

SITE-SPECIFIC QUALITY ASSURANCE & QUALITY CONTROL AUDIT



Permit Closure Type – Final

PERMIT CLOSURE REPORT – RANGELAND

Location ID 330784

Location Name COLORADO ENERGY FEDERAL-610N64W/14SWNW

Report Date

29 Nov 2024

Soil Sage has conducted a thorough data audit as part of our Quality Assurance and Quality Control (QA/QC) protocols.

Quality Assurance & Quality Control Audit

Auditor	Soil Sage
Audit Date	05/30/2023
Review Audit Date	11/29/2024

Audit Methodology

The following source materials were consulted during the QA and QC audit process:

- ✓ Site Permit Closures provided by CIVITAS Resources
- ✓ Colorado Oil & Gas Information System – COGIS Database
- ✓ On-site Evaluation and Proprietary Soil Sage Drone Imagery data collection
- ✓ Review of legacy imagery for site location and facility parameters

All pertinent data, imagery, and materials are included at the end of this report.

Site Description

Name	COLORADO ENERGY FEDERAL-610N64W/14SWNW		
Location ID	330784		
Operator / #	HIGHPOINT OPERATING CORPORATION / 10071		
Field	PAWNEE PIONEER 67805		
County, State	WELD, CO		
Lat/Long	40.836291 / -104.519447		
	<input checked="" type="checkbox"/> Planned Location		As Drilled
Facility Status	CL	Location	SWNW 14 10N64W
Facility Status Date	07/10/2020	Access Road	Oil & Gas Access
Facility Entities	<input checked="" type="checkbox"/> Tank Battery		Pits
	<input checked="" type="checkbox"/> Wells	<input checked="" type="checkbox"/>	Off-Location Flowlines (Form 44)
	Domestic Taps	<input checked="" type="checkbox"/>	On-Location Flowlines (Form 42)
Equipment Remaining on Site	<input checked="" type="checkbox"/> None		Debris or Non-Oil & Gas
	List of Equipment:		
Environment Incidents & Remediation	None	<input checked="" type="checkbox"/>	Spill or Release (Form 19)
	Remediation (Form 27/27A)		
Inspection Corrective Actions (CA)s	<p>Corrective Actions (CA)s were detected during the QA & QC Audit.</p> <p>CA Overall Status: 3 of 3 Completed</p> <p>2 CAs:</p> <p>CA-Approving Inspection Doc # & Date: 696300236 & 06/05/2019</p> <ul style="list-style-type: none"> ○ Inspector: Erica Petrie <p>Form FIRR Doc # & Submittal Date: 401957028 & 03/14/2019</p> <ul style="list-style-type: none"> ○ Overall Status: CAC ○ Originating Field Inspection Report (FIR) Doc: 679600274 ○ CA#: 122120 Date Completed: 02/28/2019 Fence is in compliance with Rule 603.f. COGCC Decision: Approved pending re-inspection ○ CA#: 122121 Date Completed: 02/28/2019 All valves, pipes, and fittings have been securely fastened and maintained in good mechanical condition per Rule 605.d. COGCC Decision: Approved pending re-inspection <p>All corrective actions have been completed. Site ready for re-inspection.</p>		

	<p>1 CA: Spill or Release 440716</p> <ul style="list-style-type: none"> ○ Corrective Actions: Continue Spill Reporting, Remediate Soil by 02/02/2015 ○ Correction Actions Resolving Doc #: 400799905 & 03/06/2015 Attachments: Excavation Report Flowline Leak Resolving Report (41 pages) Doc # 400801806 & 03/02/2015. <p>Complete COGCC Inspection Search Results: Link</p>
<p>Sundry Notice (Form 4)</p>	<p>No Form 4s were detected during the QA & QC Audit.</p>
<p>On Location Flowlines (Form 42)</p>	<p>Form 42s were detected during the QA & QC Audit. See individual scout card data for details.</p>
<p>Off-Location Flowlines (Form 44)</p>	<p>No Form 44s were detected during the QA & QC Audit. However, this location is referenced in Form 44 Doc # 402532103 pertaining to the COLORADO ENERGY FEDERAL Flowline ID 464018 that was abandoned in place on 09/17/2020. This Location, 330784, is one of multiple locations connected to the COLORADO ENERGY FEDERAL Flowline. Two Verification Letters of Abandonment provide additional specifics: Doc # 402532123 and Doc # 402532124.</p>
<p>COGIS Spill or Release (Form 19)</p>	<p>Spill or Release FACILITY ID: 440716</p> <ul style="list-style-type: none"> ○ Status & Date: CL & 01/23/2015 ○ Lat/Long: 40.837950 / -104.521000 ○ Operator: WARD PETROLEUM CORPORATION <p>Form 19 Resolving Doc # & Date: 400799905 & 03/06/2015</p> <ul style="list-style-type: none"> ○ Date Closed: 02/26/2015 ○ Pumper noticed well had not produced for past two days, but polish rod was not hot. Walked around area and noticed spill on surface due to split in flowline. Flowline was test 1 month ago. Immediately shut well in and ordered backhoe to build temporary berm to keep spill from navigating further. Estimated 15 bbl release from pumper. Theoretical release for last two days is 8 bbl of oil. Will assess location with BLM, COGCC, and forestry service to properly remediate spill. ○ Attachments: Excavation Report Flowline Leak Resolving Report (41 pages) Doc # 400801806 & 03/02/2015. <p>Form 19 Initial Doc # & Date: 400779475 & 01/28/2015</p> <ul style="list-style-type: none"> ○ Date of Discovery: 01/23/2015

	<ul style="list-style-type: none"> ○ Spill Type: Recent Spill ○ Reference Location Facility ID & Type: Flowline for Well COLORADO ENERGY FEDERAL #14-4 ○ Operator: WARD PETROLEUM CORPORATION ○ Operator Comments: Pumper noticed well had not produced for past two days, but polish rod was not hot. Walked around area and noticed spill on surface due to split in flowline. Flowline was test 1 month ago. Immediately shut well in and ordered backhoe to build temporary berm to keep spill from navigating further. Estimated 15 bbl release from pumper. Theoretical release for last two days is 8 bbl of oil. Will assess location with BLM, COGCC, and forestry service to properly remediate spill. ○ Corrective Action: Continue Spill Reporting, Remediate Soil by 02/02/2015. See Corrective Action report section above for details.
<p>Field Inspection Form (Form INSP)</p>	<p>Form INSP Doc # & Date: 696104743 & 07/22/2021</p> <ul style="list-style-type: none"> ○ Status Summary: No Follow Up Inspection Required ○ Inspected Facilities: Well COLORADO ENERGY FEDERAL #14-4, Abandoned, Centralized Tank Battery serving Locations 330782, 330783, and 330784. ○ Inspection Status: PA ○ Inspection Date & Inspector: 07/21/2021 ○ Comments: Plugged and Abandoned Well COLORADO ENERGY FEDERAL #14-4 appears to be cut/capped. Form 6 Doc # 402437985 indicates plugging, cut/cap date of 07/10/2020. Approved. Observed abandoned centralized Tank Battery serving three locations (330782, 330783, and 330784) and confirmed all equipment removed. GPS coordinates for Tank Battery: 40.839987 / -104.518626). Overall, during this inspection, NO possible compliance issues were observed. ○ Attachments: Inspection Photos Doc # 696104744. Photos show Well COLORADO ENERGY FEDERAL #14-4 as well as the Centralized Tank Battery for 3 Locations (330782, 330783, and 330784). <hr/> <p>Form INSP Doc # & Date: 696300236 & 06/05/2019</p> <ul style="list-style-type: none"> ○ Status Summary: This is a Follow Up Inspection. No Follow Up Inspection Required. ○ Inspected Facilities: Well COLORADO ENERGY FEDERAL #14-4 ○ Inspection Status: PR

- **Inspection Date & Inspector:** 06/05/2019 by Erica Petrie
- **Comments:** During the field inspection for the well, the following compliance issues (Corrective Actions) were resolved from previous Inspection Doc # 679600274.
- **Attachments:** Inspection Photos Doc # [696300237](#)

Form INSP Doc # & Date: [679600274](#) & 02/05/2019

- **Status Summary:** PR
- **Inspected Facilities:** Well COLORADO ENERGY FEDERAL #14-4
- **Inspection Status:** SI
- **Inspection Date & Inspector:** 01/29/2019 by Brittani Santistevan
- **2 Corrective Actions:** 1) Fencing: Wire fence in disrepair - comply with Rule 603.f. 2) Equipment: Tubing not fastened on the prime mover. Securely fasten all valves, pipes, and fittings to ensure good mechanical condition, inspect at regular intervals and maintain in good mechanical condition per Rule 605.d.
- **Attachments:** Inspection photos Doc # [679600278](#)

Form INSP Doc # & Date: [667400535](#) & 01/28/2015

- **Status Summary:** not provided
- **Inspected Facilities:** Well COLORADO ENERGY FEDERAL #14-4
- **Inspection Status:** EI
- **Inspection Date & Inspector:** 01/26/2015 by Rick Allison
- **Comments:** COGCC Environmental Staff Inspection of Spill ID 440716. Supplemental Spill Report is due by 2/2/2015. Additional Supplemental Reports may be submitted as additional documentation becomes available (e.g. waste manifest, lab reports). Spill appears to have affected an approximate 45' x 150' area on the surface. Operator plans to excavate impacted soil and remove impacted soil for disposal. Operator will coordinate surface disturbance with the USFS. Operator shall demonstrate that soil remaining in the excavation meets the Concentration Levels listed in Table 910-1. Soil samples shall be collected from each sidewall and the base of the excavation, at a minimum. Soil sample analysis shall include BTEX, TPH-GRO and TPH-DRO.
- **Corrective Actions:** Continue Spill Reporting, Remediate Soil by 02/02/2015
- **Correction Actions Resolving Doc #:** [400799905](#) & 03/06/2015 **with**

	<p>attachments: Excavation Report Flowline Leak Resolving Report (41 pages) Doc # 400801806</p> <ul style="list-style-type: none"> ○ Inspection Attachments: Inspection Photos of Flowline Spill/Release Docs # 667400536 and 667400537.
COGIS Tank Facilities Information (Scout Card)	<p>No Tank Battery documents were detected during this QA/QC Audit. However, the Tank Battery is referenced in Inspection Doc # 696104743. It is a Centralized Tank Battery serving 3 Locations: 330782, 330783, and 330784. GPS coordinates: 40.839987 / -104.518626.</p>
COGIS Well Information (Scout Card)	<p>Well Name: COLORADO ENERGY FEDERAL #14-4 API#: 05-123-19618 FACILITY ID: 251814</p> <ul style="list-style-type: none"> ○ Status & Date: PA & 07/10/2020 ○ Lat/Long As Drilled: 40.836230 / -104.519700 ○ Form 6 Doc # & Date: 402437985 & 01/26/2021 ○ Form 42 Doc # & Date: 402433700 & 06/29/2020 <p>Purpose: Start of plugging operations</p>

COGCC Abbreviations: [Location & Facility Status Codes](#), [Inspection Types & Statuses](#) and [COGCC Help](#).

Audit Key Findings – Designation Land Use Observations

PREVIOUS LAND USE	CURRENT LAND USE
<p>Reference Imagery for Infrastructure: Landsat/Copernicus 2013</p>	<p>Remotely Sensed Imagery: 05/25/2023</p>
<p>Designation: Oil & Gas Facility</p>	<p>Designation: Rangeland</p>

The following imagery sources were reviewed during this audit:

EarthExplorer, DRCOG 2002 - 2014, NAIP Imagery 2011, 2013, 2015, 2017, 2019, 2021, ESRI Maxar and Remotely Sensed Imagery Sep 2022

Closure Information

This is the Location of plugged and abandoned Well COLORADO ENERGY FEDERAL #14-4. The well's off-site, centralized Tank Battery (Lat/Long. 40.839987 / -104.518626) is abandoned and shared with Locations 330782 and 330783. This Location is one of multiple locations connected to the COLORADO ENERGY FEDERAL Flowline (ID 464018) that was abandoned in place on 09/17/2020.

Corrective action annotated at Location 330368 applies to this site.

Site Photo

Site Investigation and Photos Date

26 Aug 2024

Cardinal directional photos of the site



North



East



South



West

ATTACHMENTS

Reclamation Plan

Site Specific Reclamation Plan
Soil Analytical Spreadsheet
Ward Laboratory Analysis
Forest Service Seed Mix

Maps and Figures

Area Maps

Current Site Overview
Reclaim Area

SITE-SPECIFIC RECLAMATION PLAN



Permit Closure Type – Final

Failed Reclamation Inspection

Site Description

Name	COLORADO ENERGY FEDERAL-610N64W/14SWNW
Location ID	330784
Operator / #	HIGHPOINT OPERATING CORPORATION / 10071
Field	PAWNEE PIONEER 67805
County, State	WELD, CO

Report Date

29 Nov 2024

Site Evaluation

Investigator: Soil Sage

Investigation Date: 26 Aug 2024

Previous Investigation Date: 30 May 2023

Reference Soil Information: The Pawnee area contains six primary soil types and three secondary soil types.

Primary Map Units

- MU 5 – Ascalon Sandy Loam
 - This soil is formed from wind-reworked alluvium and/or calcareous sandy eolian deposits. Landform is interfluvial, with the Sandy Plains Ecological Site. Soils are well drained with a moderate water holding capacity, and slope 5 to 9 percent.

Secondary Map Units

- MU 51 – Peetz Gravelly Sandy Loam
 - This soil is formed from calcareous gravelly alluvium. Landform is ridges and breaks, with the Gravel Breaks Ecological Site. Soils are somewhat excessively drained with a low water holding capacity, and slope 5 to 20 percent.

Soil chemical properties within the rooting zone to 50 inches is described in the Soil Properties – USDA Soil Properties section of this report.

Current Land Use in Reference Area: Range land

Observations

Overall, for the Pawnee cluster the site is on federal land with cattle grazing rights. Intermixed with wildlife grazing. The road system is currently being used.

Weed pressure has occurred along the roads and at each site.

Site Soils

During the field investigation, Soil Sage collected soil samples from 0-8 inches within the reclamation area. These soils were analyzed to establish current soil physicochemical properties for reclamation planning. See spreadsheet attachment Table 1 for site specific soil characterizations, that include the previous soil analysis and the associated reference soils. Reference USDA Soils and Ecological Site Description for historical properties.

Site Specific Soil Characterization Data

Sample Date: 26 Aug 2024

Previous Sampling Date: 30 May 2023

Soil Analytical Summary

The soil sampling design was based upon the land use type and the number of soil types, referred to as soil Map Units.

Summary of the average analytical soil results for the Site.

Physical and Chemical Properties for the topsoil and subsoil

Depth inches	Texture	pH	EC	OM %	SAR
Topsoil 8	Sandy Clay Loam	7.5	1.16	1.8	1.3
Previous Site Topsoil 12 (avg)	Sandy Clay Loam	8.0	0.65	2.0	0.4
Reference 4 Topsoil	Sandy Clay Loam	8.0	0.25	2.7	0.1

Plant Available Chemical Properties for topsoil and subsoil

Depth inches	Nitrogen (N) ppm	Phosphorus (P) ppm	Potassium (K) ppm	N Lbs/A
Topsoil 8	38	13	580	92
Previous Site Topsoil 12 (avg)	18	14	416	32
Reference 4 Topsoil	0.5	6	363	1

Plant Nutrients Salts topsoil and subsoil

Depth inches	Sodium (Na) ppm	Chloride (Cl) ppm	Sulfates (S) ppm
Topsoil 8	91	16	11
Previous Site Topsoil 12 (avg)	26	1.8	10
Reference 4 Topsoil	7	0.6	1.9

This site does not have elevated values for Electric Conductivity (EC) and Sodium Absorption Ratio (SAR*). For SAR values that approach and exceed 1, this would indicate the presence of naturally occurring salts or the accumulation of salts based on other factors.

In addition, the analysis performed at the laboratory identified the presence of two additional salts – Chloride and Sulfate. These salts at elevated concentrations, typically above 100 ppm, can impede plant growth depending on environmental conditions, previous land use activities and other soil properties.

*Sodium Adsorption Ratio - SAR is a measure of the ratio of sodium (Na+) relative to calcium (Ca2+) and magnesium (Mg2+) in the water extract (solution phase) from a saturated soil paste.

Vegetation

Site vegetation observations took place in Aug within the reclamation extent. Weeds are the primary vegetation during the site visit.

Weeds

Weed Summary

Common Name	Weed List Type
Kochia	Common
Amaranths	Common

Weed Inventory Criteria

- Each site is accessed for noxious weeds and common weeds
- Data are aggregated using point locations coupled with percent cover assessments and area measurements as needed
- Governance - Colorado Department of Agriculture - Colorado Noxious Weeds List, effective October 2020
- List A - Designated for eradication, List B - Designated to stop the continued spread, List C - Facilitate more integrated effective weed management, Watch List - Determined to pose a potential threat to agriculture and natural productivity.
- Common - designates weeds that do not fall within the Colorado Department of Agriculture lists
- Other - designates other identified weeds at the site

Site Characteristics

Soil/Erosion

Exposed soils have moderate susceptibility to water erosion and are in the high susceptible group for wind erosion due to ecosystem dynamics and vegetative cover.

Summary Acreage Table

Description	Acres
Total Disturbance Extent	0.9
○ Reclaim Extent	0.9
○ Road*	Included

The road extends to the main access road.

*Road reference the overview map for full road extent.

Site Recommendation and Re-Evaluation

Replacement Soil Requirements

Texture: Clay Loam

Organic Matter: 3%

pH: 7.7 - 7.9

Nitrate N: less than 11 ppm

Sodium: less than 90 ppm

Chloride Cl: less than 10 ppm

Sulfate S: less than 18 ppm

Soil tests must be submitted to Luke Kelly (lkelly@civiresources.com) and Sam Streeter (sam@soilsage.com) for approval prior to use on the project. Certified Weed Free Straw must be used, and evidence must be supplied to Luke Kelly and Sam Streeter. Soil Sage will be performing inspections during reclamation activities and after work is complete to ensure success. Schedule of reclamation activities (approximate) must be submitted before reclamation starts and any changes to the schedule must be communicated via email to Luke Kelly and Sam Streeter.

Seed Mix - NRCS

Vegetation Seed Mix

Forest Service has provided a seed mix to Civitas.

Seed mix included in the attachment section.

Soil Amendments

New soil specifications are outlined above.

Application of soil amendments for this prairie ecosystem will be limited to UREA (46-0-0) 50 lbs./acre for plant establishment.

Reclamation Activities and Notes:

- Continuous bare ground on road and pad
- Pad has surface gravel
- Low weed impact
- Recommendations
 - Remove, replace, decompact, disc, seed and straw crimp. Use USFS seed mix that is adjusted to work with the entire site

Road

- Reclaim to USFS road.

Reclaim Area Protocol

Step	Description	Complete Date
1 – Soil Samples	Collection of soil samples from the site	26 Aug 2024
2 – Remove Exclusion Fence	Not Applicable	
3 – Soil Removal to Mapped Extent 0.3 acres	Removal of non-compliant soil to 12 inches within the reclaim extent.	
4 – Soil Removal Inspection	In-person inspection and confirmation with soil sampling	
5 – Imported Soil Sample Test Results Review*	Verification of imported soil with current lab test results	
6 – Soil Import	Import soils as specified in the plan	
7 – Seeding – 0.9 acres	Planting appropriate seed mix for reclamation 20 PLS/sq ft	
8 – Straw Spread and Crimp	Spreading and crimping straw to stabilize soil	
9 – Monitor	Continuous monitoring post reclamation	
10 – Weed Management	Monthly monitoring is recommended with appropriate herbicide control	

*Soil Import Properties – reference Soil Replacement Requirements

Site Photos – Soil 6 – 330784

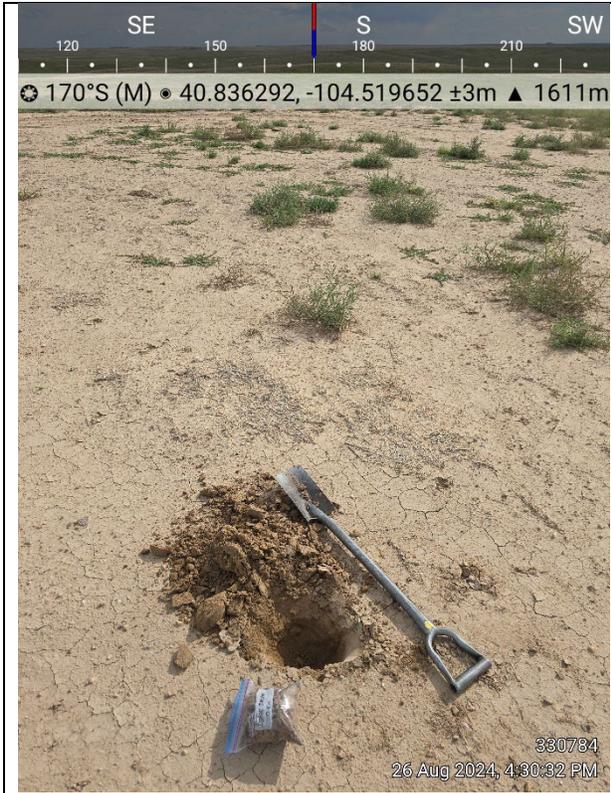
Lat/Long: 40.836279 / -104.51967

Nearest Facility #: 330784

Date: 26 Aug 2024

Photo locations correspond with the overview map and soil table.

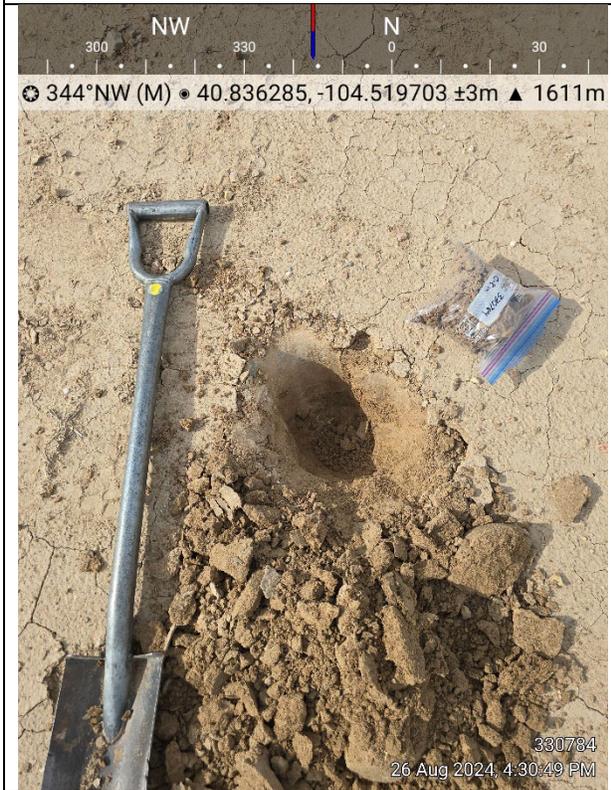




South



West



North and Ground

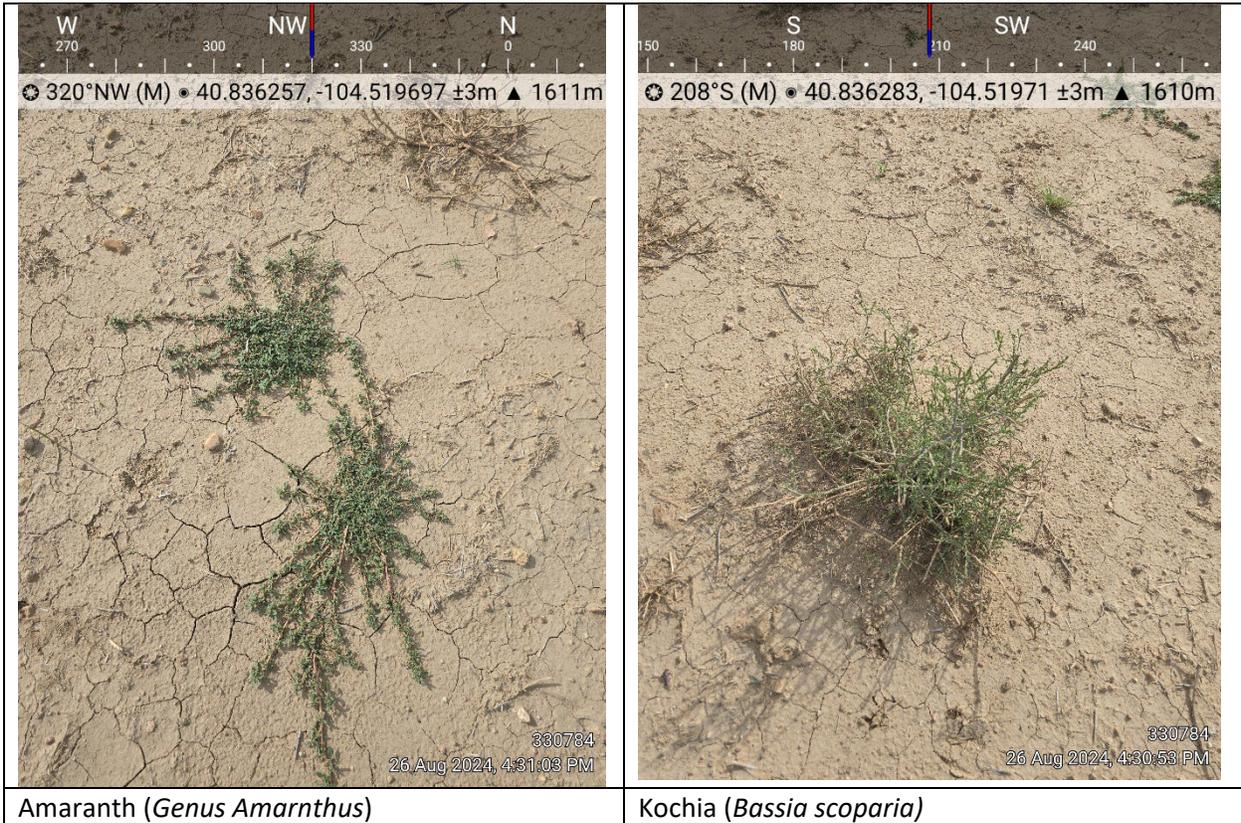
Site Photos – Vegetation – 330784

Lat/Long: 40.836257 / -104.51971

Nearest Facility #: 330784

Date Range: 26 Aug 2027

Photo locations correspond with the overview veg and vegetation table.



Amaranth (*Genus Amaranthus*)

Kochia (*Bassia scoparia*)

TABLE 1: Soil Report

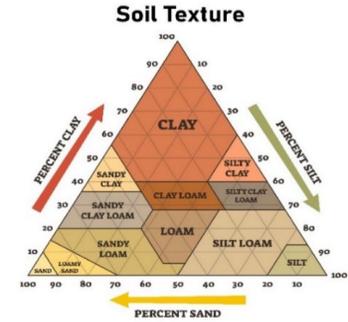
Client	Civitas	Date	26-Aug-24
Operator	Bonanza Creek	Ward	20240903
Location ID - Name	Pawnee		
Type	Location Topsoil replacement		



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SOIL REPORT

Location	Soil Profile			Physical Properties			Texture Hydro
	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	Partical Size			
				Sand %	Silt %	Clay %	
CIV-330368-SOIL 1	0	8	8	34	22	44	Clay
CIV-330502-SOIL 2	0	8	8	46	24	30	Sandy Clay Loam
CIV-330688-SOIL 3	0	8	8	54	18	28	Sandy Clay Loam
CIV-330782-SOIL 4	0	8	8	44	20	36	Clay Loam
CIV-330783-SOIL 5	0	8	8	44	18	38	Clay Loam
CIV-330784-SOIL 6	0	8	8	54	16	30	Sandy Clay Loam
CIV-431982-SOIL 7	0	8	8	44	18	38	Clay Loam



Location	Soil Profile			Chemical Properties					SAR	Calcium Carbonate %
	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	pH Sat Paste	ECe mmhos/cm	CEC meq/100g	Excess Lime	Organic Matter (LOI) %		
CIV-330368-SOIL 1	0	8	8	7.6	1.58	52.6	HIGH	2.9	10.1	2.1
CIV-330502-SOIL 2	0	8	8	7.2	2.08	39.9	HIGH	2	1.4	1.5
CIV-330688-SOIL 3	0	8	8	7.3	1.96	44.2	HIGH	2	1.4	2.9
CIV-330782-SOIL 4	0	8	8	6.9	1.43	23.2	LOW	1.8	0.8	0.1
CIV-330783-SOIL 5	0	8	8	7.4	1.22	50.8	HIGH	2.6	1.1	6.6
CIV-330784-SOIL 6	0	8	8	7.5	1.16	47.4	HIGH	1.8	1.3	3.6
CIV-431982-SOIL 7	0	8	8	7.4	1.23	39.2	HIGH	3.1	0.6	0.8
ECMC Table 915-1				6-8.3	<4				<6	

Extraction Method

Location	Soil Profile			Extraction Method			Nitrate - N Lbs/A
	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	KCL Nitrate-N ppm	M3 Phosphorus P ppm	NH4OAc Potassium K ppm	
CIV-330368-SOIL 1	0	8	8	24.2	28	798	58
CIV-330502-SOIL 2	0	8	8	67.4	32	541	162
CIV-330688-SOIL 3	0	8	8	35.4	87	329	85
CIV-330782-SOIL 4	0	8	8	46.6	26	363	112
CIV-330783-SOIL 5	0	8	8	46.8	30	541	112
CIV-330784-SOIL 6	0	8	8	38.2	13	580	92
CIV-431982-SOIL 7	0	8	8	44.2	20	712	106



Location	Soil Profile			Plant Available			Hot Water	Ca-NO3	M3 Sulfate	AB-DTPA	Iron	Manganese	Zinc
	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	NH4OAc Calcium	NH4OAc Magnesium	NH4OAc Sodium							
				Ca ppm	Mg ppm	Na ppm							
CIV-330368-SOIL 1	0	8	8	8408	411	1174	5.83	76	14.3	0.43	1.1	1.7	0.35
CIV-330502-SOIL 2	0	8	8	7035	351	96	0.57	45.8	25.8	0.33	2	2	0.26
CIV-330688-SOIL 3	0	8	8	7453	668	125	1.01	36.6	108	0.62	5.9	2.5	2.17
CIV-330782-SOIL 4	0	8	8	3757	394	54	0.35	16.6	15.2	0.45	2.7	2.8	0.33
CIV-330783-SOIL 5	0	8	8	9125	404	91	0.89	18.7	16.6	0.31	1.2	1.8	0.95
CIV-330784-SOIL 6	0	8	8	8517	348	91	0.4	15.4	11.3	0.21	1.1	1	2.15
CIV-431982-SOIL 7	0	8	8	6744	413	54	0.48	24.2	14.1	0.32	1.3	1.3	0.31

ECMC Table 915-1

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Terms Defined

- pH: A measure of the acidity or basicity (alkalinity) of a soil. pH is defined as the negative logarithm (base 10) of the activity of hydronium ion in a solution
- ECe: The Electrical Conductivity of a saturated soil Extract that measures salinity
- Alkalinity: Alkalinity indicates a solution's power to react with acid and buffer its pH - the power to keep its pH from changing. The higher the Alkanility, the higher the buffering capacity against pH change.
- CEC - Cation Exchange Capacity: The measure of how many cations can be retained on soil particle surfaces.
- CEC Ranges:
 - Range 11-50: High Clay, more lime to correct a given pH, greater capacity to hold nutrients, physical effects of high clay content, high water-holding capacity
 - Range 1-10: High Sand, Nitrogen and potassium leaching, less lime to correct a given pH, physical effects of high sand content, low water-holding capacity

Optimal pH range for plant growth

6.0 -7.0



Reference Key
Low
Medium
High
Optimal
Neutral
No Reference
Analytical Error

Typical Soil Concentrations sufficient for plant growth				
Element	Symbol	mg/kg	percent	Relative number of atoms
Nitrogen	N	15,000	1.5	1,000,000
Potassium	K	10,000	1	250,000
Calcium	Ca	5,000	0.5	125,000
Magnesium	Mg	2,000	0.2	80,000
Phosphorus	P	2,000	0.2	60,000
Sulfur	S	1,000	0.1	30,000
Chlorine	Cl	100	--	3,000
Iron	Fe	100	--	2,000
Boron	B	20	--	2,000
Manganese	Mn	50	--	1,000
Zinc	Zn	20	--	300
Copper	Cu	6	--	100
Molybdenum	Mo	0.1	--	1
Nickel	Ni	0.1	--	1

- Notes
- Root Formation
- Chlorophyll Formation
- Proteins & NPK Uptake
- Chlorophyll catalyst
- Absorption Calcium
- Photosynthesis & Respiration - correlated with %OM
- Fixation of Organic Nitrogen

Source: E.Epstein, 1965

Ag Testing - Consulting

Account No. : 19356

Soil Analysis Report

DANIELS, JUDY
SOIL SAGE LLC
8323 DEPEW WAY
ARVADA

CO 80003

Invoice No. : 1430856
Date Received : 08/29/2024
Date Reported : 09/03/2024

Results For : CIV
 Location : PAWNEE

Lab No. : 90067 Depth : 0 - 8
 ID : CIV-330784-SOIL 6

1:1 Soil pH	8.1
Soluble Salts 1:1, mmho/cm	0.25
Excess Lime Rating	HIGH
Organic Matter LOI, %	1.8
Nitrate-N KCl, ppm N	38.2
Nitrate-N, lbs N / Acre	92
Phosphorus M3, ppm P	13
Potassium NH ₄ OAc, ppm K	580
Sulfate M-3, ppm S	11.3
Zinc DTPA, ppm Zn	2.15
Iron DTPA, ppm Fe	1.1
Manganese DTPA, ppm Mn	1.0
Copper DTPA, ppm Cu	0.21
Calcium NH ₄ OAc, ppm Ca	8517
Magnesium NH ₄ OAc, ppm Mg	348
Sodium NH ₄ OAc, ppm Na	91
Chloride Ca-NO ₃ , ppm Cl	15.4
Boron Hot Water, ppm B	0.40
Calcium Carbonate, %	3.6

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
47.4	0	3	90	6	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	40
Sat Paste pH	7.5
Sat Paste ECe, mmho/cm	1.16
HCO ₃ , ppm	110
Cl, ppm	26
Ca, ppm	114
Mg, ppm	13
Na, ppm	54
S, ppm	16.0

Reviewed By : Nick Ward

9/6/2024

Copy : 1

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Account No. : 19356

Soil Analysis Report

DANIELS, JUDY
SOIL SAGE LLC
8323 DEPEW WAY
ARVADA CO 80003

Invoice No. : 1430856
Date Received : 08/29/2024
Date Reported : 09/03/2024

Results For : CIV
Location : PAWNEE

Sodium Adsorption Ratio			1.3
Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Clay Loam	54	16	30

Scientific Binomial	Common Name	Season	Seeds/lb	Percent of mix	Total Pounds PLS Per Acre	Variety
<i>Pascopyrum smithii</i>	western wheatgrass	Cool	110,000	0.3	11.88	
<i>Bouteloua curtipendula</i>	side-oats grama	Warm	191,000	0.15	3.42	Butte or Trailway
<i>Buchloë dactyloides</i>	buffalograss	Warm	56,000	0.15	11.67	Cody or Tatanka
<i>Chondrosum gracile</i>	blue grama	Warm	825,000	0.15	0.79	Alma or Hachita
<i>Nassella viridula</i>	green needlegrass	Warm	181,000	0.05	1.20	
<i>Sporobolus cryptandrus</i>	sand dropseed	Warm	5,398,000	0.05	0.04	
<i>Hesperostipa comata</i>	needle-and-thread	Cool	115,000	0.1	3.79	Canbar or High Plains
<i>Cleome serrulata</i>	Rocky Mtn beeplant	NA	65,900	0.03	2.0	
<i>Sphaeralcea coccinea</i>	scarlet globemallow	NA	500,000	0.02	0.17	
			TOTAL	1	34.95	

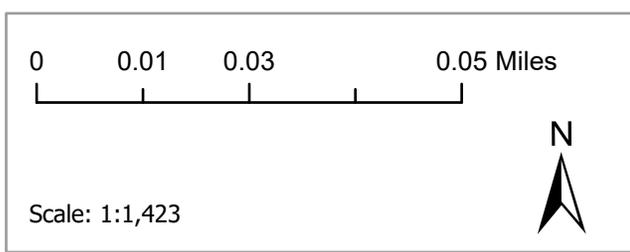
PLS = Pure, Live Seed



**CIV - 330784 - Colorado Energy Federal
610N64W/14SWNW
Map Extent - Reclaim Extent**

Imagery: RS Orthomosaic & DSM
 Imagery Date: 26 Aug 2024
 Map Date: 02 Dec 2024
 Datum: NAD_1983_UTM_Zone_13N
 POC: Soil Sage

- ◆ Oil and Gas Locations
- Soil Sample Point
- ▭ Disturbance Boundary
- ▭ Soil Removal & Replace



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 Bureau, USDA, USFWS





CIV - 330784 - Colorado Energy Federal 610N64W/14SWNW

Map Extent - Reclaim Extent

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 Datum: NAD_1983_UTM_Zone_13N
 POC: Soil Sage

- ◆ Oil and Gas Locations
- ▭ Disturbance Boundary
- ▭ Seed Boundary

0 0.01 0.03 0.05 Miles

Scale: 1:1,423

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