MATERIALS MANAGEMENT PLAN

For

Drill Cuttings

Located at the

Starkey Cutting Trench

COGCC Location **436610**

1058 County Road 215

Parachute, CO 81635-0370

November 2014

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Tables

Attachments

1.0 Introduction

This Material Management Plan (Plan) provides a description of the management procedures for drill cuttings located at the Starkey Cuttings Trench, which are generated as an exploration and production (E&P) waste stream from natural gas well drilling conducted by WPX Energy in the Piceance Basin of Colorado. Drill cuttings will be managed in accordance with Rules 907 and 1003 of the Colorado Oil and Gas Conservation Commission (COGCC) Rules, as amended April 1, 2009.

This Materials Management Plan is being prepared and submitted for COGCC approval to satisfy the COGCC Form 2A COA (Document # 400549476). The Plan incorporates the following key elements:

- Waste Generation and Identification
- Site Location
- Facility Design
- Spill Prevention and Response
- Cuttings Management
- Sampling Procedures
- Cuttings Treatment Methods
- Final Reclamation of the Site
- Recordkeeping

2.0 Waste Generation and Identification

Cuttings are generated during the drilling process when the drill bit grinds rock into smaller particles. Drill cuttings are continuously produced as downhole drilling advances, therefore, cuttings are continuously carried to the surface and discharged during the drilling process. The drill cuttings range in size from large particles centimeters (cm) in size to small particles less than a millimeter (mm) in size (fines).

Drilling mud is prepared and circulated through the drill string and the wellbore. The drilling mud is used to cool the bit, stabilize the sides of the borehole, control downhole pressure, and transport the cuttings from the bit to the surface for removal. This is accomplished as the drilling mud is circulated down through the drill pipe and bit, and then upward through the annular space between the drill pipe and formation wall. Upon return to the surface, the drill cuttings are separated from the drilling mud using solids control equipment (one or more shale shakers, centrifuges, desander/desilter, etc.). After passing through solids control equipment, the drilling mud is stored in mud tanks and then re-circulated down through the drilling pipe and bit. The solids control equipment, located either at the drilling rig or at a Centralized E&P Waste Management Facility, separates and then discharges the drill cuttings for collection and subsequent storage, management, and/or disposal in a cuttings trench, on the well pad surface adjacent to the drill rig, or at a centrally located cuttings management location, such as the Starkey Cuttings Trench location[1].

[1] http://web.ead.anl.gov/dwm/techdesc/sep/index.cfm

The Starkey Cuttings Trench will be utilized for storage and disposal of drill cuttings, including fine solids (i.e., fine drill cuttings) recovered during the drilling mud recycling process. Frac sand, tank bottoms, sludge, cement returns, or other exploration and production waste will not be managed or disposed of at this location.

At multi-well pad locations, where multiple wells are drilled from a single pad, the volume of drill cuttings generated may exceed the storage capacity of the trench located on the pad, especially where the pad footprint is limited due to topographic, environmental, or other physical factors. Where pad size is insufficient for the volume of cuttings generated, the excess cuttings will be transported to the Starkey Cuttings Trench where they can be properly managed and disposed of. The list of locations that might have an excess volume of cuttings needing to be transported to the Starkey Cuttings Trench is listed in *Table 1 – Waste Generation Locations*[2]. This list may be amended to include additional locations as needed.

3.0 Facility Location

The Starkey Cuttings Trench is located north of the Colorado River in the NENE quarter/quarter of Section 32, Township 6S, Range 96W, 6th PM. The location coordinates are 39.487328 N and -108.126739 W. The area map is included in the Attachment A. The Starkey Cuttings Trench is located at a base of a plateau at an elevation of 5533 ft MSL. The NRCS identifies the dominate soil type within the boundary of the Starkey Cuttings Trench location as Nihill Channery loam. The Soil Map Unit Description is included in Attachment B. Starkey Gulch is located approximately 422 feet to the southeast of the proposed facility and the closest water well is located 2005 feet northeast of the location in very close proximity to Parachute Creek. The depth to groundwater is noted to be 25 feet. However, Parachute Creek is documented as a losing stream in many areas making the depth to groundwater greater at distances further from the creek. This can be confirmed by previous investigative work at a nearby compressor station located to the northeast of the proposed facility. Depth to groundwater at that facility was approximately 45 feet. In addition, the topographic setting of the proposed facility places it out of the fluvial/alluvial sediments of Starkey Gulch and Parachute Creek and in the colluvial sediments of the nearby hillside to the northwest. With the close proximity of the proposed facility to the adjacent hillside; bedrock (Wasatch Fm.) could be relatively shallow and would most likely be devoid of groundwater. If groundwater were to be present in the vicinity of the proposed facility, it would likely be at a depth of 40 feet or greater. Hydrology map is included in Attachment C.

Average annual precipitation, based on precipitation records from Rifle, Colorado is 11.61 inches. Average annual gross evaporation, based on NOAA Technical Report NWS – 33 is estimated to be 45.0 inches. Monthly distributions are provided below.

[2] Table 1 is based on the current WPX drilling schedule

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Annual Prcipitation (in.)*	0.86	0.77	0.94	1.01	1.00	0.73	1.03	1.14	1.14	1.19	0.88	0.93	11.61
Average Annual Evaporation (in.)**	0.45	1.35	2.70	4.05	5.63	6.98	7.20	5.85	4.95	3.38	1.80	0.68	45.00

* Precipitation Data from Western Regional Climate Center - Rifle Weather Station

**NOAA Technical Report NWS 33 - Map 3 'Free Water Surface Evaporation 1956 - 1970'

This facility is located in a non-sensitive area; see Attachment D for the Sensitive Area Determination.

4.0 Facility Design

The Starkey Cuttings Trench is defined in the COGCC Rules 100 Series as an ancillary cuttings trench designated, at a location other than a well pad, for the purpose of disposing and/or managing cuttings. In accordance with the COGCC Rule 903 a.(3). an Earthen Pit Report/Permit, Form 15, is not required for drilling pits unless they are designed to hold fluids containing hydrocarbon concentrations exceeding 10000 ppm TPH or chloride concentrations at total well depth exceeding 15,000 ppm. The Starkey Cuttings Trench is designed to receive cuttings only; the Starkey cuttings trench will not be used to manage any free liquids or fluids of any type therefore Form 15 is not required. A Form 2A was submitted and approved by COGCC (#400549476) in accordance with Rule 303.d.(1) where surface disturbance will occur at a previously undisturbed site or surface disturbance occurs for the purpose of modifying or expanding an oil and gas location. Ancillary facilities are intended to provide short-term and localized support for the management of drill cuttings in the area where drilling is actively conducted. Ancillary facilities with trenches designated for cuttings management will not have an active lifespan of more than 3 years.

4.1 Construction

The Starkey Cuttings Trench capacity is estimated to be 52,700 cubic yards. The construction layout and cross section are included in Attachment E. During construction of this site, topsoil will be salvaged and stockpiled from all proposed disturbance areas. If less than 6 inches of topsoil (i.e., soils with some organic matter content) are available, topsoil may be mixed with suitable subsoil materials for stockpiling so that a minimum of 6 inches of plant growth material is available for use during reclamation. Under no circumstances would subsoil that is unsuitable as a plant growth medium be mixed with topsoil materials. All surface vegetation stripped with topsoil would be incorporated directly into the topsoil to augment organic matter content and seed source availability however large amounts of shrub materials might require separate handling. Stabilization seeding of topsoil and/or surface piles will occur during the first available seeding season. Runoff will be diverted around topsoil stockpiles to minimize loss of topsoil to erosion, and stockpiles will be located as close as possible to the future reclamation site. The subsoil materials will be stockpiled separately from topsoil stockpiles.

4.2 Best Management Practices

The entire perimeter of the Starkey Cuttings Trench location will be fenced and locked to prevent public access, prevent unauthorized vehicular traffic and illegal dumping of wastes and to prevent access by wildlife or livestock. The Starkey cuttings trench will not be used to manage any fluids of any type therefore netting of the trench is not necessary.

4.3 Infiltration Test

In accordance with the COGCC Rule 904 a.(1). liner is not required for drilling pits unless they are designed for use with fluids containing hydrocarbon concentrations exceeding 10000 ppm TPH or chloride concentrations at total well depth exceeding 15,000 ppm. The Starkey Cuttings Trench is designed to receive dry cuttings only. The Starkey cuttings trench will not be used to manage any free liquids or fluids of any type therefore a liner is not required. However to ensure that the trench subsurface is not impacted and to ensure that there is no threat to impact groundwater by managing cuttings at this location, an infiltration test will be conducted during construction of the site.

4.4 Stormwater Management

Stormwater will be managed in accordance with the COGCC Rule 1000.f. and the Grand Valley Field Stormwater Management Plan (CDPHE permit #COR038544).

The entire perimeter of the Starkey Cuttings Trench location is surrounded by an earthen berm to prevent run-on and runoff during and after stormwater events. Stormwater accumulation within the perimeter berm will either be allowed to evaporate or, if the safety and efficiency of cuttings management operations are compromised, may be recovered via a vacuum truck and disposed of at a centralized E&P waste management facility.

5.0 Spill Prevention and Response

The entire perimeter of the Starkey Cuttings Trench location will be surrounded by an earthen berm to prevent any potential releases from leaving the location. Since there will be no fluids managed at this location, the potential for a release is very low. However, if a potential release were to migrate off the facility on the northeastern side, flow would migrate off of the facility on the southeastern side; flow would be directly into the access road bar ditch. If a potential releases were to impact the access road bar ditch, it would have to migrate 840 feet before encountering a culvert which diverts flow under the road into a well-defined ephemeral drainage on the south side of the road. From this point,

flow would have to migrate an additional 420 feet and through three (3) rock check dams before converging with Starkey Gulch. It is not anticipated any flow would reach Starkey Gulch due to the fact the cuttings will be in a semi-solid state meaning no free liquids should be associated with the trench. In the unlikely event of a spill or release, the spill will be reported and remediated in accordance with the COGCC 900 Series Rules and the most current WPX Energy Spill Prevention and Response Plan.

6.0 Cuttings Management

Cuttings transported to the Starkey Cuttings trench will be managed on the pad surface in batches of less than 1000 cubic yards. Batches will be separated into individual cells, and only one cell will be actively accepting cuttings at a given time. Cuttings brought to the Starkey Cuttings Trench will be generated from several geological formations which include shallow formations bearing little or no oil and/or gas and deeper, gas-bearing, formations including the Mesaverde (Williams Fork) and Mancos (Niobrara). WPX recognizes that the cuttings generated from different formations have different chemical composition. Therefore, managing cuttings in small batches will ensure accurate characterization of the cuttings, allow accurate identification of treatment method (if needed), and expedite the final reclamation of the site. Cuttings brought on site will be placed on the pad surface within the currently active cell within the trench boundary until the content of the active cell approaches 1000 cubic yards of material. Prior to disposal of each batch of drill cuttings, sampling and analysis will be performed to demonstrate that the drill cuttings do not exceed COGCC Table 910-1 concentration levels for soils. If the batch of drill cuttings does not meet these Table 910-1 concentration levels, the cuttings will be treated within their designated cell until the allowable concentration levels are met (see Section 8.0 for cuttings treatment options). Cuttings brought to this location that exceed the requirements in Table 910-1 will be completely segregated from materials that meet the requirements in Table 910-1. Once a batch of cuttings meets Table 910-1 concentration levels, an appropriately sized portion of the cuttings trench will be excavated to dispose of the batch of cuttings within the trench boundary. Sampling and analytical methods applied to characterize drill cuttings are described below in section 7.0.

The Starkey cuttings trench will not be used to manage any free liquids or fluids of any type. Cement returns are not allowed at the Starkey cuttings trench and will be managed at the well pad at which they originated. Although storm water BMPs are in place to control both storm water run-on and run-off at the Starkey cuttings trench, storm water that falls directly onto the location may occasionally accumulate and need to be pumped/removed as needed.

7.0 Field Sample Methods and Procedures

Cuttings samples will be collected in accordance with solid waste sampling methodologies, environmental sampling and monitoring protocols, and quality assurance practices developed and prepared by the Environmental Protection Agency's (EPA) Office of Solid Waste; specified in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* 3rd Edition, Update IV.

7.1 Drill Cuttings Sampling

Cuttings stored within the permitted cuttings trench boundary will be characterized prior to disposal at the Starkey Cuttings Trench. Cuttings managed in separate cells containing no more than 1000 cubic yards of material, will be sampled prior to disposal. Prior to each disposal event, composite samples composed of four grab samples from separate locations within each cell will be collected using a shovel, track hoe or rubber tired backhoe. The grab samples will be stockpiled in an area adjacent to the pile and mixed. The mixed materials will comprise the composite sample which will then be placed directly into laboratory

specified sample containers and labeled according to the relevant COGCC Table 910-1 analytes. For transport, sample containers will be placed inside a cooler, and cooled to 4°C or less to preserve sample integrity.

Samples will be submitted according to the laboratory's Chain of Custody (COC) protocol unless otherwise specified. The attached *Table 2: Soil Sample Collections, Handling and Analysis Summary* identifies the laboratory sampling specifications including parameters, analytical methods, and sample handling information (i.e., bottles and holding times).

7.2 Storage Area Sampling

It is anticipated that most, if not all, of the surface area within the trench perimeter will ultimately be utilized for cuttings disposal. However, any cuttings storage area that is not eventually used for cuttings disposal will be sampled for the COGCC Table 910-1 analytes. Depending on the size of the area, up to four grab samples will be collected to verify no hydrocarbon impacts are present. Samples will be placed into laboratory specified sample containers and labeled according to the relevant COGCC Table 910-1 analytes. The attached Table 2 summarizes sampling specifications including parameters, analytical methods, and sample handling information (i.e., bottles and holding times).

7.3 Background Sampling

At least three background grab samples from nearby, non-impacted native soil will be collected and analyzed for arsenic concentrations. Analytical results of background soil samples will be compared against those from the drill cutting samples. The attached Table 2 summarizes sampling specifications including parameters, analytical methods, and sample handling information (i.e., bottles and holding times).

For transport, sample containers will be placed inside a cooler, and cooled to 4°C or less to preserve sample integrity. GPS coordinates will be collected of each sampling location for future reference and identification. Samples will be submitted following a Chain of Custody protocol to an accredited analytical laboratory.

7.4 Equipment Decontamination

Pre-cleaned, wide mouth, glass sampling containers will be used to collect the cuttings sampled as described in Table 2.

7.5 Sampling Analysis

Sampling parameters for drill cuttings can be categorized into three types of contaminants of concern: organics, inorganics, and metals. Cuttings samples will be analyzed in accordance with the EPA methods specified in latest version of "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) and Rule 910 of COGCC Rules and Regulations. The analytical parameters in these three categories include:

Organic compounds – *TEPH (DRO - diesel), TVPH (GRO - gas), BTEX, and PAHs (Polycyclic Aromatic Hydrocarbons)*

Inorganic properties – *pH, Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR)*

Metals – *Total metals*

The specific analytical test methods and chemical constituents in these categories and their allowable concentration levels, as specified in COGCC Table 910-1, are summarized in Table 2.

7.6 Quality Control and Quality Assurance

Samples submitted to the laboratory will be subject to their standard quality assurance/quality control (QA/QC) measures to satisfy a Level II Standard Analytical Result package from an accredited laboratory, which includes:

- Level I Data Summary Package
- Surrogate Recoveries with QC limits
- Sample matrix, units, effective dilutions, prep batch number if available (for tracking prep QC) and percent moisture, if appropriate.
- Batch QC Summary Reports of:
  - Method Blanks
  - Laboratory Control Spike Recoveries
  - Matrix Spike/Duplicate Recoveries and RPDs.

8.0 Cuttings Treatment Methods

WPX Energy has several options to treat drill cuttings that exceed Table 910-1 contaminant concentration levels; however, even after treatment most drill cuttings may still exceed the Table 910-1 acceptable concentration levels for arsenic and select inorganic parameters (pH, SAR, and EC).

(1) **Moisture control for transportation and reclamation.** Cuttings are often blended first with sawdust and/or excess clean soil (not topsoil) excavated and stockpiled during pad/trench construction. Blending has an added benefit of reducing slightly elevated organic contaminant concentrations in the cuttings. Blending with clean soil dilutes and reduces elevated concentrations to acceptable levels before the cuttings/soil mix is disposed of in a cuttings trench at depths below the major rooting zone for plants. [3]

(2) **Arsenic.** Drill cuttings that exceed Table 910-1 concentration levels for arsenic will be evaluated by comparison to site-specific background analytical data. Data collection, data analysis, and documentation of cuttings that exceed Table 910-1 concentrations for arsenic will be reported to the COGCC environmental staff via Sundry Notice Form 4 prior to the final reclamation of the site.

[3] Bansal and Sugiarto 1999

(3) **Inorganics**. Cuttings that exceed Table 910-1 concentration levels for inorganics (pH, SAR, and EC), which were established to be protective of vegetative growth, are allowed to be buried in cuttings pits or trenches at depths of at least three (3) feet below the ground surface to avoid potential adverse impacts to the growth of vegetation.

(4) **Organic Compounds.** Organic compounds in cuttings will be treated either by adding clean soil, as described in section 8.0(1), and/or by the use of microorganisms (i.e., bacteria and nutrients), also known as bioremediation, biological treatment, or biotreatment, which is a natural treatment process whereby microorganisms in, or added to, the soil to breakdown residual petroleum hydrocarbons into carbon dioxide and water. Any residual hydrocarbons that may be detected in the cuttings above Table 910-1 concentration levels will be treated by adding bacteria to the cuttings to degrade hydrocarbons and reduce TPH concentrations. The objective of biotreatment is to accelerate the natural decomposition process by adding or cultivating bacterial populations and controlling certain parameters such as oxygen, temperature and moisture in the cuttings.

9.0 Final Reclamation of the Site

The Starkey Cuttings Trench will be closed and reclaimed in accordance with the COGCC Rule 905. a. and 1003. d. Cuttings stored in the trench will meet the concentration levels of Table 910-1 as described above and will be sufficiently dry prior to backfilling and recontouring activities. The backfilling of the Starkey Cuttings Trench will consist of returning the subsoil and topsoil to their original relative positions so that cuttings will be confined to the trench area underneath a native soil cover and not incorporated into surface materials.

A minimum of three (3) feet of clean cover will be backfilled over all cuttings. During the two (2) year period following drilling trench closure, if subsidence occurs over the closed location, additional topsoil will be added to the depression and the land will be re-leveled as close to the intended contour as practicable. See Attachment F for a more detailed Reclamation Plan.

10.0 Recordkeeping

WPX Energy will maintain the following records related to the management of drill cuttings transported to the Starkey Cuttings Trench for a period of 5 years from their date of generation:

- Approved Form 2A that authorizes surface disturbance for a drill cuttings trench
- Field sampling records and laboratory analytical reports for disposed drill cuttings and background soils
- Variance requests for exceeding COGCC Table 910-1 concentration levels for arsenic and inorganic parameters in soil and drill cuttings and the accompanying Form 4 Sundry Notice
- A spreadsheet that summarizes pad locations where the cuttings where generated and the volumes transported to the Starkey Cuttings Trench

Records will be maintained at the WPX Energy Parachute, Colorado field office. Upon written request from the COGCC, WPX Energy will provide copies of the records requested within a 5 year record retention period following their generation.

Table 1. Waste Generation Locations[4]

Pad Name	Location	Pad Name	Location
BCU 24-36-199	NWSW-36-1N-99W	RG 22-15-298	SENW-15-2S-98W
BCU 31-25-199	NENW-25-1N-99W	RG 24-29-298	SESW-29-2S-98W
DOE 2-M-35	NWSW-35-6S-96W	RG 31-22-298	NWNE-22-2S-98W
DOE 2-W-27	NENE-27-6S-95W	RG 34-27-299	SWSE-27-2S-99W
GM 11-28	NWNW-28-6S-96W	RG 43-15-298	SWNW-14-2S-98W
GM 12-20	NESW-20-6S-96W	RGU 11-26-198	NWNW-26-1S-98W
GM 13-33	NWSW-33-6S-96W	RGU 12-1-298	SWNW-1-2S-98W
GM 14-27	NESW-34-6S-96W	RGU 12-35-198	SWNE-35-1S-98W
GM 21-12	NENW-12-7S-96W	RGU 13-36-198	NWSW-36-1S-98W
GM 21-14	NENW-14-7S-96W	RGU 22-26-198	SENW-26-1S-98W
GM 23-20	NESW-20-6S-96W	RGU 31-2-298	NWNE-2-2S-98W
GM 24-27	SESW-27-6S-96W	RGU 32-35-198	NESW-35-1S-98W
GM 31-34	NWNE-34-6S-96W	RGU 32-36-198	SENE-36-1S-98W
GM 321-34	NENW-34-6S-96W	RGU 33-25-198	NWSE-25-1S-98W
GM 32-27	SWNE-27-6S-96W	RGU 34-27-198	NWNE-34-1S-98W
GM 323-28	SESW-28-6S-96W	RGU 41-23-198	NWNW-24-1S-98W
GM 32-4	SWNE-4-7S-96W	RGU 41-8-298	NWSW-9-2S-98W
GM 34-14	SWSE-14-7S-96W	RGU 42-26-198	SENE-26-1S-98W
GM 34-4	SESW-4-7S-96W	RGU 43-23-198	SESE-23-1S-98W
GR 14-28	SWSW-28-6S-96W	RMV 130-16	SESW-16-6S-94W
GR 23-11V	NESW-11-7S-96W	RMV 20-35	NWSE-35-6S-94W
GV 18-23	NENW-23-7S-96W	RMV 4-16	SWSE-16-6S-94W
GV 26-28	SWSE-28-6S-96W	RU 13-6	NWSW-6-7S-93W
GV 33-22	NWSE-22-7S-96W	RU 21-8	NENW-8-7S-93W
JUHAN 14-26H	SESW-26-6S-94W	RU 22-7	SENE-7-7S-93W
KP 11-16	NWNW-16-6S-91W	RU 34-6	SWSE-6-7S-93W
KP 13-16	NE NW SW-16-6S-91W	RU 42-7	SENE-7-7S-93W
KP 24-23	SESW-23-6S-91W	RU 44-7	SESE-7-7S-93W
KP 32-26	SESE-23-6S-91W	RWF 23-3	NESW-3-7S-94W
KP 43-8	NESE-8-6S-91W	RWF 33-3	NWSE-3-7S-94W
MV 11-11	NENW-11-7S-96W	RWF 43-23	NESE-23-6S-94W
MV 16-9	NWNW-9-7S-96W	SG 22-32	NWNE-32-7S-96W
MV 28-4	SENW-4-7S-96W	SG 23-22	NESW-22-7S-96W
MV 34-5	SESE-5-7S-96W	SG 24-22	SESW-22-7S-96W
MV 43-31	SESE-31-6S-95W	SG 43-15	NWSE-15-7S-96W
MV 45-10	NWNE-10-7S-96W	SG 43-28	NESE-28-7S-96W
MV 5-10	SWNE-10-7S-96W	SP 32-14	SWNE-14-7S-95W
MV 55-29	NENW-29-6S-96W	SR 24-9	SESW-9-7S-94W
Nolte 14-44	SESE-14-7S-96W	SR 42-9	SENE-9-7S-94W

[4] Based on the current WPX drilling schedule. Locations might be added as the drilling schedule changes.

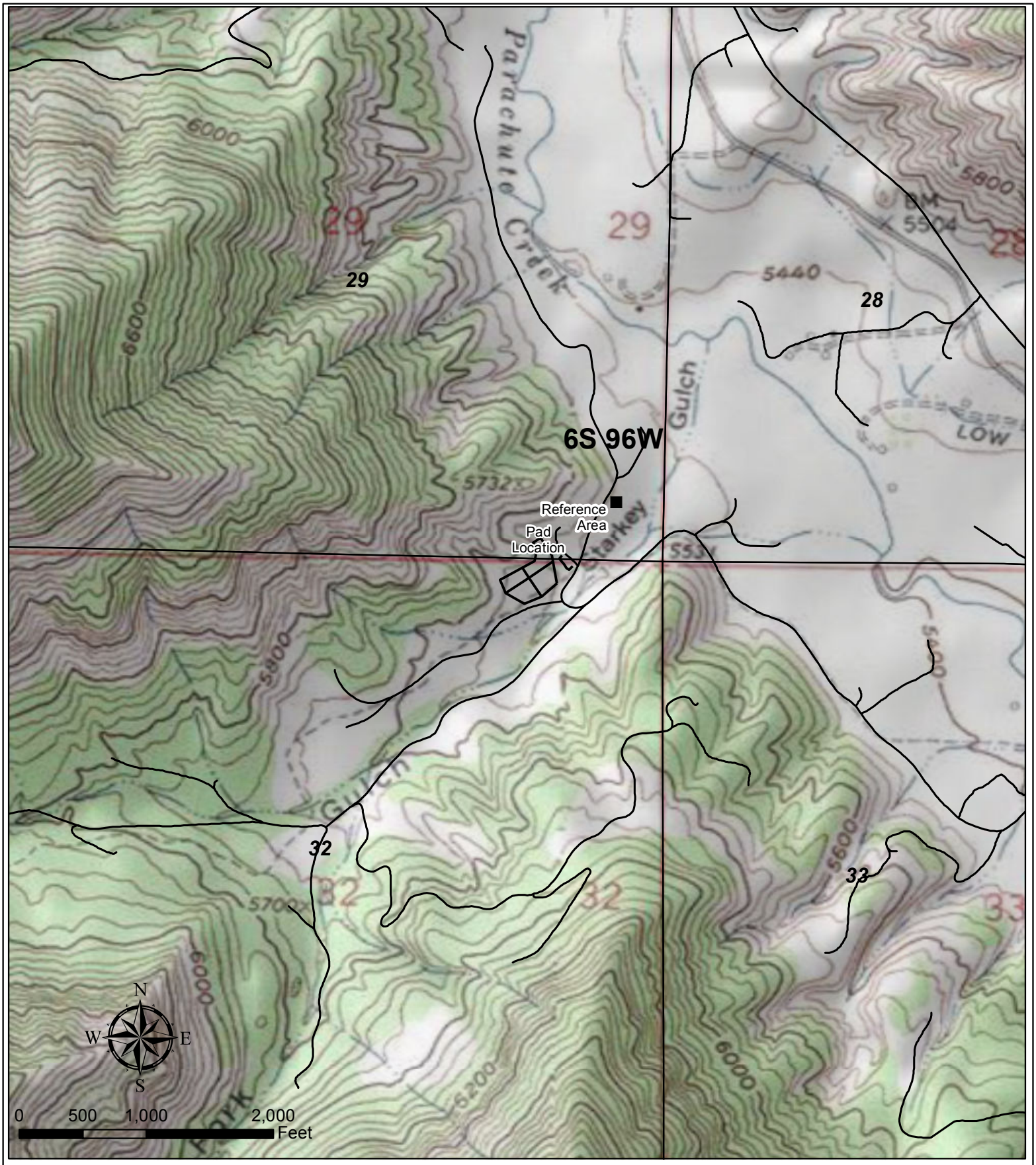
Pad Name	Location	Pad Name	Location
NRG 13-13-198	NWSW-13-1S-98W	SR 43-7	NESE-7-7S-94W
PA 21-10	NENW-10-7S-95W	TR 11-1-698	NWSW-1-6S-98W
PA 21-6	SESW-31-6S-95W	TR 12-1-698	SWSW-1-6S-98W
PA 23-26	NESW-26-6S-95W	TR 24-21-597	SESW-21-5S-97W
PA 24-12	SESW-12-7S-95W	TR 31-24-597	SESE-13-5S-97W
PA 24-32	SESW-32-6S-95W	TR 31-33-597	NWNE-33-5S-97W
PA 34-12	NESE-12-7S-95W	TR 32-21-597	NWNE-21-5S-97W
PA 341-32	NENE-32-6S-95W	TR 33-33-597	NWNE-33-5S-97W
RG 11-7-397	NWNW-7-3S-97W	TR 41-2-698	NENE-2-6S-98W
RG 13-13-298	NWSW-13-2S-98W	TR 44-27-597	SESE-27-5S-97W

[4] Based on the current WPX drilling schedule. Locations might be added as the drilling schedule changes.

Table 2. Soil Sample Collections, Handling and Analysis Summary

Analyte Class	Analysis	COGCC Table 910-1 Concentrations Standard	Holding Time	Method
Organics	TEPH (DRO)	500 mg/kg	14 days	SW 8015 mod
	TVPH (GRO)	500 mg/kg		
	Benzene	0.17 mg/kg	14 days	SW 8021
	Toluene	85 mg/kg		
	Ethylbenzene	100 mg/kg		
	Xylenes (total)	175 mg/kg		
	Acenaphthene	1,000 mg/kg	14 days	SW 8270
	Anthracene	1,000 mg/kg		
	Benzo (A) anthracene	0.22 mg/kg		
	Benzo (B) fluoranthene	0.22 mg/kg		
	Benzo (K) fluoranthene	2.2 mg/kg		
	Benzo (A) pyrene	0.022 mg/kg		
	Chrysene	22 mg/kg		
	Dibenzo(A,H)anthracene	0.022 mg/kg		
	Fluoranthene	1,000 mg/kg		
	Fluorene	1,000 mg/kg		
	Indeno(1,2,3,C,D)pyrene	0.22 mg/kg		
	Napthalene	23 mg/kg		
	Pyrene	1,000 mg/kg		
Inorganics	Electrical Conductivity	< 4 mmhos/cm or 2x background	28 days	USDA Hdbk
	Sodium Adsorption Rate	< 12	180 days	
	pH	6-9	< 24	SW 9045
Total Metals	Arsenic	0.39 mg/kg	28 days for Hg & 180 days for remaining	SW 6010, 6020, 7470
	Barium	15,000 mg/kg		
	Cadmium	70 mg/kg		
	Chromium (III)	120,000 mg/kg		
	Chromium (VI)	23 mg/kg		
	Copper	3,100 mg/kg		
	Lead (inorganic)	400 mg/kg		
	Mercury	23 mg/kg		
	Nickel (soluble salts)	1,600 mg/kg		
	Selenium	390 mg/kg		
	Silver	390 mg/kg		
	Zinc	23,000 mg/kg		

Attachment A



Legend

Pad

WPX Energy Rocky Mountain, LLC

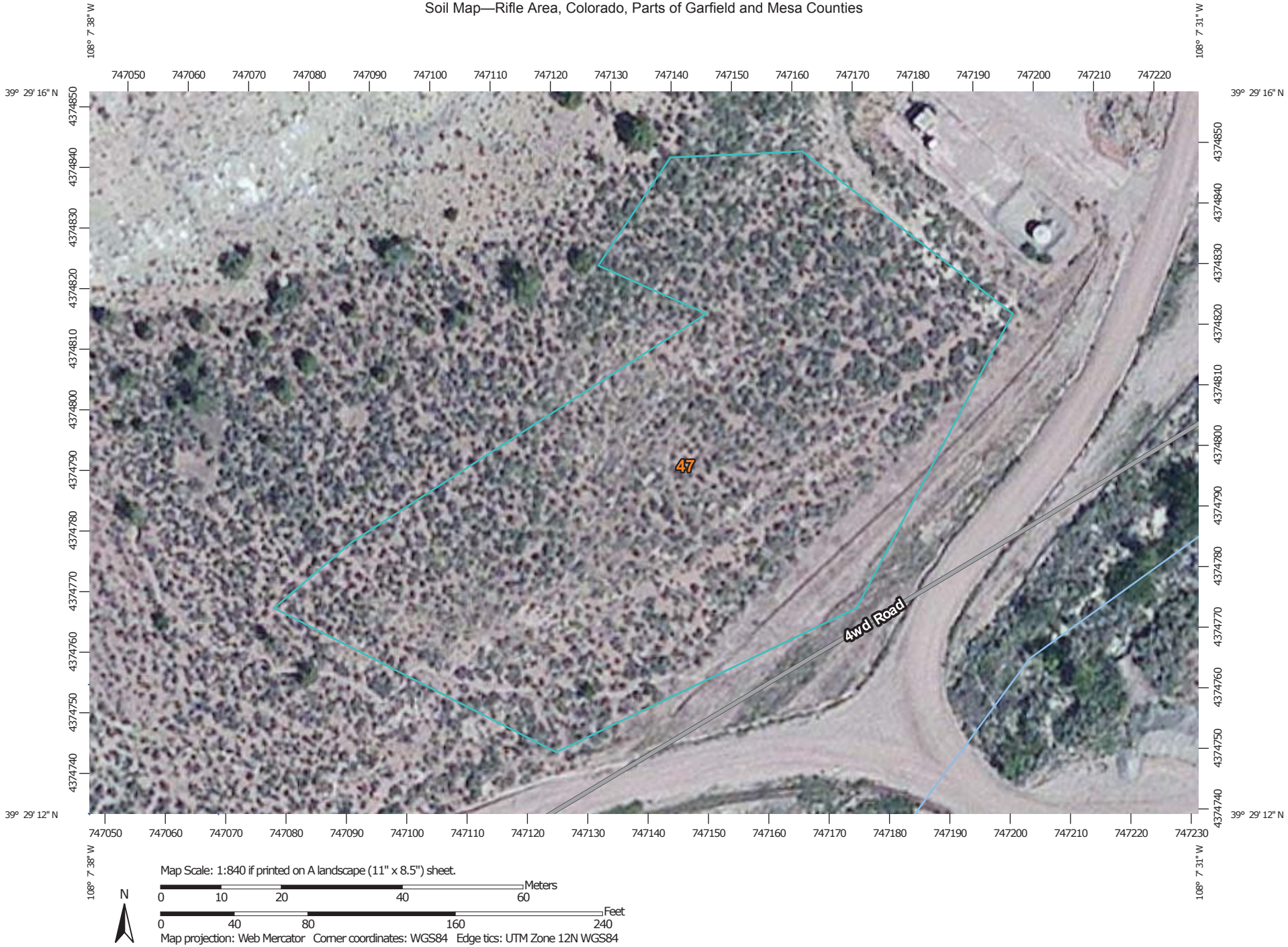
Plat 5D

Starkey Cuttings Trench
Reference Area Map

T:\Projects\PIC\GrandValley\14\0129_StarkeyCuttingsTrench_2A Figures\Reference.mxd Atankers 1/29/2014 3:06:36 PM

Attachment B

Soil Map—Rifle Area, Colorado, Parts of Garfield and Mesa Counties



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 8, Sep 22, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2010—Sep 2, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
47	Nihill channery loam, 6 to 25 percent slopes	1.5	100.0%
Totals for Area of Interest		**1.5**	**100.0%**

Rifle Area, Colorado, Parts of Garfield and Mesa Counties

47—Nihill channery loam, 6 to 25 percent slopes

Map Unit Setting

Elevation: 5,000 to 6,500 feet

Map Unit Composition

Nihill and similar soils: 85 percent

Description of Nihill

Setting

Landform: Valley sides, alluvial fans
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 11 inches: moderately alkaline, channery loam
H2 - 11 to 18 inches: moderately alkaline, very channery loam
H3 - 18 to 60 inches: moderately alkaline, stratified extremely channery sandy loam to extremely channery loam

Properties and qualities

Slope: 6 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

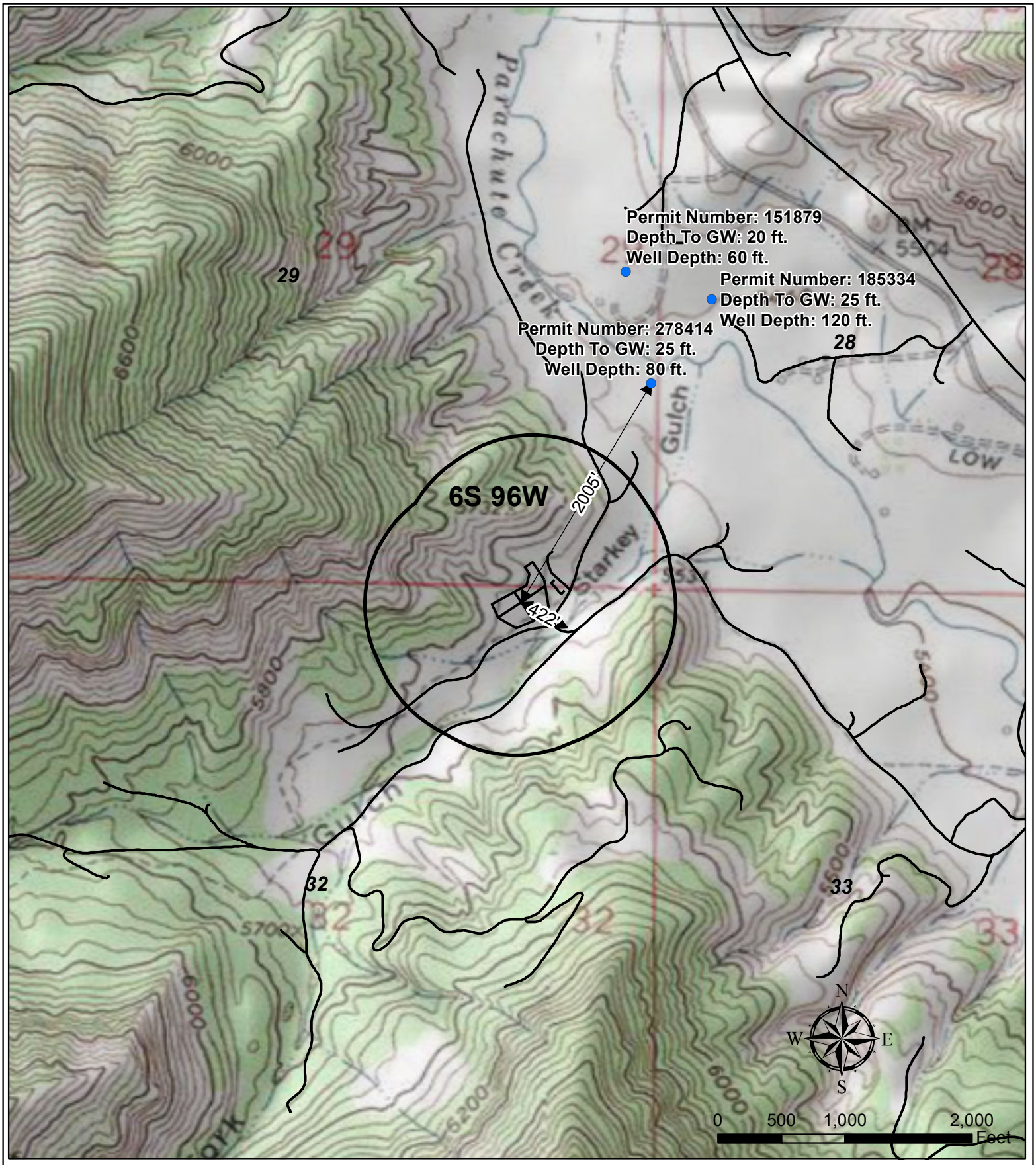
Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Rolling Loam (R048AY298CO)

Data Source Information

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 7, Dec 23, 2013

Attachment C



Legend

- Water Well
- Pad
- Existing Road
- 1000' Buffer (from edge of pad)

WPX Energy Rocky Mountain, LLC

Plat 5C
Starkey Cuttings Trench
Hydrology Map

T7S R96W, Section 23

WPXENERGY

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Attachment D

Sensitive Area Determination Checklist

WPX Energy Rocky Mountain, LLC (WPX)			
Person(s) Conducting Field Inspection		Finn Whiting	02/11/2014
		Geologist	
Site Information			
Location:	Starkey Cuttings Trench		Time: 9:30
Type of Facility:	Proposed Cuttings Storage Facility		
Environmental Conditions	Overcast, ~4" of snow on ground, Frozen ground conditions.		
Temperature (°F)	28 °F		

Has the proposed, new or existing location been designated as a sensitive area?
☐ Yes ☑ No

SURFACE WATER

1. Are there any surface water features or SWSAs adjacent to or within ¼ mile of the proposed/new or existing facility?
   ☑ Yes ☐ No

   If yes, list type of surface water feature(s), i.e. rivers, creeks, streams, seeps, springs, wetlands: Starkey Gulch, a USGS identified intermittent drainage tributary to Parachute Creek; and three (3) unnamed non USGS identified ephemeral drainage features.

   If yes, describe location relative to facility:
   Starkey Gulch is located 422 feet to the southeast of the proposed facility center. The three (3) unnamed non USGS identified ephemeral drainages are adjacent to the proposed facility center with defined channels entering the facility's boundary.

2. Could a potential release from the facility reach surface water features?
   ☑ Yes ☐ No

   If yes, describe the pathway a release from the facility would likely follow to determine if the potential to impact surface water is high or low. If a potential release were to migrate off of the facility, flow would be to the southeast into the access road bar ditch located adjacent to the southeastern side of the proposed facility

3. Is the potential to impact surface water from a facility release high or low?
   ☐ High ☑ Low

WPXENERGY

GROUNDWATER

1. Will the proposed/new or existing facility have any pits which will contain hydrocarbons and chlorides or other E&P wastes?
   ☑ Yes ☐ No
   If yes, List the pit type(s): Cuttings trench.

2. Is the site of the proposed facility underlain by an unconfined aquifer or recharge zone?
   ☐ Yes ☑ No

3. Is the hydraulic conductivity of the underlying soil or geologic material $\leq 1.0x10^{-7}$ cm/sec?
   ☑ Yes ☐ No

4. Is the proposed facility located within 1/8 mile of a domestic water well or 1/4 mile of a public water supply well which would use the same aquifer?
   ☐ Yes ☑ No

5. Is the proposed facility located within a 100 year floodplain?
   ☐ Yes (*Sensitive Area*) ☑ No (*If no, proceed to question #6.*)

6. Is the depth to groundwater known?
   ☐ Yes (*If yes, follow instructions provided in 6(a) of this section).*
   ☑ No (*If no, follow instructions provided in 6(b) of this section*).

   (a) If yes, could a potential release from the proposed facility reach groundwater?
   ☐ Yes ☐ No
   If yes, explain:

   (b) If no:
   (i) Evaluate surrounding soils, topography, and vegetation which may suggest the presence of shallow groundwater.
   (ii) Gather information from surrounding well data in order to determine a depth to groundwater, i.e. State Engineers Office.

7. Is the potential to impact ground water from the facility in the event of a release high or low?
   ☐ High ☑ Low

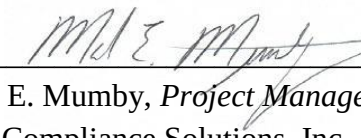
Additional Comments:

As stated in the surface water section of this sensitive area determination, there are three (3) unnamed non USGS identified ephemeral drainages and Starkey Gulch, a USGS identified intermittent drainage, located within a ¼ mile radius of the proposed facility. The facility, as it is currently proposed, limits the direction of a potential release to the southeastern side. If a potential release were to migrate off of the facility on the southeastern side, flow would be directly into the access road bar ditch. During facility construction, Best management Practices (BMPs) should be installed in the form of an earthen perimeter berm and raised entrance point on the fill slope sides of the proposed facility. Due to the close proximity of the access road and location of the soil stockpiles, construction of a diversion ditch will most likely not be feasible. All installed BMP's should be monitored and maintained to ensure sire containment in the vent of a potential release.

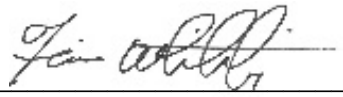
The State Engineer's Office and USGS records were reviewed and revealed no water wells are located within a ¼ mile of the proposed facility. The vegetative cover in the immediate vicinity of the facility which is dominated by xeric vegetation typical of the elevation and location (sage brush, juniper, and bunch grasses) does not suggest the presence of shallow groundwater. The nearest permitted water well (permit number 278414) is located 2,005 feet northeast of the proposed facility in very close proximity to Parachute Creek. The depth to groundwater is noted to be 25 feet. However, Parachute Creek is documented as a losing stream in many areas making the depth to groundwater greater at distances further from the creek. This can be confirmed by previous investigative work at a nearby compressor station located to the northeast of the proposed facility. Depth to groundwater at that facility was approximately 45 feet. In addition, the topographic setting of the proposed facility places it out of the fluvial/alluvial sediments of Starkey Gulch and Parachute Creek and in the colluvial sediments of the nearby hillside to the northwest. With the close proximity of the proposed facility to the adjacent hillside; bedrock (Wasatch Fm.) could be relatively shallow and would most likely be devoid of groundwater. If groundwater were to be present in the vicinity of the proposed facility, it would likely be at a depth of 40 feet or greater.

Based on the information collected during the site visit and desktop review, the potential to impact groundwater has been deemed as being low. The greatest potential for impacts would be storm water run on from the drainages located to the northwest of the proposed facility. All three noted drainages can carry significant flow during periods of precipitation. During facility construction it will be imperative to divert any flow from these drainages around the facility and into Starkey Gulch. This will be especially warranted in the summer months during the annual monsoon precipitation patterns typically experienced from mid to late summer. As the proposed facility will not be utilized for storing fluids, the potential to impact any surface water features (Starkey Gulch) will be relatively low. If a potential releases were to impact the access road bar ditch, it would have to migrate 840 feet before encountering a culvert which diverts flow under the road into a well-defined ephemeral drainage on the south side of the road. From this point,

flow would have to migrate an additional 420 feet and through three (3) rock check dams before converging with Starkey Gulch. Best management practices can also be installed where the assess road bar ditch crosses under the road to further prevent any fluid migration from reaching Starkey gulch. By COGCC decision the facilities close proximity to Starkey Gulch would classify it as being located in a sensitive area. However, as noted above, with the materials being stored on-site (cuttings) and if adequate (BMPs) are installed and maintained the potential for impacts to the surface water features and actual flowing surface water would be deemed to be low. With the potential for impacts to groundwater, surface water features, and actual flowing surface water being deemed as low, the facility can be designated as being in a non-sensitive area.

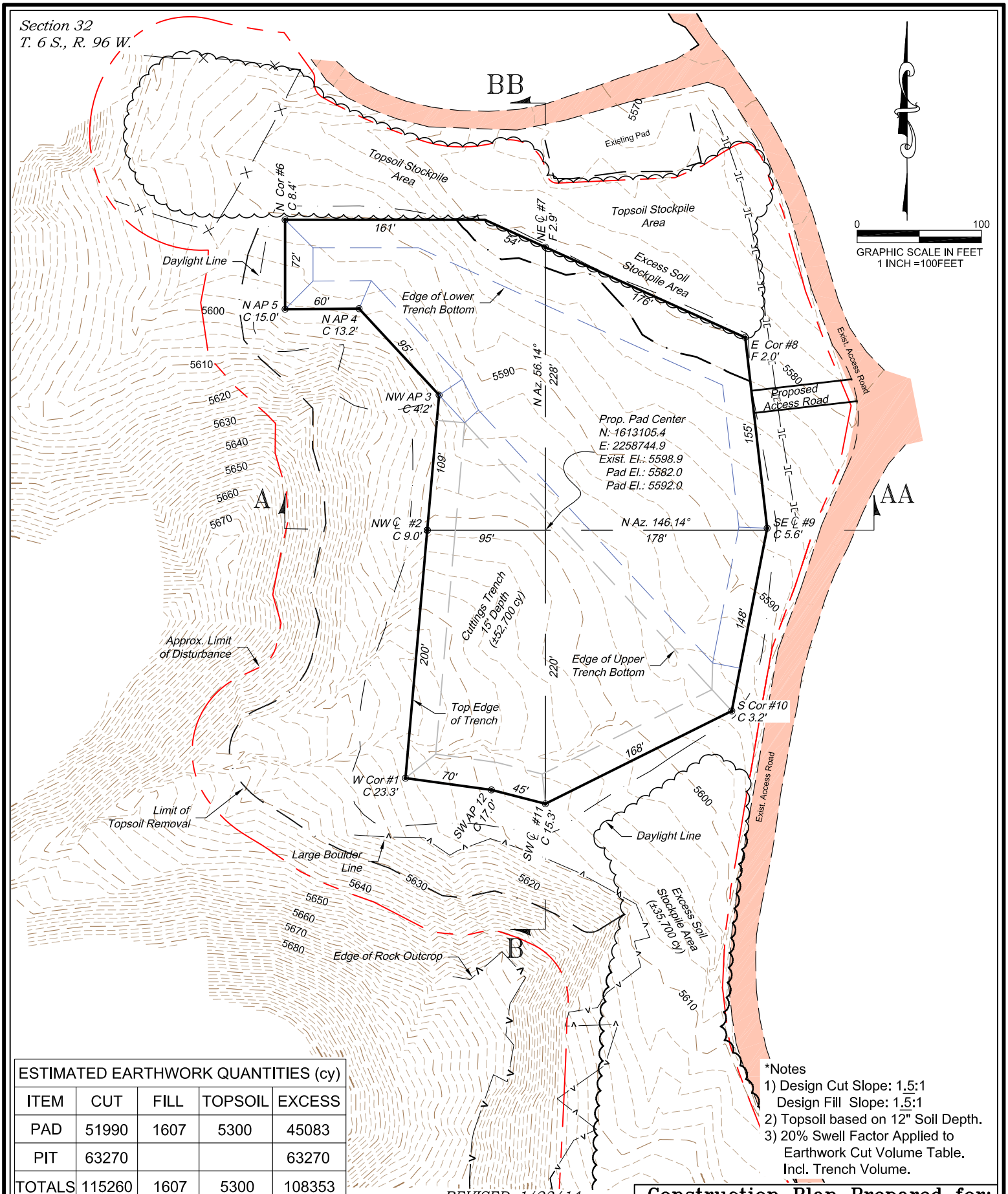
Inspector Signature(s):  Date: 2/12/2014

Mark E. Mumby, *Project Manager/RPG*
HRL Compliance Solutions, Inc.

Inspector Signature(s):  Date: 02/11/2014

Finn Whiting, *Geologist / Environmental Inspector*
HRL Compliance Solutions, Inc.

Attachment E



ESTIMATED EARTHWORK QUANTITIES (cy)				
ITEM	CUT	FILL	TOPSOIL	EXCESS
PAD	51990	1607	5300	45083
PIT	63270			63270
TOTALS	115260	1607	5300	108353

*Notes
1) Design Cut Slope: 1.5:1
Design Fill Slope: 1.5:1
2) Topsoil based on 12" Soil Depth.
3) 20% Swell Factor Applied to Earthwork Cut Volume Table. Incl. Trench Volume.

REVISED: 1/23/14

136 East Third Street
Rifle, Colorado 81650
Ph. (970) 625-2720
Fax (970) 625-2773
BOOKCLIFF Survey Services, Inc.

SCALE: 1" = 100'
DATE: 11/5/13
PLAT: 1 of 2
PROJECT: Valley
DFT: cs

Construction Plan Prepared for:
WPX ENERGY
WPX Energy Rocky Mountain, LLC

Starkey Cuttings Trench
CONSTRUCTION LAYOUT

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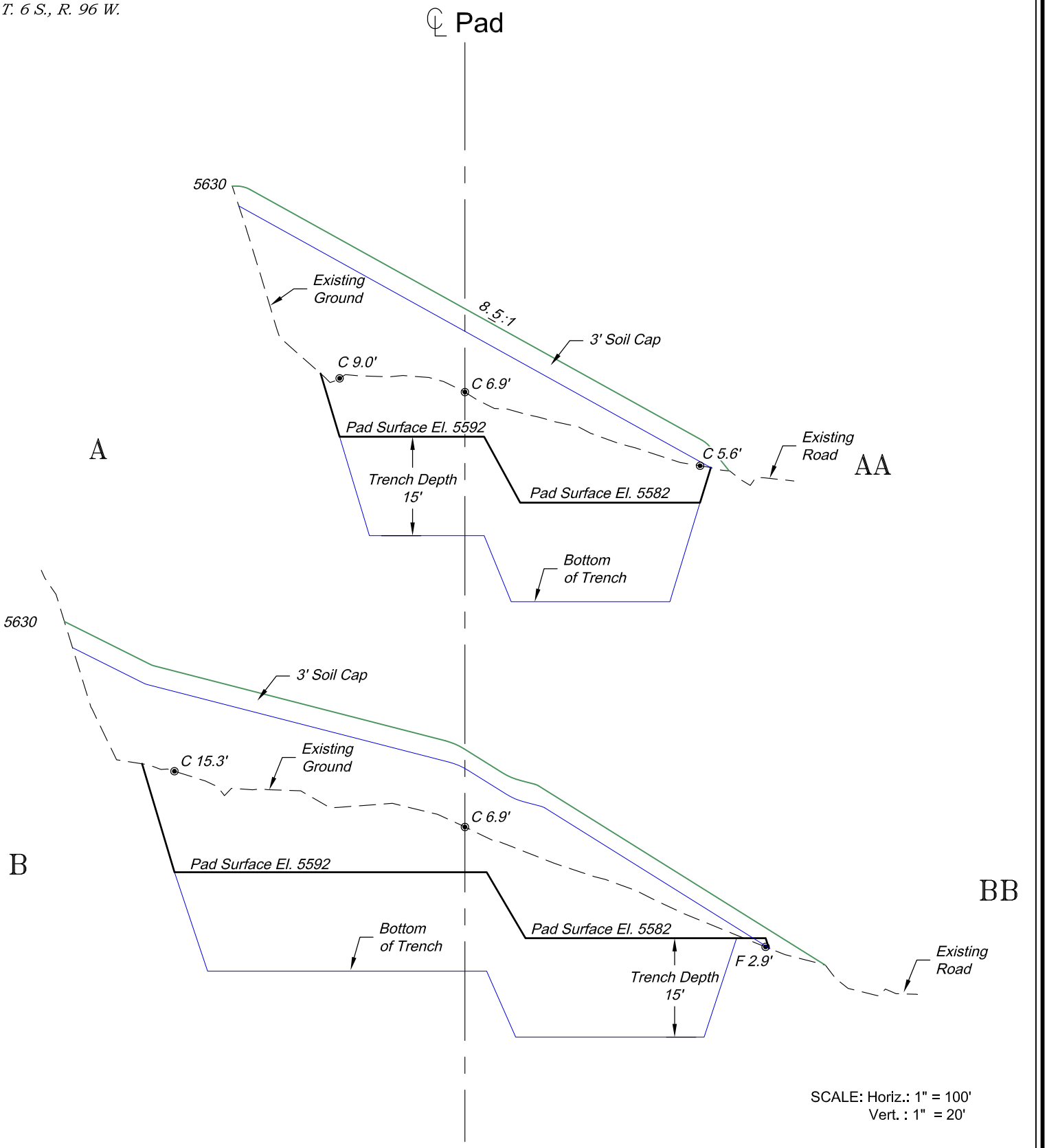
Section 32
T. 6 S., R. 96 W.



SCALE: Horiz.: 1" = 100'
Vert. : 1" = 20'

REVISED: 1/23/14

136 East Third Street
Rifle, Colorado 81650
Ph. (970) 625-2720
Fax (970) 625-2773

BOOKCLIFF Survey Services, Inc.

SCALE:	As Noted
DATE:	11/5/13
PLAT:	2 of 2
PROJECT:	Valley
DFT:	cs

Construction Plan Prepared for:
WPXENERGY WPX Energy Rocky Mountain, LLC

Starkey Cuttings Trench
CONSTRUCTION LAYOUT
CROSS SECTIONS

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Attachment F

RECLAMATION PLAN

WPX ENERGY ROCKY MOUNTAIN, LLC
1058 CR 215
Parachute, CO 81635

DATE PREPARED:
April 2014

1.0 Introduction

This Reclamation Plan (Plan) describes procedures necessary for the reclamation of an Oil and Gas location. The Plan includes final reclamation for a site which is no longer in operation and has been taken out of service and removed. Re-contouring, reseeding, noxious weed treatment, storm water mitigation and monitoring of the site will be addressed.

The reclamation of disturbed land is a critical component when creating a system where ecological functions and values are restored once ground disturbance activities have ceased. Rehabilitation of the disturbed area assists the natural ecological processes to move towards a self-promoting condition. Once a self-supporting environment has been established, the natural processes of the location can take over and continue the rehabilitation processes with minimal intervention from outside parties. The costs associated with the rehabilitation process will be minimized to the operator if proper treatments are applied initially to ensure the best environment possible for rehabilitation treatments to succeed.

Bonding is required for oil and gas lease operations (43 CFR 3104, 36 CFR 228 E). The operator must identify which bond will be utilized to provide the coverage. The bond will cover the activities the operator performs including, but not limited to: plugging leasehold wells, pit closures, surface reclamation, and cleanup of abandoned operations. The Colorado Oil and Gas Conservation Commission (COGCC) 1000 Series Reclamation Regulations declare that reclamation activities will take place no later than twelve (12) months after operations stop on non-crop lands. This Plan is designed to provide guidance concerning reclamation activities for WPX Energy Rocky Mountain, LLC (WPX) land and environmental managers once the site of concern is no longer utilized for operations. The area to be reclaimed shall be kept as weed free as practicable of all undesirable noxious weed species. Weed control measures shall be conducted in compliance with the Colorado Noxious Weed Act (C.R.S. 35-5.5-101.et.seq). Storm water mitigation will be in compliance with the Colorado Department of Health and Environment (CDPHE) Water Quality Division General Permit Series COR-030000 and COGCC 1002.f regulations.

Procedures identified in this plan apply only to the defined area of the Starkey Cuttings Trench location. Personnel working on this project should be familiar with the Plan and its contents prior to commencing reclamation activities.

2.0 Final Reclamation

The final reclamation process has three (3) stages to be completed in sequential order. Reclamation processes will occur no later than twelve (12) months after activity ends and reclamation activities will be in compliance with COGCC Rules 1000 Series. Dust suppression measures are required under the Colorado Department Public Health and Environment (CDPHE) fugitive dust, and will be implemented as applicable. Each stage will be applied to the reclamation of the well pad.

2.1 Stage One (Removal and Disposal)

All manmade structures and equipment will be removed from the site by means of backhoe, bulldozer, skidsteer or other appropriate heavy machinery. WPX will remove all safety and stormwater BMPs, and other surface objects from the premises. All access roads shall be closed, graded and recontoured. Culverts and any other obstructions that were part of the access road(s) shall be removed. Well locations, access road and associated production facilities shall be reclaimed. Pits shall be backfilled. As applicable, compaction alleviation, restoration, and revegetation of sites and access roads shall be performed to the same standards as established for interim reclamation under COGCC Rule 1003. Wooden stakes used to secure wattles and straw bales and other temporary BMPs and/or waste associated with operations on site will be disposed of properly. This includes any trash left behind on location such as pipe fittings, used lumber, and miscellaneous items that have been discarded. Gravel, road base and large cobbles installed on site for surface stabilization controls will be removed. . Temporary fencing put in place during operations will be removed. Existing fence lines or historic fence lines within the designated area of the site will be repaired, replaced, or removed as agreed to by WPX.

2.2 Stage Two (Substrate Preparation)

The condition of the soil is important for the establishment of a healthy self-sustaining environment. Soil samples will be collected to determine the salinity and solidity of the soil. Amendments will be utilized, as applicable.

Stained/contaminated soils will be removed. Locations where the soil has visible spills will have the contaminated soil removed or remediated, and disposed of in accordance with CDPHE and COGCC waste management regulations. Once the substrate is void of chemical presence, and gravel that was applied to the location during operation has been removed, reclamation work associated with the soil may commence.

To alleviate soil compaction, the substrate will be cross ripped to a depth of 18 inches. Cross ripping will take place when the soil moisture is below 35 percent of field capacity. The cross ripping is specified by the COGCC Rules under the 1000 Series. The substrate

shall be contoured to emulate the surrounding lands topography. The soil used to contour the landscape will be applied in accordance to the order it was removed (i.e. first off, last on). This practice will ensure that the soil is applied to the appropriate horizon from which it was taken from initially. Salvaged topsoil will be distributed across the entire disturbed area at a depth of six (6) to twelve (12) inches, as applicable.

2.3 Stage Three (Planting/Timing)

Seedbed preparation will consist of scarifying, tilling or harrowing seedbed to a depth of three (3) to four (4) inches post ripping. This will occur just prior to seeding. Drill seeding will be performed at a depth of 0.5 inches, seed will be covered with soil and lightly compacted to ensure good seed to soil contact. Seed will be applied using a rangeland seed drill with a seed release and agitation mechanism sufficient to allow seeds of various size and density to be planted at the proper seeding depth.

If possible, planting should occur in juncture with a predicted precipitation event. By positioning the seed below the snow fall or rain, the seed will receive contact with the soil and utilize the benefits of the precipitation. Spring planting can be conducted after the frost line is gone from the soil.

3.0 Storm Water Mitigation

3.1 Best Management Practices (BMPs)

To avoid erosion of topsoil and seed transport from storm events, Best Management Practices (BMPs) will be installed where applicable on the perimeter of the location. Given the location of the site, surface roughening, and pocking will reduce storm water impact and capture and retain precipitation. This will aid in the germination of the seed and increase seedling survival.

3.2 Reclamation Monitoring

Monitoring of the vegetative progress is vital to ensure that proper procedures were implemented on the location. Monitoring will allow for early response to potential problems encountered during the reclamation process. Identifying challenges to the reclamation goals at an early stage will allow for adequate time to formulate a response to the situation. By identifying potential complications early in the process, the future costs associated with rehabilitation will be minimized for the operator.

If the treatments do not show the desired outcome, additional actions will be taken to reach reclamation goals. After the source of the problem is identified, careful attention will be paid to the timing of the supplemental treatment. If treatments such as seeding are not carried out at the proper time, the treatment will not be effective and the operator will effectively increase rehabilitation costs.

Monitoring activities will examine several parameters including: the condition of implemented BMPs, growth state and success rate of areas seeded, presence and location of noxious weeds, and possible sources of failure for reclamation processes. Photo documentation is required for all the above parameters for high-quality progress tracking.

After the initial reclamation amendments are applied, and CDPHE requirements of 70 percent (%) pre-disturbance levels have been met as well as COGCC requirements of 80 percent (%) vegetative cover are met, a tri-annual monitoring scheme will be implemented. Monitoring activities will occur in the spring, summer and fall. Qualified individuals will carry out visual surveys. Monitoring will occur until COGCC requirements of 80 percent (%) desired vegetation has been reached.

4.0 References

Colorado Oil and Gas Conservation Commission (COGCC). Rule 1000 series. 2008.

Natural Resources Conservation Service. USDA. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/ February 17, 2012.