

2RP-4490
DELINEATION PLAN
Antelope Tank Battery
Produced Water Spill
Eddy County, New Mexico

Latitude: 32.7884
Longitude: -103.8262

LAI Project No. 17-0175-37

November 28, 2017

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



Sarah R. Johnson
Staff Geologist

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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 New Mexico Oil Conservation Division (OCD) District 2 and State Land Office (SLO) for a produced water spill at the Antelope Tank Battery (Site) located in Unit K (NE/4, SW/4), Section 36, Township 17 South, Range 31 East in Eddy County, New Mexico. The geodetic position is 32.7884 North and -103.8262 West. Figure 1 presents a topographic map. Figure 2 presents an aerial map.

1.1 Background

The spill occurred on October 1, 2017, due to a ruptured poly flow line allowing for the release of approximately 15 to 20 barrels (bbl) of produced water to be released. Approximately 7 bbl were recovered. The fluids migrated east of the tank battery into the pasture. The flow line was shut-in and repaired. The affected area measures approximately 2,600 square feet. The initial C-141 was submitted on November 7, 2017 and assigned remediation permit number 2RP-4490. 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 topography slopes gently towards the southwest;
- The nearest surface water feature is a seasonal playa about 685 feet south 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 sand;
- The surface geology is designated as Eolian and piedmont deposits (Holocene to middle Pleistocene)- interlayered eolian sands and piedmont-slope deposits;
- Groundwater occurs in the Ogallala formation at approximately 454 feet below ground surface (bgs) (1994);
- The nearest freshwater well is located in Unit P (SE/4, SE/4), Section 1, Township 18 South, Range 31 East about 1.40 miles southeast of the Site.

1.3 Recommended Remediation Action Levels

Recommended 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	200 – 1,000 Horizontal Feet	10

The following RRAL apply to the release for ranking score: 10

- Benzene 10 mg/Kg
- BTEX 50 mg/Kg
- TPH 1,000 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 a depth of approximately 4 feet bgs and at 2 foot intervals to a depth of approximately 12 feet bgs using direct push technology (DPT) depending on subsurface conditions. Additional soil samples will be collected in each cardinal direction (north, south, east and west) of the lined containment at the same depth intervals for horizontal delineation. The soil samples will be delivered under chain of custody and preservation to Permian Basin Environmental Lab (PBEL) in Midland, Texas, and analyzed for benzene, toluene, ethylbenzene and xylenes (BTEX), total petroleum hydrocarbons (TPH), including gasoline range organics (GRO), diesel range organics (DRO) and oil range organics (ORO) and chloride by EPA SW-846 Methods 8021B, 8015M and 300 respectively. Pending laboratory results, further delineation may be required to reach cleanup level standards. Figure 2 presents a site map showing proposed soil sample locations. Appendix B presents photographs.

3.0 REMEDIATION PLAN

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

Figures

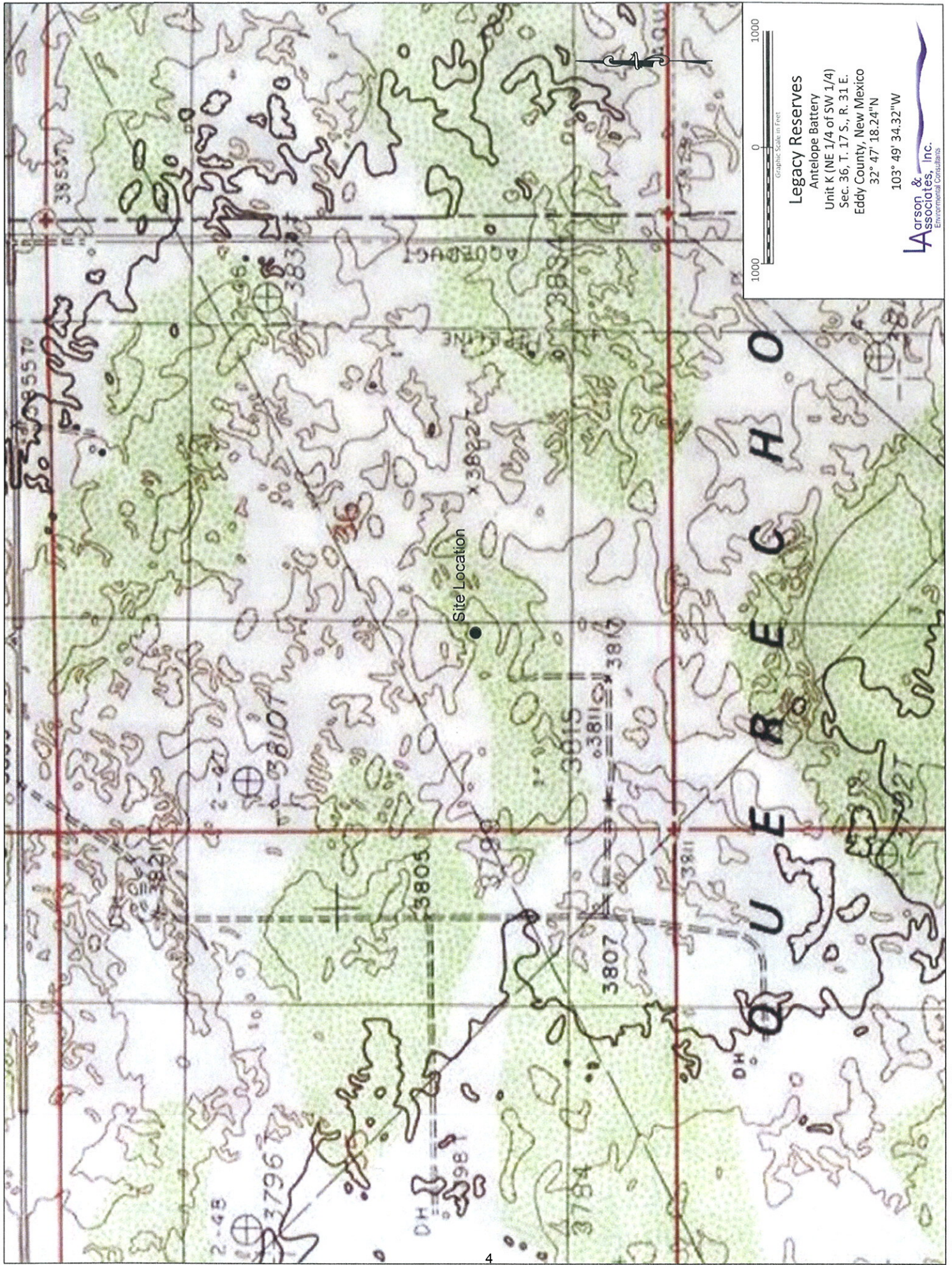


Figure 1 - Topographic Map



Figure 2 - Aerial Map Showing Proposed Sample Location

Appendix A

Initial C-141

NM OIL CONSERVATION
ARTESIA DISTRICT

NOV 16 2017

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

RECEIVED Copy to appropriate District Office in accordance with 19.15.29 NMAC.

Release Notification and Corrective Action

NAB1732-448948 **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: Antelope Tank Battery **Antelope 36 St. Com #1** Facility Type: Tank Battery

Surface Owner: State of New Mexico **(SLO)** Mineral Owner **State (SLO)** API No. 30-015-32040

LOCATION OF RELEASE

Unit Letter K	Section 36	Township 17S	Range 31 E	Feet from the 1650	North/South Line South	Feet from the 1650	East/West Line West	County Eddy
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Latitude 32.7884 Longitude -103.8262

NATURE OF RELEASE

Type of Release: Produced Water	Volume of Release: ~15-20 bbl	Volume Recovered ~7 bbl
Source of Release: Poly Flow Line	Date and Hour of Occurrence Oct. 1, 2017 6:00 am	Date and Hour of Discovery Oct. 1, 2017 7:30 am
Was Immediate Notice Given? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Required	If YES, To Whom? N/A	
By Whom? N/A	Date and Hour: N/A	
Was a Watercourse Reached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If YES, Volume Impacting the Watercourse: N/A	
If a Watercourse was Impacted, Describe Fully.* N/A		
Describe Cause of Problem and Remedial Action Taken.* A ruptured poly flow line allowed for the release of approximately 15 to 20 barrels (bbl) of produced water to flow east of the tank battery into the pasture. The flow line was shut-in and repaired. The affected area measures approximately 30 x 100 feet. A vacuum truck was used to recover approximately 7 bbl of standing fluid that was returned to the battery.		
Describe Area Affected and Cleanup Action Taken.* Larson & Associates, Inc., will prepare a plan to delineate spill for OCD approval. A delineation report with remediation plan will be submitted to OCD for approval prior to remediating spill. The State of New Mexico State Land Office, as land owner, will be included on the submissions to the OCD.		

Past due
C-141
Initial

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOC'D 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 NMOC'D 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, NMOC'D 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: <i>Brian Cunningham</i>	OIL CONSERVATION DIVISION	
Printed Name: Brian Cunningham	Approved by Environmental Specialist <i>[Signature]</i>	
Title: Production Foreman	Approval Date: 11/20/17	Expiration Date: N/A
E-mail Address: bcunningham@legacylp.com	Conditions of Approval: <i>see attached</i>	Attached: <i>22094490</i>
Date: October 3, 2017 Phone: 432-234-9450		

* Attach Additional Sheets If Necessary

Operator/Responsible Party,

The OCD has received the form C-141 you provided on **11/16/17** regarding an unauthorized release. The information contained on that form has been entered into our incident database and remediation case number 22P-4490 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 12/16/17. 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; C₆ thru C₃₆), 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; C₆ thru C₃₆), 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: Mark Larson <Mark@laenvironmental.com>
Sent: Friday, November 17, 2017 6:47 AM
To: Weaver, Crystal, EMNRD
Subject: Re: Initial C-141, Legacy Reserves, LP, Antelope Battery Spill, EddyCounty, New Mexico

Crystal,

Was sent by accident to Olivia Yu at District 1! Ms. Yu was out for 2 weeks and responded yesterday. Entirely my fault!
Mark

Sent from my iPhone

On Nov 16, 2017, at 5:57 PM, Weaver, Crystal, EMNRD <Crystal.Weaver@state.nm.us> wrote:

Thanks Mark.

This one is pretty old. Any particular reason for the delay?

From: Mark Larson [<mailto:Mark@laenvironmental.com>]
Sent: Thursday, November 16, 2017 4:27 PM
To: Bratcher, Mike, EMNRD <mike.bratcher@state.nm.us>; Weaver, Crystal, EMNRD <Crystal.Weaver@state.nm.us>
Subject: FW: Initial C-141, Legacy Reserves, LP, Antelope Battery Spill, Eddy County, New Mexico

Mike/Crystal,

Please see attached initial C-141 for a spill that occurred at the Legacy Reserves, L.P., Antelope Battery in Eddy County, New Mexico. Please contact me if you have questions.

Thank you,
Mark J. Larson, P.G.
President/Sr. Project Manager
507 N. Marienfeld St., Suite 205
Midland, Texas 79701
Office – 432-687-0901
Cell – 432- 556-8656
Fax – 432-687-0456
mark@laenvironmental.com

<image001.jpg>

“Serving the Permian Basin Since 2000”

Weaver, Crystal, EMNRD

From: Yu, Olivia, EMNRD
Sent: Thursday, November 16, 2017 4:16 PM
To: Weaver, Crystal, EMNRD; Bratcher, Mike, EMNRD
Subject: FW: Initial C-141, Legacy Reserves, LP, Antelope Battery Spill, Lea County, New Mexico
Attachments: Signed C-141, October 3, 2017.pdf

This one is yours. Just across the line in District 2.

Thanks,
Olivia

From: Mark Larson [mailto:Mark@laenvironmental.com]
Sent: Tuesday, November 7, 2017 1:59 PM
To: Yu, Olivia, EMNRD <Olivia.Yu@state.nm.us>; 'bcunningham@legacyp.com' <bcunningham@legacyp.com>
Cc: Sarah Johnson <SJohnson@laenvironmental.com>
Subject: Re: Initial C-141, Legacy Reserves, LP, Antelope Battery Spill, Lea County, New Mexico

Dear Ms. Yu,
The attached C-141 (initial) is submitted to the New Mexico Oil Conservation Division (OCD) on behalf of Legacy Reserves, LP, for a produced water spill at the Antelope Tank Battery located in Unit K (NE/4, SW/4), Section 36, Township 17 South, Range 31 East, Lea County, New Mexico. The longitude and latitude are N32.7884° and W103.8262°. Larson & Associates, Inc. (LAI) will submit a delineation plan following receipt of the remediation permit (1RP) number. Please contact Brian Cunningham with Legacy at (432) 234-9450 or me if you have questions.
Respectfully,

Respectfully,

Mark J. Larson, P.G.
President/Sr. Project Manager
507 N. Marienfeld St., Suite 205
Midland, Texas 79701
Office – 432-687-0901
Cell – 432- 556-8656
Fax – 432-687-0456
mark@laenvironmental.com



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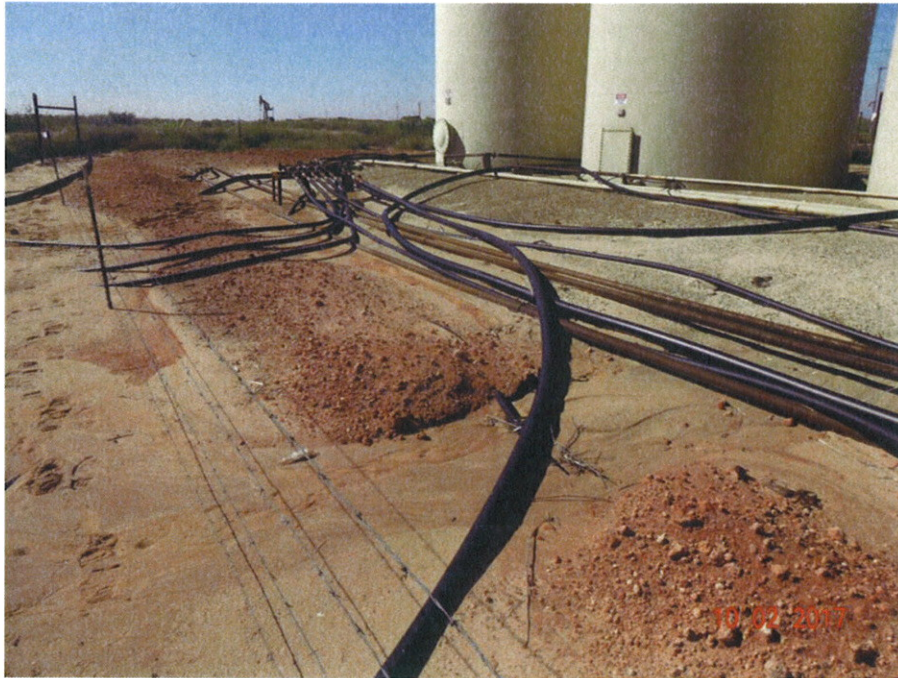
Appendix B
Photographs



Site Prior to Remediation Viewing North



Site Prior to Remediation Viewing Northeast



Site Prior to Remediation Viewing South



Site Prior to Remediation Viewing East

2RP-4490
Antelope Battery
November 28, 2017



Site Prior to Remediation Viewing Southeast