# 3R-1047

# COPC
# San Juan 27-5 Unit #1
# Human Health and Ecological Risk Assessment / OCD Response

# 6-5-2017

183

## Smith, Cory, EMNRD

**From:** Smith, Cory, EMNRD
**Sent:** Monday, June 5, 2017 2:16 PM
**To:** 'Frost, Gwendolynne'
**Cc:** Powell, Brandon, EMNRD; Fields, Vanessa, EMNRD; Aebi, Mark A.; whitney thomas (l1thomas@blm.gov); Griswold, Jim, EMNRD; Walker, Jeffrey (Jeff.Walker@ghd.com)
**Subject:** RE: San Juan 27-5 #1 (API# 30-039-07154) Supplemental Site Assessment Report (3RP-1047)

Good afternoon Gwen,

The OCD received the Human Health and Ecological Risk Assessment for the San Juan 27-5 #1 on May 22, 2017. After review the OCD has denied COPC request for a risk based closure at this time. As previously mentioned, the site contains impacts within shallow zones of 0-10'. As per the previous email the impacts were discovered approximately 1 year and 5 months ago and no remediation has taken place. The OCD email dated March 29, 2017 (see email chain below) gave COPC 90 days to start remediation which is June 27th.

The OCD is requiring COPC begin remediation as stated in the previous email by June 27th on the highly impacted shallow zones.

1. IF COPC chooses to use an alternative remediation then Dig/Haul, COPC must submit an alternative remediation plan for the highly impacted shallow zones. The OCD will not grant an extension for this submittal. The plan is required to include the selected remediation techniques and start of proposed remediation. Please ensure any alternative submittal is submitted with ample time for review and approval prior to the 30 day deadline.

If you have any questions please give me call.

Cory Smith
Environmental Specialist
Oil Conservation Division
Energy, Minerals, & Natural Resources
1000 Rio Brazos, Aztec, NM 87410
(505)334-6178 ext 115
cory.smith@state.nm.us

**From:** Frost, Gwendolynne [mailto:Gwendolynne.Frost@conocophillips.com]
**Sent:** Monday, June 5, 2017 1:50 PM
**To:** Smith, Cory, EMNRD <Cory.Smith@state.nm.us>
**Cc:** Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>; Aebi, Mark A. <Mark.A.Aebi@conocophillips.com>; whitney thomas (l1thomas@blm.gov) <l1thomas@blm.gov>; Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Walker, Jeffrey (Jeff.Walker@ghd.com) <Jeff.Walker@ghd.com>
**Subject:** RE: San Juan 27-5 #1 (API# 30-039-07154) Supplemental Site Assessment Report (3RP-1047)

Good afternoon Cory, have you and the NMOCD/BLM had a chance to review the Human Health and Ecological Risk Assessment (HHRA) that ConocoPhillips submitted below for the San Juan 27-5 No. 1 (3RP-1047)? Please let me know your thoughts or comments.

Thank you,
Gwen

**From:** Frost, Gwendolynne
**Sent:** Wednesday, May 17, 2017 8:06 AM
**To:** 'Smith, Cory, EMNRD' <Cory.Smith@state.nm.us>
**Cc:** 'Powell, Brandon, EMNRD' <Brandon.Powell@state.nm.us>; 'Fields, Vanessa, EMNRD' <Vanessa.Fields@state.nm.us>; Aebi, Mark A. <Mark.A.Aebi@conocophillips.com>; 'whitney thomas (l1thomas@blm.gov)' <l1thomas@blm.gov>; Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Walker, Jeffrey (Jeff.Walker@ghd.com) <Jeff.Walker@ghd.com>
**Subject:** RE: San Juan 27-5 #1 (API# 30-039-07154) Supplemental Site Assessment Report (3RP-1047)

Cory
Good morning, ConocoPhillips Company (COPC) would like to provide the Human Health and Ecological Risk Assessments completed for the San Juan 27-5 No. 1 (3RP-1047) for your review. GHD will be submitting a hard copy for your files.

Please let me know your thoughts or comments. COPC and GHD are available to meet to discuss further if needed.

*Thank you,*
*Gwen Frost*
Environmental Coordinator
San Juan Asset – RBU
T: 505.326.9549 | M: 505.215.3121

**From:** Frost, Gwendolynne
**Sent:** Thursday, April 27, 2017 5:15 PM
**To:** 'Smith, Cory, EMNRD' <Cory.Smith@state.nm.us>
**Cc:** Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>; Aebi, Mark A. <Mark.A.Aebi@conocophillips.com>
**Subject:** RE: San Juan 27-5 #1 (API# 30-039-07154 Supplemental Site Assessment Report

Cory
Thank you for providing the correspondence. I will review the information in its entirety and get back with you as soon as possible. Please know that I am aware of the imposed deadline for implementation of remediation at the San Juan 27-5 No. 1 and ConocoPhillips is working towards that. I anticipate that the Risk Assessment for the site to be available May 12th, and at that time COPC will provide the results to NMOCD/BLM for review and a path forward.

Thank you,
Gwen Frost

**From:** Smith, Cory, EMNRD [mailto:Cory.Smith@state.nm.us]
**Sent:** Thursday, April 27, 2017 1:41 PM
**To:** Frost, Gwendolynne <Gwendolynne.Frost@conocophillips.com>
**Cc:** Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>
**Subject:** [EXTERNAL]FW: San Juan 27-5 #1 (API# 30-039-07154 Supplemental Site Assessment Report

Gwen,

Please see the below email in regards to SJ 27-5 #1 release.

If you have any additional questions please give me a call.

Cory Smith
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(505)334-6178 ext 115
cory.smith@state.nm.us

**From:** Smith, Cory, EMNRD
**Sent:** Friday, March 31, 2017 11:53 AM
**To:** 'Walker, Jeffrey' <Jeff.Walker@ghd.com>
**Cc:** Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>; Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Bayliss, Randolph, EMNRD <Randolph.Bayliss@state.nm.us>; Crouch, J. Brady <J.Brady.Crouch@conocophillips.com>
**Subject:** RE: San Juan 27-5 #1 (API# 30-039-07154 Supplemental Site Assessment Report

Jeff,

We understand attenuating circumstances may impede COPC's ability to meet the 30 day deadline to submit additional Work plans. The OCD may grant COPC a short extension if warranted solely to the plan submittal timeline, if this extension is requested COPC will need to provide the current status of the plans and the anticipated submittal timeline. Regardless of an extension to the plan submittal, COPC will still be required to meet the 90 day deadline for implementation of the remediation. Please note, the OCD overall required timelines extend 30 days past the proposed dates received from COPC in their January 19. 2017 letter.

If you have additional questions please give me a call.

Cory Smith
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cory.smith@state.nm.us

**From:** Walker, Jeffrey [mailto:Jeff.Walker@ghd.com]
**Sent:** Friday, March 31, 2017 10:20 AM
**To:** Smith, Cory, EMNRD <Cory.Smith@state.nm.us>
**Cc:** Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>; Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Bayliss, Randolph, EMNRD <Randolph.Bayliss@state.nm.us>; Crouch, J. Brady <J.Brady.Crouch@conocophillips.com>
**Subject:** RE: San Juan 27-5 #1 (API# 30-039-07154 Supplemental Site Assessment Report

Cory,

Thank you for taking the time to discuss the C-141 conditional approval and answering our concerns/questions. As we also discussed, the completion of subsurface delineation to the west (northwest) of boring SB-7 can be accomplished during excavation in lieu of an additional boring in this area. ConocoPhillips is working diligently to complete the supplemental site characterization and quantitative risk assessment according to the schedule outlined in our letter, dated January 19, 2017, and as further imposed in your email of March 29, 2017. Please be assured that ConocoPhillips is using the opportunity to further characterize site contaminants, receptors, hydrogeology, etc, towards generating a remediation plan that is absolutely protective of health and the environment and appreciates your understanding of the attenuating circumstances (contractual, weather, rig scheduling, etc) we discussed that challenges the 30 day submittal timeline.

Thank you-Jeff

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**From:** Smith, Cory, EMNRD [mailto:Cory.Smith@state.nm.us]
**Sent:** Friday, March 31, 2017 9:14 AM
**To:** Walker, Jeffrey
**Cc:** Powell, Brandon, EMNRD; Fields, Vanessa, EMNRD; Griswold, Jim, EMNRD; Bayliss, Randolph, EMNRD; Crouch, J. Brady
**Subject:** RE: San Juan 27-5 #1 (API# 30-039-07154 Supplemental Site Assessment Report

Jeffrey,

As per our phone conversation this morning in regards to using TX1005/TX1006 sampling methods. As discussed COPC can use these sampling methods for COPC knowledge and decisions making however these samples will not be accepted for confirmation closure samples.

Thanks,

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**From:** Smith, Cory, EMNRD
**Sent:** Wednesday, March 29, 2017 3:24 PM
**To:** 'Crouch, J. Brady' <J.Brady.Crouch@conocophillips.com>
**Cc:** Walker, Jeffrey <Jeff.Walker@ghd.com>; Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>; Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Bayliss, Randolph, EMNRD <Randolph.Bayliss@state.nm.us>
**Subject:** FW: San Juan 27-5 #1 (API# 30-039-07154 Supplemental Site Assessment Report

Good Afternoon Brady,

Upon review of the delineation report for the San Juan 27-5 #1 (API# 30-039-07154) the OCD has approved the subsequent C-141 with the following conditions of approval.

1. COPC request to use sampling method TX1005/1006 is denied as the overall method TX1005/1006 is not a New Mexico approved method. If you would like to breakout your specific sampling plan using this method as a guideline but using laboratory methods 8015M GRO/DRO/MRO which includes C6-36 and 8260 for BTEX, we can review your specific sampling plan.
2. COPC's request to further characterize the site to aid in the selection of the most appropriate remedial action is the operators option. Please note it appears the site is not fully delineated to the west as SB-7 is still above standards and additional delineation will be required in this direction. If COPC elects to use this option, the additional delineation plan must be submitted within 30 days and implemented within 90days. This option will not relieve COPC of the requirements of approval conditions #3 and #4.
3. Because the release was discovered approximately 1 year and 4 months ago and no remediation has taken place, we are requiring remediation to begin within the next 90 days on the highly impacted shallow zones.
4. COPC must submit a remediation plan for the highly impacted shallow zones within 30 days to the District Aztec Office. The plan is required to include the selected remediation techniques and start of proposed remediation.

The release site has been assigned as 3RP-1047 please reference the 3RP number on any further submitted documents. COPC may find the signed documents through the OCD website searching with that number(Instructions below). The approved C-141 and delineation report will be scanned to this location. If you have any additional questions please give me a call.

To find the 3RP
1. Navigate to http://ocdimage.emnrd.state.nm.us/imaging/AEOrderCriteria.aspx
2. In the Order Type drop down Box select "3R – Remediation Permit – Aztec- (3RP)
3. In the Order Number/Amendment Type in your given number
4. Click search

If you have any additional questions please give me a call.

Cory Smith
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**From:** Smith, Cory, EMNRD
**Sent:** Tuesday, February 28, 2017 11:21 AM
**To:** 'Crouch, J. Brady' <J.Brady.Crouch@conocophillips.com>
**Cc:** Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>; Walker, Jeffrey <Jeff.Walker@ghd.com>
**Subject:** RE: Supplemental Site Assessment and Remediation Plans

Mr. Crouch

I apologize for the delay in getting back to you. I did received and reviewed the letter received on Jan 23, 2017. Before proceeding to submitting the Human Health Risk Assessment( HHRA) and Ecological Risk

Assessments (ERA). Please submit in hardcopy an "updated" initial c-141 including the delineation report for each site. I have the Delineation report for the San Juan 27-5 31 but, there is no signed C-141 with it.

Thank you,

Cory Smith
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(505)334-6178 ext 115
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**From:** Crouch, J. Brady [mailto:J.Brady.Crouch@conocophillips.com]
**Sent:** Thursday, January 19, 2017 1:56 PM
**To:** Smith, Cory, EMNRD <Cory.Smith@state.nm.us>
**Cc:** Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Powell, Brandon, EMNRD <Brandon.Powell@state.nm.us>; Fields, Vanessa, EMNRD <Vanessa.Fields@state.nm.us>; Walker, Jeffrey <Jeff.Walker@ghd.com>
**Subject:** Supplemental Site Assessment and Remediation Plans

Cory,

It was a pleasure to meet you last week out in the Farmington area. As we discussed at that time, attached is a letter to help establish a proposed path forward on three sites (San Juan 27-5 #1, San Juan 27-5 #69, Krause WN Federal #2) within the San Juan Basin. I am sending this letter to you electronically here so that you may begin your evaluation on our proposed path forward to closure; the original signed copy will mailed out to you tomorrow for your records. Thank you for your time, as well as Vanessa's and Brandon's, in the field last week. I look forward to working with you on these sites and others into the future. All the best!

Regards,

**J. Brady Crouch**
Program Manager
Risk Management & Remediation

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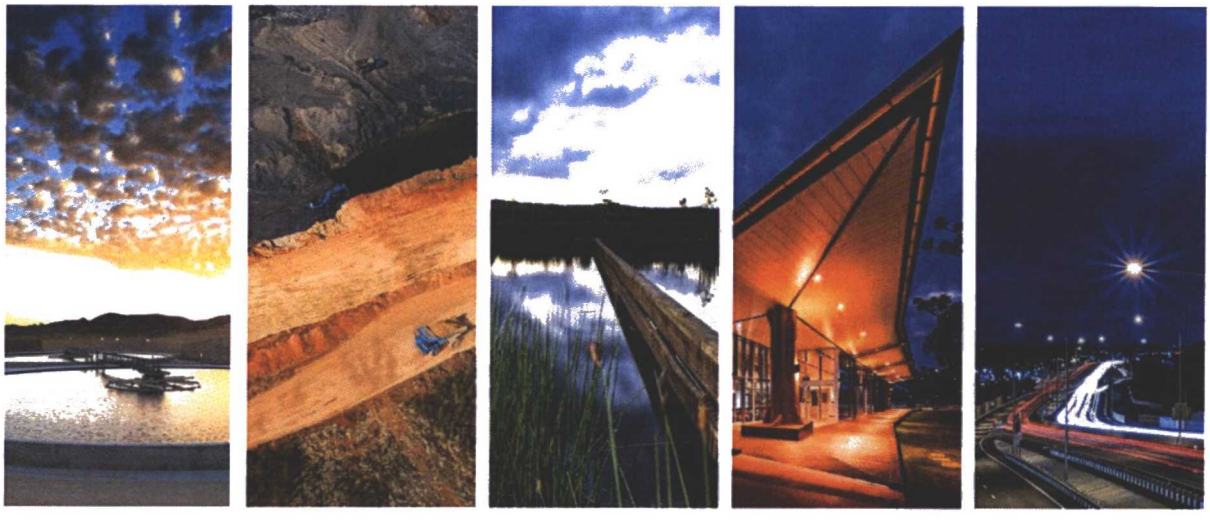
Cell: (832) 916-7930
j.brady.crouch@conocophillips.com

Final





# Human Health and Ecological Risk Assessments

San Juan 27-5 No.1
Rio Arriba County, NM
NMOCD Site No. 3RP-1047

ConocoPhillips Company, Houston, Texas

**GHD** | 1755 Wittington Place Suite 500 Dallas Texas 75234

11124687 | 1 | May 16 2017

# Executive Summary

GHD has prepared an integrated Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) for San Juan 27-5 No. 1, which experienced an accidental release of an unknown quantity of condensate. The objective of the HHRA/ERA is to utilize the existing State and Federal risk assessment guidance to determine the potential for adverse effects on various receptors post-spill and over the life-cycle of hydrocarbons at the Site.

The process of conducting human and ecological risk assessments has been well established at Federal, State, and Regional sites. The corresponding risk-based approaches have been captured in legislation, guidance documentation, and successful cleanup actions/closures. As such, there is an extensive track record of regulatory, legal, risk, and practical precedents to facilitate safe closures of contaminated sites using risk-based approaches.

A series of Site investigations were completed, including the collection of soil samples and a groundwater sample for the analysis of hydrocarbon constituents to support the HHRA and ERA. The risk analysis for soil relative to the residential and commercial /industrial exposure scenarios indicated that the principal constituent group at the Site with concentrations in excess of the conservative screening levels was total petroleum hydrocarbons (TPH), specifically, the fractions consisting of C6-C10, GRO, >C12-C28, C6-C35. In the quantitative HHRA, the TPH fractions were found to be below the site-specific cleanup level (SSCL) for TPH in commercial/industrial soil. TPH from November 2015 exceeded the SSCL for TPH in residential soil, however, natural attenuation appears to occur, as seen by the dramatic reduction in concentrations of TPH fractions in samples collected in April 2017. Thus, there is no potential for unacceptable risk to human health from exposure to soil on the Site.

For groundwater, no chemical constituents were detected in a recent sample collected in April 2017; therefore, there is no potential for unacceptable risk to human health from groundwater at the Site.

Soil and groundwater were also analyzed for risk-based screening levels for livestock grazing at the Site to determine if beef ingestion is a plausible and complete exposure pathway. Despite discrepancies in chemicals with RBSLs (e.g., crude oil vs. TPH fractions), it is clear that there are no exceedances of livestock RBSLs for soil and groundwater. Thus, there is no potential for unacceptable risk to human health from consuming beef from livestock on the Site.

Ecological risk assessment of the soil analytical results relative to the conservative screening benchmarks for ecological receptors identified none of the compounds requiring further evaluation in ecological risk assessment.

The results of the HHRA and ERA are conclusive that any remaining hydrocarbons in Site soils do not pose any reasonable probability of injury or detriment to public health, fresh waters, animals or plant life, or property; or unreasonably interfere with public welfare or use of the property, whether it be current or future.

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# List of Acronyms

| | |
|---|---|
| AUF | Area Utilization Factor |
| BAF | Bioaccumulation Factor |
| BCOC | Bioaccumulative Chemical of Concern |
| bgs | Below Ground Surface |
| BTEX | Benzene, Toluene, Ethylbenzene, Xylene |
| BTV | Background Threshold Value |
| BW | Body Weight |
| C | Concentration |
| CCME | Canadian Council of Ministers of the Environment |
| CEM | Conceptual Exposure Model |
| COC | Chemical of Concern |
| CRA | Conestoga-Rovers and Associates |
| CSM | Conceptual Site Model |
| DW | Dry Weight |
| Eco-PCL | Ecological Protective Concentration Level |
| ECO-SSL | Ecological Soil Screening Level |
| EPC | Exposure Point Concentration |
| ERA | Ecological Risk Assessment |
| ESB | Ecological Screening Benchmark |
| FOD | Frequency of Detection |
| ft | Feet |
| FWS | U.S. Fish and Wildlife Service |
| HQ | Hazard Quotient |
| IR | Ingestion Rate |
| kg | Kilogram |
| $K_{ow}$ | Octanol-water partition coefficient |
| L | Liter |
| LOD | Limit of Detection |
| mg | Milligram |
| ORNL | Oak Ridge National Laboratory |
| PCL | Protective Concentration Level |

| | |
|---|---|
| RQ | Refinement Quotient |
| RAL | Residential Assessment Level |
| ROC | Receptor of Concern |
| SH | State Highway |
| SLERA | Screening Level Ecological Risk Assessment |
| SSERA | Site-Specific Ecological Risk Assessment |
| SQ | Screening Quotient |
| SVOC | Semi-Volatile Organic Compound |
| TCEQ | Texas Commission on Environmental Quality |
| TPH | Total Petroleum Hydrocarbon |
| TPWD | Texas Parks & Wildlife Department |
| TRRP | Texas Risk Reduction Program |
| TRV | Toxicity Reference Value |
| TWDB | Texas Water Development Board |
| UCL | 95% Upper Confidence Limit |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |

# 1. Introduction

GHD Services Inc. (GHD) on behalf of ConocoPhillips Company (ConocoPhillips) has prepared this integrated Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) for the San Juan 27-5 No. 1 (Site). The Site is located in Section 4, Township 27 North, and Range 5 West, in Rio Arriba County, New Mexico (Figure 1.1). The GPS coordinates for the Site are 36.59725° North, 107.35659° West. The Site consists of an active gas well and associated production equipment (Figure 1.2). Additional on-site features include a water well, a livestock mineral feeder, and a small man-made earthen stock tank for livestock (Figure 1.2).

This integrated HHRA/ERA supports the Site assessment field activities conducted by GHD on September 15 and 16, 2016, and the Site field activities conducted by GHD on April 12, 2017. The *Site Assessment Report* detailing the Site field activities was previously submitted to Mr. Brady Crouch with ConocoPhillips on November 18, 2016 (GHD, 2016). Prior to GHD's Site assessment, a Site assessment was conducted in April 2016 by Rule Engineering, LLC (Rule). This HHRA/ERA also incorporates the data from the Rule site assessment.

The HHRA/ERA report includes a summary of the Site background, field activities from November 2015 through April 2017, as well as an updated sample location map, tabulation of field screening and laboratory analytical test results obtained to-date. The objective of the HHRA/ERA is to determine the potential for adverse effects on various receptors post-release.

# 2. Site Assessment

## 2.1 History and Background

### 2.1.1 Historical Release Event

Hydrocarbon impacted soil was discovered while trenching for an equipment upgrade on November 30, 2015. A sample was collected by a ConocoPhillips environmental specialist. The sample was submitted for confirmatory laboratory analyses of volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8021B and total petroleum hydrocarbons (TPH) (e.g., gasoline and diesel range organics [GRO/DRO]) by EPA Method 8015D (see GHD [2016] for laboratory reports).

Results indicated the TPH concentration was 5,820 milligrams per kilogram (mg/kg, also referred to as parts per million [ppm]),which is above the New Mexico Oil Conservation Division (NMOCD) screening levels established for the Site of 100 ppm for total TPH (NMOCD, 1993).

Additional details on previous field activities are further discussed in the Site Assessment Report complete by GHD (GHD, 2016).

### 2.1.2 April 2017 Field Activities by GHD

Additional field samples were collected in April 2017 to supplement the existing data. On April 12, 2017, one soil boring, B-17, was advance to a depth of 17 feet below ground surface (ft bgs), and

five samples from the boring were submitted for laboratory analysis (Figure 1.2). One groundwater sample from the water well on-site was collected. The samples were submitted to Pace Analytical (Pace) located in Lenexa, Kansas for the analyses. The soil samples were analyzed for polycyclic aromatic hydrocarbons (PAH) by EPA 8270 by SIM and TPH fractions by TX1005 and TX1006 methods. The groundwater sample was analyzed for VOCs, specifically, benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA method 8260 and PAHs by EPA 8270 by SIM. The laboratory report is found in Appendix D.

## 2.2 Site Setting

The San Juan Basin accounts for half of the Navajo section of the Colorado Plateau physiographic province. The area is characterized by a wide range of land forms from broad uplands and wide valleys, to deep canyons, badlands, volcanic plugs, mesas, buttes, and hogbacks. In areas away from canyons and mesas or buttes, local relief is generally low.

### 2.2.1 Geology

The San Jose Formation of Eocene age outcrops at the Site, as well as over the surface of a vast portion of the San Juan Basin. The San Jose Formation was deposited in various fluvial-type environments. In general, the unit consists of an interbedded sequence of sandstone, siltstone, and variegated shale. The thickness of the San Jose Formation varies from 200 ft in the west and south to almost 2,700 ft in the center of the San Juan Basin.

### 2.2.2 Hydrology and Hydrogeology

Groundwater is associated with alluvial and fluvial sandstone aquifers. Thus, the occurrence of groundwater is mainly controlled by the distribution of sandstone in the formation. The distribution of such sandstone is the result of original depositional extent, plus any post-depositional modifications, namely erosion and structural deformation. Transmissivity data for San Jose Formation are minimal. Values of 40 and 120 feet squared per day ($ft^2/d$) were determined from two aquifer tests (Stone et al., 1983). The reported or measured discharges from 46 water wells completed in San Jose Formation range from 0.15 to 61 gallons per minute (gpm), with the median of 5 gpm. Most of the wells provide water for livestock and potable domestic use. The depth to groundwater at the Site is approximately 80 feet below ground surface, based on the driller's log for the on-site water well, on file with the New Mexico Office of the State Engineer.

### 2.2.3 Climate

The climate is generally arid to semiarid. In the central part of the San Juan Basin, annual precipitation is generally 10 inches (in). Most precipitation (approximately 60% of the total) occurs during summer months in the form of local, often intense thunderstorms. Higher elevations receive considerable winter precipitation. Maximum temperatures generally occur in July, and minima are recorded in January. Temperature extremes in the basin include a high of 110 degrees Fahrenheit (°F) at Fruitland, NM, 42 miles (mi) northwest of the Site, and a low of -48 °F at Dulce, NM, 33 mi northeast of the Site. Wind directions vary in the basin because of topography (numerous ridges and valleys). Spring is the windiest season, with wind velocities averaging 10 to 12 miles per hour

(mph), whereas summer winds average only 8 mph. The average evaporation during the period May through October is 46 in.

### 2.2.4 Land Use

Land use in the area is principally petroleum extraction and stock grazing (cattle and sheep), as well as various recreational activities. The Site has no use restrictions or restrictive covenants.

### 2.2.5 Constituents of Interest

Historical activities at the Site were associated with a historical release of an unknown amount of hydrocarbons. Accordingly, the constituents of interest include TPH, PAHs, and BTEX, which are VOCs.

### 2.2.6 Transport and Fate

There are several potential mechanisms for transporting constituents from one or more source area to areas that may be frequented by receptors. One such mechanism is overland surface flow during storm events. Constituents dissolved in storm water, or adsorbed to particles suspended in storm water, may be transported from source areas to other portions of the Site.

The fate of constituents in surface flow is dependent on the chemical and physical properties of the constituents and their interaction with the physical and biological properties of the habitats. For example, VOCs transported in surface runoff will likely volatilize to the atmosphere. Hydrophobic compounds will likely leave solution and bind to organic matter in the soil, or in the sediment, of a nearby waterbody. Other less hydrophobic compounds may remain in solution.

Wind is another potential mechanism for transport of chemical constituents from source to receptors areas. Constituents transported by wind may be deposited on land or nearby water conveyances.

Another potential source of transport is the movement of chemicals dissolved in water percolating through soil. If the downward migration of constituents intersects groundwater, constituents may be transported via groundwater flow. The fate of constituents in groundwater is dependent upon the chemical and physical properties of the specific constituents and the interaction of the constituents with the physical properties of the subsurface soil. Hydrophobic constituents (i.e., those constituents with low aqueous solubility) will likely leave aqueous solutions and will bind to organic matter in subsurface soil. Other less hydrophobic constituents may remain in solution. If there are constituents that are transported in groundwater, they could potentially discharge into nearby waterbodies.

# 3. Data for Risk Assessment

The soil data for the quantitative risk assessment were collected in November 2015, April and September 2016, and April 2017 as part of various Site investigations, construction excavation, confirmatory, and step-out sampling activities described in Section 2. Environmental media samples were submitted to Hall Environmental Analysis Laboratory (HEAL) located in Albuquerque, New Mexico and Pace Analytical (Pace) located in Lenexa, Kansas. The corresponding results were

initially screened "as is" (i.e., without consideration of what impacted media was excavated and what remains on-Site) to identify the constituents of potential concern. All analytical results available for the Site are presented in Appendix A.1-A.4.

### 3.1 Validation

Prior to performing the risk assessment, soil data were validated by a GHD chemist. Evaluation of the data was based on information obtained from the chain of custody forms, finished report forms, method blank data, and recovery data from surrogate spikes/laboratory control samples (LCS)/matrix spikes (MS). The QA/QC criteria by which these data have been assessed are outlined in the analytical methods and applicable guidance from the document titled, "*USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*," USEPA 540-R-08-01, June 2008.

### 3.2 Treatment of Non-Detects

When necessary, non-detect samples (censored datasets) were evaluated following the appropriate methodology outlined in the most recent version of US EPA's ProUCL Technical Guide (Guide). Currently, the Guide indicates that the Kaplan-Meier (KM) method yields more precise and accurate estimate of decision characteristics than those based on substitution and regression on order statistics. The use of one-half the minimum detection limit (MDL) or sample quantitation limit (SQL), or other simple substitution methods, are not considered appropriate methods for handling non-detects. In this report, the KM method was applied with ProUCL when appropriate.

### 3.3 Data Usability Statement

Based on the results of validation, as well as the data review by a senior GHD risk assessor, the soil data appear to be acceptable for the purpose of performing human health and ecological risk assessments.

# 4. Review of Risk-Based Closure Programs Applicable to the Site

The Site assessment data discussed in Sections 2 and 3 are evaluated for the potential for unacceptable risks to human and ecological receptors. The process of conducting human and ecological risk assessments has been well established at Federal, State, and Regional sites. The corresponding risk-based approaches have been captured in legislation, guidance documentation, and successful cleanup actions/closures. As such, there is an extensive track record of regulatory, legal, risk, and practical precedents to facilitate safe closures of contaminated sites using risk-based approaches.

Below is an overview of key risk programs applicable to the Site. The presented information is discussed in context of Site conditions, nature of operations, and how it relates to the risk assessment in this report. The methods and approaches selected for the current risk assessment

are consistent with those from the United States Environmental Protection Agency (USEPA), NMED, and contiguous states, as well as the standard risk assessment practice.

## 4.1 Federal Risk Guidance

Much of the risk assessment science dates back nearly 50 years to the inception of the USEPA and, subsequently, the enacting of the National Oil and Hazardous Substance Pollution Contingency Plan (NOHSPCP; 53 Federal Register 51394), as well as the Superfund program. The Superfund program was created in 1980 when Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It facilitates the USEPA's interaction with communities, potentially-responsible parties (PRPs), scientists, researchers, contractors, and state/local/ tribal/Federal authorities to identify hazardous waste sites, test the conditions of these sites, formulate cleanup plans, and to conduct clean-up. With the establishment of the Superfund program and the allotment of substantial funds for clean-up, the USEPA began to generate guidance[1] on how to conduct human health and ecological risk assessments. Over the years, risk guidance has accumulated into an extensive collection of reference documents, commonly referred to as RAGS (Risk Assessment Guidance for Superfund) and (Ecological Risk Assessment Guidance for Superfund). Specific titles used in the current risk assessment are listed in Sections 6 and 7.

The scientific principle behind the risk assessment is the toxicological concept of "dose makes the poison." That is, certain levels of exposure are acceptable as long as they are below the specified health-based limits. For human receptors, the acceptable incremental cancer risk ranges from 1 in 1,000,000 (1E-06) to 1 in 10,000 (1E-05), and for non-cancer effects, is 1 to 3 times (as quantified by the Hazard Quotient [HQ] or Index [HI]) the toxicity reference dose[2]. For ecological receptors, any residual risks must be demonstrated as not to impact health of populations, or individual Threatened or Endangered Species (T&E). These risk decision criteria, along with standard risk assessment tools from Federal and State risk guidance, including New Mexico, are adopted in the current risk assessment since the Site has Federal and State regulatory involvement.

## 4.2 New Mexico Risk Guidance

Recently (March 2017), New Mexico has issued a new version of the Risk Assessment Guidance for Site Investigation and Remediation[3]. Within it, NMED discusses the soil screening guidance (SSG) and the methodology to derive site- and chemical-specific soil screening levels (SSLs), tap water screening levels, and vapor intrusion screening levels (VISLs). The SSG utilizes risk assessment methods from various USEPA risk assessment guidance documentation, including identifying and evaluating the appropriate exposure pathways and receptors based on default or site-specific, exposure parameters under residential and non-residential land use scenarios.

The SSG provides site managers with a risk-based framework for developing and applying the SSLs, and determining whether certain areas or entire sites are contaminated to an extent which

1 Also based on policies in the National Oil and Hazardous Substance Pollution Contingency Plan (53 Federal Register 51394).

2 https://www.epa.gov/risk/regional-removal-management-levels-chemicals-rmls

3 https://www.env.nm.gov/HWB/guidance.html

warrants further investigation, or can be left in place. The risk framework is intended to assist and streamline site investigation and corrective action process by focusing resources on those sites or areas that pose the greatest risk to human health and the environment. NMED indicates that the implementation of the methodologies outlined within the SSG may significantly reduce the time necessary to complete site investigations and cleanup actions, as well as improve the consistency of these investigations among similar sites in New Mexico.

NMED recognizes that there is a wide spectrum of contamination that could be present at a site, from heavy impacts requiring removal, to those below even the most conservative and generic screening levels. The agency states that appropriate, site-specific cleanup goals acceptable to, and approved by the agency, may fall anywhere within this range. NMED notes that the SSLs, which are based on the 1E-05 target risk for carcinogens and an HQ of 1E+00 for noncarcinogens, are protective of domestic groundwater. As such, the NMED SSLs serve as a generic benchmark for screening level comparisons of contaminant concentrations in soil and do not themselves represent cleanup standards. Hence, the SSLs alone do not trigger the need for a response action or define "unacceptable" levels of contamination in soil.

While concentrations above the NMED SSLs presented in this document do not automatically designate this Site as "contaminated" or trigger the need for a response action, detected concentrations in Site soils exceeding screening levels suggest that further assessment is appropriate, including performing a Site-specific risk assessment, which is performed in Sections 5 and 6. Further optional evaluation may also include additional sampling to better characterize the nature and extent of contamination, consideration of background levels, reevaluation of constituents of potential concern or associated risk and hazard using site-specific parameters, and/or a reassessment of the assumptions associated with the generic SSLs (e.g., appropriateness of route-to-route extrapolations and use of chronic toxicity values to evaluate childhood and construction-worker exposures). A full range of NMED risk assessment steps and procedures for evaluating human and ecological health, including exposure averaging, Site-specific conceptual exposure model, and cleanup level development, are considered in this risk assessment.

## 4.3 New Mexico Oil Conservation Division

New Mexico Oil Conservation Division (OCD) regulates oil, gas, and geothermal activity in New Mexico. OCD gathers well production data, permits new wells, enforces the division's rules and the state's oil and gas statutes, oversees plugging and abandoning of wells, and ensures responsible land restoration. The applicable statues are written into Parts 1 thru 39 of Title 19, Chapter 15 of the New Mexico Administrative Code (NMAC) and are captured in Guidelines for Remediation of Leaks, Spills, and Releases[4]. NMAC is primarily designed to control exploration and production aspects, with some components having environmental application such as the establishment of Closure Criteria for Recycling Containments under 19.15.34 NMAC[5]. There is no source provided for these criteria, but they appear to be based on the analytical detection or, perhaps, aesthetic limits of the methods cited in 19.15.34 NMAC. As such, they are general in nature, do not consider site-specific conditions, or otherwise encompass technical/health risk assessment aspects.

4 http://www.emnrd.state.nm.us/OCD/documents?7C_spill1.pdf

5 http://www.emnrd.state.nm.us/OCD/rules.html

### 4.4 Bureau of Land Management Risk Guidance

As the major Federal land owner in New Mexico, and as the surface owner of the Site, the BLM is an important stakeholder. Furthermore, BLM in New Mexico manages one of the largest oil and gas programs on Federal lands. BLM Law Enforcement is responsible for investigating incidents relating to theft of natural resources, loss of associated royalties, vandalism of equipment related to oil and gas production, violations of the Migratory Bird Treaty Act (MBTA), as well as hazardous material non-compliance. BLM does not have separate regulations concerning contamination and cleanup, but as a Department of the Interior (DOI) agency, it defers to State and Federal guidance (i.e., USEPA) regarding risk assessment and cleanup.

### 4.5 Contiguous States Risk Guidance

Bordered by the oil and gas-producing States of Texas, Oklahoma, Kansas, Colorado, Utah, and Arizona, the State of New Mexico is not isolated in its assessment of the potential risks associated with hydrocarbon impacts, including those on Federal lands. Similar to New Mexico, the States of Texas[6], Oklahoma[7], Kansas[8], Colorado[9], Utah[10], and Arizona[11] have established methodologies for conducting Site-specific, multi-tiered risk-assessments to aid in ensuring consistent, effective, and efficient site closure mechanisms. These programs are also sourced largely in the Federal Superfund program and share similar features, including the development of site-specific, risk-based cleanup goals. Therefore, the execution of the risk assessment using NMED guidance and tools would be consistent not only with Federal, but also regional site cleanup and closure procedures.

# 5. Human Health Risk Assessment

### 5.1 Introduction

The significance of the analytical results discussed in Sections 2 and 3, relative to the potential for impacts on human health, is assessed below. In accordance with the USEPA's Risk Assessment Guidance for Superfund (RAGS) (USEPA, 1989) and the NMED's Risk Assessment Guidance for Site Investigations and Remediation (NMED, 2017), the main steps in an HHRA are hazard identification, exposure assessment, toxicity assessment, and risk characterization.

Traditionally, these steps are executed in sequence to yield a "forward" risk assessment, which helps to determine whether current or future exposures may, or may not, be associated with potentially unacceptable health risks/hazards. However, the "reverse" risk assessment approach performed herein, where risk-based screening levels are compared to the exposure media

6 http://www.tceq.state.tx.us/remediation/trrp/trrp.html
7 http://www.deq.state.ok.us/lpdnew/FactSheets/RiskBasedDecisionMakingSiteCleanup.pdf
8 http://www.kdheks.gov/remedial/rsk_manual_page.html
9 https://www.colorado.gov/pacific/cdphe/approach-soil-screening-values
10 http://www.rules.utah.gov/publicat/code/r315/r315-101.htm
11 http://legacy.azdeq.gov/environ/waste/cleanup/index.html#risk

concentrations, is also recognized by the USEPA (via the Regional Screening Level [RSL] methodology; USEPA, 2015) and NMED (via NMED's 2017 Risk Assessment Guidance for Site Investigations and Remediation; NMED, 2017).

The main reason for conducting a "reverse" risk assessment for the Site is simplicity and efficiency. The comparison of exposure media results to the screening levels readily identifies not only the potential risks on a sample-by-sample basis (or point-to-point; a conservative approach), but also directly delineates locations within the Site where detected concentrations in Site media may need remediation and/or risk management decisions. This is the end product of the reverse HHRA.

The Reasonable Maximum Exposure (RME) and Central Tendency Exposure (CTE) scenarios are commonly used in risk assessments (per USEPA's Risk Assessment Guidance for Superfund; USEPA, 1989; USEPA, 2002; and USEPA, 2004). As such, they are incorporated into HHRAs to account for exposure averaging, which is experienced by actual receptors. The use of the RME and CTE exposure scenarios helps to offset the built-in conservatism in general risk assessments and facilitates realistic (i.e., pragmatic) risk conclusions that are directly applicable to remedy design and risk management. This approach also strikes a balance between the practical nature of a "reverse" risk assessment and the traditional "forward" risk assessment.

## 5.2 Conceptual Exposure Model for Human Receptors

The hazard identification step involves the development of a Conceptual Exposure Model (CEM) for human receptors and the identification of constituents of potential concern (COPCs) via screening of exposure media data against conservative screening levels (this step was performed in Section 3.1). The CEM for the Site is discussed below.

A CEM is a simplified representation of the relationship between chemical sources, fate and transport processes, exposure pathways, and exposure routes to receptors at a given location. Its purpose is to identify complete exposure pathways that must be addressed in a risk assessment. Per the USEPA (1989), a complete exposure pathway must have the following components:

1) Source of a chemical constituent; 2) Transport mechanism from source to receptor; 3) Exposure point; and 4) Route to the receptor. A pathway is incomplete if any of these four components are missing. Otherwise, the pathway is complete and must be evaluated further.

A conservative CEM for the Site is presented in Figure 5.1. Soil is the primary source medium. Air is considered a secondary source medium based on the potential for soil particulate matter (or dust) to be entrained and present in ambient and indoor air. Additional secondary source media include soil gas (through volatilization from soil), garden produce (grown in the contaminated soil), beef (from cattle grazing on the contaminated soil), groundwater (through leaching from soil), and surface water/sediment (through storm water runoff during wet events).

The current land use of the Site is rangeland, where the prairies are used for livestock grazing. Since there are no restrictions on the current designated land use, the Site is required to maintain its unrestricted status into foreseeable future. Therefore, based on the current and future land use, the on-Site receptors may include all receptor types from construction; utility; outdoor; indoor workers (adults) performing excavation, maintenance, and regular workplace activities, to residents

(adults and children) and occasional young adult trespassers, to livestock allowed to graze on the Site (see Figure 5.1).

## 5.3 Potentially-Complete Exposure Pathways

Based on the characterization of the Site and their current/future use, the potentially-complete exposure pathways for each current/future receptor are:

- Current/Future Construction/Utility Worker (adult):
  - Dermal contact with soil, sediment[12], groundwater, surface water[13];
  - Ingestion of soil, sediment, groundwater, surface water; and
  - Inhalation of soil/sediment particulate matter (or dust) and vapors entrained in ambient air.
- Current/Future Outdoor Worker (adult):
  - Dermal contact with soil, sediment, groundwater, surface water;
  - Ingestion of soil, sediment, groundwater, surface water; and
  - Inhalation of soil/sediment particulate matter (or dust) and vapors entrained in ambient air.
- Current/Future Trespasser (young adult):
  - Dermal contact with soil, sediment, groundwater, surface water;
  - Ingestion of soil, sediment, groundwater, surface water; and
  - Inhalation of soil/sediment particulate matter (or dust) and vapors entrained in ambient air.
- Future Indoor Worker (adult):
  - Dermal contact with surface soil dust, groundwater;
  - Ingestion of surface soil dust, groundwater; and
  - Inhalation of soil particulate matter (or dust) entrained in ambient air and indoor air, and inhalation of volatile constituents, if present, migrating to ambient air and indoor air.
- Future Resident (child and adult):
  - Dermal contact with soil, sediment, groundwater, surface water;
  - Ingestion of soil, sediment, groundwater, surface water;
  - Inhalation of soil particulate matter (or dust) entrained in ambient air and indoor air, and inhalation of volatile constituents, if present, migrating to ambient air and indoor air; and
  - Ingestion of garden produces grown in potentially-affected soil and/or beef from cattle raised in potentially-affected soil.

12 The Site is dry and does not have perennial bodies with the exception of the manmade stock pond to the north of the wellhead, thus, "sediment" is defined here for all applicable receptors as the wet soil in and around the stock pond or any dry soil at the bottom of nearby storm drainage areas (e.g., naturally cut rain channels).

13 Water in the man-made stock pond, as well as storm water in drainage areas for all applicable receptors.

For the purposes of this assessment, a worker is an adult (exposure parameters based on age from 16 to 30 years per USEPA, 2004) and a trespasser is a young adult (youth) (exposure parameters based on age from 6 to 16 years per USEPA, 2004).

An outdoor worker is a receptor that performs his/her duties primarily outdoors for a set period of time (8 hours per day, 225 days per year, for 25 years per NMED, 2017). Outdoor workers can be directly exposed to surface soil, ambient air (dust and vapor), and groundwater (if working near subsurface excavations that encounter groundwater), though to a lesser degree than a construction/utility worker described below. An outdoor worker may also be directly exposed to sediment and surface water occasionally present during infrequent wet events.

A construction/utility worker is expected to be present at the Site on short-term basis and is limited by the duration of construction, maintenance, and subsurface activities. However, due to the invasive nature of construction, the worker may be exposed to all potentially-affected media including, surface/subsurface soil, ambient air (dust and vapor), and groundwater (if conducting subsurface excavations that encounter groundwater) via dermal contact, ingestion, and inhalation. However, the typical implementation of personal protective equipment, safety procedures, and industrial hygiene measures will limit or eliminate such exposures for these receptors. A construction/utility worker may also be directly exposed to sediment and surface water occasionally during infrequent wet events.

A trespasser may enter the Site and inadvertently come into contact with potentially-affected surface/subsurface soil, ambient air (dust and vapor), and groundwater (while excavations that encounter groundwater remain open or from the nearby well water faucet). However, any resulting exposures typically would be limited and brief. A trespasser may also be directly exposed to sediment and surface water occasionally during infrequent wet events.

Indoor workers are not currently present on Site, but may be in the future, since there is no land use restriction. An indoor worker is an occupant of a commercial building who infrequently ventures beyond their indoor work space, other than a parking lot, and works scheduled hours each day. This type of receptor has limited potential for direct exposure to soil, ambient air (dust), and indoor air (vapors if volatile constituents are present), and groundwater. Any affected dust originating from surface soil may exist in ambient air and enter the building and lead to exposure. Although exposures to this source are expected to be relatively low, the indoor worker is assumed to be exposed to a concentration equivalent to surface soil as described in USEPA (2002). Dermal and ingestion exposure to groundwater use is possible in future because there is no restriction on the use of groundwater at the Site.

A resident is a young child from age 0 to 2 years, a child from age 2 to 6 years, a young adult from age 6 to 16 years, or an adult from age 16 to 26 years (USEPA, 2004 and USEPA, 2014b). This receptor accounts for potential young child, child, and young adult exposures to mutagenic carcinogens (USEPA, 2006). The resident is expected to occupy a dwelling, and the associated land, for as long as a lifetime. During that time, repeated exposure to surface soil, ambient air (dust), and indoor air (vapors if volatile constituents are present) may occur. Future exposure to groundwater via potable water may be possible since its use at the Site is not prohibited. Local residents may also venture into the storm water drainage areas and be directly exposed to sediment and surface water occasionally during infrequent wet events.

Given the arid climate at the Site and lack of perennial bodies of water nearby, the only surface water (and the associated "sediment") is that located at the stock pond, as well as that of sporadic flood events inundating dry washes. Given their infrequent nature and lack of impacted material remaining, the Site receptor exposure frequency is set accordingly low.

## 5.4 Incomplete Exposure Pathways

Based on field observations, local geology, and historical investigations on Site, the groundwater at the Site is deep (estimated depth approximately 80 ft bgs) (GHD, 2015 and 2016). Therefore, current/future exposure to groundwater encountered while conducting/entering excavations is not likely. Groundwater is pumped to the surface for livestock at the stock pond; however, the presence of livestock at and near the stock pond make it an undesirable water source for humans. As a result, the groundwater pathway is not quantified in the HHRA.

Ambient air exposure pathway is deemed incomplete since surficial and immediate subsurface impacts have been excavated and refilled with clean fill. For the same reason, leaching to groundwater is not expected and any residual hydrocarbons are likely to degrade over short distances (ITRC, 2014).

As there are neither residential dwellings nor commercial/industrial structures on-Site currently, the residential receptors and indoor worker receptors are only considered for future scenarios in this HHRA as a conservative approach.

NMED (2017) indicates that the ingestion of homegrown produce should be considered as a potential exposure pathway for residents. Specifically, for those sites greater than two acres in size, grazing of cattle must be evaluated to determine if beef ingestion is a plausible and complete exposure pathway. Because the size of the Site is approximately less than 2 acres, a quantitative assessment of this pathway is not required (NMED, 2017); however, the presence of livestock was noted at the Site, so the livestock pathway will be included in the quantitative assessment.

The CEM is incorporated into the overall risk assessment for the Site. Additional details on the CEM and receptors are contained in Tables 5.2 through 5.7.

## 5.5 Determination of Human Health COPCs

COPCs are chemicals related to a site that have the potential to pose unacceptable risk to human health. In general, constituents are identified as COPCs based on their detected concentrations relative to default screening levels, frequency of occurrence, and history of use. The screening levels are generic (i.e., apply to all sites), and therefore, are necessarily conservative.

The initial screening step helps to ensure that all potential risks due to specific constituents, however minimal, are identified early on. The Site-specific cleanup levels (SSCLs) can then be used in the refinement step to identify any notable risks that may need to be addressed via remediation and/or institutional controls. Any constituents determined to be present in the exposure medium of interest (e.g., soil) at concentrations above the relevant USEPA and NMED screening levels, and that had a detection frequency (DF) greater than 5 percent (after USEPA, 1989), were identified as COPCs.

The dataset applied in the COPC screening were from historical and recent investigations (see Section 3). The COPCs above the screening levels were carried forward to the HHRA and are listed in the Section 5.5.1 below. These COPCs were assessed further by comparing the detected concentrations to the SSCLs developed for the potentially-complete exposure pathways for the Site.

Additionally, and consistent with the USEPA guidance (USEPA, 2004), two measures of average exposure are generally calculated (also referred to as the Exposure Point Concentrations [EPCs]) for comparison to SSCLs for industrial soil: the CTE estimate and the RME estimate. The CTE is mathematically represented by the arithmetic or geometric mean, and the RME by the 95 percent Upper Confidence Limit (95% UCL) on the mean calculated using USEPA's ProUCL software. Risk conclusions are conservatively based on the RME scenarios.

The data for surface and subsurface soils in this report are limited, so it is not possible to generate the CTE, RME and 95% UCL for soils relevant to exposures for most receptors. As an alternative, the maximum concentration for each COPC will be used for comparison to SSCLs.

### 5.5.1 Summary of Identified COPCs and Exposure Pathways

The most sensitive screening levels (i.e., those intended for residential application and developed for groundwater protections with tap water screening levels) were selected to identify the COPCs even if the most sensitive land use is not planned. Based on the identified COPCs and the associated exposure media, the human exposure pathways that are potentially complete and are further evaluated quantitatively in the HHRA, are summarized in Appendix A.1 and A.2 (soil and groundwater, respectively) and Figures 5.1 and 5.2.

Several TPH fractions (C6-C10 [GRO], >C12-C28, and C6-C35) exceed the soil screening levels for residents, and TPH (C6-C35) exceeds the soil screening level for construction workers (Appendix A.1). Hence, these constituents are identified as COPCs and forwarded for further analysis.

Naphthalene, ethylbenzene, and toluene (total) are initially identified as soil-to-groundwater COPCs because the detected concentrations in soils exceed the screening levels developed for groundwater protection in samples collected in November 2015, April 2016, and September 2016[14] (Appendix A.2). However, analytical results of groundwater tested during the April 2017 field event show that none of the chemical constituents are detected (Appendix 5.2). Thus, naphthalene, ethylbenzene, and xylenes (total) are not evaluated quantitatively in the current HHRA.

Soil and groundwater were also analyzed for risk-based screening levels for livestock grazing at the Site to determine if beef ingestion is a plausible and complete exposure pathway. Livestock screening levels are not generally generated by federal and state agencies; however, the American Petroleum Institute (API) developed risk-based screening levels (RBSLs) for several livestock species exposed to soil during grazing and to groundwater when drinking from the stock pond filled with pumped groundwater (API, 2006). Despite the discrepancies in chemicals with RBSLs (e.g.,

[14] In the development of generic NMED SSLs, a Dilution Attenuation Factor (DAF) of 20 was deemed as being reasonably protective to maintain an approach that is protective of groundwater quality (NMED, 2017). SSCLs for the protection of groundwater can be developed using the NMED site-specific model approach, which is generally more sensitive to the DAF than to other parameters in the soil water partition equation. However, no sufficient Site-specific data on hydrologic conditions (e.g. hydraulic conductivity and infiltration rate) are available to calculate a Site-specific DAF, thus the default value was employed.

crude oil vs. TPH fractions), it is clear that there are no exceedances of livestock RBSLs for soil and groundwater. Thus, there is no potential for unacceptable risk to human health from consuming beef from livestock on the Site.

**Table 5.1 COPC Screening Results**

| Soil-Residential | Soil-Commercial/ Industrial | Soil-Construction | Soil To Tap Water | Groundwater |
|---|---|---|---|---|
| TPH (>C12-C28) | -- | TPH (C6-C35) | Naphthalene* | -- |
| TPH (C6-C10) GRO | | | Ethylbenzene* | |
| TPH (C6-C35) | | | Xylenes (total)* | |

*Based on leaching from soil to groundwater. However, these chemical were not detected in a recent groundwater sample, so they were not evaluated quantitatively in the HHRA.

## 5.6 Exposure Assessment

Exposure is defined as the contact of a receptor (i.e., a person) with a chemical or physical agent. Exposure assessment is the estimation of the magnitude, frequency, duration, and routes associated with the receptor chemical contact. Exposure assessment provides a systematic analysis of the potential exposure mechanism by which a receptor may be exposed to a chemical at a given study area (USEPA, 1989). This step in the risk assessment is very important, because if there is no exposure there is also no risk.

The following guidance documents were considered in quantifying the level of exposure at the Site:

i. NMED, 2017. New Mexico Environmental Department Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017;

ii. USEPA, 1989. Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1 89/002, December 1989;

iii. USEPA, 1991b. Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part B, Development of Risk Based Preliminary Remediation Goals), Publication 9285.7 01B;

iv. USEPA, 1997. Exposure Factors Handbook, EPA/600/P 95/002F, August 1997;

v. USEPA, 2002a. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4 24, December 2002;

vi. USEPA, 2004. Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual, (Part E; Supplemental Guidance for Dermal Risk Assessment), Final, EPA/540/R/99/005, July 2004;

vii. USEPA, 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Office of Solid Waste and Emergency Response, United States Environmental Protection Agency, EPA530 R 05 006, September 2005; and

viii. USEPA, 2006a. Child Specific Exposure Factors Handbook (External Review Draft), EPA 600 R06 096A, September 2006.

In a traditional HHRA, exposure estimates are calculated to reflect chemical concentration in exposure media, contact rate, and exposure time in a term called intake or a dose. Current HHRA is directed toward the development of SSCLs, where estimates of intake are combined with the NMED's target risk/hazard thresholds in a reverse fashion to produce a safe concentration for a given media of interest (primarily soil at the Site). The details on deriving the SSCL equations are presented in Section 5.7.

Standard intake equations from the USEPA (1989; 2004; and 2005) are applied to quantify exposure to the COPCs identified in soil (Section 5.7.1). The receptor exposure factors and assumptions for each potentially-complete exposure pathway are presented in Section 5.7.4.

## 5.7 Development of SSCLs

The risk characterization step of the HHRA relies on the SSCLs for residential and commercial/industrial soil developed specifically for the Site receptors. These SSCLs are based on exposure modeling combined with appropriate COPC toxicity reference values (TRVs) and the NMED's policy-based target cancer risk threshold of 1E-05, and target non-cancer hazard threshold of 1E+00 (NMED, 2017).

Site-specific input regarding exposure assumptions for the Site receptors were incorporated into the development of the SSCLs in residential and commercial/industrial soil. Details on the SSCL calculation methodology are summarized below. Data on the CEM, assumptions, and SSCL equations/input/calculations are summarized in Tables 5.1 through 5.19. Additional risk characterization is facilitated by the calculation of EPCs based on the maximum concentrations[15], and comparing these EPCs to the SSCL values for residential and commercial/industrial soil.

### 5.7.1 Forward Exposure Equations

Based on standard USEPA guidance (USEPA, 2004), forward equations for intake of COPCs via exposure to various exposure media and routes are as follows:

#### Soil Incidental Ingestion Exposure Route

The standard forward equation for calculating chemical intake via incidental ingestion of soil is:

$$CDI = \frac{C \times IR \times EF \times ED \times CF \times FI}{BW \times AT}$$

***Equation 1***

Where:

| | | |
|---|---|---|
| *CDI* | = | Chronic daily chemical intake via soil ingestion (mg/kg body weight-day) |
| *C* | = | Chemical concentration in soil (mg/kg) |
| *IR* | = | Incidental ingestion rate (mg soil/day) |

[15] Due to insufficient samples needed to calculate RME and CTE estimates

*EF* = Exposure frequency (days/year)

*ED* = Exposure duration (years)

*CF* = Conversion factor ($10^{-6}$ kg/mg)

*FI* = Fraction ingested from contaminated source (unitless)

*BW* = Body weight (kg)

*AT* = Averaging time (averaging period; days)

### Soil Dermal Contact Exposure Pathway

The standard forward equation for calculating chemical intake via dermal exposure to soil is:

$$CDI = \frac{C \times SA \times AF \times ABS \times EF \times ED \times CF}{BW \times AT}$$

***Equation 2***

Where:

*CDI* = Chronic daily chemical intake via dermal contact (mg/kg body weight-day)

*C* = Chemical concentration in soil (mg/kg)

*SA* = Skin surface area available for contact ($cm^2$/event)

*AF* = Soil to skin adherence factor ($mg/cm^2$)

*ABS* = Chemical absorption factor (unitless)

*EF* = Exposure frequency (events/year)

*ED* = Exposure duration (years)

*CF* = Conversion factor ($10^{-6}$ kg/mg)

*BW* = Body weight (kg)

*AT* = Averaging time (averaging period; days)

### Soil Particulate Matter Inhalation Exposure Route

The standard forward equation for calculating chemical intake from the inhalation of particulate matter originating from soil is:

$$CDI = \frac{C \times FT \times EF \times ED \times (1/PEF)}{AT}$$

***Equation 3***

Where:

*CDI* = Chronic daily chemical intake via soil particulate matter ($mg/m^3$)

*C* = Chemical concentration in soil (mg/kg)

*FT* = Fraction time exposed (unitless)

*EF* = Exposure frequency (days/year)

*ED* = Exposure duration (years)

*PEF* = Soil particulate emission factor ($m^3$/kg; NMED, 2017)

*AT* = Averaging time (averaging period, days)

The forward equations presented above are combined (to simulate simultaneous exposure to Site media) and then solved for the exposure media concentration term as described below.

### 5.7.2 Reverse Exposure Equations

The potential for non-cancer health effects associated with exposure to COPCs is generally evaluated by comparing an exposure level over a specified time period to a reference dose or a concentration. This ratio, termed the hazard quotient (HQ), is calculated as:

$$HQ = \frac{CDI}{RfD \text{ or } RfC}$$

***Equation 4***

Where:

*HQ* = The Hazard Quotient (unitless) is the ratio of the exposure dose of a chemical to a reference dose, which is not expected to cause adverse effects from a lifetime exposure. A hazard quotient equal to or below 1 is considered protective of human health and corresponds to NMED's target non-carcinogenic hazard threshold (NMED, 2017).

*CDI* = The Chronic Daily Intake, or exposure, is the chemical dose calculated by applying the exposure scenario assumptions, and is expressed as either mg/kg body weight/day for ingestion and dermal exposure or as $mg/m^3$ for inhalation exposures. The intake represents the average daily chemical dose over the expected period of exposure.

*RfD* = The Reference Dose is a daily dose believed not to cause an adverse effect from a lifetime of exposure (mg/kg body weight-day). The RfD is based on experimental data and/or epidemiological studies.

*RfC* = The Reference Concentration is a daily concentration in air believed not to cause an adverse effect from even a lifetime of exposure ($mg/m^3$). The RfC is based on experimental data.

The potential for cancer-type effects associated with exposures to carcinogenic COPCs is generally evaluated over a lifetime. Therefore, cancer risks are calculated utilizing the following general equation:

$$CR = LADD \times CSF$$ **Equation 5**

Where:

*CR* = Estimated upper bound on additional cancer risk over a lifetime of an individual exposed to a carcinogen for a specified time (unitless). The NMED's policy-based target carcinogenic risk threshold is 1E-05 (NMED, 2017).

*LADD* = The Lifetime Average Daily Dose of the chemical calculated using exposure scenario assumptions and expressed in mg/kg body weight-day. The intake represents the total lifetime chemical dose averaged over an individual expected lifetime of 70 years.

*CSF* = The Cancer Slope Factor models the potential carcinogenic response and is expressed as $(mg/kg\ body\ weight\text{-}day)^{-1}$.

For the development of SSCLs, the equations above, once combined with the intake equations and the NMED's target risk/hazard thresholds, are applied to develop media concentrations that are protective of human health.

For example, for the ingestion exposure to soil, substituting the intake equation (Equation 1) into Equation 4 yields:

$$HQ = \frac{\frac{C \times IR \times EF \times ED \times CF \times FI}{BW \times AT}}{RfD}$$ **Equation 6**

Applying the NMED's target hazard quotient threshold (*THQ*) of 1, rearranging Equation 6 to solve for *C*, and re-naming *C* as the *SSCL* produces the following:

$$SSCL = \frac{THQ \times RfD \times BW \times AT}{IR \times EF \times ED \times CF \times FI}$$ **Equation 7**

Exposure to soil via dermal contact and particulate matter inhalation can also be accounted for in the SSCL by adding Equations 2 and 3 to Equation 7, per USEPA (2002) guidance. Thus, the calculation of the SSCL becomes:

$$SSCL = \frac{THQ \times AT}{EF \times ED \times \left[\left(\frac{1}{RfD}\right) \times IR \times CF \times FI \times \left(\frac{1}{BW}\right) + \left(\frac{1}{RfD}\right) \times SA \times AF \times CF \times ABS \times \left(\frac{1}{BW}\right) + \left(\frac{1}{RfC}\right) \times FT \times (1/PEF)\right]}$$

**Equation 8**

SSCLs are developed for cancer and non-cancer health effects via this procedure. Tables 5.10 through 5.15 list the equations used to calculate SSCLs. These equations and the adopted methodology are consistent with those used by the USEPA to derive the RSLs[16].

The final SSCLs (i.e., most sensitive levels for the applicable receptors and exposure pathway/routes) are then determined as follows:

1. For each receptor and exposure pathway, the lower of the carcinogenic and non-carcinogenic chemical cleanup level is selected for that receptor and exposure pathway.
2. If more than one SSCL is available, the lowest value is identified as the final SSCL for a given medium and a COPC.

The final SSCLs are summarized in Tables 5.16 and 5.17 for commercial/industrial land use and residential land use, respectively. The most sensitive receptors (i.e., those with the lowest SSCLs chosen as the final SSCLs) are the construction/utility worker (2.15E+04, due to direct contact with COPCs) for commercial/industrial soil and residents exposed to soil (5.14E+03).

### 5.7.3 Total Petroleum Hydrocarbon Criteria Work Group (TPHCWG) Approach

The TPH cleanup levels calculated by GHD were based on the TPHCWG methodology, which is a scientifically-defensible approach takes into consideration the composition of a given petroleum mixture in terms of the hydrocarbon chain length (i.e., number of carbons present), structure (i.e., linear [aliphatic] or ring [aromatic] arrangement of carbons), boiling range composition (i.e., from volatile to heavy fractions), and toxicity.

Since TPH is a highly variable mixture of many aliphatic and aromatic hydrocarbons, the current scientific approach for assessing potential health hazards due to TPH exposure requires determining the actual hydrocarbon fraction composition of the TPH mixture present. The TPHCWG has developed toxicity levels for specific aliphatic/aromatic hydrocarbon ranges and, therefore, a meaningful comparison between the exposure media data and these levels requires them to share similar mixture composition. This has been recognized in the TCEQ (2000) guidance document, "*Development of Human Health PCLs for Total Petroleum Hydrocarbon Mixtures,*" which is based on the aliphatic/aromatic hydrocarbon fractions approach developed by the TPHCWG. The approach has been widely adopted for evaluating human health risk from petroleum hydrocarbons in soil throughout the United States (e.g., Texas, Massachusetts, etc.).

The development of risk-based cleanup levels for TPH depends on the composition of the petroleum hydrocarbon product at a given location. Differences in composition reflect differences in the proportion of toxic and mobile hydrocarbons, which directly influence the potential for environmental impact and drive the magnitude of the cleanup level. The composition of a given petroleum hydrocarbon product can usually be determined using gas chromatography.

Because TPH has been established as a COPC for the Site, the TPHCWG approach is applied to the Site where 2 samples from a recent soil collection (April 12, 2017) soil samples at the hydrocarbon source area were analyzed by TX1005 and TX1006. These two analytical methods are

[16] https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016

capable of splitting the sample into multiple hydrocarbon fractions and structures (i.e., carbon chains and rings) as listed below.

| *Aliphatic Fractions* | *Aromatic Fractions* |
|---|---|
| $C_6$ | $>C_7$-$C_8$ |
| $>C_6$-$C_8$ | $>C_8$-$C_{10}$ |
| $>C_8$-$C_{10}$ | $>C_{10}$-$C_{12}$ |
| $>C_{10}$-$C_{12}$ | $>C_{12}$-$C_{16}$ |
| $>C_{12}$-$C_{16}$ | $>C_{16}$-$C_{21}$ |
| $>C_{16}$-$C_{21}$ | $>C_{21}$-$C_{35}$ |
| $>C_{21}$-$C_{35}$ | |

The TX1005 and TX1006 results at the Site are presented in Appendix 5.1, and are considered representative of the TPH fractions at this Site.

Since the magnitude of a risk-based cleanup level for TPH is dependent on mass fractions of aliphatic and aromatic boiling point ranges, the TX1006 results were used to determine the mass fraction represented by each of the seven aliphatic and six aromatic boiling point ranges. These mass fractions were calculated by dividing the concentration of each boiling point range by the total concentration in the TPH mixture (Table 5.18). Once calculated, the mass fractions are paired with Toxicity Reference Values (TRVs) for each boiling point range, exposure assumptions per an exposure pathway, and the NMED's target hazard threshold of 1 (see Tables 5.10 through 5.15).

The lower of TPH Texas Method 1005 (TX1005)-based or the TPH Texas Method 1006 (TX1006)-based SSCL is chosen as the final TPH soil. The resulting SSCLs are compared to the TPH results at the Site (see Section 5.9).

### 5.7.4 Exposure Factors and Assumptions

Exposure factors and assumptions used as input for the intake equations are summarized in Tables 5.2 through 5.9. The most recent NMED and USEPA exposure factors are used in current HHRA (NMED, 2017 and USEPA, 2015).

A construction/utility/outdoor worker is likely to be a realistic receptor at the Site. In comparison, an indoor worker and resident are not part of the current land use at the Site and, thus, are evaluated here only from the theoretical perspective.

Similar to the worker scenario, trespasser (young adult) exposure is assumed to occur via dermal contact with affected media, incidental ingestion of such media, and inhalation of particulate matter present in ambient air.

For all exposure pathways where carcinogenic COPCs are considered, an averaging time (AT) of 70 years is used to prorate the total cumulative intake over a lifetime per NMED and USEPA guidance (NMED, 2017 and USEPA, 2004). Where non-carcinogenic COPCs are considered, the AT is selected based on the endpoint being assessed, also per the cited NMED and USEPA guidance.

## 5.8 Toxicity Assessment

The toxicity assessment weighs the available evidence regarding the nature and magnitude of adverse effects associated with each COPC (i.e., it helps to identify the relevant toxicity values). Toxicity values were primarily obtained from the NMED (2017), USEPA May 2016 RSLs (USEPA, 2016), and TCEQ (2000). The toxicity data applied in the HHRA for non-carcinogenic TPHs are presented in Tables 5.8 and 5.9.

### 5.8.1 Oral-to-Dermal Toxicity Factor Adjustment

Typically, the toxicity values are based on the administered dose (i.e., oral intake, injection, etc.). To characterize risk from the dermal exposure pathway, adjustment of the oral toxicity factor to represent an absorbed dose rather than an administered dose was necessary per the USEPA guidance (USEPA, 2004). In the case of the COPCs at the Site, all adjustment factors are conservatively set to 100 percent, indicating complete absorption.

## 5.9 Risk Assessment

This section compares the derived SSCLs to the exposure media results at individual sampling locations at the Site to identify any specific areas with elevated concentrations of COPCs (via point-to-point comparisons). Normally, the next step is to compare SSCLs to average exposure levels (i.e., RMEs and CTEs) across the entire parcel (per standard risk assessment practice). The risk results from the latter step, the exposure averaging analysis (based on RME results), are used to formulate final risk statements for this parcel. However, RME and CTE estimates cannot be calculated due to insufficient samples so maximum concentration comparisons (i.e., point-to-point) to SSCLs will suffice for the current data set.

### 5.9.1 Point-to-Point Comparisons

COPC exceedances above the corresponding SSCLs at individual sampling locations provide useful information regarding the locations of areas with elevated concentrations at the Site. The presence of these areas is not necessarily indicative of human health risks. Rather, that further analysis of overall exposures (i.e., the exposure averaging analysis) is needed for this parcel. The latter may be conducted at a later date if maximum concentrations exceed the corresponding SSCLs.

The comparisons of the detected COPC concentrations in soil to the corresponding SSCLs lead to the following observations for chemicals identified as the potential risk drivers at the Site.

#### 5.9.1.1 Total Petroleum Hydrocarbons (TPHs)

There are no TPH exceedances at the Site compared to the commercial/industrial SSCLs of 21,500 mg/kg (Table 5.19), developed with the approach described in Section 5.7.4. TPH from the construction trench (fractions C6-C10 [GRO] and C10-C26, resulting in a concentration of 5,820 mg/kg) sampled in November 2015 exceeds the residential SSCLs of 5,140 mg/kg. A more recent surface soil sample collected in April 2017 demonstrates that TPH fractions are below detection, suggesting the natural attenuation of TPH in the environment (e.g., volatilization, biodegradation) to

below the residential SSCL in surface soil. Furthermore, there are no TPH exceedances of residential SSCL in subsurface soil at the Site.

## 5.10 Conclusions

The risk analysis for soil relative to the residential and commercial/industrial exposure scenarios indicates that the principal constituent groups at the Site with concentrations in excess of the conservative screening levels include TPH.

BTEX was not detected at concentrations exceeding the residential and commercial/industrial soil screening levels, but was identified as a COPC due to the exceedance of the soil screening levels for protection of groundwater in samples collected in November 2015 and September 2016. However, the SSCLs for protection of groundwater at the Site were not developed for BTEX because BTEX was not detected in a groundwater sample collected on April 12, 2017. Therefore, BTEX was removed from the COPC list for further consideration in current HHRA.

Similar to BTEX, naphthalene was not detected at concentrations exceeding the residential and commercial/industrial soil screening levels, but was identified as a COPC due to the exceedance of the soil screening levels for protection of groundwater in samples collected in April 2017. The SSCL for protection of groundwater at the Site was not developed for naphthalene because naphthalene was not detected in a groundwater sample collected on April 12, 2017. Therefore, naphthalene was removed from the COPC list for further consideration in current HHRA.

TPH exceeded the conservative residential and commercial/industrial soil screening levels and, as such, was identified as a COPC at the Site and carried forward in the quantitative HHRA, which included the application of the soil SSCLs. These SSCLs were derived under the residential and commercial/industrial scenarios following the TPHCWG. The soil TPH SSCLs were applied to the soil sampling data by comparisons to point-to-point concentrations to draw risk conclusions regarding individual sampling locations and Site-wide risks as summarized below.

### 5.10.1 Individual Sampling Locations

The point-to-point comparisons showed that maximum levels of TPH fractions at the Site do not exceed the residential and commercial/industrial SSCLs.

Therefore, no Site-wide risk drivers were identified.

### 5.10.2 HHRA Risk Statement

In summary, the existing data indicate that soil is generally free from COPC impacts throughout the Site (i.e., site wide). Furthermore, the groundwater is also free from COPC impacts at the Site. This risk statement is inclusive of, and considers, all of the COPCs, pathways, routes, and receptors applicable to the Site. As such, no further action (NFA) is recommended for the Site.

# 6. Ecological Risk Assessment

## 6.1 Introduction

### 6.1.1 Overview

Guidance published by the USEPA outlines an 8-Step process for evaluating the potential for risk to ecological receptors (USEPA, 1997). A screening-level ERA (SLERA) consists of Steps 1 and 2 of the 8-Step process and it is completed in this section. Background information on the Site history, geology, hydrology, and use is included in Section 2 and is similar to the information in previous regulatory submissions (e.g., GHD, 2016). Accordingly, the reader is referred to those sources for additional details. As indicated in Section 3, the dataset for the current ERA consists of analytical results data obtained by Rule and GHD from 2015, 2016, and 2017 (GHD, 2016). Findings from the ERA, and any subsequent phases of the ERA process will be used to support the risk management decisions at the Site.

### 6.1.2 Purpose and Objective

The objective of a SLERA is to identify those chemical constituents that have the potential for impacting one or more groups of ecological receptors, and eliminate from further evaluation those constituents that have a limited potential to pose risk. This step is accomplished by comparing the maximum concentrations detected in environmental media to conservative ecological screening values (ESVs) that are protective of all receptor groups. The identification of the constituents of potential ecological concern (COPECs) allows the subsequent steps of the ERA process, including any additional data collection, to focus on those constituents and exposure pathways with the greatest potential to pose risk.

After the SLERA, is Step 3 of the 8-Step process, which is the problem formulation phase for the baseline ERA (BERA). In Step 3, chemical constituents identified in the SLERA as COPECs are refined by evaluating the assumptions for exposure and toxicological responses of ecological receptors to the COPECs. The refinement process incorporates numerous factors not considered at the screening level, such as site-specific background concentrations, individual receptor groups, RME concentrations (i.e., 95 percent upper confidence limits (UCLs), alternative ecotoxicological benchmarks, and food chain modeling. The primary objective of the refinement process is to eliminate from further consideration those constituents that have a limited potential for impacts on biota. This current ERA includes the Step 3 component as discussed in Section 6.5.

Consistent with the objectives identified above, the goal of the ERA for the Site is to identify those chemical constituents detected in surface and subsurface soils (i.e., soil in the depth interval of 0 to 1 ft bgs for most ecological receptors, and soil in the depth interval of 0 to 10 ft bgs for burrowing ecological receptors) that have a reasonable potential to pose risk to ecological receptors.

## 6.2 Step 1: Screening Level Problem Formulation

### 6.2.1 Ecological Setting

The Site is located to the south of the area of Muñoz Canyon in arid desert land, and just south of New Mexico State Route 469.

### 6.2.2 Habitat

The primary cover types at the Site are sparse arid desert grasses, shrubs, and Pinyon pine trees, and Juniper trees. A general vegetation classification map is provided in Figure 6.1.

### 6.2.3 Waterways

The immediate vicinity of the Site contains a water well and a small man-made earthen stock tank to the north of the well head. Due to the nature of the Site and geographical region, there are only ephemeral surface water bodies near the Site.

### 6.2.4 Wildlife

The New Mexico Department of Game and Fish (NMGF) reported 726 species in Rio Arriba County (Appendix B.1). Of these species, 33 are fish, 11 are amphibians, 28 are reptiles, 250 are birds, 89 are mammals, 22 are molluscs, 2 are crustaceans, 275 are insects (19 are of the order Ephemeroptera [mayflies], 19 are of the order Odonata [dragonflies], 63 are of the order Orthoptera [grasshoppers and crickets], 18 are of the order Coleoptera [beetles], 156 are of the order Lepidoptera [moths and butterflies], 9 are spiders, and 7 are miscellaneous arachnids. In addition, 20 threatened and endangered species are located in Rio Arriba County (Appendix B.2). Of these species, 12 are considered threatened, 8 are endangered, and 4 are found on critical habitats. The Federal and State-listed species of concern found in Rio Arriba County are listed below.

| Species | Status of species |
|---|---|
| Spotted Bat (*Euderma masculatum*) | Threatened |
| Canada Lynx (*Lynx canadensis*) | Threatened |
| Pacific Marten (*Martes caurina*) | Threatened |
| Meadow Jumping Mouse (*Zapus hudsonius luteus*) | Endangered |
| White Tailed Ptarmigan (*Lagopus leucura*) | Endangered |
| Brown Pelican (*Pelecanus occidentalis*) | Endangered |
| Common Black Hawk (*Buteogallus anthracinus*) | Threatened |
| Bald Eagle (*Haliaeetus leucocephalus*) | Threatened |
| Peregrin Falcon (*Falcon peregrinus*) | Threatened |
| Arctic Peregrin Falcon (*Falco peregrinus tundris*) | Threatened |
| Least Tern (*Stemula antillarum*) | Endangered |
| Yellow Billed Cuckoo (Western Pop) (*Coccyzus americanus occidentalis*) | Threatened |
| Boreal Owl (*Aegolius funereus*) | Threatened |
| Mexican Spotted Owl (*Strix occidentalis lucida*) | Threatened |
| Southwest Willow Flycatcher (*Empidonax traillii extimus*) | Endangered |
| Gray Vireo (*Vireo vicinior*) | Threatened |
| Baird's Sparrow (*Ammodramus bairdii*) | Threatened |

| Species | Status of species |
|---|---|
| Boreal toad (*Anaxyrus boreas boreas*) | Endangered |
| Jemez Mountains Salamander (*Plethodon neomexicanus*) | Endangered |
| Roundtail Chub (Upper Basin Populations) (*Gila robusta*) | Endangered |

Field observations at the Site have not confirmed the presence any of these species in the area.

### 6.2.5 Potentially-Complete Exposure Pathways

According to guidance for ERA (USEPA, 1997; NMED, 2017), a complete exposure pathway must have the following components:

1. An anthropogenic source of a chemical constituent;
2. A mechanism for transport of the constituent from the source to one or more ecological receptors; and
3. Exposure of ecological receptors to the constituent (i.e., exposure route).

Mechanisms for the transport of constituents from the source to ecological receptors are discussed in Section 2.2.7. The potential exposure routes include direct contact (i.e., absorption via integument), ingestion, and inhalation.

Because of the nature of the release of COPECs at the Site, the potentially-complete exposure routes for surface soil at the Site are:

- Absorption via integument and ingestion by soil invertebrates;
- Root absorption of constituents in soil by flora;
- Direct contact with soil by plants and fauna;
- Incidental ingestion of soil and bioaccumulative chemicals of concern (BCOCs) by insectivores and omnivores via food web transfer;
- Incidental ingestion of soil and constituents taken up by, and bioaccumulated in, plant tissue by herbivores and omnivores via food web transfer; and
- Ingestion of soil and BCOCs by carnivores via food web transfer.

A CEM of the potentially-complete exposure pathways is provided as Figure 6.2.

### 6.2.6 Incomplete Exposure Pathways

In an ERA, the inhalation exposure route is generally not considered to be significant. Accordingly, this SLERA does not consider inhalation. Moreover, while Figure 6.2 includes a potential exposure pathway to aquatic and benthic receptors due to COPEC migration to surface water and sediments, the Site does not support aquatic life so this exposure pathway is incomplete.

### 6.2.7 Assessment and Measurement Endpoints

#### 6.2.7.1 Assessment Endpoints

Table 6.1 identifies the assessment endpoints for the ERA. The assessment endpoints for soil are species richness and productivity of the terrestrial plant and soil invertebrate communities, as well as the relative and absolute densities of avian and mammalian insectivores, herbivores, omnivores, and carnivores.

BCOCs are constituents that have the potential to bioaccumulate and bioconcentrate in food webs. Constituents classified as BCOCs may pose risk to upper trophic level consumers via food items directly exposed to Site-related COPECs in soil. Correspondingly, the assessment endpoints for this SLERA include predatory birds and mammals, which potentially forage at the Site. However, BCOCs for soil (TCEQ, 2006) are not included in the list of COPEC at the Site, so BCOCs will not be considered in the current ERA.

Although present, or potentially-present in the Site, herpetiles (amphibians and reptiles) are not evaluated directly due to a paucity of ecotoxicological data adequate to evaluate the potential for risk at the screening level. For this ERA, as well as the subsequent analyses, ESVs for soil are deemed protective of herpetiles.

The selected assessment endpoints are intentionally broad. Once the final COPECs are identified (i.e., completion of Step 3), Site-specific assessment endpoints will be developed for specific receptor groups, if further assessment is required.

#### 6.2.7.2 Measurement Endpoints

For the screening assessment, the maximum detected concentrations of each constituent detected in soil are used as measurement endpoints for primary receptors (i.e., receptors directly exposed to environmental media). To evaluate the potential for risk, the maximum detected concentrations are compared to ESVs, which are conservative benchmark concentrations that are protective of all receptor groups identified in the assessment endpoints (i.e., terrestrial plants, soil invertebrates, and avian& mammalian wildlife).

Table 6.1 identifies the measurement endpoints associated with each of the assessment endpoints listed in Section 6.3.4.1. A more detailed discussion of ESVs is provided in Section 6.4.2.2.

### 6.2.8 Samples Used in the Ecological Risk Assessment

Figure 1.2 identifies the locations of surface soil samples evaluated in this ERA. According to the USEPA guidance, for the evaluation of risks to ecological receptors, only the samples collected from the surficial soil layer (i.e., 0 to 2 ft bgs, or less) are to be included in the ERA dataset since ecological receptors are generally not exposed to soil deeper than 2 ft bgs. However, NMED guidance (NMED, 2017), which is the primary reference document used in the current ERA, indicates that surficial soil layer is considered 0 to 1 ft bgs for most ecological receptors, and 0 to 10 ft bgs for burrowing ecological receptors (e.g., prairie dogs). Accordingly, the corresponding dataset consists of 1 sample collected in November 2015 (at 0-0.5 ft bgs), and 2 soil samples (1 collected at 0-0.5 ft bgs and 1 collected at 9-10.5 bgs) collected on April 12, 2017.

Surface soil samples were analyzed for VOCs (BTEX), SVOCs (PAHs), and TPH. The complete dataset evaluated in this ERA is provided in Appendix A.3 and A.4.

### 6.2.9 Ecological Screening Values

To ensure that the potential for risk is not incorrectly dismissed, screening levels are very conservative. That is, assumptions regarding exposure and toxicological effects are biased toward identifying risk. Because the ESVs are conservative, it can be concluded with a high level of certainty that constituents with concentrations below their ESVs do not pose risk to ecological receptors. On the other hand, constituents with maximum concentrations that exceed their ESVs do not necessarily indicate risk or adverse impacts to ecological receptors. Rather, this indicates that a potential for risk may exist and that further assessment should be undertaken to verify or strengthen the conclusions of the SLERA.

ESVs were acquired from a variety of sources recognized by the USEPA and state regulatory agencies. Sources of ESVs were searched using the Ecological Benchmark Tool developed and maintained by the Oak Ridge National Laboratory (ORNL). The Ecological Benchmark Tool can be accessed through the ORNL's website (ORNL, 2014)[17].

A hierarchical approach was used in the selection of appropriate ESVs. The first tier in the hierarchy considered the ecological soil screening levels (ECO-SSLs) developed by USEPA (2010). Whenever multiple benchmarks were available within a tier, the lowest value was selected as the ESV to maintain a level of conservatism commensurate with a screening-level assessment.

The ORNL database does not have ecological benchmarks for all constituents for which the Site data are available. A decision as to the potential for these constituents to pose risk should be based on current or past use/generation of a constituent on the Site, the likelihood of exposure, and best scientific judgment of the risk assessor and risk manager. For this SLERA, constituents that do not have an ESV and were not detected, were eliminated from further consideration. However, those constituents that do not have ESVs, but were detected in one or more samples were retained as COPECs. These constituents will be evaluated in subsequent steps of the ERA process using literature and/or best professional judgment as to their potential to produce risk to ecological receptors at the Site.

The first tier in the selection of ESVs for soil consisted of the ECO-SSLs identified by the USEPA (2010)[18]. The rationale for using ECO-SSLs as the first tier is that they have a strong technical basis and have recently been developed or revised by the USEPA. If multiple ECO-SSLs were available for a given constituent (i.e., developed for terrestrial plants, soil invertebrates, avian wildlife, or mammalian wildlife), then the lowest of the available ECO-SSLs was selected as the ESV. If an ECO-SSL was not available, the second tier in the hierarchy included the ecological screening benchmarks identified for earthworms and plants by TCEQ (2006)[19]. If benchmarks were available for both earthworms and plants, the lower of the two benchmarks was selected as the ESV per the conservative nature of the screening-level assessment.

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17 https://rais.ornl.gov/tools/eco_search.php

18 https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-and-documents

19 http://www.tceq.state.tx.us/remediation/trrp/guidance.html

For the third tier, all other available ecological screening benchmarks in the Ecological Benchmark Tool database were considered. When more than one benchmark was available, the lowest of the available benchmarks was selected as the ESV per the rationale stated above.

***Tier I Benchmarks***

The lowest of the following benchmarks was selected as the ESV:

- USEPA ECO-SSL for avian receptors (USEPA, multiple source documents);
- USEPA ECO-SSL for soil invertebrates (USEPA, multiple source documents);
- USEPA ECO-SSL for mammalian receptors (USEPA, multiple source documents); and
- USEPA ECO-SSL for plants (USEPA, multiple source documents).

***Tier II Benchmarks***

The lowest of the following benchmarks was selected as the ESV:

- TCEQ ecological screening benchmark for earthworms (TCEQ, 2006); and
- TCEQ ecological screening benchmark for plants (TCEQ, 2006).

***Tier III Benchmarks***

The lowest benchmark from the following sources was selected as the ESV:

- USEPA Region 4 soil screening benchmark (USEPA, 2001); and
- USEPA Region 5 Ecological Screening Level (ESL) (USEPA, 2003).

Table 6.2 identifies the ESVs for soil.

## 6.3 Step 2: Screening-Level Exposure Estimate and Risk Calculation

### 6.3.1 Exposure Estimates

A screening quotient (SQ), calculated as the maximum detected concentration divided by the ESV, was used to determine if the constituent has the potential to pose risk to ecological receptors. An SQ greater than 1E+00 identifies a potential for risk. Thus, those Site constituents with an SQ greater than 1E+00 were identified as COPECs and were carried forward to Step 3 of the risk assessment process for further evaluation and refinement in Section 6.6.

### 6.3.2 Risk Calculation

#### 6.3.2.1 Chemicals Detected

Table 6.3 identifies the constituents that were detected in surface soil above the laboratory detection limits. For each constituent, Table 6.3 identifies the number of samples analyzed, number of samples with detected concentrations, frequency of detection (DF, also cited as acronym FOD in this report), minimum and maximum detected concentrations, sample location with the maximum

detected concentration, ESV, SQ, and status as a COPEC. This Site posed additional challenges with this step of the risk assessment. For these data the 95 percent UCL concentrations on the mean could not be generated due to the small sample size. Professional judgement was made as to which chemicals are forwarded in this step. Detected concentrations in samples collected from 0-1 ft bgs and 0-10 ft bgs are provided in Figures 6.3 and 6.4, respectively.

### *BTEX*

Ethylbenzene and xylene were the BTEX constituents detected at one sample location (Construction Trench [collected 11/30/2015) from 0-0.5 ft bgs (benzene and toluene were not detected). The SQ for ethylbenzene is 28, the SQ for xylene is 144. However, the two chemicals were not screened into the next ERA step because BTEX is volatile and readily biodegradable by natural attenuation so it is assumed that concentrations of ethylbenzene and xylene have continued to weather and attenuate to non-detect levels over the past 18 months. Therefore, ethylbenzene and xylene were eliminated as COPECs.

### *Polycyclic Aromatic Hydrocarbons*

Ten out of sixteen PAHs analyzed for were detected in B-17 collected at 0-0.5 ft bgs. None of the ten detected PAHs constituents had SQs greater than 1. However, in the B-17 sample collected from 9-10.5 ft bgs, napthalene was the only constituent with an SQ greater than 1 (SQ=4.3).Therefore, naphthalene is the only constituent that was screened into the next ERA step. The fifteen other constituents were eliminated as COPECs.

### *Petroleum Hydrocarbons*

The samples of surface soil from the Site were analyzed for petroleum hydrocarbons using two analytical methods: The GRO (C6-C10), DRO (C10-C28), and MRO were detected by the M8015B and SW8015 methods, and aliphatic and aromatic TPH fractions were detected by TX1005 and TX1006 methods (Appendix A.3 and A.4).

ESVs for petroleum hydrocarbons are limited. The Canadian Council of Ministers of the Environment (CCME) identifies benchmarks for four carbon fractions: C6-C10, C10-C16, C16-C34, and >C34 for coarse-grained and fine-grained soils and four land uses (agricultural, residential/parkland, commercial, and industrial). These are the so-called "Canada-Wide Standards" (CCME, 2008).

The GRO fraction, but not the DRO or MRO fractions analyzed in this study is comparable to the Canadian ESVs. The GRO (C6-C10) and TPH (C10-C26) fractions were analyzed in the Construction Trench sample (collected November 30, 2015), and were the most prevalent. The ESV for C6-C10 fraction is 210 mg/kg for agricultural and residential land uses. The fractions expected to be present on the Site over the longer term are those with a higher number of carbons (C16-C34 and >C34), as the fractions with shorter carbon chains (C6-C10 and C10-C16) weather relatively quickly in the environment (DiToro et al., 2007). The ESV for the C16-C34 fraction is 1,300 mg/kg for agricultural and residential land uses, and the ESV for the >C34 fraction is 5,600 mg/kg for agricultural and residential land uses.

The Atlantic Partnership for RBCA (risk based corrective action) Implementation (PIRI) has published ESVs for the protection of plants and invertebrates via direct contact and for the

protection of wildlife (PIRI, 2012). The carbon fractions identified by PIRI (2012) are the same fractions identified in the Canada-Wide Standards (i.e., C6-C10, C10-C16, C16-C34, and >C34). Similarly, PIRI identifies ESVs for agricultural, residential/parkland, commercial, and industrial land uses. The PIRI ESVs for the protection of plants and invertebrates are the same as the Canada-Wide Standards for fine-grained soil. The ESVs for the protection of wildlife, which are based on agricultural land use, are 11,000 mg/kg for the C6-C10, 9,800 mg/kg for the C10-C16, 16,000 mg/kg for the C16-C34, and 8,400 mg/kg for the >C34 fraction.

The maximum detected concentration of any fraction analyzed by any analytical method is 5,500 mg/kg (Construction Trench on 11/30/2015), which is the DRO (C10-26) fraction. This maximum concentration is above the Canada-Wide Standard for plants and invertebrates for the C6-C10 fraction, but below all PIRI ESVs for the protection of wildlife. All TPH fractions that were analyzed in the most recent sampling (April 2017) were all non-detects. It is presumed that concentrations of the (C10-26) and GRO (C6-C10) fractions will continue to weather and attenuate to non-detect levels. Moreover, the detected TPH are found in deep soil (i.e. greater than 9 ft bgs), and beyond the reach of most ecological receptors. Therefore, TPHs are eliminated as COPECs.

### 6.3.3 Preliminary Constituents of Potential Ecological Concern

An individual constituent, or a constituent group, is retained as a COPEC, through the SLERA process, if:

1. The SQ is greater than 1 (i.e., the maximum concentration exceeds its ESV);
2. The constituent/group was not detected and the LODs for greater than 90 percent of the samples exceeds its ESV; or
3. The constituent/group was detected and an ESV was not identified.

Based on the first criterion, one individual constituent was retained as a COPEC through the SLERA process (Table 6.5). The second and third criteria were not applicable to the dataset for this report. The individual constituent was naphthalene, and it is forwarded to Step 3 for further refinement as discussed below.

## 6.4 Step 3: Refinement of Constituents of Potential Ecological Concern

### 6.4.1 Overview

This section presents the results of the initial phase of Step 3 of the 8-Step process for conducting ERA (per USEPA, 1997), which refines COPECs by considering specific receptor groups, alternative ecological benchmarks, Site-specific conditions (e.g., background concentrations), food chain modeling-based risk assessment, and more ecologically-realistic estimates of exposure concentrations.

### 6.4.2 Refinement of Receptor Groups

#### 6.4.2.1 Methodology

The refinement process considers ecological benchmarks for the following four receptor groups:

- Terrestrial plants;
- Soil invertebrates;
- Avian receptors; and
- Mammalian receptors.

The USEPA (2010) has developed ECO-SSLs for the above receptor groups. Other sources of ecological benchmarks specific to terrestrial plants, soil invertebrates, and avian and mammalian wildlife include ORNL (Efroymson et al., 1997a; 1997b), CCME (2007; 2010), and USEPA, Region 5 (USEPA, 2003). For those constituents with multiple benchmarks, the most appropriate benchmark was selected as the refinement benchmark (RB). The benchmarks selected as RBs were used to eliminate, or retain, individual constituents and constituent groups identified as preliminary COPECs.

The selection of the RBs generally considers site-specific background concentrations. Data for the background samples are used to calculate background threshold values (BTVs) using ProUCL, Version 5.0 (USEPA, 2014b). Any benchmarks below a site-specific BTV are eliminated from consideration. The rationale is that ecological benchmarks are intentionally conservative and, in some cases, are below natural or site background concentrations, which is not realistic.

This Site posed additional challenges with this step of the risk assessment. First, background samples were not available for the Site, so BTVs could not be generated for the data set.

Due to the lack of benchmark data, Tier 1 screening levels were used as refinement benchmarks for the following six ecological receptors deemed important by NMED (2017):

1. Terrestrial plant community;
2. Deer mouse;
3. Horned lark;
4. Kit fox (typically evaluated at sites greater than 267 acres);
5. Pronghorn antelope (typically evaluated at sites greater than 342 acres); and
6. Red-tailed hawk (typically evaluated at sites greater than 177 acres).

The above key receptors encompass primary producers, as well as the three levels of consumers (primary, secondary, and tertiary). The key receptors are described in further detail below.

***Deer Mouse***

The deer mouse (*Peromyscus maniculatus*) is a common rodent throughout much of North America that can thrive in a variety of habitats. The deer mouse was selected as a representative receptor because it is prevalent in New Mexico and represents one of the several species of omnivorous

rodents that may be present at the Site. Small rodents are also a major food source for larger omnivorous and carnivorous species. The deer mouse has a relatively small home range and could, therefore, be exposed to COPECs at the Site.

### *Horned Lark*

The horned lark (*Eremophila alpestris*) is a common terrestrial bird. It spends much of its time on the ground and its diet consists mainly of insects and seeds. The horned lark was chosen as the representative receptor because it is prevalent in New Mexico and represents one of the many small terrestrial bird species that could be present at the Site. Since the horned lark spends most of its time on the ground, it also provides a conservative measure of effect since it has a higher rate of incidental ingestion of soil than other song birds. The horned lark is also a major food source for omnivorous intermediate species, and top avian carnivores. The horned lark is evaluated based on an omnivorous diet of invertebrates and plant matter. This receptor has a relatively small home range and could, therefore, be exposed to COPECs at the Site.

### *Kit Fox*

The kit fox (*Vulpes macrotis*) is native to the western United States and Mexico. Its diet consists of mostly small mammals. Although the kit fox's diet may also consist of plant matter during certain times of the year, the kit fox will be evaluated as a carnivore, with diet consisting of 100% prey items. It was selected as a key receptor because it is sensitive species, is common in New Mexico, and the surrounding area likely provides suitable habitat for this animal. The kit fox also is representative of a mammalian carnivore within the food web. The kit fox is typically evaluated at sites that are larger than 276 acres. Since kit fox has a large home range size (2,767 acres) (Zoellick & Smith, 1992), it is assumed that risks are negligible from exposure to COPECs at sites that are less than 10% of the receptors home range. Unless the area use factor (AUF) is at least 10%, food items potentially contaminated with COPECs and incidental soil ingestion at a site would not contribute significantly to the receptor's diet and exposure to COPECs (see Site-relevant discussion in Section 6.4.2.2 for this receptor).

### *Red-Tailed Hawk*

The red-tailed hawk (*Buteo jamaicensis*) was selected as a top carnivore avian key receptor. The red-tailed hawk is widespread throughout New Mexico and is one of the most common birds of prey. It hunts primarily rodents, rabbits, birds, and reptiles. The red-tailed hawk was chosen as a key receptor since it is a common species through New Mexico. The red-tailed hawk is typically evaluated at sites that are larger than 177 acres. Since the red-tailed hawk has a large home range size (1,770 acres) (US EPA, 1993b), risks to the red-tailed hawk from exposure to COPECs at sites smaller than 177 acres (10% of the home range) would be negligible (see Site-relevant discussion in Section 6.4.2.2 for this receptor).

### *Pronghorn Antelope*

The pronghorn (*Antilocapra Americana*) is a popular big game species that occurs in western Canada, United States, and northern Mexico. Its diet consists mainly of sagebrush and other shrubs, grasses, and forbs. The pronghorn was selected as a key receptor representative of large herbivorous species of wildlife. The pronghorn is typically evaluated at sites that are larger than 342

acres. Since the pronghorn has a large home range size (3,422 acres) (Reynolds, 1984), risks to the pronghorn from exposures to COPECs at sites smaller than 342 acres (10% of the home range) would be negligible (see Site-relevant discussion in Section 6.4.2.2 for this receptor).

#### 6.4.2.2 Selection of Refined Ecological Site Receptors and Exposure Conditions

The following assumptions are made with the refinement benchmark assessment:

- Maximum concentration values are used for all COPECs and ecological receptors at each sampling location. Sampling locations that are 0 to 0.5 ft bgs are used for most terrestrial receptors, and sampling locations that are 0 to 10 ft bgs are used for burrowing receptors (e.g., prairie dogs). Therefore, naphthalene will be removed as a COPEC for the horned lark;
- 100% of the diet is assumed to contain the maximum concentration of each COPEC detected in the site media;
- Minimum reported body weights are applied;
- Maximum dietary intake rates are used;
- It is assumed that 100% of the diet consists of direct ingestion of contaminated soil;
- It is assumed that the bioavailability is 100% at each site; and
- Foraging ranges are initial set equal to the size of the Site. This means that the AUF in the Site is set to a value of one. However, the kit fox, pronghorn antelope, and red-tailed hawk have ranges that are much greater than the size of the Site. Therefore, naphthalene will be removed as a COPEC for these three receptors.

#### 6.4.2.3 Refinement Benchmarks and Screening Process

Table 6.6 identifies the RBs for the terrestrial plant community, deer mouse, and horned lark. For plants and soil invertebrates, a refinement quotient (RQ) was calculated by dividing the maximum concentration of a constituent by its RB. An RQ less than or equal to 1 indicates no potential for risk, whereas RQs greater than 1 indicate that risks cannot be dismissed with current information. Normally, an area-wide statistic of central tendency (e.g., 95 percent UCL) is used for calculating the RQ; however, there are insufficient samples to calculate the 95 percent UCL. As an alternative, the maximum concentration of naphthalene was compared to RBs to calculate the RQ values.

### 6.4.3 Refined Risk Estimates

#### 6.4.3.1 Terrestrial Plants

Table 6.7 summarizes the evaluation of risk to terrestrial plants. Information presented includes the RBs, number of samples, number of samples with detected concentrations, maximum concentration, RQ, number and percentage of samples with concentrations that exceed the RBs, as well as the rationale for retaining or eliminating a constituent as a COPEC.

The RQ for naphthalene in subsurface soil could not be calculated, as an RB is not available for this chemical. Alternatively, low molecular weight PAHs ($PAH_{LMW}$) was used as a surrogate for naphthalene. Unfortunately, an ECO-SSL for plants is not available, so an RQ for $PAH_{LMW}$ cannot

be calculated. Regardless, it is GHD's experience (also shared by the general risk assessment community) that ecological benchmarks for plants are poorly correlated with species richness and diversity of plant communities. In the absence of toxicological data, observation of areas with stressed vegetation (e.g., stunted growth, chlorosis) provides direct evidence of risk or impact to plant communities. The Site observations did not reveal vegetation with these stress characteristics. Based on the presented lines of evidence, naphthalene is eliminated as a COPEC for terrestrial plants.

### 6.4.4 Mammalian Wildlife

Table 6.8 summarizes the evaluation of risks to mammalian wildlife. The RQ for naphthalene in subsurface soil could not be calculated, as an RB is not available for this chemical. Alternatively, the concentration of $PAH_{LMW}$, which does have a mammalian ECO-SSL value (100 mg/kg), was calculated as a surrogate for naphthalene. The RQ for $PAH_{LMW}$ is 7.0E-5. Therefore, naphthalene is eliminated as a COPEC for mammalian wildlife.

## 6.5 Ecological Risk Assessment Conclusions

Based on the ERA analyses, none of the chemical constituents detected in the soils at the Site are considered as constituents of ecological concern (COECs). As such, no further actions are planned for the Site to address ecological receptors.

# 7. Uncertainty Analysis

There are sources of uncertainty in all aspects of the risk assessment process. There are uncertainties associated with sampling data, exposure assessment, and toxicity assessment. In response, the USEPA applies a conservative approach in developing guidance for risk assessments to prevent the underestimation of risk. Accordingly, the current HHRA and ERA err on the conservative side of the risk continuum, as described below.

Uncertainties associated with the exposure model stem from the input parameters used to estimate intake. However, most model parameters were "default," as adopted directly from USEPA RAGS (USEPA, 1989; USEPA, 2002; USEPA, 2004; USEPA, 2006; and USEPA, 2014) and NMED documentation (NMED, 2017). Therefore, the likelihood of missing an actual risk is low. Furthermore, because the input parameters are conservative in nature, actual exposures (and any risks) are likely to be lower than those suggested in this HHRA and ERA. Also, a conservative assumption is made that there is no exposure dilution (e.g., all ingested soil is contaminated). As a result, the collective tally of conservative input parameters leads to the likely overestimation of any risks.

This HHRA evaluated the soil-to-groundwater pathway via the application of leaching models with NMED generic hydraulic condition parameters, which yield soil concentrations protective of the groundwater receptor. The resulting soil limits, although potentially useful, are fraught with uncertainty as any model outcomes are. This is demonstrated in the fact that the soil-to-groundwater SSLs indicated exceedances, however, data from the groundwater sample collected in April 2017 showed no detected concentrations of chemicals. Furthermore, the Site-specific leaching

models were not applied because no sufficient site-specific data on hydrologic conditions were available to calculate a site-specific DAF. The soil-to-groundwater pathway is considered incomplete based on: 1) the depth to groundwater at the Site is large (approximately 70-80 ft bgs); 2) chemicals with SQ > 1 are volatile and have likely attenuated due to natural biodegradation since the initial sampling in November 2015.

Few samples of surface and subsurface soils were available to conduct thorough HHRA and ERA assessments. While no risk was determined by using maximum chemical concentrations as surrogates for RMEs, additional soil sample would increase the robustness of the HHRA and ERA analyses. The same limited conclusion occurs with groundwater, which only had one sample. Additional groundwater monitoring would increase the robustness and confidence in the HHRA for human receptors and livestock.

# 8. Summary of Conclusions

GHD has prepared an integrated Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) for the San Juan 27-5 No. 1, which experienced a historical release of an unknown amount quantity of hydrocarbons. A series of Site investigation and soil removal actions were completed, including the collection of soil samples for the analysis of hydrocarbon constituents to support the HHRA and ERA. The objective of the HHRA/ERA was to utilize the existing State and Federal risk assessment guidance to determine the potential for adverse effects on various receptors post-spill and subsequent to cleanup operations at the Site.

The 1993 OCD Remediation Guidelines require that corrective actions be taken to assure the protection of fresh waters, public health, and the environment. Subsequent soil boring and sandstone coring assessments in 2016 were conducted to delineate potential remaining hydrocarbons, and samples were collected and used in the comprehensive HHRA and ERA completed herein. The results of the HHRA and ERA are conclusive in that any remaining hydrocarbons in Site soils do not pose any reasonable probability of injury or detriment to public health, fresh waters, animal or plan life, or property, or unreasonably interfere with public welfare or use of the property, currently or in future.

## 8.1 Human Health Risk Assessment Results

The risk analysis for soil relative to the residential and commercial/industrial exposure scenarios indicates that the principal constituent group at the Site with concentrations in excess of the conservative screening levels was TPH. TPH exceeded the conservative residential and commercial/industrial soil screening levels and, as such, was identified as a COPC at the Site. TPH was carried forward to the quantitative HHRA, where soil TPH SSCLs were derived under the residential and commercial/industrial scenarios and applied to the soil sampling data via comparisons to point-to-point concentrations. In the quantitative HHRA, the TPH fractions were found to be below the site-specific cleanup level (SSCL) for TPH in commercial/industrial soil. TPH from November 2015 exceeded the SSCL for TPH in residential soil, however, natural attenuation appears to occur, as seen by the dramatic reduction in concentrations of TPH fractions in samples

collected in April 2017. Therefore, no Site-wide risk drivers for human health were identified in soil at the Site.

To-date, default criteria were determined by the OCD according to ranking found in the 1993 OCD Remediation Guidelines. According to that document, the ranking criteria of depth to groundwater, distance to a wellhead protection area, and distance to a surface water body are used to determine the default remedial concentrations in soil. These criteria do not take into account the well-established methods of site-specific fate and transport analysis, as well as the toxicity of petroleum hydrocarbons and, therefore, do not realistically evaluate the potential for actual risks to human health and the environment at the Site. Specifically, the soil criterion of 100 ppm TPH included in the OCD Guidelines significantly overstates the real Site risks. Using the standard quantitative TPH assessment methodology originated by the TPHCWG, and subsequently adopted by several States and multi-stakeholder organizations such as the Interstate Technology & Regulatory Council (ITRC), the current quantitative risk assessment estimates a residential soil SSCL of 5,140 mg/kg, and a commercial/industrial soil SSCL of 21,500 mg/kg. These SSCLs are comparable to those accepted at other hydrocarbon sites across US and none of the Site-wide exposure estimates exceeded these limits.

In regard to groundwater, both BTEX and naphthalene were not detected at concentrations exceeding the residential and commercial/industrial soil screening levels, but were initially identified as COPCs due to the exceedance of the soil screening levels for the protection of groundwater. However, the SSCLs for protection of groundwater at the Site were not developed for BTEX and naphthalene because of its potential to leach into deep groundwater (80 ft bgs) is not a concern and because neither BTEX nor naphthalene were detected in a recent groundwater sample. Furthermore, the Site is in an arid area with little or no precipitation. Therefore, no Site-wide risk drivers for human health were identified in groundwater or soil leaching into groundwater at the Site.

## 8.2 Ecological Risk Assessment Results

ERA of the soil analytical results relative to the conservative screening benchmarks for ecological receptors identified COPEC (naphthalene) as part of Steps 1 and 2 of the SLERA screening process.

Subsequent ERA efforts consisted of performing Step 3 of the 8-Step process for conducting ERAs, which refined COPECs to yield more precise identification of potential risk drivers. This process considered refined ecological benchmarks for two main ecological groups including terrestrial plants and mammalian receptors. Within these groups, terrestrial plants and small-ranging mammal (deer mouse) were selected as the representative species appropriate for the Site. Moreover, these species are deemed important by NMED.

For plants, the RQ could not be calculated, but the single detect was from the 0-10 ft bgs, thus naphthalene was eliminated as a COPEC.

For mammals, the RQs for $PAH_{LMW}$, the surrogate for naphthalene, was below 1. Therefore, naphthalene was eliminated as a COPEC for mammals.

Based on the results of the ERA, none of the chemical constituents detected in Site soil were COECs.

# 9. Recommendations

In summary, the existing data indicate that soil is generally free from COPC and COPEC impacts throughout the Site (i.e., Site wide). This risk statement is inclusive of, and considers, all of the COPCs and COPECs, pathways, routes, and receptors applicable to the Site. Although two locations collected in November 2015 exhibited TPH concentrations above the SSCL for residential soil under point-to-point comparison, no recently collected samples exceeded the SSCL for residential soil. Additionally, the observed soil impacts found at depths beyond the reach of sensitive receptors (>10 ft bgs) also did not result in leaching into groundwater. This quantitative risk assessment goes beyond the default screening/cleanup levels and considers the potential for actual risks to human health and the environment. Since no such risks were identified, a no further action (NFA) designation is recommended for the Site.

# 10. References


American Petroleum Institute (API). 2006. Protecting Livestock: Answer to Frequently Asked Questions about Livestock Exposure to Crude Oil in Oilfield Operations. Product No. 10PL06, API, Washington, DC.

Canadian Council of Ministers of the Environment (CCME). 2007. Environmental Quality Guidelines, Canadian Soil Quality Guidelines for the Protection of Human and Environmental Health. Update 7.1, December 2007.

CCME. 2008. Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil. 2001, Revised January 2008.

CCME. 2010. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Carcinogenic and Other PAHs. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Oklahoma Department of Environmental Quality (DEQ). 2012. Risk-Based Levels for Total Petroleum Hydrocarbons (TPH), October 2012.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997a. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory. ES/ER/TM-126/R2.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997b. Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory. ES/ER/TM-85/R3.

GHD. 2016. Site Assessment Report, San Juan 27-5 No. 1, San Juan County, New Mexico, November 2016.

Interstate Technology & Regulatory Council (ITRC). 2014. Petroleum Vapor Intrusion: Fundamentals of Screening, Investigation, and Management developed by the Interstate Technology & Regulatory Council (ITRC) Petroleum Vapor Intrusion Team, October 2014.

New Mexico Environment Department (NMED). 2017. Risk Assessment Guidance for Site Investigations and Remediation, Volume I and II: Soil Screening-Level Ecological Risk Assessments. Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, NM. March 2017. https://www.env.nm.gov/HWB/guidance.html.

New Mexico Department of Game and Fish (NMGF). 2016. Report County Species List for Rio Arriba. Biota Information System of New Mexico (BISON-M). New Mexico Department of Game and Fish, Santa Fe, NM. Accessed August 3, 2016. http://www.bison-m.org/.

Oak Ridge National Laboratory (ORNL). 2014. Ecological Benchmark Tool. Accessed on April 9, 2014. http://rais.ornl.gov/tools/eco_search.php.

Partnership in RBCA Implementation (PIRI). 2012. Atlantic RBCA (Risk-Based Corrective Action) for Petroleum Impacted Sites in Atlantic Canada. Version 3. User Guidance. July 2012.

Salanitro, J.P., Dorn, P.B., Huesemann, M.H., Moore, K.O., Rhodes, I.A., Rice, J.L.M., Vipond, T.E., Western, M.M., Wisniewski, H.L. 1997. Crude oil hydrocarbon and soil ecotoxicology assessment. Environ. Sci. Technol. 31, 1769-1776.

TCEQ. 2006. Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas RG-263 (Revised). Remediation Division. January 2006. Accessed on April 9, 2014. Website available at: http://www.tceq.state.tx.us/assets/public/remediation/eco/0106erag-update.pdf.

Texas Commission on Environmental Quality (TCEQ). 2010. Texas Risk Reduction Program (TRRP), Development of Human Health PCLs for Total Petroleum Hydrocarbon Mixtures, January 2010.

U.S. Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989.

USEPA. 1991. Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), Publication 9285.7-01B.

USEPA. 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Environmental Response Team. June 5, 1997. EPA/540/R-97/006.

USEPA. 1997. Exposure Factors Handbook, EPA/600/P-95/002F, August 1997.

USEPA. 2001. Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment. Originally published November 1995. Website version last updated November 30, 2001. Accessed on April 9, 2014. Available at: http://www.epa.gov/region4/waste/ots/ecolbul.htm.

USEPA. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

USEPA. 2003. Region 5, RCRA, Ecological Screening Levels, August 22, 2003.

USEPA. 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final, EPA/540/R/99/005, July 2004.

USEPA. 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Office of Solid Waste and Emergency Response, United States Environmental Protection Agency,
EPA530-R-05-006. September 2005. http://www.epa.gov/combustion/risk.htm

USEPA. 2006. Child-Specific Exposure Factors Handbook (External Review Draft), EPA-600-R06-096A, September 2006.

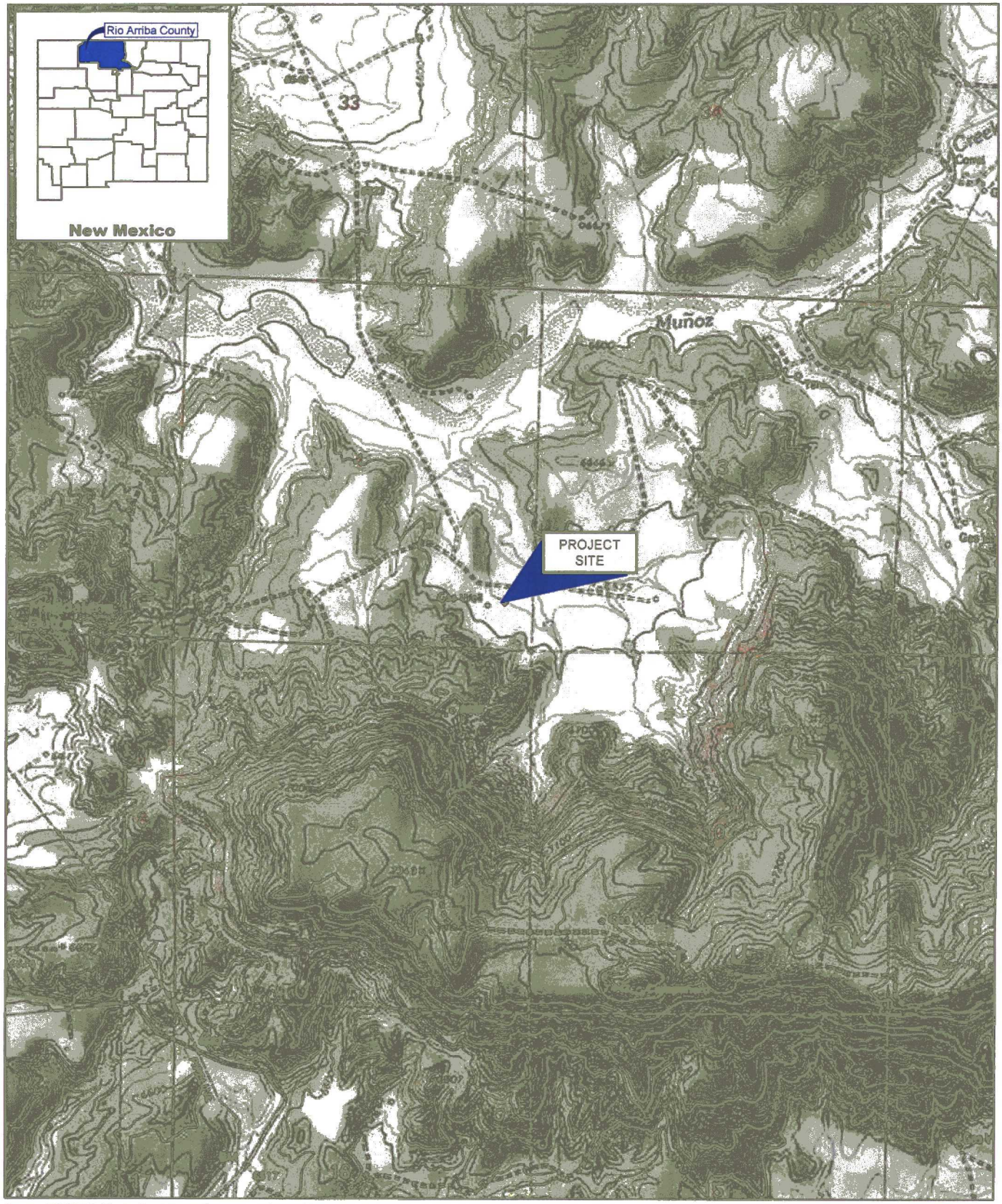
USEPA. 2007. Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs): Interim Final. OSWER Directive 9285.7-78. Accessed on May 9, 2017. Available at: https://rais.ornl.gov/guidance/epa_eco.html

USEPA. 2014. A Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 2014.

USEPA. 2014b. Statistical Software ProUCL Version 5 for Environmental Applications for Data Sets with and without Nondetect
Observations. http://www.epa.gov/osp/hstl/tsc/softwared.htm.

USEPA. 2016. Regional Screening Levels (Formerly Human Health Medium-Specific Screening Levels), USEPA, May 2016.

# Figures




Source: USGS 7.5 Minute Quad "Vigas Canyon and Santos Peak, New Mexico"

Lat/Long: 36.597344° North, -107.356730° West

0 1000 2000ft

Coordinate System:
NAD 1983 (2011) StatePlane-
New Mexico Central (US Feet)

CONOCOPHILLIPS COMPANY
SAN JUAN 27-5 No. 1, RIO ARRIBA COUNTY, NM
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

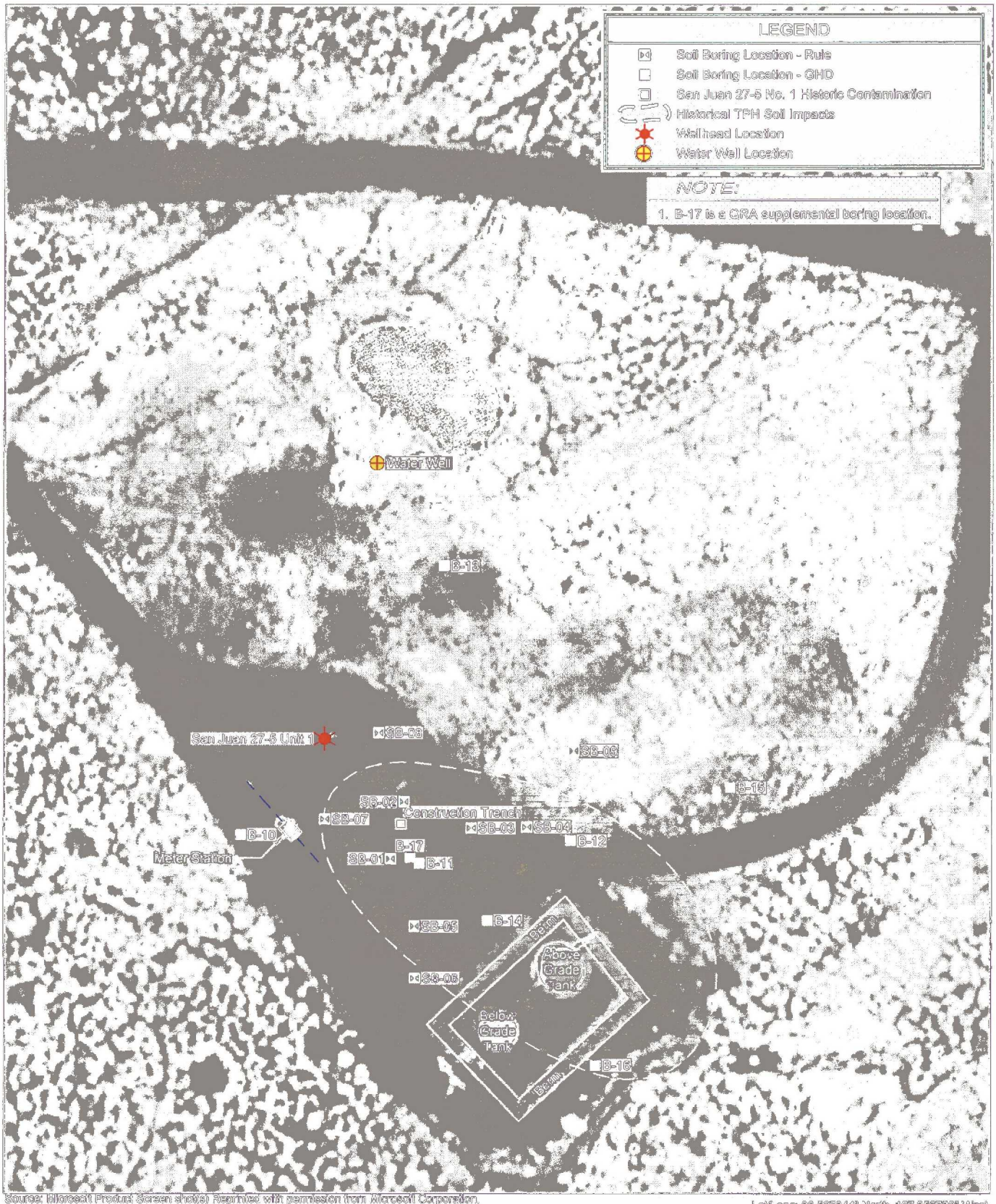
11124687-2AS00

May 4, 2017

SITE LOCATION MAP

FIGURE 1.1

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1112----\11124687-CoP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DL001.dwg




Source: Microsoft Product Screen shot(s) Reprinted with permission from Microsoft Corporation. Acquisition Date: June 2016. Accessed August 12, 2016.

Lat/Long: 36.537344° North, 107.553730° West

0 10 30ft

Coordinate System:
NAD 1983 (2011) StatePlane
New Mexico Central (US Feet)

GHD

CONOCOPHILLIPS COMPANY
SAN JUAN 27-5 No. 1, RIO ARRIBA COUNTY, NM
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

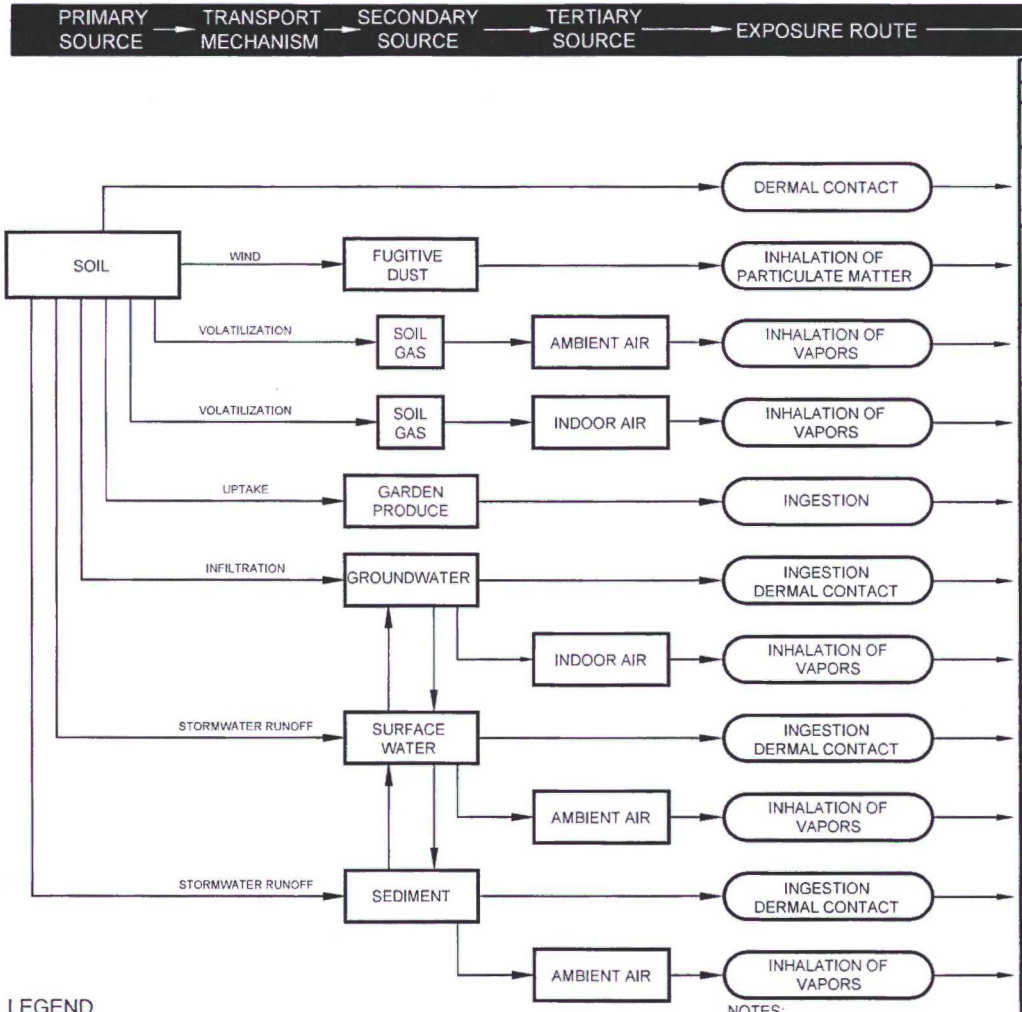
11124687-2AS00

May 11, 2017

SITE DETAILS MAP

FIGURE 1.2

CAD File: I:\CAD\FlexEight Digit Job Numbers\1112---\11124687-ConP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DI-001.dwg




| POTENTIALLY-EXPOSED CURRENT OR FUTURE RECEPTORS – SAN JUAN 27-5 No.1 SITE | | | | |
|---|---|---|---|---|
| INDOOR WORKER | OUTDOOR WORKER | CONSTRUCTION / UTILITY WORKER | TRESPASSER | RESIDENT |
| – | ● (1) | ● (1) | ● (1) | ● (1) |
| ● (1) | ● (1) | ● (1) | ● (1) | ● (1) |
| ● (2) | ● (2) | ● (2) | ● (2) | ● (2) |
| ● (2) | – | – | – | ● (2) |
| – | – | – | – | ● (2) |
| ● (2) | ● (2) | ● (2) | ● (2) | ● (2) |
| ● (2) | – | – | – | ● (2) |
| – | ● (3) | ● (3) | ● (3) | ● (3) |
| ● (3) | ● (3) | ● (3) | ● (3) | ● (3) |
| – | ● (3) | ● (3) | ● (3) | ● (3) |
| ● (3) | ● (3) | ● (3) | ● (3) | ● (3) |

LEGEND

● POTENTIALLY-COMPLETE EXPOSURE PATHWAY CONSIDERED IN HHRA

– INCOMPLETE EXPOSURE PATHWAY

NOTES:

1. (1) BASED ON THE IDENTIFIED CHEMICALS OF POTENTIAL CONCERN.
2. (2) PATHWAY CONSIDERED POTENTIALLY COMPLETE AS A CONSERVATIVE APPROACH.
3. (3) PATHWAY CONSIDERED OCCASIONALLY COMPLETE DUE TO SPORADIC WET EVENTS AS A CONSERVATIVE APPROACH.

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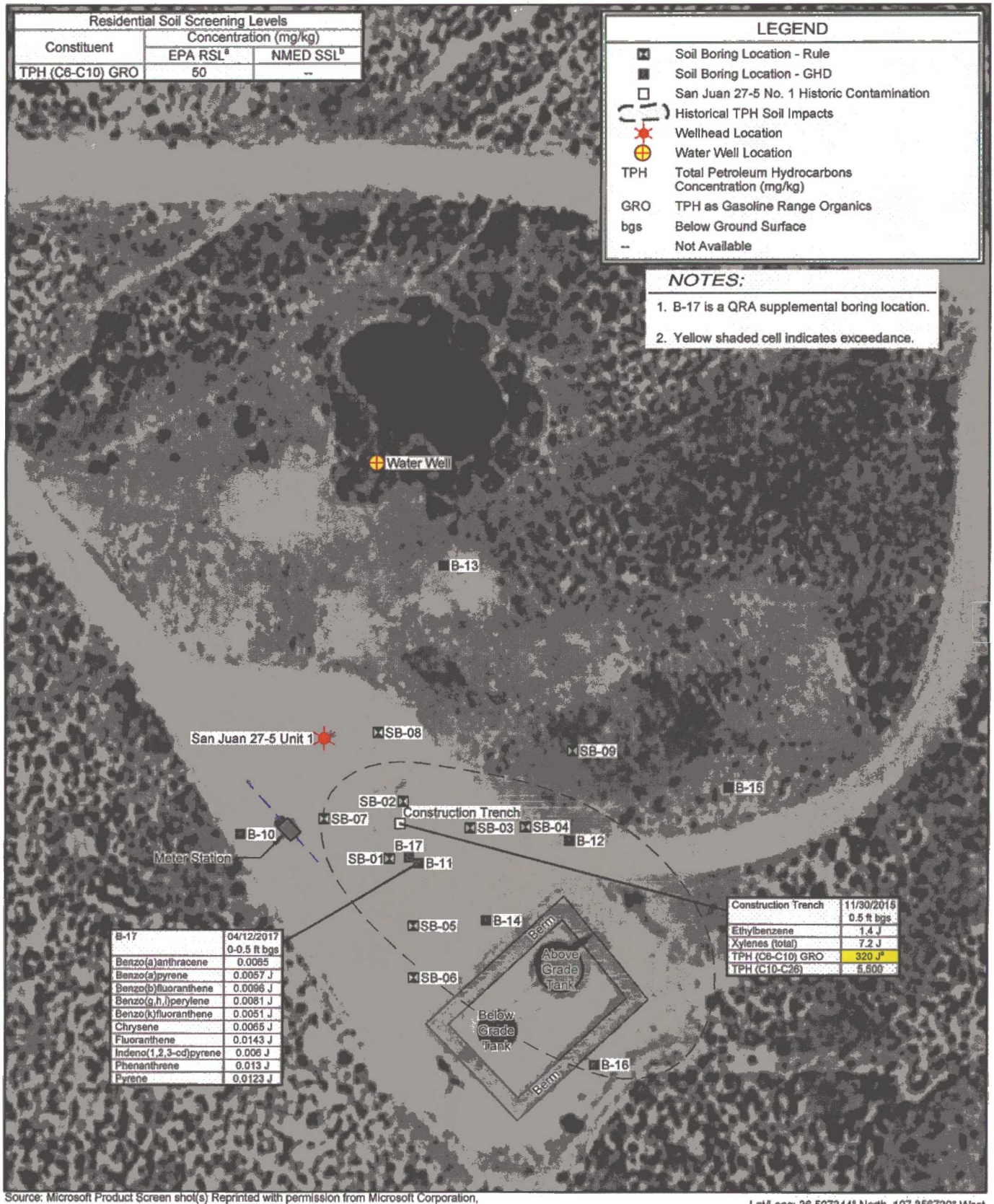
11124687-2AS00

May 18, 2017

# CONCEPTUAL SITE MODEL FOR HUMAN RECEPTORS

FIGURE 5.1

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1112---\11124687-CoP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DL001.dwg




Source: Microsoft Product Screen shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2010, Accessed August 12, 2016.

Lat/Long: 36.597344° North, 107.356730° West

0 10 30ft

Coordinate System: NAD 1983 (2011) StatePlane- New Mexico Central (US Feet)

GHD

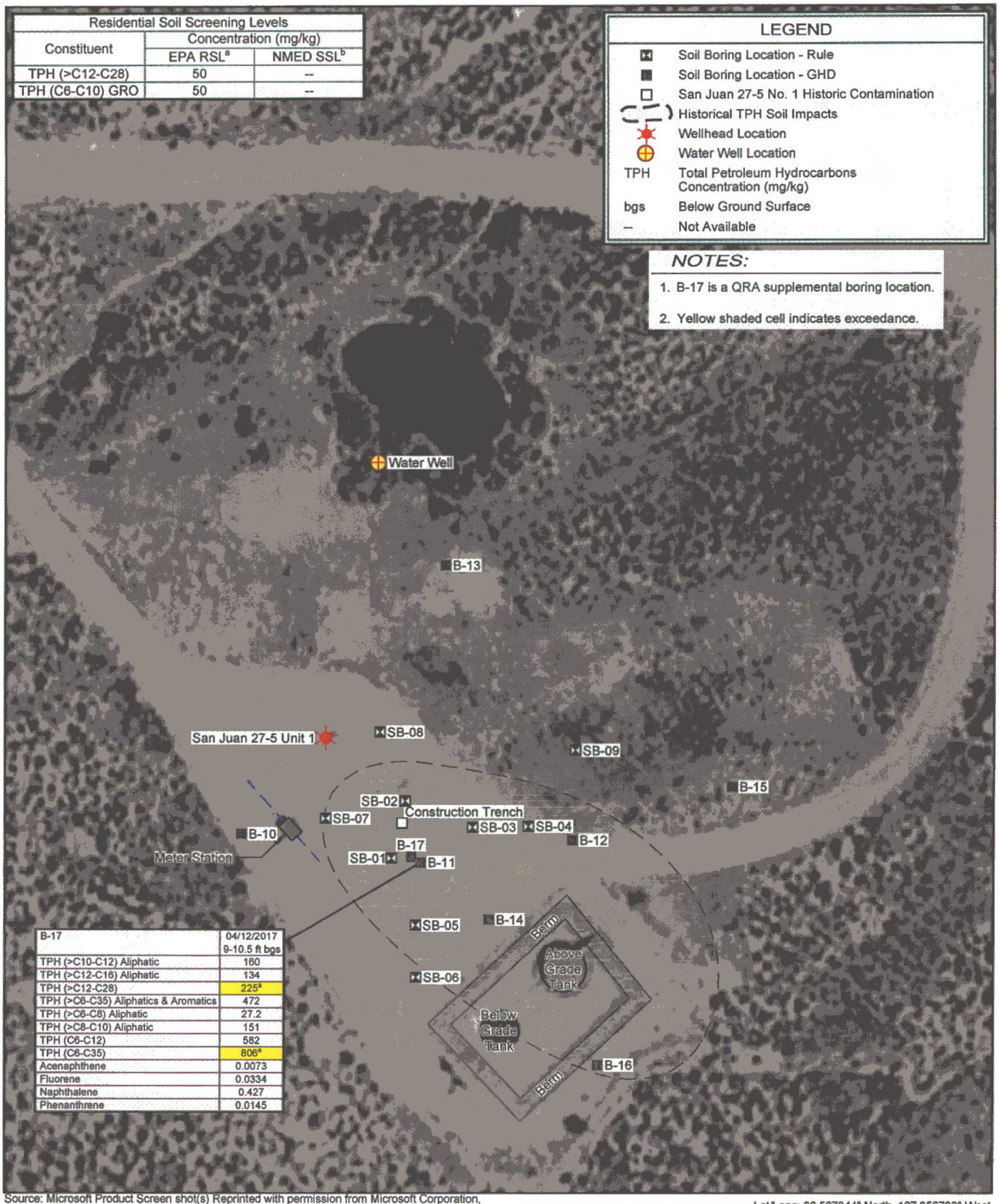
CONOCOPHILLIPS COMPANY
SAN JUAN 27-5 No. 1, RIO ARRIBA COUNTY, NM
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

11124687-2AS00
May 12, 2017

# CHEMICAL CONCENTRATIONS IN SOIL (0-1 FT BGS) - HHRA

FIGURE 5.2

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1112---\11124687-CoP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DL001.dwg




| Residential Soil Screening Levels | | |
|---|---|---|
| Constituent | Concentration (mg/kg) | |
| | EPA RSL[a] | NMED SSL[b] |
| TPH (>C12-C28) | 50 | -- |
| TPH (C6-C10) GRO | 50 | -- |

**LEGEND**

- Soil Boring Location - Rule
- Soil Boring Location - GHD
- San Juan 27-5 No. 1 Historic Contamination
- Historical TPH Soil Impacts
- Wellhead Location
- Water Well Location
- TPH — Total Petroleum Hydrocarbons Concentration (mg/kg)
- bgs — Below Ground Surface
- -- — Not Available

**NOTES:**

1. B-17 is a QRA supplemental boring location.
2. Yellow shaded cell indicates exceedance.

| B-17 | 04/12/2017 9-10.5 ft bgs |
|---|---|
| TPH (>C10-C12) Aliphatic | 160 |
| TPH (>C12-C16) Aliphatic | 134 |
| TPH (>C12-C28) | 225[a] |
| TPH (>C6-C35) Aliphatics & Aromatics | 472 |
| TPH (>C6-C8) Aliphatic | 27.2 |
| TPH (>C8-C10) Aliphatic | 151 |
| TPH (C6-C12) | 582 |
| TPH (C6-C35) | 806[a] |
| Acenaphthene | 0.0073 |
| Fluorene | 0.0334 |
| Naphthalene | 0.427 |
| Phenanthrene | 0.0145 |

Source: Microsoft Product Screen shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2010, Accessed August 12, 2016.

Lat/Long: 36.597344° North, 107.356730° West

0 10 30ft

Coordinate System: NAD 1983 (2011) StatePlane- New Mexico Central (US Feet)

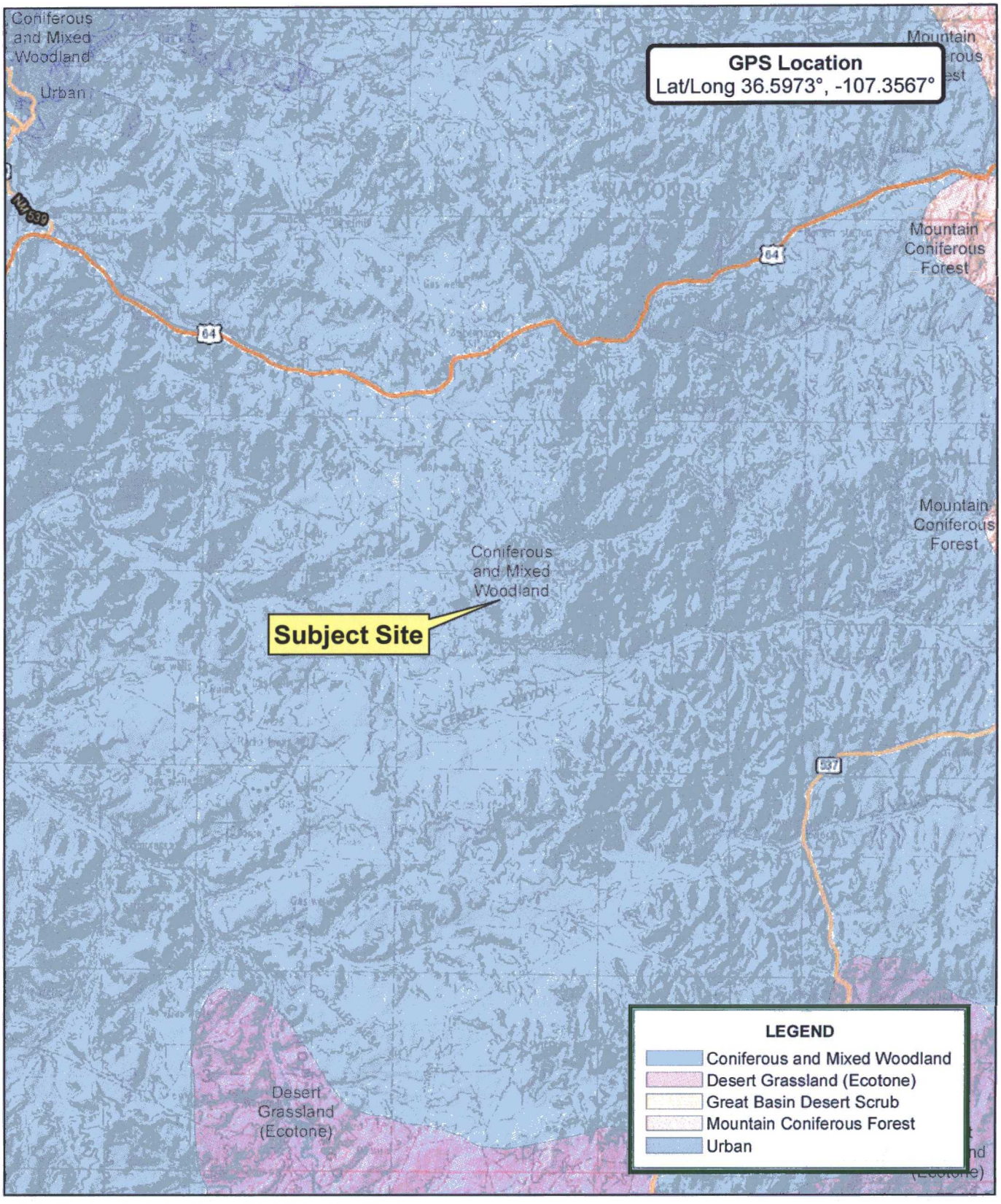
CONOCOPHILLIPS COMPANY
SAN JUAN 27-5 No. 1, RIO ARRIBA COUNTY, NM
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

11124687-2AS00
May 12, 2017

# CHEMICAL CONCENTRATIONS IN SOIL (0-10 FT BGS) - HHRA

FIGURE 5.3

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1112----\11124687-CoP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DL001.dwg




Source: Earth Data Analysis Center, University of New Mexico

0 2 4
Miles

Coordinate System:
NAD 1983 2011 StatePlane New Mexico Central FIPS 3002 Ft US

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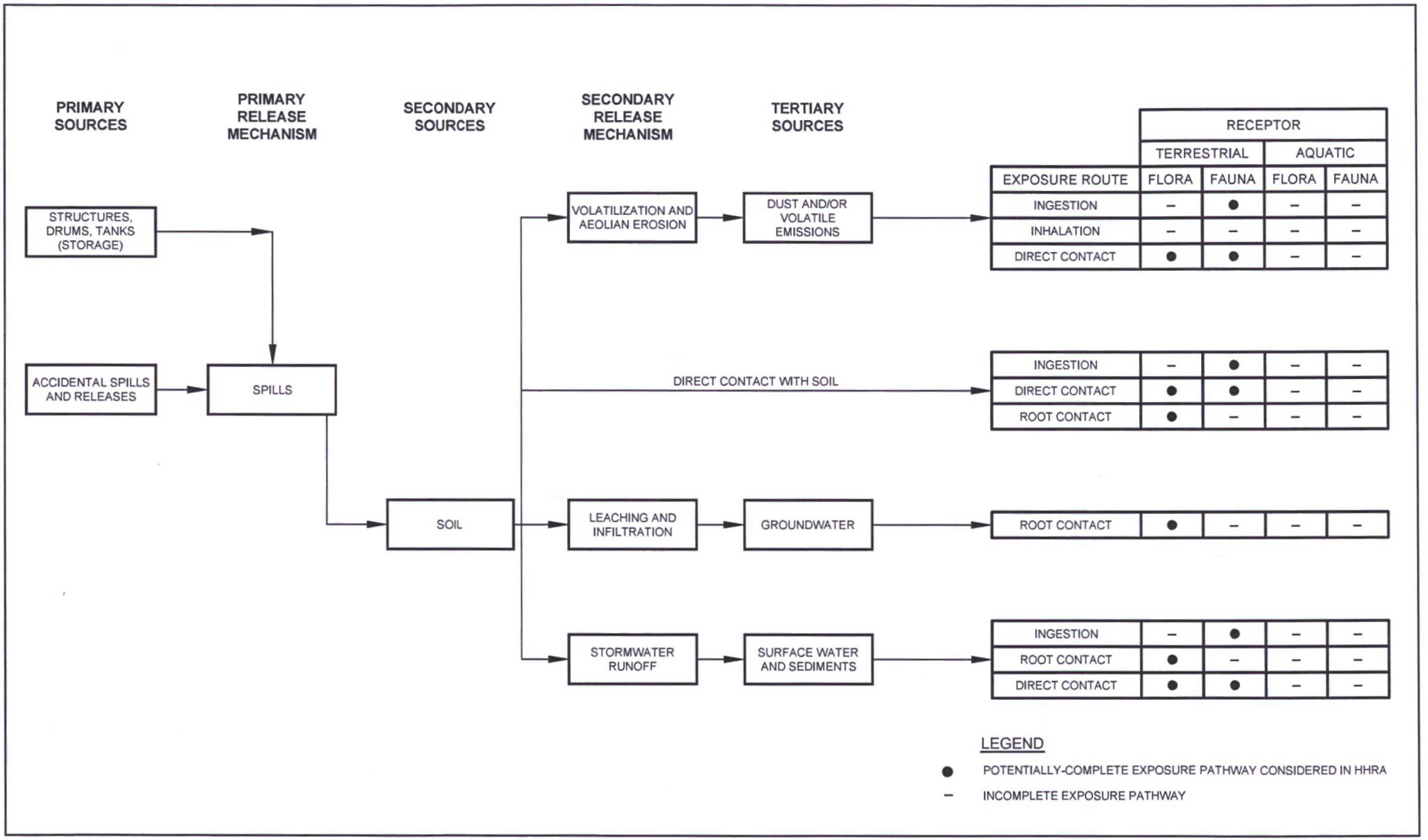
May 11, 2017

# GENERAL VEGETATION CLASSIFICATION MAP

FIGURE 6.1

GIS File: G:\GIS\Projects\8 digits\1112----\11124687-CoP_San Juan\11124687-00(001)GIS-DL001_Veg.mxd

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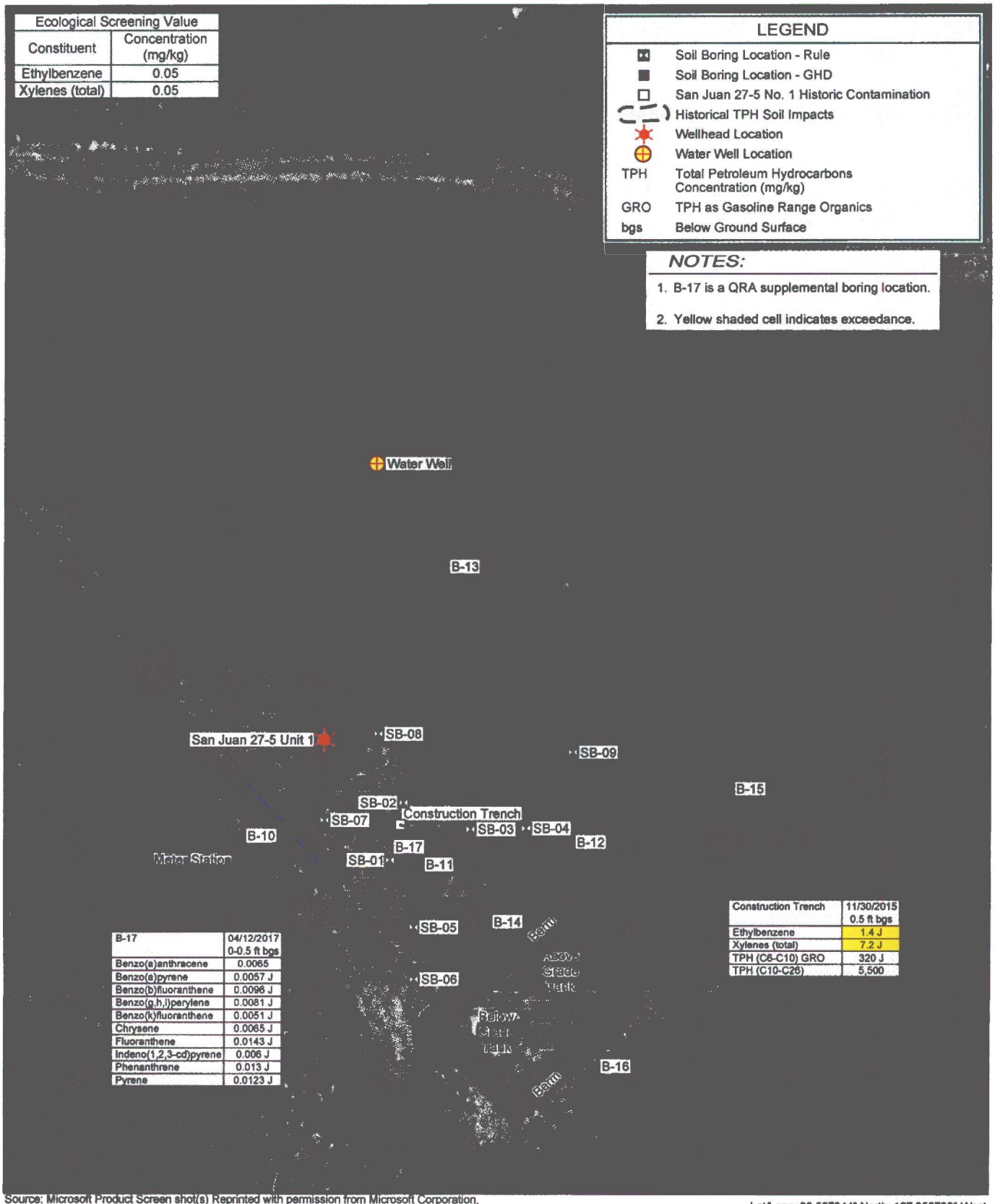
May 4, 2017

# CONCEPTUAL SITE MODEL FOR ECOLOGICAL RECEPTORS

FIGURE 6.2

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1112—\11124687-CoP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DL001.dwg




Source: Microsoft Product Screen shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2010, Accessed August 12, 2016.

Lat/Long: 36.597344° North, 107.356730° West

0 10 30ft

Coordinate System: NAD 1983 (2011) StatePlane- New Mexico Central (US Feet)

CONOCOPHILLIPS COMPANY
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HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

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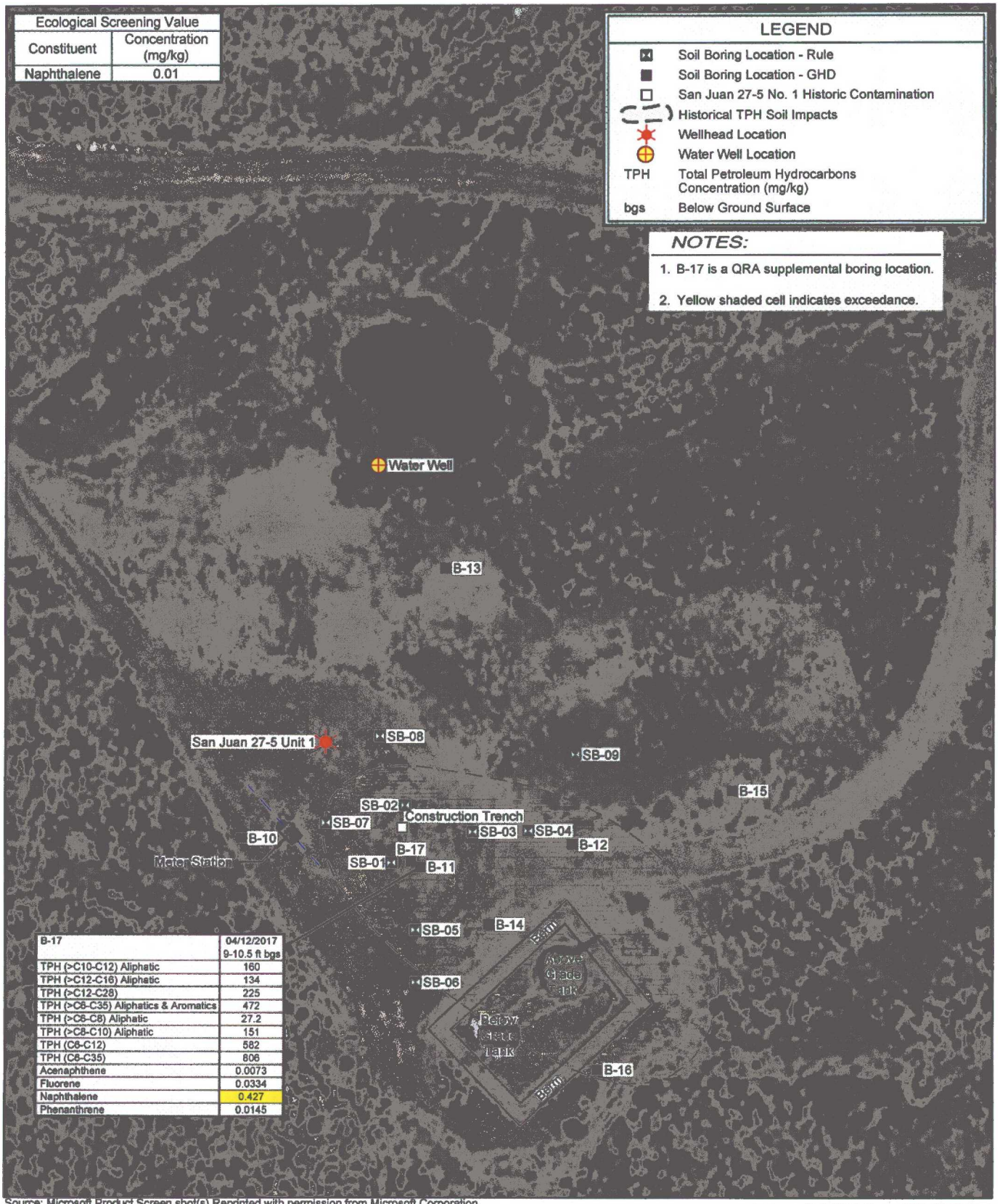
# CHEMICAL CONCENTRATIONS IN SOIL (0-1 FT BGS) - ERA

FIGURE 6.3

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1112----\11124687-CoP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DL001.dwg




Source: Microsoft Product Screen shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2010, Accessed August 12, 2016.

Lat/Long: 36.597344° North, 107.356730° West

0 10 30ft

Coordinate System: NAD 1983 (2011) StatePlane- New Mexico Central (US Feet)

GHD

CONOCOPHILLIPS COMPANY
SAN JUAN 27-5 No. 1, RIO ARRIBA COUNTY, NM
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

11124687-2AS00
May 12, 2017

# CHEMICAL CONCENTRATIONS IN SOIL (0-10 FT BGS) - ERA

FIGURE 6.4

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1112----\11124687-CoP-San Juan 27-5 No. 1\11124687-2AS00\11124687-2AS00(001)\11124687-2AS00(001)GN-DL001.dwg

# Tables

**Table 5.1**

**Potentially - Complete Exposure Pathway Scenarios Based on Identified COPCs**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Scenario/ Timeframe | Receptor Population | Receptor Age | Source Medium | Exposure Medium | Exposure Route | Rationale for Selection of Exposure Pathway |
|---|---|---|---|---|---|---|
| Current/Future | Construction/Utility Worker | Adult | Surface and Subsurface Soil (0 to > 2 ft BGS) | Soil | Ingestion of Soil | Potential exposure to impacted soil during ground-intrusive activities. |
| | | | | | Dermal Contact with Soil | |
| | | | | Ambient Air | Inhalation of Particulate Matter and Vapors | Potential exposure to vapor and soil dust during general activities. |
| | | | Sediment | Sediment | Ingestion of Sediment | Potential exposure to impacted sediment and surface water during construction/remediation activities. |
| | | | | | Dermal Contact with Sediment | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Surface Water | Water | Ingestion of Surface Water | |
| | | | | | Dermal Contact with Surface Water | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Groundwater | Water | Ingestion of Groundwater | Potential exposure to impacted groundwater during excavation activities. |
| | | | | | Dermal Contact with Groundwater | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | Outdoor Worker | Adult | Surface Soil (0 to 2 ft BGS) | Soil | Ingestion of Soil | Potential exposure to impacted soil during maintenance activities. |
| | | | | | Dermal Contact with Soil | |
| | | | | Ambient Air | Inhalation of Particulate Matter and Vapors | Potential exposure to vapors and soil dust during maintenance activities. |
| | | | Sediment | Sediment | Ingestion of Sediment | Potential exposure to impacted sediment and surface water during maintenance activities. |
| | | | | | Dermal Contact with Sediment | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Surface Water | Water | Ingestion of Surface Water | |
| | | | | | Dermal Contact with Surface Water | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Groundwater | Water | Ingestion of Groundwater | Potential exposure to impacted groundwater during maintenance activities. |
| | | | | | Dermal Contact with Groundwater | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | Trespasser | Young Adult | Surface and Subsurface Soil (0 to > 10 ft BGS) | Soil | Ingestion of Soil | Potential exposure to various media during trespassing activities, which includes events during active remediation. |
| | | | | | Dermal Contact with Soil | |
| | | | | Ambient Air | Inhalation of Particulate Matter and Vapors | |
| | | | Sediment | Sediment | Ingestion of Sediment | |
| | | | | | Dermal Contact with Sediment | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Surface Water | Water | Ingestion of Surface Water | |
| | | | | | Dermal Contact with Surface Water | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Groundwater | Water | Ingestion of Groundwater | |
| | | | | | Dermal Contact with Groundwater | |
| | | | | Ambient Air | Inhalation of Vapors | |
| Future | Resident | Child | Surface Soil (0 to 2 ft BGS) | Soil | Ingestion of Soil | Potential exposure to various media during general activities. |
| | | | | | Dermal Contact with Soil | |
| | | | | Indoor Air | Inhalation of Particulate Matter | |
| | | | | Produce/Beef | Ingestion of Vegetables and/or Beef | |
| | | | Sediment | Sediment | Ingestion of Sediment | |
| | | | | | Dermal Contact with Sediment | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Surface Water | Water | Ingestion of Surface Water | |
| | | | | | Dermal Contact with Surface Water | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Groundwater | Water | Ingestion of Groundwater | |
| | | | | | Dermal Contact with Groundwater | |
| | | | | Indoor Air | Inhalation of Vapors | |
| | | Adult | Surface Soil (0 to 2 ft BGS) | Soil | Ingestion of Soil | Potential exposure to various media during general activities. |
| | | | | | Dermal Contact with Soil | |
| | | | | Indoor Air | Inhalation of Particulate Matter | |
| | | | | Produce/Beef | Ingestion of Vegetables and/or Beef | |
| | | | Sediment | Sediment | Ingestion of Sediment | |
| | | | | | Dermal Contact with Sediment | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Surface Water | Water | Ingestion of Surface Water | |
| | | | | | Dermal Contact with Surface Water | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Groundwater | Water | Ingestion of Groundwater | |
| | | | | | Dermal Contact with Groundwater | |
| | | | | Indoor Air | Inhalation of Vapors | |
| | Indoor Worker | Adult | Surface Soil (0 to 2 ft BGS) | Soil | Ingestion of Soil Dust | Potential exposure to groundwater (via tap water), soil dust, and intruding vapors while working indoors. |
| | | | | | Dermal Contact with Soil Dust | |
| | | | | | Inhalation of Particulate Matter and Vapors | |
| | | | Groundwater | Water | Ingestion of Groundwater | |
| | | | | | Dermal Contact with Groundwater | |
| | | | | Ambient Air | Inhalation of Vapors | |
| | | | Sediment | Ambient Air | Inhalation of Vapors | |
| | | | Surface Water | Ambient Air | Inhalation of Vapors | |

Notes:

COPC = Constituent of Potential Concern
ft BGS = feet below ground surface

**Table 5.2**

**Assumptions for Construction/Utility Worker Exposure to Surface and Subsurface Soil (0 to >2 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Scenario Timeframe: Current/Future
Medium: Surface and Subsurface Soil
Exposure Medium: Soil/Ambient Air
Receptor Population: Construction/Utility Worker
Receptor Age: Adult (Age 16-30)

| Exposure Route | Parameter Code | Parameter Definition | Units | Exposure Assumption | Exposure Assumption Rationale/ Reference |
|---|---|---|---|---|---|
| Ingestion | IR | Ingestion Rate of Soil | mg/day | 330 | NEMD, 2017 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | days/year | 250 | NEMD, 2017 |
| | ED | Exposure Duration | years | 1 | NEMD, 2017 |
| | BW | Body Weight | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 365 | USEPA, 1989 |
| | ABSo | Absorption Factor | unitless | 1 | Professional Judgment (1) |
| Dermal | SA | Skin Surface Area Available for Contact | $cm^2$/event | 3,470 | NEMD, 2017 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | days/year | 250 | NEMD, 2017 |
| | ED | Exposure Duration | years | 1 | NEMD, 2017 |
| | BW | Body Weight | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 365 | USEPA, 1989 |
| | AF | Soil to Skin Adherence Factor | $mg/cm^2$ | 0.3 | NEMD, 2017 |
| | ABSd | Absorption Factor | unitless | Chemical-specific | (2) |
| Inhalation | FT | Fraction Time Exposed | unitless | 8/24 | Professional Judgment (3) |
| | EF | Exposure Frequency | days/year | 250 | NEMD, 2017 |
| | ED | Exposure Duration | years | 1 | NEMD, 2017 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 365 | USEPA, 1989 |
| | PEF | Particulate Emission Factor | $m^3/kg$ | 2.1E+06 | NEMD, 2017 |

Notes:

-- = Not Available or Applicable
ft BGS = feet below ground surface
(1) Conservatively assumes that all ingested soil is contaminated soil.
(2) Dermal absorption factor for TPH is 0.1 (USEPA, 2004 and Health Canada, 2004).
(3) Assumed an 8-hour work day.

References:

Health Canada, 2004: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), September 2004.
NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002, December 1989.
USEPA, 1997: Exposure Factors Handbook, August 1997.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.
USEPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.
USEPA, 2014: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 2014.

Table 5.3

**Assumptions for Outdoor Worker Exposure to Surface Soil (0 to 2 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Soil/Ambient Air
Receptor Population: Outdoor Worker
Receptor Age: Adult (Age 16-30)

| Exposure Route | Parameter Code | Parameter Definition | Units | Exposure Assumption | Exposure Assumption Rationale/ Reference |
|---|---|---|---|---|---|
| Ingestion | IR | Ingestion Rate of Soil | mg/day | 100 | NMED, 2017 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | days/year | 225 | NMED, 2017 |
| | ED | Exposure Duration | years | 25 | NMED, 2017 |
| | BW | Body Weight | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 9,125 | USEPA, 1989 |
| | ABSo | Absorption Factor | unitless | 1 | Professional Judgment (1) |
| Dermal | SA | Skin Surface Area Available for Contact | $cm^2$/event | 3,470 | USEPA, 2014 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | days/year | 225 | NMED, 2017 |
| | ED | Exposure Duration | years | 25 | NMED, 2017 |
| | BW | Body Weight | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 9,125 | USEPA, 1989 |
| | AF | Soil to Skin Adherence Factor | $mg/cm^2$ | 0.12 | NMED, 2017 |
| | ABSd | Absorption Factor | unitless | Chemical-specific | (2) |
| Inhalation | FT | Fraction Time Exposed | unitless | 8/24 | Professional Judgment (3) |
| | EF | Exposure Frequency | days/year | 225 | NMED, 2017 |
| | ED | Exposure Duration | years | 25 | NMED, 2017 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 9,125 | USEPA, 1989 |
| | PEF | Particulate Emission Factor | $m^3/kg$ | 6.61E+09 | NEMD, 2017 |

Notes:

-- = Not Available or Applicable
ft BGS = feet below ground surface
(1) Conservatively assumes that all ingested soil is contaminated soil.
(2) Dermal absorption factor for TPH is 0.1 (USEPA, 2004 and Health Canada, 2004).
(3) Assumed an 8-hour work day.

References:

Health Canada, 2004: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), September 2004.
NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR, EPA/540-1-89-002, December 1989.
USEPA, 1997: Exposure Factors Handbook, August 1997.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.
USEPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.
USEPA, 2014: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 2014.

## Assumptions for Indoor Worker Exposure to Surface Soil (0 to 2 ft bgs)
## HHRA: San Juan 27-5 No. 1
## ConocoPhillips Company
## Rio Arriba County, New Mexico

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Soil/Ambient Air
Receptor Population: Indoor Worker
Receptor Age: Adult (16 to 30 years)

| Exposure Route | Parameter Code | Parameter Definition | Units | Exposure Assumption | Exposure Assumption Rationale/ Reference |
|---|---|---|---|---|---|
| Ingestion | IR | Ingestion Rate of Soil Dust | mg/day | 50 | USEPA, 2002 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | days/year | 225 | NMED, 2017 |
| | ED | Exposure Duration | years | 25 | NMED, 2017 |
| | BW | Body Weight | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 9,125 | USEPA, 1989 |
| | ABSo | Absorption Factor | unitless | 1 | Professional Judgment (1) |
| Dermal | SA | Skin Surface Area Available for Contact | $cm^2$/event | 3,470 | USEPA, 2014 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | events/year | 225 | NMED, 2017 |
| | ED | Exposure Duration | years | 25 | NMED, 2017 |
| | BW | Body Weight | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 9,125 | USEPA, 1989 |
| | AF | Soil to Skin Adherence Factor | $mg/cm^2$ | 0.12 | USEPA, 2014 |
| | ABSd | Absorption Factor | unitless | Chemical-specific | (2) |
| Inhalation | FT | Fraction Time Exposed | unitless | 8/24 | Professional Judgment (3) |
| | EF | Exposure Frequency | days/year | 225 | NMED, 2017 |
| | ED | Exposure Duration | years | 25 | NMED, 2017 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 9,125 | USEPA, 2002 |
| | PEF | Particulate Emission Factor | $m^3/kg$ | 6.61E+09 | NEMD, 2017 |

Notes:

-- = Not Available or Applicable

ft BGS = feet below ground surface

(1) Conservatively assumes that all ingested soil is contaminated soil.

(2) Dermal absorption factor for TPH is 0.1 (USEPA, 2004 and Health Canada, 2004).

(3) Assumed a 8-hour work day.

References:

Health Canada, 2004: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), September 2004.

NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR, EPA/540-1-89-002, December 1989.

USEPA, 1997: Exposure Factors Handbook, August 1997.

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.

USEPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

USEPA, 2014: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 2014.

**TABLE 5.5**

**Assumptions for Trespasser Exposure to Surface and Subsurface Soil (0 to >2 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Scenario Timeframe: Current/Future
Medium: Surface and Subsurface Soil
Exposure Medium: Soil/Ambient Air
Receptor Population: Trespasser
Receptor Age: Young Adult (Age 6-16)

| Exposure Route | Parameter Code | Parameter Definition | Units | Exposure Assumption | Exposure Assumption Rationale/ Reference |
|---|---|---|---|---|---|
| Ingestion | IR | Ingestion Rate of Soil | mg/day | 100 | USEPA, 2002 (1) |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | days/year | 52 | DEQ, 2013 |
| | ED | Exposure Duration | years | 6 | DEQ, 2013 |
| | BW | Body Weight | kg | 52 | DEQ, 2013 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 2,190 | USEPA, 1989 |
| | ABSo | Absorption Factor | unitless | 1 | Professional Judgment (2) |
| Dermal | SA | Skin Surface Area Available for Contact | $cm^2$/event | 4,219 | USEPA, 2006 (3) |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | -- |
| | EF | Exposure Frequency | days/year | 52 | DEQ, 2013 |
| | ED | Exposure Duration | years | 6 | DEQ, 2013 |
| | BW | Body Weight | kg | 52 | DEQ, 2013 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 2,190 | USEPA, 1989 |
| | AF | Soil to Skin Adherence Factor | $mg/cm^2$ | 0.12 | USEPA, 2014 |
| | ABSd | Absorption Factor | unitless | Chemical-specific | (4) |
| Inhalation | FT | Fraction Time Exposed | unitless | 2.5/24 | Professional Judgment (5) |
| | EF | Exposure Frequency | days/year | 52 | DEQ, 2013 |
| | ED | Exposure Duration | years | 6 | DEQ, 2013 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NC | Averaging Time (non-cancer) | days | 2,190 | USEPA, 1989 |
| | PEF | Particulate Emission Factor | $m^3/kg$ | 6.61E+09 | NEMD, 2017 |

Notes:

-- = Not Available or Applicable
ft BGS = feet below ground surface
(1) Incidental ingestion of soil is assumed to be similar to that for an outdoor worker.
(2) Conservatively assumes that all ingested soil is contaminated soil.
(3) Based on male and female mean surface areas and percent body parts. Refer to Table 8-6 and Table 8-3 of USEPA (2006).
(4) Dermal absorption factor for TPH is 0.1 (USEPA, 2004 and Health Canada, 2004).
(5) Each trespassing event is assumed to last 2.5 hours.

References:

DEQ, 2013: Risk-Based Decision Making for Site Cleanup. DEQ's Facts Sheets, July 2013.
Health Canada, 2004: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), September 2004.
NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002, December 1989.
USEPA, 1997: Exposure Factors Handbook, August 1997.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.
USEPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, Ju
USEPA, 2006: Child-Specific Exposure Factors Handbook (External Review Draft), EPA-600-R06-096A, September 2006.
USEPA, 2014: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 2014.

**Assumptions for Resident Exposure to Surface Soil (0 to 2 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Soil/Ambient Air
Receptor Population: Resident
Receptor Age: Child and Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | Exposure Assumption | Exposure Assumption Rationale/ Reference |
|---|---|---|---|---|---|
| Ingestion | IRyc | Ingestion Rate of Soil - Young Child (Age 0-2) | mg/day | 200 | USEPA, 2002 |
| | IRc | Ingestion Rate of Soil - Child (Age 2-6) | mg/day | 200 | USEPA, 2002 |
| | IRya | Ingestion Rate of Soil - Young Adult (Age 6-16) | mg/day | 100 | USEPA, 2002 |
| | IRa | Ingestion Rate of Soil - Adult (Age 16-26) | mg/day | 100 | USEPA, 2002 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | – |
| | EF | Exposure Frequency | days/year | 350 | USEPA, 2004 |
| | EDyc | Exposure Duration - Young Child (Age 0-2) | years | 2 | USEPA, 2005 |
| | EDc | Exposure Duration - Child (Age 2-6) | years | 4 | USEPA, 2005 |
| | EDya | Exposure Duration - Young Adult (Age 6-16) | years | 10 | USEPA, 2005 |
| | EDa | Exposure Duration - Adult (Age 16-26) | years | 10 | USEPA, 2014 |
| | BWyc | Body Weight - Young Child (Age 0-2) | kg | 10 | USEPA, 2006 (1) |
| | BWc | Body Weight - Child (Age 2-6) | kg | 18 | USEPA, 2006 (1) |
| | BWya | Body Weight - Young Adult (Age 6-16) | kg | 44 | USEPA, 2006 (1) |
| | BWa | Body Weight - Adult (Age 16-26) | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NCyc | Averaging Time (non-cancer) - Young Child (Age 0-2) | days | 730 | USEPA, 1989 |
| | AT-NCc | Averaging Time (non-cancer) - Child (Age 2-6) | days | 1,460 | USEPA, 1989 |
| | AT-NCya | Averaging Time (non-cancer) - Young Adult (Age 6-16) | days | 3,650 | USEPA, 1989 |
| | AT-NCa | Averaging Time (non-cancer) - Adult (Age 16-26) | days | 3,650 | USEPA, 1989 |
| | ABSo | Absorption Factor | unitless | 1 | Professional Judgment (2) |
| Dermal | SAyc | Skin Surface Area Available for Contact - Young Child (Age 0-2) | $cm^2$/event | 1,297 | USEPA, 2006 (3) |
| | SAc | Skin Surface Area Available for Contact - Child (Age 2-6) | $cm^2$/event | 2,204 | USEPA, 2006 (3) |
| | SAya | Skin Surface Area Available for Contact - Young Adult (Age 6-16) | $cm^2$/event | 4,219 | USEPA, 2006 (3) |
| | SAa | Skin Surface Area Available for Contact - Adult (Age 16-26) | $cm^2$/event | 6,032 | USEPA, 2014 |
| | CF | Conversion Factor | kg/mg | 1.00E-06 | – |
| | EF | Exposure Frequency | days/year | 350 | USEPA, 2004 |
| | EDyc | Exposure Duration - Young Child (Age 0-2) | years | 2 | USEPA, 2005 |
| | EDc | Exposure Duration - Child (Age 2-6) | years | 4 | USEPA, 2005 |
| | EDya | Exposure Duration - Young Adult (Age 6-16) | years | 10 | USEPA, 2005 |
| | EDa | Exposure Duration - Adult (Age 16-26) | years | 10 | USEPA, 2014 |
| | BWyc | Body Weight - Young Child (Age 0-2) | kg | 10 | USEPA, 2006 (1) |
| | BWc | Body Weight - Child (Age 2-6) | kg | 18 | USEPA, 2006 (1) |
| | BWya | Body Weight - Young Adult (Age 6-16) | kg | 44 | USEPA, 2006 (1) |
| | BWa | Body Weight - Adult (Age 16-26) | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NCyc | Averaging Time (non-cancer) - Young Child (Age 0-2) | days | 730 | USEPA, 1989 |
| | AT-Ncc | Averaging Time (non-cancer) - Child (Age 2-6) | days | 1,460 | USEPA, 1989 |
| | AT-NCya | Averaging Time (non-cancer) - Young Adult (Age 6-16) | days | 3,650 | USEPA, 1989 |
| | AT-NCa | Averaging Time (non-cancer) - Adult (Age 16-26) | days | 3,650 | USEPA, 1989 |
| | AFyc | Soil to Skin Adherence Factor - Young Child (Age 0-2) | $mg/cm^2$ | 0.2 | USEPA, 2014 |
| | AFc | Soil to Skin Adherence Factor - Child (Age 2-6) | $mg/cm^2$ | 0.2 | USEPA, 2014 |
| | AFya | Soil to Skin Adherence Factor - Young Adult (Age 6-16) | $mg/cm^2$ | 0.07 | USEPA, 2014 |
| | AFa | Soil to Skin Adherence Factor - Adult (Age 16-26) | $mg/cm^2$ | 0.07 | USEPA, 2014 |
| | ABSd | Absorption Factor | unitless | Chemical-specific (4) | USEPA, 2004 |

**Assumptions for Resident Exposure to Surface Soil (0 to 2 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Soil/Ambient Air
Receptor Population: Resident
Receptor Age: Child and Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | Exposure Assumption | Exposure Assumption Rationale/ Reference |
|---|---|---|---|---|---|
| Inhalation | FT | Fraction Time Exposed | unitless | 3/24 | USEPA, 2006 (5) |
| | EF | Exposure Frequency | days/year | 350 | USEPA, 2002 |
| | EDyc | Exposure Duration - Young Child (Age 0-2) | years | 2 | USEPA, 2005 |
| | EDc | Exposure Duration - Child (Age 2-6) | years | 4 | USEPA, 2005 |
| | EDya | Exposure Duration - Young Adult (Age 6-16) | years | 10 | USEPA, 2005 |
| | EDa | Exposure Duration - Adult (Age 16-26) | years | 10 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | days | 25,550 | USEPA, 1989 |
| | AT-NCyc | Averaging Time (non-cancer) - Young Child (Age 0-2) | days | 730 | USEPA, 1989 |
| | AT-NCc | Averaging Time (non-cancer) - Child (Age 2-6) | days | 1,460 | USEPA, 1989 |
| | AT-NCya | Averaging Time (non-cancer) - Young Adult (Age 6-16) | days | 3,650 | USEPA, 1989 |
| | AT-NCa | Averaging Time (non-cancer) - Adult (Age 16-26) | days | 3,650 | USEPA, 1989 |
| | PEF | Particulate Emission Factor | $m^3/kg$ | 6.61E+09 | NEMD, 2017 |

Notes:

-- = Not Available or Applicable
ft BGS = feet below ground surface
(1) Body weights are average calculated weights based on male and female mean body weight, as indicated in USEPA (2006; Table 11-5).
(2) Professional Judgment; conservatively assumes all ingested soil is contaminated soil.
(3) Surface areas are average calculated areas based on male and female mean surface areas and percent body parts. Refer to Table 8-6 and Table 8-3 of USEPA (2006), respectively.
(4) Dermal absorption factor for TPH is 0.1 (USEPA, 2004 and Health Canada, 2004).
(5) Exposure time based on mean time spent outdoors for ages 3-5 yrs, and assumes that adult will spend the same amount of time outdoors with their child. Refer to Table 9-75 of USEPA (2006).

References:

Health Canada, 2004: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), September 2004.
NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR, EPA/540-1-89-002, December 1989.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.
USEPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.
USEPA, 2005: Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F, March 2005.
USEPA, 2006: Child-Specific Exposure Factors Handbook (External Review Draft), EPA-600-R06-096A, September 2006.
USEPA, 2014: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 2014.

**Table 5.7**

**Assumptions for Resident Exposure to Garden Produce**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Garden Produce
Receptor Population: Resident
Receptor Age: Child and Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | Exposure Assumption | Exposure Assumption Rationale/ Reference |
|---|---|---|---|---|---|
| Ingestion | $Pr_{ag}$ | Above-Ground Plant Concentration due to Root Uptake | mg/kg DW | Chemical-specific | USEPA, 2005b (1) |
| | $Pr_{bg}$ | Below-Ground Plant Concentration due to Root Uptake | mg/kg DW | Chemical-specific | USEPA, 2005b (1) |
| | CRagyc | Consumption Rate of Above-Ground Produce - Young Child (Age 0-2) | kg/day | 0.129 | USEPA, 1997a (2) |
| | CRagc | Consumption Rate of Above-Ground Produce - Child (Age 2-6) | kg/day | 0.233 | USEPA, 1997a (2) |
| | CRagya | Consumption Rate of Above-Ground Produce - Young Adult (Age 6-16) | kg/day | 0.188 | USEPA, 1997a (2) |
| | CRaga | Consumption Rate of Above-Ground Produce - Adult (Age 16-26) | kg/day | 0.341 | USEPA, 1997a (2) |
| | CRbgyc | Consumption Rate of Below-Ground Produce - Young Child (Age 0-2) | kg/day | 0.0715 | USEPA, 1997a (2) |
| | CRbgc | Consumption Rate of Below-Ground Produce - Child (Age 2-6) | kg/day | 0.129 | USEPA, 1997a (2) |
| | CRbgya | Consumption Rate of Below-Ground Produce - Young Adult (Age 6-16) | kg/day | 0.585 | USEPA, 1997a (2) |
| | CRbga | Consumption Rate of Below-Ground Produce - Adult (Age 16-26) | kg/day | 1.063 | USEPA, 1997a (2) |
| | $F_{ag}$ | Fraction of Above-Ground produce consumed that is homegrown | unitless | 0.063 | USEPA, 1997b (3) |
| | $F_{bg}$ | Fraction of Below-Ground produce consumed that is homegrown | unitless | 0.042 | USEPA, 1997b (3) |
| | EDyc | Exposure Duration - Young Child (Age 0-2) | years | 2 | USEPA, 2005a |
| | EDc | Exposure Duration - Child (Age 2-6) | years | 4 | USEPA, 2005a |
| | EDya | Exposure Duration - Young Adult (Age 6-16) | years | 10 | USEPA, 2005a |
| | EDa | Exposure Duration - Adult (Age 16-26) | years | 10 | USEPA, 2014 |
| | BWyc | Body Weight - Young Child (Age 0-2) | kg | 10 | USEPA, 2006 (4) |
| | BWc | Body Weight - Child (Age 2-6) | kg | 18 | USEPA, 2006 (4) |
| | BWya | Body Weight - Young Adult (Age 6-16) | kg | 44 | USEPA, 2006 (4) |
| | BWa | Body Weight - Adult (Age 16-26) | kg | 80 | USEPA, 2014 |
| | AT-C | Averaging Time (cancer) | years | 70 | USEPA, 1989 |
| | AT-NCyc | Averaging Time (non-cancer) - Young Child (Age 0-2) | years | 2 | USEPA, 1989 |
| | AT-NCc | Averaging Time (non-cancer) - Child (Age 2-6) | years | 4 | USEPA, 1989 |
| | AT-NCya | Averaging Time (non-cancer) - Young Adult (Age 6-16) | years | 10 | USEPA, 1989 |
| | AT-NCa | Averaging Time (non-cancer) - Adult (Age 16-26) | years | 10 | USEPA, 2014 |

Notes:

DW = dry weight

(1) Plant concentrations were calculated according to equations presented in USEPA (2005b). Refer to Tables 3.25 and 3.26 for COPCs after screening for consideration of garden produce exposure.

(2) Consumption rates of above- and below-ground produce were calculated from data in Tables 9-7, 9-8, 9-9, and 9-10 (for above-ground produce), and Table 9.11 (for below-ground produce) of USEPA (1997a). Results for children and adults are presented as the average of the 95th percentile data for <0, 0-2, and 3-5 year olds, and 6-11, 12-19, and 20-39 year olds, respectively. Values converted to kg/day by multiplying by body weight.

(3) Calculated from data presented for the Southern Region in Table 13.71 of USEPA (1997b). The fraction of home-produced above-ground produce is taken as the average of exposed and protected fruits and vegetables; the fraction of home-produced below-ground produce is the value for root vegetables.

(4) Body weights are average calculated weights based on male and female mean body weight as indicated in USEPA (2006; Table 11-5).

References:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR, EPA/540-1-89-002, December 1989.

USEPA, 1997a: Exposure Factors Handbook, Volume I, August 1997.

USEPA, 1997b: Exposure Factors Handbook, Volume II, August 1997.

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.

USEPA, 2005a: Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F, March 2005.

USEPA, 2005b: Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Office of Solid Waste and Emergency Response, United States Environmental Protection Agency, EPA530-R-05-006, September 2005.

USEPA, 2006: Child-Specific Exposure Factors Handbook (External Review Draft), EPA-600-R06-096A, September 2006.

USEPA, 2014: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 2014.

**Table 5.8**

**Non-Cancer Toxicity Data - Oral and Dermal Routes of Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Constituents of Potential Concern (COPC) | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor ($ABS_{GI}$) (1) | Absorbed Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/ Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (MMM-YY) |
|---|---|---|---|---|---|---|---|---|---|---|
| **TPH (by TX Method 1005)** | | | | | | | | | | |
| TPH (C6-C12; GRO) | Chronic | 4.00E-02 | mg/kg-d | 100% | 4.00E-02 | mg/kg-d | -- | -- | TCEQ | Jun-12 |
| TPH (>C12-C28; DRO) | Chronic | 4.00E-02 | mg/kg-d | 100% | 4.00E-02 | mg/kg-d | -- | -- | TCEQ | Jun-12 |
| TPH (>C28-C35; LOR) | Chronic | 4.00E-02 | mg/kg-d | 100% | 4.00E-02 | mg/kg-d | -- | -- | TCEQ | Jun-12 |
| **TPH (by TX Method 1006)** | | | | | | | | | | |
| Aliphatic (C6) | Chronic | 6.00E-02 | mg/kg-d | 100% | 6.00E-02 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C6-C8) | Chronic | 6.00E-02 | mg/kg-d | 100% | 6.00E-02 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C8-C10) | Chronic | 1.00E-01 | mg/kg-d | 100% | 1.00E-01 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C10-C12) | Chronic | 1.00E-01 | mg/kg-d | 100% | 1.00E-01 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C12-C16) | Chronic | 1.00E-01 | mg/kg-d | 100% | 1.00E-01 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C16-C21) | Chronic | 2.00E+00 | mg/kg-d | 100% | 2.00E+00 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C21-C35) | Chronic | 2.00E+00 | mg/kg-d | 100% | 2.00E+00 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C7-C8) | Chronic | 1.00E-01 | mg/kg-d | 100% | 1.00E-01 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C8-C10) | Chronic | 4.00E-02 | mg/kg-d | 100% | 4.00E-02 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C10-C12) | Chronic | 4.00E-02 | mg/kg-d | 100% | 4.00E-02 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C12-C16) | Chronic | 4.00E-02 | mg/kg-d | 100% | 4.00E-02 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C16-C21) | Chronic | 3.00E-02 | mg/kg-d | 100% | 3.00E-02 | mg/kg-d | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C21-C35) | Chronic | 3.00E-02 | mg/kg-d | 100% | 3.00E-02 | mg/kg-d | -- | -- | TCEQ | Mar-16 |

Notes:

-- Not Available or Applicable
DRO Diesel Range Organics
GRO Gasoline Range Organics
LOR Lube Oil Range
RfD Reference Dose
RSL Regional Screening Level
TCEQ Texas Commission on Environmental Quality
TPH Total Petroleum Hydrocarbons

(1) Percent gastrointestinal (GI) absorption ($ABS_{GI}$) as presented in Exhibit 4-1 of USEPA, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.
Note: If GI absorption is equal to or greater than 50%, a default value of 100% was used, as recommended in USEPA (2004). For parameters not presented in Exhibit 4-1, a default value of 100% was assumed.

(2) Absorbed Dermal RfD = Oral RfD x ($ABS_{GI}$/100), consistent with Equation 4.3 of USEPA (2004).

(3) USEPA has ruled that a reference dose is inappropriate for constituents without a threshold.
A default USEPA screening level of 800 mg/kg for soil is adopted as the screening level for industrial exposure scenarios.

References:

TCEQ, 2012: Texas Commission of Environmental Quality (TCEQ), Summary of Updates to the Tables Accompanying the Texas Risk Reduction Program (TRRP) Rule, http://www.tceq.texas.gov/assets/public/remediation/trrp/trrptoxpcls.pdf, June 2012.

TCEQ, 2016: Texas Commission on Environmental Quality (TCEQ), Texas Risk Reduction Program (TRRP) Protective Concentration Levels (PCLs), March 2016 PCL and Supporting Tables http://www.tceq.state.tx.us/remediation/trrp/trrppcls.html.

USEPA, 2004: RAGS Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

USEPA, 2015: Regional Screening Levels (RSLs), USEPA November 2015.

**Non-Cancer Toxicity Data - Inhalation Route of Exposure**
**HHRA: San Juan 27-5 No. 1**
**Conocophillips Company**
**Rio Arriba County, New Mexico**

| | Chronic/ Subchronic | Inhalation Value RfC | Units | Primary Target Organ | Combined Uncertainty/Modifying Factors | Source of RfC | Dates (MMM-YY) |
|---|---|---|---|---|---|---|---|
| **TPH (by TX Method 1005)** | | | | | | | |
| TPH (C6-C12; GRO) | Chronic | 2.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Jun-12 |
| TPH (>C12-C28; DRO) | Chronic | 2.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Jun-12 |
| TPH (>C28-C35; LOR) | Chronic | 2.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Jun-12 |
| **TPH (by TX Method 1006)** | | | | | | | |
| Aliphatic (C6) | Chronic | 6.70E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C6-C8) | Chronic | 6.70E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C8-C10) | Chronic | 5.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C10-C12) | Chronic | 5.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C12-C16) | Chronic | 5.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aliphatic (>C16-C21) | -- | -- | -- | -- | -- | -- | -- |
| Aliphatic (>C21-C35) | -- | -- | -- | -- | -- | -- | -- |
| Aromatic (>C7-C8) | Chronic | 1.90E+00 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C8-C10) | Chronic | 2.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C10-C12) | Chronic | 2.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C12-C16) | Chronic | 2.00E-01 | $mg/m^3$ | -- | -- | TCEQ | Mar-16 |
| Aromatic (>C16-C21) | -- | -- | -- | -- | -- | -- | -- |
| Aromatic (>C21-C35) | -- | -- | -- | -- | -- | -- | -- |

Notes:

-- Not Available or Applicable
DRO Diesel Range Organics
GRO Gasoline Range Organics
LOR Lube Oil Range
RfC Inhalation Reference Concentration
RSL Regional Screening Level
TCEQ Texas Commission on Environmental Quality
TPH Total Petroleum Hydrocarbons
(1) USEPA has ruled that a reference dose is inappropriate for constituents without a threshold.
A default USEPA screening level of 800 mg/kg for soil is adopted as the screening level for industrial exposure scenarios

References:

TCEQ, 2012: Texas Commission of Environmental Quality (TCEQ), Summary of Updates to the Tables Accompanying the Texas Risk Reduction Program (TRRP) Rule, http://www.tceq.texas.gov/assets/public/remediation/trrp/trrptoxpcls.pdf, June 2012.

TCEQ, 2016: Texas Commission on Environmental Quality (TCEQ), Texas Risk Reduction Program (TRRP) Protective Concentration Levels (PCLs), March 2016 PCL and Supporting Tables. http://www.tceq.state.tx.us/remediation/trrp/trrppcls.html.

USEPA, 2015: Regional Screening Levels (RSLs), USEPA November 2015.

**Table 5.10**

**Derivation of Site-Specific Cleanup Levels for Surface and Subsurface Soil (0 To >2 ft bgs) - Construction/Utility Worker Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data CSF Oral 1/(mg/kg-d) | CSF Dermal 1/(mg/kg-d) | URF Inhalation 1/(mg/m³) | Non-Cancer Toxicity Data RfD Oral (mg/kg-d) | RfD Dermal (mg/kg-d) | RfC Inhalation (mg/m³) | Absorption Factor ABSo Oral (%/100) | ABSd Dermal (%/100) | Particulate Emission Factor PEF (m³/kg) | Construction/Utility Worker TR Adult (mg/kg) | THQ Adult (mg/kg) | Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH (by TX1005)** | | | | | | | | | | | | | **3.21E+04** |
| TPH (C6-C12; GRO) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.07E+04 | – | 1.07E+04 |
| TPH (>C12-C28; DRO) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.07E+04 | – | 1.07E+04 |
| TPH (>C28-C35; LOR) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.07E+04 | – | 1.07E+04 |

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data CSF Oral 1/(mg/kg-d) | CSF Dermal 1/(mg/kg-d) | URF Inhalation 1/(mg/m³) | Non-Cancer Toxicity Data RfD Oral (mg/kg-d) | RfD Dermal (mg/kg-d) | RfC Inhalation (mg/m³) | Absorption Factor ABSo Oral (%/100) | ABSd Dermal (%/100) | Particulate Emission Factor PEF (m³/kg) | Construction/Utility Worker TR Adult (mg/kg) | THQ Adult (mg/kg) | Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH [2] (by TX1006) - TPHCWG Site-Specific Mass Fraction Approach as Implemented by TCEQ (2000)** | | | | | | | | | | | | SSCL for Total TPH (minimum of $SSCL_1$ and $SSCL_2$) = | **2.15E+04** |
| | | | | | | | | | | | | $SSCL_1$ (MFi/SSCLi) [2] = | 2.15E+04 |
| | | | | | | | | | | | | $SSCL_2$ (SSCLi/MFi) [3] = | 1.04E+05 |
| | | | | | | | | | | | | | TPH MFi |
| Aliphatic (C6) | – | – | – | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.61E+04 | 1.61E+04 | 2.03E-02 |
| Aliphatic (>C6-C8) | – | – | – | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.61E+04 | 1.61E+04 | 6.34E-02 |
| Aliphatic (>C8-C10) | – | – | – | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 2.67E+04 | 2.67E+04 | 2.43E-01 |
| Aliphatic (>C10-C12) | – | – | – | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 2.67E+04 | 2.67E+04 | 2.57E-01 |
| Aliphatic (>C12-C16) | – | – | – | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 2.67E+04 | 2.67E+04 | 2.17E-01 |
| Aliphatic (>C16-C21) | – | – | – | 2.00E+00 | 2.00E+00 | – | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 5.38E+05 | 5.38E+05 | 2.03E-02 |
| Aliphatic (>C21-C35) | – | – | – | 2.00E+00 | 2.00E+00 | – | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 5.38E+05 | 5.38E+05 | 4.07E-02 |
| Aromatic (>C7-C8) | – | – | – | 1.00E-01 | 1.00E-01 | 1.90E+00 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 2.69E+04 | 2.69E+04 | 4.70E-03 |
| Aromatic (>C8-C10) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.07E+04 | 1.07E+04 | 3.13E-02 |
| Aromatic (>C10-C12) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.07E+04 | 1.07E+04 | 2.03E-02 |
| Aromatic (>C12-C16) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 1.07E+04 | 1.07E+04 | 2.03E-02 |
| Aromatic (>C16-C21) | – | – | – | 3.00E-02 | 3.00E-02 | – | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 8.07E+03 | 8.07E+03 | 2.03E-02 |
| Aromatic (>C21-C35) | – | – | – | 3.00E-02 | 3.00E-02 | – | 1.00E+00 | 1.00E-01 | 2.10E+06 | NV | 8.07E+03 | 8.07E+03 | 4.07E-02 |

**Table 5.10**

**Derivation of Site-Specific Cleanup Levels for Surface and Subsurface Soil (0 To >2 ft bgs) - Construction/Utility Worker Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Notes:

| | |
|---|---|
| **BOLD** | Value indicates SSCL |
| – | Not Available or Applicable |
| ft BGS | feet below ground surface |
| DRO | Diesel Range Organics |
| GRO | Gasoline Range Organics |
| LOR | Lube Oil Range |
| NV | No Value |
| TPH | Total Petroleum Hydrocarbons |
| (1) | Final SSCL is the lower of the carcinogenic and noncarcinogenic concentrations; for TPH it is the lower of the TX1005 or TX1006 methods. |
| (2) | $SSCL_1$ is calculated as $SSCL_1$ = HI/Sum (MFi/SSCLi), following TCEQ (2000; Table 3, Equation 3-1). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18. |
| (3) | $SSCL_2$ is calculated as $SSCL_2$ = MIN(SSCLi/MFi), following TCEQ (2000; Table 3, Equation 3-2). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18. |

References:

NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.

DEQ, 2013: Risk-Based Decision Making for Site Cleanup, DEQ's Facts Sheets, July 2013.

TCEQ, 2000: Development of Human Health Protective Concentration Levels (PCLs) for Total Petroleum Hydrocarbon (TPH) Mixtures, Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance, Remediation, RG-366/TRRP-27, June 2000.

| Construction/Utility Worker Exposure Assumptions | Abbreviation | Value | Source |
|---|---|---|---|
| Site-Specific Cleanup Level for Soil (mg/kg) | $SSCL_{soil}$ | calculated | – |
| Target Risk Level (unitless) | TR | 1.0E-05 | NMED, 2017 |
| Target Hazard Level (unitless) | THQ | 1 | NMED, 2017 |
| Reference Dose (mg/kg-day) | RfD | chemical-specific | Table 5.8 |
| Reference Concentration (mg/m$^3$) | RfC | chemical-specific | Table 5.9 |
| Ingestion Rate (mg/day) | IR | 330 | Table 5.2 |
| Absorption Factor - Oral (%/100) | ABSo | chemical-specific | Table 5.2 |
| Surface Area Exposed (cm$^2$/day) | SA | 3470 | Table 5.2 |
| Adherence Factor (mg/cm$^2$) | AF | 0.3 | Table 5.2 |
| Absorption Factor - Dermal (%/100) | ABSd | chemical-specific | Table 5.2 |
| Fraction Time Exposed (unitless) | FT | 8/24 | Table 5.2 |
| Exposure Frequency (days/year) | EF | 250 | Table 5.2 |
| Exposure Duration (years) | ED | 1 | Table 5.2 |
| Body Weight (kg) | BW | 80 | Table 5.2 |
| Conversion Factor (kg/mg) | CF | 0.000001 | Table 5.2 |
| Averaging Time - carc. (days) | AT-C | 25550 | Table 5.2 |
| Averaging Time - noncarc. (days) | AT-NC | 365 | Table 5.2 |
| Particulate Emission Factor (m$^3$/kg) | PEF | Site-specific | Table 5.2 |

**Exposure Equations**

Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{TR \times AT\text{-}C}{EF \times ED \times [(CSF \times IR \times CF \times ABSo)/BW + (CSF \times SA \times AF \times CF \times ABSd)/BW + (URF \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{THQ \times AT\text{-}NC}{EF \times ED \times [((1/RfD) \times IR \times CF \times ABSo)/BW + ((1/RfD) \times SA \times AF \times CF \times ABSd)/BW + ((1/RfC) \times FT \times (1/PEF))]}$$

**Table 5.11**

**Derivation of Site-Specific Cleanup Levels for Surface Soil (0 To 2 ft bgs) - Outdoor Worker Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data CSF Oral 1/(mg/kg-d) | CSF Dermal 1/(mg/kg-d) | URF Inhalation 1/(mg/m³) | Non-Cancer Toxicity Data RfD Oral (mg/kg-d) | RfD Dermal (mg/kg-d) | RfC Inhalation (mg/m³) | Absorption Factor ABSo Oral (%/100) | ABSd Dermal (%/100) | Particulate Emission Factor PEF (m³/kg) | Outdoor Worker TR Adult (mg/kg) | Outdoor Worker THQ Adult (mg/kg) | Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH [2] (by TX1005)** | | | | | | | | | | | | | **1.10E+05** |
| TPH (C6-C12; GRO) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 3.66E+04 | – | 3.66E+04 |
| TPH (>C12-C28; DRO) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 3.66E+04 | – | 3.66E+04 |
| TPH (>C28-C35; LOR) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 3.66E+04 | – | 3.66E+04 |

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data CSF Oral 1/(mg/kg-d) | CSF Dermal 1/(mg/kg-d) | URF Inhalation 1/(mg/m³) | Non-Cancer Toxicity Data RfD Oral (mg/kg-d) | RfD Dermal (mg/kg-d) | RfC Inhalation (mg/m³) | Absorption Factor ABSo Oral (%/100) | ABSd Dermal (%/100) | Particulate Emission Factor PEF (m³/kg) | Outdoor Worker TR Adult (mg/kg) | Outdoor Worker THQ Adult (mg/kg) | Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH (by TX1006) - TPHCWG Site-Specific Mass Fraction Approach as Implemented by TCEQ (2000)** | | | | | | | | | | | | SSCL for Total TPH (minimum of $SSCL_1$ and $SSCL_2$) = | **7.34E+04** |
| | | | | | | | | | | | | $SSCL_1$ (MFi/SSCLi)[2] = | 7.34E+04 |
| | | | | | | | | | | | | $SSCL_2$ (SSCLi/MFi)[3] = | 3.56E+04 |
| | | | | | | | | | | | | | TPH MFi |
| Aliphatic (C6) | – | – | – | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.50E+04 | 5.50E+04 | 2.03E-02 |
| Aliphatic (>C6-C8) | – | – | – | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.50E+04 | 5.50E+04 | 6.34E-02 |
| Aliphatic (>C8-C10) | – | – | – | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.16E+04 | 9.16E+04 | 2.43E-01 |
| Aliphatic (>C10-C12) | – | – | – | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.16E+04 | 9.16E+04 | 2.57E-01 |
| Aliphatic (>C12-C16) | – | – | – | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.16E+04 | 9.16E+04 | 2.17E-01 |
| Aliphatic (>C16-C21) | – | – | – | 2.00E+00 | 2.00E+00 | – | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.83E+06 | 1.83E+06 | 2.03E-02 |
| Aliphatic (>C21-C35) | – | – | – | 2.00E+00 | 2.00E+00 | – | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.83E+06 | 1.83E+06 | 4.07E-02 |
| Aromatic (>C7-C8) | – | – | – | 1.00E-01 | 1.00E-01 | 1.90E+00 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.16E+04 | 9.16E+04 | 4.70E-03 |
| Aromatic (>C8-C10) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 3.66E+04 | 3.66E+04 | 3.13E-02 |
| Aromatic (>C10-C12) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 3.66E+04 | 3.66E+04 | 2.03E-02 |
| Aromatic (>C12-C16) | – | – | – | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 3.66E+04 | 3.66E+04 | 2.03E-02 |
| Aromatic (>C16-C21) | – | – | – | 3.00E-02 | 3.00E-02 | – | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.75E+04 | 2.75E+04 | 2.03E-02 |
| Aromatic (>C21-C35) | – | – | – | 3.00E-02 | 3.00E-02 | – | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.75E+04 | 2.75E+04 | 4.07E-02 |

**Table 5.11**

**Derivation of Site-Specific Cleanup Levels for Surface Soil (0 To 2 ft bgs) - Outdoor Worker Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Notes:

**BOLD** Value indicates SSCL
-- Not Available or Applicable
ft BGS feet below ground surface
DRO Diesel Range Organics
GRO Gasoline Range Organics
LOR Lube Oil Range
NV No Value
TPH Total Petroleum Hydrocarbons
(1) Final SSCL is the lower of the carcinogenic and noncarcinogenic concentrations; for TPH, it is the lower of the TX1005 or TX1006 methods; for lead, a default USEPA screening level of 800 mg/kg is adopted.
(2) $SSCL_1$ is calculated as $SSCL_1$ = HI/Sum (MFi/SSCLi), following TCEQ (2000: Table 3, Equation 3-1). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18.
(3) $SSCL_2$ is calculated as $SSCL_2$ = MIN(SSCLi/MFi), following TCEQ (2000; Table 3, Equation 3-2). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18.

References:

NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
DEQ, 2013: Risk-Based Decision Making for Site Cleanup, DEQ's Facts Sheets, July 2013.
TCEQ, 2000: Development of Human Health Protective Concentration Levels (PCLs) for Total Petroleum Hydrocarbon (TPH) Mixtures, Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance, Remediation, RG-366/TRRP-27, June 2000.

| Outdoor Worker Exposure Assumptions | Abbreviation | Value | Source |
|---|---|---|---|
| Site-Specific Cleanup Level for Soil (mg/kg) | $SSCL_{soil}$ | calculated | -- |
| Target Risk Level (unitless) | TR | 1.0E-05 | NMED, 2017 |
| Target Hazard Level (unitless) | THQ | 1 | NMED, 2017 |
| Reference Dose (mg/kg-day) | RfD | chemical-specific | Table 5.8 |
| Reference Concentration ($mg/m^3$) | RfC | chemical-specific | Table 5.9 |
| Ingestion Rate (mg/day) | IR | 100 | Table 5.3 |
| Absorption Factor - Oral (%/100) | ABSo | chemical-specific | Table 5.3 |
| Surface Area Exposed ($cm^2$/day) | SA | 3,470 | Table 5.3 |
| Adherence Factor ($mg/cm^2$) | AF | 0.12 | Table 5.3 |
| Absorption Factor - Dermal (%/100) | ABSd | chemical-specific | Table 5.3 |
| Fraction Time Exposed (unitless) | FT | 8/24 | Table 5.3 |
| Exposure Frequency (days/year) | EF | 225 | Table 5.3 |
| Exposure Duration (years) | ED | 25 | Table 5.3 |
| Body Weight (kg) | BW | 80 | Table 5.3 |
| Conversion Factor (kg/mg) | CF | 1.0E-06 | Table 5.3 |
| Averaging Time - carc. (days) | AT-C | 25,550 | Table 5.3 |
| Averaging Time - noncarc. (days) | AT-NC | 9,125 | Table 5.3 |
| Particulate Emission Factor ($m^3$/kg) | PEF | 6.61E+09 | Table 5.3 |

**Exposure Equations**

Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{TR \times AT\text{-}C}{EF \times ED \times [(CSF \times IR \times CF \times ABSo)/BW + (CSF \times SA \times AF \times CF \times ABSd)/BW + (URF \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{THQ \times AT\text{-}NC}{EF \times ED \times [((1/RfD) \times IR \times CF \times ABSo)/BW + ((1/RfD) \times SA \times AF \times CF \times ABSd)/BW + ((1/RfC) \times FT \times (1/PEF))]}$$

**Table 5.12**

**Derivation of Site-Specific Cleanup Levels for Surface Soil (0 To 2 ft bgs) - Indoor Worker Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data | | | Non-Cancer Toxicity Data | | | Absorption Factor | | Particulate Emission Factor | Indoor Worker | | Cleanup Level per TPH Mass Fraction | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CSF | | URF | RfD | | RfC | ABSo | ABSd | | TR | THQ | | |
| | Oral | Dermal | Inhalation | Oral | Dermal | Inhalation | Oral | Dermal | PEF | Adult | Adult | | |
| | 1/(mg/kg-d) | 1/(mg/kg-d) | 1/($mg/m^3$) | (mg/kg-d) | (mg/kg-d) | ($mg/m^3$) | (%/100) | (%/100) | ($m^3$/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) |
| **Total TPH (by TX1005)** | | | | | | | | | | | | | **1.70E+05** |
| TPH (C6-C12; GRO) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.66E+04 | -- | 5.66E+04 |
| TPH (>C12-C28; DRO) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.66E+04 | -- | 5.66E+04 |
| TPH (>C28-C35; LOR) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.66E+04 | -- | 5.66E+04 |

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data | | | Non-Cancer Toxicity Data | | | Absorption Factor | | Particulate Emission Factor | Indoor Worker | | Cleanup Level per TPH Mass Fraction | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CSF | | URF | RfD | | RfC | ABSo | ABSd | | TR | THQ | | | |
| | Oral | Dermal | Inhalation | Oral | Dermal | Inhalation | Oral | Dermal | PEF | Adult | Adult | | | |
| | 1/(mg/kg-d) | 1/(mg/kg-d) | 1/($mg/m^3$) | (mg/kg-d) | (mg/kg-d) | ($mg/m^3$) | (%/100) | (%/100) | ($m^3$/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | |
| **Total TPH[2] (by TX1006) - TPHCWG Site-Specific Mass Fraction Approach as Implemented by TCEQ (2000)** | | | | | | | | | | | | SSCL for Total TPH (minimum of $SSCL_1$ and $SSCL_2$) = | **1.13E+05** | |
| | | | | | | | | | | | | $SSCL_1$ (MFi/SSCLi)[2] = | 1.13E+05 | |
| | | | | | | | | | | | | $SSCL_2$ (SSCLi/MFi)[3] = | 5.51E+05 | |
| | | | | | | | | | | | | | | TPH MFi |
| Aliphatic (C6) | -- | -- | -- | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 8.50E+04 | 8.50E+04 | | 2.03E-02 |
| Aliphatic (>C6-C8) | -- | -- | -- | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 8.50E+04 | 8.50E+04 | | 6.34E-02 |
| Aliphatic (>C8-C10) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.42E+05 | 1.42E+05 | | 2.43E-01 |
| Aliphatic (>C10-C12) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.42E+05 | 1.42E+05 | | 2.57E-01 |
| Aliphatic (>C12-C16) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.42E+05 | 1.42E+05 | | 2.17E-01 |
| Aliphatic (>C16-C21) | -- | -- | -- | 2.00E+00 | 2.00E+00 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.83E+06 | 2.83E+06 | | 2.03E-02 |
| Aliphatic (>C21-C35) | -- | -- | -- | 2.00E+00 | 2.00E+00 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.83E+06 | 2.83E+06 | | 4.07E-02 |
| Aromatic (>C7-C8) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 1.90E+00 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.42E+05 | 1.42E+05 | | 4.70E-03 |
| Aromatic (>C8-C10) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.66E+04 | 5.66E+04 | | 3.13E-02 |
| Aromatic (>C10-C12) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.66E+04 | 5.66E+04 | | 2.03E-02 |
| Aromatic (>C12-C16) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 5.66E+04 | 5.66E+04 | | 2.03E-02 |
| Aromatic (>C16-C21) | -- | -- | -- | 3.00E-02 | 3.00E-02 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 4.25E+04 | 4.25E+04 | | 2.03E-02 |
| Aromatic (>C21-C35) | -- | -- | -- | 3.00E-02 | 3.00E-02 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 4.25E+04 | 4.25E+04 | | 4.07E-02 |

**Table 5.12**

**Derivation of Site-Specific Cleanup Levels for Surface Soil (0 To 2 ft bgs) - Indoor Worker Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Notes:

**BOLD** Value indicates SSCL
– Not Available or Applicable
ft BGS feet below ground surface
DRO Diesel Range Organics
GRO Gasoline Range Organics
LOR Lube Oil Range
NV No Value
TPH Total Petroleum Hydrocarbons
(1) Final SSCL is the lower of the carcinogenic and noncarcinogenic concentrations; for TPH, it is the lower of the TX1005 or TX1006 methods; for lead, a default USEPA screening level of 800 mg/kg is adopted.
(2) $SSCL_1$ is calculated as $SSCL_1$ = HI/Sum (MFi/SSCLi), following TCEQ (2000; Table 3, Equation 3-1). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18
(3) $SSCL_2$ is calculated as $SSCL_2$ = MIN(SSCLi/MFi), following TCEQ (2000; Table 3, Equation 3-2). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18.

References:

NMED, 2015: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, July 2015.
DEQ, 2013: Risk-Based Decision Making for Site Cleanup, DEQ's Facts Sheets, July 2013.
TCEQ, 2000: Development of Human Health Protective Concentration Levels (PCLs) for Total Petroleum Hydrocarbon (TPH) Mixtures, Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance, Remediation, RG-366/TRRP-27, June 2000.

| Indoor Worker Exposure Assumptions | Abbreviation | Value | Source |
|---|---|---|---|
| Site-Specific Cleanup Level for Soil (mg/kg) | $SSCL_{soil}$ | calculated | – |
| Target Risk Level (unitless) | TR | 1.0E-05 | NMED, 2017 |
| Target Hazard Level (unitless) | THQ | 1 | NMED, 2017 |
| Reference Dose (mg/kg-day) | RfD | chemical-specific | Table 5.8 |
| Reference Concentration ($mg/m^3$) | RfC | chemical-specific | Table 5.9 |
| Ingestion Rate (mg/day) | IR | 50 | Table 5.4 |
| Absorption Factor - Oral (%/100) | ABSo | chemical-specific | Table 5.4 |
| Surface Area Exposed ($cm^2$/day) | SA | 3,470 | Table 5.4 |
| Adherence Factor ($mg/cm^2$) | AF | 0.12 | Table 5.4 |
| Absorption Factor - Dermal (%/100) | ABSd | chemical-specific | Table 5.4 |
| Fraction Time Exposed (unitless) | FT | 8/24 | Table 5.4 |
| Exposure Frequency (days/year) | EF | 225 | Table 5.4 |
| Exposure Duration (years) | ED | 25 | Table 5.4 |
| Body Weight (kg) | BW | 80 | Table 5.4 |
| Conversion Factor (kg/mg) | CF | 1.0E-06 | Table 5.4 |
| Averaging Time - carc. (days) | AT-C | 25,550 | Table 5.4 |
| Averaging Time - noncarc. (days) | AT-NC | 9,125 | Table 5.4 |
| Particulate Emission Factor ($m^3$/kg) | PEF | 6.61E+09 | Table 5.4 |

**Exposure Equations**

Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{TR \times AT\text{-}C}{EF \times ED \times [(CSF \times IR \times CF \times ABSo)/BW + (CSF \times SA \times AF \times CF \times ABSd)/BW + (URF \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{THQ \times AT\text{-}NC}{EF \times ED \times [((1/RfD) \times IR \times CF \times ABSo)/BW + ((1/RfD) \times SA \times AF \times CF \times ABSd)/BW + ((1/RfC) \times FT \times (1/PEF))]}$$

Table 5.13

Derivation of Site-Specific Cleanup Levels For Surface and Subsurface Soil (0 To >2 ft bgs) - Trespasser Oral, Dermal, and Dust Inhalation Exposure
HHRA: San Juan 27-5 No. 1
ConocoPhillips Company
Rio Arriba County, New Mexico

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data CSF Oral 1/(mg/kg-d) | CSF Dermal 1/(mg/kg-d) | URF Inhalation 1/(mg/m$^3$) | Non-Cancer Toxicity Data RfD Oral (mg/kg-d) | RfD Dermal (mg/kg-d) | RfC Inhalation (mg/m$^3$) | Absorption Factor ABSo Oral (%/100) | ABSd Dermal (%/100) | Particulate Emission Factor PEF (m$^3$/kg) | Trespasser TR Youth (mg/kg) | THQ Youth (mg/kg) | Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH (by TX1005)** | | | | | | | | | | | | | 2.91E+05 |
| TPH (C6-C12; GRO) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.69E+04 | -- | 9.69E+04 |
| TPH (>C12-C28; DRO) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.69E+04 | -- | 9.69E+04 |
| TPH (>C28-C35; LOR) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.69E+04 | -- | 9.69E+04 |

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data CSF Oral 1/(mg/kg-d) | CSF Dermal 1/(mg/kg-d) | URF Inhalation 1/(mg/m$^3$) | Non-Cancer Toxicity Data RfD Oral (mg/kg-d) | RfD Dermal (mg/kg-d) | RfC Inhalation (mg/m$^3$) | Absorption Factor ABSo Oral (%/100) | ABSd Dermal (%/100) | Particulate Emission Factor PEF (m$^3$/kg) | Trespasser TR Youth (mg/kg) | THQ Youth (mg/kg) | Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$)[1] (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH[2] (by TX1006) - TPHCWG Site-Specific Mass Fraction Approach as Implemented by TCEQ (2000)** | | | | | | | | | | | | SSCL for Total TPH (minimum of $SSCL_1$ and $SSCL_2$) = | 1.94E+05 |
| | | | | | | | | | | | | $SSCL_1$ (MFi/SSCLi)[2] = | 1.94E+05 |
| | | | | | | | | | | | | $SSCL_2$ (SSCLi/MFi)[3] = | 9.42E+05 |
| | | | | | | | | | | | | | TPH MFi |
| Aliphatic (C6) | -- | -- | -- | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.45E+05 | 1.45E+05 | 2.03E-02 |
| Aliphatic (>C6-C8) | -- | -- | -- | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.45E+05 | 1.45E+05 | 6.34E-02 |
| Aliphatic (>C8-C10) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.42E+05 | 2.42E+05 | 2.43E-01 |
| Aliphatic (>C10-C12) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.42E+05 | 2.42E+05 | 2.57E-01 |
| Aliphatic (>C12-C16) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.42E+05 | 2.42E+05 | 2.17E-01 |
| Aliphatic (>C16-C21) | -- | -- | -- | 2.00E+00 | 2.00E+00 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 4.85E+06 | 4.85E+06 | 2.03E-02 |
| Aliphatic (>C21-C35) | -- | -- | -- | 2.00E+00 | 2.00E+00 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 4.85E+06 | 4.85E+06 | 4.07E-02 |
| Aromatic (>C7-C8) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 1.90E+00 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.42E+05 | 2.42E+05 | 4.70E-03 |
| Aromatic (>C8-C10) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.69E+04 | 9.69E+04 | 3.13E-02 |
| Aromatic (>C10-C12) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.69E+04 | 9.69E+04 | 2.03E-02 |
| Aromatic (>C12-C16) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 9.69E+04 | 9.69E+04 | 2.03E-02 |
| Aromatic (>C16-C21) | -- | -- | -- | 3.00E-02 | 3.00E-02 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 7.27E+04 | 7.27E+04 | 2.03E-02 |
| Aromatic (>C21-C35) | -- | -- | -- | 3.00E-02 | 3.00E-02 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 7.27E+04 | 7.27E+04 | 4.07E-02 |

**Table 5.13**

**Derivation of Site-Specific Cleanup Levels For Surface and Subsurface Soil (0 To >2 ft bgs) - Trespasser Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Notes:

**BOLD** Value indicates SSCL
-- Not Available or Applicable
ft BGS feet below ground surface
DRO Diesel Range Organics
GRO Gasoline Range Organics
LOR Lube Oil Range
NV No Value
TPH Total Petroleum Hydrocarbons
(1) Final SSCL is the lower of the carcinogenic and noncarcinogenic concentrations; for TPH, it is the lower of the TX1005 or TX1006 methods.
(2) $SSCL_1$ is calculated as $SSCL_1$ = HI/Sum (MFi/SSCLi), following TCEQ (2000; Table 3, Equation 3-1). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18.
(3) $SSCL_2$ is calculated as $SSCL_2$ = MIN(SSCLi/MFi), following TCEQ (2000; Table 3, Equation 3-2). The mass fraction (MFi) results for soil samples taken from a TPH source is reported in Table 5.18.

References:

NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
DEQ, 2013: Risk-Based Decision Making for Site Cleanup, DEQ's Facts Sheets, July 2013.
TCEQ, 2000: Development of Human Health Protective Concentration Levels (PCLs) for Total Petroleum Hydrocarbon (TPH) Mixtures, Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance, Remediation, RG-366/TRRP-27, June 2000.

| Trespasser Exposure Assumptions | Abbreviation | Value | Source |
|---|---|---|---|
| Site-Specific Cleanup Level for Soil (mg/kg) | $SSCL_{soil}$ | calculated | -- |
| Target Risk Level (unitless) | TR | 1.0E-05 | NMED, 2017 |
| Target Hazard Level (unitless) | THQ | 1 | NMED, 2017 |
| Reference Dose (mg/kg-day) | RfD | chemical-specific | Table 5.8 |
| Reference Concentration (mg/m$^3$) | RfC | chemical-specific | Table 5.9 |
| Ingestion Rate (mg/day) | IR | 100 | Table 5.5 |
| Absorption Factor - Oral (%/100) | ABSo | chemical-specific | Table 5.5 |
| Surface Area Exposed (cm$^2$/day) | SA | 4,219 | Table 5.5 |
| Adherence Factor (mg/cm$^2$) | AF | 0.12 | Table 5.5 |
| Absorption Factor - Dermal (%/100) | ABSd | chemical-specific | Table 5.5 |
| Fraction Time Exposed (unitless) | FT | 2.5/24 | Table 5.5 |
| Exposure Frequency (days/year) | EF | 52 | Table 5.5 |
| Exposure Duration (years) | ED | 6 | Table 5.5 |
| Body Weight (kg) | BW | 52 | Table 5.5 |
| Conversion Factor (kg/mg) | CF | 1.0E-06 | Table 5.5 |
| Averaging Time - carc. (days) | AT-C | 25,550 | Table 5.5 |
| Averaging Time - noncarc. (days) | AT-NC | 2,190 | Table 5.5 |
| Particulate Emission Factor (m$^3$/kg) | PEF | 6.61E+09 | Table 5.5 |

**Exposure Equations**

Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{TR \times AT\text{-}C}{EF \times ED \times [(CSF \times IR \times CF \times ABSo)/BW + (CSF \times SA \times AF \times CF \times ABSd)/BW + (URF \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$SSCL_{soil} = \frac{THQ \times AT\text{-}NC}{EF \times ED \times MF \times [((1/RfD) \times IR \times CF \times ABSo)/BW + ((1/RfD) \times SA \times AF \times CF \times ABSd)/BW + ((1/RfC) \times FT \times (1/PEF))]}$$

Table 5.14

**Derivation of Site-Specific Cleanup Levels for Surface Soil (0 To 2 ft bgs) - Residential Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Constituents of Potential Concern (COPC) | Mutagenic Compound Yes or No | Cancer Toxicity Data | | | Non-Cancer Toxicity Data | | | Absorption Factor | | Particulate Emission Factor | Resident | | | | | TPH Mass Fraction | Cleanup Level per TPH Mass Fraction | Site-Specific Cleanup Level for Soil ($SSCL_{sos}$)[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CSF | | URF | RfD | | RfC | ABSo | ABSd | | TR Lifetime[1] | THQ Young Child (0-2 yrs) | THQ Child (2-6 yrs) | THQ Adolescent (6-16 yrs) | THQ Adult (16-26 yrs) | | | |
| | | Oral 1/(mg/kg-d) | Dermal 1/(mg/kg-d) | Inhalation 1/($mg/m^3$) | Oral (mg/kg-d) | Dermal (mg/kg-d) | Inhalation ($mg/m^3$) | Oral (%/100) | Dermal (%/100) | PEF ($m^3/kg$) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) |
| **Total TPH[3] (by TX1005)** | | | | | | | | | | | | | | | | | | |
| TPH (C6-C12; GRO) | No | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.77E+03 | 2.56E+03 | 2.58E+04 | 2.35E+04 | -- | -- | **7.69E+03** |
| TPH (>C12-C28; DRO) | No | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.77E+03 | 2.56E+03 | 2.58E+04 | 2.35E+04 | -- | -- | 2.56E+03 |
| TPH (>C28-C35; LOR) | No | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.77E+03 | 2.56E+03 | 2.58E+04 | 2.35E+04 | -- | -- | 2.56E+03 |

| Constituents of Potential Concern (COPC) | Cancer Toxicity Data | | | Non-Cancer Toxicity Data | | | Absorption Factor | | Particulate Emission Factor | Resident | | | | | TPH Mass Fraction | Cleanup Level per TPH Mass Fraction | Site-Specific Cleanup Level for Soil ($SSCL_{sos}$)[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CSF | | URF | RfD | | RfC | ABSo | ABSd | | TR Lifetime[1] | THQ Young Child (0-2 yrs) | THQ Child (2-6 yrs) | THQ Adolescent (6-16 yrs) | THQ Adult (16-30 yrs) | | | |
| | Oral 1/(mg/kg-d) | Dermal 1/(mg/kg-d) | Inhalation 1/($mg/m^3$) | Oral (mg/kg-d) | Dermal (mg/kg-d) | Inhalation ($mg/m^3$) | Oral (%/100) | Dermal (%/100) | PEF ($m^3/kg$) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) |
| **Total TPH[3] (by TX1006) - TPHCWG Site-Specific Mass Fraction Approach as Implemented by TCEQ (2000)** | | | | | | | | | | | | | | | | | SSCL for Total TPH (minimum of $SSCL_1$ and $SSCL_2$) = **5.14E+03** |
| | | | | | | | | | | | | | | | | | $SSCL_1$ (MFi/SSCLi)[4] = 5.14E+03 |
| | | | | | | | | | | | | | | | | | $SSCL_2$ (SSCLi/MFi)[5] = 2.49E+04 |
| | | | | | | | | | | | | | | | | | TPH MFi |
| Aliphatic (C6) | -- | -- | -- | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 4.15E+03 | 3.85E+03 | 3.86E+04 | 3.52E+04 | 3.85E+03 | 3.85E+03 | 2.03E-02 |
| Aliphatic (>C6-C8) | -- | -- | -- | 6.00E-02 | 6.00E-02 | 6.70E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 4.15E+03 | 3.85E+03 | 3.86E+04 | 3.52E+04 | 3.85E+03 | 3.85E+03 | 6.34E-02 |
| Aliphatic (>C8-C10) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 6.92E+03 | 6.41E+03 | 6.44E+04 | 5.87E+04 | 6.41E+03 | 6.41E+03 | 2.43E-01 |
| Aliphatic (>C10-C12) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 6.92E+03 | 6.41E+03 | 6.44E+04 | 5.87E+04 | 6.41E+03 | 6.41E+03 | 2.57E-01 |
| Aliphatic (>C12-C16) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 5.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 6.92E+03 | 6.41E+03 | 6.44E+04 | 5.87E+04 | 6.41E+03 | 6.41E+03 | 2.17E-01 |
| Aliphatic (>C16-C21) | -- | -- | -- | 2.00E+00 | 2.00E+00 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.38E+05 | 1.28E+05 | 1.29E+06 | 1.17E+06 | 1.28E+05 | 1.28E+05 | 2.03E-02 |
| Aliphatic (>C21-C35) | -- | -- | -- | 2.00E+00 | 2.00E+00 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 1.38E+05 | 1.28E+05 | 1.29E+06 | 1.17E+06 | 1.28E+05 | 1.28E+05 | 4.07E-02 |
| Aromatic (>C7-C8) | -- | -- | -- | 1.00E-01 | 1.00E-01 | 1.90E+00 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 6.92E+03 | 6.41E+03 | 6.44E+04 | 5.87E+04 | 6.41E+03 | 6.41E+03 | 4.70E-03 |
| Aromatic (>C8-C10) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.77E+03 | 2.56E+03 | 2.58E+04 | 2.35E+04 | 2.56E+03 | 2.56E+03 | 3.13E-02 |
| Aromatic (>C10-C12) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.77E+03 | 2.56E+03 | 2.58E+04 | 2.35E+04 | 2.56E+03 | 2.56E+03 | 2.03E-02 |
| Aromatic (>C12-C16) | -- | -- | -- | 4.00E-02 | 4.00E-02 | 2.00E-01 | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.77E+03 | 2.56E+03 | 2.58E+04 | 2.35E+04 | 2.56E+03 | 2.56E+03 | 2.03E-02 |
| Aromatic (>C16-C21) | -- | -- | -- | 3.00E-02 | 3.00E-02 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.08E+03 | 1.92E+03 | 1.93E+04 | 1.76E+04 | 1.92E+03 | 1.92E+03 | 2.03E-02 |
| Aromatic (>C21-C35) | -- | -- | -- | 3.00E-02 | 3.00E-02 | -- | 1.00E+00 | 1.00E-01 | 6.61E+09 | NV | 2.08E+03 | 1.92E+03 | 1.93E+04 | 1.76E+04 | 1.92E+03 | 1.92E+03 | 4.07E-02 |

**Table 5.14**

**Derivation of Site-Specific Cleanup Levels for Surface Soil (0 To 2 ft bgs) - Residential Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Notes:

**BOLD** Value indicates SSCL
-- Not Available or Applicable
ft BGS feet below ground surface
DRO Diesel Range Organics
GRO Gasoline Range Organics
LOR Lube Oil Range
NV No Value
TPH Total Petroleum Hydrocarbons
(1) Carcinogenic risk includes young child, child, adolescent, and adult over a 26-year residency.
(2) The selected SSCL is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.
(3) TPH is not identified as a COPC but is included here because soil SSCLs are developed for TPH as part of the Uncertainty Analysis in Section 4.
(4) $SSCL_1$ is calculated as $SSCL_1$ = HI/Sum (MFi/SSCLi), following TCEQ (2000; Table 3, Equation 3-1). The mass fraction results for soil samples from a TPH source is reported in Table 5.18.
(5) $SSCL_2$ is calculated as $SSCL_2$ = MIN(SSCLi/MFi), following TCEQ (2000; Table 3, Equation 3-2). The average of the mass fraction results for soil samples from a TPH is reported in Table 5.18.

References:

NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
DEQ, 2013: Risk-Based Decision Making for Site Cleanup, DEQ's Facts Sheets, July 2013.
TCEQ, 2000: Development of Human Health Protective Concentration Levels (PCLs) for Total Petroleum Hydrocarbon (TPH) Mixtures, Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance, Remediation, RG-366/TRRP-27, June 2000.

| Resident Exposure Assumptions | Abbreviation | Value | Source |
|---|---|---|---|
| Cleanup Level for Soil (mg/kg) | $SSCL_{soil}$ | calculated | -- |
| Target Risk Level (unitless) | TR | 1.0E-05 | NMED, 2017 |
| Target Hazard Level (unitless) | THQ | 1 | NMED, 2017 |
| Reference Dose (mg/kg-day) | RfD | chemical-specific | Table 5.8 |
| Reference Concentration (mg/m$^3$) | RfC | chemical-specific | Table 5.9 |
| Ingestion Rate (mg/day) - Young Child (Age 0-2) | IRyc | 200 | Table 5.6 |
| Ingestion Rate (mg/day) - Child (Age 2-6) | IRc | 200 | Table 5.6 |
| Ingestion Rate (mg/day) - Young Adult (Age 6-16) | IRya | 100 | Table 5.6 |
| Ingestion Rate (mg/day) - Adult (Age 16-26) | IRa | 100 | Table 5.6 |
| Absorption Factor - Oral (%/100) | ABSo | 1 | Table 5.6 |
| Surface Area (cm$^2$/day) - Young Child (Age 0-2) | SAyc | 1,297 | Table 5.6 |
| Surface Area (cm$^2$/day) - Child (Age 2-6) | SAc | 2,204 | Table 5.6 |
| Surface Area (cm$^2$/day) - Young Adult (Age 6-16) | SAya | 4,219 | Table 5.6 |
| Surface Area (cm$^2$/day) - Adult (Age 16-26) | SAa | 6,032 | Table 5.6 |
| Adherence Factor (mg/cm$^2$) - Young Child (Age 0-2) | AFyc | 0.2 | Table 5.6 |
| Adherence Factor (mg/cm$^2$) - Child (Age 2-6) | AFc | 0.2 | Table 5.6 |
| Adherence Factor (mg/cm$^2$) - Young Adult (Age 6-16) | AFya | 0.07 | Table 5.6 |
| Adherence Factor (mg/cm$^2$) - Adult (Age 16-26) | AFa | 0.07 | Table 5.6 |
| Absorption Factor - Dermal (%/100) | ABSd | chemical-specific | Table 5.6 |
| Fraction Time Exposed (unitless) | FT | 3/24 | Table 5.6 |
| Exposure Frequency (days/year) | EF | 350 | Table 5.6 |
| Exposure Duration (years) - Young Child (Age 0-2) | EDyc | 2 | Table 5.6 |
| Exposure Duration (years) - Child (Age 2-6) | EDc | 4 | Table 5.6 |
| Exposure Duration (years) - Young Adult (Age 6-16) | EDya | 10 | Table 5.6 |
| Exposure Duration (years) - Adult (Age 16-26) | EDa | 10 | Table 5.6 |
| Mutagenic Factor (unitless) - Young Child (Age 0-2) | MF1 | 10 | Table 5.6 |
| Mutagenic Factor (unitless) - Child (Age 2-6) | MF2 | 3 | Table 5.6 |
| Mutagenic Factor (unitless) - Young Adult (Age 6-16) | MF3 | 3 | Table 5.6 |
| Mutagenic Factor (unitless) - Adult (Age 16-26) | MF4 | 1 | Table 5.6 |
| Body Weight (kg) - Young Child (Age 0-2) | BWyc | 15 | Table 5.6 |
| Body Weight (kg) - Child (Age 2-6) | BWc | 15 | Table 5.6 |
| Body Weight (kg) - Young Adult (Age 6-16) | BWya | 80 | Table 5.6 |
| Body Weight (kg) - Adult (Age 16-26) | BWa | 80 | Table 5.6 |
| Conversion Factor (kg/mg) | CF | 1.0E-06 | Table 5.6 |
| Averaging Time - carc. (days) | AT-C | 25,550 | Table 5.6 |
| Averaging Time - noncarc. (days) - Young Child (Age 0-2) | AT-NCyc | 730 | Table 5.6 |
| Averaging Time - noncarc. (days) - Child (Age 2-6) | AT-NCc | 1,460 | Table 5.6 |
| Averaging Time - noncarc. (days) - Young Adult (Age 6-16) | AT-NCya | 3,650 | Table 5.6 |
| Averaging Time - noncarc. (days) - Adult (Age 16-26) | AT-NCa | 3,650 | Table 5.6 |
| Particulate Emission Factor (m$^3$/kg) | PEF | 6.61E+09 | Table 5.6 |

**Table 5.14**

**Derivation of Site-Specific Cleanup Levels for Surface Soil (0 To 2 ft bgs) - Residential Oral, Dermal, and Dust Inhalation Exposure**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

**Exposure Equations**

Carcinogenic Constituents:

$$SSCL_{soil} = \frac{TR \times AT\text{-}C}{EF \times [((((CSF \times IRyc \times EDyc \times CF \times ABSo) / BWyc + (CSF \times SAyc \times AFyc \times EDyc \times CF \times ABSd) / BWyc + (URF \times FT \times EDyc \times (1/PEF))) + ((CSF \times IRc \times EDc \times CF \times ABSo) / BWc + (CSF \times SAc \times AFc \times EDc \times CF \times ABSd) / BWc + (URF \times FT \times EDc \times (1/PEF))) + ((CSF \times IRya \times EDya \times CF \times ABSo) / BWya + (CSF \times SAya \times AFya \times EDya \times CF \times ABSd) / BWya + (URF \times FT \times EDya \times (1/PEF))) + ((CSF \times IRa \times EDa \times CF \times ABSo) / BWa + (CSF \times SAa \times AFa \times EDa \times CF \times ABSd) / BWa + (URF \times FT \times EDa \times (1/PEF)))]}$$

Carcinogenic Constituents: Mutagenic Compounds

$$SSCL_{soil} = \frac{TR \times AT\text{-}C}{EF \times [((((CSF \times IRyc \times EDyc \times MF1 \times CF \times ABSo) / BWyc + (CSF \times SAyc \times AFyc \times EDyc \times CF \times MF1 \times ABSd) / BWyc + (URF \times FT \times EDyc \times MF1 \times (1/PEF))) + ((CSF \times IRc \times EDc \times MF2 \times CF \times ABSo) / BWc + (CSF \times SAc \times AFc \times EDc \times MF2 \times CF \times ABSd) / BWc + (URF \times FT \times EDc \times MF2 \times (1/PEF))) + ((CSF \times IRya \times EDya \times MF3 \times CF \times ABSo) / BWya + (CSF \times SAya \times AFya \times EDya \times MF3 \times CF \times ABSd) / BWya + (URF \times FT \times EDya \times MF3 \times (1/PEF))) + ((CSF \times IRa \times EDa \times MF4 \times CF \times ABSo) / BWa + (CSF \times SAa \times AFa \times EDa \times MF4 \times CF \times ABSd) / BWa + (URF \times FT \times EDa \times MF4 \times (1/PEF)))]}$$

Non-Carcinogenic Constituents:

$$SSCL_{soil} = \frac{THQ \times AT\text{-}NC}{EF \times ED \times [((1/RfD) \times IR \times CF \times ABSo)/BW + ((1/RfD) \times SA \times AF \times CF \times ABSd)/BW + ((1/RfC) \times FT \times (1/PEF))]}$$

Table 5.15

**Derivation of Site-Specific Cleanup Levels for Soil - Residential Exposure to Homegrown Below-Ground Garden Produce**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Constituents of Potential Concern (COPC) | Mutagenic Compound Yes or No | Toxicity Data CSF Oral 1/(mg/kg-d) | Toxicity Data RfD Oral (mg/kg-d) | Allowable Residential Below-Ground Produce Exposure TR Lifetime[1] (mg/kg DW) | THQ Young Child (0-2 yrs) (mg/kg DW) | THQ Child (2-6 yrs) (mg/kg DW) | THQ Young Adult (6-16 yrs) (mg/kg DW) | THQ Adult (16-26 yrs) (mg/kg DW) | Allowable Below-Ground Produce Concentration $Pr_{bg}$[2] (mg/kg DW) | Correction Factor for Below Ground Vegetation $VG_{root}$[3] | Plant-Soil Bioconcentration Factor Below-Ground Produce $Br_{rootveg}$[4] (mg/kg DW)/(mg/kg soil) | TPH Mass Fraction | Site-Specific Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$) (mg/kg)[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH[6] (by TX1005)** | | | | | | | | | | | | | | **9.05E+03** |
| TPH (C6-C12; GRO) | No | -- | 4.00E-02 | NV | 7.99E+00 | 4.43E+00 | 5.21E+00 | 2.87E+00 | 2.87E+00 | 1.00E-02 | 9.50E-02 | -- | -- | 3.02E+03 |
| TPH (>C12-C28; DRO) | No | -- | 4.00E-02 | NV | 7.99E+00 | 4.43E+00 | 5.21E+00 | 2.87E+00 | 2.87E+00 | 1.00E-02 | 9.50E-02 | -- | -- | 3.02E+03 |
| TPH (>C28-C35; LOR) | No | -- | 4.00E-02 | NV | 7.99E+00 | 4.43E+00 | 5.21E+00 | 2.87E+00 | 2.87E+00 | 1.00E-02 | 9.50E-02 | -- | -- | 3.02E+03 |

| Constituents of Potential Concern (1) (COPC) | Toxicity Data CSF oral 1/(mg/kg-d) | Toxicity Data RfD oral (mg/kg-d) | Allowable Residential Below-Ground Produce Exposure TR Lifetime[1] (mg/kg DW) | THQ Young Child (0-2 yrs) (mg/kg DW) | THQ Child (2-6 yrs) (mg/kg DW) | THQ Young Adult (6-16 yrs) (mg/kg DW) | THQ Adult (16-30 yrs) (mg/kg DW) | Allowable Below-Ground Produce Concentration $Pr_{bg}$[2] (mg/kg DW) | Correction Factor for Below Ground Vegetation $VG_{root}$[3] | Plant-Soil Bioconcentration Factor Below-Ground Produce $Br_{rootveg}$[4] (mg/kg DW)/(mg/kg soil) | TPH Mass Fraction | Site-Specific Cleanup Level per TPH Mass Fraction (mg/kg) | Site-Specific Cleanup Level for Soil ($SSCL_{soil}$) (mg/kg)[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total TPH[6] (by TX1006) - TPHCWG Site-Specific Mass Fraction Approach as Implemented by TCEQ (2000)** | | | | | | | | | | | | | SSCL for Total TPH (minimum of $SSCL_1$ and $SSCL_2$) = **9.06E+03** |
| | | | | | | | | | | | | | $SSCL_1$ (MFi/SSCLi)[7] = 9.06E+03 |
| | | | | | | | | | | | | | $SSCL_2$ (SSCLi/MFi)[8] = 4.18E+04 |
| | | | | | | | | | | | | | TPH MFi |
| Aliphatic (C6) | -- | 6.00E-02 | NV | 1.80E+01 | 9.97E+00 | 1.17E+01 | 6.45E+00 | 6.45E+00 | 1.00E-02 | 9.50E-02 | 6.79E+03 | 6.45E+00 | 2.03E-02 |
| Aliphatic (>C6-C8) | -- | 6.00E-02 | NV | 1.80E+01 | 9.97E+00 | 1.17E+01 | 6.45E+00 | 6.45E+00 | 1.00E-02 | 9.50E-02 | 6.79E+03 | 6.45E+00 | 6.34E-02 |
| Aliphatic (>C8-C10) | -- | 1.00E-01 | NV | 5.00E+01 | 2.77E+01 | 3.26E+01 | 1.79E+01 | 1.79E+01 | 1.00E-02 | 9.50E-02 | 1.89E+04 | 1.79E+01 | 2.43E-01 |
| Aliphatic (>C10-C12) | -- | 1.00E-01 | NV | 5.00E+01 | 2.77E+01 | 3.26E+01 | 1.79E+01 | 1.79E+01 | 1.00E-02 | 9.50E-02 | 1.89E+04 | 1.79E+01 | 2.57E-01 |
| Aliphatic (>C12-C16) | -- | 1.00E-01 | NV | 5.00E+01 | 2.77E+01 | 3.26E+01 | 1.79E+01 | 1.79E+01 | 1.00E-02 | 9.50E-02 | 1.89E+04 | 1.79E+01 | 2.17E-01 |
| Aliphatic (>C16-C21) | -- | 2.00E+00 | NV | 2.00E+04 | 1.11E+04 | 1.30E+04 | 7.17E+03 | 7.17E+03 | 1.00E-02 | 9.50E-02 | 7.54E+06 | 7.17E+03 | 2.03E-02 |
| Aliphatic (>C21-C35) | -- | 2.00E+00 | NV | 2.00E+04 | 1.11E+04 | 1.30E+04 | 7.17E+03 | 7.17E+03 | 1.00E-02 | 9.50E-02 | 7.54E+06 | 7.17E+03 | 4.07E-02 |
| Aromatic (>C7-C8) | -- | 1.00E-01 | NV | 5.00E+01 | 2.77E+01 | 3.26E+01 | 1.79E+01 | 1.79E+01 | 1.00E-02 | 9.50E-02 | 1.89E+04 | 1.79E+01 | 4.70E-03 |
| Aromatic (>C8-C10) | -- | 4.00E-02 | NV | 7.99E+00 | 4.43E+00 | 5.21E+00 | 2.87E+00 | 2.87E+00 | 1.00E-02 | 9.50E-02 | 3.02E+03 | 2.87E+00 | 3.13E-02 |
| Aromatic (>C10-C12) | -- | 4.00E-02 | NV | 7.99E+00 | 4.43E+00 | 5.21E+00 | 2.87E+00 | 2.87E+00 | 1.00E-02 | 9.50E-02 | 3.02E+03 | 2.87E+00 | 2.03E-02 |
| Aromatic (>C12-C16) | -- | 4.00E-02 | NV | 7.99E+00 | 4.43E+00 | 5.21E+00 | 2.87E+00 | 2.87E+00 | 1.00E-02 | 9.50E-02 | 3.02E+03 | 2.87E+00 | 2.03E-02 |
| Aromatic (>C16-C21) | -- | 3.00E-02 | NV | 4.50E+00 | 2.49E+00 | 2.93E+00 | 1.61E+00 | 1.61E+00 | 1.00E-02 | 9.50E-02 | 1.70E+03 | 1.61E+00 | 2.03E-02 |
| Aromatic (>C21-C35) | -- | 3.00E-02 | NV | 4.50E+00 | 2.49E+00 | 2.93E+00 | 1.61E+00 | 1.61E+00 | 1.00E-02 | 9.50E-02 | 1.70E+03 | 1.61E+00 | 4.07E-02 |

**Table 5.15**

**Derivation of Site-Specific Cleanup Levels for Soil - Residential Exposure to Homegrown Below-Ground Garden Produce**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

Notes:

**BOLD** **Value indicates SSCL**
-- Not Available or Applicable
DRO Diesel Range Organics
GRO Gasoline Range Organics
LOR Lube Oil Range
NV No Value
TPH Total Petroleum Hydrocarbons
(1) Carcinogenic risk includes young child, child, young adult, and adult over a 26-year residency.
(2) The selected Allowable Below-Ground Produce Concentration value is the lowest of the carcinogenic-based and non-carcinogenic-based concentrations.
(3) Correction factors applied as follows: VG = 0.01 for chemicals with a log $K_{ow}$ greater than 4; VG = 1.0 for chemicals with a log $K_{ow}$ less than 4.
(4) Where $Br_{rootveg}$ was not provided from Chemical-Specific Input Values; for compounds with log $K_{ow}$ values greater than or equal to 2.0, $Br_{rootveg}$ = Root Concentration Factor (RCF) / $K_{ds}$, where log (RCF) = 0.77 x log $K_{ow}$ - 1.52; Equations A-2-14 & A-2-16, Appendix A-2, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, USEPA530-R-05-006, September 2005 (USEPA, 2005). Calculated from the formula $K_{ds} = K_{oc} \times f_s$, where fs is a conservatively applied sorbent content (fraction of clays plus organic carbon) of 0.03, as presented in Section 3.2 of the USEPA Superfund Chemical Data Matrix Methodology (USEPA, 2004).
(5) The selected SSCL is based on the lower of the allowable below ground produce concentration value, $Pr_{bg}$, corresponding to the lowest of the carcinogenic-based and non-carcinogenic-based concentrations divided by the product of the plant-soil bioconcentration factor, $Br_{rootveg}$, and the correction factor, $VG_{root}$.
(6) TPH is not identified as a COPC but is included here because soil SSCLs are developed for TPH as part of the Uncertainty Analysis in Section 4.
(7) $SSCL_1$ is calculated as $SSCL_1$ = HI/Sum (MFi/SSCLi), following TCEQ (2000; Table 3, Equation 3-1). The mass fraction (MFi) results for a soil sample taken from a TPH source is reported in Table 3.18.
(8) $SSCL_2$ is calculated as $SSCL_2$ = MIN(SSCLi/MFi), following TCEQ (2000; Table 3, Equation 3-2). The mass fraction (MFi) results for a soil sample taken from a TPH source is reported in Table 3.18.

References:

NMED, 2017: Risk Assessment Guidance for Site Investigations and Remediation, Volume I, March 2017.
DEQ, 2013: Risk-Based Decision Making for Site Cleanup, DEQ's Facts Sheets, July 2013.
TCEQ, 2000: Development of Human Health Protective Concentration Levels (PCLs) for Total Petroleum Hydrocarbon (TPH) Mixtures, Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance, Remediation, RG-366/TRRP-27, June 2000.
USEPA, 2004: Superfund Chemical Data Matrix (SCDM). Office of Emergency and Remedial Response, United States Environmental Protection Agency, EPA/540-R-94-009 January, 2004.
USEPA, 2005: Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Office of Solid Waste and Emergency Response, United States Environmental Protection Agency, EPA530-R-05-006, September 2005.

Table 5.15

**Derivation of Site-Specific Cleanup Levels for Soil - Residential Exposure to Homegrown Below-Ground Garden Produce**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Resident Exposure Assumptions | Abbreviation | Value | Source |
|---|---|---|---|
| Site-Specific Cleanup Level for Soil (mg/kg) | $SSCL_{soil}$ | calculated | -- |
| Target Risk Level (unitless) | TR | 1.0E-05 | NMED, 2017 |
| Target Hazard Level (unitless) | THQ | 1 | NMED, 2017 |
| Reference Dose (mg/kg-day) | RfD | chemical-specific | Table 5.8 |
| Consumption Rate of Below-Ground Produce (kg/day) - Young Child (Age 0-2) | $CR_{bgyc}$ | 0.0715 | Table 5.7 |
| Consumption Rate of Below-Ground Produce (kg/day) - Child (Age 2-6) | $CR_{bgc}$ | 0.129 | Table 5.7 |
| Consumption Rate of Below-Ground Produce (kg/day) - Young Adult (Age 6-16) | $CR_{bgya}$ | 0.585 | Table 5.7 |
| Consumption Rate of Below-Ground Produce (kg/day) - Adult (Age 16-26) | $CR_{bga}$ | 1.063 | Table 5.7 |
| Correction Factor for Below-Ground Vegetation | $VG_{root}$ | chemical-specific | (3) |
| Plant-Soil Bioconcentration Factor for Below-Ground Produce | $Br_{rootveg}$ | chemical-specific | (4) |
| Fraction of Homegrown Below-Ground Produce Consumed | $F_{bg}$ | 0.042 | Table 5.7 |
| Exposure Duration (years) - Young Child (Age 0-2) | EDyc | 2 | Table 5.7 |
| Exposure Duration (years) - Child (Age 2-6) | EDc | 4 | Table 5.7 |
| Exposure Duration (years) - Young Adult (Age 6-16) | EDya | 10 | Table 5.7 |
| Exposure Duration (years) - Adult (Age 16-26) | EDa | 10 | Table 5.7 |
| Mutagenic Factor (unitless) - Young Child (Age 0-2) | MF1 | 10 | Table 5.7 |
| Mutagenic Factor (unitless) - Child (Age 2-6) | MF2 | 3 | Table 5.7 |
| Mutagenic Factor (unitless) - Young Adult (Age 6-16) | MF3 | 3 | Table 5.7 |
| Mutagenic Factor (unitless) - Adult (Age 16-26) | MF4 | 1 | Table 5.7 |
| Body Weight (kg) - Young Child (Age 0-2) | BWyc | 15 | Table 5.7 |
| Body Weight (kg) - Child (Age 2-6) | BWc | 15 | Table 5.7 |
| Body Weight (kg) - Young Adult (Age 6-16) | BWya | 80 | Table 5.7 |
| Body Weight (kg) - Adult (Age 16-26) | BWa | 80 | Table 5.7 |
| Averaging Time - carc. (years) | AT-C | 70 | Table 5.7 |
| Averaging Time (non-cancer) - Young Child (Age 0-2) (years) | AT-NCyc | 2 | Table 5.7 |
| Averaging Time (non-cancer) - Child (Age 2-6) (years) | AT-NCc | 4 | Table 5.7 |
| Averaging Time (non-cancer) - Young Adult (Age 6-16) (years) | AT-NCya | 10 | Table 5.7 |
| Averaging Time (non-cancer) - Adult (Age 16-26) (years) | AT-NCa | 10 | Table 5.7 |

**Below-Ground Produce (Prbg) Exposure Equations**

Carcinogenic Constituents:

$$Pr_{bg} = \frac{TR \times AT\text{-}C}{[F_{bg} \times ((CR_{bgyc} \times EDyc \times CSF/ BWyc) + (CR_{bgc} \times EDc \times CSF / BWc) + (CR_{bgya} \times EDya \times CSF/ BWya) + (CR_{bga} \times EDa \times CSF/ BWa))]}$$

Carcinogenic Constituents: Mutagenic Compounds

$$Pr_{bg} = \frac{TR \times AT\text{-}C}{[F_{bg} \times ((CR_{bgyc} \times EDyc \times CSF \times MF1 / BWyc) + (CR_{bgc} \times EDc \times CSF \times MF2 / BWc) + (CR_{bgya} \times EDya \times CSF \times MF3 / BWya) + (CR_{bga} \times EDa \times CSF \times MF4 / BWa))]}$$

Non-Carcinogenic Constituents:

$$Pr_{bg} = \frac{THQ \times AT\text{-}NC}{[ED \times CR_{bg} \times F_{bg} \times (1/RfD) / BW]}$$

$$SSCL_{soil} = \frac{Pr_{bg}}{Br_{rootveg} \times VG_{root}}$$

**Table 5.16**

**Summary of Site-Specific Cleanup Levels for Industrial Soil**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| (COPC) | Calculated SSCLs Per Exposure Pathway [1] (Table Reference) | | | | Site-Specific Cleanup Level (SSCL) [2] |
|---|---|---|---|---|---|
| | Human Health-Based SSCLs | | | | |
| | (A) Construction/Utility Worker (see Table 5.10) | (B) Outdoor Worker (see Table 5.11) | (C) Indoor Worker (see Table 5.12) | (D) Trespasser (see Table 5.13) | |
| **Surface Soil (mg/kg)** | | | | | |
| **Total TPH [3]** | 2.15E+04 | 7.34E+04 | 1.13E+05 | 1.94E+05 | **2.15E+04** |

Notes:

**BOLD** Value indicates final SSCL
COPC Constituents of Potential Concern
TPH Total Petroleum Hydrocarbons
(1) Exposure Pathway:

| Receptor | Pathway |
|---|---|
| (A) Construction/Utility Worker | Direct Contact (incidental ingestion of soil, dermal contact, and inhalation of soil dust) |
| (B) Outdoor Worker | Direct Contact (incidental ingestion of soil, dermal contact, and inhalation of soil dust) |
| (C) Indoor Worker | Direct Contact (incidental ingestion of soil, dermal contact, and inhalation of soil dust) |
| (D) Trespasser | Direct Contact (incidental ingestion of soil, dermal contact, and inhalation of soil dust) |

(2) Final SSCL corresponds to the lowest applicable or practicable calculated risk-based or default USEPA Regional Screening Level value.
(3) Based on the lower of Total TPH (by TX1006) or Total TPH (by TX1005).

Table 5.17

**Summary of Site-Specific Cleanup Levels for Residential Soil**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| COPC | Calculated SSCLs Per Exposure Pathway [1] (Table Reference) | | | Site-Specific Cleanup Level (SSCL) [2] |
|---|---|---|---|---|
| | Human Health-Based SSCLs | | | |
| | (A) Soil (see Table 5.14) | (B) Produce (Above) | (C) Produce (Below) (see Table 5.15) | Soil |
| | mg/kg | mg/kg | mg/kg | mg/kg |
| Total TPH [3] | 5.14E+03 | – | 9.06E+03 | **5.14E+03** |

Notes:

**BOLD** Value indicates final SSCL
– Not available or applicable
COPC Constituents of Potential Concern
TPH Total Petroleum Hydrocarbons
(1) Exposure Pathway:

| Receptor | Pathway |
|---|---|
| (A) Soil | Direct Contact (incidental ingestion, dermal contact, and inhalation of soil dust) |
| (B) Produce (above ground) | Direct Contact (ingestion of produce) |
| (C) Produce (below ground) | Direct Contact (ingestion of produce) |

(2) Final SSCL corresponds to the lowest applicable or practicable calculated risk-based or default USEPA Regional Screening Level value.
(3) Based on the lower of Total TPH (by TX1006) or Total TPH (by TX1005).

**Table 5.18**

**Derivation of TPH Mass Fractions for Soil**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Boiling Point Range | Concentration[1] $C_i$ (mg/kg) | TPH Mass Fraction[2] $MF_i$ |
|---|---|---|
| C6 Aliphatic | 6.60E+00 | 2.03E-02 |
| >C6-C8 Aliphatic | 2.06E+01 | 6.34E-02 |
| >C8-C10 Aliphatic | 7.90E+01 | 2.43E-01 |
| >C10-C12 Aliphatic | 8.35E+01 | 2.57E-01 |
| >C12-C16 Aliphatic | 7.05E+01 | 2.17E-01 |
| >C16-C21 Aliphatic | 6.60E+00 | 2.03E-02 |
| >C21-C35 Aliphatic | 1.32E+01 | 4.07E-02 |
| >C7-C8 Aromatic | 1.53E+00 | 4.70E-03 |
| >C8-C10 Aromatic | 1.02E+01 | 3.13E-02 |
| >C10-C12 Aromatic | 6.60E+00 | 2.03E-02 |
| >C12-C16 Aromatic | 6.60E+00 | 2.03E-02 |
| >C16-C21 Aromatic | 6.60E+00 | 2.03E-02 |
| >C21-C35 Aromatic | 1.32E+01 | 4.07E-02 |
| Total TPH | **3.25E+02** | **1.00E+00** |

Notes:

ND Not Detected
TPH Total Petroleum Hydrocarbons
(1) Concentration is average across representative soil samples collected from the Site on April 12, 2017.
(2) TPH Mass Fraction is calculated as $MF_i = C_i$/Total TPH, following TCEQ (2000).

Non-detect concentrations are assigned a value equal to one-half of the reporting limit.

Reference:

TCEQ, 2000: Development of Human Health Protective Concentration Levels (PCLs) for Total Petroleum Hydrocarbon (TPH) Mixtures, Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance, Remediation, RG-366/TRRP-27, June 2000.

Table 5.19

Soil Exposure Point Concentrations
HHRA: San Juan 27-5 No. 1
ConocoPhillips Company
Rio Arriba County, New Mexico

| COPC | Unit | $SSCL_{soil}$ | | Maximum Detected Value | Maximum | | Arithmetic Mean | CTE | | | | | RME | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Maximum > $SSCL_{soil}$ | | | Arithmetic Mean > $SSCL_{soil}$ | | Geometric Mean | Geometric Mean > $SSCL_{soil}$ | | 95% UCL | 95% UCL > $SSCL_{soil}$ | |
| | | Residential | Commercial/ Industrial | | Residential | Commercial/ Industrial | | Residential | Commercial/ Industrial | | Residential | Commercial/ Industrial | | Residential | Commercial/ Industrial |
| TPH - Extractable (DRO) | mg/kg | 5.14E+03 | 2.15E+04 | NA | n/c | n/c | n/c | n/c | n/c | n/c | n/c | n/c | NC | n/c | n/c |
| TPH - Purgeable (GRO) | mg/kg | 5.14E+03 | 2.15E+04 | 3.20E+02 | N | N | n/c | n/c | n/c | n/c | n/c | n/c | NC | n/c | n/c |
| Total Petroleum Hydrocarbons (>C12-C28) | mg/kg | 5.14E+03 | 2.15E+04 | 2.25E+02 | N | N | n/c | n/c | n/c | n/c | n/c | n/c | NC | n/c | n/c |
| Total Petroleum Hydrocarbons (C6-C35) | mg/kg | 5.14E+03 | 2.15E+04 | 8.06E+02 | N | N | n/c | n/c | n/c | NC | n/c | n/c | NC | n/c | n/c |

Notes:

COPC = Constituent of Potential Concern
CTE = Central Tendency Exposure
NA = Not Applicable
n/c = Not Calculated
N = No
RME = Reasonable Maximum Exposure
$SSCL_{soil}$ = Site Specific Cleanup Level for Soil
TPH = Total Petroleum Hydrocarbons
UCL = Upper Confidence Level
Y = Yes

**Table 6.1**

**Assessment and Measurement Endpoints**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Exposure Medium | Exposure Route | Assessment Endpoint | Measurement Endpoint |
|---|---|---|---|
| Soil | Direct Contact<br>Ingestion/Uptake<br>Adsorption | Populations of avian and mammalian insectivores, herbivores, omnivores, and carnivores | Maximum detected concentration of chemical constituents in soil |
| | | Relative and absolute densities of avian and mammalian insectivores, herbivores, omnivores, and carnivores | |
| | Food Web Transfer<br>(Ingestion and Absorption) | Species richness and productivity of benthic macroinvertebrate community | Maximum detected concentration of chemical constituents in soil<br>Estimated ingestion of BCOCs in soil<br>(based on maximum concentration) |
| | | Relative and absolute densities of avian and mammalian insectivores, herbivores, omnivores, and carnivores | |
| Sediment | Direct Contact<br>Ingestion<br>Adsorption | Species richness and productivity of benthic macroinvertebrate community | Maximum detected concentration of chemical constituents in sediment |
| | | Relative and absolute densities of avian and mammalian insectivores, herbivores, omnivores, and carnivores | |
| | Food Web Transfer<br>(Ingestion and Absorption) | Relative and absolute densities of avian and mammalian insectivores, herbivores, omnivores, carnivores, and piscivores | Maximum detected concentration of chemical constituents in sediment<br>Estimated ingestion of BCOCs in sediment<br>(based on maximum concentration) |

Notes:

BCOC - Bioaccumulative Chemical of Concern
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level

**Table 6.2**

**Ecological Screening Values for Soil**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Chemical | CAS No. | Units | Ecological Screening Value | Source |
|---|---|---|---|---|
| **BTEX** | | | | |
| Benzene | 71-43-2 | mg/kg | 0.05 | USEPA Region 4 |
| Ethylbenzene | 100-41-4 | mg/kg | 0.05 | USEPA Region 4 |
| Toluene | 108-88-3 | mg/kg | 200 | TCEQ Plants |
| Xylenes (total) | 1330-20-7 | mg/kg | 0.05 | USEPA Region 4 |
| **Polycyclic Aromatic Hydrocarbons** | | | | |
| Acenaphthene | 83-32-9 | mg/kg | 20 | TCEQ Plants |
| Acenaphthylene | 208-96-8 | mg/kg | 682 | USEPA Region 5 |
| Anthracene | 120-12-7 | mg/kg | 0.1 | USEPA Region 4 |
| Benz(a)anthracene | 56-55-3 | mg/kg | 5.21 | USEPA Region 5 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.1 | USEPA Region 4 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 59.8 | USEPA Region 5 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 119 | USEPA Region 5 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 148 | USEPA Region 5 |
| Chrysene | 218-01-9 | mg/kg | 4.73 | USEPA Region 5 |
| Dibenz(a,h)anthracene | 53-70-3 | mg/kg | 18.4 | USEPA Region 5 |
| Fluoranthene | 206-44-0 | mg/kg | 0.1 | USEPA Region 4 |
| Fluorene | 86-73-7 | mg/kg | 30 | TCEQ Earthworms |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 109 | USEPA Region 5 |
| Naphthalene | 91-20-3 | mg/kg | 0.1 | USEPA Region 4 |
| Phenanthrene | 85-01-8 | mg/kg | 0.1 | USEPA Region 4 |
| Pyrene | 129-00-0 | mg/kg | 0.1 | USEPA Region 4 |
| **Total Petroleum Hydrocarbons** | | | | |
| C5-C12 | n/a | mg/kg | n/a | -- |
| C6-C12 | n/a | mg/kg | n/a | -- |
| C6-C35 | n/a | mg/kg | n/a | -- |
| C10-C28 | n/a | mg/kg | n/a | -- |
| C12-C28 | n/a | mg/kg | n/a | -- |
| C28-C35 | n/a | mg/kg | n/a | -- |

Notes:

BTEX - Benzene, Toluene, Ethylbenzene, and Xylene
CAS No. - Chemical Abstract Services Number
mg/kg - Milligram Per Kilogram
n/a - not available
TCEQ Earthworms - Ecological Screening Benchmark for Earthworms (TCEQ, 2006)
TCEQ Plants - Ecological Screening Benchmark for Plants (TCEQ 2006)
USEPA Region 4 - Ecological Screening Benchmark (USEPA, 2001)
USEPA Region 5 - Ecological Screening Level (ESL) (USEPA, 2003)
-- Source not available

**Table 6.3**

**Screening Summary for Surface Soil (0-1 ft bgs) - Detected Constituents**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Chemicals | Units | No. Samples | No. Detects | FOD | Maximum | Location of Maximum | ESV | SQ | COPEC | Rationale |
|---|---|---|---|---|---|---|---|---|---|---|
| **TPH** | | | | | | | | | | |
| TPH (C6-C10) GRO | mg/kg | 1 | 1 | 100% | 5500 | Construction Trench | n/a | n/c | No | b |
| TPH (C10-C26) | mg/kg | 1 | 1 | 100% | 320 J | Construction Trench | n/a | n/c | No | b |
| **PAHs** | | | | | | | | | | |
| Benz(a)anthracene | mg/kg | 1 | 1 | 100% | 0.0065 | B-17* | 5.21 | 1.2E-03 | No | b |
| Benzo(a)pyrene | mg/kg | 1 | 1 | 100% | 0.0057 J | B-17* | 0.1 | 5.7E-02 | No | b |
| Benzo(b)fluoranthene | mg/kg | 1 | 1 | 100% | 0.0096 J | B-17* | 59.8 | 1.6E-04 | No | b |
| Benzo(g,h,i)perylene | mg/kg | 1 | 1 | 100% | 0.0081 J | B-17* | 119 | 6.8E-05 | No | b |
| Benzo(k)fluoranthene | mg/kg | 1 | 1 | 100% | 0.0051 J | B-17* | 148 | 3.4E-05 | No | b |
| Chrysene | mg/kg | 1 | 1 | 100% | 0.0065 J | B-17* | 4.73 | 1.4E-03 | No | b |
| Fluoranthene | mg/kg | 1 | 1 | 100% | 0.0143 J | B-17* | 0.1 | 1.4E-01 | No | b |
| Indeno(1,2,3-cd)pyrene | mg/kg | 1 | 1 | 100% | 0.006 J | B-17* | 109 | 5.5E-05 | No | b |
| Phenanthrene | mg/kg | 1 | 1 | 100% | 0.013 J | B-17* | 0.1 | 1.3E-01 | No | b |
| Pyrene | mg/kg | 1 | 1 | 100% | 0.0123 J | B-17* | 0.1 | 1.2E-01 | No | b |
| **BTEX** | | | | | | | | | | |
| Ethylbenzene | mg/kg | 1 | 1 | 100% | 1.4 J | B-17* | 0.05 | 3E+01 | No | b |
| Xylenes (total) | mg/kg | 1 | 1 | 100% | 7.2 J | B-17* | 0.05 | 1E+02 | No | b |

Notes:

* - QRA (Quantitative Risk Assessment) supplemental boring location
b - See discussion in text for rationale for eliminating as a COPEC
BTEX - Benzene, Toluene, Ethylbenzene, and Xylene
COPEC - Chemical of Potential Ecological Concern (see Table 6.2 for sources for ESVs)
ESV - Ecological Screening Value
FOD - Frequency of Detection
ft bgs - Feet Below Ground Surface
J - Estimated value
mg/kg - Milligram Per Kilogram
n/a - not available
n/c - not calculated
PAHs - Polycyclic Aromatic Hydrocarbons
SQ - Screening Quotient

TPH - Total Petroleum Hydrocarbons

Table 6.4

Screening Summary for Surface Soil (0-10 ft bgs) - Detected Constituents
ERA: San Juan 27-5 No. 1
ConocoPhillips Company
Rio Arriba County, New Mexico

| Chemicals | Units | No. Samples | No. Detects | FOD | Maximum | Location of Maximum | ESV | SQ | COPEC | Rationale |
|---|---|---|---|---|---|---|---|---|---|---|
| **TPH** | | | | | | | | | | |
| TPH (>C10-C12) Aliphatic | mg/kg | 1 | 1 | 100% | 160 | B-17* | n/a | n/c | No | b |
| TPH (>C12-C16) Aliphatic | mg/kg | 1 | 1 | 100% | 134 | B-17* | n/a | n/c | No | b |
| TPH (>C12-C28) | mg/kg | 1 | 1 | 100% | 225 | B-17* | n/a | n/c | No | b |
| TPH (>C6-C35) Aliphatics & Aromatics | mg/kg | 1 | 1 | 100% | 472 | B-17* | n/a | n/c | No | b |
| TPH (>C6-C8) Aliphatic | mg/kg | 1 | 1 | 100% | 27.2 | B-17* | n/a | n/c | No | b |
| TPH (>C8-C10) Aliphatic | mg/kg | 1 | 1 | 100% | 151 | B-17* | n/a | n/c | No | b |
| TPH (C6-C12) | mg/kg | 1 | 1 | 100% | 582 | B-17* | n/a | n/c | No | b |
| TPH (C6-C35) | mg/kg | 1 | 1 | 100% | 806 | B-17* | n/a | n/c | No | b |
| **PAHs** | | | | | | | | | | |
| Acenaphthene | mg/kg | 1 | 1 | 100% | 0.0073 | B-17* | 20 | 4E-04 | No | SQ < 1 |
| Fluorene | mg/kg | 1 | 1 | 100% | 0.0334 | B-17* | 30 | 1E-03 | No | SQ < 1 |
| **Naphthalene** | **mg/kg** | **1** | **1** | **100%** | **0.427** | **B-17*** | **0.1** | **4E+00** | **Yes** | **SQ > 1** |
| Phenanthrene | mg/kg | 1 | 1 | 100% | 0.0145 | B-17* | 0.1 | 1E-01 | No | SQ < 1 |

Notes:

**Bold Font identifies constituent retained as a COPEC**
b - See discussion in text for rationale for eliminating as a COPEC
* - QRA (Quantitative Risk Assessment) supplemental boring location
COPEC - Chemical of Potential Ecological Concern (see Table 6.2 for sources for ESVs)
ESV - Ecological Screening Value
FOD - Frequency of Detection
ft bgs - Feet Below Ground Surface
mg/kg - Milligram Per Kilogram
n/a - not available
n/c - not calculated
PAHs - Polycyclic Aromatic Hydrocarbons
SQ - Screening Quotient
TPH - Total Petroleum Hydrocarbons

**Table 6.5**

**Preliminary Chemicals of Potential Ecological Concern in Surface Soil (0-1 ft bgs)**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Chemicals of Potential Ecological Concern | SQ > 1 |
|---|---|
| **PAHs** | |
| Naphthalene | 4E+00 |

Notes:

ft bgs - Feet Below Ground Surface
PAHs - Polycyclic Aromatic Hydrocarbons
SQ - Screening Quotient

**Table 6.6**

**Exposure Parameters for Indicator Species**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Chemicals | Units | Plants | | | | Deer Mouse | | | | Horned Lark | | | | Kit Fox[a] | | | | Pronghorn Antelope[a] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Rodent Omnivorse; major food source for larger omnivores and carnivores | | | | Surrogate for American Robin (Avian Omnivore) | | | | Surrogate for Red Fox (Mammalian Top Carnivore) | | | | Large Herbivore | | | |
| | | USEPA | ORNL | CCME | NMED | USEPA | ORNL | CCME | NMED | USEPA | ORNL | CCME | NMED | USEPA | ORNL | CCME | NMED | USEPA | ORNL | CCME | NMED |
| **PAHs** | | | | | | | | | | | | | | | | | | | | | |
| $PAH_{LMW}$[1] | mg/kg | n/a | n/a | n/a | n/a | 100 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 100 | n/a | n/a | n/a | 100 | n/a | n/a | n/a |
| Naphthalene | mg/kg | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

Notes:

[a] - receptor ranges are larger than the Site, therefore, they are not evaluated
BTEX - Benzene, Toluene, Ethylbenzene, and Xylene
CCME - Canadian Council of Ministers of the Environment
COC - Chemical of Concern
kg - Kilogram
mg - Milligram
n/a - Data on home range size not available
ORNL - Oak Ridge National Laboratory
$PAH_{LMW}$ - Polycyclic Aromatic Hydrocarbon Low Molecular Weight

Source:

[1] - $PAH_{LMW}$ EPA ECO-SSLs (USEPA, 2007)

**Table 6.7**

**Refinement for Plant Community**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Chemicals of Concern | Units | Refinement Benchmark | No. Samples | No. Detects | Maximum Detected | RQ (Max Detected) | No. Detects > RB | % Detects > RB | Retain as Plant COC | Rationale |
|---|---|---|---|---|---|---|---|---|---|---|
| **PAHs (0-10 ft bgs)** | | | | | | | | | | |
| Naphthalene | mg/kg | n/a | 1 | 1 | 0.427 | n/c | n/a | No | No | b |

Notes:

b - See discussion in text for rationale for eliminating as a COPEC
BCOC - Bioaccumulative Chemical of Concern
BTV - Background Threshold Value
COC - Chemical of Concern
ECO-SSL - Ecological Soil Screening Level
ft bgs - Feet Below Ground Surface
J - Estimated value
mg/kg - Milligram Per Kilogram
n/a - Ecological Soil Screening Level not available
n/c - not calculated
$PAH_{LMW}$ - Polycyclic Aromatic Hydrocarbon Low Molecular Weight
RQ - Refinement Quotient

**Table 6.8**

**Refinement for Mammalian Wildlife (Deer Mouse-Rodent Omnivore)**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| Chemicals of Concern | Units | Refinement Benchmark | No. Samples | No. Detects | Maximum Detected | RQ (Max Detected) | No. Detects > RB | % Detects > RB | Retain as Mammalian COC | Rationale |
|---|---|---|---|---|---|---|---|---|---|---|
| **PAHs (0-10 ft bgs)** | | | | | | | | | | |
| $PAH_{LMW}$[1] | mg/kg | 100 | 1 | 1 | 0.0073 | 0.00007 | 0 | 0% | No | RQ<1 |
| Naphthalene | mg/kg | n/a | 1 | 1 | 0.427 | n/c | n/a | No | No | b |

Notes:

b - See discussion in text for rationale for eliminating as a COPEC
COC - Chemical of Concern
ECO-SSL - Ecological Soil Screening Level
ft bgs - Feet Below Ground Surface
J - Estimated value
mg/kg - Milligram Per Kilogram
n/a - Ecological Soil Screening Level not available
n/c - not calculated
RB - Refinement Benchmark
$PAH_{LMW}$ - Polycyclic Aromatic Hydrocarbon Low Molecular Weight
RQ - Refinement Quotient

Sources:

[1] - $PAH_{LMW}$ EPA ECO-SSLs (USEPA, 2007)

# Appendix A
# Summaries of Analytical Results

**Appendix A.1**

**Summary of Analytical Results for Soil (0-10 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company Rio Arriba County, New Mexico**

| Sample Location: | | | | | | | | | | | Construction Trench | SB-01 | SB-03 | SB-04 | SB-07 | B-10 | B-11 | B-11 | B-12 | B-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | | | | | | | | | San Juan 27-5 #1 | SB-01@21-22 | SB-03@22-23 | SB-04@22.5-23 | SB-07@22-23 | S-11124687-091516-JW-B10@24' | S-11124687-091516-JW-B11@14' | S-11124687-091516-JW-B11@35' | S-11124687-091516-JW-B12@43.5' | S-11124687-091516-JW-B12@50' |
| Sample Date: | | | | | | | | | | | 11/30/2015 | 4/20/2016 | 4/20/2016 | 4/20/2016 | 4/20/2016 | 9/15/2016 | 9/15/2016 | 9/15/2016 | 9/15/2016 | 9/15/2016 |
| Sample Depth: | | | | | | | | | | | (0.5-) ft BGS | (21-22) ft BGS | (22-23) ft BGS | (22.5-23) ft BGS | (22-23) ft BGS | (24-) ft BGS | (14-) ft BGS | (35-) ft BGS | (43.5-) ft BGS | (50-) ft BGS |
| **Parameters** | **Units** | **EPA Residential RSL** | **EPA Industrial RSL** | **EPA MCL-based RSL** | **EPA Tap water-based RSL** | **NMED Residential SSL** | **NMED Commercial/ Industrial SSL** | **NMED Construction SSL** | **NMED Tap water-based SSL** | **API Livestock RBSL** | | | | | | | | | | |
| **Petroleum Products** | | a | b | c | d | e | f | g | h | i | | | | | | | | | | |
| Total Petroleum Hydrocarbons - Crude Oil | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 44,900 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | 50 | 500 | -- | -- | 1000 | 3000 | 3000 | -- | -- | -- | -- | -- | -- | -- | 10.6 U | 1180[ab] | 13.5 | 106[a] | 14.2 |
| Total Petroleum Hydrocarbons (>C10-C12) Aliphatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C10-C12) Aromatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C12-C16) Aliphatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C12-C16) Aromatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C12-C28) | mg/kg | 50 | 500 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C16-C21) Aliphatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C16-C21) Aromatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C21-C35) Aliphatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C28-C35) | mg/kg | 50 | 500 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C6-C8) Aliphatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C7-C8) Aromatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C8-C10) Aliphatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (>C8-C10) Aromatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (C10-C26) | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5500 | 480 | 100 | 340 | 1100 | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (C21-C35) Aromatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 10.6 U | 116 U | 11.6 U | 10.7 U | 10.5 U |
| Total Petroleum Hydrocarbons (C6) Aliphatic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 50 | 500 | -- | -- | -- | -- | -- | -- | -- | 320 J[a] | 170[a] | 110 J[a] | 160 J[a] | 190 J[a] | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 50 | 500 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.53 U | 293[a] | 1.0 | 145[a] | 0.52 U |
| Total Petroleum Hydrocarbons (C6-C12) | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Petroleum Hydrocarbons (C6-C35) | mg/kg | 50 | 500 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SVOCs - SIM** | | | | | | | | | | | | | | | | | | | | |
| $PAH_{LMW}$ | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 177 | | | | | | | | | | |
| $PAH_{HMW}$ | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 35.5 | | | | | | | | | | |
| Acenaphthene | mg/kg | 3600 | 45000 | -- | 110 | 3477 | 50519 | 15060 | 82.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | mg/kg | 18000 | 230000 | -- | 1160 | 17385 | 252597 | 75301 | 851 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | mg/kg | 1.6 | 29 | -- | 0.84 | 1.53 | 32.3 | 240 | 0.637 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | mg/kg | 0.16 | 2.9 | 48 | 0.8 | 1.12 | 23.6 | 106 | 4.42 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | mg/kg | 1.6 | 29 | -- | 8.2 | 1.53 | 32.3 | 240 | 6.17 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | mg/kg | 16 | 290 | -- | 80 | 15.3 | 323 | 2313 | 60.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | mg/kg | 160 | 2900 | -- | 240 | 153 | 3229 | 23126 | 186 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenz(a,h)anthracene | mg/kg | 0.16 | 2.9 | -- | 2.6 | 0.153 | 3.23 | 24 | 1.97 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | mg/kg | 2400 | 30000 | -- | 1780 | 2318 | 33680 | 10040 | 1337 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | mg/kg | 2400 | 30000 | -- | 108 | 2318 | 33680 | 10040 | 80 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | mg/kg | 1.6 | 29 | -- | 26 | 1.53 | 32.3 | 240 | 20 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | mg/kg | 38 | 170 | -- | 0.108 | 1159 | 16840 | 5020 | 0.0823 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | mg/kg | -- | -- | -- | -- | 1738 | 25260 | 7530 | 85.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | mg/kg | 1800 | 23000 | -- | 260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **VOCs** | | | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 12 | 51 | 0.52 | 0.046 | 17.7 | 86.5 | 141 | 0.038 | 1,270 | 0.24 U | 0.093 U | 0.094 U | 0.093 U | 0.094 U | 0.0053 U | 0.29 U | 0.0058 U | 0.27 U | 0.0052 U |
| Ethylbenzene | mg/kg | 58 | 250 | 160 | 0.34 | 74.5 | 365 | 1757 | 0.264 | 1,030 | 1.4 J[ab] | 0.47[ab] | 0.55[ab] | 0.37[ab] | 0.19 U | 0.0053 U | 0.29 U | 0.0058 U | 0.27 U | 0.0052 U |
| Toluene | mg/kg | 4900 | 47000 | 13.8 | 15.2 | 5221 | 61110 | 13978 | 12.1 | 7,900 | 0.48 U | 0.19 U | 0.19 U | 0.19 U | 0.19 U | 0.0053 U | 0.29 U | 0.0058 U | 0.36 | 0.0052 U |
| Xylenes (total) | mg/kg | 580 | 2500 | 198 | 3.8 | 863 | 4237 | 791 | 2.98 | 6,330 | 7.2 J[ab] | 3.1[b] | 0.37 U | 0.81 | 1.6 J | 0.011 U | 4.8[ab] | 0.012 U | 2.3 | 0.011 |
| **Wet** | | | | | | | | | | | | | | | | | | | | |
| Percent moisture | % | | | | | | | | | | -- | -- | -- | -- | -- | 6.1 | 15.0 | 14.1 | 8.7 | 5.2 |
| Total solids | % | | | | | | | | | | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Footnotes:
U Not detected at the associated reporting limit.
J Estimated concentration.
UJ Not detected; associated reporting limit is estimated.
$PAH_{LMW}$ Low Molecular Weight Polycyclic Aromatic Hydrocarbons
$PAH_{HMW}$ High Molecular Weight Polycyclic Aromatic Hydrocarbons
SVOC Semivolatile Organic Compounds
VOC Volatile Organic Compounds

**Appendix A.1**

**Summary of Analytical Results for Soil (0-10 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company Rio Arriba County, New Mexico**

| Sample Location: | | B-13 | B-14 | B-14 | B-15 | B-15 | B-16 | B-16 | B-17 | B-17 | B-17 | B-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | S-11124687-091616-JW-B13@40' | S-11124687-091616-JW-B14@30' | S-11124687-091616-JW-B14@40' | S-11124687-091616-JW-B15@34' | S-11124687-091616-JW-B15@40' | S-11124687-091616-JW-B16@35' | S-11124687-091616-JW-B16@40' | S-11124687-041217-B17@0.5'-JW | S-11124687-041217-B17@9'-JW | S-11124687-041217-B17@12'-JW | S-11124687-041217-B17@14'-JW |
| Sample Date: | | 9/16/2016 | 9/16/2016 | 9/16/2016 | 9/16/2016 | 9/16/2016 | 9/16/2016 | 9/16/2016 | 4/12/2017 | 4/12/2017 | 4/12/2017 | 4/12/2017 |
| Sample Depth: | | (40-) ft BGS | (30-) ft BGS | (40-) ft BGS | (34-) ft BGS | (40-) ft BGS | (35-) ft BGS | (40-) ft BGS | (0-0.5) ft BGS | (9-10.5) ft BGS | (12-13.5) ft BGS | (14-15.5) ft BGS |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Petroleum Products** | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons - Crude Oil | mg/kg | – | – | – | – | – | – | – | – | – | – | – |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | 11.3 U | 246* | 10.3 U | 37.2 | 10.1 U | 154* | 10.1 U | – | – | – | – |
| Total Petroleum Hydrocarbons (>C10-C12) Aliphatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 160 | 61.6 | 13.8 U |
| Total Petroleum Hydrocarbons (>C10-C12) Aromatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 12.4 U | 13.2 U | 13.8 U |
| Total Petroleum Hydrocarbons (>C12-C16) Aliphatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 134 | 50.5 | 13.8 U |
| Total Petroleum Hydrocarbons (>C12-C16) Aromatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 12.4 U | 13.2 U | 13.8 U |
| Total Petroleum Hydrocarbons (>C12-C28) | mg/kg | – | – | – | – | – | – | – | 6.4 U | 225* | 85.8* | 11.2 |
| Total Petroleum Hydrocarbons (>C16-C21) Aliphatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 12.4 U | 13.2 U | 13.8 U |
| Total Petroleum Hydrocarbons (>C16-C21) Aromatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 12.4 U | 13.2 U | 13.8 U |
| Total Petroleum Hydrocarbons (>C21-C35) Aliphatic | mg/kg | – | – | – | – | – | – | – | 27.9 U | 24.9 U | 26.4 U | 27.5 U |
| Total Petroleum Hydrocarbons (>C28-C35) | mg/kg | – | – | – | – | – | – | – | 26.9 U | 23.9 U | 25.3 U | 26.4 U |
| Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics | mg/kg | – | – | – | – | – | – | – | 3.2 UJ | 472 | 169 | 3.2 U |
| Total Petroleum Hydrocarbons (>C6-C8) Aliphatic | mg/kg | – | – | – | – | – | – | – | 27.9 U | 27.2 | 26.4 U | 27.5 U |
| Total Petroleum Hydrocarbons (>C7-C8) Aromatic | mg/kg | – | – | – | – | – | – | – | 3.2 U | 2.9 U | 3.0 U | 3.2 U |
| Total Petroleum Hydrocarbons (>C8-C10) Aliphatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 151 | 56.8 | 13.8 U |
| Total Petroleum Hydrocarbons (>C8-C10) Aromatic | mg/kg | – | – | – | – | – | – | – | 21.5 U | 19.1 U | 20.3 U | 21.2 U |
| Total Petroleum Hydrocarbons (C10-C26) | mg/kg | – | – | – | – | – | – | – | – | – | – | – |
| Total Petroleum Hydrocarbons (C21-C35) Aromatic | mg/kg | – | – | – | – | – | – | – | 27.9 U | 24.9 U | 26.4 U | 27.5 U |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | 11.3 U | 31.2 U | 10.3 U | 10.9 U | 10.1 U | 10.8 U | 10.1 U | – | – | – | – |
| Total Petroleum Hydrocarbons (C6) Aliphatic | mg/kg | – | – | – | – | – | – | – | 14.0 U | 12.4 U | 13.2 U | 13.8 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | – | – | – | – | – | – | – | – | – | – | – |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 0.59 U | 1.4 | 0.53 U | 3.1 | 0.51 U | 8.0 | 0.52 U | – | – | – | – |
| Total Petroleum Hydrocarbons (C6-C12) | mg/kg | – | – | – | – | – | – | – | 12.9 U | 582 | 222 | 22.7 |
| Total Petroleum Hydrocarbons (C6-C35) | mg/kg | – | – | – | – | – | – | – | 6.4 U | 806* | 308* | 34.0 |
| **SVOCs - SIM** | | | | | | | | | | | | |
| $PAH_{LMW}$ | mg/kg | | | | | | | | | | | |
| $PAH_{HMW}$ | mg/kg | | | | | | | | | | | |
| Acenaphthene | mg/kg | – | – | – | – | – | – | – | 0.0036 U | 0.0073 | 0.0039 U | 0.0038 U |
| Acenaphthylene | mg/kg | – | – | – | – | – | – | – | 0.0036 U | 0.0035 U | 0.0039 U | 0.0038 U |
| Anthracene | mg/kg | – | – | – | – | – | – | – | 0.0036 U | 0.0035 U | 0.0039 U | 0.0055 |
| Benzo(a)anthracene | mg/kg | – | – | – | – | – | – | – | 0.0065 | 0.0035 U | 0.0039 U | 0.0076 |
| Benzo(a)pyrene | mg/kg | – | – | – | – | – | – | – | 0.0057 J | 0.0035 U | 0.0039 U | 0.0038 U |
| Benzo(b)fluoranthene | mg/kg | – | – | – | – | – | – | – | 0.0096 J | 0.0035 U | 0.0039 U | 0.0056 |
| Benzo(g,h,i)perylene | mg/kg | – | – | – | – | – | – | – | 0.0081 J | 0.0035 U | 0.0039 U | 0.0038 U |
| Benzo(k)fluoranthene | mg/kg | – | – | – | – | – | – | – | 0.0051 J | 0.0035 U | 0.0039 U | 0.0038 U |
| Chrysene | mg/kg | – | – | – | – | – | – | – | 0.0065 J | 0.0035 U | 0.0039 U | 0.0071 |
| Dibenz(a,h)anthracene | mg/kg | – | – | – | – | – | – | – | 0.0036 U | 0.0035 U | 0.0039 U | 0.0038 U |
| Fluoranthene | mg/kg | – | – | – | – | – | – | – | 0.0143 J | 0.0035 U | 0.0039 U | 0.0229 |
| Fluorene | mg/kg | – | – | – | – | – | – | – | 0.0036 U | 0.0334 | 0.0091 | 0.0045 |
| Indeno(1,2,3-cd)pyrene | mg/kg | – | – | – | – | – | – | – | 0.006 J | 0.0035 U | 0.0039 U | 0.0038 U |
| Naphthalene | mg/kg | – | – | – | – | – | – | – | 0.0036 U | 0.427* | 0.142* | 0.0201 |
| Phenanthrene | mg/kg | – | – | – | – | – | – | – | 0.013 J | 0.0145 | 0.0044 | 0.0244 |
| Pyrene | mg/kg | – | – | – | – | – | – | – | 0.0123 J | 0.0035 U | 0.0039 U | 0.0198 |
| **VOCs** | | | | | | | | | | | | |
| Benzene | mg/kg | 0.0059 U | 0.0052 U | 0.0053 U | 0.0055 U | 0.0051 U | 0.021 | 0.0052 U | – | – | – | – |
| Ethylbenzene | mg/kg | 0.0059 U | 0.0052 U | 0.0053 U | 0.0055 U | 0.0051 U | 0.052 | 0.0052 U | – | – | – | – |
| Toluene | mg/kg | 0.0059 U | 0.0052 U | 0.0053 U | 0.0055 U | 0.0051 U | 0.14 | 0.0052 U | – | – | – | – |
| Xylenes (total) | mg/kg | 0.012 U | 0.010 U | 0.011 U | 0.053 | 0.010 U | 1.6 | 0.010 U | – | – | – | – |
| **Wet** | | | | | | | | | | | | |
| Percent moisture | % | 16.4 | 5.3 | 5.5 | 10.1 | 2.8 | 8.9 | 4.9 | 5.7 | 8.7 | 14.3 | 12.5 |
| Total solids | % | – | – | – | – | – | – | – | 94.3 | 91.3 | 85.7 | 87.5 |

Not detected at the associated reporting limit.
Estimated concentration.
Not detected; associated reporting limit is estimated.
Low Molecular Weight Polycyclic Aromatic Hydrocarbons
High Molecular Weight Polycyclic Aromatic Hydrocarbons
Semivolatile Organic Compounds
Volatile Organic Compounds

**Appendix A.1**

**Summary of Analytical Results for Soil (0-10 ft bgs)**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company Rio Arriba County, New Mexico**

| | | |
|---|---|---|
| **Sample Location:** | | **B-17** |
| **Sample ID:** | | **S-11124687-041217-B17@17-JW** |
| **Sample Date:** | | **4/12/2017** |
| **Sample Depth:** | | **(17-18.5) ft BGS** |
| **Parameters** | **Units** | |
| **Petroleum Products** | | |
| Total Petroleum Hydrocarbons - Crude Oil | mg/kg | -- |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | -- |
| Total Petroleum Hydrocarbons (>C10-C12) Aliphatic | mg/kg | 320 |
| Total Petroleum Hydrocarbons (>C10-C12) Aromatic | mg/kg | 13.1 U |
| Total Petroleum Hydrocarbons (>C12-C16) Aliphatic | mg/kg | 213 |
| Total Petroleum Hydrocarbons (>C12-C16) Aromatic | mg/kg | 13.1 U |
| Total Petroleum Hydrocarbons (>C12-C28) | mg/kg | 353[a] |
| Total Petroleum Hydrocarbons (>C16-C21) Aliphatic | mg/kg | 13.1 U |
| Total Petroleum Hydrocarbons (>C16-C21) Aromatic | mg/kg | 13.1 U |
| Total Petroleum Hydrocarbons (>C21-C35) Aliphatic | mg/kg | 26.1 U |
| Total Petroleum Hydrocarbons (>C28-C35) | mg/kg | 25.1 U |
| Total Petroleum Hydrocarbons (>C8-C35) Aliphatics & Aromatics | mg/kg | 1000 |
| Total Petroleum Hydrocarbons (>C6-C8) Aliphatic | mg/kg | 54.9 |
| Total Petroleum Hydrocarbons (>C7-C8) Aromatic | mg/kg | 3.0 U |
| Total Petroleum Hydrocarbons (>C8-C10) Aliphatic | mg/kg | 386 |
| Total Petroleum Hydrocarbons (>C8-C10) Aromatic | mg/kg | 28.3 |
| Total Petroleum Hydrocarbons (C10-C26) | mg/kg | -- |
| Total Petroleum Hydrocarbons (C21-C35) Aromatic | mg/kg | 26.1 U |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | -- |
| Total Petroleum Hydrocarbons (C6) Aliphatic | mg/kg | 13.1 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | -- |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | -- |
| Total Petroleum Hydrocarbons (C6-C12) | mg/kg | 1280 |
| Total Petroleum Hydrocarbons (C6-C35) | mg/kg | 1639[ab] |
| **SVOCs - SIM** | | |
| $PAH_{LMW}$ | mg/kg | |
| $PAH_{HMW}$ | mg/kg | |
| Acenaphthene | mg/kg | 0.0078 |
| Acenaphthylene | mg/kg | 0.0039 U |
| Anthracene | mg/kg | 0.0079 U |
| Benzo(a)anthracene | mg/kg | 0.0039 U |
| Benzo(a)pyrene | mg/kg | 0.0039 U |
| Benzo(b)fluoranthene | mg/kg | 0.0039 U |
| Benzo(g,h,i)perylene | mg/kg | 0.0039 U |
| Benzo(k)fluoranthene | mg/kg | 0.0039 U |
| Chrysene | mg/kg | 0.0039 U |
| Dibenz(a,h)anthracene | mg/kg | 0.0039 U |
| Fluoranthene | mg/kg | 0.0079 U |
| Fluorene | mg/kg | 0.0377 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.0039 U |
| Naphthalene | mg/kg | 0.696[ab] |
| Phenanthrene | mg/kg | 0.0162 |
| Pyrene | mg/kg | 0.0039 U |
| **VOCs** | | |
| Benzene | mg/kg | -- |
| Ethylbenzene | mg/kg | -- |
| Toluene | mg/kg | -- |
| Xylenes (total) | mg/kg | -- |
| **Wet** | | |
| Percent moisture | % | 17.8 |
| Total solids | % | 82.2 |

Not detected at the associated reporting limit.
Estimated concentration.
Not detected; associated reporting limit is estimated.
Low Molecular Weight Polycyclic Aromatic Hydrocarbons
High Molecular Weight Polycyclic Aromatic Hydrocarbons
Semivolatile Organic Compounds
Volatile Organic Compounds

**Summary of Analytical Results for Groundwater**
**HHRA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| | | | | | |
|---|---|---|---|---|---|
| **Sample Location:** | | | | | **Well** |
| **Sample ID:** | | | | | **W-11124687-041217-WELL-JW** |
| **Sample Date:** | | | | | **4/12/2017** |
| **Parameters** | **Units** | **EPA Tap Water RSL** | **NMED Tap Water SSL** | **API Livestock RBSL** | |
| | | a | b | c | |
| **Petroleum Products** | | | | | |
| Crude Oil | mg/L | -- | -- | 1200 | |
| **SVOCs - SIM** | | | | | |
| $PAH_{LMW}$ | mg/L | -- | -- | 4.4 | -- |
| $PAH_{HMW}$ | mg/L | -- | -- | 0.88 | -- |
| Acenaphthene | mg/L | 0.53 | 0.535 | -- | 0.000091 U |
| Acenaphthylene | mg/L | -- | -- | -- | 0.000091 U |
| Anthracene | mg/L | 1.8 | 1.72 | -- | 0.000091 U |
| Benzo(a)anthracene | mg/L | 0.00012 | 0.00012 | -- | 0.000091 U |
| Benzo(a)pyrene | mg/L | 0.000034 | 0.000251 | -- | 0.000091 U |
| Benzo(b)fluoranthene | mg/L | 0.00034 | 0.000343 | -- | 0.000091 U |
| Benzo(g,h,i)perylene | mg/L | -- | -- | -- | 0.000091 U |
| Benzo(k)fluoranthene | mg/L | 0.0034 | 0.00343 | -- | 0.000091 U |
| Chrysene | mg/L | 0.034 | 0.0343 | -- | 0.000091 U |
| Dibenz(a,h)anthracene | mg/L | 0.000034 | 0.0000343 | -- | 0.000091 U |
| Fluoranthene | mg/L | 0.8 | 0.802 | -- | 0.00045 U |
| Fluorene | mg/L | 0.29 | 0.288 | -- | 0.000091 U |
| Indeno(1,2,3-cd)pyrene | mg/L | 0.00034 | 0.000343 | -- | 0.000091 U |
| Naphthalene | mg/L | 0.0017 | 0.00165 | -- | 0.00045 U |
| Phenanthrene | mg/L | -- | 0.17 | -- | 0.00045 U |
| Pyrene | mg/L | 0.12 | 0.117 | -- | 0.000091 U |
| **VOCs** | | | | | |
| Benzene | mg/L | 0.0046 | 0.00455 | 31.4 | 0.001 U |
| Ethylbenzene | mg/L | 0.0015 | 0.015 | 25.6 | 0.001 U |
| Toluene | mg/L | 1.1 | 1.09 | 196 | 0.001 U |
| Xylenes (total) | mg/L | 0.19 | 0.193 | 157 | 0.003 U |

Footnotes:

U Not detected at the associated reporting limit.
$PAH_{LMW}$ Low Molecular Weight Polycyclic Aromatic Hydrocarbons
$PAH_{HMW}$ High Molecular Weight Polycyclic Aromatic Hydrocarbons
SVOC Semivolatile Organic Compounds
VOC Volatile Organic Compounds

Appendix A.3

Summary of Analytical Results for Surface Soil (0-1 ft bgs): Petroleum Products, SVOCs, and VOCs
ERA: San Juan 27-5 No. 1
ConocoPhillips Company
Rio Arriba County, New Mexico

| Sample Location: | | B-17 | Construction Trench |
|---|---|---|---|
| Sample ID: | | S-11124687-041217-B17@0.5'-JW | San Juan 27-5 #1 |
| Sample Date: | | 4/12/2017 | 11/30/2015 |
| Sample Depth: | | (0-0.5) ft BGS | (0.5-) ft BGS |
| **Parameters** | **Units ESVs** | | |
| **Petroleum Products** | | | |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | -- | -- |
| Total Petroleum Hydrocarbons (>C10-C12) Aliphatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (>C10-C12) Aromatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (>C12-C16) Aliphatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (>C12-C16) Aromatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (>C12-C28) | mg/kg | 6.4 U | -- |
| Total Petroleum Hydrocarbons (>C16-C21) Aliphatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (>C16-C21) Aromatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (>C21-C35) Aliphatic | mg/kg | 27.9 U | -- |
| Total Petroleum Hydrocarbons (>C28-C35) | mg/kg | 26.9 U | -- |
| Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics | mg/kg | 3.2 UJ | -- |
| Total Petroleum Hydrocarbons (>C6-C8) Aliphatic | mg/kg | 27.9 U | -- |
| Total Petroleum Hydrocarbons (>C7-C8) Aromatic | mg/kg | 3.2 U | -- |
| Total Petroleum Hydrocarbons (>C8-C10) Aliphatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (>C8-C10) Aromatic | mg/kg | 21.5 U | -- |
| Total Petroleum Hydrocarbons (C10-C26) | mg/kg | -- | 5500 |
| Total Petroleum Hydrocarbons (C21-C35) Aromatic | mg/kg | 27.9 U | -- |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | -- | -- |
| Total Petroleum Hydrocarbons (C6) Aliphatic | mg/kg | 14.0 U | -- |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | -- | 320 J |
| Total Petroleum Hydrocarbons (C6-C12) | mg/kg | 12.9 U | -- |
| Total Petroleum Hydrocarbons (C6-C35) | mg/kg | 6.4 U | -- |

Appendix A.3

Summary of Analytical Results for Surface Soil (0-1 ft bgs): Petroleum Products, SVOCs, and VOCs
ERA: San Juan 27-5 No. 1
ConocoPhillips Company
Rio Arriba County, New Mexico

| Sample Location: | | | B-17 | Construction Trench |
|---|---|---|---|---|
| Sample ID: | | | S-11124687-041217-B17@0.5'-JW | San Juan 27-5 #1 |
| Sample Date: | | | 4/12/2017 | 11/30/2015 |
| Sample Depth: | | | (0-0.5) ft BGS | (0.5-) ft BGS |
| **SVOCs - SIM** | | | | |
| Acenaphthene | mg/kg | 20 | 0.0036 U | -- |
| Acenaphthylene | mg/kg | 682 | 0.0036 U | -- |
| Anthracene | mg/kg | 0.1 | 0.0036 U | -- |
| Benzo(a)anthracene | mg/kg | 5.21 | 0.0065 | -- |
| Benzo(a)pyrene | mg/kg | 0.1 | 0.0057 J | -- |
| Benzo(b)fluoranthene | mg/kg | 59.8 | 0.0096 J | -- |
| Benzo(g,h,i)perylene | mg/kg | 119 | 0.0081 J | -- |
| Benzo(k)fluoranthene | mg/kg | 148 | 0.0051 J | -- |
| Chrysene | mg/kg | 4.73 | 0.0065 J | -- |
| Dibenz(a,h)anthracene | mg/kg | 18.4 | 0.0036 U | -- |
| Fluoranthene | mg/kg | 0.1 | 0.0143 J | -- |
| Fluorene | mg/kg | 30 | 0.0036 U | -- |
| Indeno(1,2,3-cd)pyrene | mg/kg | 109 | 0.006 J | -- |
| Naphthalene | mg/kg | 0.1 | 0.0036 U | -- |
| Phenanthrene | mg/kg | 0.1 | 0.013 J | -- |
| Pyrene | mg/kg | 0.1 | 0.0123 J | -- |

**Appendix A.3**

**Summary of Analytical Results for Surface Soil (0-1 ft bgs): Petroleum Products, SVOCs, and VOCs**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| | | | | |
|---|---|---|---|---|
| **Sample Location:** | | | **B-17** | **Construction Trench** |
| **Sample ID:** | | | **S-11124687-041217-B17@0.5'-JW** | **San Juan 27-5 #1** |
| **Sample Date:** | | | **4/12/2017** | **11/30/2015** |
| **Sample Depth:** | | | **(0-0.5) ft BGS** | **(0.5-) ft BGS** |
| **VOCs** | | | | |
| Benzene | mg/kg | 0.05 | -- | 0.24 U |
| Ethylbenzene | mg/kg | 0.05 | -- | **1.4 J** |
| Toluene | mg/kg | 200 | -- | 0.48 U |
| Xylenes (total) | mg/kg | 0.05 | -- | **7.2 J** |
| **Wet** | | | | |
| Percent moisture | % | | 5.7 | -- |
| Total solids | % | | 94.3 | -- |

Notes:

**1.4 J** Boxed, shaded cells indicate concentrations that exceed the ecological screening value for soil
ft bgs Feet Below Ground Surface
mg/kg Milligram Per Kilogram
U Not detected at the associated reporting limit.
J Estimated concentration.
UJ Not detected; associated reporting limit is estimated.

Appendix A.4

Summary of Analytical Results for Surface and Subsurface Soil (0-10 ft bgs): Petroleum Products, SVOCs, and VOCs
ERA: San Juan 27-5 No. 1
ConocoPhillips Company
Rio Arriba County, New Mexico

| | | | |
|---|---|---|---|
| **Sample Location:** | | | **B-17** |
| **Sample ID:** | | | **S-11124687-041217-B17@9'-JW** |
| **Sample Date:** | | | **4/12/2017** |
| **Sample Depth:** | | | **(9-10.5) ft BGS** |
| **Parameters** | **Units** | **ESVs** | |
| **Petroleum Products** | | | |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | | -- |
| Total Petroleum Hydrocarbons (>C10-C12) Aliphatic | mg/kg | | 160 |
| Total Petroleum Hydrocarbons (>C10-C12) Aromatic | mg/kg | | 12.4 U |
| Total Petroleum Hydrocarbons (>C12-C16) Aliphatic | mg/kg | | 134 |
| Total Petroleum Hydrocarbons (>C12-C16) Aromatic | mg/kg | | 12.4 U |
| Total Petroleum Hydrocarbons (>C12-C28) | mg/kg | | 225 |
| Total Petroleum Hydrocarbons (>C16-C21) Aliphatic | mg/kg | | 12.4 U |
| Total Petroleum Hydrocarbons (>C16-C21) Aromatic | mg/kg | | 12.4 U |
| Total Petroleum Hydrocarbons (>C21-C35) Aliphatic | mg/kg | | 24.9 U |
| Total Petroleum Hydrocarbons (>C28-C35) | mg/kg | | 23.9 U |
| Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics | mg/kg | | 472 |
| Total Petroleum Hydrocarbons (>C6-C8) Aliphatic | mg/kg | | 27.2 |
| Total Petroleum Hydrocarbons (>C7-C8) Aromatic | mg/kg | | 2.9 U |
| Total Petroleum Hydrocarbons (>C8-C10) Aliphatic | mg/kg | | 151 |
| Total Petroleum Hydrocarbons (>C8-C10) Aromatic | mg/kg | | 19.1 U |
| Total Petroleum Hydrocarbons (C10-C26) | mg/kg | | -- |
| Total Petroleum Hydrocarbons (C21-C35) Aromatic | mg/kg | | 24.9 U |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | | -- |
| Total Petroleum Hydrocarbons (C6) Aliphatic | mg/kg | | 12.4 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | | -- |
| Total Petroleum Hydrocarbons (C6-C12) | mg/kg | | 582 |
| Total Petroleum Hydrocarbons (C6-C35) | mg/kg | | 806 |

Appendix A.4

Summary of Analytical Results for Surface and Subsurface Soil (0-10 ft bgs): Petroleum Products, SVOCs, and VOCs
ERA: San Juan 27-5 No. 1
ConocoPhillips Company
Rio Arriba County, New Mexico

| | | | |
|---|---|---|---|
| **Sample Location:** | | | **B-17** |
| **Sample ID:** | | | **S-11124687-041217-B17@9'-JW** |
| **Sample Date:** | | | **4/12/2017** |
| **Sample Depth:** | | | **(9-10.5) ft BGS** |
| **Parameters** | **Units** | **ESVs** | |
| **SVOCs - SIM** | | | |
| Acenaphthene | mg/kg | 20 | 0.0073 |
| Acenaphthylene | mg/kg | 682 | 0.0035 U |
| Anthracene | mg/kg | 0.1 | 0.0035 U |
| Benzo(a)anthracene | mg/kg | 5.21 | 0.0035 U |
| Benzo(a)pyrene | mg/kg | 0.1 | 0.0035 U |
| Benzo(b)fluoranthene | mg/kg | 59.8 | 0.0035 U |
| Benzo(g,h,i)perylene | mg/kg | 119 | 0.0035 U |
| Benzo(k)fluoranthene | mg/kg | 148 | 0.0035 U |
| Chrysene | mg/kg | 4.73 | 0.0035 U |
| Dibenz(a,h)anthracene | mg/kg | 18.4 | 0.0035 U |
| Fluoranthene | mg/kg | 0.1 | 0.0035 U |
| Fluorene | mg/kg | 30 | 0.0334 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 109 | 0.0035 U |
| Naphthalene | mg/kg | 0.1 | **0.427** |
| Phenanthrene | mg/kg | 0.1 | 0.0145 |
| Pyrene | mg/kg | 0.1 | 0.0035 U |

**Appendix A.4**

**Summary of Analytical Results for Surface and Subsurface Soil (0-10 ft bgs): Petroleum Products, SVOCs, and VOCs**
**ERA: San Juan 27-5 No. 1**
**ConocoPhillips Company**
**Rio Arriba County, New Mexico**

| | | | |
|---|---|---|---|
| **Sample Location:** | | | **B-17** |
| **Sample ID:** | | | **S-11124687-041217-B17@9'-JW** |
| **Sample Date:** | | | **4/12/2017** |
| **Sample Depth:** | | | **(9-10.5) ft BGS** |
| **Parameters** | **Units** | **ESVs** | |
| **VOCs** | | | |
| Benzene | mg/kg | 0.05 | -- |
| Ethylbenzene | mg/kg | 0.05 | -- |
| Toluene | mg/kg | 200 | -- |
| Xylenes (total) | mg/kg | 0.05 | -- |
| **Wet** | | | |
| Percent moisture | % | | 8.7 |
| Total solids | % | | 91.3 |

Notes:

1.4 J Boxed, shaded cells indicate concentrations that exceed the ecological screening value for soil
ft bgs Feet Below Ground Surface
mg/kg Milligram Per Kilogram
U Not detected at the associated reporting limit.
J Estimated concentration.
UJ Not detected; associated reporting limit is estimated.

# Appendix B
# Species List Report/Threatened and Endangered Species

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 10010 | Largemouth Bass | *Micropterus salmoides* | Rio Arriba |
| 10020 | Smallmouth Bass | *Micropterus dolomieui* | Rio Arriba |
| 10045 | Bluegill | *Lepomis macrochirus* | Rio Arriba |
| 10065 | Black Bullhead | *Ameiurus melas* | Rio Arriba |
| 10080 | Common Carp | *Cyprinus carpio* | Rio Arriba |
| 10090 | River Carpsucker | *Carpiodes carpio* | Rio Arriba |
| 10100 | Channel Catfish | *Ictalurus punctatus* | Rio Arriba |
| 10130 | Flathead Chub | *Platygobio gracilis* | Rio Arriba |
| 10140 | Rio Grande Chub | *Gila pandora* | Rio Arriba |
| 10145 | Roundtail Chub (upper basin populations) | *Gila robusta* | Rio Arriba |
| 10165 | White Crappie | *Pomoxis annularis* | Rio Arriba |
| 10175 | Longnose Dace | *Rhinichthys cataractae* | Rio Arriba |
| 10185 | Speckled Dace (Non-Gila pop.) | *Rhinichthys osculus* | Rio Arriba |
| 10260 | Plains Killifish | *Fundulus zebrinus* | Rio Arriba |
| 10285 | Fathead Minnow | *Pimephales promelas* | Rio Arriba |
| 10325 | Western mosquitofish | *Gambusia affinis* | Rio Arriba |
| 10335 | Yellow Perch | *Perca flavescens* | Rio Arriba |
| 10340 | Northern Pike | *Esox lucius* | Rio Arriba |
| 10375 | Kokanee Salmon | *Oncorhynchus nerka* | Rio Arriba |
| 10385 | Mottled Sculpin | *Cottus bairdi* | Rio Arriba |
| 10430 | Red Shiner | *Cyprinella lutrensis* | Rio Arriba |
| 10495 | Bluehead Sucker | *Catostomus discobolus discobolus* | Rio Arriba |
| 10505 | Flannelmouth Sucker | *Catostomus latipinnis* | Rio Arriba |
| 10515 | Rio Grande Sucker | *Catostomus plebeius* | Rio Arriba |
| 10525 | White Sucker | *Catostomus commersoni* | Rio Arriba |
| 10530 | Green Sunfish | *Lepomis cyanellus* | Rio Arriba |
| 10570 | Brook Trout | *Salvelinus fontinalis* | Rio Arriba |
| 10575 | Brown Trout | *Salmo trutta* | Rio Arriba |
| 10585 | Rio Grande Cutthroat Trout | *Oncorhynchus clarkii virginalis* | Rio Arriba |
| 10595 | Cutthroat Trout | *Oncorhynchus clarkii* | Rio Arriba |
| 10610 | Lake Trout | *Salvelinus namaycush* | Rio Arriba |
| 10615 | *Rainbow Trout* | *Oncorhynchus mykiss* | Rio Arriba |
| 10630 | Walleye | *Stizostedion vitreum* | Rio Arriba |
| 20005 | Bullfrog | *Lithobates catesbeianus* | Rio Arriba |
| 20015 | Boreal Chorus Frog | *Pseudacris maculata* | Rio Arriba |
| 20035 | Northern Leopard Frog | *Lithobates pipiens* | Rio Arriba |
| 20040 | Plains Leopard Frog | *Lithobates blairi* | Rio Arriba |
| 20060 | Jemez Mountains Salamander | *Plethodon neomexicanus* | Rio Arriba |
| 20070 | Tiger Salamander | *Ambystoma mavortium mavortium; nebulosum* | Rio Arriba |
| 20080 | New Mexico Spadefoot | *Spea multiplicata* | Rio Arriba |
| 20085 | Plains Spadefoot | *Spea bombifrons* | Rio Arriba |
| 20090 | Boreal Toad | *Anaxyrus boreas boreas* | Rio Arriba |
| 20100 | Great Plains Toad | *Anaxyrus cognatus* | Rio Arriba |
| 20115 | Red-spotted Toad | *Anaxyrus punctatus* | Rio Arriba |
| 20130 | Woodhouse's Toad | *Anaxyrus woodhousii* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 30005 | Coachwhip | *Coluber flagellum* | Rio Arriba |
| 30030 | Eastern Collared Lizard | *Crotaphytus collaris* | Rio Arriba |
| 30045 | Common Lesser Earless Lizard | *Holbrookia maculata approximans; maculata; bunkeri* | Rio Arriba |
| 30057 | Plateau Fence Lizard | *Sceloporus tristichus* | Rio Arriba |
| 30065 | Round-tailed Horned Lizard | *Phrynosoma modestum* | Rio Arriba |
| 30085 | Northern Sagebrush Lizard | *Sceloporus graciosus* | Rio Arriba |
| 30090 | Hernandez's Short-horned Lizard | *Phrynosoma hernandesi* | Rio Arriba |
| 30095 | Common Side-blotched Lizard | *Uta stansburiana* | Rio Arriba |
| 30120 | Northern Tree Lizard | *Urosaurus ornatus* | Rio Arriba |
| 30160 | Western Diamond-backed Rattlesnake | *Crotalus atrox* | Rio Arriba |
| 30180 | Prairie Rattlesnake | *Crotalus viridis* | Rio Arriba |
| 30200 | Many-lined Skink | *Plestiodon multivirgatus* | Rio Arriba |
| 30230 | Texas Blind Snake | *Rena dissectus* | Rio Arriba |
| 30245 | Great Plains Rat Snake | *Pantherophis emoryi* | Rio Arriba |
| 30250 | Black-necked Gartersnake | *Thamnophis cyrtopsis* | Rio Arriba |
| 30259 | New Mexico Gartersnake | *Thamnophis sirtalis* | Rio Arriba |
| 30280 | Wandering Gartersnake | *Thamnophis elegans* | Rio Arriba |
| 30285 | Glossy Snake | *Arizona elegans* | Rio Arriba |
| 30290 | Gophersnake | *Pituophis catenifer* | Rio Arriba |
| 30295 | Smooth Greensnake | *Opheodrys vernalis* | Rio Arriba |
| 30310 | Plains Hog-nosed Snake | *Heterodon nasicus* | Rio Arriba |
| 30350 | Milk Snake | *Lampropeltis triangulum* | Rio Arriba |
| 30365 | Mountain Patchnose Snake | *Salvadora grahamiae* | Rio Arriba |
| 30435 | Western Painted Turtle | *Chrysemys picta* | Rio Arriba |
| 30450 | Desert Striped Whipsnake | *Coluber taeniatus* | Rio Arriba |
| 30475 | New Mexico Whiptail | *Aspidoscelis neomexicana* | Rio Arriba |
| 30485 | Chihuahuan Spotted Whiptail | *Aspidoscelis exsanguis* | Rio Arriba |
| 30515 | Plateau Striped Whiptail | *Aspidoscelis velox* | Rio Arriba |
| 40015 | American Avocet | *Recurvirostra americana* | Rio Arriba |
| 40030 | American Bittern | *Botaurus lentiginosus* | Rio Arriba |
| 40035 | Least Bittern | *Ixobrychus exilis exilis* | Rio Arriba |
| 40040 | Common Black Hawk | *Buteogallus anthracinus* | Rio Arriba |
| 40045 | Brewer's Blackbird | *Euphagus cyanocephalus* | Rio Arriba |
| 40050 | Red-winged Blackbird | *Agelaius phoeniceus* | Rio Arriba |
| 40055 | Rusty Blackbird | *Euphagus carolinus* | Rio Arriba |
| 40060 | Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | Rio Arriba |
| 40065 | Eastern Bluebird | *Sialia sialis* | Rio Arriba |
| 40070 | Mountain Bluebird | *Sialia currucoides* | Rio Arriba |
| 40075 | Western Bluebird | *Sialia mexicana* | Rio Arriba |
| 40080 | Bobolink | *Dolichonyx oryzivorus* | Rio Arriba |
| 40100 | Indigo Bunting | *Passerina cyanea* | Rio Arriba |
| 40105 | Lark Bunting | *Calamospiza melanocorys* | Rio Arriba |
| 40110 | Lazuli Bunting | *Passerina amoena* | Rio Arriba |
| 40130 | Bushtit | *Psaltriparus minimus* | Rio Arriba |
| 40150 | Gray Catbird | *Dumetella carolinensis* | Rio Arriba |

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**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 40155 | Yellow-breasted Chat | *Icteria virens* | Rio Arriba |
| 40160 | Black-capped Chickadee | *Poecile atricapillus* | Rio Arriba |
| 40175 | Mountain Chickadee | *Poecile gambeli* | Rio Arriba |
| 40185 | American Coot | *Fulica americana* | Rio Arriba |
| 40190 | Double-crested Cormorant | *Phalacrocorax auritus* | Rio Arriba |
| 40205 | Brown-headed Cowbird | *Molothrus ater* | Rio Arriba |
| 40215 | Sandhill Crane | *Antigone canadensis* | Rio Arriba |
| 40225 | Brown Creeper | *Certhia americana* | Rio Arriba |
| 40230 | Red Crossbill | *Loxia curvirostra* | Rio Arriba |
| 40240 | American Crow | *Corvus brachyrhynchos* | Rio Arriba |
| 40250 | Yellow-billed Cuckoo (western pop) | *Coccyzus americanus occidentalis* | Rio Arriba |
| 40255 | Long-billed Curlew | *Numenius americanus* | Rio Arriba |
| 40260 | Dickcissel | *Spiza americana* | Rio Arriba |
| 40265 | American Dipper | *Cinclus mexicanus* | Rio Arriba |
| 40275 | Mourning Dove | *Zenaida macroura* | Rio Arriba |
| 40304 | Bufflehead Duck | *Bucephala albeola* | Rio Arriba |
| 40306 | Canvasback Duck | *Aythya valisineria* | Rio Arriba |
| 40308 | Gadwall Duck | *Anas strepera* | Rio Arriba |
| 40312 | Barrow's Goldeneye Duck | *Bucephala islandica* | Rio Arriba |
| 40314 | Common Goldeneye Duck | *Bucephala clangula* | Rio Arriba |
| 40318 | Mallard Duck | *Anas platyrhynchos* | Rio Arriba |
| 40322 | Common Merganser Duck | *Mergus merganser* | Rio Arriba |
| 40324 | Hooded Merganser Duck | *Lophodytes cucullatus* | Rio Arriba |
| 40332 | Northern Pintail | *Anas acuta* | Rio Arriba |
| 40334 | Redhead Duck | *Aythya americana* | Rio Arriba |
| 40336 | Ring-necked Duck | *Aythya collaris* | Rio Arriba |
| 40338 | Ruddy Duck | *Oxyura jamaicensis* | Rio Arriba |
| 40342 | Lesser Scaup Duck | *Aythya affinis* | Rio Arriba |
| 40350 | Northern Shoveler Duck | *Anas clypeata* | Rio Arriba |
| 40352 | Blue-winged Teal Duck | *Anas discors* | Rio Arriba |
| 40354 | Cinnamon Teal Duck | *Anas cyanoptera* | Rio Arriba |
| 40356 | Green-winged Teal Duck | *Anas crecca* | Rio Arriba |
| 40362 | American Wigeon Duck | *Anas americana* | Rio Arriba |
| 40366 | Wood Duck | *Aix sponsa* | Rio Arriba |
| 40370 | Bald Eagle | *Haliaeetus leucocephalus* | Rio Arriba |
| 40372 | Golden Eagle | *Aquila chrysaetos* | Rio Arriba |
| 40378 | Snowy Egret | *Egretta thula* | Rio Arriba |
| 40384 | Peregrine Falcon | *Falco peregrinus* | Rio Arriba |
| 40385 | Arctic Peregrine Falcon | *Falco peregrinus tundrius* | Rio Arriba |
| 40390 | Prairie Falcon | *Falco mexicanus* | Rio Arriba |
| 40395 | Cassin's Finch | *Haemorhous cassinii* | Rio Arriba |
| 40400 | House Finch | *Haemorhous mexicanus* | Rio Arriba |
| 40410 | Black Rosy-Finch | *Leucosticte atrata* | Rio Arriba |
| 40415 | Brown-capped Rosy-Finch | *Leucosticte australis* | Rio Arriba |
| 40425 | Northern Flicker | *Colaptes auratus* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 40440 | Ash-throated Flycatcher | *Myiarchus cinerascens* | Rio Arriba |
| 40453 | Cordilleran Flycatcher | *Empidonax occidentalis* | Rio Arriba |
| 40455 | Dusky Flycatcher | *Empidonax oberholseri* | Rio Arriba |
| 40470 | Gray Flycatcher | *Empidonax wrightii* | Rio Arriba |
| 40480 | Hammond's Flycatcher | *Empidonax hammondii* | Rio Arriba |
| 40495 | Olive-sided Flycatcher | *Contopus cooperi* | Rio Arriba |
| 40520 | Willow Flycatcher | *Empidonax traillii brewsteri; adastus* | Rio Arriba |
| 40521 | Southwestern Willow Flycatcher | *Empidonax traillii extimus* | Rio Arriba |
| 40550 | Blue-gray Gnatcatcher | *Polioptila caerulea* | Rio Arriba |
| 40575 | American Goldfinch | *Spinus tristis* | Rio Arriba |
| 40585 | Lesser Goldfinch | *Spinus psaltria* | Rio Arriba |
| 40590 | Canada Goose | *Branta canadensis* | Rio Arriba |
| 40610 | Northern Goshawk | *Accipiter gentilis* | Rio Arriba |
| 40615 | Common Grackle | *Quiscalus quiscula* | Rio Arriba |
| 40620 | Great-tailed Grackle | *Quiscalus mexicanus* | Rio Arriba |
| 40625 | Clark's Grebe | *Aechmophorus clarkii* | Rio Arriba |
| 40630 | Eared Grebe | *Podiceps nigricollis* | Rio Arriba |
| 40635 | Horned Grebe | *Podiceps auritus* | Rio Arriba |
| 40645 | Pied-billed Grebe | *Podilymbus podiceps* | Rio Arriba |
| 40655 | Western Grebe | *Aechmophorus occidentalis* | Rio Arriba |
| 40660 | Black-headed Grosbeak | *Pheucticus melanocephalus* | Rio Arriba |
| 40665 | Blue Grosbeak | *Passerina caerulea* | Rio Arriba |
| 40670 | Evening Grosbeak | *Coccothraustes vespertinus* | Rio Arriba |
| 40675 | Pine Grosbeak | *Pinicola enucleator* | Rio Arriba |
| 40700 | Dusky Grouse | *Dendragapus obscurus* | Rio Arriba |
| 40725 | Bonaparte's Gull | *Choricocephalus philadelphia* | Rio Arriba |
| 40730 | California Gull | *Larus californicus* | Rio Arriba |
| 40770 | Ring-billed Gull | *Larus delawarensis* | Rio Arriba |
| 40790 | Northern Harrier | *Circus cyaneus* | Rio Arriba |
| 40795 | Broad-winged Hawk | *Buteo platypterus* | Rio Arriba |
| 40800 | Cooper's Hawk | *Accipiter cooperii* | Rio Arriba |
| 40805 | Ferruginous Hawk | *Buteo regalis* | Rio Arriba |
| 40825 | Red-tailed Hawk | *Buteo jamaicensis* | Rio Arriba |
| 40830 | Rough-legged Hawk | *Buteo lagopus* | Rio Arriba |
| 40835 | Sharp-shinned Hawk | *Accipiter striatus* | Rio Arriba |
| 40840 | Swainson's Hawk | *Buteo swainsoni* | Rio Arriba |
| 40850 | Zone-tailed Hawk | *Buteo albonotatus* | Rio Arriba |
| 40855 | Great Blue Heron | *Ardea herodias* | Rio Arriba |
| 40870 | Black-crowned Night-Heron | *Nycticorax nycticorax* | Rio Arriba |
| 40895 | Black-chinned Hummingbird | *Archilochus alexandri* | Rio Arriba |
| 40910 | Broad-tailed Hummingbird | *Selasphorus platycercus* | Rio Arriba |
| 40935 | Magnificent Hummingbird | *Eugenes fulgens* | Rio Arriba |
| 40945 | Rufous Hummingbird | *Selasphorus rufus* | Rio Arriba |
| 40970 | White-faced Ibis | *Plegadis chihi* | Rio Arriba |
| 40990 | Blue Jay | *Cyanocitta cristata* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 40995 | Gray Jay | *Perisoreus canadensis* | Rio Arriba |
| 41005 | Pinyon Jay | *Gymnorhinus cyanocephalus* | Rio Arriba |
| 41010 | Woodhouse's Scrub Jay | *Aphelocoma woodhouseii* | Rio Arriba |
| 41015 | Steller's Jay | *Cyanocitta stelleri* | Rio Arriba |
| 41020 | Dark-eyed Junco | *Junco hyemalis* | Rio Arriba |
| 41030 | American Kestrel | *Falco sparverius* | Rio Arriba |
| 41035 | Killdeer | *Charadrius vociferus* | Rio Arriba |
| 41040 | Cassin's Kingbird | *Tyrannus vociferans* | Rio Arriba |
| 41050 | Eastern Kingbird | *Tyrannus tyrannus* | Rio Arriba |
| 41065 | Western Kingbird | *Tyrannus verticalis* | Rio Arriba |
| 41070 | Belted Kingfisher | *Megaceryle alcyon* | Rio Arriba |
| 41080 | Golden-crowned Kinglet | *Regulus satrapa* | Rio Arriba |
| 41085 | Ruby-crowned Kinglet | *Regulus calendula* | Rio Arriba |
| 41105 | Mississippi Kite | *Ictinia mississippiensis* | Rio Arriba |
| 41125 | Horned Lark | *Eremophila alpestris* | Rio Arriba |
| 41150 | Common Loon | *Gavia immer* | Rio Arriba |
| 41165 | Black-billed Magpie | *Pica hudsonia* | Rio Arriba |
| 41175 | Purple Martin | *Progne subis* | Rio Arriba |
| 41185 | Western Meadowlark | *Sturnella neglecta* | Rio Arriba |
| 41210 | Northern Mockingbird | *Mimus polyglottos* | Rio Arriba |
| 41225 | Common Nighthawk | *Chordeiles minor* | Rio Arriba |
| 41240 | Clark's Nutcracker | *Nucifraga columbiana* | Rio Arriba |
| 41245 | Pygmy Nuthatch | *Sitta pygmaea* | Rio Arriba |
| 41250 | Red-breasted Nuthatch | *Sitta canadensis* | Rio Arriba |
| 41255 | White-breasted Nuthatch | *Sitta carolinensis* | Rio Arriba |
| 41280 | Bullock's Oriole | *Icterus bullockii* | Rio Arriba |
| 41281 | Baltimore Oriole | *Icterus galbula* | Rio Arriba |
| 41290 | Scott's Oriole | *Icterus parisorum* | Rio Arriba |
| 41300 | Osprey | *Pandion haliaetus* | Rio Arriba |
| 41305 | Ovenbird | *Seiurus aurocapilla* | Rio Arriba |
| 41315 | Boreal Owl | *Aegolius funereus* | Rio Arriba |
| 41320 | Burrowing Owl | *Athene cunicularia* | Rio Arriba |
| 41330 | Flammulated Owl | *Psiloscops flammeolus* | Rio Arriba |
| 41335 | Great Horned Owl | *Bubo virginianus* | Rio Arriba |
| 41340 | Long-eared Owl | *Asio otus* | Rio Arriba |
| 41345 | Northern Pygmy Owl | *Glaucidium gnoma* | Rio Arriba |
| 41355 | Western Screech-Owl | *Megascops kennicottii* | Rio Arriba |
| 41375 | Mexican Spotted Owl | *Strix occidentalis lucida* | Rio Arriba |
| 41395 | Northern Parula | *Setophaga americana* | Rio Arriba |
| 41400 | Brown Pelican | *Pelecanus occidentalis* | Rio Arriba |
| 41405 | American White Pelican | *Pelecanus erythrorhynchos* | Rio Arriba |
| 41420 | Western Wood Pewee | *Contopus sordidulus* | Rio Arriba |
| 41440 | Wilson's Phalarope | *Phalaropus tricolor* | Rio Arriba |
| 41450 | Black Phoebe | *Sayornis nigricans* | Rio Arriba |
| 41455 | Eastern Phoebe | *Sayornis phoebe* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 41460 | Say's Phoebe | *Sayornis saya* | Rio Arriba |
| 41465 | Band-tailed Pigeon | *Patagioenas fasciata* | Rio Arriba |
| 41480 | American Pipit | *Anthus rubescens* | Rio Arriba |
| 41500 | Mountain Plover | *Charadrius montanus* | Rio Arriba |
| 41520 | Common Poorwill | *Phalaenoptilus nuttalli* | Rio Arriba |
| 41530 | White-tailed Ptarmigan | *Lagopus leucura* | Rio Arriba |
| 41540 | Gambel's Quail | *Callipepla gambelii* | Rio Arriba |
| 41550 | Scaled Quail | *Callipepla squamata* | Rio Arriba |
| 41565 | Virginia Rail | *Rallus limicola* | Rio Arriba |
| 41580 | Common Raven | *Corvus corax* | Rio Arriba |
| 41610 | Greater Roadrunner | *Geococcyx californianus* | Rio Arriba |
| 41615 | American Robin | *Turdus migratorius* | Rio Arriba |
| 41650 | Least Sandpiper | *Calidris minutilla* | Rio Arriba |
| 41670 | Spotted Sandpiper | *Actitis macularius* | Rio Arriba |
| 41680 | Upland Sandpiper | *Bartramia longicauda* | Rio Arriba |
| 41685 | Western Sandpiper | *Calidris mauri* | Rio Arriba |
| 41700 | Red-naped Sapsucker | *Sphyrapicus nuchalis* | Rio Arriba |
| 41705 | Williamson's Sapsucker | *Sphyrapicus thyroideus* | Rio Arriba |
| 41710 | Yellow-bellied Sapsucker | *Sphyrapicus varius* | Rio Arriba |
| 41750 | Loggerhead Shrike | *Lanius ludovicianus* | Rio Arriba |
| 41755 | Northern Shrike | *Lanius excubitor* | Rio Arriba |
| 41760 | Pine Siskin | *Spinus pinus* | Rio Arriba |
| 41770 | Wilson's Snipe | *Gallinago delicata* | Rio Arriba |
| 41775 | Townsend's Solitaire | *Myadestes townsendi* | Rio Arriba |
| 41780 | Sora | *Porzana carolina* | Rio Arriba |
| 41785 | Baird's Sparrow | *Ammodramus bairdii* | Rio Arriba |
| 41795 | Black-throated Sparrow | *Amphispiza bilineata* | Rio Arriba |
| 41805 | Brewer's Sparrow | *Spizella breweri* | Rio Arriba |
| 41815 | Chipping Sparrow | *Spizella passerina* | Rio Arriba |
| 41855 | House Sparrow | *Passer domesticus* | Rio Arriba |
| 41860 | Lark Sparrow | *Chondestes grammacus* | Rio Arriba |
| 41870 | Lincoln's Sparrow | *Melospiza lincolnii* | Rio Arriba |
| 41880 | Sagebrush Sparrow | *Artemisiospiza nevadensis* | Rio Arriba |
| 41885 | Savannah Sparrow | *Passerculus sandwichensis nevadensis; anthinus* | Rio Arriba |
| 41890 | Song Sparrow | *Melospiza melodia* | Rio Arriba |
| 41895 | Swamp Sparrow | *Melospiza georgiana* | Rio Arriba |
| 41905 | Vesper Sparrow | *Pooecetes gramineus* | Rio Arriba |
| 41910 | White-crowned Sparrow | *Zonotrichia leucophrys* | Rio Arriba |
| 41930 | European Starling | *Sturnus vulgaris* | Rio Arriba |
| 41945 | Bank Swallow | *Riparia riparia* | Rio Arriba |
| 41950 | Barn Swallow | *Hirundo rustica* | Rio Arriba |
| 41960 | Cliff Swallow | *Petrochelidon pyrrhonota* | Rio Arriba |
| 41965 | N. Rough-winged Swallow | *Stelgidopteryx serripennis* | Rio Arriba |
| 41970 | Tree Swallow | *Tachycineta bicolor* | Rio Arriba |
| 41975 | Violet-green Swallow | *Tachycineta thalassina* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
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| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 41990 | Black Swift | *Cypseloides niger* | Rio Arriba |
| 41995 | Chimney Swift | *Chaetura pelagica* | Rio Arriba |
| 42005 | White-throated Swift | *Aeronautes saxatalis* | Rio Arriba |
| 42010 | Hepatic Tanager | *Piranga flava* | Rio Arriba |
| 42020 | Summer Tanager | *Piranga rubra* | Rio Arriba |
| 42025 | Western Tanager | *Piranga ludoviciana* | Rio Arriba |
| 42050 | Black Tern | *Chlidonias niger* | Rio Arriba |
| 42070 | Least Tern | *Sternula antillarum* | Rio Arriba |
| 42075 | Bendire's Thrasher | *Toxostoma bendirei* | Rio Arriba |
| 42080 | Brown Thrasher | *Toxostoma rufum* | Rio Arriba |
| 42095 | Sage Thrasher | *Oreoscoptes montanus* | Rio Arriba |
| 42110 | Hermit Thrush | *Catharus guttatus* | Rio Arriba |
| 42115 | Swainson's Thrush | *Catharus ustulatus* | Rio Arriba |
| 42135 | Juniper Titmouse | *Baeolophus ridgwayi* | Rio Arriba |
| 42145 | Canyon Towhee | *Melozone fusca* | Rio Arriba |
| 42150 | Green-tailed Towhee | *Pipilo chlorurus* | Rio Arriba |
| 42155 | Spotted Towhee | *Pipilo maculatus* | Rio Arriba |
| 42200 | Gray Vireo | *Vireo vicinior* | Rio Arriba |
| 42215 | Red-eyed Vireo | *Vireo olivaceus* | Rio Arriba |
| 42220 | Blue-headed Vireo | *Vireo solitarius* | Rio Arriba |
| 42221 | Cassin's Vireo | *Vireo cassinii* | Rio Arriba |
| 42222 | Plumbeous Vireo | *Vireo plumbeus* | Rio Arriba |
| 42225 | Warbling Vireo | *Vireo gilvus* | Rio Arriba |
| 42245 | Turkey Vulture | *Cathartes aura* | Rio Arriba |
| 42320 | Grace's Warbler | *Setophaga graciae* | Rio Arriba |
| 42325 | Black-throated Gray Warbler | *Setophaga nigrescens* | Rio Arriba |
| 42330 | Black-throated Green Warbler | *Setophaga virens* | Rio Arriba |
| 42340 | Hooded Warbler | *Setophaga citrina* | Rio Arriba |
| 42355 | Macgillivray's Warbler | *Geothlypis tolmiei* | Rio Arriba |
| 42380 | Orange-crowned Warbler | *Oreothlypis celata* | Rio Arriba |
| 42385 | Palm Warbler | *Setophaga palmarum* | Rio Arriba |
| 42430 | Virginia's Warbler | *Oreothlypis virginiae* | Rio Arriba |
| 42435 | Wilson's Warbler | *Cardellina pusilla* | Rio Arriba |
| 42445 | Yellow Warbler | *Setophaga petechia* | Rio Arriba |
| 42450 | Yellow-rumped Warbler | *Setophaga coronata* | Rio Arriba |
| 42465 | Northern Waterthrush | *Parkesia noveboracensis* | Rio Arriba |
| 42470 | Bohemian Waxwing | *Bombycilla garrulus* | Rio Arriba |
| 42475 | Cedar Waxwing | *Bombycilla cedrorum* | Rio Arriba |
| 42485 | Mexican Whip-poor-will | *Antrostomus arizonae* | Rio Arriba |
| 42490 | Eastern Whip-poor-will | *Antrostomus vociferus* | Rio Arriba |
| 42515 | Downy Woodpecker | *Picoides pubescens* | Rio Arriba |
| 42530 | Hairy Woodpecker | *Picoides villosus* | Rio Arriba |
| 42535 | Ladder-backed Woodpecker | *Picoides scalaris* | Rio Arriba |
| 42540 | Lewis's Woodpecker | *Melanerpes lewis* | Rio Arriba |
| 42555 | Red-headed Woodpecker | *Melanerpes erythrocephalus* | Rio Arriba |

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| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 42565 | American Three-toed Woodpecker | *Picoides dorsalis* | Rio Arriba |
| 42575 | Bewick's Wren | *Thryomanes bewickii* | Rio Arriba |
| 42585 | Canyon Wren | *Catherpes mexicanus* | Rio Arriba |
| 42595 | House Wren | *Troglodytes aedon* | Rio Arriba |
| 42600 | Marsh Wren | *Cistothorus palustris* | Rio Arriba |
| 42605 | Rock Wren | *Salpinctes obsoletus* | Rio Arriba |
| 42615 | Winter Wren | *Troglodytes hemialis* | Rio Arriba |
| 42630 | Common Yellowthroat | *Geothlypis trichas* | Rio Arriba |
| 50010 | American Badger | *Taxidea taxus* | Rio Arriba |
| 50025 | Pale Townsend's Big-eared Bat | *Corynorhinus townsendii* | Rio Arriba |
| 50030 | Big Brown Bat | *Eptesicus fuscus* | Rio Arriba |
| 50033 | California Myotis | *Myotis californicus* | Rio Arriba |
| 50037 | Big Free-tailed Bat | *Nyctinomops macrotis* | Rio Arriba |
| 50040 | Brazilian Free-tailed Bat | *Tadarida brasiliensis* | Rio Arriba |
| 50047 | Fringed Myotis | *Myotis thysanodes* | Rio Arriba |
| 50050 | Hoary Bat | *Lasiurus cinereus* | Rio Arriba |
| 50057 | Long-eared Myotis | *Myotis evotis* | Rio Arriba |
| 50059 | Long-legged Myotis | *Myotis volans* | Rio Arriba |
| 50080 | Pallid Bat | *Antrozous pallidus* | Rio Arriba |
| 50083 | Canyon Bat | *Parastrellus hesperus* | Rio Arriba |
| 50090 | Silver-haired Bat | *Lasionycteris noctivagans* | Rio Arriba |
| 50093 | Western Small-footed Myotis | *Myotis ciliolabrum* | Rio Arriba |
| 50095 | Spotted Bat | *Euderma maculatum* | Rio Arriba |
| 50103 | Yuma Myotis | *Myotis yumanensis* | Rio Arriba |
| 50105 | Black Bear | *Ursus americanus* | Rio Arriba |
| 50115 | American Beaver | *Castor canadensis* | Rio Arriba |
| 50130 | Bobcat | *Lynx rufus* | Rio Arriba |
| 50145 | Colorado Chipmunk | *australis; oscuraensis* | Rio Arriba |
| 50160 | Least Chipmunk | *chuskaensis* | Rio Arriba |
| 50185 | Coyote | *Canis latrans* | Rio Arriba |
| 50190 | Mule Deer | *Odocoileus hemionus* | Rio Arriba |
| 50194 | White-tailed Deer (Texas) | *Odocoileus virginianus texana* | Rio Arriba |
| 50197 | Moose | *Alces alces* | Rio Arriba |
| 50205 | Gunnison's prairie dog (prairie subspecies) | *Cynomys gunnisoni zuniensis* | Rio Arriba |
| 50206 | Gunnison's Prairie Dog (montane subspecies) | *Cynomys gunnisoni gunnisoni* | Rio Arriba |
| 50215 | Elk | *Cervus canadensis nelsoni* | Rio Arriba |
| 50230 | Common Gray Fox | *Urocyon cinereoargenteus* | Rio Arriba |
| 50235 | Kit Fox | *Vulpes macrotis* | Rio Arriba |
| 50240 | Red Fox | *Vulpes vulpes* | Rio Arriba |
| 50255 | Botta's Pocket Gopher | *Thomomys bottae actuosus; alienus; aureus; collis; connectens; cultellus; fulvus; guadalupensis; lachuguilla; mearnsi; morulus; opulentus; paguatae; pectoralis; peramplus; pervagus; planorum; rufidulus; ruidosae; tol* | Rio Arriba |
| 50265 | Northern Pocket Gopher | *Thomomys talpoides fossor; kaibabensis* | Rio Arriba |

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|---|---|---|---|
| 50287 | Feral Horse | *Equus caballus* | Rio Arriba |
| 50320 | Mountain Lion | *Puma concolor* | Rio Arriba |
| 50325 | Canada Lynx | *Lynx canadensis* | Rio Arriba |
| 50330 | Yellow-bellied Marmot | *Marmota flaviventris* | Rio Arriba |
| 50335 | Pacific Marten | *Martes caurina* | Rio Arriba |
| 50355 | Brush Mouse | *Peromyscus boylii* | Rio Arriba |
| 50365 | Canyon Mouse | *Peromyscus crinitus* | Rio Arriba |
| 50370 | Deer Mouse | *Peromyscus maniculatus* | Rio Arriba |
| 50380 | N. Grasshopper Mouse | *Onychomys leucogaster* | Rio Arriba |
| 50400 | Western Harvest Mouse | *Reithrodontomys megalotis megalotis; aztecus* | Rio Arriba |
| 50405 | House Mouse | *Mus musculus* | Rio Arriba |
| 50410 | Meadow Jumping Mouse | *Zapus hudsonius luteus* | Rio Arriba |
| 50415 | Western Jumping Mouse | *Zapus princeps* | Rio Arriba |
| 50425 | Pinyon Mouse | *Peromyscus truei* | Rio Arriba |
| 50460 | Plains Pocket Mouse | *Perognathus flavescens* | Rio Arriba |
| 50470 | Silky Pocket Mouse | *Perognathus flavus flavus; hopiensis* | Rio Arriba |
| 50480 | Northern Rock Mouse | *Peromyscus nasutus* | Rio Arriba |
| 50490 | White-footed Mouse | *Peromyscus leucopus* | Rio Arriba |
| 50495 | Common Muskrat | *Ondatra zibethicus pallidus; osoyooensis; cinnamominus* | Rio Arriba |
| 50556 | North American River Otter | *Lontra canadensis* | Rio Arriba |
| 50565 | American Pika | *Ochotona princeps incana; saxatilis* | Rio Arriba |
| 50580 | Common Porcupine | *Erethizon dorsatum* | Rio Arriba |
| 50585 | Pronghorn | *Antilocapra americana americana* | Rio Arriba |
| 50587 | Desert Cottontail Rabbit | *Sylvilagus audubonii* | Rio Arriba |
| 50589 | Nuttall's Cottontail Rabbit | *Sylvilagus nuttallii* | Rio Arriba |
| 50590 | Snowshoe Hare | *Lepus americanus* | Rio Arriba |
| 50591 | Black-tailed Jackrabbit | *Lepus californicus* | Rio Arriba |
| 50593 | White-tailed Jackrabbit | *Lepus townsendii* | Rio Arriba |
| 50595 | Common Raccoon | *Procyon lotor* | Rio Arriba |
| 50635 | Ord's Kangaroo Rat | *Dipodomys ordii* | Rio Arriba |
| 50645 | Bushy-tailed Wood Rat | *Neotoma cinerea* | Rio Arriba |
| 50650 | Mexican Wood Rat | *Neotoma mexicana mexicana; inopinata; pinetorum; scopulorum* | Rio Arriba |
| 50655 | S. Plains Wood Rat | *Neotoma micropus canescens* | Rio Arriba |
| 50660 | Stephen's Wood Rat | *Neotoma stephensi* | Rio Arriba |
| 50665 | White-throated Wood Rat | *Neotoma albigula* | Rio Arriba |
| 50670 | Ringtail | *Bassariscus astutus* | Rio Arriba |
| 50680 | Rocky Mtn. Bighorn Sheep | *Ovis canadensis canadensis* | Rio Arriba |
| 50700 | Dwarf Shrew | *Sorex nanus* | Rio Arriba |
| 50710 | Masked Shrew | *Sorex cinereus* | Rio Arriba |
| 50715 | Merriam's Shrew | *Sorex merriami* | Rio Arriba |
| 50725 | Dusky Shrew | *Sorex monticola* | Rio Arriba |
| 50730 | Western Water Shrew | *Sorex navigator* | Rio Arriba |
| 50747 | Western Spotted Skunk | *Spilogale gracilis* | Rio Arriba |

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| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 50750 | Striped Skunk | *Mephitis mephitis* | Rio Arriba |
| 50755 | Abert's Squirrel | *Sciurus aberti aberti; chuscensis; ferreus* | Rio Arriba |
| 50785 | Golden-mantled Ground Squirrel | *Callospermophilus lateralis* | Rio Arriba |
| 50795 | Spotted Ground Squirrel | *Xerospermophilus spilosoma* | Rio Arriba |
| 50800 | Thirteen-lined Ground Squirrel | *Ictidomys tridecemlineatus arenicola; blanca; hollisteri* | Rio Arriba |
| 50810 | Red Squirrel | *Tamiasciurus hudsonicus fremonti; lychnuchus; mogollonensis* | Rio Arriba |
| 50815 | Rock Squirrel | *Otospermophilus variegatus grammurus* | Rio Arriba |
| 50820 | Heather Vole | *Phenacomys intermedius* | Rio Arriba |
| 50825 | Long-tailed Vole | *Microtus longicaudus longicaudus; alticola; baileyi; mordax* | Rio Arriba |
| 50840 | Montane Vole | *Microtus montanus fusus* | Rio Arriba |
| 50855 | Southern Red-backed Vole | *Myodes gapperi* | Rio Arriba |
| 50858 | Ermine Weasel | *Mustela erminea* | Rio Arriba |
| 50860 | Long-tailed Weasel | *Mustela frenata* | Rio Arriba |
| 60075 | Rocky Mountainsnail | *Oreohelix strigosa* | Rio Arriba |
| 60076 | Socorro Mountainsnail | *Oreohelix neomexicana* | Rio Arriba |
| 60379 | Forest Disc Snail | *Discus whitneyi* | Rio Arriba |
| 60385 | Spruce Snail | *Microphysula ingersolli* | Rio Arriba |
| 60390 | Brown Hive Snail | *Euconulus fulvus* | Rio Arriba |
| 60395 | Quick Gloss Snail | *Zonitoides arboreus* | Rio Arriba |
| 60400 | Western Glass Snail | *Vitrina pellucida* | Rio Arriba |
| 60405 | Meadow Slug Snail | *Deroceras laeve* | Rio Arriba |
| 60420 | Rocky Mtn. Column Snail | *Pupilla blandi* | Rio Arriba |
| 60430 | Vertigo Snail | *Vertigo arizonensis* | Rio Arriba |
| 60440 | Silky Vallonia Snail | *Vallonia cyclophorella* | Rio Arriba |
| 60445 | Glossy Pillar Snail | *Cionella lubrica* | Rio Arriba |
| 60450 | Widespread Column Snail | *Pupilla muscorum* | Rio Arriba |
| 60465 | Ribbed Dagger Snail | *Pupoides hordaceus* | Rio Arriba |
| 60500 | Montane Snaggletooth Snail | *Gastrocopta pilsbryana* | Rio Arriba |
| 60550 | Vertigo Snail | *Vertigo concinnula* | Rio Arriba |
| 60575 | Multirib Vallonia Snail | *Vallonia gracilicosta* | Rio Arriba |
| 60640 | Mexican Coil Snail | *Helicodiscus eigenmani* | Rio Arriba |
| 60750 | Suboval Ambersnail | *Catinella vermeta* | Rio Arriba |
| 60760 | Amber Glass Snail | *Nesovitrea hammonis* | Rio Arriba |
| 60765 | Minute Gem Snail | *Hawaiia minuscula* | Rio Arriba |
| 60785 | Jemez Woodlandsnail | *Ashmunella ashmuni* | Rio Arriba |
| 70160 | Scud | *Hyalella azteca* | Rio Arriba |
| 70255 | Colorado Fairy Shrimp | *Branchinecta coloradensis* | Rio Arriba |
| 70260 | Versatile Fairy Shrimp | *Branchinecta lindahli* | Rio Arriba |
| 100010 | False Ameletus Mayfly | *Ameletus falsus* | Rio Arriba |
| 100200 | Mayfly | *Acentrella insignificans* | Rio Arriba |
| 100280 | Mayfly | *Baetis tricaudatus* | Rio Arriba |
| 100340 | Mayfly | *Callibaetis pictus* | Rio Arriba |
| 100500 | Mayfly | *Ephemera simulans* | Rio Arriba |

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|---|---|---|---|
| 100610 | Mayfly | *Epeorus albertae* | Rio Arriba |
| 100630 | Mayfly | *Epeorus longimanus* | Rio Arriba |
| 100640 | Mayfly | *Epeorus margarita* | Rio Arriba |
| 100680 | Mayfly | *Nixe criddlei* | Rio Arriba |
| 100690 | Mayfly | *Nixe simplicioides* | Rio Arriba |
| 100740 | Mayfly | *Rhithrogena undulata* | Rio Arriba |
| 100960 | Mayfly | *Paraleptophlebia heteronea* | Rio Arriba |
| 100970 | Mayfly | *Paraleptophlebia memorialis* | Rio Arriba |
| 102120 | Mayfly | *Drunella doddsi* | Rio Arriba |
| 102150 | Mayfly | *Ephemerella inermis* | Rio Arriba |
| 102180 | Mayfly | *Serratella micheneri* | Rio Arriba |
| 102200 | Mayfly | *Timpanoga hecuba* | Rio Arriba |
| 102300 | Mayfly | *Leptohyphes apache* | Rio Arriba |
| 102340 | Mayfly | *Tricorythodes explicatus* | Rio Arriba |
| 115020 | American Rubyspot | *Hetaerina americana* | Rio Arriba |
| 115025 | Pacific Spiketail | *Cordulegaster dorsalis* | Rio Arriba |
| 115035 | Blue-eyed Darner | *Rhionaeschna multicolor* | Rio Arriba |
| 115055 | Common Green Darner | *Anax junius* | Rio Arriba |
| 115210 | Great Spreadwing | *Archilestes grandis* | Rio Arriba |
| 115240 | Spotted Spreadwing | *Lestes congener* | Rio Arriba |
| 115250 | Common Spreadwing | *Lestes disjunctus* | Rio Arriba |
| 115260 | Spread-winged Damselfly | *Lestes disjuntcus* | Rio Arriba |
| 115270 | Emerald Spreadwing | *Lestes dryas* | Rio Arriba |
| 115420 | Western Red Damsel | *Amphiagrion abbreviatum* | Rio Arriba |
| 115430 | Narrow-winged Damselfly | *Amphiagrion saucium* | Rio Arriba |
| 115460 | Blue-fronted Dancer | *Argia apicalis* | Rio Arriba |
| 115560 | Springwater Dancer | *Argia plana* | Rio Arriba |
| 115620 | Vivid Dancer | *Argia vivida* | Rio Arriba |
| 115770 | Boreal Bluet | *Enallagma boreale* | Rio Arriba |
| 115790 | Familiar Bluet | *Enallagma civile* | Rio Arriba |
| 115810 | Northern Bluet | *Enallagma annexum* | Rio Arriba |
| 115820 | Arroyo Bluet | *Enallagma praevarum* | Rio Arriba |
| 115850 | Painted Damsel | *Hesperagrion heterodoxum* | Rio Arriba |
| 115920 | Plains Forktail | *Ischnura damula* | Rio Arriba |
| 115930 | Mexican Forktail | *Ischnura demorsa* | Rio Arriba |
| 116087 | Variable Darner | *Aeshna interrupta* | Rio Arriba |
| 116095 | Boreal Whiteface | *Leucorrhinia borealis* | Rio Arriba |
| 120080 | Green Bird Grasshopper | *Schistocerca alutacea shoshone* | Rio Arriba |
| 120170 | Green Streak Grasshopper | *Hesperotettix viridis* | Rio Arriba |
| 120180 | Grasshopper | *Hesperotettix speciosus* | Rio Arriba |
| 120250 | Grasshopper | *Melanoplus splendidus* | Rio Arriba |
| 120255 | Grasshopper | *Melanoplus cumbres* | Rio Arriba |
| 120260 | Bruner's Spur-Throat Grasshopper | *Melanoplus bruneri* | Rio Arriba |
| 120290 | Differential Grasshopper | *Melanoplus differentialis* | Rio Arriba |
| 120300 | Two-Striped Grasshopper | *Melanoplus bivittatus* | Rio Arriba |

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|---|---|---|---|
| 120350 | Northern Spur-Throat Grasshopper | *Melanoplus borealis* | Rio Arriba |
| 120360 | Grasshopper | *Melanoplus lakinus* | Rio Arriba |
| 120370 | Little Pasture Spur-Throat Grasshopper | *Melanoplus confusus* | Rio Arriba |
| 120390 | Tiny Spur-Throat Grasshopper | *Melanoplus infantilis* | Rio Arriba |
| 120420 | Red-Legged Grasshopper | *Melanoplus femurrubrum* | Rio Arriba |
| 120430 | Narrow-Winged Spur-Throat Grasshopper | *Melanoplus angustipennis* | Rio Arriba |
| 120460 | Bowditch's Spur-Throat Grasshopper | *Melanoplus bowditchi* | Rio Arriba |
| 120490 | Glaucous-Legged Grasshopper | *Melanoplus glaucipes* | Rio Arriba |
| 120500 | Flabellate Grasshopper | *Melanoplus occidentalis* | Rio Arriba |
| 120510 | Packard's Grasshopper | *Melanoplus packardi* | Rio Arriba |
| 120520 | Grasshopper | *Melanoplus foedus* | Rio Arriba |
| 120530 | Gladston's Spur-Throat Grasshopper | *Melanoplus gladstoni* | Rio Arriba |
| 120540 | Kennicott's Spur-Throat Grasshopper | *Melanoplus kennicott's* | Rio Arriba |
| 120620 | Grasshopper | *Melanoplus bohemani* | Rio Arriba |
| 120640 | Grasshopper | *Mermiria texana* | Rio Arriba |
| 120710 | Obscure Grasshopper | *Opeia obscura* | Rio Arriba |
| 120720 | Velvet-Striped Grasshopper | *Eritettix simplex* | Rio Arriba |
| 120760 | Spotted Wing Grasshopper | *Cordillacris occipitalis* | Rio Arriba |
| 120880 | Striped Slant-Faced Grasshopper | *Amphitornus coloradus* | Rio Arriba |
| 120900 | Club-Horned Grasshopper | *Aeropedellus clavatus* | Rio Arriba |
| 120920 | Rufous Grasshopper | *Heliaula rufa* | Rio Arriba |
| 120930 | Cream Grasshopper | *Cibolacris parviceps* | Rio Arriba |
| 120950 | White Cross Grasshopper | *Aulocara femoratum* | Rio Arriba |
| 120960 | Elliott Grasshopper | *Aulocara elliotti* | Rio Arriba |
| 120990 | Grasshopper | *Psoloessa texana* | Rio Arriba |
| 121000 | Brown Spotted Range Grasshopper | *Psoloessa delicatula* | Rio Arriba |
| 121010 | White Whiskers Grasshopper | *Ageneotettix deorum* | Rio Arriba |
| 121040 | Clear-Winged Grasshopper | *Camnula pellucida* | Rio Arriba |
| 121050 | Northern Green-Striped Locust Grasshopper | *Chortophaga viridifasciata* | Rio Arriba |
| 121080 | Dusky Grasshopper | *Encoptolophus costalis* | Rio Arriba |
| 121100 | Carolina Grasshopper | *Dissosteira carolina* | Rio Arriba |
| 121120 | Red-Winged Grasshopper | *Arphia pseudonietana* | Rio Arriba |
| 121140 | Speckled Rangeland Grasshopper | *Arphia conspera* | Rio Arriba |
| 121200 | Mottled Sand Grasshopper | *Spharagemon collare* | Rio Arriba |
| 121210 | Campestral Grasshopper | *Spharagemon campestris* | Rio Arriba |
| 121280 | Grasshopper | *Hippopedon capito* | Rio Arriba |
| 121340 | Kiowa Range Grasshopper | *Trachyrhachys kiowa* | Rio Arriba |
| 121360 | Platte Range Grasshopper | *Mestobregna plattei* | Rio Arriba |
| 121370 | Grasshopper | *Mestobregna terricolor* | Rio Arriba |
| 121400 | Arroyo Grasshopper | *Heliastus benjamini* | Rio Arriba |
| 121410 | Blue-Winged Grasshopper | *Leprus intermedius* | Rio Arriba |
| 121430 | Pronotal Range Grasshopper | *Cratypedes neglectus* | Rio Arriba |
| 121440 | Grasshopper | *Xanthippus montanus* | Rio Arriba |
| 121450 | Red Shanks Grasshopper | *Xanthippus corallipes* | Rio Arriba |
| 121470 | Wrangler Grasshopper | *Circotettix rabula* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 121490 | Groove-Headed Grasshopper | *Conozoa sulcifrons* | Rio Arriba |
| 121500 | Grasshopper | *Conozoa texana* | Rio Arriba |
| 121530 | Grasshopper | *Trimerotropis barnumi* | Rio Arriba |
| 121540 | Strenuous Grasshopper | *Trimerotropis californica* | Rio Arriba |
| 121560 | Crackling Forest Grasshopper | *Trimerotropis verruculata* | Rio Arriba |
| 121590 | Grasshopper | *Trimerotropis inconspicua* | Rio Arriba |
| 121610 | Thomas' Slender Grasshopper | *Trimerotropis gracilis* | Rio Arriba |
| 121620 | Grasshopper | *Trimerotropis fratercula* | Rio Arriba |
| 121690 | Barren Land Grasshopper | *Trimerotropis pristrinaria* | Rio Arriba |
| 121700 | Grasshopper | *Trimerotropis modesta* | Rio Arriba |
| 190236 | Tiger Beetle | *Cicindela fulgida fulgida; pseudowillistoni* | Rio Arriba |
| 190240 | Tiger Beetle | *Cicindela hirticollis* | Rio Arriba |
| 190246 | Tiger Beetle | *Cicindela lengi lengi; jordai* | Rio Arriba |
| 190248 | Dainty Tiger Beetle | *Cicindela lepida* | Rio Arriba |
| 190252 | Tiger Beetle | *Cicindela longilabris laurentii* | Rio Arriba |
| 190256 | Tiger Beetle | *Cicindela marutha* | Rio Arriba |
| 190260 | Tiger Beetle | *Cicindela nigrocoerula* | Rio Arriba |
| 190262 | Tiger Beetle | *Cicindela obsoleta obsoleta; santaclarae* | Rio Arriba |
| 190266 | Tiger Beetle | *Cicindela oregona* | Rio Arriba |
| 190274 | Tiger Beetle | *Cicindela pulchra* | Rio Arriba |
| 190276 | Tiger Beetle | *Cicindela punctulata* | Rio Arriba |
| 190278 | Tiger Beetle | *Cicindela purpurea* | Rio Arriba |
| 190280 | Tiger Beetle | *Cicindela repanda* | Rio Arriba |
| 190286 | Tiger Beetle | *Cicindela sedecimpunctata* | Rio Arriba |
| 190290 | Tiger Beetle | *Cicindela sperata* | Rio Arriba |
| 190295 | Variable Tiger Beetle | *Cicindela terricola* | Rio Arriba |
| 190300 | Tiger Beetle | *Cicindela tranquebarica* | Rio Arriba |
| 190306 | Nevada Tiger Beetle | *Ellipsoptera nevadica tubensis* | Rio Arriba |
| 210025 | Silver-Spotted Skipper | *Epargyreus clarus clarus* | Rio Arriba |
| 210130 | Short-Tailed Skipper | *Zestusa dorus* | Rio Arriba |
| 210310 | Northern Cloudywing Skipper | *Thorybes pylades* | Rio Arriba |
| 210325 | Mexican Cloudwing Skipper | *Thorybes mexicanus* | Rio Arriba |
| 210535 | Dreamy Duskywing Skipper | *Erynnis icelus* | Rio Arriba |
| 210550 | Sleepy Duskywing Skipper | *Erynnis brizo* | Rio Arriba |
| 210580 | Rocky Mtn Duskywing Skipper | *Erynnis telemachus* | Rio Arriba |
| 210625 | Horace's Duskywing Skipper | *Erynnis horatius* | Rio Arriba |
| 210670 | Pacuvius Duskywing Skipper | *Erynnis pacuvius* | Rio Arriba |
| 210700 | Afranius Duskywing Skipper | *Erynnis afranius* | Rio Arriba |
| 210715 | Persius Duskywing Skipper | *Erynnis persius* | Rio Arriba |
| 210730 | Loki Grizzled Skipper | *Pyrgus centaureae* | Rio Arriba |
| 210745 | Mountain Checkered Skipper | *Pyrgus xanthus* | Rio Arriba |
| 210775 | Common Checkered Skipper | *Pyrgus communis* | Rio Arriba |
| 210850 | Northern White Skipper | *Heliopetes ericetorum* | Rio Arriba |
| 210940 | Saltbush Sootywing Skipper | *Hesperopsis alpheus* | Rio Arriba |
| 210970 | Russet Skipperling Skipper | *Piruna pirus* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 211105 | Garita Skipperling Skipper | *Oarisma garita* | Rio Arriba |
| 211195 | Rhesus Skipper | *Yvretta rhesus* | Rio Arriba |
| 211240 | Morrison's Skipper | *Stinga morrisoni* | Rio Arriba |
| 211255 | Uncas Skipper | *Hesperia uncas uncas* | Rio Arriba |
| 211285 | Juba Skipper | *Hesperia juba* | Rio Arriba |
| 211300 | Colorado Branded Skipper | *Hesperia comma colorado* | Rio Arriba |
| 211330 | Apache Skipper | *Hesperia woodgatei* | Rio Arriba |
| 211360 | Pahaska Skipper | *Hesperia pahaska pahaska* | Rio Arriba |
| 211390 | Green Skipper | *Hesperia viridis* | Rio Arriba |
| 211405 | Nevada Skipper | *Hesperia nevada* | Rio Arriba |
| 211420 | Sandhill Skipper | *Polites sabuleti* | Rio Arriba |
| 211450 | Draco Skipper | *Polites draco* | Rio Arriba |
| 211465 | Tawny-Edged Skipper | *Polites themistocles* | Rio Arriba |
| 211555 | Napa Woodland Skipper | *Ochlodes sylvanoides* | Rio Arriba |
| 211630 | Taxiles Skipper | *Poanes taxiles* | Rio Arriba |
| 211660 | Kiowa Dun Skipper | *Euphyes vestris* | Rio Arriba |
| 211720 | Viereck's Skipper | *Atrytonopsis vierecki* | Rio Arriba |
| 211750 | Python Skipper | *Atrytonopsis python* | Rio Arriba |
| 211795 | Simius Roadside Skipper | *Amblyscirtes simius* | Rio Arriba |
| 211825 | Cassus Roadside Skipper | *Amblyscirtes cassus* | Rio Arriba |
| 211840 | Bronze Roadside Skipper | *Amblyscirtes aenus* | Rio Arriba |
| 211855 | Oslar's Roadside Skipper | *Amblyscirtes oslari* | Rio Arriba |
| 211945 | Roadside Skipper | *Amblyscirtes vialis* | Rio Arriba |
| 211960 | Orange-headed Roadside Skipper | *Amblyscirtes phylace* | Rio Arriba |
| 212185 | Colorado Giant Skipper | *Megathymus coloradensis coloradensis* | Rio Arriba |
| 212275 | Strecker's Giant Skipper | *Megathymus streckeri streckeri* | Rio Arriba |
| 212335 | Roger's False Parnassian Butterfly | *Parnassius phoebus* | Rio Arriba |
| 212395 | Black Swallowtail Butterfly | *Papilio polyxenes asterius* | Rio Arriba |
| 212425 | Baird's Swallowtail Butterfly | *Papilio bairdii* | Rio Arriba |
| 212440 | Anise Swallowtail Butterfly | *Papilio zelicaon zelicaon* | Rio Arriba |
| 212455 | Nitra Swallowtail Butterfly | *Papilio zelicaon nitra* | Rio Arriba |
| 212530 | Western Tiger Swallowtail Butterfly | *Pterourus rutulus rutulus* | Rio Arriba |
| 212560 | Two-Tailed Swallowtail Butterfly | *Pterourus multicaudatus* | Rio Arriba |
| 212575 | Pale Swallowtail Butterfly | *Pterourus eurymedon* | Rio Arriba |
| 212635 | Pine White Butterfly | *Neophasia menapia* | Rio Arriba |
| 212680 | Becker's White Butterfly | *Pontia beckerii* | Rio Arriba |
| 212695 | Spring White Butterfly | *Pontia sisymbrii elivata* | Rio Arriba |
| 212725 | Checkered White Butterfly | *Pontia protodice* | Rio Arriba |
| 212740 | Western White Butterfly | *Pontia occidentalis* | Rio Arriba |
| 212755 | McDunnough's White Butterfly | *Pieris napi mcdunnoughi* | Rio Arriba |
| 212785 | Cabbage White Butterfly | *Pieris rapae* | Rio Arriba |
| 212845 | Colorado Marble Butterfly | *Euchloe ausonides* | Rio Arriba |
| 212860 | Southern Marble Butterfly | *Euchloe hyantis* | Rio Arriba |
| 212920 | Ingham's Orangetip Butterfly | *Anthocharis sara* | Rio Arriba |
| 212935 | Western Common Sulphur Butterfly | *Colias philodice* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 212950 | Orange Sulphur Butterfly | *Colias eurytheme* | Rio Arriba |
| 212965 | Queen Alexandra's Sulphur Butterfly | *Colias alexandra alexandra* | Rio Arriba |
| 212995 | Mead's Sulphur Butterfly | *Colias meadii* | Rio Arriba |
| 213010 | Scudder's Willow Sulphur Butterfly | *Colias scudderii* | Rio Arriba |
| 213025 | Southern Dogface Butterfly | *Zerene cesonia* | Rio Arriba |
| 213175 | Mexican Yellow Butterfly | *Eurema mexicanum* | Rio Arriba |
| 213250 | Sleepy Orange Butterfly | *Eurema nicippe* | Rio Arriba |
| 213265 | Dainty Sulphur Butterfly | *Nathalis iole* | Rio Arriba |
| 213280 | Shellbach's Copper Butterfly | *Tharsalea arota* | Rio Arriba |
| 213355 | Sirius Copper Butterfly | *Chalceria rubida* | Rio Arriba |
| 213370 | Blue Copper Butterfly | *Chalceria heteronea* | Rio Arriba |
| 213385 | Purplish Copper Butterfly | *Epidemia helloides* | Rio Arriba |
| 213400 | Colorado Hairstreak Butterfly | *Hypaurotis crysalus* | Rio Arriba |
| 213430 | Great Purple Hairstreak Butterfly | *Atlides halesus* | Rio Arriba |
| 213520 | Immaculate Hairstreak Butterfly | *Satyrium titus immaculosus* | Rio Arriba |
| 213535 | Cross's Hairstreak Butterfly | *Satyrium behrii* | Rio Arriba |
| 213550 | Itys Hairstreak Butterfly | *Satyrium sylvinum* | Rio Arriba |
| 213565 | Godart's Hairstreak Butterfly | *Satyrium calanus* | Rio Arriba |
| 213610 | Leda Hairstreak Butterfly | *Ministrymon leda* | Rio Arriba |
| 213655 | Rocky Mountain Green Hairstreak Butterfly | *Callophrys affinis homoperplexa* | Rio Arriba |
| 213670 | Sheridan's Hairstreak Butterfly | *Callophrys sheridanii sheridanii* | Rio Arriba |
| 213730 | Thicket Hairstreak Butterfly | *Mitoura spinetorum* | Rio Arriba |
| 213745 | Juniper Hairstreak Butterfly | *Mitoura siva* | Rio Arriba |
| 213805 | Western Elfin Butterfly | *Incisalia augustinus iroides* | Rio Arriba |
| 213850 | Obscure Elfin Butterfly | *Incisalia polia* | Rio Arriba |
| 213880 | Western Pine Elfin Butterfly | *Incisalia eryphon* | Rio Arriba |
| 213970 | Frank's Common Hairstreak Butterfly | *Strymon melinus* | Rio Arriba |
| 214015 | Western Pygmy Blue Butterfly | *Brephidum exile* | Rio Arriba |
| 214045 | Marine Blue Butterfly | *Leptotes marina* | Rio Arriba |
| 214090 | Reakirt's Blue Butterfly | *Hemiargus isola* | Rio Arriba |
| 214120 | Western Tailed Blue Butterfly | *Everes amyntula* | Rio Arriba |
| 214150 | Arizona Blue Butterfly | *Celastrina ladon cinerea* | Rio Arriba |
| 214165 | Square-spotted Blue Butterfly | *Euphilotes battoides centralis* | Rio Arriba |
| 214285 | Spalding's Blue Butterfly | *Euphilotes spaldingi* | Rio Arriba |
| 214330 | Silvery Blue Butterfly | *Glaucopsyche lygdamus oro* | Rio Arriba |
| 214360 | Melissa Blue Butterfly | *Lycaeides melissa* | Rio Arriba |
| 214375 | Whitmer's Blue Butterfly | *Plebejus saepiolus whitmeri* | Rio Arriba |
| 214405 | Lycea Blue Butterfly | *Plebejus icarioides lycea* | Rio Arriba |
| 214450 | Texas Blue Butterfly | *Plebejus acmon* | Rio Arriba |
| 214465 | Rustic Blue Butterfly | *Agriades rusticus* | Rio Arriba |
| 214570 | Mormon Metalmark Butterfly | *Apodemia mormo mormo* | Rio Arriba |
| 214675 | Nais Metalmark Butterfly | *Apodemia nais* | Rio Arriba |
| 214690 | Southern Snout Butterfly | *Libytheana bachmanii* | Rio Arriba |
| 214765 | Variegated Fritillary Butterfly | *Euptoieta claudia* | Rio Arriba |
| 214795 | Great Spangled Fritillary Butterfly | *Speyeria cybele* | Rio Arriba |

**Appendix B.1**

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 214870 | Edwards' Fritillary Butterfly | *Speyeria edwardsii* | Rio Arriba |
| 214900 | Nikias Fritillary Butterfly | *Speyeria hesperis nikias* | Rio Arriba |
| 214945 | Electa Fritillary Butterfly | *Speyeria hesperis electa* | Rio Arriba |
| 215005 | Eurynome Silverspot Butterfly | *Speyeria mormonia* | Rio Arriba |
| 215020 | Tolland Fritillary Butterfly | *Clossiana selene* | Rio Arriba |
| 215035 | Brown's Fritillary Butterfly | *Clossiana freija* | Rio Arriba |
| 215050 | Helena Fritillary Butterfly | *Clossiana titania* | Rio Arriba |
| 215080 | Montane Penstemon Checkerspot Butterfly | *Poladryas minuta arachne* | Rio Arriba |
| 215155 | Fulvia Checkerspot Butterfly | *Thessalia fulvia* | Rio Arriba |
| 215260 | Carlota Checkerspot Butterfly | *Chlosyne gorgone* | Rio Arriba |
| 215275 | Drusius Checkerspot Butterfly | *Charidryas nycteis* | Rio Arriba |
| 215290 | Pearly Checkerspot Butterfly | *Charidryas acastus acastus* | Rio Arriba |
| 215470 | Pearl Crescent Butterfly | *Phyciodes tharos Type B* | Rio Arriba |
| 215500 | Camillus Crescent Butterfly | *Phyciodes pulchella* | Rio Arriba |
| 215515 | Painted Crescent Butterfly | *Phyciodes pictus* | Rio Arriba |
| 215545 | Mylitta Crescent Butterfly | *Phyciodes mylitta* | Rio Arriba |
| 215575 | Alena Checkerspot Butterfly | *Occidryas anicia alena* | Rio Arriba |
| 215590 | Chuska Mountains Checkerspot Butterfly | *Euphydryas anicia chuskae* | Rio Arriba |
| 215620 | Mead's Checkerspot Butterfly | *Occidryas anicia eurytion* | Rio Arriba |
| 215680 | Satyr Anglewing Butterfly | *Polygonia satyrus* | Rio Arriba |
| 215695 | Green Comma Butterfly | *Polygonia faunus* | Rio Arriba |
| 215710 | Hoary Comma Butterfly | *Polygonia gracilis* | Rio Arriba |
| 215725 | California Tortoise Shell Butterfly | *Nymphalis californica* | Rio Arriba |
| 215740 | Mourning Cloak Butterfly | *Nymphalis antiopa* | Rio Arriba |
| 215755 | Milbert's Tortoise Shell Butterfly | *Aglais milberti* | Rio Arriba |
| 215770 | American Lady Butterfly | *Vanessa virginiensis* | Rio Arriba |
| 215785 | Painted Lady Butterfly | *Vanessa cardui* | Rio Arriba |
| 215800 | West Coast Lady Butterfly | *Vanessa annabella* | Rio Arriba |
| 215815 | Red Admiral Butterfly | *Vanessa atalanta* | Rio Arriba |
| 215830 | Buckeye Butterfly | *Junonia coenia* | Rio Arriba |
| 215965 | Viceroy Butterfly | *Limenitis archippus archippus* | Rio Arriba |
| 216010 | Weidemeyer's Admiral Butterfly | *Limenitis weidemeyerii weidemeyerii* | Rio Arriba |
| 216040 | Arizona Sister Butterfly | *Adelpha bredowii* | Rio Arriba |
| 216295 | Canyonland Satyr Butterfly | *Cyllopsis pertepida dorothea* | Rio Arriba |
| 216385 | Ochre Ringlet Butterfly | *Coenonympha ochracea ochracea* | Rio Arriba |
| 216415 | Common Wood-Nymph Butterfly | *Cercyonis pegala* | Rio Arriba |
| 216430 | Mead's Wood Nymph Butterfly | *Cercyonis meadii meadii* | Rio Arriba |
| 216475 | Charon Satyr Butterfly | *Cercyonis oetus* | Rio Arriba |
| 216505 | Common Alpine Butterfly | *Erebia epipsodea* | Rio Arriba |
| 216535 | Ridings' Satyr Butterfly | *Neominois ridingsii ridingsii* | Rio Arriba |
| 216565 | Chryxus Arctic Butterfly | *Oeneis chryxus chryxus* | Rio Arriba |
| 216595 | Uhler's Arctic Butterfly | *Oeneis uhleri* | Rio Arriba |
| 216640 | CO Melissa Arctic Butterfly | *Oeneis melissa* | Rio Arriba |
| 216655 | Bruce's Arctic Butterfly | *Oeneis polixenes* | Rio Arriba |
| 216670 | Monarch Butterfly | *Danaus plexippus* | Rio Arriba |

## Appendix B.1

**Species List Report for Rio Arriba County**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Species ID | Common Name | Scientific Name | County |
|---|---|---|---|
| 216685 | Striated Queen Butterfly | *Danaus gilippus* | Rio Arriba |
| 217150 | Moth | *Hemileuca nuttalli* | Rio Arriba |
| 217585 | Twin-spot Sphinx Moth | *Smerinthus jamaicensis* | Rio Arriba |
| 218095 | White-lined Sphinx Moth | *Hyles lineata* | Rio Arriba |
| 301480 | Comb-Footed Spider | *Theridion neomexicanum* | Rio Arriba |
| 301490 | Comb-Footed Spider | *Theridion ohlerti* | Rio Arriba |
| 302810 | Orb Weaver Spider | *Araneus bicentenarius* | Rio Arriba |
| 303560 | Thin-legged Wolf Spider | *Pardosa coloradensis* | Rio Arriba |
| 303580 | Thin-legged Wolf Spider | *Pardosa distincta* | Rio Arriba |
| 303620 | Thin-legged Wolf Spider | *Pardosa fuscula* | Rio Arriba |
| 303680 | Thin-legged Wolf Spider | *Pardosa ourayensis* | Rio Arriba |
| 303700 | Thin-legged Wolf Spider | *Pardosa sternalis* | Rio Arriba |
| 303960 | Spider | *Varacosa gosiuta* | Rio Arriba |
| 321040 | Pseudoscorpion | *Mundochthonius montanus* | Rio Arriba |
| 321080 | Pseudoscorpion | *Lechytia pacifica* | Rio Arriba |
| 321100 | Pseudoscorpion | *Syarinus obscurus* | Rio Arriba |
| 321130 | Pseudoscorpion | *Chitrella transversa* | Rio Arriba |
| 321240 | Pseudoscorpion | *Hesperochernes utahensis* | Rio Arriba |
| 321310 | Pseudoscorpion | *Dinocheirus athleticus* | Rio Arriba |
| 321400 | Pseudoscorpion | *Parachelifer persimilis* | Rio Arriba |

Source:
Biota Information System of New Mexico. Report County TES Table for Rio Arriba: New Mexico wildlife of concern. New Mexico Department of Game and Fish, Santa Fe, NM. 2017. http://www.bison-m.org.

**Appendix B.2**

**New Mexico Wildlife of Concern: Threatened and Endangered Species**
**Ecological Risk Assessment**
**ConocoPhillips Company**
**San Juan 27-5 No. 1, Rio Arriba County, New Mexico**

| Common Name | Scientific Name | NMGF | US FWS | Critical Habitat |
|---|---|---|---|---|
| **Mammals** | | | | |
| Spotted Bat | *Euderma masculatum* | T | | |
| Canada Lynx | *Lynx canadensis* | | T | |
| Pacific Marten | *Martes caurina* | T | | |
| Meadow Jumping Mouse | *Zapus hudsonius luteus* | E | E | Y |
| | | | | |
| **Birds** | | | | |
| White-Tailed Ptarmigan | *Lagopus leucura* | E | | |
| Brown Pelican | *Pelecanus occidentalis* | E | | |
| Common Black Hawk | *Buteogallus anthracinus* | T | | |
| Bald Eagle | *Haliaeetus leucocephalus* | T | | |
| Peregrin Falcon | *Falco peregrinus* | T | | |
| Arctic Peregrin Falcon | *Falco peregrinus tundris* | T | | |
| Least Tern | *Sternula antillarum* | E | E | |
| Yellow-Billed Cuckoo (Western Pop) | *Coccyzus americanus occidentalis* | | T | |
| Boreal Owl | *Aegolius funereus* | T | | |
| Mexican Spotted Owl | *Strix occidentalis lucida* | | T | Y |
| Southwest Willow Flycatcher | *Empidonax traillii extimus* | E | E | Y |
| Gray Vireo | *Vireo vicinior* | T | | |
| Baird's Sparrow | *Ammodramus bairdii* | T | | |
| | | | | |
| **Amphibians** | | | | |
| Boreal Toad | *Anaxyrus boreas boreas* | E | | |
| Jemez Mountains Salamander | *Plethodon neomexicanus* | E | E | Y |
| | | | | |
| **Fish** | | | | |
| Roundtail Chub (Upper Basin Populations) | *Gila robusta* | E | | |

Notes:

E - Endanged
NMGF - New Mexico Game and Fish
T - Threatened
US FWS - US Fish and Wildlife Service
Y - Yes

Source:
Biota Information System of New Mexico. Report County TES Table for Rio Arriba: New Mexico wildlife of concern. New Mexico Department of Game and Fish, Santa Fe, NM. 2017. http://www.bison-m.org.

# Appendix C
# Analytical Report for Soil and Groundwater

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

April 19, 2017

Christine Mathews
GHD Services, Inc.
6212 Indian School Rd. NE St2
Albuquerque, NM 87110

RE: Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

Dear Christine Mathews:
Enclosed are the analytical results for sample(s) received by the laboratory on April 12, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Alice Spiller

Alice Spiller
alice.spiller@pacelabs.com
(913)563-1409
Project Manager

Enclosures

cc: Angela Bown, GHD Services, Inc,
Jeffrey Walker, GHD Services, Inc

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

## CERTIFICATIONS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Kansas Certification IDs**
9608 Loiret Boulevard, Lenexa, KS 66219
WY STR Certification #: 2456.01
Arkansas Certification #: 15-016-0
Illinois Certification #: 003097
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212008A
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070

**Dallas Certification IDs:**
400 West Bethany Dr Suite 190, Allen, TX 75013
EPA# TX00074
Florida Certification #: E871118
Texas Certification #: T104704232
Kansas Certification #: E-10388
Arkansas Certification #: 88-0647
Oklahoma Certification #: TX00074
Louisiana Certification #: 30686
Iowa Certification #: 408
Florida Certification #: E871118
Nevada Certification #: TX00074

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

## SAMPLE SUMMARY

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|---|---|---|---|---|
| 60241926001 | S-11124687-041217-B17@0.5'-JW | Solid | 04/12/17 11:15 | 04/12/17 23:00 |
| 60241926002 | S-11124687-041217-B17@9'-JW | Solid | 04/12/17 11:35 | 04/12/17 23:00 |
| 60241926003 | S-11124687-041217-B17@12'-JW | Solid | 04/12/17 11:55 | 04/12/17 23:00 |
| 60241926004 | S-11124687-041217-B17@14'-JW | Solid | 04/12/17 12:00 | 04/12/17 23:00 |
| 60241926005 | S-11124687-041217-B17@17'-JW | Solid | 04/12/17 12:10 | 04/12/17 23:00 |
| 60241926006 | W-11124687-041217-WELL-JW | Water | 04/12/17 13:15 | 04/12/17 23:00 |
| 60241926007 | TRIP BLANK | Water | 04/12/17 13:15 | 04/12/17 23:00 |

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## SAMPLE ANALYTE COUNT

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

| Lab ID | Sample ID | Method | Analysts | Analytes Reported | Laboratory |
|---|---|---|---|---|---|
| 60241926001 | S-11124687-041217-B17@0.5'-JW | TCEQ 1005 | JS | 6 | PASI-D |
| | | TCEQ 1006 | JS | 14 | PASI-D |
| | | EPA 8270 by SIM | NAW | 18 | PASI-K |
| | | ASTM D2974 | CJW | 1 | PASI-K |
| | | SM 2540G | LDF | 1 | PASI-K |
| 60241926002 | S-11124687-041217-B17@9'-JW | TCEQ 1005 | JS | 6 | PASI-D |
| | | TCEQ 1006 | JS | 14 | PASI-D |
| | | EPA 8270 by SIM | NAW | 18 | PASI-K |
| | | ASTM D2974 | CJW | 1 | PASI-K |
| | | SM 2540G | LDF | 1 | PASI-K |
| 60241926003 | S-11124687-041217-B17@12'-JW | TCEQ 1005 | JS | 6 | PASI-D |
| | | TCEQ 1006 | JS | 14 | PASI-D |
| | | EPA 8270 by SIM | NAW | 18 | PASI-K |
| | | ASTM D2974 | CJW | 1 | PASI-K |
| | | SM 2540G | LDF | 1 | PASI-K |
| 60241926004 | S-11124687-041217-B17@14'-JW | TCEQ 1005 | JS | 6 | PASI-D |
| | | TCEQ 1006 | JS | 14 | PASI-D |
| | | EPA 8270 by SIM | NAW | 18 | PASI-K |
| | | ASTM D2974 | CJW | 1 | PASI-K |
| | | SM 2540G | LDF | 1 | PASI-K |
| 60241926005 | S-11124687-041217-B17@17'-JW | TCEQ 1005 | JS | 6 | PASI-D |
| | | TCEQ 1006 | JS | 14 | PASI-D |
| | | EPA 8270 by SIM | NAW | 18 | PASI-K |
| | | ASTM D2974 | CJW | 1 | PASI-K |
| | | SM 2540G | LDF | 1 | PASI-K |
| 60241926006 | W-11124687-041217-WELL-JW | EPA 8270C by SIM | NAW | 18 | PASI-K |
| | | EPA 8260 | EAG | 8 | PASI-K |

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **TCEQ 1005**
**Description:** TCEQ 1005 TPH
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

**General Information:**
5 samples were analyzed for TCEQ 1005. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**
The samples were analyzed within the method required hold times with any exceptions noted below.

**Sample Preparation:**
The samples were prepared in accordance with TCEQ 1005 with any exceptions noted below.

**Initial Calibrations (including MS Tune as applicable):**
All criteria were within method requirements with any exceptions noted below.

**Continuing Calibration:**
All criteria were within method requirements with any exceptions noted below.

**Surrogates:**
All surrogates were within QC limits with any exceptions noted below.

**Method Blank:**
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 74056

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60241926001

R1: RPD value was outside control limits.

- MSD (Lab ID: 320714)
  - TPH (>C28-C35)

**Additional Comments:**

## REPORT OF LABORATORY ANALYSIS

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **TCEQ 1006**
**Description:** TCEQ 1006 TPH
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

**General Information:**
5 samples were analyzed for TCEQ 1006. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**
The samples were analyzed within the method required hold times with any exceptions noted below.

**Sample Preparation:**
The samples were prepared in accordance with TCEQ 1006 with any exceptions noted below.

**Initial Calibrations (including MS Tune as applicable):**
All criteria were within method requirements with any exceptions noted below.

**Continuing Calibration:**
All criteria were within method requirements with any exceptions noted below.

**Surrogates:**
All surrogates were within QC limits with any exceptions noted below.

**Method Blank:**
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 74072

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60241926001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 320718)
  - C6-C35 Aliphatic & Aromatic
- MSD (Lab ID: 320719)
  - C6-C35 Aliphatic & Aromatic

**Additional Comments:**

Analyte Comments:

QC Batch: 74072

N2: The lab does not hold NELAC/TNI accreditation for this parameter.

- BLANK (Lab ID: 320715)
  - Aliphatic (>C06-C08)
  - Aliphatic (>C08-C10)

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **TCEQ 1006**
**Description:** TCEQ 1006 TPH
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

Analyte Comments:

QC Batch: 74072

N2: The lab does not hold NELAC/TNI accreditation for this parameter.

- BLANK (Lab ID: 320715)
  - Aliphatic (>C10-C12)
  - Aliphatic (>C12-C16)
  - Aliphatic (>C16-C21)
  - Aliphatic (>C21-C35)
  - C6-C35 Aliphatic & Aromatic
  - Aromatic (>C07-C08)
  - Aromatic (>C08-C10)
  - Aromatic (>C10-C12)
  - Aromatic (>C12-C16)
  - Aromatic (>C16-C21)
  - Aromatic (>C21-C35)
  - Aliphatic (C6)
- LCS (Lab ID: 320716)
  - C6-C35 Aliphatic & Aromatic
- LCSD (Lab ID: 320717)
  - C6-C35 Aliphatic & Aromatic
- MS (Lab ID: 320718)
  - C6-C35 Aliphatic & Aromatic
- MSD (Lab ID: 320719)
  - C6-C35 Aliphatic & Aromatic
- S-11124687-041217-B17@0.5'-JW (Lab ID: 60241926001)
  - Aliphatic (>C06-C08)
  - Aliphatic (>C08-C10)
  - Aliphatic (>C10-C12)
  - Aliphatic (>C12-C16)
  - Aliphatic (>C16-C21)
  - Aliphatic (>C21-C35)
  - C6-C35 Aliphatic & Aromatic
  - Aromatic (>C07-C08)
  - Aromatic (>C08-C10)
  - Aromatic (>C10-C12)
  - Aromatic (>C12-C16)
  - Aromatic (>C16-C21)
  - Aromatic (>C21-C35)
  - Aliphatic (C6)
- S-11124687-041217-B17@12'-JW (Lab ID: 60241926003)
  - Aliphatic (>C06-C08)
  - Aliphatic (>C08-C10)
  - Aliphatic (>C10-C12)
  - Aliphatic (>C12-C16)
  - Aliphatic (>C16-C21)
  - Aliphatic (>C21-C35)

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **TCEQ 1006**
**Description:** TCEQ 1006 TPH
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

Analyte Comments:

QC Batch: 74072

N2: The lab does not hold NELAC/TNI accreditation for this parameter.

- S-11124687-041217-B17@12'-JW (Lab ID: 60241926003)
  - C6-C35 Aliphatic & Aromatic
  - Aromatic (>C07-C08)
  - Aromatic (>C08-C10)
  - Aromatic (>C10-C12)
  - Aromatic (>C12-C16)
  - Aromatic (>C16-C21)
  - Aromatic (>C21-C35)
  - Aliphatic (C6)
- S-11124687-041217-B17@14'-JW (Lab ID: 60241926004)
  - Aliphatic (>C06-C08)
  - Aliphatic (>C08-C10)
  - Aliphatic (>C10-C12)
  - Aliphatic (>C12-C16)
  - Aliphatic (>C16-C21)
  - Aliphatic (>C21-C35)
  - C6-C35 Aliphatic & Aromatic
  - Aromatic (>C07-C08)
  - Aromatic (>C08-C10)
  - Aromatic (>C10-C12)
  - Aromatic (>C12-C16)
  - Aromatic (>C16-C21)
  - Aromatic (>C21-C35)
  - Aliphatic (C6)
- S-11124687-041217-B17@17'-JW (Lab ID: 60241926005)
  - Aliphatic (>C06-C08)
  - Aliphatic (>C08-C10)
  - Aliphatic (>C10-C12)
  - Aliphatic (>C12-C16)
  - Aliphatic (>C16-C21)
  - Aliphatic (>C21-C35)
  - C6-C35 Aliphatic & Aromatic
  - Aromatic (>C07-C08)
  - Aromatic (>C08-C10)
  - Aromatic (>C10-C12)
  - Aromatic (>C12-C16)
  - Aromatic (>C16-C21)
  - Aromatic (>C21-C35)
  - Aliphatic (C6)
- S-11124687-041217-B17@9'-JW (Lab ID: 60241926002)
  - Aliphatic (>C06-C08)
  - Aliphatic (>C08-C10)
  - Aliphatic (>C10-C12)

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **TCEQ 1006**
**Description:** TCEQ 1006 TPH
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

Analyte Comments:

QC Batch: 74072

N2: The lab does not hold NELAC/TNI accreditation for this parameter.

- S-11124687-041217-B17@9'-JW (Lab ID: 60241926002)
  - Aliphatic (>C12-C16)
  - Aliphatic (>C16-C21)
  - Aliphatic (>C21-C35)
  - C6-C35 Aliphatic & Aromatic
  - Aromatic (>C07-C08)
  - Aromatic (>C08-C10)
  - Aromatic (>C10-C12)
  - Aromatic (>C12-C16)
  - Aromatic (>C16-C21)
  - Aromatic (>C21-C35)
  - Aliphatic (C6)

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **EPA 8270 by SIM**
**Description:** 8270 MSSV PAH by SIM
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

**General Information:**
5 samples were analyzed for EPA 8270 by SIM. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**
The samples were analyzed within the method required hold times with any exceptions noted below.

**Sample Preparation:**
The samples were prepared in accordance with EPA 3546 with any exceptions noted below.

**Initial Calibrations (including MS Tune as applicable):**
All criteria were within method requirements with any exceptions noted below.

**Continuing Calibration:**
All criteria were within method requirements with any exceptions noted below.

**Internal Standards:**
All internal standards were within QC limits with any exceptions noted below.

**Surrogates:**
All surrogates were within QC limits with any exceptions noted below.

**Method Blank:**
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 472640

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60241926001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 1935209)
  - Benzo(a)pyrene
  - Benzo(b)fluoranthene
  - Chrysene
  - Fluoranthene
  - Phenanthrene
  - Pyrene

R1: RPD value was outside control limits.

- MSD (Lab ID: 1935210)

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **EPA 8270 by SIM**
**Description:** 8270 MSSV PAH by SIM
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

QC Batch: 472640

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60241926001

R1: RPD value was outside control limits.

- Acenaphthene
- Anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Chrysene
- Fluoranthene
- Indeno(1,2,3-cd)pyrene
- Phenanthrene
- Pyrene

**Additional Comments:**

Analyte Comments:

QC Batch: 472640

2e: The methods baseline separation for isomers pairs in the Initial Calibration or Continuing Calibration Verification (CCV) was less than the expected 50% valley to baseline. No further action was taken for this method variation. The two compounds are still being reported as individual isomers and not a combined total, since there is separation between the two isomers.

- MS (Lab ID: 1935209)
  - Benzo(b)fluoranthene
- MSD (Lab ID: 1935210)
  - Benzo(b)fluoranthene
- S-11124687-041217-B17@0.5'-JW (Lab ID: 60241926001)
  - Benzo(b)fluoranthene
- S-11124687-041217-B17@14'-JW (Lab ID: 60241926004)
  - Benzo(b)fluoranthene

D3: Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

- S-11124687-041217-B17@17'-JW (Lab ID: 60241926005)
  - Phenanthrene

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **EPA 8270C by SIM**
**Description:** 8270 MSSV PAH by SIM
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

**General Information:**
1 sample was analyzed for EPA 8270C by SIM. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**
The samples were analyzed within the method required hold times with any exceptions noted below.

**Sample Preparation:**
The samples were prepared in accordance with EPA 3510C with any exceptions noted below.

**Initial Calibrations (including MS Tune as applicable):**
All criteria were within method requirements with any exceptions noted below.

**Continuing Calibration:**
All criteria were within method requirements with any exceptions noted below.

**Internal Standards:**
All internal standards were within QC limits with any exceptions noted below.

**Surrogates:**
All surrogates were within QC limits with any exceptions noted below.

**Method Blank:**
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 472702

A matrix spike/matrix spike duplicate was not performed due to insufficient sample volume.

**Additional Comments:**

Analyte Comments:

QC Batch: 472702

1e: A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

- W-11124687-041217-WELL-JW (Lab ID: 60241926006)
  - Acenaphthene
  - Acenaphthylene
  - Anthracene
  - Benzo(k)fluoranthene

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **EPA 8270C by SIM**
**Description:** 8270 MSSV PAH by SIM
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

Analyte Comments:

QC Batch: 472702

1e: A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

- W-11124687-041217-WELL-JW (Lab ID: 60241926006)
  - Benzo(g,h,i)perylene
  - Benzo(a)anthracene
  - Benzo(b)fluoranthene
  - Benzo(a)pyrene
  - Chrysene
  - Dibenz(a,h)anthracene
  - Fluorene
  - Fluoranthene
  - Indeno(1,2,3-cd)pyrene
  - Naphthalene
  - Phenanthrene
  - Pyrene

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# PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **EPA 8260**
**Description:** 8260 MSV UST, Water
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

**General Information:**
1 sample was analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**
The samples were analyzed within the method required hold times with any exceptions noted below.

**Initial Calibrations (including MS Tune as applicable):**
All criteria were within method requirements with any exceptions noted below.

**Continuing Calibration:**
All criteria were within method requirements with any exceptions noted below.

**Internal Standards:**
All internal standards were within QC limits with any exceptions noted below.

**Surrogates:**
All surrogates were within QC limits with any exceptions noted below.

**Method Blank:**
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 472656

A matrix spike/matrix spike duplicate was not performed due to insufficient sample volume.

**Additional Comments:**

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## PROJECT NARRATIVE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Method:** **SM 2540G**
**Description:** 2540G Total Percent Solids
**Client:** GHD Services_COP NM
**Date:** April 19, 2017

**General Information:**
5 samples were analyzed for SM 2540G. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**
The samples were analyzed within the method required hold times with any exceptions noted below.

**Method Blank:**
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**
All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

**Duplicate Sample:**
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

**Additional Comments:**

This data package has been reviewed for quality and completeness and is approved for release.

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## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@0.5'-JW** **Lab ID: 60241926001** Collected: 04/12/17 11:15 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **TCEQ 1005 TPH** | Analytical Method: TCEQ 1005 Preparation Method: TCEQ 1005 | | | | | | | |
| TPH (C06-C12) | ND | mg/kg | 12.9 | 1 | 04/14/17 13:00 | 04/15/17 04:26 | | |
| TPH (>C12-C28) | ND | mg/kg | 6.4 | 1 | 04/14/17 13:00 | 04/15/17 04:26 | | |
| TPH (>C28-C35) | ND | mg/kg | 26.9 | 1 | 04/14/17 13:00 | 04/15/17 04:00 | | R1 |
| TPH Total (C06-C35) | ND | mg/kg | 6.4 | 1 | 04/14/17 13:00 | 04/15/17 04:26 | | |
| ***Surrogates*** | | | | | | | | |
| o-Terphenyl (S) | 120 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 04:26 | 84-15-1 | |
| 1-Chlorooctane (S) | 115 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 04:26 | 3386-33-2 | |
| **TCEQ 1006 TPH** | Analytical Method: TCEQ 1006 Preparation Method: TCEQ 1006 | | | | | | | |
| Aliphatic (C6) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 18:43 | | N2 |
| Aliphatic (>C06-C08) | ND | mg/kg | 27.9 | 1 | 04/16/17 12:25 | 04/17/17 18:43 | | N2 |
| Aliphatic (>C08-C10) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 18:43 | | N2 |
| Aliphatic (>C10-C12) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 18:43 | | N2 |
| Aliphatic (>C12-C16) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 18:43 | | N2 |
| Aliphatic (>C16-C21) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 18:43 | | N2 |
| Aliphatic (>C21-C35) | ND | mg/kg | 27.9 | 1 | 04/16/17 12:25 | 04/17/17 18:43 | | N2 |
| Aromatic (>C07-C08) | ND | mg/kg | 3.2 | 1 | 04/16/17 12:25 | 04/17/17 19:09 | | N2 |
| Aromatic (>C08-C10) | ND | mg/kg | 21.5 | 1 | 04/16/17 12:25 | 04/17/17 19:09 | | N2 |
| Aromatic (>C10-C12) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 19:09 | | N2 |
| Aromatic (>C12-C16) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 19:09 | | N2 |
| Aromatic (>C16-C21) | ND | mg/kg | 14.0 | 1 | 04/16/17 12:25 | 04/17/17 19:09 | | N2 |
| Aromatic (>C21-C35) | ND | mg/kg | 27.9 | 1 | 04/16/17 12:25 | 04/17/17 19:09 | | N2 |
| C6-C35 Aliphatic & Aromatic | ND | mg/kg | 3.2 | 1 | 04/16/17 12:25 | 04/17/17 19:09 | | M1,N2 |
| **8270 MSSV PAH by SIM** | Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546 | | | | | | | |
| Acenaphthene | ND | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 83-32-9 | R1 |
| Acenaphthylene | ND | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 208-96-8 | |
| Anthracene | ND | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 120-12-7 | R1 |
| Benzo(a)anthracene | **6.5** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 56-55-3 | |
| Benzo(a)pyrene | **5.7** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 50-32-8 | M1,R1 |
| Benzo(b)fluoranthene | **9.6** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 205-99-2 | 2e,M1, R1 |
| Benzo(g,h,i)perylene | **8.1** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 191-24-2 | R1 |
| Benzo(k)fluoranthene | **5.1** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 207-08-9 | R1 |
| Chrysene | **6.5** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 218-01-9 | M1,R1 |
| Dibenz(a,h)anthracene | ND | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 53-70-3 | |
| Fluoranthene | **14.3** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 206-44-0 | M1,R1 |
| Fluorene | ND | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 86-73-7 | |
| Indeno(1,2,3-cd)pyrene | **6.0** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 193-39-5 | R1 |
| Naphthalene | ND | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 91-20-3 | |
| Phenanthrene | **13.0** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 85-01-8 | M1,R1 |
| Pyrene | **12.3** | ug/kg | 3.6 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 129-00-0 | M1,R1 |
| ***Surrogates*** | | | | | | | | |
| 2-Fluorobiphenyl (S) | 82 | % | 54-93 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 321-60-8 | |
| Terphenyl-d14 (S) | 107 | % | 49-120 | 1 | 04/13/17 00:00 | 04/14/17 17:48 | 1718-51-0 | |

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@0.5'-JW** **Lab ID: 60241926001** Collected: 04/12/17 11:15 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **Percent Moisture** | Analytical Method: ASTM D2974 | | | | | | | |
| Percent Moisture | **9.8** | % | 0.50 | 1 | | 04/14/17 00:00 | | |
| **2540G Total Percent Solids** | Analytical Method: SM 2540G | | | | | | | |
| Total Solids | **94.3** | % | 0.10 | 1 | | 04/13/17 17:18 | | |

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## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@9'-JW** **Lab ID: 60241926002** Collected: 04/12/17 11:35 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **TCEQ 1005 TPH** | Analytical Method: TCEQ 1005 Preparation Method: TCEQ 1005 | | | | | | | |
| TPH (C06-C12) | **582** | mg/kg | 11.5 | 1 | 04/14/17 13:00 | 04/15/17 04:52 | | |
| TPH (>C12-C28) | **225** | mg/kg | 5.7 | 1 | 04/14/17 13:00 | 04/15/17 04:52 | | |
| TPH (>C28-C35) | ND | mg/kg | 23.9 | 1 | 04/14/17 13:00 | 04/15/17 04:26 | | |
| TPH Total (C06-C35) | **806** | mg/kg | 5.7 | 1 | 04/14/17 13:00 | 04/15/17 04:52 | | |
| ***Surrogates*** | | | | | | | | |
| o-Terphenyl (S) | 114 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 04:52 | 84-15-1 | |
| 1-Chlorooctane (S) | 117 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 04:52 | 3386-33-2 | |
| **TCEQ 1006 TPH** | Analytical Method: TCEQ 1006 Preparation Method: TCEQ 1006 | | | | | | | |
| Aliphatic (C6) | ND | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 19:35 | | N2 |
| Aliphatic (>C06-C08) | **27.2** | mg/kg | 24.9 | 1 | 04/16/17 12:25 | 04/17/17 19:35 | | N2 |
| Aliphatic (>C08-C10) | **151** | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 19:35 | | N2 |
| Aliphatic (>C10-C12) | **160** | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 19:35 | | N2 |
| Aliphatic (>C12-C16) | **134** | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 19:35 | | N2 |
| Aliphatic (>C16-C21) | ND | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 19:35 | | N2 |
| Aliphatic (>C21-C35) | ND | mg/kg | 24.9 | 1 | 04/16/17 12:25 | 04/17/17 19:35 | | N2 |
| Aromatic (>C07-C08) | ND | mg/kg | 2.9 | 1 | 04/16/17 12:25 | 04/17/17 20:01 | | N2 |
| Aromatic (>C08-C10) | ND | mg/kg | 19.1 | 1 | 04/16/17 12:25 | 04/17/17 20:01 | | N2 |
| Aromatic (>C10-C12) | ND | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 20:01 | | N2 |
| Aromatic (>C12-C16) | ND | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 20:01 | | N2 |
| Aromatic (>C16-C21) | ND | mg/kg | 12.4 | 1 | 04/16/17 12:25 | 04/17/17 20:01 | | N2 |
| Aromatic (>C21-C35) | ND | mg/kg | 24.9 | 1 | 04/16/17 12:25 | 04/17/17 20:01 | | N2 |
| C6-C35 Aliphatic & Aromatic | **472** | mg/kg | 2.9 | 1 | 04/16/17 12:25 | 04/17/17 20:01 | | N2 |
| **8270 MSSV PAH by SIM** | Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546 | | | | | | | |
| Acenaphthene | **7.3** | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 83-32-9 | |
| Acenaphthylene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 208-96-8 | |
| Anthracene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 120-12-7 | |
| Benzo(a)anthracene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 56-55-3 | |
| Benzo(a)pyrene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 50-32-8 | |
| Benzo(b)fluoranthene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 205-99-2 | |
| Benzo(g,h,i)perylene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 191-24-2 | |
| Benzo(k)fluoranthene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 207-08-9 | |
| Chrysene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 218-01-9 | |
| Dibenz(a,h)anthracene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 53-70-3 | |
| Fluoranthene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 206-44-0 | |
| Fluorene | **33.4** | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 86-73-7 | |
| Indeno(1,2,3-cd)pyrene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 193-39-5 | |
| Naphthalene | **427** | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 91-20-3 | |
| Phenanthrene | **14.5** | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 85-01-8 | |
| Pyrene | ND | ug/kg | 3.5 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 129-00-0 | |
| ***Surrogates*** | | | | | | | | |
| 2-Fluorobiphenyl (S) | 84 | % | 54-93 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 321-60-8 | |
| Terphenyl-d14 (S) | 98 | % | 49-120 | 1 | 04/13/17 00:00 | 04/14/17 18:45 | 1718-51-0 | |

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Lenexa, KS 66219
(913)599-5665

## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@9'-JW** **Lab ID: 60241926002** Collected: 04/12/17 11:35 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **Percent Moisture** | Analytical Method: ASTM D2974 | | | | | | | |
| Percent Moisture | **8.8** | % | 0.50 | 1 | | 04/14/17 00:00 | | |
| **2540G Total Percent Solids** | Analytical Method: SM 2540G | | | | | | | |
| Total Solids | **91.3** | % | 0.10 | 1 | | 04/13/17 17:20 | | |

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## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@12'-JW** **Lab ID: 60241926003** Collected: 04/12/17 11:55 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **TCEQ 1005 TPH** | Analytical Method: TCEQ 1005 Preparation Method: TCEQ 1005 | | | | | | | |
| TPH (C06-C12) | **222** | mg/kg | 12.2 | 1 | 04/14/17 13:00 | 04/15/17 05:18 | | |
| TPH (>C12-C28) | **85.8** | mg/kg | 6.1 | 1 | 04/14/17 13:00 | 04/15/17 05:18 | | |
| TPH (>C28-C35) | ND | mg/kg | 25.3 | 1 | 04/14/17 13:00 | 04/15/17 05:18 | | |
| TPH Total (C06-C35) | **308** | mg/kg | 6.1 | 1 | 04/14/17 13:00 | 04/15/17 05:18 | | |
| ***Surrogates*** | | | | | | | | |
| o-Terphenyl (S) | 115 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 05:18 | 84-15-1 | |
| 1-Chlorooctane (S) | 117 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 05:18 | 3386-33-2 | |
| **TCEQ 1006 TPH** | Analytical Method: TCEQ 1006 Preparation Method: TCEQ 1006 | | | | | | | |
| Aliphatic (C6) | ND | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| Aliphatic (>C06-C08) | ND | mg/kg | 26.4 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| Aliphatic (>C08-C10) | **56.8** | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| Aliphatic (>C10-C12) | **61.6** | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| Aliphatic (>C12-C16) | **50.5** | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| Aliphatic (>C16-C21) | ND | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| Aliphatic (>C21-C35) | ND | mg/kg | 26.4 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| Aromatic (>C07-C08) | ND | mg/kg | 3.0 | 1 | 04/16/17 12:25 | 04/17/17 20:53 | | N2 |
| Aromatic (>C08-C10) | ND | mg/kg | 20.3 | 1 | 04/16/17 12:25 | 04/17/17 20:53 | | N2 |
| Aromatic (>C10-C12) | ND | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:53 | | N2 |
| Aromatic (>C12-C16) | ND | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:53 | | N2 |
| Aromatic (>C16-C21) | ND | mg/kg | 13.2 | 1 | 04/16/17 12:25 | 04/17/17 20:53 | | N2 |
| Aromatic (>C21-C35) | ND | mg/kg | 26.4 | 1 | 04/16/17 12:25 | 04/17/17 20:53 | | N2 |
| C6-C35 Aliphatic & Aromatic | **169** | mg/kg | 3.0 | 1 | 04/16/17 12:25 | 04/17/17 20:27 | | N2 |
| **8270 MSSV PAH by SIM** | Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546 | | | | | | | |
| Acenaphthene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 83-32-9 | |
| Acenaphthylene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 208-96-8 | |
| Anthracene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 120-12-7 | |
| Benzo(a)anthracene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 56-55-3 | |
| Benzo(a)pyrene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 50-32-8 | |
| Benzo(b)fluoranthene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 205-99-2 | |
| Benzo(g,h,i)perylene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 191-24-2 | |
| Benzo(k)fluoranthene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 207-08-9 | |
| Chrysene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 218-01-9 | |
| Dibenz(a,h)anthracene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 53-70-3 | |
| Fluoranthene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 206-44-0 | |
| Fluorene | **9.1** | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 86-73-7 | |
| Indeno(1,2,3-cd)pyrene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 193-39-5 | |
| Naphthalene | **142** | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 91-20-3 | |
| Phenanthrene | **4.4** | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 85-01-8 | |
| Pyrene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 129-00-0 | |
| ***Surrogates*** | | | | | | | | |
| 2-Fluorobiphenyl (S) | 70 | % | 54-93 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 321-60-8 | |
| Terphenyl-d14 (S) | 87 | % | 49-120 | 1 | 04/13/17 00:00 | 04/14/17 19:04 | 1718-51-0 | |

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
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## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@12'-JW** **Lab ID: 60241926003** Collected: 04/12/17 11:55 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **Percent Moisture** | Analytical Method: ASTM D2974 | | | | | | | |
| Percent Moisture | **16.4** | % | 0.50 | 1 | | 04/14/17 00:00 | | |
| **2540G Total Percent Solids** | Analytical Method: SM 2540G | | | | | | | |
| Total Solids | **85.7** | % | 0.10 | 1 | | 04/13/17 17:23 | | |

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## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@14'-JW** **Lab ID: 60241926004** Collected: 04/12/17 12:00 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **TCEQ 1005 TPH** | Analytical Method: TCEQ 1005 Preparation Method: TCEQ 1005 | | | | | | | |
| TPH (C06-C12) | **22.7** | mg/kg | 12.7 | 1 | 04/14/17 13:00 | 04/15/17 05:45 | | |
| TPH (>C12-C28) | **11.2** | mg/kg | 6.3 | 1 | 04/14/17 13:00 | 04/15/17 05:45 | | |
| TPH (>C28-C35) | ND | mg/kg | 26.4 | 1 | 04/14/17 13:00 | 04/15/17 05:45 | | |
| TPH Total (C06-C35) | **34.0** | mg/kg | 6.3 | 1 | 04/14/17 13:00 | 04/15/17 05:45 | | |
| ***Surrogates*** | | | | | | | | |
| o-Terphenyl (S) | 104 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 05:45 | 84-15-1 | |
| 1-Chlorooctane (S) | 101 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 05:45 | 3386-33-2 | |
| **TCEQ 1006 TPH** | Analytical Method: TCEQ 1006 Preparation Method: TCEQ 1006 | | | | | | | |
| Aliphatic (C6) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| Aliphatic (>C06-C08) | ND | mg/kg | 27.5 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| Aliphatic (>C08-C10) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| Aliphatic (>C10-C12) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| Aliphatic (>C12-C16) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| Aliphatic (>C16-C21) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| Aliphatic (>C21-C35) | ND | mg/kg | 27.5 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| Aromatic (>C07-C08) | ND | mg/kg | 3.2 | 1 | 04/16/17 12:25 | 04/17/17 21:45 | | N2 |
| Aromatic (>C08-C10) | ND | mg/kg | 21.2 | 1 | 04/16/17 12:25 | 04/17/17 21:45 | | N2 |
| Aromatic (>C10-C12) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:45 | | N2 |
| Aromatic (>C12-C16) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:45 | | N2 |
| Aromatic (>C16-C21) | ND | mg/kg | 13.8 | 1 | 04/16/17 12:25 | 04/17/17 21:45 | | N2 |
| Aromatic (>C21-C35) | ND | mg/kg | 27.5 | 1 | 04/16/17 12:25 | 04/17/17 21:45 | | N2 |
| C6-C35 Aliphatic & Aromatic | ND | mg/kg | 3.2 | 1 | 04/16/17 12:25 | 04/17/17 21:19 | | N2 |
| **8270 MSSV PAH by SIM** | Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546 | | | | | | | |
| Acenaphthene | ND | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 83-32-9 | |
| Acenaphthylene | ND | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 208-96-8 | |
| Anthracene | **5.5** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 120-12-7 | |
| Benzo(a)anthracene | **7.6** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 56-55-3 | |
| Benzo(a)pyrene | ND | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 50-32-8 | |
| Benzo(b)fluoranthene | **5.6** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 205-99-2 | 2e |
| Benzo(g,h,i)perylene | ND | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 191-24-2 | |
| Benzo(k)fluoranthene | ND | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 207-08-9 | |
| Chrysene | **7.1** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 218-01-9 | |
| Dibenz(a,h)anthracene | ND | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 53-70-3 | |
| Fluoranthene | **22.9** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 206-44-0 | |
| Fluorene | **4.5** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 86-73-7 | |
| Indeno(1,2,3-cd)pyrene | ND | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 193-39-5 | |
| Naphthalene | **20.1** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 91-20-3 | |
| Phenanthrene | **24.4** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 85-01-8 | |
| Pyrene | **19.8** | ug/kg | 3.8 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 129-00-0 | |
| ***Surrogates*** | | | | | | | | |
| 2-Fluorobiphenyl (S) | 80 | % | 54-93 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 321-60-8 | |
| Terphenyl-d14 (S) | 97 | % | 49-120 | 1 | 04/13/17 00:00 | 04/14/17 19:23 | 1718-51-0 | |

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@14'-JW** **Lab ID: 60241926004** Collected: 04/12/17 12:00 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **Percent Moisture** | Analytical Method: ASTM D2974 | | | | | | | |
| Percent Moisture | **13.2** | % | 0.50 | 1 | | 04/14/17 00:00 | | |
| **2540G Total Percent Solids** | Analytical Method: SM 2540G | | | | | | | |
| Total Solids | **87.5** | % | 0.10 | 1 | | 04/13/17 17:25 | | |

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## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@17'-JW** **Lab ID: 60241926005** Collected: 04/12/17 12:10 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **TCEQ 1005 TPH** | Analytical Method: TCEQ 1005 Preparation Method: TCEQ 1005 | | | | | | | |
| TPH (C06-C12) | **1280** | mg/kg | 12.1 | 1 | 04/14/17 13:00 | 04/15/17 06:10 | | |
| TPH (>C12-C28) | **353** | mg/kg | 6.0 | 1 | 04/14/17 13:00 | 04/15/17 06:10 | | |
| TPH (>C28-C35) | ND | mg/kg | 25.1 | 1 | 04/14/17 13:00 | 04/15/17 06:10 | | |
| TPH Total (C06-C35) | **1630** | mg/kg | 6.0 | 1 | 04/14/17 13:00 | 04/15/17 06:10 | | |
| ***Surrogates*** | | | | | | | | |
| o-Terphenyl (S) | 124 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 06:10 | 84-15-1 | |
| 1-Chlorooctane (S) | 117 | %. | 70-130 | 1 | 04/14/17 13:00 | 04/15/17 05:45 | 3386-33-2 | |
| **TCEQ 1006 TPH** | Analytical Method: TCEQ 1006 Preparation Method: TCEQ 1006 | | | | | | | |
| Aliphatic (C6) | ND | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| Aliphatic (>C06-C08) | **54.9** | mg/kg | 26.1 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| Aliphatic (>C08-C10) | **386** | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| Aliphatic (>C10-C12) | **320** | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| Aliphatic (>C12-C16) | **213** | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| Aliphatic (>C16-C21) | ND | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| Aliphatic (>C21-C35) | ND | mg/kg | 26.1 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| Aromatic (>C07-C08) | ND | mg/kg | 3.0 | 1 | 04/16/17 12:25 | 04/17/17 22:38 | | N2 |
| Aromatic (>C08-C10) | **28.3** | mg/kg | 20.1 | 1 | 04/16/17 12:25 | 04/17/17 22:38 | | N2 |
| Aromatic (>C10-C12) | ND | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:38 | | N2 |
| Aromatic (>C12-C16) | ND | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:38 | | N2 |
| Aromatic (>C16-C21) | ND | mg/kg | 13.1 | 1 | 04/16/17 12:25 | 04/17/17 22:38 | | N2 |
| Aromatic (>C21-C35) | ND | mg/kg | 26.1 | 1 | 04/16/17 12:25 | 04/17/17 22:38 | | N2 |
| C6-C35 Aliphatic & Aromatic | **1000** | mg/kg | 3.0 | 1 | 04/16/17 12:25 | 04/17/17 22:12 | | N2 |
| **8270 MSSV PAH by SIM** | Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546 | | | | | | | |
| Acenaphthene | **7.8** | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 83-32-9 | |
| Acenaphthylene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 208-96-8 | |
| Anthracene | ND | ug/kg | 7.9 | 2 | 04/13/17 00:00 | 04/14/17 20:03 | 120-12-7 | |
| Benzo(a)anthracene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 56-55-3 | |
| Benzo(a)pyrene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 50-32-8 | |
| Benzo(b)fluoranthene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 205-99-2 | |
| Benzo(g,h,i)perylene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 191-24-2 | |
| Benzo(k)fluoranthene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 207-08-9 | |
| Chrysene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 218-01-9 | |
| Dibenz(a,h)anthracene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 53-70-3 | |
| Fluoranthene | ND | ug/kg | 7.9 | 2 | 04/13/17 00:00 | 04/14/17 20:03 | 206-44-0 | |
| Fluorene | **37.7** | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 86-73-7 | |
| Indeno(1,2,3-cd)pyrene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 193-39-5 | |
| Naphthalene | **696** | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 91-20-3 | |
| Phenanthrene | **16.2** | ug/kg | 7.9 | 2 | 04/13/17 00:00 | 04/14/17 20:03 | 85-01-8 | D3 |
| Pyrene | ND | ug/kg | 3.9 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 129-00-0 | |
| ***Surrogates*** | | | | | | | | |
| 2-Fluorobiphenyl (S) | 87 | % | 54-93 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 321-60-8 | |
| Terphenyl-d14 (S) | 93 | % | 49-120 | 1 | 04/13/17 00:00 | 04/14/17 19:42 | 1718-51-0 | |

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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(913)599-5665

## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: S-11124687-041217-B17@17'-JW** **Lab ID: 60241926005** Collected: 04/12/17 12:10 Received: 04/12/17 23:00 Matrix: Solid

***Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.***

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **Percent Moisture** | Analytical Method: ASTM D2974 | | | | | | | |
| Percent Moisture | **20.6** | % | 0.50 | 1 | | 04/14/17 00:00 | | |
| **2540G Total Percent Solids** | Analytical Method: SM 2540G | | | | | | | |
| Total Solids | **82.2** | % | 0.10 | 1 | | 04/13/17 17:27 | | |

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## ANALYTICAL RESULTS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

**Sample: W-11124687-041217-WELL-JW** **Lab ID: 60241926006** Collected: 04/12/17 13:15 Received: 04/12/17 23:00 Matrix: Water

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **8270 MSSV PAH by SIM** | Analytical Method: EPA 8270C by SIM Preparation Method: EPA 3510C | | | | | | | |
| Acenaphthene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 83-32-9 | 1e |
| Acenaphthylene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 208-96-8 | 1e |
| Anthracene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 120-12-7 | 1e |
| Benzo(a)anthracene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 56-55-3 | 1e |
| Benzo(a)pyrene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 50-32-8 | 1e |
| Benzo(b)fluoranthene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 205-99-2 | 1e |
| Benzo(g,h,i)perylene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 191-24-2 | 1e |
| Benzo(k)fluoranthene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 207-08-9 | 1e |
| Chrysene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 218-01-9 | 1e |
| Dibenz(a,h)anthracene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 53-70-3 | 1e |
| Fluoranthene | ND | ug/L | 0.45 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 206-44-0 | 1e |
| Fluorene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 86-73-7 | 1e |
| Indeno(1,2,3-cd)pyrene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 193-39-5 | 1e |
| Naphthalene | ND | ug/L | 0.45 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 91-20-3 | 1e |
| Phenanthrene | ND | ug/L | 0.45 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 85-01-8 | 1e |
| Pyrene | ND | ug/L | 0.091 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 129-00-0 | 1e |
| ***Surrogates*** | | | | | | | | |
| 2-Fluorobiphenyl (S) | 93 | % | 39-114 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 321-60-8 | |
| Terphenyl-d14 (S) | 95 | % | 43-117 | 1 | 04/13/17 00:00 | 04/15/17 00:32 | 1718-51-0 | |
| **8260 MSV UST, Water** | Analytical Method: EPA 8260 | | | | | | | |
| Benzene | ND | ug/L | 1.0 | 1 | | 04/13/17 23:46 | 71-43-2 | |
| Ethylbenzene | ND | ug/L | 1.0 | 1 | | 04/13/17 23:46 | 100-41-4 | |
| Toluene | ND | ug/L | 1.0 | 1 | | 04/13/17 23:46 | 108-88-3 | |
| Xylene (Total) | ND | ug/L | 3.0 | 1 | | 04/13/17 23:46 | 1330-20-7 | |
| ***Surrogates*** | | | | | | | | |
| Toluene-d8 (S) | 98 | % | 80-108 | 1 | | 04/13/17 23:46 | 2037-26-5 | |
| 4-Bromofluorobenzene (S) | 110 | % | 80-113 | 1 | | 04/13/17 23:46 | 460-00-4 | |
| 1,2-Dichloroethane-d4 (S) | 102 | % | 80-114 | 1 | | 04/13/17 23:46 | 17060-07-0 | |
| Preservation pH | **1.0** | | 1.0 | 1 | | 04/13/17 23:46 | | |

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## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

QC Batch: 472656
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV UST-WATER
Associated Lab Samples: 60241926006

METHOD BLANK: 1935306
Matrix: Water
Associated Lab Samples: 60241926006

| Parameter | Units | Blank Result | Reporting Limit | Analyzed | Qualifiers |
|---|---|---|---|---|---|
| Benzene | ug/L | ND | 1.0 | 04/13/17 23:32 | |
| Ethylbenzene | ug/L | ND | 1.0 | 04/13/17 23:32 | |
| Toluene | ug/L | ND | 1.0 | 04/13/17 23:32 | |
| Xylene (Total) | ug/L | ND | 3.0 | 04/13/17 23:32 | |
| 1,2-Dichloroethane-d4 (S) | % | 103 | 80-114 | 04/13/17 23:32 | |
| 4-Bromofluorobenzene (S) | % | 107 | 80-113 | 04/13/17 23:32 | |
| Toluene-d8 (S) | % | 97 | 80-108 | 04/13/17 23:32 | |

LABORATORY CONTROL SAMPLE: 1935307

| Parameter | Units | Spike Conc. | LCS Result | LCS % Rec | % Rec Limits | Qualifiers |
|---|---|---|---|---|---|---|
| Benzene | ug/L | 20 | 20.1 | 101 | 82-115 | |
| Ethylbenzene | ug/L | 20 | 18.8 | 94 | 83-112 | |
| Toluene | ug/L | 20 | 19.2 | 96 | 78-113 | |
| Xylene (Total) | ug/L | 60 | 55.9 | 93 | 83-114 | |
| 1,2-Dichloroethane-d4 (S) | % | | | 103 | 80-114 | |
| 4-Bromofluorobenzene (S) | % | | | 106 | 80-113 | |
| Toluene-d8 (S) | % | | | 99 | 80-108 | |

**Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.**

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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(913)599-5665

## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

QC Batch: 472640 Analysis Method: EPA 8270 by SIM
QC Batch Method: EPA 3546 Analysis Description: 8270/3546 MSSV PAH by SIM
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

METHOD BLANK: 1935207 Matrix: Solid
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

| Parameter | Units | Blank Result | Reporting Limit | Analyzed | Qualifiers |
|---|---|---|---|---|---|
| Acenaphthene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Acenaphthylene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Anthracene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Benzo(a)anthracene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Benzo(a)pyrene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Benzo(b)fluoranthene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Benzo(g,h,i)perylene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Benzo(k)fluoranthene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Chrysene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Dibenz(a,h)anthracene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Fluoranthene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Fluorene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Indeno(1,2,3-cd)pyrene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Naphthalene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Phenanthrene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| Pyrene | ug/kg | ND | 3.3 | 04/14/17 17:10 | |
| 2-Fluorobiphenyl (S) | % | 77 | 54-93 | 04/14/17 17:10 | |
| Terphenyl-d14 (S) | % | 98 | 49-120 | 04/14/17 17:10 | |

LABORATORY CONTROL SAMPLE: 1935208

| Parameter | Units | Spike Conc. | LCS Result | LCS % Rec | % Rec Limits | Qualifiers |
|---|---|---|---|---|---|---|
| Acenaphthene | ug/kg | 33.2 | 27.5 | 83 | 64-113 | |
| Acenaphthylene | ug/kg | 33.2 | 26.4 | 80 | 62-112 | |
| Anthracene | ug/kg | 33.2 | 27.4 | 82 | 56-113 | |
| Benzo(a)anthracene | ug/kg | 33.2 | 30.4 | 92 | 62-120 | |
| Benzo(a)pyrene | ug/kg | 33.2 | 30.0 | 90 | 52-119 | |
| Benzo(b)fluoranthene | ug/kg | 33.2 | 32.4 | 98 | 56-128 | |
| Benzo(g,h,i)perylene | ug/kg | 33.2 | 30.2 | 91 | 51-127 | |
| Benzo(k)fluoranthene | ug/kg | 33.2 | 28.9 | 87 | 61-122 | |
| Chrysene | ug/kg | 33.2 | 28.2 | 85 | 54-129 | |
| Dibenz(a,h)anthracene | ug/kg | 33.2 | 32.3 | 97 | 49-130 | |
| Fluoranthene | ug/kg | 33.2 | 28.3 | 85 | 61-120 | |
| Fluorene | ug/kg | 33.2 | 27.9 | 84 | 62-116 | |
| Indeno(1,2,3-cd)pyrene | ug/kg | 33.2 | 30.7 | 92 | 53-123 | |
| Naphthalene | ug/kg | 33.2 | 27.9 | 84 | 63-116 | |
| Phenanthrene | ug/kg | 33.2 | 27.5 | 83 | 62-116 | |
| Pyrene | ug/kg | 33.2 | 32.2 | 97 | 60-127 | |
| 2-Fluorobiphenyl (S) | % | | | 84 | 54-93 | |
| Terphenyl-d14 (S) | % | | | 104 | 49-120 | |

**Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.**

## REPORT OF LABORATORY ANALYSIS

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(913)599-5665

## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1935209 1935210

| Parameter | Units | 60241926001 Result | MS Spike Conc. | MSD Spike Conc. | MS Result | MSD Result | MS % Rec | MSD % Rec | % Rec Limits | RPD | Max RPD | Qual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acenaphthene | ug/kg | ND | 36.6 | 36 | 46.4 | 29.1 | 127 | 81 | 10-270 | 46 | 27 | R1 |
| Acenaphthylene | ug/kg | ND | 36.6 | 36 | 27.8 | 27.2 | 76 | 75 | 10-188 | 2 | 29 | |
| Anthracene | ug/kg | ND | 36.6 | 36 | 61.4 | 31.1 | 160 | 78 | 10-184 | 66 | 30 | R1 |
| Benzo(a)anthracene | ug/kg | 6.5 | 36.6 | 36 | 99.8 | 35.9 | 255 | 82 | 10-274 | 94 | 111 | |
| Benzo(a)pyrene | ug/kg | 5.7 | 36.6 | 36 | 82.6 | 32.0 | 210 | 73 | 10-167 | 88 | 63 | M1,R1 |
| Benzo(b)fluoranthene | ug/kg | 9.6 | 36.6 | 36 | 107 | 40.3 | 265 | 85 | 10-226 | 90 | 51 | 2e,M1, R1 |
| Benzo(g,h,i)perylene | ug/kg | 8.1 | 36.6 | 36 | 69.0 | 37.5 | 166 | 81 | 10-170 | 59 | 54 | R1 |
| Benzo(k)fluoranthene | ug/kg | 5.1 | 36.6 | 36 | 61.9 | 30.6 | 155 | 71 | 10-190 | 68 | 36 | R1 |
| Chrysene | ug/kg | 6.5 | 36.6 | 36 | 83.9 | 33.0 | 212 | 74 | 10-203 | 87 | 42 | M1,R1 |
| Dibenz(a,h)anthracene | ug/kg | ND | 36.6 | 36 | 34.5 | 30.7 | 90 | 81 | 10-199 | 11 | 35 | |
| Fluoranthene | ug/kg | 14.3 | 36.6 | 36 | 191 | 38.9 | 482 | 68 | 10-273 | 132 | 41 | M1,R1 |
| Fluorene | ug/kg | ND | 36.6 | 36 | 44.0 | 31.3 | 115 | 81 | 10-231 | 34 | 81 | |
| Indeno(1,2,3-cd)pyrene | ug/kg | 6.0 | 36.6 | 36 | 59.4 | 34.0 | 146 | 78 | 10-210 | 54 | 49 | R1 |
| Naphthalene | ug/kg | ND | 36.6 | 36 | 33.2 | 31.2 | 86 | 81 | 10-227 | 6 | 96 | |
| Phenanthrene | ug/kg | 13.0 | 36.6 | 36 | 152 | 34.8 | 381 | 61 | 10-295 | 126 | 57 | M1,R1 |
| Pyrene | ug/kg | 12.3 | 36.6 | 36 | 169 | 42.0 | 428 | 82 | 10-299 | 120 | 60 | M1,R1 |
| 2-Fluorobiphenyl (S) | % | | | | | | 78 | 78 | 54-93 | | | |
| Terphenyl-d14 (S) | % | | | | | | 98 | 100 | 49-120 | | | |

**Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.**

## REPORT OF LABORATORY ANALYSIS

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## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

QC Batch: 472702
QC Batch Method: EPA 3510C
Associated Lab Samples: 60241926006

Analysis Method: EPA 8270C by SIM
Analysis Description: 8270 Water PAH by SIM MSSV

METHOD BLANK: 1935422 Matrix: Water
Associated Lab Samples: 60241926006

| Parameter | Units | Blank Result | Reporting Limit | Analyzed | Qualifiers |
|---|---|---|---|---|---|
| Acenaphthene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Acenaphthylene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Anthracene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Benzo(a)anthracene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Benzo(a)pyrene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Benzo(b)fluoranthene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Benzo(g,h,i)perylene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Benzo(k)fluoranthene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Chrysene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Dibenz(a,h)anthracene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Fluoranthene | ug/L | ND | 0.50 | 04/14/17 19:21 | |
| Fluorene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Indeno(1,2,3-cd)pyrene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| Naphthalene | ug/L | ND | 0.50 | 04/14/17 19:21 | |
| Phenanthrene | ug/L | ND | 0.50 | 04/14/17 19:21 | |
| Pyrene | ug/L | ND | 0.10 | 04/14/17 19:21 | |
| 2-Fluorobiphenyl (S) | % | 105 | 39-114 | 04/14/17 19:21 | |
| Terphenyl-d14 (S) | % | 111 | 43-117 | 04/14/17 19:21 | |

LABORATORY CONTROL SAMPLE: 1935423

| Parameter | Units | Spike Conc. | LCS Result | LCS % Rec | % Rec Limits | Qualifiers |
|---|---|---|---|---|---|---|
| Acenaphthene | ug/L | 10 | 8.7 | 87 | 52-118 | |
| Acenaphthylene | ug/L | 10 | 9.3 | 93 | 54-124 | |
| Anthracene | ug/L | 10 | 8.9 | 89 | 59-121 | |
| Benzo(a)anthracene | ug/L | 10 | 10.2 | 102 | 63-126 | |
| Benzo(a)pyrene | ug/L | 10 | 9.1 | 91 | 63-127 | |
| Benzo(b)fluoranthene | ug/L | 10 | 10.0 | 100 | 59-127 | |
| Benzo(g,h,i)perylene | ug/L | 10 | 8.7 | 87 | 56-128 | |
| Benzo(k)fluoranthene | ug/L | 10 | 7.9 | 79 | 56-125 | |
| Chrysene | ug/L | 10 | 7.6 | 76 | 60-119 | |
| Dibenz(a,h)anthracene | ug/L | 10 | 8.5 | 85 | 54-142 | |
| Fluoranthene | ug/L | 10 | 9.8 | 98 | 68-133 | |
| Fluorene | ug/L | 10 | 9.0 | 90 | 56-120 | |
| Indeno(1,2,3-cd)pyrene | ug/L | 10 | 8.6 | 86 | 60-136 | |
| Naphthalene | ug/L | 10 | 9.0 | 90 | 50-119 | |
| Phenanthrene | ug/L | 10 | 9.0 | 90 | 54-116 | |
| Pyrene | ug/L | 10 | 7.8 | 78 | 51-117 | |
| 2-Fluorobiphenyl (S) | % | | | 94 | 39-114 | |
| Terphenyl-d14 (S) | % | | | 86 | 43-117 | |

**Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.**

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

QC Batch: 74056 Analysis Method: TCEQ 1005
QC Batch Method: TCEQ 1005 Analysis Description: TX1005 TPH GCS
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

METHOD BLANK: 320636 Matrix: Solid
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

| Parameter | Units | Blank Result | Reporting Limit | Analyzed | Qualifiers |
|---|---|---|---|---|---|
| TPH (>C12-C28) | mg/kg | ND | 6.0 | 04/15/17 02:16 | |
| TPH (>C28-C35) | mg/kg | ND | 24.9 | 04/15/17 02:16 | |
| TPH (C06-C12) | mg/kg | ND | 12.0 | 04/15/17 02:16 | |
| TPH Total (C06-C35) | mg/kg | ND | 6.0 | 04/15/17 02:16 | |
| 1-Chlorooctane (S) | %. | 100 | 70-130 | 04/15/17 02:16 | |
| o-Terphenyl (S) | %. | 106 | 70-130 | 04/15/17 02:16 | |

LABORATORY CONTROL SAMPLE & LCSD: 320637 320638

| Parameter | Units | Spike Conc. | LCS Result | LCSD Result | LCS % Rec | LCSD % Rec | % Rec Limits | RPD | Max RPD | Qualifiers |
|---|---|---|---|---|---|---|---|---|---|---|
| TPH (>C12-C28) | mg/kg | 99.5 | 89.5 | 89.2 | 90 | 89 | 75-125 | 0 | 20 | |
| TPH (>C28-C35) | mg/kg | 33.2 | 31.6 | 29.5 | 95 | 89 | 75-125 | 7 | 20 | |
| TPH (C06-C12) | mg/kg | 199 | 179 | 173 | 90 | 87 | 75-125 | 3 | 20 | |
| TPH Total (C06-C35) | mg/kg | 332 | 300 | 291 | 90 | 88 | 75-125 | 3 | 20 | |
| 1-Chlorooctane (S) | %. | | | | 106 | 103 | 70-130 | | | |
| o-Terphenyl (S) | %. | | | | 108 | 106 | 70-130 | | | |

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 320713 320714

| Parameter | Units | 60241926001 Result | MS Spike Conc. | MSD Spike Conc. | MS Result | MSD Result | MS % Rec | MSD % Rec | % Rec Limits | RPD | Max RPD | Qual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH (>C12-C28) | mg/kg | ND | 106 | 109 | 107 | 104 | 101 | 95 | 75-125 | 3 | 20 | |
| TPH (>C28-C35) | mg/kg | ND | 35.5 | 36.4 | 38.7 | 30.6 | 106 | 81 | 75-125 | 23 | 20 | R1 |
| TPH (C06-C12) | mg/kg | ND | 213 | 219 | 210 | 202 | 97 | 90 | 75-125 | 4 | 20 | |
| TPH Total (C06-C35) | mg/kg | ND | 355 | 364 | 356 | 336 | 100 | 92 | 75-125 | 6 | 20 | |
| 1-Chlorooctane (S) | %. | | | | | | 112 | 104 | 70-130 | | | |
| o-Terphenyl (S) | %. | | | | | | 114 | 107 | 70-130 | | | |

**Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.**

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

QC Batch: 74072 Analysis Method: TCEQ 1006
QC Batch Method: TCEQ 1006 Analysis Description: TX1006 TPH GCS
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

METHOD BLANK: 320715 Matrix: Solid
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

| Parameter | Units | Blank Result | Reporting Limit | Analyzed | Qualifiers |
|---|---|---|---|---|---|
| Aliphatic (>C06-C08) | mg/kg | ND | 25.9 | 04/17/17 12:32 | N2 |
| Aliphatic (>C08-C10) | mg/kg | ND | 12.9 | 04/17/17 12:32 | N2 |
| Aliphatic (>C10-C12) | mg/kg | ND | 12.9 | 04/17/17 12:32 | N2 |
| Aliphatic (>C12-C16) | mg/kg | ND | 12.9 | 04/17/17 12:32 | N2 |
| Aliphatic (>C16-C21) | mg/kg | ND | 12.9 | 04/17/17 12:32 | N2 |
| Aliphatic (>C21-C35) | mg/kg | ND | 25.9 | 04/17/17 12:32 | N2 |
| Aliphatic (C6) | mg/kg | ND | 12.9 | 04/17/17 12:32 | N2 |
| Aromatic (>C07-C08) | mg/kg | ND | 3.0 | 04/17/17 12:59 | N2 |
| Aromatic (>C08-C10) | mg/kg | ND | 19.9 | 04/17/17 12:59 | N2 |
| Aromatic (>C10-C12) | mg/kg | ND | 12.9 | 04/17/17 12:59 | N2 |
| Aromatic (>C12-C16) | mg/kg | ND | 12.9 | 04/17/17 12:59 | N2 |
| Aromatic (>C16-C21) | mg/kg | ND | 12.9 | 04/17/17 12:59 | N2 |
| Aromatic (>C21-C35) | mg/kg | ND | 25.9 | 04/17/17 12:59 | N2 |
| C6-C35 Aliphatic & Aromatic | mg/kg | ND | 3.0 | 04/17/17 12:32 | N2 |

LABORATORY CONTROL SAMPLE & LCSD: 320716 320717

| Parameter | Units | Spike Conc. | LCS Result | LCSD Result | LCS % Rec | LCSD % Rec | % Rec Limits | RPD | Max RPD | Qualifiers |
|---|---|---|---|---|---|---|---|---|---|---|
| C6-C35 Aliphatic & Aromatic | mg/kg | 315 | 191 | 216 | 61 | 68 | 60-140 | 12 | 20 | N2 |

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 320718 320719

| Parameter | Units | 60241926001 Result | MS Spike Conc. | MSD Spike Conc. | MS Result | MSD Result | MS % Rec | MSD % Rec | % Rec Limits | RPD | Max RPD | Qual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C6-C35 Aliphatic & Aromatic | mg/kg | ND | 337 | 346 | 186 | 178 | 55 | 51 | 60-140 | 4 | 20 | M1,N2 |

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

QC Batch: 472704 Analysis Method: ASTM D2974
QC Batch Method: ASTM D2974 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

METHOD BLANK: 1935434 Matrix: Solid
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

| Parameter | Units | Blank Result | Reporting Limit | Analyzed | Qualifiers |
|---|---|---|---|---|---|
| Percent Moisture | % | ND | 0.50 | 04/14/17 00:00 | |

SAMPLE DUPLICATE: 1935435

| Parameter | Units | 60241926001 Result | Dup Result | RPD | Max RPD | Qualifiers |
|---|---|---|---|---|---|---|
| Percent Moisture | % | 9.8 | 10.7 | 8 | 20 | |

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## REPORT OF LABORATORY ANALYSIS

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(913)599-5665

## QUALITY CONTROL DATA

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

QC Batch: 472748 Analysis Method: SM 2540G
QC Batch Method: SM 2540G Analysis Description: 2540G Total Solids
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

METHOD BLANK: 1935579 Matrix: Solid
Associated Lab Samples: 60241926001, 60241926002, 60241926003, 60241926004, 60241926005

| Parameter | Units | Blank Result | Reporting Limit | Analyzed | Qualifiers |
|---|---|---|---|---|---|
| Total Solids | % | ND | 0.10 | 04/13/17 17:16 | |

SAMPLE DUPLICATE: 1935580

| Parameter | Units | 60241740001 Result | Dup Result | RPD | Max RPD | Qualifiers |
|---|---|---|---|---|---|---|
| Total Solids | % | 23.1 | 24.9 | 8 | 8 | |

SAMPLE DUPLICATE: 1935581

| Parameter | Units | 60241734005 Result | Dup Result | RPD | Max RPD | Qualifiers |
|---|---|---|---|---|---|---|
| Total Solids | % | 3.2 | 3.1 | 2 | 8 | |

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## REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

# QUALIFIERS

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

## DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

## LABORATORIES

| | |
|---|---|
| PASI-D | Pace Analytical Services - Dallas |
| PASI-K | Pace Analytical Services - Kansas City |

## BATCH QUALIFIERS

Batch: 472656

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 472702

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

## ANALYTE QUALIFIERS

| | |
|---|---|
| 1e | A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume. |
| 2e | The methods baseline separation for isomers pairs in the Initial Calibration or Continuing Calibration Verification (CCV) was less than the expected 50% valley to baseline. No further action was taken for this method variation. The two compounds are still being reported as individual isomers and not a combined total, since there is separation between the two isomers. |
| D3 | Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference. |
| M1 | Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery. |
| N2 | The lab does not hold NELAC/TNI accreditation for this parameter. |
| R1 | RPD value was outside control limits. |

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(913)599-5665

## QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 11124687 COP San Juan 27-5 No1
Pace Project No.: 60241926

| Lab ID | Sample ID | QC Batch Method | QC Batch | Analytical Method | Analytical Batch |
|---|---|---|---|---|---|
| 60241926001 | S-11124687-041217-B17@0.5'-JW | TCEQ 1005 | 74056 | TCEQ 1005 | 74074 |
| 60241926002 | S-11124687-041217-B17@9'-JW | TCEQ 1005 | 74056 | TCEQ 1005 | 74074 |
| 60241926003 | S-11124687-041217-B17@12'-JW | TCEQ 1005 | 74056 | TCEQ 1005 | 74074 |
| 60241926004 | S-11124687-041217-B17@14'-JW | TCEQ 1005 | 74056 | TCEQ 1005 | 74074 |
| 60241926005 | S-11124687-041217-B17@17'-JW | TCEQ 1005 | 74056 | TCEQ 1005 | 74074 |
| 60241926001 | S-11124687-041217-B17@0.5'-JW | TCEQ 1006 | 74072 | TCEQ 1006 | 74107 |
| 60241926002 | S-11124687-041217-B17@9'-JW | TCEQ 1006 | 74072 | TCEQ 1006 | 74107 |
| 60241926003 | S-11124687-041217-B17@12'-JW | TCEQ 1006 | 74072 | TCEQ 1006 | 74107 |
| 60241926004 | S-11124687-041217-B17@14'-JW | TCEQ 1006 | 74072 | TCEQ 1006 | 74107 |
| 60241926005 | S-11124687-041217-B17@17'-JW | TCEQ 1006 | 74072 | TCEQ 1006 | 74107 |
| 60241926001 | S-11124687-041217-B17@0.5'-JW | EPA 3546 | 472640 | EPA 8270 by SIM | 472935 |
| 60241926002 | S-11124687-041217-B17@9'-JW | EPA 3546 | 472640 | EPA 8270 by SIM | 472935 |
| 60241926003 | S-11124687-041217-B17@12'-JW | EPA 3546 | 472640 | EPA 8270 by SIM | 472935 |
| 60241926004 | S-11124687-041217-B17@14'-JW | EPA 3546 | 472640 | EPA 8270 by SIM | 472935 |
| 60241926005 | S-11124687-041217-B17@17'-JW | EPA 3546 | 472640 | EPA 8270 by SIM | 472935 |
| 60241926006 | W-11124687-041217-WELL-JW | EPA 3510C | 472702 | EPA 8270C by SIM | 472901 |
| 60241926006 | W-11124687-041217-WELL-JW | EPA 8260 | 472656 | | |
| 60241926001 | S-11124687-041217-B17@0.5'-JW | ASTM D2974 | 472704 | | |
| 60241926002 | S-11124687-041217-B17@9'-JW | ASTM D2974 | 472704 | | |
| 60241926003 | S-11124687-041217-B17@12'-JW | ASTM D2974 | 472704 | | |
| 60241926004 | S-11124687-041217-B17@14'-JW | ASTM D2974 | 472704 | | |
| 60241926005 | S-11124687-041217-B17@17'-JW | ASTM D2974 | 472704 | | |
| 60241926001 | S-11124687-041217-B17@0.5'-JW | SM 2540G | 472748 | | |
| 60241926002 | S-11124687-041217-B17@9'-JW | SM 2540G | 472748 | | |
| 60241926003 | S-11124687-041217-B17@12'-JW | SM 2540G | 472748 | | |
| 60241926004 | S-11124687-041217-B17@14'-JW | SM 2540G | 472748 | | |
| 60241926005 | S-11124687-041217-B17@17'-JW | SM 2540G | 472748 | | |

Pace Analytical
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**Sample Condition Upon Receipt**
**ESI Tech Spec Client**

**WO# : 60241926**

60241926

**Client Name:** GHD COP

**Courier:** FedEx ☒ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☐ Other ☐

**Tracking #:** 7285 6591 4254 **Pace Shipping Label Used?** Yes ☐ No ☐

**Custody Seal on Cooler/Box Present:** Yes ☒ No ☐ **Seals Intact:** Yes ☒ No ☐

**Packing Material:** Bubble Wrap ☐ Bubble Bags ☒ Foam ☐ None ☐ Other ☐

**Thermometer Used:** (CF +1.5) T-266 / (CF +0.2) T-239 **Type of Ice:** (Wet) Blue None

**Cooler Temperature (°C):** As-read 1.6 Corr. Factor (CF +1.5) CF +0.2 **Corrected** 3.1

**Date and initials of person examining contents:** JB 4/12/17

Temperature should be above freezing to 6°C

| | | |
|---|---|---|
| Chain of Custody present: | ☒Yes ☐No ☐N/A | |
| Chain of Custody relinquished: | ☒Yes ☐No ☐N/A | |
| Samples arrived within holding time: | ☒Yes ☐No ☐N/A | |
| Short Hold Time analyses (<72hr): | ☒Yes ☐No ☐N/A | TX1005 |
| Rush Turn Around Time requested: | ☒Yes ☐No ☐N/A | 3 Day |
| Sufficient volume: | ☒Yes ☐No ☐N/A | |
| Correct containers used: | ☒Yes ☐No ☐N/A | |
| Pace containers used: | ☒Yes ☐No ☐N/A | |
| Containers intact: | ☒Yes ☐No ☐N/A | |
| Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs? | ☒Yes ☐No ☐N/A | |
| Filtered volume received for dissolved tests? | ☐Yes ☐No ☒N/A | |
| Sample labels match COC: Date / time / ID / analyses | ☒Yes ☐No ☐N/A | |
| Samples contain multiple phases? Matrix: SL WT | ☐Yes ☒No ☐N/A | |
| Containers requiring pH preservation in compliance? (HNO3, H2SO4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO) | ☐Yes ☐No ☒N/A | |
| Cyanide water sample checks: ☒ N/A<br>Lead acetate strip turns dark? (Record only)<br>Potassium Iodide test strip turns blue/purple? (Preserve) | ☐Yes ☐No<br>☐Yes ☐No | |
| Trip Blank present: | ☒Yes ☐No ☐N/A | |
| Headspace in VOA vials ( >6mm): | ☐Yes ☒No ☐N/A | |
| Samples from USDA Regulated Area: State: NM | ☐Yes ☒No ☐N/A | |
| Additional labels attached to 5035A / TX1005 vials in the field? | ☐Yes ☒No ☐N/A | |

**Client Notification/ Resolution:** Copy COC to Client? Y / N Field Data Required? Y / N

**Person Contacted:** Date/Time:

**Comments/ Resolution:**

**Project Manager Review:** Alice **Date:** 4/13/17

**Temp Log:** Record start and finish times when unpacking cooler, if >20 min, recheck sample temps.

| | |
|---|---|
| Start: | Start: |
| End: | End: |
| Temp: | Temp: |

# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

| Section A Required Client Information: | | Section B Required Project Information: | | Section C Invoice Information: | |
|---|---|---|---|---|---|
| Company: | GHD Services_COP NM | Report To: | Jeffrey Walker | Attention: | ~~Heather~~ |
| Address: | 6121 Indian School Rd NE | Copy To: | david.johnson@ghd.com | Company Name: | ~~GHD~~ |
| | Albuquerque NM 87110 | | | Address: | |
| Email: | jeff.walker@ghd.com | Purchase Order #: | | Pace Quote: | |
| Phone: | ~~505-877-3920~~ Fax: | Project Name: | 11124687 COP San Juan 27-5 No1 | Pace Project Manager: | alice.spiller@pacelabs.com, |
| Requested Due Date: | | Project #: | | Pace Profile #: | 8644, line 36 |

Regulatory Agency

State / Location: NM

Requested Analysis Filtered (Y/N)

| ITEM # | SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique) | MATRIX CODE (see valid codes to left) | SAMPLE TYPE (G=GRAB C=COMP) | COLLECTED START DATE | COLLECTED START TIME | COLLECTED END DATE | COLLECTED END TIME | SAMPLE TEMP AT COLLECTION | # OF CONTAINERS | Preservatives: Unpreserved | H2SO4 | HNO3 | HCl | NaOH | Na2S2O3 | Methanol | Other | Analyses Test: PAH 8270 by SIM | TX1005 | TX1006 | Total Solids | 8260 BTEX | 8270 PAH SIM reduced volu | Residual Chlorine (Y/N) | 00241926 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | S-11124687-041217-B17C0.5-SW | S | G | 4/12/17 | 1115 | — | — | ~~80~~ | 10 | | | | | | | | | X | X | X | X | X | (2) WI FL (6) DRO (3) BTEX | | 001 |
| 2 | S-11124687-041217-B17C9'-SW | S | G | 4/12/17 | 1135 | — | — | | 10 | | | | | | | | | X | X | X | X | | | | 002 |
| 3 | S-11124687-041217-B17C12'-SW | | | | 1155 | | | | | | | | | | | | | X | X | X | X | | | | 003 |
| 4 | S-11124687-041217-B17C14'-SW | | | | 1200 | | | | | | | | | | | | | X | X | X | X | | | | 004 |
| 5 | S-11124687-041217-B17C17'-SW | | | | 1210 | | | | | | | | | | | | | X | X | X | X | | | | 005 soils |
| 6 | W-11124687-041217-Well-SW | | | | 1315 | | | | | | | | | | | | | | | | | X | | | (1) AG4H ~~(1) AG1U~~ (3) DG9H TB | 006 |
| | | | | | | | | | | | | | | | | | | | | | | | | | (3) DG9H TB 007 |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | | | | | |

MATRIX CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

| ADDITIONAL COMMENTS | RELINQUISHED BY / AFFILIATION | DATE | TIME | ACCEPTED BY / AFFILIATION | DATE | TIME | SAMPLE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 DAY TAT | Jeff Walker GHD | 4/12/17 | 1610 | | 4/13/17 | 0905 | 3c1 | Y | Y | Y |
| | | | | | | | | | | |
| | | | | | | | | | | |

| SAMPLER NAME AND SIGNATURE | | | | |
|---|---|---|---|---|
| PRINT Name of SAMPLER: | Jeff W | | | |
| SIGNATURE of SAMPLER: | | DATE Signed: | 4/12/17 | |

TEMP in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

# Appendix D
# Data Validation Memo

# Memorandum

April 17, 2017

| | | | |
|---|---|---|---|
| To: | Jeff Walker, David Johnson | Ref. No.: | 11124687 |
| From: | Angela Bown | Tel: | 513-942-4750 |

**Subject:** **Analytical Results and Reduced Validation Assessment Soil Borings Conoco Phillips – San Juan 27-5 No. 1 Rio Arriba County, New Mexico November 2015 - September 2016**

## 1. Introduction

This document details a reduced validation of analytical results for soil samples collected in support of the Assessment Soil Borings sampling at the San Juan 27-5 No. 1 site during November 2015 through September 2016. Samples were submitted to Pace Analytical (Pace) located in Lenexa, Kansas and Hall Environmental Analysis Laboratory located in Albuquerque, New Mexico. A sample collection and analysis summary is presented in Table 1. The validated analytical results are summarized in Table 2. A summary of the analytical methodology is presented in Table 3.

Standard GHD report deliverables were submitted by the laboratory. The final results and supporting quality assurance/quality control (QA/QC) data were assessed. Evaluation of the data was based on information obtained from the chain of custody forms, finished report forms, method blank data, and recovery data from surrogate spikes, laboratory control samples (LCS), and matrix spikes (MS).

The QA/QC criteria by which these data have been assessed are outlined in the analytical methods referenced in Table 3 and applicable guidance from the document entitled, "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review", USEPA 540-R-08-01, June 2008.

This Item will subsequently be referred to as the "Guidelines" in this Memorandum.

## 2. Sample Holding Time and Preservation

The sample holding time criteria for the analyses are summarized in Table 3. Sample chain of custody documents and analytical reports were used to determine sample holding times. All samples were prepared and analyzed within the required holding times.

All samples were properly preserved, delivered on ice, and stored by the laboratory at the required temperature (0-6°C).

**GHD**
9033 Meridian Way West Chester Ohio 45069 USA
T 513 942 4750 F 513 942 8585 W www.ghd.com

## 3. Laboratory Method Blank Analyses

Method blanks are prepared from a purified matrix and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the analytical procedures.

For this study, laboratory method blanks were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

All method blank results were non-detect, indicating that laboratory contamination was not a factor for this investigation.

## 4. Surrogate Spike Recoveries - Organic Analyses

In accordance with the methods employed, all samples, blanks, and QC samples analyzed for organics are spiked with surrogate compounds prior to sample extraction and/or analysis. Surrogate recoveries provide a means to evaluate the effects of laboratory performance on individual sample matrices.

Due to necessary sample dilutions (five times and greater), surrogate recoveries could not be evaluated for some samples.

All samples submitted for organic determinations were spiked with the appropriate number of surrogate compounds prior to sample extraction and/or analysis.

Surrogate recoveries were assessed against laboratory control limits. Most surrogate recoveries were within the laboratory control limits. Table 4 presents the sample results that were qualified due to outlying surrogate recoveries. High surrogate recoveries do not impact the associate non-detect sample results.

## 5. Laboratory Control Sample (LCS) Analyses

LCS are prepared and analyzed as samples to assess the analytical efficiencies of the methods employed, independent of sample matrix effects.

For this study, LCS were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

The LCS contained all compounds/carbon ranges of interest. All LCS recoveries were within the laboratory control limits, demonstrating acceptable analytical accuracy.

## 6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

To evaluate the effects of sample matrices on the preparation process, measurement procedures, and accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS/MSD samples. The relative percent difference (RPD) between the MS and MSD is used to assess analytical precision.

MS/MSD analyses were performed as specified in Table 1 for diesel range organics (DRO).

The MS/MSD samples were spiked with the carbon ranges of interest. All percent recoveries and RPD values were within the laboratory control limits, demonstrating acceptable analytical accuracy and precision.

## 7. Field QA/QC Samples

No field QA/QC samples were submitted for this event.

## 8. Analyte Reporting

No positive analyte detections less than the reporting limit (RL) but greater than the laboratory's method detection limits (MDL) were reported.

Non-detect results were presented as non-detect at the RL in Table 2.

All soil results from Pace were reported on a dry weight basis.

All soil results from Hall were reported on a wet weight basis.

## 9. Conclusion

Based on the assessment detailed in the foregoing, the data summarized in Table 2 are acceptable with the qualifications noted herein.

**Table 1**

**Sample Collection and Analysis Summary**
**Assessment Soil Borings**
**Conoco Phillips - San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| Sample Identification | Location | Matrix | Initial Sample Depth (ft. bgs.) | Final Sample Depth (ft. bgs.) | Collection Date (mm/dd/yyyy) | Collection Time (hr:min) | Analysis/Parameters: BTEX/TPH-GRO | BTEX | TPH-GRO | TPH-DRO/ORO | TPH-DRO | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Juan 27-5 #1 | Construction Trench | Soil | 0.5 | - | 11/30/2015 | 15:00 | | X | X | | X | |
| SB-01@21-22 | SB-01 | Soil | 21 | 22 | 04/20/2016 | 12:30 | | X | X | | X | |
| SB-03@22-23 | SB-03 | Soil | 22 | 23 | 04/20/2016 | 13:40 | | X | X | | X | |
| SB-04@22.5-23 | SB-04 | Soil | 22.5 | 23 | 04/20/2016 | 14:15 | | X | X | | X | |
| SB-07@22-23 | SB-07 | Soil | 22 | 23 | 04/20/2016 | 15:20 | | X | X | | X | |
| S-11124687-091516-JW-B10@24' | B-10 | Soil | 24 | - | 09/15/2016 | 11:15 | X | | | X | | MS/MSD |
| S-11124687-091516-JW-B11@14' | B-11 | Soil | 14 | - | 09/15/2016 | 13:20 | X | | | X | | |
| S-11124687-091516-JW-B11@35' | B-11 | Soil | 35 | - | 09/15/2016 | 13:35 | X | | | X | | |
| S-11124687-091516-JW-B12@43.5' | B-12 | Soil | 43.5 | - | 09/15/2016 | 16:50 | X | | | X | | |
| S-11124687-091516-JW-B12@50' | B-12 | Soil | 50 | - | 09/15/2016 | 17:25 | X | | | X | | |
| S-11124687-091616-JW-B13@40' | B-13 | Soil | 40 | - | 09/16/2016 | 10:30 | X | | | X | | |
| S-11124687-091616-JW-B14@30' | B-14 | Soil | 30 | - | 09/16/2016 | 12:10 | X | | | X | | |
| S-11124687-091616-JW-B14@40' | B-14 | Soil | 40 | - | 09/16/2016 | 13:05 | X | | | X | | |
| S-11124687-091616-JW-B15@34' | B-15 | Soil | 34 | - | 09/16/2016 | 14:45 | X | | | X | | |
| S-11124687-091616-JW-B15@40' | B-15 | Soil | 40 | - | 09/16/2016 | 15:00 | X | | | X | | |
| S-11124687-091616-JW-B16@35' | B-16 | Soil | 35 | - | 09/16/2016 | 16:25 | X | | | X | | |
| S-11124687-091616-JW-B16@40' | B-16 | Soil | 40 | - | 09/16/2016 | 16:45 | X | | | X | | |

Notes:

| | |
|---|---|
| BTEX | - Benzene, Toluene, Ethylbenzene, and Xylenes |
| DRO | - Diesel Range Organics |
| ft. bgs. | - Feet below ground surface |
| GRO | - Gasoline Range Organics |
| MS/MSD | - Matrix Spike/Matrix Spike Duplicate |
| ORO | - Oil Range Organics |
| TPH | - Total Petroleum Hydrocarbons |
| - | - Not Applicable. |

Table 2

**Analytical Results Summary**
**Assessment Soil Borings**
**Conoco Phillips – San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| | | | | |
|---|---|---|---|---|
| **Location ID:** | | **B-10** | **B-11** | **B-11** |
| **Sample Name:** | | **S-11124687-091516-JW-B10@24'** | **S-11124687-091516-JW-B11@14'** | **S-11124687-091516-JW-B11@35'** |
| **Sample Date:** | | **09/15/2016** | **09/15/2016** | **09/15/2016** |
| **Depth:** | | **24 ft BGS** | **14 ft BGS** | **35 ft BGS** |
| **Parameters** | **Unit** | | | |
| **Volatile Organic Compounds** | | | | |
| Benzene | mg/kg | 0.0053 U | 0.29 U | 0.0058 U |
| Ethylbenzene | mg/kg | 0.0053 U | 0.29 U | 0.0058 U |
| Toluene | mg/kg | 0.0053 U | 0.29 U | 0.0058 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 0.53 U | 293 | 1.0 |
| Xylenes (total) | mg/kg | 0.011 U | 4.8 | 0.012 U |
| **Total Petroleum Hydrocarbons (TPH)** | | | | |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | 10.6 U | 116 U | 11.6 U |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | 10.6 U | 1180 | 13.5 |
| **General Chemistry** | | | | |
| Percent moisture | % | 6.1 | 15.0 | 14.1 |

Notes:

-- - Not applicable
J - Estimated Concentration
U - Not detected at the associated reporting limit
ft BGS - Feet below ground surface

Table 2

**Analytical Results Summary**
**Assessment Soil Borings**
**Conoco Phillips – San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| | Location ID: | B-12 | B-12 | B-13 |
|---|---|---|---|---|
| | Sample Name: | S-11124687-091516-JW-B12@43.5' | S-11124687-091516-JW-B12@50' | S-11124687-091616-JW-B13@40' |
| | Sample Date: | 09/15/2016 | 09/15/2016 | 09/16/2016 |
| | Depth: | 43.5 ft BGS | 60 ft BGS | 40 ft BGS |
| **Parameters** | **Unit** | | | |
| **Volatile Organic Compounds** | | | | |
| Benzene | mg/kg | 0.27 U | 0.0052 U | 0.0059 U |
| Ethylbenzene | mg/kg | 0.27 U | 0.0052 U | 0.0059 U |
| Toluene | mg/kg | 0.36 | 0.0052 U | 0.0059 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 145 | 0.52 U | 0.59 U |
| Xylenes (total) | mg/kg | 2.3 | 0.011 | 0.012 U |
| **Total Petroleum Hydrocarbons (TPH)** | | | | |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | 10.7 U | 10.5 U | 11.3 U |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | 106 | 14.2 | 11.3 U |
| **General Chemistry** | | | | |
| Percent moisture | % | 8.7 | 5.2 | 16.4 |

Notes:

-- - Not applicable
J - Estimated Concentration
U - Not detected at the associated reporting limit
ft BGS - Feet below ground surface

**Table 2**

**Analytical Results Summary**
**Assessment Soil Borings**
**Conoco Phillips – San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| | | | | |
|---|---|---|---|---|
| **Location ID:** | | **B-14** | **B-14** | **B-15** |
| **Sample Name:** | | **S-11124687-091616-JW-B14@30'** | **S-11124687-091616-JW-B14@40'** | **S-11124687-091616-JW-B15@34'** |
| **Sample Date:** | | **09/16/2016** | **09/16/2016** | **09/16/2016** |
| **Depth:** | | **30 ft BGS** | **40 ft BGS** | **34 ft BGS** |
| **Parameters** | **Unit** | | | |
| **Volatile Organic Compounds** | | | | |
| Benzene | mg/kg | 0.0052 U | 0.0053 U | 0.0055 U |
| Ethylbenzene | mg/kg | 0.0052 U | 0.0053 U | 0.0055 U |
| Toluene | mg/kg | 0.0052 U | 0.0053 U | 0.0055 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 1.4 | 0.53 U | 3.1 |
| Xylenes (total) | mg/kg | 0.010 U | 0.011 U | 0.053 |
| **Total Petroleum Hydrocarbons (TPH)** | | | | |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | 31.2 U | 10.3 U | 10.9 U |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | 246 | 10.3 U | 37.2 |
| **General Chemistry** | | | | |
| Percent moisture | % | 5.3 | 5.5 | 10.1 |

Notes:

-- - Not applicable
J - Estimated Concentration
U - Not detected at the associated reporting limit
ft BGS - Feet below ground surface

Table 2

**Analytical Results Summary**
**Assessment Soil Borings**
**Conoco Phillips – San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| | Location ID: | B-15 | B-16 | B-16 | Construction Trench |
|---|---|---|---|---|---|
| | Sample Name: | S-11124687-091616-JW-B15@40' | S-11124687-091616-JW-B16@35' | S-11124687-091616-JW-B16@40' | San Juan 27-5 #1 |
| | Sample Date: | 09/16/2016 | 09/16/2016 | 09/16/2016 | 11/30/2015 |
| | Depth: | 40 ft BGS | 35 ft BGS | 40 ft BGS | 0.5 ft BGS |
| **Parameters** | **Unit** | | | | |
| **Volatile Organic Compounds** | | | | | |
| Benzene | mg/kg | 0.0051 U | 0.021 | 0.0052 U | 0.24 U |
| Ethylbenzene | mg/kg | 0.0051 U | 0.052 | 0.0052 U | 1.4 J |
| Toluene | mg/kg | 0.0051 U | 0.14 | 0.0052 U | 0.48 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 0.51 U | 8.0 | 0.52 U | 7.2 J |
| Xylenes (total) | mg/kg | 0.010 U | 1.6 | 0.010 U | |
| **Total Petroleum Hydrocarbons (TPH)** | | | | | 5500 |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | 10.1 U | 10.8 U | 10.1 U | 320 J |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | 10.1 U | 154 | 10.1 U | |
| **General Chemistry** | | | | | |
| Percent moisture | % | 2.8 | 8.9 | 4.9 | - |

Notes:

-- - Not applicable
J - Estimated Concentration
U - Not detected at the associated reporting limit
ft BGS - Feet below ground surface

Table 2

**Analytical Results Summary**
**Assessment Soil Borings**
**Conoco Phillips – San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| | | | | | |
|---|---|---|---|---|---|
| **Location ID:** | | **SB-01** | **SB-03** | **SB-04** | **SB-07** |
| **Sample Name:** | | **SB-01@21-22** | **SB-03@22-23** | **SB-04@22.5-23** | **SB-07@22-23** |
| **Sample Date:** | | **04/20/2016** | **04/20/2016** | **04/20/2016** | **04/20/2016** |
| **Depth:** | | **21-22 ft BGS** | **22-23 ft BGS** | **22.5-23 ft BGS** | **22-23 ft BGS** |
| **Parameters** | **Unit** | | | | |
| **Volatile Organic Compounds** | | | | | |
| Benzene | mg/kg | 0.093 U | 0.094 U | 0.093 U | 0.094 U |
| Ethylbenzene | mg/kg | 0.47 | 0.55 | 0.37 | 0.19 U |
| Toluene | mg/kg | 0.19 U | 0.19 U | 0.19 U | 0.19 U |
| Total Petroleum Hydrocarbons (C6-C10) GRO | mg/kg | 3.1 | 0.37 U | 0.81 | 1.6 J |
| Xylenes (total) | mg/kg | | | | |
| **Total Petroleum Hydrocarbons (TPH)** | | 480 | 100 | 340 | 1100 |
| Total Petroleum Hydrocarbons (C28-C35) ORO | mg/kg | 170 | 110 J | 160 J | 190 J |
| Total Petroleum Hydrocarbons - Extractable (DRO) | mg/kg | | | | |
| **General Chemistry** | | | | | |
| Percent moisture | % | - | - | - | - |

Notes:

-- - Not applicable
J - Estimated Concentration
U - Not detected at the associated reporting limit
ft BGS - Feet below ground surface

**Table 3**

**Analytical Methods**
**Assessment Soil Borings**
**Conoco Phillips - San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| Parameter | Method | Matrix | Holding Time | |
|---|---|---|---|---|
| | | | Collection to Extraction (Days) | Collection or Extraction to Analysis (Days) |
| BTEX/TPH-GRO | SW-846 8260B | Soil | - | 14 |
| BTEX | SW-846 8021 | Soil | - | 14 |
| TPH-GRO | SW-846 8015B | Soil | - | 14 |
| TPH-DRO/ORO | SW-846 8015B | Soil | 14 | 40 |
| TPH-DRO | SW-846 8015B | Soil | 14 | 40 |

Notes:

SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, 1986, with subsequent revisions
BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes
TPH - Total Petroleum Hydrocarbons
GRO - Gasoline Range Organics
DRO - Diesel Range Organics
ORO - Oil Range Organics
\- - Not Applicable.

**Table 4**

**Qualified Sample Data Due to Outlying of Surrogate Recoveries**
**Assessment Soil Borings**
**Conoco Phillips - San Juan 27-5 No. 1**
**Rio Arriba County, New Mexico**
**November 2015 - September 2016**

| Parameter | Sample ID | Surrogate | Surrogate % Recovery | Control Limits % Recovery | Analyte | Qualified Result | Units |
|---|---|---|---|---|---|---|---|
| TPH-GRO | San Juan 27-5 #1 | Bromofluorobenzene | 270 | 66-112 | TPH (C6-C10) GRO | 320 J | mg/Kg |
| BTEX | San Juan 27-5 #1 | Bromofluorobenzene | 149 | 80-120 | Ethylbenzene | 1.4 J | mg/Kg |
| | | | | | Xylenes (total) | 7.2 J | mg/Kg |
| TPH-GRO | SB-03@22-23 | Bromofluorobenzene | 466 | 80-120 | TPH (C6-C10) GRO | 110 J | mg/Kg |
| TPH-GRO | SB-04@22.5-23 | Bromofluorobenzene | 193 | 80-120 | TPH (C6-C10) GRO | 160 J | mg/Kg |
| TPH-GRO | SB-07@22-23 | Bromofluorobenzene | 696 | 80-120 | TPH (C6-C10) GRO | 190 J | mg/Kg |
| BTEX | SB-07@22-23 | Bromofluorobenzene | 126 | 80-120 | Xylenes (total) | 1.6 J | mg/Kg |

Notes:

J - Estimated concentration
BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes
GRO - Gasoline Range Organics
TPH - Total Petroleum Hydrocarbons