhole equipment, etc. will be conducted between drilling soil boring/well installation locations and at the completion of all site work to avoid site cross-contamination and off-site transport of contamination. Decontamination will consist of Liquinox/Alconox solution wash/scrub, potable high pressure wash, hot water rinse (steam cleaning) and water rinse. A decontamination pad area will be constructed to contain all overspray, liquids and solids generated during decontamination procedures. Decontamination fluids will be containerized and transported on a daily basis to the onsite water storage tank in the staging area. Upon completion of drilling activities, the temporary decontamination pad will be removed and properly disposed.

5.7 Management of Investigation-derived Wastes

Three general types of investigation-dervied waste (IDW) are expected to be produced during site characterization activities. Each type of IDW is described below.

General construction debris waste generated during the well abandonment including PVC pipe, concrete pads, and protective casings will be moved by the drilling subcontractor to a central staging area and placed in roll-off boxes for off-site disposal. This debris and other trash generated during drilling operations will be disposed of at the Waste Management landfill in Bloomfield, NM.

Unconsolidated soil generated during drilling activities, including solids from decontamination, will be containerized in rolloff containers for bulk storage,eventual transport and disposal at the Envirotech, Inc. landfarm.

Decontamination and well development water will be containerized onsite in a temporary storage tank for transport to and eventual disposal at Basin Disposal, Inc.

Prior to transport of the IDW, waste characterization samples will be collected and analytical results will be supplied to the disposal facility. Approval from the waste disposal facility will be obtained prior to shipping waste offsite.

5.8 Site Characterization Report

Once the field activities have been completed and data have been received and evaluated, draft and final versions of a Site Characterization Report will be prepared for the SJRP site to summarize the results of soil boring, soil sampling, and monitoring well installation. The Site Characterization Report will include a presentation of field observations and tabular summary of all soil laboratory analytical results. The report will also summarize the results of quality control sampling performed as part of the field program.

Following incorporation of EPNG review comments, CH2M will finalize the report and submit it to NMOCD. EPNG will schedule a meeting with NMOCD to discuss the report and if comments are received, CH2M and EPNG will discuss and decide upon the appropriate response. The agreed upon response to NMOCD comments will be submitted to NMOCD before issuing a revised report for consideration and approval.

6 Site Monitoring

6.1 Depth to Water Measurements

Depth to water measurements will be collected annually from all wells, including the Praxair wells, to provide information regarding the hydrogeology of the site.

6.2 Annual Monitoring

All new and existing groundwater monitoring wells at the SJRP, including the three Praxair pond wells, will become part of the annual groundwater monitoring program. An attempt to obtain an access agreement between EPNG and Praxair will be made that allows EPNG annual access to the monitoring wells for sampling purposes. The following procedures will be followed for annual monitoring.

All site operations will be coordinated with the EPNG project manager and local operations personnel.

Sampling will be conducted using HydraSleeve sampling equipment. The HydraSleeve is classified as a no-purge (passive) grab sampling device, meaning that it is used to collect ground-water samples directly from the screened interval of a well without having to purge the well prior to sample collection. The HydraSleeve causes no drawdown in the well (until the sample is withdrawn from the water column) and only minimal disturbance of the water column, because it has a very thin cross section and it displaces very little water (< 100 milliliters) during deployment into the well. The HydraSleeve collects a sample from within the screen only, and it excludes water from any other part of the water column in the well through the use of a self-sealing check valve at the top of the sampler. It is a single-use (disposable) sampler that is not intended for reuse, so there are no decontamination requirements for the sampler itself. Any purge or excess water generated during sampling will be containerized in 55-gallon drums, sampled for characterization to determine the appropriate disposal method, and transported to the on-site designated staging area.

Samples collected annually from all wells at the SJRP will be submitted to the analytical laboratory for:

- VOCs using USEPA SW-846 Method 8260B,
- TPH using USEPA Method 8015 Modified for gasoline, diesel, and motor oil range organics,
- Nitrate plus nitrite using Method 353.2,
- NMWQCC dissolved metals including arsenic, barium, aluminum, boron, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, and selenium using USEPA SW 846 Method 6010B and 7470A,
- Total dissolved solids using Method 160.1,
- Alkalinity using Method 310.1,
- Sulfate using Method 300, and
- Chloride using Method 300.

In addition, laboratory MS/MSD samples will be collected for the laboratory to assess accuracy, precision, and matrix interference of the groundwater samples. These samples will be collected in the same manner as duplicate samples and are labeled extra volume samples for MS/MSD. Also, equipment rinsate samples and trip blanks will be collected to assess field operations and sample transport.

Once final results are received from the analytical laboratory, CH2M will perform data quality assessment, or validation, on 100 percent of the samples analyzed. The analytical data will be reviewed and validated by CH2M chemists, in accordance with the following documents:

- Test Methods for Evaluating Solid Wastes, SW-846, Revision V (USEPA, 2015)
- National Functional Guidelines for Evaluating Organic Data Review (USEPA, 2014)

Sample results will be subject to a Level IV data review that includes an evaluation of the following quality control parameters:

- Data Completeness
- Holding Times and Preservation
- Calibrations
- Blank Analysis Results
- Analytical reporting limits, method detection limits, and limits of detection
- Surrogate Recoveries
- Laboratory Control Sample Results
- MS/MSD Results
- Field Duplicates
- Laboratory Spike Results
- Sample Result Verification
- Overall Assessment

A data validation memorandum will be prepared that summarizes the results of the data review. The report will be appended to the Annual Report, described below.

Draft and final versions of an Annual Groundwater Monitoring report will be prepared to summarize the results of annual water level measurements and groundwater sampling at new and existing wells at the SJRP site. The Annual Groundwater Monitoring Report will include a tabular summary of all groundwater laboratory analytical results, results of quality control sampling and a data validation technical memorandum. The report will also include a discussion and comparison of water levels and detected COCs in reference to previous monitoring data.

7 References

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Figures

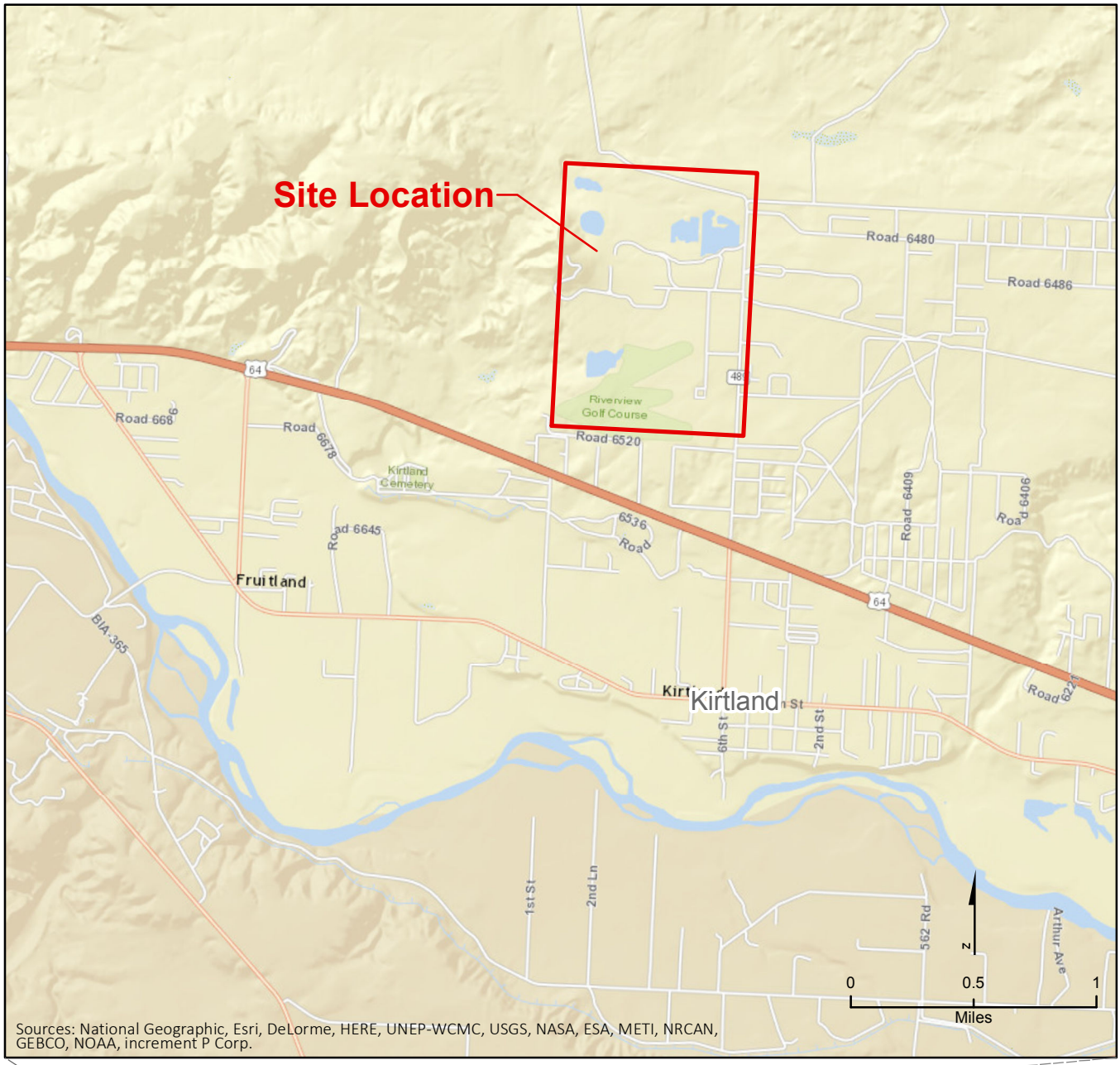

Figure 1
Site Location Map
San Juan River Gas Plant Site
Kirtland, New Mexico

LEGEND

- Abandoned Geoprobe Boring
- Monitoring Well
- Abandoned Monitoring Well
- Praxair Plant Monitoring Well
- Proposed Soil Boring
- Proposed Monitoring Well
- Site Feature
- Fence
- Flare Pit

N

0 260 520

Feet

Figure 2
Proposed Site Characterization Investigation Locations
San Juan River Gas Plant Site
Kirtland, New Mexico

Appendix A
Soil and Groundwater Regulatory Screening Levels

TABLE A-1 Soil Sample Screening Criteria
Site Characterization Work Plan, San Juan Gas Plant, Kirtland, New Mexico

Analyte	CAS Number	New Mexico Industrial/Occupational Soil Screening Criteria[1] (mg/kg)	NMOCD Recommended Remediation Action Level[2] (mg/kg)
Benzene	71-43-2	87.2	NA
Toluene	108-88-3	61,300	NA
Ethylbenzene	100-41-4	368	NA
Xylenes	1330-20-7	4,280	NA
TPH[3]	NA	NA	100
Aluminum	7429-90-05	1,290,000	NA
Arsenic	7440-38-2	21.5	NA
Barium	7440-39-3	255,000	NA
Boron	7440-42-8	259,000	NA
Cadmium	7440-43-9	1,110	NA
Chromium	16065-83-1	1,950,000	NA
Cobalt	744-48-4	NA	NA
Iron	7439-89-6	908,000	NA
Lead	7439-92-1	800	NA
Manganese	7439-96-5	160,000	NA
Mercury	7439-97-6	112	NA
Molybdenum	7439-98-7	6,490	NA
Nickel	7440-02-0	25,700	NA
Selenium	7782-49-2	6,490	NA

Notes:
[1] = New Mexico Environment Department Risk Assessment Guidance for Site Investigations and Remediation, December 2014
[2] = Calculated following Section IV.A.2.b. of the NMOCD Guidelines for Remediation of Leaks, Spills and Releases. August 13, 1993. The Depth to Ground Water at the site is less than 50 feet, which generates a Total Ranking Score of 20 that indicates the listed Remediation Action Level is required.
[3] = TPH to be analyzed for gasoline range organics, diesel range organics, and motor oil organics vai USEPA Method 8015 Modified. The total TPH concentration will be the sum of those three reported concentrations.
CAS = Chemical Abstract Service
mg/kg = milligrams per kilogram
NA = not applicable

Table A-2 Groundwater Sample Screening Criteria
Site Characterization Work Plan, San Juan Gas Plant, Kirtland, New Mexico

Analyte	CAS Number	NMWQCC Standard[1] (mg/L)	USEPA MCL[2] (mg/L)
Benzene	71-43-2	0.01	0.005
Toluene	108-88-3	0.75	1
Ethylbenzene	100-41-4	0.75	0.7
Xylenes	1330-20-7	0.62	10
Nitrate-Nitrite as N	14797-55-8	10	0.01
Aluminum	7429-90-05	5.0[3]	NA
Arsenic	7440-38-2	0.1	0.01
Barium	7440-39-3	1	2
Boron	7440-42-8	0.75[3]	NA
Cadmium	7440-43-9	0.01	0.005
Chromium	16065-83-1	0.05	0.1
Cobalt	7440-48-4	0.05[3]	NA
Iron	7439-89-6	1	NA
Lead	7439-92-1	0.05	0.015
Manganese	7439-96-5	0.2	NA
Mercury	7439-97-6	0.002	0.002
Molybdenum	7439-98-7	1.0[3]	NA
Nickel	7440-02-0	0.2[3]	NA
Selenium	7782-49-2	0.05	0.05
Calcium	NA	NA	NA
Magnesium	NA	NA	NA
Potassium	NA	NA	NA
Sodium	NA	NA	NA
Sulfate	NA	600	NA
Chloride	NA	250	NA
Bromide	NA	NA	NA
Alkalinity as CO_3 and HCO_3	NA	NA	NA
Total Dissolved Solids	NA	1,000	NA

Notes:

[1]= New Mexico Administrative Code, Title 20 Environmental Protection, Chapter 6 Water Quality, Part 2 Ground and Surface Water Protection

[2] = United States Environmental Protection Agency Regional Screening Levels (RSL), January 2015

[3] = New Mexico Standard for Irrigation Use

CAS = Chemical Abstract Service NA = Not Applicable

MCL = Maximum Contaminant Level NMWQCC = New Mexico Water Quality Control Commission