

**SELECT WATER
SOLUTIONS, LLC**
JESSE JAMES RECYCLING FACILITY

***C-147 FLUID RECYCLING
CONTAINMENT APPLICATION***

**SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO**



APRIL 2024



024113-00



2500 North Eleventh Street ■ □□ Post Office Box 6029 ■ □□ Enid, Oklahoma 73702 ■ □□ (580) 234-8780 ■ □□ Fax (580) 237-4302

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

Form C-147
Revised April 3, 2017

Recycling Facility and/or Recycling Containment

Type of Facility: ☒ Recycling Facility ☒ Recycling Containment*
Type of action: ☒ Permit ☐ Registration
☐ Modification ☐ Extension
☐ Closure ☐ Other (explain) _____

* At the time C-147 is submitted to the division for a Recycling Containment, a copy shall be provided to the surface owner.

Be advised that approval of this request does not relieve the operator of liability should operations result in pollution of surface water, ground water or the environment. Nor does approval relieve the operator of its responsibility to comply with any other applicable governmental authority's rules, regulations or ordinances.

1.
Operator: Select Water Solutions, LLC (For multiple operators attach page with information) OGRID #: 289068
Address: 1820 North I-35, Gainesville TX 76240
Facility or well name (include API# if associated with a well): Jesse James Recycle Facility North Containment
OCD Permit Number: 1RF-518 (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr N/4 Section 28 Township 19 South Range 33 County: Lea
Surface Owner: ☐ Federal ☐ State ☒ Private ☐ Tribal Trust or Indian Allotment

2.
☐ **Recycling Facility:**
Location of recycling facility (if applicable): Latitude _____ Longitude _____ NAD83
Proposed Use: ☐ Drilling* ☐ Completion* ☐ Production* ☐ Plugging*
**The re-use of produced water may NOT be used until fresh water zones are cased and cemented*
☐ Other, *requires permit for other uses. Describe use, process, testing, volume of produced water and ensure there will be no adverse impact on groundwater or surface water.*
☒ Fluid Storage
☐ Above ground tanks ☒ Recycling containment ☐ Activity permitted under 19.15.17 NMAC explain type _____
☐ Activity permitted under 19.15.36 NMAC explain type: _____ ☐ Other explain _____
☐ For multiple or additional recycling containments, attach design and location information of each containment
☐ **Closure Report (required within 60 days of closure completion):** ☐ Recycling Facility Closure Completion Date: _____

3.
☒ **Recycling Containment:**
☐ Annual Extension after initial 5 years (attach summary of monthly leak detection inspections for previous year)
Center of Recycling Containment (if applicable): Latitude 32.635548° Longitude -103.668623° NAD83
☐ For multiple or additional recycling containments, attach design and location information of each containment
☒ Lined ☐ Liner type: Thickness 60/40 mil ☐ LLDPE ☒ HDPE ☐ PVC ☐ Other _____
☐ String-Reinforced
Liner Seams: ☒ Welded ☐ Factory ☐ Other _____ Volume: 1,041,999 bbl Dimensions: L 1090 x W 650 x D 24
☐ Recycling Containment Closure Completion Date: _____

4.

Bonding:

- ☐ Covered under bonding pursuant to 19.15.8 NMAC per 19.15.34.15(A)(2) NMAC (These containments are limited to only the wells owned or operated by the owners of the containment.)
- ☒ Bonding in accordance with 19.15.34.15(A)(1). Amount of bond \$2,699,977.68 (work on these facilities cannot commence until bonding amounts are approved)
- ☒ Attach closure cost estimate and documentation on how the closure cost was calculated.

5.

Fencing:

- ☐ Four foot height, four strands of barbed wire evenly spaced between one and four feet
- ☒ Alternate. Please specify 8-ft Tall Wire Mesh Game Fence

6.

Signs:

- ☒ 12"x 24", 2" lettering, providing Operator's name, site location, and emergency telephone numbers
- ☐ Signed in compliance with 19.15.16.8 NMAC

7.

Variances:

Justifications and/or demonstrations that the proposed variance will afford reasonable protection against contamination of fresh water, human health, and the environment.

Check the below box only if a variance is requested:

☒ Variance(s): Requests must be submitted to the appropriate division district for consideration of approval. If a Variance is requested, include the variance information on a separate page and attach it to the C-147 as part of the application.

If a Variance is requested, it must be approved prior to implementation.

8.

Siting Criteria for Recycling Containment

Instructions: The applicant must provide attachments that demonstrate compliance for each siting criteria below as part of the application. Potential examples of the siting attachment source material are provided below under each criteria.

General siting**Ground water is less than 50 feet below the bottom of the Recycling Containment.**

NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells

☐ Yes ☒ No
☐ NA

Within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended.

☐ Yes ☒ No
☐ NA

- Written confirmation or verification from the municipality; written approval obtained from the municipality

Within the area overlying a subsurface mine.

☐ Yes ☒ No

- Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division

Within an unstable area.

☐ Yes ☒ No

- Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map

Within a 100-year floodplain. FEMA map

☐ Yes ☒ No

Within 300 feet of a continuously flowing watercourse, or 200 feet of any other significant watercourse, or lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark).

☐ Yes ☒ No

- Topographic map; visual inspection (certification) of the proposed site

Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application.

☐ Yes ☒ No

- Visual inspection (certification) of the proposed site; aerial photo; satellite image

Within 500 horizontal feet of a spring or a fresh water well used for domestic or stock watering purposes, in existence at the time of initial application.

☐ Yes ☒ No

- NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site

Within 500 feet of a wetland.

☐ Yes ☒ No

- US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site

9.
Recycling Facility and/or Containment Checklist:

Instructions: Each of the following items must be attached to the application. Indicate, by a check mark in the box, that the documents are attached.

- ☒ Design Plan - based upon the appropriate requirements.
☒ Operating and Maintenance Plan - based upon the appropriate requirements.
☒ Closure Plan - based upon the appropriate requirements.
☒ Site Specific Groundwater Data -
☒ Siting Criteria Compliance Demonstrations -
☒ Certify that notice of the C-147 (only) has been sent to the surface owner(s)

10.
Operator Application Certification:

I hereby certify that the information and attachments submitted with this application are true, accurate and complete to the best of my knowledge and belief.

Name (Print): John McGillis Title: SR-VP operations
Signature: John McGillis Date: 4-9-2024
e-mail address: jmcgillis@selectwater.com Telephone: 713-806-0488

11.
OCD Representative Signature: Victoria Venegas Approval Date: 04/18/2024

Title: Environmental Specialist OCD Permit Number: 1RF-518

- ☒ OCD Conditions
☒ Additional OCD Conditions on Attachment

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 Signature: John McGillis Date: 4-9-2024
 e-mail address: jmcgillis@selectwater.com Telephone: 713-806-0488

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OCD Representative Signature: Victoria Venegas Approval Date: 04/18/2024Title: Environmental Specialist OCD Permit Number: 1RF-518

- ☒ OCD Conditions _____
☒ Additional OCD Conditions on Attachment _____



April 8, 2024

Ms. Victoria Venegas
New Mexico EMNRD
Oil Conservation Division

RE: Rule 34 Variance Request –Produced Water Impoundment Bird Netting

Ms. Venegas:

Select Water Solutions, LLC is requesting a variance to Rule 34-Part 12(E) Netting to ensure the recycling facility is protected from wildlife. Based on our experience from previous projects, we believe audible bird deterrents provide equal or better protection when compared to netting. In addition, they require less inspection, maintenance, and repair over the life of the facility.

Select is proposing to use the "Bird-X Mega Blaster Pro" system. This system will replace the netting required by the current rule. It should be noted that this variance has been granted on previous sites.

Should you have any questions or require additional information, please contact me by phone at 580-234-8780 or by email at dschrantz@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in blue ink, appearing to read "Doug Schrantz", is written over the printed name.

Doug Schrantz, P.E.
Engineering Director and Principal Engineer





April 8, 2024

Ms. Victoria Venegas
New Mexico EMNRD
Oil Conservation Division

RE: Rule 34 Variance Request –Produced Water Impoundment Fencing

Ms. Venegas:

Select Water Solutions, LLC is requesting a variance to C-147 Fencing requirement for requiring a fence four foot in height, with four strands of barbed wire evenly spaced between one and four feet. Select is requesting approval to a wire mesh, game fence, eight (8) feet in height. Based on our experience, we feel that the requested fencing will provide greater security to the facility for excluding animals and unauthorized individual access. Details for this type of fence can be found on Sheet 11 of 11 in Appendix C Engineering Drawings.

The proposed fencing has been approved for other C-147 facilities and used extensively on similar projects in New Mexico and Texas with outstanding success in deterring unauthorized entry by both humans and wildlife. It should be noted that this variance request has been approved on previous sites.

Should you have any questions or require additional information, please contact me by phone at 580-234-8780 or by email at dschrantz@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

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Doug Schrantz, P.E.
Engineering Director and Principal Engineer





April 08, 2024

Ms. Victoria Venegas
New Mexico EMNRD
Oil Conservation Division

RE: Rule 34 Variance Request –Produced Water Recycling Containment Secondary Liner

Ms. Venegas:

Select Water Solutions, LLC is requesting a variance to Rule 34 Part 12(A)(4) requiring secondary liners to be 30-mil string reinforced LLDPE. Select is requesting approval to use 40-mil HDPE in place of the specified material in the proposed Recycle Containment. Based on our experience, we feel that the requested material will allow us to provide equal environmental protection in our impoundments.

Due to the construction of the 30-mil reinforced LLDPE material, nondestructive QA/QC testing cannot be performed. The proposed 40-mil HDPE will be seamed in a manner that will allow nondestructive pressure testing of the seams to ensure proper sealing.

The proposed HDPE is appropriate material for the proposed use in the impoundment and is compatible with the material that will be stored. This material will provide equal or better environmental protection as the specified 30-mil reinforced LLDPE.

The proposed new liner system cross-section for the earthen containment is as follows: prepared subgrade, 10 oz. geotextile, 40-mil HDPE, 200-mil geonet, 60-mil HDPE. This will replace the cross-section required by the current rule. It should also be noted that this variance has been granted on past sites.

Should you have any questions or require additional information, please contact me by phone at 580-234-8780 or by email at dschrantz@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

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Engineering Director and Principal Engineer





JESSE JAMES RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
024113-00

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APPENDIX A BANKS WATER WELL REPORT

APPENDIX B GEOTECHNICAL ENGINEERING REPORT

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APPENDIX E MATERIAL SPECIFICATION

APPENDIX F OPERATING AND MAINTENANCE PLAN

APPENDIX G CLOSURE PLAN



SITE CRITERIA FOR RECYCLING CONTAINMENT

1.0 LOCATION

Select Energy Services is proposing to construct a recycle facility, Jesse James Recycle Facility, located in Section 28, Township 19 South, Range 33 East in Lea County, New Mexico. An aerial photographic map, *Figure 1*, shows the location of the proposed facility. This study was performed on the proposed location to evaluate that the proposed facility location would be in accordance with the 19.15.34.11 NMAC Siting Requirements for Recycling Containments.

2.0 DISTANCE TO GROUNDWATER

2.1 GROUNDWATER WELLS

Banks Environmental Data (Banks) was contracted to search the New Mexico Office of State Engineers (OSE) records for water wells within a 1.0-mi. radius of the proposed facility location. According to Banks, no water wells were identified within a 1.0-mi radius of the proposed facility. The Banks Water Well Report is included as *Appendix A*, and *Figure 2.1* illustrates that there are no water wells located within the 1.0-mi. radius of the proposed facility.

The New Mexico Oil and Gas Division (NMOCD) requires that groundwater (freshwater as defined by NMOCD rules) at the location be greater than 50-ft below the containment bottom. *Figure 2.1* demonstrates the following to meet these criteria:

1. The location of the proposed facility shown on the United States Geologic Survey (USGS) Laguna Gatuna NW Quadrangle, NM 7.5 Minute Series Topographic Map.
2. A 1.0-mile radius from the site, and location of water wells in comparison to that radius. It should be noted, OSE wells can be mis-located as older wells are plotted in the center of the quarter, quarter, quarter section, township, and range.
3. The Banks search of the OSE records show there were no water wells located within a 1.0-mi radius from the boundary of the proposed facility.

No onsite investigation was performed at this facility due to the proximity of a facility that was constructed approximately one year prior. During onsite investigation at the neighboring facility, conducted by COZ Engineering, LLC on April 13, 2023, seven (7) total borings were advanced on the proposed facility location. Six (6) borings were drilled to a total depth of approximately 26-ft. bgs. and one (1) boring was drilled to a total depth of approximately 75-ft. bgs. The groundwater table was not encountered during the onsite field investigation. The geotechnical engineering report prepared by COZ Engineering, LLC is included in *Appendix B*.



2.2 AQUIFERS

Information reviewed from the Bureau of Land Management (BLM) Carlsbad Field Office shows the proposed facility is located within an aquifer system labeled "other." Other aquifer systems are localized aquifers, typically alluvial or terrace aquifer systems. *Figure 2.2* shows the site location in reference to Bureau of Land Management Declared Aquifers in the State of New Mexico.

2.3 GEOLOGY

A geological map of New Mexico was obtained from the United States Geological Survey (USGS) to review the geologic setting for the proposed containment location. Based on the review of the geologic map, the proposed facility lies within the Eolian and Piedmont deposits. It consists of Interlayered eolian sands and piedmont-slope deposits along the eastern flank of the Pecos River valley, primarily between Roswell and Carlsbad. Typically capped by thin eolian deposits.

Figure 2.3 is reproduction of the USGS New Mexico Geologic Map. *Figure 2.3* shows the following:

1. Location of the proposed Containment
2. Geologic setting of the Containment

Area stratigraphy to a depth of 75-ft. bgs. was obtained from seven (7) geotechnical borings conducted on the neighboring site by COZ Engineering, LLC on April 13, 2023. The onsite investigation determined that the soils and geology at the site were generally composed of silty sand with varying amounts of gravel and carbonate indurations from the surface to the total drilled depths of approximately 26-ft. bgs. and 75-bgs.

3.0 DISTANCE TO MUNICIPALITIES AND FRESHWATER FIELDS

Figure 3 demonstrates that the location is not located within incorporated municipal boundaries or within a defined municipal freshwater field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3. *Figure 3* illustrates the following:

1. The closest municipality to the proposed facility is Monument, New Mexico, located approximately 22-mi. to the east.
2. The closest freshwater field to the proposed facility is the Hobbs Municipal Water System, located approximately 32.2-mi. to the northeast.

4.0 DISTANCE TO SUBSURFACE MINES

According to the New Mexico Mining and Minerals Division there are no subsurface mines near the proposed facility. The proposed facility location is not within an area overlying a subsurface mine. *Figure 4* illustrates the following:



1. The nearest registered subsurface mine is Pit-C0-1110-0, an active mining site. The subsurface aggregate and stone mine is located approximately 8.8-mi. to the southeast of the proposed facility location.

5.0 DISTANCE TO HIGH OR CRITICAL KARST AREAS (UNSTABLE AREAS)

The Bureau of Land Management Carlsbad Field Office Cave Potential map was reviewed for the proposed facility. *Figure 5* illustrates the following:

1. The proposed facility is located in a “low” karst potential area.

6.0 DISTANCE TO 100-YEAR FLOOD PLAIN

The Federal Emergency Management Agency (FEMA) Flood Map Service Center was utilized to review the flood map for the proposed facility location. The proposed facility is located on FEMA flood map panel number 35025C1250D, “Zone D” and was effective on 12/16/2008. *Figure 6* demonstrates the area of the site is located on a “Not Printed” panel.

1. The proposed facility is located within “Zone D.” Zone D is described as “Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted.”

7.0 DISTANCE TO SURFACE WATER

After review of the Laguna Gatuna, NM, USGS 7.5-Minute Series Topographic map, *Figure 7*, there is no continuously flowing surface waters located on or near the proposed facility. *Figure 7* illustrates the following:

1. No continuously flowing surface waters or other water bodies defined by NMOCD are located on the proposed facility.
2. The closest surface waterbody is a draw located approximately 1.1-mi. to the south.

8.0 DISTANCE TO PERMANENT RESIDENCE OR STRUCTURES

The aerial image provided in *Figure 8*, demonstrates:

1. The proposed facility is not within 1,000-ft. of an occupied permanent residence, school, hospital, institution, church, or other permanent structure. The only items of interest found were existing oil and gas infrastructure. No churches, schools, or residential structures were identified.
2. *Figure 8* and *Figure 1 (Site Map)* show that the nearest structure to the site is oil and gas infrastructure.

9.0 DISTANCE TO NON-PUBLIC WATER SUPPLY

The proposed facility must not be within 500-ft. horizontally of a spring or freshwater well used for domestic or stock watering purposes, in existence at the time of initial application. *Figure 9* demonstrates the following:



C147L REGISTRATION PACKAGE
JESSE JAMES RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
024113-00

1. The proposed facility is not located within 500-ft. horizontally of a spring or freshwater well.
2. No springs were identified within the proposed facility location.

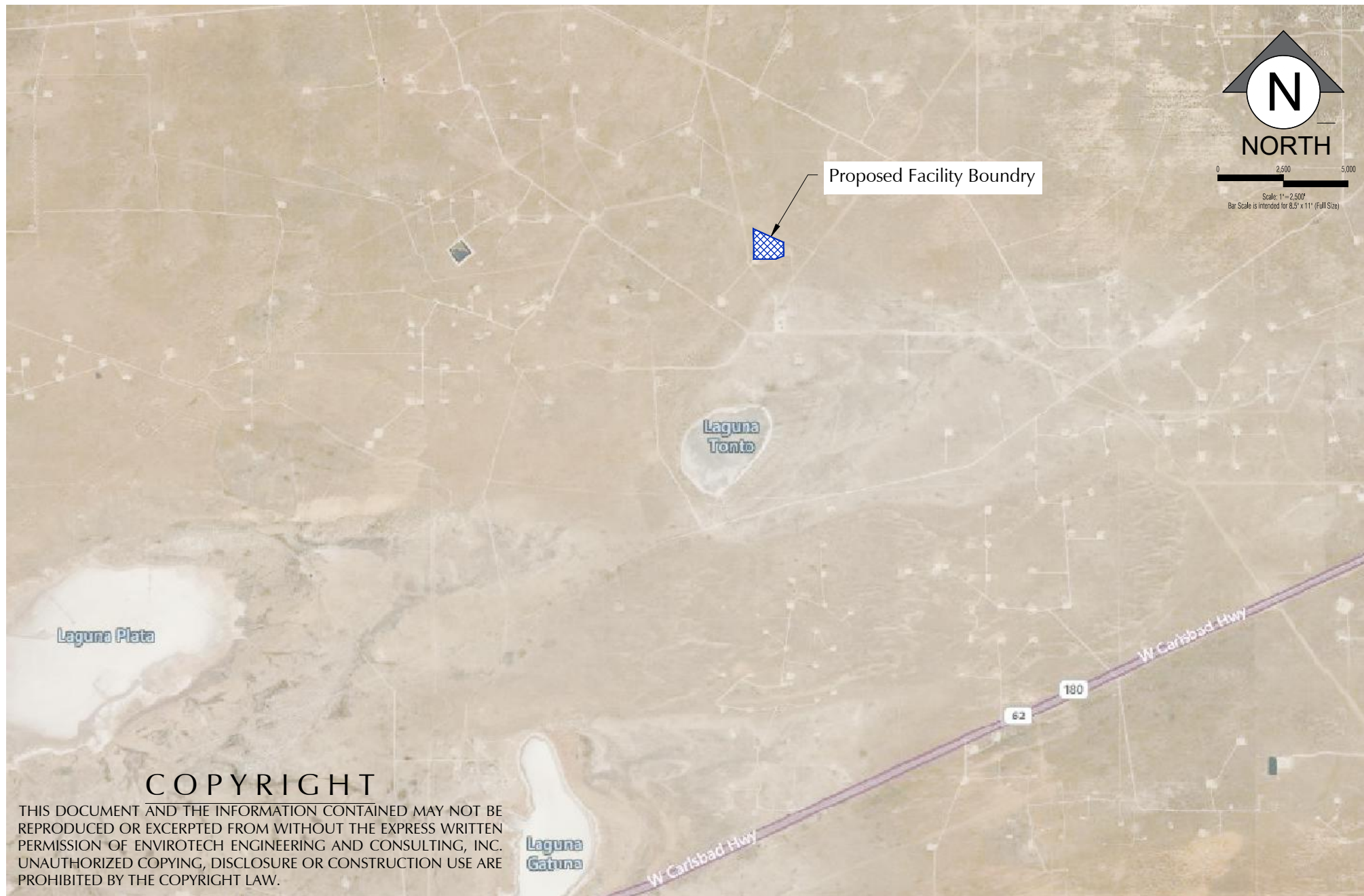
In addition, *Figure 2.1 (Groundwater Wells Map)* illustrates that the proposed facility location is not located within 1,000-ft. of known domestic water wells. There are no identified domestic water wells within a 1.0-mi. radius of the proposed facility location.

10.0 DISTANCE TO WETLANDS

The United States Fish and Wildlife National Wetlands Inventory Maps were reviewed for the area of the proposed facility. *Figure 10* confirms the proposed facility is not located within an area of a potential wetland. In addition, *Figure 10* illustrates the following:

1. The nearest potential wetland is located approximately 1.15-mi. to the south of the proposed facility location. The potential wetland closest to the proposed facility is labeled as a "Lake" with a wetland code "L2USA."
2. The National Wetlands Inventory Maps do not show a potential wetland located within 500-ft. of the proposed facility location.

It should be noted the United States Fish and Wildlife Service generates the NWI maps through infrared aerial imagery and aerial photograph interpretation; no actual field reconnaissance was conducted in the making of the maps. As such, the NWI maps do not always accurately identify wetlands or the extent of those wetlands; therefore, the maps are used for preliminary analysis only.



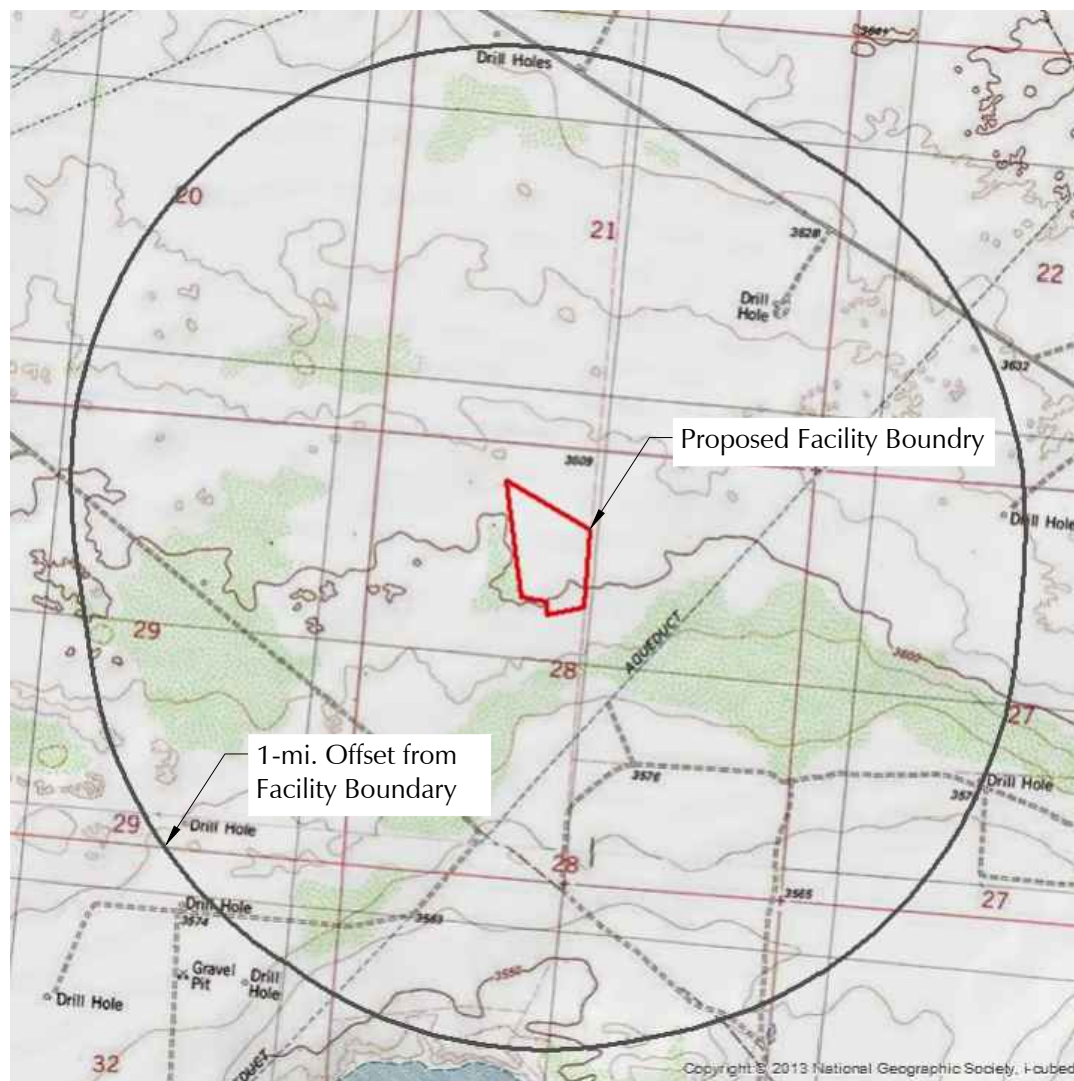
Site Map

Jesse James Recycle Facility
Northwest Quarter of Section 28,
Township 19 South, Range 33 East, Lea County, New Mexico



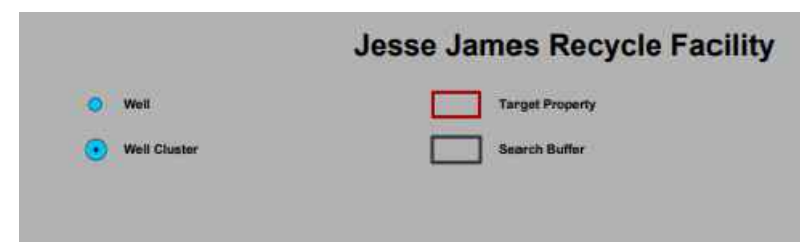
Project No.
24.113-00

Figure 1



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C.A. #1960 - Expiration Date: 6-30-2024

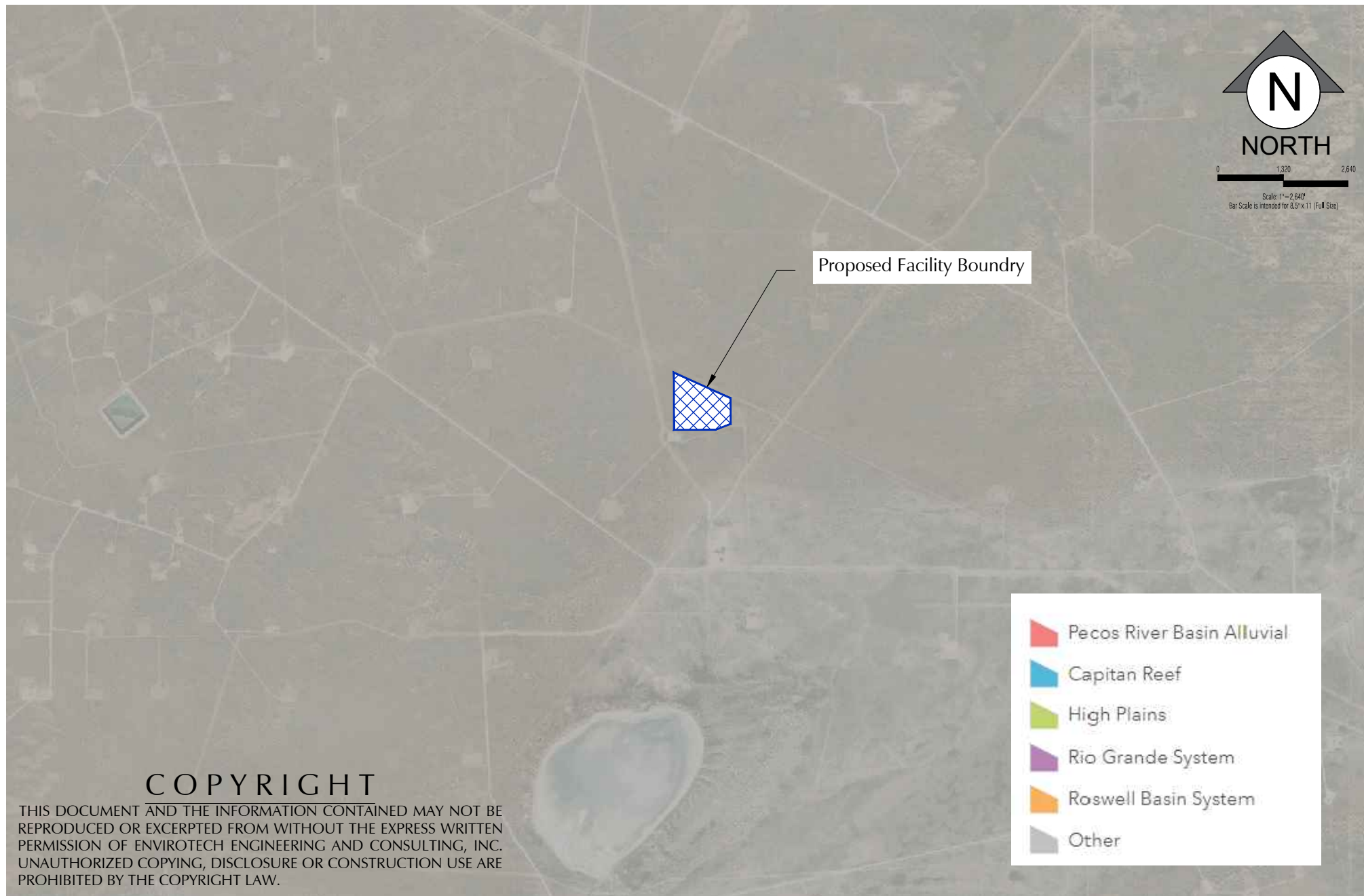
Groundwater Wells Map

Jesse James Recycle Facility
Northwest Quarter of Section 28,
Township 19 South, Range 33 East, Lea County, New Mexico

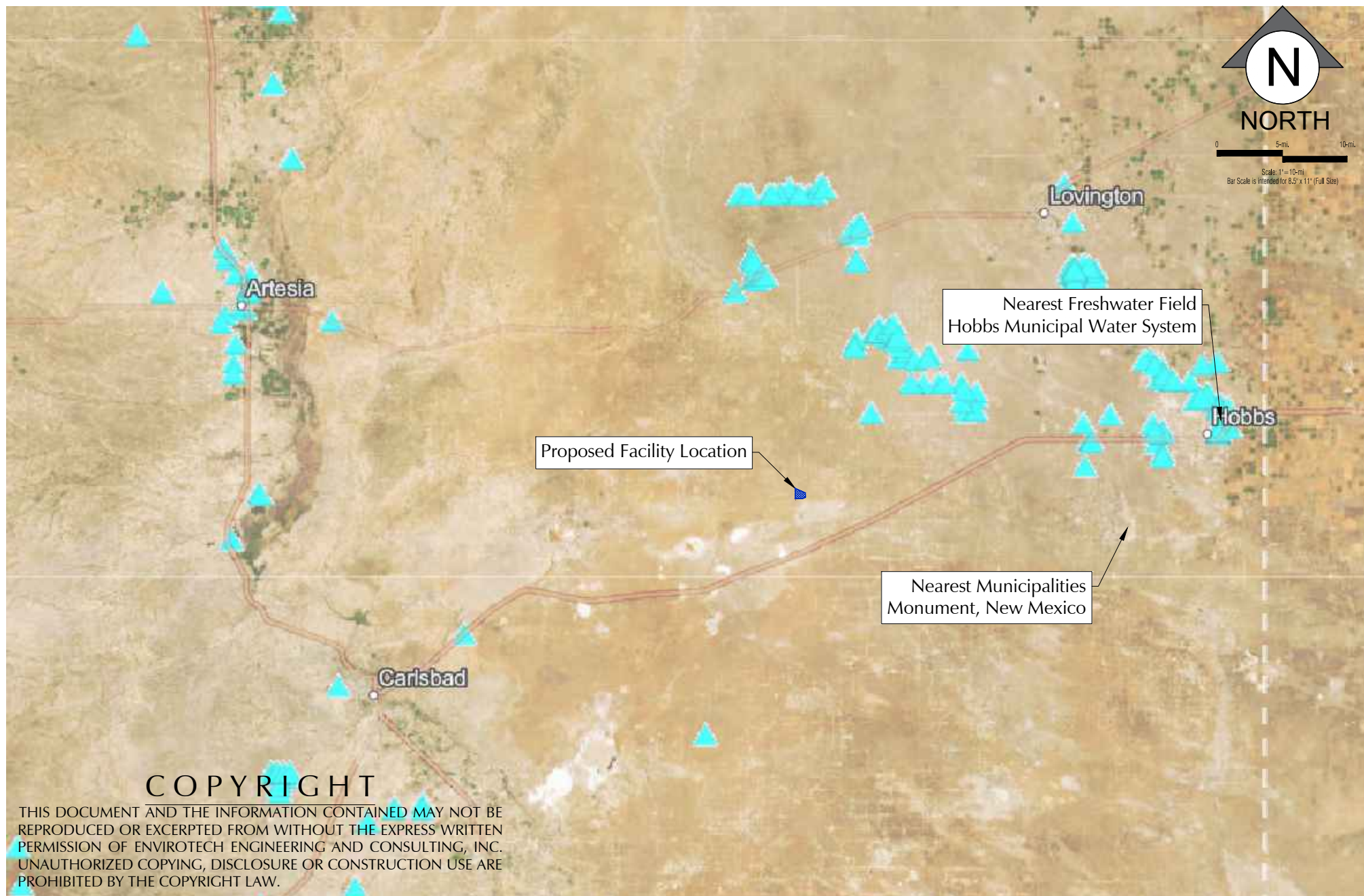


Project No.
24.113-00

Figure 2.1







Municipalities & Freshwater Fields Map

Jesse James Recycle Facility
Northwest Quarter of Section 28,
Township 19 South, Range 33 East, Lea County, New Mexico

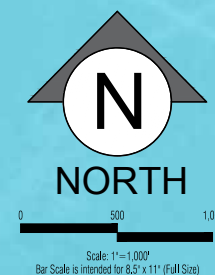
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ENGINEERING
2500 N. Eleventh Street Enid, OK 73701 • 580.234.8780 • envirotechconsulting.com
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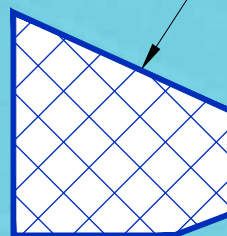
Project No.
24.113-00

Figure 3



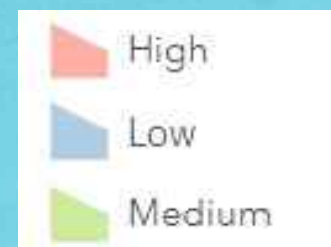


Proposed Facility Boundary



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Karst and Cave Potential Map

Jesse James Recycle Facility
Northwest Quarter of Section 28,
Township 19 South, Range 33 East, Lea County, New Mexico

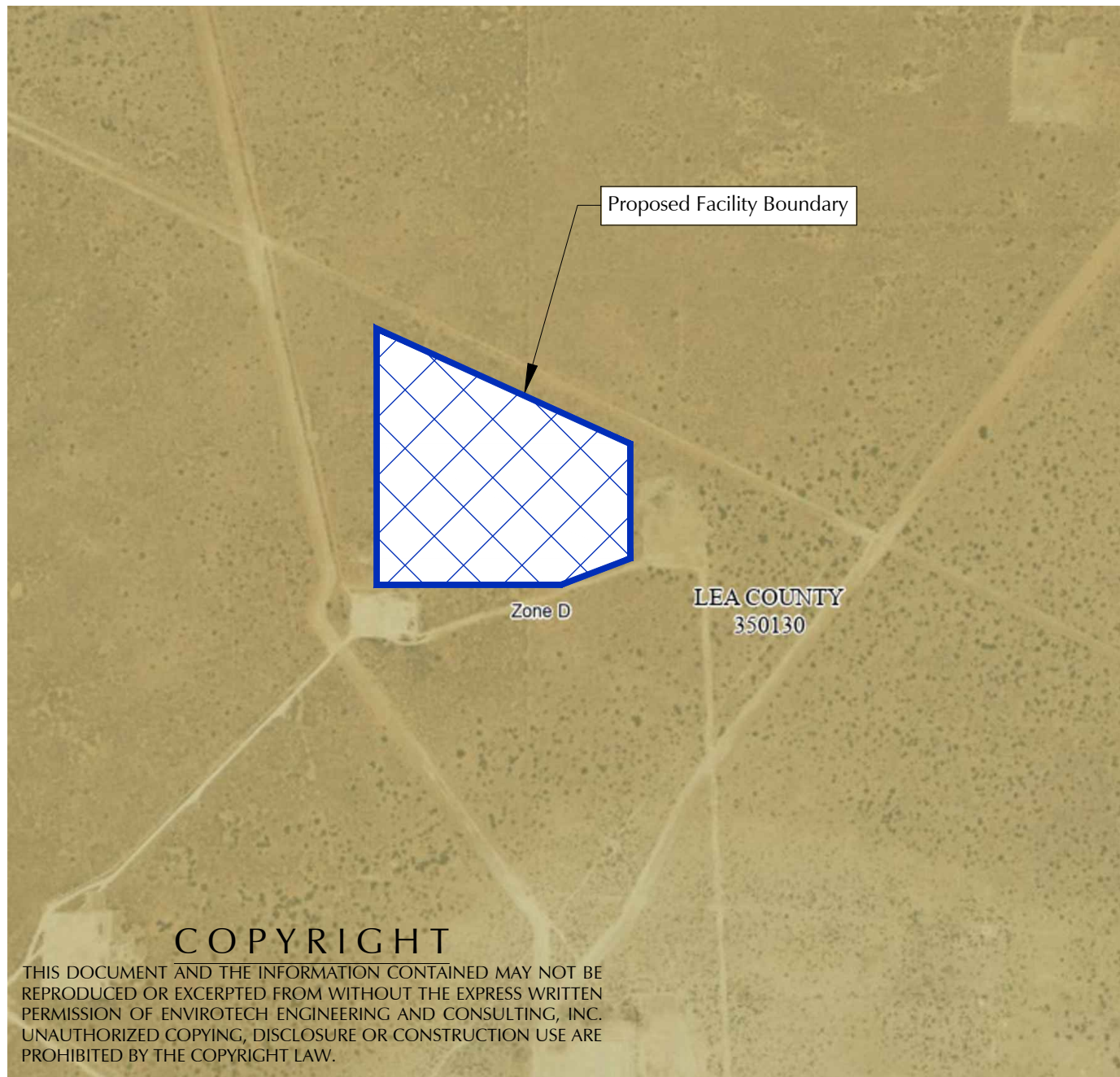


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24.113-00

Figure 5

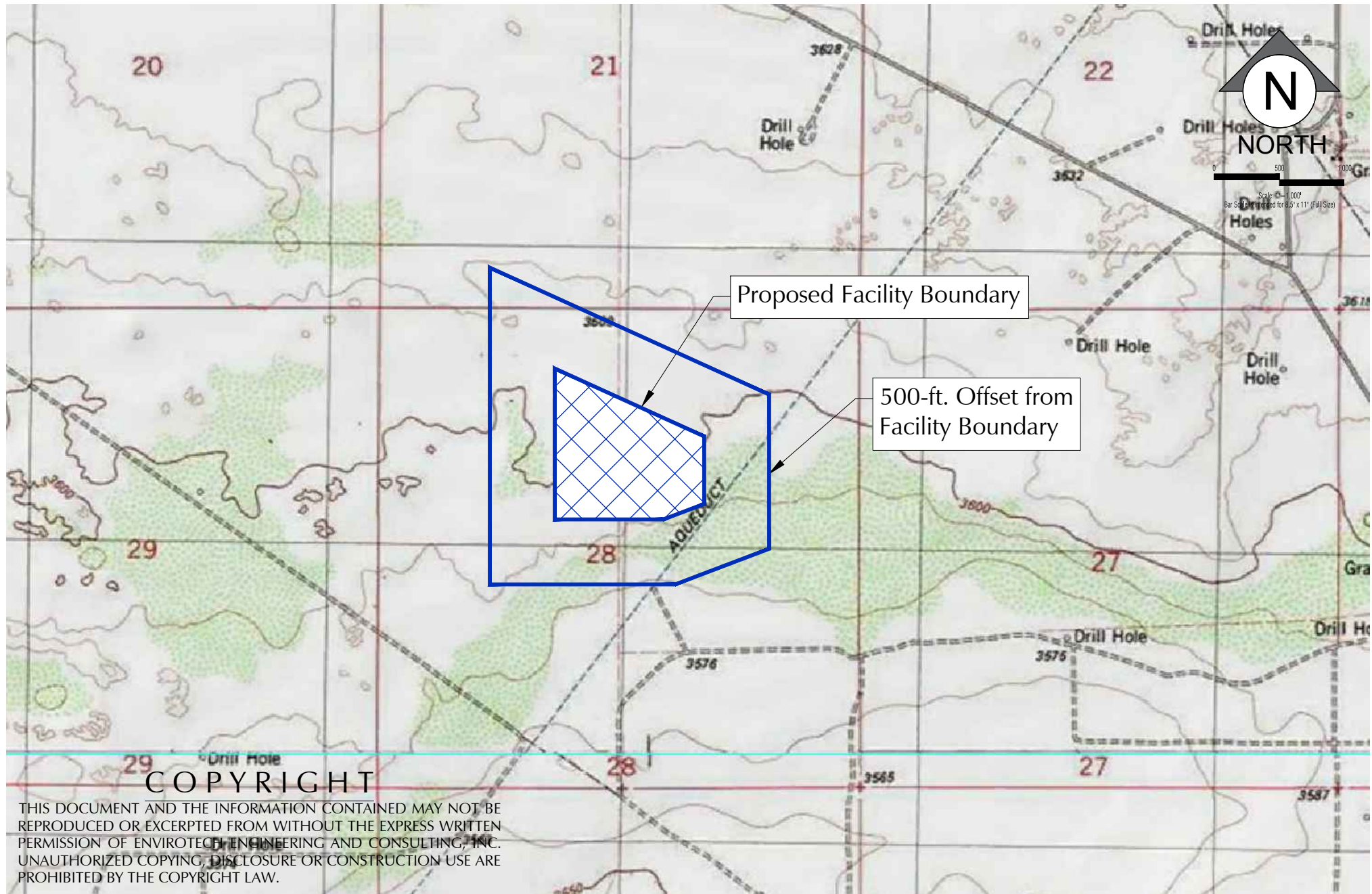


Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped





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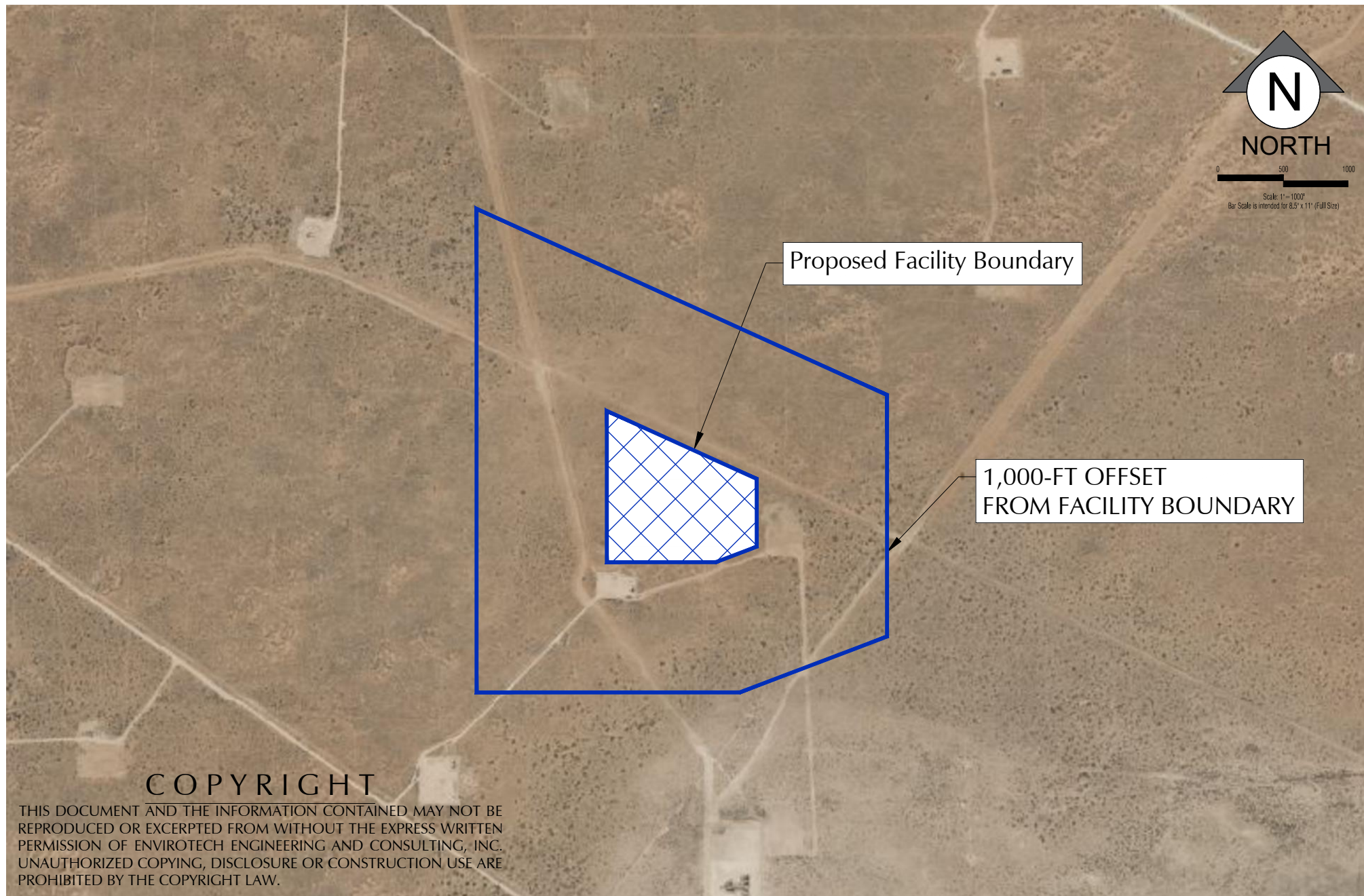
Surface Water Map

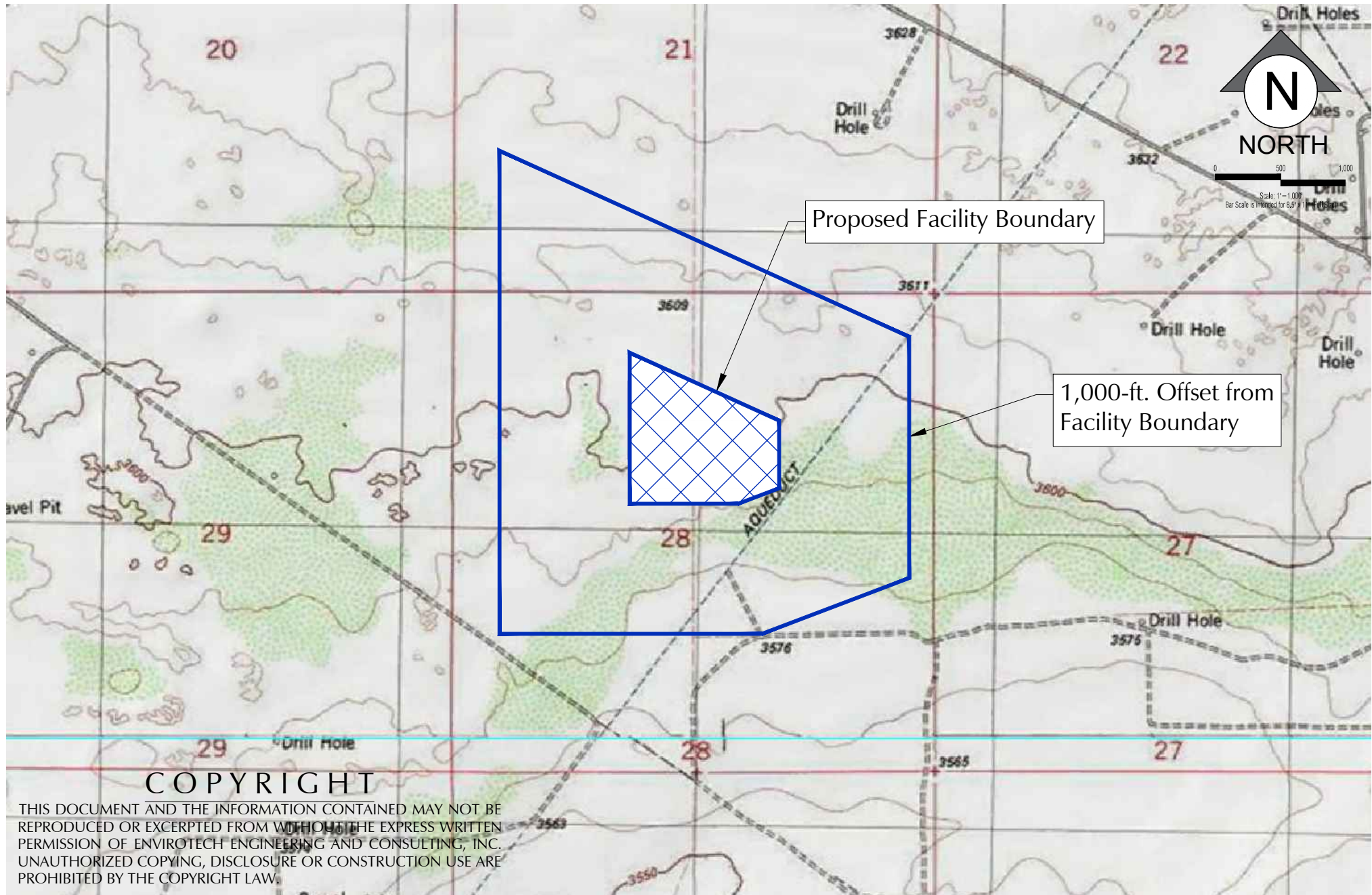
Jesse James Recycle Facility
Northwest Quarter of Section 28,
Township 19 South, Range 33 East, Lea County, New Mexico



Project No.
24.113-00

Figure 7





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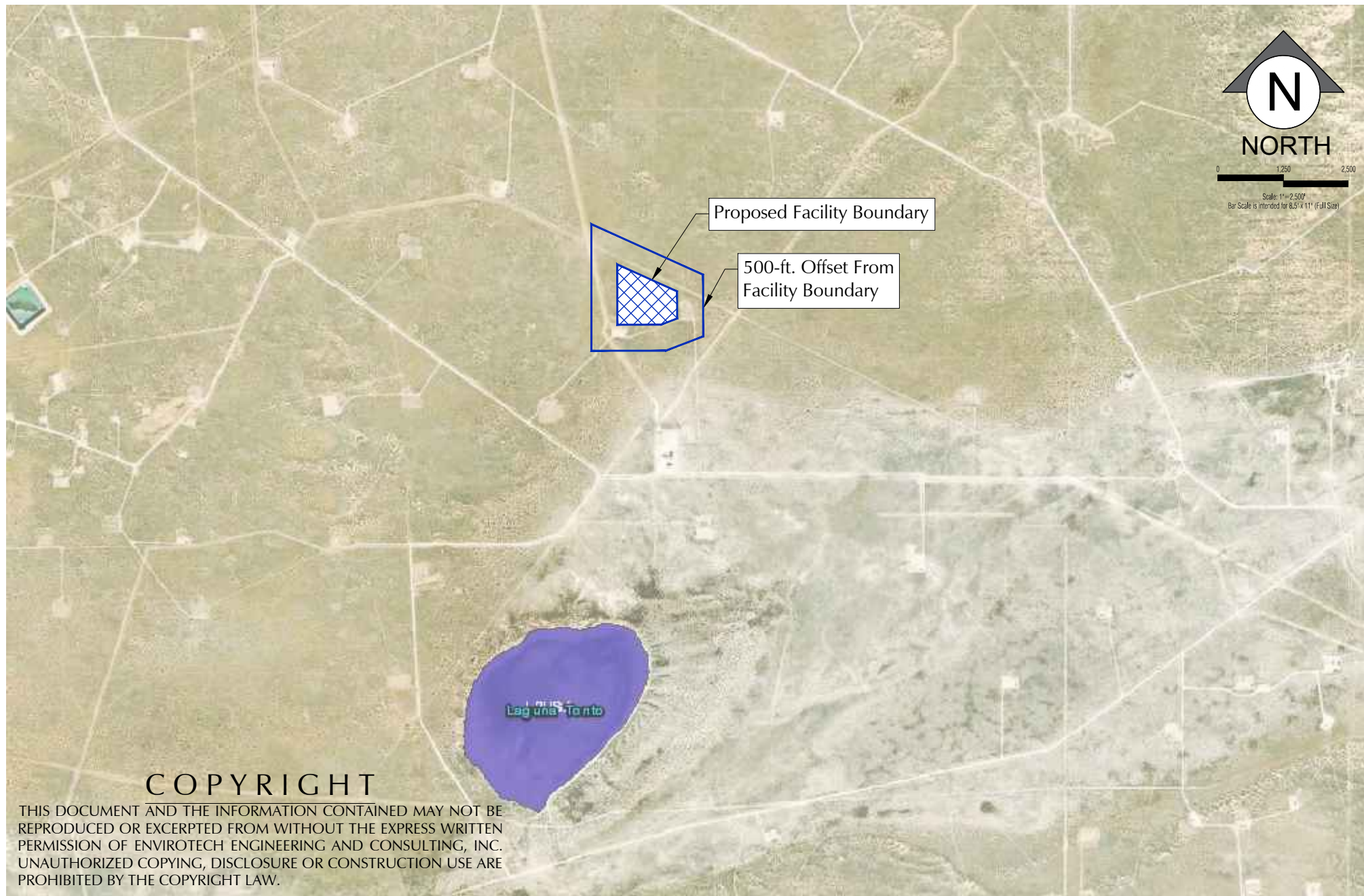
Non-Public Water Supply Map

Jesse James Recycle Facility
Northwest Quarter of Section 28,
Township 19 South, Range 33 East, Lea County, New Mexico



Project No.
24.113-00

Figure 9





C147L REGISTRATION PACKAGE
JESSE JAMES RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
024113-00

APPENDIX A

BANKS WATER WELL REPORT

Prepared for:

ENVIROTECH ENGINEERING & CONSULTING, INC. - OKC
2500 N. 11th St
Enid, OK 73701



Water Well Report

Jesse James Recycle Facility

NM

Lea County

PO #: 024113-00

ES-143671

Monday, March 18, 2024



Table of Contents

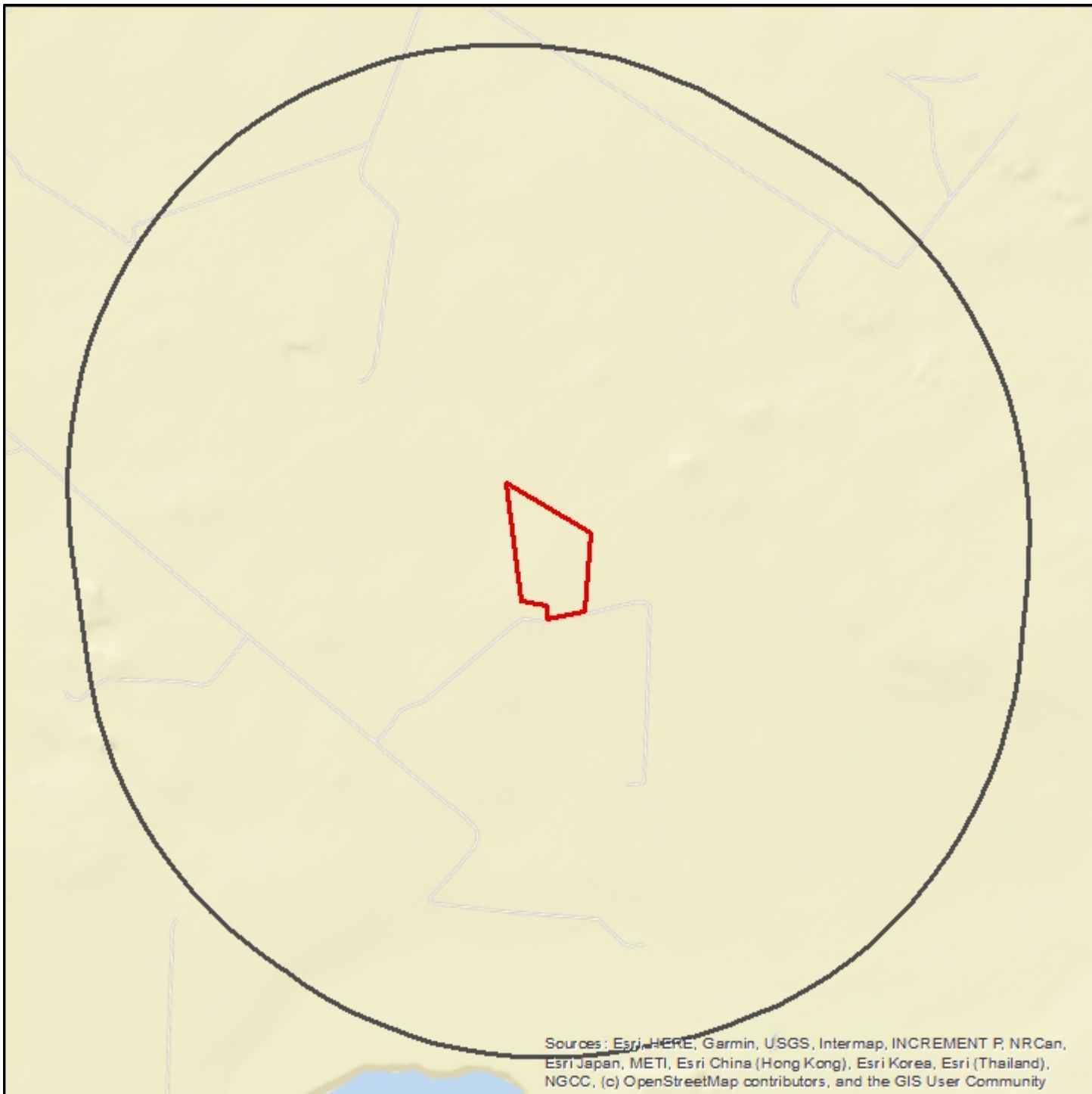
Geographic Summary	3
Maps	
Summary Map - 1 Mile Buffer	4
Topographic Overlay Map - 1 Mile Buffer	5
Current Imagery Overlay Map - 1 Mile Buffer	6
Water Well Details	7
Database Definitions and Sources	8
Disclaimer	9



Geographic Summary

Location	
Lea County, NM	
Target location is 0.039 square miles and has a 0.85 mile perimeter	
Coordinates	
Longitude & Latitude in Degrees Minutes Seconds	NA
Longitude & Latitude in Decimal Degrees	NA
X and Y in UTM	NA
Elevation	
NA	
Zip Codes Searched	
Search Distance	Zip Codes (historical zip codes included)
Target Property	88260, 88213, 88262, 88264
1 mile	88260, 88213, 88262, 88264
Topos Searched	
Search Distance	Topo Name
Target Property	Laguna Gatuna NW (1984)
1 mile	Laguna Gatuna NW (1984), Laguna Gatuna (1984)

Summary Map - 1 Mile Buffer



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Jesse James Recycle Facility

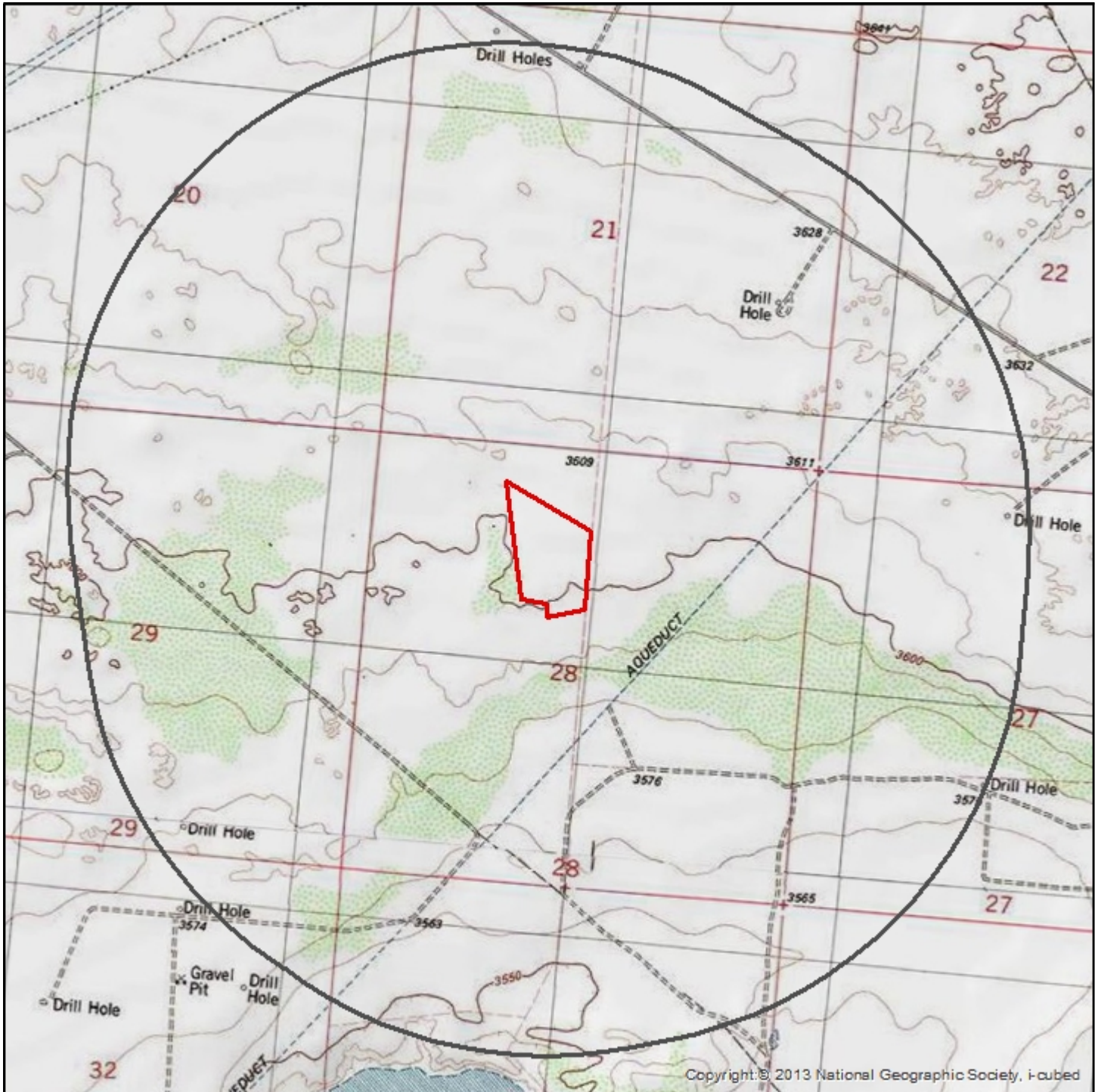
- | | |
|--|---|
|  Well |  Target Property |
|  Well Cluster |  Search Buffer |

1 : 21,000
1 inch = 0.331 miles
1 inch = 1750 feet
1 centimeter = 0.210 kilometers
1 centimeter = 210 meters

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33° 0' 00" North
Second Standard Parallel: 45° 0' 00" North
Central Meridian: 96° 0' 00" West
Latitude of Origin: 39° 0' 00" North



Topographic Overlay Map - 1 Mile Buffer



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Jesse James Recycle Facility

- Well
- Well Cluster

- Target Property
- Search Buffer

Target Property Quad Name(s)
Laguna Gatuna NW (1984)

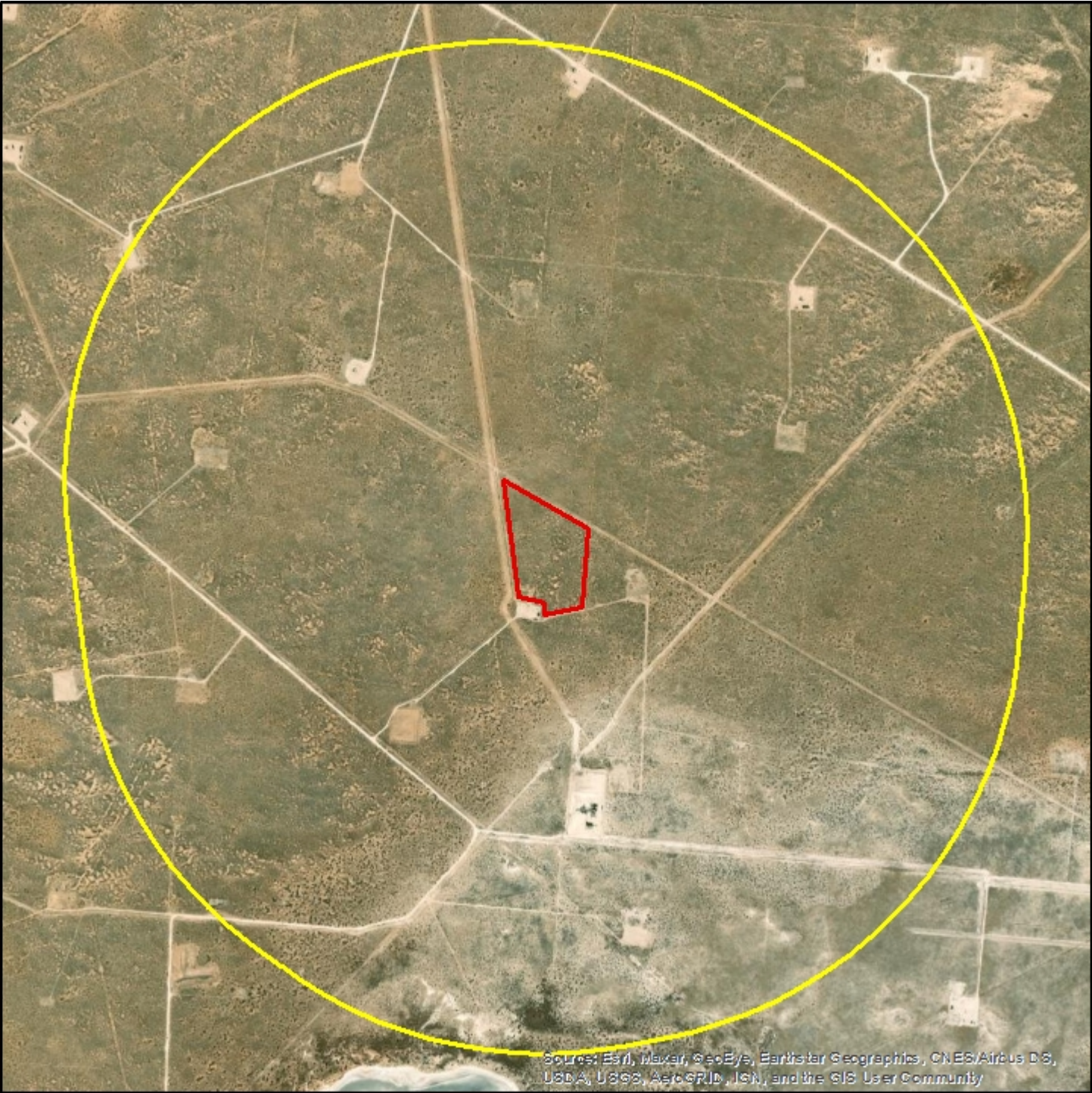
1 : 21,000
1 inch = 0.331 miles
1 inch = 1750 feet

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33° 0' 00" North
Second Standard Parallel: 45° 0' 00" North
Central Meridian: 96° 0' 00" West
Latitude of Origin: 39° 0' 00" North





Current Imagery Overlay Map - 1 Mile Buffer



Jesse James Recycle Facility

- Well
- Well Cluster
- Target Property
- Search Buffer

1 : 21,000
1 inch = 0.331 miles
1 inch = 1750 feet
1 centimeter = 0.210 kilometers
1 centimeter = 210 meters

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33° 00' North
Second Standard Parallel: 45° 00' North
Central Meridian: 96° 00' West
Latitude of Origin: 39° 00' North



Water Well Details



Banks Environmental Data performed a thorough search and no water wells were found.

Dataset Descriptions and Sources



Dataset	Source	Dataset Description	Update Schedule	Data Requested	Data Obtained	Data Updated	Source Updated
NM WW - New Mexico Water Wells	New Mexico Office of the State Engineer	This WATERS dataset contains all groundwater records and water rights applications compiled by New Mexico Office of the State Engineer (OSE). OSE is in the process of digitizing all records, all wells have not yet been plotted.	Quarterly	01/31/2024	01/31/2024	01/31/2024	01/16/2024
NM WW HIST - New Mexico Historical Water Wells	New Mexico Office of the State Engineer	This dataset contains all groundwater records found at the New Mexico Office of the State Engineer Water Rights Division district office. Groundwater rights are administered and filed at the district level: Albuquerque (District I), Roswell (District II),		N/A	N/A	N/A	N/A
USGS WW - USGS Water Wells	U.S. Geological Survey	This dataset contains groundwater well records from the U.S. Geological Survey.	Semi-annually	11/13/2023	11/13/2023	11/13/2023	11/13/2023

Disclaimer

The Banks Environmental Data Water Well Report was prepared from existing state water well databases and/or additional file data/records research conducted at the state agency and the U.S. Geological Survey. Banks Environmental Data has performed a thorough and diligent search of all groundwater well information provided and recorded. All mapped locations are based on information obtained from the source. Although Banks performs quality assurance and quality control on all research projects, we recognize that any inaccuracies of the records and mapped well locations could possibly be traced to the appropriate regulatory authority or the actual driller. It may be possible that some water well schedules and logs have never been submitted to the regulatory authority by the water driller and, thus, may explain the possible unaccountability of privately drilled wells. It is uncertain if the above listing provides 100% of the existing wells within the area of review. Therefore, Banks Environmental Data cannot fully guarantee the accuracy of the data or well location(s) of those maps and records maintained by the regulatory authorities.



C147L REGISTRATION PACKAGE
JESSE JAMES RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
024113-00

APPENDIX B

GEOTECHNICAL ENGINEERING REPORT

COZ Engineering, LLC

GEOTECHNICAL ENGINEERING REPORT

SELECT EARTHSTONE RECYCLING FACILITY

LEA COUNTY, NEW MEXICO

Project No. 4223053

April 29, 2023

Prepared for:

ENVIROTECH ENGINEERING & CONSULTING, INC.

Enid, Oklahoma

Prepared by:

COZ ENGINEERING, LLC

Las Cruces, New Mexico

COZ Engineering, LLC

PO Box 13331
Las Cruces, New Mexico 88013
Cell: 575.642.7671
Email: thecoz42@gmail.com

April 29, 2023

Envirotech Engineering & Consulting, Inc.
2500 North Eleventh Street
Enid, OK 73701

Attn. Mitchell Ratke, EIT
P: 580.234.8780
E: mratke@envirotechconsulting.com

**Re: Geotechnical Engineering Report
Select Earthstone Recycling Facility
Smith Ranch Road, 32.633002, -103.672278
Lea County, New Mexico
COZ Report No. 4223053**

Dear Mr. Ratke:

The following is a geotechnical engineering report for the proposed Select Earthstone Recycling Facility near Hobbs, New Mexico. Recommendations for earthwork, embankments and other geotechnical considerations are presented in the report.

Thank you for the opportunity to provide this geotechnical engineering report. If you have any questions or concerns, please contact me at (575)-642-7671.

Sincerely,
COZ Engineering, LLC

Dan Cosper, P.E.



Select Earthstone Recycling Facility

April 29, 2023

COZ Report No. 4223053

<i>Site Investigation:</i>	<i>1</i>
<i>Site Conditions:</i>	<i>1</i>
<i>Planned Construction:</i>	<i>1</i>
<i>Site Grading:</i>	<i>1</i>
<i>Soil Improvements:</i>	<i>2</i>
<i>Fill Material:</i>	<i>2</i>
<i>Excavation of Embankment Areas:</i>	<i>3</i>
<i>Embankment Placement:</i>	<i>3</i>
<i>Seismic Site Classification:</i>	<i>3</i>
<i>Testing and Inspection:</i>	<i>4</i>
<i>Report Limitations:</i>	<i>4</i>

Appendix:

Site Plan

Boring Logs

Laboratory Results

Select Earthstone Recycling Facility

April 29, 2023

COZ Report No. 4223053

Site Investigation:

A subsurface investigation was performed for the proposed Select Earthstone Recycling Facility to be located at Lat.: 32.633002° Long.: -103.672278° near Hobbs, New Mexico. Seven (7) test borings were advanced within the proposed facility near client requested locations. The borings were advanced to depths of 25 and 75 feet below ground surface (bgs).

Site Conditions:

The ground surface consisted of exposed subgrade with areas of dense vegetation. Soils investigated at this site were comprised of silty sand with varying amounts of gravel and carbonate indurations from the surface to the total explored depths of about 25 and 75 feet bgs.

The groundwater table was not encountered during the field investigation.

Planned Construction:

Based on the information provided, the project will include the construction of a recycling facility.

Site Grading:

Areas for planned construction should be clear of debris, vegetation and any oversized or deleterious material prior to grading operations. Fill construction shall not be allowed on

Select Earthstone Recycling Facility

April 29, 2023

COZ Report No. 4223053

surfaces that contain vegetation or rocks larger than four inches in greatest dimension. No fill shall be placed that contains vegetative material as decomposition of that material can cause voids and possibly result in surface settlement. Voids in the soil matrix created or encountered during grading operations shall be backfilled with compacted fill material.

Positive drainage away from embankments should be provided throughout the life of the project. Areas adjacent to embankments that could retain water should be sealed or eliminated.

Soil Improvements:

Subgrade preparation (beneath embankments and engineered fills) should consist of scarifying the native soil surface a minimum thickness of 10 inches, moisture conditioning (+/- 2% of optimum moisture content per ASTM D-698) and compaction to a minimum of 95% of standard Proctor density (per ASTM D-698). Engineered fill materials should be placed in 10-inch maximum lifts, moisture conditioned to within 2% of optimum moisture content (per ASTM D-698) and compacted to a minimum of 95% of standard Proctor density (per ASTM D-698).

Fill Material:

Engineered fill material for this project should meet the following gradation criteria:

<u>Sieve</u>	<u>% Passing</u>
4"	100
¾"	70-100
#4	50-100
#200	50 max.

Select Earthstone Recycling Facility

April 29, 2023

COZ Report No. 4223053

The plasticity index of the minus #40 sieve portion should not exceed twenty (20). On-site soils meet the above specifications.

Excavation of Embankment Areas:

The soil below the new embankments should be scarified ten inches, moisture conditioned and compacted. The interior/exterior width of subgrade preparation should extend to the intersection of the slopes of the embankment fill. Once the subgrade preparation has been observed and approved by the geotechnical engineer, embankment fill operations can initiate.

Embankment Placement:

Once the subgrade has been prepared, on-site embankment material stockpiles should be moisture conditioned in preparation for lift placement. The embankments should be constructed as a unit from the bottom elevation to the rim elevation.

The distal slopes of the embankments should be overbuilt and cut to final grade to provide compaction to these edges of the embankments. The embankments should be constructed in strict accordance with the project plans and specifications.

Seismic Site Classification:

The seismic site classification is based upon the soil profile in the upper 100 feet as defined by the weighted average of standard penetration blow-counts or shear wave velocity in

Select Earthstone Recycling Facility

April 29, 2023

COZ Report No. 4223053

accordance with Section 20.4 of the ASCE 7 and the International Building Code (IBC). Based upon my field investigation, it is my opinion that the Seismic Site Classification is **C** ("**Very Dense Soil or Soft Rock**"). The maximum depth of the borings advanced at the site was 75 feet. Therefore, soil properties below the maximum boring depth to 100 feet were estimated based on my experience with the general area. Deeper borings or geophysical testing would be required to confirm the conditions below the current boring depth.

Testing and Inspection:

It is recommended that all site grading operations be inspected by a geotechnical engineer. The inspecting engineer should be responsible for immediately reporting any site or soil conditions that vary significantly from this report.

The testing of materials should be made at the following:

- 1) One (1) soil density every 5,000 square feet of prepared subgrade and embankment fill areas (ASTM D-1556, ASTM D-2167, or ASTM D-2922, ASTM D-3017).
- 2) One (1) sieve analysis and plasticity index per material used according to ASTM D-422 and ASTM D-4318.
- 3) One (1) proctor per each type of material used according to ASTM D-698.

Report Limitations:

The conclusions, recommendations and opinions presented herein are:

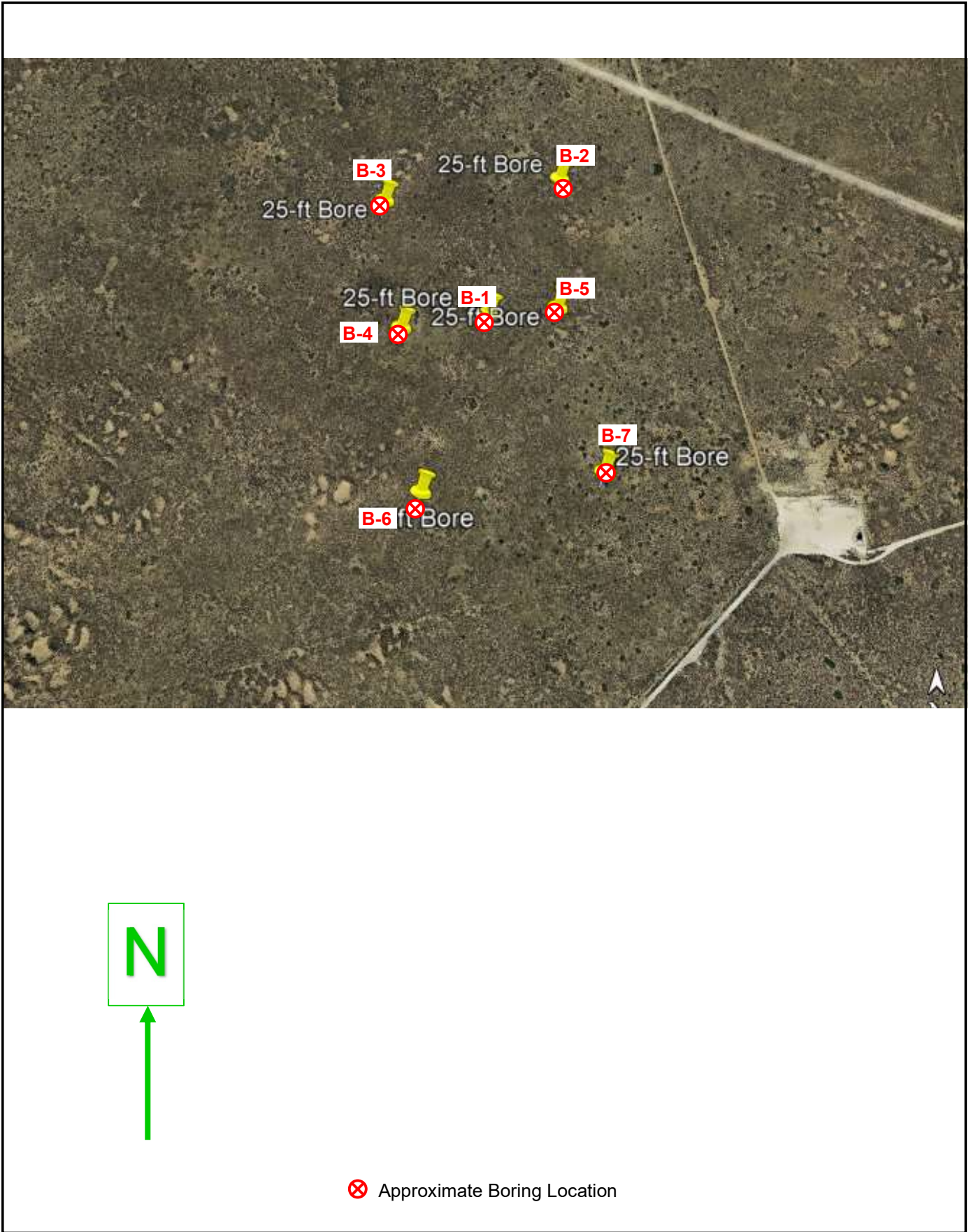
Select Earthstone Recycling Facility

April 29, 2023

COZ Report No. 4223053

- 1) Based upon evaluation and interpretation of the findings of the field and laboratory program.
- 2) Based upon an interpolation of soil conditions between and beyond the explorations.
- 3) Subject to confirmation of the conditions encountered during construction.
- 4) Based upon the assumption that sufficient observation and testing will be provided during construction.


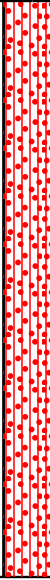
There is no other warranty, either express or implied. Any person using this report for bidding or construction purposes should perform such independent investigation as he deems necessary to satisfy himself as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project. If conditions are encountered during construction that appear to differ from those indicated in this report, I should be notified immediately.



Project Manager: DC	Project No. 4223053	COZ Engineering, LLC PO Box 13331 Las Cruces, NM 88013	BORING LOCATION PLAN	Exhibit
Drawn by: DC	Scale: AS SHOWN		Select Earthstone Recycling Facility	1
Checked by: DC	File Name: Figures		Smith Ranch Road, 32.633002, -103.672278	
Approved by: DC	Date: 4-29-23		Lea County, New Mexico	

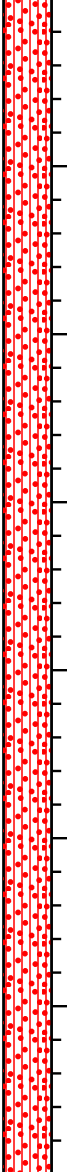
Project: Select Earthstone Recycling Facility	Log of Boring B-1 Sheet 1 of 2
Project Location: Smith Ranch Road, 32.633002, -103.672278, Lea County, NM	
Project Number: 4223053	

Date(s) Drilled 4-13-23	Logged By JS	Checked By COZ
Drilling Method hollow-stem auger	Drill Bit Size/Type	Total Depth of Borehole 75 feet bgs
Drill Rig Type CME-75	Drilling Contractor Southlands	Approximate Surface Elevation
Groundwater Level and Date Measured not encountered	Sampling Method(s)	Hammer Data
Borehole Backfill cuttings	Location see boring plan	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
	0				SM		SILTY SAND WITH GRAVEL: light brown, dry				
	5										
	10										
	15										
	20				SM		SILTY SAND: red brown, dry				
	25										
	30										
	35										
	40										

Project: **Select Earthstone Recycling Facility**
Project Location: **Smith Ranch Road, 32.633002, -103.672278, Lea County, NM**
Project Number: **4223053**

Log of Boring B-1
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
	40				SM		SILTY SAND: red brown, dry				
	45										
	50										
	55										
	60										
	65										
	70										
	75						Bottom of Boring				
	80										

C:\Users\thecho\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bg4[COZ Engineering 1.tpl]

Project: **Select Earthstone Recycling Facility**Project Location: **Smith Ranch Road, 32.633002, -103.672278, Lea County, NM**Project Number: **4223053**

Log of Boring B-2

Sheet 1 of 1







Date(s) Drilled 4-13-23	Logged By JS	Checked By COZ
Drilling Method hollow-stem auger	Drill Bit Size/Type	Total Depth of Borehole 26 feet bgs
Drill Rig Type CME-75	Drilling Contractor Southlands	Approximate Surface Elevation
Groundwater Level and Date Measured not encountered	Sampling Method(s) SPT	Hammer Data
Borehole Backfill cuttings	Location see boring plan	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
0					SM		SILTY SAND: light brown, dry, very dense, trace gravel				
5			1	20\47\50							
10			2	7\30\50				6.3	20.1		NP
15			3	13\50							
20			4	28\50							
25			5	20\50							
							Bottom of Boring				
30											
35											
40											

C:\Users\theco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ Engineering 1.tbl

Project: Select Earthstone Recycling Facility	Log of Boring B-3 Sheet 1 of 1
Project Location: Smith Ranch Road, 32.633002, -103.672278, Lea County, NM	
Project Number: 4223053	

Date(s) Drilled 4-13-23	Logged By JS	Checked By COZ
Drilling Method hollow-stem auger	Drill Bit Size/Type	Total Depth of Borehole 26.5 feet bgs
Drill Rig Type CME-75	Drilling Contractor Southlands	Approximate Surface Elevation
Groundwater Level and Date Measured not encountered	Sampling Method(s) SPT	Hammer Data
Borehole Backfill cuttings	Location see boring plan	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
	0				SM		SILTY SAND: brown, dry, medium dense, trace gravel				
	5		1	3\8\5							
	10		2	18\18\18			dense	7.2	19.1		NP
	15		3	25\29\50			very dense				
	20		4	15\26\25			light brown				
	25		5	11\14\16			dense				
							Bottom of Boring				
	30										
	35										
	40										

Project: **Select Earthstone Recycling Facility**Project Location: **Smith Ranch Road, 32.633002, -103.672278, Lea County, NM**Project Number: **4223053**

Log of Boring B-4

Sheet 1 of 1

Date(s) Drilled 4-13-23	Logged By JS	Checked By COZ
Drilling Method hollow-stem auger	Drill Bit Size/Type	Total Depth of Borehole 26.5 feet bgs
Drill Rig Type CME-75	Drilling Contractor Southlands	Approximate Surface Elevation
Groundwater Level and Date Measured not encountered	Sampling Method(s) SPT	Hammer Data
Borehole Backfill cuttings	Location see boring plan	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
0					SM		SILTY SAND: light brown, dry, very dense				
5			1	5\17\50							
10			2	50							
15			3	21\50							
20			4	14\30\50			light red brown	8.6	18.1		NP
25			5	18\30\30							
							Bottom of Boring				
30											
35											
40											

C:\Users\theco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\4[COZ Engineering 1.tbl]

Project: Select Earthstone Recycling Facility	Log of Boring B-5 Sheet 1 of 1
Project Location: Smith Ranch Road, 32.633002, -103.672278, Lea County, NM	
Project Number: 4223053	

Date(s) Drilled 4-13-23	Logged By JS	Checked By COZ
Drilling Method hollow-stem auger	Drill Bit Size/Type	Total Depth of Borehole 26.5 feet bgs
Drill Rig Type CME-75	Drilling Contractor Southlands	Approximate Surface Elevation
Groundwater Level and Date Measured not encountered	Sampling Method(s) SPT	Hammer Data
Borehole Backfill cuttings	Location see boring plan	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
	0				SM		SILTY SAND: light brown to white, dry, dense, carbonate indurated, trace gravel				
	5		1	30\20\18				4.9	17.4		NP
	10		2	11\19\50			very dense				
	15		3	32\50							
	20		4	16\35\50			light red brown				
	25		5	22\28\50							
							Bottom of Boring				
	30										
	35										
	40										

Project: **Select Earthstone Recycling Facility**Project Location: **Smith Ranch Road, 32.633002, -103.672278, Lea County, NM**Project Number: **4223053**

Log of Boring B-6

Sheet 1 of 1

Date(s) Drilled 4-13-23	Logged By JS	Checked By COZ
Drilling Method hollow-stem auger	Drill Bit Size/Type	Total Depth of Borehole 26 feet bgs
Drill Rig Type CME-75	Drilling Contractor Southlands	Approximate Surface Elevation
Groundwater Level and Date Measured not encountered	Sampling Method(s) SPT	Hammer Data
Borehole Backfill cuttings	Location see boring plan	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
0					SM		SILTY SAND WITH GRAVEL: brown, dry to moist, medium dense				
5			1	5/4/8				9.1	12.7	22	2
10			2	24/25/50			very dense				
15			3	22/34/50							
20			4	20/24/50							
25			5	18/50							
							Bottom of Boring				
30											
35											
40											

C:\Users\theco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs4[COZ Engineering 1.tpl]

Project: **Select Earthstone Recycling Facility**Project Location: **Smith Ranch Road, 32.633002, -103.672278, Lea County, NM**Project Number: **4223053**

Log of Boring B-7

Sheet 1 of 1

Date(s) Drilled 4-13-23	Logged By JS	Checked By COZ
Drilling Method hollow-stem auger	Drill Bit Size/Type	Total Depth of Borehole 26.5 feet bgs
Drill Rig Type CME-75	Drilling Contractor Southlands	Approximate Surface Elevation
Groundwater Level and Date Measured not encountered	Sampling Method(s) SPT	Hammer Data
Borehole Backfill cuttings	Location see boring plan	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
0					SM		SILTY SAND: light brown, dry, dense				
5			1	17\24\20				7.2	25.2		NP
10			2	19\16\13			medium dense				
15			3	14\13\14							
20			4	19\19\50			very dense				
25			5	14\26\50			red brown				
							Bottom of Boring				
30											
35											
40											

C:\Users\theco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ Engineering 1.tbl

Project: **Select Earthstone Recycling Facility**Project Location: **Smith Ranch Road, 32.633002, -103.672278, Lea County, NM**Project Number: **4223053****Key to Log of Boring
Sheet 1 of 1**

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Percent Fines	LL, %	PI, %
1	2	3	4	5	6	7	8	9	10	11	12

COLUMN DESCRIPTIONS

- 1** Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Material Type: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
10 Percent Fines: The percent fines (soil passing the No. 200 Sieve) in the sample. WA indicates a Wash Sieve, SA indicates a Sieve Analysis.
11 LL, %: Liquid Limit, expressed as a water content.
12 PI, %: Plasticity Index, expressed as a water content.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
 COMP: Compaction test
 CONS: One-dimensional consolidation test
 LL: Liquid Limit, percent

PI: Plasticity Index, percent
 SA: Sieve analysis (percent passing No. 200 Sieve)
 UC: Unconfined compressive strength test, Qu, in ksf
 WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Silty SAND (SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler



Bulk Sample



3-inch-OD California w/ brass rings



CME Sampler



Grab Sample



2.5-inch-OD Modified California w/ brass liners



Pitcher Sample



2-inch-OD unlined split spoon (SPT)



Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)



Water level (after waiting)



Minor change in material properties within a stratum



Inferred/gradational contact between strata



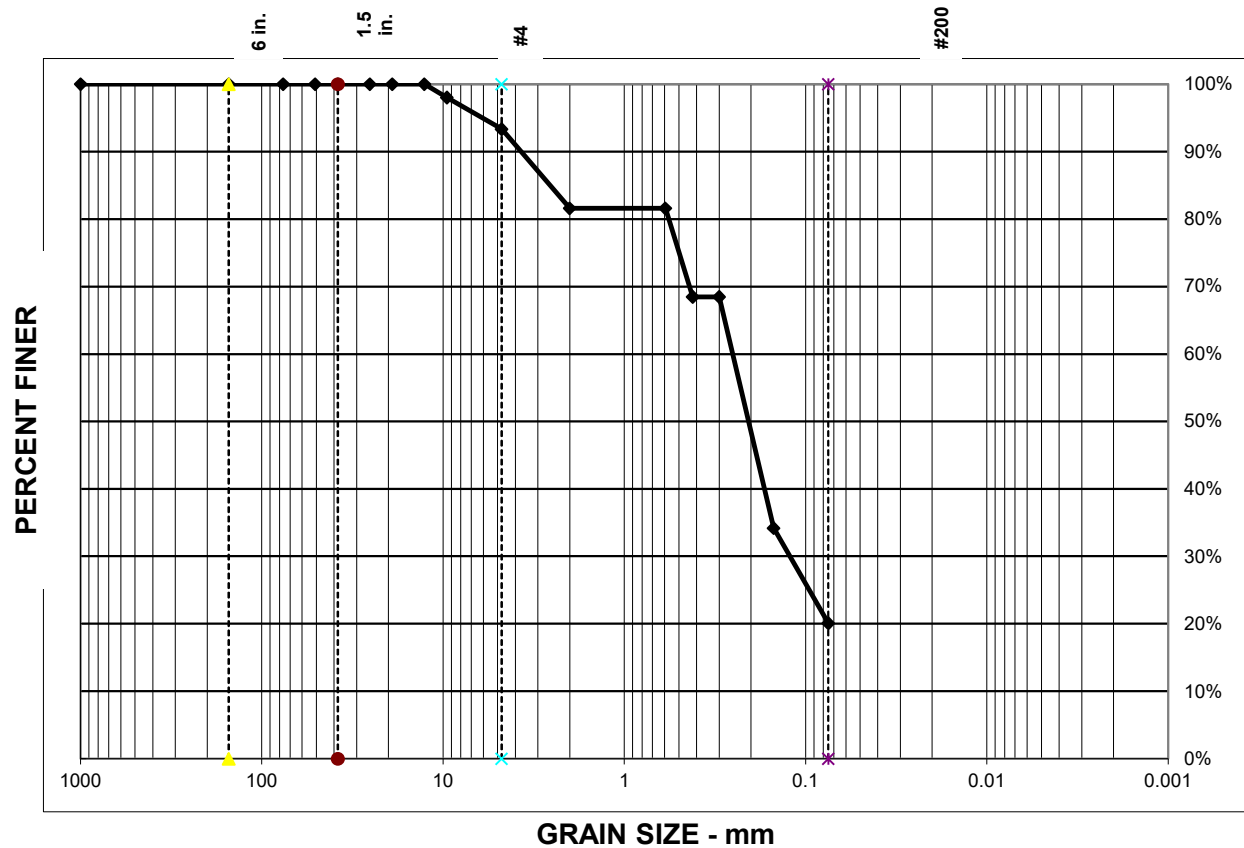
Queried contact between strata

GENERAL NOTES

- 1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
 2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Figure B-1

GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY (ASTM C136)

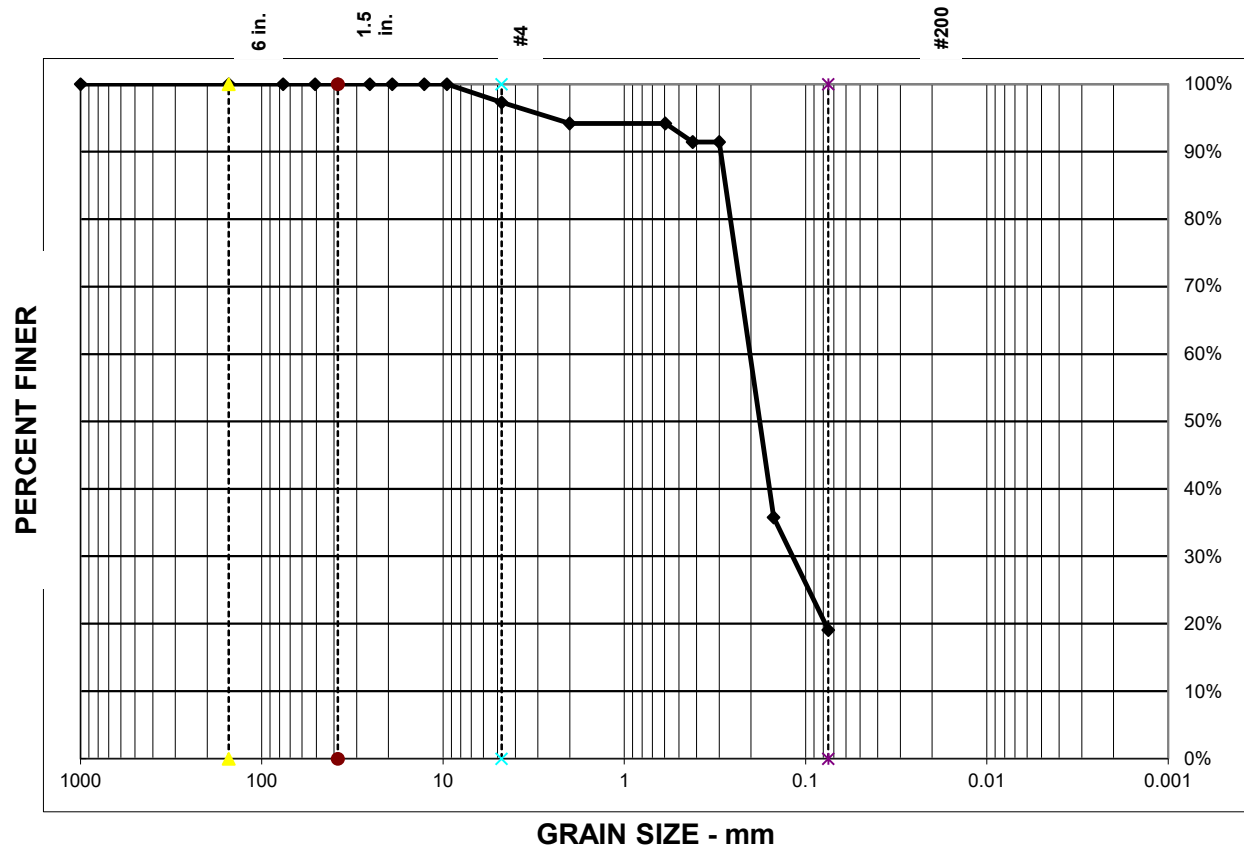
Sieve Size	1 1/2"	3/4"	3/8"	#4	#10	#40	#100	#200
% Passing (Cumulative)	100%	100%	98%	93%	82%	68%	34%	20.1%
Specification								

% GRAVEL =	7%	D ₈₅ =	2.6	D ₁₅ =
% SAND =	73%	D ₆₀ =	0.3	D ₁₀ =
% SILT & CLAY =	20%	D ₅₀ =	0.2	C _U =
		D ₃₀ =	0.1	C _c =

Sample Date: 4/13/23
Project No.: 4223053
Project Name: Select Earthstone Recycling Facility
Report Date: 4/28/23
Sample Location: B-2 at 10'
Liquid Limit: Plasticity Index: NP
USCS Classification: SM
Material Description: Silty Sand
Moisture Content: 6.3%

COZ Engineering, LLC
PO Box 13331
Las Cruces, NM 88013
(575) 642-7671

GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY (ASTM C136)

Sieve Size	1 1/2"	3/4"	3/8"	#4	#10	#40	#100	#200
% Passing (Cumulative)	100%	100%	100%	97%	94%	91%	36%	19.1%
Specification								

% GRAVEL =	3%	D ₈₅ =	0.3	D ₁₅ =
% SAND =	78%	D ₆₀ =	0.2	D ₁₀ =
% SILT & CLAY =	19%	D ₅₀ =	0.2	C _u =
		D ₃₀ =	0.1	C _c =

Sample Date: 4/13/23

Project No.: 4223053

Project Name: Select Earthstone Recycling Facility

Report Date: 4/28/23

Sample Location: B-3 at 10'

Liquid Limit: Plasticity Index: NP

USCS Classification: SM

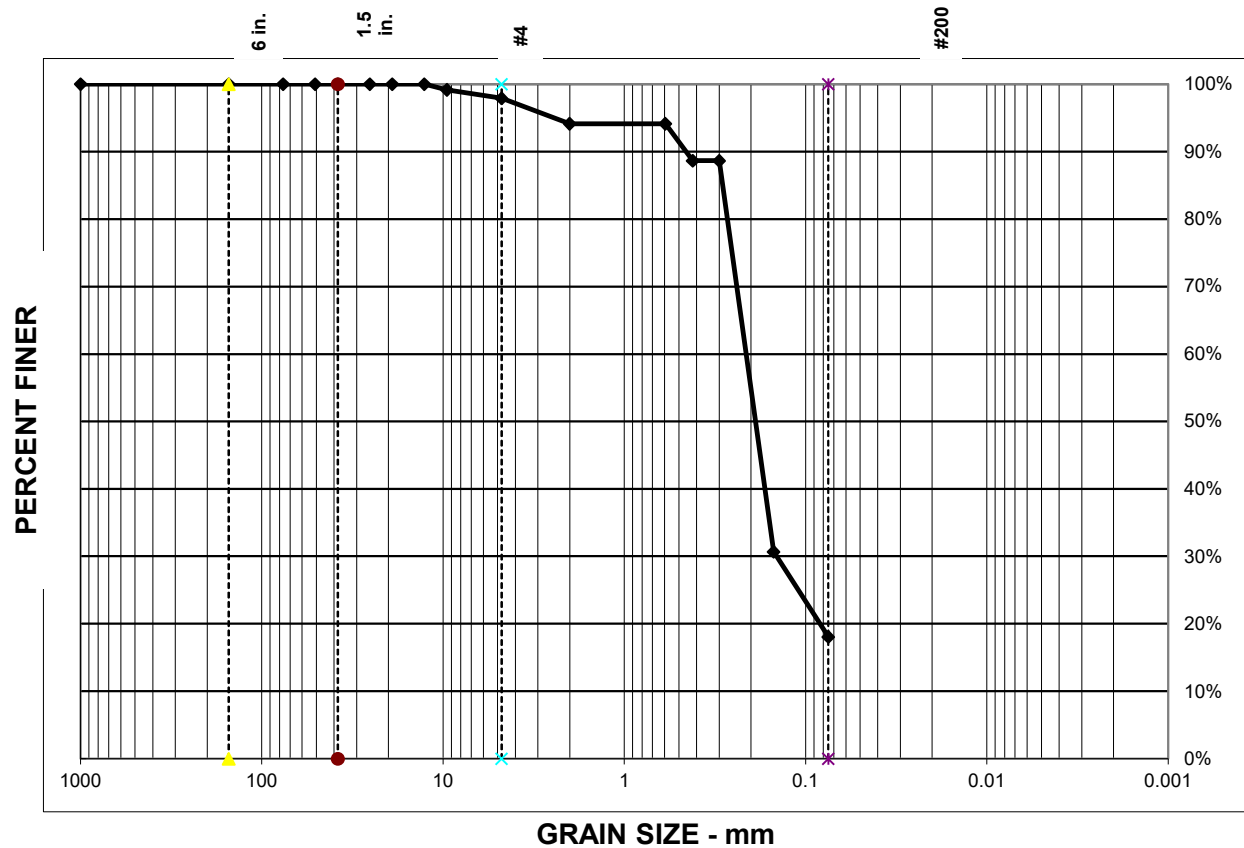
Material Description: Silty Sand

Moisture Content: 7.2%

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Las Cruces, NM 88013
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GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY (ASTM C136)

Sieve Size	1 1/2"	3/4"	3/8"	#4	#10	#40	#100	#200
% Passing (Cumulative)	100%	100%	99%	98%	94%	89%	31%	18.1%
Specification								

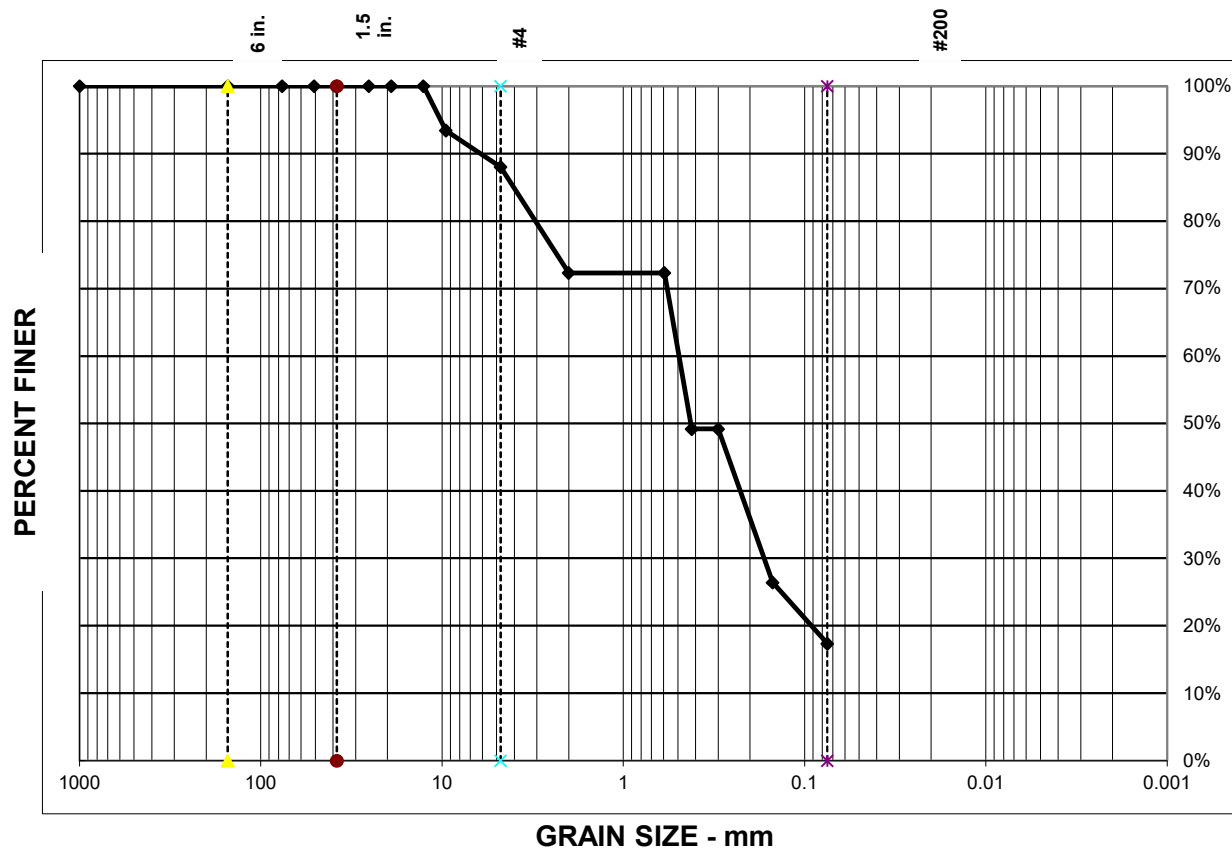
% GRAVEL =	2%	D ₈₅ =	0.3	D ₁₅ =
% SAND =	80%	D ₆₀ =	0.2	D ₁₀ =
% SILT & CLAY =	18%	D ₅₀ =	0.2	C _U =
		D ₃₀ =	0.1	C _c =

Sample Date: 4/13/23
Project No.: 4223053
Project Name: Select Earthstone Recycling Facility
Report Date: 4/28/23
Sample Location: B-4 at 20'
Liquid Limit: Plasticity Index: NP
USCS Classification: SM
Material Description: Silty Sand
Moisture Content: 8.6%

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Las Cruces, NM 88013
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GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY (ASTM C136)

Sieve Size	1 1/2"	3/4"	3/8"	#4	#10	#40	#100	#200
% Passing (Cumulative)	100%	100%	93%	88%	72%	49%	26%	17.4%
Specification								

% GRAVEL = 12%

$D_{85} = 4.0$

$D_{15} =$

% SAND = 71%

$D_{60} = 0.5$

$D_{10} =$

% SILT & CLAY = 17%

$D_{50} = 0.4$

$C_U =$

$D_{30} = 0.2$

$C_C =$

Sample Date: 4/13/23

Project No.: 4223053

Project Name: Select Earthstone Recycling Facility

Report Date: 4/28/23

Sample Location: B-5 at 5'

Liquid Limit:

Plasticity Index: NP

USCS Classification: SM

Material Description: Silty Sand

Moisture Content: 4.9%

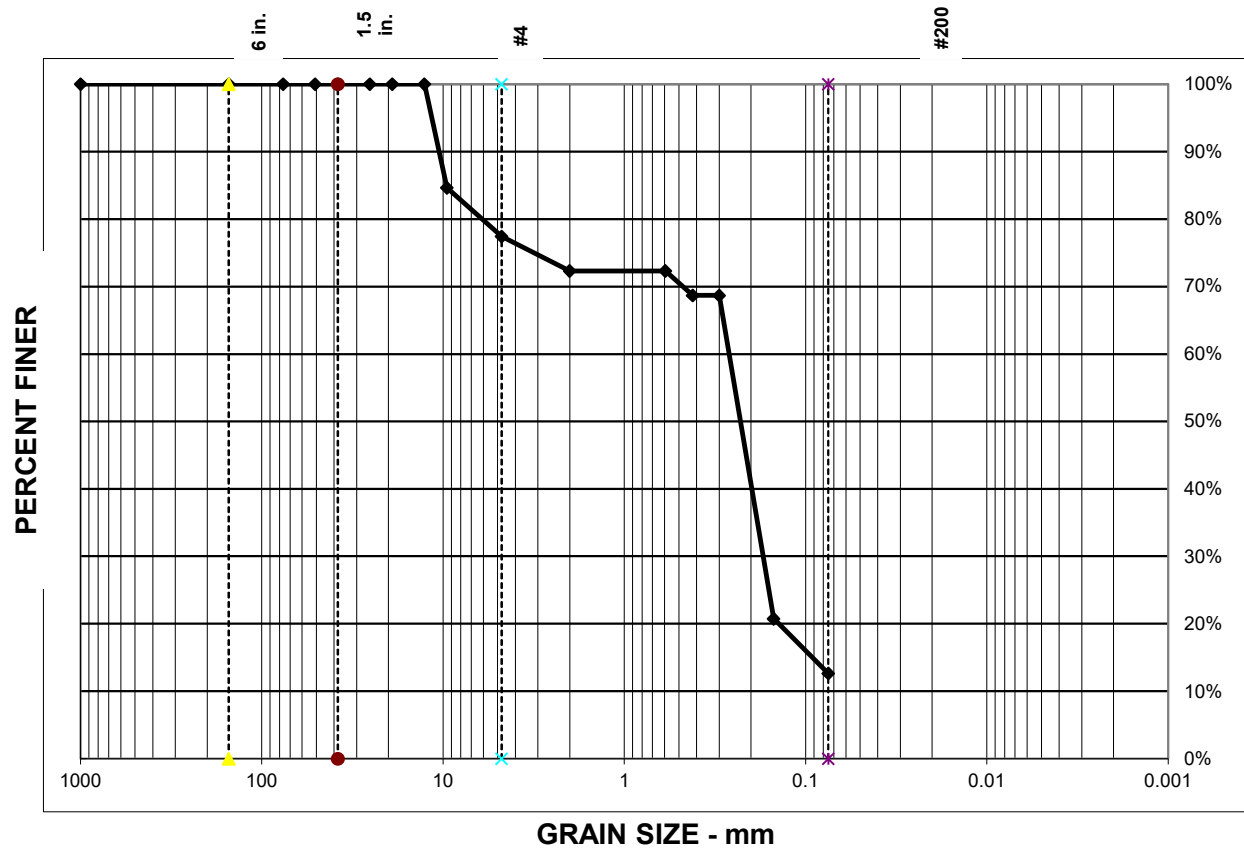
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Las Cruces, NM 88013

(575) 642-7671

GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY (ASTM C136)

Sieve Size	1 1/2"	3/4"	3/8"	#4	#10	#40	#100	#200
% Passing (Cumulative)	100%	100%	85%	77%	72%	69%	21%	12.7%
Specification								

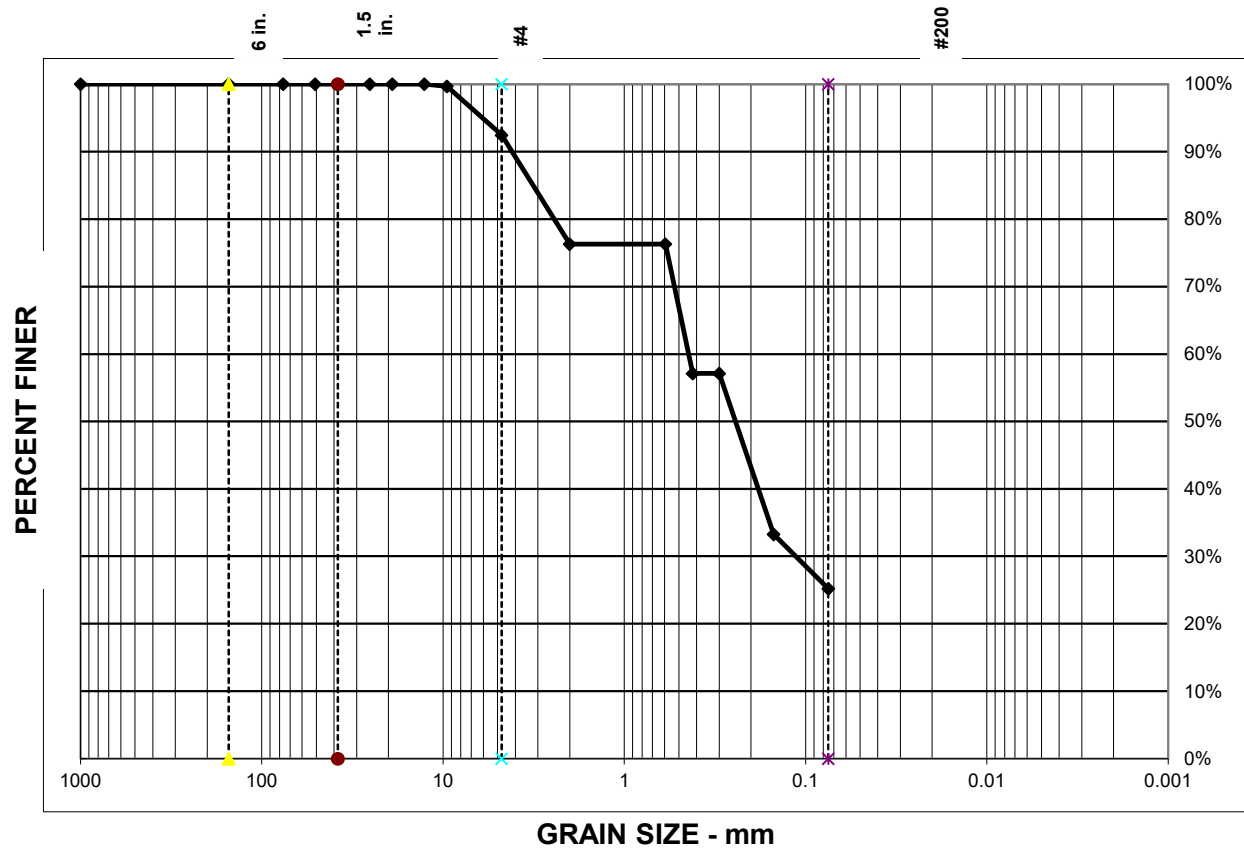
% GRAVEL =	23%	D ₈₅ =	9.6	D ₁₅ =	0.1
% SAND =	65%	D ₆₀ =	0.3	D ₁₀ =	
% SILT & CLAY =	13%	D ₅₀ =	0.2	C _U =	
		D ₃₀ =	0.2	C _c =	

Sample Date: 4/13/23
Project No.: 4223053
Project Name: Select Earthstone Recycling Facility
Report Date: 4/28/23
Sample Location: B-6 at 5'
Liquid Limit: 22 Plasticity Index: 2
USCS Classification: SM
Material Description: Silty Sand with Gravel
Moisture Content: 9.1%

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Las Cruces, NM 88013
(575) 642-7671

GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY (ASTM C136)

Sieve Size	1 1/2"	3/4"	3/8"	#4	#10	#40	#100	#200
% Passing (Cumulative)	100%	100%	100%	92%	76%	57%	33%	25.2%
Specification								

% GRAVEL =	8%	D ₈₅ =	3.2	D ₁₅ =
% SAND =	67%	D ₆₀ =	0.4	D ₁₀ =
% SILT & CLAY =	25%	D ₅₀ =	0.2	C _U =
		D ₃₀ =	0.1	C _c =

Sample Date: 4/13/23
Project No.: 4223053
Project Name: Select Earthstone Recycling Facility
Report Date: 4/28/23
Sample Location: B-7 at 5'
Liquid Limit: Plasticity Index: NP
USCS Classification: SM
Material Description: Silty Sand
Moisture Content: 7.2%

COZ Engineering, LLC
PO Box 13331
Las Cruces, NM 88013
(575) 642-7671

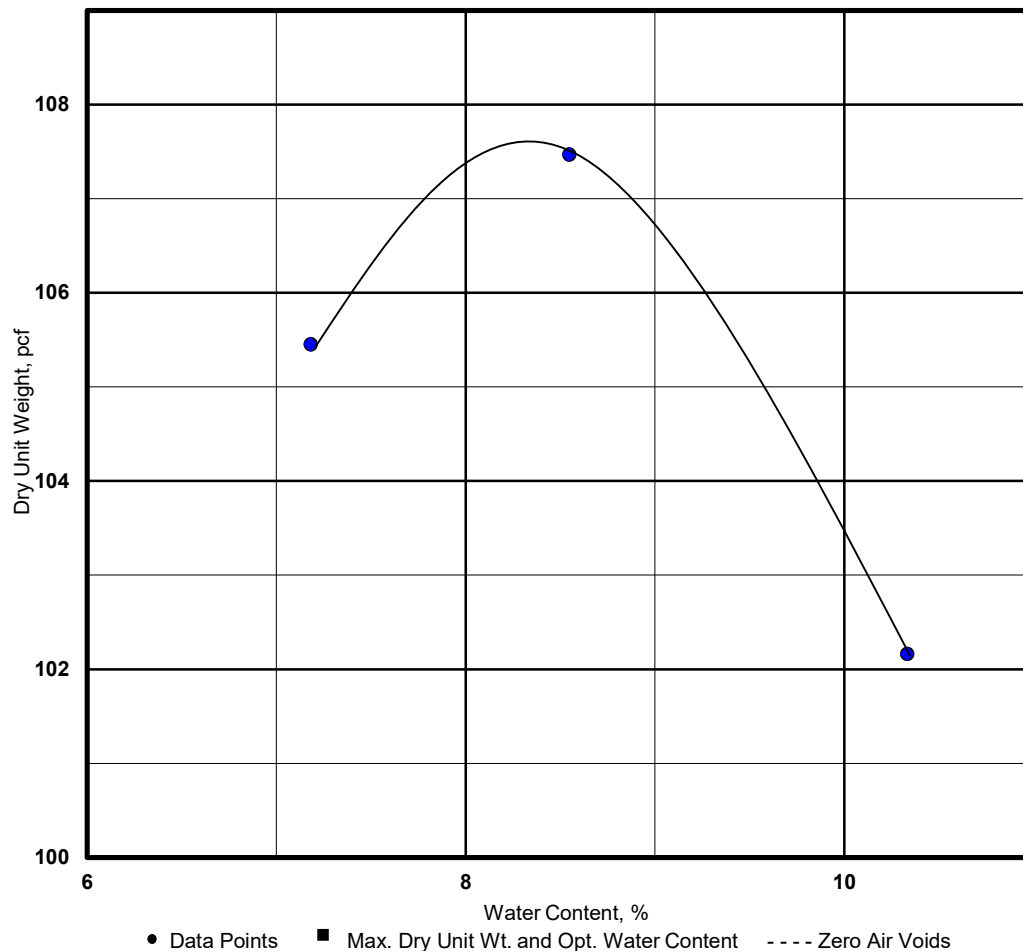
Laboratory Compaction Characteristics of Soil

COZ Engineering, LLC

P. O. Box 13331
Las Cruces, NM 88013
575-642-7671

Client Name: EnvirotechProject Name: Select Earthstone Recycling FacilityLocation: 32.633002, -103.672278Lea County, New MexicoSource Material: B-2 at 5'-10'Sample Description: Silty SandProctor #1Material Designation: SM Sample date: 4/13/2023Test Method: ASTM-698Test Procedure: ASample Preparation: COZRammer: Mechanical X ManualProject No.: 4223053 Date: 4/28/2023

TEST RESULTS

Maximum Dry Unit Wt.: 107.7 pcfOptimum Water Content: 8.3 %Liquid Limit: Plastic Limit: Plasticity Index: NP% passing # 200 sieve: 20Reviewed by: Dan Cosper, P. E.

Laboratory Compaction Characteristics of Soil

COZ Engineering, LLC
P. O. Box 13331
Las Cruces, NM 88013
575-642-7671

Client Name: Envirotech

Project Name: Select Earthstone Recycling Facility

Location: 32.633002, -103.672278
Lea County, New Mexico

Source Material: B-6 at 0-5'

Sample Description: Silty Sand with Gravel
Proctor #2

Material Designation: SM Sample date: 4/13/2023

Test Method: ASTM-698

Test Procedure: B

Sample Preparation: COZ

Rammer: Mechanical X Manual

Project No.: 4223053 Date: 4/28/2023

TEST RESULTS

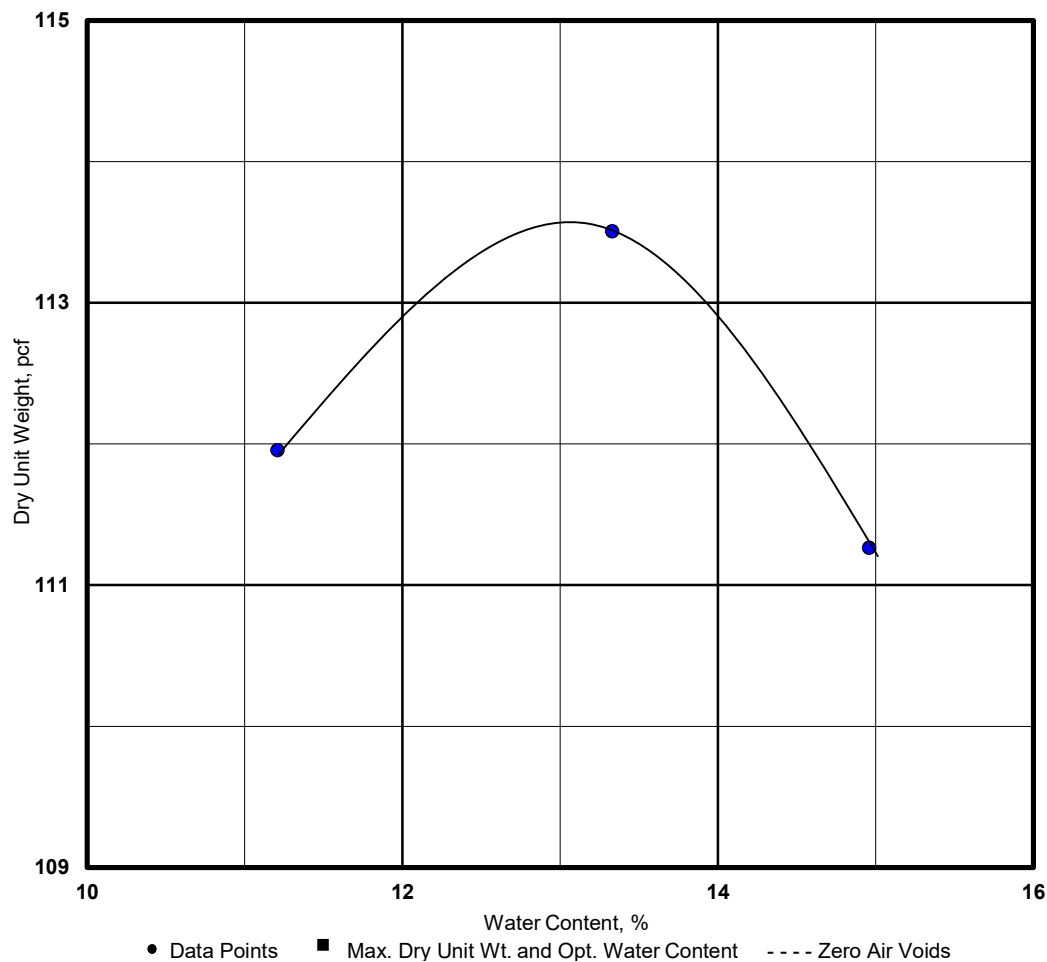
Maximum Dry Unit Wt.: 113.6 pcf

Optimum Water Content: 13.1 %

Liquid Limit: 22 Plastic Limit: 20

Plasticity Index: 2

% passing # 200 sieve: 13

Reviewed by: Dan Cosper, P. E.




C147L REGISTRATION PACKAGE
JESSE JAMES RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
024113-00

APPENDIX C

ENGINEERING DRAWINGS

JESSE JAMES RECYCLE FACILITY
SELECT WATER SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
32.634651° , -103.668630°
N 32° 38' 4.74" , W 103° 40' 7.07"

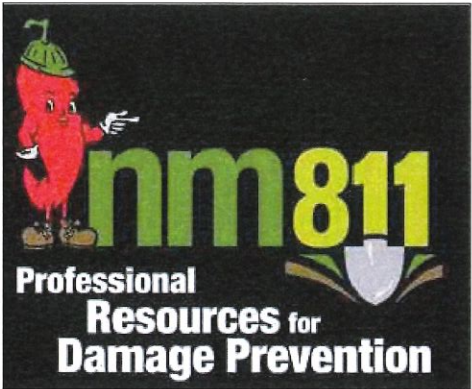


INDEX TO DRAWINGS

SHEET NO.	DESCRIPTION
1	COVER
2	PROJECT LOCATION
3	EXISTING SITE FEATURES
4	SITE PLAN
5	PIT CAPACITY TABLES
6	RUB SHEET & FENCE PLAN
7	CROSS SECTIONS
8	CROSS SECTIONS
9	SUMP DETAILS
10	LINER DETAILS
11	FENCE DETAILS

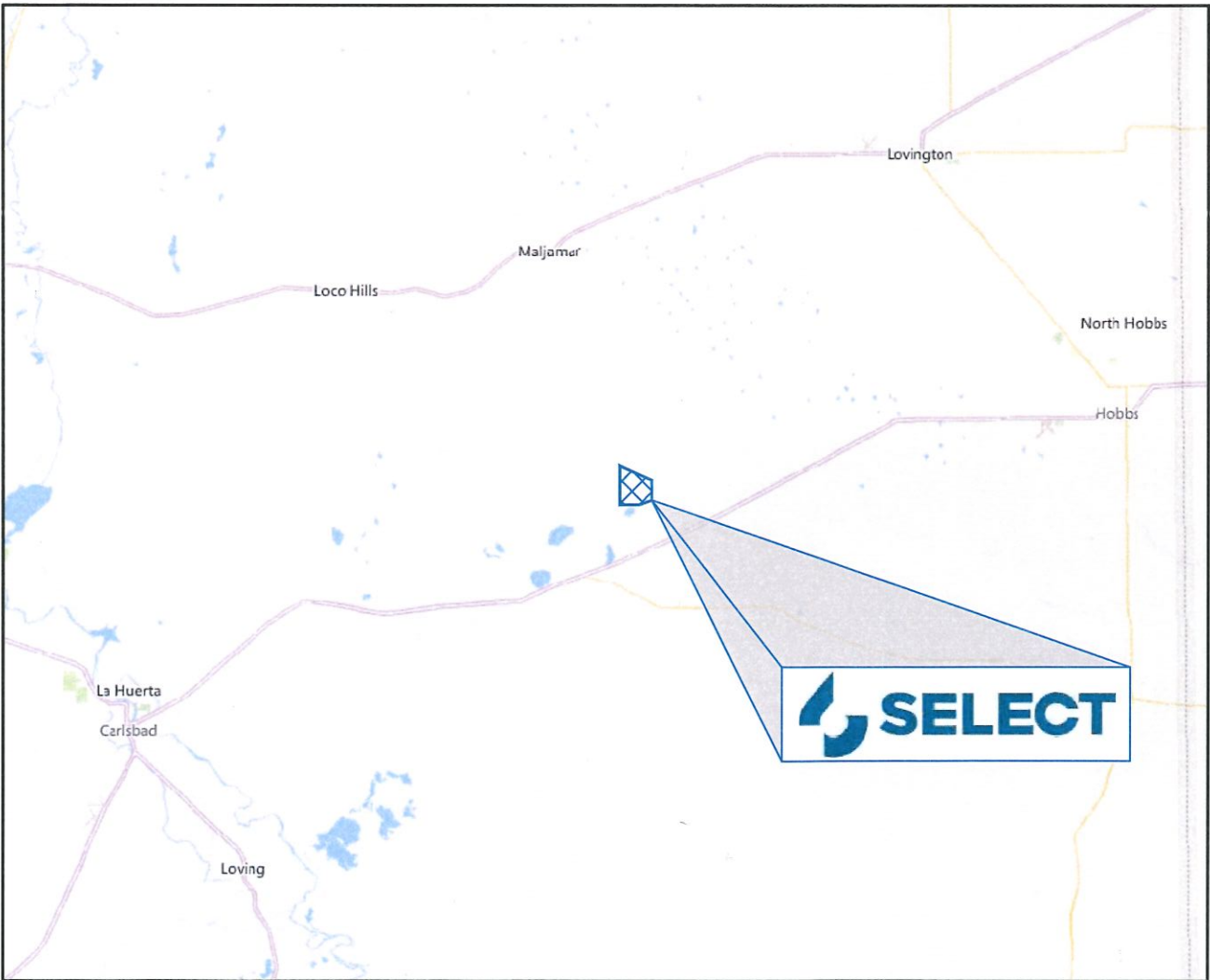
CONTACTS

JOHN MCGILLIS - SELECT WATER SOLUTIONS,LLC - (713)- 806-0488
ENVIROTECH ENGINEERING & CONSULTING - MITCHELL RATKE, PE (580)-234-8780 (DESIGN ENGINEER)
ENVIROTECH ENGINEERING & CONSULTING - DOUG SCHRANTZ, PE (580)-234-8780 (SUPERVISING ENGINEER)



UTILITY CAUTION

THE CONTRACTOR IS CAUTIONED THE LOCATION AND DEPTH OF EXISTING UTILITIES AS SHOWN ON THESE PLANS ARE BASED ON PUBLICLY AVAILABLE RECORDS OF THE VARIOUS UTILITY COMPANIES AND FIELD MEASUREMENTS. THE INFORMATION PROVIDED IS NOT TO BE RELIED ON AS BEING PRECISE OR COMPLETE. THE CONTRACTOR MUST CONTACT THE LOCAL UTILITY LOCATION CENTER AT LEAST 72 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES.



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ENVIROTECH

ENGINEERING

2200 North Eleventh Street

Enid, Oklahoma

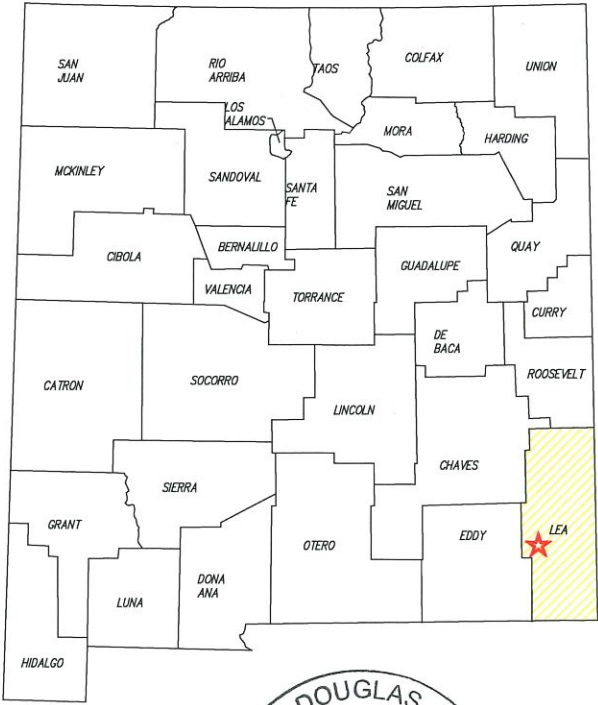
73502-2348-7780

envirotechengineering.com

PE #29284 - Expiration Date: 12-31-2024

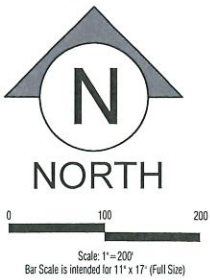
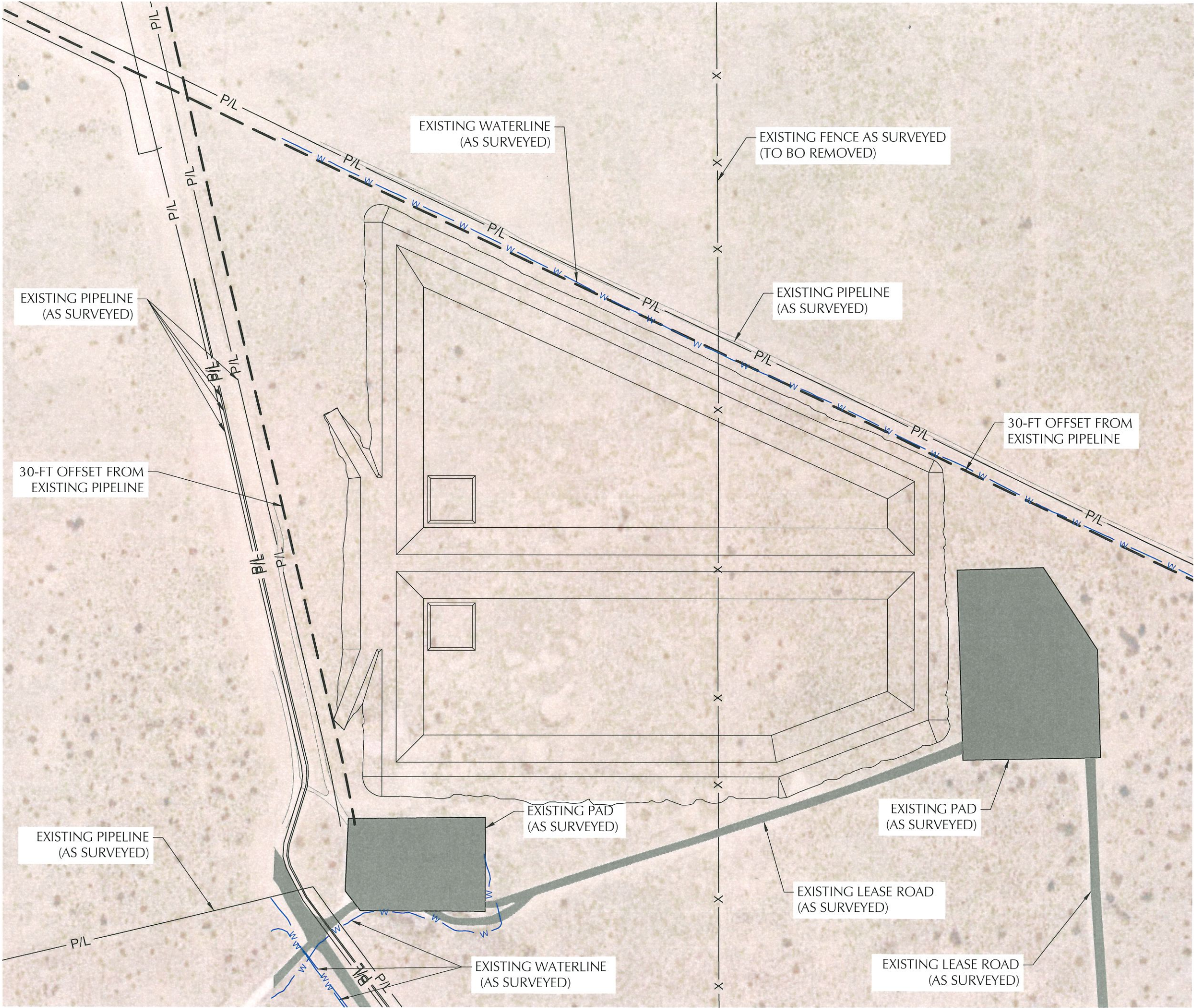
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NO.	DATE	DESCRIPTION



PROJECT LOCATION
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

DATE:	APRIL 2024
SCALE:	NOT TO SCALE
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	2 OF 11





**ENVIROTECH
ENGINEERING**
2500 North Elmwood Street
Enid, Oklahoma
500.234.8780
envirotechengineering.com
PL #29284 - Expiration Date: 12-31-2024

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NO.	DATE	DESCRIPTION



EXISTING SITE FEATURES
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO



DATE:	APRIL 2024
SCALE:	1" = 200'
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	3 OF 11

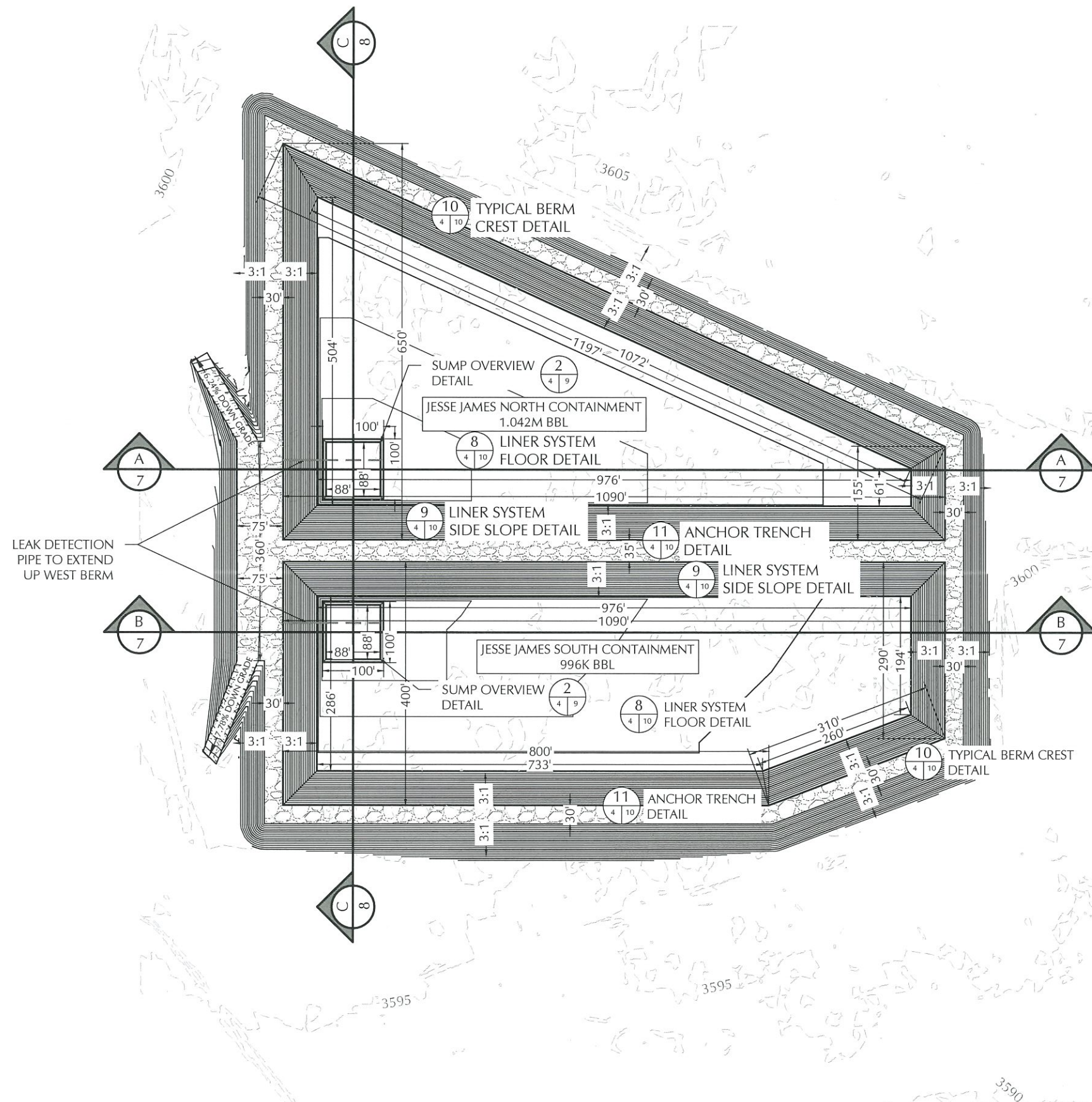
NO.	DATE	DESCRIPTION



SITE PLAN
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

DATE:	APRIL 2024
SCALE:	1" = 200'
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	4 OF 11

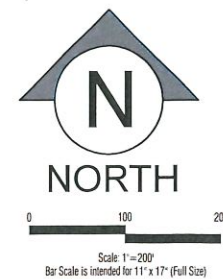
4 OF 11



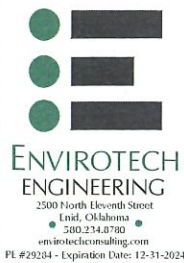
- DETAIL NUMBER

SHEET NUMBER
WHERE DETAIL CALLOUT IS LOCATED
ON PLAN SHEET

— SHEET NUMBER
WHERE DETAIL IS LOCATED
WITHIN SET



Scale: 1"=200'
Bar Scale is intended for 11" x 17" (Full Size)



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NO.	DATE	DESCRIPTION



PIT CAPACITY TABLES
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

DATE:	APRIL 2024
SCALE:	1" = 100'
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	5 OF 11

Owner	Select Water Solutions, LLC		
Site Name	Jesse James Recycle North Storage Containment		
	Top	Bottom	Max
Lagoon Features			Liq. Level
Side slope Ratio	3		3
Maximum Depth (ft)	24.0		21.0
Lagoon Top Width (ft)	1090	976	1072
Lagoon Top Length (ft)	650	504	632
Maximum Total Vol (ft ³)	7,124,616		5,850,015
Maximum Total Vol (bbls)	1,269,030		1,041,999

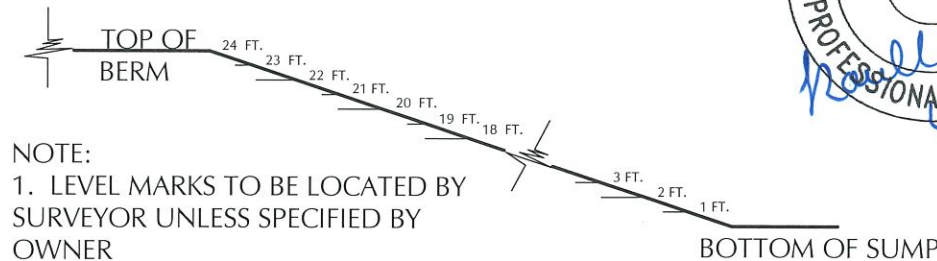
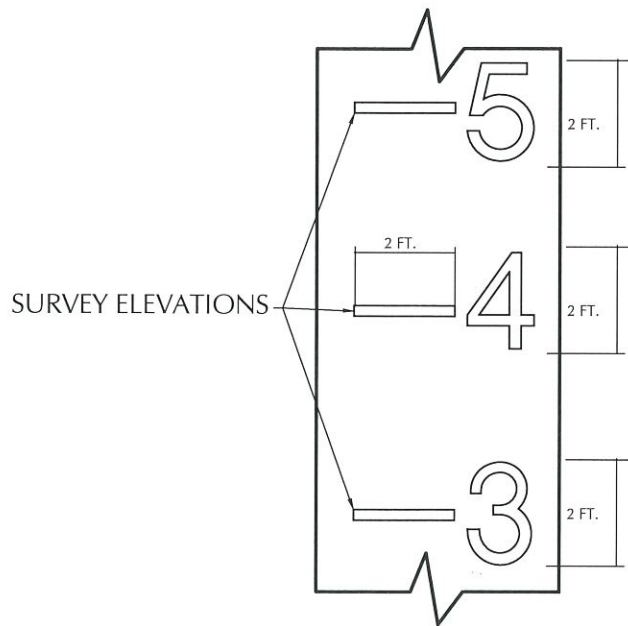
Freeboard
Maximum Capacity
Storage Volume
Floor
Sump

Elevation	Lagoon Liq Depth	Storage	Remaining Stor Vol	Gallons Storage	BBLS Storage	Percent of Total Volume	Vol in lagoon	Gallons Storage	Vol in Lagoon	Vol in Lagoon	Percent Total Vol
ft	ft	ft	ft ³	gal	bbls	%	ft ³	gal	bbls	ac-ft	%
3614.50	24.0	0.0	-	-	-	0.0%	7,124,616	53,299,249	1,269,030	163.56	100%
3613.50	23.0	1.0	434,041	3,247,062	77,311	6.1%	6,690,574	50,052,187	1,191,719	153.59	94%
3612.50	22.0	2.0	858,883	6,425,305	152,983	12.1%	6,265,732	46,873,945	1,116,046	143.84	88%
3611.50	21.0	3.0	1,274,601	9,535,287	227,031	17.9%	5,850,015	43,763,963	1,041,999	134.30	82%
3610.50	20.0	4.0	1,681,270	12,577,580	299,466	23.6%	5,443,346	40,721,669	969,564	124.96	76%
3609.50	19.0	5.0	2,078,966	15,552,744	370,303	29.2%	5,045,650	37,746,506	898,726	115.83	71%
3608.50	18.0	6.0	2,467,764	18,461,345	439,556	34.6%	4,656,851	34,837,904	829,474	106.91	65%
3607.50	17.0	7.0	2,847,741	21,303,949	507,237	40.0%	4,276,875	31,995,301	761,793	98.18	60%
3606.50	16.0	8.0	3,218,971	24,081,121	573,360	45.2%	3,905,645	29,218,129	695,670	89.66	55%
3605.50	15.0	9.0	3,581,530	26,793,425	637,939	50.3%	3,543,086	26,505,824	631,091	81.34	50%
3604.50	14.0	10.0	3,935,494	29,441,428	700,986	55.2%	3,189,122	23,857,822	568,043	73.21	45%
3603.50	13.0	11.0	4,280,938	32,025,694	762,517	60.1%	2,843,678	21,273,556	506,513	65.28	40%
3602.50	12.0	12.0	4,617,937	34,546,787	822,543	64.8%	2,506,679	18,752,463	446,487	57.55	35%
3601.50	11.0	13.0	4,946,568	37,005,274	881,078	69.4%	2,178,048	16,293,975	387,952	50.00	31%
3600.50	10.0	14.0	5,266,905	39,401,717	938,136	73.9%	1,857,710	13,897,532	330,894	42.65	26%
3599.50	9.0	15.0	5,579,025	41,736,684	993,731	78.3%	1,545,591	11,562,565	275,299	35.48	22%
3598.50	8.0	16.0	5,883,002	44,010,739	1,047,875	82.6%	1,241,613	9,288,510	221,155	28.50	17%
3597.50	7.0	17.0	6,178,913	46,224,447	1,100,582	86.7%	945,703	7,074,802	168,448	21.71	13%
3596.50	6.0	18.0	6,466,832	48,378,373	1,151,866	90.8%	657,783	4,920,877	117,164	15.10	9%
3595.50	5.0	19.0	6,746,836	50,473,084	1,201,740	94.7%	377,779	2,826,166	67,290	8.67	5%
3594.50	4.0	20.0	6,960,668	52,072,761	1,239,828	97.7%	163,947	1,226,489	29,202	3.76	2%
3593.50	3.0	21.0	7,070,472	52,894,198	1,259,386	99.2%	54,144	405,051	9,644	1.24	1%
3592.50	2.0	22.0	7,106,922	53,166,883	1,265,878	99.8%	17,694	132,367	3,152	0.41	0%
3591.50	1.0	23.0	7,116,333	53,237,286	1,267,554	99.9%	8,283	61,963	1,475	0.19	0%
3590.50	0.0	24.0	7,124,616	53,299,249	1,269,030	100.0%	-	-	-	-	0%

Owner	Select Water Solutions, LLC		
Site Name	Jesse James Recycle South Storage Containment		
	Top	Bottom	Max
Lagoon Features			Liq. Level
Side slope Ratio	3		3
Maximum Depth (ft)	24.0		21.0
Lagoon Top Width (ft)	1090	976	1072
Lagoon Top Length (ft)	400	286	382
Maximum Total Vol (ft ³)	6,817,668		5,596,384
Maximum Total Vol (bbls)	1,214,356		996,823

Freeboard
Maximum Capacity
Storage Volume
Floor
Sump

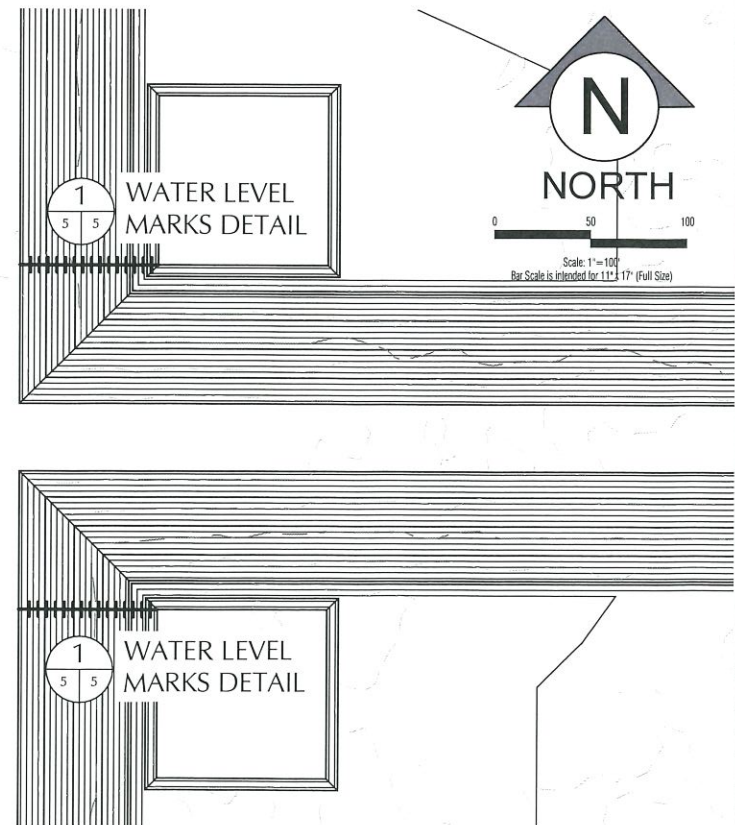
Elevation	Lagoon Liq Depth	Storage	Remaining Stor Vol	Gallons Storage	BBLS Storage	Percent of Total Volume	Vol in lagoon	Gallons Storage	Vol in Lagoon	Vol in Lagoon	Percent Total Vol
ft	ft	ft	ft ³	gal	bbls	%	ft ³	gal	bbls	ac-ft	%
3614.50	24.0	0.0	-	-	-	0.0%	6,817,668	51,002,972	1,214,356	156.51	100%
3613.50	23.0	1.0	415,671	3,109,633	74,039	6.1%	6,401,997	47,893,340	1,140,318	146.97	94%
3612.50	22.0	2.0	822,742	6,154,933	146,546	12.1%	5,994,926	44,848,039	1,067,810	137.62	88%
3611.50	21.0	3.0	1,221,283	9,136,420	217,534	17.9%	5,596,384	41,866,552	996,823	128.48	82%
3610.50	20.0	4.0	1,611,364	12,054,617	287,015	23.6%	5,206,303	38,948,356	927,342	119.52	76%
3609.50	19.0	5.0	1,993,055	14,910,044	355,001	29.2%	4,824,613	36,092,928	859,355	110.76	71%
3608.50	18.0	6.0	2,366,425	17,703,224	421,505	34.7%	4,451,243	33,299,748	792,851	102.19	65%
3607.50	17.0	7.0	2,731,544	20,434,678	486,540	40.1%	4,086,124	30,568,294	727,817	93.80	60%
3606.50	16.0	8.0	3,088,481	23,104,929	550,117	45.3%	3,729,186	27,898,044	664,239	85.61	55%
3605.50	15.0	9.0	3,437,307	25,714,494	612,250	50.4%	3,380,361	25,288,478	602,107	77.60	50%
3604.50	14.0	10.0	3,778,091	28,263,900	672,950	55.4%	3,039,577	22,739,072	541,406	69.78	45%
3603.50	13.0	11.0	4,110,903	30,753,665	732,230	60.3%	2,706,765	20,249,307	482,126	62.14	40%
3602.50	12.0	12.0	4,435,812	33,184,312	790,103	65.1%	2,381,855	17,818,660	424,254	54.68	35%
3601.50	11.0	13.0	4,752,889	35,556,361	846,580	69.7%	2,064,779	15,446,612	367,776	47.40	30%
3600.50	10.0	14.0	5,062,202	37,870,336	901,675	74.3%	1,755,465	13,132,637	312,682	40.30	26%
3599.50	9.0	15.0	5,363,822	40,126,756	955,399	78.7%	1,453,845	10,876,217	258,958	33.38	21%
3598.50	8.0	16.0	5,657,819	42,326,145	1,007,765	83.0%	1,159,849	8,676,828	206,591	26.63	17%
3597.50	7.0	17.0	5,944,262	44,469,023	1,058,786	87.2%	873,406	6,533,949	155,570	20.05	13%
3596.50	6.0	18.0	6,223,220	46,555,910	1,108,474	91.3%	594,448	4,447,062	105,882	13.65	9%
3595.50	5.0	19.0	6,494,764	48,587,331	1,156,841	95.3%	322,904	2,415,642	57,515	7.41	5%
3594.50	4.0	20.0	6,680,244	49,974,907	1,189,879	98.0%	137,424	1,028,065	24,478	3.15	2%
3593.50	3.0	21.0	6,770,689	50,651,522	1,205,989	99.3%	46,979	351,451	8,368	1.08	1%
3592.50	2.0	22.0	6,799,974	50,870,606	1,211,205	99.7%	17,694	132,367	3,152	0.41	0%
3591.50	1.0	23.0	6,809,385	50,941,009	1,212,881	99.9%	8,283	61,963	1,475	0.19	0%
3590.50	0.0	24.0	6,817,668	51,002,972	1,214,356	100.0%	-	-	-	-	0%

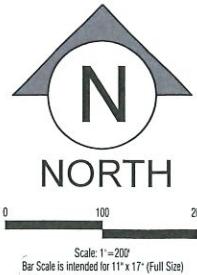


- NOTE:
- LEVEL MARKS TO BE LOCATED BY SURVEYOR UNLESS SPECIFIED BY OWNER
 - MARKS TO BE MADE BY AN EXTRUSION WELDER USING BLACK FILAMENT (OR WHITE FILAMENT ON BLACK LINER).
 - MARKS SHOULD BEGIN AT THE TOP OF BERM AND CONTINUE TO THE BOTTOM OF THE SUMP. (TOP OF BERM SHOULD READ 24-FT, BOTTOM OF SUMP +1-FT SHOULD READ 1-FT)

4. REFERENCE PIT CAPACITY TABLES FOR ACCURATE ELEVATIONS

WATER LEVEL MARKS DETAIL
NOT TO SCALE





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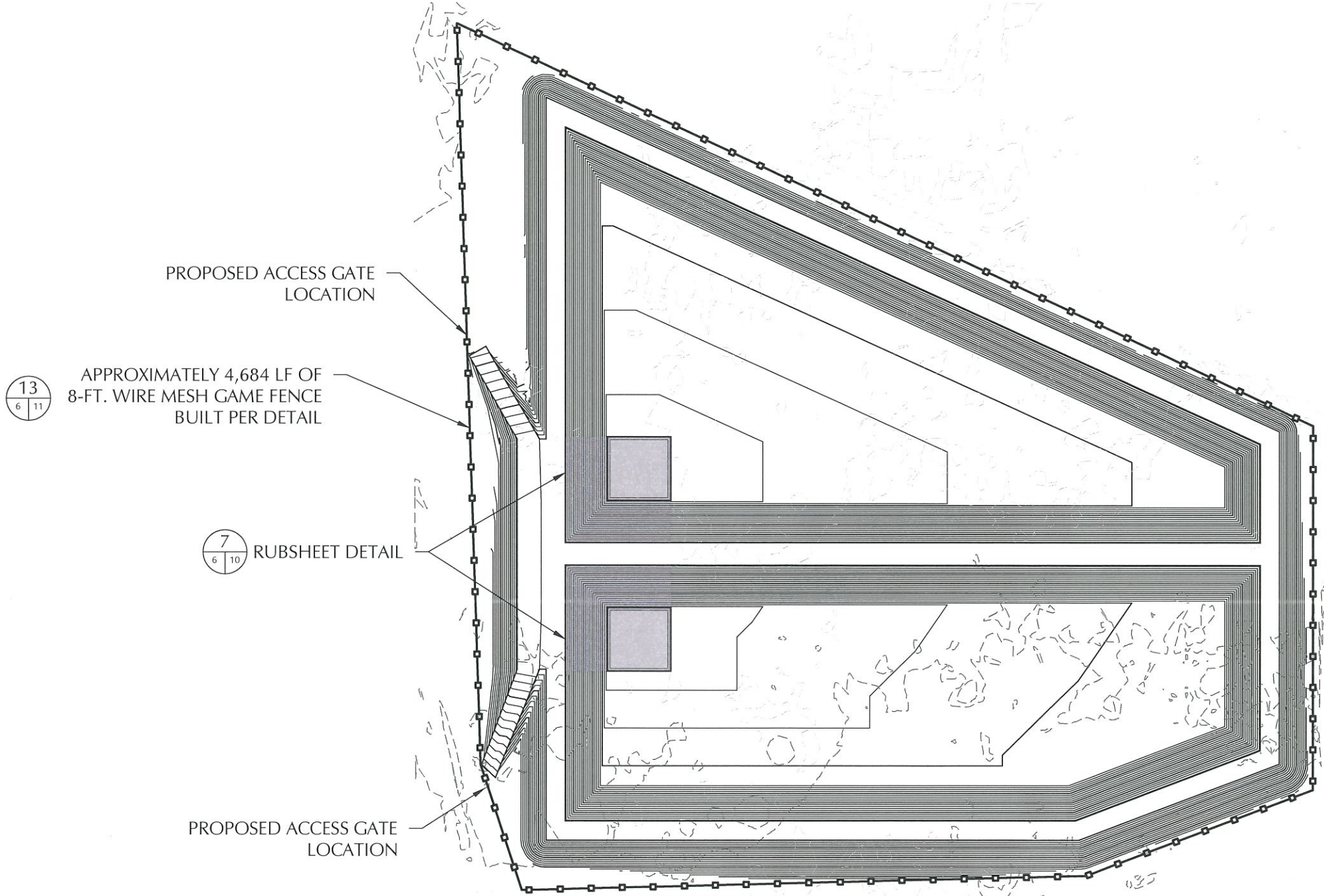
NO.	DATE	DESCRIPTION

NO.	DATE	DESCRIPTION
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SELECT

RUB SHEET & FENCE PLAN
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

DATE:	APRIL 2024
SCALE:	1" = 200'
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	6 OF 11





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Diagram illustrating the cross-section of the Jesse James North Containment structure, showing dimensions and elevations.

Key Dimensions and Elevations:

- Top of Berm ELEV.=3614.5'
- MAX WATER ELEV. = 3611.5'
- JESSE JAMES NORTH CONTAINMENT 1.042M BBL
- DESIGN SURFACE PRE-CONSTRUCTION GRADE
- BOTTOM OF SUMP ELEV.=3590.0'
- 0.35% DOWNGRADE

Horizontal Dimensions (Feet):

- Top Width: 1090.0'
- Water Level Width: 1072.0'
- Left Side Slope: 75.0'
- Right Side Slope: 30.0'
- Bottom Width (Left): 88.0'
- Bottom Width (Right): 16.0'
- Bottom Width (Total): 100.0'

Vertical Dimensions (Feet):

- Water Depth (Left): 21.0'
- Water Depth (Right): 19.0'
- Sump Depth (Left): 2.0'

Diagram illustrating the cross-section of the Jesse James South Containment 997K BBL. The structure is shown with a 0.35% downgrade. Key features and dimensions include:

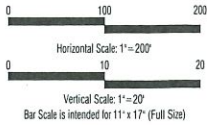
- Top of Berm ELEV. = 3614.5'
- MAX WATER ELEV. = 3611.5'
- JESSE JAMES SOUTH CONTAINMENT 997K BBL
- DESIGN SURFACE
- PRE-CONSTRUCTION GRADE
- BOTTOM OF SUMP ELEV. = 3590.5'
- Dimensions: 75.0', 1090.0', 1072.0', 30.0', 21.0', 24.0', 19.0', 16.0', 88.0', 100.0', 2.0', 3.0', 1.0'

CROSS SECTIONS
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

DATE:	APRIL 2024
SCALE:	VERTICAL 1"=20' HORIZONTAL 1"=200'
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	

7 OF 11

A circular professional engineer seal for the State of New Mexico. The outer ring contains the text "ROWELL DOUGLAS SCHRAMM" at the top and "PROFESSIONAL ENGINEER" at the bottom. The inner ring contains "NEW MEXICO". The center of the seal contains the number "29284". The seal is signed in blue ink with the name "Rowell Schramm" and the date "4/8/21".



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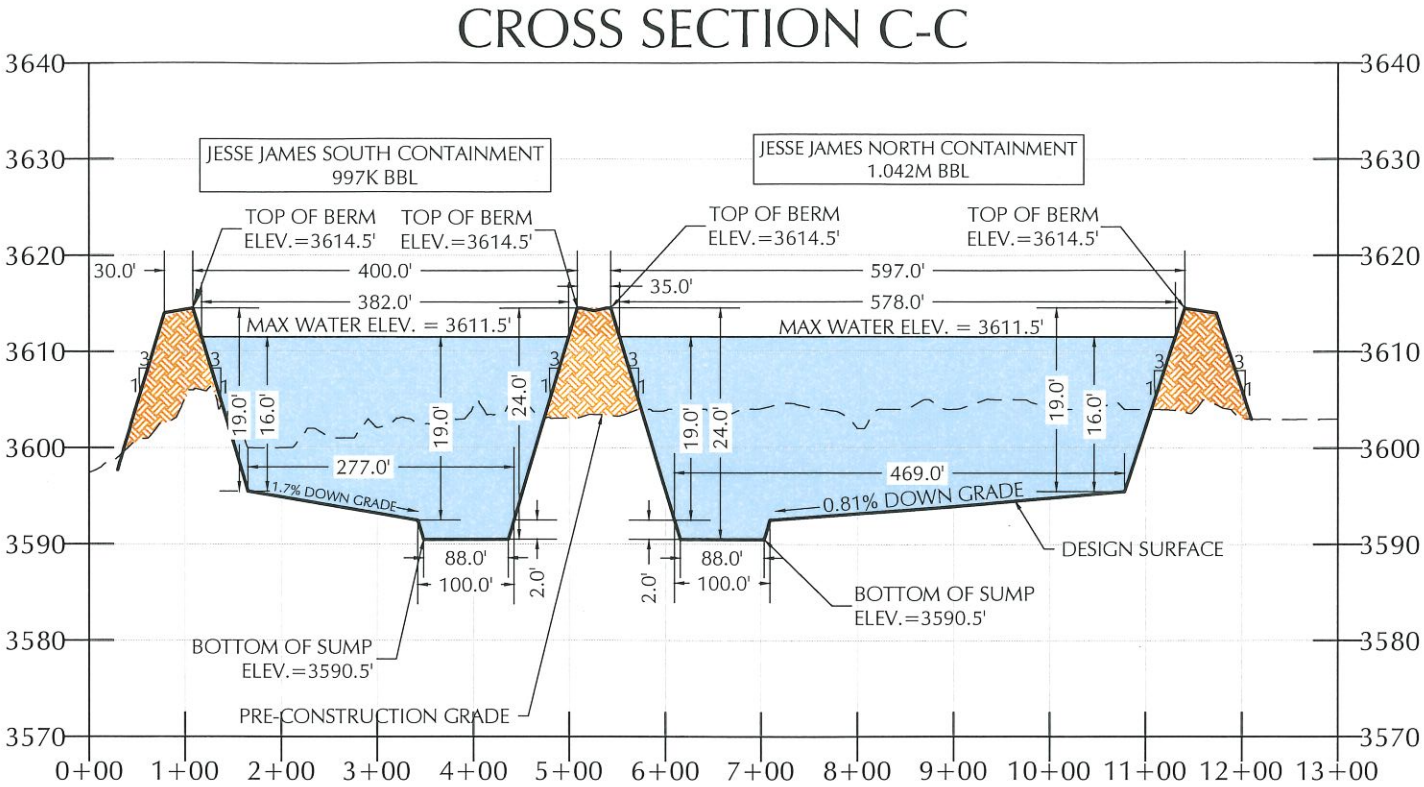
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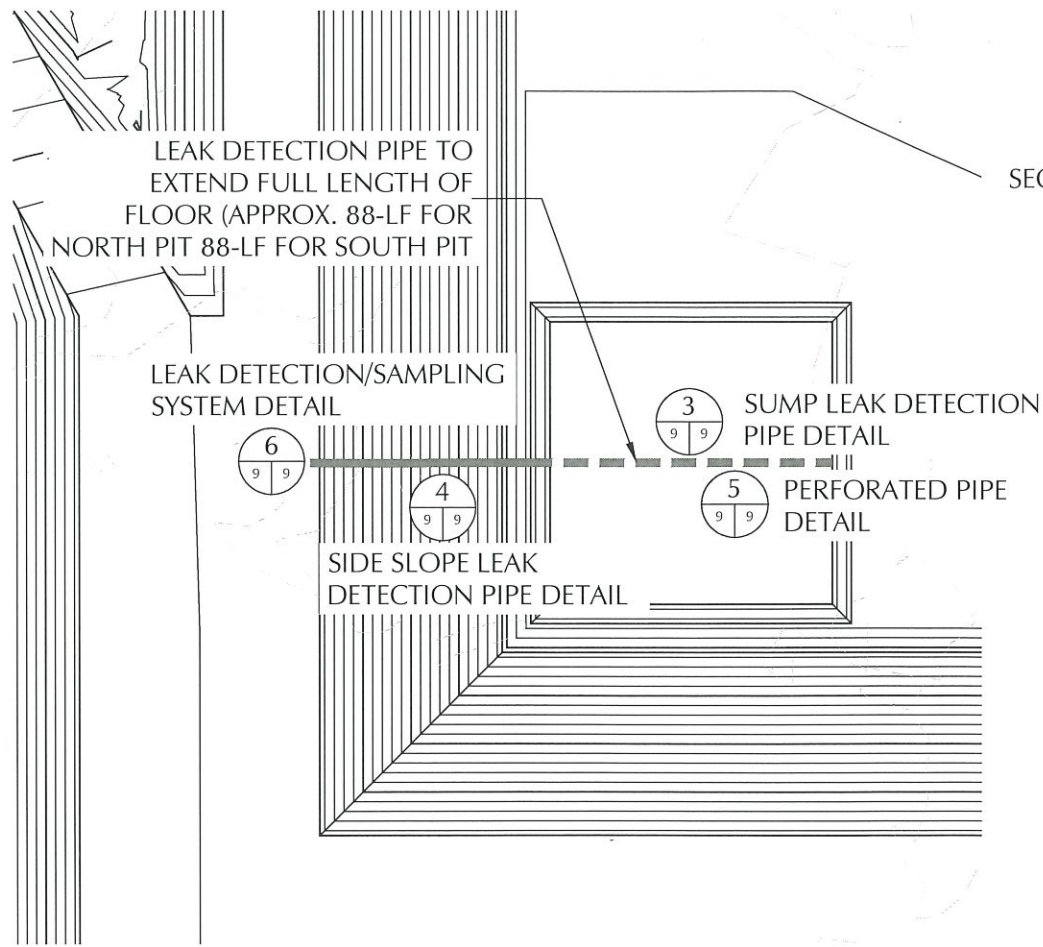
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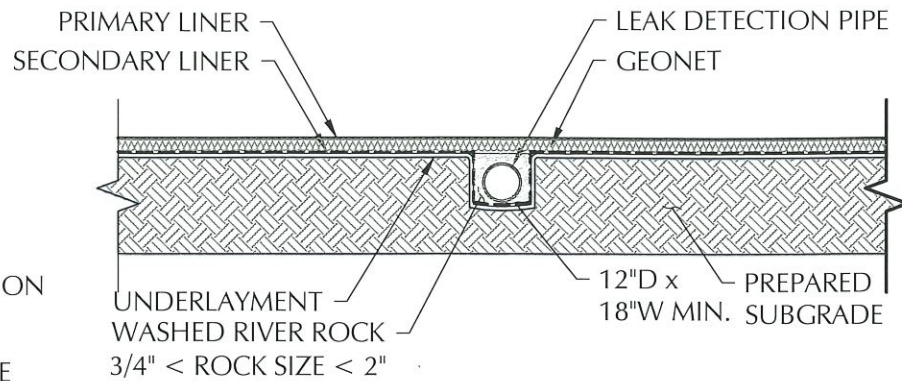
CROSS SECTIONS
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

DATE:	APRIL 2024
SCALE:	VERTICAL 1"=20' HORIZONTAL 1"=200'
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	8 OF 11

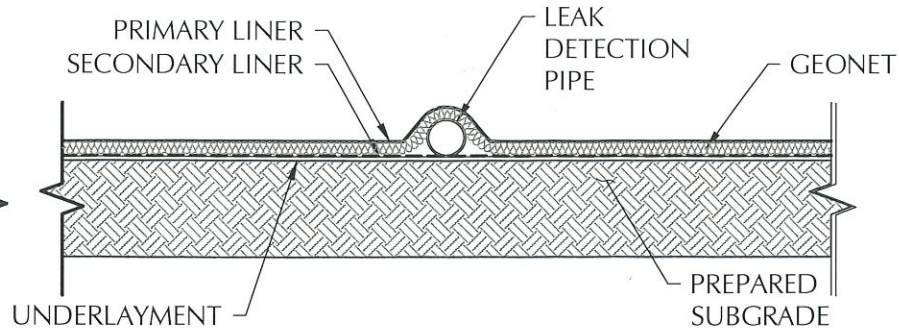




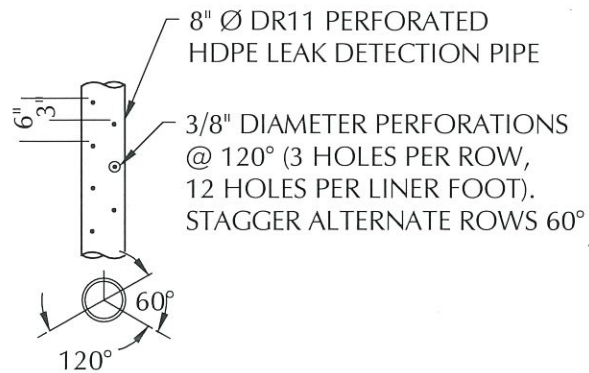
SUMP OVERVIEW DETAIL (2) NOT TO SCALE



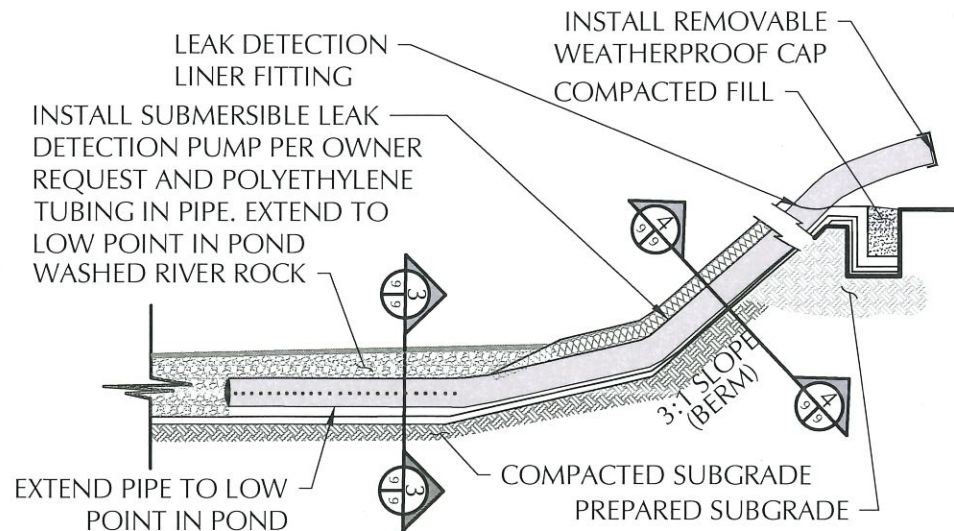
SUMP LEAK DETECTION PIPE DETAIL (3) NOT TO SCALE



SIDE SLOPE LEAK DETECTION PIPE DETAIL (4) NOT TO SCALE



PERFORATED PIPE DETAIL (5) NOT TO SCALE



LEAK DETECTION/SAMPLING SYSTEM DETAIL (6) NOT TO SCALE

PROPOSED PIT REFERENCE TABLE	
DETAIL	DESCRIPTION
PRIMARY LINER	60- MIL HDPE SMOOTH LINER
LEAK DETECTION	200-MIL GEONET
SECONDARY LINER	40-MIL HDPE SMOOTH LINER
UNDERLAYMENT	10 OZ GEOTEXTILE
SUMP	3590.5-FT ELEVATION
BERM (ROAD CREST)	DESIGN ELEV. 3614.5 FT- RD CREST (30-FT')
LEAK DETECTION PIPING	8-IN DR11. PERFORATED HDPE LEAK DETECTION PIPE

NOTES:

1. LEAK DETECTION SYSTEM TO BE INSTALLED BY OWNER.
2. PERFORATED PIPE TO BE ALONG THE BOTTOM OF THE POND. SOLID PIPE ON THE SIDE SLOPE.
3. CONSTRUCT COMPACTED SUBGRADE TO 95% STANDARD PROCTOR AS PER ASTM D-698.
4. EXTEND 60 MIL. RUB SHEET 1.0-FT PAST TOP OF SHOULDER OF SUMP.
5. WASH RIVER ROCK SHALL BE 3/4" MIN. & 2" MAX.





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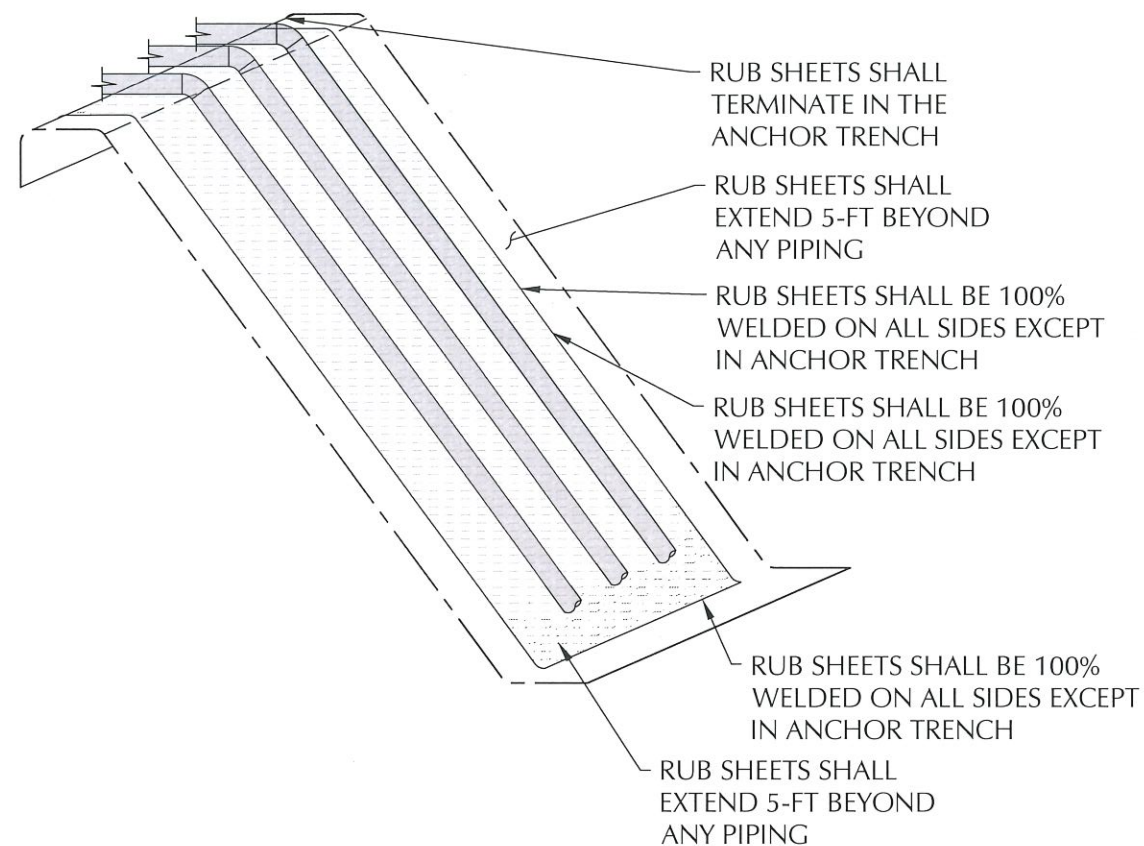
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NO.	DATE	DESCRIPTION



LINER DETAILS
JESSE JAMES RECYCLE FACILITY
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SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

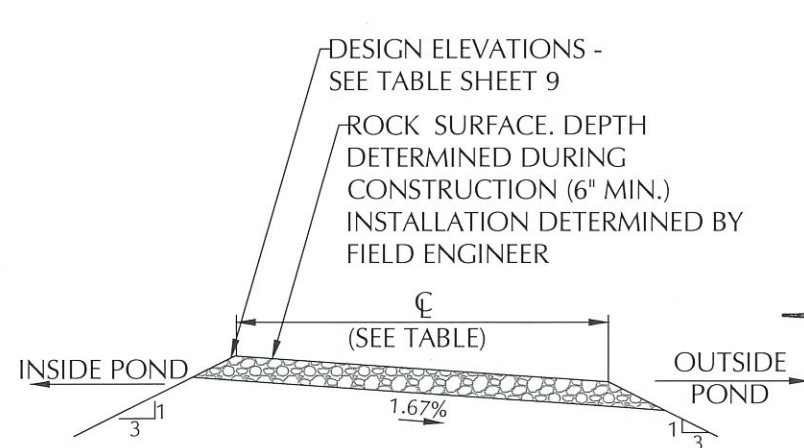
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SCALE:	NOT TO SCALE
DESIGNED BY:	M. RATKE
DRAWN BY:	R. MOHAN
CHECKED BY:	D. SCHRANTZ
PROJECT NO.	024113-00
SHEET NO.	10 OF 11



RUB SHEET DETAIL

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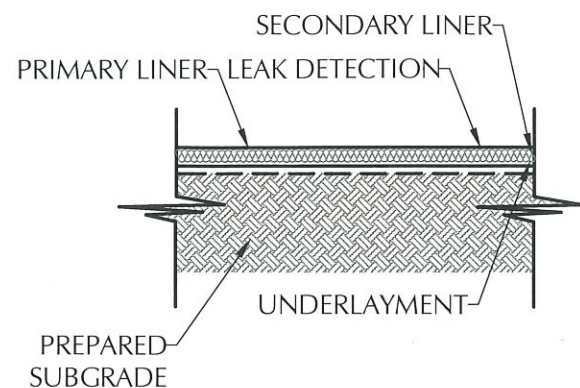
7
6 10



TYPICAL BERM CREST DETAIL

Not to Scale

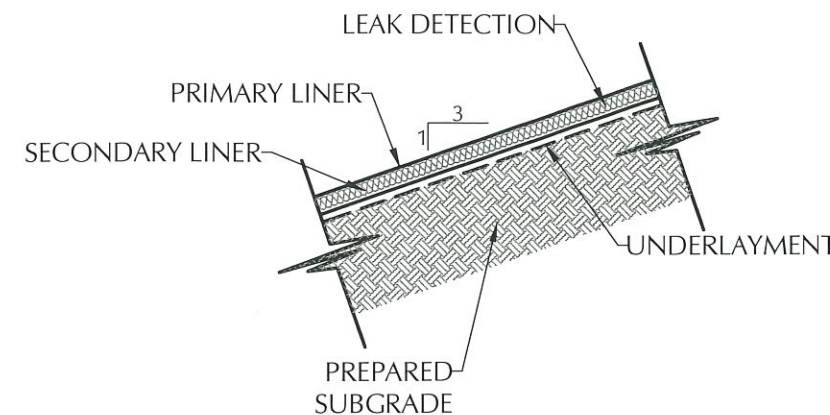
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4 10



LINER SYSTEM FLOOR DETAIL

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8
4 10



LINER SYSTEM SIDE SLOPE DETAIL

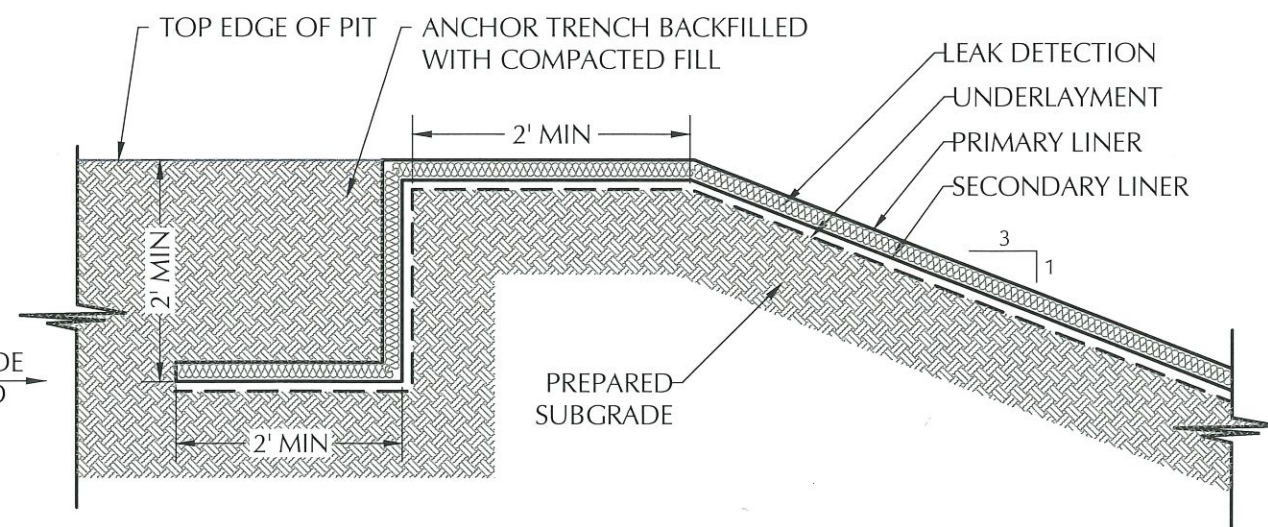
Not to Scale

9
4 10



GENERAL NOTES:

1. SEE REFERENCE TABLES SHEET 9 FOR LINER SPECIFICATIONS
2. PREPARED SUBGRADE MEANS COMPACTED SMOOTH SUBGRADE FREE OF ROCK, ROOTS, WOOD DEBRIS, CONCRETE RUBBLE AND ANY SHARP OBJECTS THAT MIGHT PUNCTURE THE HDPE LINER.
3. ALL INTERIOR SLOPES AND TOP OF BERMS TO BE SMOOTH DRUM ROLLED.
4. ALL EMBANKMENT SLOPES SHALL HAVE A RATIO OF 3:1, COMPACTED EARTH EMBANKMENTS TO BE CONSTRUCTED WITH 8 INCH (MAXIMUM LOOSE LIFTS), COMPACTED TO 95% STANDARD PROCTOR DENSITY (ASTM D698), AND MOISTURE CONDITIONS TO +/- 2% OPTIMUM MOISTURE (ASTM D698)
5. PERFORM GEOTECHNICAL ANALYSIS ON EXISTING SOIL TO CONFIRM SOIL IS SUITABLE FOR USE IN THE LEVEE.
6. ALL BOTTOM OF PITS SHALL SLOPE TO THE SUMP.



ANCHOR TRENCH DETAIL

Not to Scale

11
4 10



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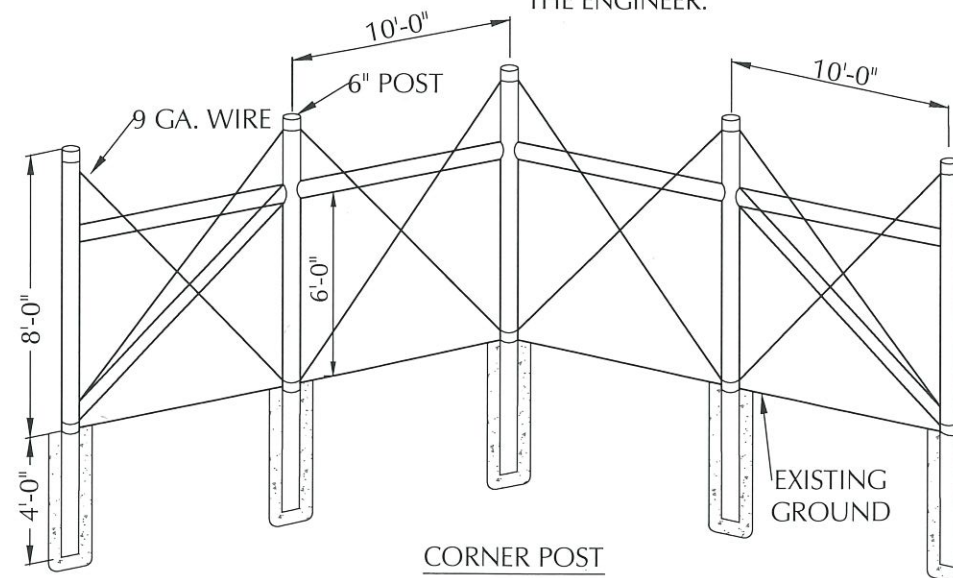
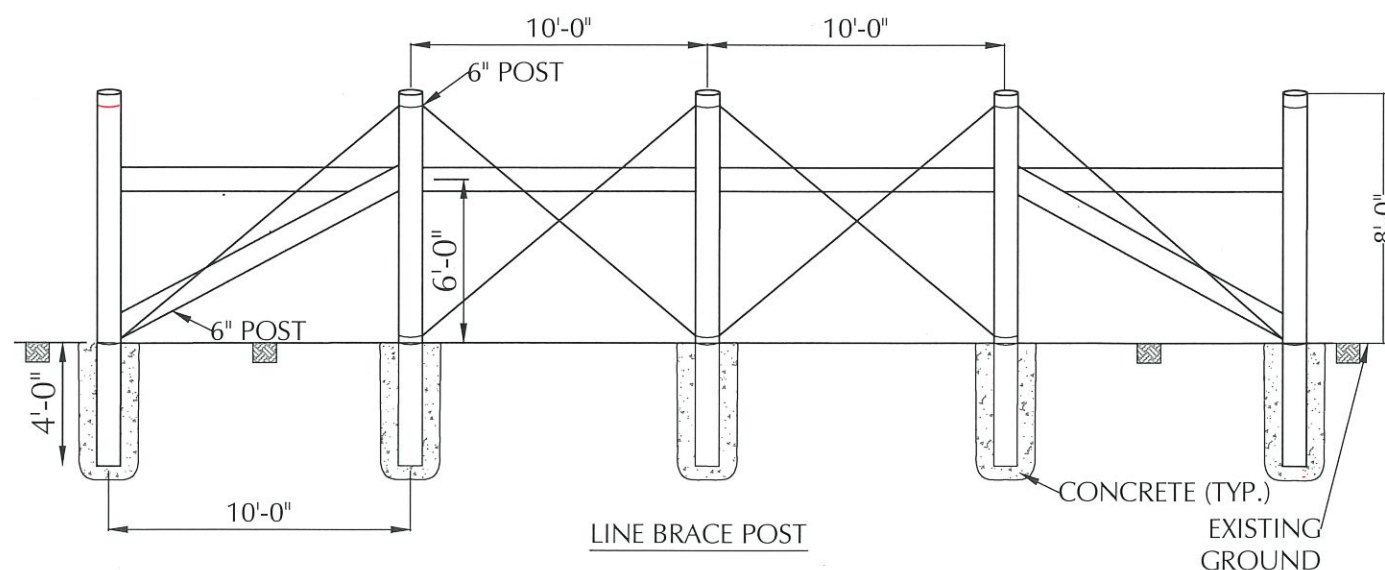
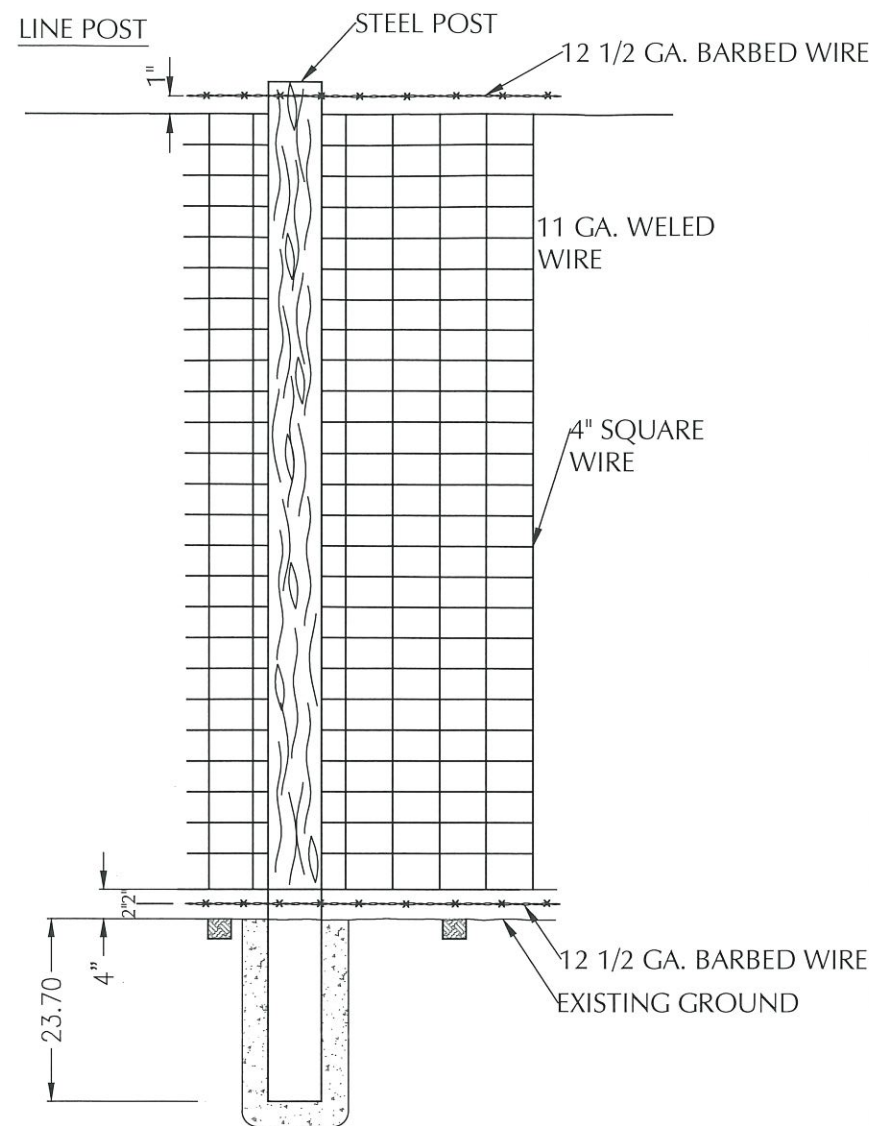
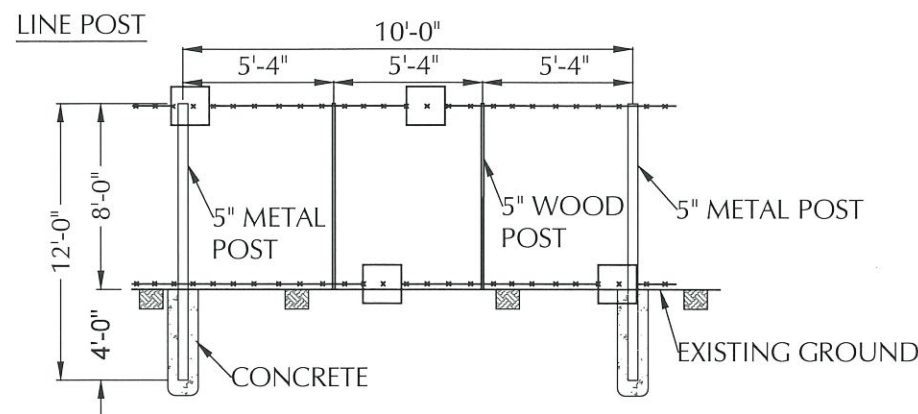
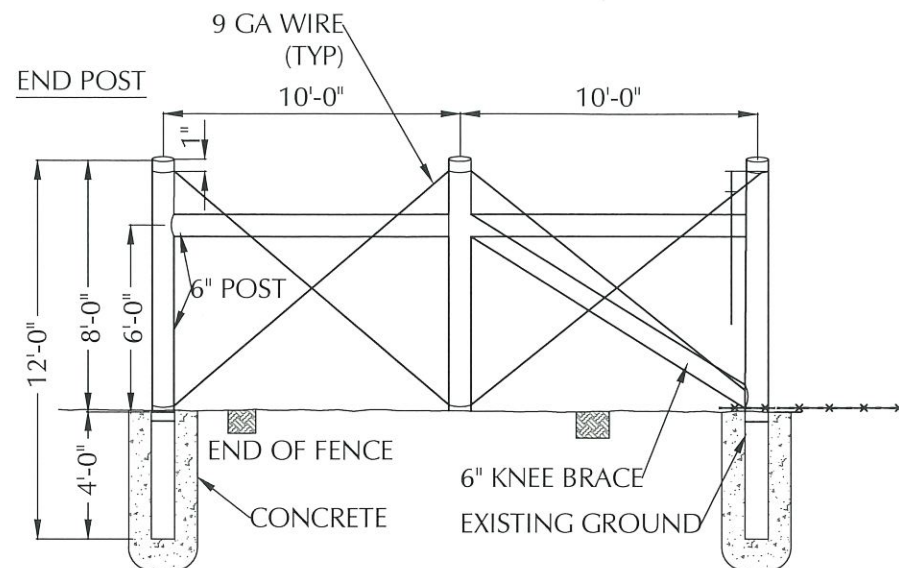
NO.	DATE	DESCRIPTION



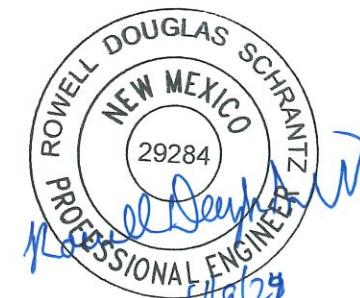
FENCE DETAILS
JESSE JAMES RECYCLE FACILITY
SELECT ENERGY SOLUTIONS, LLC
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST,
LEA COUNTY, NEW MEXICO

DATE: APRIL 2024
SCALE: NOT TO SCALE
DESIGNED BY: M. RATKE
DRAWN BY: R. MOHAN
CHECKED BY: D. SCHRANTZ
PROJECT NO. 024113-00
SHEET NO.

1. AT EACH LOCATION WHERE AN ELECTRIC TRANSMISSION, DISTRIBUTION OR SECONDARY LINE CROSSES A BARRIER FENCE, THE CONTRACTOR SHALL FURNISH AND INSTALL A GROUND CONFORMING TO ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE- THE GROUND ROD SHALL BE A MINIMUM DIAMETER OF 1/2-IN. AND 8-FT. IN LENGTH, AND DRIVEN AT LEAST 7 1/2 FT. INTO THE GROUND. THE ROD SHALL BE CONNECTED TO EACH WIRE WITH A MINIMUM AWG NO. 8 STRANDED COPPER WIRE. GROUNDING WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
2. LINE BRACE POSTS SHALL BE SPACED AT 400 FT. INTERVALS, WHERE FENCING IS CONTINUOUS AND WHERE END, CORNER AND LINE BRACE POSTS ARE NOT SPECIFIED.
3. ALL LINE POSTS SHALL BE 5 IN. MIN. DIAMETER AND 12 FT. LONG. ALL END, CORNER AND LINE BRACE POSTS SHALL BE 6 IN. MIN. DIAMETER AND 12 FT. LONG.
4. BARBED WIRE SHALL BE DOUBLE WRAPPED AND TIED OFF AT END POSTS, CORNER POSTS AND LINE BRACE POSTS.
5. WOVEN WIRE SHALL BE SINGLE WRAPPED AND TIED OFF. FENCE TO BE CONTINUED, SHALL BE RESTARTED IN LIKE MANNER. WOVEN WIRE FENCE FABRIC SHALL CONFORM TO AASHTO M 279 (ASTM A 116) DESIGN NO. 1047-6-11 WITH CLASS I COATING.
6. STEEL BARBED WIRE SHALL CONFORM TO AASHTO M 200 (ASTM A 121) 12-1/2 GAGE WITH CLASS 1 COATING.
7. ALL FENCE WIRE TIES, BRACE WIRES, STAPLES AND OTHER WIRE APPURTENANCES SHALL BE GALVANIZED IN CONFORMANCE WITH AASHTO M 232.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RE-ESTABLISHING DISTURBED OR DESTROYED SURVEY MONUMENTS TO THE APPROPRIATE ACCURACY.
9. ALL MISCELLANEOUS HARDWARE SHALL BE FURNISHED GALVANIZED OR ALUMINUM COATED. ALL METAL PIPE POSTS SHALL BE CAPPED.
10. READY MIX CONCRETE MAY BE USED AS A SUBSTITUTE FOR CLASS "A" CONCRETE FOR THE CONCRETE FOOTING IF APPROVED BY THE ENGINEER.



8-FT GAME FENCE DETAIL 13
Not to Scale





C147L REGISTRATION PACKAGE
JESSE JAMES RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
024113-00

APPENDIX D

DESIGN AND CONSTRUCTION PLAN



Select Energy Services is proposing to construct two (2) storage containment in Section 28, Township 19 South, Range 33 East, Lea County, New Mexico. Jesse James Recycle shall consist of two (2) containments with a total operational volume of approximately 2,038,822-bbl.

OPERATION AND MAINTENANCE PROCEDURES

Applicable mandates in Rule 34 are underlined. This plan addresses construction of lined earthen containments. *Appendix C* presents Engineering Design Plans. *Appendix E* provides liner and geotextile specifications.

Field conditions may create the need for minor modification of the containment design (e.g. changing the length, width, or depth.)

Dike Protection and Structural Integrity

Design elements are addressed in the section of this submission containing the foundation recommendations. The recommendations are based on site-specific data. The operator, engineer, and selected contractor will review the recommendations prior to beginning the earthwork and adhere to the specific recommendations.

The design and operation provide for the confinement of produced water to prevent releases and to prevent overtopping due to wave action or rainfall. Additionally, the design prevents run-on of surface water as the containment is surrounded by an above-grade levee (berm) and diversion ditch to prevent run-on of surface water.

Stockpile Topsoil

Where topsoil is present, prior to constructing containment, the operator will strip and stockpile the topsoil for use as the final cover or fill at the time of closure. The topsoil will be stockpiled adjacent to perimeter fence surrounding the containment or incorporated into the levee.

Signage

The design calls for an upright sign no less than 12-in by 24-in with lettering not less than two inches in height in a conspicuous place on the fence surrounding the containment. The sign is posted in a manner and location such that a person can easily read the legend. The sign will provide the following information:

1. The operator's name,
2. The location of the site by quarter-quarter or unit letter, section, township and range, and
3. Emergency telephone numbers.



Fencing

The design provides for a fence to enclose the Recycling Containment in a manner that deters unauthorized wildlife and human access. The design calls for a 8-ft tall wire mesh game fence around the containment to exclude wildlife (see detail contained in engineering design drawings). This fence provides greater wildlife (and human) deterrence than the minimum required barbed wire fence with four strands evenly spaced in the interval between one foot and four feet above ground level. The fence will be gated to provide access for maintenance and placement of pumps and other necessary equipment. As stated in the O&M plan, the operator will ensure that all gates associated with the fence are closed and locked when responsible personnel are not onsite.

Netting and Protection of Wildlife

The game fence around the containment will be effective in excluding antelope, deer, coyotes, and most other terrestrial wildlife.

The Recycling Containment is otherwise protective of wildlife, including migratory birds. The containment will contain treated produced water that has not shown to be a material threat to birds due to hydrogen sulfide gas or floating, free-phase hydrocarbons. The O&M plan calls for the operator to inspect for and, within 30 days of discovery, report the discovery of dead migratory birds or other wildlife to the appropriate wildlife agency and to the division district office in order to facilitate assessment and implementation of measures to prevent incidents from reoccurring.

The containment will have a properly constructed foundation and interior slopes consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear. Geotextile may be placed under the liner when needed to reduce localized stress-strain or protuberances that otherwise may compromise the liner's integrity.

Appendix C shows for earthen containments;

1. The levee has an inside grade no steeper than three horizontal feet to one vertical foot (3H:1V).
2. The levee outside grade is no steeper than three horizontal feet to one vertical foot (3H:1V).
3. The top of the levee is wide enough to install an anchor trench and provide adequate room for inspection and maintenance.
4. The caliche gravel placed on the outside levee provides additional erosion control.

Field conditions may create the need for changes to the design. Any changes to the construction or grade requirements due to unforeseen conditions will be reviewed and approved prior to initiating installation of the liner system. Any design change that does not conform to the NMOCD Rule will be the subject of a variance request and will be submitted **to the OCD for review and approval**.



LINER AND DRAINAGE GEOTEXTILE INSTALLATION

The containment has a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions.

The primary (upper) liner is a geomembrane liner composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. It is 60-mil HDPE. The secondary liner is 40-mil HDPE. Liner compatibility meets or exceeds a subsequent relevant publication to EPA SW-846 method 9090A.

The Recycling Containment design has a leak detection system between the upper and lower geomembrane liners of 200-mil geonet to facilitate drainage. The leak detection system consists of a properly designed drainage and collection and removal system placed above the lower geomembrane liner in depressions and sloped to facilitate the earliest possible leak detection. The containment floor design calls for a slope toward the sump. This slope, combined with the highly transmissive geonet drainage layer, provides for the earliest possible leak detection.

The liners and drainage material will be installed consistent with the manufacture's specifications (See Appendix E). In addition to any specifications of the manufacturer, protocols for liner installation include measures to:

1. Minimize liner seams and orient them up and down, not across, a slope of the levee.
2. Use factory welded seams where possible.
3. Field seams in geosynthetic material are thermally seamed; prior to field seaming, overlap liner four to six inches.
4. Minimize the number of field seams and corners and irregularly shaped areas.
5. Provide for no horizontal seams within five feet of the slope's toe.
6. Use qualified personnel to perform field welding and testing.
7. Avoid excessive stress-strain on the liner.
8. The edges of all liners are anchored in the bottom of a compacted earth-filled trench that is at least 18-in deep.

At points of discharge into the lined earthen containment, the pipe configuration effectively protects the liner from excessive hydrostatic force or mechanical damage during filling. The design shows that at any point of discharge into or suction from the recycling containment, the liner is protected from excessive hydrostatic force or mechanical damage. External discharge or suction lines do not penetrate the liner.

Pumping from the containment to hydraulic fracturing operations is the responsibility of stimulation contractors. Typically, numerous lines are permanently placed in the containment with floats attached to prevent damage to the liner system. The containment may be equipped with permanent HDPE



stinger (supported by a sacrificial liner or geotextile) for withdrawal of fluid during operations, if the owner deems necessary. External discharge or suction lines do not penetrate the liner.

LEAK DETECTION AND FLUID REMOVAL SYSTEM INSTALLATION

The leak detection system, contains the following design elements:

1. The 200-mil geonet drainage material between the primary and secondary liner is sufficiently permeable to allow the transport of fluids to the observation ports (*Appendix C*).
2. The containment floor, sloped towards the monitoring riser pipe, facilitates the earliest possible leak detection of the containment bottom. A pump may be placed in an observation port to provide for fluid removal.
3. Piping will withstand chemical attack from any seepage, structural loading from stresses and disturbances from overlying water, cover materials, equipment operation, and expansion or contraction (see *Appendix C*).
4. The slope of the interior subgrade should be great enough to facilitate drainage.



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APPENDIX E

MATERIAL SPECIFICATIONS



MATERIAL SPECIFICATIONS
SELECT ENERGY SOLUTIONS, LLC
JESSE JAMES RECYCLE FACILITY
LEA COUNTY, NEW MEXICO
024113-00

Select Energy Services is proposing to construct two (2) storage containment in Section 28, Township 19 South, Range 33 East, Lea County, New Mexico. Jesse James Recycle shall consist of two (2) containments with a total operational volume of approximately 2,038,822-bbl.

GEOMEMBRANE SPECIFICATION

This specification covers the technical requirements for the Manufacturing and Installation of the geomembrane. All materials meet or exceed the requirements of this specification, and all work will be performed in accordance with the procedures provided in these project specifications.

1.1 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheet
 - 2. D 1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
 - 3. D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
 - 4. D 1603 Test Method for Carbon Black in Olefin Plastics
 - 5. D 3895 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
 - 6. D 4218 Standard Test Method for Determination of Carbon Black in Polyethylene Compounds
 - 7. D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
 - 8. D 5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
 - 9. D 5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
 - 10. D 5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
 - 11. D 5994 Standard Test Method for Measuring Core Thickness of Textured Geomembranes
 - 12. D 6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
 - 13. D 6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
 - 14. D 7240 Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test)
- B. Geosynthetic Research Institute
 - 1. GRI GM 13 Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
 - 2. GRI GM 17 Test Properties, Testing Frequency and Recommended Warranty for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes



1.2 DEFINITIONS

- A. Lot - A quantity of resin (usually the capacity of one rail car) used in the manufacture of geomembranes. Finished roll will be identified by a roll number traceable to the resin lot used.
- B. Construction Quality Assurance Consultant (CONSULTANT) – The Party, independent from MANUFACTURER and INSTALLER, that is responsible for observing and documenting activities related to quality assurance during the lining system construction.
- C. ENGINEER- The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.
- D. Geomembrane Manufacturer (MANUFACTURER) - The party responsible for manufacturing the geomembrane rolls.
- E. Geosynthetic Quality Assurance Laboratory (TESTING LABORATORY) – The Party, independent from the OWNER, MANUFACTURER, and INSTALLER, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the OWNER.
- F. INSTALLER- The Party responsible for field handling, transporting, storing, deploying, seaming, and testing of the geomembrane seams.
- G. Panel- Unit area of geomembrane that will be seamed in the field that is larger than 100-ft².
- H. Patch - Unit area of geomembrane that will be seamed in the field that is less than 100-ft².
- I. Subgrade Surface - Soil layer surface which immediately underlies the geosynthetic material(s).

1.3 SUBMITTALS POST-AWARD

- A. Furnish the following product data, in writing, to ENGINEER prior to installation of the geomembrane material:
 - 1. Resin Data shall include the following:
 - a. Certification stating that the resin meets the specification requirements (see *Table 1.9B*).
 - 2. Geomembrane Roll
 - a. Statement certifying no recycled polymer and no more than 10% rework of the same type of material is added to the resin (product run may be recycled).
- B. The INSTALLER shall furnish the following information to the ENGINEER and OWNER prior to installation:
 - 1. Installation layout drawings
 - 2. Must show proposed panel layout including field seams and details
 - 3. Must be approved prior to installing the geomembrane
 - 4. Approved drawings will be for concept only; actual panel placement will be determined by site conditions
 - 5. Installer's Geosynthetic Field Installation Quality Assurance Plan



- C. The INSTALLER will submit the following to the ENGINEER upon completion of installation:
1. Certificate stating the geomembrane has been installed in accordance with the Contract Documents
 2. Material and installation warranties
 3. As-built drawings showing actual geomembrane placement and seams including typical anchor trench detail

1.4 QUALITY ASSURANCE

- A. The OWNER will engage and pay for the services of a Geosynthetic Quality Assurance Consultant and Laboratory to monitor geomembrane installation.

1.5 QUALIFICATIONS

A. MANUFACTURER

1. Geomembrane shall be manufactured by the following:
 - a. GSE Lining Technology, LLC
 - b. approved equal
2. MANUFACTURER shall have manufactured a minimum of 10,000,000 square feet of polyethylene geomembrane during the last year.

B. INSTALLER

1. Installation shall be performed by one of the following installation companies (or approved equal)
 - a. GSE Lining Technology, LLC
 - b. GSE Approved Installers
2. INSTALLER shall have installed a minimum of 5,000,000-ft² of HDPE geomembrane during the last two years.
3. INSTALLER shall have worked in a similar capacity on at least 5 projects similar in complexity to the project described in the contract documents, and with at least 500,000-ft² of HDPE geomembrane installation on each project.
4. The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.
5. The INSTALLER shall provide a minimum of one Master Seamer for work on the project.
6. Must have completed a minimum of 1,000,000-ft² of geomembrane seaming work using the type of seaming apparatus proposed for the use on this Project.

1.6 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

- A. LABELING - Each roll of geomembrane delivered to the site shall be labeled by the MANUFACTURER. The label will identify:
1. manufacturer's name
 2. product identification
 3. thickness
 4. length
 5. width



6. roll number
- B. DELIVERY - Rolls of liner will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.
- C. STORAGE - The on-site storage location for geomembrane material, provided by the CONTRACTOR to protect the geomembrane from punctures, abrasions and excessive dirt and moisture, should have the following characteristics:
 1. level (no wooden pallets)
 2. smooth
 3. dry
 4. protected from theft and vandalism
 5. adjacent to the area being lined
- D. Handling- Materials are to be handled so as to prevent damage.

1.7 WARRANTY

- A. Material shall be warrantied, on a pro-rata basis, against Manufacturer's defects for a period of 5 years from the date of geomembrane installation.
- B. Installation shall be warrantied against defects in workmanship for a period of 1 year from the date of geomembrane completion.

1.8 GEOMEMBRANE PROPERTIES

- A. Material shall be smooth/textured polyethylene geomembrane as shown on the drawings.
- B. Resin
 1. Resin shall be new, first quality, compounded and manufactured specifically for producing geomembrane.
 2. Natural resin (without carbon black) shall meet the following requirements:

Table 1.9B RAW MATERIAL PROPERTIES			
Property	Test Method	HDPE	LLDPE
Density (g/cm ³)	ASTM D 1505	≥ 0.932	≥ 0.915
Melt Flow Index (g/10 min)	ASTM D 1238 (190/2.16)	≤ 1.0	≤ 1.0
OIT (minutes)	ASTM D 3895 (1 atm/200°C)	≥ 100	≥ 100

- C. Geomembrane Rolls
 1. Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black.
 2. Geomembrane shall be free of holes, pinholes as verified by on-line electrical detection, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.



3. Geomembrane material is to be supplied in roll form. Each roll is to be identified with labels indicating roll number, thickness, length, width, and MANUFACTURER.
 4. All liner sheets produced at the factory shall be inspected prior to shipment for compliance with the physical property requirements listed in section 1.09 D and be tested by an acceptable method of inspecting for pinholes. If pinholes are located, identified and indicated during manufacturing, these pinholes may be corrected during installation.
- D. Smooth surfaced geomembrane shall meet the requirements shown in the following data sheets below:
1. *Table 1.1* for Black HDPE
 2. *Table 1.2* for Green HDPE
 3. *Table 1.3* for White HDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 4. *Table 1.4* for Smooth Leak Location Liner HDPE
 - a. The geomembrane shall have a coextruded, electrically conductive layer.
 - b. The conductive layer is installed downward.
 - c. Electrical testing shall be performed after liner installation by the INSTALLER.
 5. *Table 1.5* for Smooth White Leak Location Liner HDPE
 - a. The geomembrane shall have a coextruded, electrically conductive layer.
 - b. The conductive layer is installed downward.
 - c. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - d. The white surface shall be installed upwards.
 - e. Electrical testing shall be performed after liner installation by the INSTALLER.
 6. *Table 1.6* for Black LLDPE
 7. *Table 1.7* for White-surfaced LLDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 8. *Table 1.8* for Leak Location Liner LLDPE
 - a. The geomembrane shall have a coextruded, electrically conductive layer.
 - b. The conductive layer is installed downward.
 - c. Electrical testing shall be performed after liner installation by the INSTALLER.
 9. *Table 1.9* for White Leak Location Liner LLDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 - c. The geomembrane shall have a coextruded, electrically conductive layer.
 - d. The conductive layer is installed downward.
 - e. Electrical testing shall be performed after liner installation by the INSTALLER.



MATERIAL SPECIFICATIONS
SELECT ENERGY SOLUTIONS, LLC
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TABLE 1.1: GSE HD SMOOTH GEOMEMBRANE							
Tested Property	Test Method	Frequency	Minimum Average Values				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	114 63 700 12	152 84 700 12	228 126 700 12	304 168 700 12	380 210 700 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	54	72	108	144	180
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Notch Constant Tensile Load, hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100	>100
Typical Roll Dimensions							
Roll Length ⁽²⁾ , ft			1,120	870	560	430	340
Roll Width ⁽²⁾ , ft			22.5	22.5	22.5	22.5	22.5
Roll Area, ft ²			25,200	19,575	12,600	9,675	7,650

- NOTES:
 - ⁽¹⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽²⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE HD Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



MATERIAL SPECIFICATIONS
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TABLE 1.2: GSE GREEN SMOOTH GEOMEMBRANE							
Tested Property	Test Method	Frequency	Minimum Average Values				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	114 63 700 12	152 84 700 12	228 126 700 12	304 168 700 12	380 210 700 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	54	72	108	144	180
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Notch Constant Tensile Load, hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100	>100
Typical Roll Dimensions							
Roll Length ⁽³⁾ , ft			1,120	870	560	430	340
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5	22.5
Roll Area, ft ²			25,200	19,575	12,600	9,675	7,650



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- NOTES:
 - ⁽¹⁾GSE Green Smooth may have an overall ash content of 3.0% due to the green layer. These values apply to the black layer only.
 - ⁽²⁾Dispersion applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE Green Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.

TABLE 1.3: GSE WHITE SMOOTH GEOMEMBRANE							
Tested Property	Test Method	Frequency	Minimum Average Values				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	114 63 700 12	152 84 700 12	228 126 700 12	304 168 700 12	380 210 700 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	54	72	108	144	180
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Notch Constant Tensile Load, hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100	>100
Typical Roll Dimensions							
Roll Length ⁽³⁾ , ft			1,120	870	560	430	340
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5	22.5



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Roll Area, ft ²	25,200	19,575	12,600	9,675	7,650
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- NOTES:
 - ⁽¹⁾GSE White Smooth may have an overall ash content of 3.0% due to the white layer. These values apply to the black layer only.
 - ⁽²⁾Dispersion applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE White Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.

TABLE 1.4: GSE LEAK LOCATION SMOOTH GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	152 84 700 12	228 126 700 12	304 168 700 12	380 210 700 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	72	108	144	180
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Notch Constant Tensile Load, hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft			870	560	430	340
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5



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Roll Area, ft ²	19,575	12,600	9,675	7,650
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- NOTES:
 - ⁽¹⁾GSE Leak Location Smooth may have an overall ash content of 3.0% due to the conductive layer. These values apply to the non-conductive black layer only.
 - ⁽²⁾Dispersion applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE Leak Location Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D746.
 - *Modified.



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TABLE 1.5: GSE LEAK LOCATION WHITE SMOOTH GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in- width Strength at Yield, lb/in- width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	152 84 700 12	228 126 700 12	304 168 700 12	380 210 700 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	72	108	144	180
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Notch Constant Tensile Load, hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft			870	560	430	340
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²			19,575	12,600	9,675	7,650

- NOTES:
 - ⁽¹⁾GSE Leak Location White Smooth may have an overall ash content of 3.0% due to the white and conductive layers. These values apply to the black layer only.
 - ⁽²⁾Dispersion applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE Leak Location White Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $<-77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TABLE 1.6: GSE ULTRAFLEX SMOOTH GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Value			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	152 800	228 800	304 800	380 800
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	56	84	112	140
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽²⁾ , ft			870	560	430	340
Roll Width ⁽²⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²			19,575	12,600	9,675	7,650

- NOTES:
 - ⁽¹⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽²⁾Roll lengths and widths have a tolerance of ± 1 %.
 - GSE UltraFlex is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of ± 2 % when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TALBE 1.7: GSE ULTRAFLEX WHITE SMOOTH GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Value			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	152 800	228 800	304 800	380 800
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	56	84	112	140
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft			870	560	430	340
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²			19,575	12,600	9,675	7,650

- NOTES:
 - ⁽¹⁾GSE UltraFlex White Smooth may have an overall ash content greater than 3.0% due to the white layer. These values apply to the black layer only.
 - ⁽²⁾ Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE UltraFlex White Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TABLE 1.8: GSE ULTRAFLEX LEAK LOCATION LINER SMOOTH GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Value			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	152 800	228 800	304 800	380 800
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	56	84	112	140
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft			870	560	430	340
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²			19,575	12,600	9,675	7,650

- NOTES:
 - ⁽¹⁾GSE UltraFlex Leak Location Smooth may have an overall ash content greater than 3.0% due to the conductive layer. These values apply to the non-conductive black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE UltraFlex Leak Location Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TABLE 1.9: GSE ULTRAFLEX LEAK LOCATION LINER WHITE SMOOTH GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Value			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in- width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	152 800	228 800	304 800	380 800
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	56	84	112	140
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft			870	560	430	340
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²			19,575	12,600	9,675	7,650

- NOTES:
 - ⁽¹⁾GSE UltraFlex Leak Location White Smooth may have an overall ash content greater than 3.0% due to the white and conductive layers. These values apply to the non-conductive black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE UltraFlex Leak Location White Smooth is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



- E. Textured surfaced geomembrane shall meet the requirements shown in the following data sheets below.
1. Table 2.1 for Black coextruded textured HDPE
 2. Table 2.2 for Green coextruded textured HDPE
 3. Table 2.3 for White coextruded textured HDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 4. Table 2.4 for Leak Location Liner coextruded textured HDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 5. Table 2.5 for White Leak Location Liner coextruded textured HDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 6. Table 2.6 for Black coextruded textured LLDPE
 7. Table 2.7 for White coextruded textured LLDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 8. Table 2.8 for Leak Location Liner coextruded textured LLDPE
 - a. The geomembrane shall have a coextruded, electrically conductive layer.
 - b. The conductive layer is installed downward.
 - c. Electrical testing shall be performed after liner installation by the INSTALLER.
 9. Table 2.9 for White Leak Location Liner coextruded textured LLDPE
 - a. The geomembrane shall be a white-surfaced, coextruded geomembrane.
 - b. The white surface shall be installed upwards.
 - c. The geomembrane shall have a coextruded, electrically conductive layer.
 - d. The conductive layer is installed downward.
 - e. Electrical testing shall be performed after liner installation by the INSTALLER.



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TABLE 2.1: GSE HD TEXTURED GEOMEMBRANE							
Tested Property	Test Method	Frequency	Minimum Average Values				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5994	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	45 63 100 12	60 84 100 12	90 126 100 12	120 168 100 12	150 210 100 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	45	60	90	120	150
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Asperity Height, mil	ASTM D 7466	second roll	16	18	18	18	18
Notch Constant Tensile Load ⁽²⁾ , hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100	>100
Typical Roll Dimensions							
Roll Length ⁽³⁾ , ft	Double-Sided	Textured	830	700	520	400	330
	Single-Sided	Textured	1,010	780	540	410	330
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5	22.5
Roll Area, ft ²	Double-Sided	Textured	18,675	15,750	11,700	9,000	7,425
	Single-Sided	Textured	22,725	17,550	12,150	9,225	7,425



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- NOTES:
 - ⁽¹⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽²⁾NCTL for GSE HD Textured is conducted on representative smooth geomembrane samples.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE HD Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.

TABLE 2.2 GSE GREEN TEXTURED GEOMEMBRANE							
Tested Property	Test Method	Frequency	Minimum Average Values				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5994	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	45 63 100 12	60 84 100 12	90 126 100 12	120 168 100 12	150 210 100 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	45	60	90	120	150
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Asperity Height, mil	ASTM D 7466	second roll	16	18	18	18	18
Notch Constant Tensile Load ⁽³⁾ , hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100	>100
Typical Roll Dimensions							
Roll Length ⁽⁴⁾ , ft	Double-Sided Textured Single-Sided Textured		830 1,010	700 780	520 540	400 410	330 330
Roll Width ⁽⁴⁾ , ft			22.5	22.5	22.5	22.5	22.5



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Roll Area, ft ²	Double-Sided	Textured	18,675	15,750	11,700	9,000	7,425
	Single-Sided Textured		22,725	17,550	12,150	9,225	7,425

- NOTES:
 - ⁽¹⁾GSE Green may have an overall ash content greater than 3.0% due to the green layer. These values apply to the black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾NCTL for GSE Green Textured is conducted on representative smooth geomembrane samples.
 - ⁽⁴⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE Green Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TABLE 2.3: GSE WHITE TEXTURED GEOMEMBRANE							
Tested Property	Test Method	Frequency	Minimum Average Values				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5994	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	45 63 100 12	60 84 100 12	90 126 100 12	120 168 100 12	150 210 100 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	45	60	90	120	150
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Asperity Height, mil	ASTM D 7466	second roll	16	18	18	18	18
Notch Constant Tensile Load ⁽³⁾ , hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100	>100
Typical Roll Dimensions							
Roll Length ⁽⁴⁾ , ft	Double-Sided Textured Single-Sided Textured		830 1,010	700 780	520 540	400 410	330 330
Roll Width ⁽⁴⁾ , ft			22.5	22.5	22.5	22.5	22.5
Roll Area, ft ²	Double-Sided Textured Single-Sided Textured		18,675 22,725	15,750 17,550	11,700 12,150	9,000 9,225	7,425 7,425



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- NOTES:
 - ⁽¹⁾GSE White may have an overall ash content greater than 3.0% due to the white layer. These values apply to the black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾NCTL for GSE White Textured is conducted on representative smooth geomembrane samples.
 - ⁽⁴⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE White Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
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TABLE 2.4: GSE LEAK LOCATION LINER TEXTURED GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5994	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in- width Strength at Yield, lb/in- width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	60 84 100 12	90 126 100 12	120 168 100 12	150 210 100 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	60	90	120	150
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Asperity Height, mil	ASTM D 7466	second roll	18	18	18	18
Notch Constant Tensile Load ⁽³⁾ , hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽⁴⁾ , ft	Double-Sided	Textured	700	520	400	330
	Single-Sided	Textured	780	540	410	330
Roll Width ⁽⁴⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²	Double-Sided	Textured	15,750	11,700	9,000	7,425
	Single-Sided	Textured	17,550	12,150	9,225	7,425



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- NOTES:
 - ⁽¹⁾GSE Leak Location may have an overall ash content greater than 3.0% due to the conductive layer. These values apply to the non-conductive layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾NCTL for GSE Leak Location Textured is conducted on representative smooth geomembrane samples.
 - ⁽⁴⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE Leak Location Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TABLE 2.5: GSE LEAK LOCATION LINER WHITE TEXTURED GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil	ASTM D 5994	every roll	40	60	80	100
Lowest individual reading			36	54	72	90
Density, g/cm ³ , (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940
Tensile Properties (each direction)	ASTM D 6693, Type IV	20,000 lbs				
Strength at Break, lb/in-width	Dumbbell, 2 ipm		60	90	120	150
Strength at Yield, lb/in-width			84	126	168	210
Elongation at Break, %	G.L. 2.0 in		100	100	100	100
Elongation at Yield, %	G.L. 1.3 in		12	12	12	12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	60	90	120	150
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Asperity Height, mil	ASTM D 7466	second roll	18	18	18	18
Notch Constant Tensile Load ⁽²⁾ , hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽⁴⁾ , ft	Double-Sided	Textured	700	520	400	330
	Single-Sided	Textured	780	540	410	330
Roll Width ⁽⁴⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²	Double-Sided	Textured	15,750	11,700	9,000	7,425
	Single-Sided	Textured	17,550	12,150	9,225	7,425



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- NOTES:
 - ⁽¹⁾GSE Leak Location White may have an overall ash content greater than 3.0% due to the conductive and white layers. These values apply to the non-conductive black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾NCTL for GSE Leak Location White Textured is conducted on representative smooth geomembrane samples.
 - ⁽⁴⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE Leak Location White Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTb of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.

TABLE 2.6: GSE ULTRAFLEX TEXTURED GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	60 250	90 250	120 250	150 250
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	44	66	88	110
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Asperity Height, mil	ASTM D 7466	second roll	18	18	18	18
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽²⁾ , ft	Double-Sided Textured Single-Sided Textured		700 650	520 420	400 320	330 250
Roll Width ⁽²⁾ , ft			22.5	22.5	22.5	22.5



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Roll Area, ft ²	Double-Sided	Textured	15,750	11,700	9,000	7,425
	Single-Sided Textured		14,625	9,450	7,200	5,625

- NOTES:
 - ⁽¹⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽²⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE UltraFlex Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TABLE 2.7: GSE ULTRAFLEX WHITE TEXTURED GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	60 250	90 250	120 250	150 250
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	44	66	88	110
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Asperity Height, mil	ASTM D 7466	second roll	18	18	18	18
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft	Double-Sided	Textured	700	520	400	330
	Single-Sided	Textured	650	420	320	250
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²	Double-Sided	Textured	15,750	11,700	9,000	7,425
	Single-Sided	Textured	14,625	9,450	7,200	5,625

- NOTES:
 - ⁽¹⁾GSE UltraFlex White Textured may have an overall ash content greater than 3.0% due to the white layer. These values apply to the black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE UltraFlex White Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



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TABLE 2.8: GSE ULTRAFLEX LEAK LOCATION TEXTURED GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	60 250	90 250	120 250	150 250
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	44	66	88	110
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Asperity Height, mil	ASTM D 7466	second roll	18	18	18	18
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft	Double-Sided Textured Single-Sided Textured		700 650	520 420	400 320	330 250
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²	Double-Sided Textured Single-Sided Textured		15,750 14,625	11,700 9,450	9,000 7,200	7,425 5,625

- NOTES:
 - ⁽¹⁾GSE UltraFlex Leak Location Textured may have an overall ash content greater than 3.0% due to the conductive layer. These values apply to the non-conductive black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE UltraFlex Leak Location Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
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TABLE 2.9: GSE ULTRAFLEX LEAK LOCATION WHITE TEXTURED GEOMEMBRANE						
Tested Property	Test Method	Frequency	Minimum Average Values			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	40 36	60 54	80 72	100 90
Density, g/cm ³ (max.)	ASTM D 1505	200,000 lbs	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in- width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lbs	60 250	90 250	120 250	150 250
Tear Resistance, lb	ASTM D 1004	45,000 lbs	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	44	66	88	110
Carbon Black Content ⁽¹⁾ , % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾	Note ⁽²⁾
Asperity Height, mil	ASTM D 7466	second roll	18	18	18	18
Oxidative Induction Time, min	ASTM D 3895, 200°C; O ₂ , 1 atm	200,000 lbs	>100	>100	>100	>100
Typical Roll Dimensions						
Roll Length ⁽³⁾ , ft	Double-Sided	Textured	700	520	400	330
	Single-Sided	Textured	650	420	320	250
Roll Width ⁽³⁾ , ft			22.5	22.5	22.5	22.5
Roll Area, ft ²	Double-Sided	Textured	15,750	11,700	9,000	7,425
	Single-Sided	Textured	14,625	9,450	7,200	5,625

- NOTES:
 - ⁽¹⁾GSE UltraFlex Leak Location White Textured may have an overall ash content greater than 3.0% due to the white and conductive layers. These values apply to the non-conductive black layer only.
 - ⁽²⁾Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
 - ⁽³⁾Roll lengths and widths have a tolerance of $\pm 1\%$.
 - GSE UltraFlex Leak Location White Textured is available in rolls weighing approximately 4,000 lb.
 - All GSE geomembranes have dimensional stability of $\pm 2\%$ when tested according to ASTM D 1204 and LTB of $< -77^{\circ}\text{C}$ when tested according to ASTM D 746.
 - *Modified.



F. Extrudate Rod or Bead

1. Extrudate material shall be made from same type resin as the geomembrane.
2. Additives shall be thoroughly dispersed.
3. Materials shall be free of contamination by moisture or foreign matter.

1.9 EQUIPMENT

A. Welding equipment and accessories shall meet the following requirements:

1. Gauges showing temperatures in apparatus such as extrusion welder or fusion welder shall be present.
2. An adequate number of welding apparatus shall be available to avoid delaying work.
3. Power source must be capable of providing constant voltage under combined line load.

1.10 DEPLOYMENT

- A. Assign each panel a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.
- B. Visually inspect the geomembrane during deployment for imperfections and mark faulty or suspect areas.
- C. Deployment of geomembrane panels shall be performed in a manner that will comply with the following guidelines:
1. Geomembranes shall be installed according to site-specific specifications, and GSE Conductive should be installed with the Conductive layer down.
 - i. *Note: A spark tester or ohm meter can be used to determine Conductive layer.*
 2. Unroll geomembrane using methods that will not damage geomembrane and will protect underlying surface from damage (spreader bar, protected equipment bucket).
 3. Place ballast (commonly sandbags) on geomembrane which will not damage geomembrane to prevent wind uplift.
 4. Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage it. Smoking will not be permitted on the geomembrane.
 5. Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATV's and trucks are acceptable if wheel contact is less than 8 psi.
 6. Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.
- D. Sufficient material (slack) shall be provided to allow for thermal expansion and contraction of the material.

1.11 FIELD SEAMING

- A. Seams shall meet the following requirements:



1. To the maximum extent possible, orient seams parallel to the line of the slope, i.e., down and not across slope.
 2. Minimize number of field seams in corners, odd-shaped geometric locations and outside corners.
 3. Slope seams (panels) shall extend a minimum of 5-ft beyond the grade break into the flat area.
 4. Use a sequential seam numbering system compatible with panel numbering system that is agreeable to the CONSULTANT and INSTALLER.
 5. Align seam overlaps consistent with the requirements of the welding equipment being used. A 6-in overlap is commonly suggested.
- B. During Welding Operations
1. Provide at least one Master Seamer who shall provide direct supervision over other welders as necessary.
- C. Extrusion Welding
1. Hot-air tack adjacent pieces together using procedures that do not damage the geomembrane.
 2. Clean geomembrane surfaces by disc grinder or equivalent.
 3. Purge welding apparatus of heat-degraded extrudate before welding.
- D. Hot Wedge Welding
1. Welding apparatus shall be a self-propelled device equipped with an electronic controller which displays applicable temperatures.
 2. Clean seam area of dust, mud, moisture and debris immediately ahead of hot wedge welder.
 3. Protect against moisture build-up between sheets.
- E. Trial Welds
1. Perform trial welds on geomembrane samples to verify welding equipment is operating properly.
 2. Make trial welds under the same surface and environmental conditions as the production welds, i.e., in contact with subgrade and similar ambient temperature.
 3. Minimum of two trial welds per day, per welding apparatus, one made prior to the start of work and one completed at mid shift.
 4. Cut four, one-inch wide by six-inch long test strips from the trial weld.
 5. Quantitatively test specimens for peel adhesion, and then for shear strength.
 6. Trial weld specimens shall pass when the results shown in the following tables for HDPE and LLDPE are achieved in both peel and shear test.



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TABLE 1.12.6A: MINIMUM WELD VALUES FOR HDPE GEOMEMBRANES							
Property	Test Method	30	40	60	80	100	120
Peel Strength (fusion), ppi	ASTM D 6392	49	65	98	130	162	196
Peel Strength (extrusion), ppi	ASTM D 6392	39	52	78	104	130	157
Shear Strength (fusion & ext.), ppi	ASTM D 6392	61	81	121	162	203	242

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TABLE 1.2.6B: MINIMUM WELD VALUES FOR LLDPE GEOMEMBRANES						
Property	Test Method	30	40	60	80	100
Peel Strength (extrusion), ppi	ASTM D 6392	36	48	72	96	120
Peel Strength (fusion), ppi	ASTM D 6392	38	50	75	100	125
Shear Strength (fusion & ext.), ppi	ASTM D 6392	45	60	90	120	150

7. The break, when peel testing, occurs in the liner material itself, not through peel separation (FTB).
 8. The break is ductile.
 9. Repeat the trial weld, in its entirety, when any of the trial weld samples fail in either peel or shear.
 10. No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed trial weld.
- F. Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. INSTALLER shall demonstrate that acceptable seaming can be performed by completing acceptable trial welds.
- G. Defects and Repairs
1. Examine all seams and non-seam areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.
 2. Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover geomembrane at locations that have been repaired until test results with passing values are available.



1.12 FIELD QUALITY ASSURANCE

- A. MANUFACTURER and INSTALLER shall participate in and conform to all terms and requirements of the Owner's quality assurance program. CONTRACTOR shall be responsible for assuring this participation.
- B. Quality assurance requirements are as specified in this Section and in the Field Installation Quality Assurance Manual if it is included in the contract.
- C. Field Testing
 - 1. Non-destructive testing may be carried out as the seaming progresses or at completion of all field seaming.
 - b. Vacuum Testing
 - 1) Shall be performed in accordance with ASTM D 5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
 - b. Air Pressure Testing
 - 1) Shall be performed in accordance with ASTM D 5820, Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes.
 - c. Spark Testing
 - 1. Shall be performed accordance with ASTM D 7240 Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test).
 - d. Other approved methods.
 - 2. Destructive Testing (performed by CONSULTANT with assistance from INSTALLER)
 - b. Location and Frequency of Testing
 - 1) Collect destructive test samples at a frequency of one per every 500 lineal feet of seam length.
 - 2) Test locations will be determined after seaming.
 - 3) Exercise Method of Attributes as described by GRI GM-14 (Geosynthetic Research Institute, <http://www.geosynthetic-institute.org>) to minimize test samples taken.
 - c. Sampling Procedures are performed as follows:
 - 1) INSTALLER shall cut samples at locations designated by the CONSULTANT as the seaming progresses in order to obtain field laboratory test results before the geomembrane is covered.
 - 2) CONSULTANT will number each sample, and the location will be noted on the installation as-built.
 - a) Samples shall be 12-in wide by minimal length with the seam centered lengthwise.
 - b) Cut a 2-in wide strip from each end of the sample for field-testing.
 - c) Cut the remaining sample into two parts for distribution as follows:



- d) One portion for INSTALLER, 12-in by 12-in
- e) One portion for the Third-Party laboratory, 12-in by 18-in
- f) Additional samples may be archived if required.
- 3) Destructive testing shall be performed in accordance with ASTM D 6392, Standard Test Method for Determining the Integrity of Non-Reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
 - a) INSTALLER shall repair all holes in the geomembrane resulting from destructive sampling.
- 4) Repair and test the continuity of the repair in accordance with these Specifications.
- 3. Failed Seam Procedures
 - a. If the seam fails, INSTALLER shall follow one of two options:
 - 1) Reconstruct the seam between any two passed test locations.
 - 2) Trace the weld to intermediate location at least 10-ft minimum or where the seam ends in both directions from the location of the failed test.
 - b) The next seam welded using the same welding device is required to obtain an additional sample, i.e., if one side of the seam is less than 10-ft long.
 - c) If sample passes, then the seam shall be reconstructed or capped between the test sample locations.
 - d) If any sample fails, the process shall be repeated to establish the zone in which the seam shall be reconstructed.

1.13 REPAIR PROCEDURES

- A. Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.
- B. Repair any portion of unsatisfactory geomembrane or seam area failing a destructive or non-destructive test.
- C. INSTALLER shall be responsible for repair of defective areas.
- D. Agreement upon the appropriate repair method shall be decided between
 - 1. CONSULTANT and INSTALLER by using one of the following repair methods:
 - a. Patching- Used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
 - b. Abrading and Re-welding- Used to repair short section of a seam.
 - c. Spot Welding- Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced.
 - d. Capping- Used to repair long lengths of failed seams.
 - e. Flap Welding- Used to extrusion weld the flap (excess outer portion) of a fusion weld in lieu of a full cap.
 - 1) Remove the unacceptable seam and replace with new material.
- E. The following procedures shall be observed when a repair method is used:
 - 1. All geomembrane surfaces shall be clean and dry at the time of repair.



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2. Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.
 3. Extend patches or caps at least 6 inches for extrusion welds and 4 inches for wedge welds beyond the edge of the defect, and around all corners of patch material.
- F. Repair Verification
1. Number and log each patch repair (performed by CONSULTANT).
 2. Non-destructively test each repair using methods specified in this Specification.



1.1 SCOPE

This specification covers the technical requirements for the Manufacturing and Installation of the nonwoven geotextile. All materials meet or exceed the requirements of this specification, and all work will be performed in accordance with the procedures provided in these project specifications.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
1. ASTM D 5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles
 2. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 3. ASTM D 4533, Standard Test Method for Index Trapezoidal Tearing Strength of Geotextiles
 4. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
 5. ASTM D 4491, Standard Test Method for Water Permeability of Geotextiles by Permittivity
 6. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
 7. ASTM D 4354, Standard Practice for Sampling of Geosynthetics for Testing
 8. ASTM D 4759, Standard Practice for Determining the Specifications Conformance of Geosynthetics

1.3 SUBMITTALS

- A. Prior to material delivery to project site, the contractor shall provide the engineer with a written certification or manufacturers quality control data which displays that the geotextile meets or exceeds minimum average roll values (MARV) specified herein.
- B. The contractor shall submit, if required by the engineer, manufacturer's quality control manual for the geotextile to be delivered to the site.

2. PRODUCT

2.1 GEOTEXTILE

- A. The nonwoven needle-punched geotextile specified herein shall be made from staple fiber.
- B. The geotextile shall be manufactured from prime quality virgin polymer.
- C. The geotextile shall be able to withstand direct exposure to ultraviolet radiation from Sun for up to 30 days without any noticeable effect on index or performance properties.
- D. Geotextile shall meet or exceed all material properties listed in *Table 1*.



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TABLE 1: GEOTEXTILE PROPERTIES			
Property	Test Method	Test Frequency	Value
Mass per Unit Area, oz/yd ²	ASTM D 5261	90,000-ft ²	12
Grab Tensile Strength, lb	ASTM D 4632	90,000-ft ²	320
CBR Puncture Strength, lb	ASTM D 6241	540,000-ft ²	925
Grab Elongation, %	ASTM D 4632	90,000-ft ²	50
Trapezoidal Tear Strength, lb	ASTM D 4533	90,000-ft ²	125
UV Resistance, % retained after 500 hours	ASTM D 4355	per formulation	70

2.2 MANUFACTURE

- A. All rolls of the geotextile shall be identified with permanent marking on the roll or packaging, with the manufacturers name, product identification, roll number, and roll dimensions.

2.3 TRANSPORT

- A. Transportation of the geotextile shall be the responsibility of the contractor.
B. During shipment, the geotextile shall be protected from ultraviolet light exposure, precipitation, mud, dirt, dust, puncture, or other damaging or deleterious conditions.
C. Upon delivery at the job site, the contractor shall ensure that the geotextile rolls are handled and stored in accordance with the manufacturer's instructions as to prevent damage.

3. EXECUTION

3.1 QUALITY ASSURANCE

- A. The engineer shall examine the geotextile rolls upon delivery to the site and report any deviations from project specifications to the contractor.

3.2 INSTALLATION



- A. The geotextile shall be handled in such a manner as to ensure that it is not damaged in any way. Should the contractor damage the geotextile to the extent that it is no longer usable as determined by these specifications or by the engineer, the contractor shall replace the geotextile at his own cost.
- B. The geotextile shall be installed to the lines and grades as shown on the contract drawings and as described herein.
- C. The geotextile shall be rolled down the slope in such a manner as to continuously keep the geotextile in tension by self-weight. The geotextile shall be securely anchored in an anchor trench where applicable, or by other approved or specified methods.
- D. In the presence of wind, all geotextiles shall be weighted by sandbags or approved equivalent. Such anchors shall be installed during placement and shall remain in place until replaced with cover material.
- E. The contractor shall take necessary precautions to prevent damage to adjacent or underlying materials during placement of the geotextile. Should damage to such material occur due to the fault of the contractor, the latter shall repair the damaged materials at his own cost and to the satisfaction of the engineer.
- F. During placement of the geotextile, care shall be taken not to entrap soil, stones or excessive moisture that could hamper subsequent seaming of the geotextile as judged by the engineer.
- G. The geotextile shall not be exposed to precipitation prior to being installed and shall not be exposed to direct sunlight for more than 15 days after installation.
- H. The geotextile shall be seamed using heat seaming or stitching methods as recommended by the manufacturer and approved by the engineer. Sewn seams shall be made using polymeric thread with chemical resistance equal to or exceeding that of the geotextile. All sewn seams shall be continuous. Seams shall be oriented down slopes perpendicular to grading contours unless otherwise specified. For heat-seaming, fusion welding techniques recommended by the manufacturer shall be used.
- I. The contractor shall not use heavy equipment to traffic above the geotextile without approved protection.
- J. The geotextile shall be covered as soon as possible after installation and approval. Installed geotextile shall not be left exposed for more than 15 days.
- K. Material overlying the geotextile shall be carefully placed to avoid wrinkling or damage to the geotextile.



SINGLE SIDED GEOCOMPOSITE

1.1 SCOPE

This specification covers the technical requirements for the manufacturing and installation of the geocomposite drainage layer. All materials meet or exceed the requirements of this specification, and all work will be performed in accordance with the procedures provided in these project specifications.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D 1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
2. D 1505-98 Standard Test Method for Density of Plastics by the Density-Gradient Technique
3. ASTM D 4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle Furnace Technique D 1603-94 Standard Test Method for Carbon Black in Olefin Plastics
4. D 4355-02 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
5. D 4491-99 Standard Test Method for Water Permeability of Geotextiles by Permittivity
6. D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles
7. D 4716-00 Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
8. D 4751-99 Standard Test Method for Determining Apparent Opening Size of a Geotextile
9. D 6241 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile- Related Products Using a 50-mm Probe D 4833-88 (1996) Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
10. D 5261-92 (1996) Standard Test Method for Measuring the Mass Per Unit Area of Geotextiles
11. D7005-03 Determining The Bond Strength (Ply-Adhesion) of Geocomposites
12. D 7179 Standard Test Method for Determining Geonet Breaking Force

B. Relevant publications from the Environmental Protection Agency (EPA):

1. Daniel, D.E. and R.M. Koerner, (1993), Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities, EPA/600/R-93/182.



1.3 DEFINITIONS

- A. Construction Quality Assurance Consultant (CONSULTANT) – The Party, independent from MANUFACTURER and INSTALLER, that is responsible for observing and documenting activities related to quality assurance during the lining system construction.
- B. ENGINEER - The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.
- C. Geocomposite Manufacturer (MANUFACTURER) - The party responsible for manufacturing the geocomposite rolls.
- D. Geosynthetic Quality Assurance Laboratory (TESTING LABORATORY) -The Party, independent from the MANUFACTURER and INSTALLER, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the OWNER.
- E. INSTALLER- Party responsible for field handling, transporting, storing and deploying the geocomposite.
- F. Lot- A quantity of resin (usually the capacity of one rail car) used to manufacture polyethylene geocomposite rolls. The finished rolls will be identified by a roll number traceable to the resin lot.

1.4 QUALIFICATIONS

- A. MANUFACTURER
 - 1. Geocomposite shall be manufactured by the following:
 - a. GSE Lining Technology, Inc.
 - b. Approved Equal
 - 2. MANUFACTURER shall have manufactured a minimum of 10,000,000-ft² of polyethylene geocomposite material during the last year.
- B. INSTALLER
 - 1. INSTALLER shall have installed a minimum of 500,000 square feet of geocomposite in the last 3 years.
 - 2. INSTALLER shall have worked in a similar capacity on at least 5 projects similar in complexity to the project described in the contract documents, and within at least 50,000 square feet of geonet installation on each project.
 - 3. The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.

1.5 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

- A. Labeling- Each roll delivered to the site shall be wrapped and labeled by the MANUFACTURER. The label will identify:
 - 1. Manufacturer's name
 - 2. Product identification
 - 3. Length
 - 4. Width



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- 5. Roll number
- C. Delivery- Rolls will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.
- D. Storage- The on-site storage location provided by the CONTRACTOR to protect the geonet from abrasions, excessive dirt and moisture, shall have the following characteristics:
 - 1. Level (no wooden pallets)
 - 2. Smooth
 - 3. Dry
 - 4. Protected from theft and vandalism
 - 5. Adjacent to the area being lined
- E. Handling
 - 1. The CONTRACTOR and INSTALLER shall handle all rolls in such a manner to ensure they are not damaged in any way.
 - 2. The INSTALLER shall take any necessary precautions to prevent damage to underlying layers during placement of the drainage material.

1.6 WARRANTY

- A. Material shall be warranted, on a pro-rata basis against defects for a period of 1-year from the date of the geocomposite installation.
- B. Installation shall be warranted against defects in workmanship for a period of 1-year from the date of geocomposite completion.

2. PRODUCTS

2.1 GEOCOMPOSITE PROPERTIES

- A. A geocomposite shall be manufactured by extruding two crossing strands to form a bi-planar drainage net structure with a non-woven geotextile bonded to one or both sides.
- B. The geocomposite specified shall have properties that meet or exceed the values listed in the following data sheets below.



MATERIAL SPECIFICATIONS
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TABLE 1: GEOCOMPOSITE PROPERTIES

Property	Test Method	Frequency	Value
Geocomposite			
Transmissivity (1), gal/min/ft (m ² /sec) Single-Sided Composite	ASTM D 4716	1/540,000-ft ²	6.2 (1.3 x 10 ⁻³)
Ply Adhesion, lb/in	ASTM D 7005	1/50,000-ft ²	0.5
Geonet			
Geonet Core Thickness, mil (1)	ASTM D 5199	1/50,000-ft ²	270
Transmissivity (2), gal/min/ft (m ² /sec)	ASTM D 4716	1/540,000-ft ²	19 (4 x 10 ⁻³)
Compressive Strength, lbs/ft	ASTM D 6364	1/540,000-ft ²	40,000
Density, g/cm ³	ASTM D 1505	1/50,000-ft ²	0.94
Tensile Strength (MD), lb/in	ASTM D 7179	1/50,000-ft ²	100
Carbon Black Content, %	ASTM D 4218	1/50,000-ft ²	2.0
8 oz. Geotextile (prior to lamination)			
Mass per Unit Area, oz/yd ²	ASTM D 5261	1/90,000-ft ²	8
Grab Tensile Strength, lb	ASTM D 4632	1/90,000-ft ²	220
Grab Elongation	ASTM D 4632	1/90,000-ft ²	50%
CBR Puncture Strength, lb	ASTM D 6241	1/540,000-ft ²	575
Trapezoidal Tear Strength, lb	ASTM D 4533	1/90,000-ft ²	90
AOS, US Sieve (mm)	ASTM D 4751	1/540,000-ft ²	80 (0.180)
Permittivity, sec-1	ASTM D 4491	1/540,000-ft ²	1.3
Water Flow Rate, gpm/ft ²	ASTM D 4491	1/540,000-ft ²	95
UV Resistance, % Retained	ASTM D 4355 (after 500 hours)	per formulation	70

- Note: The design engineer shall prepare the table above based on the GSE product data sheet and then delete this note



C. Resin

1. Resin shall be new first quality, compounded polyethylene resin.
2. Natural resin (without carbon black) shall meet the following additional
 - a. minimum requirements:

TABLE 2: RAW MATERIAL PROPERTIES		
Property	Test Method ⁽¹⁾	Value
Density (g/cm ³)	ASTM D 1505	>0.94
Melt Flow Index (g/10 min)	ASTM D 1238	≤ 1.0

¹GSE utilizes test equipment and procedures that enable effective and economical confirmation that the product will conform to specifications based on the noted procedures. Some test procedures have been modified for application to geosynthetics. All procedures and values are subject to change without prior notification.

2.2 MANUFACTURING QUALITY CONTROL

The geocomposite shall be manufactured in accordance with the Manufacturer's Quality Control Plan submitted to and approved by the ENGINEER.

The geocomposite shall be tested according to the test methods and frequencies listed on Table 1 which has been prepared based on product data sheets.

3. EXECUTION

3.1 FAMILIARIZATION

A. Inspection

1. Prior to implementing any of the work in the Section to be lined, the INSTALLER shall carefully inspect the installed work of all other Sections and verify that all Work is complete to the point where the installation of the Section may properly commence without adverse impact.
2. If the INSTALLER has any concerns regarding the installed work of other Sections, he shall notify the Project ENGINEER.

3.2 MATERIAL PLACEMENT

- A. The geocomposite roll should be installed in the direction of the slope and in the intended direction of flow unless otherwise specified by the ENGINEER.
 1. If the project contains long, steep slopes, special care should be taken so that only full length rolls are used at the top of the slope.



- B. In the presence of wind, all geocomposites shall be weighted down with sandbags or the equivalent. Such sandbags shall be used during placement and remain until replaced with cover material.
- C. If the project includes an anchor trench at the top of the slopes, the geocomposite shall be properly anchored to resist sliding. Anchor trench compacting equipment shall not come into direct contact with the geocomposite.
- D. In applying fill material, no equipment can drive directly across the geocomposite. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure.
- E. The cover soil shall be placed in the geocomposite in a manner that prevents damage to the geocomposite. Placement of the cover soil shall proceed immediately following the placement and inspection of the geocomposite.

3.3 SEAMS AND OVERLAPS

- A. Each component of the geocomposite will be secured or seamed to the like component at overlaps.
- B. Geonet Components
 - 1. Adjacent edges of the geonet along the length of the geocomposite roll shall be placed with the edges of each geonet butted against each other.
 - 2. The overlaps shall be joined by tying the geonet structure with cable ties. These ties shall be spaced every 5-ft along the roll length.
 - 3. Adjoining geocomposite rolls (end to end) across the roll width should be shingled down in the direction of the slope, with the geonet portion of the top overlapping the geonet portion of the bottom geocomposite a minimum of 12-in across the roll width.
 - 4. The geonet portion should be tied every 6-in in the anchor trench or as specified by the ENGINEER.

3.4 REPAIR

- A. Prior to covering the deployed geocomposite, each roll shall be inspected for damage resulting from construction.
- B. Any rips, tears or damaged areas on the deployed geocomposite shall be removed and patched. The patch shall be secured to the original geonet by tying every 6-in with the approved tying devices. If the area to be repaired is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be cut out and the two portions of the geonet shall be joined in accordance with *Subsection 3.03*.



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APPENDIX F

OPERATING AND MAINTENANCE PLAN



Select Energy Services is proposing to construct two (2) storage containment in Section 28, Township 19 South, Range 33 East, Lea County, New Mexico. Jesse James Recycle shall consist of two (2) containments with a total operational volume of approximately 2,038,822-bbl.

OPERATION AND MAINTENANCE PROCEDURES

In this plan, the underlined text represents the language of the Rule.

The operator will operate and maintain the lined earthen containments to contain liquids and solids (blow sand and minimal precipitates from the treated produced water) and maintain the integrity of the liner system in a manner that prevents contamination of fresh water and protects public health and the environment as described below. The purpose of the lined earthen containment is to facilitate recycling, reuse, and reclamation of produced water derived from nearby oil and gas wells. During periods when water for E&P operations is not needed, produced water will discharge to one of the injection wells in the operator's SWD system. The containment will not be used for the disposal of produced water or other oilfield waste.

The operation of the Recycling Containment is summarized below:

1. Via pipeline, produced water generated from nearby oil and gas wells is delivered to a treatment system located as indicated in the C-147.
2. After treatment, the produced water discharges into the containment.
3. When required, treated produced water is removed from the containment for E&P operations. At this time, treated produced water will be used for drilling beneath the fresh water zones (beneath surface casing), for well stimulation (e.g. hydraulic fracturing) and other E&P uses as approved by OCD.
4. Whenever the maximum fluid capacity of the containment is reached, treatment and discharge to the containment ceases (see Freeboard and Overtopping Plan, below).
5. The operator will keep accurate records and shall report monthly to the division the total volume of water received for recycling, with the amount of fresh water received listed separately, and the total volume of water leaving the facility for disposition by use on form C-148.
6. The operator will maintain accurate records that identify the sources and disposition of all recycled water that shall be made available for review by the division upon request.
7. The containment shall be deemed to have ceased operations if less than 20 % of the total fluid capacity is used every six months following the first withdrawal of produced water for use. The operator will report cessation of operations to the appropriate division district office. The appropriate division district office may grant an extension to this determination of cessation of operations not to exceed six months.

The operation of the lined earthen containment will follow the mandates listed below:

1. The operator will not discharge into or store any hazardous waste (as defined by 40 CFR 261 and NMAC 19.15.2.7.H.3) in the containments.
2. If the containment's primary liner is compromised above the fluid's surface, the operator will repair the damage or initiate replacement of the primary liner within 48 hours of discovery or seek an extension of time from the Division District office.



3. If the primary liner is compromised below the fluid's surface, the operator will remove all fluid above the damage or leak within 48 hours of discover, notify the division district office, and repair the damage or replace the primary liner.
4. If any penetration of the containment liner is confirmed by sampling of fluid in the leak detection system (see Inspection and Monitoring Plan), the operator will:
 - a. Begin and maintain fluid removal from the leak detection/pump-back system,
 - b. Notify the District office within 48 hours (phone or email) of the discovery,
 - c. Identify the location of the leak, and
 - d. Repair the damage or, if necessary, replace the containment liner.
5. The operator will install, or maintain onsite, an oil absorbent boom or other device to contain an unanticipated release and the operator will remove any visible layer of oil from the surface of the recycling containment.
6. The operator will report releases of fluid in a manner consistent with NMAC 19.15.29.
7. The containment will be operated to prevent the collection of surface water run-on.
8. The operator will maintain the containment free of miscellaneous solid waste or debris.
9. The operator will maintain at least 3-ft of freeboard for the containment and will use a welded ladder gauge to allow easy determination of the required 3-ft of freeboard.
10. As described in the design/construction plan, the injection or withdrawal of fluids from the containment is accomplished through hardware that prevents damage to the liner by erosion, fluid jets, or impact from installation and removal of hoses or pipes.
11. The operator shall ensure that all gates associated with the fence are closed and locked when responsible personnel are not onsite.
12. The operator will maintain the fences in good repair.

MONITORING, INSPECTION, AND REPORTING PLAN

The operator will inspect the recycling containment and associated leak detection systems weekly while it contains fluids. The operator shall maintain a current log of such inspections and make the log available for review by the division upon request.

Weekly inspections consist of:

1. Reading and recording the fluid height of staff gauges,
2. Recording any evidence that the pond surface shows visible oil,
3. Visually inspecting the containment's exposed liners, and
4. Checking the leak detection system for any evidence of a loss of integrity of the primary liner.

As stated above, if a liner's integrity is compromised, or if any penetration of the liner occurs above the water surface, then the operator will notify the District office within 48 hours (phone or email).

Monthly, the operator will:

1. Inspect diversion ditches and berms around the containment to check for erosion and collection of surface water run-on.
2. Inspect the leak detection system for evidence of damage or malfunction and monitor for leakage.
3. Inspect the containment for migratory birds and other wildlife. Within 30 days of discovery, report the discovery of dead migratory birds or other wildlife to the appropriate wildlife agency



- and to the division district office in order to facilitate assessment and implementation of measures to prevent incidents from reoccurring.
4. Report to the division the total volume of water received for recycling, with the amount of fresh water received listed separately, and the total volume of water leaving the facility for disposition by use on form C-148.
 5. Record sources and disposition of all recycled water.

The operator will maintain a log of all inspections and make the log available for the appropriate Division District office's review upon request.

FREEBOARD AND OVERTOPPING PREVENTION PLAN

The method of operation of the containment allows for maintaining freeboard with very few potential problems. When the capacity of the containment is reached (3-ft of freeboard), the discharge of treated produced water ceases and the produced water generated by nearby oil and gas wells is managed by disposing of fluid at a local injection well.

If rising water levels suggest that 3-ft of freeboard will not be maintained, the operator will implement one or more of the following options:

1. Cease discharging treated produced water to the containment.
2. Accelerate re-use of the treated produced water for purposes approved by the Division.
3. Transfer treated produced water from the containment to a Division approved injection well.

The reading of the staff gauge typically occurs daily when treatment operations are ongoing and weekly when discharge to the containment is not occurring.

PROTOCOL FOR LEAK DETECTION MONITORING, FLUID REMOVAL, AND REPORTING

As shown in *Appendix C*, the leak detection system includes a monitoring system. Any fluid released from the primary liner will flow to the collection sump, where fluid level monitoring is possible at the monitoring riser pipe associated with the leak detection system.

Staff may employ a portable electronic water level meter to determine if fluid exists in the monitoring riser pipe. Obtaining accurate readings of water levels in a sloped pipe beneath a containment can be a challenge. An electrician's wire snake may be required to push the probe to the bottom of the port and the probe may be fixed in a 2-in pipe "dry housing" to avoid false readings due to water condensation on the pipe. There are many techniques to determine the existence of water in the sumps, including low-flow pumps and a simple small bailer affixed to an electrician's snake. The operator will use the method that works best for this containment.

If seepage from the containment into the leak detection system is suspected by a positive fluid level measurement, the operator will:

1. Re-measure fluid levels in the monitoring riser pipe on a daily basis for one week to determine the rate of seepage.
2. Collect a water sample from the monitoring riser pipe to confirm the seepage is treated produced water from the containment via field conductivity and chloride measurements.



3. Notify NMOCD of a confirmed positive detection in the system within 48 hours of sampling (initial notification).
4. Install a pump into the monitoring riser pipe sump to continually (manually on a daily basis or via automatic timers) remove fluids from the leak detection system into the containment until the liner is repaired or replaced.
5. Dispatch a liner professional to inspect the portion of the containment suspected of leakage during a "low water" monitoring event.
6. Provide NMOCD a second report describing the inspection and/or repair within 20 days of the initial notification.

If the point of release is obvious from a low water inspection, the liner professional will repair the loss of integrity. If the point of release cannot be determined by the inspection, the liner professional will develop a more robust plan to identify the point(s) of release. The inspection plan and schedule will be submitted to OCD with the second report. The operator will implement the plan upon OCD approval.



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APPENDIX G

CLOSURE PLAN



CLOSURE PLAN
SELECT ENERGY SERVICES
JESSE JAMES RECYCLE CONTAINMENT
LEA COUNTY, NEW MEXICO
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Select Energy Services is proposing to construct two (2) storage containment in Section 28, Township 19 South, Range 33 East, Lea County, New Mexico. Jesse James Recycle shall consist of two (2) containments with a total operational volume of approximately 2,038,822-bbl.

CLOSURE PLAN

In this plan, underlined text represents the language of the Rule.

After operations cease, the operator will remove all fluids within 60 days and close the containment within six months from the date the operator ceases operations from the containment for use.

The operator shall substantially restore the impacted surface area to

1. The condition that existed prior to the construction of the recycling containment or
2. To a condition imposed by federal, state trust land, or tribal agencies on lands managed by those agencies as these provisions govern the obligations of any operator subject to those provisions.

EXCAVATION AND REMOVAL CLOSURE PLAN - PROTOCOLS AND PROCEDURES

The operator will remove all liquids from the pits and either:

- a. Dispose of the liquids in a division-approved facility, or
- b. Recycle, reuse, or reclaim the water for reuse in drilling and stimulation

The operator will close the recycling containment by first removing all fluids, contents, and synthetic liners and transferring these materials to a Division approved facility.

After the removal of the pit contents and liners, soils beneath the pit will be tested by collection of a five-point (minimum) composite sample, which includes stained or wet soils, if any. That sample shall be analyzed for the constituents listed in Table 1 of 19.15.34.14.

After review of the laboratory results:

- a. If any contaminant concentration is higher than the parameters listed in Table 1, additional delineation may be required, and the operator must receive approval before proceeding with closure.
- b. If all contaminant concentrations are less than or equal to the parameters listed in Table 1, then the operator will proceed to:
 - i. Backfill with non-waste containing, uncontaminated earthen material or
 - ii. Undertake an alternative closure process pursuant to a variance request after approval by OCD.

The operator will reclaim the containment's location to a safe and stable condition that blends with the surrounding undisturbed area.

Topsoils and subsoils shall be replaced to their original relative positions and contoured so as to achieve erosion control, long-term stability, and preservation of surface water flow patterns.

The disturbed area shall then be reseeded in the first favorable growing season following closure of a recycling containment.



CLOSURE PLAN
SELECT ENERGY SERVICES
JESSE JAMES RECYCLE CONTAINMENT
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CLOSURE DOCUMENTATION

Within 60 days of closure completion, the operator shall submit a closure report on Form C-147, including required attachments, to document all closure activities including sampling results and the details on any backfilling, capping or covering, where applicable. The closure report shall certify that all information in the report and attachments is correct and that the operator has complied with all applicable closure requirements and conditions specified in division rules or directives.

The operator shall notify the division when reclamation and re-vegetation are complete. Specifically, the notice will document that all ground surface disturbing activities at the site have been completed, and a uniform vegetative cover has been established that reflects a life-form ratio of plus or minus fifty percent (50%) of pre-disturbance levels and a total percent plant cover of at least seventy percent (70%) of pre-disturbance levels, excluding noxious weeds.

Select Energy Solutions, LLC
Jesse James Recycle Facility
Closure Cost Estimate

Item	Units	Quantity	\$/Unit	Estimate Cost
Facility Closure				
1 Fluid removal				
Jesse James Recycle North Containment	bbls	1,041,999	\$ 0.50	\$ 520,999.50
Jesse James Recycle South Containment	bbls	996,823	\$ 0.50	\$ 498,411.50
2 Vac truck (final fluid removal)	hrs	20	\$ 125.00	\$ 2,500.00
3 Liner removal (fold-in-place)				
Covers removal and disposal	SF	3,707,176	\$ 0.18	\$ 667,291.68
4 Equipment removal				
Pit clean-out and residue haul-off	LS	1	\$ 10,000.00	\$ 10,000.00
Equipment removal (tanks, gun barrel, FWKO)	LS	1	\$ 7,500.00	\$ 7,500.00
Electrical decommissioning (pumps and panels)	LS	1	\$ 5,000.00	\$ 5,000.00
Misc equipment clean-up and removal	hr	120	\$ 135.00	\$ 16,200.00
5 Site Restoration				
Dozer - push in berms (bid)	CY	193,315	\$ 5.00	\$ 966,575.00
and final grading of the site				
Re-vegetation	ea	1	\$ 5,500.00	\$ 5,500.00
Estimated Total				\$ 2,699,977.68

Assumptions

No Remediation will be necessary

Pit is full at time of closure

Pit berms above natural grade will be used to fill voids below natural grade



Venegas, Victoria, EMNRD

From: Venegas, Victoria, EMNRD
Sent: Thursday, April 18, 2024 3:33 PM
To: John McGillis; tbricker@selectenergy.com
Subject: 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891]
Attachments: C-147 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] 04.18.2024.pdf

1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891]

Good afternoon Mr. Gillis.

NMOCD has reviewed the recycling containment permit application and related documents, submitted by [289068] SELECT ENERGY SERVICES, LLC on April 11, 2024, Application ID: 332357, for 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] in Unit Letter C, Section 28, Township 19S, Range 33E, Lea County, New Mexico. [289068] SELECT ENERGY SERVICES, LLC requested variances from 19.15.34 NMAC for 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891].

The following variances have been approved:

- The variance from 19.15.34.13.E NMAC for the installation of an audible “Bird-X Mega Blaster Pro” bird deterrence system is approved.
- The variance to NMAC 19.15.34.12.D to install a wire mesh, game fence, eight (8) feet in height is approved.
- The variance to 19.15.34.12.A.(4) NMAC for the installation on the AST containment of a 40-mil non-reinforced LLDPE secondary liner is approved. The proposed liner system cross-section for the earthen containment is as follows: prepare subgrade, 10 oz. geotextile, 40-mil HDPE secondary liner, 200-mil geonet, 60-mil HDPE primary liner.

The form C-147 and related documents for 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] is approved with the following conditions of approval:

- The purpose of this permit is for oil and gas activities regulated under the NMAC 19.15.34.3 STATUTORY AUTHORITY: 19.15.34 NMAC is adopted pursuant to the Oil and Gas Act, Paragraph (15) of Section 70-2-12(B) NMSA 1978, which authorizes the division to regulate the disposition of water produced or used in connection with the drilling for or producing of oil and gas or both and Paragraph (21) of Section 70-2-12(B) NMSA 1978 which authorizes the regulation of the disposition of nondomestic wastes from the exploration, development, production or storage of crude oil or natural gas.
- 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] is approved for five years of operation from the date of permit application.
- 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] permit expires on April 11, 2029. If [289068] SELECT ENERGY SERVICES, LLC wishes to extend operations for the past five years period, an annual permit extension request must be submitted using an OCD form C-147 through OCD Permitting by March 11, 2029.
- 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] consists of two (2) inground containments. The total fluid capacity of 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] is 2,038,822.00 BBL.
- The total closure cost estimated of 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] in the amount of \$2,699,977.68, meets the requirements of NMAC 19.15.34.15.A. The financial assurance should be mailed to Oil Conservation Division; Bonding and Compliance; 1220 South St Frances Drive; Santa Fe, NM 87505.

- [289068] SELECT ENERGY SERVICES, LLC shall construct, operate, maintain, close, and reclaim 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] in compliance with NMAC 19.15.34 NMAC.
- [289068] SELECT ENERGY SERVICES, LLC shall notify OCD, through OCD Permitting, when construction of 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] commences.
- [289068] SELECT ENERGY SERVICES, LLC shall notify NMOCDD through OCD Permitting when recycling operations commence and cease at 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891].
- A minimum of 3-feet freeboard must be maintained at 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] at all times during operations.
- If less than 20% of the total fluid capacity is utilized every six months, beginning from the first withdrawal, operations of the 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] is considered ceased and a notification of cessation of operations should be sent electronically to OCD Permitting. A request to extend the cessation of operation, not to exceed six months, may be submitted using a C-147 form through OCD Permitting. If after that 6-month extension period, the 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] is not utilized at a minimum of 20% fluid capacity, no additional extensions would be granted, and the operator would be directed to remove all fluids and proceed with the closure requirements.
- [289068] SELECT ENERGY SERVICES, LLC shall submit monthly reports of recycling and reuse of produced water, drilling fluids, and liquid oil field waste on OCD form C-148 via OCD Permitting even if there is zero activity.
- [289068] SELECT ENERGY SERVICES, LLC shall inspect the recycling containment and associated leak detection systems weekly while it contains fluids. The operator shall maintain a current log of such inspections and make the log available for review by the division upon request as per 19.15.34.13.A.
- [289068] SELECT ENERGY SERVICES, LLC shall comply with 19.15.29 NMAC Releases in the event of any release of produced water or other oil field waste at 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891].

Victoria Venegas • Environmental Specialist

Environmental Bureau

EMNRD - Oil Conservation Division

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811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 332357

CONDITIONS

Operator: SELECT ENERGY SERVICES, LLC 1820 N I-35 Gainesville, TX 76240	OGRID: 289068
	Action Number: 332357
	Action Type: [C-147] Water Recycle Long (C-147L)

CONDITIONS

Created By	Condition	Condition Date
vvenegas	• 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] is approved for five years of operation from the date of permit application. • 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] permit expires on April 11, 2029. If [289068] SELECT ENERGY SERVICES, LLC wishes to extend operations for the past five years period, an annual permit extension request must be submitted using an OCD form C-147 through OCD Permitting by March 11, 2029. • [289068] SELECT ENERGY SERVICES, LLC shall construct, operate, maintain, close, and reclaim 1RF-518 - JESSE JAMES RECYCLING FACILITY ID [fVV2410951891] in compliance with NMAC 19.15.34 NMAC.	4/18/2024