2RP-4655
Coyote #1 Battery
DELINEATION PLAN
Produced Water Spill
Eddy County, New Mexico

Latitude: 32° 47' 29.67"
Longitude: 103° 49' 35.67"

LAI Project No. 17-0175-40

April 10, 2018

Prepared for:

Legacy Reserves Operating, LP
303 West Wall Street, Suite 1300
Midland, Texas 79701

Prepared by:

Larson & Associates, Inc.
507 North Marienfeld Street, Suite 205
Midland, Texas 79701

Mark J. Larson, P.G.
Certified Professional Geologist #10490

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1.0 INTRODUCTION

Larson & Associates, Inc. (LAI) has prepared this delineation plan on behalf of Legacy Reserves Operating, LP (Legacy) for submittal to the Oil Conservation Division (OCD) District 2 for a produced water spill at the Coyote #1 Battery (Site) located in Unit F (SE/4, NW/4), Section 36, Township 17 South, Range 31 East in Eddy County, New Mexico. The geodetic position is North 32° 47' 29.67" and West 103° 49' 35.67". Figure 1 presents a topographic map. Figure 2 presents an aerial map.

1.1 Background

On an unknown date between approximately 6 and 7 barrels (bbl) of produced water were released. The released fluids pooled in the pasture to the southwest of the Site. The pasture show distressed vegetation as well as standing salt on the surface. The initial C-141 was submitted on January 3, 2018 and assigned remediation permit number 2RP-4655. Appendix A presents the initial C-141.

1.2 Physical Setting

The physical setting is as follows:

- The surface elevation is approximately 3,825 feet above mean sea level (msl);
- The surface topography slopes gently towards the southwest;
- There is no surface water within 1,000 feet of the Site;
- The soils are designated as "Kermit-Berino fine sands, 0 to 3 percent slopes" consisting of 0 to 60 inches of fine sands;
- The surface geology is Eolian and piedmont deposits (Holocene to middle Pleistocene)-interlayered eolian sands and piedmont-slope deposits;
- Groundwater occurs in the Ogallala formation at approximately 454.25 feet below ground surface (bgs) (1994);
- The nearest fresh water well is located in Unit P (SE/4, SE/4), Section 1, Township 18 South, Range 37 East, approximately 1.64 miles southeast of the Site.

1.2 Remediation Action Levels

Remediation Action Levels (RRAL) were calculated for benzene, BTEX and TPH based on the following criteria established by the OCD in *"Guidelines for Remediation of Leaks, Spills and Releases, pp. 6-7, August 13, 1993":*

Criteria	*Result*	*Score*
Depth-to-Groundwater	>100 Feet	0
Wellhead Protection Area	No	0
Distance to Surface Water Body	>1000 Horizontal Feet	0

The following RRAL apply to release ranking score: 0

- Benzene 10 mg/Kg
- BTEX 50 mg/Kg
- TPH 5,000 mg/Kg

Depth to groundwater greater than 100 feet bgs requires vertical delineation for chloride to 600 milligrams per kilogram (mg/Kg) and maintained to a minimum 5 feet farther in depth.

2.0 DELINEATION PLAN

LAI proposes to collect soil samples at three (3) locations within the spill area. The samples will be collected at 1 foot intervals to approximately 4 feet bgs and 2 foot intervals to approximately 12 feet bgs using direct push technology (DPT) depending on subsurface conditions. Additional samples will be collected in each cardinal direction (north, south, east and west) of the spill area at the same depth intervals for horizontal delineation. The soil samples will be delivered under preservation and chain of custody to Xenco Laboratories (Xenco) in Midland, Texas. The upper samples (0 to 1 foot) will be analyzed for BTEX (sum of benzene, toluene, ethylbenzene and xylene), TPH (total petroleum hydrocarbons) including gasoline range organics (GRO), diesel range organics (DRO) and oil range organics (ORO) by EPA SW-846 Methods 8021B and 8015M. All samples will be analyzed for chloride by EPA SW-846 Method 300. Pending laboratory results, further delineation will be performed to achieve the RRALs. Appendix B presents photographs.

3.0 REMEDIATION PLAN

Legacy will include a remediation plan in the delineation report submitted to the OCD upon receipt of the laboratory report.

Figures

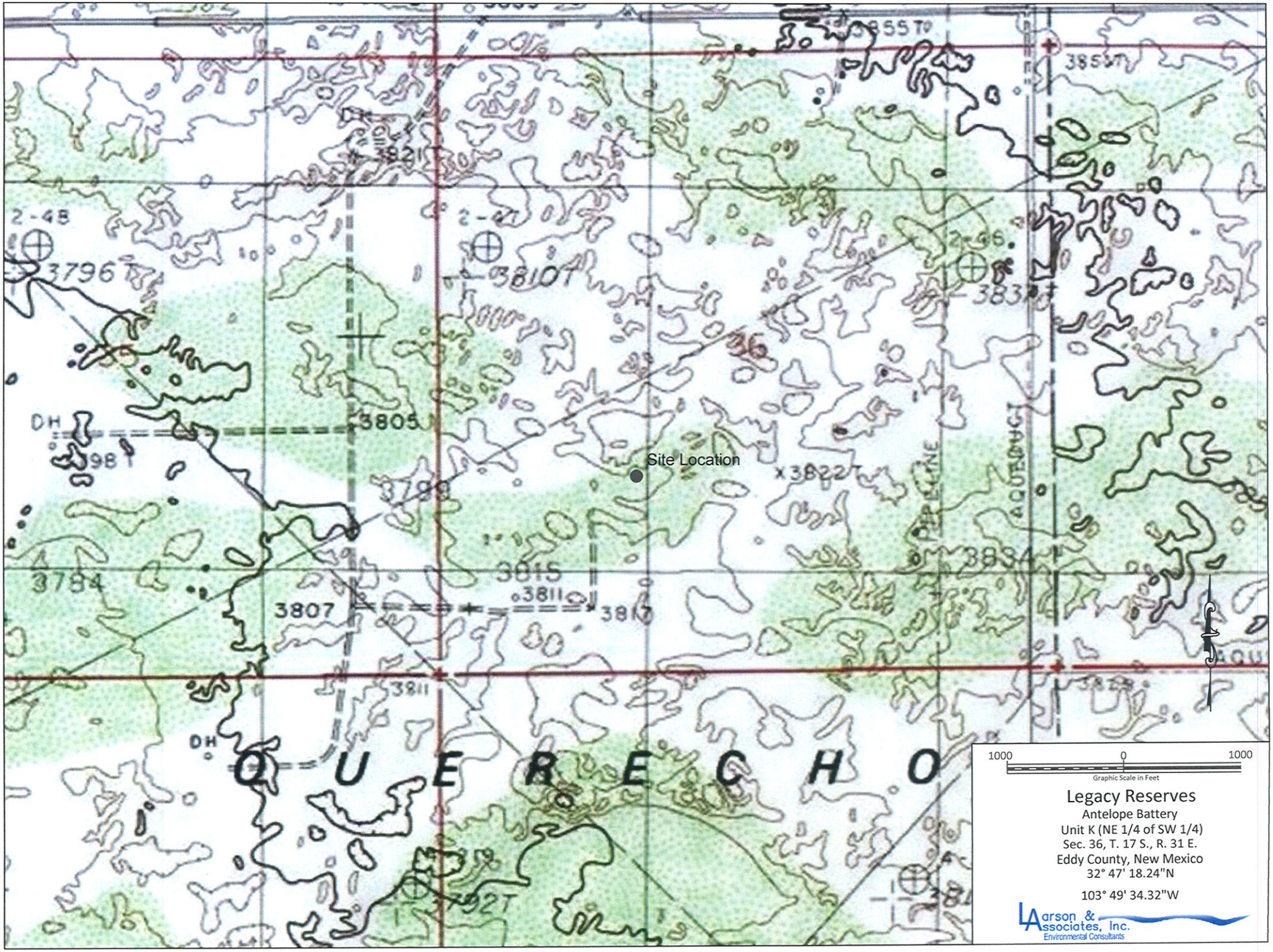


Figure 1 - Topographic Map

Figure 2 - Aerial Map Showing Proposed Sample Location

Appendix A

Initial C-141

* Operator said they sent 1/3/18 but OCD did not received them.

received on 3/8/18 OCD - Artesia, NM District II

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

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 8, 2011

Submit 1 Copy to appropriate District Office in accordance with 19.15.29 NMAC.

Release Notification and Corrective Action

nAB1806827959

OPERATOR

☒ Initial Report ☐ Final Report

Name of Company: Legacy Reserves Operating, LP 240974	Contact: Brian Cunningham
Address: 303 W. Wall Street, Suite 1300 Midland, TX 79701	Telephone No. 432-234-9450
Facility: Coyote #1 Battery	Facility Type: Battery Tank Battery

Surface Owner: State	Mineral Owner: State	API No. 30-015-32419

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
F	36	17S	31E					Eddy County

32.7920227 Latitude ~~32° 47' 29.67"~~ Longitude ~~103° 49' 35.67"~~ -103.9263016

NATURE OF RELEASE

Type of Release Produced Water	Volume of Release 6-7 bbl	Volume Recovered 0 bbl
Source of Release unknown	Date and Hour of Occurrence unknown	Date and Hour of Discovery unknown
Was Immediate Notice Given? ☐ Yes ☒ No ☐ Not Required	If YES, To Whom? N/A	
By Whom? N/A	Date and Hour N/A	
Was a Watercourse Reached? ☐ Yes ☒ No	If YES, Volume Impacting the Watercourse. N/A	

If a Watercourse was Impacted, Describe Fully.*

Not applicable.

Describe Cause of Problem and Remedial Action Taken.*

Approximately 6 to 7 bbl of produced water were released and pooled in the pasture to the southwest of the battery. No bbl were recovered. An area in the pasture measuring approximately 12,500 square feet to the southwest of the Coyote #1 Battery showed distressed vegetation as well as standing salt on the surface.

Describe Area Affected and Cleanup Action Taken.*

Larson & Associates, Inc., will prepare a plan to delineate the spill for OCD approval. a delienation report with remediaiton plan will be submitted to the OCD for apprval prior to remediation of the spill. The State of New Mexico State Land Office, as land owner, will be included on the submission to the OCD.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD 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 NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD 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.

Signature: Brian Cunningham	OIL CONSERVATION DIVISION
Printed Name: Brian Cunningham	Approved by Environmental Specialist:
Title: Production Foreman	Approval Date: / Expiration Date:
E-mail Address: bcunningham@legacylp.com	Conditions of Approval: See attached / Attached ☒
Date: 12/20/17 Phone: 432-234-9450	

* Attach Additional Sheets If Necessary

Please refer to the New Mexico Oil Conservation Division Website for updated form(s) at: http://www.emnrd.state.nm.us/OCD/forms.html Thank you

Operator/Responsible Party,

The OCD has received the form C-141 you provided on **3/8/18** regarding an unauthorized release. The information contained on that form has been entered into our incident database and remediation case number 2RP-4655 has been assigned. **Please refer to this case number in all future correspondence.**

It is the Division's obligation under both the Oil & Gas Act and Water Quality Act to provide for the protection of public health and the environment. Our regulations (19.15.29.11 NMAC) state the following,

> *The responsible person shall complete division-approved corrective action for releases that endanger public health or the environment. The responsible person shall address releases in accordance with a remediation plan submitted to and approved by the division or with an abatement plan submitted in accordance with 19.15.30 NMAC.* [emphasis added]

Release characterization is the first phase of corrective action unless the release is ongoing or is of limited volume and all impacts can be immediately addressed. Proper and cost-effective remediation typically cannot occur without adequate characterization of the impacts of any release. Furthermore, the Division has the ability to impose reasonable conditions upon the efforts it oversees. **As such, the Division is requiring a workplan for the characterization of impacts associated with this release be submitted to the OCD District II office in Artesia on or before 4/8/18. If and when the release characterization workplan is approved, there will be an associated deadline for submittal of the resultant investigation report. Modest extensions of time to these deadlines may be granted, but only with acceptable justification.**

The goals of a characterization effort are: 1) determination of the lateral and vertical extents along with the magnitude of soil contamination. 2) determine if groundwater or surface waters have been impacted. 3) If groundwater or surface waters have been impacted, what are the extents and magnitude of that impact. 4) The characterization of any other adverse impacts that may have occurred (examples: impacts on vegetation, impacts on wildlife, air quality, loss of use of property, etc.). To meet these goals as quickly as possible, the following items must, at a minimum, be addressed in the release characterization workplan and subsequent reporting:

- Horizontal delineation of soil impacts in each of the four cardinal compass directions. Adsorbed soil contamination must be characterized for the following constituents using the associated laboratory methods: benzene, toluene, ethylbenzene, and total xylenes by either Method 8260 or 8021, total petroleum hydrocarbons by Method 8015 extended range (GRO+DRO+MRO; C_6 thru C_{36}), and for chloride by Method 300. This is not an exclusive list of potential contaminants. Analyzed parameters should be modified based on the nature of the released substance(s). Soil sampling must be both within the impacted area and beyond.

- Vertical delineation of soil impacts. Adsorbed soil contamination must be characterized for the following constituents using the associated laboratory methods: benzene, toluene, ethylbenzene, and total xylenes by either Method 8260 or 8021, total petroleum hydrocarbons by Method 8015 extended range (GRO+DRO+MRO; C_6 thru C_{36}), and for chloride by Method 300. As above, this is not an exclusive list of potential contaminants and can be modified. Vertical characterization samples should be taken at depth intervals no greater than five feet apart. Lithologic description of encountered soils must also be provided. At least ten vertical feet of soils with contaminant concentrations at or below these values must be demonstrated as existing above the water table.

- Nominal detection limits for field and laboratory analyses must be provided.

- Composite sampling is not generally allowed.

- Field screening and assessment techniques are acceptable (headspace, titration, EC [include algorithm for validation purposes], EM, etc.), but the sampling and assay procedures must be clearly defined. Copies of field notes are highly desirable. A statistically significant set of split samples must be submitted for confirmatory laboratory analysis, including the laterally farthest and vertically deepest sets of soil samples. Make sure there are at least two soil samples submitted

for laboratory analysis from each borehole or test pit (highest observed contamination and deepest depth investigated). Copies of the actual laboratory results must be provided including chain of custody documentation.

•Probable depth to shallowest protectable groundwater and lateral distance to nearest surface water. If there is an estimate of groundwater depth, the information used to arrive at that estimate must be provided. If there is a reasonable assumption that the depth to protectable water is 50 feet or less, the responsible party should anticipate the need for at least one groundwater monitoring well to be installed in the area of likely maximum contamination.

• If groundwater contamination is encountered, an additional investigation workplan may be required to determine the extents of that contamination. Groundwater and/or surface water samples, if any, must be analyzed by a competent laboratory for volatile organic hydrocarbons (typically Method 8260 full list), total dissolved solids, pH, major anions and cations including chloride and sulfate, dissolved iron, and dissolved manganese. The investigation workplan must provide the groundwater sampling method(s) and sample handling protocols. To the fullest extent possible, aqueous analyses must be undertaken using nominal method detection limits. As with the soil analyses, copies of the actual laboratory results must be provided including chain of custody documentation.

• Accurately scaled and well-drafted site maps must be provided providing the location of borings, test pits, monitoring wells, potentially impacted areas, and significant surface features including roads and site infrastructure that might limit either the release characterization or remedial efforts. Field sketches may be included in subsequent reporting, but should not be considered stand-alone documentation of the site's layout. Digital photographic documentation of the location and fieldwork is recommended, especially if unusual circumstances are encountered.

Nothing herein should be interpreted to preclude emergency response actions or to imply immediate remediation by removal cannot proceed as warranted. Nonetheless, characterization of impacts and confirmation of the effectiveness of remedial efforts must still be provided to the OCD before any release incident will be closed.

Jim Griswold
OCD Environmental Bureau Chief
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
505-476-3465
jim.griswold@state.nm.us

Weaver, Crystal, EMNRD

From: Weaver, Crystal, EMNRD
Sent: Thursday, March 8, 2018 1:56 PM
To: Yu, Olivia, EMNRD; Bratcher, Mike, EMNRD
Cc: 'Sarah Johnson'; Mark Larson; bcunningham@legacylp.com
Subject: RE: Legacy Reserves, L.P., 2RP-4490 Antelope Battery & Coyote #1 C-141

Hello all,

Thank you Olivia.

Sarah, I responded to your delineation plan for the Antelope battery (case number 2RP-4490) already prior to receiving this forwarded email from Olivia. However, I checked my records/emails for a C-141 submission for Legacy's Coyote #1 Battery and I don't have anything. I also checked further to see if maybe my email is just messing up by looking in our database to see if one was received, meaning I checked the admin entry records as well, and I don't show anything regarding a release occurring at the Coyote location was processed around Jan 2018 by out administrative folks here in our office either. I literally don't have it.

Olivia is not needing to be involved on this one if the release occurred in Eddy county and she forwarded me the attachments you sent her from your email you sent her yesterday. So now I have the Initial C-141 for Coyote #1 Battery. I will get it processed.

Thank you and sorry for the confusion,

Crystal Weaver
Environmental Specialist
OCD – Artesia District II
811 S. 1st Street
Artesia, NM 88210
Office: 575-748-1283 ext. 101
Cell: 575-840-5963
Fax: 575-748-9720

From: Yu, Olivia, EMNRD
Sent: Thursday, March 8, 2018 11:15 AM
To: Bratcher, Mike, EMNRD <mike.bratcher@state.nm.us>; Weaver, Crystal, EMNRD <Crystal.Weaver@state.nm.us>
Subject: FW: Legacy Reserves, L.P., 2RP-4490 Antelope Battery & Coyote #1 C-141

Good morning Mike & Crystal:

FYI, if you did not receive an equivalent email. I told them that I do not need to be in communication for this one.

Olivia

From: Sarah Johnson [mailto:SJohnson@laenvironmental.com]
Sent: Wednesday, March 7, 2018 2:26 PM
To: Yu, Olivia, EMNRD <Olivia.Yu@state.nm.us>
Cc: Mark Larson <Mark@laenvironmental.com>; bcunningham@legacylp.com
Subject: Legacy Reserves, L.P., 2RP-4490 Antelope Battery & Coyote #1 C-141

Dear Ms. Yu,

Larson & Associates, Inc. on behalf of the Legacy Reserves, LP. (Legacy) would like to request an update on the Coyote #1 Battery and the Antelope Battery (2RP-4490), in Eddy County, New Mexico. The initial C-141 for the Coyote #1 Battery was submitted to Crystal Weaver in District 2 on January 3, 2018 and submitted to District 1 on January 10, 2018. The delineation plan for the Antelope Battery was submitted to District 2 on December 15, 2018. Please see attached both documents for your review. Please feel free to contact me at (432) 687-0901 or (432) 664-5357 (cell) if you have any questions.

Respectfully,

Sarah Johnson
Staff Geologist
507 N. Marienfeld St., Suite 205
Midland, Texas 79701
Office – 432-687-0901
Cell – 432-664-5357
Fax – 432-687-0456
sjohnson@laenvironmental.com

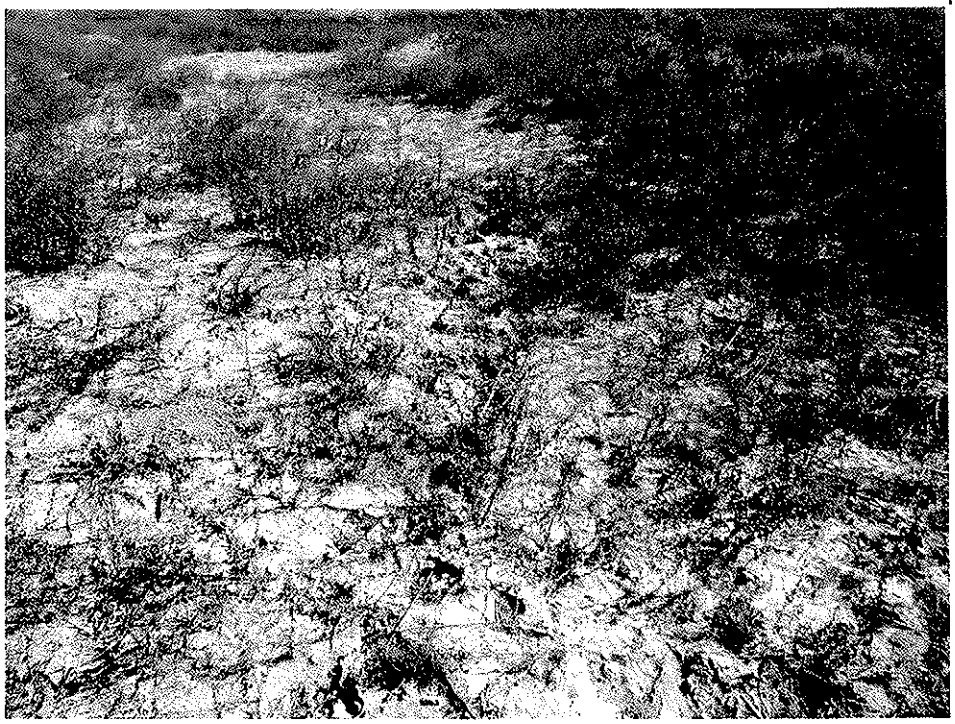
Larson & Associates, Inc.
Environmental Consultants

Appendix B

Photographs

Site Location

Spill Area Viewing East, November 21, 2017



Spill Viewing East, November 21, 2017