APPROVED
By Olivia Yu at 2:43 pm, Sep 21, 2017

NMOCD approves of the proposed delineation plan for 1RP-4732 and 1RP-4738. Permissible chloride level of 600 mg/kg is granted for vertical and horizontal delineation.

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ENVIRONMENT

Subject:
Work Plan for Site Assessment and Liner Inspection
Warren State #1 Production Facility
OMNCD Remediation Case Numbers: 1RP-4732 and 1RP-4738
Lea County, New Mexico

Date:
September 11, 2017

Contact:
Colin Melson

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Our ref:
TX001562.0001

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Dear Mr. Griswold:

On behalf of Marathon Oil Company (Marathon), Arcadis U.S., Inc. (Arcadis) has prepared this work plan to assess current soil conditions and to inspect the secondary containment liner to confirm that it will contain liquids at the Warren State #1 Production Facility (the Site). The Site is located approximately 1.75-mile east-northeast of the intersection of S. Prairie View Road and Midway Road in eastern Lea County, New Mexico (**Figure 1**).

BACKGROUND

On June 6, 2017, the high-level switch on the produced water tank at the Site was manually bypassed which prevented the produced water from the Warren State #1 well (30-025-34034) to be pumped to a nearby injection well. Because of the manual bypass, the 500-barrel (bbl) produced water tanks at the Site were overfilled, and 200-bbls of produced water were released to secondary containment. The released fluids were recovered using a vacuum truck and were transported offsite for disposal.

Following the previous release to secondary containment, a second release occurred at the Site on June 9, 2017. Approximately 200-bbls of produced water were released and overflowed the secondary containment structure into a pasture. Approximately 1,000-bbls were recovered from the secondary containment structure via vacuum truck and disposed offsite. The incident is under investigation, and the exact cause has not yet been determined.

Marathon notified the NMOCD of each release incident via submittal of the Release Notification and Corrective Action Form C-141. NMOCD assigned remediation case numbers 1RP-4732 and 1RP-4738 to the two spills, respectively.

SCOPE OF WORK

Based on the Release Notification and Corrective Action Form C-141 for each spill event, the liner of the secondary containment and current condition of subsurface soils requires evaluation. The following site assessment will be performed in accordance with New Mexico Administrative Code 19.15.30 NMAC.

Task 1 – Site Assessment

Task 1a - Liner Inspection

Arcadis will inspect the liner integrity within the secondary containment structure to confirm it will continue to contain liquids. It is understood that the current liner system consists of a high-density polyethylene (HDPE) liner overlain with gravel. Soft dig methods (hand shovels) will be employed to expose the liner in targeted locations to determine if breakthrough or tearing of the liner has occurred. The inspection will focus on walkways or high foot traffic areas, adjacent to system or equipment footings, along seams, and in low spots. Photographic documentation of the exposed/inspected area will be collected. The exposed areas will be restored to original condition post inspection.

Task 1b - Soil Assessment – Hand Auger

A New Mexico One Call Locate Request will be placed at a minimum of 48 hours prior to commencing field activities to help identify any public utility alignment that may be in conflict with the proposed sampling. Upon completion of utility clearance, four soil borings will be advanced outside of the release area and four secondary soil borings will be advanced within the release area using a hand auger at the locations depicted on **Figure 2** (i.e. secondary containment structure and spill area) to assess current soil conditions. Soils will be screened for organic vapors using photo-ionization detector (PID), logged for lithology, and soil samples will be collected for analysis. A chloride EC meter or test strips will be used to determine which samples will be selected for laboratory analysis. The soil samples selected for chemical analysis will be collected and submitted for analysis in accordance with the soil sampling procedures discussed in the sections below.

The total depth of the hand auger soil borings are not anticipated to exceed 10 feet below ground surface due to the nature of the soil conditions in the area. It should be noted that the geology in southeast New Mexico does not always allow for hand auger borehole advancement with refusal commonly occurring within 18 inches of surface. The assessment activities described below will commence if refusal is met within the first 18 inches of surface.

Task 1c - Soil Assessment – Drilling Rig Option, if needed

If refusal is encountered in the hand auger borings within the first 18 inches, a private utility contractor will be subcontracted to aid in identification of any subsurface lines in and around the site using Ground Penetrating Radar (GPR) and radio detection. This subsurface line locate will be used in conjunction with

the New Mexico One Call Locate Request. Sample locations may require field modification due to onsite utility locations and/or field conditions.

The field crew will attempt air-knifing or hydro-vac to clear borehole locations from surface grade to a depth of four feet to further reduce the potential to hit buried utilities. Once cleared, the initial four soil borings will be advanced into the subsurface as shown on **Figure 2**, in areas outside of the release area where visible signs of the release (i.e., stressed vegetation or surface staining) are observed. The total borehole depths are assumed not to exceed 30 feet below ground surface (ft bgs). Up to four secondary soil borings will be advanced in the areas where visible signs of the release (i.e., stressed vegetation or surface staining) are observed downgradient of the secondary containment (**Figure 2)**. This area is anticipated to be located northeast of the tank battery based on information provided by Marathon personnel. If visual observations of staining or stressed vegetation are not identified, the secondary borings will be placed approximately 25 feet laterally from any boring in which field screening readings are observed in the primary soil borings. Soil cores will be screened for organic vapors using a PID and chlorides using a EC meter and logged for lithology and soil samples collected for analysis as appropriate. The soil samples selected for chemical analysis will be collected and submitted for analysis in accordance with the soil sampling procedures discussed in the sections below.

A review of the New Mexico Water Rights Reporting System online database indicates the depth to groundwater within a ½-mile radius of the Site is approximately 51 feet bgs. Groundwater was reported at a depth of 41 feet bgs in a water well located within 1,000 feet of the release area. Additionally, except for small seasonal playa type lakes and stock ponds in the general area, no significant surface water bodies are present within one mile of the Site. Shallow groundwater is not anticipated to be encountered while drilling. A review of historical aerial photographs of the Site do not indicate the presence of historical releases at the Site. As such Marathon requests a variance that the permissible chloride limit of 600 mg/Kg be established at this Site for vertical delineation purposes. A temporary groundwater monitoring well may be installed and sampled per NMOCD regulations in the event groundwater is observed while drilling or if chloride concentrations are indicated at depth exceeding permissible limits.

The coordinates of each soil boring location will be identified in the field using a hand-held global positioning system (GPS), and any surface staining will additionally be mapped using a GPS in support of report preparation. After completion of the field drilling activities, soil cuttings from each boring will be containerized in DOT-approved drums for later disposal at a Marathon-approved facility.

Soil Sampling Procedures

As discussed above, Marathon requests a variance to allow the permissible chloride limit of 600 mg/Kg for both vertical and horizontal delineation at the Site. Horizontal delineation to the permissible chloride limit of 600 mg/Kg must be maintained in sample locations spaced less than 50 feet apart. Soil samples will be field screened using chloride to assist in the soil sample collection process. Three samples will be collected from each soil boring advanced in support of Task 1b or 1c for laboratory analysis as follows:

- One sample will be collected from the 0 to 2 ft depth interval,
- the second sample will be collected from either the mid depth interval or the first interval indicating chlorides below permissible levels (600 mg/Kg) by field screening, and
- A third sample collected from the terminus of the soil boring to demonstrate horizontal delineation, with expected depth to be greater than 5 feet deeper than the second sample.

Permissible values for benzene (10 mg/Kg), total BTEX (50 mg/Kg) and TPH extended range (100 mg/Kg) will be maintained for a minimum of 2 feet below the deepest sample meeting the permissible range.

A groundwater monitoring well will be installed in the event groundwater is encountered within 30 feet bgs, or field screening for chlorides indicate chloride concentrations exceed the permissible limits at the boring terminus. One soil boring in the downgradient of the release will be developed as a groundwater water well.

A total of twenty-four soil samples will be collected with the secondary borehole location samples placed on hold pending analytical results from the primary borehole samples. Additionally, two quality assurance and quality control (QA/QC) soil samples will be collected from the soil borings as follows:

- One QA/QC sample will be collected from the deepest sample, and
- One QA/QC sample will be collected from the soil boring located farthest from the point of release.

An aliquot of soils selected for laboratory analysis will be field-screened for chloride by either using a handheld chloride EC meter or mixing the soil with distilled water and testing the rinsate using Hach chloride test strips to measure chloride concentrations in milligrams per liter (mg/L).

Soil Laboratory Analyses

The soil samples collected for laboratory analysis will be placed in clean, laboratory-supplied sample containers and submitted to Xenco Laboratories, Inc. in Midland, Texas (Xenco) under chain-of-custody protocol. The samples will be analyzed for the following using a standard two-week turnaround time:

- Benzene, toluene, ethylene, and xylenes (collectively referred to as BTEX) by EPA Method 8260B,
- Gasoline Range Organics, Oil Range Organics, and Diesel Range Organics (GRO, ORO, and DRO) by EPA Method 8015M,
- Chloride by EPA Method 300, and
- Percent moisture by Standard Method (SM) 2540B.

Task 2 – Reporting

Results of the site assessment will be compiled in a report including the final laboratory and field testing data, and relevant laboratory chain of command documentation will be submitted to the NMOCD. The report will include site maps, sample locations, and photographs, as appropriate. Should additional assessment or remediation be warranted, Arcadis will prepare a follow up work plan.

SCHEDULE

Arcadis anticipates beginning field work once agency approval has been received. It is estimated that field work will take one day if hand auger sampling is successful and three days if an air rotary drilling rig is necessary. Analytical results are anticipated to be received within 10 business days of submittal to the analytical laboratory upon completion of the field work. A final report will be prepared for submittal to the NMOCD.

CLOSING

Marathon and Arcadis appreciate your assistance on this project. If you have any questions regarding this work plan, please do not hesitate to contact Ms. Wendy Gram with Marathon at (713) 296-2862.

Sincerely,

Arcadis U.S., Inc.

Colin Melson, P.G.
Senior Geologist

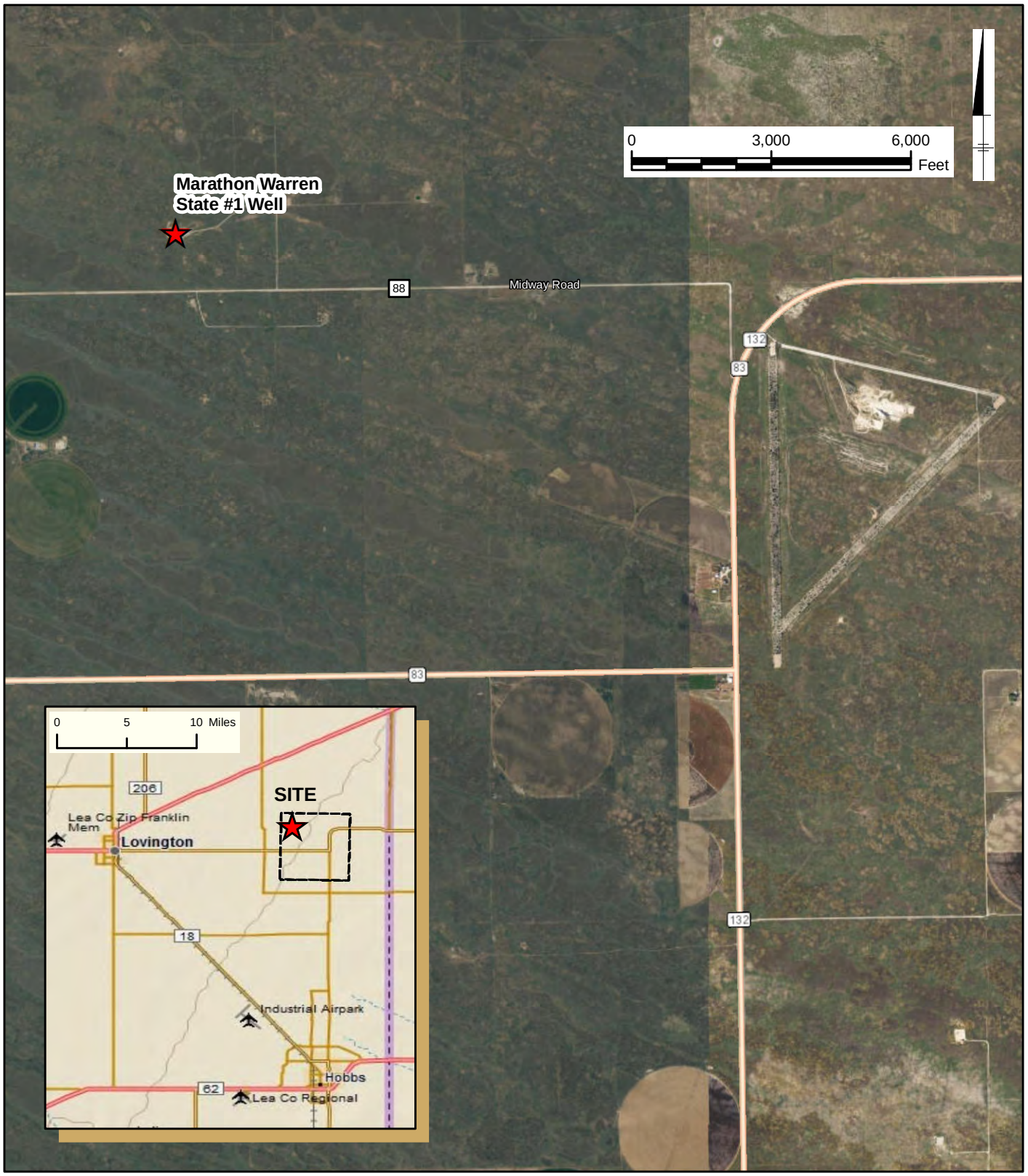
Copies:
Wendy Gram – Marathon Oil Company
Mr. Jim Griswold – NMOCD
Ryan Mueller – Arcadis

Enclosures:

Figures

1 Site Location Map

2 Proposed Soil Boring Map



MARATHON OIL COMPANY
LEA COUNTY, NEW MEXICO
WARREN STATE #1 WELL PRODUCTION FACILITY

SITE LOCATION MAP

July 2017

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FIGURE 1

Ground Condition Depicted 5/11/2016
Digital Data Courtesy of USDA, NAIP

City: Houston Div/Group: Remediation West -Air Group Created By: W Berry Last Saved By: wberry ; Client (Project #)
D:_Arcadis\Land Services\Marathon\WarrenState\Warren_SLM.mxd 7/17/2017 4:47:57 PM

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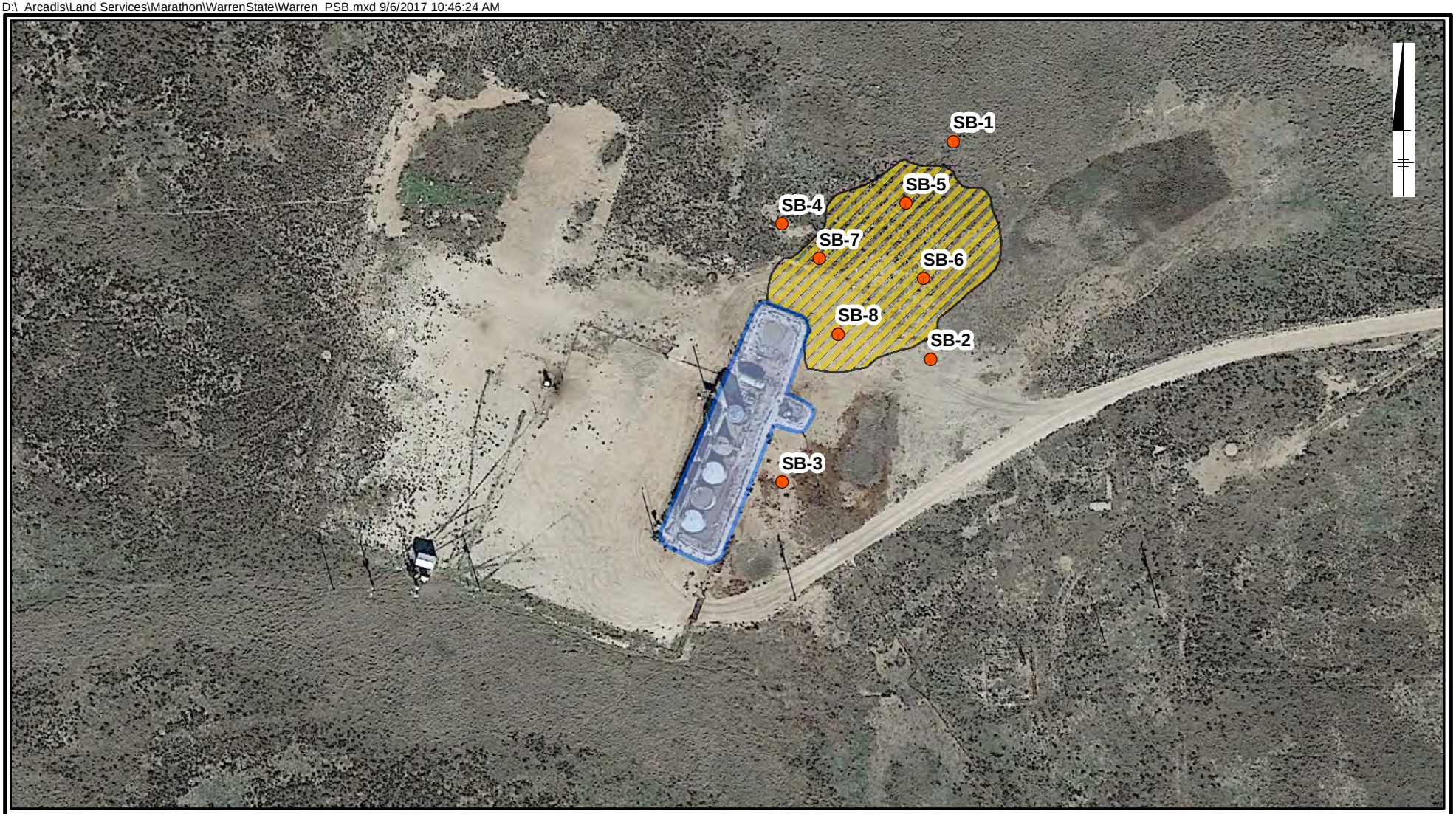

0 100 200 Feet

GRAPHIC SCALE

LEGEND:

- Proposed Soil Boring
- Secondary Containment Structure
- Spill Area

Ground Condition Depicted 11/22/2016
Digital Data Courtesy of Google Earth

NOTE:
"Secondary" soil borings locations will be selected based on field observations.

MARATHON OIL COMPANY
LEA COUNTY, NEW MEXICO
WARREN STATE #1 WELL PRODUCTION FACILITY

PROPOSED SOIL BORINGS

September 2017

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FIGURE 2