

Incident ID	nAPP2210326434
District RP	
Facility ID	
Application ID	

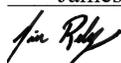
## Closure

The responsible party must attach information demonstrating they have complied with all applicable closure requirements and any conditions or directives of the OCD. This demonstration should be in the form of a comprehensive report (electronic submittals in .pdf format are preferred) including a scaled site map, sampling diagrams, relevant field notes, photographs of any excavation prior to backfilling, laboratory data including chain of custody documents of final sampling, and a narrative of the remedial activities. Refer to 19.15.29.12 NMAC.

**Closure Report Attachment Checklist:** *Each of the following items must be included in the closure report.*

- A scaled site and sampling diagram as described in 19.15.29.11 NMAC
- Photographs of the remediated site prior to backfill or photos of the liner integrity if applicable (Note: appropriate OCD District office must be notified 2 days prior to liner inspection)
- Laboratory analyses of final sampling (Note: appropriate ODC District office must be notified 2 days prior to final sampling)
- Description of remediation activities

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations. The responsible party acknowledges they must substantially restore, reclaim, and re-vegetate the impacted surface area to the conditions that existed prior to the release or their final land use in accordance with 19.15.29.13 NMAC including notification to the OCD when reclamation and re-vegetation are complete.

Printed Name: James Raley Title: Environmental Specialist  
 Signature:  Date: 5/11/2022  
 email: jim.raley@dvn.com Telephone: 575-689-7597

**OCD Only**

Received by: Robert Hamlet Date: 6/14/2022

Closure approval by the OCD does not relieve the responsible party of liability should their operations have failed to adequately investigate and remediate contamination that poses a threat to groundwater, surface water, human health, or the environment nor does not relieve the responsible party of compliance with any other federal, state, or local laws and/or regulations.

Closure Approved by:  Date: 6/14/2022  
 Printed Name: Robert Hamlet Title: Environmental Specialist - Advanced



May 10, 2022

Vertex Project #: 22E-01335

**Spill Closure Report:** Ross Draw Unit 42 Tank Battery (Section 22, Township 26 South, Range 30 East)  
API: 30-015-40623  
County: Eddy  
Incident Report: nAPP2210326434

**Prepared For:** **WPX Energy Permian, LLC**  
5315 Buena Vista Drive  
Carlsbad, New Mexico 88220

**New Mexico Oil Conservation Division - District 2**

811 South 1<sup>st</sup> Street  
Artesia, New Mexico 88210

WPX Energy Permian, LLC (WPX) retained Vertex Resource Services Inc. (Vertex) to conduct a Spill Assessment for a release of produced water due to a mechanical failure on the water pump allowing the produced water tank to overflow inside the lined containment at Ross Draw Unit 42 Tank Battery API 30-015-40623, Incident nAPP2210326434 (hereafter referred to as "RDU 42"). WPX provided spill notification to the New Mexico Oil Conservation District (NMOCD) District 2, via submission of an initial C-141 Release Notification (Attachment 1). This letter provides a description of the Spill Assessment and includes a request for Spill Closure. The spill area is located at N 32.0270348, W -103.8680038.

This letter provides a description of the liner inspection and demonstrates that closure criteria established in 19.15.29.12 *New Mexico Administrative Code* (NMAC; New Mexico Oil Conservation Division, 2018) have been met and all applicable regulations are being followed. This document is intended to serve as a final report to obtain approval from NMOCD for closure of this release.

## Background

The site is located approximately 14.15 miles north of Orla, Texas. The legal location for the site is Section 22, Township 26 South and Range 30 East in Eddy County, New Mexico. The spill area is located on Bureau of Land Management (BLM) property.

*The Geological Map of New Mexico* (New Mexico Bureau of Geology and Mineral Resources, 2014 – 2017) indicates the site's surface geology is comprised primarily of Qep – Eolian and piedmont deposits (Holocene to middle Pleistocene) and is characterized as eolian sands and piedmont-slope deposits. The National Resources Conservation Service Web Soil Survey characterizes the predominant soil texture on the site is Gypsum land-Reeves complex. It tends to be well drained with high runoff and very low available moisture levels in the soil profile (United States Department of Agriculture, Natural Resources Conservation Service, 2020).

The surrounding landscape is associated with plains and hills at elevations of 3,000 to 5,000 feet above sea level. The climate is semi-arid, with an annual precipitation ranging between 10 to 14 inches. Historically, the plant community

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has a grassland aspect, dominated by grasses with shrubs and half-shrubs sparse and evenly distributed. Tobosa, black grama, and blue grama dominate the area. Creosote, tarbush, and mesquite may expand or invade the area.

There is no surface water located on-site. The nearest significant watercourse, as defined in Subsection P of 19.15.17.7 NMAC, is the Pecos River located approximately 4.09 miles southwest of the site (Google Earth Pro, 2022). There are no continuous flowing watercourses or significant watercourses, lakebeds, sinkholes, playa lakes, or other critical water or community features as outlined in Paragraph (4) of Subsection C of 19.15.29.12 NMAC.

### **Incident Description**

The spill occurred on April 12, 2022, due to a mechanical failure on the water pump allowing the produced water tank to overflow. The spill was reported on April 13, 2022 and involved the release of approximately 15 barrels (bbl.) of produced water into the lined containment. Approximately 15 bbl. of free fluid was removed during initial spill clean-up. The NMOCD C-141 Report: nAPP2210326434 is included in Attachment 1. The Daily Field Report (DFR) and site photographs are included in Attachment 2.

### **Closure Criteria Determination**

The depth to groundwater was determined using information from the United States Geological Survey National Water Information Mapping System and Office of the State Engineers Water Rights Database. A 0.5-mile search radius was used to determine groundwater depth. The closest recorded depth to groundwater was determined to be 180 feet below ground surface and 1.95 miles from the site. Documentation used in Closure Criteria Determination research is included in Attachment 3.

WPX Energy Permian, LLC  
Ross Draw Unit 42 Tank Battery, nAPP2210326434

2022 Spill Assessment and Closure  
May 2022

<b>Closure Criteria Worksheet</b>			
<b>Site Name: Ross Draw Unit 42 Tank Battery</b>			
<b>Spill Coordinates:</b>		<b>X: 32.0270348</b>	<b>Y: -103.8680038</b>
<b>Site Specific Conditions</b>		<b>Value</b>	<b>Unit</b>
1	Depth to Groundwater	180	feet
2	Within 300 feet of any continuously flowing watercourse or any other significant watercourse	28,346	feet
3	Within 200 feet of any lakebed, sinkhole or playa lake (measured from the ordinary high-water mark)	28,346	feet
4	Within 300 feet from an occupied residence, school, hospital, institution or church	37,063	feet
5	i) Within 500 feet of a spring or a private, domestic fresh water well used by less than five households for domestic or stock watering purposes, <b>or</b>	15,443	feet
	ii) Within 1000 feet of any fresh water well or spring	15,443	feet
6	Within incorporated municipal boundaries or within a defined municipal fresh water field covered under a municipal ordinance adopted pursuant to Section 3-27-3 NMSA 1978 as amended, unless the municipality specifically approves	No	(Y/N)
7	Within 300 feet of a wetland	2,450	feet
8	Within the area overlying a subsurface mine	No	(Y/N)
9	Within an unstable area (Karst Map)	Medium	Critical High Medium Low
10	Within a 100-year Floodplain	Undetermined	year
11	Soil Type	Gypsum land-Reeves complex	
12	Ecological Classification	Loamy	
13	Geology	Qep	
	<b>NMAC 19.15.29.12 E (Table 1) Closure Criteria</b>	<50'	<50' 51-100' >100'

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WPX Energy Permian, LLC  
Ross Draw Unit 42 Tank Battery, nAPP2210326434

2022 Spill Assessment and Closure  
May 2022

Using site characterization information, a closure criteria determination worksheet (Attachment 3) was completed to determine if the release would be subject to any of the special case scenarios outlined in Paragraph (4) of Subsection C of 19.15.29.12 NMAC, if the release had escaped secondary containment.

Based on data included in the closure criteria determination worksheet, the release at RDX would not be subject to the requirements of Paragraph (4) of Subsection C of 19.15.29.12 NMAC and the closure criteria for the site would be determined to be associated with the following constituent concentration limits based on depth to groundwater. The constituent concentration closure criteria determined for the site are presented in Table 1.

Minimum depth below any point within the horizontal boundary of the release to groundwater less than 10,000 mg/l TDS	Constituent	Limit
< 50 feet	Chloride	600 mg/kg
	TPH (GRO+DRO+MRO)	100 mg/kg
	BTEX	50 mg/kg
	Benzene	10 mg/kg

## Remedial Actions Taken

An initial site inspection of the spill area was completed on April 22, 2022, which identified the area of the spill specified in the initial C-141 Report. The DFR associated with the site inspection is included in Attachment 2.

Notification that a liner inspection was scheduled to be completed was provided to the NMOCD on April 20, 2022. Visual observation of the liner was completed on all sides and the base of the containment, around equipment, and of all seams in the liner. As evidenced in the DFR, liner integrity was confirmed, and the Liner Inspection Notification email is presented in Attachment 4.

## Closure Request

Vertex recommends no remediation action to address the release at Ross Draw Unit 42 Tank Battery. The secondary containment liner appeared to be intact and had the ability to contain the release, as shown in the inspection photographs included with the DFR (Attachment 2). There are no anticipated risks to human, ecological or hydrological receptors associated with the release site.

Vertex requests that incident nAPP2210326434 be closed as all closure requirements set forth in Subsection E of 19.15.29.12 NMAC have been met. WPX certifies that all information in this report and the attachments is correct, and that they have complied with all applicable closure requirements and conditions specified in Division rules and directives to meet NMOCD requirements to obtain closure on the open release at Ross Draw Unit 42 Tank Battery.

Should you have any questions or concerns, please do not hesitate to contact the undersigned at 575.361.9880 or mpeppin@vertex.ca.

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**WPX Energy Permian, LLC**  
Ross Draw Unit 42 Tank Battery, nAPP2210326434

**2022 Spill Assessment and Closure**  
May 2022

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Monica Peppin  
PROJECT MANAGER, REPORTING

May 10, 2022

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Date

## Attachments

- Attachment 1. NMOCD C-141 Report
- Attachment 2. Daily field report with pictures
- Attachment 3. Closure Criteria Research Determination Documentation
- Attachment 4. Required 48-hr Notification of Liner Inspection to Regulatory Agencies

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## References

- Water Column/Average Depth to Water Report*. New Mexico Water Rights Reporting System, (2020). Retrieved from <http://nmwrrs.ose.state.nm.us/nmwrrs/waterColumn.html>
- Assessed and Impaired Waters of New Mexico*. New Mexico Department of Surface Water Quality Bureau, (2020). Retrieved from <https://gis.web.env.nm.gov/oem/?map=swqb>
- Interactive Geologic Map*. New Mexico Bureau of Geology and Mineral Resources, (2014-2017). Retrieved from <http://geoinfo.nmt.edu>
- Measured Distance from the Subject Site to Residence*. Google Earth Pro, (2020). Retrieved from <https://earth.google.com>
- Point of Diversion Location Report*. New Mexico Water Rights Reporting System, (2020). Retrieved from <http://nmwrrs.ose.state.nm.us/nmwrrs/wellSurfaceDiversion.html>
- Measured Distance from the Subject Site to Municipal Boundaries* Google Inc. (2022). *Google Earth Pro (Version 7.3.3)* [Software]. Retrieved from <https://earth.google.com>
- National Wetland Inventory Surface Waters and Wetland*. United State Fish and Wildlife Service, (2020). Retrieved from <https://www.fws.gov/wetlands/data/mapper.html>
- Coal Mine Resources in New Mexico*. NM Mining and Minerals Division, (2019). Retrieved from <http://www.emnrd.state.nm.us/MMD/gismapminedata.html>
- New Mexico Cave/Karsts*. United States Department of the Interior, Bureau of Land Management, (2019) Retrieved from <https://www.blm.gov/programs/recreation/recreation-programs/caves/new-mexico>
- Flood Map Number 35015C1875D*. United States Department of Homeland Security, FEMA Flood Map Service Center, (2010). Retrieved from <https://msc.fema.gov/portal/search?AddressQuery=malaga%20new%20mexico#searchresultsanchor>
- Well Log/Meter Information Report*. NM Office of the State Engineer, New Mexico Water Rights Reporting System. (2019). Retrieved from <http://nmwrrs.ose.state.nm.us/nmwrrs/meterReport.html>
- Natural Resources and Wildlife Oil and Gas Releases*. New Mexico Oil Conservation Division, (2019). Santa Fe, New Mexico.
- Soil Survey, New Mexico*. United States Department of Agriculture, Soil Conservation Service in Cooperation with New Mexico Agricultural Experiment Station. (1971). Retrieved from [http://www.wipp.energy.gov/library/Information\\_Repository\\_A/Supplemental\\_Information/Chugg%20et%20al%201971%20w-map.pdf](http://www.wipp.energy.gov/library/Information_Repository_A/Supplemental_Information/Chugg%20et%20al%201971%20w-map.pdf)

**WPX Energy Permian, LLC**  
Ross Draw Unit 42 Tank Battery, nAPP2210326434

**2022 Spill Assessment and Closure**  
May 2022

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## **Limitations**

This report has been prepared for the sole benefit of WPX Energy Permian, LLC. This document may not be used by any other person or entity, with the exception of the New Mexico Oil Conservation Division, without the express written consent of Vertex Resource Services Inc. (Vertex) and WPX Energy Permian, LLC. Any use of this report by a third party, or any reliance on decisions made based on it, or damages suffered as a result of the use of this report are the sole responsibility of the user.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgement of Vertex based on the data collected during the assessment. Due to the nature of the assessment and the data available, Vertex cannot warrant against undiscovered environmental liabilities. Conclusions and recommendations presented in this report should not be considered legal advice.

## **ATTACHMENT 1**

District I  
1625 N. French Dr., Hobbs, NM 88240  
District II  
811 S. First St., Artesia, NM 88210  
District III  
1000 Rio Brazos Road, Aztec, NM 87410  
District IV  
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico  
Energy Minerals and Natural  
Resources Department  
Oil Conservation Division  
1220 South St. Francis Dr.  
Santa Fe, NM 87505

Form C-141  
Revised August 24, 2018  
Submit to appropriate OCD District office

Incident ID	nAPP2210326434
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Application ID	

## Release Notification

### Responsible Party

Responsible Party: WPX Energy Permian, LLC	OGRID: 246289
Contact Name: Jim Raley	Contact Telephone: 575-689-7597
Contact email: jim.ralej@dvn.com	Incident # (assigned by OCD) nAPP2210326434
Contact mailing address: 5315 Buena Vista Dr., Carlsbad NM 88220	

### Location of Release Source

Latitude 32.0270348 \_\_\_\_\_ Longitude -103.8680038 \_\_\_\_\_  
(NAD 83 in decimal degrees to 5 decimal places)

Site Name: Ross Draw Unit 42 Tank Battery	Site Type: Oil Production Site
Date Release Discovered: April 12, 2022	API# (if applicable) 30-015-40623

Unit Letter	Section	Township	Range	County
J	22	26S	30E	Eddy

Surface Owner:  State  Federal  Tribal  Private (Name: \_\_\_\_\_)

### Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

<input type="checkbox"/> Crude Oil	Volume Released (bbls) 0	Volume Recovered (bbls) 0
<input checked="" type="checkbox"/> Produced Water	Volume Released (bbls) 15	Volume Recovered (bbls) 15
	Is the concentration of dissolved chloride in the produced water >10,000 mg/l?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Condensate	Volume Released (bbls)	Volume Recovered (bbls)
<input type="checkbox"/> Natural Gas	Volume Released (Mcf)	Volume Recovered (Mcf)
<input type="checkbox"/> Other (describe)	Volume/Weight Released (provide units)	Volume/Weight Recovered (provide units)

Cause of Release: Mechanical failure of water transfer pump allowed produced water tank to overflow 15 bbls of produced water to lined secondary containment. Fluids recovered, liner to be inspected.

*bbl estimate = recovered fluids (bbls)*

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Was this a major release as defined by 19.15.29.7(A) NMAC?  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If YES, for what reason(s) does the responsible party consider this a major release?
If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)	

### Initial Response

*The responsible party must undertake the following actions immediately unless they could create a safety hazard that would result in injury*

<input checked="" type="checkbox"/> The source of the release has been stopped. <input checked="" type="checkbox"/> The impacted area has been secured to protect human health and the environment. <input checked="" type="checkbox"/> Released materials have been contained via the use of berms or dikes, absorbent pads, or other containment devices. <input checked="" type="checkbox"/> All free liquids and recoverable materials have been removed and managed appropriately.
If all the actions described above have <u>not</u> been undertaken, explain why:
Per 19.15.29.8 B. (4) NMAC the responsible party may commence remediation immediately after discovery of a release. If remediation has begun, please attach a narrative of actions to date. If remedial efforts have been successfully completed or if the release occurred within a lined containment area (see 19.15.29.11(A)(5)(a) NMAC), please attach all information needed for closure evaluation.
I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.
Printed Name: <u>James Raley</u> Title: <u>Environmental Specialist</u>
Signature:  Date: <u>4/13/2022</u>
email: <u>jim.raley@dvn.com</u> Telephone: <u>575-689-7597</u>
<b><u>OCD Only</u></b>  Received by: _____ Date: _____

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## Site Assessment/Characterization

*This information must be provided to the appropriate district office no later than 90 days after the release discovery date.*

What is the shallowest depth to groundwater beneath the area affected by the release?	__ 180 __ (ft bgs)
Did this release impact groundwater or surface water?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within 1000 feet of any other fresh water well or spring?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within 300 feet of a wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release overlying a subsurface mine?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release overlying an unstable area such as karst geology?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Are the lateral extents of the release within a 100-year floodplain?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Did the release impact areas <b>not</b> on an exploration, development, production, or storage site?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Attach a comprehensive report (electronic submittals in .pdf format are preferred) demonstrating the lateral and vertical extents of soil contamination associated with the release have been determined. Refer to 19.15.29.11 NMAC for specifics.

**Characterization Report Checklist:** *Each of the following items must be included in the report.*

- N/A Scaled site map showing impacted area, surface features, subsurface features, delineation points, and monitoring wells.
- Field data
- N/A Data table of soil contaminant concentration data
- Depth to water determination
- Determination of water sources and significant watercourses within ½-mile of the lateral extents of the release
- N/A Boring or excavation logs
- Photographs including date and GIS information
- N/A Topographic/Aerial maps
- N/A Laboratory data including chain of custody

If the site characterization report does not include completed efforts at remediation of the release, the report must include a proposed remediation plan. That plan must include the estimated volume of material to be remediated, the proposed remediation technique, proposed sampling plan and methods, anticipated timelines for beginning and completing the remediation. The closure criteria for a release are contained in Table 1 of 19.15.29.12 NMAC, however, use of the table is modified by site- and release-specific parameters.

State of New Mexico  
Oil Conservation Division

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Printed Name: James Raley Title: Environmental Specialist

Signature:  Date: 5/11/2022

email: jim.raley@dvn.com Telephone: 575-689-7597

**OCD Only**

Received by: \_\_\_\_\_ Date: \_\_\_\_\_

State of New Mexico  
Oil Conservation Division

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## Closure

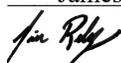
The responsible party must attach information demonstrating they have complied with all applicable closure requirements and any conditions or directives of the OCD. This demonstration should be in the form of a comprehensive report (electronic submittals in .pdf format are preferred) including a scaled site map, sampling diagrams, relevant field notes, photographs of any excavation prior to backfilling, laboratory data including chain of custody documents of final sampling, and a narrative of the remedial activities. Refer to 19.15.29.12 NMAC.

**Closure Report Attachment Checklist:** *Each of the following items must be included in the closure report.*

- N/A A scaled site and sampling diagram as described in 19.15.29.11 NMAC
- Photographs of the remediated site prior to backfill or photos of the liner integrity if applicable (Note: appropriate OCD District office must be notified 2 days prior to liner inspection)
- N/A Laboratory analyses of final sampling (Note: appropriate ODC District office must be notified 2 days prior to final sampling)
- N/A Description of remediation activities

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations. The responsible party acknowledges they must substantially restore, reclaim, and re-vegetate the impacted surface area to the conditions that existed prior to the release or their final land use in accordance with 19.15.29.13 NMAC including notification to the OCD when reclamation and re-vegetation are complete.

Printed Name: James Raley Title: Environmental Specialist

Signature:  Date: 5/11/2022

email: jim.raley@dvn.com Telephone: 575-689-7597

**OCD Only**

Received by: \_\_\_\_\_ Date: \_\_\_\_\_

Closure approval by the OCD does not relieve the responsible party of liability should their operations have failed to adequately investigate and remediate contamination that poses a threat to groundwater, surface water, human health, or the environment nor does not relieve the responsible party of compliance with any other federal, state, or local laws and/or regulations.

Closure Approved by: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name: \_\_\_\_\_ Title: \_\_\_\_\_

## **ATTACHMENT 2**



# Daily Site Visit Report

Client:	Devon Energy Corporation	Inspection Date:	4/22/2022
Site Location Name:	Ross Draw Unit 42	Report Run Date:	4/22/2022 8:30 PM
Client Contact Name:	Wes Matthews	API #:	
Client Contact Phone #:	(575) 748-0176	Project Owner:	
Unique Project ID		Project Manager:	
Project Reference #			

### Summary of Times

Arrived at Site	4/22/2022 9:20 AM
Departed Site	4/22/2022 11:50 AM

### Field Notes

**14:19** Arrived at the site and walked inside and outside of the containment. I did not see any areas of concern on the liner that would cause me to think that any of the release escaped the containment.

### Next Steps & Recommendations

1



# Daily Site Visit Report

## Site Photos

**Viewing Direction: South**



Descriptive Photo - 1  
Viewing Direction: South  
Desc: Photo facing South looking at the outside of the North containment wall.  
Created: 4/22/2022 1:41:20 PM  
Lat:32.386988, Long:-104.237890

Photo facing South looking at the outside of the North containment wall.

**Viewing Direction: North**



Descriptive Photo - 10  
Viewing Direction: North  
Desc: Photo facing North down the East wall.  
Created: 4/22/2022 1:40:48 PM  
Lat:32.386988, Long:-104.237890

Photo facing North down the East wall.

**Viewing Direction: North**



Descriptive Photo - 11  
Viewing Direction: North  
Desc: Photo facing North looking down the West wall.  
Created: 4/22/2022 1:40:48 PM  
Lat:32.386987, Long:-104.237893

Photo facing North looking down the West wall.

**Viewing Direction: East**



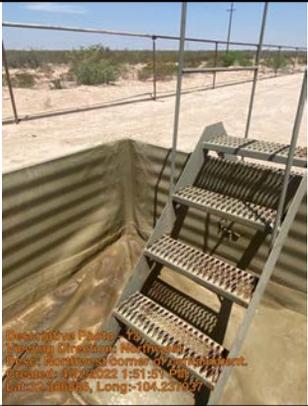
Descriptive Photo - 12  
Viewing Direction: East  
Desc: Photo facing East looking down the South wall.  
Created: 4/22/2022 1:51:05 PM  
Lat:32.386895, Long:-104.237890

Photo facing East looking down the South wall.



# Daily Site Visit Report

**Viewing Direction: Northwest**



Descriptive Photo - 13  
Viewing Direction: Northwest  
Desc: Northwest corner of containment.  
Created: 4/22/2022 1:51:58 PM  
Lat: 32.86895, Long: -104.23792

Northwest corner of containment.

**Viewing Direction: Northeast**



Descriptive Photo - 14  
Viewing Direction: Northeast  
Desc: Northeast corner of containment.  
Created: 4/22/2022 1:52:16 PM  
Lat: 32.86897, Long: -104.23792

Northeast corner of containment.

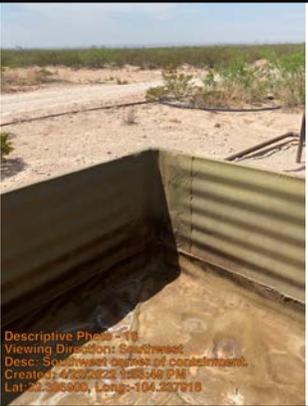
**Viewing Direction: Southeast**



Descriptive Photo - 15  
Viewing Direction: Southeast  
Desc: Southeast corner of containment.  
Created: 4/22/2022 1:53:23 PM  
Lat: 32.86892, Long: -104.23793

Southeast corner of containment.

**Viewing Direction: Southwest**



Descriptive Photo - 16  
Viewing Direction: Southwest  
Desc: Southwest corner of containment.  
Created: 4/22/2022 1:53:40 PM  
Lat: 32.86890, Long: -104.23791

Southwest corner of containment.



# Daily Site Visit Report

**Viewing Direction: West**



Descriptive Photo - 2  
Viewing Direction: West  
Desc: Photo facing West looking at the outside of the East containment wall.  
Created: 4/22/2022 1:42:11 PM  
Lat:32.386864, Long:-104.237920

Photo facing West looking at the outside of the East containment wall.

**Viewing Direction: North**



Descriptive Photo - 3  
Viewing Direction: North  
Desc: Photo facing North looking at the outside of the South containment wall.  
Created: 4/22/2022 1:43:50 PM  
Lat:32.386863, Long:-104.237936

Photo facing North looking at the outside of the South containment wall.

**Viewing Direction: East**



Descriptive Photo - 4  
Viewing Direction: East  
Desc: Photo facing East looking at the outside of the West containment wall.  
Created: 4/22/2022 1:44:37 PM  
Lat:32.386864, Long:-104.237934

Photo facing East looking at the outside of the West containment wall.

**Viewing Direction: East**



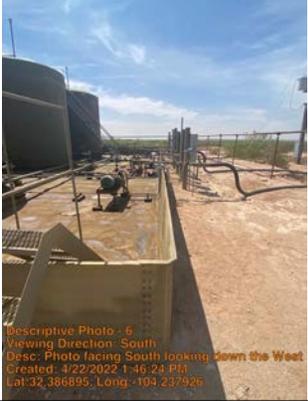
Descriptive Photo - 5  
Viewing Direction: East  
Desc: Photo facing East looking down the North wall.  
Created: 4/22/2022 1:45:39 PM  
Lat:32.386867, Long:-104.237932

Photo facing East looking down the North wall.



# Daily Site Visit Report

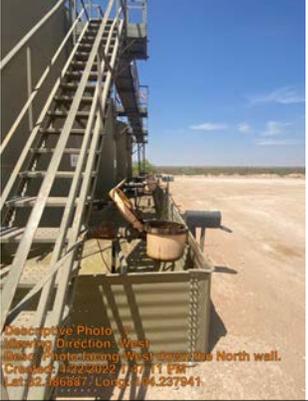
**Viewing Direction: South**



Descriptive Photo - 6  
Viewing Direction: South  
Desc: Photo facing South looking down the West  
Created: 4/22/2022 1:46:24 PM  
Lat:32.386895, Long: -104.237926

Photo facing South looking down the West wall.

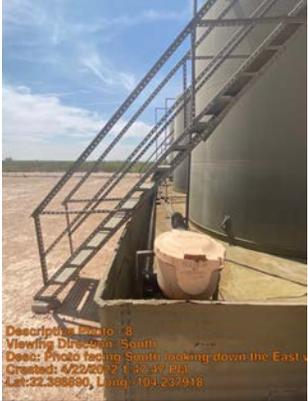
**Viewing Direction: West**



Descriptive Photo - 7  
Viewing Direction: West  
Desc: Photo facing West down the North wall.  
Created: 4/22/2022 1:47:11 PM  
Lat:32.386887, Long: -104.237941

Photo facing West down the North wall.

**Viewing Direction: South**



Descriptive Photo - 8  
Viewing Direction: South  
Desc: Photo facing South looking down the East  
Created: 4/22/2022 1:48:17 PM  
Lat:32.386895, Long: -104.237918

Photo facing South looking down the East wall.

**Viewing Direction: West**



Descriptive Photo - 9  
Viewing Direction: West  
Desc: Photo facing West down the South wall.  
Created: 4/22/2022 1:49:11 PM  
Lat:32.386875, Long: -104.237926

Photo facing West down the South wall.

# Daily Site Visit Report



Daily Site Visit Signature

**Inspector:** Jaime Balencia

**Signature:**   
Signature

**ATTACHMENT 3**



# New Mexico Office of the State Engineer

## Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)  
 (quarters are smallest to largest) (NAD83 UTM in meters)

<b>Well Tag</b>	<b>POD Number</b>	<b>Q64</b>	<b>Q16</b>	<b>Q4</b>	<b>Sec</b>	<b>Tw</b>	<b>Rng</b>	<b>X</b>	<b>Y</b>
C	02165				24	26S	30E	610036	3544121*

<b>Driller License:</b> 421	<b>Driller Company:</b> GLENN'S WATER WELL SERVICE	
<b>Driller Name:</b> CORKY GLENN		
<b>Drill Start Date:</b> 05/02/1988	<b>Drill Finish Date:</b> 05/02/1988	<b>Plug Date:</b>
<b>Log File Date:</b> 05/05/1988	<b>PCW Rev Date:</b>	<b>Source:</b> Shallow
<b>Pump Type:</b>	<b>Pipe Discharge Size:</b>	<b>Estimated Yield:</b> 75 GPM
<b>Casing Size:</b> 6.63	<b>Depth Well:</b> 440 feet	<b>Depth Water:</b> 180 feet

<b>Water Bearing Stratifications:</b>	<b>Top</b>	<b>Bottom</b>	<b>Description</b>
	318	432	Other/Unknown

<b>Casing Perforations:</b>	<b>Top</b>	<b>Bottom</b>
	296	440

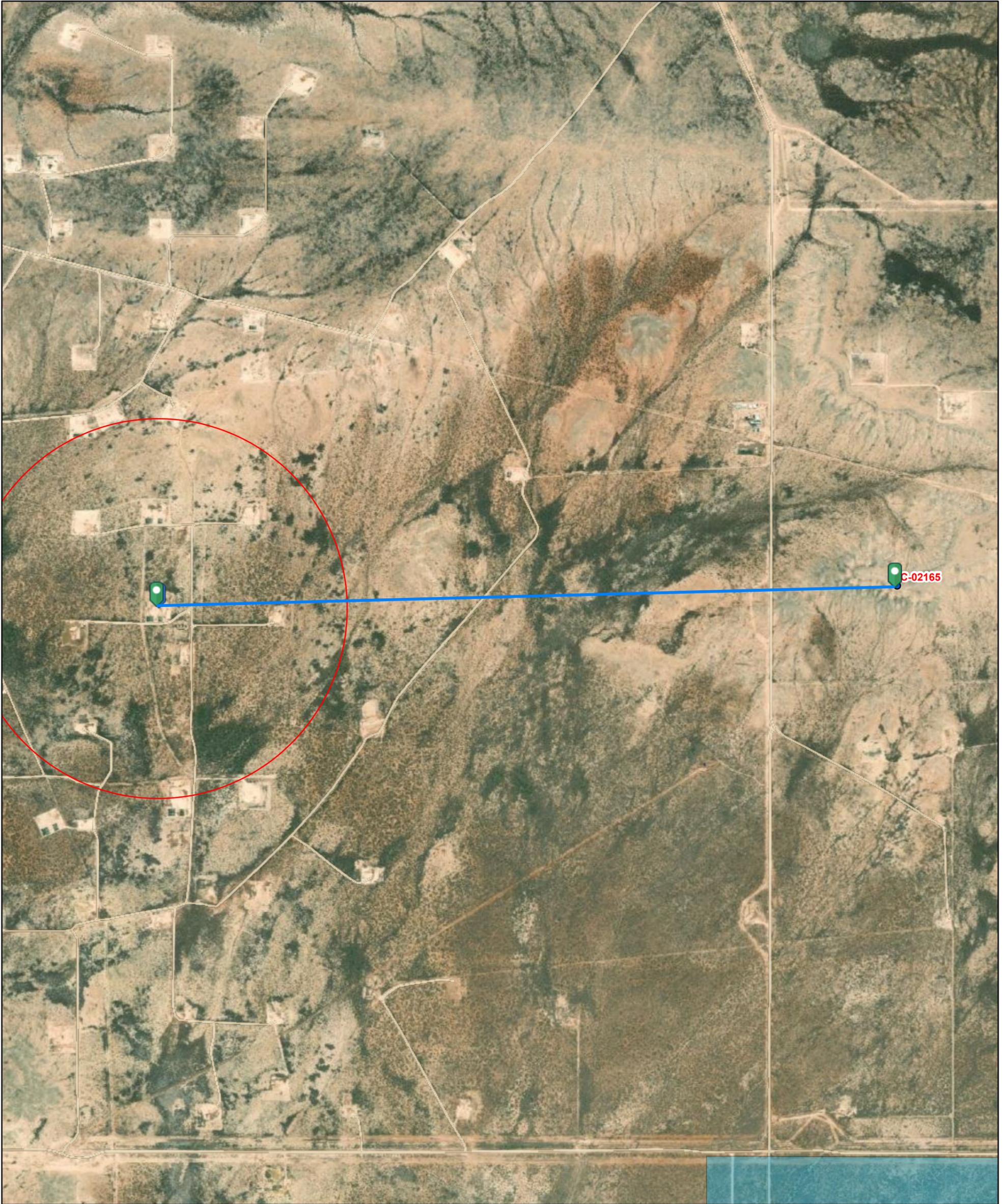
\*UTM location was derived from PLSS - see Help

The data is furnished by the NMOSE/ISC and is accepted by the recipient with the expressed understanding that the OSE/ISC make no warranties, expressed or implied, concerning the accuracy, completeness, reliability, usability, or suitability for any particular purpose of the data.

4/21/22 3:30 PM

POINT OF DIVERSION SUMMARY

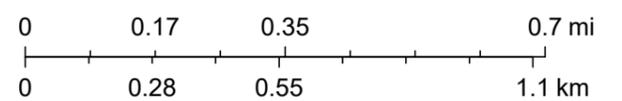
# Ross Draw Unit 42 Tank Battery



4/21/2022, 3:29:42 PM

- Override 1
- GIS WATERS PODs
- Active
- OSE District Boundary
- New Mexico State Trust Lands
- Both Estates
- SiteBoundaries

1:18,056



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, Garmin, (c) OpenStreetMap contributors, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, U.S. Department of Energy Office of Legacy

# Ross Draw Unit 42 Tank Battery

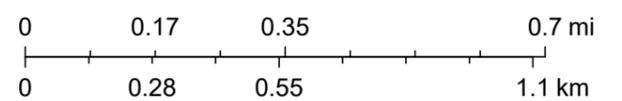


4/21/2022, 3:28:01 PM

GIS WATERS PODs

- Pending
- OSE District Boundary
- New Mexico State Trust Lands
- Both Estates
- SiteBoundaries

1:18,056



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, Garmin, (c) OpenStreetMap contributors, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, U.S. Department of Energy Office of Legacy



# Ross Draw Unit 42 Tank Battery



April 21, 2022

### Wetlands

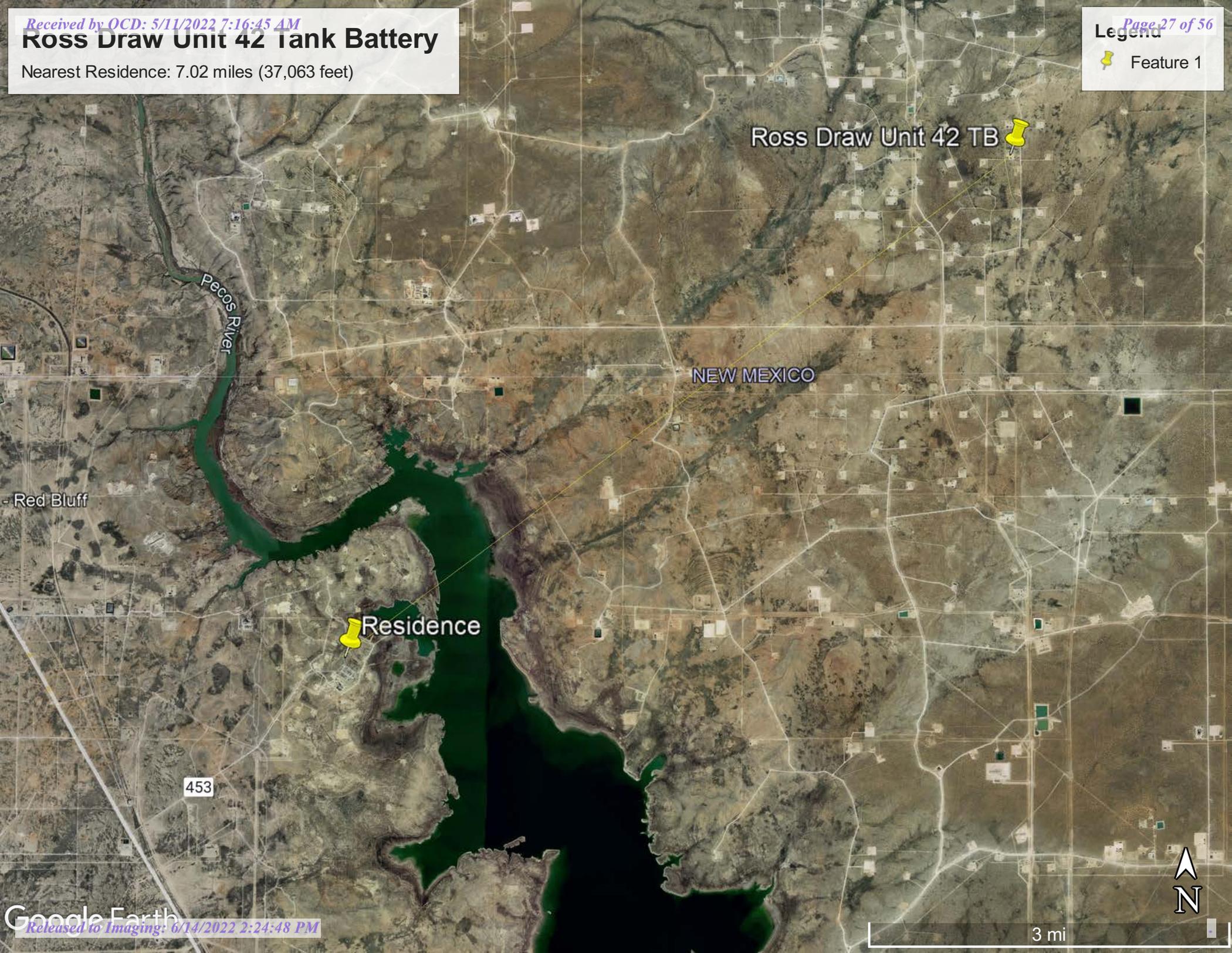
- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Lake
- Estuarine and Marine Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

# Ross Draw Unit 42 Tank Battery

Nearest Residence: 7.02 miles (37,063 feet)

Feature 1



Ross Draw Unit 42 TB

NEW MEXICO

Pecos River

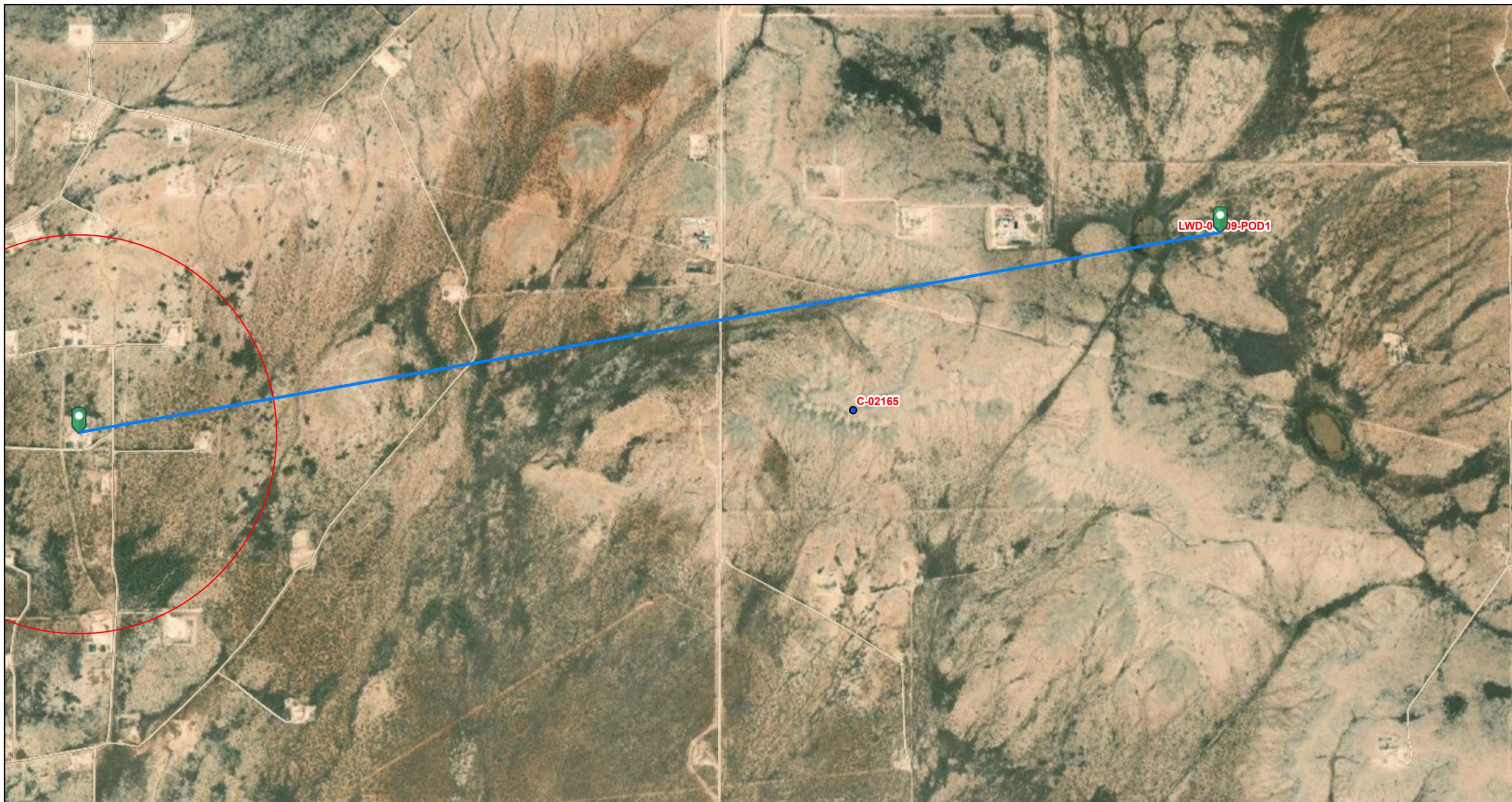
Residence

453



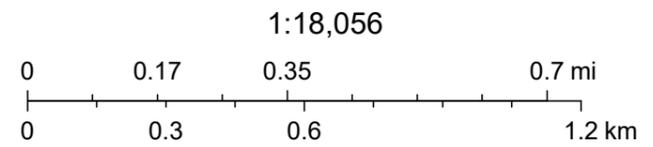
3 mi

# Ross Draw Unit 42 Tank Battery



4/21/2022, 3:34:39 PM

- Override 1
- GIS WATERS PODs
- Active
- OSE District Boundary
- SiteBoundaries



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, Garmin, (c) OpenStreetMap contributors, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, U.S. Department of Energy Office of Legacy



# New Mexico Office of the State Engineer

## Water Right Summary



**WR File Number:** LWD 01209      **Subbasin:** CUB      **Cross Reference:** LWD-C-14  
**Primary Purpose:** PLS    NON 72-12-1 LIVESTOCK WATERING  
**Primary Status:** DCL    DECLARATION  
**Total Acres:** 11                      **Subfile:** -                      **Header:** -  
**Total Diversion:** 22.7              **Cause/Case:** -  
**Owner:** BUCK & LARUE JACKSON TRUST

### Documents on File

Trn #	Doc	File/Act	Status		Transaction Desc.	From/		Acres	Diversion	Consumptive
			1	2		To				
<a href="#">get images</a>	<a href="#">631580</a>	<a href="#">DCL</a>	<a href="#">1992-03-16</a>	DCL	PRC	LWD-C-14	T	11	22.7	

### Current Points of Diversion

(NAD83 UTM in meters)

POD Number	Well Tag	Source	Q	Q16	Q4Sec	Tws	Rng	X	Y	Other Location Desc
<a href="#">LWD 01209 POD1</a>			64	1	19	26S	31E	611349	3544855*	

\*An (\*) after northing value indicates UTM location was derived from PLSS - see Help

### Priority Summary

Priority	Status	Acres	Diversion	Pod Number
12/31/1906	DCL	11	22.7	<a href="#">LWD 01209 POD1</a>

### Place of Use

Q	Q	Q16	Q4Sec	Tws	Rng	Acres	Diversion	CU	Use	Priority	Status	Other Location Desc
256	64	1	19	26S	31E	11	22.7		PLS	12/31/1906	DCL	

### Source

Acres	Diversion	CU	Use	Priority	Source Description
11	22.7		PLS	12/31/1906	SW

The data is furnished by the NMOSE/ISC and is accepted by the recipient with the expressed understanding that the OSE/ISC make no warranties, expressed or implied, concerning the accuracy, completeness, reliability, usability, or suitability for any particular purpose of the data.

4/21/22 3:31 PM

WATER RIGHT  
SUMMARY

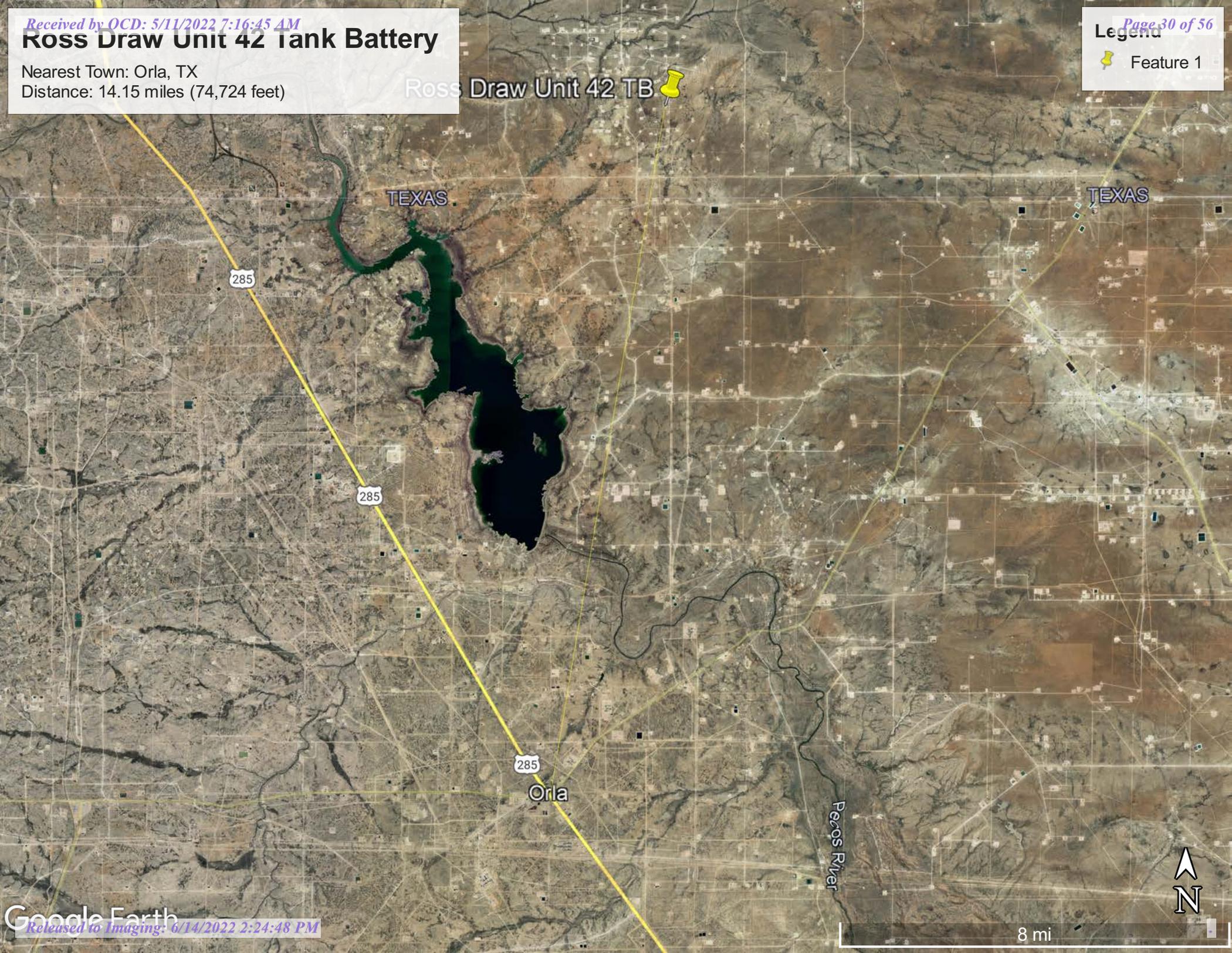
# Ross Draw Unit 42 Tank Battery

Nearest Town: Orla, TX  
Distance: 14.15 miles (74,724 feet)

Legend

- Feature 1

Ross Draw Unit 42 TB



285

285

285

Orla

TEXAS

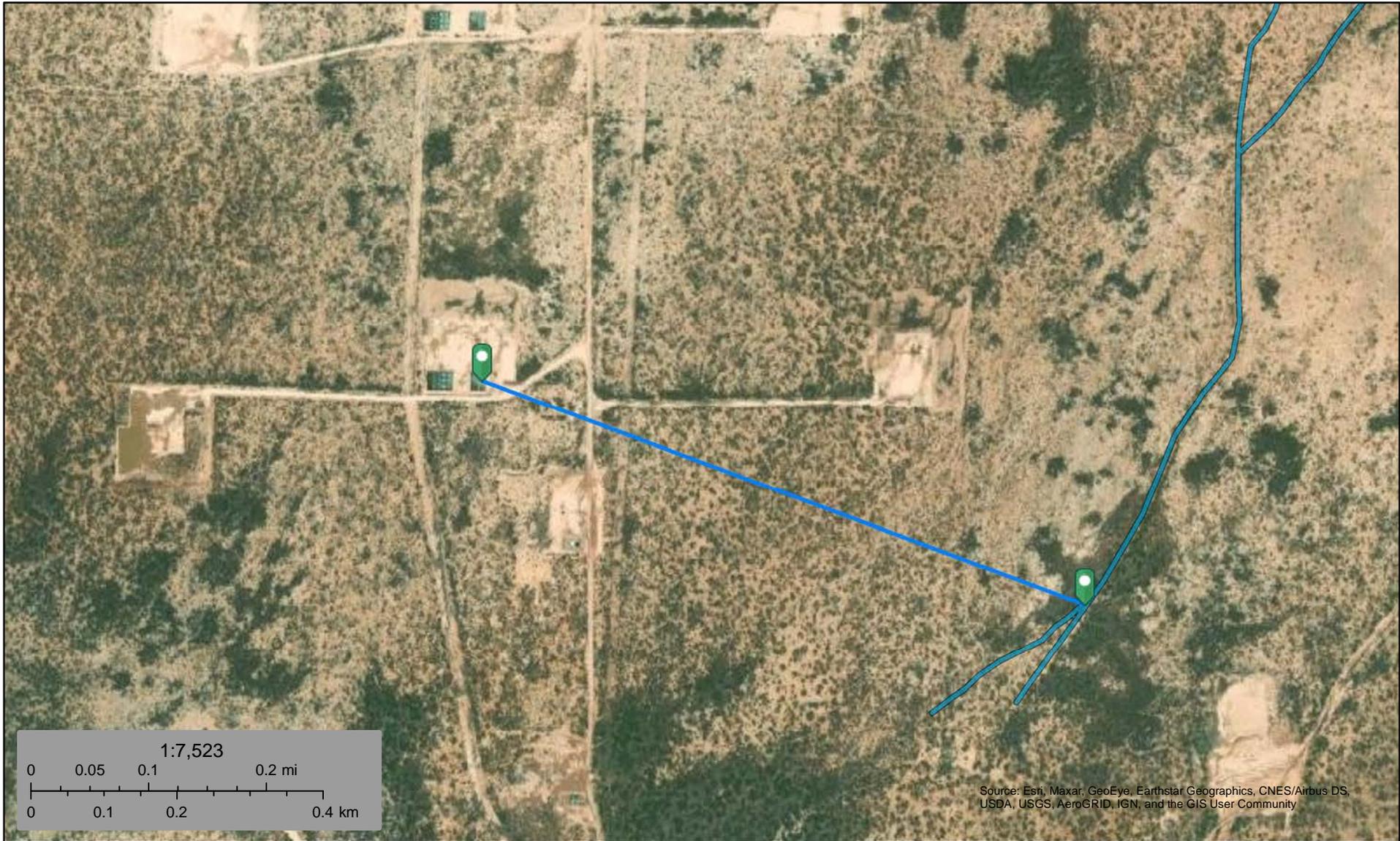
TEXAS

Pecos River



8 mi

# Ross Draw Unit 42 Tank Battery



April 21, 2022

### Wetlands

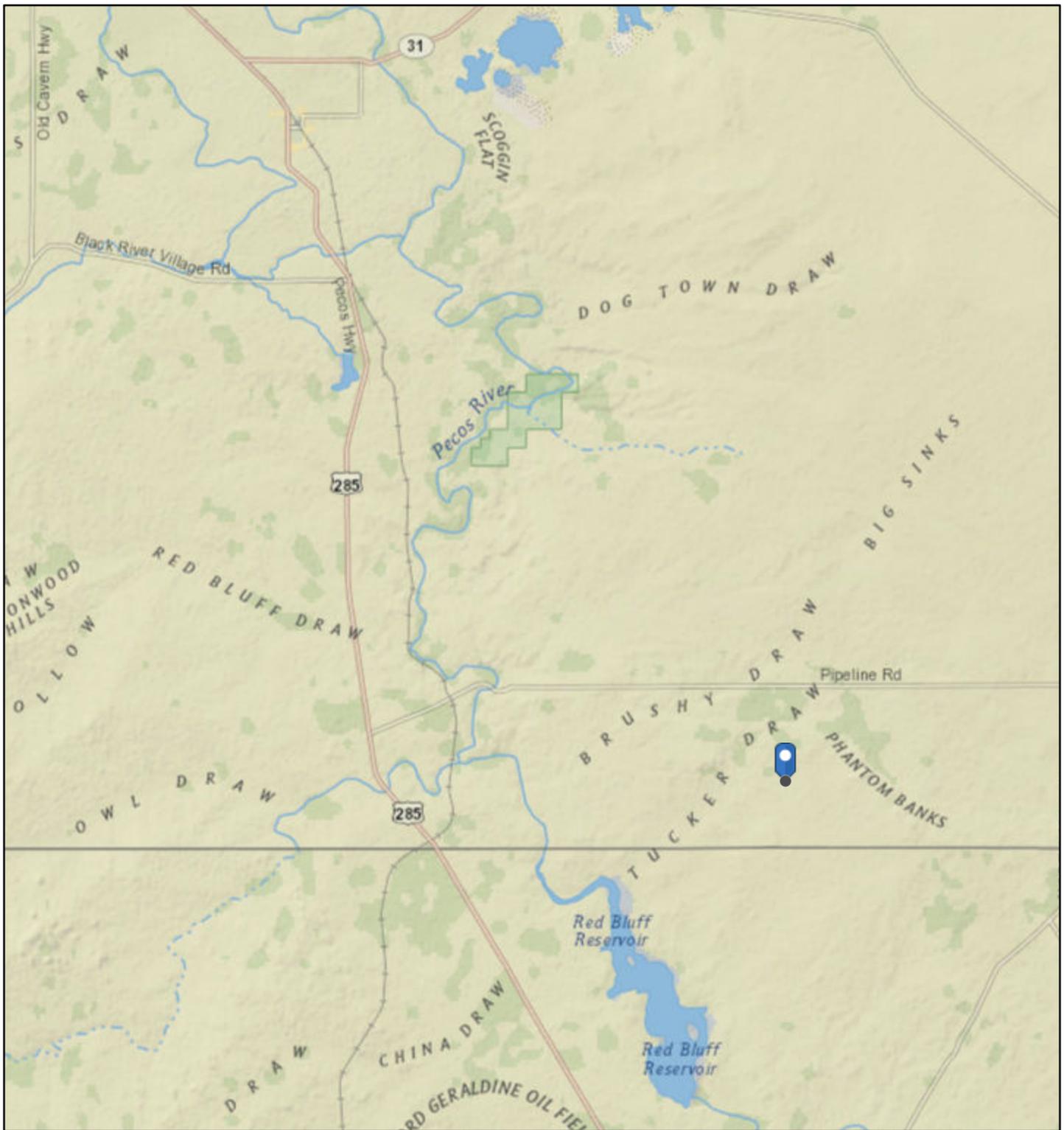
-  Estuarine and Marine Deepwater
-  Estuarine and Marine Wetland

-  Freshwater Emergent Wetland
-  Freshwater Forested/Shrub Wetland
-  Freshwater Pond

-  Lake
-  Other
-  Riverine

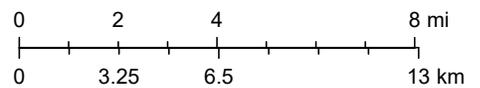
This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

# Coal Mines in New Mexico



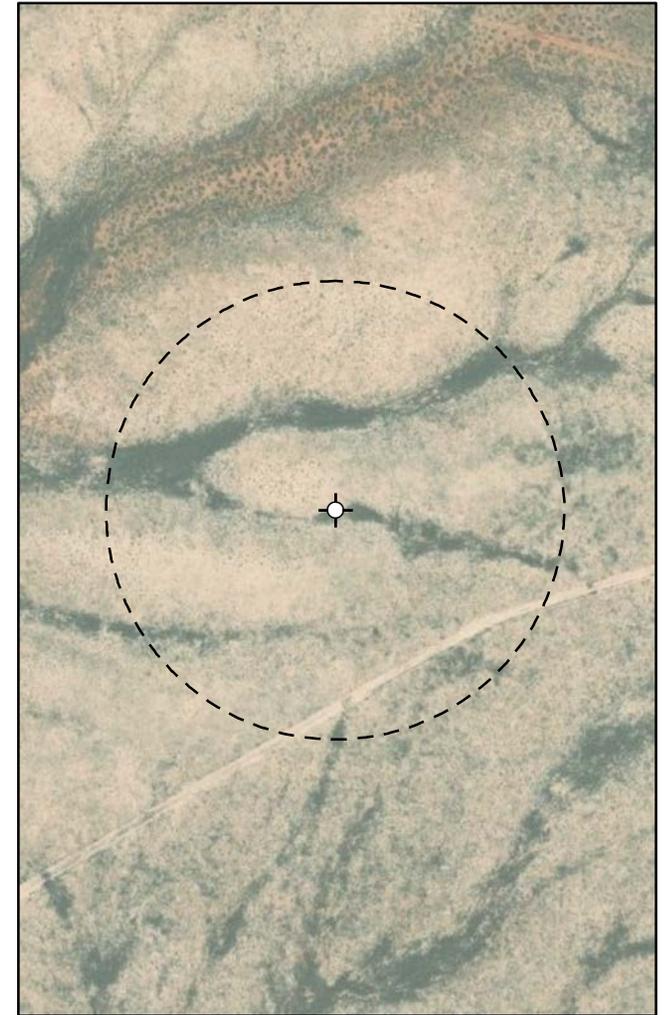
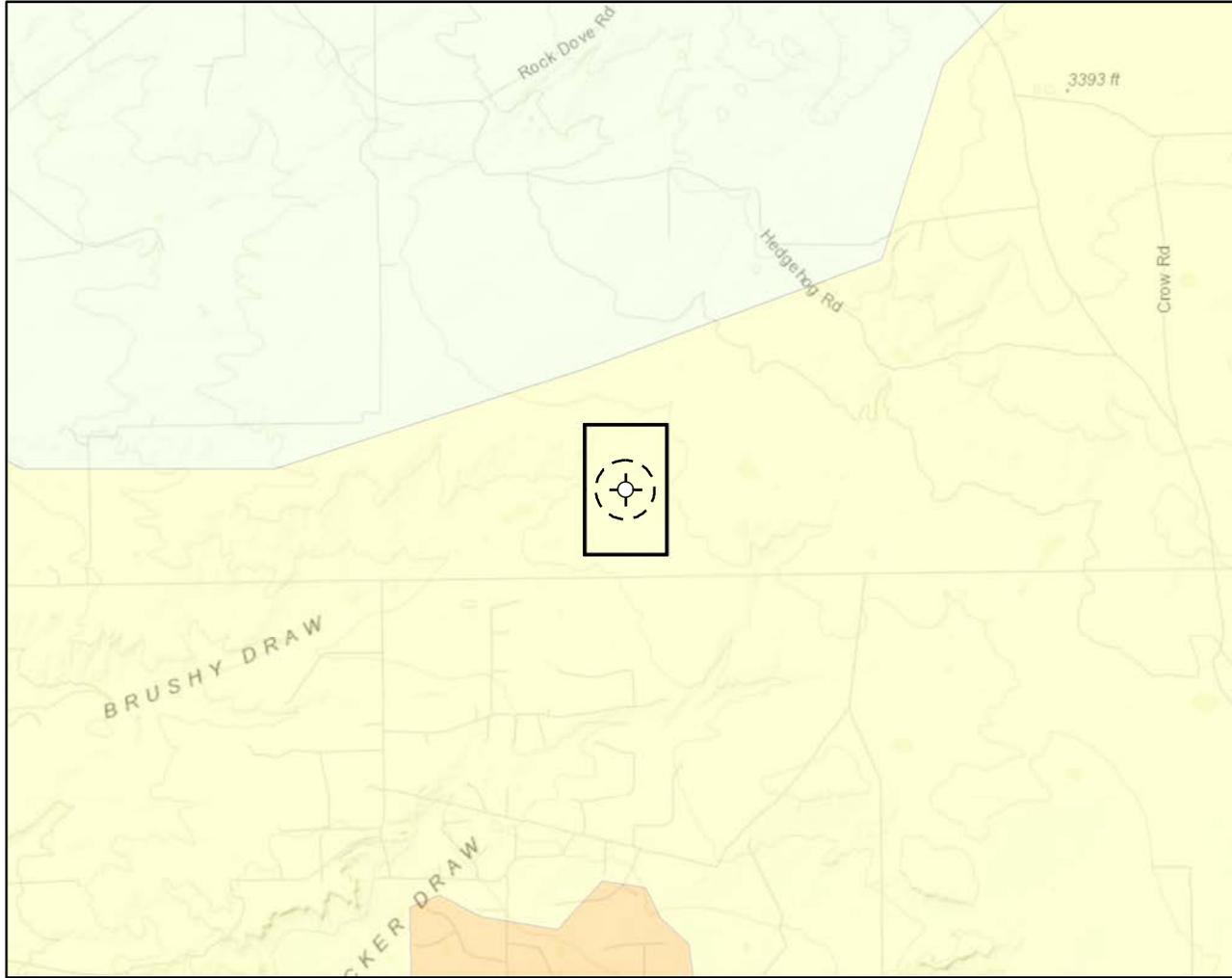
4/21/2022, 3:47:58 PM

1:288,895



National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Document Path: G:\1-Projects\US PROJECTS\Devon Energy Corporation\2022\2E-01335 - Ross Draw Unit 42 Tank Battery\Figure X Karst Potential Map Ross Draw Unit 42 Tank Battery.mxd



**Karst Potential**

- Critical
- High
- Medium
- Low

-  Site Location
-  Site Buffer ( 1,000 ft. )

**Overview Map**

0 0.25 0.5 1 mi

**Detail Map**

0 150 300 600 ft.



Map Center:  
Lat/Long: 32.072703, -103.868004

NAD 1983 UTM Zone 13N  
Date: Apr 22/22



**Karst Potential Map  
Ross Draw Unit 42 Tank Battery**

FIGURE:

X



Geospatial data presented in this figure may be derived from external sources and Vertex does not assume any liability for inaccuracies. This figure is intended for reference use only and is not certified for legal, survey, or engineering purposes.

Note: Inset Map, ESRI 20XX; Overview Map: ESRI World Topographic. Karst potential data sourced from Roswell Field Office, Bureau of Land Management, 2020 or United States Department of the Interior, Bureau of Land Management. (2018). Karst Potential.

VERSATILITY. EXPERTISE.

# National Flood Hazard Layer FIRMette



103°52'24"W 32°1'53"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs

GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

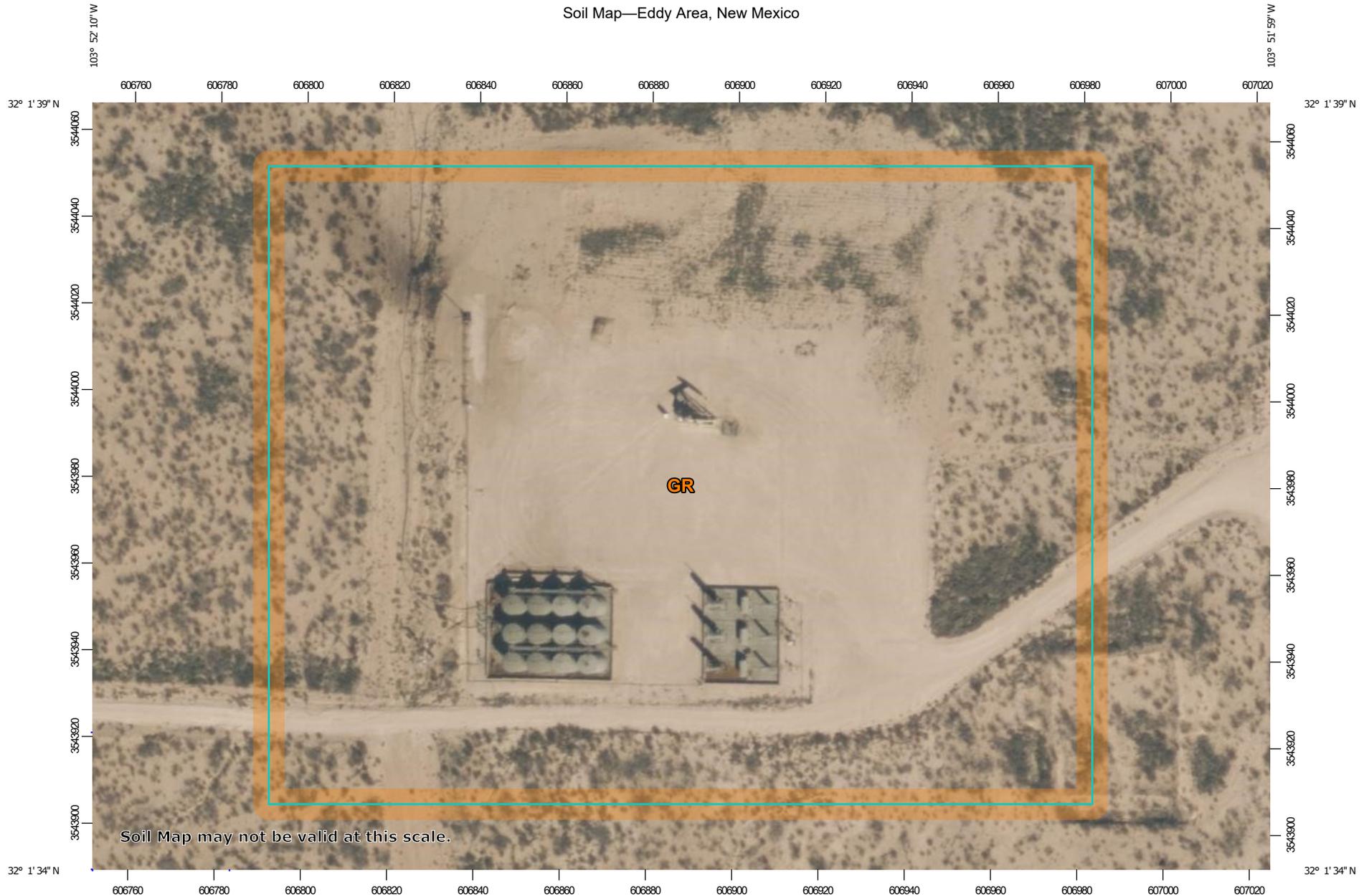
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

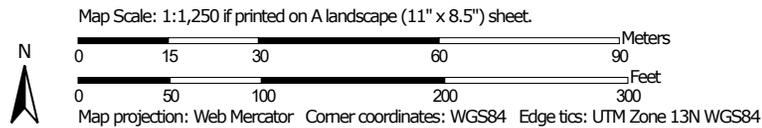
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/21/2022 at 5:49 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Soil Map—Eddy Area, New Mexico



Soil Map may not be valid at this scale.



Soil Map—Eddy Area, New Mexico

### MAP LEGEND

**Area of Interest (AOI)**

 Area of Interest (AOI)

**Soils**

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

**Special Point Features**

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

**Water Features**

 Streams and Canals

**Transportation**

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

**Background**

 Aerial Photography

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

**Warning:** Soil Map may not be valid at this scale.  
 Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Eddy Area, New Mexico  
 Survey Area Data: Version 17, Sep 12, 2021

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

Date(s) aerial images were photographed: Feb 7, 2020—May 12, 2020

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

Soil Map—Eddy Area, New Mexico

---

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GR	Gypsum land-Reeves complex, 0 to 3 percent slopes, eroded	7.0	100.0%
<b>Totals for Area of Interest</b>		<b>7.0</b>	<b>100.0%</b>

Map Unit Description: Gypsum land-Reeves complex, 0 to 3 percent slopes, eroded---Eddy Area, New Mexico

---

## Eddy Area, New Mexico

### GR—Gypsum land-Reeves complex, 0 to 3 percent slopes, eroded

#### Map Unit Setting

*National map unit symbol:* 1w4h  
*Elevation:* 3,000 to 5,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 60 to 64 degrees F  
*Frost-free period:* 190 to 220 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Gypsum land:* 55 percent  
*Reeves and similar soils:* 35 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Gypsum Land

##### Setting

*Landform:* Ridges, plains, hills  
*Landform position (two-dimensional):* Shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Side slope, crest, nose slope, head slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Linear  
*Parent material:* Residuum weathered from gypsum

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 8s  
*Hydric soil rating:* No

#### Description of Reeves

##### Setting

*Landform:* Ridges, plains, hills  
*Landform position (two-dimensional):* Shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Side slope, crest, nose slope, head slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Linear  
*Parent material:* Residuum weathered from gypsum

##### Typical profile

*H1 - 0 to 8 inches:* sandy loam  
*H2 - 8 to 32 inches:* clay loam

Map Unit Description: Gypsum land-Reeves complex, 0 to 3 percent slopes, eroded--Eddy Area, New Mexico

---

*H3 - 32 to 60 inches: gypsiferous material*

**Properties and qualities**

*Slope: 0 to 1 percent*

*Depth to restrictive feature: More than 80 inches*

*Drainage class: Well drained*

*Runoff class: High*

*Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Calcium carbonate, maximum content: 25 percent*

*Gypsum, maximum content: 80 percent*

*Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)*

*Sodium adsorption ratio, maximum: 4.0*

*Available water supply, 0 to 60 inches: Low (about 4.3 inches)*

**Interpretive groups**

*Land capability classification (irrigated): 3s*

*Land capability classification (nonirrigated): 7s*

*Hydrologic Soil Group: B*

*Ecological site: R042XC007NM - Loamy*

*Hydric soil rating: No*

**Minor Components**

**Unnamed soils**

*Percent of map unit: 10 percent*

*Hydric soil rating: No*

**Data Source Information**

Soil Survey Area: Eddy Area, New Mexico

Survey Area Data: Version 17, Sep 12, 2021

## Ecological site R042XC007NM Loamy

Accessed: 04/12/2022

### General information



**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

### Physiographic features

This site occurs on uplands landforms, mainly on hill slopes, ridges, plains, terraces and some fan remnants. Slopes range from 1 to 5 percent and average about 3 percent. Average annual precipitation is about 8 to 14 inches. Elevations range from 2,842 to 5,000 feet.

**Table 2. Representative physiographic features**

Landforms	(1) Plain (2) Terrace (3) Fan piedmont
Flooding frequency	None
Ponding frequency	None
Elevation	2,842–5,000 ft
Slope	0–5%
Aspect	E, S, W

## Climatic features

The average annual precipitation ranges from 8 to 13 inches. Variations of 5 inches, more or less, are common. Over 80 percent of the precipitation falls from April through October. Most of the summer precipitation comes in the form of high intensity short duration thunderstorms.

Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature is 61 degrees with extremes of 25 degrees below zero in the winter to 112 degrees in the summer.

The average frost-free season is 207 to 220 days. The last killing frost is in late March or early April, and the first killing frost is in late October or early November.

Temperature and rainfall both favor warm season perennial plant growth. In years of abundant spring moisture, annual forbs and cool season grasses can make up an important component of this site. Strong winds blow from the southwest in January through June rapidly drying out the soil during a critical time for cool season plant growth.

Climate data was obtained from <http://www.wrcc.sage.dri.edu/summary/climsmnm.html> web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

**Table 3. Representative climatic features**

Frost-free period (average)	221 days
Freeze-free period (average)	240 days
Precipitation total (average)	13 in

## Influencing water features

This site is not influenced by wetland or streams.

## Soil features

The soils of this site are deep to moderately deep. The moderately deep soils have either a petrocalcic, petrogypsic or gypsum horizon between 30 and 40 inches.

Surface textures are loam, silt loam, very fine sandy loam, or clay loam. Substratum textures are loam, silty clay loam, clay loam, or silt loams. Subsoil textures are silt loam, clay loam, silty clay loam, gravelly loam, gravelly clay loam or very gravelly loam. Permeability is moderate to slow and the available water holding capacity is high to moderate. The Atoka, Reeves, Russler, Milner soils may have high amounts of CaCO<sub>3</sub>, ranging as high as 40 percent in the subsoil. Rock fragments range from 5 to 50 percent in the subsoil. Reeves, Russler, Milner, Holloman soils will have 40 to 80 percent gypsum in the underlying material.

Maximum and minimum values listed below represent the characteristic soils for this site.

Characteristic Soils:

Atoka (petrocalcic)  
 Bigetty  
 Reagan  
 Reakor  
 Reeves (gypsum)  
 Russler (gypsum)  
 Largo  
 Russler (gypsum)  
 Largo  
 Berino  
 Tinney  
 Midessa  
 Ratliff

Holloman (gypsum)  
Milner (gypsum)

**Table 4. Representative soil features**

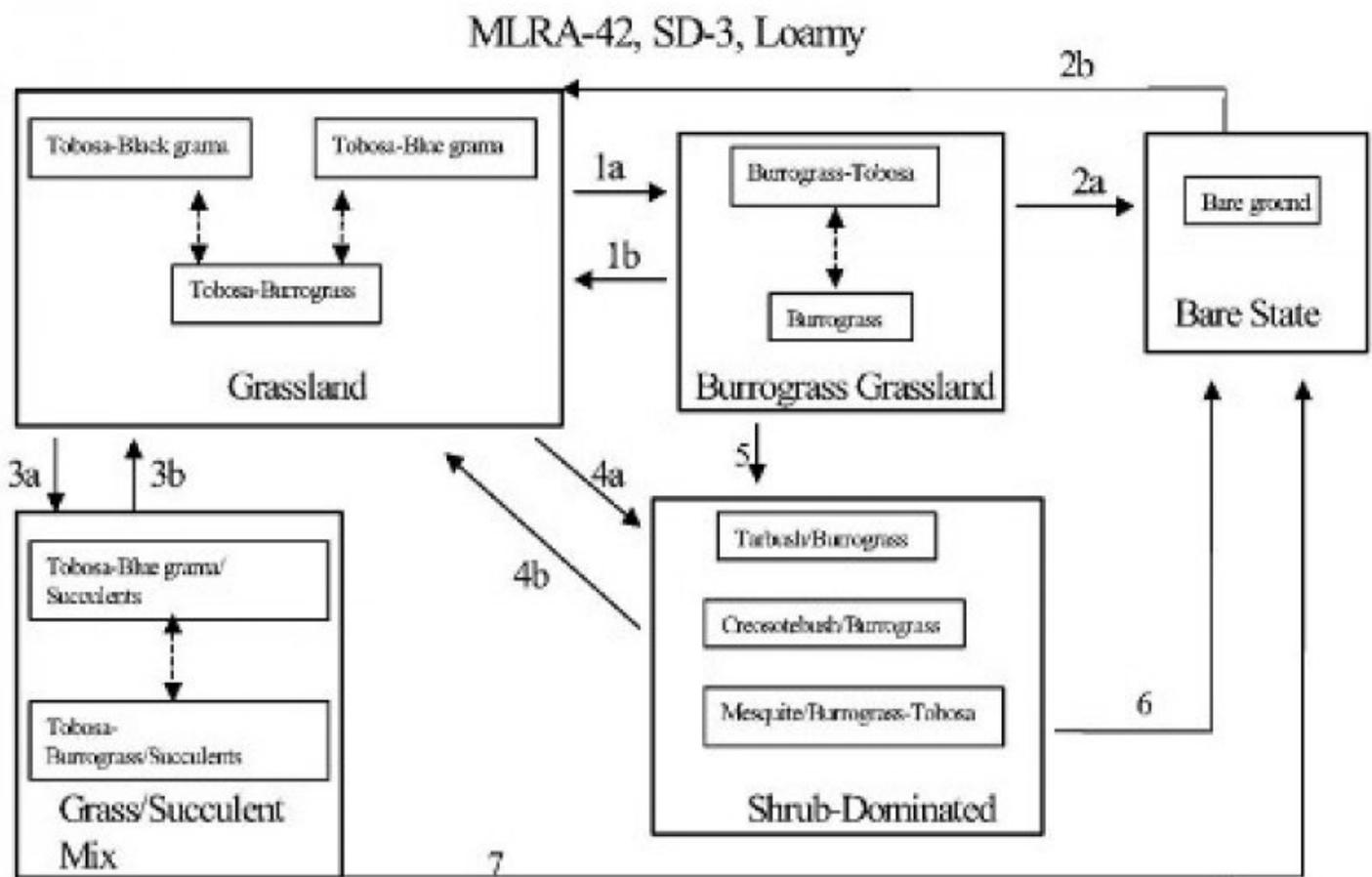
Surface texture	(1) Loam (2) Very fine sandy loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to slow
Soil depth	30–72 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–12 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–6
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

Overview: The Loamy site is associated with the Gyp Upland ecological site with which it intergrades. There is a pronounced increase in alkali sacaton along this interface. The loamy site is also associated with the Gravelly and Shallow ecological sites from which it receives run-on water. The Draw site often dissects Loamy sites and is distinguished from the Loamy site by increased production or greater densities of woody species. The historic plant community has a grassland aspect, dominated by grasses with shrubs and half-shrubs sparse and evenly distributed. Tobosa, black grama and blue grama are the dominant species. Retrogression within this state is characterized by a decrease in black and blue grama and an increase in burrograss. Continuous overgrazing and drought can initiate a transition to a Burrograss- Grassland state. Continued reduction in grass cover and resulting infiltration problems may eventually effect a change to a Bare State, with very little or no remaining grass cover. Alternatively, creosotebush, tarbush or mesquite may expand or invade. Transitions back to a Grassland State from a Bare or Shrub-Dominated state are costly and may not be economically feasible. Decreased fire frequency may play a part in the transition to the Grass/Succulent Mix state with increased amounts of cholla and prickly pear.

## State and transition model

Plant Communities and Transitional Pathways (diagram)



- 1a. Soil drying, overgrazing, drought, soil surface sealing. 1b. Restore natural overland flow, increase infiltration, prescribed grazing.
- 2a. Severe reduction in cover, soil surface sealing, decreased infiltration, erosion. 2b. Restore hydrology, break up physical crust, range seeding, prescribed grazing.
- 3a. Lack of fire, overgrazing, hail storms or other physical disturbance, drought. 3b. Prescribed fire, brush control, prescribed grazing.
- 4a. Seed dispersal of shrubs, persistent loss of grass cover, competition by shrubs, lack of fire. 4b. Brush control, range seeding -dependent on amount of grass (seed bank) remaining.
- 5. Loss of grass cover, seed dispersal of shrubs, competition by shrubs.
- 6. & 7. Brush control with continued loss of grass cover, soil sealing, erosion.

Figure 4.

**State 1  
Historic Climax Plant Community**

**Community 1.1  
Historic Climax Plant Community**

State Containing Historic Climax Plant Community  
Grassland:

The historic plant community has a grassland aspect, dominated by grasses with shrubs and half-shrubs sparse and evenly distributed. Black grama, blue grama, and tobosa are the dominant grass species. There are a variety of

perennial forbs and their production varies widely by season and year. Globemallow, verbena, groundsels, croton and filaree are forbs commonly found on this site. Fourwing saltbush and winterfat are two of the more palatable shrubs. The Loamy ecological site encompasses a wide variety of soils, with surface textures ranging from sandy loams to clay loams. Soil depths range from shallow to very deep and can include sub surface features such as calcic, petrocalcic, and gypsic horizons. These variations cause differences in plant community composition and dynamics. Black grama is found at highest densities on coarser textured sandy loams, with blue grama preferring finer textured loam and silt loam, and tobosa favoring lower landscape positions and loam to clay loam surface textures. Burrograss may often be the dominant grass species on silty soils, perhaps in part due to the seedlings ability to auger into and establish on physically crusted soils. Gypsum influenced soils typically have greater amounts of tobosa, burrograss, and ephedra. There is greater representation of sideoats and vine mesquite within the tobosa-blue grama community. Retrogression under continuous heavy grazing results in a decrease of black grama, blue grama, sideoats grama, plains bristlegrass, bush muhly, cane bluestem, vine mesquite, winterfat, and fourwing saltbush. Species such as burrograss, threeawns, sand dropseed, sand muhly, and broom snakeweed increase under continuous heavy grazing or prolonged periods of drought. Under continued retrogression burrograss can completely dominate the site. Creosotebush, tarbush, and mesquite, can also dominate. Cholla and prickly pear can increase on areas that are disturbed or overgrazed.

Diagnosis: Tobosa, black grama, and blue grama are the dominant species. Grass cover is uniformly distributed with few large bare areas. Shrubs are sparse and evenly distributed. Slopes range from level to gently sloping and usually display limited evidence of active rills and gully formation if plant cover remains intact. Litter movement associated with overland flow is limited to smaller size class litter and short distances.

Other shrubs include: yucca, mesquite, tarbush, cholla and creosote bush.

Other forbs include: desert holly, scorpionweed, bladderpod, flax, nama, fleabane, Indianwheat, Indian blanket flower, groundcherry, deerstongue, and rayless goldenrod.

**Table 5. Annual production by plant type**

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	585	833	1080
Forb	39	55	72
Shrub/Vine	26	37	48
<b>Total</b>	<b>650</b>	<b>925</b>	<b>1200</b>

**Table 6. Ground cover**

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	15-30%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	25-30%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	40-50%

**Figure 6. Plant community growth curve (percent production by month).**

NM2807, R042XC007NM Loamy HCPC. R042XC007NM Loamy HCPC Warm Season Plant Community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	10	25	30	15	5	0	0

## State 2

### Burrograss-Grassland

#### Community 2.1

##### Burrograss-Grassland

Burrograss-Grassland: Changes in hydrology resulting in decreased available soil moisture, reduces grass cover and increases bare ground. Burrograss is the dominant grass. Tobosa cover is variable and can range from sizeable areas to small patches occupying only depressions or the lowest and wettest positions within the site. Threeawns, ear muhly, sand muhly, and fluffgrass occur at increased densities compared to the grassland state. Shrub densities may increase especially mesquite, creosotebush or tarbush. Retrogression within this state is characterized by a further decrease in grass cover and increased bare ground. Further deterioration of this site can result in the transition to a bare state or becoming shrub dominated.

Diagnosis: Burrograss is the dominant species. Grass cover is no longer uniformly distributed, instead tending to be patchy with large areas of bare ground present. Physical crusts are present in bare areas reducing infiltration and suppressing seedling establishment by any grass species other than burrograss.

Transition to Burrograss-Grassland (1a): Transitions from grassland to a burrograss-grassland state may occur due to changes in hydrology. Gullies, roads or obstructions that alter natural water flow patterns may cause this transition. Changes in surface hydrology may also occur due to overgrazing or drought. The reduction in grass cover promotes increased soil physical crusts and reduces infiltration. 5

Key indicators of approach to transition:

- ? Diversion of overland flow resulting in decreased soil moisture.
- ? Increase in amount of burrograss cover
- ? Reduction in grass cover and increase in size and frequency of bare patches.
- ? Formation of physical crusts—indicating reduced infiltration.
- ? Evidence of litter movement—indicating loss or redistribution of organic matter.

Transition back to Grassland (1b) The natural hydrology of the site must be returned. Culverts, turnouts, or rerouting roads may help re-establish natural overland flow, if roads or trails have altered the hydrology. Erosion control structures or shaping and filling gullies may help regain natural flow patterns and establish vegetation if the flow has been channeled. Breaking up physical crusts by soil disturbance may promote infiltration and seedling emergence. Allow natural revegetation to take place. Prescribed grazing will help ensure proper forage utilization and reduce grass loss due to grazing.

## State 3

### Bare State

#### Community 3.1

##### Bare State

Bare State: Extremely low ground cover, soil degradation and erosion characterize this state. Very little vegetation remains. Burrograss is the dominant grass and cover is extremely patchy. Physical soil crusts are extensive. Erosion and resource depletion increase as site degrades.

Diagnosis: Very little cover remains. Erosion is evident by soil sealing, water flow patterns, pedestals or terracettes. Rills and gullies may be present and active.

Transition to Bare State (2a): Extended drought, continuous heavy grazing, or other disturbance that severely

depletes grass cover can effect this transition. As grass cover decreases, sheet flow and erosion increase, and physical soil crusts form, thereby further reducing infiltration.

Key indicators of approach to transition:

- ? Continued reduction in grass cover.
- ? Increased soil surface sealing.
- ? Increased erosion.
- ? Reduced aggregate stability in bare areas.

Transition back to Grassland (2b) Restore the hydrology, see (1a). With the extent of grass loss range seeding may be necessary. Utilizing livestock or mechanical means to break up the physical crusts may increase infiltration and aid seedling establishment. Prescribed grazing will help ensure adequate deferment period following seeding, and proper forage utilization once the grass stand is well established. The degree to which this site is capable of recovery depends on the restoration of hydrology, extent of degradation to soil resources, and adequate rainfall necessary to establish grasses.

## **State 4**

### **Grass/Succulent Mix**

#### **Community 4.1**

##### **Grass/Succulent Mix**

Grass / Succulent Mix: Increased representations of succulents characterize this site. Increased densities of cholla or pricklypear is recognized as a management concern, but their impact on grass production is unclear. Light to medium cholla or prickly pear infestation doesn't seem to greatly reduce grass production, however it limits access to palatable grasses and interferes with livestock movement and handling. Tobosa and blue grama are the dominant species on this site. Retrogression within this site is characterized by a decrease in blue grama and an increase in succulents, tobosa and burrograss.

Diagnosis: Cholla or prickly pear is found at increased densities. Grass cover is variable ranging from uniformly distributed to patchy with frequent areas of bare ground present. Tobosa or blue grama is the dominant grass species.

Transition to Grass/Succulent Mix (3a): If fire was historically a part of desert grassland ecosystem and played a role in suppressing seedlings of shrubs and succulents, then fire suppression may favor the increase of succulents.<sup>1</sup> Heavy grazing by livestock or other physical disturbances may help disseminate seed and increase the establishment of succulents. Areas historically overgrazed by sheep are sometimes associated with higher densities of Succulents. Intense hailstorms can spread pricklypear by breaking off joints causing new plants to take root.<sup>3</sup> During severe drought perennial grass cover can decline significantly, leaving resources available for use by more drought tolerant succulents. Cholla and pricklypear are both adapted to and favored by drought due to the ability of their shallow, wide spreading root systems to absorb and store water.<sup>4</sup>

Key indicators of approach to transition:

- ? Decrease or change in distribution of grass cover.
- ? Increase in amount of succulent seedlings.
- ? Increased cover of succulents.

Transition back to Grassland (3b) Fire is an effective means of controlling cholla and prickly pear if adequate grass cover remains to carry fire.<sup>2</sup> Cholla greater than two feet tall or pricklypear with a large amount of pads (>15-20) are harder to kill. Chemical control is effective in controlling prickly pear and cholla; apply when growth starts in May. Hand grubbing is also effective if cholla or pricklypear is severed 2-4 inches below ground and care is taken not to let broken joints or pads take root. Stacking and burning piles and grubbing during winter or drought help keeps broken joints and pads from rooting. Prescribed grazing will help ensure proper forage utilization and sustain grass cover.

## **State 5**

### **Shrub Dominated**

## Community 5.1 Shrub Dominated

Shrub Dominated: Increased shrub cover characterizes this state. Mesquite, creosotebush, and/or tarbush are the dominant shrub species. Burrograss or tobosa is the dominant grass species. Grass cover is decreased, typically patchy with large bare areas present; however, sometimes grass cover can remain relatively high for extended periods when associated with light to moderate infestations of mesquite. Variations in soil characteristics play a part in determining which shrub species increase. Mesquite is well adapted to a wide range of soil types, but increases more often on deep soils low in carbonates, that have a sandy surface overlying finer textured soils. Tarbush prefers finer textured, calcareous soils, usually in lower positions that receive some extra water. Creosotebush is less tolerant of fine textured soils, preferring sandy, calcareous soils that have some gravel. Creosotebush also does well on soils that are shallow over caliche. Retrogression within this state is characterized by a decrease in tobosa, and an increase in burrograss. As the site continues to degrade shrub cover continues to increase and grass cover is severely reduced.

Diagnosis: Mesquite, Creosotebush, and/or tarbush are the dominant shrubs. Blue grama and black grama cover is low or absent. Burrograss or tobosa are the dominant grasses. Typically grass cover is patchy with large interconnected bare areas present. Physical soil crusts are present, especially on silt loam surface soils.

Transition to Shrub Dominated (4a): Wildlife and livestock consume and disperse mesquite seeds. Flood events may wash creosote or tarbush seeds off adjacent gravelly sites onto the loamy site and supply adequate moisture for germination. Persistent loss of grass cover due to overgrazing or drought can cause large bare patches, providing competition free areas for shrub seedling establishment. As shrub cover increases, competition for soil resources, especially water, becomes a major factor in further reducing grass cover. Reduction of fire, due to either fire suppression policy or loss of adequate fine fuels may increase the probability of shrub encroachment. Increased soil surface physical crusts and associated decreased infiltration, may prevent the establishment of grass seedlings.

Transition to Shrub Dominated (5): The dispersal of creosotebush, tarbush or mesquite seed, combined with loss of grass cover and resource competition by shrubs may cause this transition.

Key indicators of approach to transition:

- ? Decreased grass and litter cover.
- ? Increased bare patch size.
- ? Increased physical soil crusts.
- ? Increased amount of mesquite, creosotebush, or tarbush seedlings.
- ? Increased shrub cover.

Transition back to Grassland (4b) Brush control will be necessary to remove shrubs and eliminate competition for resources necessary for grass establishment or reproduction. Seeding may be necessary on those sites where desired grass species are absent or very limited. Pitting and seeding may increase the chances of successful grass establishment. Prescribed grazing will help ensure adequate time is elapsed before grazing seeded area is allowed and proper forage utilization following seeding establishment.

Transition to Bare State (6): If grass cover on the shrub-dominated state is severely limited and shrubs are removed a bare state may result. This transition will depend on amount of grasses or seed remaining, whether site is seeded, or if seeding is successful.

Transition to Bare State (7): Removal of succulents and continued overgrazing or drought may cause loss of remaining grasses and erosion. Soil surface physical crusting may also be an important factor in inhibiting grass seedling establishment

### Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

<b>Grass/Grasslike</b>					
1	<b>Warm Season</b>			278–324	
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	278–324	–
2	<b>Warm Season</b>			9–46	
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	9–46	–
3	<b>Warm Season</b>			231–278	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	231–278	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	231–278	–
4	<b>Warm Season</b>			28–46	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	28–46	–
5	<b>Warm Season</b>			46–93	
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	46–93	–
	plains bristlegrass	SEVU2	<i>Setaria vulpiseta</i>	46–93	–
6	<b>Warm Season</b>			9–28	
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	9–28	–
7	<b>Warm Season</b>			46–93	
	threeawn	ARIST	<i>Aristida</i>	46–93	–
	muhly	MUHLE	<i>Muhlenbergia</i>	46–93	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	46–93	–
8	<b>Warm Season</b>			28–46	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	28–46	–
<b>Shrub/Vine</b>					
9	<b>Shrub</b>			9–28	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	9–28	–
	jointfir	EPHED	<i>Ephedra</i>	9–28	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	9–28	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	5–24	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	5–24	–
	plains bristlegrass	SEVU2	<i>Setaria vulpiseta</i>	5–24	–
10	<b>Shrub</b>			9–28	
	javelina bush	COER5	<i>Condalia ericoides</i>	9–28	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	9–28	–
	Grass, annual	2GA	<i>Grass, annual</i>	5–15	–
11	<b>Shrubs</b>			9–28	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	9–28	–
<b>Forb</b>					
12	<b>Forb</b>			9–46	
	threadleaf ragwort	SEFLF	<i>Senecio flaccidus var. flaccidus</i>	9–46	–
	globemallow	SPHAE	<i>Sphaeralcea</i>	9–46	–
	verbena	VEPO4	<i>Verbena polystachya</i>	9–46	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	5–15	–
	pricklypear	OPUNT	<i>Opuntia</i>	5–15	–
13	<b>Forb</b>			9–28	
	croton	CROTO	<i>Croton</i>	9–28	–

	woolly groundsel	PACA15	<i>Packera cana</i>	9-28	-
14	<b>Forb</b>			9-28	
	Goodding's tansyaster	MAPIG2	<i>Machaeranthera pinnatifida</i> ssp. <i>gooddingii</i> var. <i>gooddingii</i>	9-28	-
	woolly paperflower	PSTA	<i>Psilostrophe tagetina</i>	9-28	-
15	<b>Forb</b>			9-28	
	redstem stork's bill	ERCI6	<i>Erodium cicutarium</i>	9-28	-
	Texas stork's bill	ERTE13	<i>Erodium texanum</i>	9-28	-
16	<b>Forb</b>			9-28	
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	9-28	-

## Animal community

This site provides habitats which support a resident animal community that is characterized by pronghorn antelope, black-tailed jackrabbit, black tailed prairie dog, yellow-faced pocket gopher, banner-tailed kangaroo rat, hispid cotton rat, swift fox, burrowing owl, horned lark, mockingbird, meadowlark, mourning dove, scaled quail, Great Plains toad, plains spadefoot toad, prairie rattlesnake and western coachwhip snake.

## Hydrological functions

The runoff curve numbers are determined by field investigations using hydraulic cover conditions and hydrologic soil groups.

Hydrologic Interpretations  
Soil Series Hydrologic Group  
Atoka C  
Bigetty B  
Ratliff B  
Reyab B  
Holloman B  
Largo B  
Holloman B  
Bigetty B  
Berino B  
Reagan B  
Reakor B  
Reeves B  
Russler C

## Recreational uses

This site offers limited potential for hiking, horseback riding, nature observation and photography. Game bird, antelope and predator hunting are also limited.

## Wood products

This site has no potential for wood products

## Other products

This site is suitable for grazing by all kinds and classes of livestock, during all seasons of the year. Under retrogression, such plants as black grama, blue grama, sideoats grama, bush muhly, plains bristlegrass, Arizona cottontop, fourwing saltbush and winterfat decrease and there is an increase in burrograss, threeawns, sand dropseed, muhlys, broom snakeweed and javilinabush. Under continued retrogression, burrograss can completely

dominate the site. Creosotebush, mesquite, and tarbush can also dominate. Grazing management alone will not improve the site in the above situation. This site is well suited to a system of management that rotates the season of use.

## Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index Ac/AUM

100 - 76 3.0 – 4.2

75 – 51 4.1 – 5.5

50 – 26 5.3 – 7.0

25 – 0 7.1 +

## Inventory data references

Other References:

Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Eddy County Lea County and Chavez County.

## Other references

Literature References:

1. Brooks, M.L., AND D.A. Pyke. 2001. Invasive plants and fire in the deserts of North America. Pages 1–14 in K.E.M. Galley and T.P. Wilson (eds.). Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species.
2. Bunting, S.C., H.A. Wright, and L.F. Neuenschwander. 1980. Long-term effects of fire on cactus in the Southern Mixed Prairie of Texas. *J. Range. Manage.* 33: 85-88.
3. Laycock, W.A. 1982. Hail as an ecological factor in the increase of prickly pear cactus. p. 359-361. In: J.A. Smith and V.W. Hays (eds.) *Proc. XIV Int. Grassland Congr.* Westview Press, Boulder, Colo.
4. Vallentine, J.F. 1989. *Range Developments and Improvements.* 3rd Edition. Academic Press. San Diego, California.
5. U.S. Department of Agriculture, Natural Resources Conservation Service. 2001. Soil Quality Information Sheet. Rangeland Soil Quality—Physical and Biological Soil Crusts. Rangeland Sheet 6, [Online]. Available: <http://www.statlab.iastate.edu/survey/SQL/range.html>

## Contributors

David Trujillo

Don Sylvester

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:**

---

2. **Presence of water flow patterns:**

---

3. **Number and height of erosional pedestals or terracettes:**

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

---

5. **Number of gullies and erosion associated with gullies:**

---

6. **Extent of wind scoured, blowouts and/or depositional areas:**

---

7. **Amount of litter movement (describe size and distance expected to travel):**

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
- 

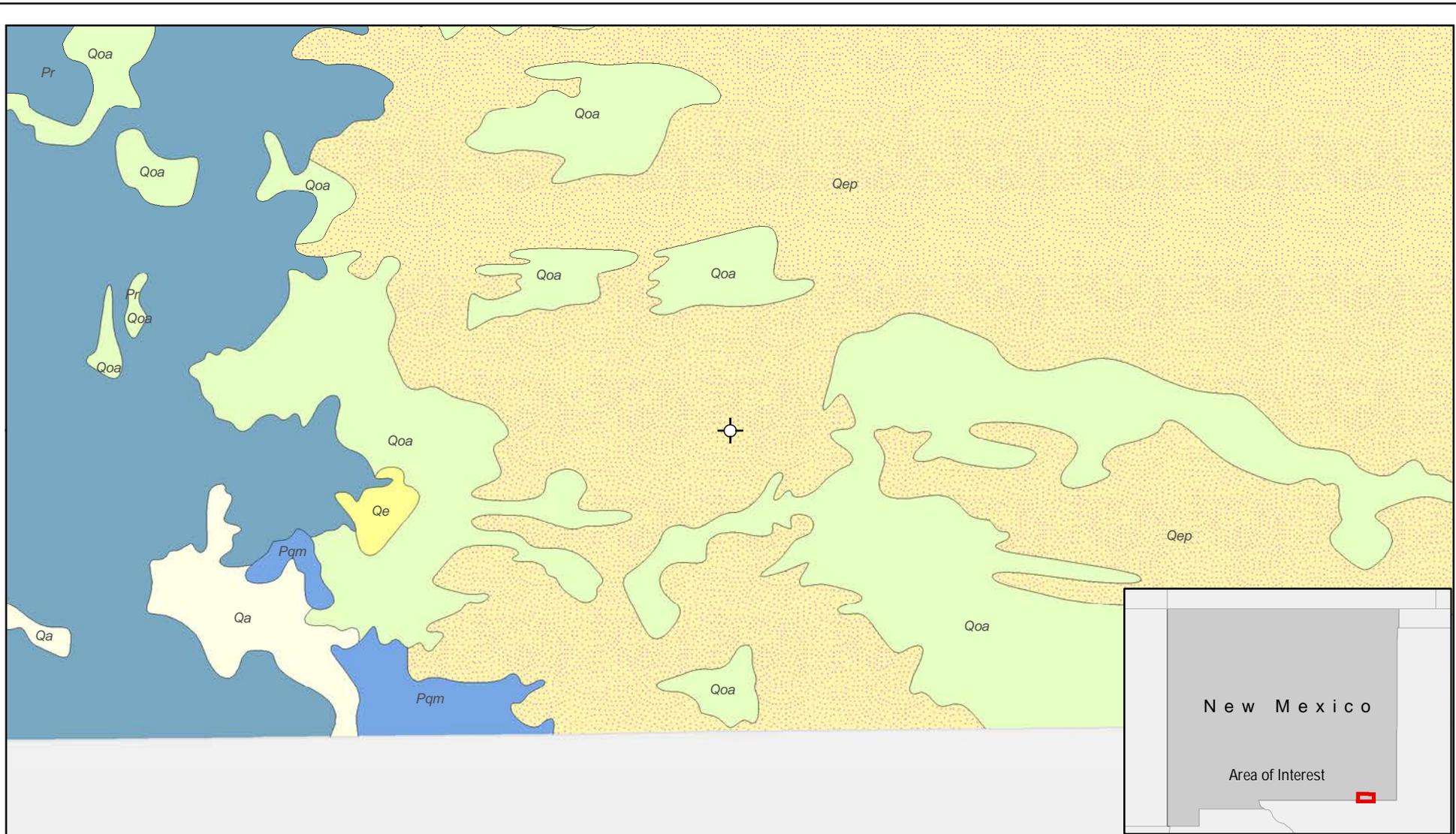
14. **Average percent litter cover (%) and depth ( in):**
- 

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
- 

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**
- 

17. **Perennial plant reproductive capability:**
-

Document Path: G:\1-Projects\US PROJECTS\Devon Energy Corporation\2022\2E-01335 - Ross Draw Unit 42 Tank Battery\Figure G Geologic Potential Map Ross Draw Unit 42 Tank Battery.mxd



 Site Location	<b>Lithologic Contacts</b>	<b>Lithologic Units</b>	 Qa	 Qoa
 [contact] lithologic	 Pqm	 Qe		
 map-boundary	 Pr	 Qep		



0 1.25 2.5 Miles  
 Map Center:  
 Lat/Long: 32.072694, -103.868032

NAD 1983 UTM Zone 13N  
 Date: Apr 22/22



**New Mexico Geology**  
**Ross Draw Unit 42 Tank Battery**

FIGURE:

G



Geospatial data presented in this figure may be derived from external sources and Vertex does not assume any liability for inaccuracies. This figure is intended for reference use only and is not certified for legal, survey, or engineering purposes.

Note: Geology data sourced from New Mexico Bureau of Geology & Mineral Resources, Bureau of Land Management.

VERSATILITY. EXPERTISE.

**ATTACHMENT 4**



Dhugal Hanton <vertexresourcegroupusa@gmail.com>

---

## 48 Hour Notification Liner Inspection nAPP2210326434

1 message

---

**Dhugal Hanton** <vertexresourcegroupusa@gmail.com>

Wed, Apr 20, 2022 at 8:18 AM

To: "Enviro, OCD, EMNRD" <OCD.Enviro@state.nm.us>, "CFO\_Spill, BLM\_NM" <blm\_nm\_cfo\_spill@blm.gov>

All,

Please accept this email as 48-hr notification that Vertex Resource Services has scheduled a liner inspection to be conducted for the following releases:

nAPP2210326434 DOR: 3/21/2022 Site Name: Ross Draw Unit 42 Tank Battery

This work will be completed on behalf of WPX Energy Permian, LLC

On Friday, April 22, 2022 at approximately 9:00 a.m., Jaime Balencia will be on site to conduct a liner inspection. If you need directions to the site, please do not hesitate to contact him. If you have any questions or concerns regarding this notification, please give me a call at 575-361-9880.

Thank you,

**Monica Peppin**

Sr. Environmental Technician

Vertex Resource Services Inc.  
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**State of New Mexico**  
**Energy, Minerals and Natural Resources**  
**Oil Conservation Division**  
**1220 S. St Francis Dr.**  
**Santa Fe, NM 87505**

CONDITIONS

Action 105870

**CONDITIONS**

Operator: WPX Energy Permian, LLC Devon Energy - Regulatory Oklahoma City, OK 73102	OGRID: 246289
	Action Number: 105870
	Action Type: [C-141] Release Corrective Action (C-141)

**CONDITIONS**

Created By	Condition	Condition Date
rhamlet	We have received your closure report and final C-141 for Incident #NAPP2210326434 ROSS DRAW UNIT 42 TANK BATTERY, thank you. This closure is approved.	6/14/2022