INFORMATION ONLY

Environmental & Safety Solutions, Inc.

Electronic Correspondence

December 12, 2017

Ms. Olivia Wu
Environmental Specialist
State of New Mexico
Oil Conservation Division (NMOCD)
1625 N. French Drive
Hobbs, NM 88240
Olivia.wu@state.nm.us

Re: Proposed Revision to Approved Corrective Action Plan
Endeavour Energy – NC State #1
Average Depth to Groundwater: 226 Feet (USGS)
Lea County, NM
API No. 30-025-28695
Latitude: 32.962310, Longitude: -103.747950
RP No.: 1RP-4710

Dear Ms. Wu:

Etech Environmental & Safety Solutions, Inc. (Etech) was been contracted by Endeavour Energy (Endeavour) to provide environmental services including mitigation on the NC State #1 produced water release RP#: 1RP-4710. As a part of the move towards completion of mitigation, Etech has performed a review of the previously approved corrective action plan of the site and subsequently proposed in a meeting with you at the NMOCD Hobbs Office on March 14, 2018. Since the meeting was only verbal between you and me, it was requested a more formal submittal be made with other documentation needed and then we could include a representative from the State Land Office (SLO). A quick summary of the meeting and details of the proposed corrective action are presented below.

Meeting Summary

It was noted that when the delineation report was submitted, the consultant requested deferral of the site until the facility was abandoned. This was categorically denied by NMOCD and instead conveyed that the impacted area would be excavated to 4 feet, properly disposed of, a properly seated 20 mil liner installed and the excavated area backfilled. In Etech's discussion with Endeavour, it was acknowledged that excavation of and off-site disposal of the impacted soil is needed. However, Etech and Endeavour proposed a different depth for the liner of 2 feet based upon previous experience in similar sites. Also, there were issues with practicability of excavating soils underneath poly lines and active steel lines on the pad and leading to the facility from off-site areas. Lastly there were some data gaps on the delineation report submittal including; topographic maps, soil information, alternative groundwater data. At the conclusion of the meeting another meeting would be set for the following week and details on the alternative proposed approach along with missing data from the delineation report would be provided as well.

Topographic Data

A review of topographic data for the area was conducted and found the following:

- The site is situated at approximately 4330 Feet above sea level (ASL).
- The general surface gradient of the area is to the southeast.
- There is a playa lake approximately 1078 feet down gradient from the site.
- There were other playas observed to the north, west and east. However these were well outside of the range of any influence of the site or impacted soils.
- There was a pipeline noted to the south running eastward through the southern portion of the playa then turning diagonally northeast away from the facility.
- Based upon the information from the topography evaluation, NMOCD considers the area to be sensitive.

A copy of the topographic map is provided in Attachment A.

Groundwater Data

A review of data from the USGS was performed. The data found the average depth of water for the area was approximately 226 feet. A copy of the USGS Groundwater Report is provided in Attachment B.

Geology

In the absence of specific geology on the soil borings, data was collected from the United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) web site. The type of soil in which the facility resides is classified as “Kimbrough gravelly loam, dry”.

Properties and qualities:

- Slope: 0 to 3 percent
- Depth to restrictive feature: 4 to 18 inches to petrocalcic
- Natural drainage class: Well drained
- Runoff class: High
- Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
- Depth to water table: More than 80 inches
- Frequency of flooding: None
- Frequency of ponding: None
- Calcium carbonate, maximum in profile: 95 percent
- Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- Sodium adsorption ratio, maximum in profile: 1.0
- Available water storage in profile: Very low (about 1.4 inches)

A copy of the NRCS soil survey report for the site is provided in Attachment C.

Proposed CAP Revision

Goal

It is the intended goal of this plan to protect the migration of any of the impacted soils vertically or horizontally to protect potential groundwater bearing formations and sensitive surface areas.

Technical Approach

Endeavour does concur that the best technical approach for this is the proper installation of a 20 mil liner cap. However it does propose installation of a convex shaped, key-seated liner which is seated below and to the sides of the interface of the liner with the impacted soil at a minimum depth of 2 feet below ground level (bgl). The installation sequence of the liner is as follows:

1. Excavate the impacted soils to 2 feet bgl to establish the vertical base. Sidewalls would have to clear regulatory threshold levels of 650 mg/kg or less.

2. Once achieved, the sidewalls would be expanded further approximately 3 feet. This excavated area would then be stepped down. The first step would be three feet vertically from ground level and 2 foot horizontally from the impacted soil. The step would be slightly rounded or tapered to allow easier installation of the liner.

3. The next phase would be to excavate an area 3 feet horizontally from the impacted soil and 4 feet vertically. This would be the final portion of this area for seating the liner.

4. Following completion of the seat area, the liner would be installed and the 4 foot segment of the key seat backfilled.

5. Approximately 6 inches of sand would then be installed over the liner. This is to act as a pad pending the installation of cover material. Also, at this point the clean fill from excavating the key-seat area would be placed back over the key seat area to within 6 inches horizontally of the impacted soil demark and compacted. Compaction and soil placement would continue until this soil is stabilized.

6. At this juncture, approximately 16 inches of caliche would be installed on top of the sand covered liner in 6 inch lifts, wetted and compacted. The process would be repeated until the compacted caliche reaches at, or slightly above ground level.

7. Note: Any excess clean soil from the key seating would be utilized for additional installation of berms on the south side of the location.

A diagram showing the installation configuration is provided in Attachment D.

Rationale for Technical Approach and Other Considerations

- This approach is highly effective for the prevention of vertical migration of impacted soils and due to its outward and downward extension of the seated liner provides additional protection horizontally.
- It removes the “bowl” effect of seating the liner upward which allows fluids migrating vertically to collect over the capped area.

- There is sufficient depth of the excavation to afford protection and proper compaction ensures a stable cover.
- The installation using this method does not require greater depths of excavation. However, it can be stipulated that once the facility is removed from service, the cap can be excavated and the majority of the impacted soils removed.
- There is also a practicability issue with excavating to 4 feet vertically then seating as described above. Once the reaching a depth of 4 feet below ground surface, then extending further downward to seat the liner, the excavation safety becomes a significant issue due to the nature of the soils in the area. The excavation would have to be sloped a minimum of 7 feet on each side, which in most cases, would not be practicable.
- Another issue of practicability is the area where lines are located. Excavating soil underneath the lines poses a problem. First excavation underneath poly lines presents significant problems in trying to properly shore the lines while excavating. Our experience has taught us that with the comping of warmer temperatures, poly lines tend to sag creating significant strain on them and can cause failure of the line. In addition, the facility will continue to operate while corrective actions are in progress. This means lines tied to the injection system are nearly always in a constant state of vibration. This causes other issues with failure of either type of line or sloughing of excavation sidewalls.
- Also, since the facility will be operational, the excavation and installation of the liner and cap will have to be done in phases. However, each section within a given phase will be linked to the adjoin one by using a 3 foot overlap that is sealed with a waterproof glue applied between the two layers of liner.

Restoration

Once all disposal and capping activities are complete, the areas off of the pad will use a portion of the native soil from adjacent areas and spread over the capped areas. A seed mix approves by the state land office will be broadcast over these areas to assist in proper growth of vegetation in these areas.

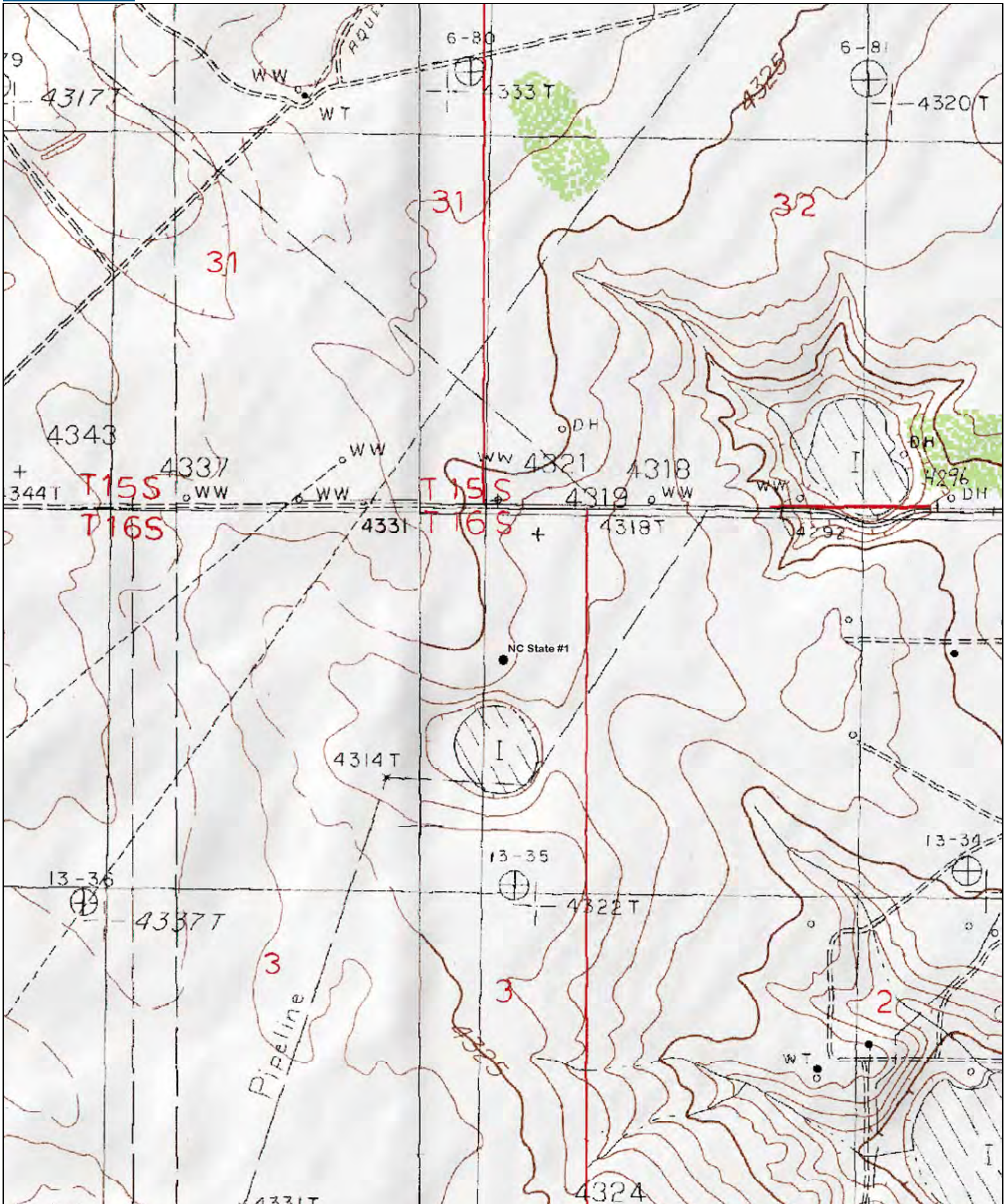
In conclusion, thank you for the opportunity to submit this alternative approach to you for review and approval. Endeavour and Etech look forward to working closely with NMOCD in the successful completion of this project.

Prepared By:

Fred Holmes
Senior Project Manager
Etech Environmental & Safety Solutions, Inc.

Attachment A
Topographic Map

XMap® 7



Scale 1:14,400

0 400 800 1200 1600 2000 2400 ft

1" = 1,200.0 ft Data Zoom 13-7

Site Topographic Map
Endeavour Energy - NC State #1

MN (6.9° E)

Attachment B
USGS Water Well Report

Click to hideNews Bulletins

- March 16, 2018 - There has been a recent change to the "Subscribe for system changes" function and it is unavailable.

  Please send an email to gs-w_support_nwisweb@usgs.gov if you would like us to add you manually until we have addressed the problem.

  - Please see news on new formats
  - Full News

Groundwater levels for the Nation

Search Results -- 3 sites found

State/Territory = New Mexico

lat_long_bounding_box =

Position	Latitude	Longitude
Corner 1	32.998038	-103.747745
Corner 2	32.902574	-103.753960
Coordinates are entered as Decimal Degrees. DMS values are converted to Decimal degrees using NAD83 as the datum. Make your bounding box bigger if you are using NAD27 Datum for your DMS values		

Minimum number of levels = 1

Save file of selected sites to local disk for future upload

USGS 325520103445601 16S.32E.15.23320

Lea County, New Mexico
Latitude 32°55'22", Longitude 103°45'08" NAD27
Land-surface elevation 4,310.00 feet above NGVD29
This well is completed in the Ogallala Formation (121OGLL) local aquifer.

Output formats
Table of data
Tab-separated data
Graph of data
Reselect period

Date	Time	? Water-level date-time accuracy	Water level, feet below land surface	Water level, feet above specific vertical datum	Referenced vertical datum	? Water-level accuracy	? Status	? Method of measurement	? Measuring agency	? Source of measurement	? Water-level approval status
1961-03-15		D	227.18			2		U		U	A
1966-02-15		D	226.78			2		U		U	A
1971-03-23		D	226.66			2		U		U	A
1976-05-07		D	226.13			2		U		U	A
1981-03-27		D	226.58			2		U		U	A
1986-01-22		D	226.62			2		U		U	A
1991-05-31		D	227.17			2		U		U	A
1996-02-20		D	227.85			2		S		U	A

Explanation

Section	Code	Description
Water-level date-time accuracy	D	Date is accurate to the Day
Water-level accuracy	2	Water level accuracy to nearest hundredth of a foot
Status		The reported water-level measurement represents a static level
Method of measurement	S	Steel-tape measurement.
Method of measurement	U	Unknown method.
Measuring agency		Not determined
Source of measurement	U	Source is unknown.
Water-level approval status	A	Approved for publication -- Processing and review completed.

USGS 325636103450601 16S.32E.03.344324

Lea County, New Mexico
Latitude 32°56'36", Longitude 103°45'06" NAD27
Land-surface elevation 4,322 feet above NAVD88
This well is completed in the Ogallala Formation (121OGLL) local aquifer.

Output formats

Table of data
Tab-separated data
Graph of data

Reselect period

Date	Time	? Water-level date-time accuracy	Water level, feet below land surface	Water level, feet above specific vertical datum	Referenced vertical datum	? Water-level accuracy	? Status	? Method of measurement	? Measuring agency	? Source of measurement	? Water-level approval status
1961-03-15		D	226.15			2	P	U		U	A
1966-02-15		D	233.19			2	R	U		U	A
1971-03-23		D	224.91			2	R	U		U	A

Explanation

Section	Code	Description
Water-level date-time accuracy	D	Date is accurate to the Day
Water-level accuracy	2	Water level accuracy to nearest hundredth of a foot
Status	P	Site was being pumped.
Status	R	Site had been pumped recently.
Method of measurement	U	Unknown method.
Measuring agency		Not determined
Source of measurement	U	Source is unknown.
Water-level approval status	A	Approved for publication -- Processing and review completed.

USGS 325743103444601 15S.32E.32.333333

Lea County, New Mexico
Latitude 32°57'58", Longitude 103°44'52" NAD27
Land-surface elevation 4,320.00 feet above NGVD29
The depth of the well is 330 feet below land surface.
This well is completed in the Ogallala Formation (121OGLL) local aquifer.

Output formats

Table of data
Tab-separated data
Graph of data
Reselect period

Date	Time	? Water-level date-time accuracy	Water level, feet below land surface	Water level, feet above specific vertical datum	Referenced vertical datum	? Water-level accuracy	? Status	? Method of measurement	? Measuring agency	? Source of measurement	? Water-level approval status
1981-01-28		D	235.08			2		U		U	A

Explanation

Section	Code	Description
Water-level date-time accuracy	D	Date is accurate to the Day
Water-level accuracy	2	Water level accuracy to nearest hundredth of a foot
Status		The reported water-level measurement represents a static level
Method of measurement	U	Unknown method.
Measuring agency		Not determined
Source of measurement	U	Source is unknown.
Water-level approval status	A	Approved for publication -- Processing and review completed.

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

Attachment C
NRCS Soil Survey

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Lea County, New Mexico

NC State #1

March 15, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,070 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 45, 90, 180, 270

Feet: 0, 100, 200, 400, 600

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lea County, New Mexico
Survey Area Data: Version 14, Sep 10, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 29, 2016—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
KO	Kimbrough gravelly loam, dry, 0 to 3 percent slopes	32.0	76.0%
PS	Portales-Stegall loams	10.1	24.0%
Totals for Area of Interest		**42.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lea County, New Mexico

KO—Kimbrough gravelly loam, dry, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tw43
Elevation: 2,500 to 4,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Kimbrough, dry, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kimbrough, Dry

Setting

Landform: Playa rims, plains
Down-slope shape: Convex, linear
Across-slope shape: Concave, linear
Parent material: Loamy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 3 inches: gravelly loam
Bw - 3 to 10 inches: loam
Bkkm1 - 10 to 16 inches: cemented material
Bkkm2 - 16 to 80 inches: cemented material

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 4 to 18 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 95 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Very Shallow 12-17" PZ (R077DY049TX)
Hydric soil rating: No

Minor Components

Eunice

Percent of map unit: 10 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Very Shallow 12-17" PZ (R077DY049TX)
Hydric soil rating: No

Spraberry

Percent of map unit: 6 percent
Landform: Plains, playa rims
Down-slope shape: Linear, convex
Across-slope shape: Linear
Ecological site: Very Shallow 12-17" PZ (R077DY049TX)
Hydric soil rating: No

Kenhill

Percent of map unit: 4 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clay Loam 12-17" PZ (R077DY038TX)
Hydric soil rating: No

PS—Portales-Stegall loams

Map Unit Setting

National map unit symbol: dmqn
Elevation: 3,600 to 4,400 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 58 to 60 degrees F
Frost-free period: 190 to 205 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Portales and similar soils: 45 percent
Stegall and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Portales

Setting

Landform: Plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Calcareous alluvium and/or calcareous eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 8 inches: loam
Bk - 8 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Limy Upland 12-17" PZ (R077DY042TX)
Hydric soil rating: No

Description of Stegall

Setting

Landform: Plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 28 inches: clay loam
Bkm - 28 to 38 inches: cemented material
BCk - 38 to 60 inches: variable

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 40 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 90 percent

Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Limy Upland 12-17" PZ (R077DY042TX)
Hydric soil rating: No

Minor Components

Lea

Percent of map unit: 8 percent
Ecological site: Limy Upland 16-21" PZ (R077CY028TX)
Hydric soil rating: No

Mansker

Percent of map unit: 7 percent
Ecological site: Limy Upland 16-21" PZ (R077CY028TX)
Hydric soil rating: No

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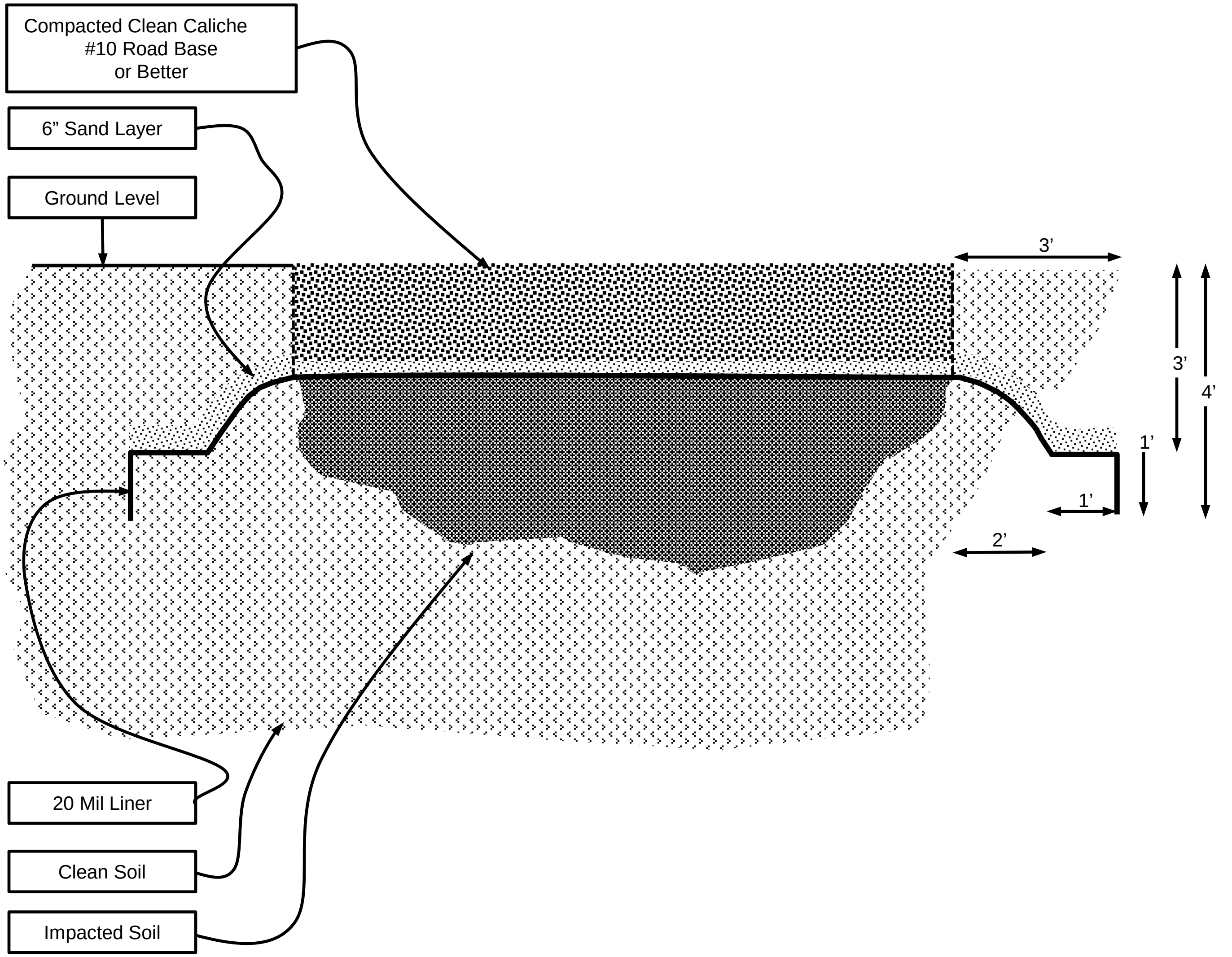
Attachment D
Liner Installation



NOTES

1. Following excavation vertically to a depth of 2 feet and side walls are clear the excavation is widened 3 feet horizontally and stepped down 4 feet vertically.

2. The first step at 3 feet is rounded slightly and is approximately 2 feet wide.

3. The liner is then installed across the top of the impacted soil and down into the bottom of the 4 foot potion of the excavation. Note: Liner is to be installed as smooth as possible, but not pulled taut. This is to allow the liner to move as needed as backfill material is installed.

4. Once the liner is in place, the excavated clean soil is replaced and compacted in the 4 foot section until it is level with the bottom of the first step.

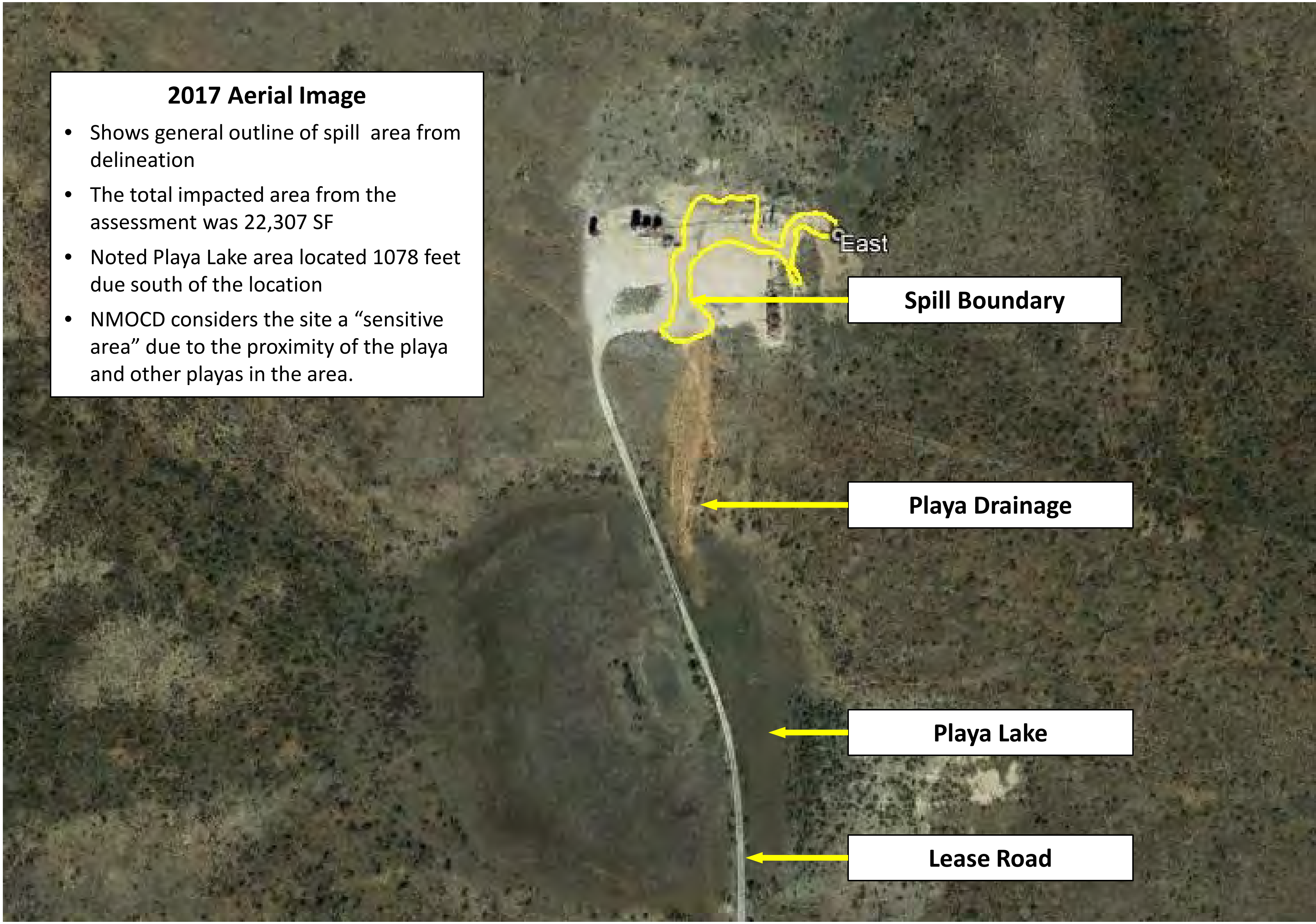
5. Six (6) inches of clean sand is installed over the liner.

6. Clean #10 road base is installed over the sand layer and compacted in 6 inch lifts until ground level is reached.

7. Excavated clean fill is replaced over the balance of the horizontal potions of the excavation outside of the impacted zone.

8. The balance of the unused material will be used for reinforcement of berms.

N / W / E / S	**Date**: March 21, 2018	**Title**: Endeavor Energy – NC State #1 – Liner Installation	**Prepared By:** Etech Environmental & Safety Solutions, Inc. Midland, Texas
	Figure: 1	**Scale**: None / **Proj. No.**: 585-9282-000	
	View: Side	**Drawn By**: FH	



2017 Aerial Image

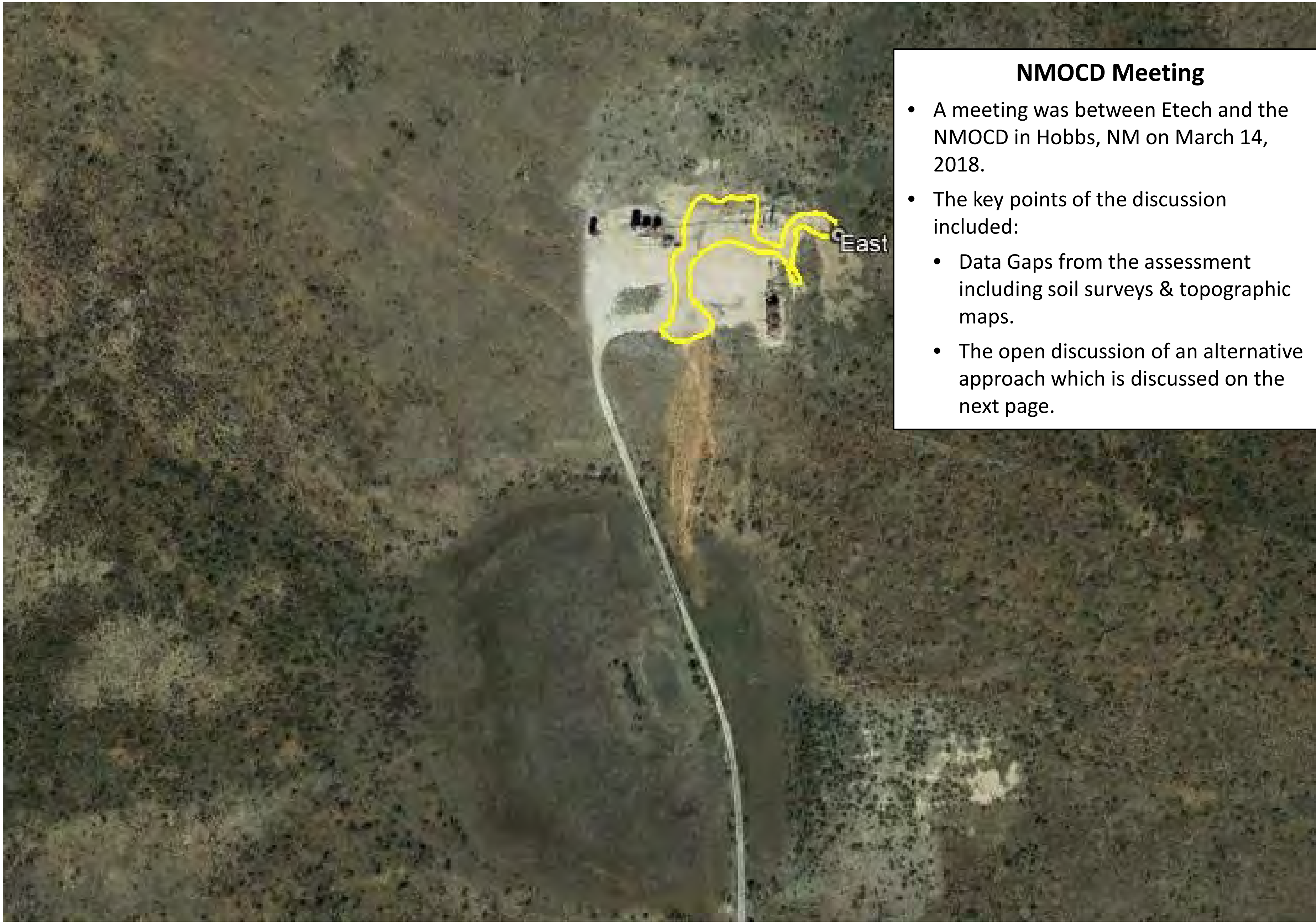
- Shows general outline of spill area from delineation
- The total impacted area from the assessment was 22,307 SF
- Noted Playa Lake area located 1078 feet due south of the location
- NMOCD considers the site a “sensitive area” due to the proximity of the playa and other playas in the area.

Assessment & Corrective Action Evaluation Report ©	Lease Name:	NC State #1	RP No:	1RP471
	Reference:	2017 Delineation Aerial Image	Project No. :	585-9282-000

Assessment

- An assessment of the site found chloride impacted soil above regulatory threshold levels in depths ranging from 4' to 9' below ground level. Levels for each boring are listed next to each boring and provided in the adjacent table.

Boring Number	Clearance Depth (ft.)
SP1	9
SP2	8
SP3	4
SP4	7
SP5	6
SP6	10
SP7	7
SP8	12
SP9	4
SP10	4
SP11	4
SP12	4
SP13	4

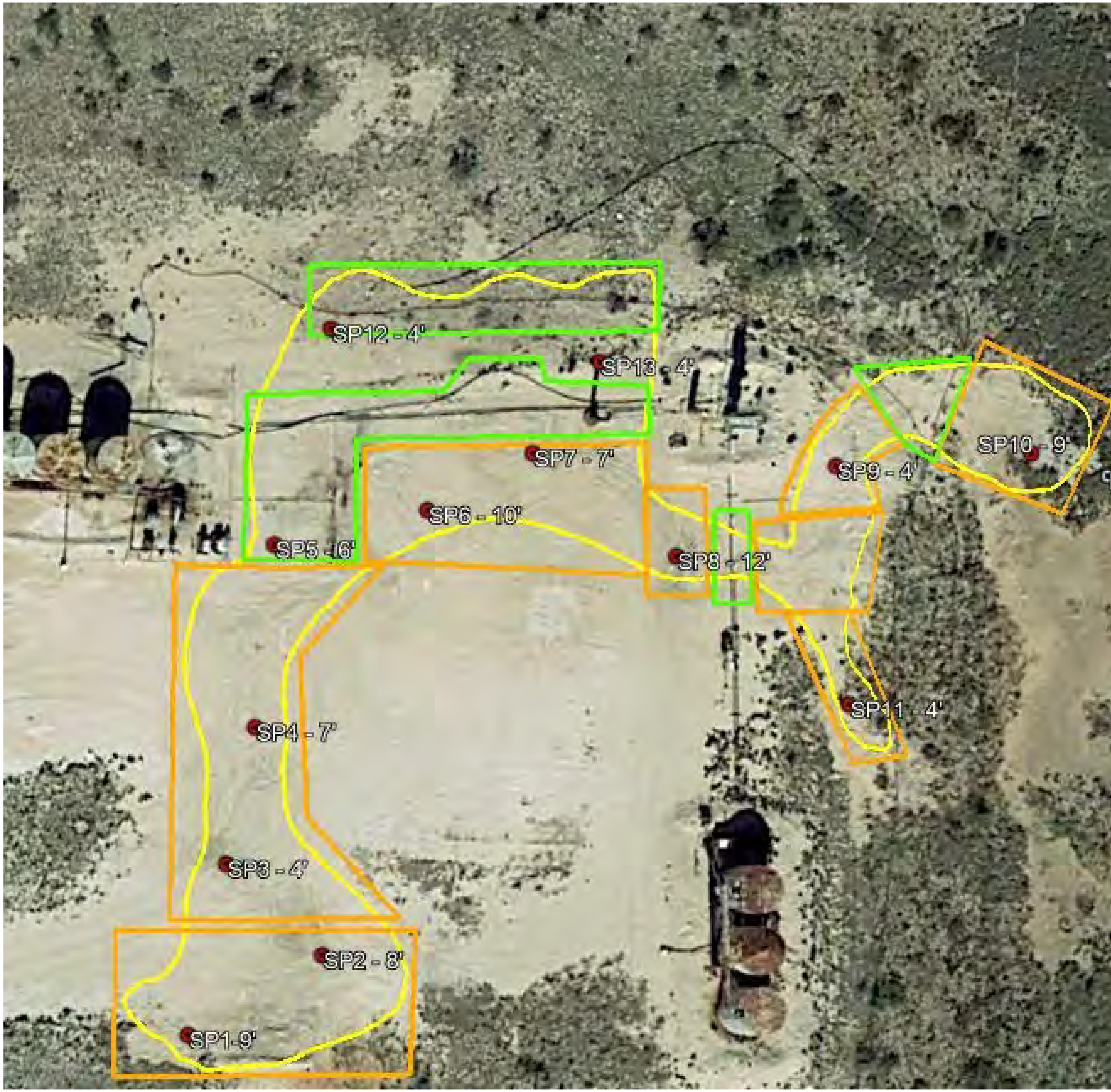


NMOCD Meeting

- A meeting was between Etech and the NMOCD in Hobbs, NM on March 14, 2018.
- The key points of the discussion included:
    - Data Gaps from the assessment including soil surveys & topographic maps.
    - The open discussion of an alternative approach which is discussed on the next page.

eTECH Environmental & Safety Solutions, Inc.

Assessment & Corrective Action Evaluation Report ©	Lease Name:	NC State #1	RP No:	1RP471
	Reference:	Excavation & Exclusion Aerial	Project No. :	585-9282-000



NMOCD Meeting

- It was conveyed to the NMOCD that while excavation and off site disposal of some soils were needed, there were some areas that it would not be practicable to do this. This included mostly areas where poly and injection lines were located (Green Lines).
- Also it was suggested that the vertical extent of the contaminated soil in other areas be excavated to 2 feet, a 20 mil liner installed and down seated. Then backfilled with caliche and compacted to grade (Tan Lines).
- This would exclude approximately 6,400 SF of area needing excavation and lining.
- One item of note is in order to complete the excavation and lining the excavations would be performed in stages to allow for 1.) continuity in operations. 2.)Allow for easier management of the installation of the liner. This does mean that where sections are joined, the liner would be seamed in 12" overlapping joints.
- Liner diagram is attached.