SITE-SPECIFIC QUALITY ASSURANCE & QUALITY CONTROL AUDIT

Permit Closure Type – Final

PERMIT CLOSURE REPORT – RANGELAND

Location ID 331251
Location Name DOW/21-28 RTB

Report Date

31 May 2023

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

Initial Job Assignment

Client	CIVITAS Resources
Work Assignment	CPW Centennial Valley State Wildlife Area Reclamation Report
Date	April 26, 2023

Quality Assurance & Quality Control Audit

Auditor	Soil Sage
Audit Date	05/02/2023

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	DOW/21-28 RTB			
Location ID	331251			
Operator / #	BONANZA CREEK ENERGY OPERATING COMPANY LLC / 8960			
Field	WATTENBERG 90750			
County, State	WELD			
Lat/Long	40.375970 / -104.443140			
		Planned Location	X	As Drilled
Facility Status	CL	**Location**		NENW 28 5N63W
Facility Status Date	11/11/2018	**Access Road**		Oil & Gas Access
Facility Entities	X	Tank Battery		Pits
	X	Wells	X	Off-Location Flowlines (**Form 44**)
		Domestic Taps	X	On-Location Flowlines (**Form 42**)
Equipment Remaining on Site		None		Debris or Non-Oil & Gas
	X	List of Equipment: unused midstream equipment		
Environment Incidents & Remediation		None	X	Spill or Release (**Form 19**)
		Remediation (**Form 27/27A**)		
Inspection Corrective Actions (CA)s	**Corrective Actions (CA)s were detected during the QA & QC Audit.** **CA Overall Status:** 2 of 2 CAs have not been completed **Originating Field Inspection Doc # & Date:** 697504606 & 04/28/2023 ○ See "Field Inspection Form" section of this report below for details. **Complete COGCC Inspection Search Results: Link**			
Sundry Notice (Form 4)	**Form 4 Doc # & Date:** 401203675 & 03/03/2017 ○ **Purpose:** Change of Location Name ○ **From:** DOW-65N63W/28NENW **To:** DOW/21-28 RTB			
On Location Flowlines (Form 42)	**Form 42s exist for Related Facilities –** See individual scout card data for report details.			
Off-Location Flowlines (Form 44)	**No Form 44s were detected during the QA & QC Audit.**			
COGIS Spill or Release (Form 19)	**Spill or Release** **FACILITY ID:** 439477 ○ **Status & Date**: CL & 10/23/2014 ○ **Lat/Long:** 40.375042 / -104.438176 **Form 19 Resolving Doc # & Date:** 400823760 & 04/16/2015			

	○ **Date Closed:** 04/10/2015 ○ **Corrected Actions (CA):** CA Completed and Request for CA Closure approved by Brian Dodek, COGCC. ○ **Operator Comments:** Once the bypass line failed and produced water surfaced at the tank battery, emergency response personnel were dispatched to remediate the release. Crews excavated down to the bypass line around the area where the produced water surfaced and hauled the soil to the Buffalo Ridge Landfill in Keenesburg, Colorado. During excavation activities groundwater was encountered. A vacuum truck was dispatched to pump groundwater from the excavation to reduce the chance for cross-contamination. The groundwater was hauled to a licensed disposal facility. No sheen or odor was observed on groundwater. Following excavation and groundwater removal, soil and groundwater samples were collected. Analytical results indicate that both the remaining soil and groundwater are compliant with COGCC Table 910-1 standards. **Form 19 Initial Doc # & Date:** 400715890 & 10/27/2014 ○ **Date of Discovery:** 10/22/2014 ○ **Spill Type:** Recent Spill ○ **Reference Location Facility ID & Type:** 331251 & Tank Battery ○ **Operator:** BONANZA CREEK ENERGY OPERATING COMPANY LLC ○ **Operator Comments –** While preparing for workover activities, a separator bypass line failed after pressuring up resulting in an approximate 1 bbl produced water release. Bonanza Creek has already dispatched personnel and equipment to assess and remediate the release.
Field Inspection Form (Form INSP)	**Form INSP Doc # & Date:** 697504606 & 04/28/2023 ○ **Status Summary:** Follow Up Inspection Required ○ **Inspected Facilities:** Well DOW #21-28 access road and Off-Site Tank Battery (assigned COGCC Location ID: 447290) ○ **Inspection Status:** RI – Reclamation Inspection (Final) ○ **Inspection Date & Inspector:** 04/20/2023 by Chris Binschus ○ **Complaint #:** 403379491 ○ **Nature of Complaint:** CPW (landowner) had concerns about failed reclamation that was previously performed by BONANZA CREEK approximately three years ago. ○ **Comments:** The well location and access road consisted mostly of weeds or bare soil. Bare soil was more prevalent along the access

	roads. The tank battery had the most perennial vegetation establishment; however, it was not reflective of reference areas and it had the most noxious weed establishment. Due to the lack of desirable vegetation establishment, COGCC is requiring soil sampling. Operator shall take samples along portions of the failed reclamation and background reference samples for comparison. Operator shall take discrete samples at six (6) inches intervals to a minimum depth of two (2) feet. See COGCC Comments Section for details on analytics. Note- Operator may need to install temporary fencing to facilitate on-going grazing operations. ○ **Additional Comment:** What appeared to be unused midstream equipment was observed at the offsite tank battery location ○ **Corrective Action #1:** Comply with Rule 1004 to conduct additional reclamation. For soil samples, submit results via Form 4 Sundry Notice to the attention of Chris Binschus no later than two weeks after receiving results. Soil samples shall be overlaid on an aerial map depicting where soil sample locations and reference samples were taken. ○ **Corrective Action #2:** Operator shall coordinate with the midstream Operator to remove equipment per Rule 1004.a. The corrective action date is the date the location was observed out of compliance. ○ **CA Dates:** 04/20/2023 ○ **Overall Final Reclamation: Fail** ○ **Attachments:** Inspection Photos Doc # 697504616
COGIS Tank Facilities Information (Scout Card)	**Tank Battery Name:** DOW/21-28 **FACILITY ID:** 447290 ○ **Status & Date**: AC & 03/02/2016 ○ **Lat/Long:** 40.374950 / -104.438000 ○ **COGCC documents:** No documents were detected during the QA & QC Audit, however, this off-site Tank Battery for is referenced in the Final Reclamation Inspection photos listed above in the “Field Inspection Form” section of this report.
COGIS Well Information (Scout Card)	**Well Name**: DOW #21-28 **API#**: 05-123-20383 **FACILITY ID**: 259830 ○ **Status & Date**: PA & 11/11/2018 ○ **Lat/Long As Drilled**: 40.375970 / -104.443140

	○ **Form 6 Subsequent Doc # & Date:** 401879689 & 03/29/2019 ○ **Form 42 Doc # & Date:** 401981598 & 03/22/2019 **Purpose:** Flowlines Abandoned

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
Reference Imagery for Infrastructure: Landsat/Copernicus 2013	**Remotely Sensed Imagery:** 05/02/2023
Designation: Oil and Gas Facility	**Designation:** Rangeland

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

Landowner Colorado Parks and Wildlife (CPW) filed a complaint on 04/20/2023 stating concerns about failed reclamation activities at the Centennial Valley State Wildlife Area performed by operator BONANZA CREEK ENERGY OPERATING COMPANY LLC approximately three years ago. In response, COGCC Reclamation Specialist Chris Binschus performed a Reclamation Inspection of the area that failed and identified two Corrective Action (CA)s requiring the operator to perform soil sampling and remove unused midstream equipment.

The inspection covers multiple locations and facilities, including this Location (331251) with Well DOW #21-28, access road, and off-site Tank Battery (447290). It also covers the access road and Tank Battery only for nearby Location 331623 (well DOW-LAURA #3-28 is covered under a separate Final Reclamation Inspection for 331623). The inspection noted the area consisted mostly of weeds or bare soil. Bare soil was more prevalent along the access roads. The tank battery had the most perennial vegetation establishment; however, it was not reflective of reference areas, and it had the most noxious weed establishment.

Our post-inspection audit revealed a produced water release at the Location and Tank Battery on 10/22/2014. The release is reported at this Location under Spill or Release ID 439477 (case closed on 04/10/2015 with an approved Request for CA Closure).

Site Photos

Site Investigation and Photos Date
05/02/2023

Cardinal directional photos of the site

North

East

South

West

ATTACHMENTS

Maps and Figures

Location Maps

CPW Overview Roads and Reclamation Extents

Area Maps

Previous Infrastructure Overview
Current Site Overview
Elevation & Contours
Slope
Hydrology
NDVI Composite
NDVI

Reports

Reclamation Report
Soil Analytics
- Overview Table
- Lab Reports

Reference Soil and Vegetation
Observations

Background Information

Natural Resources Conservation Service (NRCS) Map Unit Description

Reference Soil and Ecological Description

Supplemental Data

The following information was provided by Civitas.
Topsoil Analytical Report
Seed Mix

SITE-SPECIFIC RECLAMATION PLAN

Permit Closure Type – Final

Failed Reclamation Inspection

Site Description

Name	DOW/21-28 RTB
Location ID	331251
Operator / #	BONANZA CREEK ENERGY OPERATING COMPANY LLC / 8960
Field	WATTENBERG / 90750
County, State	WELD, CO
Associated Facilities	Tank Battery associated with Location 447290, On- and Off-Location Flowline

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Report Date

31 May 2023
Revision 5 October 2023

Site Evaluation

Investigator: Soil Sage

Investigation Date: 2-4 May 2023

Reference Soil Information: This site is comprised within one soil type, Map Unit 10 - Ellicott-Ellicott sandy-skeletal complex, 0 to 3 percent slopes, sandy texture surface and at depth. These soils are formed from noncalcareous, stratified sandy alluvium. Landform is drainageways, flood plains on intermittent streams. Excessively drained with a very low available water holding capacity. Depth ranges from 0 – 10 inches, the pH is 6.5 and the organic matter is 0.35%.

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
The Northern section is intermixed leased grazing land and "native" ecosystem along the South Platte River. The reclaimed areas have residual gravel and excessive applications of manure which have impacted the recovery of the sites.
Weed pressure has occurred along the roads and patchy areas at each site.
Debris remains along the roads and sites in the form of silt fencing, waddles and oil and gas operational equipment. Reference the observation document for specifics.

Site Soils

During the field investigation, Soil Sage collected soil samples every six inches from 0 – 24 inches within the site and reference locations within the map unit. These soils were analyzed to establish current soil physicochemical properties for reclamation planning. See spreadsheet attachment Table 1 for site specific soil characterizations and associated reference soils. Reference USDA Soils and Ecological Site Description for historical properties.

Recommendations

Data of Sampling – 2-4 May 2023

Vegetation

Spring vegetation characteristics were present, newly emerging grasses and weeds are the primary vegetation during the site visit.
Ecological Site observations serve as the baseline vegetation cover.
Table represents the present cover observations.

Sample Number	Bare Ground	Grass	Forbs	Shrubs	Litter	Weeds	Field Notes
4	25	0	0	0	30	45	

Weeds

Weed Summary Reference

Common Name	Weed List Type	Percent Cover (%)
Tansy Mustard	Common	25
Kochia	Common	20

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 ag 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

Hydrology

Hydrology – Stream Orders 1 – 4 are present - dominant streams are orders are 1, 2 and 3. Order 3 are present in locations that do have the potential for soil erosion represented by gullying and riling that follow the elevation gradient from high to low in a small portion of the current reclaim extent. These could be major runoff areas for gullying and soil erosion with heavy precipitation events.

Ponding - potential ponding can occur where water follows the elevation gradients in low lying area.

Reference Hydrology and Elevation and Contour Maps

Soil/Erosion

Exposed soils have low 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
Historic Disturbance Extent	0.41
Current Reclaim Extent	0.26
Road Associated with Facility	0.67*
Reference Extent	0.20

Total Disturbance Extent includes Well pad only. Tank Battery Extent included at Location 447290.
*Road includes long section from Location 331413.
Reference areas are shared and are available in the North Reference Document and Site Overview Reference Map.

Summary Reclamation Acreage Table

Description	Acres
Reclaim Extent	0.26
Road Reclaim Extent without additional area	0.67

Reference Reclaim Map

Summary Cubic Yards of Soils

Description	Cubic Yards
Reclaim Extent remove 6 inches	70
Reclaim Extent replace 6 inches	70
Reclaim Road remove 12 inches	1081
Reclaim Road replace 12 inches	1081
Additional Road removal	1065*
Additional Road replacement	1065*

This additional road area captures the difference between the original road and the previous road reclaim extent.

Reference Reclaim and Road Maps

Site Recommendation and Re-Evaluation

North Side
Road: 12 inches remove and replace
Pad: 6 inches remove and replace

Replacement Soil
Texture: Sandy Loam
Organic Matter: 1%
pH: 7.0 - 8.3
Nitrate N: less than 50 ppm
Sodium: less than 150 ppm
Chloride Cl: less than 100 ppm
Sulfate S: less than 100 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. On-site access must be coordinated with Colorado Parks and Wildlife (CPW) before work commences. 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

Vegetation Seed Mix

Additional reclamation procedures are recommended at this time.

Seed mixed provided by surface owner
Reference Seed Mix

Soil Amendments

New soil specifications are outlined above with NPK and OM recommendations.

Soil Analytics

Soil analytics provided to Civitas by Lone Tree Services
Soils imported by Lone Tree Services
Reference – Topsoil Report for 22-272-0302

Site Monitoring

Continue monitoring for vegetative recovery and weed control.

Pre-Reclamation Activities and Notes:

- There are active and abandoned midstream assets in both the northern and southern parts of the reclamation area.
- Remove silt fencing, waddles and remaining oil and gas operational equipment.

Reclaim Area Protocol

Time Frame	Activity	Specifications	Site Totals
Prior to Reclamation Activities	Pre-Reclamation	Remove trash, silt fencing, waddles, and oil and gas operational equipment	Refer to the observation document for the area
Spring 2023	Remove and Replace Soil	Texture: Sandy Loam Organic Matter: 1% pH: 7.0 - 8.3 Nitrate N: less than 50 ppm Sodium: less than 150 ppm Chloride Cl: less than 100 ppm Sulfate S: less than 100 ppm	0.26 Acres
Seedbed Pref	Rip	Cross rip to 18 inches, do not rip below 18 inches. Evidence of seasonably high-water table found as shallow as 18 inches. Do not interact with this layer	
	Disc	Disc the site to a depth of 6.0-inches using a disk and harrow, field cultivator, vibrashank, or another alternative suitable to site conditions	
Seeding	Seeding	If reclamation occurs > 30-days prior to preferred seeding dates, drill seed into the soil surface no deeper than ¼ -inch using the provided seed mix	
	Seed	Provided by Surface Owner	Reference Seed Mix
	Straw	Spread certified weed free straw	
	Crimp	Crimp Straw to a depth of 3 inches without cutting the mulch fiber	
Monitoring	Continuous	Site should be monitored post reclamation to ensure success	
Weed Management		Due to the seed bank of cheatgrass, thistle and kochia monthly monitoring is recommended with appropriate herbicide control	

Site Photos – Soil 3 – S3

Lat/Long: 40.375994 / -104.443141
Nearest Facility #: 331251
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

	
Soil Picture 1	Soil Picture 2

Site Photos – Vegetation 4 – V4

Lat/Long: 40.375953 / -104.443247
Nearest Facility #: 331251
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

Veg

Veg - North

Veg - East

Veg - South

Veg – West

Tansy Mustard – *Descurainia pinata* – Common Weed

Kochia – *Kochia scoparia* – Common Weed

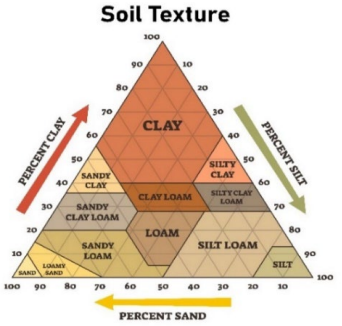
TABLE 1: Soil Report

Client	Civitas				
Operator	Bonanza Creek		**Date**	17-May-23	
Location ID - Name	CPW	North Side	**Ward**	20230512	
Type	Well, Tank Battery, Roads, Reference				

SOIL REPORT

Physical Properties

	Soil Profile			Partical Size				
Location	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	**Sand %**	**Silt %**	**Clay %**	**Texture Hydro**	**Location Ref**
Soil - 3.1	0	6	6	87	6	7	Loamy Sand	331251-Well
Soil - 3.2	6	12	6	86	6	8	Loamy Sand	
Soil - 3.3	12	18	6	87	3	10	Loamy Sand	
Soil - 3.4	18	24	6	83	10	7	Loamy Sand	
Site Average				**86**	**6**	**8**		



		Bottom Depth	Soil Thickness					
	Top Depth (in)	(in)	(in)	**Sand %**	**Silt %**	**Clay %**	**Texture Hydro**	**Location Ref**
Soil - 5.1 REF	0	6	6	87	6	7	Loamy Sand	MU10
Soil - 5.2 REF	6	12	6	90	5	5	Sand	MU10
Soil - 5.3 REF	12	18	6	90	5	5	Sand	MU10
Soil - 5.4 REF	18	24	6	90	4	6	Sand	MU10
Soil - 6.1 REF	0	6	6	74	14	12	Sandy Loam	MU10
Soil - 6.2 REF	6	12	6	75	12	13	Sandy Loam	MU10
Soil - 6.3 REF	12	18	6	83	6	11	Loamy Sand	MU10
Soil - 6.4 REF	18	24	6	68	14	18	Sandy Loam	MU10
Soil - 10.1 REF	0	6	6	69	18	13	Sandy Loam	MU10
Soil - 10.2 REF	6	12	6	69	18	13	Sandy Loam	MU10
Soil - 10.3 REF	12	18	6	69	18	13	Sandy Loam	MU10
Soil - 10.4 REF	18	24	6	85	8	7	Loamy Sand	MU10
Soil - 15.1 REF	0	6	6	41	30	29	Clay Loam	MU10
Soil - 15.2 REF	6	12	6	53	22	25	Sandy Clay Loam	MU10
Soil - 15.3 REF	12	18	6	89	6	5	Sand	MU10
Soil - 15.4 REF	18	24	6	91	4	5	Sand	MU10
Site Ref Average				**76**	**12**	**12**		

Chemical Properties

	Soil Profile								
Location	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	**pH Sat Paste**	**ECe mmhos/cm**	**CEC meq/100g**	**Excess Lime CaCO3 Rating**	**Organic Matter (LOI) %**	**SAR Sat Paste**
Soil - 3.1	0	6	6	7.6	0.4	9.4	NONE	1	0.6
Soil - 3.2	6	12	6	8.3	0.63	14.1	LOW	0.9	1.2
Soil - 3.3	12	18	6	8.1	0.37	8.3	NONE	0.6	1.3
Soil - 3.4	18	24	6	8.2	0.34	9.4	NONE	0.6	2
Site Average				**8.1**	**0.4**	**10.3**		**0.8**	**1.3**

	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	pH Sat Paste	ECe mmhos/cm	CEC meq/100g	Excess Lime CaCO3 Rating	Organic Matter (LOI) %	SAR Sat Paste
Soil - 5.1 REF	0	6	6	8.1	0.18	7.5	NONE	0.5	0.2
Soil - 5.2 REF	6	12	6	8.3	0.15	4.4	NONE	0.3	0.1
Soil - 5.3 REF	12	18	6	8.2	0.16	3.7	NONE	0.3	0.2
Soil - 5.4 REF	18	24	6	8.3	0.17	5.2	NONE	0.3	0.2
Soil - 6.1 REF	0	6	6	7.1	0.54	8.6	NONE	1.5	0.1
Soil - 6.2 REF	6	12	6	7.5	0.47	9	NONE	1.1	0.2
Soil - 6.3 REF	12	18	6	7.9	0.44	17.3	LOW	0.7	0.5
Soil - 6.4 REF	18	24	6	8	0.49	23.2	HIGH	1.2	1
Soil - 10.1 REF	0	6	6	7	2.17	9.5	NONE	1.3	3.1
Soil - 10.2 REF	6	12	6	7.2	1.88	11.4	NONE	1.4	3.4
Soil - 10.3 REF	12	18	6	7.6	1.19	9.4	NONE	1.1	3.1
Soil - 10.4 REF	18	24	6	7.9	0.58	5.3	NONE	0.6	2.8
Soil - 15.1 REF	0	6	6	7.7	1.57	26.9	HIGH	3.4	1.4
Soil - 15.2 REF	6	12	6	7.5	1.98	21	NONE	2.6	2.5
Soil - 15.3 REF	12	18	6	8	0.29	2.7	NONE	0.3	1.4
Soil - 15.4 REF	18	24	6	8	0.3	2	NONE	0.2	1.2
Site Ref Average				**7.8**	**0.79**	**10.4**		**1.1**	**1.3**

	Soil Profile			**Extraction Method**	**KCL**	**M3**	**NH4OAc**					
Location	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)		**Nitrate-N**	**Phosphorus P**	**Potassium K**	**Nitrate - N**		**Nitrate-N**	**Phosphorus P**	**Potassium K**
					ppm	**ppm**	**ppm**	**Lbs/A**		**ppm**	**ppm**	**ppm**
Soil - 3.1	0	6	6		1.9	213	289	3	0-12	1.9	213	289
Soil - 3.2	6	12	6		6.4	74	238	12	12-24	4	36	170.5
Soil - 3.3	12	18	6		4.3	34	166	8				
Soil - 3.4	18	24	6		3.7	38	175	7				
Site Average					**4**	**90**	**217**	**8**				

	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	Nitrate-N ppm	Phosphorus P ppm	Potassium K ppm	Nitrate - N Lbs/A				
Soil - 5.1 REF	0	6	6	2.1	15	92	4	0-12	2.1	15	92
Soil - 5.2 REF	6	12	6	0.5	9	25	1	12-24	0.5	9	24
Soil - 5.3 REF	12	18	6	< 0.1	9	24	0				
Soil - 5.4 REF	18	24	6	0.5	9	24	1				
Soil - 6.1 REF	0	6	6	11.2	66	205	20	0-12	7.3	34	179
Soil - 6.2 REF	6	12	6	7.3	34	179	13	12-24	7	22	193.5
Soil - 6.3 REF	12	18	6	8.2	8	65	15				
Soil - 6.4 REF	18	24	6	10.7	5	52	51				
Soil - 10.1 REF	0	6	6	3.3	39	335	6	0-12	6.4	35	317
Soil - 10.2 REF	6	12	6	6.4	35	317	12	12-24	4.6	50	124.5
Soil - 10.3 REF	12	18	6	2.5	18	127	4				

Soil - 10.4 REF	18	24	6	0.7	31	42		3				
Soil - 15.1 REF	0	6	6	8.5	69	207		15	0-12	8.5	69	207
Soil - 15.2 REF	6	12	6	4.4	25	116		8	12-24	0.85	8	20
Soil - 15.3 REF	12	18	6	1	10	20		2				
Soil - 15.4 REF	18	24	6	0.7	6	20		1				
Site Ref Average				**4.5**	**24**	**116**		**10**				

	Soil Profile			**Plant Available**									
Location	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	**NH4OAc Calcium Ca ppm**	**NH4OAc Magnesium Mg ppm**	**NH4OAc Sodium Na ppm**	**Hot Water Boron B ppm**	**Ca-NO3 Chloride Cl ppm**	**M3 Sulfate S ppm**	**AB-DTPA Copper Cu ppm**	**Iron Fe ppm**	**Manganese Mn ppm**	**Zinc Zn ppm**
Soil - 3.1	0	6	6	1482	139	23	0.81	6.7	16.8	1.3	12	2	5.23
Soil - 3.2	6	12	6	2442	129	42	0.69	14.5	28.2	1.47	12.9	1.8	4.2
Soil - 3.3	12	18	6	1384	100	37	0.63	4.5	9.8	1.08	8.2	1.4	2.95
Soil - 3.4	18	24	6	1541	113	59	0.84	3.5	10.5	2.44	8.5	1.8	10.57
Site Average				**1712**	**120**	**40**	**0.74**	**7.3**	**16.3**	**1.57**	**10.4**	**1.8**	**5.74**

Reference	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	**Calcium Ca ppm**	**Magnesium Mg ppm**	**Sodium Na ppm**	**Boron B ppm**	**Chloride Cl ppm**	**Sulfate S ppm**	**Copper Cu ppm**	**Iron Fe ppm**	**Manganese Mn ppm**	**Zinc Zn ppm**
Soil - 5.1 REF	0	6	6	1169	131	68	0.27	1	3.2	0.4	7.8	1.4	0.31
Soil - 5.2 REF	6	12	6	746	73	7	0.21	0.2	2.9	0.22	5.6	1.2	0.31
Soil - 5.3 REF	12	18	6	604	69	6	0.19	0.2	2.5	0.18	5.4	1.3	0.24
Soil - 5.4 REF	18	24	6	849	100	8	0.17	0	3.7	0.21	6.1	1.1	0.18
Soil - 6.1 REF	0	6	6	1272	205	7	0.66	0.9	6.3	0.55	9.2	4	0.15
Soil - 6.2 REF	6	12	6	1318	227	14	0.62	0.9	4.6	0.49	5.3	2.7	1.32
Soil - 6.3 REF	12	18	6	2973	263	18	0.4	1.1	13.5	0.3	3.6	1.4	0.5
Soil - 6.4 REF	18	24	6	3848	435	44	0.62	1.6	17.6	0.5	4.5	1.3	0.12
Soil - 10.1 REF	0	6	6	1200	224	168	1.14	61.5	111.9	0.57	13.7	3.7	0.64
Soil - 10.2 REF	6	12	6	1503	264	194	1.23	60	99.2	0.49	10.2	3.1	0.81
Soil - 10.3 REF	12	18	6	1276	242	146	0.81	48.2	53.6	0.4	5.9	2	0.31
Soil - 10.4 REF	18	24	6	769	130	65	0.41	14.5	22.6	0.27	5	1.4	0.16
Soil - 15.1 REF	0	6	6	4091	636	148	2.12	6.5	145	5.2	10.5	2.6	3.12
Soil - 15.2 REF	6	12	6	2917	611	233	1.33	11.4	142.9	1.96	14.8	2.5	1.49
Soil - 15.3 REF	12	18	6	362	80	31	0.28	3.4	12.1	0.24	6	1.1	0.24
Soil - 15.4 REF	18	24	6	266	64	24	0.33	3.2	7.8	0.15	3.8	1.2	0.25
Site Ref Average				**1573**	**235**	**74**	**0.67**	**13.4**	**40.6**	**0.76**	**7.3**	**2.0**	**0.63**

SOIL REPORT

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	Notes
		ppm		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	Root Formation
Magnesium	Mg	2,000	0.2	80,000	Chlorophyll Formation
Phosphorus	P	2,000	0.2	60,000	
Sulfur	S	1,000	0.1	30,000	Proteins & NPK Uptake
Chlorine	Cl	100	--	3,000	
Iron	Fe	100	--	2,000	Chlorophyll catalyst
Boron	B	20	--	2,000	Absorption Calcium
Manganese	Mn	50	--	1,000	
Zinc	Zn	20	--	300	
Copper	Cu	6	--	100	Photosynthesis & Respiration - correlated with %OM
Molybdenum	Mo	0.1	--	1	Fixation of Organic Nitrogen
Nickel	Ni	0.1	--	1	

Source: E.Epstein, 1965

Service Credits - Maxar

CIV - CPW North Side
Map Extent - Overview Reclaim & Road Reclaim Extent

Imagery: RS Orthomosaic & DSM
Imagery Date: 2 May 2023
Map Date: 31 May 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Legend

- Well
- Tank Battery
- Reclaim Extent
- Road Reclaim

0 210 420 Meters

Reclaim Extent: 3.1 surface Acres
Road: 7 surface Acres including buffer

Scale: 1:7,000

N

CIV - 331251 - DOW 21-28
Map Extent - Overview (Road)

Imagery: RS Orthomosaic & DSM
Imagery Date: 2 May 2023
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Legend

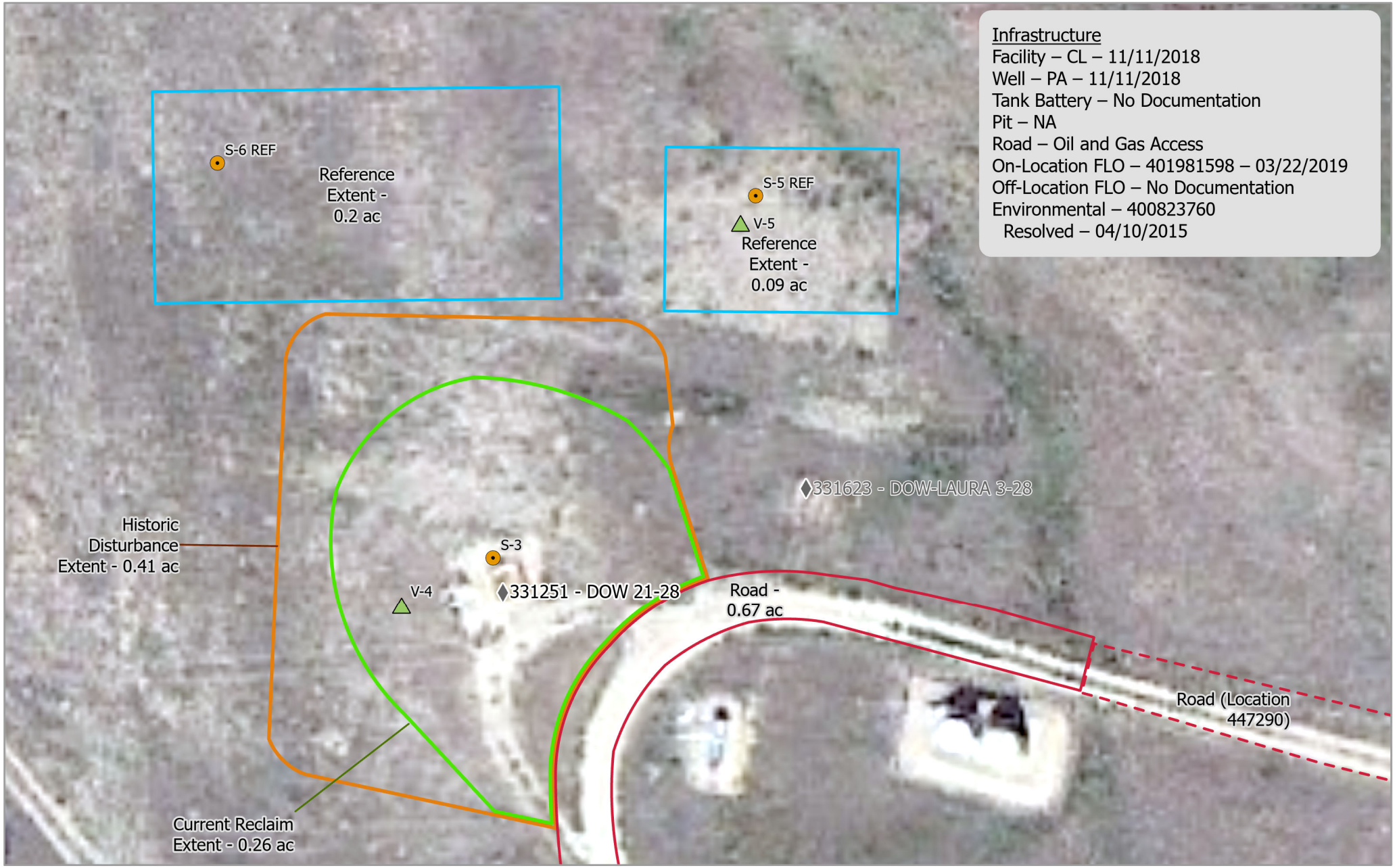
- Well
- Tank Battery
- Observation Points
- Historic Disturbance Extent
- Current Reclaim Extent
- Reference Extent
- Road

0 75 150 Meters

Scale: 1:2,600

Pad Location:
40.375970
-104.443140

N



CIV - 331251 - DOW 21-28
Map Extent - Landsat/Copernicus 2013

Imagery: Landsat Copernicus
Imagery Date: 6 Sep 2013
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

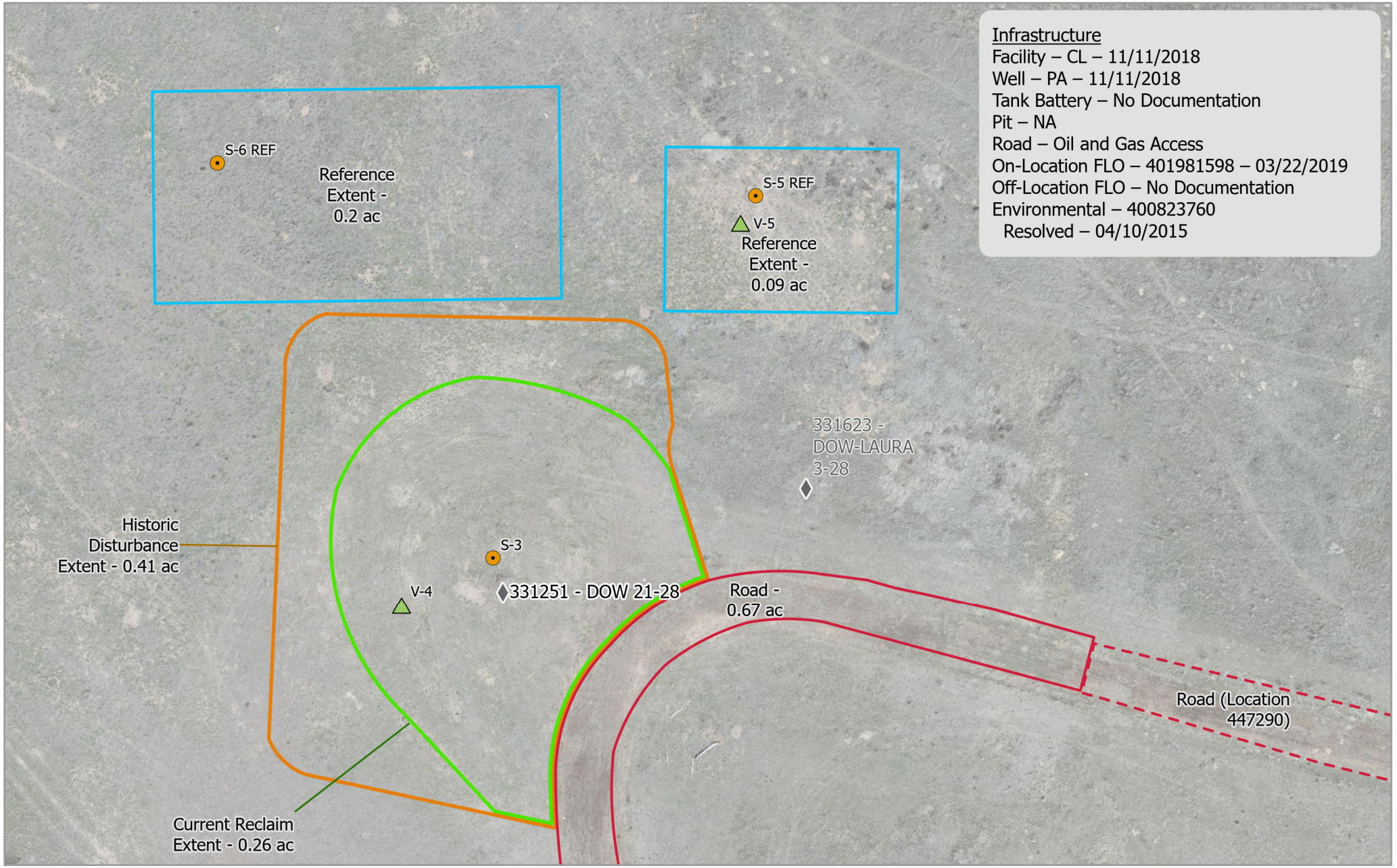
Legend
- Well
- Soils
- Veg
- Historic Disturbance Extent
- Current Reclaim Extent
- Reference Extent
- Road

0 10 20 Meters

Scale: 1:500

Pad Location:
40.375970
-104.443140

N



CIV - 331251 - DOW 21-28
Map Extent - Overview

Imagery: RS Orthomosaic & DSM
Imagery Date: 2 May 2023
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Legend

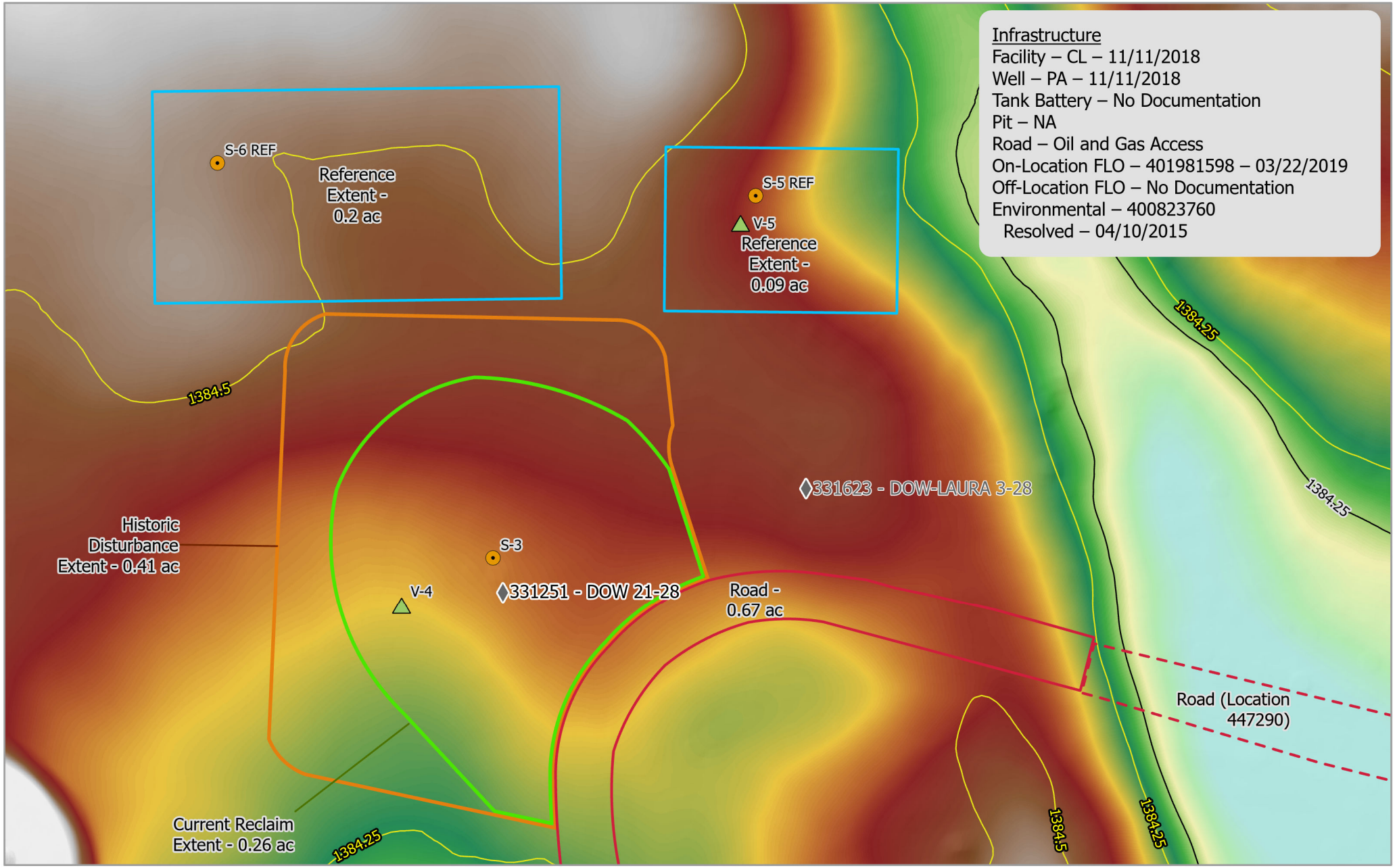
- Well
- Soils
- Veg
- Historic Disturbance Extent
- Current Reclaim Extent
- Reference Extent
- Road

0 10 20 Meters

Scale: 1:500

Pad Location:
40.375970
-104.443140

N



CIV - 331251 - DOW 21-28
Map Extent - Elevation & Contours

Imagery: RS DSM, USGS
Imagery Date: 2 May 2023, 2013
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

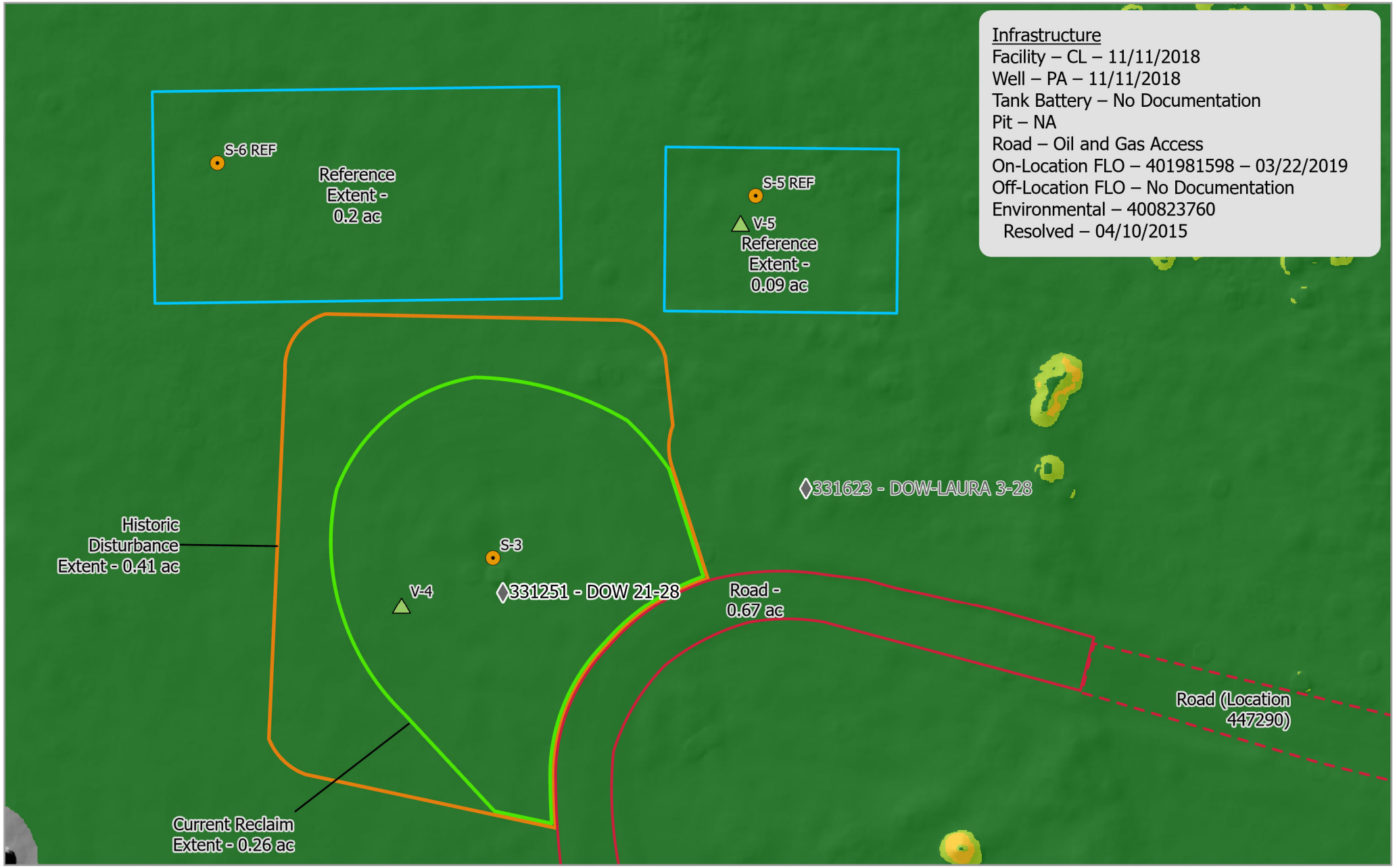
Well
Soils
Veg
0.25 m Contours (2013)
0.25 m Contours (2023)
Historic Disturbance Extent
Current Reclaim Extent
Reference Extent
Road
Elevation Meters
1404
1369

0 10 20 Meters

Scale: 1:500

Pad Location:
40.375970
-104.443140

N



CIV - 331251 - DOW 21-28
Map Extent - Slope

Imagery: RS DSM
Imagery Date: 2 May 2023
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Well
Soils
Veg
Historic Disturbance Extent
Current Reclaim Extent
Reference Extent
Road

Slope
Percent
<15
15 - 30
30 - 100
>100

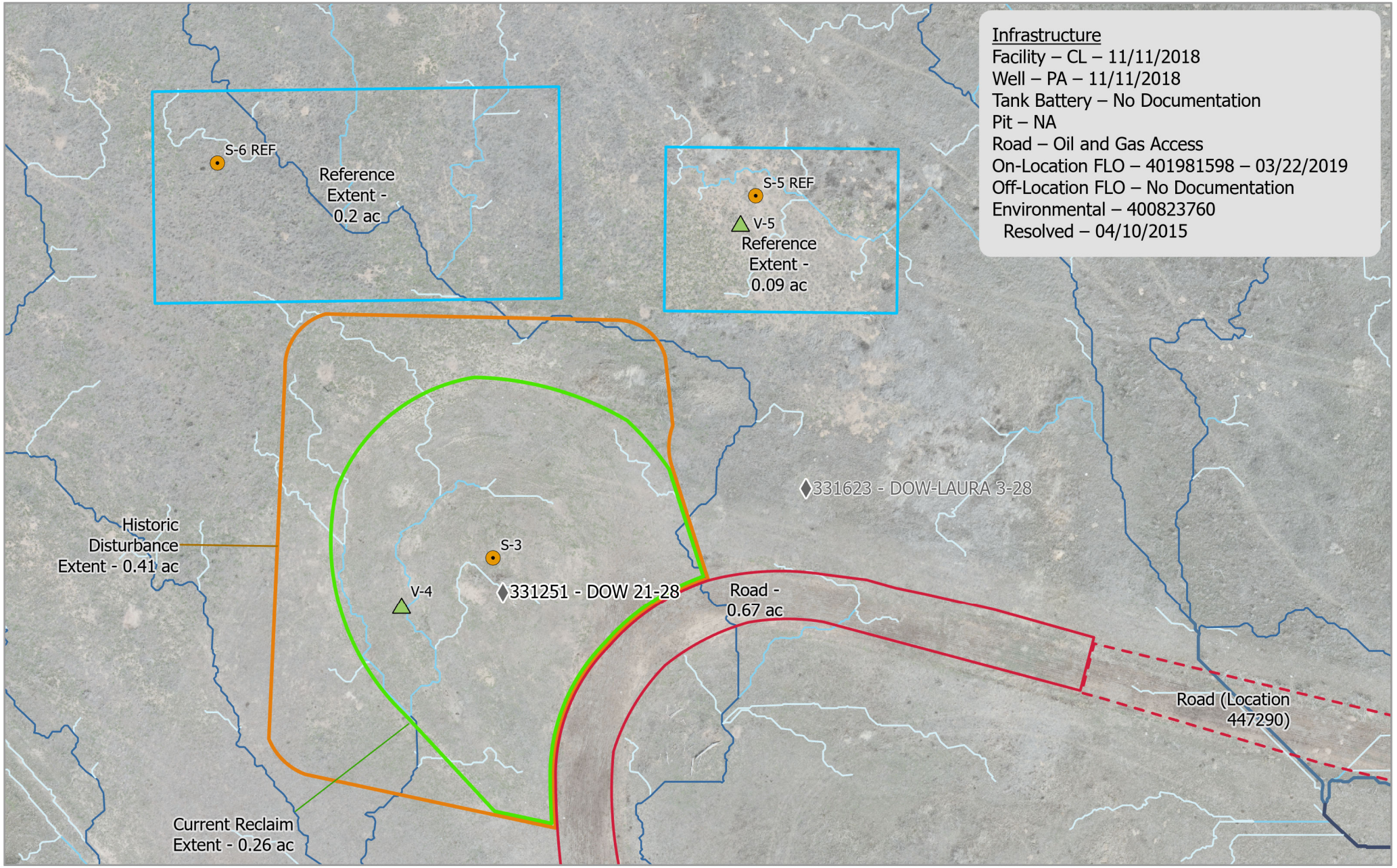
0 10 20 Meters

Scale: 1:500

Pad Location:
40.375970
-104.443140

N

Service Credits -



CIV - 331251 - DOW 21-28
Map Extent - Hydrology

Imagery: RS Orthomosaic & DSM
Imagery Date: 2 May 2023
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

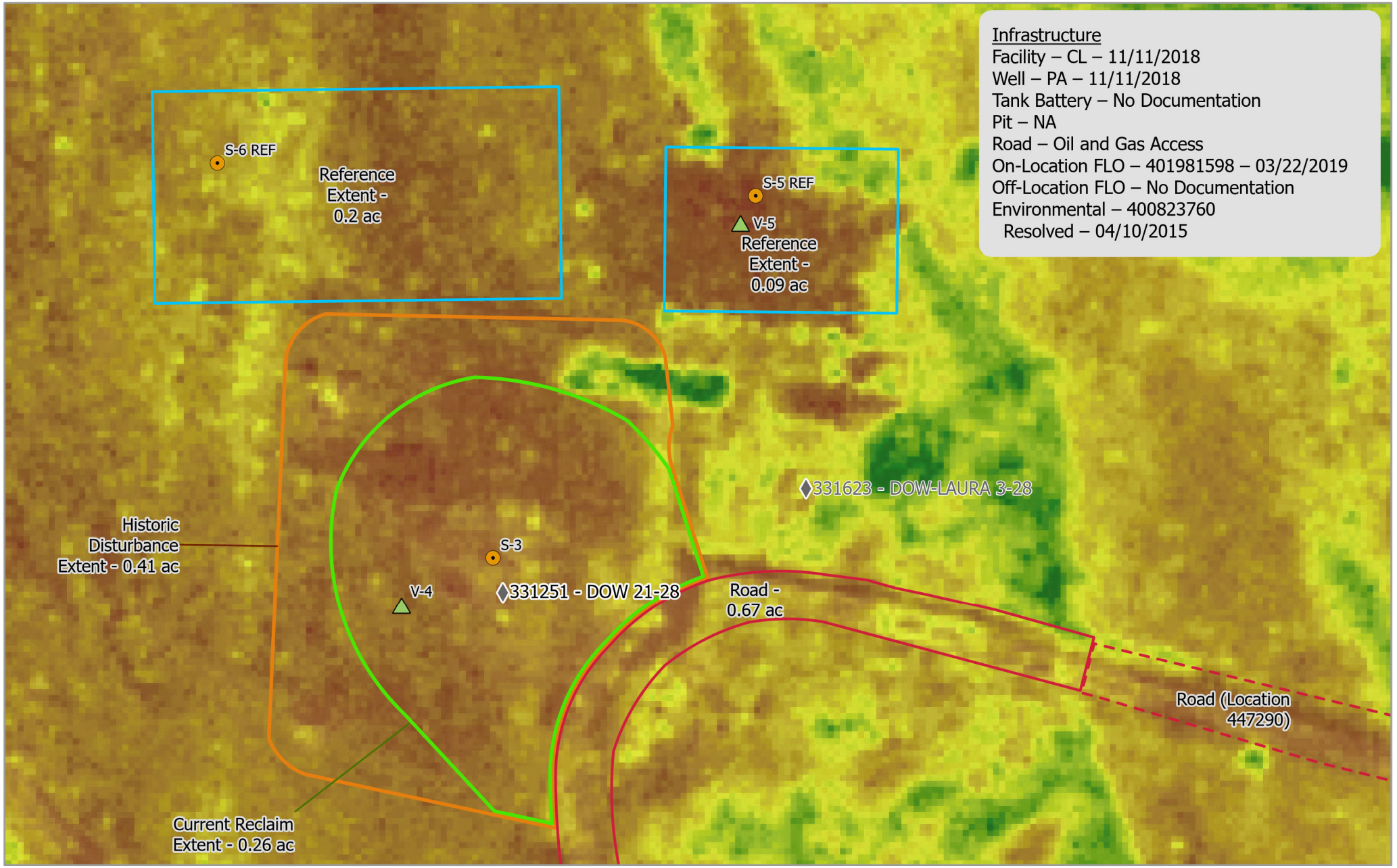
Well
Soils
Veg
Historic Disturbance Extent
Current Reclaim Extent
Reference Extent
Road
Stream Order
1
2
3
4
5
6

0 10 20 Meters

Scale: 1:500

Pad Location:
40.375970
-104.443140

N



CIV - 331251 - DOW 21-28
Map Extent - NAIP NDVI Composite

Imagery: USDA NAIP
Imagery Date: 2011-2021
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Legend

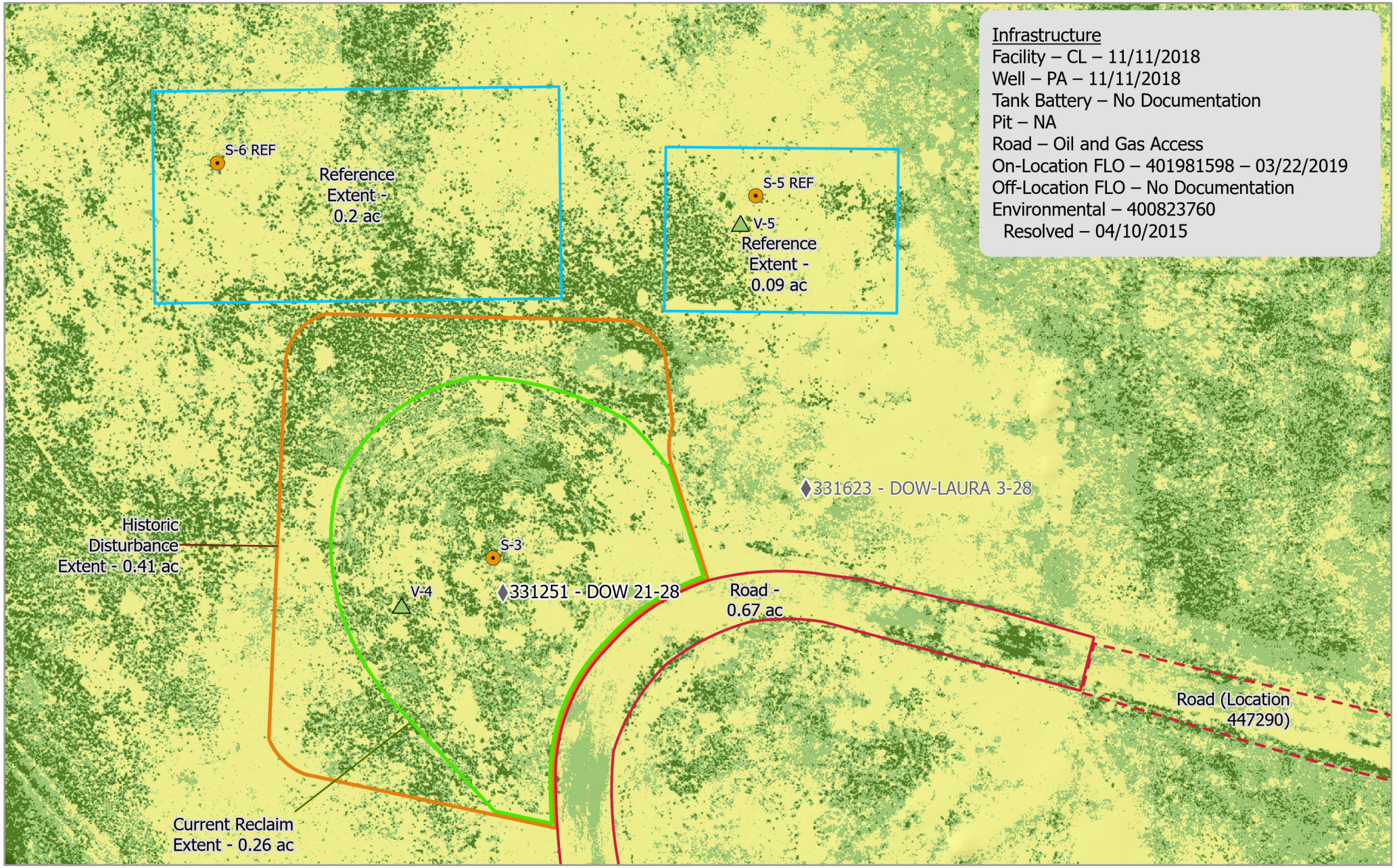
- Well
- Soils
- Veg
- Historic Disturbance Extent
- Current Reclaim Extent
- Reference Extent
- Road

0 10 20 Meters

Scale: 1:500

Pad Location:
40.375970
-104.443140

N



CIV - 331251 - DOW 21-28
Map Extent - NDVI

Imagery: RS Multispectral
Imagery Date: 2 May 2023
Map Date: 13 Sep 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Well
Soils
Veg
Historic Disturbance Extent
Current Reclaim Extent
Reference Extent
Road

NDVI Classes
1-Veg
2-Veg
3-Non Veg
4-Non Veg
5-Non Veg

0 10 20 Meters

Scale: 1:500

Pad Location:
40.375970
-104.443140

N

CPW Soil and Vegetation

North Side Reference

Site Soils

These soils were analyzed to establish current soil physicochemical properties.
Soil Analytical Spreadsheet
Map Unit(s) – 10
The CPW_North_SoilData_17MAY2023 - contains 4 soil references.

Overview of the 0-12 inches

- Soil texture is a Sandy Loam/Loamy Sand with intermixed Sandy Clay Loam
- pH 7.5
- ECe 1.1
- Organic Matter % - 1.5
- SAR 1.4
- N-P-K – 6-38-199
- Nitrate-N Lbs/A = 11
- Sodium – 105 ppm
- Chloride – 18 ppm
- Sulfate – 64 ppm

NOTE: The native soils have elevated sodium levels in 2 of the 4 samples in the top 12 inches which has a direct correlation to the higher ECe and SAR values.

Vegetation Analysis

Ecological Site observations serve as the baseline vegetation cover.
Table represents the present cover observations.
During the time of sampling the site contained bare ground no vegetation analysis performed.

Sample Number	Bare Ground	Grass	Forbs	Shrubs	Litter	Weeds	Field Notes
8	5	20	0	0	65	10	
11	20	15	5	0	50	10	
16	10	20	0	0	60	10	

Site Average for Vegetative Cover and Total Percent Cover based on field sampling.

Grasses	Forbs	Total Percent Cover	Site Target Recovery (80%)
18	5	23	18

Weeds

Weed Summary Reference based on 2-4 May 2023 Monitoring

Common Name	Weed List Type	Percent Cover (%)
Field Bindweed	List C Noxious	10
Tansy Mustard	Common Weed	10

Reference Soil and Vegetation Field Observation Photos

Site Photos – Soil 5 – S5 REF

Lat/Long: 40.376311 / -104.442836
Nearest Facility #: 331623 and 331251
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

Soil Picture 1

Soil Picture 2 Vegetation at Soil Location

Site Photos – Soil 6 – S6 REF

Lat/Long: 40.376343 / -104.443456
Nearest Facility #: 331623 and 331251
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

	
Soil Picture 1	Soil Picture 2 Vegetation at Soil Location
	

Site Photos – Soil 10 – S10 REF

Lat/Long: 40.370999 / -104.431953
Nearest Facility #: 305671, 331381 and 305223
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

	
Soil Picture 1	Soil Picture 2 Vegetation at Soil Location

Site Photos – Soil 15 – S15 REF

Lat/Long: 40.367564 / -104.432884
Nearest Facility #: 305223
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

	
Soil Picture 1	Soil Picture 2 Vegetation at Soil Location

Site Photos – Vegetation 8 – V8 REF

Lat/Long: 40.371947 / -104.438097
Nearest Facility #: 331413
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

Veg

Veg - North

Veg - East

Veg - South

	
Veg – West	Grass ssp.
	
Field Bindweed – *Convolvulus arvensis* – Colorado List C Noxious Weed	

Site Photos – Vegetation 11 – V11 REF

Lat/Long: 40.371095 / -104.431946
Nearest Facility #:
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

Veg

Veg - North

Veg - East

Veg - South

	
Veg – West	Tansy Mustard – *Descurainia pinata* – Common Weed
	
Grass ssp.	Tansy Mustard – *Descurainia pinata* – Common Weed

Site Photos – Vegetation 16 – V16 REF

Lat/Long: 40.367575 / -104.432707
Nearest Facility #: 305223
Date Range: 2-4 May 2023
Photo locations correspond with the overview map and vegetation table.

Veg

Veg - North

Veg - East

Veg - South

	
Veg – West	Grass ssp. and Field Bindweed – *Convolvulus arvensis* – Colorado List C Noxious Weed
	
Grass ssp. and Field Bindweed – *Convolvulus arvensis* – Colorado List C Noxious Weed	Grass ssp. and Field Bindweed – *Convolvulus arvensis* – Colorado List C Noxious Weed

CPW Site Observations

North

Reference the Observation overview map

Observation 12 – ROAD - North

40.375215 / -104.43867

	
Distinctive start of the manure application, 4-6 inches manure and compaction.	

Observation 13 - ROAD- North

40.375561 / -104.440652

	
Manure in the top 4 inches then compaction	

Observation 14 - ROAD- North

40.374259 / -104.44192

	
Sand and manure with compaction	

Observation 15 – ROAD - North

40.372523 / -104.439919

	
Top 6 inches is manure, sand with compaction	

Observation 16 – ROAD, CORRAL, VEHICLE TRAFFIC - North

North of the 331413

40.372919 / -104.437395

	
Cheatgrass and gravel	Road
	
OK Corral on the footprint of the disturbance	Gravel and weds

Soil Properties

USDA Soil Description

Reference Soil Information

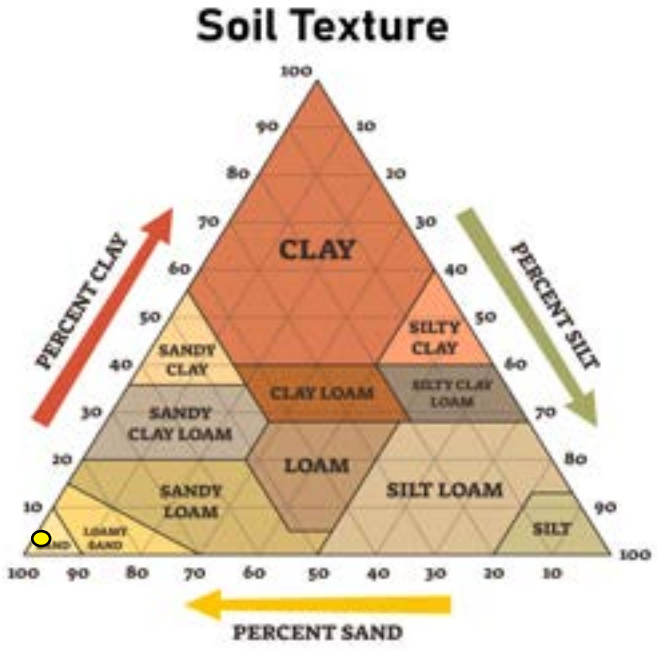
The location of the site is contained within one soil type, Ellicott-Ellicott sandy-skeletal complex.

Map Unit 10 Reference Soil information - Ellicott-Ellicott sandy-skeletal complex

This soil is formed from noncalcareous, stratified sandy alluvium. Landform is drainageways, flood plains on intermittent streams, with the Sandy Bottomland Ecological Site. Soils are excessively drained with a very low water holding capacity, and slope 0-3 percent.

	Physical			Chemical			
Depth (in)	**Texture**	**Bulk Density**	**Partical Size Percent sand, silt, clay**	**pH**	**EC**	**SAR**	**OM%**
0-10	Sand	1.65	95-3-2	6.5	0.1	0.0	0.35
10-20	Sand	1.64	95-4-1	7.0	0.1	0.0	0.25
20-30	Sand	1.63	95-4-1	7.2	0.1	0.0	0.25
30-40	Sand	1.63	95-4-1	7.6	0.1	0.0	0.25
40-50	Coarse Sand	1.66	95-4-1	7.6	0.1	0.0	0.25
50 +	Coard Sand	1.68	95-4-2	7.6	0.1	0.0	0.25

Soil Texture Triangle reflect the 0-10 in depth



Erosion Potential (10 inches)

- K Factor, Whole soil - .02. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.
- Wind Erodibility Group – 1. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.

Soil Reference Information

There is a general relationship of soil bulk density to root growth based on soil texture. Bulk densities ideal for root growth are less than 1.60 g/cc for sandy textures, less than 1.40 g/cc for loamy textures, and less than 1.10 g/cc for clayey textures. Bulk densities that restrict root growth are greater than 1.80 g/cc for sandy textures, 1.65 g/cc for loamy textures, and 1.47 g/cc for clayey textures.

Vegetation

Reference vegetation – Sandy Bottomland Ecology

Climate

Average Annual Precipitation 14 to 17 inches annually - average 15 inches

Average Annual Air Temperature ranges from 48 to 52 degrees F

Drought conditions in effect

Long-term effects of these latest drought events have yet to be determined. Growth of native cool-season plants begin about April 1 and continue to mid-June. Native warm-season plants begin growth about May 1 and continue to about August 15. Regrowth of cool-season plants occur in September in most years, depending on moisture.

Reference dynamics

The Reference State is characterized by a dominance of warm-season tallgrasses (sand bluestem, prairie sandreed, and switchgrass). The Shrub State is dominated by sand sagebrush and a minor component of understory species (sand dropseed, Fendler threeawn). The Eroded State is characterized by annual forbs and grasses (sunflower, kochia, Russian thistle, cheatgrass) and early successional plants (sandhill muhly, sand dropseed, Fendler threeawn, and lemon scurfpea).

Drought has increased mortality of blue grama and other bunchgrasses significantly in some locales.

Principle dominants are sand bluestem, prairie sandreed, and switchgrass. Subdominant grasses include needle and thread, blue grama, little bluestem, and western wheatgrass. Significant forbs and shrubs are pacific peavine, evening primrose, prairie clovers, leadplant and western sandcherry. Cottonwoods may be present. The potential vegetation is about 70-85% grasses or grass-like plants, 8-15% forbs and 7-15% shrubs.

Carbon sequestration is greatly reduced.

Reference Vegetation – Sandy Bottomland Ecology

At Risk Plant Community

Key species from the Reference Plant Community, Sand bluestem, prairie sandreed, switchgrass, western sandcherry and leadplant have decreased in frequency and production. Blue grama and sand sagebrush have increased. Sand dropseed, Fendler threeawn, slimflower scurfpea, and Cuman ragweed (western ragweed) have also increased.

The risk of losing some of the tallgrass species, palatable forbs and shrubs. The reduction of tallgrass species, nitrogen-fixing forbs, key shrub component and increased warm-season shortgrass has altered the biotic integrity of this plant community. Nutrient cycle, water cycle and energy flow are at risk of becoming impaired.

Vegetation

Sandy Bottomland Ecosystem Vegetative Community Composition

Common Name	Scientific Name
Sand Bluestem	*Andropogon hallii*
Prairie Sandreed	*Calamovilfa longifolia*
Switchgrass	*Panicum virgatum*
Indiangrass	*Sorghastrum nutans*
Needle and Thread	*Hesperostipa comata ssp. comata*
Blue Grama	*Bouteloua gracilis*
Western Wheatgrass	*Pascopyrum smithii*
Little Bluestem	*Schizachyrium scoparium*
Sideoats Grama	*Bouteloua curtipendula*
Sand Dropseed	*Sporobolus cryptandrus*
Indian Ricegrass	*Achnatherum hymenoides*
Hairy Grama	*Bouteloua hirsuta*
Prairie Junegrass	*Koeleria macrantha*
Saltgrass	*Distichlis spicata*
Sixweeks Fescue	*Vulpia octoflora*
Sand Bluestem	*Andropogon hallii*
Switchgrass	*Panicum virgatum*
Indiangrass	*Sorghastrum nutans*
Manystem Pea	*Lathyrus polymorphus*
Dotted Blazing Star	*Liatris punctata*
Purple Prairie Clover	*Dalea purpurea var. purpurea*
Broadbeard Beardtongue	*Penstemon angustifolius*
Upright Prairie Coneflower	*Ratibida columnifera*
Scarlet Globemallow	*Sphaeralcea coccinea*
White Heath Aster	*Symphyotrichum ericoides var. ericoides*
Annual Buckwheat	*Eriogonum annuum*
White Sagebrush	*Artemisia ludoviciana*
Painted Milkvetch	*Atragalus ceramicus var. filifolius*

Change Detection

Normalized Difference Vegetation (NDVI)

Section will primarily focus on the NDVI imagery for vegetation reference and current analytics.

The composite NAIP NDVI imagery from 2010-2020, this data set does not contain the NDVI values to perform statistical analysis. The imagery foot print encompasses the site extent and a vegetation reference extent for vegetative analysis.

Remotely sensed data was gathered on 2 - 4 May 2023, which reflects the current vegetative cover statistics.

NDVI calculations used the Near Infrared from the multispectral sensors. The NDVI reflects the measurements from the plant's topmost layer of leaves, typically used during spring emergence into mid-season growth.

Account No. : 19356

Soil Analysis Report

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

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62410 **Depth :** 0 - 6
ID : CIV-CPW2-SOIL 3.1

1:1 Soil pH	8.3
Soluble Salts 1:1, mmho/cm	0.16
Excess Lime Rating	NONE
Organic Matter LOI, %	1.0
Nitrate-N KCl, ppm N	1.9
Nitrate-N, lbs N / Acre	3
Phosphorus M3, ppm P	213
Potassium NH_4OAc, ppm K	289
Sulfate M-3, ppm S	16.8
Zinc DTPA, ppm Zn	5.23
Iron DTPA, ppm Fe	12.0
Manganese DTPA, ppm Mn	2.0
Copper DTPA, ppm Cu	1.30
Calcium NH_4OAc, ppm Ca	1482
Magnesium NH_4OAc, ppm Mg	139
Sodium NH_4OAc, ppm Na	23
Chloride $Ca\text{-}NO_3$, ppm Cl	6.7
Boron Hot Water, ppm B	0.81

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
9.4	0	8	79	12	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	33
Sat Paste pH	7.6
Sat Paste ECe, mmho/cm	0.40
HCO_3, ppm	140
Cl, ppm	16
Ca, ppm	39
Mg, ppm	9
Na, ppm	15
S, ppm	12.2
Sodium Adsorption Ratio	0.6

Reviewed By : Raymond Ward **5/17/2023** **Copy : 1**

Bus: 308-234-2418
Fax: 308-234-1940
web site
www.wardlab.com
4007 Cherry Ave., P.O. Box 788
Kearney, Nebraska 68848-0788

Account No. : 19356

Soil Analysis Report

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

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Loamy Sand	87	6	7

Bus: 308-234-2418
Fax: 308-234-1940
web site
www.wardlab.com
4007 Cherry Ave., P.O. Box 788
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Soil Analysis Report

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

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62411 **Depth :** 6 - 12
ID : CIV-CPW2-SOIL 3.2

1:1 Soil pH	8.9
Soluble Salts 1:1, mmho/cm	0.21
Excess Lime Rating	LOW
Organic Matter LOI, %	0.9
Nitrate-N KCl, ppm N	6.4
Nitrate-N, lbs N / Acre	12
Phosphorus M3, ppm P	74
Potassium NH_4OAc, ppm K	238
Sulfate M-3, ppm S	28.2
Zinc DTPA, ppm Zn	4.20
Iron DTPA, ppm Fe	12.9
Manganese DTPA, ppm Mn	1.8
Copper DTPA, ppm Cu	1.47
Calcium NH_4OAc, ppm Ca	2442
Magnesium NH_4OAc, ppm Mg	129
Sodium NH_4OAc, ppm Na	42
Chloride $Ca\text{-}NO_3$, ppm Cl	14.5
Boron Hot Water, ppm B	0.69

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
14.1	0	4	87	8	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	41
Sat Paste pH	8.3
Sat Paste ECe, mmho/cm	0.63
HCO_3, ppm	147
Cl, ppm	48
Ca, ppm	63
Mg, ppm	10
Na, ppm	37
S, ppm	30.6
Sodium Adsorption Ratio	1.2

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Loamy Sand	86	6	8

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Results For : CIV
Location : CPW2

Lab No. : 62412 **Depth :** 12 - 18
ID : CIV-CPW2-SOIL 3.3

1:1 Soil pH	8.7
Soluble Salts 1:1, mmho/cm	0.15
Excess Lime Rating	NONE
Organic Matter LOI, %	0.6
Nitrate-N KCl, ppm N	4.3
Nitrate-N, lbs N / Acre	8
Phosphorus M3, ppm P	34
Potassium NH_4OAc, ppm K	166
Sulfate M-3, ppm S	9.8
Zinc DTPA, ppm Zn	2.95
Iron DTPA, ppm Fe	8.2
Manganese DTPA, ppm Mn	1.4
Copper DTPA, ppm Cu	1.08
Calcium NH_4OAc, ppm Ca	1384
Magnesium NH_4OAc, ppm Mg	100
Sodium NH_4OAc, ppm Na	37
Chloride $Ca\text{-}NO_3$, ppm Cl	4.5
Boron Hot Water, ppm B	0.63

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
8.3	0	5	83	10	2

Saturated Soil Paste Analysis (SAR)

Saturation, %	39
Sat Paste pH	8.1
Sat Paste ECe, mmho/cm	0.37
HCO_3, ppm	100
Cl, ppm	13
Ca, ppm	29
Mg, ppm	5
Na, ppm	28
S, ppm	10.5
Sodium Adsorption Ratio	1.3

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Loamy Sand	87	3	10

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Invoice No. : 1401762
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Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62413 **Depth :** 18 - 24
ID : CIV-CPW2-SOIL 3.4

1:1 Soil pH	8.7
Soluble Salts 1:1, mmho/cm	0.15
Excess Lime Rating	NONE
Organic Matter LOI, %	0.6
Nitrate-N KCl, ppm N	3.7
Nitrate-N, lbs N / Acre	7
Phosphorus M3, ppm P	38
Potassium NH_4OAc, ppm K	175
Sulfate M-3, ppm S	10.5
Zinc DTPA, ppm Zn	10.57
Iron DTPA, ppm Fe	8.5
Manganese DTPA, ppm Mn	1.8
Copper DTPA, ppm Cu	2.44
Calcium NH_4OAc, ppm Ca	1541
Magnesium NH_4OAc, ppm Mg	113
Sodium NH_4OAc, ppm Na	59
Chloride $Ca\text{-}NO_3$, ppm Cl	3.5
Boron Hot Water, ppm B	0.84

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
9.4	0	5	82	10	3

Saturated Soil Paste Analysis (SAR)

Saturation, %	47
Sat Paste pH	8.2
Sat Paste ECe, mmho/cm	0.34
HCO_3, ppm	106
Cl, ppm	10
Ca, ppm	23
Mg, ppm	4
Na, ppm	39
S, ppm	8.7
Sodium Adsorption Ratio	2.0

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ARVADA **CO** **80003**

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Loamy Sand	83	10	7

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Invoice No. : 1401762
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Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62418 **Depth :** 0 - 6
ID : CIV-CPW2-SOIL 5.1

1:1 Soil pH	8.6
Soluble Salts 1:1, mmho/cm	0.06
Excess Lime Rating	NONE
Organic Matter LOI, %	0.5
Nitrate-N KCl, ppm N	2.1
Nitrate-N, lbs N / Acre	4
Phosphorus M3, ppm P	15
Potassium NH_4OAc, ppm K	92
Sulfate M-3, ppm S	3.2
Zinc DTPA, ppm Zn	0.31
Iron DTPA, ppm Fe	7.8
Manganese DTPA, ppm Mn	1.4
Copper DTPA, ppm Cu	0.40
Calcium NH_4OAc, ppm Ca	1169
Magnesium NH_4OAc, ppm Mg	131
Sodium NH_4OAc, ppm Na	68
Chloride $Ca\text{-}NO_3$, ppm Cl	1.0
Boron Hot Water, ppm B	0.27

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
7.5	0	3	78	15	4

Saturated Soil Paste Analysis (SAR)

Saturation, %	49
Sat Paste pH	8.1
Sat Paste ECe, mmho/cm	0.18
HCO_3, ppm	73
Cl, ppm	4
Ca, ppm	30
Mg, ppm	5
Na, ppm	4
S, ppm	2.8
Sodium Adsorption Ratio	0.2

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Loamy Sand	87	6	7

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Results For : CIV
Location : CPW2

Lab No. : 62419 **Depth :** 6 - 12
ID : CIV-CPW2-SOIL 5.2

1:1 Soil pH	8.7
Soluble Salts 1:1, mmho/cm	0.05
Excess Lime Rating	NONE
Organic Matter LOI, %	0.3
Nitrate-N KCl, ppm N	0.5
Nitrate-N, lbs N / Acre	1
Phosphorus M3, ppm P	9
Potassium NH_4OAc, ppm K	25
Sulfate M-3, ppm S	2.9
Zinc DTPA, ppm Zn	0.31
Iron DTPA, ppm Fe	5.6
Manganese DTPA, ppm Mn	1.2
Copper DTPA, ppm Cu	0.22
Calcium NH_4OAc, ppm Ca	746
Magnesium NH_4OAc, ppm Mg	73
Sodium NH_4OAc, ppm Na	7
Chloride Ca-NO_3, ppm Cl	0.2
Boron Hot Water, ppm B	0.21

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
4.4	0	1	84	14	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	44
Sat Paste pH	8.3
Sat Paste ECe, mmho/cm	0.15
HCO_3, ppm	68
Cl, ppm	3
Ca, ppm	21
Mg, ppm	5
Na, ppm	3
S, ppm	1.5
Sodium Adsorption Ratio	0.1

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sand	90	5	5

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Invoice No. : 1401762
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Results For : CIV
Location : CPW2

Lab No. : 62420 **Depth :** 12 - 18
ID : CIV-CPW2-SOIL 5.3

1:1 Soil pH	8.8
Soluble Salts 1:1, mmho/cm	0.05
Excess Lime Rating	NONE
Organic Matter LOI, %	0.3
Nitrate-N KCl, ppm N	< 0.1
Nitrate-N, lbs N / Acre	0
Phosphorus M3, ppm P	9
Potassium NH_4OAc, ppm K	24
Sulfate M-3, ppm S	2.5
Zinc DTPA, ppm Zn	0.24
Iron DTPA, ppm Fe	5.4
Manganese DTPA, ppm Mn	1.3
Copper DTPA, ppm Cu	0.18
Calcium NH_4OAc, ppm Ca	604
Magnesium NH_4OAc, ppm Mg	69
Sodium NH_4OAc, ppm Na	6
Chloride Ca-NO_3, ppm Cl	0.2
Boron Hot Water, ppm B	0.19

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
3.7	0	2	81	16	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	30
Sat Paste pH	8.2
Sat Paste ECe, mmho/cm	0.16
HCO_3, ppm	76
Cl, ppm	3
Ca, ppm	24
Mg, ppm	6
Na, ppm	3
S, ppm	1.4
Sodium Adsorption Ratio	0.2

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sand	90	5	5

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Results For : CIV
Location : CPW2

Lab No. : 62421 **Depth :** 18 - 24
ID : CIV-CPW2-SOIL 5.4

1:1 Soil pH	8.7
Soluble Salts 1:1, mmho/cm	0.05
Excess Lime Rating	NONE
Organic Matter LOI, %	0.3
Nitrate-N KCl, ppm N	0.5
Nitrate-N, lbs N / Acre	1
Phosphorus M3, ppm P	9
Potassium NH_4OAc, ppm K	24
Sulfate M-3, ppm S	3.7
Zinc DTPA, ppm Zn	0.15
Iron DTPA, ppm Fe	6.1
Manganese DTPA, ppm Mn	1.1
Copper DTPA, ppm Cu	0.21
Calcium NH_4OAc, ppm Ca	849
Magnesium NH_4OAc, ppm Mg	100
Sodium NH_4OAc, ppm Na	8
Chloride $Ca\text{-}NO_3$, ppm Cl	0.0
Boron Hot Water, ppm B	0.17

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
5.2	0	1	82	16	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	33
Sat Paste pH	8.3
Sat Paste ECe, mmho/cm	0.17
HCO_3, ppm	77
Cl, ppm	3
Ca, ppm	24
Mg, ppm	7
Na, ppm	4
S, ppm	1.8
Sodium Adsorption Ratio	0.2

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Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sand	90	4	6

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Results For : CIV
Location : CPW2

Lab No. : 62422	Depth : 0 - 6
ID : CIV-CPW2-SOIL 6.1	
1:1 Soil pH	7.9
Soluble Salts 1:1, mmho/cm	0.13
Excess Lime Rating	NONE
Organic Matter LOI, %	1.5
Nitrate-N KCl, ppm N	11.2
Nitrate-N, lbs N / Acre	20
Phosphorus M3, ppm P	66
Potassium NH_4OAc, ppm K	205
Sulfate M-3, ppm S	6.3
Zinc DTPA, ppm Zn	1.32
Iron DTPA, ppm Fe	9.2
Manganese DTPA, ppm Mn	4.0
Copper DTPA, ppm Cu	0.55
Calcium NH_4OAc, ppm Ca	1272
Magnesium NH_4OAc, ppm Mg	205
Sodium NH_4OAc, ppm Na	7
Chloride $Ca\text{-}NO_3$, ppm Cl	0.9
Boron Hot Water, ppm B	0.66

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
8.6	0	6	74	20	0

Saturated Soil Paste Analysis (SAR)

Saturation, %	41
Sat Paste pH	7.1
Sat Paste ECe, mmho/cm	0.54
HCO_3, ppm	150
Cl, ppm	4
Ca, ppm	77
Mg, ppm	20
Na, ppm	3
S, ppm	6.9
Sodium Adsorption Ratio	0.1

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Loam	74	14	12

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Invoice No. : 1401762
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Results For : CIV
Location : CPW2

Lab No. : 62423 **Depth :** 6 - 12
ID : CIV-CPW2-SOIL 6.2

1:1 Soil pH	8.0
Soluble Salts 1:1, mmho/cm	0.10
Excess Lime Rating	NONE
Organic Matter LOI, %	1.1
Nitrate-N KCl, ppm N	7.3
Nitrate-N, lbs N / Acre	13
Phosphorus M3, ppm P	34
Potassium NH_4OAc, ppm K	179
Sulfate M-3, ppm S	4.6
Zinc DTPA, ppm Zn	0.50
Iron DTPA, ppm Fe	5.3
Manganese DTPA, ppm Mn	2.7
Copper DTPA, ppm Cu	0.49
Calcium NH_4OAc, ppm Ca	1318
Magnesium NH_4OAc, ppm Mg	227
Sodium NH_4OAc, ppm Na	14
Chloride $Ca\text{-}NO_3$, ppm Cl	0.9
Boron Hot Water, ppm B	0.62

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
9.0	0	5	73	21	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	33
Sat Paste pH	7.5
Sat Paste ECe, mmho/cm	0.47
HCO_3, ppm	135
Cl, ppm	8
Ca, ppm	66
Mg, ppm	17
Na, ppm	8
S, ppm	7.9
Sodium Adsorption Ratio	0.2

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Loam	75	12	13

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Results For : CIV
Location : CPW2

Lab No. : 62424 **Depth :** 12 - 18
ID : CIV-CPW2-SOIL 6.3

1:1 Soil pH	8.6
Soluble Salts 1:1, mmho/cm	0.13
Excess Lime Rating	LOW
Organic Matter LOI, %	0.7
Nitrate-N KCl, ppm N	8.2
Nitrate-N, lbs N / Acre	15
Phosphorus M3, ppm P	8
Potassium NH_4OAc, ppm K	65
Sulfate M-3, ppm S	13.5
Zinc DTPA, ppm Zn	0.12
Iron DTPA, ppm Fe	3.6
Manganese DTPA, ppm Mn	1.4
Copper DTPA, ppm Cu	0.30
Calcium NH_4OAc, ppm Ca	2973
Magnesium NH_4OAc, ppm Mg	263
Sodium NH_4OAc, ppm Na	18
Chloride Ca-NO_3, ppm Cl	1.1
Boron Hot Water, ppm B	0.40

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
17.3	0	1	86	13	0

Saturated Soil Paste Analysis (SAR)

Saturation, %	29
Sat Paste pH	7.9
Sat Paste ECe, mmho/cm	0.44
HCO_3, ppm	94
Cl, ppm	8
Ca, ppm	56
Mg, ppm	17
Na, ppm	15
S, ppm	10.2
Sodium Adsorption Ratio	0.5

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Loamy Sand	83	6	11

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Results For : CIV
Location : CPW2

Lab No. : 62425 **Depth :** 8 - 24
ID : CIV-CPW2-SOIL 6.4

1:1 Soil pH	8.6
Soluble Salts 1:1, mmho/cm	0.20
Excess Lime Rating	HIGH
Organic Matter LOI, %	1.2
Nitrate-N KCl, ppm N	10.7
Nitrate-N, lbs N / Acre	51
Phosphorus M3, ppm P	5
Potassium NH_4OAc, ppm K	52
Sulfate M-3, ppm S	17.6
Zinc DTPA, ppm Zn	0.18
Iron DTPA, ppm Fe	4.5
Manganese DTPA, ppm Mn	1.3
Copper DTPA, ppm Cu	0.50
Calcium NH_4OAc, ppm Ca	3848
Magnesium NH_4OAc, ppm Mg	435
Sodium NH_4OAc, ppm Na	44
Chloride $Ca\text{-}NO_3$, ppm Cl	1.6
Boron Hot Water, ppm B	0.62

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
23.2	0	1	82	16	1

Saturated Soil Paste Analysis (SAR)

Saturation, %	48
Sat Paste pH	8.0
Sat Paste ECe, mmho/cm	0.49
HCO_3, ppm	116
Cl, ppm	6
Ca, ppm	50
Mg, ppm	19
Na, ppm	32
S, ppm	10.8
Sodium Adsorption Ratio	1.0

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Account No. : 19356

Soil Analysis Report

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

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Loam	68	14	18

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Soil Analysis Report

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SOIL SAGE LLC
8323 DEPEW WAY
ARVADA CO 80003

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62438 **Depth :** 0 - 6
ID : CIV-CPW2-SOIL 10.1

1:1 Soil pH	7.4
Soluble Salts 1:1, mmho/cm	0.81
Excess Lime Rating	NONE
Organic Matter LOI, %	1.3
Nitrate-N KCl, ppm N	3.3
Nitrate-N, lbs N / Acre	6
Phosphorus M3, ppm P	39
Potassium NH_4OAc, ppm K	335
Sulfate M-3, ppm S	111.9
Zinc DTPA, ppm Zn	0.64
Iron DTPA, ppm Fe	13.7
Manganese DTPA, ppm Mn	3.7
Copper DTPA, ppm Cu	0.57
Calcium NH_4OAc, ppm Ca	1200
Magnesium NH_4OAc, ppm Mg	224
Sodium NH_4OAc, ppm Na	168
Chloride Ca-NO_3, ppm Cl	61.5
Boron Hot Water, ppm B	1.14

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
9.5	0	9	63	20	8

Saturated Soil Paste Analysis (SAR)

Saturation, %	37
Sat Paste pH	7.0
Sat Paste ECe, mmho/cm	2.17
HCO_3, ppm	118
Cl, ppm	174
Ca, ppm	178
Mg, ppm	47
Na, ppm	183
S, ppm	252.5
Sodium Adsorption Ratio	3.1

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Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Loam	69	18	13

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Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62439 **Depth :** 6 - 12
ID : CIV-CPW2-SOIL 10.2

1:1 Soil pH	7.8
Soluble Salts 1:1, mmho/cm	0.74
Excess Lime Rating	NONE
Organic Matter LOI, %	1.4
Nitrate-N KCl, ppm N	6.4
Nitrate-N, lbs N / Acre	12
Phosphorus M3, ppm P	35
Potassium NH_4OAc, ppm K	317
Sulfate M-3, ppm S	99.2
Zinc DTPA, ppm Zn	0.81
Iron DTPA, ppm Fe	10.2
Manganese DTPA, ppm Mn	3.1
Copper DTPA, ppm Cu	0.49
Calcium NH_4OAc, ppm Ca	1503
Magnesium NH_4OAc, ppm Mg	264
Sodium NH_4OAc, ppm Na	194
Chloride Ca-NO_3, ppm Cl	60.0
Boron Hot Water, ppm B	1.23

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
11.4	0	7	66	19	7

Saturated Soil Paste Analysis (SAR)

Saturation, %	43
Sat Paste pH	7.2
Sat Paste ECe, mmho/cm	1.88
HCO_3, ppm	140
Cl, ppm	151
Ca, ppm	141
Mg, ppm	39
Na, ppm	175
S, ppm	202.4
Sodium Adsorption Ratio	3.4

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ARVADA **CO** **80003**

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Loam	69	18	13

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Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62440 **Depth :** 12 - 18
ID : CIV-CPW2-SOIL 10.3

1:1 Soil pH	8.3
Soluble Salts 1:1, mmho/cm	0.46
Excess Lime Rating	NONE
Organic Matter LOI, %	1.1
Nitrate-N KCl, ppm N	2.5
Nitrate-N, lbs N / Acre	4
Phosphorus M3, ppm P	18
Potassium NH_4OAc, ppm K	127
Sulfate M-3, ppm S	53.6
Zinc DTPA, ppm Zn	0.31
Iron DTPA, ppm Fe	5.9
Manganese DTPA, ppm Mn	2.0
Copper DTPA, ppm Cu	0.40
Calcium NH_4OAc, ppm Ca	1276
Magnesium NH_4OAc, ppm Mg	242
Sodium NH_4OAc, ppm Na	146
Chloride $Ca\text{-}NO_3$, ppm Cl	48.2
Boron Hot Water, ppm B	0.81

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
9.4	0	3	68	22	7

Saturated Soil Paste Analysis (SAR)

Saturation, %	40
Sat Paste pH	7.6
Sat Paste ECe, mmho/cm	1.19
HCO_3, ppm	95
Cl, ppm	107
Ca, ppm	80
Mg, ppm	22
Na, ppm	122
S, ppm	107.2
Sodium Adsorption Ratio	3.1

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Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Loam	69	18	13

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Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62441 **Depth :** 8 - 24
ID : CIV-CPW2-SOIL 10.4

1:1 Soil pH	8.7
Soluble Salts 1:1, mmho/cm	0.22
Excess Lime Rating	NONE
Organic Matter LOI, %	0.6
Nitrate-N KCl, ppm N	0.7
Nitrate-N, lbs N / Acre	3
Phosphorus M3, ppm P	31
Potassium NH_4OAc, ppm K	42
Sulfate M-3, ppm S	22.6
Zinc DTPA, ppm Zn	0.16
Iron DTPA, ppm Fe	5.0
Manganese DTPA, ppm Mn	1.4
Copper DTPA, ppm Cu	0.27
Calcium NH_4OAc, ppm Ca	769
Magnesium NH_4OAc, ppm Mg	130
Sodium NH_4OAc, ppm Na	65
Chloride Ca-NO_3, ppm Cl	14.5
Boron Hot Water, ppm B	0.41

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
5.3	0	2	72	20	5

Saturated Soil Paste Analysis (SAR)

Saturation, %	31
Sat Paste pH	7.9
Sat Paste ECe, mmho/cm	0.58
HCO_3, ppm	89
Cl, ppm	43
Ca, ppm	32
Mg, ppm	10
Na, ppm	71
S, ppm	46.4
Sodium Adsorption Ratio	2.8

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ARVADA **CO** **80003**

Invoice No. : 1401762
Date Received : 05/10/2023
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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Loamy Sand	85	8	7

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Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62458 **Depth :** 0 - 6
ID : CIV-CPW2-SOIL 15.1

1:1 Soil pH	8.3
Soluble Salts 1:1, mmho/cm	0.63
Excess Lime Rating	HIGH
Organic Matter LOI, %	3.4
Nitrate-N KCl, ppm N	8.5
Nitrate-N, lbs N / Acre	15
Phosphorus M3, ppm P	69
Potassium NH_4OAc, ppm K	207
Sulfate M-3, ppm S	145.0
Zinc DTPA, ppm Zn	3.12
Iron DTPA, ppm Fe	10.5
Manganese DTPA, ppm Mn	2.6
Copper DTPA, ppm Cu	5.20
Calcium NH_4OAc, ppm Ca	4091
Magnesium NH_4OAc, ppm Mg	636
Sodium NH_4OAc, ppm Na	148
Chloride $Ca\text{-}NO_3$, ppm Cl	6.5
Boron Hot Water, ppm B	2.12

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
26.9	0	2	76	20	2

Saturated Soil Paste Analysis (SAR)

Saturation, %	57
Sat Paste pH	7.7
Sat Paste ECe, mmho/cm	1.57
HCO_3, ppm	165
Cl, ppm	21
Ca, ppm	198
Mg, ppm	61
Na, ppm	88
S, ppm	230.0
Sodium Adsorption Ratio	1.4

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Date Received : 05/10/2023
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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Clay Loam	41	30	29

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Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62459 **Depth :** 6 - 12
ID : CIV-CPW2-SOIL 15.2

1:1 Soil pH	8.1
Soluble Salts 1:1, mmho/cm	0.69
Excess Lime Rating	NONE
Organic Matter LOI, %	2.6
Nitrate-N KCl, ppm N	4.4
Nitrate-N, lbs N / Acre	8
Phosphorus M3, ppm P	25
Potassium NH_4OAc, ppm K	116
Sulfate M-3, ppm S	142.9
Zinc DTPA, ppm Zn	1.49
Iron DTPA, ppm Fe	14.8
Manganese DTPA, ppm Mn	2.5
Copper DTPA, ppm Cu	1.96
Calcium NH_4OAc, ppm Ca	2917
Magnesium NH_4OAc, ppm Mg	611
Sodium NH_4OAc, ppm Na	233
Chloride Ca-NO_3, ppm Cl	11.4
Boron Hot Water, ppm B	1.33

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
21.0	0	1	70	24	5

Saturated Soil Paste Analysis (SAR)

Saturation, %	44
Sat Paste pH	7.5
Sat Paste ECe, mmho/cm	1.98
HCO_3, ppm	122
Cl, ppm	35
Ca, ppm	200
Mg, ppm	72
Na, ppm	162
S, ppm	317.4
Sodium Adsorption Ratio	2.5

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ARVADA **CO** **80003**

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sandy Clay Loam	53	22	25

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ARVADA CO 80003

Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Lab No. : 62460 **Depth :** 12 - 18
ID : CIV-CPW2-SOIL 15.3

1:1 Soil pH	8.6
Soluble Salts 1:1, mmho/cm	0.11
Excess Lime Rating	NONE
Organic Matter LOI, %	0.3
Nitrate-N KCl, ppm N	1.0
Nitrate-N, lbs N / Acre	2
Phosphorus M3, ppm P	10
Potassium NH_4OAc, ppm K	20
Sulfate M-3, ppm S	12.1
Zinc DTPA, ppm Zn	0.24
Iron DTPA, ppm Fe	6.0
Manganese DTPA, ppm Mn	1.1
Copper DTPA, ppm Cu	0.24
Calcium NH_4OAc, ppm Ca	362
Magnesium NH_4OAc, ppm Mg	80
Sodium NH_4OAc, ppm Na	31
Chloride $Ca\text{-}NO_3$, ppm Cl	3.4
Boron Hot Water, ppm B	0.28

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
2.7	0	2	68	25	5

Saturated Soil Paste Analysis (SAR)

Saturation, %	43
Sat Paste pH	8.0
Sat Paste ECe, mmho/cm	0.29
HCO_3, ppm	68
Cl, ppm	7
Ca, ppm	21
Mg, ppm	8
Na, ppm	31
S, ppm	21.6
Sodium Adsorption Ratio	1.4

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Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sand	89	6	5

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Results For : CIV
Location : CPW2

Lab No. : 62461 **Depth :** 18 - 24
ID : CIV-CPW2-SOIL 15.4

1:1 Soil pH	8.7
Soluble Salts 1:1, mmho/cm	0.11
Excess Lime Rating	NONE
Organic Matter LOI, %	0.2
Nitrate-N KCl, ppm N	0.7
Nitrate-N, lbs N / Acre	1
Phosphorus M3, ppm P	6
Potassium NH_4OAc, ppm K	20
Sulfate M-3, ppm S	7.8
Zinc DTPA, ppm Zn	0.25
Iron DTPA, ppm Fe	3.8
Manganese DTPA, ppm Mn	1.2
Copper DTPA, ppm Cu	0.15
Calcium NH_4OAc, ppm Ca	266
Magnesium NH_4OAc, ppm Mg	64
Sodium NH_4OAc, ppm Na	24
Chloride $Ca\text{-}NO_3$, ppm Cl	3.2
Boron Hot Water, ppm B	0.33

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
2.0	0	3	66	26	5

Saturated Soil Paste Analysis (SAR)

Saturation, %	< 0
Sat Paste pH	8.0
Sat Paste ECe, mmho/cm	0.30
HCO_3, ppm	66
Cl, ppm	11
Ca, ppm	22
Mg, ppm	9
Na, ppm	27
S, ppm	20.9
Sodium Adsorption Ratio	1.2

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8323 DEPEW WAY
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Invoice No. : 1401762
Date Received : 05/10/2023
Date Reported : 05/12/2023

Results For : CIV
Location : CPW2

Soil Texture	Sand, %	Silt, %	Clay, %
Sand	91	4	5

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USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Grass Seeding Planned and Applied Worksheet

Grass Seeding PART I - Planned

Cooperator	Area 3 SWA Sandy soil seed mix	Date	
Tract/Field No		Acres	
Soil Survey Area		Map Unit (s)	1
Contract No.		CIN	

Seeding dates	Nov 1 - Apr 30	Purpose	Other
Seedbed preparation	No Till	Seed rate	20
Drill type	no-till grass	Acres to be seeded	1.00
Planting depth-Drill spacing (in)	.25 ----7-10inches		

	N	P_2O_5	K_2O
Planned fertilizer application (lb/ac)			

A Nutrient Management Plan is not required for the establishment of vegetative conservation practices.

Planned weed control activities	Description	Herbicide
	Date(s)	as needed
Planned residue cover or mulch	Type	Other NRCS approved cover
	Amount (lb/ac)	
	Application method	

Attach WIN-PST Soil-Pesticide Interaction Risk Report for all chemical suppression activities

Seed Mix Recommendation, † ‡

Common name N=native, I=introduced		Genus, species	Recommended Cultivar	% of seed mix	Pounds (lbs) pure live seed (PLS)
Grasses, forbs					
Switchgrass	Native	*Panicum virgatum*	Blackwell	20.0	0.45
Little bluestem	Native	*Schizachyrium scoparium*	Aldous, cimm.,camper, blaze	12.5	0.42
Yellow indiangrass	Native	*Sorghastrum nutans*	cheyenne	15.0	0.77
Sand bluestem	Native	*Andropogon hallii*	chet	15.0	1.19
Prairie sandreed	Native	*Calimovilfa longifolia*	Goshen	4.0	0.13
Indian ricegrass	Native	*Achnatherum hymenoides*	Paloma, Rimrock	2.0	0.12
Blanketflower	Native	*Gaillardia aristata*		3.0	0.13
Maxmilian sunflower	Native	*Helianthus maximilianii*		3.0	0.15
Prairie Coneflower	Native	*Ratibida columnifera*		3.0	0.03
Purple prairie clover	Native	*Dalea purpurea purpurea*		2.0	0.06
Annual sunflower	Native	*Helianthus annuus*		2.0	0.29
Small burnet	troduce	*Sanguisorba minor*		3.0	0.62
Alfalfa	troduce	*Medicago sativa*		3.0	0.12
Sainfoin	troduce	*Onobrychis vicifolia*		3.0	0.87
Yellow sweetclover	troduce	*Melilotus officinale*		2.0	0.07
Western Yarrow	Native	*Achilea lanulosa*		2.0	0.01
Blue flax	Native	*Linum lewisii*		2.0	0.06
Black-eyed Susan	Native	*Rudbeckia hirta*		3.5	0.02
Shrubs					
Fourwing Saltbush	Native	*Atriplex canescens*			0.10
skunkbush sumac	Native	*Rhus trilobata*			0.17
0					0.00
				Shrubs	0.27
				Grasses, Forbs	5.49
				Total lbs PLS	5.76
				Seed Rate (lbs PLS/acre)	5.76

† Certified Seed is required for all NRCS cost share programs

‡ Complete a Tree and Shrub Establishment 612 Job Sheet for bare-root shrub plantings

Additional Recommendations

All native legumes must be innoculated. Seed MUST be sorted by size and type (e.g., large hard, small, fluffy).

REPORT NUMBER
22-272-0302 v2
COMPLETED DATE
Oct 10, 2022
ACCOUNT
65502
RECEIVED DATE
Sep 29, 2022

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TODAY'S DATE
Oct 10, 2022

QUANDARY CONSULTANTS
Michael Dinkel
10603 E 6th pl
Aurora CO 80010

IDENTIFICATION
MIKE DINKEL

SOIL ANALYSIS REPORT

NEUTRAL AMMONIUM ACETATE (EXCHANGEABLE)

LAB NUMBER *400*	SAMPLE IDENTIFICATION	ORGANIC MATTER L.O.I.		PHOSPHORUS P_1 (WEAK BRAY) 1:7		PHOSPHORUS P_2 (STRONG BRAY) 1:7		OLSEN BICARBONATE P		POTASSIUM K		MAGNESIUM Mg		CALCIUM Ca		SODIUM Na		pH SOIL pH 1:1	pH BUFFER INDEX	CATION EXCHANGE CAPACITY C.E.C.	PERCENT BASE SATURATION (COMPUTED) % K	% Mg	% Ca	% H	% Na
		percent	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE			meq/100g					
37771	5501	2.0	L	150	VH	154	VH			427	VH	534	VH	3299	H	43		7.7		22.2	4.9	20.0	74.3	0.0	0.8
37772	5502	1.6	L	107	VH	131	VH			499	VH	478	VH	2727	H	135	VH	7.8		19.5	6.6	20.4	70.0	0.0	3.0
37773	5503	2.0	L	88	VH	156	VH			353	VH	354	VH	2466	H	35		8.1		16.3	5.6	18.1	75.4	0.0	0.9
37774	5504	1.9	L	107	VH	131	VH			347	VH	422	VH	2758	H	54		7.9		18.4	4.8	19.1	74.8	0.0	1.3

LAB NUMBER *400*	NITRATE-N (FIA) SURFACE ppm	SURFACE lbs/A	SURFACE depth (in)	SUBSOIL 1 ppm	SUBSOIL 1 lbs/A	SUBSOIL 1 depth (in)	SUBSOIL 2 ppm	SUBSOIL 2 lbs/A	SUBSOIL 2 depth (in)	Total lbs/A	SULFUR S ICAP ppm	SULFUR RATE	ZINC Zn DTPA ppm	ZINC RATE	MANGANESE Mn DTPA ppm	MANGANESE RATE	IRON Fe DTPA ppm	IRON RATE	COPPER Cu DTPA ppm	COPPER RATE	BORON B SORB. DTPA ppm	BORON RATE	EXCESS LIME RATE	SOLUBLE SALTS 1:1 mmhos/cm	SOLUBLE SALTS RATE
37771	75	270	0-12							270	28	VH	0.5	VL	2	VL	7	L	0.5	L	0.5	L	M	0.8	L
37772	101	364	0-12							364	33	VH	3.7	H	7	L	12	M	1.2	M	1.0	M	M	1.2	M
37773	14	50	0-12							50	21	H	3.3	H	5	L	23	H	1.2	M	0.9	M	M	0.4	L
37774	30	108	0-12							108	27	VH	5.4	H	3	VL	25	VH	1.3	H	1.0	M	M	0.5	L

REV.10/17

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REPORT NUMBER
22-272-0302 v2
COMPLETED DATE
Oct 10, 2022
ACCOUNT
65502
RECEIVED DATE
Sep 29, 2022

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TODAY'S DATE
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ADDITIONAL SOIL ANALYSIS

Labnum *400*	Sample ID	E.C. EC electrode mmhos/cm
37771	5501 *Depth: 0-12*	2.0
37772	5502 *Depth: 0-12*	3.4
37773	5503 *Depth: 0-12*	0.7
37774	5504 *Depth: 0-12*	1.0

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SODIUM ADSORPTION RATIO REPORT

Method Lab Number	Sample Id	CALCULATED Sodium Adsorption Ratio	SATURATED PASTE EXTRACTION Sodium (Water Soluble) mg/L	Magnesium (Water Soluble) mg/L	Calcium (Water Soluble) mg/L
Units					
400377715501		0.5	37	64	257
400377725502		2.0	166	98	334
400377735503		0.6	25	20	78
400377745504		0.9	43	31	122

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SOIL FERTILITY RECOMMENDATIONS (POUNDS PER ACRE)

YOUR SAMPLE NUMBER (LAB NUMBER)	INTENDED CROP	YIELD GOAL	PREVIOUS CROP	SOIL AMENDMENTS					N NITROGEN	P_2O_5 PHOSPHATE	K_2O POTASH	Mg MAGNE-SIUM	S SULFUR	Zn ZINC	Mn MANGA-NESE	Fe IRON	Cu COPPER	B BORON
				LIME LBS/A OF	LIME TON	GYPSUM TONS/A		ELEMENTAL SULFUR LBS/A										
5501 (40037771)	BROME/ORCHRD GRS-ton	3.0	UNKNOWN						--	--	--	--	--	0.8	--	--	--	--
5502 (40037772)	BROME/ORCHRD GRS-ton	3.0	UNKNOWN			0.2	OR	30	--	--	--	--	--	--	--	--	--	--
5503 (40037773)	BROME/ORCHRD GRS-ton	3.0	UNKNOWN						--	--	--	--	--	--	--	--	--	--
5504 (40037774)	BROME/ORCHRD GRS-ton	3.0	UNKNOWN						--	--	--	--	--	--	--	--	--	--

REV. 12/03

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SOIL HEALTH ASSESSMENT

ANALYTICAL LABORATORY FINDINGS

SAMPLE IDENTIFICATION	5501
LABORATORY NUMBER	40037771

ANALYTE	UNITS	RESULTS	LOW / MEDIUM / OPTIMUM / VERY HIGH
H3A EXTRACTION			
ORTHOPHOSPHATE-P	ppm	169.5	
PHOSPHORUS	ppm	177	
POTASSIUM	ppm	169	
MAGNESIUM	ppm	344	
CALCIUM	ppm	2818	
SODIUM	ppm	41	
IRON	ppm	23	
ALUMINUM	ppm	81	
WATER SOLUBLE			
NITRATE-N	ppm	75	
AMMONIACAL-N	ppm	1.5	
ORTHOPHOSPHATE-P	ppm	12.35	
CARBON	ppm	130.7	
TOTAL NITROGEN	ppm	77.6	
1 DAY CO_2C BURST		119.00	
ORGANIC CARBON	ppm	130.7	
ORGANIC NITROGEN	ppm	1.1	
ORGANIC C/N RATIO		118.8	

ADDITIONAL NITROGEN CREDIT IDENTIFIED VIA HANEY TEST: **N/A. Sample depth not 0-6"**

NITROGEN RECOMMENDATIONS MAY INCLUDE ADDITIONAL NITROGEN CREDITS BASED ON PREVIOUS CROPS AND NITROGEN MINERALIZATION RATES.

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SOIL HEALTH CALCULATION

13.3

0 — 25

The **H3A Soil Extractant** was developed by Haney*. This extract is designed to mimic organic acids produced by living plant root systems. These organic acids increase nutrient availability in the root zone.

The **Water Soluble Extract** provides a snapshot of nutrients that are immediately available to the plants.

The **CO_2 Burst** test is very good indicator of soil health. This test measures the amount of CO_2 naturally released from the soil due to the activity of the soil microbes through microbial respiration. This test is very dependent on the amount of carbon that is available to the soil microbes and the form that the carbon is in. As the available carbon increases in your soil the Microbial respiration will increase.

Organic Carbon is the available total water extractable organic carbon from your soil. This pool of carbon is roughly 80 times smaller than the Soil Organic Matter. The organic carbon pool reflects the energy/food source that is driving the soil microbes.

The **Organic Nitrogen** pool is replenished by fresh plant residues, manure, composts, and dying soil microbes.

The **Organic C/N ratio** is a critical component of the nutrient cycle. A soil C/N ratio above 20 generally indicates that Nitrogen will be tied up and not available to plants. The ideal range for the Organic C/N ratio will be from 8:1 to 15:1.

The **Soil Health Calculation** uses the CO_2 Burst, Organic Carbon, Organic Nitrogen, and the C/N ratio to generate the soil health number. This calculation looks at the balance of soil carbon and nitrogen and their relationship to microbial activity. This number represents the overall health of your system. Soil values will range from 0 to 25. A soil with a value below 7 would be considered low. You want to see this number increase as you make changes and adjustments. Keeping track of this number will allow you to gauge the effects of your management practices over time.

*Modifications to the New Soil Extractant H3A-1: A Multinutrient Extractant
R.L. Haney (a); E.B. Haney (b); L.R. Hossner (c); J.G. Arnold (a)

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SOIL HEALTH ASSESSMENT

ANALYTICAL LABORATORY FINDINGS

SAMPLE IDENTIFICATION	5502
LABORATORY NUMBER	40037772

ANALYTE	UNITS	RESULTS	LOW / MEDIUM / OPTIMUM / VERY HIGH
H3A EXTRACTION			
ORTHOPHOSPHATE-P	ppm	135.3	
PHOSPHORUS	ppm	140	
POTASSIUM	ppm	260	
MAGNESIUM	ppm	350	
CALCIUM	ppm	2791	
SODIUM	ppm	139	
IRON	ppm	43	
ALUMINUM	ppm	64	
WATER SOLUBLE			
NITRATE-N	ppm	101	
AMMONIACAL-N	ppm	1.2	
ORTHOPHOSPHATE-P	ppm	9.75	
CARBON	ppm	122.0	
TOTAL NITROGEN	ppm	103.9	
1 DAY CO_2C BURST		38.00	
ORGANIC CARBON	ppm	122.0	
ORGANIC NITROGEN	ppm	1.7	
ORGANIC C/N RATIO		71.8	

ADDITIONAL NITROGEN CREDIT IDENTIFIED VIA HANEY TEST: **N/A. Sample depth not 0-6"**

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SOIL HEALTH CALCULATION

5.2

0 — 25

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R.L. Haney (a); E.B. Haney (b); L.R. Hossner (c); J.G. Arnold (a)

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SOIL HEALTH ASSESSMENT

ANALYTICAL LABORATORY FINDINGS

SAMPLE IDENTIFICATION	5503
LABORATORY NUMBER	40037773

ANALYTE	UNITS	RESULTS	LOW / MEDIUM / OPTIMUM / VERY HIGH
H3A EXTRACTION			
ORTHOPHOSPHATE-P	ppm	141.2	
PHOSPHORUS	ppm	148	
POTASSIUM	ppm	203	
MAGNESIUM	ppm	298	
CALCIUM	ppm	2922	
SODIUM	ppm	38	
IRON	ppm	26	
ALUMINUM	ppm	45	
WATER SOLUBLE			
NITRATE-N	ppm	16	
AMMONIACAL-N	ppm	2.1	
ORTHOPHOSPHATE-P	ppm	10.87	
CARBON	ppm	106.9	
TOTAL NITROGEN	ppm	21.4	
1 DAY CO_2C BURST		21.00	
ORGANIC CARBON	ppm	106.9	
ORGANIC NITROGEN	ppm	3.3	
ORGANIC C/N RATIO		32.4	

ADDITIONAL NITROGEN CREDIT IDENTIFIED VIA HANEY TEST: **N/A. Sample depth not 0-6"**

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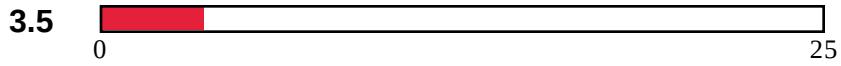
SOIL HEALTH CALCULATION



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SOIL HEALTH ASSESSMENT

ANALYTICAL LABORATORY FINDINGS

SAMPLE IDENTIFICATION	5504
LABORATORY NUMBER	40037774

ANALYTE	UNITS	RESULTS	LOW / MEDIUM / OPTIMUM / VERY HIGH
H3A EXTRACTION			
ORTHOPHOSPHATE-P	ppm	185.7	
PHOSPHORUS	ppm	196	
POTASSIUM	ppm	176	
MAGNESIUM	ppm	317	
CALCIUM	ppm	2521	
SODIUM	ppm	60	
IRON	ppm	45	
ALUMINUM	ppm	78	
WATER SOLUBLE			
NITRATE-N	ppm	34	
AMMONIACAL-N	ppm	0.7	
ORTHOPHOSPHATE-P	ppm	11.27	
CARBON	ppm	160.3	
TOTAL NITROGEN	ppm	37.2	
1 DAY CO_2C BURST		52.00	
ORGANIC CARBON	ppm	160.3	
ORGANIC NITROGEN	ppm	2.5	
ORGANIC C/N RATIO		64.1	

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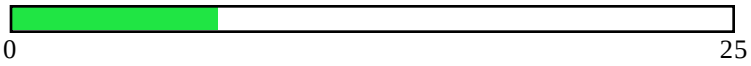
SOIL HEALTH CALCULATION

7.1



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