INFORMATION ONLY

1RP-4723
DELINEATION PLAN
East Caprock SWD Well #5
Produced Water Spill

Lea County, New Mexico

Latitude: N33° 16' 59.80"
Longitude: W103° 41' 13.20"

LAI Project No. 17-0158-01

June 21, 2017

Prepared for:

Paladin Energy Corporation
10290 Monroe Drive, Suite 301
Dallas, Texas 75229

Prepared by:

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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

This delineation plan is submitted to the New Mexico Oil Conservation Division (OCD) District 1 on behalf of Paladin Energy Corporation (Paladin) for a produced water spill at the East Caprock SWD Well #5 (Site). The legal description is Unit B (NW/4, NE/4), Section 14, Township 12 South, Range 32 East, in Lea County, New Mexico. The geodetic position is north 33° 16' 59.80" and west 103° 41' 13.20". Figure 1 presents a location and topographic map. Figure 2 presents an aerial map. Figure 3 presents a Site drawing.

1.1 Background

The spill occurred on June 11, 2017, after the poly injection line parted at a valve near well causing a produced water release on location. The spill breeched the berm near the southwest corner of location, allowing produced water to flow east into the pasture approximately 950 feet. Approximately 1,700 bbl of produced water was released with approximately 1,020 bbl recovered. Paladin personnel discovered the release on June 12, 2017. Verbal notification was provided to the OCD District 1, on June 13, 2017. The initial C-141 was submitted to OCD District 1 and approved on June 15, 2017. The release was assigned remediation permit 1 RP-4723 with conditions. Attachment A presents the initial C-141.

The spill occurred in an unlined area near the well. The spill covered the well location measuring about 33,928 square feet and flowed east into the pasture covering an area approximately 90,000 square feet for a total of approximately 122,928 square feet or about 2.82 acres. The injection pump was shut in and water was recovered to allow repairs to the injection line. Soil was pushed up to repair the berm near the southwest corner to contain fluid to the location. Paladin contracted a vacuum truck to recover standing fluid on the well location and return it to tanks. Attachment B presents photographs.

1.2 Physical Setting

The physical setting is as follows:

- Elevation is approximately 4,356 feet above mean sea level (MSL);
- Topography slopes gently toward the east;
- The nearest surface water feature is a playa located about 1,650 feet east of the Site;
- The soils are designated as "Kimbrough Gravelly Loam" and "Kimbrough-Lea complex", consisting of calcareous alluvium derived from reworking the Blackwater Draw (Pleistocene) and Ogallala (Pliocene) formations, in descending order;
- The soil developed over cemented material (caliche);
- The upper geological unit is the Tertiary-age Blackwater Draw and Ogallala formations, in descending order, comprised of very fine to medium-grained quartz sand and gravel, with minor amount of silt and clay with indistinct to massive crossbeds;
- The Ogallala formation is underlain by clay, silty clay, shale and sandstone of the Chinle formation (Triassic) and is about 300 feet thick;

- The nearest fresh water well is located in UnitE (SW/4, NW/4), Section 13, Township 12 South, Range 32 East, about 2,500 feet east - southeast (down gradient) of the Site;
- The well is used for livestock watering and has a reported depth to groundwater of approximately 30 feet below ground surface (bgs).

1.3 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, August 13,* 1993":

Criteria	*Result*	*Score*
Depth-to-Groundwater	<50 feet	20
Wellhead Protection Area	No	0
Distance to Surface Water Body	>1000 Horizontal Feet	0

The following RRAL apply to the release for ranking score: 20

- Benzene 10 mg/Kg
- BTEX 50 mg/Kg
- TPH 1,000 mg/Kg

2.0 DELINEATION PLAN

LAI proposes to use direct push technology (DPT) to collect soil samples at ten (10) locations from the spill plus four (4) locations in each cardinal direction (north, south, east and west) outside the spill for a total of fourteen (14) locations shown on Figure 4. Soil samples will be collected from each location in one foot increments (i.e., 0 to 1, 1 to 2, 2 to 3 feet, etc.) to approximately four (4) foot bgs or refusal on caliche.

The samples will be collected in laboratory containers that will be hand delivered under preservation and chain of custody to an environmental laboratory. The laboratory will analyze the upper sample (0 to 1 foot) for total petroleum hydrocarbons (TPH) by EPA SW-846 Method 8015M, including gasoline range organics (C6 – C12), diesel range organics (>C12 – C28), oil range organics (>C28 – C35). All samples will be analyzed for chloride by EPA Method 300.

If necessary, an air rotary rig will be used to collect additional samples to vertically delineate chloride in soil. Additional samples will be collected at the location reporting the highest chloride concentration above 250 milligrams per kilogram (mg/Kg) in the deepest sample. Additional soil samples will be collected with a jam tube sampler every 5 feet (5, 10, 15 feet, etc.) to approximately 25 feet bgs.

3.0 REMEDIATION PLAN

Paladin will prepare a remediation plan for OCD approval following receipt of the laboratory analysis of delineation soil samples.

Figures

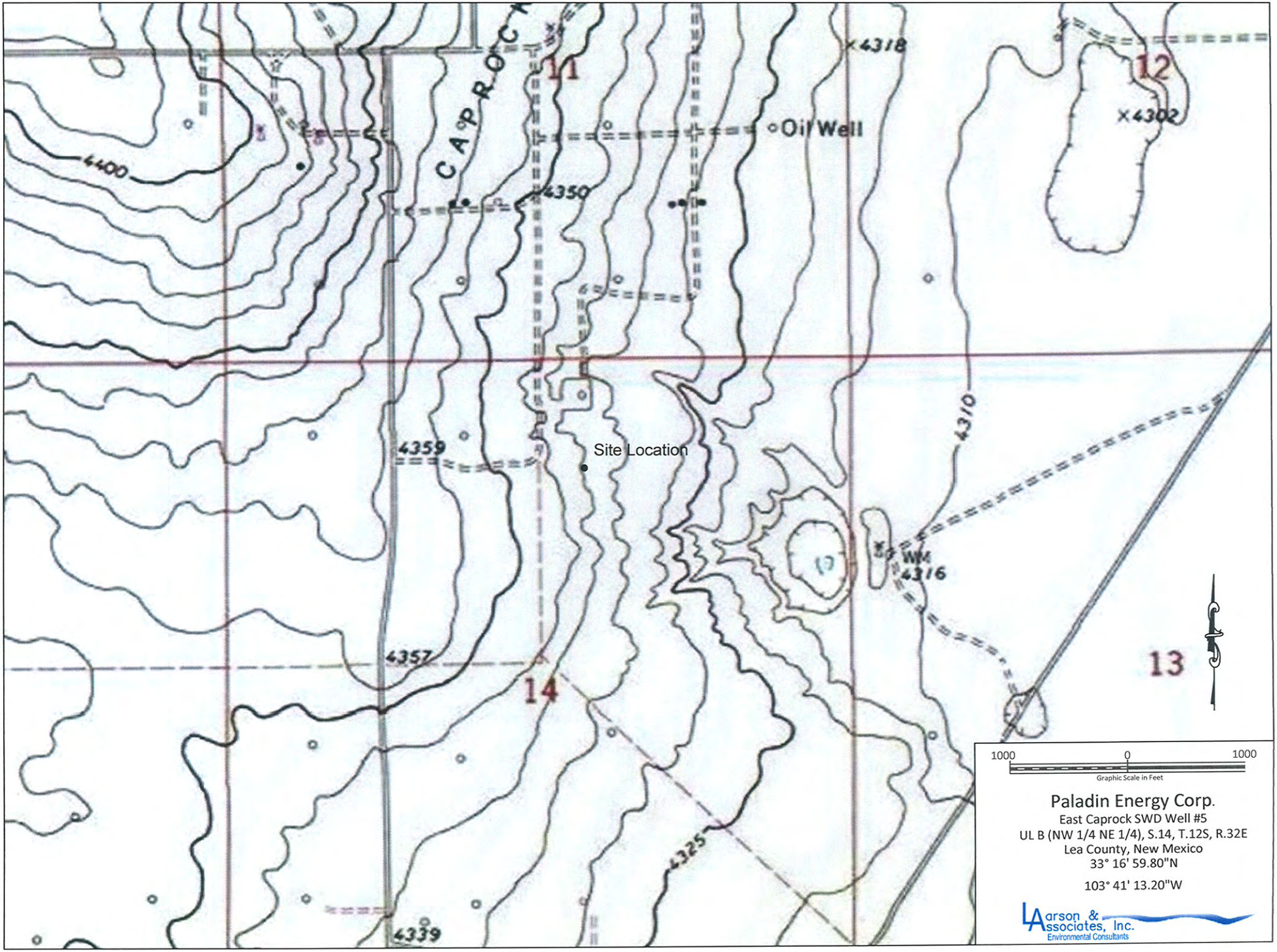


Figure 1 - Topographic Map

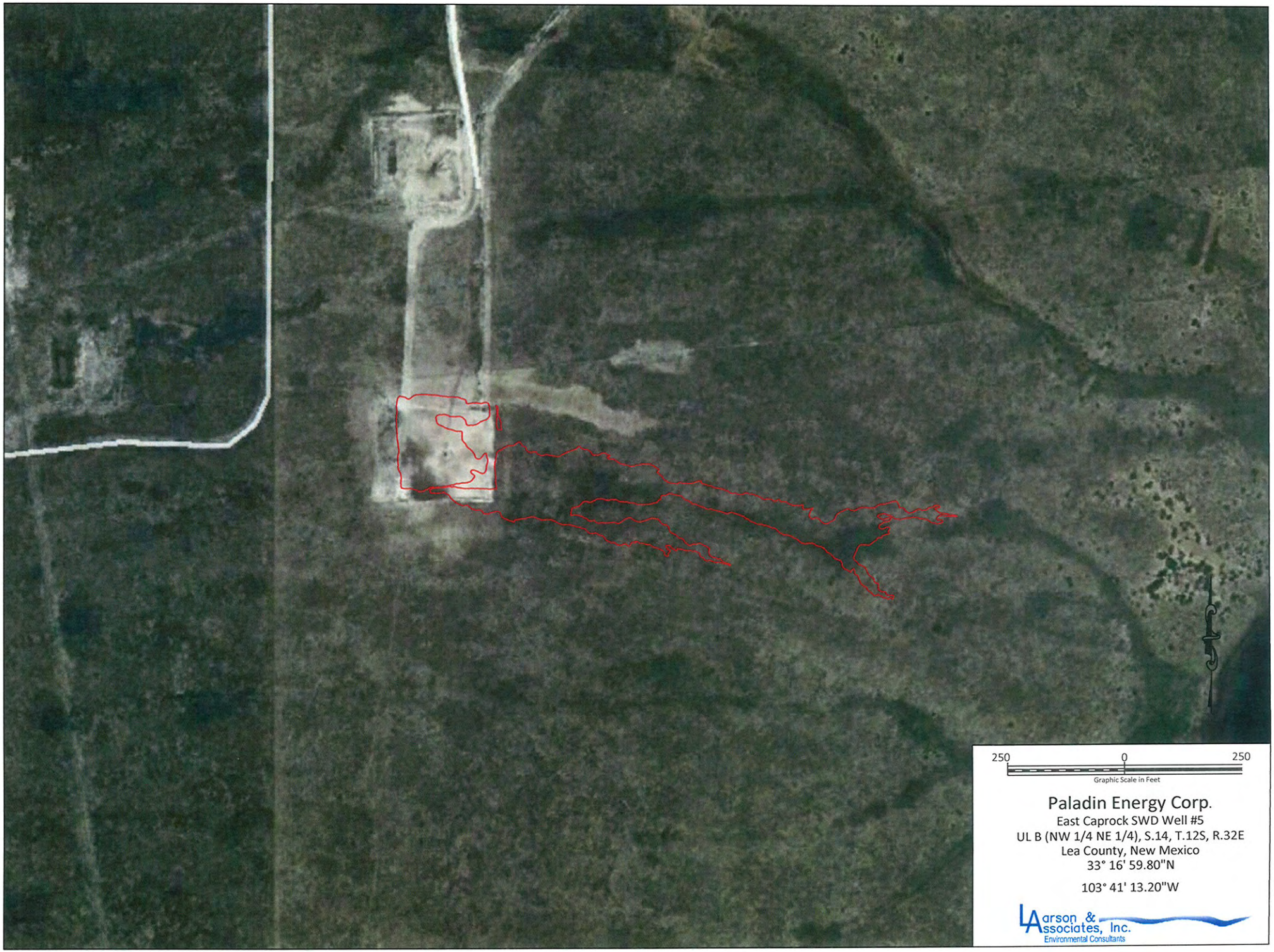


Figure 2 - Aerial Map

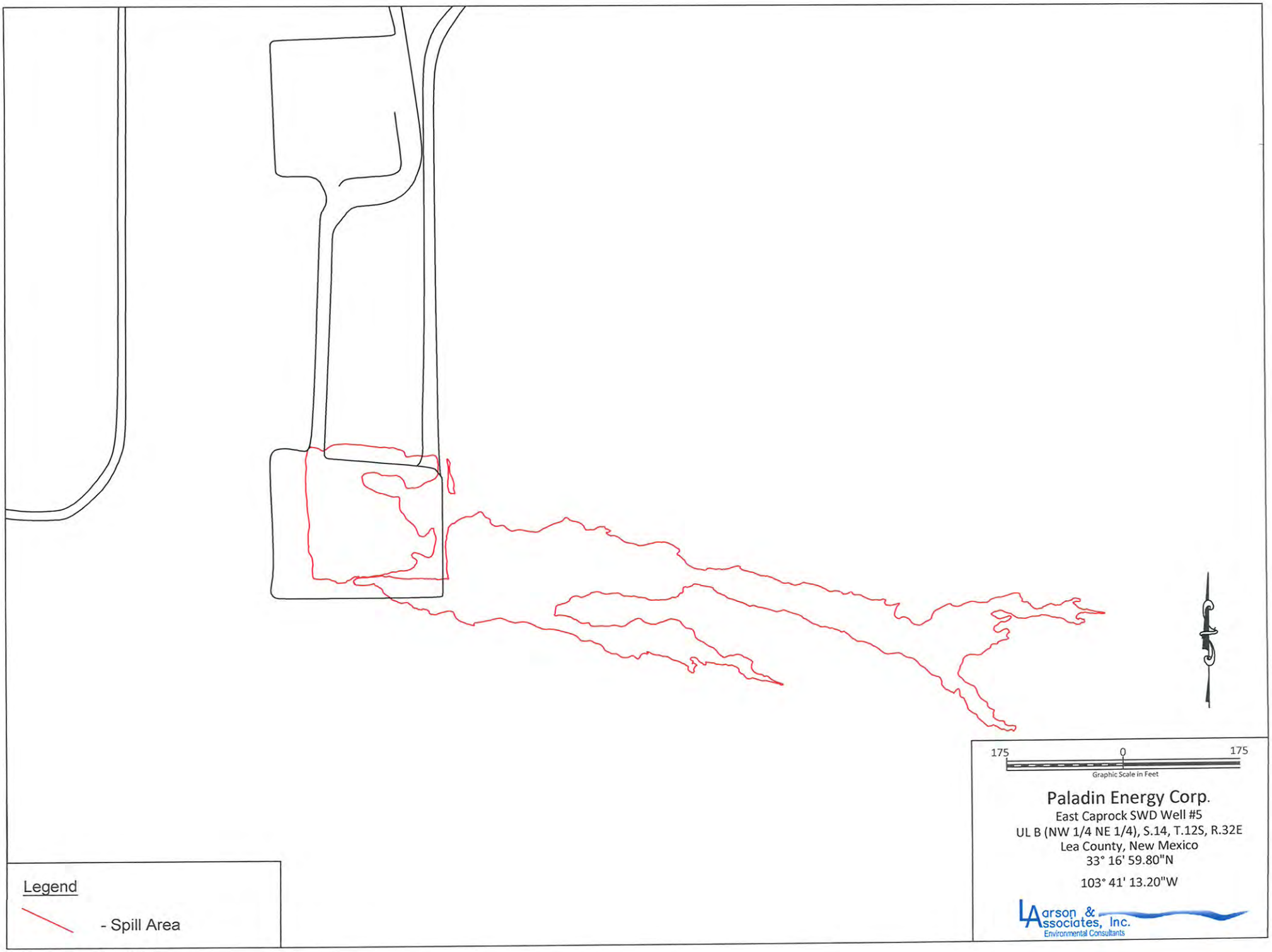


Figure 3 - Site Map

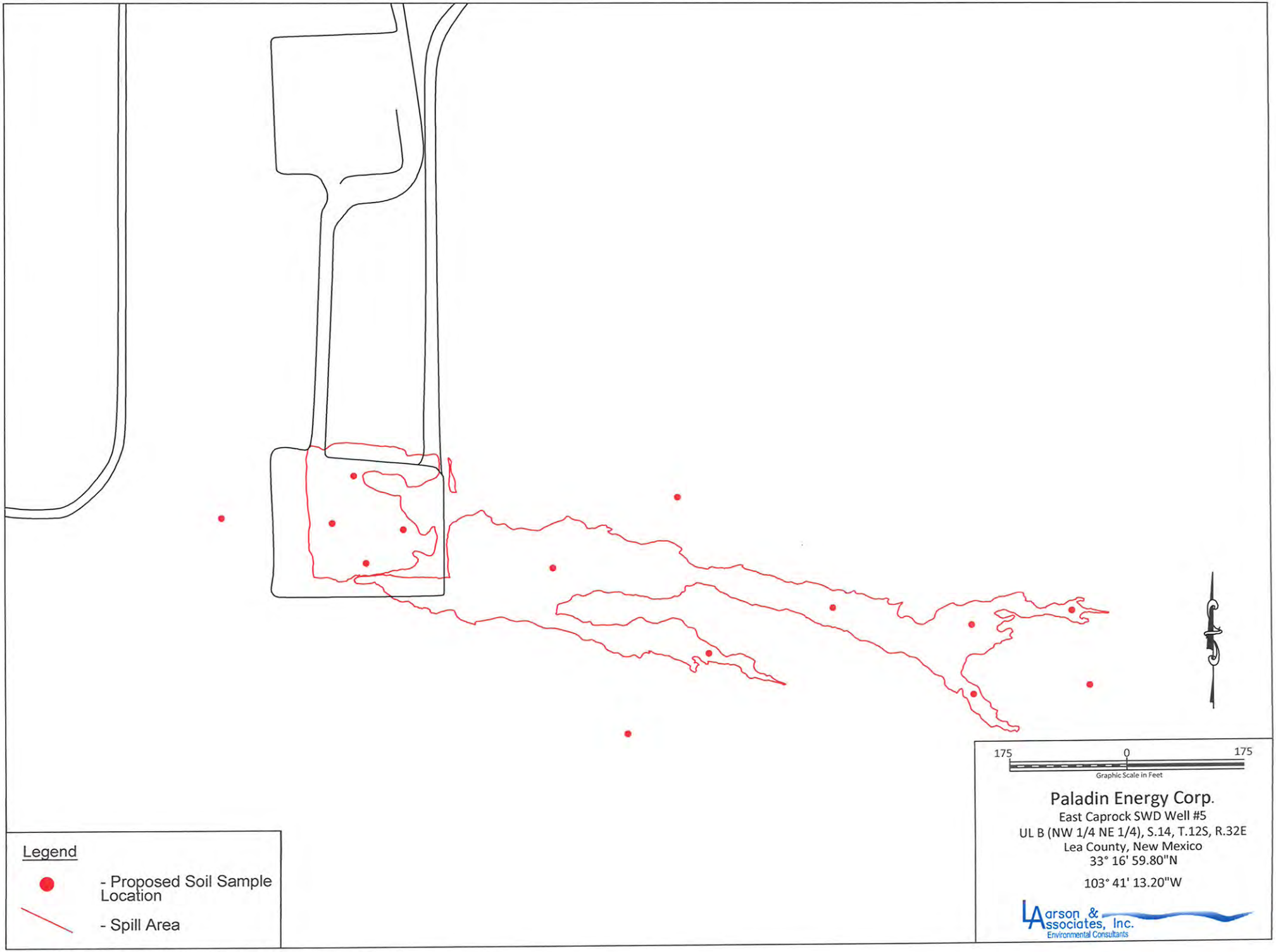


Figure 4 - Proposed Soil Sample Map

Attachment A

Initial C-141

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, 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 October 10, 2003

Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

Release Notification and Corrective Action

OPERATOR

☒ Initial Report ☐ Final Report

Name of Company: Paladin Energy Corporation	Contact: Mickey Horn
Address: 10290 Monroe Drive Suite 301, Dallas, TX 75229	Telephone No.: (214) 352-7273
Facility Name: East Caprock SWD No. 005	Facility Type: SWD Well

Surface Owner: Ricky Pierce	Mineral Owner	Lease No. API No. 3002540335

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
B	14	12S	32E	930	North	2290	East	Lea

Latitude: N33° 16" 59.80" **Longitude: W103° 41' 13.20"**

NATURE OF RELEASE

Type of Release: Produced Water	Volume of Release: 1,700 bbl	Volume Recovered: 1,020 bbl
Source of Release: Poly line parted at valve near well	Date and Hour of Occurrence: 06-11-2017	Date and Hour of Discovery: 06-12-2017; 08:00AM
Was Immediate Notice Given? ☒ Yes ☐ No ☐ Not Required	If YES, To Whom? Olivia Yu, Environmental Specialist, OCD District 1	
By Whom? Mickey Horn	Date and Hour 6/13/2017; 09:30AM	
Was a Watercourse Reached? ☐ Yes ☒ No	If YES, Volume Impacting the Watercourse.	
If a Watercourse was Impacted, Describe Fully.*		

RECEIVED
By Olivia Yu at 9:02 am, Jun 15, 2017

Describe Cause of Problem and Remedial Action Taken.* Poly injection line parted at valve near well causing produced water released onto location. Spill breached berm near southeast corner of location allowing produced water to flow east into pasture approximately 950 feet. Injection pump was shut-in and berm repaired to contain fluid to location. Vacuum truck was dispatched to recover standing fluid on location.

Describe Area Affected and Cleanup Action Taken.* Affected area on location is approximately 33,928 square feet. Affected area east of location is approximately 90,000 square feet for a total of approximately 122,928 square feet. Approximately 1,020 bbl of produced water was recovered and returned to tanks. Affected area will be delineated to determine remediation.

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:	OIL CONSERVATION DIVISION
Printed Name: George G. Fenton	Approved by District Supervisor:
Title: President	Approval Date: 6/15/2017 Expiration Date:
E-mail Address:	Conditions of Approval: see attached directive Attached ☑
Date: 06-13-2017 Phone: (214) 654-0132	

* Attach Additional Sheets If Necessary

1RP-4723 nOY1716632697 pOY1716633006

Operator/Responsible Party,

The OCD has received the form C-141 you provided on _6/13/2017_ regarding an unauthorized release. The information contained on that form has been entered into our incident database and remediation case number _1RP-4723__ 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 _1_ office in __Hobbs____ on or before _7/15/2017_. 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.

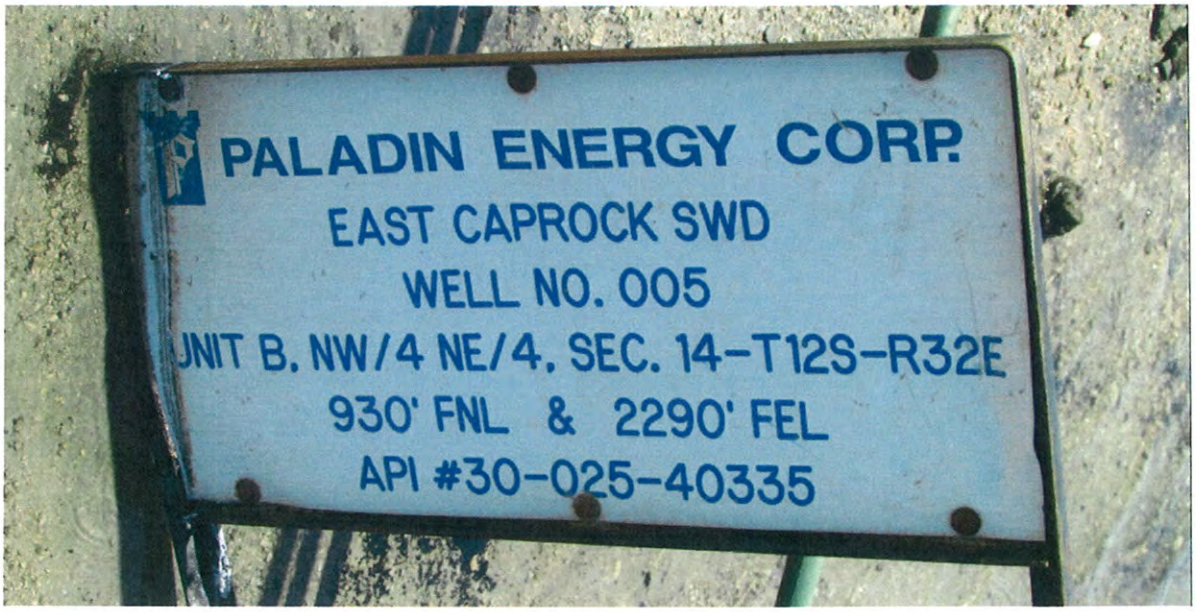
• Accurately scaled and well-drafted site maps must be provided providing the location of borings, test pits, monitoring wells, potentially impacted areas, and significant surface features including roads and site infrastructure that might limit either the release characterization or remedial efforts. 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

Attachment B

Photographs



Location Sign

Spill Area near Southwest Corner of Well Pad Viewing North, June 12, 2017

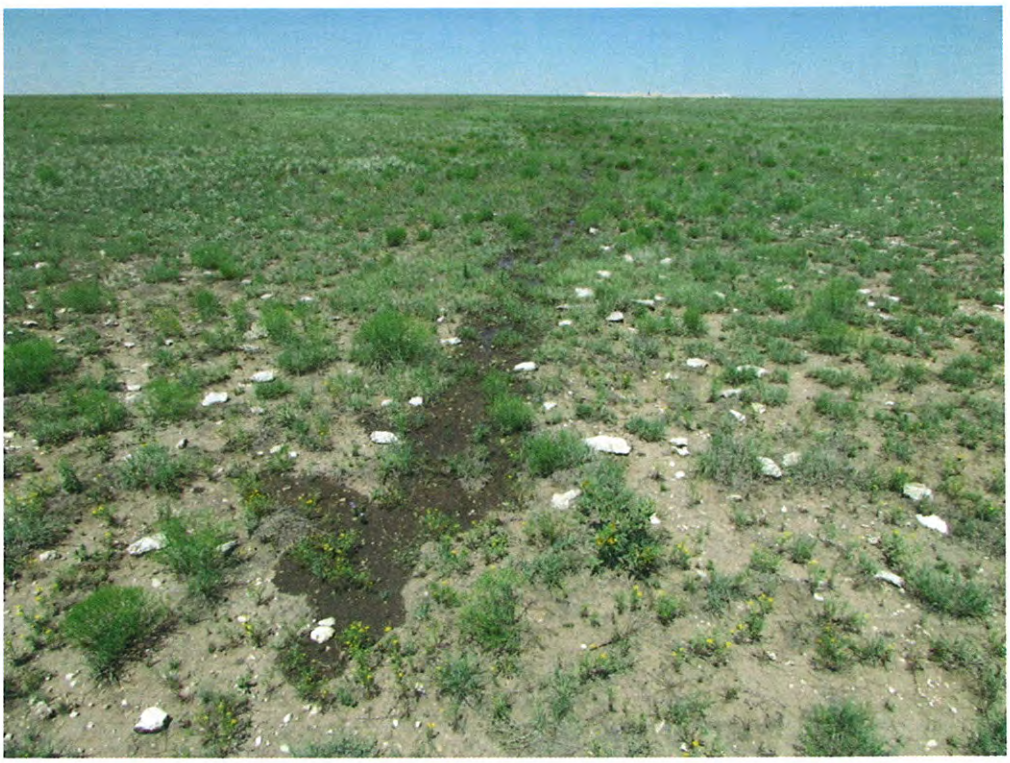
Spill Area West of Well Viewing South, June 12, 2017

Spill Area South of Well Viewing East, June 12, 2017

Spill Area East of Location Viewing West, June 12, 2017

Spill Area East of Location Viewing East, June 12, 2017

Spill Area East of Location Viewing East, June 12, 2017



Spill Area East of Location Viewing West, June 12, 2017

Spill Area South of Location Viewing East, June 20, 2017

Spill Area East of Location Viewing East, June 20, 2017

Spill Area East of Location Viewing East, June 20, 2017