Location Checklist

Operator / #	HIGHPOINT OPERATING CORPORATION / 10071			
Location ID & Name	305204 ROTHE-65N63W/31NESW			
County	Weld, CO			
Well Information	Well Name:	ROTHE #23-31		
	Well API #:	05-123-22642		
	Lat/Long as Drilled:	40.354090 / -104.481190		
	Plug Date & Form 6s Doc #:	11/22/2021 & 402887965		
Facility Entities	X	Tank Battery (Off-Site)		Pits
	X	Wells	X	On-Location Flowlines (Form 42) Doc #: 402840503
		Domestic Taps	X	Off-Location Flowlines (Form 44) Doc #: 402913578
Equipment On-Site	X	None		Debris
		Pit mouse/rat holes, cellars backfilled		
Access Road	X	Regraded	X	Contoured
		Culverts removed	X	Gravel removed
		Pre-Existing (Must provide supporting documentation)		
Reclamation Status	X	Location and associated disturbances reclaimed		
		Subsidence		
Spills or Releases (Form 19)	X	No		Yes
Remediation (Form 27/27A)		No	X	Yes - Resolved 2022
On-Location Flowlines		No	X	Yes
Off-Location Flowlines		No	X	Yes
Inspection Corrective Actions		No	X	Yes – Resolved 2019
Sundry Notice	Form 4 Doc # & Date:	403018374 & 04/26/2022		
	Purpose:	Final Reclamation will commence approximately 04/15/2022. Per Rule 1004.c.(4) operator shall submit Sundry Notice reporting final reclamation is complete and site is ready for inspection when vegetation reaches 80% coverage.		
	Comments:	Prepped for seed as of 4/15/2022, turned over to surface owner for crop.		
	Attachments:	None		
Drone Information	Make & Model	DJI M300/DJI Mavic 3 Multispectral		
	Image Processing Software	Pix4dfields – RGB/Multispectral Imagery & Pix4dmatic – RGB Imagery		
	Pilot Name & FAA Certificate #	Sam Streeter, #4100157		
	Date of FAA Certificate Issuance	23 Dec 2023		

Site-Specific Quality Assurance & Quality Control Audit

Final Reclamation Complete Notice – Cropland

Permit Closure Report – Cropland

Location ID 305204
Location Name ROTHE-65N63W/31NESW

Report Date

18 Feb 2025

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

Crop Year and Type

Crop 2024 – Grass Hay

Quality Assurance & Quality Control Audit

Auditor	Soil Sage
Audit Date	22 Nov 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	ROTHE-65N63W/31NESW			
Location ID	305204			
Operator / #	HIGHPOINT OPERATING CORPORATION / 10071			
Field	WATTENBERG / 90750			
County, State	Weld, CO			
Lat/Long	40.354090 / -104.481190			
		Planned Location	X	As Drilled
Facility Status	CL	**Location**		NESW 31 5N63W
Facility Status Date	11/22/2021			
Facility Entities	X	Tank Battery (Off-Site)		Pits
	X	Wells	X	Off-Location Flowlines (**Form 44**)
		Domestic Taps	X	On-Location Flowlines (**Form 42**)
		Electric Utilities		
Equipment on Site	X	No		Yes
		If yes, list:		
		Pit mouse/rat holes, cellars backfilled		
Access Road	X	Regraded	X	Contoured
		Culverts Removed	X	Gravel Removed
		Pre-Existing: must provide supporting documentation		
Environment Incidents & Remediation		None		Spill or Release (**Form 19**)
	X	Remediation (**Form 27/27A**)		
Variance Requests	**No Variance Requests were detected during this QA & QC Audit.**			
Inspection Corrective Actions (CA)s	**Corrective Actions (CAs) were detected during the QA & QC Audit.** **CA Overall Status:** 2 of 2 CAs Completed **CA-Approving Inspection Doc # & Date:** 696101424 & 10/16/2019 ○ **Inspector:** Bret Evins **Form FIRR Doc # & Submittal Date:** 402183185 & 10/17/2019 ○ **Overall Status:** CAC ○ **Originating Field Inspection Report (FIR) Doc #:** 696101251 ○ **CA #:** 130038 **Date Completed:** 09/13/2019 Wellsite & Access Road - Weed removal and control has been completed to comply with Rule 603.f. **ECMC Decision:** Approved			

	○ **CA #:** 130039 **Date Completed:** 09/13/2019 Wellsite & Access Road - Weed removal and control has been completed to comply with Rule 603.f. **ECMC Decision:** Approved
	Complete ECMC Inspection Search Results: Link
Sundry Notice (Form 4)	**Form 4s were detected during the QA & QC Audit.** See individual scout card data for details.
On Location Flowlines (Form 42)	**Form 42s were detected during the QA & QC Audit.** See individual scout card data for details.
Off-Location Flowlines (Form 44)	**Form 44 Doc # & Date:** 402913578 & 04/21/2022 ○ **Purpose:** Abandonment Verification ○ **Abandonment Date:** 11/22/2021 ○ **ECMC Approval Date & Signee:** 04/21/2022 by Julie Murphy ○ **Operator Comments:** Two flowlines abandoned in place in accordance with rule 1105.e. requirements Rothe_5N-63W-31_NWSW_05056331bc_05056331dc_01M ○ **Note:** This Form 44 includes data for two Off-Location Flowlines: 463120 and 463119. This Location is connected to 463119 below. **Flowline Facility Information** ○ **ECMC Flowline ID:** 463119 ○ **Operator Flowline ID:** Rothe_5N-63W-31_NWSW_05056331bc_05056331dc_01M ○ **Status & Date:** CL & 11/22/2021 ○ **Flowline Type:** Wellhead Line ○ **Type of Fluids Transported:** Multiphase ○ **Start Point Location ID:** 305204 ○ **Start Point Riser Lat/Long:** 40.354090/-104.481190 (ROTHE #23-31 Well) ○ **Equipment at Start Point:** Well ○ **End Point Location ID:** 445077 ○ **End Point Riser Lat/Long:** 40.348844/-104.479325 (ROTHE-65N63W/31SESW Production Facilities) ○ **Equipment at End Point Riser:** Separator

Site Investigation and Remediation Workplan (Form 27/27A)	**Remediation Project #:** 20598 **Form 27A Supplemental Doc # & Date:** 403107181 & 07/18/2022 ○ **Purpose:** Rule 913.c.(9): Decommissioning of Oil and Gas Facilities. Wellhead Cut/Cap and Flowline Abandonment. ○ **Lat/Long of Remediation:** 40.354090/-104.481190 (Well) 40.348869/-104.478927 (Off-Location Flowline) ○ **Facility Type & Facility ID:** Well & API # 05-123-22642 Off-Location Flowline & 463119 ○ **Operator Comments:** None ○ **ECMC Comments:** Based on the information presented no further remedial action is necessary at this time and the COGCC approves the closure request. However, should future conditions at the site indicate contaminant concentrations in soils exceeding COGCC standards or if groundwater is found to be impacted, then further investigation and/or remediation activities may be required. This no further action determination is limited to environmental remediation. Operator is required to comply with COGCC 1100 Series Rules for Flowline Regulations for all Flowline Abandonment activities and COGCC 400 Series Rules for Wellhead Plugging and Abandonment. The surface area disturbed by the remediation activity shall be reclaimed in accordance with the 1000 Series Reclamation Rules. For locations with active ongoing oil and gas operations, comply with Rule 1003 interim reclamation requirements and for locations that will no longer have active oil and gas operations, comply with Rule 1004 Final Reclamation requirements. ○ **ECMC COAs:** None ○ **Closure Request Approved:** 07/18/2022 by Robert Chesson ○ **Final Resolution:** **Case Resolved on 07/18/2022** ○ **Attachments:** Closure Assessment Summary Doc # 403107182 **Form 27 Initial Doc # & Date:** 402814750 & 10/29/2021 ○ **Purpose:** Rule 913.c.(9): Decommissioning of Oil and Gas Facilities. Wellhead Cut/Cap and Flowline Abandonment. ○ **Operator Comments:** This Form 27 Intent is submitted prior to decommissioning multiple related assets: - Cut/cap of the Rothe 23-31 (05-123-22642) - Abandonment of off-location flowline Rothe_5N-63W-31_NWSW_05056331bc_05056331dc_01M (463119). See attached Site Map for details.

Field Inspection Form (Form INSP)	**Form INSP Doc # & Date:** 707602938 & 06/11/2024 ○ **Status Summary:** NO FOLLOW UP INSPECTION REQUIRED. ○ **Inspected Facilities:** ROTHE 23-31 (Well) ○ **Inspection Status:** PA ○ **Inspection Date & Inspector:** 06/11/2024 by Bret Evins ○ **Comments:** This is a PLUGGED & ABANDONED WELL inspection. Well(s): 1: Plugged & Abandoned | PA. Battery: Abandoned. ALL equipment has been removed. Abandoned Battery SE corner GPS coordinates: 40.348787 / -104.479217 Abandoned Centralized Battery formerly served 2 Location IDs (305178, 305204). (Well(s): 2: Plugged & Abandoned | PA). WELL STATUS COMMENT: Plugged & Abandoned | PA. Form 6-SRA on file. Plugging, cut/cap date: 11/22/2021. Approved. Plugged & Abandoned | PA well GPS coordinates: 40.354090 / -104.481190 Routine inspection. *Any Corrective Actions from prior inspections that have not been addressed remain applicable. ○ **Attachments:** Inspection Photos Doc # 707602939 **Form INSP Doc # & Date:** 696101424 & 10/16/2019 ○ **Status Summary:** THIS IS A FOLLOW UP INSPECTION. NO FOLLOW UP INSPECTION REQUIRED. ○ **Inspected Facilities:** ROTHE 23-31 (Well) ○ **Inspection Status:** TA ○ **Inspection Date & Inspector:** 10/16/2019 by Bret Evins ○ **Comments:** This is a WELL inspection. Well(s): 1 ; Temporarily Abandoned | TA. Battery: Shut-down | Inactive. Centralized Battery serves 2 Location IDs (305178, 305204). (Well(s): 2 ; Temporarily Abandoned | TA). Refer to Field Inspection Doc. #696101422 and/or Location ID #305178 for Battery / Facility, Equipment info. Follow-up to Field Inspection Doc. #696101251 dated 09/03/2019. Prior insp: Weed encroachment at wellsite, & wellsite access road. Refer to Rule 603.f for guidance. Remove, manage, & control weeds around wellsite, & wellsite access road. Comply with Rule 603.f. Corrective Action date: 09/16/2019. This insp: * Weeds NOW appear mitigated at wellsite & wellsite access road. See photos #1-4. Appears plumbed to surface. Temporarily Abandoned | TA. Last prod: 06/2017. TA status per doc # 401544187. Witnessed MIT: 10/15/2019. Refer to Field Inspection Doc. #696101414 dated 10/15/2019, Form 42 Doc #402186870. Follow-up to Field Inspection Doc. #696101251 dated 09/03/2019.

	During this inspection, the following prior possible compliance issues appear to be addressed: 1.) Weed encroachment at wellsite, & wellsite access road. Refer to Rule 603.f for guidance. Remove, manage, & control weeds around wellsite, & wellsite access road. Comply with Rule 603.f. Corrective Action date: 09/16/2019. * Weeds NOW appear mitigated at wellsite & wellsite access road. See photos #1-4. During this inspection, NO possible compliance issues were observed. This is a summary of the inspection report. ○ **Attachments:** Inspection Photos Doc # 696101425
COGIS Tank Facilities Information (Scout Card)	**Tank Battery Name:** ROTHE-65N63W #31SESW **FACILITY ID:** 445078 ○ **Status & Date**: AC & 03/03/2016 ○ **Lat/Long**: 40.348844 / -104.479325 ○ **ECMC documents:** No documents were detected during the QA & QC Audit, however, this Tank Battery is referenced in Field Inspection Doc # 707602938 and is shared with well ROTHE #24-31 API #05-123-22602 at Location ID 305178. ○ **Note**: The Tank Battery is located at Location ID 445077.
COGIS Well Information (Scout Card)	**Well Name**: ROTHE #23-31 **API#**: 05-123-22642 **FACILITY ID**: 275567 ○ **Status & Date**: PA & 11/22/2021 ○ **Lat/Long as Drilled**: 40.354090 / -104.481190 ○ **Form 6 Doc # & Date:** 402887965 & 09/02/2022 ○ **Form 4 Doc # & Date:** 403018374 & 04/26/2022 **Purpose:** Final Reclamation will commence approximately 04/15/2022. ○ **Form 42 Doc # & Date:** 402840503 & 10/13/2021 **Purpose:** START OF PLUGGING OPERATIONS - 48-hour notice required

ECMC Abbreviations: Location & Facility Status Codes, Inspection Types & Statuses and ECMC Help.

Audit Key Findings – Designation Land Use Observations

PREVIOUS LAND USE	CURRENT LAND USE
Reference Imagery for Infrastructure: USGS NAPP 1988; DRCOG 2004; NAIP 2009	**Remotely Sensed Imagery:** 09 Sep 2024; 15 Jan 2025
Designation: Oil & Gas Facility	**Designation:** Cropland

The following imagery sources were reviewed during this Audit: EarthExplorer, DRCOG, USDA NAIP, ESRI, Google Earth and Soil Sage Remotely Sensed Imagery.

Site Observation Notes

No additional information.

In accordance with ECMC guidance, this cropland evaluation has demonstrated that this location has been returned to its original condition and crops are reflective of the cropland reference areas.

Closure Information

Location ID 305204 ROTHE-65N63W/31NESW is in Weld County, Colorado near the intersection of County Road 61 and County Road 50. There is one plugged and abandoned well (ROTHE #23-31 API # 05-123-22642). There is an Off-Location Flowline (Flowline ID 463119) between this well and the Off-Site Production Facility at Location ID 445077.

There was a Corrective Action at this location on September 3rd, 2019, due to weed encroachment at the wellsite and the wellsite access road. This was resolved in September 2019 and an ECMC inspection approved the CA on October 16th, 2019.

On October 29th, 2021, a Form 27 Initial was submitted for Rule 913.c.(9): Decommissioning of Oil and Gas Facilities and Wellhead Cut/Cap and Flowline Abandonment, under Remediation Project # 20598. Remediation Project # 20598 was closed in a Form 27 Supplemental on July 18th, 2022.

ROTHE #23-31 well (API # 05-123-22642) was plugged and abandoned on November 22nd, 2021. The access road was reclaimed at this time. The related Off-Site Production Facility, Location ID 445077, was closed and reclaimed at the same time.

In 2024, the parcel that overlaps the Location ID 305204 Disturbance Extent was converted from flood irrigation to pivot irrigation. In the included maps and cardinal directional drone photos, there is a circular line around the field where inside is green and outside is brown. This is because the corners of this field are no longer being irrigated. There is no visual difference in the irrigated and non-irrigated areas that overlap the location disturbance extent.

Soil Sage drone imagery confirms that no equipment was left on site at this location after reclamation activities occurred.

Summary Acreage Table

Description	Acres
Historic Disturbance Extent	0.31
Access Road	0.15
Flowline	Not Included
Tank Battery	Off-Site (Loc ID 445077)
Well Pad	0.16

Drone Information

Make	DJI
Model	M300/Mavic 3 Multispectral
Image Processing Software	Pix4dfields – RGB/Multispectral Imagery & Pix4dmatic – RGB Imagery
Pilot Name	Sam Streeter
Pilot FAA Certificate Number	4100157
Date of FAA Certificate Issuance	23 Dec 2023

CIV - 305204- ROTHE 23-31
Map Extent - Pre-Infrastructure Overview 1988

Imagery: USGS NAPP
Imagery Date: 1 Jul 1988
Map Date: 17 Feb 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Wells
Historical Farm Road

0 65 130 260 Meters

Scale: 1:4,500

Pad Location:
40.354090
-104.481190

N

CIV - 305204- ROTHE 23-31
Map Extent - Pre-Infrastructure Overview 2004

Imagery: DRCOG
Imagery Date: 13 Apr 2004
Map Date: 17 Feb 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Wells
Historical Farm Road

0 65 130 260 Meters

Scale: 1:4,500

Pad Location:
40.354090
-104.481190

N

CIV - 305204- ROTHE 23-31
Map Extent - Pre-Plugging Overview

Imagery: NAIP
Imagery Date: 2009
Map Date: 26 Jan 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

- Wells
- Remediation
- Flowline
- Historic Disturbance Extent
- Well Access Road
- Historical Farm Road

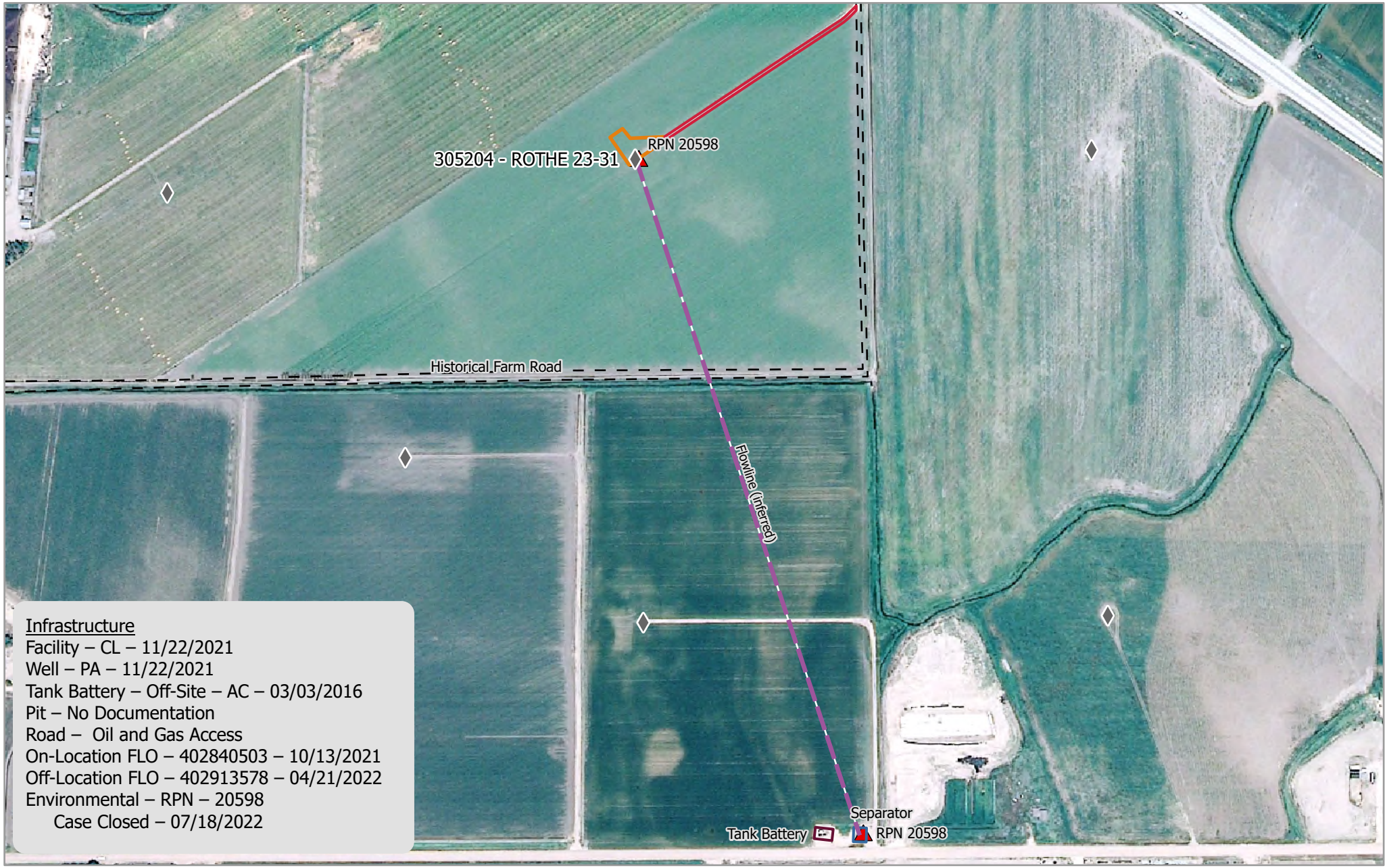
0 35 70 140 Meters

Total Disturbance: 0.31 Acres

Scale: 1:2,400

Pad Location: 40.354090 -104.481190

N



Infrastructure
Facility – CL – 11/22/2021
Well – PA – 11/22/2021
Tank Battery – Off-Site – AC – 03/03/2016
Pit – No Documentation
Road – Oil and Gas Access
On-Location FLO – 402840503 – 10/13/2021
Off-Location FLO – 402913578 – 04/21/2022
Environmental – RPN – 20598
Case Closed – 07/18/2022

CIV - 305204- ROTHE 23-31
Map Extent - Pre-Plugging Flowline Overview

Imagery: NAIP
Imagery Date: 2009
Map Date: 17 Feb 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Wells
Remediation
Flowline
Historic Disturbance Extent
Well Access Road
Historical Farm Road
Tank Battery
Separator

0 65 130 260 Meters

Total Disturbance:
0.31 Acres

Scale: 1:4,400

Pad Location:
40.354090
-104.481190

N

CIV - 305204- ROTHE 23-31
Map Extent - Post-Plugging Overview

Imagery: RS Orthomosaic
Imagery Date: 9 Sep 2024
Map Date: 26 Jan 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

- Wells
- Remediation
- Flowline
- Historic Disturbance Extent
- Well Access Road
- Historical Farm Road

0 35 70 140 Meters

Total Disturbance:
0.31 Acres

Scale: 1:2,400

Pad Location:
40.354090
-104.481190

N

CIV - 305204- ROTHE 23-31
Map Extent - Post-Plugging Flowline Overview

Imagery: RS Orthomosaic
Imagery Date: 9 Sep 2024
Map Date: 17 Feb 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Wells
ObservationPoints
Remediation
Flowline
Historic Disturbance Extent
Well Access Road
Historical Farm Road
Tank Battery
Separator

0 65 130 260 Meters

Total Disturbance:
0.31 Acres

Scale: 1:4,400

Pad Location:
40.354090
-104.481190

N

Cardinal Directional Drone Photos & Reference Area Photos

Site Investigation and Photos Date

09 Sep 2024

Drone Photo Height

240 feet

Cardinal directional photos of the site. Reference overview map.

In View – Well, Access Road, Flowline **EAST** – 40.353879 / -104.482391

In View – Well, Tank Battery (Loc ID 445077), Access Road, Flowline **SOUTHEAST** – 40.354799 / -104.481994

In View – Well, Tank Battery (Loc ID 445077), Access Road, Flowline **SOUTH** – 40.355019 / -104.481552

In View – Well, Access Road, Flowline **SOUTHWEST** – 40.354656 / -104.480067

In View – Well, Access Road, Flowline **WEST –** 40.354091 / -104.479698

In View – Tank Battery (Loc ID 445077), Access Road, Flowline **NORTH –** 40.348442 / -104.479158

In View – Tank Battery (Loc ID 445077), Access Road, Flowline **EAST –** 40.348851 / -104.479942

In View – Tank Battery (Loc ID 445077), Access Road, Flowline **SOUTH –** 40.349412 / -104.479212

In View – Tank Battery (Loc ID 445077), Access Road, Flowline **WEST –** 40.348914 / -104.478519

In View – Well, Tank Battery (Loc ID 445077), Access Road, Flowline **NORTHWEST –** 40.348387/-104.478587

Well – Handheld Photographic Evidence

Site Investigation and Photos Date

09 Sep 2024

Handheld photos taken from County Road 50 looking towards ROTHE #23-31 wellhead. No handheld photos taken from ROTHE #23-31 wellhead due to crop height.

	
Looking North – 40.348747/-104.479536	Looking Northwest – 40.348819/-104.479819

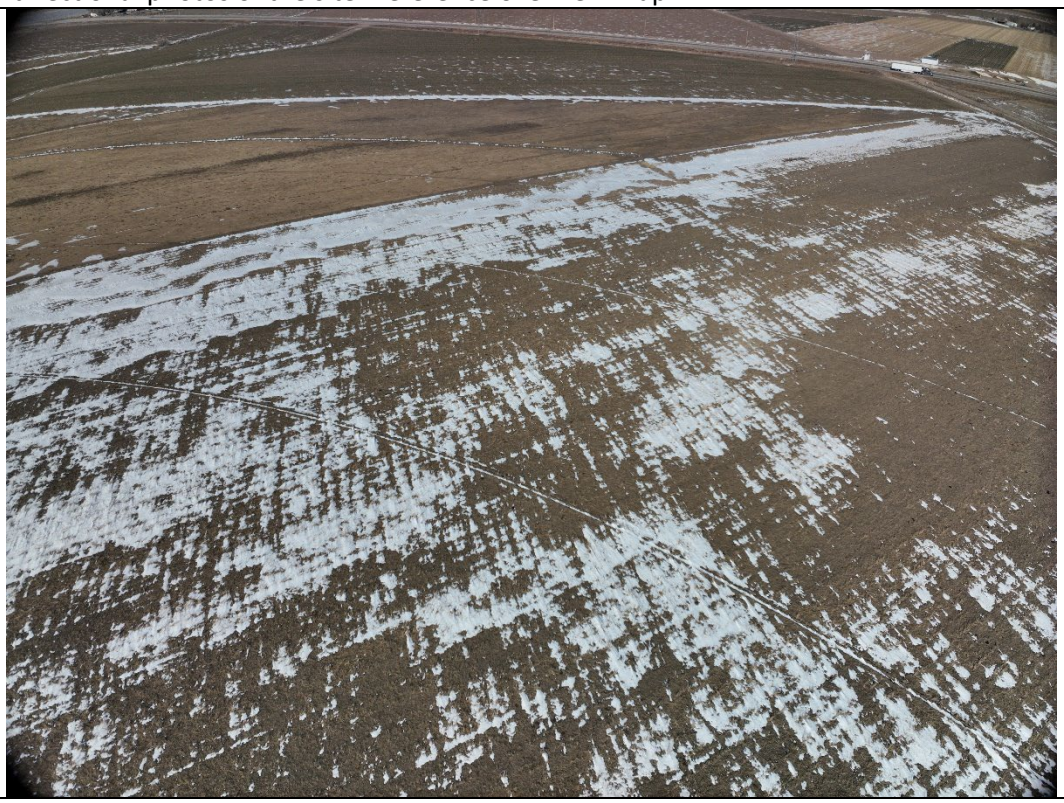
	
Looking Northwest – 40.348743/-104.479954	

Cardinal Directional Drone Photos Showing No Equipment Remaining

Site Investigation and Photos Date
15 Jan 2025

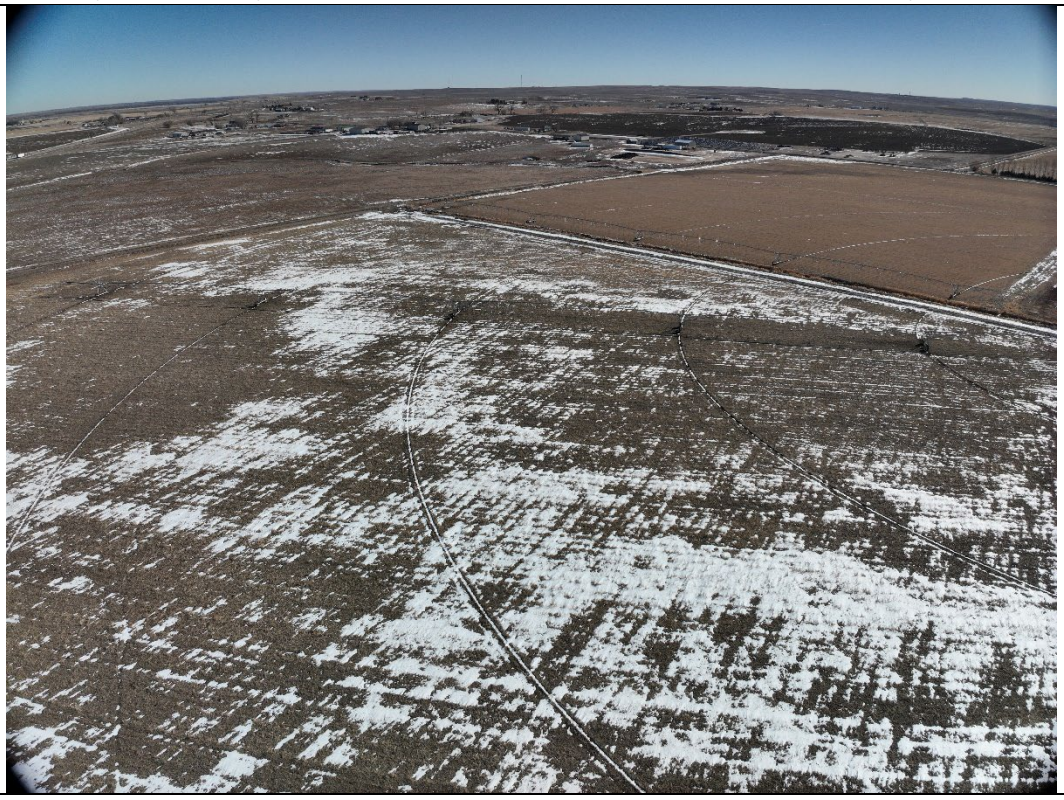
Drone Photo Height
175 feet

Cardinal directional photos of the site. Reference overview map.



In View – Well, Access Road, Flowline **NORTH** – 40.353121 / -104.481180

In View – Well, Access Road, Flowline **EAST** – 40.354060 / -104.482231



In View – Well, Tank Battery (Loc ID 445077), Access Road, Flowline **SOUTHEAST** – 40.354228 / -104.482160

In View – Well, Tank Battery (Loc ID 445077), Access Road, Flowline **SOUTH** – 40.355331 / -104.481175

In View – Well, Access Road, Flowline **WEST** – 40.354090 / -104.479791

In View – Tank Battery (Loc ID 445077), Access Road, Flowline **EAST** – 40.349051 / -104.479894

In View – Tank Battery (Loc ID 445077), Access Road, Flowline **SOUTH** – 40.350014 / -104.479259

ATTACHMENTS

Maps and Figures

Area Maps

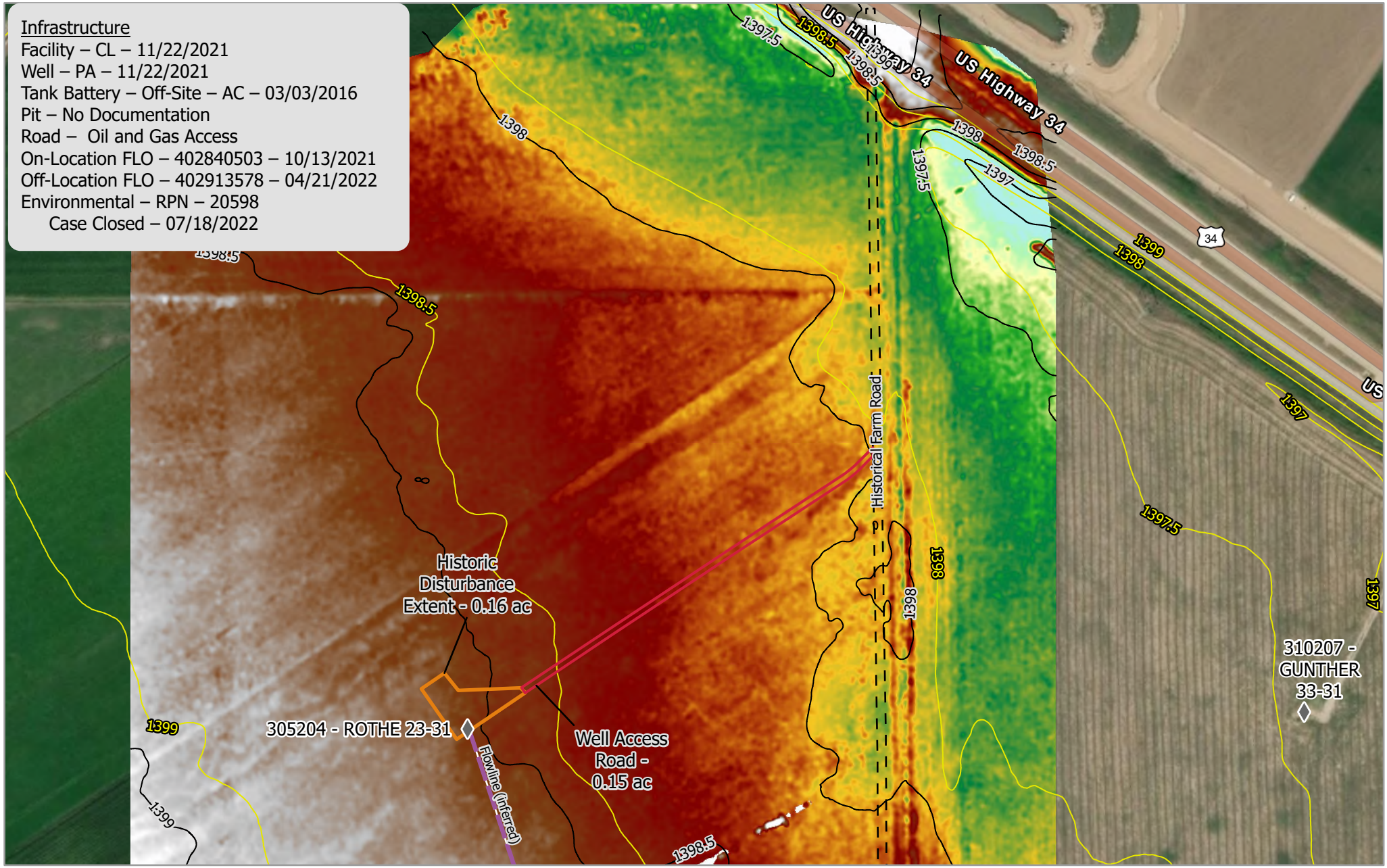
Elevation & Contours

Hydrology

Background Information

Natural Resources Conservation Service (NRCS) Map Unit Description

Reference Soil Document



CIV - 305204- ROTHE 23-31
Map Extent - Elevation & Contours

Imagery: USGS, RS DSM
Imagery Date: 2014, 2025
Map Date: 26 Jan 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Wells
Flowline
0.5 Meter Contour (2014)
0.5 Meter Contour (2024)
Historic Disturbance Extent
Well Access Road
Historical Farm Road
Elevation
Meters
1403
1396

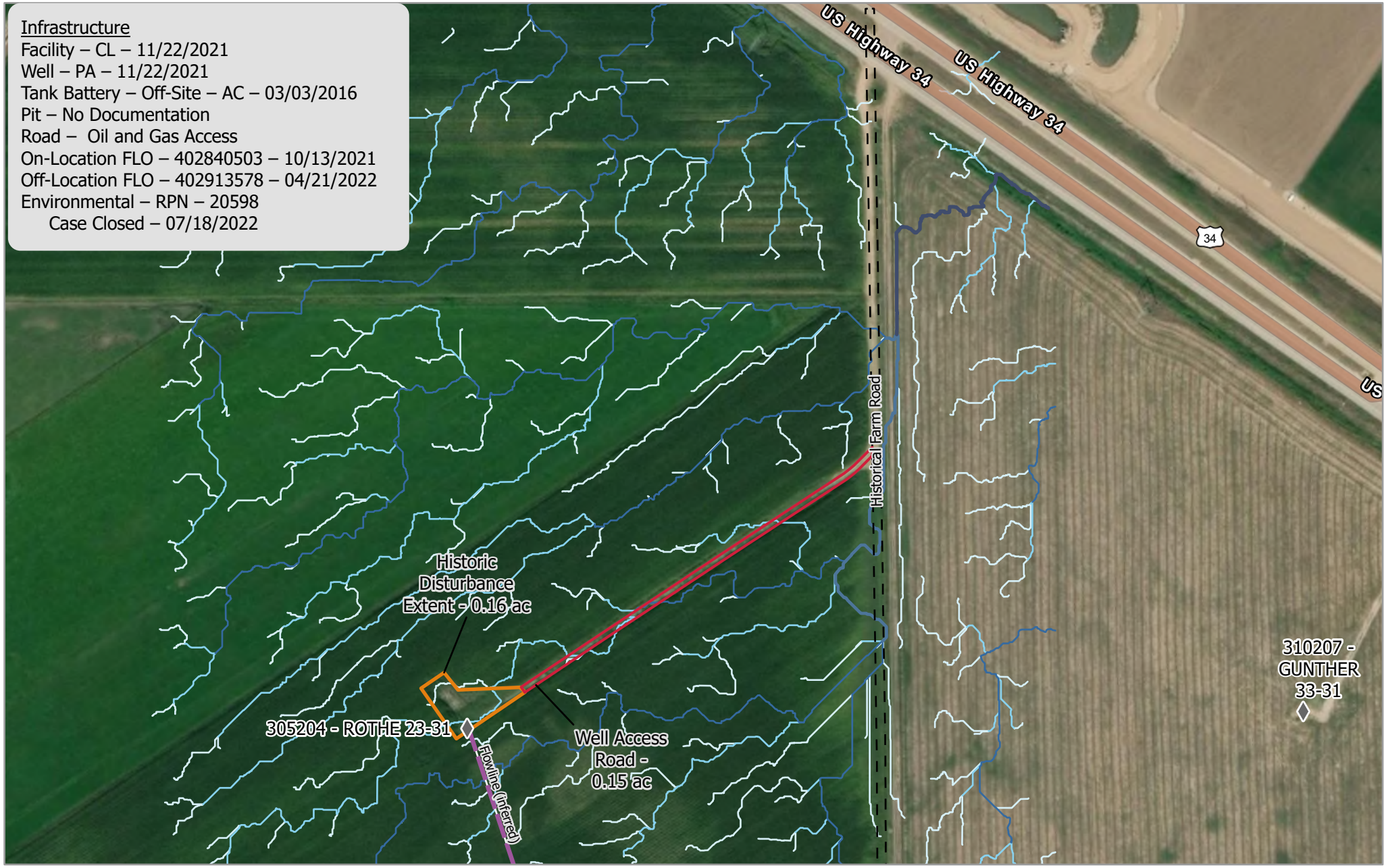
0 35 70 140 Meters

Total Disturbance:
0.31 Acres

Pad Location:
40.354090
-104.481190

Scale: 1:2,400

N



CIV - 305204- ROTHE 23-31
Map Extent - Hydrology

Imagery: RS DSM, RS Orthomosaic
Imagery Date: 15 Jan 2025, 9 Sep 2024
Map Date: 26 Jan 2025
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Wells
Flowline
Historic Disturbance Extent
Well Access Road
Historical Farm Road

Stream Order
1
2
3
4
5

0 35 70 140 Meters

Total Disturbance:
0.31 Acres

Scale: 1:2,400

Pad Location:
40.354090
-104.481190

N

Soil Properties

USDA Soil Description

Reference Soil Information

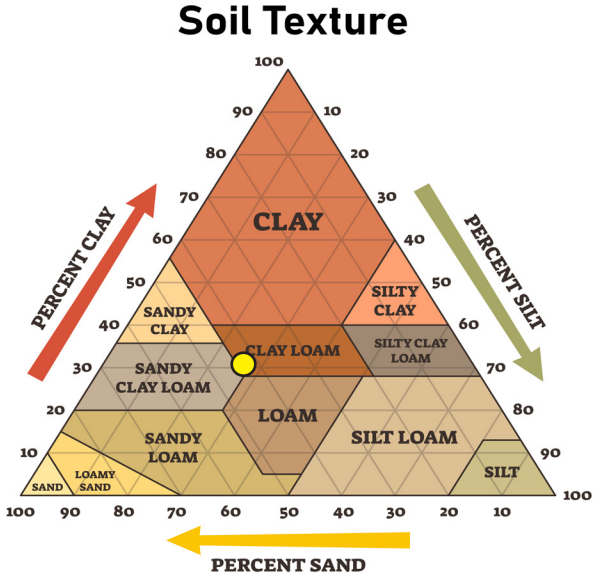
The location of the site is contained within one soil type, Nunn Clay Loam.

Map Unit 41 Reference Soil information - Nunn Clay Loam

This soil is formed from Pleistocene aged alluvium and/or eolian deposits. Landform is terraces. Ecological Site Description is Clayey Plains. Soils are well-drained with a high water holding capacity, and slope 0 to 1 percent.

	Physical			Chemical			
Depth (in)	**Texture**	**Bulk Density**	**Particle Size Percent sand, silt, clay**	**pH**	**EC**	**SAR**	**OM%**
0-6	Clay Loam	1.41	43-26-31	7.2	0.5	0.0	1.50
6-10	Clay Loam	1.37	32-30-38	7.6	0.5	0.0	1.50
10-26	Clay Loam	1.37	32-30-38	7.6	0.5	0.0	1.50
26-31	Clay Loam	1.46	42-26-32	8.0	0.5	0.0	0.75
31-47	Loam	1.52	47-32-21	8.4	0.5	0.1	0.25
47-80	Loam	1.54	48-28-24	8.5	0.5	0.1	0.25

Soil Texture Triangle reflect the 0-10 in depth



Erosion Potential (10 inches)

- K Factor, Whole soil - .32. 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 – 6. 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 – Clayey Plains Ecology

Climate

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

Average Annual Air Temperature ranges from 50 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.

The plant community consists of 70-90% grasses and grass-likes, 5-15% forbs, and 5-15% shrubs. Dominant grasses include western wheatgrass, green needlegrass, and blue grama. Other grasses and grass-like plants that occur in minor amounts are buffalograss, sideoats grama, and sun sedge. Significant forbs are American vetch, purple prairie clover, and scarlet globemallow. Dominant shrubs that occupy this community are fourwing saltbush and winterfat.

Well suited to carbon sequestration.

Ecological dynamics

The Warm-Season Shortgrass State is characterized by a warm-season shortgrass bunchgrass (blue grama) and stoloniferous grass (buffalograss). The Increased Bare Ground State is characterized by early successional warm-season and cool-season short bunchgrass (Fendler threeawn, squirreltail), annual grasses (sixweeks fescue), and forbs (curlycup gumweed). Common annual invasives (cheatgrass, Russian thistle), and/or perennial invasives (bindweed) may also occur. Drought has increased mortality of blue grama and green needlegrass in some locations.

Reference Vegetation – Clayey Plains Ecology

At Risk Plant Community

Key species from the Reference Plant Community, green needlegrass, western wheatgrass, American vetch, fourwing saltbush, and winterfat, have decreased in abundance. Blue grama and buffalograss have increased in abundance. Sand dropseed, red threeawn, sixweeks fescue, bottlebrush squirreltail, and hairy false goldenaster (aka hairy goldaster) have also increased.

The plant community is at risk of losing green needlegrass, western wheatgrass, American vetch, fourwing saltbush, and winterfat.

Vegetation

Reference Vegetation – Clayey Plains Ecology

Warm-Season Shortgrass Dominant Plant Community

Most of the key grass, forb, and shrub species are absent. Western wheatgrass may persist in trace amounts, greatly reduced in vigor and not readily seen. Blue grama and buffalograss dominate the community with a tight "sod-bound" appearance. Red threeawn, sand dropseed, sixweeks fescue, and hairy false goldenaster (aka hairy goldaster) have increased.

Increased Bare Ground Plant Community

Red threeawn, curlycup gumweed and annual plants such as sixweeks fescue, cheatgrass and Russianthistle have increased and/or invaded. Blue grama may persist in localized areas. Introduced species such as field bindweed can also be present, especially on prairie dog towns. An ecological threshold has been crossed. Erosion and loss of organic matter/carbon reserves are concerns. Nutrient and water cycles and energy flow are impaired.

Transition State

Long-term heavy continuous grazing with over stocking, or excessive defoliation, without adequate recovery periods following each grazing event will shift this plant community toward the Increased Bare Ground Plant Community. An ecological threshold has been crossed. Erosion and loss of organic matter/carbon reserves are concerns.

Clayey Plains Ecosystem Vegetative Community Composition

Common Name	Scientific Name
Western Wheatgrass	*Pascopyrum smithii*
Blue Grama	*Bouteloua gracilis*
Green Needlegrass	*Nassella viridula*
Buffalograss	*Bouteloua dactyloides*
Sideoats Grama	*Bouteloua curtipendula*
Alkali Sacaton	*Sporobolus airoides*
Needleleaf Sedge	*Carex duriuscula*
Saltgrass	*Distichlis spicata*
Indian Ricegrass	*Achnatherum hymenoides*
Sand Dropseed	*Sporobuolus cryptandrus*
American Vetch	*Vicia americana*
Purple Prairie Clover	*Dalea purpurea*
Scarlet Globemallow	*Sphaeralcea coccinea*
Dotted Blazing Star	*Liatris punctata*
Rush Skeletonplant	*Lygodesmia juncea*
Prairie Sunflower	*Helianthus petiolaris*