

**Devon Energy
Production Company,
L.P. – Produced Water
Treatment Research
Pilot Project
2RF-141 - Cotton Draw
Recycling Facility ID
[fVV2325636574].
Conditions of Approval**

**[6137] Devon Energy
Production Company, L.P
03/20/2024**

State of New Mexico
Energy, Minerals and Natural Resources Department

Michelle Lujan Grisham
Governor

Dylan Fuge
Deputy Secretary

Dylan Fuge, Division Director (Acting)
Oil Conservation Division



BY ELECTRONIC MAIL ONLY

March 19, 2024

Paul Barbour
Devon Energy Production Company, L.P.
333 West Sheridan Avenue
Oklahoma City, Oklahoma 73102
Paul.barbour@dvn.com

RE: Devon Energy Production Company, L.P. – Produced Water Treatment Research Pilot Project

Dear Mr. Barbour:

The New Mexico Oil Conservation Division (OCD) has reviewed the C-147 Form and related documentation submitted by [6137] Devon Energy Production Company, L.P. (Devon) on 3/11/2024, for the proposed produced water treatment pilot project located at Cotton Draw Recycle Facility (2RF-141) in Eddy County, New Mexico.

The purpose of this project is to perform a 30-day produced water desalination trial to test the effectiveness of Crystal Clearwater Resources proprietary Spontaneous Evaporation and Condensation Technology. The trial will test two types of water; one that has been pre-treated with a dissolved air flotation unit to remove solids and iron, and another that has only had settling time to allow for the water and oil to separate. The goal of the trial is to produce water that has a total dissolved solids level of less than 500 parts per million and remove BTEX, ammonia, and other potential contaminants.

Given 19.15.34.8(A)(3) NMAC allows for pilot projects related to produced water research, the OCD hereby approves the pilot project subject to the following conditions of approval:

- Devon agrees to the specific provisions set out in this document, all applicable requirements of 19.15.34 NMAC, and the commitments made in the attachments to the C-147 Form.
- The financial assurance (FA) associated with the pilot project is \$31,938.32. The FA must be on OCD-prescribed forms, or forms otherwise acceptable to the OCD, payable to the OCD. Bond forms can be found at the bottom of OCD's Forms Page located at <https://www.emnrd.nm.gov/ocd/ocd-forms/>. Prior to construction of pilot project, the FA must be submitted to:
 - OCD - Administration and Compliance Bureau
1220 South St Frances Drive,
Santa Fe, NM 87505

- Devon shall notify the OCD when the pilot project commences operation and ceases operation.
- Devon shall conduct weekly inspections of piping/fittings, liner integrity, and berm integrity during the course of the pilot project. Devon must report any upset condition to the OCD including the steps taken to address the upset condition within 24 hours of discovery.
- Devon must comply with 19.15.29 NMAC in the event of a release of produced water whether treated or untreated. Any contaminated soil must be disposed of at an approved surface waste management facility (SWMF).
- The OCD understands Devon is still evaluating post treatment technologies. Devon must notify the OCD prior to post treatment, the type of technology Devon plans to use.
- Devon must recycle **all** of the treated/untreated produced water back into the Cotton Draw Recycle Facility.
- Devon must install a 60-mil HDPE liner, underlain with 10 oz. geotextile fabric, within the earthen berm as secondary containment. Proposed treatment equipment must be placed within this area and a vacuum truck must be available to remove accumulated stormwater as necessary. Collected stormwater must be sent for disposal at an approved disposal location.
- Devon must submit a C-147 Form to modify permit 2RF-141 to *include the existing, unpermitted, 350,000 bbl above ground storage tank*.
- After pilot project completion, any disturbed areas must be reclaimed and brought back to their natural state.
- If Devon needs to make modifications, a modification request must be submitted to OCD on form C-147 along with the additional documentation for the requested modification. The modification must be approved by the OCD before implementation.
- Devon must submit a final report to the OCD within 45-days of pilot project completion on form C-147, including the following:
 - Attachments, photos, etc., to document closure activities,
 - All analytical testing results, along with a summary documenting any exceedances, if applicable,
 - Volume of produced water treated,
 - Volume of produced water sent back to the Cotton Draw Recycling Facility,
 - Project duration,
 - Summary of any releases of produced water and clean-up activities,
 - A summary of all waste disposal activities, including receiving SWMF, and
 - An overall discussion of the pilot project's success and/or lessons learned.

The permit number for this project is 2RF-141 - Cotton Draw Recycling Facility ID [fVV2325636574]. The Permittee shall include this permit number in all future communications with the OCD. If you have any questions, please do not hesitate to contact me at (505) 909-0269 or via email at Victoria.Venegas@emnrd.nm.gov.

Regards,

Victoria Venegas

Victoria Venegas • Environmental Specialist
Environmental Bureau
EMNRD - Oil Conservation Division
(575) 909-0269 | Victoria.Venegas@emnrd.nm.gov
<https://www.emnrd.nm.gov/oed/>





February 29, 2024

Leigh Barr
Administrative Permitting Supervisor
New Mexico Oil Conservation Division
1220 S. St Francis Drive
Santa Fe, NM 87505

Re: Response to the NMOCD letter from L. Barr to P. Barbour of Devon Energy regarding a Produced Water Treatment Pilot Project at the Devon Energy Cotton Draw Recycle Facility (2RF-141).

Leigh:

Per your request via Letter dated January 19, 2024, Devon Energy would like to submit the following documents for review by NMOCD regarding the proposed produced water treatment pilot project at the Cotton Draw Recycle Facility (2RF-141). Contained in this submission is an itemized checklist showing how Devon intends to address each of the 16 items in your letter. Enclosed in the package are all necessary supporting documents required to show compliance with each of the 16 items requested.

1. Enclosed in this package is a C-147 Long form with sections 1-10 filled out.
2. Enclosed in this package is a document from the New Mexico Produced Water Research Consortium (NMPWRC) detailing the specifics of the proposed project. Section 6 of this document titled "Pilot-System Process and Design" Details the treatment process including Pretreatment and Post-treatment. A process flow diagram is provided in Figure 1.
3. Enclosed in this package is written approval from the Bureau of Land Management allowing Devon Energy to operate a Produced Water Pilot Project at the Cotton Draw Facility.
4. A complete list of all equipment is enclosed in this package. This included a description of the material of the equipment, the approximate capacity of each piece of equipment, and whether the item is pilot project specific and brought in or if it exists at the facility permanently.
5. No new land will be disturbed for this pilot project. The proposed area this project will occupy is an empty area on the existing Cotton Draw Treatment Pad. A visual of this can be found in the NMPWRC document in Section 2 titled "Project Site Location and Description."
6. A complete list of chemicals planned to be used is included in Section 6 of the NMPWRC document provided. This list includes hydrogen peroxide, coagulant, and flocculant. Sample analytical results are provided in Section 7 of the NMPWRC document titled "Project Goals and Objectives." It should be noted that no new chemicals will be added during the desalination process. All chemicals will be added between the AST and DAF unit and will be part of the traditional recycle process of the Cotton Draw Facility.
7. The secondary containment area around the proposed treatment equipment will be an earthen berm measuring 90 ft by 150 ft by 3 ft. The secondary containment will be lined with a 60-mil HDPE liner underlain with 10oz geotextile fabric. A diagram showing the secondary

containment berm is included in Figure 2. In the event of a large enough storm event that would cause significant stormwater buildup, a vacuum truck will be used to remove the accumulated stormwater. The collected stormwater will be sent for disposal at an approved disposal location.

8. All pilot project equipment will be placed in the lined secondary containment area described in Item 7. If there is a release of produced water from this pilot project, it will be contained inside the secondary containment area. To ensure that the HDPE liner is functional, regular inspections will be conducted and any holes, rips, or tears in the liner repaired.
9. No leak detection measures for the secondary containment liner will be in place aside from regular inspections. The Recycle Containment leak detection system at the Cotton Draw Recycle Facility will be checked regularly per NMOCD guidelines. All pipe fittings, piping, and treatment equipment will be inspected at least weekly for leaks.
10. All waste streams will be disposed of at the appropriate location depending on what waste stream it is. A disposal plan is included in the NMPWRC document Section 11 "Disposal and Decommissioning."
11. All fluid will be removed at the time of decommissioning. All fluid will be disposed of in the Cotton Draw Recycle Containment.
12. The target constituents that will be tested for are included in the NMPWRC document Section 7.
13. All produced water will be transferred via pipeline in and out of the treatment system.
14. The pilot project is expected to run from April 22, 2024, through May 22, 2024. It is anticipated that approximately 150 BBL per day will be treated in the desalination unit.
15. Best Management Practice Inspections will be conducted at least weekly. An example checklist of inspected items is enclosed in this package.
16. A full closure plan of the pilot project along with a closure cost estimate are enclosed in this package.

Should you have any questions or require additional information, please contact me by phone at 580-234-8780 or by email at mratke@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.



Mitchell Ratke, P.E.
Project Engineer/Project Manager

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-147
Revised April 3, 2017

Recycling Facility and/or Recycling Containment

Type of Facility: ☐ Recycling Facility ☒ Recycling Containment*
Type of action: ☐ Permit ☐ Registration
☐ Modification ☐ Extension
☐ Closure ☒ Other (explain) PW Research Pilot

*** At the time C-147 is submitted to the division for a Recycling Containment, a copy shall be provided to the surface owner.**

Be advised that approval of this request does not relieve the operator of liability should operations result in pollution of surface water, ground water or the environment. Nor does approval relieve the operator of its responsibility to comply with any other applicable governmental authority's rules, regulations or ordinances.

1.

Operator: Devon Energy Corporation (For multiple operators attach page with information) OGRID #: 6137
Address: 333 West Sheridan, Oklahoma City, Oklahoma 737102-8260
Facility or well name (include API# if associated with a well): Cotton Draw Recycle Facility
OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr 1 Section 22 Township 25 South Range 31 County: Eddy
Surface Owner: ☐ Federal ☒ State ☐ Private ☐ Tribal Trust or Indian Allotment

2.

☐ **Recycling Facility:**
Location of recycling facility (if applicable): Latitude _____ Longitude _____ NAD83
Proposed Use: ☐ Drilling* ☐ Completion* ☐ Production* ☐ Plugging *
**The re-use of produced water may NOT be used until fresh water zones are cased and cemented*
☐ Other, *requires permit for other uses. Describe use, process, testing, volume of produced water and ensure there will be no adverse impact on groundwater or surface water.*
☐ Fluid Storage
☐ Above ground tanks ☐ Recycling containment ☐ Activity permitted under 19.15.17 NMAC explain type _____
☐ Activity permitted under 19.15.36 NMAC explain type: _____ ☐ Other explain _____
☐ For multiple or additional recycling containments, attach design and location information of each containment
☐ **Closure Report (required within 60 days of closure completion):** ☐ Recycling Facility Closure Completion Date: _____

3.

☐ **Recycling Containment:**
☐ Annual Extension after initial 5 years (attach summary of monthly leak detection inspections for previous year)
Center of Recycling Containment (if applicable): Latitude _____ Longitude _____ NAD83
☐ For multiple or additional recycling containments, attach design and location information of each containment
☐ Lined ☐ Liner type: Thickness _____ mil ☐ LLDPE ☐ HDPE ☐ PVC ☐ Other _____
☐ String-Reinforced
Liner Seams: ☐ Welded ☐ Factory ☐ Other _____ Volume: _____ bbl Dimensions: L _____ x W _____ x D _____
☐ Recycling Containment Closure Completion Date: _____

4.

Bonding:

- ☐ Covered under bonding pursuant to 19.15.8 NMAC per 19.15.34.15(A)(2) NMAC (These containments are limited to only the wells owned or operated by the owners of the containment.)
- ☐ Bonding in accordance with 19.15.34.15(A)(1). Amount of bond \$ _____ (work on these facilities cannot commence until bonding amounts are approved)
- ☐ Attach closure cost estimate and documentation on how the closure cost was calculated.

5.

Fencing:

- ☐ Four foot height, four strands of barbed wire evenly spaced between one and four feet
- ☐ Alternate. Please specify _____

6.

Signs:

- ☐ 12"x 24", 2" lettering, providing Operator's name, site location, and emergency telephone numbers
- ☐ Signed in compliance with 19.15.16.8 NMAC

7.

Variances:

Justifications and/or demonstrations that the proposed variance will afford reasonable protection against contamination of fresh water, human health, and the environment.

Check the below box only if a variance is requested:

- ☐ Variance(s): Requests must be submitted to the appropriate division district for consideration of approval. If a Variance is requested, include the variance information on a separate page and attach it to the C-147 as part of the application.

If a Variance is requested, it must be approved prior to implementation.

8.

Siting Criteria for Recycling Containment

Instructions: The applicant must provide attachments that demonstrate compliance for each siting criteria below as part of the application. Potential examples of the siting attachment source material are provided below under each criteria.

General siting**Ground water is less than 50 feet below the bottom of the Recycling Containment.**

NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells

☐ Yes ☐ No
☐ NA

Within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended.

☐ Yes ☐ No
☐ NA

- Written confirmation or verification from the municipality; written approval obtained from the municipality

Within the area overlying a subsurface mine.

☐ Yes ☐ No

- Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division

Within an unstable area.

☐ Yes ☐ No

- Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map

Within a 100-year floodplain. FEMA map

☐ Yes ☐ No

Within 300 feet of a continuously flowing watercourse, or 200 feet of any other significant watercourse, or lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark).

☐ Yes ☐ No

- Topographic map; visual inspection (certification) of the proposed site

Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application.

☐ Yes ☐ No

- Visual inspection (certification) of the proposed site; aerial photo; satellite image

Within 500 horizontal feet of a spring or a fresh water well used for domestic or stock watering purposes, in existence at the time of initial application.

☐ Yes ☐ No

- NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site

Within 500 feet of a wetland.

☐ Yes ☐ No

- US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site

9.

Recycling Facility and/or Containment Checklist:

Instructions: Each of the following items must be attached to the application. Indicate, by a check mark in the box, that the documents are attached.

- ☐ Design Plan - based upon the appropriate requirements.
- ☐ Operating and Maintenance Plan - based upon the appropriate requirements.
- ☐ Closure Plan - based upon the appropriate requirements.
- ☐ Site Specific Groundwater Data -
- ☐ Siting Criteria Compliance Demonstrations –
- ☐ **Certify that notice of the C-147 (only) has been sent to the surface owner(s)**

10.

Operator Application Certification:

I hereby certify that the information and attachments submitted with this application are true, accurate and complete to the best of my knowledge and belief.

Name (Print): Josh Bruening Title: Supervisor

Signature:  Date: 3/25/2024

e-mail address: josh.bruening@dvn.com Telephone: 405-552-7882

11.

OCD Representative Signature: Victoria Venegas Approval Date: 03/26/2024

Title: Environmental Specialist OCD Permit Number: 2RF-141

☒ OCD Conditions

☒ Additional OCD Conditions on Attachment



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

1. Applicant Summary Information:

Company: Devon Energy Production Company, L.P., 333 West Sheridan Avenue, Oklahoma City, Oklahoma 73102

Points of Contact	Company	Email	Phone
Paul Barbour	Devon Energy	Paul.barbour@dvn.com	(405)228-4308
Josh Bruening	Devon Energy	Josh.bruening@dvn.com	(405)552-7882
Joseph Olson	Devon Energy	Joseph.olson@dvn.com	(405)228-2444
Justin Maxwell	Devon Energy	Justin.maxwell@dvn.com	(575)988-1550

Company Description and Produced Water Treatment Experience:

Devon Energy is a leading independent energy company engaged in finding and producing oil and natural gas. With headquarters in Oklahoma City, Devon's operations are focused onshore in the United States. The company's portfolio of assets provides stable, environmentally responsible production and a platform for future growth. Devon has more than 2,000 employees who are dedicated to delivering results and improving the quality of life for people who live and work in the communities where the company operates.

As the first company to recycle flowback and produced water in natural gas wells in north Texas, Devon is an industry pioneer in recycling. We became one of the leading recyclers of treated produced water in New Mexico and led the effort to establish state rules to encourage the practice. Our recycling efforts are now concentrated in the New Mexico Delaware Basin, where we have our highest level of activity and water scarcity is an issue. Since 2015, Devon has reused over 250 million barrels of water from its water treatment facilities.

Application Date: January 22, 2024

Pilot Date: Estimated April 22, 2024

Type and scale of Project: Pilot scale of 75 barrels per day of clean effluent.

Project Funding: Funded by Devon Energy

Project Collaborators:

Group/Company	Role	Contact Info
Crystal Clearwater Resources	Technology Provider	Apoorva Sharma Chief Operating Officer, asharma@ccrh2o.com , (403)880-2421 Scott Carson , Chief Commercial Officer scarson@ccrh2o.com , (972) 345 3229
TBD – Devon is still evaluating post treatment options and if this will be done in a lab or in the field. Once a company is identified, DVN will inform the NMPWRC.	Post Treatment Ammonia Removal	



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

2. Project Site Location and Description:

- **Basin:** Permian Basin
- **Location:** Section 22, Township 25 South, Range 31 East, N.M.P.M. Eddy County, State of New Mexico
- **Coordinates:** Lat: 32.115076° N Lon: 103.758510° W
- **General Directions:** From HW128, turn south on to Orla RD. Drive ~6 miles South on Orla Road and turn West. These are lease roads. Then proceed to the site.
- **Site Description:** Cotton Draw 22 Water Treatment Facility (CD 22)
- **Land Status:** Bureau of Land Management
- **Arial view of site:**



The pilot plant will be in containment by the NE corner of the pond. No new pad location will need to be built for the site.

- **Produced Water Source and Quality:** (produced water source and general quality in ppm TDS). The produced water source is from the Wolfcamp, Bone Spring and Avalon



Produced Water Treatment Pilot Project Background Information For Use in NMED Treatment Permit Discussions 2023

formations around the treatment facilities. The TDS of the water is generally between 115,000ppm and 130,000ppm.

3. Executive Summary:

Devon Energy desires to perform a 30-day produced water desalination trial to test the effectiveness of Crystal Clearwater Resources (CCR) proprietary Spontaneous Evaporation and Condensation Technology (SPEC). The trial will test two types of water; one that has been pre-treated with a dissolved air flotation unit to remove solids and iron, and another that has only had settling time to allow for the water and oil to separate. The goal of the trial is to produce water that has a total dissolved solids (TDS) level of less than 500 parts per million (ppm) and remove BTEX, ammonia, and other potential contaminants.

The data collected from the trial will be shared with the New Mexico Produced Water Consortium, NMED, OCD, and other interested parties to provide information to help develop regulations for safe surface discharge.

The trial is an important step in Devon Energy's commitment to finding innovative solutions to reduce the environmental impact of its operations. By partnering with Crystal Clearwater Resources, Devon Energy is exploring new ways to treat and recycle produced water that can be a valuable resource in the drought-stricken area of Southeast New Mexico.

The results of the trial will provide valuable data to regulators and the industry, helping to ensure that produced water can be safely treated and discharged into the environment.

4. Proposed Reuse Application of Treated Water: (following statement required)

For the purposes of this test, there will be no discharge of the produced water. The distillate will be collected in a holding tank for sampling before being blended back with the concentrated brine for discharge into the CD 22 produced water pit to be used in Devon's drilling and completion operations.

5. Similar or related permits/notification needed with other agencies, or nearby properties:

Attached Form C-147 from The State of New Mexico Energy Minerals and Natural Resources Department.

6. Pilot-System Process and Design:

Pretreatment

1. Raw produced water enters a newly installed above ground storage tank (AST) or is processed through a gun barrel to remove oil and solids.
2. Raw produced water is then moved from the AST or gun barrel to the treatment plant where it is treated with chemicals such as hydrogen peroxide, a coagulant, and a flocculant.
3. The water is agitated via a serpentine system of pipes.



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

4. Water is then put into a dissolved air flotation (DAF) unit for removal of the solids.
5. The discharge of the DAF units has the same TDS as the water going in, but the solids and iron has been removed. Water is then stored in the pond for use in drilling and completions operations.

Desalination

The desalination process will be tested with water that has gone through the pretreatment step above and raw water directly from the AST tank.

SPEC employs the process of evaporation/condensation which has two main advantages. First, it allows the replacement of large, complex equipment made from exotic metallurgy. Second, the tendency for fouling/mineral scaling is drastically reduced, along with associated downtime/maintenance costs required by most thermal technologies. An overview of the treatment process is as follows:

6. Pretreated or untreated influent is transferred enters the evaporator loop from the feed tank.
7. The brine stream is heated using heat recovered from the condensate loop through a heat exchanger. Most of the thermal energy required for this process is recovered through this operation.
8. The heated brine stream is heated to the desired process temperature through a second heat exchanger which pulls new heat from any heat source (e.g., boiler, waste heat recovery, solar thermal) through a liquid media (e.g., Ethylene glycol). In the Devon trial, a propane burner will be used as the heat source.
9. The fully heated brine stream cascades through the entire series of evaporators.
10. The brine temperature drops in each stage as water evaporates.
11. The concentrated brine stream at the bottom of the evaporator loop is recirculated until the salinity reaches the desired level (~240,000TDS).
12. Similarly, the temperature of the distillate increases as water cascades through each stage.
13. The heat accumulated in the condenser stream is recovered internally by the heat exchanger to drive further evaporation.
14. The concentrated effluent will be blended into Devon's produced water pond to be used in drilling and completions operations. The clean effluent will be blended into the produced water pond as well or may go through a post treatment process for further polishing.

Post Treatment – Devon is still evaluating which post treatment will be used.

15. The clean effluent will be polished through activated carbon to remove co-distilled compounds and Devon is still evaluating technologies to address ammonia removal. These technologies could be:
 - Electrolysis and oxidation
 - Moving bed biofilm reactor (MBBR)
 - Others
16. Post treated clean effluent will be discharged into the produced water pit to be used in drilling and completion operations.

7. Project Goals and Objectives: (Summary of objectives and KPI's similar to below)



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

The pilot project is expected to operate for 30 days producing up to 75bbbls/day of clean effluent compatible with reuse for agricultural irrigation or industrial uses such as green hydrogen or cooling water for data centers. It is expected the concentrate and distillate will have the following beginning and final qualities.

Parameter	Influent Water	Concentrated Effluent	Clean Effluent
TDS, mg/L	123,000	240,000	<500
pH	6.4	6.4	6.4
Water Volume (bbbls/d)	150	~ 75	~ 75
Ammonia, mg/L*	x	Y	<10

*Devon does not test for ammonia in its standard testing protocols.

Additionally, the concentrated brine will be tested for lithium, iodine, and other valuable minerals that could be extracted economically once they are concentrated. The following Key Performance Indicators (KPI's) will be evaluated to assess system and process cost effectiveness and overall performance:

Operational throughput – ~75 bbbls/day of clean effluent water

Operational uptime – 23 average hours/day

Non-productive time - 1 hours/day

Meet water quality target - 95% of time

Estimated Energy use/cost per bbl treated - ~ 1.3 kwh/bbl, ~ 0.15 mmbtu/bbl, and \$x/bbl

Clean effluent and concentrate effluent recovery – 50% average bbbls/bbbls treated

The data collected will be utilized to help develop larger-scale treatment systems to support enhanced operations efficiencies and reduce full-scale treatment costs.

8. Summary of Risk and Toxicology Sampling, Testing, and Analysis: (Following Statement Required)

The KPI's noted above will be measured daily on-site with simple field-testing systems and monitors. Daily samples of the influent and both effluent streams will be captured by CCR or Devon to be sent to a lab for analysis.

Risk and Toxicology testing and analysis of the treated produced water will be coordinated and managed through the NMPWRC. Samples will be taken and tested using the Consortium's sampling protocol, and their Risk and Toxicology testing protocol. CCR will coordinate with the NMPWRC so they can collect and prepare Risk and Toxicology analysis samples to ensure proper care, custody, and control. The Consortium will collect up to two set of samples once routine operations have been established to provide information on process efficacy and reliability relative to potential future treated water safety.

9. Equipment Vendor and Associated Suppliers: (Identify as appropriate)

Equipment or Vendor Name/Description	Role
Crystal Clearwater Resources	Technology supplier
Frac Tank rental	Frac Tank provider



Produced Water Treatment Pilot Project Background Information For Use in NMED Treatment Permit Discussions 2023

Post Treatment provider – TBD	Post Treatment
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10. Expected Produced Water Users: (Required Statement)

The effluent streams from the pilot operations will be discharged into the CD 22 produced water pit to be used in drilling and completions operations.

11. Disposal and Decommissioning: (Required information)

Equipment: None - Reuse for testing at other sites

Material: Secondary containment and expendables for the treatment system will be 60 mil HDPE liner with 10oz geo.

Water: All water will be disposed by discharge into Devon's Cotton Draw 22 produced water pond (OCD permit number 2RF-141, 10/02/2023).

Soil: Any contaminated soil will be disposed at R360 Environmental Solutions at 4507 W. Carlsbad HWY, Hobbs, NM, 88241. It is not expected that any soil will be contaminated because the entire system will be in containment.

12. Expected Operational Testing, Reporting, and Proposed Review Schedule

Pilot mobilization, set up, and shakedown: estimated 4/22/2024

Pilot Operations: 4/22/2024 through 5/22/2024

Draft Report: 7/1/2024

Well Name: SHIRE 22-15 FED COM	Well Location: T25S / R31E / SEC 22 / SESE / 32.1095196 / -103.7599752	County or Parish/State: EDDY / NM
Well Number: 718H	Type of Well: OIL WELL	Allottee or Tribe Name:
Lease Number: NMNM16131	Unit or CA Name:	Unit or CA Number:
US Well Number: 300154733000S1	Well Status: Producing Oil Well	Operator: DEVON ENERGY PRODUCTION COMPANY LP

Notice of Intent

Sundry ID: 2778125

Type of Submission: Notice of Intent	Type of Action: Surface Disturbance
Date Sundry Submitted: 03/06/2024	Time Sundry Submitted: 10:04
Date proposed operation will begin: 04/21/2024	

Procedure Description: Devon Energy requests to complete a pilot project on Cotton Draw 22 Water Treatment facility for produced water treatment. Please find attached supporting documentation of the request and project description. Associated federal leases: NMNM 016131/ NMNM105316491

Surface Disturbance

Is any additional surface disturbance proposed?: No

NOI Attachments

Procedure Description

NMPWRC_2023_Pilot_Project_DVN_Final_20240306100344.pdf

Well Name: SHIRE 22-15 FED COM	Well Location: T25S / R31E / SEC 22 / SESE / 32.1095196 / -103.7599752	County or Parish/State: EDDY / NM
Well Number: 718H	Type of Well: OIL WELL	Allottee or Tribe Name:
Lease Number: NMNM16131	Unit or CA Name:	Unit or CA Number:
US Well Number: 300154733000S1	Well Status: Producing Oil Well	Operator: DEVON ENERGY PRODUCTION COMPANY LP

Operator

I certify that the foregoing is true and correct. Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction. Electronic submission of Sundry Notices through this system satisfies regulations requiring a

Operator Electronic Signature: JENNY HARMS

Signed on: MAR 06, 2024 10:04 AM

Name: DEVON ENERGY PRODUCTION COMPANY LP

Title: Regulatory Compliance Professional

Street Address: 333 West Sheridan Avenue

City: Oklahoma CityState: OK

Phone: (405) 552-6560

Email address: jennifer.harms@dvn.com

Field

Representative Name:

Street Address:

City:State:Zip:

Phone:

Email address:

BLM Point of Contact

BLM POC Name: CODY LAYTON

BLM POC Title: Assistant Field Manager Lands & Minerals

BLM POC Phone: 5752345959

BLM POC Email Address: clayton@blm.gov

Disposition: Approved

Disposition Date: 03/07/2024

Signature: Cody R. Layton

Devon Energy requests to complete a pilot project on Cotton Draw 22 Water Treatment facility for produced water treatment. Please find attached supporting documentation of the request and project description.

Associated federal leases: NMNM 016131/ NMNM105316491

Equipment List			
Item	Material	Approximate Capacity - BBL	Status
DAF Unit	Steel	240	Existing/Permanent
AST	Steel/HDPE Liner	350,000	Existing/Permanent
Feed Water Frac Tank	Steel	500	Temporary
Feed Water Frac Tank (2)	Steel	500	Temporary
Propane Tank	Steel	10	Temporary
Boiler	Steel		Temporary
CCR Unit	Steel	10	Temporary
Concentrated Brine Frac Tank	Steel	500	Temporary
Clean H2O CCR Storage	Steel	150	Temporary
Clean H2O CCR Storage (2)	Steel	150	Temporary
Electrolysis Unit	Steel	10	Temporary
Clean Electrolysis Storage	Steel	150	Temporary
Desalination Containment	Earthen Berm/HDPE Liner		Temporary
Cotton Draw Produced Water Pond	Earthen Containment/HDPE Liner	500,000	Existing/Permanent



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

1. Applicant Summary Information:

Company: Devon Energy Production Company, L.P., 333 West Sheridan Avenue, Oklahoma City, Oklahoma 73102

Points of Contact	Company	Email	Phone
Paul Barbour	Devon Energy	Paul.barbour@dvn.com	(405)228-4308
Josh Bruening	Devon Energy	Josh.bruening@dvn.com	(405)552-7882
Joseph Olson	Devon Energy	Joseph.olson@dvn.com	(405)228-2444
Justin Maxwell	Devon Energy	Justin.maxwell@dvn.com	(575)988-1550

Company Description and Produced Water Treatment Experience:

Devon Energy is a leading independent energy company engaged in finding and producing oil and natural gas. With headquarters in Oklahoma City, Devon's operations are focused onshore in the United States. The company's portfolio of assets provides stable, environmentally responsible production and a platform for future growth. Devon has more than 2,000 employees who are dedicated to delivering results and improving the quality of life for people who live and work in the communities where the company operates.

As the first company to recycle flowback and produced water in natural gas wells in north Texas, Devon is an industry pioneer in recycling. We became one of the leading recyclers of treated produced water in New Mexico and led the effort to establish state rules to encourage the practice. Our recycling efforts are now concentrated in the New Mexico Delaware Basin, where we have our highest level of activity and water scarcity is an issue. Since 2015, Devon has reused over 250 million barrels of water from its water treatment facilities.

Application Date: January 22, 2024

Pilot Date: Estimated April 22, 2024

Type and scale of Project: Pilot scale of 75 barrels per day of clean effluent.

Project Funding: Funded by Devon Energy

Project Collaborators:

Group/Company	Role	Contact Info
Crystal Clearwater Resources	Technology Provider	Apoorva Sharma Chief Operating Officer, asharma@ccrh2o.com , (403)880-2421 Scott Carson , Chief Commercial Officer scarson@ccrh2o.com , (972) 345 3229
TBD – Devon is still evaluating post treatment options and if this will be done in a lab or in the field. Once a company is identified, DVN will inform the NMPWRC.	Post Treatment Ammonia Removal	



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

2. Project Site Location and Description:

- **Basin:** Permian Basin
- **Location:** Section 22, Township 25 South, Range 31 East, N.M.P.M. Eddy County, State of New Mexico
- **Coordinates:** Lat: 32.115076° N Lon: 103.758510° W
- **General Directions:** From HW128, turn south on to Orla RD. Drive ~6 miles South on Orla Road and turn West. These are lease roads. Then proceed to the site.
- **Site Description:** Cotton Draw 22 Water Treatment Facility (CD 22)
- **Land Status:** Bureau of Land Management
- **Arial view of site:**



The pilot plant will be in containment by the NE corner of the pond. No new pad location will need to be built for the site.

- **Produced Water Source and Quality:** (produced water source and general quality in ppm TDS). The produced water source is from the Wolfcamp, Bone Spring and Avalon



Produced Water Treatment Pilot Project Background Information For Use in NMED Treatment Permit Discussions 2023

formations around the treatment facilities. The TDS of the water is generally between 115,000ppm and 130,000ppm.

3. Executive Summary:

Devon Energy desires to perform a 30-day produced water desalination trial to test the effectiveness of Crystal Clearwater Resources (CCR) proprietary Spontaneous Evaporation and Condensation Technology (SPEC). The trial will test two types of water; one that has been pre-treated with a dissolved air flotation unit to remove solids and iron, and another that has only had settling time to allow for the water and oil to separate. The goal of the trial is to produce water that has a total dissolved solids (TDS) level of less than 500 parts per million (ppm) and remove BTEX, ammonia, and other potential contaminants.

The data collected from the trial will be shared with the New Mexico Produced Water Consortium, NMED, OCD, and other interested parties to provide information to help develop regulations for safe surface discharge.

The trial is an important step in Devon Energy's commitment to finding innovative solutions to reduce the environmental impact of its operations. By partnering with Crystal Clearwater Resources, Devon Energy is exploring new ways to treat and recycle produced water that can be a valuable resource in the drought-stricken area of Southeast New Mexico.

The results of the trial will provide valuable data to regulators and the industry, helping to ensure that produced water can be safely treated and discharged into the environment.

4. Proposed Reuse Application of Treated Water: (following statement required)

For the purposes of this test, there will be no discharge of the produced water. The distillate will be collected in a holding tank for sampling before being blended back with the concentrated brine for discharge into the CD 22 produced water pit to be used in Devon's drilling and completion operations.

5. Similar or related permits/notification needed with other agencies, or nearby properties:

Attached Form C-147 from The State of New Mexico Energy Minerals and Natural Resources Department.

6. Pilot-System Process and Design:

Pretreatment

1. Raw produced water enters a newly installed above ground storage tank (AST) or is processed through a gun barrel to remove oil and solids.
2. Raw produced water is then moved from the AST or gun barrel to the treatment plant where it is treated with chemicals such as hydrogen peroxide, a coagulant, and a flocculant.
3. The water is agitated via a serpentine system of pipes.



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

4. Water is then put into a dissolved air flotation (DAF) unit for removal of the solids.
5. The discharge of the DAF units has the same TDS as the water going in, but the solids and iron has been removed. Water is then stored in the pond for use in drilling and completions operations.

Desalination

The desalination process will be tested with water that has gone through the pretreatment step above and raw water directly from the AST tank.

SPEC employs the process of evaporation/condensation which has two main advantages. First, it allows the replacement of large, complex equipment made from exotic metallurgy. Second, the tendency for fouling/mineral scaling is drastically reduced, along with associated downtime/maintenance costs required by most thermal technologies. An overview of the treatment process is as follows:

6. Pretreated or untreated influent is transferred enters the evaporator loop from the feed tank.
7. The brine stream is heated using heat recovered from the condensate loop through a heat exchanger. Most of the thermal energy required for this process is recovered through this operation.
8. The heated brine stream is heated to the desired process temperature through a second heat exchanger which pulls new heat from any heat source (e.g., boiler, waste heat recovery, solar thermal) through a liquid media (e.g., Ethylene glycol). In the Devon trial, a propane burner will be used as the heat source.
9. The fully heated brine stream cascades through the entire series of evaporators.
10. The brine temperature drops in each stage as water evaporates.
11. The concentrated brine stream at the bottom of the evaporator loop is recirculated until the salinity reaches the desired level (~240,000TDS).
12. Similarly, the temperature of the distillate increases as water cascades through each stage.
13. The heat accumulated in the condenser stream is recovered internally by the heat exchanger to drive further evaporation.
14. The concentrated effluent will be blended into Devon's produced water pond to be used in drilling and completions operations. The clean effluent will be blended into the produced water pond as well or may go through a post treatment process for further polishing.

Post Treatment – Devon is still evaluating which post treatment will be used.

15. The clean effluent will be polished through activated carbon to remove co-distilled compounds and Devon is still evaluating technologies to address ammonia removal. These technologies could be:
 - Electrolysis and oxidation
 - Moving bed biofilm reactor (MBBR)
 - Others
16. Post treated clean effluent will be discharged into the produced water pit to be used in drilling and completion operations.

7. Project Goals and Objectives: (Summary of objectives and KPI's similar to below)



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

The pilot project is expected to operate for 30 days producing up to 75bbls/day of clean effluent compatible with reuse for agricultural irrigation or industrial uses such as green hydrogen or cooling water for data centers. It is expected the concentrate and distillate will have the following beginning and final qualities.

Parameter	Influent Water	Concentrated Effluent	Clean Effluent
TDS, mg/L	123,000	240,000	<500
pH	6.4	6.4	6.4
Water Volume (bbls/d)	150	~ 75	~ 75
Ammonia, mg/L*	x	Y	<10

*Devon does not test for ammonia in its standard testing protocols.

Additionally, the concentrated brine will be tested for lithium, iodine, and other valuable minerals that could be extracted economically once they are concentrated. The following Key Performance Indicators (KPI's) will be evaluated to assess system and process cost effectiveness and overall performance:

Operational throughput – ~75 bbls/day of clean effluent water

Operational uptime – 23 average hours/day

Non-productive time - 1 hours/day

Meet water quality target - 95% of time

Estimated Energy use/cost per bbl treated - ~ 1.3 kwh/bbl, ~ 0.15 mmbtu/bbl, and \$x/bbl

Clean effluent and concentrate effluent recovery – 50% average bbls/bbls treated

The data collected will be utilized to help develop larger-scale treatment systems to support enhanced operations efficiencies and reduce full-scale treatment costs.

8. Summary of Risk and Toxicology Sampling, Testing, and Analysis: (Following Statement Required)

The KPI's noted above will be measured daily on-site with simple field-testing systems and monitors. Daily samples of the influent and both effluent streams will be captured by CCR or Devon to be sent to a lab for analysis.

Risk and Toxicology testing and analysis of the treated produced water will be coordinated and managed through the NMPWRC. Samples will be taken and tested using the Consortium's sampling protocol, and their Risk and Toxicology testing protocol. CCR will coordinate with the NMPWRC so they can collect and prepare Risk and Toxicology analysis samples to ensure proper care, custody, and control. The Consortium will collect up to two set of samples once routine operations have been established to provide information on process efficacy and reliability relative to potential future treated water safety.

9. Equipment Vendor and Associated Suppliers: (Identify as appropriate)

Equipment or Vendor Name/Description	Role
Crystal Clearwater Resources	Technology supplier
Frac Tank rental	Frac Tank provider



Produced Water Treatment Pilot Project Background Information

For Use in NMED Treatment Permit Discussions 2023

Post Treatment provider – TBD	Post Treatment
-------------------------------	----------------

10. Expected Produced Water Users: (Required Statement)

The effluent streams from the pilot operations will be discharged into the CD 22 produced water pit to be used in drilling and completions operations.

11. Disposal and Decommissioning: (Required information)

Equipment: None - Reuse for testing at other sites

Material: Secondary containment and expendables for the treatment system will be 60 mil HDPE liner with 10oz geo.

Water: All water will be disposed by discharge into Devon's Cotton Draw 22 produced water pond (OCD permit number 2RF-141, 10/02/2023).

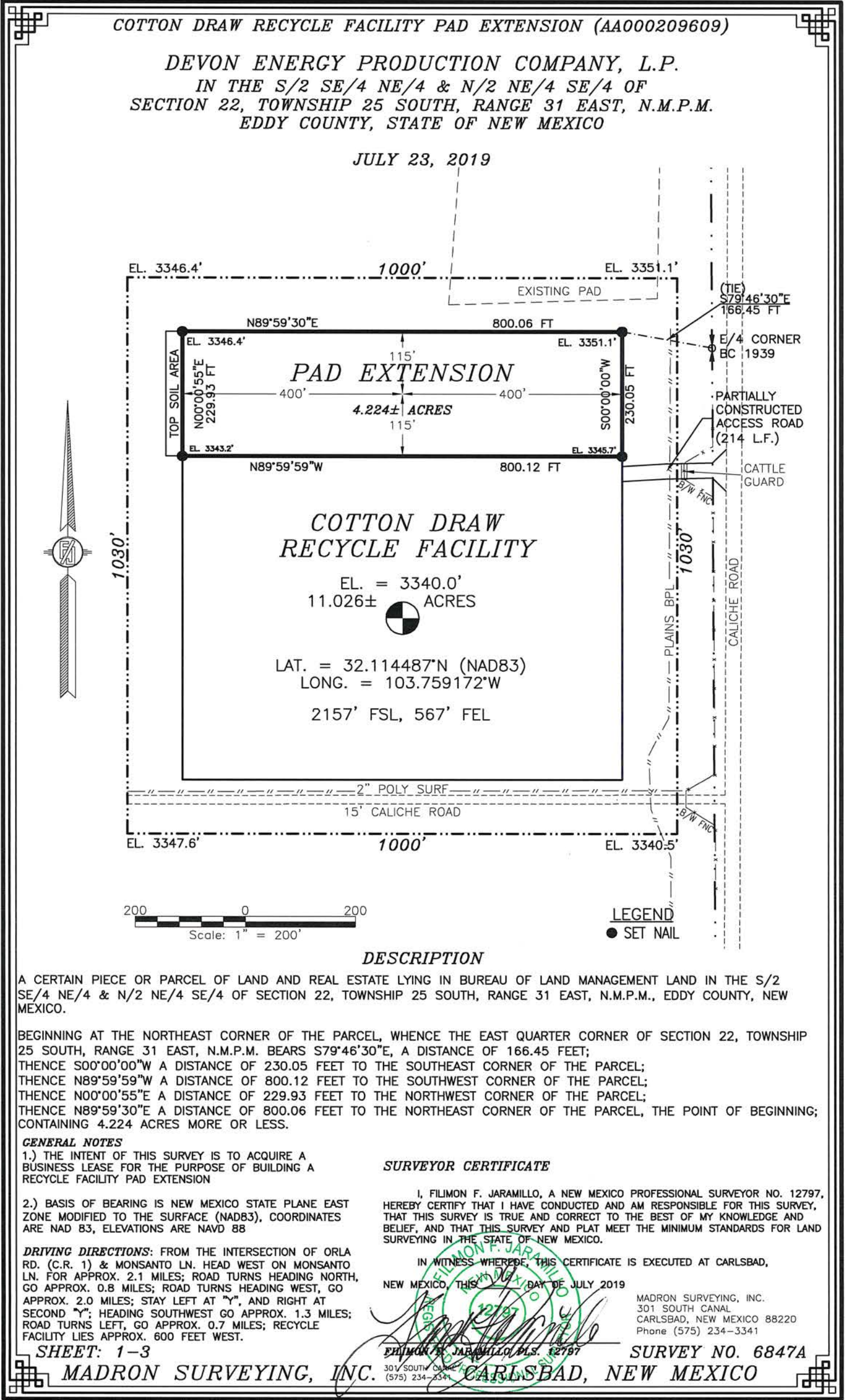
Soil: Any contaminated soil will be disposed at R360 Environmental Solutions at 4507 W. Carlsbad HWY, Hobbs, NM, 88241. It is not expected that any soil will be contaminated because the entire system will be in containment.

12. Expected Operational Testing, Reporting, and Proposed Review Schedule

Pilot mobilization, set up, and shakedown: estimated 4/22/2024

Pilot Operations: 4/22/2024 through 5/22/2024

Draft Report: 7/1/2024

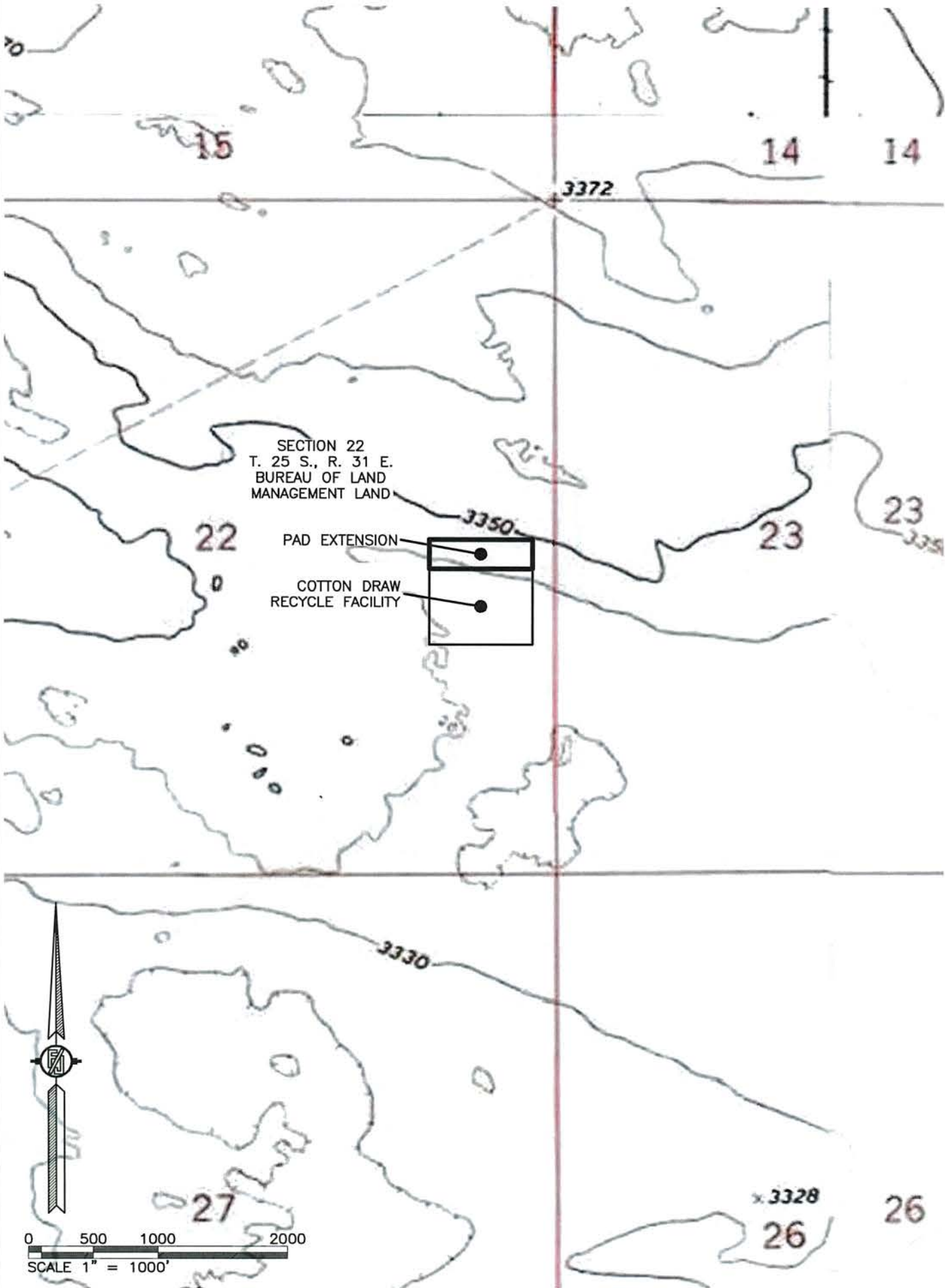


COTTON DRAW RECYCLE FACILITY PAD EXTENSION (AA000209609)

DEVON ENERGY PRODUCTION COMPANY, L.P.
IN THE S/2 SE/4 NE/4 & N/2 NE/4 SE/4 OF
SECTION 22, TOWNSHIP 25 SOUTH, RANGE 31 EAST, N.M.P.M.
EDDY COUNTY, STATE OF NEW MEXICO

JULY 23, 2019

QUAD MAP



SHEET: 2-3

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SURVEY NO. 6847A

COTTON DRAW RECYCLE FACILITY PAD EXTENSION (AA000209609)

DEVON ENERGY PRODUCTION COMPANY, L.P.
IN THE S/2 SE/4 NE/4 & N/2 NE/4 SE/4 OF
SECTION 22, TOWNSHIP 25 SOUTH, RANGE 31 EAST, N.M.P.M.
EDDY COUNTY, STATE OF NEW MEXICO

JULY 23, 2019

AERIAL PHOTO

SECTION 22
T. 25 S., R. 31 E.
BUREAU OF LAND
MANAGEMENT LAND

PAD EXTENSION

COTTON DRAW
RECYCLE FACILITY



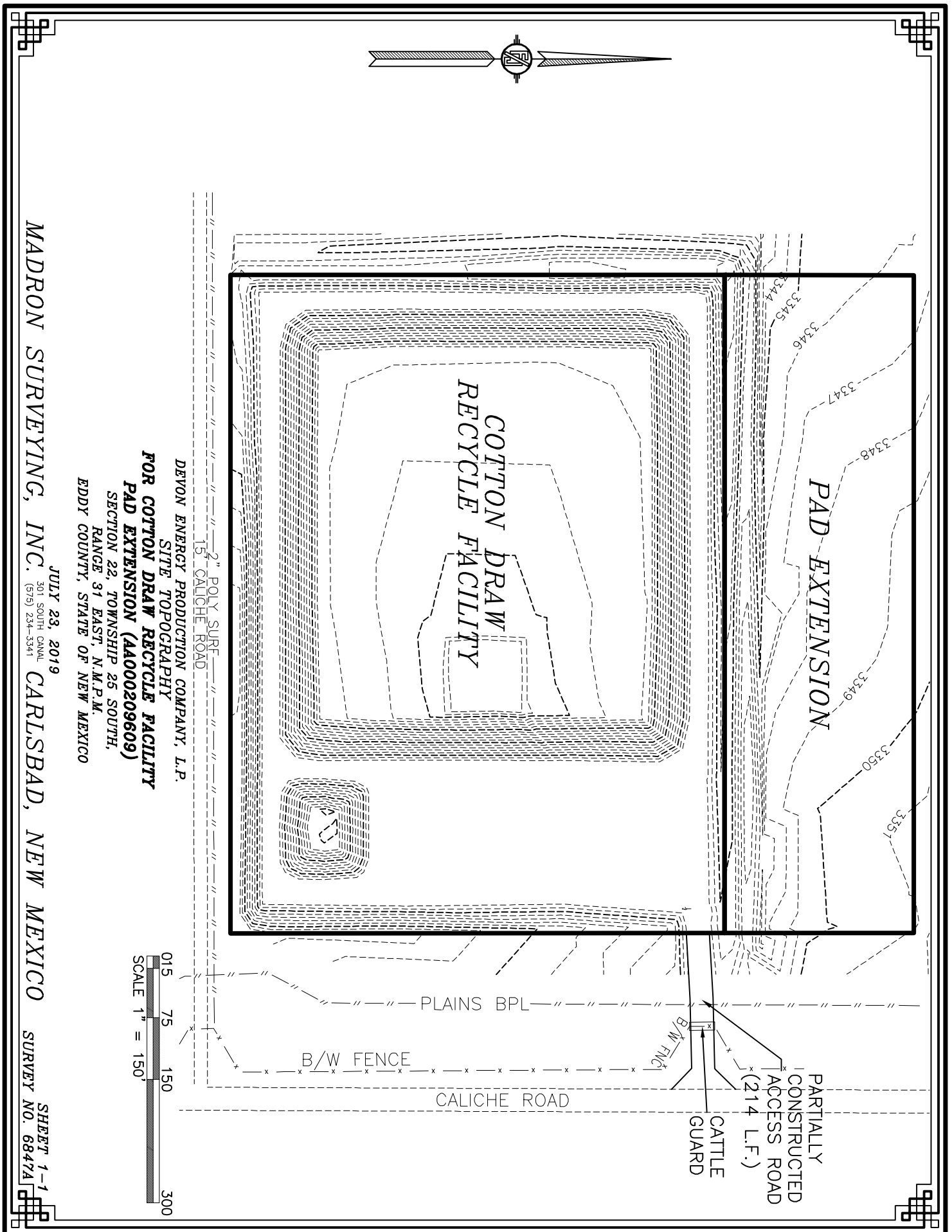
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SCALE 1" = 500'

SHEET: 3-3

MADRON SURVEYING, INC.

301 SOUTH CANAL
(575) 234-3341

SURVEY NO. 6847A
CARLSBAD, NEW MEXICO





New Mexico Environment Department
Ground Water Quality Bureau

Produced Water Pilot Project Notice of Intent to Discharge

For Department Use Only:

Agency Interest Number _____
PRD Assigned _____

1. Name and mailing address of person or group performing research (Responsible Person):

Joseph Olson
Devon Energy Production Company, L.P.
333 West Sheridan Ave. Oklahoma City, OK 73102

Work Phone: (405)228-2444
Cell/Home Phone: (918)894-1080
Email: joseph.olson@dvn.com

2. Name and position of person completing form:

3. Paul Barbour
Devon Energy Production Company, L.P.
333 West Sheridan Ave. Oklahoma City, OK 73102

Work Phone: (405)228-4308
Cell/Home Phone: (405)850-8404
Email: paul.barbour@dvn.com

3. Research Focus (PWRC Research Category): Water quality and cost effectiveness.

4. Is the proposed use of the treated produced water to be used inside or outside of the oil and gas industry? Inside _____

5. Does the location for testing the technology take place inside or outside of the oil and gas field? Inside _____

6. Physical location of the research site including size and boundaries of site (include, street address, township, range, section, county, distance from closest town or landmark, directions to facility.
There is no street address for the location. The location is in section 22 Township 25 South and Range 31 East in Eddy County New Mexico. The location is at latitude 32.113744 and Longitude -103.758072.

7. Topographic and aerial map(s) showing: See attachment 2RF-141 permit approval. (Attachment 1)

- a. land status and adjacent land status
- b. 100-year flood plain,
- c. dwellings and occupied establishments,
- d. watercourses including irrigation ditches, wetlands, lakes, karst and soils
- e. water wells (types) or springs
- f. site security
- g. site plan showing locations of relevant structures

8. List any regulatory, governmental and non-governmental agencies, including municipalities or counties that have authority on the testing location.
New Mexico Oil Conservation Division

9. Provide a description of your signage plan for the testing site. Provide as an attachment.

10. Provide a description of your site security plan, including training and site restriction methods.

The site will be manned 24 hours per day by Crystal Clearwater Resources personnel. All personnel and visitors to the location will be required to sign in at the CCR office on location. Upon arriving at the location, all visitors will be briefed on safety protocols such as a muster point, eye wash station locations, etc. Unauthorized persons or persons without the appropriate personal protection equipment at the location will immediately be asked to leave.

11. List of adjacent landowners and confirmation that adjacent landowners have been notified of the proposed pilot project.
None. This is in a remote location.

12. List the source(s) of the produced water including basin of origin. Describe how the produced water will be transported to and from the site including origin and disposal locations and onsite storage safety precautionary methods. Provide as an attachment.

13. Provide the disposal and decommissioning plan for the expected byproducts, waste products and other potentially contaminated materials. Plan should include disposition of equipment, soils, plants and piping requiring disposal and the expected disposal locations for each. Provide as an attachment.

January 30, 2023

Ground Water Quality Bureau
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Ground Water Quality Bureau

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14. Describe the expected contaminants in the untreated produced water and the treated produced water (e.g. contaminants being studied, known contaminants, known additives). Include estimated concentrations if known, and copies of laboratory analyses of untreated and treated produced water. Provide as an attachment.
15. Describe all components of the produced water processing, treatment, storage, secondary containment, and produced water system (e.g., pre-treatment units, above ground storage tanks, etc.). Include sizes, site layout map, closed loop processing plans, and specifications. Provide as an attachment.
16. Describe your disposal plan for all produced water, treated produced water, permeate or brine concentrate into a SWD. Provide as an attachment.
17. Describe your final closure plan after completion of the pilot project. Provide as an attachment.
18. **Estimated depth to ground water (ft):** 325 ft.. the estimate comes from Envirotech's review of area water wells as plotted by the Office of the State Engineers (OSE). See section 1.2 of the attached permit.

Direction of groundwater flow: The direction of the ground water flow has not been determined; however, the available data suggest the ground water is significantly deeper than the 50ft below bottom containment as required by New Mexico Oil and Gas Division for a recycling pond.

19. **Current Total Dissolved Solids Concentration in Groundwater** Approximately 123,000 mg/l TDS. See attached DAF treated water from the CD 22 pond.

Signature: _____

Date: _____

Printed name: Joseph Olson

Title: Manager Construction/Facilities

Certification by Responsible Person

I, Joseph S. Olson, hereby certify that the information and data submitted in this application are true and accurate as possible, to the best of my knowledge and professional expertise and experience.

Signed this 17 day of January, 2024, upon my oath or affirmation, before a notary of the State of Oklahoma.

Please return this form to:
NMED Ground Water Quality Bureau
P.O. Box 5469
Santa Fe, New Mexico 87502-5469



JENNIFER HARMS

Notary Public
State of Oklahoma

Commission #13010242 Exp: 11/06/25

Telephone: 505-827-2900
Fax: 505-827-2965

January 30, 2023

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New Mexico Environment Department
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Attachment 1 – Question 7.

C147 Registration Package
Cotton Draw Recycling Facility
Section 22, T25S, R31E
Eddy County, New Mexico

January 30, 2023

Ground Water Quality Bureau
Produced Water Pilot Project Notice of Intent



New Mexico Environment Department
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Attachment 2 – Question 9

Provide a description of your signage plan for the testing site.

Devon has a sign posted at the treatment location that a person can easily read the legend and other details. The sign provides the following information:

1. Operators name,
2. The location of the site by quarter-quarter or unit letter, section, township and range, and,
3. Emergency telephone numbers.

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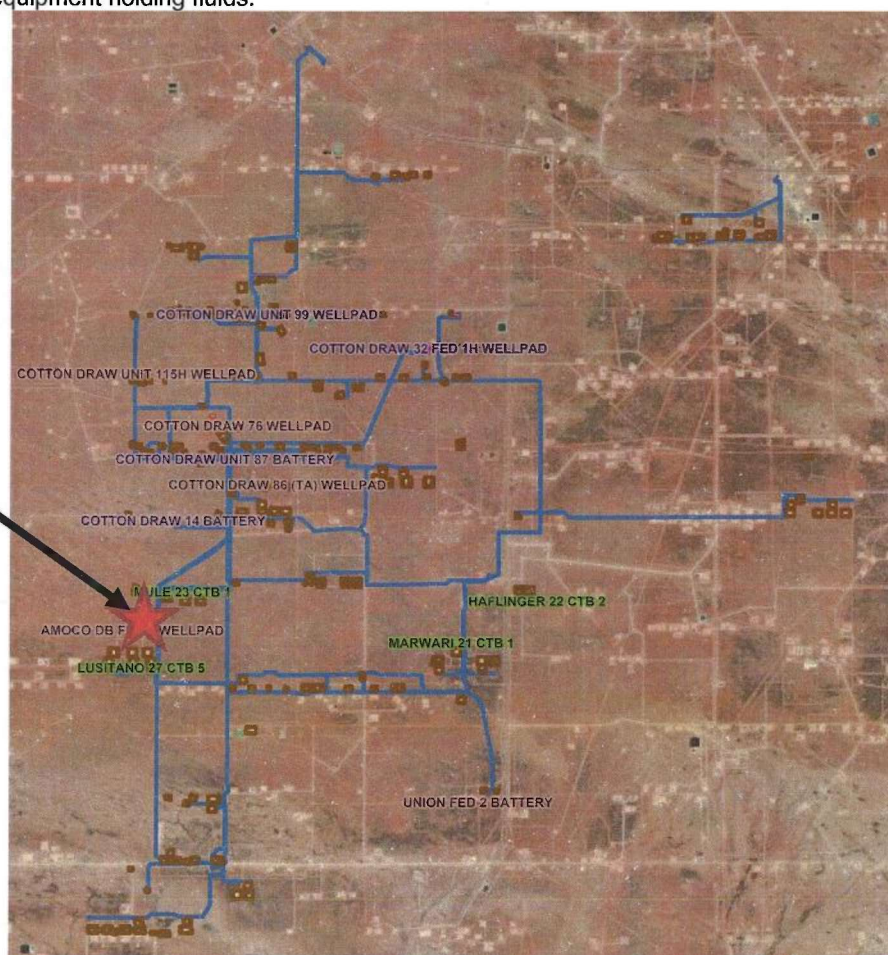
Attachment 3 - Question 12.

List the source(s) of the produced water including basin of origin. Describe how the produced water will be transported to and from the site including origin and disposal locations and onsite storage safety precautionary methods. Provide as an attachment.

The water will be transported to the Cotton Draw 22 ("CD 22") treatment facility through Devon's produced water gathering system in Devon's Cotton Draw field (see map of system). The produced water will be stored in above ground storage tanks or in Devon's produced water pond after it has been pretreated with chemicals and gone through a dissolved air flotation unit.

Before the water is processed in the proposed desalination unit, incoming water may be stored in a frac tank. Frac tanks will also be used to store the effluent streams for testing purpose before being combined again and discharged into the produced water pit to be used in completion operations. Industry standard containment for produced water will be used on all equipment holding fluids.

CD 22 Treatment
Facility



January 30, 2023

Ground Water Quality Bureau
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New Mexico Environment Department
Ground Water Quality Bureau

Produced Water Pilot Project Notice of Intent to Discharge

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PRD Assigned _____

Attachment 4 – Question 13

Provide the disposal and decommissioning plan for the expected byproducts, waste products and other potentially contaminated materials. Plan should include disposition of equipment, soils, plants and piping requiring disposal and the expected disposal locations for each. Provide as an attachment.

Disposal of by products will be handled in the same manner as current waste is handled at the approved OCD facility. If there is any soil contamination, it will be disposed of at R360 Environmental Solutions.

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Ground Water Quality Bureau
Produced Water Pilot Project Notice of Intent



New Mexico Environment Department
Ground Water Quality Bureau

Produced Water Pilot Project
Notice of Intent to Discharge

For Department Use Only:

Agency Interest Number _____

PRD Assigned _____

Attachment 5 - Question 14

Describe the expected contaminants in the untreated produced water and the treated produced water (e.g. contaminants being studied, known contaminants, known additives). Include estimated concentrations if known, and copies of laboratory analyses of untreated and treated produced water. Provide as an attachment.

Below is a complete water analysis from the CD 22 pond after water has been pretreated to remove iron and total suspended solids. These are the known contaminants in the water. In addition to testing for the contaminants below, there are likely other contaminants such as ammonia, organics (benzene, toluene, xylene, etc.), naturally occurring radioactive materials (NORM), and others that are not tested for in Devon's current operations and therefore the data is not readily available. Devon and CCR will gather samples for frequent testing of these materials and coordinate with the New Mexico Produced Water Research Consortium to have third party evaluations done on the water streams.

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	3968
Magnesium(as Mg)	515.65
Barium(as Ba)	6.02
Strontium(as Sr)	701.25
Sodium(as Na)	37039
Potassium(as K)	730.93
Lithium(as Li)	20.73
Iron(as Fe)	0.530
Aluminum(as Al)	0.0200
Manganese(as Mn)	0.690
Zinc(as Zn)	0.220

PARAMETERS

Temperature(°F)	77.00
Conductivity	163813
Resistivity	6.10

ANIONS

Chloride(as Cl)	64700
Sulfate(as SO ₄)	534.06
Dissolved CO ₂ (as CO ₂)	38.40
Bicarbonate(as HCO ₃)	294.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	16.31
Phosphate(as PO ₄)	0.440
Boron(as B)	84.61

Sample pH	7.00
Sp.Gr.(g/mL)	1.08
T.D.S.	115499

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Ground Water Quality Bureau
Produced Water Pilot Project Notice of Intent



New Mexico Environment Department
Ground Water Quality Bureau

**Produced Water Pilot Project
Notice of Intent to Discharge**

For Department Use Only:

Agency Interest Number _____
PRD Assigned _____

Attachment 6 – Question 15

Describe all components of the produced water processing, treatment, storage, secondary containment, and produced water system (e.g., pre-treatment units, above ground storage tanks, etc.). Include sizes, site layout map, closed loop processing plans, and specifications.

Pretreatment

1. Raw produced water enters a newly installed above ground storage tank (AST) or is processed through a gun barrel to remove oil and solids.
2. Raw produced water is then moved from the AST or gun barrel to the treatment plant where it is treated with chemicals such as hydrogen peroxide, a coagulant, and a flocculant.
3. The water is agitated via a serpentine system of pipes.
4. Water is then put into a dissolved air flotation (DAF) unit for removal of the solids.
5. The discharge of the DAF units has the same TDS as the water going in, but the solids and iron has been removed. Water is then stored in the pond for use in drilling and completions operations.

Desalination

The desalination process will be tested with water that has gone through the pretreatment step above and raw water directly from the AST tank.

Spontaneous Evaporation and Condensation Technology (SPEC) employs the process of evaporation/condensation which has two main advantages. First, it allows the replacement of large, complex equipment made from exotic metallurgy. Second, the tendency for fouling/mineral scaling is drastically reduced, along with associated downtime/maintenance costs required by most thermal technologies. An overview of the treatment process is as follows:

6. Pretreated or untreated influent is transferred enters the evaporator loop from the feed tank.
7. The brine stream is heated using heat recovered from the condensate loop through a heat exchanger. A majority of the thermal energy required for this process is recovered through this operation.
8. The heated brine stream is heated to the desired process temperature through a second heat exchanger which pulls new heat from any heat source (e.g., boiler, waste heat recovery, solar thermal) through a liquid media (e.g., Ethylene glycol).
9. The fully heated brine stream cascades through the entire series of evaporators.
10. The brine temperature drops in each stage as water evaporates.
11. The concentrated brine at the bottom of the evaporator loop is recirculated until the salinity reaches the desired level. It is possible to concentrate the evaporator loop up to the point of saturation.
12. Similarly, the temperature of the distillate increases as water cascades through each stage.
13. The heat accumulated in the condenser stream is recovered internally by the heat exchanger to drive further evaporation.
14. The concentrated effluent that is produced from this process will be ~240,000 TDS and will be blended into Devon's produced water pond to be used in drilling and completions operations. The clean effluent will be blended into the produced water pond as well or may go through a post treatment process for further polishing.

Post Treatment – Devon is still evaluating which post treatment will be used.

15. The clean effluent will be polished through activated carbon to remove co-distilled compounds and Devon is still evaluating technologies to address ammonia removal. These technologies could be:
 1. Electrolysis and oxidation
 2. Moving bed biofilm reactor (MBBR)
 3. Others
16. Post treated clean effluent will be discharged into the produced water pit to be used in drilling and completion operations.



New Mexico Environment Department
Ground Water Quality Bureau

Produced Water Pilot Project Notice of Intent to Discharge

For Department Use Only:

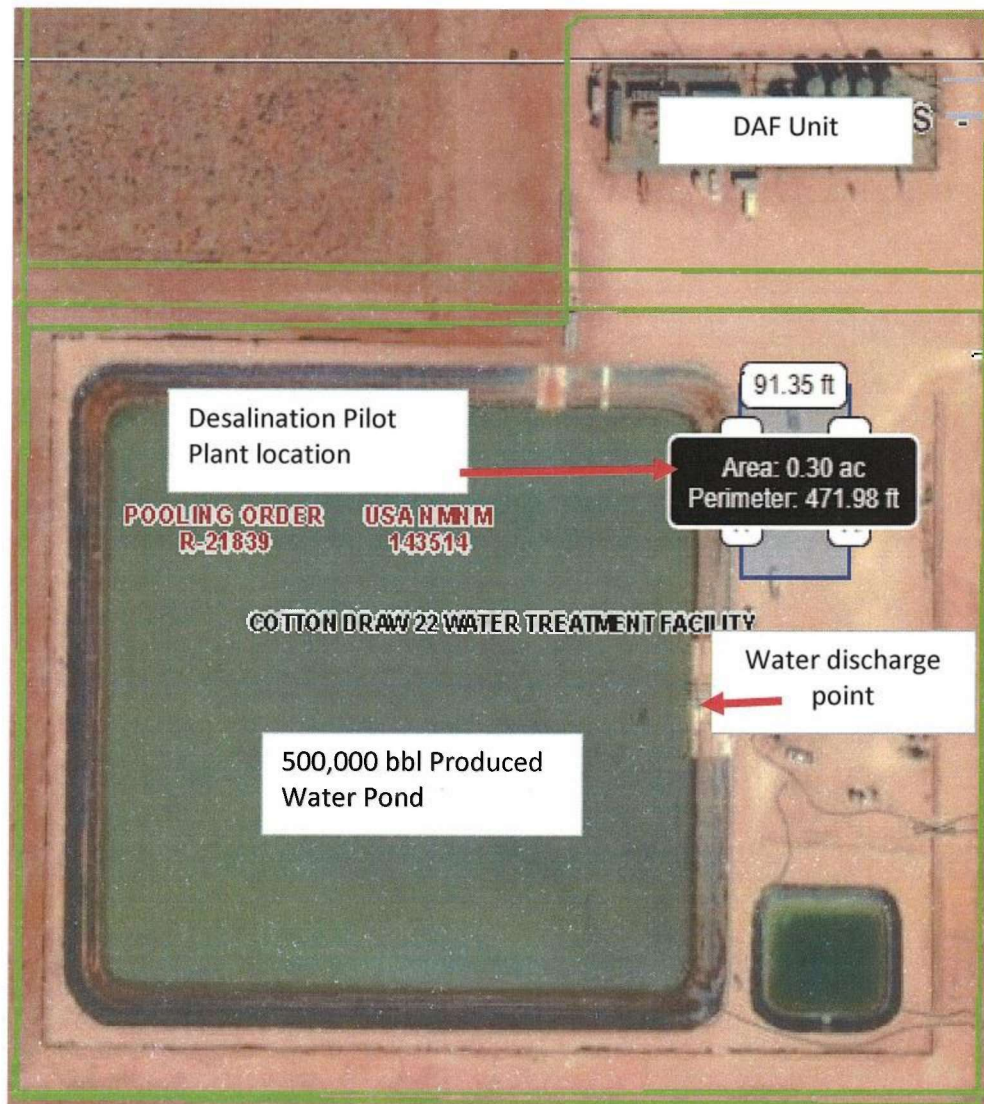
Agency Interest Number _____

PRD Assigned _____

Attachment 7 – Question 16

Describe your disposal plan for all produced water, treated produced water, permeate or brine concentrate into a SWD.

The produced water, treated produced water, and permeate/brine concentrate will not be disposed of in an SWD. Devon plans to discharge all streams into the existing, OCD approved, produced water pit for use in drilling and completions operations.



January 30, 2023

Ground Water Quality Bureau
Produced Water Pilot Project Notice of Intent



New Mexico Environment Department
Ground Water Quality Bureau

Produced Water Pilot Project Notice of Intent to Discharge

For Department Use Only:

Agency Interest Number _____
PRD Assigned _____

Attachment 8 – Question 17

Describe your final closure plan after completion of the pilot project.

After completing a produced water desalination pilot project, a final closure plan is necessary to ensure that all equipment is properly decommissioned and transported to its next location. In this case, all of the equipment used in the pilot project is mobile and will be transported by Crystal Clearwater Resources to their yard or next customer. The closure plan will include procedures for removing and cleaning all equipment, disposing of any waste materials, and restoring the site to its original condition. Any contaminated soil will be disposed at R360 Environmental Solutions at 4507 W. Carlsbad HWY, Hobbs, NM 88241.

January 30, 2023

Ground Water Quality Bureau
Produced Water Pilot Project Notice of Intent

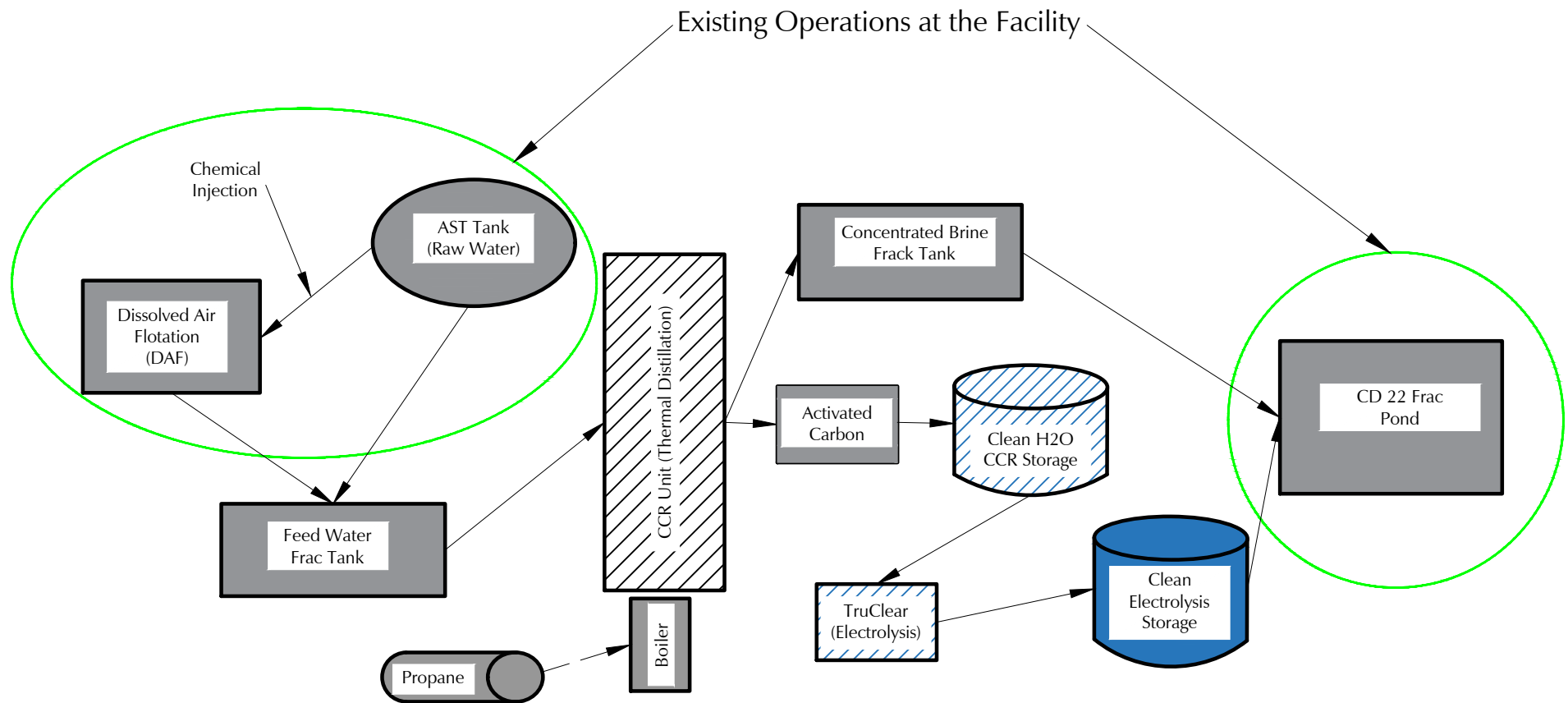
Equipment List			
Item	Material	Approximate Capacity-bbl	Status*
DAF Unit	Steel	240	Existing/Permanent
AST	Steel/HDPE Liner	35,000	Existing/Permanent
Feed Water Frac Tank #1	Steel	500	Temporary
Feed Water Frac Tank #2	Steel	500	Temporary
Propane Tank	Steel	10	Temporary
Boiler	Steel	-	Temporary
CCR Unit	Steel	10	Temporary
Concentrated Brine Frac Tank	Steel	500	Temporary
Clean H2O CCR Storage #1	Steel	150	Temporary
Clean H2O CCR Storage #2	Steel	150	Temporary
Electrolysis Unit	Steel	10	Temporary
Clean Electrolysis Storage	Steel	150	Temporary
Cotton Draw Recycle Containment	Earthen Containment/HDPE Liner	500,000	Existing/Permanent

*Permanent Items are used for day to day recycle operations of the containment

Temporary items are to be placed for pilot project duration and removed after completion of study

Weekly Inspection Checklist

<u>Item</u>	<u>Comments</u>
I. General Information	
a. Inspection Date	
b. Inspector Name	
c. Location Name	
d. Facility Name	
e. Photo of ID Sign (includes date/time)	
Y N N/A	
II. Piping/Fittings	
a. Visually inspect piping and fittings:	
i. Leaks in piping or fittings: Yes/No	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1. If yes, provide a remedial action schedule	
ii. Provide inspection photos of the piping and fittings	
Y N N/A	
II. Liner Integrity	
a. Visually inspect the containment liner surface and document:	
i. Liner Damage: Yes/No	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1. If yes, provide a remedial action schedule	
ii. Provide inspection photos of the liner (i.e. north wall, east wall, etc.)	
Y N N/A	
III. Berm Integrity	
a. Visually inspect the interior and exterior berms and document:	
i. Berm Damage: Yes/No	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1. If yes, provide a remedial action schedule	
ii. Overgrown vegetation: Yes/No	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1. If yes, provide a remedial action schedule	
iii. Provide inspection photos of the liner (i.e. north wall, east wall, etc.)	



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C.A. #1960 - Expiration Date: 6-30-2024

CCR PROCESS FLOW

DEVON COTTON DRAW PRODUCED WATER PILOT PROJECT



Project No.
24.091-00

Figure 1

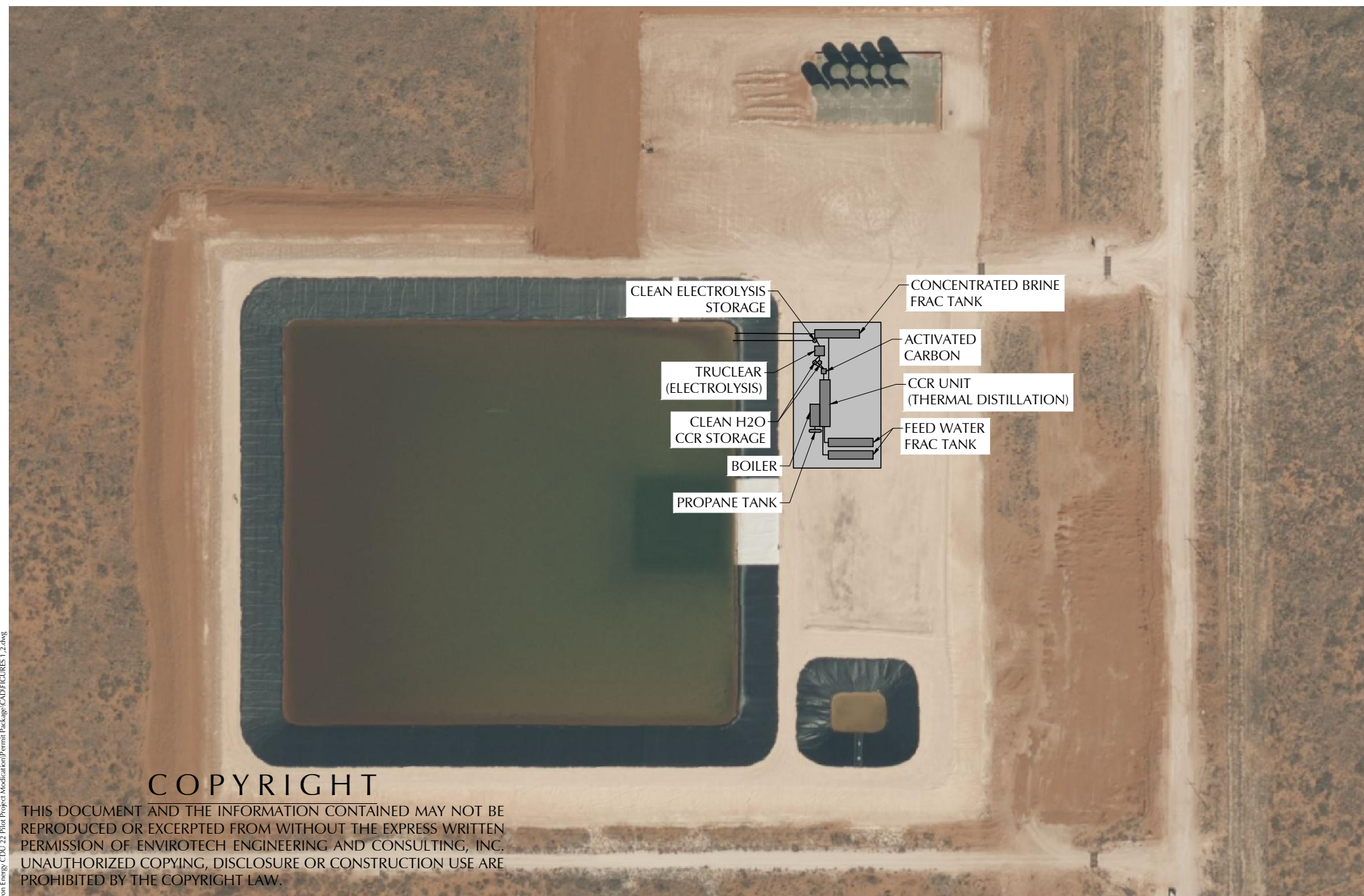


SECONDARY CONTAINMENT



devon

Figure 2



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PAD LAYOUT

DEVON COTTON DRAW PRODUCED WATER PILOT PROJECT



Project No.
24.091-00

Figure 3



Devon Energy is proposing to operate a produced water pilot project at the approved Cotton Draw Recycle Facility (2RF-141). The pilot project is to determine the viability of desalinated produced water to a level that is usable for agricultural use. The pilot project will take produced water from the existing Cotton Draw recycle process and pass it through a desalinization process. The resulting products will be water that should be suitable for agricultural use and concentrated brine. All desalinization equipment will be placed inside a secondary containment area to minimize the risk of a produced water release. The following steps have been developed to ensure that the risk of produced water release is as minimal as possible.

CLOSURE PLAN

1. Decommissioning of the facility:

- a. After the Pilot Project has been completed the system will be completely drained of all produced water, collected solids, and any other possible contaminants that may have been collected. Produced water will be pumped into the Cotton Draw Recycle containment for reuse and solids trucked to a permitted solid oil and gas waste disposal facility.
- b. After draining the produced water, the entire system, including piping, treatment equipment, and storage containers, will be flushed with fresh water. The flush water will be placed in the permitted Cotton Draw Containment for reuse as frac water.
- c. A licensed electrician will be employed to safely disconnect any electrical power to the treatment equipment. Roustabout crews will be used to disconnect all piping, pipe fittings, and valves.
- d. All non-permanent treatment equipment, like propane tanks, frac tanks, and thermal distillation units will be removed by either Devon or Technology Company personnel.

2. Removal of Secondary Containment:

- a. After all equipment is removed from the secondary containment area, the liner and geotextile will be cut into strips, rolled or folded, and taken to a permitted oil and gas disposal location.
- b. Soil samples will be taken from the subgrade beneath the containment and analyzed for any contamination by produced water or other oil and gas waste. If analytical samples show contamination of soil above the limits provided in NMAC 19.15.34.14, all contaminated soil will be removed and trucked to a permitted disposal location.
- c. After the area is cleared of contamination, the secondary containment berms will be pushed in to fill the void in the middle of the secondary containment area.



CLOSURE PLAN
DEVON ENERGY
PRODUCED WATER PILOT PROJECT
EDDY COUNTY, NEW MEXICO
024091-00

3. Return the area to preexisting conditions:
 - a. After the berms have been pushed in excess fill dirt may be needed to reestablish the level area of the Cotton Draw Pad. Excess fill dirt may be brought in from a local commercial soil borrow or on-site excavation.
 - b. Caliche may be hauled in to provide cover over the now leveled secondary containment.

Devon Energy
Cotton Draw Pilot Project
Closure Cost Estimate

Item		Units	Quantity	\$ /Unit		Estimate Cost
Facility Closure						
1	Fluid removal					
	Diposal of all fluids	bbls	1,200	\$	0.80	\$ 960.00
2	Fresh Water for Flush	bbls	1,200	\$	0.85	\$ 1,020.00
3	Liner removal (fold-in-place)	SF	27,324	\$	0.18	\$ 4,918.32
4	Equipment removal					
	Pit clean-out and residue haul-off	LS	1	\$	7,500.00	\$ 7,500.00
	Equipment removal (tanks and treatment equipme	LS	1	\$	5,000.00	\$ 5,000.00
	Electrical decomissioning (pumps and panels)	LS	1	\$	1,500.00	\$ 1,500.00
	Misc equipment clean-up and removal	hr	60	\$	125.00	\$ 7,500.00
5	Site Restoration					
	Dozer - push in berms (bid)	CY	590	\$	6.00	\$ 3,540.00
	and final grading of the site					
Estimated Total					\$	31,938.32

Assumptions

No Remediation will be necessary

System is full at time of closure

Pit berms above natural grade will be used to fill voids below natural grade

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

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

CONDITIONS

Action 322314

CONDITIONS

Operator: DEVON ENERGY PRODUCTION COMPANY, LP 333 West Sheridan Ave. Oklahoma City, OK 73102	OGRID: 6137
	Action Number: 322314
	Action Type: [C-147] Water Recycle Long (C-147L)

CONDITIONS

Created By	Condition	Condition Date
vvenegas	Conditions of Approval by email.	3/26/2024