

# Location Checklist



<b>Operator / #</b>	EXTRACTION OIL & GAS INC / 10459		
<b>Location ID &amp; Name</b>	<a href="#">307162</a> SKAER FARM-65N68W/31NWNW		
<b>County</b>	Larimer, CO		
<b>Well Information</b>	Well Name:	SKAER FARM #2	
	Well API #:	<a href="#">05-069-06215</a>	
	Lat/Long as Drilled:	40.362460 / -105.056850	
	Plug Date & Form 6s Doc #:	05/05/2015 & <a href="#">401091348</a>	
<b>Facility Entities</b>	<input checked="" type="checkbox"/>	Tank Battery (Off-Site)	Pits
	<input checked="" type="checkbox"/>	Wells	<input checked="" type="checkbox"/> On-Location Flowlines (Form 42) Doc #: <a href="#">401279843</a>
		Domestic Taps	Off-Location Flowlines (Form 44) Doc #: _____
<b>Equipment On-Site</b>	<input checked="" type="checkbox"/>	None	Debris
		Pit mouse/rat holes, cellars backfilled	
<b>Access Road</b>	<input checked="" type="checkbox"/>	Regraded	<input checked="" type="checkbox"/> Contoured
		Culverts removed	<input checked="" type="checkbox"/> Gravel removed
		Pre-Existing (Must provide supporting documentation)	
<b>Reclamation Status</b>	<input checked="" type="checkbox"/>	Location and associated disturbances reclaimed	
		Subsidence	
<b>Spills or Releases (Form 19)</b>	<input checked="" type="checkbox"/>	No	<input type="checkbox"/> Yes
<b>Remediation (Form 27/27A)</b>	<input checked="" type="checkbox"/>	No	<input type="checkbox"/> Yes
<b>On-Location Flowlines</b>		No	<input checked="" type="checkbox"/> Yes
<b>Off-Location Flowlines</b>	<input checked="" type="checkbox"/>	No	<input type="checkbox"/> Yes
<b>Inspection Corrective Actions</b>		No	<input checked="" type="checkbox"/> Yes – Resolved 2018
<b>Sundry Notice</b>	Form 4 Doc # & Date:	<a href="#">400762640</a> & 01/23/2015	
	Purpose:	As-Built GPS Location Report. SURFACE LOCATION GPS DATA Latitude/Longitude: 40.362460/-105.056850	
	Comments:	None	
	Attachments:	None	
<b>Drone Information</b>	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 Drone Imagery**

**PERMIT CLOSURE REPORT – CROPLAND**

**Location ID** 307162

**Location Name** SKAER FARM-65N68W/31NWNW

**Report Date**

27 Sep 2024

Soil Sage has conducted a thorough data audit as part of our Quality Assurance and Quality Control (QA/QC) protocols. This report was developed in accordance with the ECMC Operator Guidance – Operator supplied cropland drone imagery and information for submitting a final reclamation complete notice.

**Crop Year and Type**

Crop 2024 – Corn

**Quality Assurance & Quality Control Audit**

<b>Auditor</b>	Soil Sage
<b>Audit Date</b>	21 Mar 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

<b>Name</b>	SKAER FARM-65N68W/31NWNW		
<b>Location ID</b>	<a href="#">307162</a>		
<b>Operator / #</b>	EXTRACTION OIL & GAS INC / 10459		
<b>Field</b>	LOVELAND / 52000		
<b>County, State</b>	Larimer, CO		
<b>Lat/Long</b>	40.362033 / -105.056840		
	<input checked="" type="checkbox"/>	Planned Location	As Drilled
<b>Facility Status</b>	CL	<b>Location</b>	NWNW 31 5N68W
<b>Facility Status Date</b>	05/05/2015		
<b>Facility Entities</b>	<input checked="" type="checkbox"/>	Tank Battery (Off-Site)	Pits
	<input checked="" type="checkbox"/>	Wells	Off-Location Flowlines ( <b>Form 44</b> )
		Domestic Taps	<input checked="" type="checkbox"/> On-Location Flowlines ( <b>Form 42</b> )
		Electric Utilities	
<b>Equipment on Site</b>	<input checked="" type="checkbox"/>	No	Yes
		If yes, list:	
		Pit mouse/rat holes, cellars backfilled	
<b>Access Road</b>	<input checked="" type="checkbox"/>	Regraded	<input checked="" type="checkbox"/> Contoured
		Culverts Removed	<input checked="" type="checkbox"/> Gravel Removed
		Pre-Existing: must provide supporting documentation	
<b>Environment Incidents &amp; Remediation</b>	<input checked="" type="checkbox"/>	None	Spill or Release ( <b>Form 19</b> )
		Remediation ( <b>Form 27/27A</b> )	
<b>Variance Requests</b>	<b>No Variance Requests were detected during this QA &amp; QC Audit.</b>		
<b>Inspection Corrective Actions (CA)s</b>	<p><b>Corrective Actions (CA)s were detected during the QA &amp; QC Audit.</b></p> <p><b>CA Overall Status:</b> Approved Pending Re-Inspection</p> <p><b>CA-Approving Inspection Doc # &amp; Date:</b> <a href="#">697501510</a> &amp; 05/14/2020</p> <ul style="list-style-type: none"> <li>○ <b>Inspector:</b> Chris Binschus</li> </ul> <p><b>Form FIRR Doc # &amp; Submittal Date:</b> <a href="#">401669613</a> &amp; 06/18/2018</p> <ul style="list-style-type: none"> <li>○ <b>Overall Status:</b> 1 CA Completed</li> <li>○ <b>Originating Field Inspection Report (FIR) Doc #:</b> <a href="#">682403596</a></li> <li>○ <b>CA#:</b> 116409 <b>Date Completed:</b> 06/01/2018</li> </ul> <p>Operator shall control Canada thistle, List B CO noxious weed, prior to seed set. Spraying for noxious weeds took place on 06-01-2018</p> <p><b>ECMC Decision:</b> Approved pending re-inspection</p>		

	<p><b>Complete ECMC Inspection Search Results:</b> <a href="#">Link</a></p>
<b>Sundry Notice (Form 4)</b>	<b>Form 4s were detected during the QA &amp; QC Audit.</b> See individual scout card data for details.
<b>On Location Flowlines (Form 42)</b>	<b>Form 42s were detected during the QA &amp; QC Audit.</b> See individual scout card data for details.
<b>Off-Location Flowlines (Form 44)</b>	<b>No Form 44s were detected during the QA &amp; QC Audit.</b>
<b>Field Inspection Form (Form INSP)</b>	<p><b>Form INSP Doc # &amp; Date:</b> <a href="#">697501510</a> &amp; 05/14/2020</p> <ul style="list-style-type: none"> <li>○ <b>Status Summary:</b> THIS IS A FOLLOW UP INSPECTION. FOLLOW UP INSPECTION REQUIRED.</li> <li>○ <b>Inspected Facilities:</b> SKAER FARM 2 Well</li> <li>○ <b>Inspection Status:</b> RI</li> <li>○ <b>Inspection Date &amp; Inspector:</b> 05/12/2020 by Chris Binschus</li> <li>○ <b>Comments:</b> This is a follow up Final Reclamation and Stormwater inspection. The well location has been reseeded and planted in barley. Location will remain in-process as the location is not reflective of reference vegetative levels. Note: Canadian thistle, a List B Colorado noxious weed, was observed in the previous inspection was not observed at the time of this inspection. Operator shall continue to monitor and manage this site until the location meets Rule 1004 standards. Operator shall submit a Form 4 Final Reclamation Complete notice when the location meets Rule 1004 standards. COGCC may conduct follow-up inspections prior to receiving said notice to ensure compliance with Rule 1004. At the time of this inspection, no erosion issues were observed. COGCC staff inspected the associated offsite tank battery. The associated offsite tank battery is split. A portion is in-process of establishing vegetation (where the spill was) while the other portion is seeking a variance request.</li> <li>○ <b>Attachments:</b> Inspection Photos Doc # <a href="#">697501511</a></li> </ul> <p><b>Form INSP Doc # &amp; Date:</b> <a href="#">682403596</a> &amp; 05/25/2018</p> <ul style="list-style-type: none"> <li>○ <b>Status Summary:</b> FOLLOW UP INSPECTION REQUIRED</li> <li>○ <b>Inspected Facilities:</b> SKAER FARM 2 Well</li> <li>○ <b>Inspection Status:</b> RI</li> <li>○ <b>Inspection Date &amp; Inspector:</b> 05/17/2018 by Chris Binschus</li> <li>○ <b>Comments:</b> This is a Final Reclamation Inspection for PA Well API# <a href="#">069-06215</a>. Well was plugged 5/5/2015. Desirable vegetation was</li> </ul>

	<p>observed within the well location, but several annual, weedy vegetation and noxious weeds were observed. At a minimum, Operator shall control noxious weeds and may need to perform additional reclamation activities. Refer to the attached inspection photos. Operator shall continue to monitor and manage this site until the location meets Rule 1004 standards. Operator shall submit a Form 4 Final Reclamation Complete notice when the location meets Rule 1004 standards. COGCC may conduct follow-up inspections prior to receiving said notice to ensure compliance with Rule 1004.</p> <ul style="list-style-type: none"> <li>○ <b>Attachments:</b> Inspection Photos Doc # <a href="#">682403597</a></li> </ul>
<p><b>COGIS Tank Facilities Information (Scout Card)</b></p>	<p><b>No Tank Battery documents were detected during this QA/QC Audit.</b> However, the Tank Battery is referenced in Field Inspection Doc #<a href="#">697501510</a> and is located to the northwest of Location ID <a href="#">307162</a> based on historical imagery searches.</p>
<p><b>COGIS Well Information (Scout Card)</b></p>	<p><b>Well Name:</b> SKAER FARM #2  <b>API#:</b> <a href="#">05-069-06215</a>  <b>FACILITY ID:</b> 217028</p> <ul style="list-style-type: none"> <li>○ <b>Status &amp; Date:</b> PA &amp; 05/05/2015</li> <li>○ <b>Lat/Long as Drilled:</b> 40.362460 / -105.056850</li> <li>○ <b>Form 6 Doc # &amp; Date:</b> <a href="#">401091348</a> &amp; 03/15/2018</li> <li>○ <b>Form 42 Doc # &amp; Date:</b> <a href="#">401279843</a> &amp; 05/10/2017  <b>Purpose:</b> FLOWLINES ABANDONED - per RULE 1103.  Date completed: 04/27/2015.</li> <li>○ <b>Form 4 Doc # &amp; Date:</b> <a href="#">400762640</a> &amp; 01/23/2015  <b>Purpose:</b> As-Built GPS Location Report.  SURFACE LOCATION GPS DATA Latitude/Longitude:  40.362460/-105.056850</li> </ul>

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
<b>Reference Imagery for Infrastructure:</b> Microsoft 27 Apr 2011	<b>Remotely Sensed Imagery:</b> 3 Apr 2024; 30 Aug 2024
<b>Designation:</b> Oil & Gas Facility	<b>Designation:</b> Cropland

### 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

### 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 [307162](#) SKAER FARM-65N68W/31NWNW is in Larimer County, Colorado near the intersection of South County Road 13 and Cody Drive. There is one plugged and abandoned well (Skaer Farm #2 API # [05-069-06215](#)). There is an Off-Location Flowline between this well and the production facility located to the northwest of Location ID [307162](#) based on historical imagery.

There was a Corrective Action at this location on May 17<sup>th</sup>, 2018, due to Operator needing to control Canada thistle, List B Colorado noxious weed, prior to seed set. This was resolved in June 2018 and an ECMC inspection approved the CA on May 14<sup>th</sup>, 2020.

Skaer Farm #2 well (API #[05-069-06215](#)) was plugged and abandoned on May 5<sup>th</sup>, 2015. The access road was reclaimed at this time. The Tank Battery associated with this Location ID will be closed under a different associated Location ID.

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	0.21
Access Road	Included
Flowline	Not Included
Tank Battery	Off-Site
Well Pad	0.21

## Drone Information

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



Service Credits - Maxar, Microsoft

**CIV - 307162- SKAER FARM 2**  
**Map Extent - Pre-Infrastructure**  
**Overview**

Imagery: USGS  
 Imagery Date: 5 Oct 1983  
 Map Date: 15 Sep 2024  
 Datum: WGS 1984 UTM Zone 13N  
 POC: Soil Sage

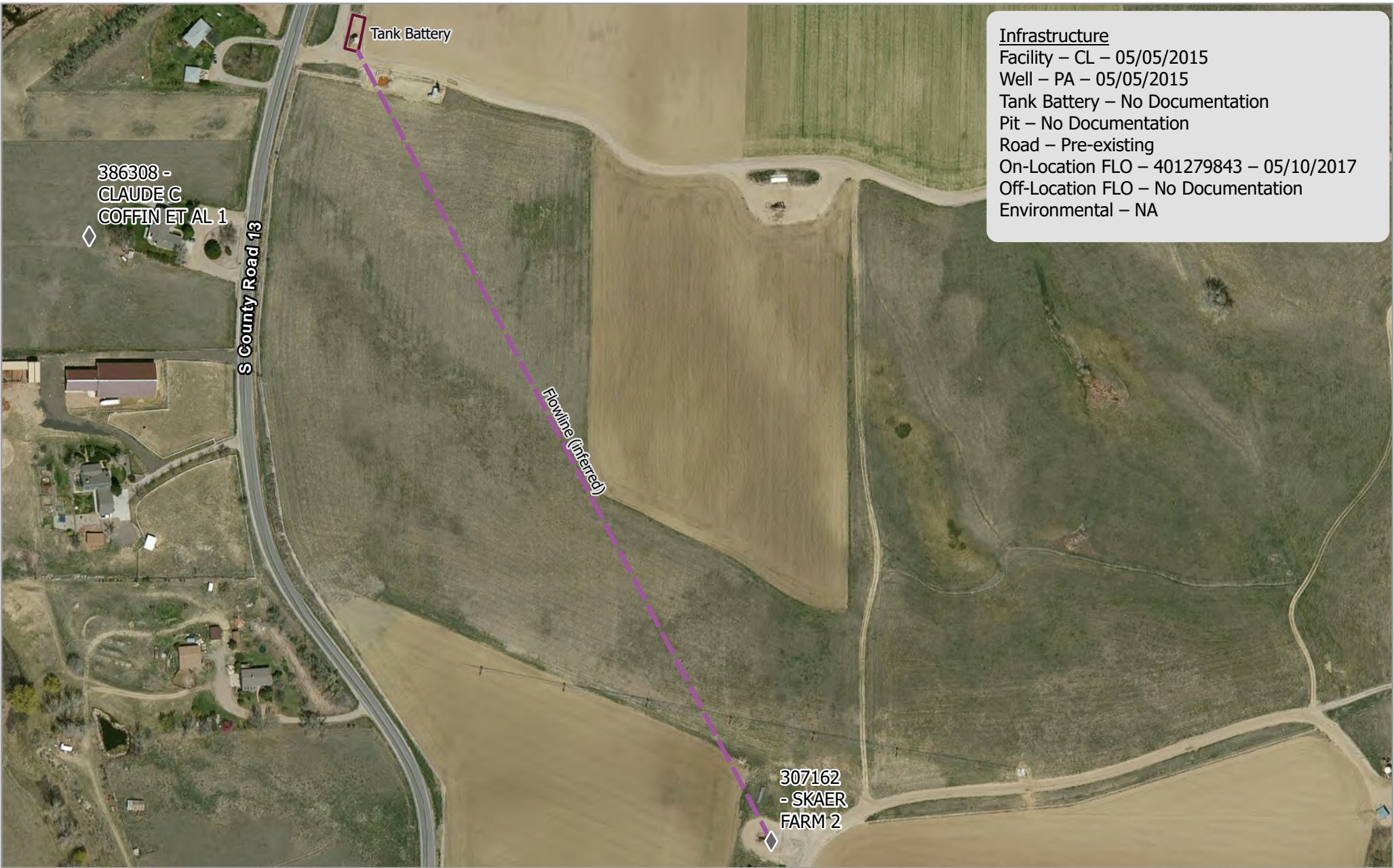
- ◆ Wells
- [ - ] Lake Access Road

0 45 90 180 Meters

Scale: 1:3,200

Pad Location:  
 40.362033  
 -105.056840





**Infrastructure**  
 Facility – CL – 05/05/2015  
 Well – PA – 05/05/2015  
 Tank Battery – No Documentation  
 Pit – No Documentation  
 Road – Pre-existing  
 On-Location FLO – 401279843 – 05/10/2017  
 Off-Location FLO – No Documentation  
 Environmental – NA

**CIV - 307162- SKAER FARM 2**  
**Map Extent - Pre-Plugging Overview**

Imagery: Microsoft  
 Imagery Date: 27 Apr 2011  
 Map Date: 15 Sep 2024  
 Datum: WGS 1984 UTM Zone 13N  
 POC: Soil Sage

- ◆ Wells
- Flowline
- ▭ Tank Battery

0 45 90 180 Meters

Scale: 1:3,000

Pad Location:  
 40.362033  
 -105.056840

N

Service Credits - Esri Community Maps  
 Contributors, City of Loveland, County of  
 Larimer, © OpenStreetMap, Microsoft, Esri,  
 TomTom, Garmin, SafeGraph,  
 GeoTechnologies, Inc., METI/NASA, USGS,  
 EPA, NPS, US Census Bureau, USDA,  
 USFWS, esri\_imagery, Maxar, Microsoft

**Infrastructure**  
 Facility – CL – 05/05/2015  
 Well – PA – 05/05/2015  
 Tank Battery – No Documentation  
 Pit – No Documentation  
 Road – Pre-existing (Lake Access Road)  
 On-Location FLO – 401279843 – 05/10/2017  
 Off-Location FLO – No Documentation  
 Environmental – NA



**CIV - 307162- SKAER FARM 2**  
**Map Extent - Pre-Plugging Overview**

Imagery: Microsoft  
 Imagery Date: 27 Apr 2011  
 Map Date: 15 Sep 2024  
 Datum: WGS 1984 UTM Zone 13N  
 POC: Soil Sage

- ◆ Wells
- Flowline
- ▭ Historic Disturbance Extent
- - - Pre-existing Lake Access Road

0 15 30 60 Meters

Total Disturbance: 0.21 Acres  
 Scale: 1:1,200

Pad Location:  
 40.362033  
 -105.056840

Service Credits - esi\_imagery, Maxar, Microsoft





**Infrastructure**  
 Facility – CL – 05/05/2015  
 Well – PA – 05/05/2015  
 Tank Battery – No Documentation  
 Pit – No Documentation  
 Road – Pre-existing  
 On-Location FLO – 401279843 – 05/10/2017  
 Off-Location FLO – No Documentation  
 Environmental – NA

**CIV - 307162- SKAER FARM 2**  
**Map Extent - Post-Planting Overview**

Imagery: RS Orthomosaic  
 Imagery Date: 30 Aug 2024  
 Map Date: 15 Sep 2024  
 Datum: WGS 1984 UTM Zone 13N  
 POC: Soil Sage

- ◆ Wells
- Flowline
- Tank Battery

0 45 90 180 Meters

Scale: 1:3,000

Pad Location:  
 40.362033  
 -105.056840

N

Service Credits - Esri Community Maps Contributors, City of Loveland, County of Larimer, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS, Maxar, Microsoft

**Infrastructure**  
 Facility – CL – 05/05/2015  
 Well – PA – 05/05/2015  
 Tank Battery – No Documentation  
 Pit – No Documentation  
 Road – Pre-existing (Lake Access Road)  
 On-Location FLO – 401279843 – 05/10/2017  
 Off-Location FLO – No Documentation  
 Environmental – NA



**CIV - 307162- SKAER FARM 2**  
**Map Extent - Post-Plugging Overview**

Imagery: RS Orthomosaic  
 Imagery Date: 30 Aug 2024  
 Map Date: 15 Sep 2024  
 Datum: WGS 1984 UTM Zone 13N  
 POC: Soil Sage

- ◆ Wells
- 📷 Observation Points
- Flowline
- ▭ Historic Disturbance Extent
- - - Pre-existing Lake Access Road

0 15 30 60 Meters

Total Disturbance: 0.21 Acres  
 Pad Location: 40.362033  
 Scale: 1:1,200 -105.056840

N



Service Credits - Maxar, Microsoft

# Cardinal Directional Drone Photos & Reference Area Photos

*Site Investigation and Photos Date*

30 Aug 2024

*Drone Photo Height*

240 feet

Cardinal directional photos of the site. Reference overview map.





**In View** – Well, Tank Battery, Access Road, Flowline

**NORTH** – 40.361812 / -105.056254



**In View** – Well, Access Road, Flowline

**EAST** – 40.362797 / -105.057611



**In View** – Well, Access Road, Flowline

**EAST** – 40.362799 / -105.057610



**In View** – Well, Access Road, Flowline

**SOUTH** – 40.363241 / -105.057019



**In View** – Well, Access Road, Flowline

**WEST** – 40.362727 / -105.055453



**In View** – Well, Tank Battery, Access Road, Flowline

**NORTHWEST** – 40.362062 / -105.055547



**In View – Tank Battery, Flowline**

**NORTH – 40.366100 / -105.059644**



**In View – Tank Battery, Flowline**

**EAST – 40.366835 / -105.059918**



**In View – Tank Battery, Flowline**

**SOUTH – 40.367477 / -105.059549**



**In View – Tank Battery, Flowline**

**WEST – 40.366966 / -105.058895**

# Well – Handheld Photographic Evidence

*Site Investigation and Photos Date*

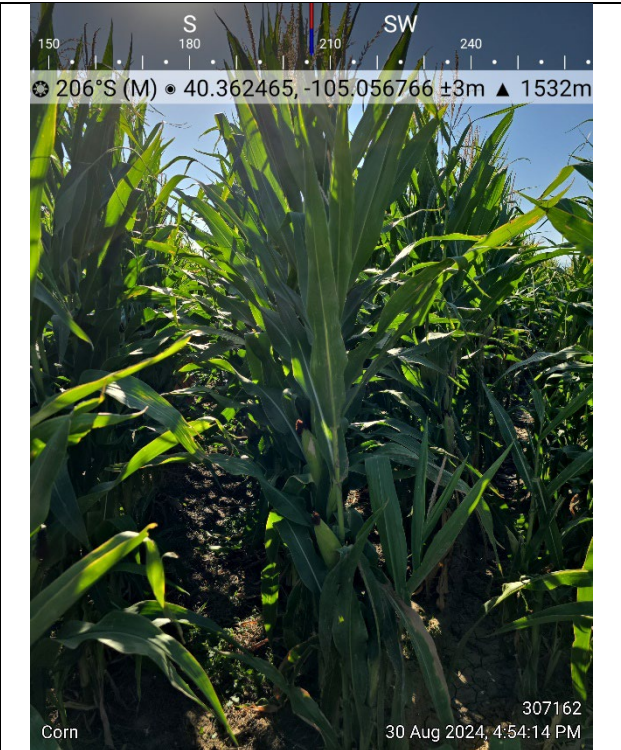
30 Aug 2024

Handheld photos taken from Location ID [307162](#), Skaer Farm #2 wellhead.





Looking South – 40.362479/-105.056698



Corn – 40.362465/-105.056766

*Cardinal Directional Drone Photos Showing No Equipment Remaining*

Site Investigation and Photos Date

03 Apr 2024

Drone Photo Height

175 feet

Cardinal directional photos of the site. Reference overview map.



**In View** – Well, Access Road, Flowline

**NORTH** – 40.361977 / -105.056658



**In View** – Well, Access Road, Flowline

**EAST** – 40.362528 / -105.057368



**In View** – Well, Access Road, Flowline

**SOUTH** – 40.362973 / -105.056962



**In View – Well, Access Road, Flowline**

**WEST – 40.362472 / -105.056186**



**In View – Well, Tank Battery, Access Road, Flowline**

**NORTHWEST – 40.362228 / -105.056173**

# ATTACHMENTS

## Maps and Figures

### *Area Maps*

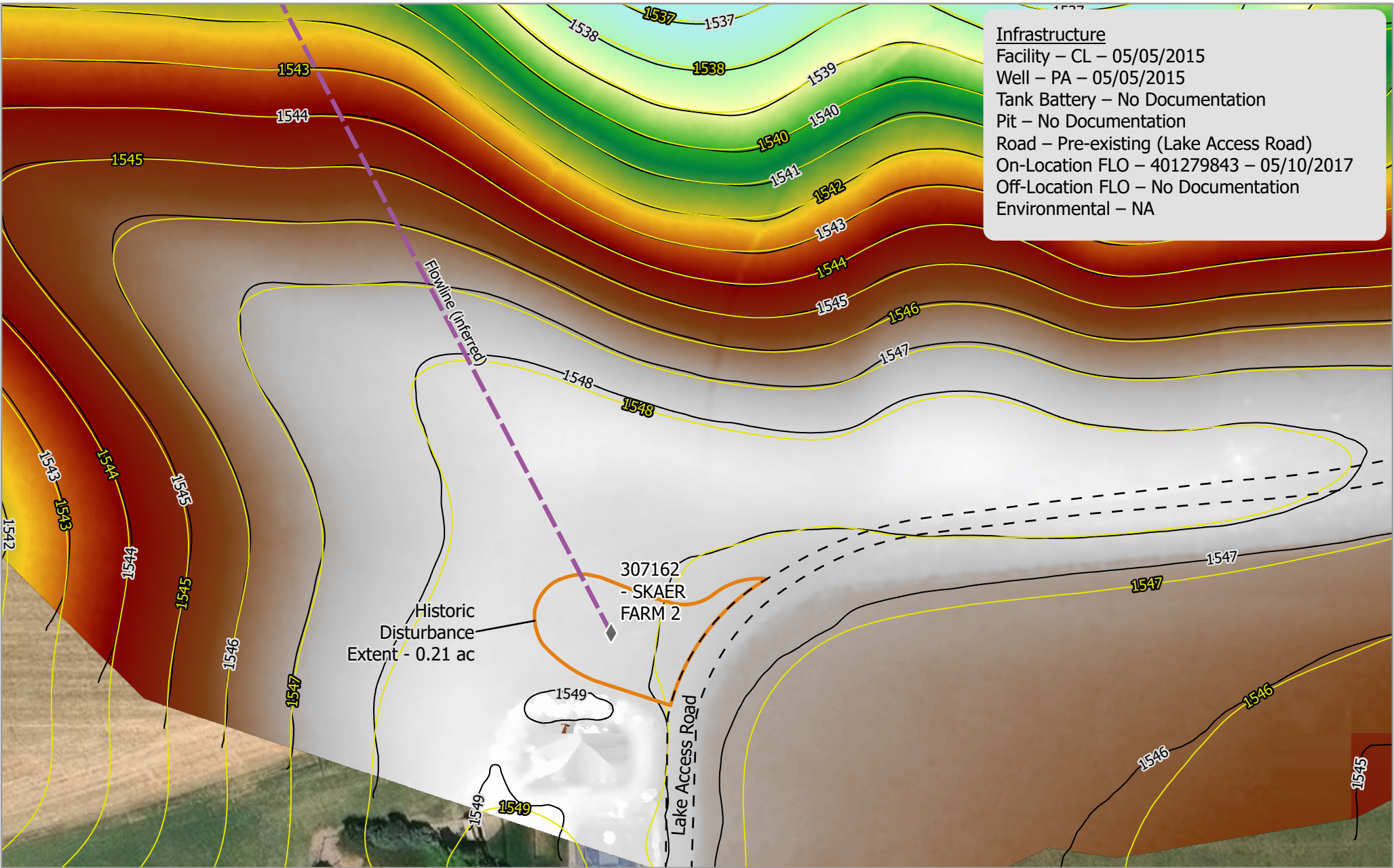
Elevation & Contours

Hydrology

## Background Information

### *Natural Resources Conservation Service (NRCS) Map Unit Description*

Reference Soil Document



**Infrastructure**  
 Facility – CL – 05/05/2015  
 Well – PA – 05/05/2015  
 Tank Battery – No Documentation  
 Pit – No Documentation  
 Road – Pre-existing (Lake Access Road)  
 On-Location FLO – 401279843 – 05/10/2017  
 Off-Location FLO – No Documentation  
 Environmental – NA

**CIV - 307162- SKAER FARM 2**  
**Map Extent - Elevation & Contours**

Imagery: RS DSM, USGS  
 Imagery Date: 2024, 2014  
 Map Date: 15 Sep 2024  
 Datum: WGS 1984 UTM Zone 13N  
 POC: Soil Sage

◆ Wells	— Pre-existing Lake Access Road
— Flowline	Elevation
— 1 Meter Contours (2014)	Meters
— 1 Meter Contours (2024)	1553
— Historic Disturbance Extent	1516

0 15 30 60 Meters

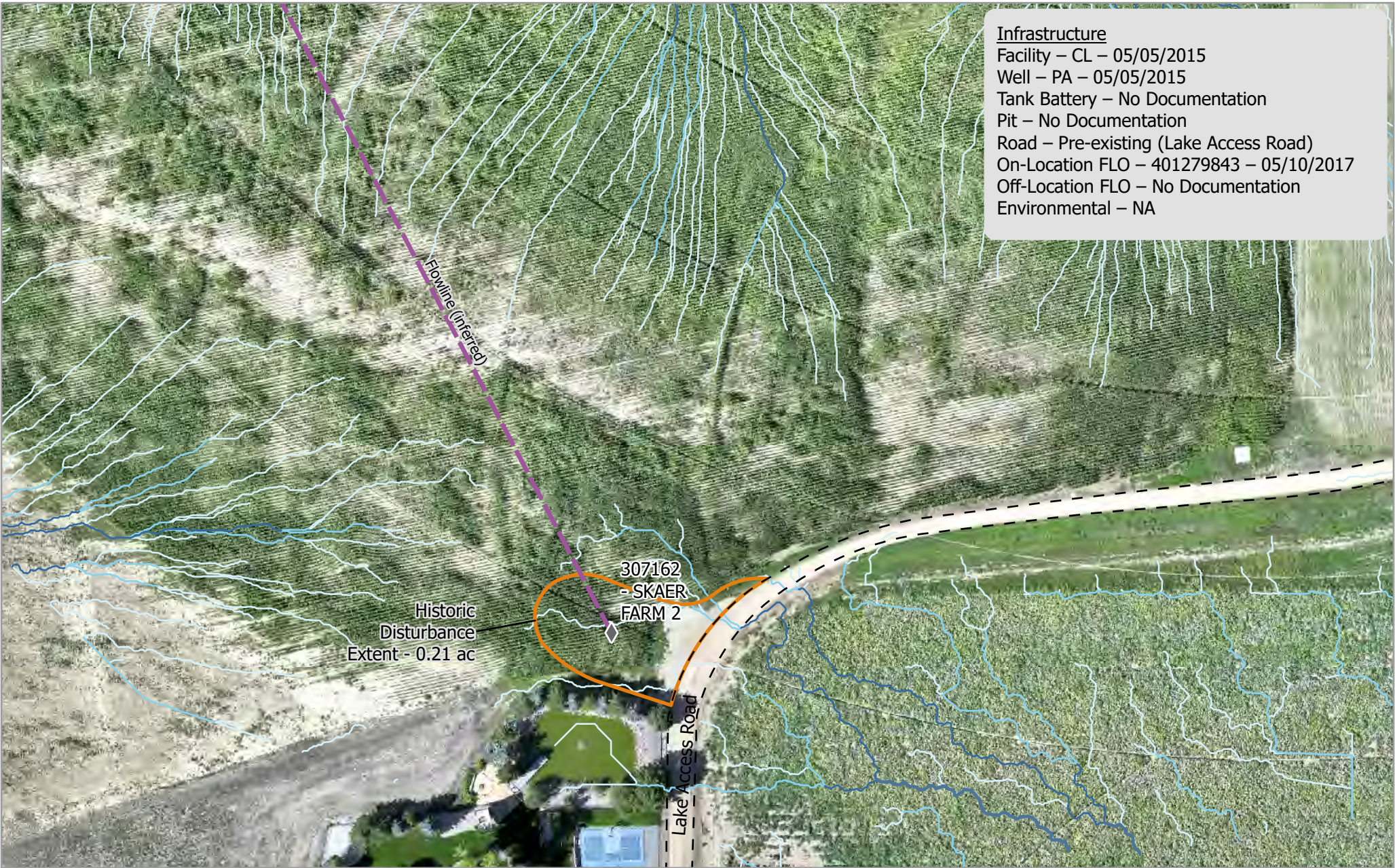
Total Disturbance: 0.21 Acres  
 Scale: 1:1,200

Pad Location:  
 40.362033  
 -105.056840

N



Service Credits - Maxar, Microsoft



**Infrastructure**  
 Facility – CL – 05/05/2015  
 Well – PA – 05/05/2015  
 Tank Battery – No Documentation  
 Pit – No Documentation  
 Road – Pre-existing (Lake Access Road)  
 On-Location FLO – 401279843 – 05/10/2017  
 Off-Location FLO – No Documentation  
 Environmental – NA

**CIV - 307162- SKAER FARM 2**  
**Map Extent - Hydrology**

Imagery: RS DSM, RS Orthomosaic  
 Imagery Date: 3 Apr 2024, 30 Aug 2024  
 Map Date: 15 Sep 2024  
 Datum: WGS 1984 UTM Zone 13N  
 POC: Soil Sage

◆ Wells	Stream Order
— Flowline	1
▭ Historic Disturbance Extent	2
[- -] Pre-existing Lake Access Road	3
	4

0 15 30 60 Meters

Total Disturbance: 0.21 Acres  
 Scale: 1:1,200

Pad Location:  
 40.362033  
 -105.056840

N



Service Credits - Maxar, Microsoft

# Soil Properties

## USDA Soil Description

<b>Location ID / Name</b>	307162 - Skaer Farms #2
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### Reference Soil Information

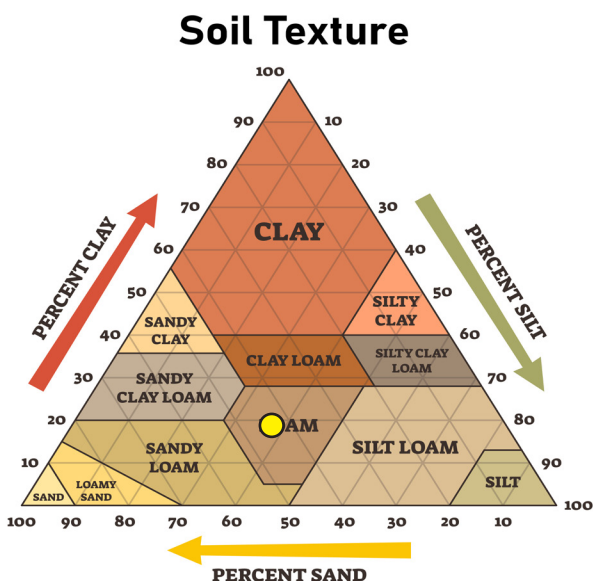
The location of the site is contained within one soil type, Ascalon Loam.

### Map Unit 8 Reference Soil information - Ascalon Loam

This soil is formed from wind-reworked alluvium and/or calcareous sandy eolian deposits. Landform is terraces. Ecological Site Description is Loamy Plains. Soils are well-drained with a moderate water holding capacity, and slope 0 to 1 percent.

Depth (in)	Physical			Chemical			
	Texture	Bulk Density	Particle Size Percent sand, silt, clay	pH	EC	SAR	OM%
0-6	Loam	1.46	43-38-19	7.2	0.1	0.0	1.50
6-12	Sandy Clay Loam	1.54	57-18-25	7.2	0.1	0.0	0.60
12-19	Sandy Clay Loam	1.58	57-18-25	7.4	0.1	0.0	0.48
19-35	Fine Sandy Loam	1.58	70-16-14	8.2	0.1	0.0	0.22
35-80	Fine Sandy Loam	1.52	64-26-10	8.2	0.1	0.0	0.10

### Soil Texture Triangle reflect the 0-10 in depth



### Erosion Potential (10 inches)

- K Factor, Whole soil - .37. 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 – 5. 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

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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

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## Reference vegetation – Loamy Plains Ecology

### Climate

Average Annual Precipitation 14 to 17 inches annually

Average Annual Air Temperature 50 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 co-dominant warm-season shortgrass (blue grama), and cool-season midgrass (western wheatgrass, green needlegrass). The Warm-Season Shortgrass State is characterized by a warm-season short bunchgrass (blue grama) and stoloniferous grass (buffalograss). The Increased Bare Ground State is characterized by early successional warm-season bunchgrass (Fendler threeawn), cool-season short bunchgrass (squirreltail), annual grasses, and annual forbs.

Drought has increased mortality of blue grama and buffalo grasses in some locations

The major grasses in the Reference Plant Community include western wheatgrass, green needlegrass, and blue grama. Western wheatgrass is a major cool-season grass in this plant community and is a valuable forage plant in late spring and/or early summer. Sub-dominant grasses include needle and thread, buffalograss, and sand dropseed. Major forbs include American vetch, upright prairie coneflower, scarlet globemallow, and dotted blazingstar (dotted gayfeather). A minor amount of shrubs such as fourwing saltbush and winterfat may also occur.

Well suited for carbon sequestration

# Vegetation

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## Reference Vegetation – Loamy Plains Ecology

### At Risk Plant Community

Key species from the Reference Plant Community, such as green needlegrass, western wheatgrass, American vetch, fourwing saltbush, and winterfat have been reduced in production. Blue grama and buffalograss have increased in abundance, are beginning to dominate the community, and will begin to exhibit a sod-bound appearance. Sand dropseed, red threeawn, sixweeks fescue, plains pricklypear, hairy false goldenaster, and bottlebrush squirreltail also have increased. This plant community is at risk of losing the cool-season grasses, key forbs such as American vetch and purple prairie clover, and key shrubs.

Total aboveground biomass has been reduced. Reduction of rhizomatous wheatgrass, nitrogen-fixing forbs, and the shrub component, and increased warm-season shortgrasses have begun to alter the biotic integrity of this community. Water and nutrient cycles may be impaired.

### Loamy Plains Ecosystem Vegetative Community Composition

Common Name	Scientific Name
Western Wheatgrass	<i>Pascopyrum smithii</i>
Green Needlegrass	<i>Nassella viridula</i>
Indian Ricegrass	<i>Achnatherum hymenoides</i>
Needle and Thread	<i>Hesperostipa comata</i>
Blue Grama	<i>Bouteloua gracilis</i>
Buffalograss	<i>Bouteloua dactyloides</i>
Sand Dropseed	<i>Sporobolus cryptandrus</i>
Sideoats Grama	<i>Bouteloua curtipendula</i>
Little Bluestem	<i>Schizachyrium scoparium</i>
Little Barley	<i>Hordeum pusillum</i>
Sixweeks Fescue	<i>Vulpia octoflora</i>
American Vetch	<i>Vicia americana</i>
Purple Prairie Clover	<i>Dalea purpurea</i> var. <i>purpurea</i>
White Locoweed	<i>Oxytropis sericea</i>
Slimflower Scurfpea	<i>Psoralidium tenuiflorum</i>
Scarlet Globemallow	<i>Sphaeralcea coccinea</i>
Broadbeard Beardtongue	<i>Penstemon angustifolius</i>
Lacy Tansyaster	<i>Machaeranthera pinnatifida</i> ssp. <i>pinnatifida</i> var. <i>pinnatifida</i>
Dotted Blazing Star	<i>Liatris punctata</i>
Upright Prairie Coneflower	<i>Rativida columnifera</i>
Rush Skeletonplant	<i>Lygodesmia juncea</i>