



**STATIONARY COMMERCIAL FLUID RECYCLING
FACILITY APPLICATION**

EARTHSTONE RECYCLE FACILITY



SECTION 28, TOWNSHIP 19S, RANGE 33E

LEA COUNTY, NEW MEXICO

JUNE 2023

CA 26432
Expires 12/31/2024
023107-00

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 Energy Services (For multiple operators attach page with information) OGRID #: 289068
Address: 1233 West Loop South, Suite 1400 Houston TX 77027
Facility or well name (include API# if associated with a well): Earthstone Recycle Facility North Pit
OCD Permit Number: 1RF-505 (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr NW/4 of NW/4 Section 28 Township 19 South Range 33 East County: Lea
Surface Owner: Federal State Private Tribal Trust or Indian Allotment

2.
 Recycling Facility:
Location of recycling facility (if applicable): Latitude 32.632713° Longitude -103.674202° 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 32.636285° Longitude -103.674286° 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: 748,187 bbl Dimensions: L 940 x W 375 x D 22
 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 \$ 2,607,890 (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 | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 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. - Written confirmation or verification from the municipality; written approval obtained from the municipality | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA |
| Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within a 100-year floodplain. FEMA map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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). - Topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 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. - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 500 feet of a wetland. - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

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): Drew Smith Title: Director of Projects
 Signature: *Drew A. Smith* Date: 06/14/2023
 e-mail address: Dasmith@selectwater.com Telephone: 281.382.3078

11.

OCD Representative Signature: *Victoria Venegas* Approval Date: 06/29/2023

Title: Environmental Specialist OCD Permit Number: 1RF-505

- OCD Conditions _____
- Additional OCD Conditions on Attachment _____

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 Energy Services (For multiple operators attach page with information) OGRID #: 289068
Address: 1233 West Loop South, Suite 1400 Houston TX 77027
Facility or well name (include API# if associated with a well): Earthstone Recycle Facility Center Pit
OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr NW/4 of NW/4 Section 28 Township 19 South Range 33 East County: Lea
Surface Owner: Federal State Private Tribal Trust or Indian Allotment

2.
 Recycling Facility:
Location of recycling facility (if applicable): Latitude 32.632713° Longitude -103.674202° 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 32.635261° Longitude -103.674095° 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: 748,187 bbl Dimensions: L 940 x W 375 x D 22
 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 \$ 2,607,890 (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 | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 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. - Written confirmation or verification from the municipality; written approval obtained from the municipality | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA |
| Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within a 100-year floodplain. FEMA map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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). - Topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 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. - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 500 feet of a wetland. - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

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): Drew Smith Title: Director of Projects
 Signature: *Drew A. Smith* Date: 06/14/2023
 e-mail address: Dasmith@selectwater.com Telephone: 281.382.3078

11.

OCD Representative Signature: _____ **Approval Date:** _____

Title: _____ **OCD Permit Number:** _____

- OCD Conditions _____
- Additional OCD Conditions on Attachment _____

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 Energy Services (For multiple operators attach page with information) OGRID #: 289068
Address: 1233 West Loop South, Suite 1400 Houston TX 77027
Facility or well name (include API# if associated with a well): Earthstone Recycle Facility Future Pit
OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr SW/4 of NW/4 Section 28 Township 19 South Range 33 East County: Lea
Surface Owner: Federal State Private Tribal Trust or Indian Allotment

2.
 Recycling Facility:
Location of recycling facility (if applicable): Latitude 32.632713° Longitude -103.674202° 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 32.664211° Longitude -103.673950° 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: 748,187 bbl Dimensions: L 940 x W 375 x D 22
 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 \$ 2,607,890 (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 | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 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. - Written confirmation or verification from the municipality; written approval obtained from the municipality | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA |
| Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within a 100-year floodplain. FEMA map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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). - Topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 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. - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 500 feet of a wetland. - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

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): Drew Smith Title: Director of Projects
 Signature: *Drew A. Smith* Date: 06/14/2023
 e-mail address: Dasmith@selectwater.com Telephone: 281.382.3078

11.

OCD Representative Signature: _____ Approval Date: _____

Title: _____ OCD Permit Number: _____

- OCD Conditions _____
- Additional OCD Conditions on Attachment _____

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 Energy Services (For multiple operators attach page with information) OGRID #: 289068
Address: 1233 West Loop South, Suite 1400 Houston TX 77027
Facility or well name (include API# if associated with a well): Earthstone Recycle Facility West AST
OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr SW/4 of NW/4 Section 28 Township 19 South Range 33 East County: Lea
Surface Owner: Federal State Private Tribal Trust or Indian Allotment

2.
 Recycling Facility:
Location of recycling facility (if applicable): Latitude 32.632713° Longitude -103.674202° 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 32.632898° Longitude -103.673130° NAD83
 For multiple or additional recycling containments, attach design and location information of each containment
 Lined Liner type: Thickness 40/40 mil LLDPE HDPE PVC Other _____
 String-Reinforced
Liner Seams: Welded Factory Other _____ Volume: 60,000 bbl Dimensions: L _____ x W 191 x D 12
 Recycling Containment Closure Completion Date: _____ **191-ft Diameter Round Tank**

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 \$ 2,607,890 (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 | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 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. - Written confirmation or verification from the municipality; written approval obtained from the municipality | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA |
| Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within a 100-year floodplain. FEMA map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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). - Topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 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. - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 500 feet of a wetland. - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

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): Drew Smith Title: Director of Projects
 Signature: *Drew A. Smith* Date: 06/14/2023
 e-mail address: Dasmith@selectwater.com Telephone: 281.382.3078

11.

OCD Representative Signature: _____ Approval Date: _____

Title: _____ OCD Permit Number: _____

- OCD Conditions _____
- Additional OCD Conditions on Attachment _____

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 Energy Services (For multiple operators attach page with information) OGRID #: 289068
Address: 1233 West Loop South, Suite 1400 Houston TX 77027
Facility or well name (include API# if associated with a well): Earthstone Recycle Facility East AST
OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr SE/4 of NW/4 Section 28 Township 19 South Range 33 East County: Lea
Surface Owner: Federal State Private Tribal Trust or Indian Allotment

2.
 Recycling Facility:
Location of recycling facility (if applicable): Latitude 32.632713° Longitude -103.674202° 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 32.632989° Longitude -103.672351° NAD83
 For multiple or additional recycling containments, attach design and location information of each containment
 Lined Liner type: Thickness 40/40 mil LLDPE HDPE PVC Other _____
 String-Reinforced
Liner Seams: Welded Factory Other _____ Volume: 60,000 bbl Dimensions: L _____ x W 191 x D 12
 Recycling Containment Closure Completion Date: _____ **191-ft Diameter Round Tank**

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 \$ 2,607,890 (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 | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 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. - Written confirmation or verification from the municipality; written approval obtained from the municipality | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA |
| Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within a 100-year floodplain. FEMA map | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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). - Topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 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. - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Within 500 feet of a wetland. - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

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): Drew Smith Title: Director of Projects
 Signature: *Drew A. Smith* Date: 06/14/2023
 e-mail address: Dasmith@selectwater.com Telephone: 281.382.3078

11.

OCD Representative Signature: _____ Approval Date: _____

Title: _____ OCD Permit Number: _____

- OCD Conditions _____
- Additional OCD Conditions on Attachment _____



June 6, 2023

Ms. Victoria Venegas
New Mexico EMNRD
Oil conservation Division

RE: Rule 34 Variance Request –Produced Water Impoundment Fencing

Ms. Venegas:

Select Energy Services (Select) 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 twilliams@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in black ink, appearing to read 'Tyler Williams'.

Tyler Williams, P.E.
President and Principal Engineer



June 6, 2023

Ms. Victoria Venegas
New Mexico EMNRD
Oil conservation Division

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

Ms. Venegas:

Select Energy Services (Select) 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 and submitted with the original permit application. 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 twilliams@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in black ink that reads 'Tyler Williams'.

Tyler Williams, P.E.
President and Principal Engineer



June 9, 2023

Ms. Victoria Venegas
New Mexico EMNRD
Oil conservation Division

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

Ms. Venegas:

Select Energy Services (Select) 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 Containments and 40-mil LLDPE Liner in the proposed ASTs. 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 and 40-mil LLDPE will be seamed in a manner that will allow nondestructive pressure testing of the seams to ensure proper sealing.

The proposed HDPE and LLDPE are 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: prepare subgrade, 10 oz. geotextile, 40-mil HDPE, 200-mil geonet, 60-mil HDPE. This will replace the cross-section required by the current rule and submitted with the original permit application. It should also be noted that this variance has been granted on past sites.

The proposed new liner system cross-section for the ASTs is as follows: prepare subgrade, 10 oz. geotextile, 40-mil LLDPE, 200-mil geonet, 40-mil LLDPE. This will replace the cross-section required by the current rule and submitted with the original permit application. 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 twilliams@envirotechconsulting.com at your convenience.

Thank you for your consideration.

Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in black ink that reads 'Tyler Williams'.

Tyler Williams, P.E.
President and Principal Engineer



June 6, 2023

Ms. Victoria Venegas
New Mexico EMNRD
Oil conservation Division

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

Ms. Venegas:

Select Energy Services (Select) is requesting a variance to Rule 34 Part 12(A)(4) requiring primary liners to be 45-mil string reinforced LLDPE. Select is requesting approval to use 40-mil LLDPE in place of the specified material in an above ground storage tank (AST). 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 45-mil reinforced LLDPE material, nondestructive QA/QC testing cannot be performed. The proposed 40-mil LLDPE will be seamed in a manner that will allow nondestructive pressure testing of the seams to ensure proper sealing.

The proposed LLDPE 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 45-mil reinforced LLDPE.

The proposed new liner system cross-section is as follows: prepare subgrade, 10 oz. geotextile, 40-mil LLDPE, 200 mil geonet, 40-mil LLDPE. 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 twilliams@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in black ink that reads 'Tyler Williams'.

Tyler Williams, P.E.
President and Principal Engineer



June 6, 2023

Ms. Victoria Venegas
New Mexico EMNRD
Oil conservation Division

RE: Rule 34 Variance Request –Produced Water Recycling Containment

Ms. Venegas:

Select Energy Services (Select) is requesting a variance to Rule 34 Part 12(A)(3) requiring “The edges of all liners shall be anchored in the bottom of a compacted earth-filled trench..”

Select is requesting approval to use an Above Ground Storage Tank (AST) as a containment structure at the Select Earthstone Recycle Facility. Based on our experience AST’s work well for this purpose, they are structurally sound and easy to maintain. Clips will be used at the top of the steel walls to secure the liner. These clips are specifically designed to hold the AST liner in place and provide the same type of liner security as an anchor trench. 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 twilliams@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in black ink, appearing to read 'Tyler Williams'.

Tyler Williams, P.E.
President and Principal Engineer



June 6, 2023

Ms. Victoria Venegas
New Mexico EMNRD
Oil conservation Division

RE: Rule 34 Variance Request –Produced Water Recycling Containment

Ms. Venegas:

Select Energy Services (Select) is requesting a variance to Rule 34 Part 12(A)(2) requiring "...The levee shall have an outside grade no steeper than three horizontal feet to one vertical foot (3H:1V)."

Select is requesting approval to use an Above Ground Storage Tank (AST) as a containment structure at the Select Earthstone Recycle Facility. Based on our experience AST's work well for this purpose, they are structurally sound and easy to maintain. This AST will have vertical walls on both interior and exterior sides and thus requires a variance for use. The AST will, however be double lined like other containments to limit the risk of leakage. 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 twilliams@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in black ink, appearing to read 'Tyler Williams'.

Tyler Williams, P.E.
President and Principal Engineer



June 6, 2023

Ms. Victoria Venegas
New Mexico EMNRD
Oil conservation Division

RE: Rule 34 Variance Request –Produced Water Recycling Containment

Ms. Venegas:

Select Energy Services (Select) is requesting a variance to Rule 34 Part 12(A)(2) requiring "... The operator shall construct the containment in a levee with an inside grade no steeper than two horizontal feet to one vertical foot (2H:1V)."

Select is requesting approval to use an Above Ground Storage Tank (AST) as a containment structure at the Select Earthstone Recycle Facility. Based on our experience AST's work well for this purpose, they are structurally sound and easy to maintain. This AST will have vertical walls on both interior and exterior sides and thus requires a variance for use. The AST will, however be double lined like other containments to limit the risk of leakage. 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 twilliams@envirotechconsulting.com at your convenience.

Thank you for your consideration.
Best regards,

ENVIROTECH ENGINEERING & CONSULTING, INC.

A handwritten signature in black ink, appearing to read 'Tyler Williams'.

Tyler Williams, P.E.
President and Principal Engineer



EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

TABLE OF CONTENTS

1.0 LOCATION..... 1

2.0 DISTANCE TO GROUNDWATER..... 1

 2.1 GROUNDWATER WELLS 1

 2.2 AQUIFERS 1

 2.3 GEOLOGY..... 2

3.0 DISTANCE TO MUNICIPALITIES AND FRESHWATER FIELDS 2

4.0 DISTANCE TO SUBSURFACE MINES..... 2

5.0 DISTANCE TO HIGH OR CRITICAL KARST AREAS (UNSTABLE AREAS) 2

6.0 DISTANCE TO 100-YEAR FLOOD PLAIN..... 3

7.0 DISTANCE TO SURFACE WATER 3

8.0 DISTANCE TO PERMANENT RESIDENCE OR STRUCTURES 3

9.0 DISTANCE TO NON-PUBLIC WATER SUPPLY 3

10.0 DISTANCE TO WETLANDS 4

APPENDICES:

APPENDIX A BANKS WATER WELL REPORT

APPENDIX B GEOTECHNICAL ENGINEERING REPORT

APPENDIX C ENGINEERING DRAWINGS

APPENDIX D DESIGN AND CONSTRUCTION PLAN

APPENDIX E MATERIAL SPECIFICATION

APPENDIX F OPERATING AND MAINTENANCE PLAN

APPENDIX G CLOSURE PLAN



C147L REGISTRATION PACKAGE
 EARTHSTONE RECYCLE FACILITY
 SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
 LEA COUNTY, NEW MEXICO
 023107-00

SITE CRITERIA FOR RECYCLING CONTAINMENT

1.0 LOCATION

Select Energy Services is proposing to construct a recycle facility, Earthstone 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 groundwater wells were identified within a 1.0-mi. radius of the proposed facility. No water wells were identified to be located within the proposed facility boundaries. The Banks Water Well Report is included as *Appendix A*, and *Figure 2.1* illustrates the location of the proposed facility boundary and the 1.0-mi. radius..

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) Angel Draw, 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 the boundary of the proposed facility.

During onsite investigation, 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 as "other". The "other" aquifer system is not considered a major aquifer within the State of New Mexico



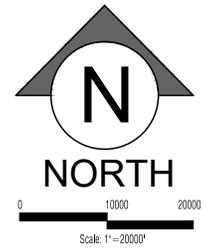
2500 N. Eleventh Street Enid, OK 73701 • 580.234.8780 • envirotechconsulting.com
C.A. #1960 - Expiration Date: 6-30-2024

Site Map
Earthstone Recycle Facility
Section 28, Township 19 South, Range 33 East
Lea County, New Mexico



Project No.
23.107-00

Figure 1



2500 N. Eleventh Street Enid, OK 73701 • 580.234.8780 • envirotechconsulting.com
C.A. #1960 - Expiration Date: 6-30-2024

Released to Imaging: 6/29/2023 9:40:55 AM

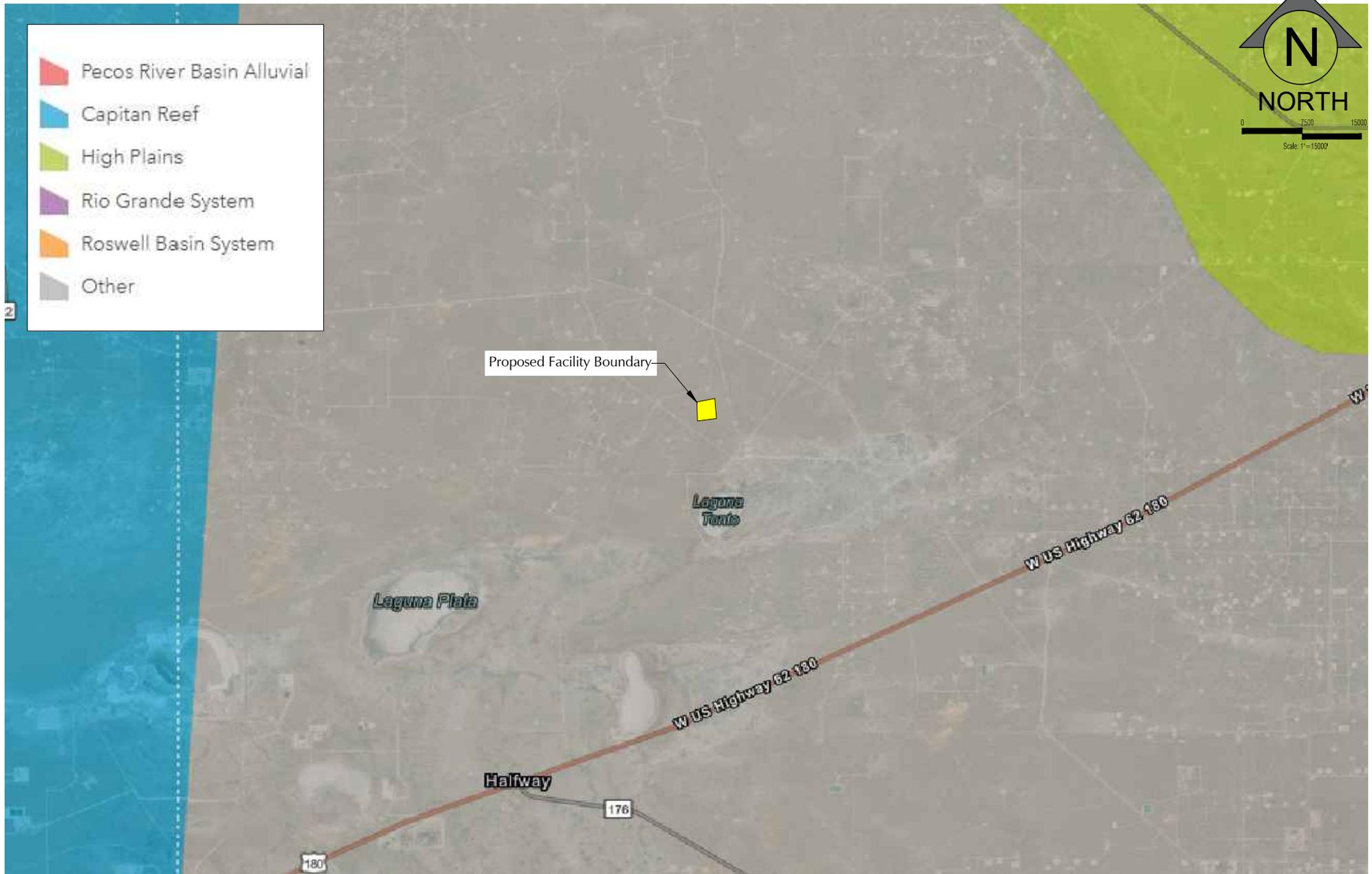
Groundwater Wells Map

Earthstone Recycle Facility
Section 28, Township 19 South, Range 33 East
Lea County, New Mexico



Project No.
23.107-00

Figure 2.1





2.3 GEOLOGY

A geological map of New Mexico was obtained from the New Mexico Bureau of Geology and Mineral Resources (NMBGMR) Interactive Resources Map to review the geologic setting for the proposed containment location. Based on the review of the geologic map, the containment location lies within the Holocene to middle Pleistocene Eolian and piedmont deposits. The interlayered eolian sands and piedmont-slope deposits along the eastern flank of the Pecos River valley, primarily between Roswell and Carlsbad. These deposits are typically capped by a thin eolian deposit.

Figure 2.3 is reproduction of the NMBGMR Interactive Resources 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 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 Carlsbad, New Mexico, located approximately 36-mi. to the southwest.
2. The closest freshwater field to the proposed facility is the Carlsbad Municipal Water System, located approximately 38.75-mi. to the southwest.

4.0 DISTANCE TO SUBSURFACE MINES

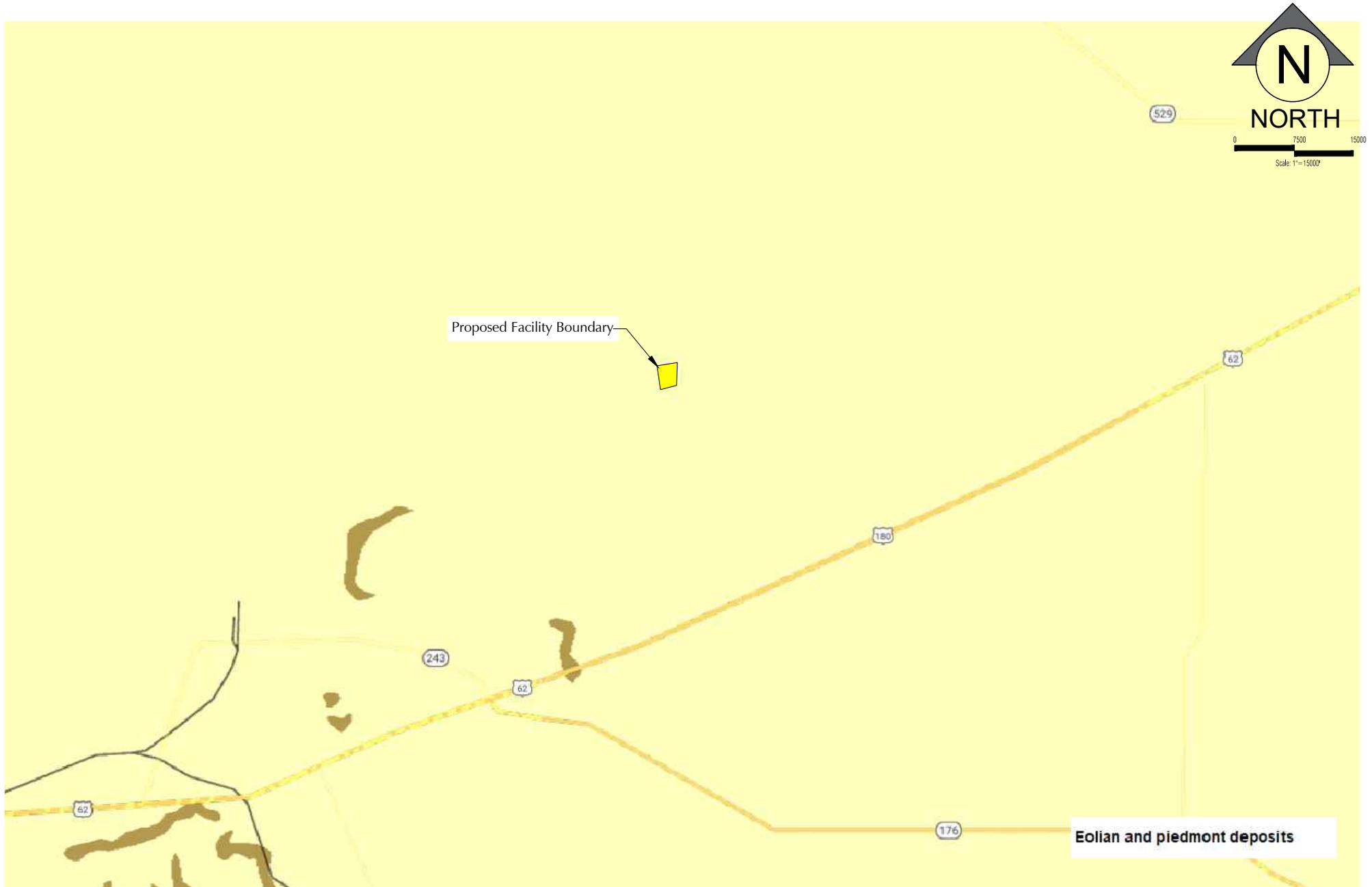
According to the New Mexico Mining and Minerals Division there are no subsurface mines near the proposed facility. The proposed facility location is not within an area overlying a subsurface mine. Figure 4 illustrates the following:

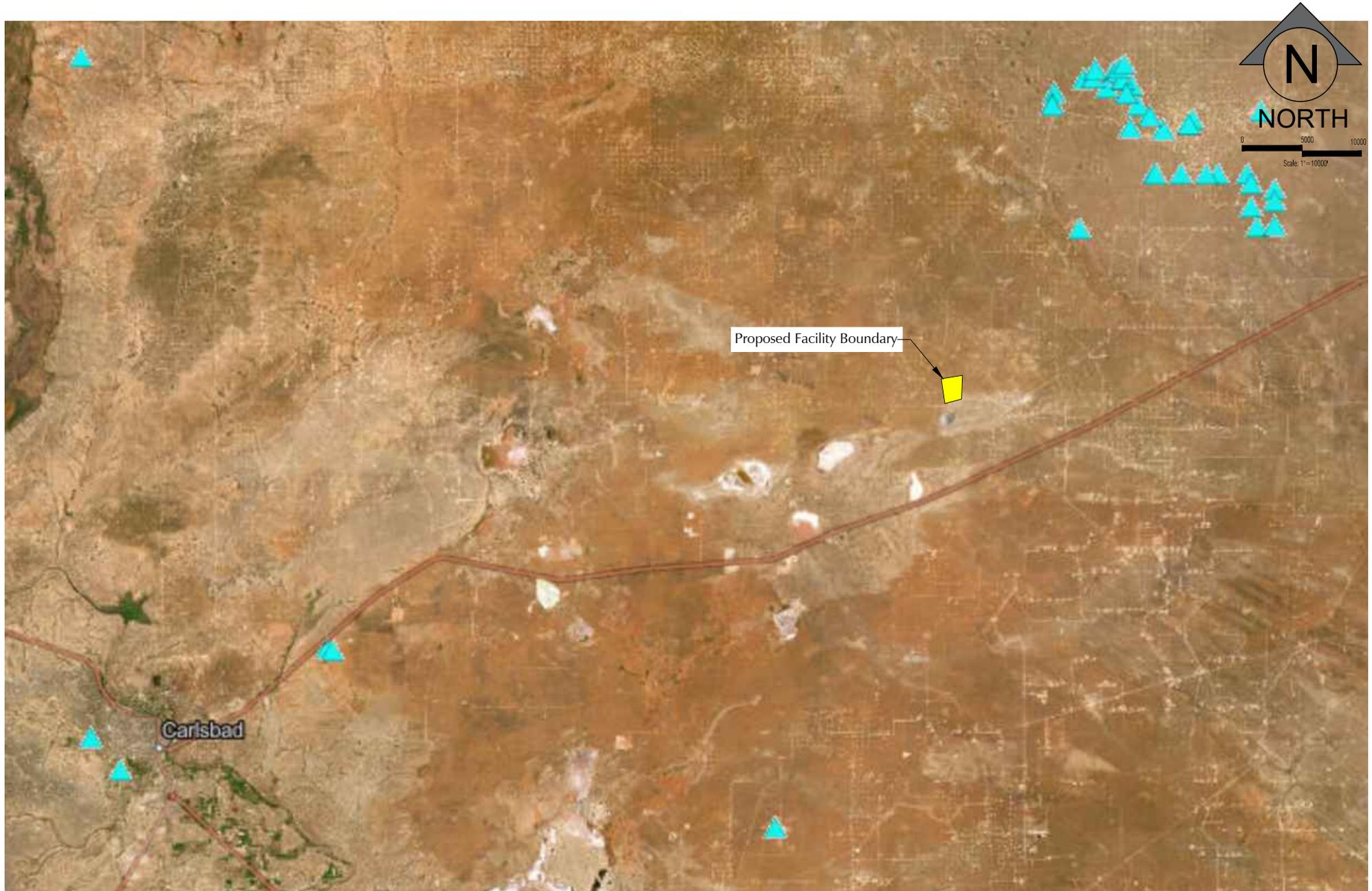
1. The nearest registered subsurface mine is the National Potash Lea Mine, that is permanently closed. The subsurface potash mine is located approximately 8.75-mi. to the southwest of the proposed facility location.

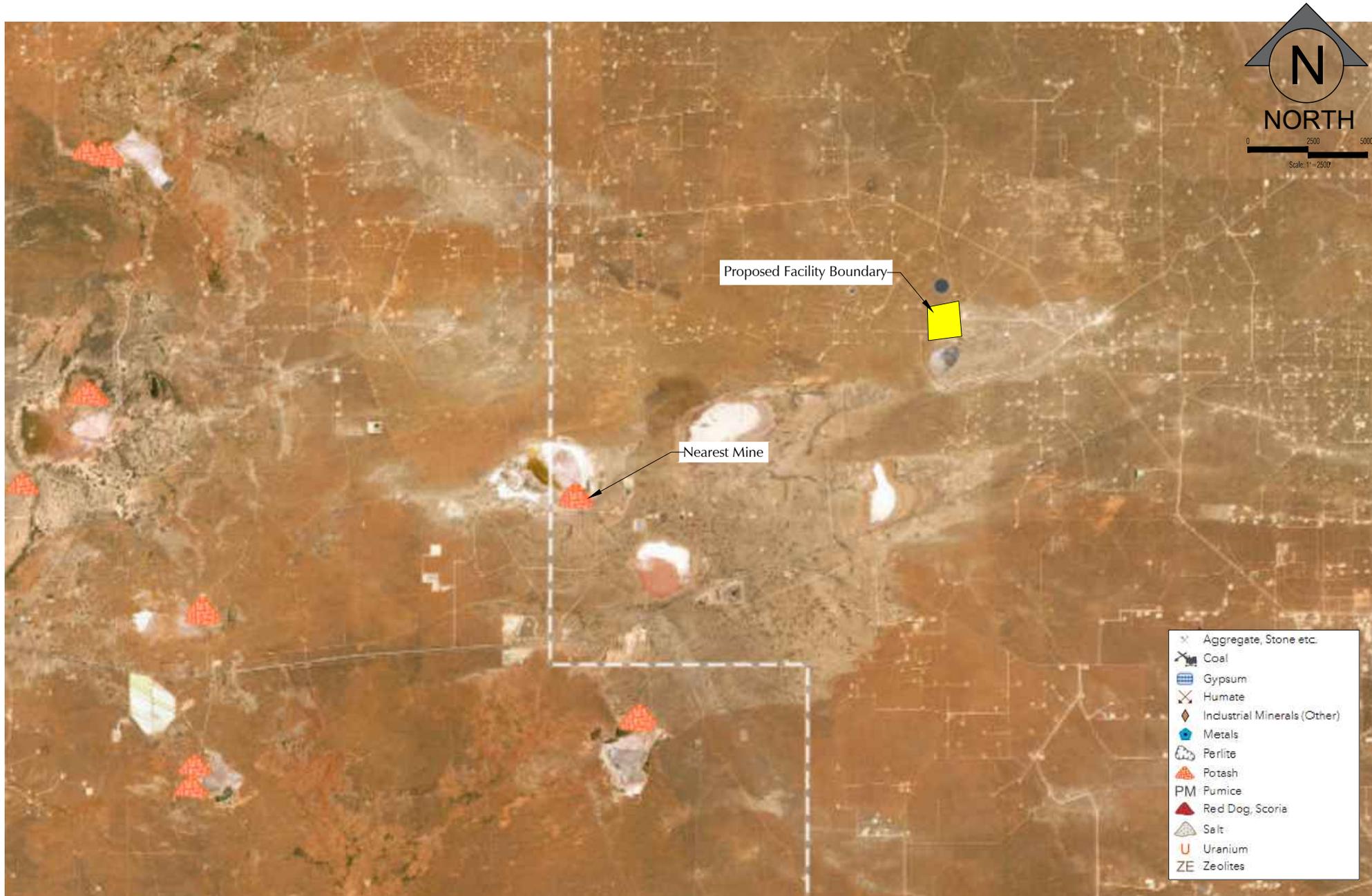
5.0 DISTANCE TO HIGH OR CRITICAL KARST AREAS (UNSTABLE AREAS)

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" was effective on 12/16/2008. *Figure 6* demonstrates the area of the site is not located within a 100-year Floodplain.

1. The proposed facility is located within "Zone D." Zone D for the proposed facility is an area of "area of undetermined flood hazard."

7.0 DISTANCE TO SURFACE WATER

After review of the Laguna Gatuna NW, 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 Laguna Tonto located approximately 1.10-mi. to the south.

8.0 DISTANCE TO PERMANENT RESIDENCE OR STRUCTURES

The United States Geological Survey (USGS) Laguna Gatuna NW, NM, USGS 7.5-Minute Series Topographic Map, *Figure 8*, demonstrates:

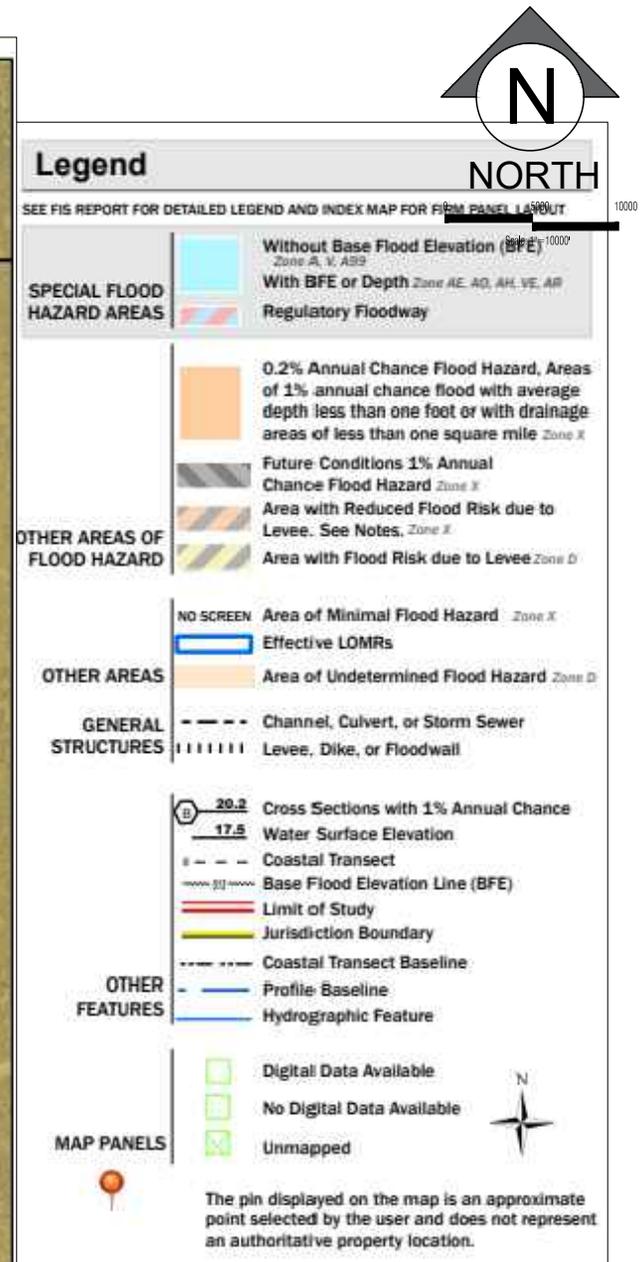
1. The proposed facility is not within 1,000-ft. of an occupied permanent residence, school, hospital, institution, church, or other permanent structure.
2. *Figure 8* and *Figure 1 (Site Map)* show that the nearest structure to the proposed facility is an oil tank battery located to the northeast.

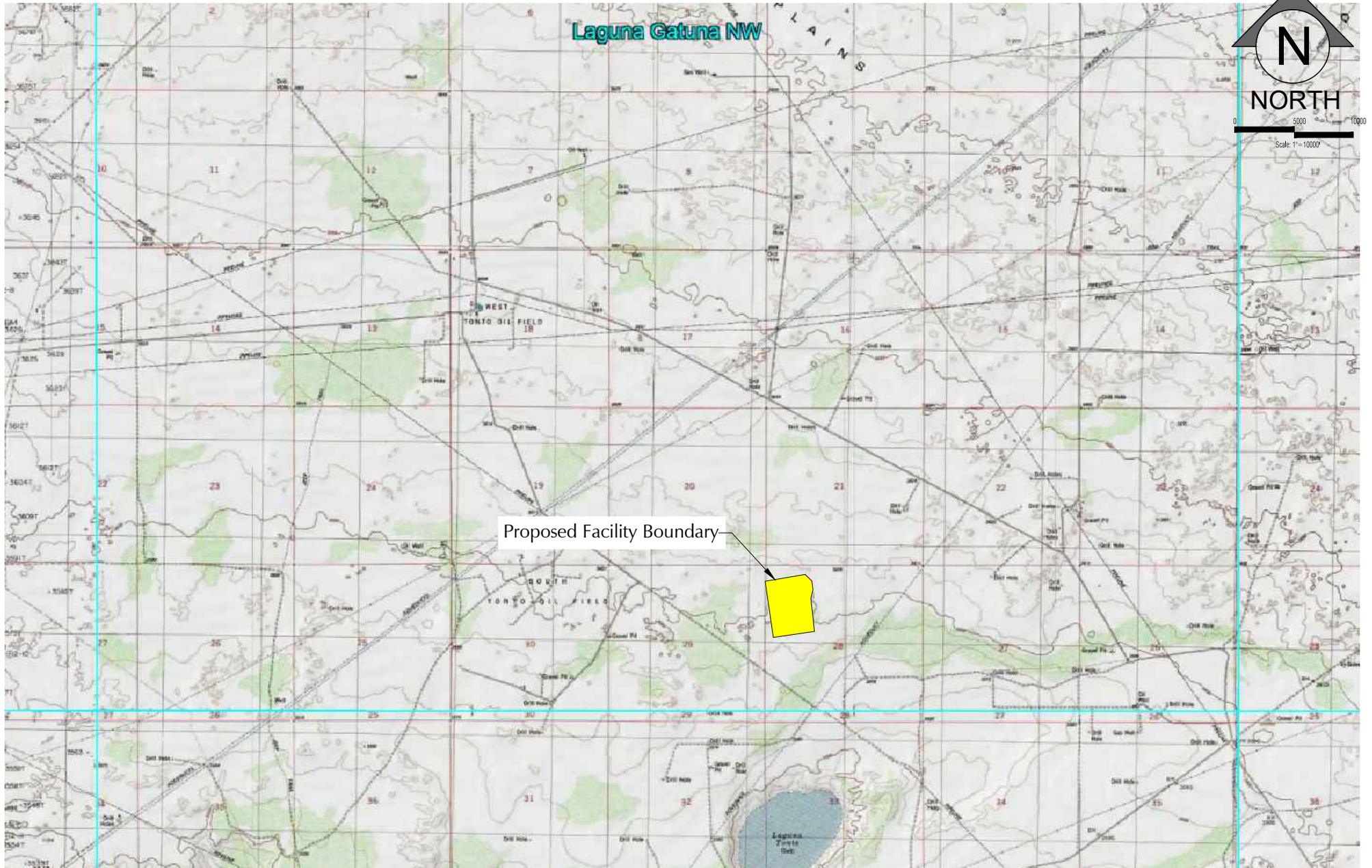
9.0 DISTANCE TO NON-PUBLIC WATER SUPPLY

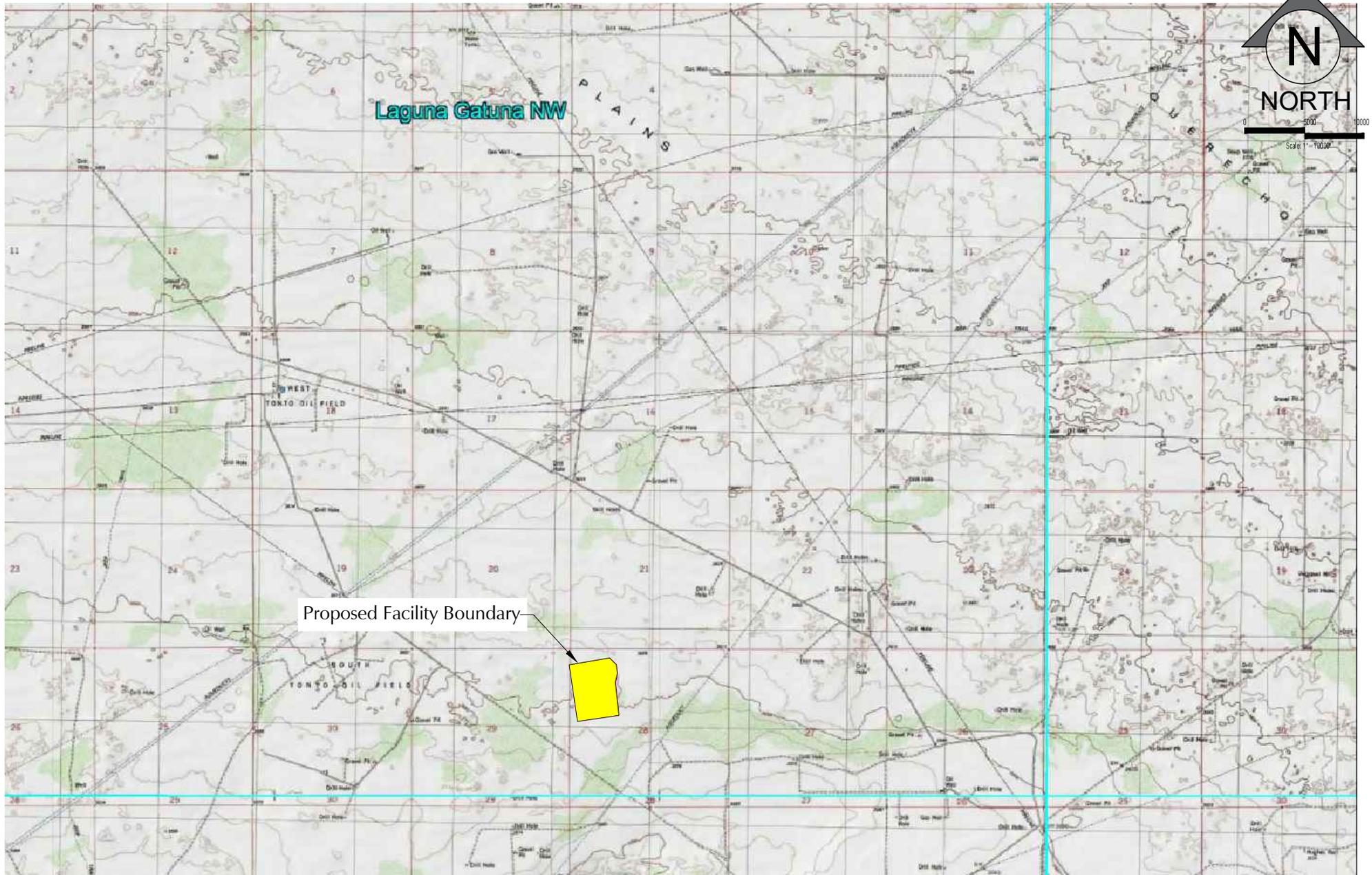
The proposed facility must not be within 500-ft. horizontally of a spring or freshwater well used for domestic or stock watering purposes, in existence at the time of initial application. *Figure 9* demonstrates the following:

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.







2500 N. Eleventh Street Enid, OK 73701 • 580.234.8780 • envirotechconsulting.com
 C.A. #1960 - Expiration Date: 6-30-2024

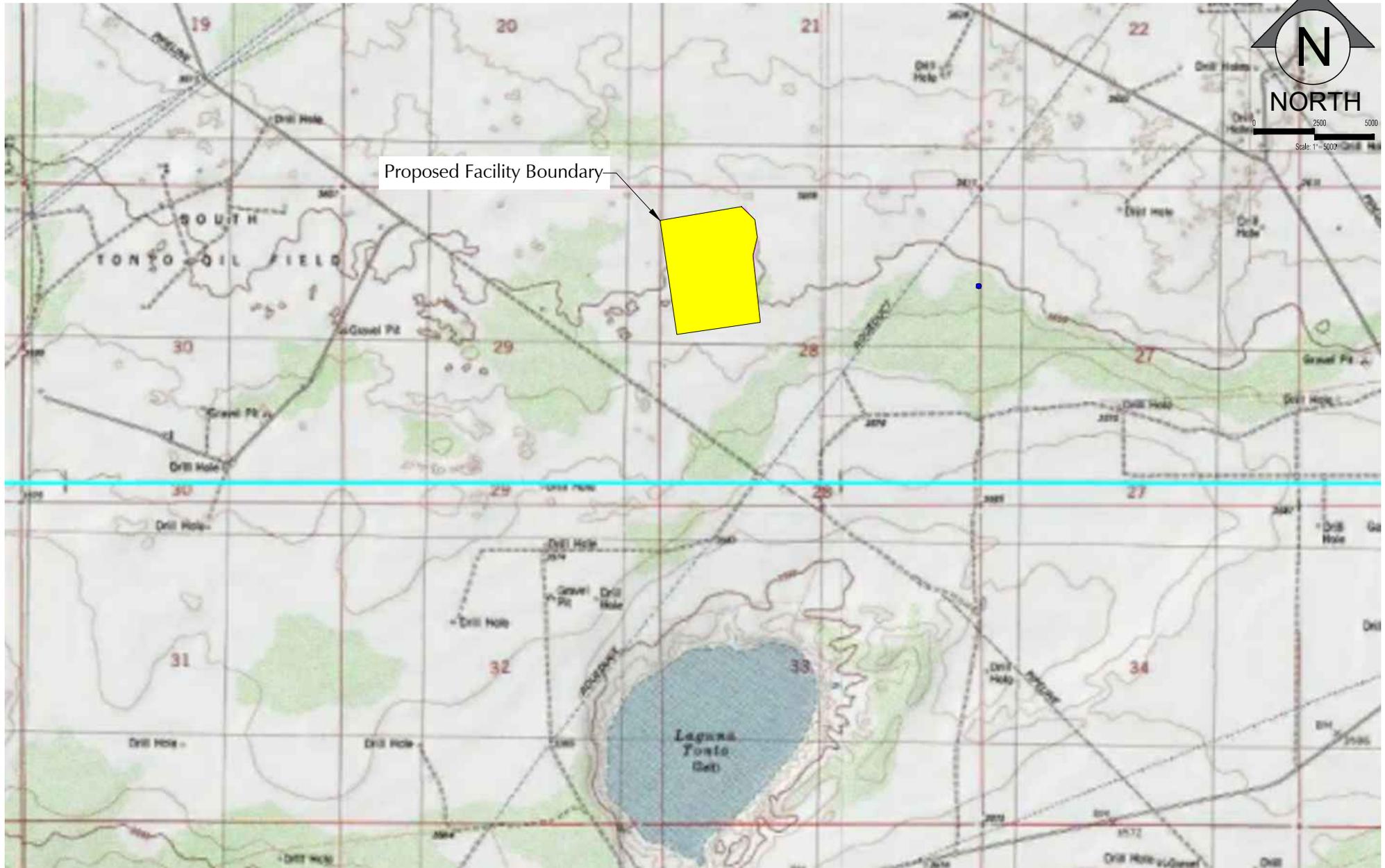
Permanent Residence & Structures Map

Earthstone Recycle Facility
 Section 28, Township 19 South, Range 33 East
 Lea County, New Mexico



Project No.
 23.107-00

Figure 8





C147L REGISTRATION PACKAGE
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

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 1.10-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.





C147L REGISTRATION PACKAGE
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

APPENDIX A

BANKS WATER WELL REPORT

Prepared for:

ENVIROTECH ENGINEERING and CONSULTING, INC
PO Box 6029
Enid, OK 73702



Water Well Report

Earthstone Recycle Facility

NM

PO #: 023107-00

ES-142225

Wednesday, June 7, 2023



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 | |
|---|--|
| NM | |
| Target location is 0.077 square miles and has a 1.12 mile perimeter | |

| Coordinates | |
|---|----|
| Longitude & Latitude in Degrees Minutes Seconds | NA |
| Longitude & Latitude in Decimal Degrees | NA |
| X and Y in UTM | NA |

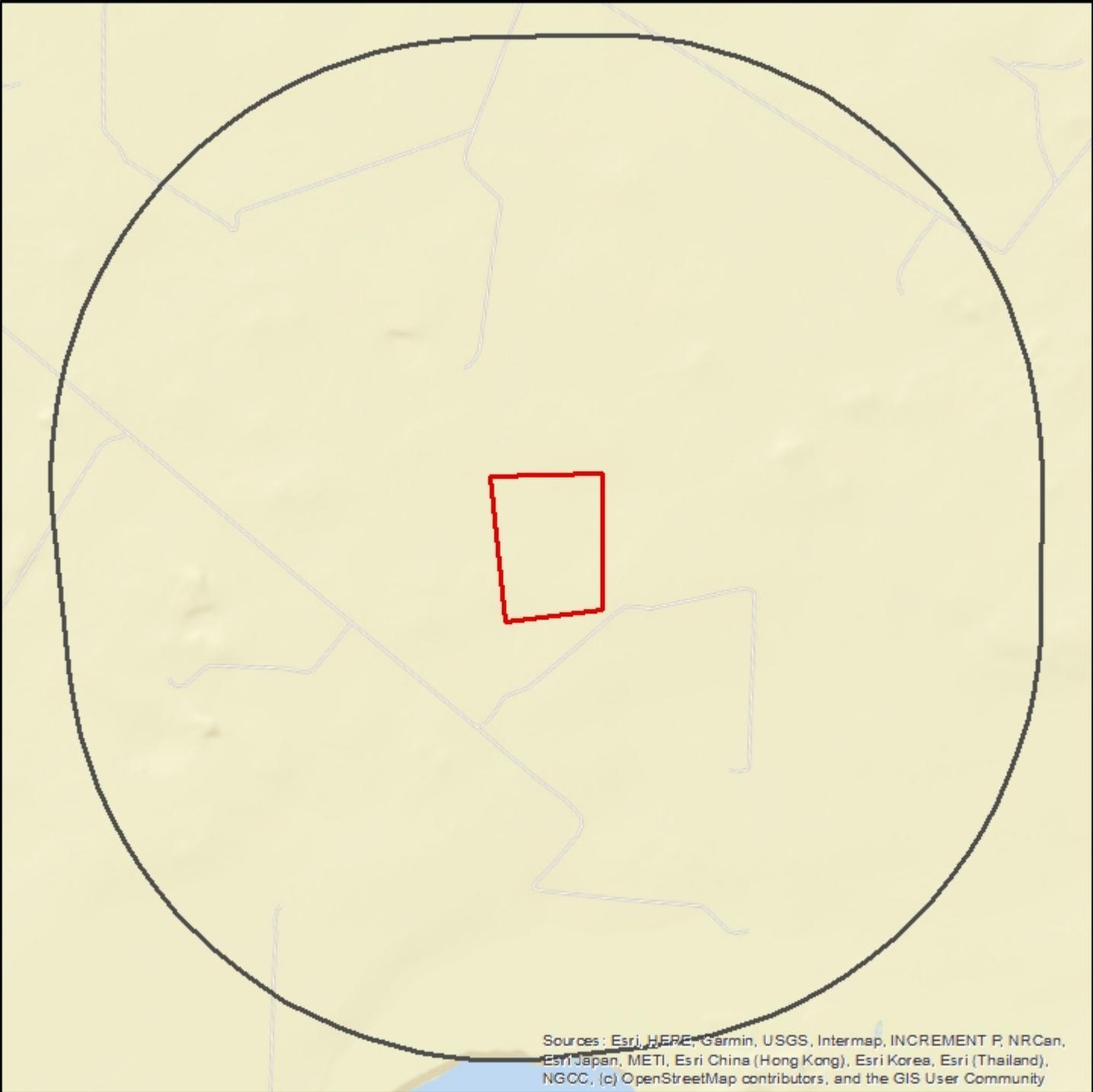
| Elevation | |
|-----------|--|
| NA | |

| 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

Earthstone 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



Topographic Overlay Map - 1 Mile Buffer



Earthstone Recycle Facility

- Well
- Well Cluster
- Target Property
- Search Buffer

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

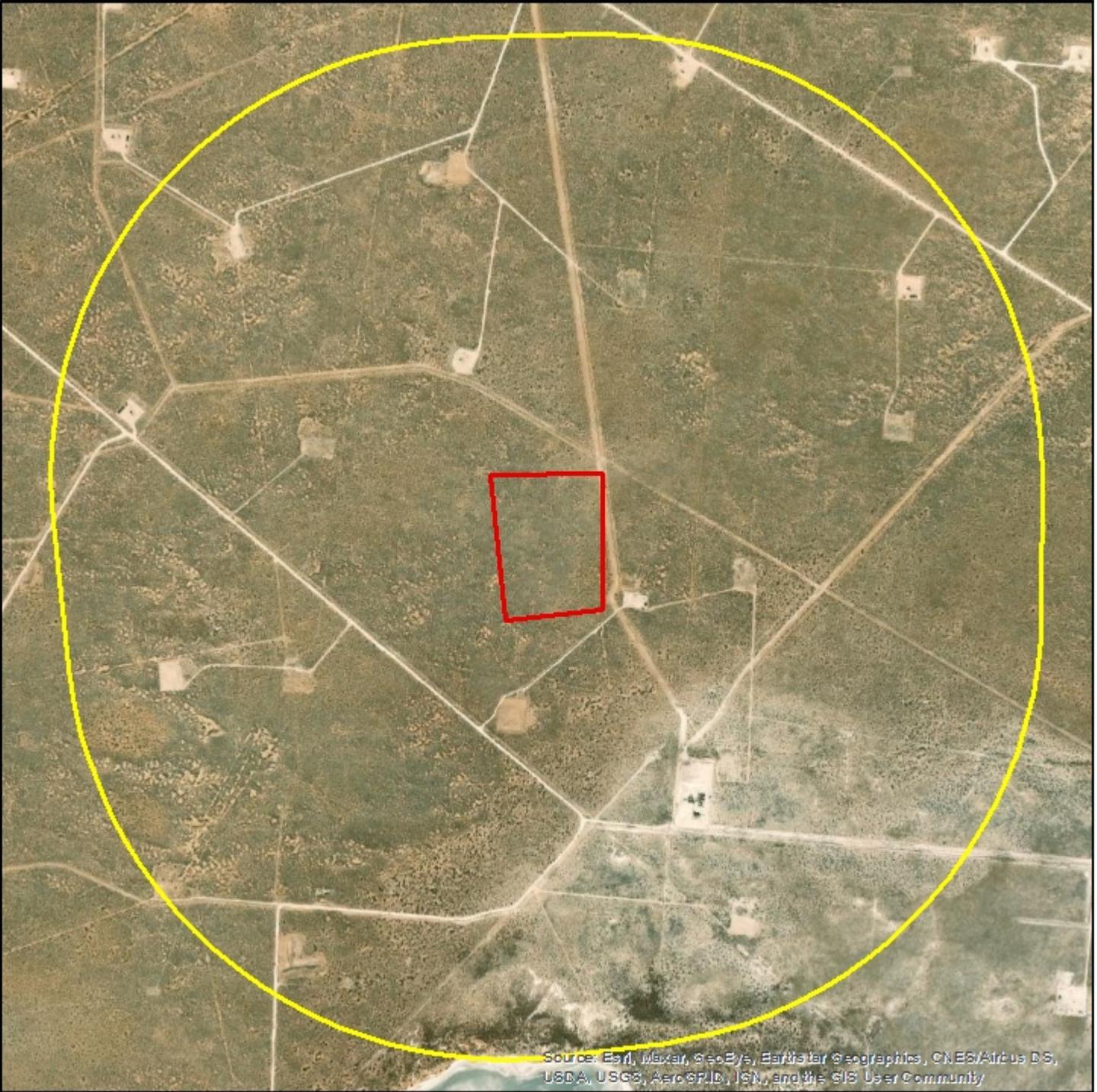
1 : 21,000
1 inch = 0.331 miles
1 inch = 1750 feet

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





Current Imagery Overlay Map - 1 Mile Buffer



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Earthstone 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' 00" North
Second Standard Parallel: 45° 00' 00" North
Central Meridian: 96° 00' 00" West
Latitude of Origin: 39° 00' 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 | 04/27/2023 | 04/27/2023 | 04/27/2023 | 04/11/2023 |
| 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 | 04/05/2023 | 04/05/2023 | 04/05/2023 | 04/05/2023 |

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
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

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 |
| 3/4" | 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:

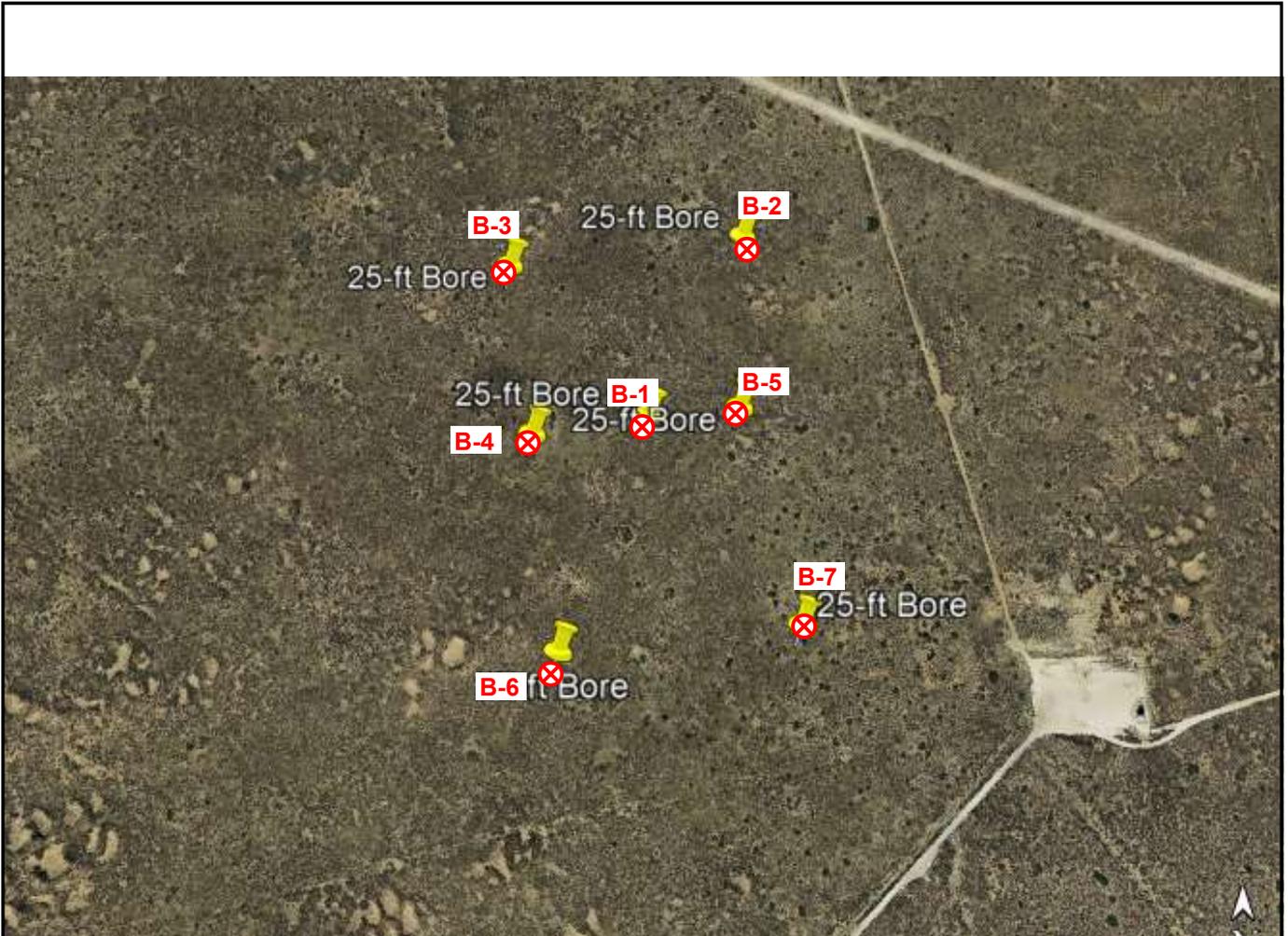
Select Earthstone Recycling Facility

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.



⊗ Approximate Boring Location

| | | | | |
|------------------------|------------------------|---|--|---------|
| 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 Smith Ranch Road, 32.633002, -103.672278 Lea County, New Mexico | 1 |
| Checked by: DC | File Name: Figures | | | |
| Approved by: DC | Date: 4-29-23 | | | |

| | |
|---|---|
| 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 1 of 2 |
|---|---|

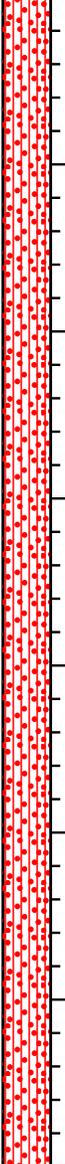
| | | |
|---|--|---|
| Date(s) Drilled: 4-13-23 | Logged By: JS | Checked By: COZ |
| Drilling Method: hollow-stem auger | Drill Bit Size/Type: | Total Depth of Borehole: 75 feet bgs |
| Drill Rig Type: CME-75 | Drilling Contractor: Southlands | Approximate Surface Elevation: |
| Groundwater Level and 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 | | | | | | | | | | |

C:\Users\thecco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ_Engineering_1.tp

| | |
|---|---|
| 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 |
|---|---|

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

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

| | |
|---|---|
| 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 | 5 |  | 1 | 20/47/50 | | | | | | | |
| 10 | 10 |  | 2 | 7/30/50 | | | | 6.3 | 20.1 | | NP |
| 15 | 15 |  | 3 | 13/50 | | | | | | | |
| 20 | 20 |  | 4 | 28/50 | | | | | | | |
| 25 | 25 |  | 5 | 20/50 | | | | | | | |
| | | | | | | | Bottom of Boring | | | | |
| 30 | 30 | | | | | | | | | | |
| 35 | 35 | | | | | | | | | | |
| 40 | 40 | | | | | | | | | | |

C:\Users\thecco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ_Engineering_1.tp

| | |
|---|---|
| Project: Select Earthstone Recycling Facility Project Location: Smith Ranch Road, 32.633002, -103.672278, Lea County, NM Project Number: 4223053 | Log of Boring B-3 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: brown, dry, medium dense, trace gravel | | | | |
| 5 | 5 | | 1 | 3/8/5 | | | | | | | |
| 10 | 10 | | 2 | 18/18/18 | | | dense | 7.2 | 19.1 | | NP |
| 15 | 15 | | 3 | 25/29/50 | | | very dense | | | | |
| 20 | 20 | | 4 | 15/26/25 | | | light brown | | | | |
| 25 | 25 | | 5 | 11/14/16 | | | dense | | | | |
| | | | | | | | Bottom of Boring | | | | |
| 30 | 30 | | | | | | | | | | |
| 35 | 35 | | | | | | | | | | |
| 40 | 40 | | | | | | | | | | |

C:\Users\thecco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ_Engineering_1.tp1

| | |
|---|---|
| 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 | 5 |  | 1 | 5\17\50 | | | | | | | |
| 10 | 10 |  | 2 | 50 | | | | | | | |
| 15 | 15 |  | 3 | 21\50 | | | | | | | |
| 20 | 20 |  | 4 | 14\30\50 | |  | light red brown | 8.6 | 18.1 | | NP |
| 25 | 25 |  | 5 | 18\30\30 | | | Bottom of Boring | | | | |
| 30 | 30 | | | | | | | | | | |
| 35 | 35 | | | | | | | | | | |
| 40 | 40 | | | | | | | | | | |

C:\Users\thecco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ_Engineering_1.tp1

| | |
|---|--|
| Project: Select Earthstone Recycling Facility Project Location: Smith Ranch Road, 32.633002, -103.672278, Lea County, NM Project Number: 4223053 | <h2 style="margin: 0;">Log of Boring B-5</h2> <h3 style="margin: 0;">Sheet 1 of 1</h3> |
|---|--|

| | | |
|---|--|---|
| 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 | 5 | | 1 | 30\20\18 | | | | 4.9 | 17.4 | | NP |
| 10 | 10 | | 2 | 11\19\50 | | | very dense | | | | |
| 15 | 15 | | 3 | 32\50 | | | | | | | |
| 20 | 20 | | 4 | 16\35\50 | | | light red brown | | | | |
| 25 | 25 | | 5 | 22\28\50 | | | | | | | |
| | | | | | | | Bottom of Boring | | | | |
| 30 | 30 | | | | | | | | | | |
| 35 | 35 | | | | | | | | | | |
| 40 | 40 | | | | | | | | | | |

C:\Users\thecco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ_Engineering_1.tp

| | |
|---|---|
| Project: Select Earthstone Recycling Facility | Log of Boring B-6 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 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 | 5 |  | 1 | 5/4/8 | | | | 9.1 | 12.7 | 22 | 2 |
| 10 | 10 |  | 2 | 24/25/50 | | | very dense | | | | |
| 15 | 15 |  | 3 | 22/34/50 | | | | | | | |
| 20 | 20 |  | 4 | 20/24/50 | | | | | | | |
| 25 | 25 |  | 5 | 18/50 | | | | | | | |
| | | | | | | | Bottom of Boring | | | | |
| 30 | | | | | | | | | | | |
| 35 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |

C:\Users\thecco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ_Engineering_1.tp

| | |
|---|---|
| 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 | 5 |  | 1 | 17\24\20 | | | | 7.2 | 25.2 | | NP |
| 10 | 10 |  | 2 | 19\16\13 | | | medium dense | | | | |
| 15 | 15 |  | 3 | 14\13\14 | | | | | | | |
| 20 | 20 |  | 4 | 19\19\50 | | | very dense | | | | |
| 25 | 25 |  | 5 | 14\26\50 | |  | red brown | | | | |
| | | | | | | | Bottom of Boring | | | | |
| 30 | 30 | | | | | | | | | | |
| 35 | 35 | | | | | | | | | | |
| 40 | 40 | | | | | | | | | | |

C:\Users\thecco\OneDrive\Desktop\Coz engineering\2023 Projects\4223053-Envirotech-Smith Ranch Road Frac Pond\logs\select logs.bgs\COZ_Engineering_1.tp1

| | |
|---|--|
| 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

- | | |
|---|--|
| <p>1 Elevation (feet): Elevation (MSL, feet).</p> <p>2 Depth (feet): Depth in feet below the ground surface.</p> <p>3 Sample Type: Type of soil sample collected at the depth interval shown.</p> <p>4 Sample Number: Sample identification number.</p> <p>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.</p> <p>6 Material Type: Type of material encountered.</p> <p>7 Graphic Log: Graphic depiction of the subsurface material encountered.</p> <p>8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.</p> | <p>9 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.</p> <p>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.</p> <p>11 LL, %: Liquid Limit, expressed as a water content.</p> <p>12 PI, %: Plasticity Index, expressed as a water content.</p> |
|---|--|

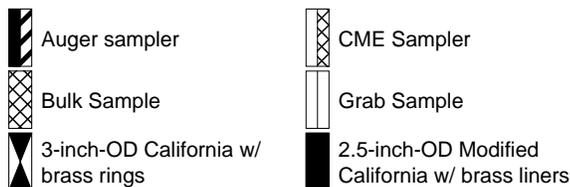
FIELD AND LABORATORY TEST ABBREVIATIONS

- | | |
|--|---|
| 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) |
|--|---|

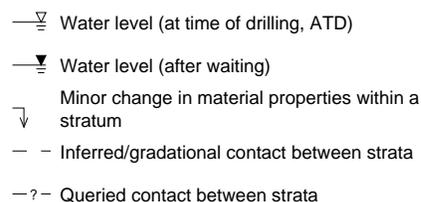
MATERIAL GRAPHIC SYMBOLS



TYPICAL SAMPLER GRAPHIC SYMBOLS



OTHER GRAPHIC SYMBOLS



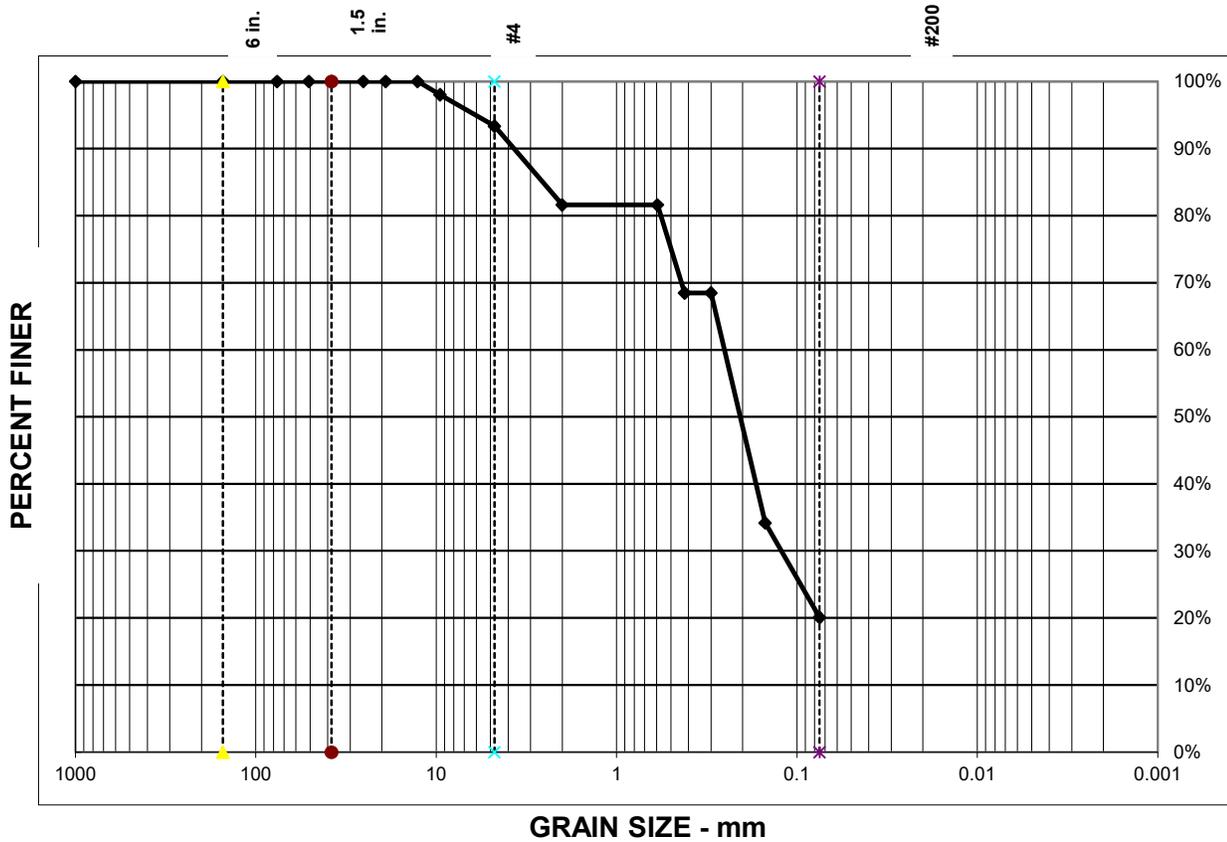
GENERAL NOTES

- 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.

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

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%

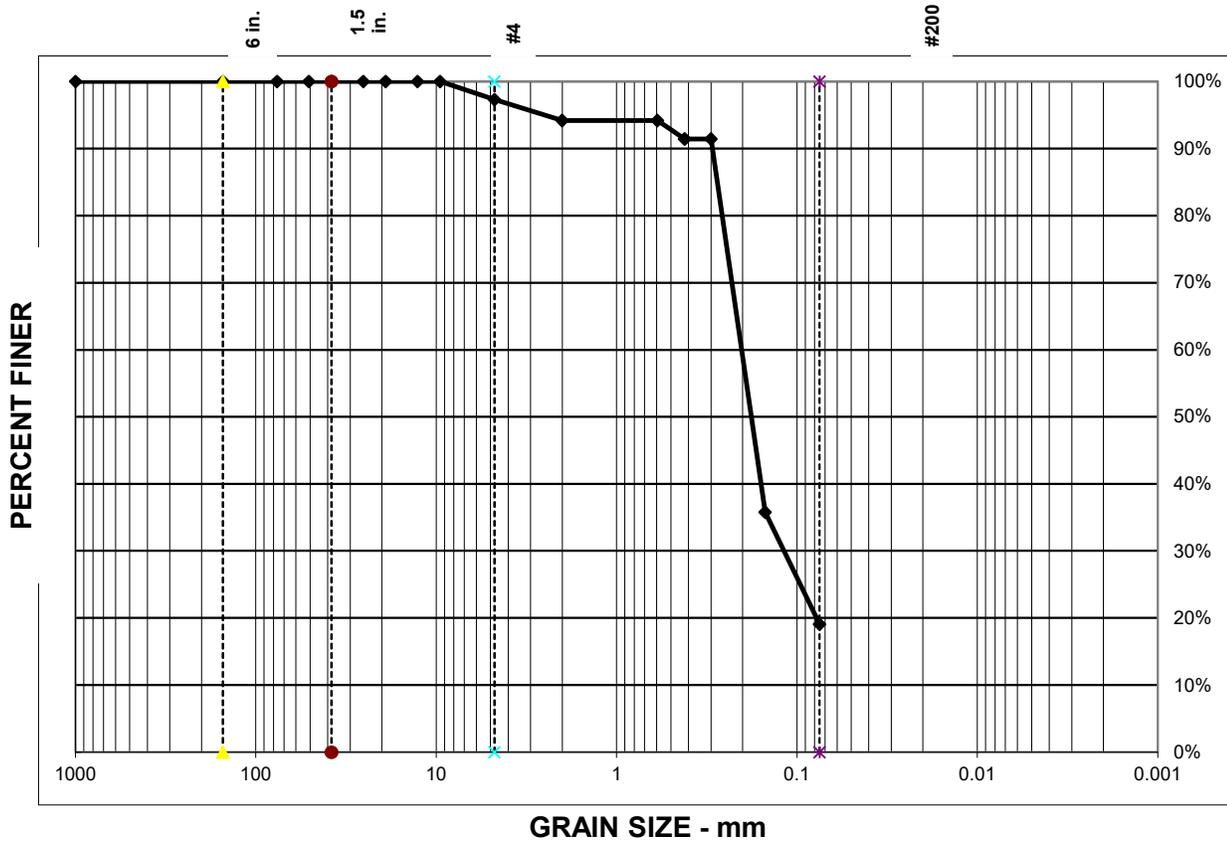
COZ Engineering, LLC

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%

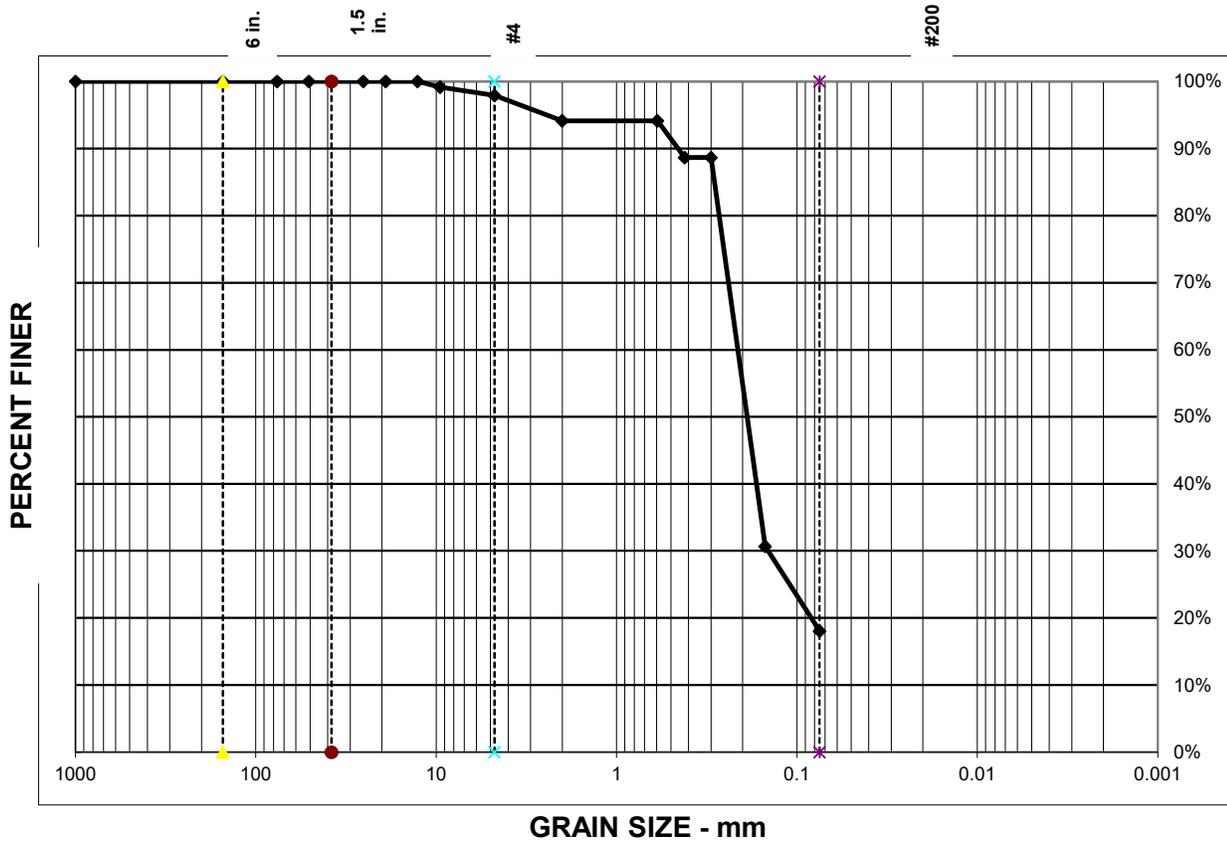
COZ Engineering, LLC

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% | 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%

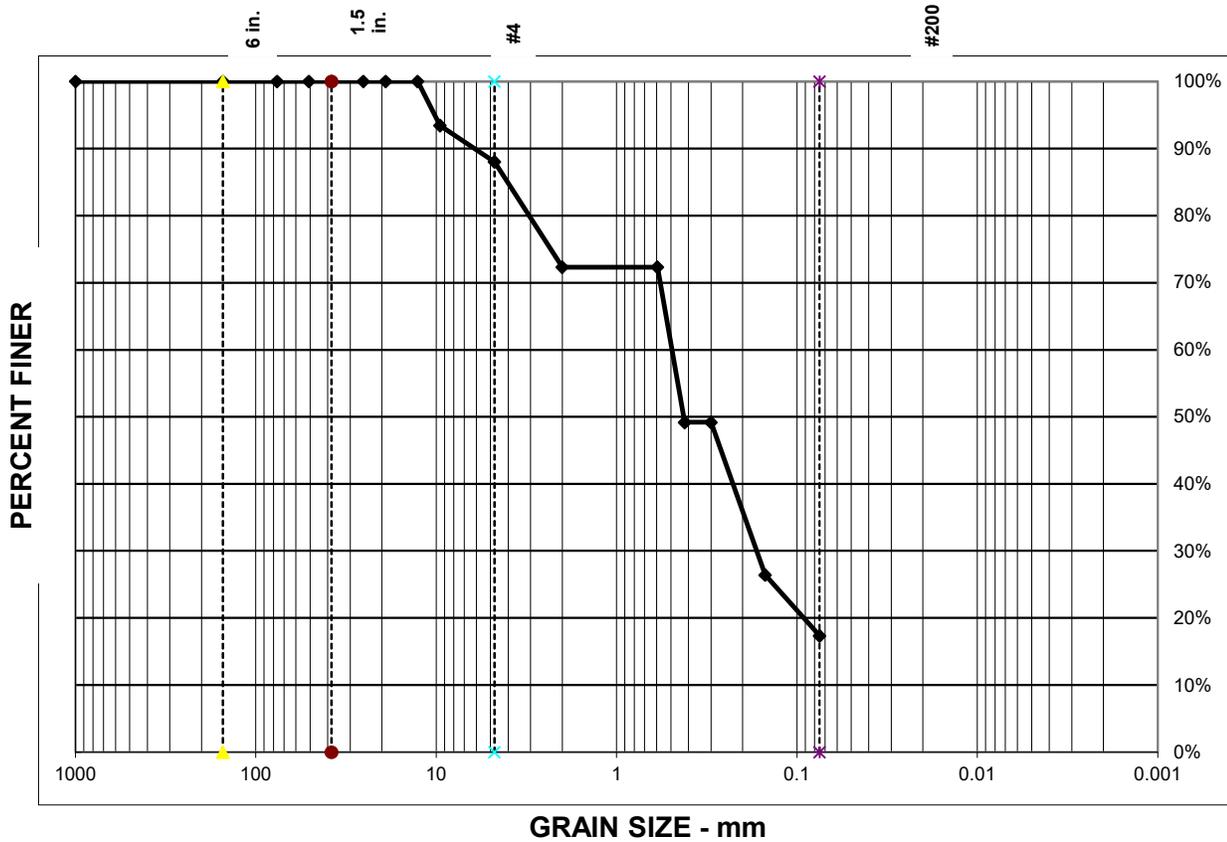
COZ Engineering, LLC

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% | 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

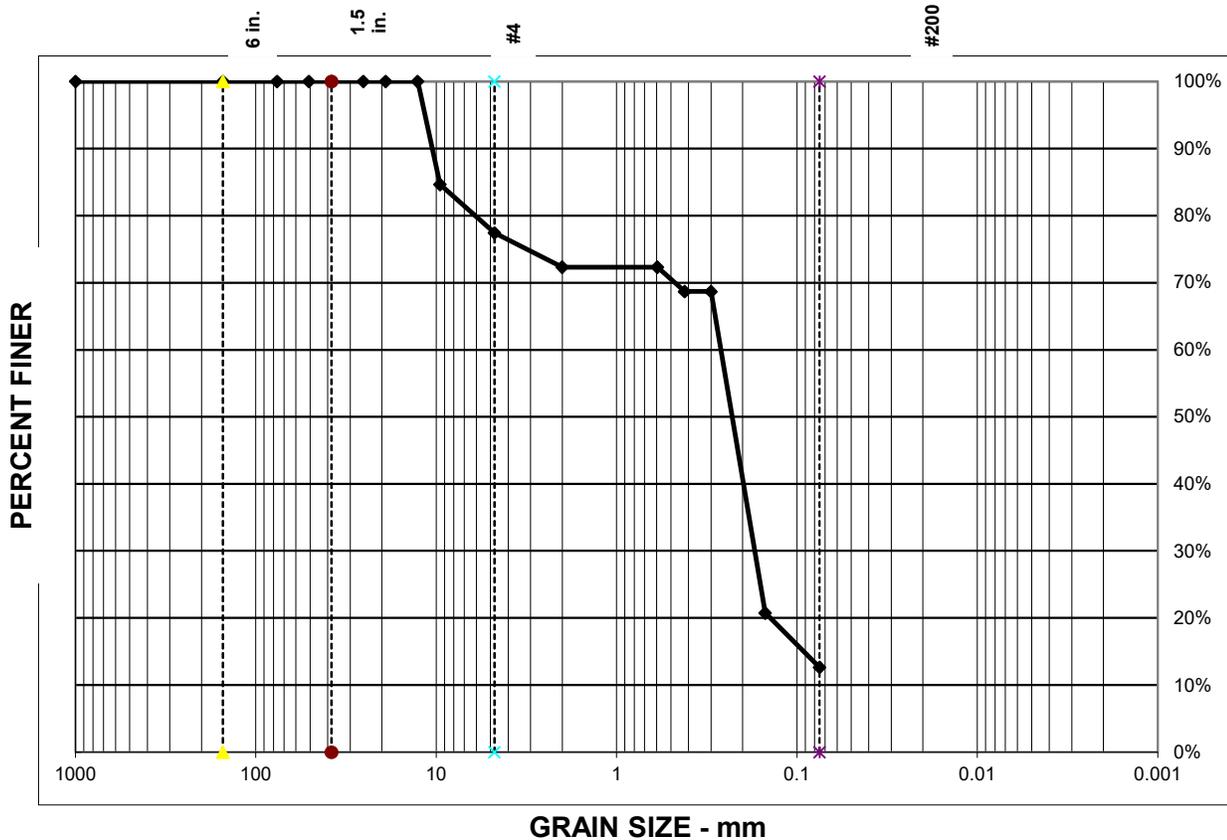
Material Description: Silty Sand

Moisture Content: 4.9%

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% | 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

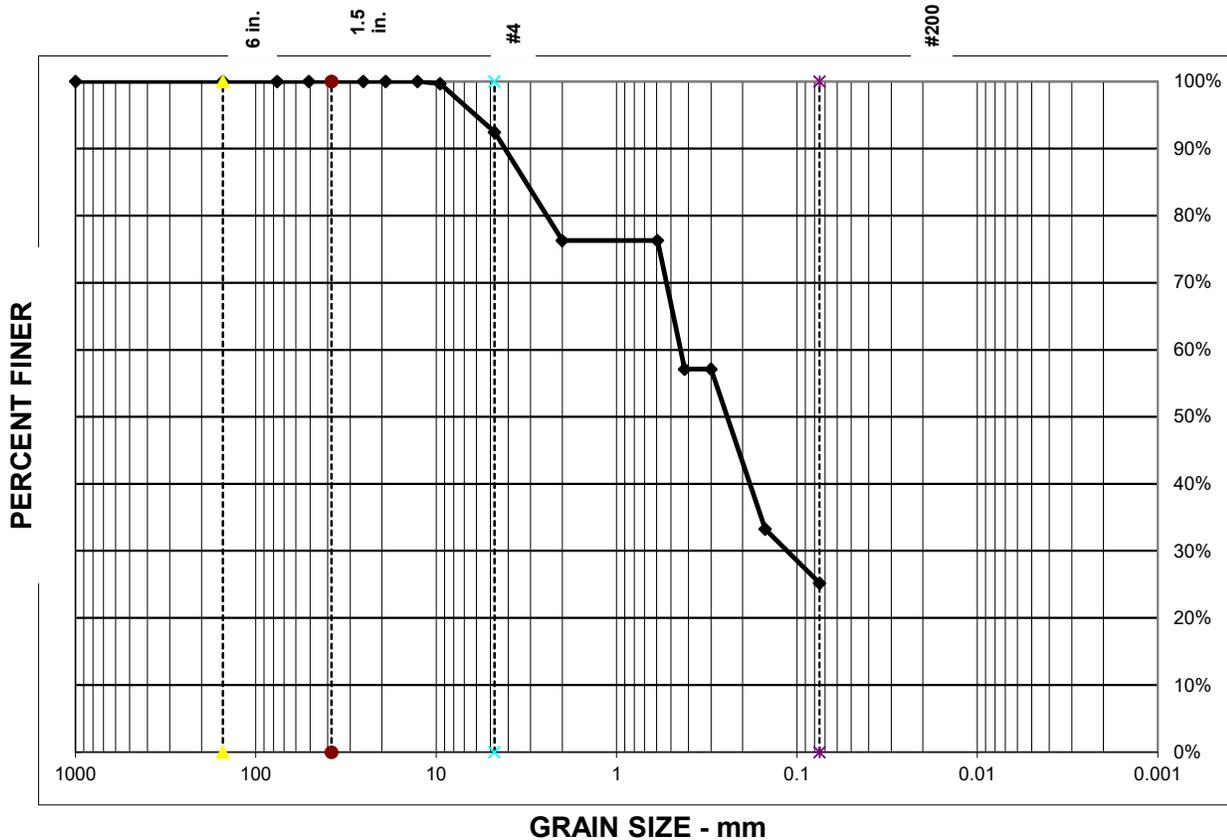
Material Description: Silty Sand with Gravel

Moisture Content: 9.1%

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% | 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

COZ Engineering, LLC

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

Laboratory Compaction Characteristics of Soil

Client Name: Envirotech
 Project Name: Select Earthstone Recycling Facility
 Location: 32.633002, -103.672278
Lea County, New Mexico
 Source Material: B-2 at 5'-10'
 Sample Description: Silty Sand
Proctor #1
 Material Designation: SM Sample date: 4/13/2023
 Test Method: ASTM-698
 Test Procedure: A
 Sample Preparation: COZ
 Rammer: Mechanical Manual

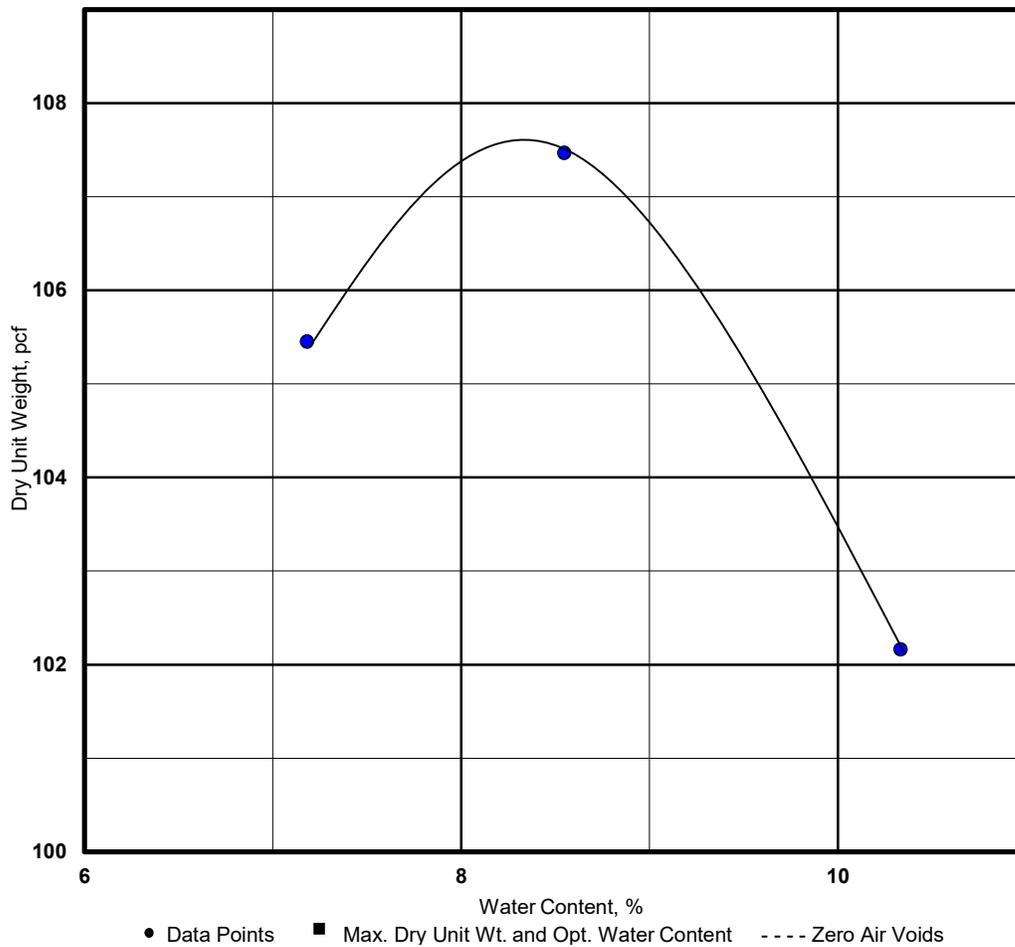
Project No.: 4223053 Date: 4/28/2023

TEST RESULTS

Maximum Dry Unit Wt.: 107.7 pcf
 Optimum Water Content: 8.3 %

Liquid Limit: Plastic Limit:
 Plasticity Index: NP
 % passing # 200 sieve: 20

Reviewed by: Dan Cosper, P. E.



COZ Engineering, LLC

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

Laboratory Compaction Characteristics of Soil

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

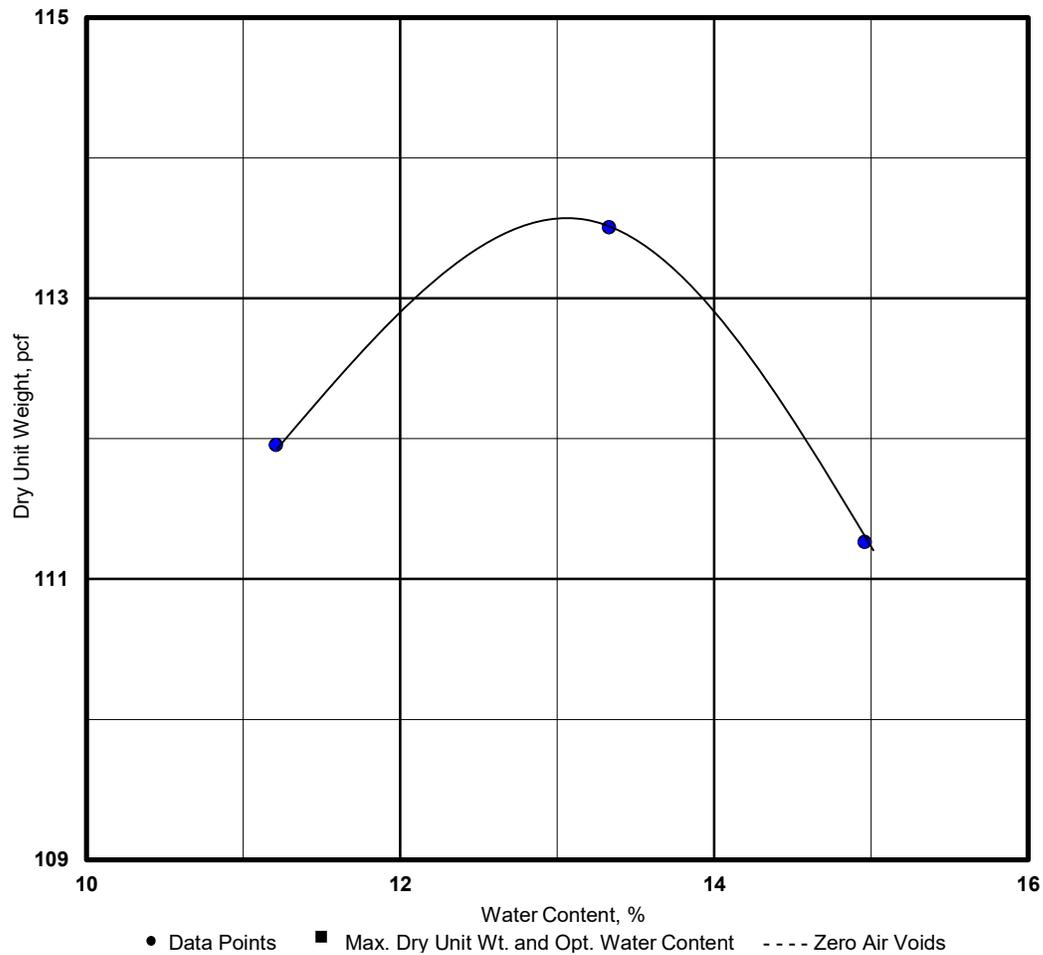
Project No.: 4223053 Date: 4/28/2023

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
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

APPENDIX C

ENGINEERING DRAWINGS

EARTHSTONE RECYCLE SELECT ENERGY

Section 28, Township 19 South, Range 33 East

32° 37' 58.1124", -103° 40' 26.7594"

32.632809°, -103.674100°

Developed In Conjunction With



Index to Drawings 11X17

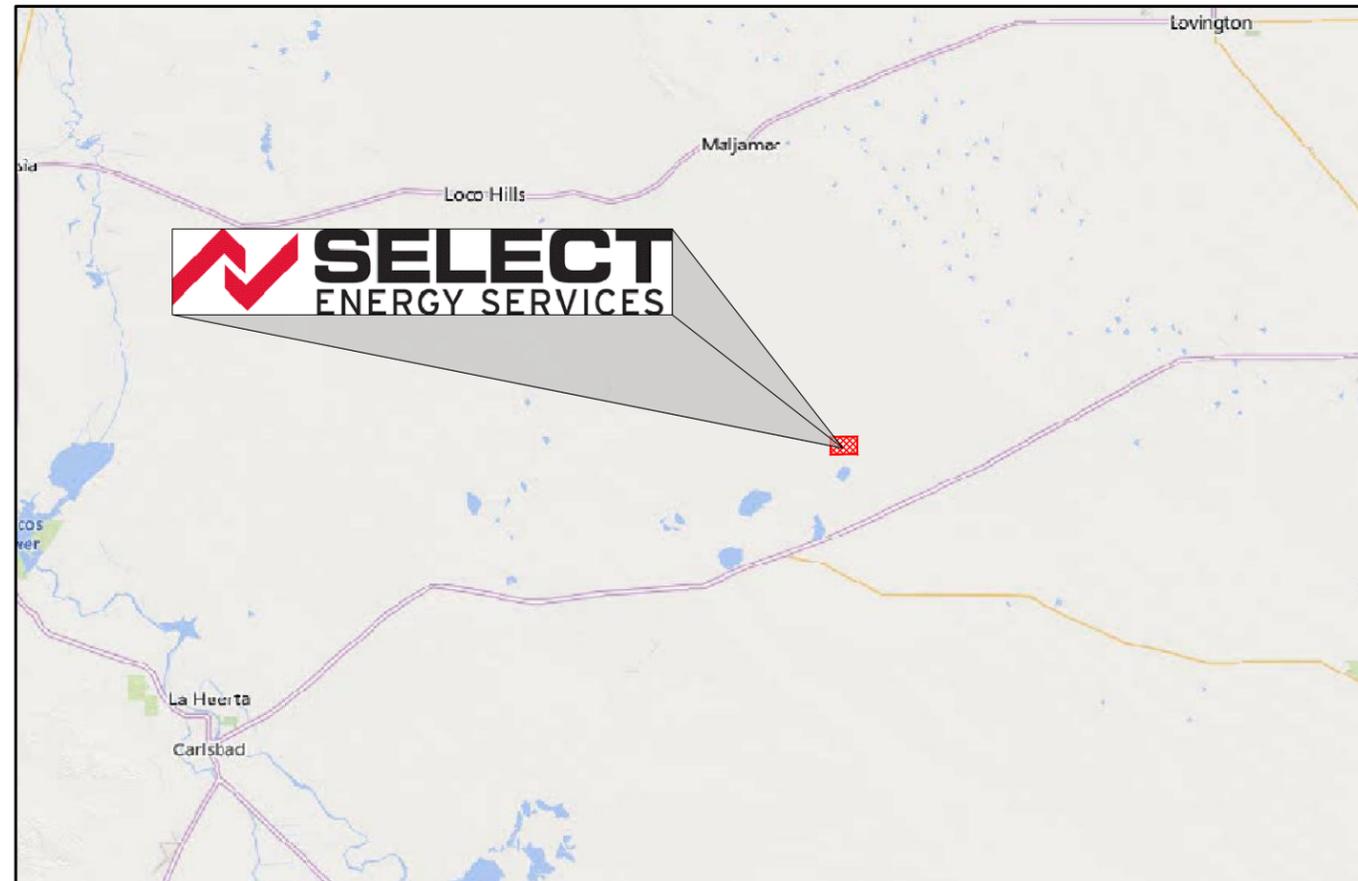
| Sheet No. | Description |
|-----------|--------------------------|
| 1. | Cover Sheet |
| 2. | Project Location & Notes |
| 3. | Existing Site Features |
| 4. | Site Plan |
| 5. | Pit Capacities |
| 6. | Rub Sheet Plan |
| 7. | Cross Sections |
| 8. | Cross Sections |
| 9. | Sump Details |
| 10. | Liner Details |
| 11. | Fence Details |

Contacts

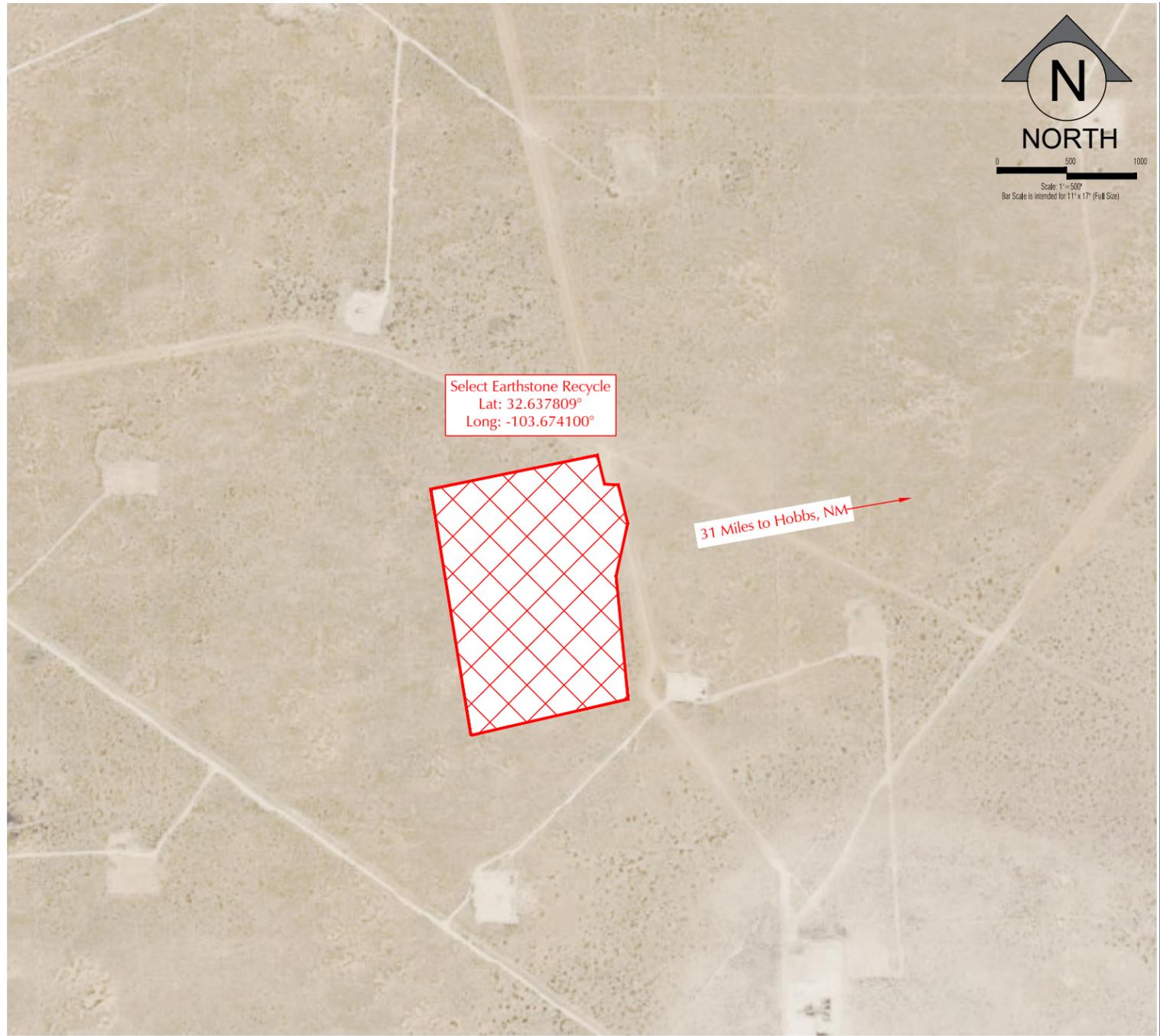
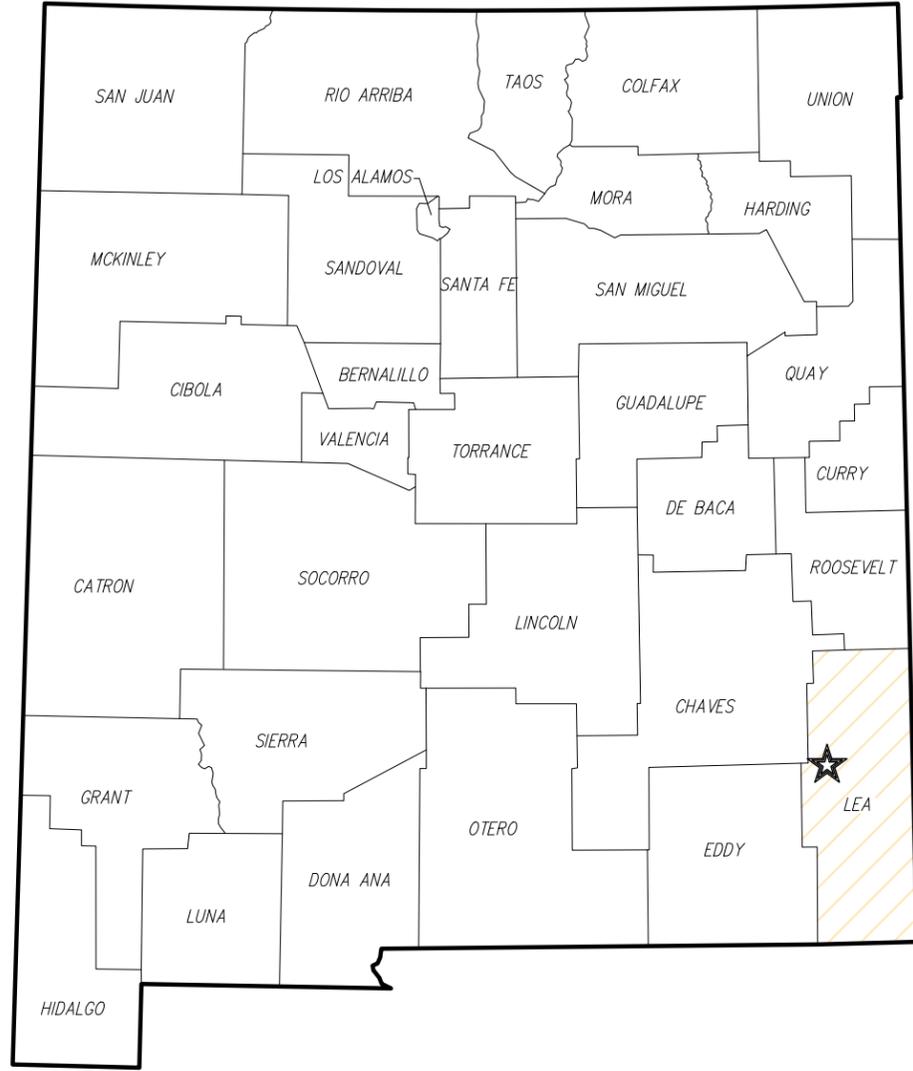
John McGillis - Select Energy Services - (713) 806-0488
Tyler Schott - MBA Energy & Industrial - (701) 367-0671

Envirotech Engineering Consulting - Mitchell Ratke, EIT (580)-234-8780
(Design Engineer)

Envirotech Engineering Consulting - Tyler Williams, PE (580)-234-8780
(Supervising Engineer)



2500 N. Eleventh Street Enid, OK 73701 • 580.234.8780 • envirotechconsulting.com
License #26432 - Expiration Date: 12-31-2024



ENVIROTECH ENGINEERING
 2500 North Eleventh Street
 Enid, Oklahoma
 580.234.8780
 envirotechconsulting.com
 License #26432 - Expiration Date: 12-31-2024

COPYRIGHT
 This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

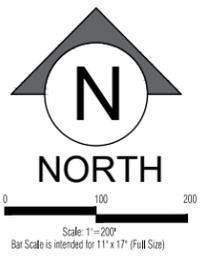
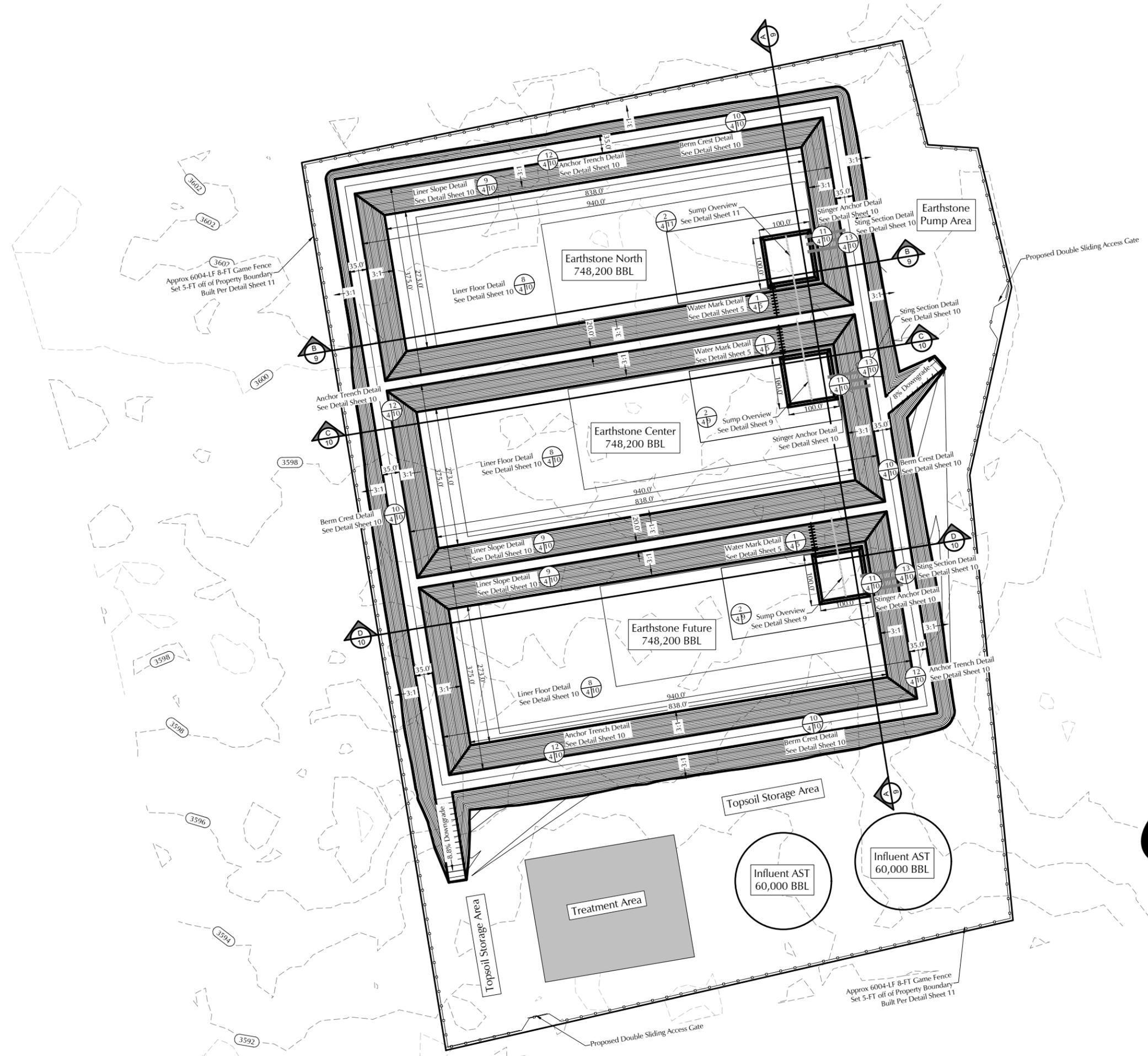
SELECT ENERGY SERVICES

Developed in Conjunction With



PROJECT LOCATION
 Earthstone Recycle
 Select Energy
 Section 28, Township 19 South, Range 28 East
 Lea County, New Mexico

| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | 1" = 1000' |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO. | 023107-00 |
| SHEET NO. | 2 of 11 |



ENVIROTECH ENGINEERING
 2500 North Eleventh Street
 Enid, Oklahoma
 580.234.8780
 envirotechconsulting.com
 C.A. #1960 - Expiration Date: 6-30-2024

COPYRIGHT
 This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

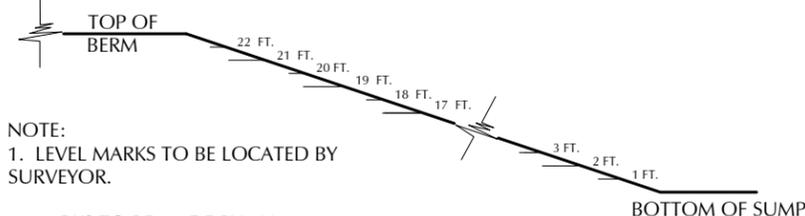
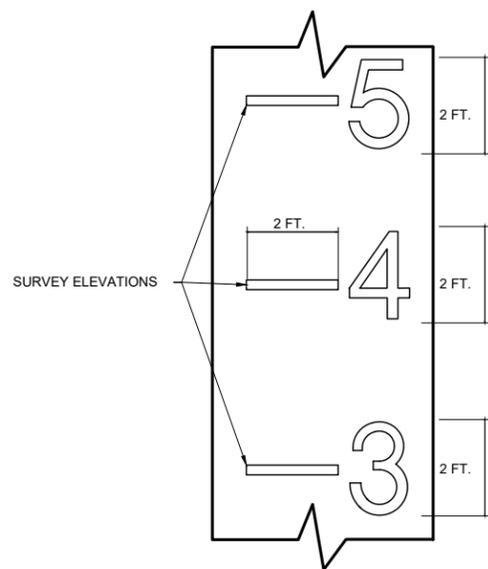
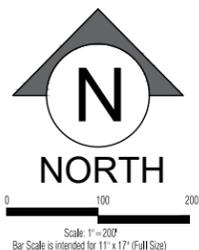
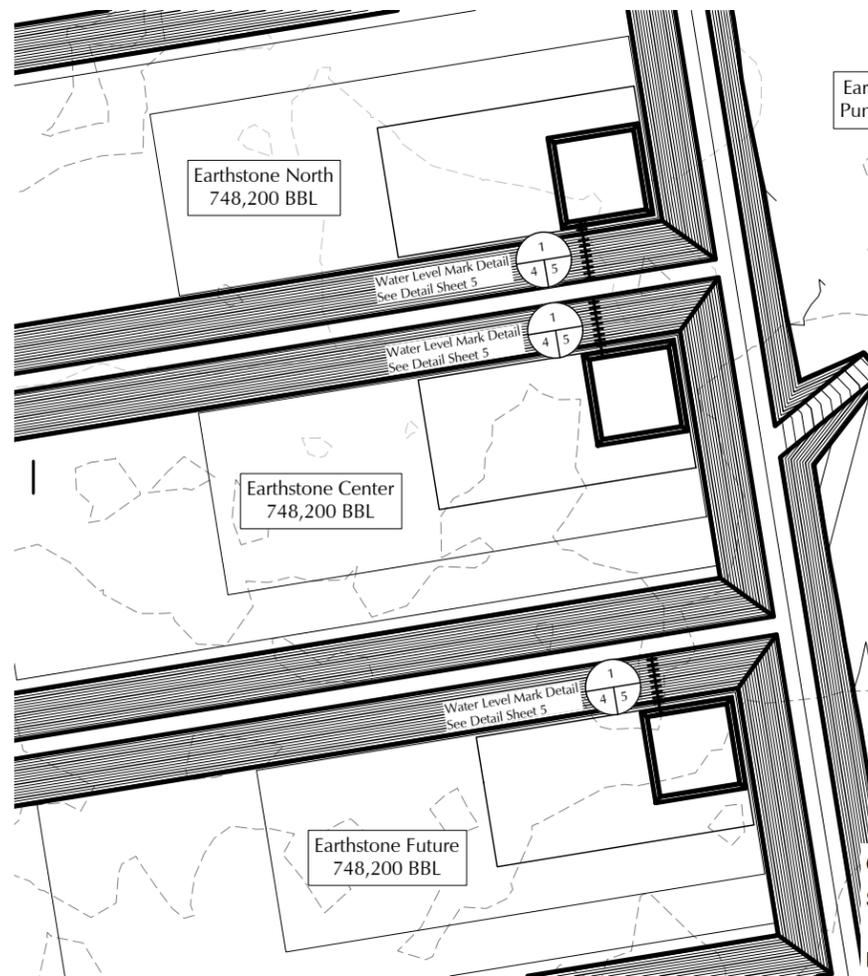
| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

SELECT ENERGY SERVICES

Developed in Conjunction With
MBA ENERGY & INDUSTRIAL

SITE PLAN
 Earthstone Recycle
 Select Energy
 Section 28, Township 19 South, Range 28 East
 Lea County, New Mexico

| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | 1" = 200' |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO.: | 023107-00 |
| SHEET NO.: | 4 of 11 |



NOTE:
1. LEVEL MARKS TO BE LOCATED BY SURVEYOR.

2. MARKS TO BE MADE BY AN EXTRUSION WELDER USING BLACK FILAMENT (OR WHITE FILAMENT ON BLACK LINER).

3. MARKS SHOULD BEGIN AT THE TOP OF BERM AND CONTINUE TO THE BOTTOM OF THE SUMP. (TOP OF BERM SHOULD READ 17-FT, BOTTOM OF SUMP +1-FT SHOULD READ 1-FT)

4. REFERENCE PIT CAPACITY TABLES FOR ACCURATE ELEVATIONS

WATER LEVEL MARKS
Not to Scale



Owner **Select Energy**
Site Name **Earthstone Recycle Storage Pits**

| Lagoon Features | Top FB | Bottom | Max Liq. Level | Freeboard |
|--------------------------------------|-------------|--------|----------------|-----------------------|
| Side slope Ratio | 3 | | 2 | Maximum Volume |
| Maximum Depth (ft) | 22.0 | | 20.0 | Storage Volume |
| Lagoon Top Width (ft) | 940 | 838 | 928 | Floor |
| Lagoon Top Length (ft) | 375 | 273 | 363 | Sump |
| Maximum Total Vol (ft ³) | 5,222,673 | | 4,533,449 | |
| Maximum Total Vol (bbls) | 930,133 | | 807,494 | |

| Lagoon Liq Depth ft | Storage ft | Remaining Stor Vol ft ³ | Gallons Storage gal | BBLs Storage bbls | Percent of Total Volume % | Vol in lagoon ft ³ | Gallons Storage gal | Vol in Lagoon bbls | Vol in Lagoon ac-ft | Percent Total Vol % |
|---------------------|------------|------------------------------------|---------------------|-------------------|---------------------------|-------------------------------|---------------------|--------------------|---------------------|---------------------|
| 22.0 | 0.0 | - | - | - | 0.0% | 5,222,673 | 39,070,816 | 930,258 | 119.90 | 100% |
| 21.0 | 1.0 | 12,882 | 61,963 | 1,475 | 0.2% | 4,874,152 | 36,463,535 | 868,179 | 111.90 | 93% |
| 20.0 | 2.0 | 27,519 | 132,367 | 3,152 | 0.5% | 4,533,449 | 33,914,731 | 807,494 | 104.07 | 87% |
| 19.0 | 3.0 | 74,035 | 356,108 | 8,479 | 1.4% | 4,200,490 | 31,423,869 | 748,187 | 96.43 | 80% |
| 18.0 | 4.0 | 211,895 | 1,019,215 | 24,267 | 4.1% | 3,875,205 | 28,990,409 | 690,248 | 88.96 | 74% |
| 17.0 | 5.0 | 485,220 | 2,333,910 | 55,569 | 9.3% | 3,557,520 | 26,613,810 | 633,662 | 81.67 | 68% |
| 16.0 | 6.0 | 846,187 | 4,070,160 | 96,909 | 16.2% | 3,247,365 | 24,293,536 | 578,418 | 74.55 | 62% |
| 15.0 | 7.0 | 1,217,632 | 5,856,810 | 139,448 | 23.3% | 2,944,666 | 22,029,050 | 524,501 | 67.60 | 56% |
| 14.0 | 8.0 | 1,599,667 | 7,694,399 | 183,200 | 30.6% | 2,649,353 | 19,819,809 | 471,900 | 60.82 | 51% |
| 13.0 | 9.0 | 1,992,405 | 9,583,467 | 228,178 | 38.1% | 2,361,352 | 17,665,278 | 420,602 | 54.21 | 45% |
| 12.0 | 10.0 | 2,395,956 | 11,524,548 | 274,394 | 45.9% | 2,080,593 | 15,564,916 | 370,593 | 47.76 | 40% |
| 11.0 | 11.0 | 2,810,433 | 13,518,185 | 321,862 | 53.8% | 1,807,002 | 13,518,185 | 321,862 | 41.48 | 35% |
| 10.0 | 12.0 | 3,235,949 | 15,564,916 | 370,593 | 62.0% | 1,540,509 | 11,524,548 | 274,394 | 35.37 | 29% |
| 9.0 | 13.0 | 3,672,615 | 17,665,278 | 420,602 | 70.3% | 1,281,041 | 9,583,467 | 228,178 | 29.41 | 25% |
| 8.0 | 14.0 | 4,120,542 | 19,819,809 | 471,900 | 78.9% | 1,028,526 | 7,694,399 | 183,200 | 23.61 | 20% |
| 7.0 | 15.0 | 4,579,844 | 22,029,050 | 524,501 | 87.7% | 782,891 | 5,856,810 | 139,448 | 17.97 | 15% |
| 6.0 | 16.0 | 5,050,631 | 24,293,536 | 578,418 | 96.7% | 544,066 | 4,070,160 | 96,909 | 12.49 | 10% |
| 5.0 | 17.0 | 5,533,017 | 26,613,810 | 633,662 | 105.9% | 311,978 | 2,333,910 | 55,569 | 7.16 | 6% |
| 4.0 | 18.0 | 6,027,112 | 28,990,409 | 690,248 | 115.4% | 136,241 | 1,019,215 | 24,267 | 3.13 | 3% |
| 3.0 | 19.0 | 6,533,029 | 31,423,869 | 748,187 | 125.1% | 47,602 | 356,108 | 8,479 | 1.09 | 1% |
| 2.0 | 20.0 | 7,050,880 | 33,914,731 | 807,494 | 135.0% | 17,694 | 132,367 | 3,152 | 0.41 | 0% |
| 1.0 | 21.0 | 7,580,776 | 36,463,535 | 868,179 | 145.2% | 8,283 | 61,963 | 1,475 | 0.19 | 0% |
| 0.0 | 22.0 | 8,122,831 | 39,070,816 | 930,258 | 155.5% | - | - | - | - | 0% |

Developed in Conjunction With



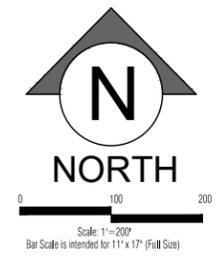
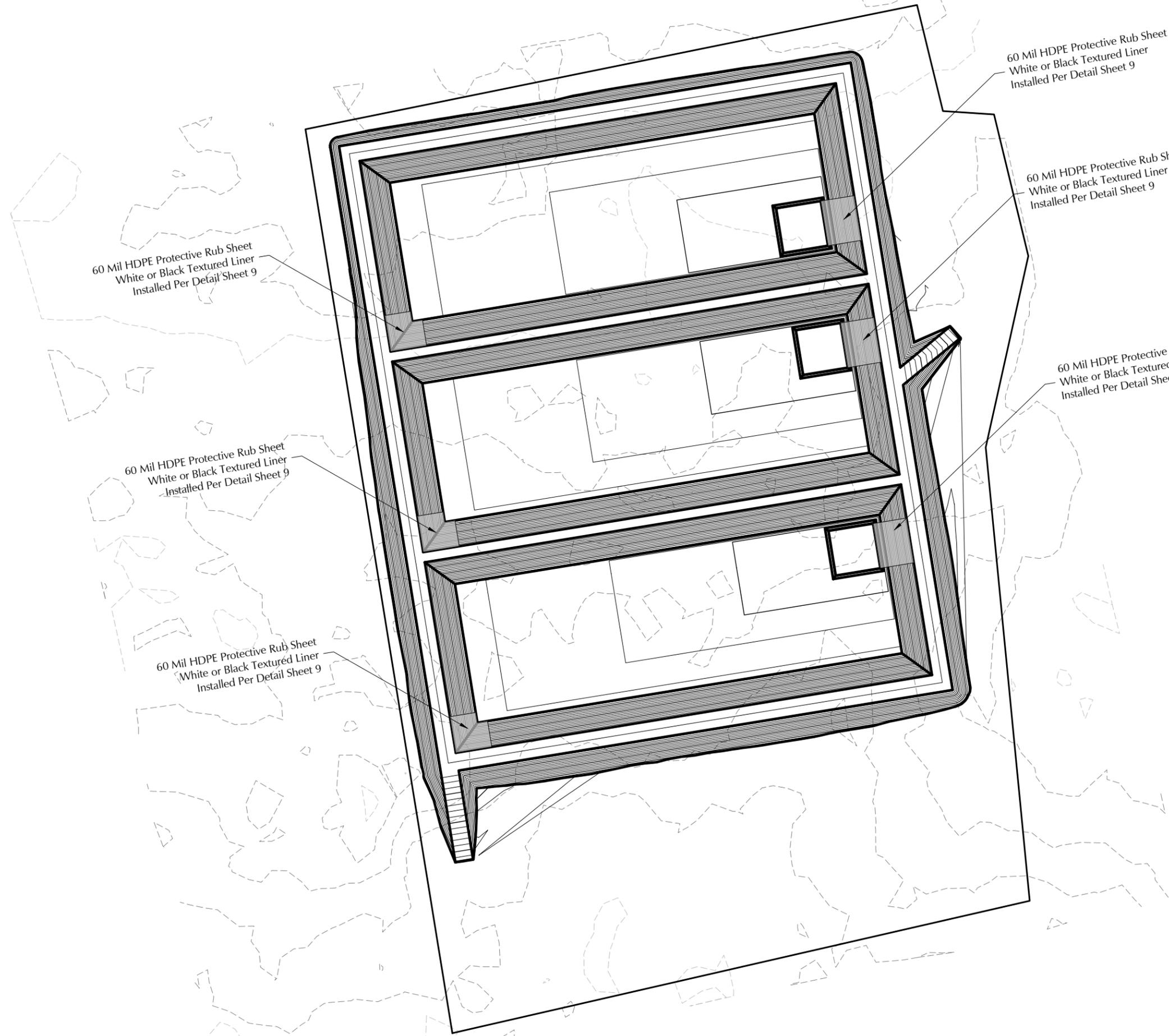
PIT CAPACITIES
Earthstone Recycle
Select Energy
Section 28, Township 19 South, Range 28 East
Lea County, New Mexico

| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | 1" = 200' |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO. | 023107-00 |
| SHEET NO. | 5 of 11 |



COPYRIGHT
This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.





COPYRIGHT
 This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |



RUB SHEET PLAN
 Earthstone Recycle
 Select Energy
 Section 28, Township 19 South, Range 28 East
 Lea County, New Mexico

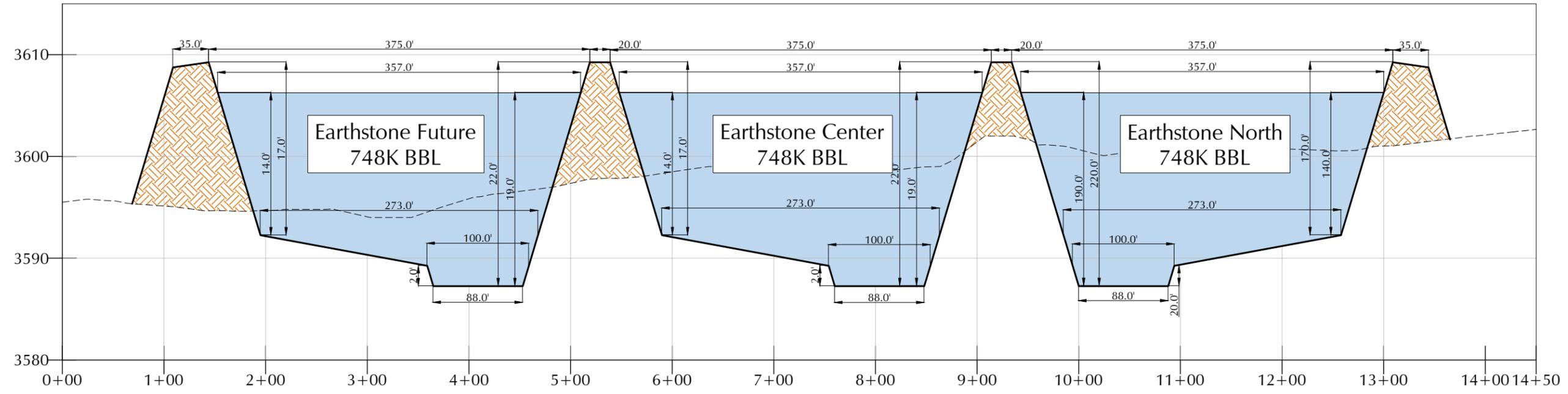
| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | 1" = 200' |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO.: | 023107-00 |
| SHEET NO.: | 6 of 11 |

COPYRIGHT
This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

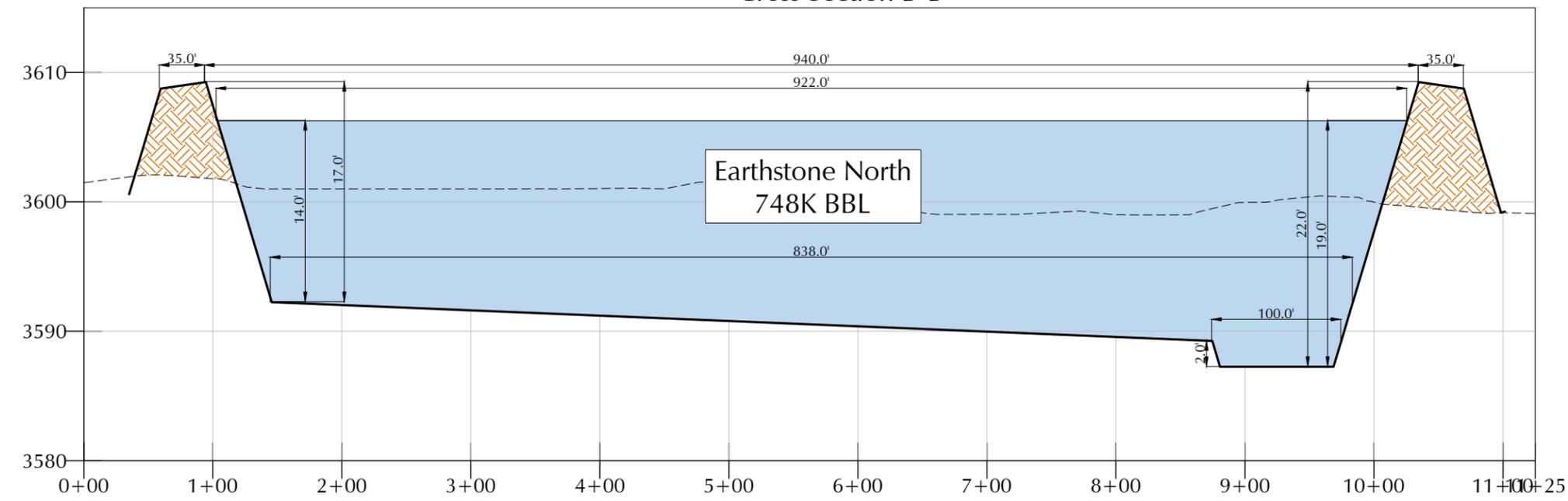
| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |



Cross Section A-A



Cross Section B-B

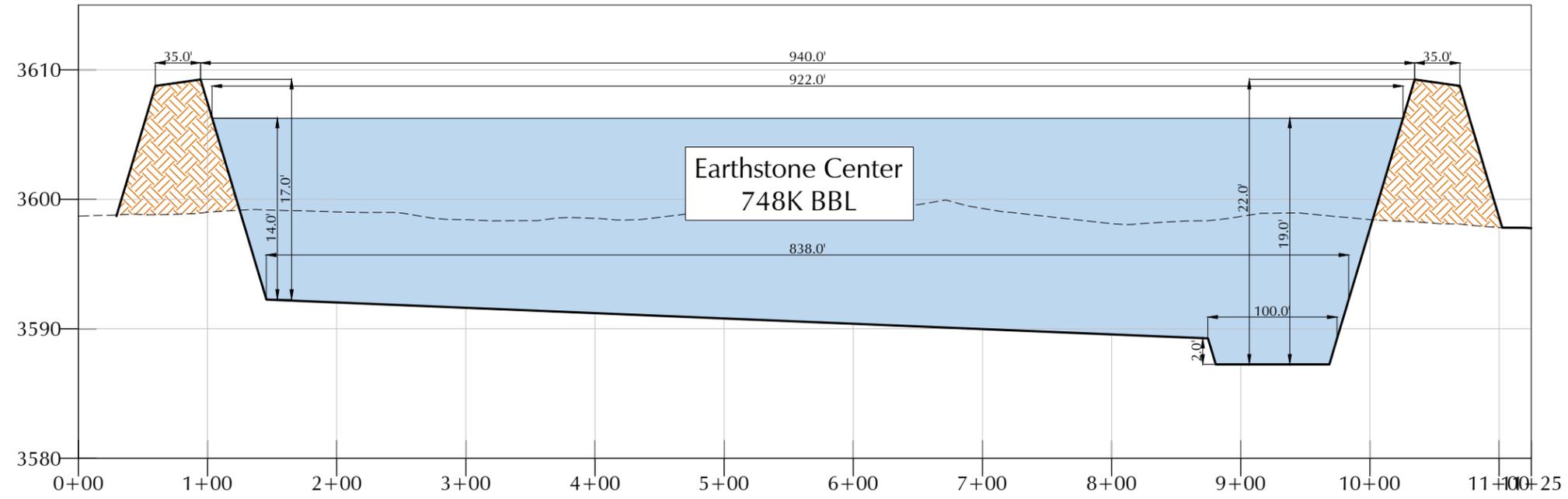


Developed in Conjunction With
MBA
ENERGY & INDUSTRIAL

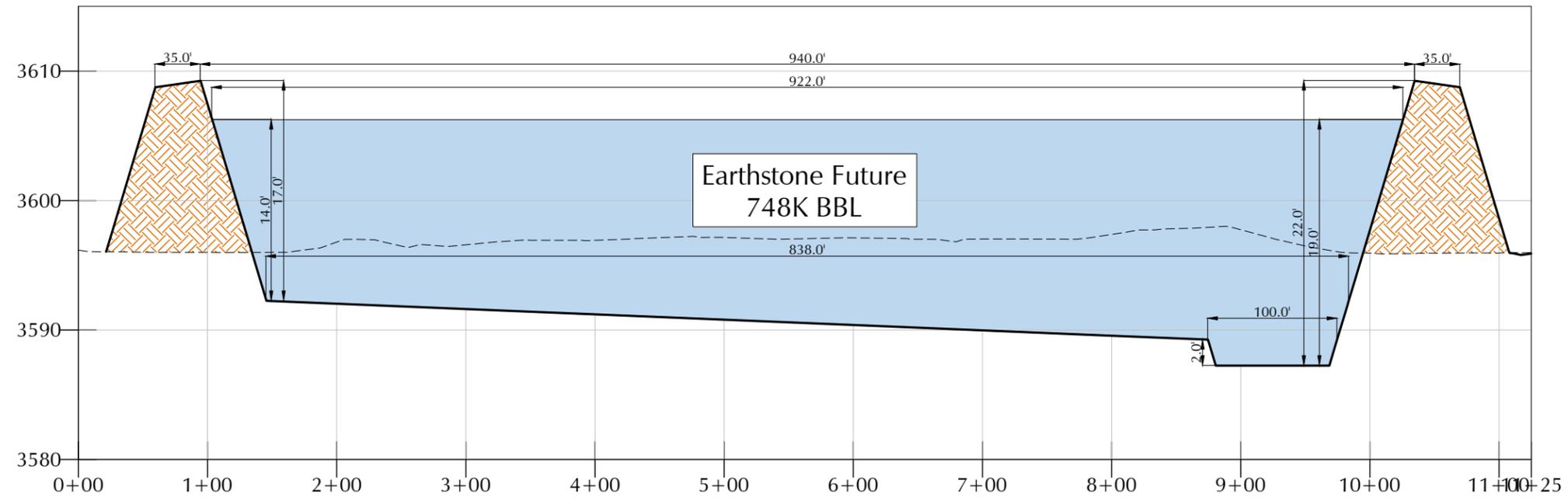
CROSS SECTIONS
Earthstone Recycle
Select Energy
Section 28, Township 19 South, Range 28 East
Lea County, New Mexico

| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | NTS |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO. | 023107-00 |
| SHEET NO. | 7 of 11 |

Cross Section C-C



Cross Section D-D



Developed in Conjunction With



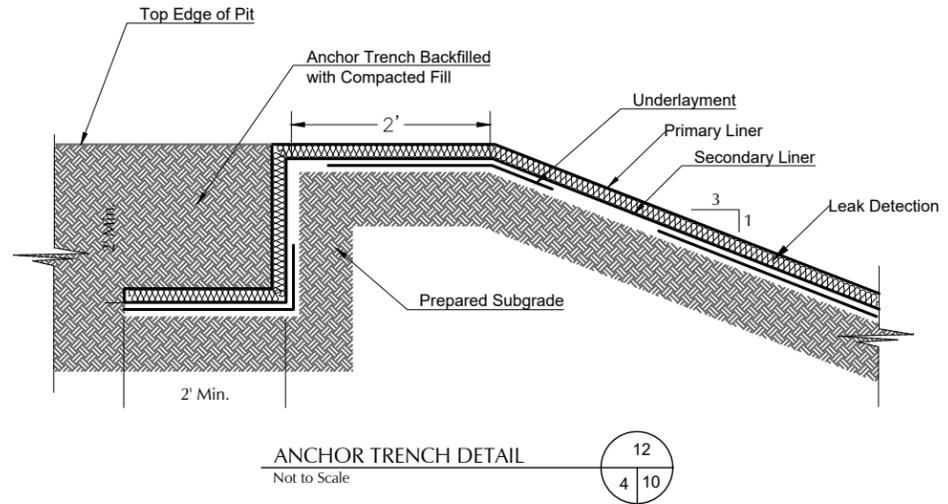
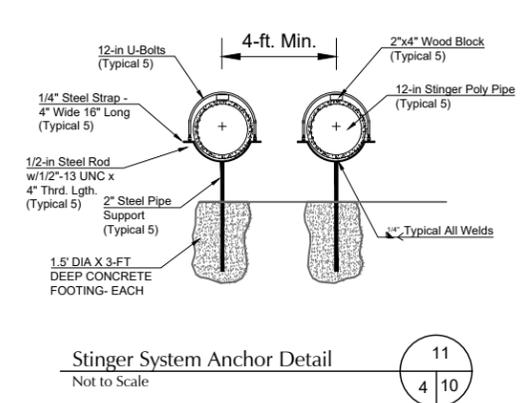
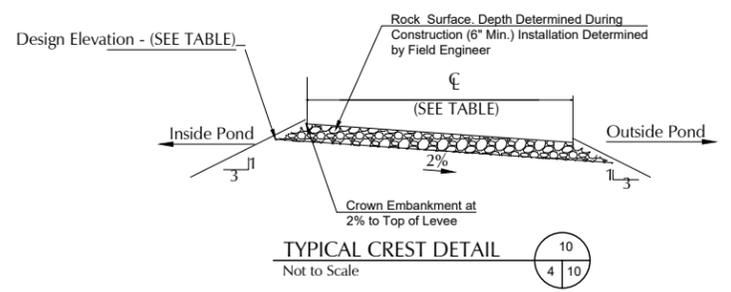
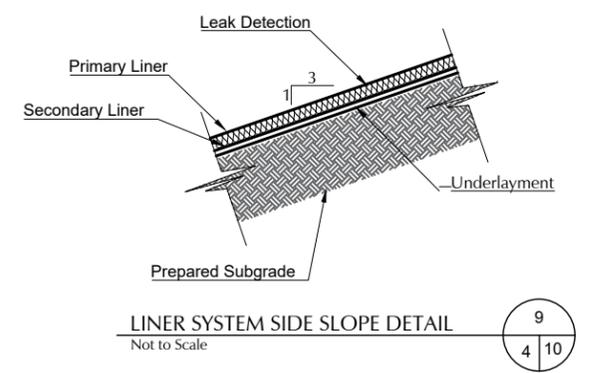
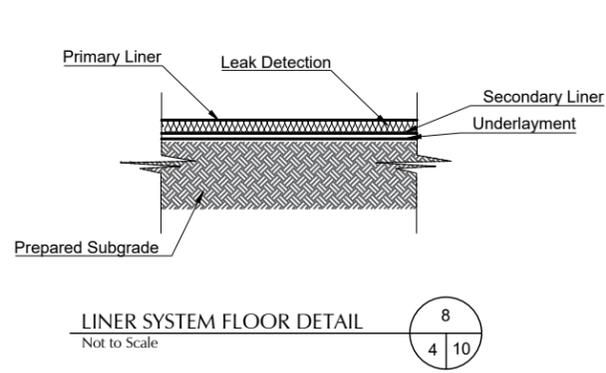
COPYRIGHT
 This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |



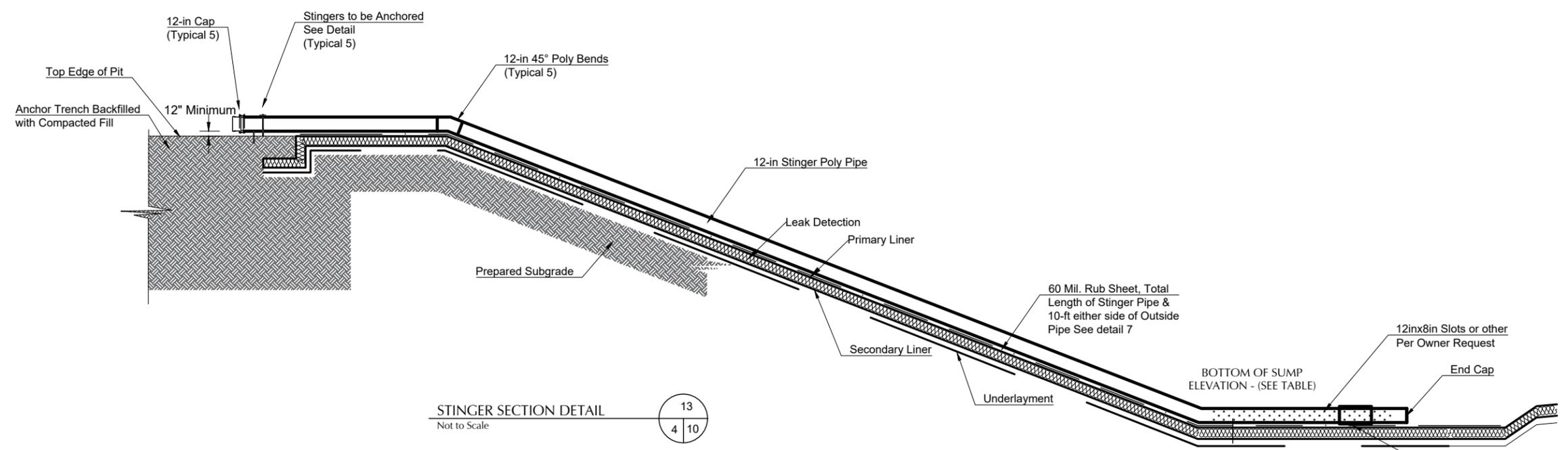
CROSS SECTIONS
 Earthstone Recycle
 Select Energy
 Section 28, Township 19 South, Range 28 East
 Lea County, New Mexico

| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | NTS |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO. | 023107-00 |
| SHEET NO. | 8 of 11 |



PROPOSED PIT REFERENCE TABLE

| DETAIL | DESCRIPTION |
|-----------------------|--|
| PRIMARY LINER | 60-Mil HDPE Smooth Liner/Textured Rub Sheets |
| LEAK DETECTION | 200-Mil Geonet |
| SECONDARY LINER | 40-Mil HDPE Smooth Liner |
| UNDERLAYMENT | 10oz Geotextile |
| SUMP | 100'x100'x2', Bottom Elevation 3587.25 |
| BERM (ROAD CREST) | 35' Wide, Top Of Berm Elevation 3609.25 |
| LEAK DETECTION PIPING | 6-in DR11. Pipe Perforated on Floor, Solid on Slopes |

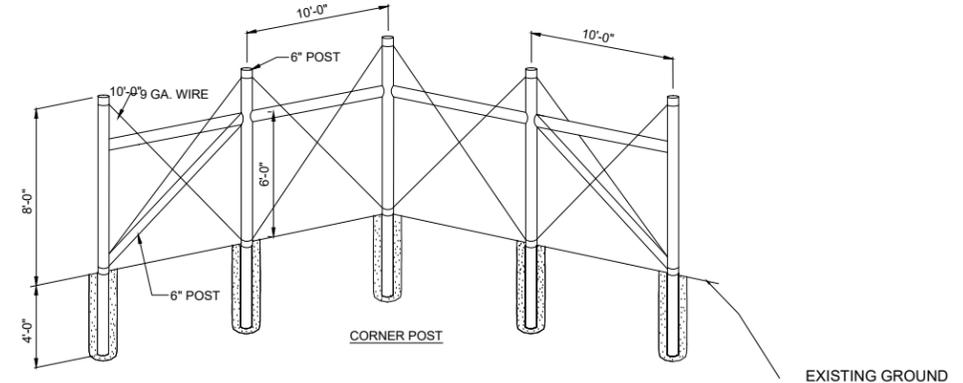
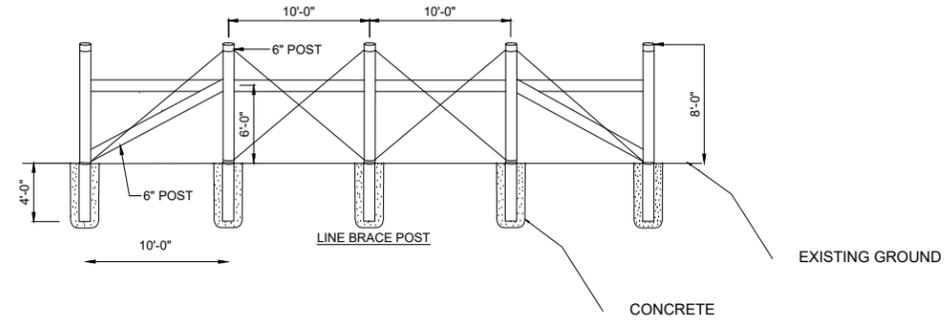
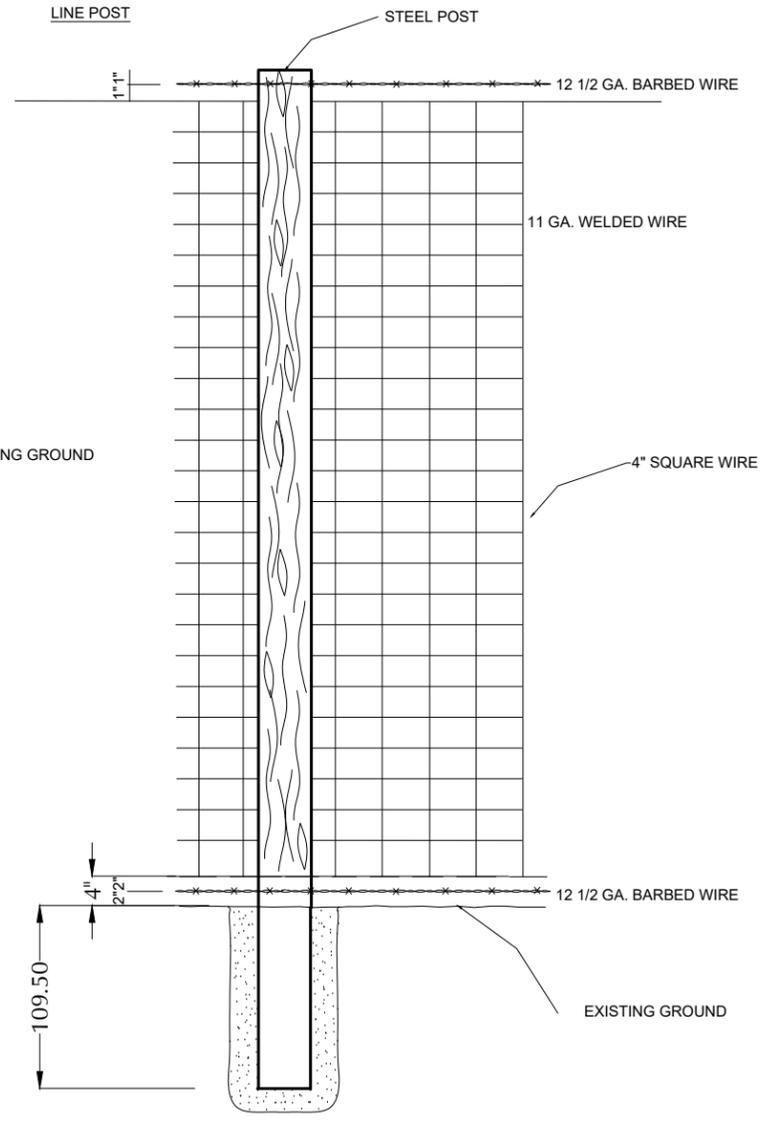
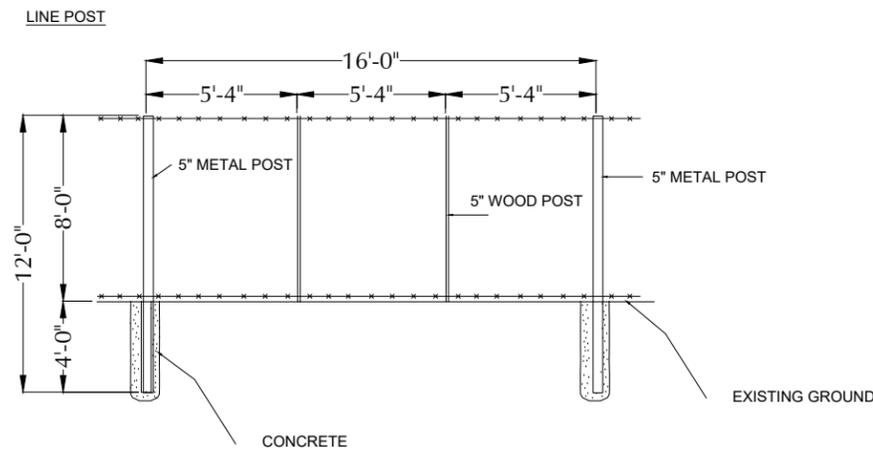
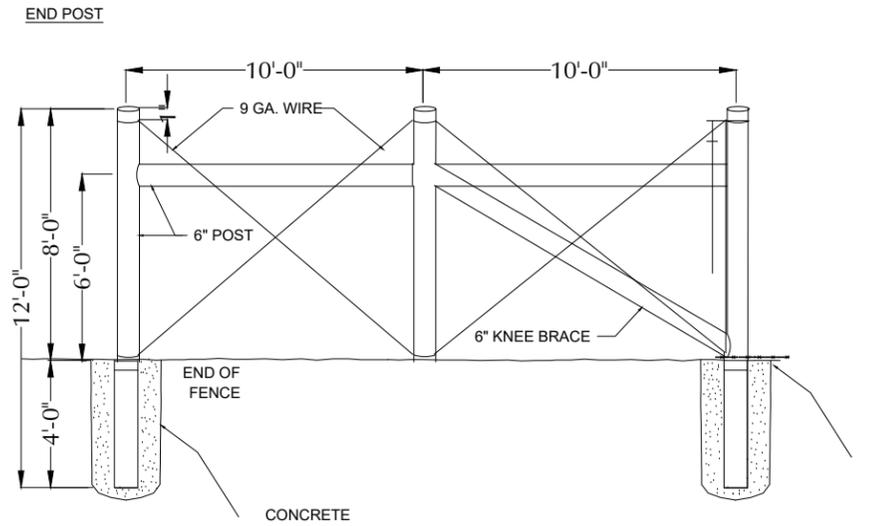


COPYRIGHT
This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.



LINER DETAILS
Earthstone Recycle
Select Energy
Section 28, Township 19 South, Range 28 East
Lea County, New Mexico

DATE: June 2023
SCALE: NTS
DESIGNED BY: M. Ratke
DRAWN BY: M. Ratke
CHECKED BY: T. Williams
PROJECT NO. 023107-00
SHEET NO. 10 of 11



COPYRIGHT
This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

SELECT
ENERGY SERVICES

Developed in Conjunction With
MBA
ENERGY & INDUSTRIAL

FENCE DETAILS
Earthstone Recycle
Select Energy
Section 28, Township 19 South, Range 28 East
Lea County, New Mexico

| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | NTS |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO. | 023107-00 |
| SHEET NO. | 11 of 11 |



C147L REGISTRATION PACKAGE
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

APPENDIX D

DESIGN AND CONSTRUCTION PLAN



Select Energy Services (Select) is proposing to construct three (3) storage pits and two (2) Above Ground Storage Tanks (AST) in Section 16, Township 19 South, Range 33 East, Lea County, New Mexico. The Earthstone Recycle shall consist of five containments with a total operational volume of approximately 2,364,000-bbl.

OPERATION AND MAINTENANCE PROCEDURES

Applicable mandates in Rule 34 are underlined. This plan addresses construction of lined earthen containments. *Appendix D* presents Engineering Design Plans. *Appendix F* 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 on the containment levee 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 D shows:

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 manufacturer's specifications (See *Appendix F*). 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 D*).
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 D*).
4. The slope of the interior subgrade should be great enough to facility drainage.



C147L REGISTRATION PACKAGE
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

APPENDIX E

MATERIAL SPECIFICATIONS



Select Energy Services (Select) is proposing to construct three (3) storage pits and two (2) Above Ground Storage Tanks (AST) in Section 16, Township 19 South, Range 33 East, Lea County, New Mexico. The Earthstone Recycle shall consist of five containments with a total operational volume of approximately 2,364,000-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 Sheeting
 - 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 ^o 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 PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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 $< -77^{\circ}$ C when tested according to ASTM D 746.
 - *Modified.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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 |



**MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00**

- 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 |
| Roll Area, ft ² | | | 25,200 | 19,575 | 12,600 | 9,675 | 7,650 |



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

- 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 $< -77^{\circ}$ 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 |
| Roll Area, ft ² | | | 19,575 | 12,600 | 9,675 | 7,650 |



-
- 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 $< -77^{\circ}$ C when tested according to ASTM D746.
 - *Modified.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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 ± 1%.
 - GSE Leak Location White Smooth 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° C when tested according to ASTM D 746.
 - *Modified.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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.



**MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00**

| 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 ±1%.
 - GSE UltraFlex White Smooth 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°C when tested according to ASTM D 746.
 - *Modified.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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.



| 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.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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 |



**MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00**

- 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 | 830 | 700 | 520 | 400 | 330 |
| | Single-Sided Textured | | 1,010 | 780 | 540 | 410 | 330 |
| Roll Width ⁽⁴⁾ , 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 |



-
- 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 $< -77^{\circ}$ C when tested according to ASTM D 746.
 - *Modified.



**MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00**

| 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 | 830 | 700 | 520 | 400 | 330 |
| | Single-Sided | Textured | 1,010 | 780 | 540 | 410 | 330 |
| Roll Width ⁽⁴⁾ , 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 |



- 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 $< -77^{\circ}$ C when tested according to ASTM D 746.
 - *Modified.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
 023107-00

| 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 |



- 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 $< -77^{\circ}$ C when tested according to ASTM D 746.
 - *Modified.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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 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) | 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 | | 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 | | 17,550 | 12,150 | 9,225 | 7,425 |

- 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.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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 | 700 | 520 | 400 | 330 |
| | Single-Sided | Textured | 650 | 420 | 320 | 250 |
| Roll Width ⁽²⁾ , 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⁾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.



**MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00**

| 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 ±1%.
 - GSE UltraFlex White Textured 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°C when tested according to ASTM D 746.
 - *Modified.



MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00

| 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 | 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 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 ±1%.
 - GSE UltraFlex Leak Location Textured 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°C when tested according to ASTM D 746.
 - *Modified.



**MATERIAL SPECIFICATIONS PLAN
EARTHSTONE RECYCLE
LEA COUNTY, NEW MEXICO
023107-00**

| 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 ±1%.
 - GSE UltraFlex Leak Location White Textured 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°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.



•

| 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 |

•

| 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.
 - 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*.



| 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
2. by Extrusion Plastometer
3. D 1505-98 Standard Test Method for Density of Plastics by the Density-Gradient Technique
4. 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
5. D 4355-02 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
6. D 4491-99 Standard Test Method for Water Permeability of Geotextiles by Permittivity
7. D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles
8. 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
9. D 4751-99 Standard Test Method for Determining Apparent Opening Size of a Geotextile
10. 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
11. D 5261-92 (1996) Standard Test Method for Measuring the Mass Per Unit Area of Geotextiles
12. D7005-03 Determining The Bond Strength (Ply-Adhesion) of Geocomposites
13. 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
 - 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.



| 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*.



C147L REGISTRATION PACKAGE
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

APPENDIX F

OPERATING AND MAINTENANCE PLAN



Select Energy Services (Select) is proposing to construct three (3) storage pits and two (2) Above Ground Storage Tanks (AST) in Section 16, Township 19 South, Range 33 East, Lea County, New Mexico. The Earthstone Recycle shall consist of five containments with a total operational volume of approximately 2,364,000-bbl.

OPERATION AND MAINTENANCE PROCEDURES

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

The operator will operate and maintain the lined earthen containment and AST 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 and AST 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 D*, 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.



C147L REGISTRATION PACKAGE
EARTHSTONE RECYCLE FACILITY
SECTION 28, TOWNSHIP 19 SOUTH, RANGE 33 EAST
LEA COUNTY, NEW MEXICO
023107-00

APPENDIX G

CLOSURE PLAN



Select Energy Services (Select) is proposing to construct three (3) storage pits and two (2) Above Ground Storage Tanks (AST) in Section 16, Township 19 South, Range 33 East, Lea County, New Mexico. The Earthstone Recycle shall consist of five containments with a total operational volume of approximately 2,364,000-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 storage pit and AST are expected to contain a small volume of solids, the majority of which will be windblown sand and dust with some mineral precipitates from the water.

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 workover 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 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 Services
Earthstone Recycle Facility
Closure Cost Estimate**

| Item | Units | Quantity | \$/Unit | Estimate Cost |
|--|-------|-----------|--------------|------------------------|
| Facility Closure | | | | |
| 1 Fluid removal | | | | |
| Earthstone Recycle Pits (748K bbls Each) | bbls | 2,244,561 | \$ 0.50 | \$ 1,122,280.50 |
| Earthstone Recycle ASTs (60K bbls Each) | bbls | 120,000 | \$ 0.50 | \$ 60,000.00 |
| 2 Vac truck (final fluid removal) | hrs | 24 | \$ 125.00 | \$ 3,000.00 |
| 3 Liner removal (fold-in-place) | | | | |
| Covers removal and disposal | SF | 4,538,550 | \$ 0.18 | \$ 816,939.00 |
| 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 | \$ 2,500.00 | \$ 2,500.00 |
| Misc equipment clean-up and removal | hr | 120 | \$ 125.00 | \$ 15,000.00 |
| Removal of AST | LS | 2 | \$ 50,000.00 | \$ 100,000.00 |
| 5 Site Restoration | | | | |
| Dozer - push in berms (bid) and final grading of the site | CY | 206,698 | \$ 2.25 | \$ 465,070.50 |
| Re-vegetation | ea | 1 | \$ 5,600.00 | \$ 5,600.00 |
| Estimated Total | | | | \$ 2,607,890.00 |

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



June 28, 2023

Ms. Victoria Venegas
New Mexico OCD
(575)-909-0269
victoria.venegas@emnrd.nm.gov

Re: Earthstone Application Addendum

Ms. Venegas,

Enclosed in this document are the requested cross-sections for the AST Leak Detection Systems. Please note that there will be two (2) ASTs placed at this facility. Both ASTs will be constructed the same and will have identical leak detection systems.

These two ASTs will be treated the same as the earthen containments planned for the facility. These ASTs will follow the same operation and maintenance procedures, monitoring and inspection procedures, and will follow the same closure plan.

All necessary C-147 forms and variances for these ASTs were included in the original submission. These ASTs were also included in the Closure Cost Estimate that was originally submitted.

ENVIROTECH ENGINEERING AND CONSULTING INC.

Sincerely yours,

A handwritten signature in black ink, appearing to read "M. Ratke".

Mitchell Ratke, EIT
Project Engineer

COPYRIGHT
This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

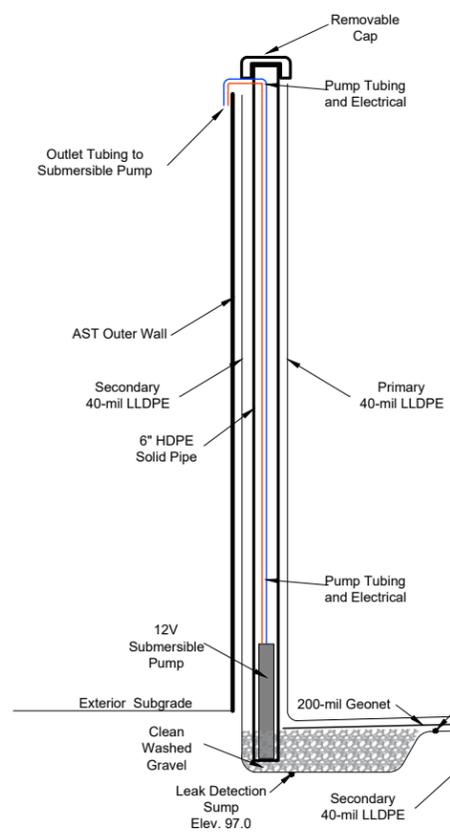
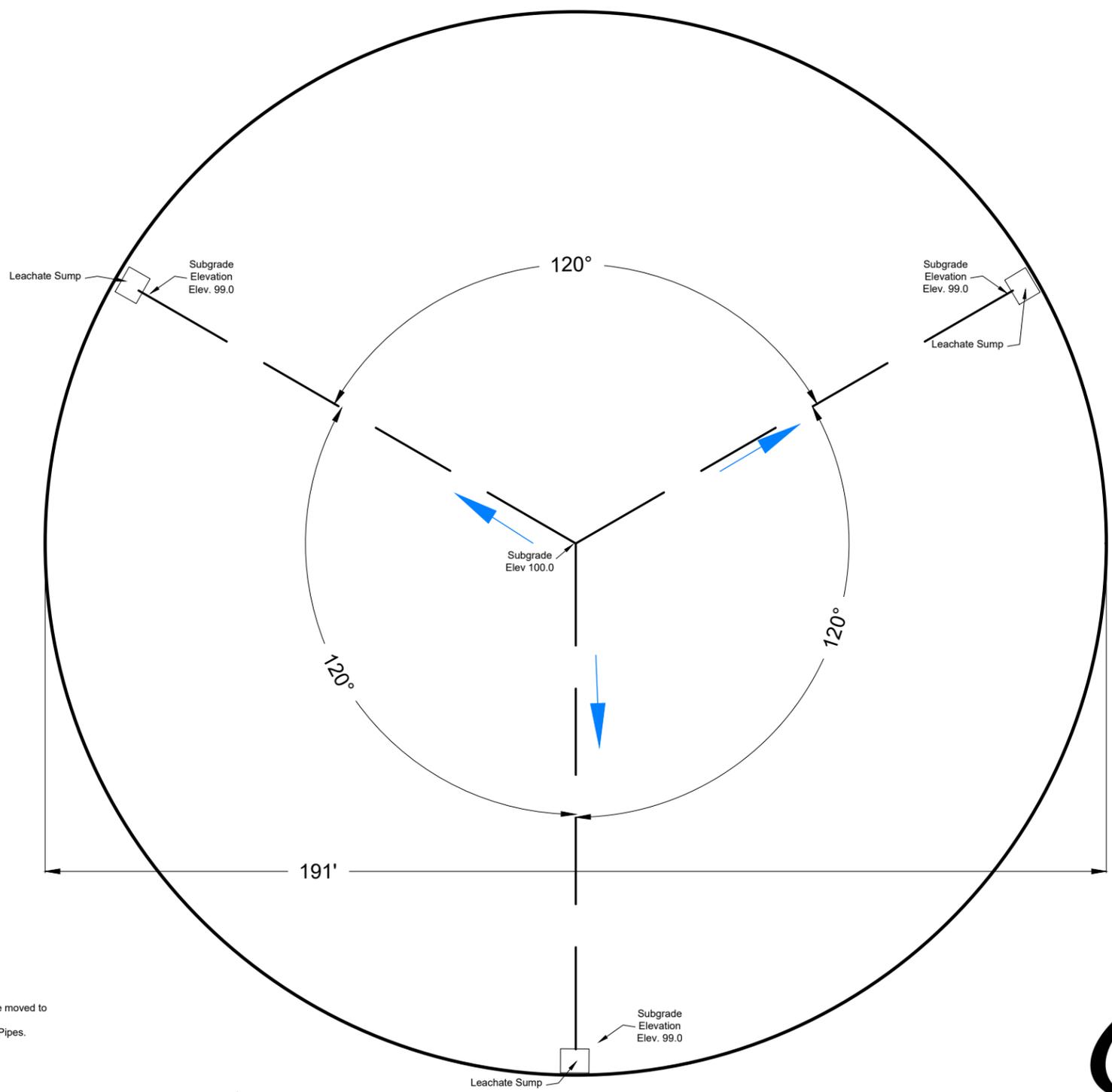


60K AST CONSTRUCTION
Earthstone Recycle
Select Energy
Section 28, Township 19 South, Range 28 East
Lea County, New Mexico

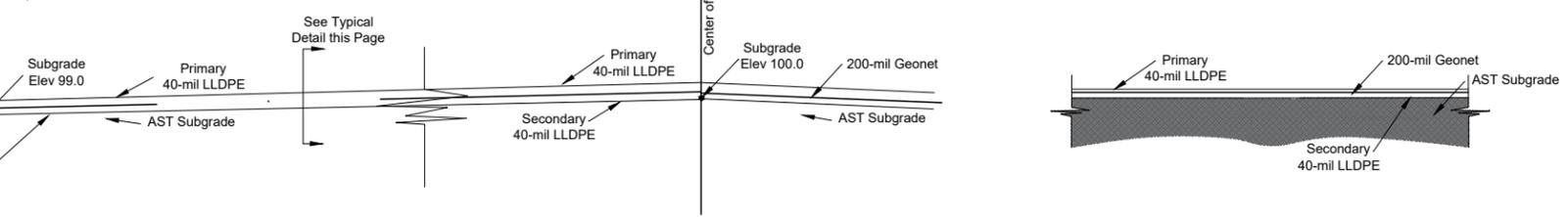
| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | NTS |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO.: | 023107-00 |

Figure 1

Utilize Leak Detection System below for AST
Leachate Flow Direction



- General Notes:**
- 12V Submersible Pump shall be mobile to be moved to each of the 3 standpipes as need.
 - Level Sensor Probe in 1 of 3 Leak Detection Pipes.
 - All HDPE Piping to be SDR 17



Developed in Conjunction With



Tyler Joe Williams
TYLER JOE WILLIAMS
NEW MEXICO
26432
PROFESSIONAL ENGINEER
6/28/2023

2020



Well Water Solutions and Rentals Inc.

STANDARD OPERATING PROCEDURE (SOP)

WELL WATER SOLUTIONS AND RENTALS INC | 1150 Coyote Bar Nunn, WY 82601

TABLE OF CONTENTS

SECTION 1.01 INTRODUCTION

- 1) ABOUT
- 2) BACKGROUND
- 3) SOP PURPOSE
- 4) EH&S PROGRAMS
- 5) SUMMARY

SECTION 1.02 AST PLANNING AND PREPARATIONS

- 1) PLANNING
- 2) REQUIRED AST ORDER INFORMATION
- 3) SITE MEETING OR SCHEDULING CALL
- 4) SITE SOIL PREPARATION
- 5) PRE-MOBILIZATION ON-SITE MEETING
- 6) CALL BEFORE YOU DIG "811"
- 7) AST MATERIAL DELIVERIES

SECTION 1.03 WWS AST PRE RIG UP REQUIREMENTS

- 1) LOADING REQUIREMENTS
- 2) JOB SAFETY ANALYSIS (JSA)
- 3) CHECK SOIL CONDITIONS
- 4) PROPER TANK POSITIONING
- 5) EQUIPMENT (WWS PROVIDED)
- 6) HAND TOOLS RECOMMENDED

SECTION 1.04 WWS AST RIG UP PROCEDURE

- 1) TANK LAYOUT
- 2) INITIAL TANK ERECTION PROCESS
- 3) SECONDARY CONTAINMENT LINERS AND INSTALLATION
- 4) TANK WALL ERECTION
- 5) PROPER LINER PLACEMENT AND CLAMPING
- 6) INSTALLING TANK ACCESSORIES
- 7) AST COMPLETION STEPS

SECTION 1.05 AST IN USE OPERATIONS

- 1) INSPECTIONS AND MONITORING
- 2) INITIAL LEAK DETECTION AND LINER REPAIR

SECTION 1.06 WWS AST RIG DOWN PROCEDURE

SECTION 1.07 WWS AST ENGINEERING STAMPS

SECTION 1.08 WWS AST ENGINEERING SPECS

SECTION 1.09 PROPER AST SETBACK AND LOCATION SAMPLE

SECTION 1.10 JLG APPROVED TELEHANDLER ATTACHMENT AND LOAD CHART

SECTION 1.11 WWS MAN BASKET UPDATED ENGINEERING DRAWINGS

SECTION 1.12 WWS MAN BASKET STAMP AND SOP

SECTION 1.13 GEOMAMBRANE FABRICATION MANUAL AND TESTING CHART

SECTION 1.14 GEOMEMBRANE INSALLATION

SECTION 1.15 WWS PREFERRED LINER SPEC OR COMPARABLE SUBSTITUTE

SECTION 1.16 GEO GRID MESH SPEC

SECTION 1.17 PATENTS AND PATENT PROTECTIONS

Section 1.01 Introduction

1) About

Well Water Solutions and Rentals Inc. aka (WWS), is the original pioneer of the portable Above Ground Storage Tank industry. The above ground storage tanks or AST's have become an integral part in saving cost in the oil and gas and industrial industries. WWS has been supplying and servicing these portable tanks for longer than any other company in the USA. We have focused our time and experience on providing the best tank products at the highest safety standards. We continue to learn and adapt every-day in our industry to make sure our employees are safe and our customers are happy.

Standard Operating Procedures or (SOPs) are a staple for safety and quality here at WWS. Our SOP for our above ground storage tank (AST) systems including planning, rig up, operations, and rig down. This SOP will discuss steps to be taken to promote the safest process, as well as list the potential hazards that should be identified and reviewed during our JSA prior to beginning the work process.

2) Background

WWS has over 170 AST's that are used for a variety of oil field and industrial applications within the fluid management operations. AST's can be used in place of traditional 500 BBL trailer tank farms and in-ground water impoundments, and are suitable for fresh water as well as production water. WWS tanks have standard sizes, ranging from 6,000 barrel (bbl) capacity to 60,000 bbl capacities. Through intensive design criteria WWS secured a patented design on the strongest possible design for an AST tank. We analyzed many methods to secure the panels together and all other methods failed our criteria. We have also set a standard in the industry for safe movement of the panels with our patented adaptor plate for a quick attach telehandler. We were able to successfully submit engineering documentation to the Oshkosh Corporation, which owns JLG and they have stamped and approved our adaptor plate.

3) SOP Purpose

WWS will extensively review this SOP with all new hire employees to assure proper understanding of all procedures. This SOP will also be reviewed with an employee if his/her responsibilities change under the plan. An electronic copy of this plan will be available at all WWS regional offices.

Training our employees to follow our SOP is the first step to a safe and successful work environment. We also need all our employees to treat everyone with respect and follow the lead of their supervisor to make sure every day is safe.

STOP WORK authority and who has the power to use it is another tool we use to help everyone stay involved in the safety process. We highly encourage all employees to feel comfortable in raising awareness of any unsafe situation happening or providing suggestions to help make any task safer as well. This helps everyone grow to be a stronger team.

This SOP may also be used to inform customers about WWS's typical equipment and procedures for setting up an AST system. This SOP will be reviewed and revised on an ongoing basis to keep pace with best oilfield and industrial practices and applicable OSHA regulations.

4) EH&S Programs

This SOP recognizes that oil and gas operating companies have developed their own health, safety, and environmental (HSE) programs that contractors who work at customer's sites like WWS, must comply with. In addition to this SOP, WWS personnel will strictly observe the policies and procedures of each operating company they are to do work with.

5) Summary

This SOP recognizes that oil and gas operating companies have developed their own health, safety, and environmental (HSE) programs that contractors who work at customer's sites like WWS, must comply with. In addition to this SOP, WWS personnel will strictly observe the policies and procedures of each operating company they are to do work with

Section 1.02 **AST Planning and Preparations**

1) Planning

Proper planning and documentation will help assure a successful AST rig up and rig down. The following steps can be utilized to fully, safely, and accurately perform the tank rig up or rig down:

- AST Order Information
- Customer Meeting
- Soil Conditions and Pad Preparation (Completed by Customer)
- Pre-Mobilization and On-site Meeting
- Notifications
- Job Safety Analysis (JSA)
- AST material requirements for delivery

2) Required AST Order Information

WWS Manager or Field Supervisor will record general AST order information including the following:

- Site location directions and coordinates
- Customer Contact Name, Phone, and Email
- Emergency Medical Contacts
- Special Safety Requirements
- Tank Utilization Dates
- Tank size and Accessories
- Special piping requests

3) Site Meeting or Scheduling Call

Prior to finalizing the delivery schedule, a meeting or conference call is held with WWS and our customers required personnel to make sure all parties are coordinating well and have the same and accurate information.

This meeting is best done in person, but must at least be covered in a phone call, followed up by a brief email confirming the AST order details, delivery schedule, and noting special conditions, safety requirements, verification of pad preparation, etc.

KEY MEETING TOPICS:

- Introduce all WWS key personnel to our customer's key personnel
- Review what tanks are needed and what use they will be needing them for
- Review AST scope of work, what is normally included, what is not
- Confirm AST size(s) to be used
- Assure a 20' working space around each tank for safe working area
- Permitting for AST (as needed)
- Current site conditions and soil preparation requirements
- Site access and truck route requirements, and any weather-related issues that could affect them
- Time line for rig up and rig down of the AST
- Detailed drawings of the location layout for tank and piping placement
- Details on "Fresh Water" source to fill the tank on the day of the set up
- Assure a minimum of 24" of water the day of the setup to quickly and safely complete the job
- Identify what other charges could be incurred by the customer and result in standby time or additional charges
- Confirm customer is responsible for the used liner, residual solids left in the tank, removal of all radioactive NORM materials, and site reclamation
- Review any and all additional safety requirements the customer may have
- WWS to follow up with an email to review all changes made

4) Site Soil Preparation

Preparation of the soils on site is required to form a dependable base for the AST.

Preparation of the tank pad is solely the responsibility of the customer/operating company.

WWS Soil Requirements are:

- Minimum soil compaction of 95% compaction
- Soil testing results shall be shared with WWS if requested
- Site must be cleared and free of debris such as sticks, sharp rocks, and trash etc.
- WWS recommends soil compaction testing to be conducted via Standard Proctor Test (American Society for Testing and Materials {ASTM} Standard D698) or Modified Proctor Test (ASTM Standard D1557)
- Compaction test results must be provided to WWS prior to the commencement of AST construction upon request
- Proof roll testing maybe be used if there is doubt of site compaction standards
- Grade of the inner AST area to be a maximum of .25% or 3" drop per 100' towards sump location
- Site shall be graveled and rolled prior to tank installation, utilizing gravel size 2B or smaller. (3/4" road grade preferred, or coarse sand with minimum thickness of 4 inches)
- *Do Not Use* crushed rock as sharp edges could puncture the tank liner

Completions of all these steps will assure a smooth, safe, and seamless tank set up.

5) Pre-Mobilization Onsite Meeting

WWS's AST team will conduct a pre-mobilization onsite meeting with the customer that documents the customer requirements for the specific pad location and AST system.

6) CALL BEFORE YOU DIG "811"

Even though the customer or their subcontractor may have already called for utility locates for the sump hole, the WWS field supervisor should call the local or state underground utility location service again at least 3 days in advance before construction/digging begins. The ticket or reference number provided by the one-call service will then be documented.

The following web site has contacts for all the states and provinces.

<http://www.call811.com/state-specific.aspx>.

Call **811** in United States

7) AST Material Deliveries

Once the delivery route and schedule are established and the pre-project onsite inspection is completed, the AST materials can be delivered. Updates and notifications will be made as agreed to during the customer meeting. WWS delivery personnel will use a spotter for the equipment driver and should unload all materials safely taking extra care to avoid damage to liners, plates, and all other AST components. Should any problem arise during the scope of operations the WWS field supervisor will notify to correct customer contact to remedy the issue.

Section 1.03 WWS AST Pre Rig Up Requirements

1) Loading Requirements

WWS will have the field supervisor complete a "**Dispatch Load In Load Out Sheet**" before and after the set-up and rig down of the AST system. This sheet will identify all the needed parts and accessories to complete the AST Rig Up. During Rig Down the "Dispatch load in load out sheet" is also filled out to ensure all parts and accessories are accounted for and in good working condition. In the event parts or accessories are missing and/or damaged the customer will assume full responsibility and be billed back for the parts and accessories.

2) Job Safety Analysis (JSA)

A job safety analysis (JSA) must be completed on-site prior to the beginning of any work. The JSA will be completed according to WWS protocol and safety programs. Customer's safety requirements will also be communicated during the JSA. All personnel, third party contractors, and customer representatives are expected to participate and sign the JSA when the JSA is completed.

3) Check Soil Conditions

Preparation of the tank pad is solely the responsibility of the customer.

However, bad weather such as wind, rain, and snow events can change the soil conditions quickly. If soil conditions change the WWS field supervisor will notify the proper customer contact.

4) Proper Tank Positioning

- Check proposed AST site to confirm that a 20' clear work area around the perimeter of the tank is possible to provide access for equipment and laydown area for AST materials and erection equipment

- Check that the minimum setback distances to existing wells, power lines, etc. are met
- Mark out the tank location using WWS marking equipment
- Establish and mark out final location for the fill and suction tube(s) and stairs

5) Equipment (WWS provided)

All equipment is subject to daily inspection. (Check condition, rigging, oil, water, fuel and cleanliness.) Here is a list of the recommended equipment needed to set a tank. Actual equipment used will vary among region and specific projects.

- One 40' and/or 60' extending straight or z boom man-lift
- 10,000 lb. or greater capacity, rough terrain forklift (JGL 10-43A is preferred telehandler)
- Backhoe or small excavator with bucket
- Skid steer

6) Hand Tools Recommended

All hand tools are subject to daily inspection.

- Two 16' ladders
- Four 4 lb. sledgehammers
- 100' or 200' tape measure
- 1 case of marking paint – minimum
- Set of wrenches ¼" – 1 ½"
- Set of sockets ¼" – 1 ½"
- One small pry bar
- 8' rock bar (digging bar)
- Five safety harnesses with retractable tethers
- Five retractable lanyards
- Duct tape
- Covered hook bladed knife
- Three 40' lifting straps (minimum of 5,000 lb capacity)
- Three 20' 3/8" chains (must have visible certification tags)
- Two rolling head pry bars
- Two ½" impact guns
- Two sets of rigging chains
- Patch tape
- Rubbing alcohol
- Patch roller
- Leather gloves
- Wire brush or wheel with 4" angle grinder
- Generator
- Steel toed rubber boots
- All personnel must have Fire retardant clothing (FRs) Safety Hard Hats, Safety Glasses, crush resistant gloves and any safety requirements from customer

Section 1.04 AST Tank Rig Up Procedure

WWS Field Supervisor will double check all paper work and location prior to setup to assure everything is correct and ready to set the AST.

1) Tank Layout

- Determine center of tank and mark with paint. Place a non-abrasive item on the center point; preferably a sandbag. This will be used to find the center of tank after liners have been placed
- Measure and double check minimum distance from tank center to existing wells or other set backs
- Measure and paint a line to mark the circumference of tank for panel placement using WWS special design marking tool
- Also mark 15' outside the tank circumference as this will show where the liner should reach once fully stretched flat. This will assure enough liner is present to go over tank walls once placed

2) Initial Tank Erection Process

- Determine where suction pipe is to be located in the tank
- Dig at least 4' wide x 6' long x 16" deep sump hole for over the wall suction pipe to set into and taper the edges so there are no sharp corners of the excavation. Or dig 3' wide x 12' long x 10" deep sump hole for undermount suction pipe
- Remove any sharp stones and debris for the digging process
- If multiple suction manifolds are required, the sumps should have a minimum of 15' of separation

Attention:

Barricade any sump pit with appropriate cones, tape, equipment, and/or have a hole watch if left open.

- All tank set-ups will utilize a standard 10oz geotextile that will be laid on the grounds surface to act as a padded protector for the liner
- A Standard LLDPE 30 mil or 40 mil liner will then be used as the primary containment, but may also be used as a secondary containment within the tank upon request.
- Check customer specifications and regulatory permitting to assure proper liner and containment requirements are met for ASTs
- Organized crew inspection walks for the entire tank base area will be performed to pick up any sharp stones or other sharp debris that could damage the liner
- The geotextile pad can now be deployed out fully at this point. It should reach beyond the tank circumference paint lines by 1'-4'
- Once geotextile is completed the liner can be fully deployed. Crews will double check that the liner will reach to the 15' marks beyond the tank circumference
- Crews will then perform a visual inspection of the liner and repair any defects as necessary
- Fold the liner towards the middle of the tank until tank circumference paint line is fully exposed

3) Secondary Containment Liners and Installation

- If tank system requires a secondary liner and leak detection system this will be installed on top of the first liner
- WWS Field Supervisor will direct the installation of the various parts and layers of the secondary containment system

- For example, a 220-mil geo grid mesh (Reference Section 1.16 for Spec) or other suitable approved spacer material can be installed between the top and bottom liner layers to provide a separation for to water flow. Installation of inspection pipes into to the designed low points of the tank will later be used for leak inspections
- Install any other customer required components for the leak inspections if needed
- Unroll top liner over geo grid to completed the secondary containment system
- Follow the same setup guidelines for a one liner system for the two-liner system, and make sure to complete the components installation fully once the first liner is clamped.

4) Tank Wall Erection

- Field Supervisor will complete a visual inspection of each panel as it is prepared to be placed
- The first tank panel will be placed and secured using the backhoe bucket
- Once backhoe fully secures the panel the telehandler can then get the next panel. Crews will continuously provide operators with spotters during all operations
- If higher winds exist crews are cautioned to pay special close attention to all operations
- Crews will repeat the panel placement process until entire tank is erected
- Personnel secured on man lift or using a ladder (depending on customer policies) then secure the panels in place with 14 retainer pins per panel.

ATTENTION:

Proper hand and foot placement is crucial when connecting AST panels. Keep hands and feet a safe distance from pinch points. Discuss where these pinch points are located when reviewing the JSA. Keep the joints in mid-range; i.e. palms are located between waist and shoulders. Create an awareness that never goes away and designate one individual to enforce the awareness when setting panels.

- Roll up excess geo pad into minimum 6" diameter cylinders around the inside of the tank ring to help support the liner at the base of the tank wall as the tank is being filled.
- Prior to lifting liner into place against inside panel, add geo strips over all panel connections points and use spray glue to secure in place
- Prior to covering sump with the geo pad or liner, confirm sump excavation has smooth sides and corners, and that no sharp stones are present.

5) Proper Liner Placement and Clamping

- After 3 or more panels are set, and all liner protections are complete, crews inside the tank can begin to hand liner up to crews outside the tank that are in the manlift
- Crew of 2 inside the tank wall unfolds and pulls the liner toward each panel (final connection of last panel will not be made until all liner to that point is pulled and secured to avoid confined space, all personnel must be out of tank before walls are closed)
- The inside crew of 2 works with the manlift crew of 2 located outside to pull the liner up and over the top of each panel. The man lift crew lifts the liner using ropes/straps gently lowered and attached (by the inside crew). The man lift crew lifts a small liner section to

the top of the panel and folds it over the top of the panel, being sure there is enough slack in the liner inside the panel wall

- Proper slack or excess liner on the vertical wall can be tested by the inside crew. The crew will pin the liner to the bottom of the wall with their boot and pull liner at chest level outwards away from the wall. There should be about 3' from wall to liner when being pulled. This is the appropriate amount of slack. If crew ever has doubt that the liner slack may not be enough WWS's experience has proven more slack the better, so just give it a little more slack if needed

NOTE: The crew must allow sufficient slack in the liner at the wall to allow for liner movement during filling and draining.

ATTENTION: Never place hands on the railing of the man basket that faces the AST panel. Proper hand placement would be the side or back rail.

- Once a section of liner is positioned properly (with liner slack inside the tank) and over the top of each panel wall, the man lift crew secures the top of the liner with clamps. (Tools in basket secured with tool lanyards) NOTE: Each clamp is notched where D-rings on the top of each panel are located. This notch acts as an added safety retainer once clamps are fully tightened. Each panel will receive 2 liner clamps
- Crews will continue to clamp until they have reached the final panel. Crews will leave this small area of liner down until all internal piping is completed

6) Installing Tank Accessories

- Install safety stair system, fill piping, and suction piping. Ensure that stair system and piping are appropriately secured to the tank walls with ratchet straps or chains
- Assemble all interior piping and assure any connections or sharp points are fully wrapped in geo material for protection

7) AST Completion Steps

- Close final panel and secure with pins
- Lift liner and secure at the closure point to finish clamping process
- Trim liner and allow approximately 2' of liner to hang over edge of tank.
- Begin to fill the tank with water and monitor filling process
- Inspect all connections and equipment, confirming at least 2 liner clamps are in place on top of each panel
- Have a minimum of 24 inches of water put in the tank to hold liner in place
- Fill tank and monitor
- Perform periodic inspections of the tank to ensure everything is in proper working order
- Every time a tank is fully emptied and refilled, an inspection must be performed
- Water should NEVER go below 12 inches at the LOWEST level in the tank. (Mark liner as a caution).

NOTE: Filling process may begin as early as ¾ of the tank wall panels are set. Only fresh water can be used if filling while personnel is in the tank. Reasons for early filling is to assist with windy days as the water weight help to hold liner in place. It is recommended no personnel be in the tank with more than 6" of water.

Section 1.05 AST In Use Operations

1) Inspections and Monitoring

AST Operation Phase includes periodic AST monitoring, leak detection, and identifying potential hazards that may have developed, change on-site conditions or tank use. If the tank is drained, it should be secured from wind impacts and the liner inspected and re-positioned (to provide sufficient slack during filling) prior to refilling. Specifically, it may be necessary to rearrange the liner folds at the walls prior to refilling if the wind has shifted the liner folds when the tank was empty.

If changes are noted, they should be communicated to the WWS Manager/Field Supervisor.

CAUTION – If conditions are observed that could indicate an imminent tank failure, clear the area immediately. Advise others in the vicinity to do so also and contact the customer to drain the tank.

2) Initial Leak Detection and Liner Repair

In the event of a leak in the tank due to a hole in the liner, the following steps should be followed.

- If there is a question that it is in fact a leak from the AST, a dye test or a pH balance test may need to be performed on both the water in the tank and on the ground using approved dye or a properly calibrated pH meter. Third party test results are recommended.
- If the leak is found to be coming from the tank, narrow down from which panel the leak is originating.
- Use a strap or rope to mark the point where the water is coming out of the tank.
- Determine if the water is coming out high or low on the tank.
- Locate the puncture or hole in the liner.
- Empty the tank to the point of damage in liner if necessary.
- Clean area of liner that needs to be repaired.
- Cut out piece of material (patch or tape) to overlay liner.
- Either weld the patch to the injured area in the liner or stick the tape (2 types – dry or underwater) over the leak.
- Make sure puncture is completely covered.
- Monitor as needed.

Section 1.06 WWS AST Rig Down Procedure

The AST breakdown follows the reverse order of the setup steps presented in the AST Rig Up Procedure above. The sump will be filled in with the same material taken out during excavation.

The customer is responsible for draining and disposing of all liquids and residual solids that have accumulated in the tank. Additionally, the customer is responsible for proper off-site management or recycling of the liner and geo pad materials, and final grading and/or reclamation of AST site.

Customer is responsible for any removal of radioactive NORM materials before WWS crews can rig down any tank.

Section 1.07 WWS AST Engineering Stamps



June 30, 2015

Well Water Solutions and Rental, Inc.
2130 W. 40th
Casper, WY 82604
Attn: Sean Lovelace

Re: Portable Frac Tank Certification – Pinned Seams

Dear Mr. Lovelace:

Per your request our office has performed a structural analysis of the portable frac tanks as well as the associated accessories. This analysis was performed to determine that the tanks meet the required strength criteria under operating conditions according to the AISC Manual of Steel Construction.

The tanks range in diameter from approximately 81 to 190 feet and are 11 feet, 8 inches in height and are designed to store water. They are constructed of individual steel reinforced panels that are connected together with a patent pending steel pin system.

The following tanks sizes were included in the analysis:

- ⊕ 10,000 BBL – Approximately 81'Ø
- ⊕ 20,000 BBL – Approximately 108'Ø
- ⊕ 30,000 BBL – Approximately 135'Ø
- ⊕ 40,000 BBL – Approximately 156'Ø
- ⊕ 50,000 BBL – Approximately 176'Ø
- ⊕ 55,000 BBL – Approximately 183'Ø
- ⊕ 60,000 BBL – Approximately 190'Ø

The tanks are constructed of the following materials:

- ⊕ Tank Panels – ASTM A36, 36 ksi Steel Plate
- ⊕ Horizontal & Vertical Framing – ASTM A500, Grade B, 46 ksi Structural Steel Tubing
- ⊕ Connecting Pins - ASTM A36, 36 ksi Steel Round Bar



1964 East 1st Street
Casper, WY 82601

PHONE (307) 265-3900
FAX (307) 265-3559
WEB SITE <http://www.pillarse.com>

June 30, 2015

Page 2 of 2

Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

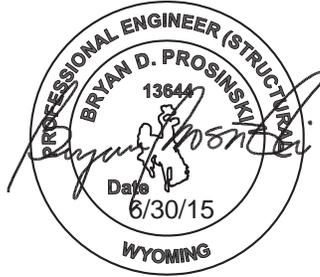
Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

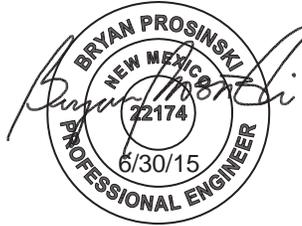
Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

J. Brendan Bummer, P.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

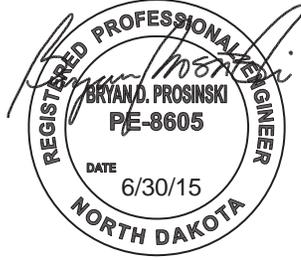
Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering





Box 7866 5014 Industrial Road, Drayton Valley, Ab. T7A 1L5 Ph: (780) 542-3096 Fax: (780) 542-6405

Engineering Compliance

July 6, 2015

KFE Project #151055

Water Well Solutions and Rentals, Inc.
 Attn: Scott Sandler
 2130 W. 40th
 Casper, Wyoming (USA) 82604

Attention: Mr. Scott Sandler

Re: Portable Frac Tank Engineering Review and Compliance – Pinned Seams
Sizes: 10K, 20K, 30K, 40K, 50K, 55K and 60K Tanks

A structural engineering review was conducted by Peter Vann (P. Eng) of Keystone Field Engineering Inc. for the above noted tank sizes. It was determined that the 'pinned' tank panel connections are capable of supporting the operating load conditions; and the panel lift points are of suitable construction according to the Canadian Handbook of Steel Construction (latest addition). The certified liner for the tanks shall have a minimum bonded seam strength of 40 ppi.

If you have any questions, please contact the office at 780-542-3096.

| | |
|---|---------------------|
| PERMIT TO PRACTICE | |
| KEYSTONE FIELD ENGINEERING INC | |
| Signature | <i>Peter Vann</i> |
| Date | <i>July 8, 2015</i> |
| PERMIT NUMBER: P 10239 | |
| The Association of Professional Engineers, Geologists and Geophysicists of Alberta | |



Peter Vann, P. Eng
 Structural Engineer

KEYSTONE FIELD ENGINEERING INC.
 PVI/kj
 Reference:
 Drawings completed by Nalco FabTech

www.keystonefieldeng.com

WWS AST Engineering Specs

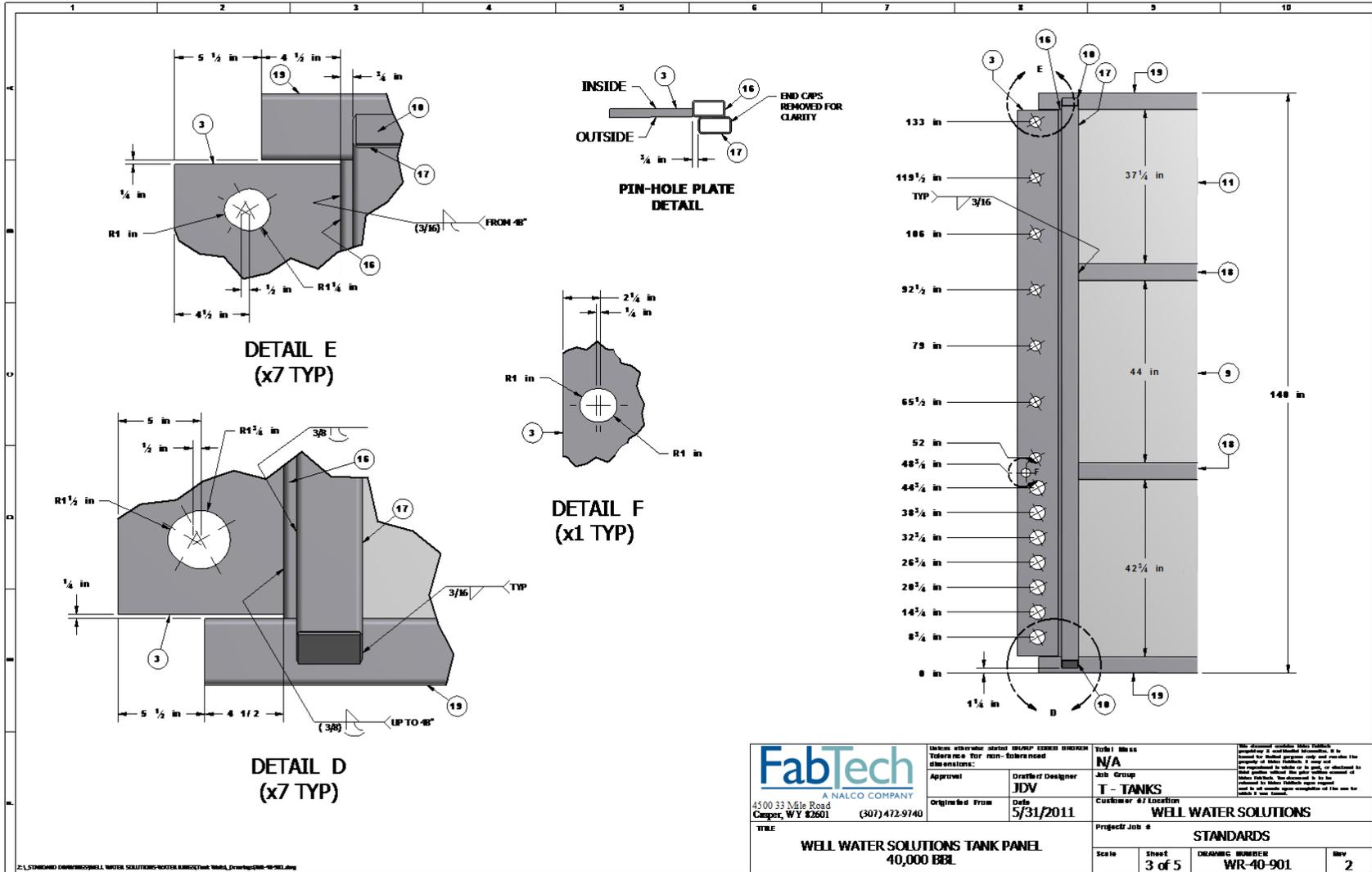
Section 1.08

| CK | ITEM | QTY | DESCRIPTION | WIDTH | LENGTH | MATERIAL | CLENGTH (in) | WEIGHT |
|----|------|--|-------------|-----------|------------|--|--------------|--------|
| 1 | 14 | BAR, ROUND, 5/8" (LOCK PIN) | | | 6 1/2 in | A36 | 6.50 | |
| 2 | 2 | D-RING, 1/2" B38, WORKING LOAD 4000 lbs | | | | A29/ A29M - 91 1045(C-1045), MODIFIED TO WELD DOWN | | 2 |
| 3 | 2 | FBAR, 1" | | 10 in | 131 1/2 in | A36 | 131.50 | 373 |
| 4 | 2 | FBAR, 10GA | | 3 in | 43 1/8 in | A36 | 86.25 | 99 |
| 5 | 2 | PAD EYE, #2 | | | | CROSBY GROUP, S-264 | | 0 |
| 6 | 7 | PM, 2" DIA | | | 4 1/2 in | KUSTOM KONCEPTS, A1018 | 31.50 | 3 |
| 7 | 7 | PM, 3" DIA | | | 4 1/2 in | KUSTOM KONCEPTS, A1018 | 31.50 | 8 |
| 8 | 2 | PLATE, 3/16" | | 3 in | 5 in | A36 | 10.00 | 2 |
| 9 | 1 | PLATE, 3/16" | | 96 in | 240 in | A36 | 240.00 | 156 |
| 10 | 6 | SHEET, 10GA | | 2 1/2 in | 3 3/4 in | A36 | 22.50 | 3 |
| 11 | 1 | SHEET, 10GA | | 42 1/2 in | 240 in | A36 | 240.00 | 50 |
| 12 | 2 | TUBE, 4" x 2" x 3/16" (MITER BOTH ENDS) | | | 52 in | A500B CLEAN COAT | 104.00 | 55 |
| 13 | 3 | TUBE, 4" x 2" x 3/16" | | | 37 1/4 in | A500B CLEAN COAT | 74.50 | 43 |
| 14 | 3 | TUBE, 4" x 2" x 3/16" | | | 42 3/4 in | A500B CLEAN COAT | 128.25 | 74 |
| 15 | 2 | TUBE, 4" x 2" x 3/16" | | | 44 in | A500B CLEAN COAT | 88.00 | 50 |
| 16 | 2 | TUBE, 4" x 2" x 3/16" | | | 132 in | A500B CLEAN COAT | 264.00 | 151 |
| 17 | 1 | TUBE, 4" x 2" x 3/16" (MITER BOTH ENDS) | | | 137 1/2 in | A500B CLEAN COAT | 137.50 | 78 |
| 18 | 2 | TUBE, 4" x 2" x 3/16", (ROLL TO 155'-6 7/8" LD.) | | | 236 3/8 in | A500B CLEAN COAT | 472.75 | 271 |
| 19 | 2 | TUBE, 4" x 2" x 3/16", (ROLL TO 155'-6 7/8" LD.) | | | 253 7/8 in | A500B CLEAN COAT | 507.75 | 291 |

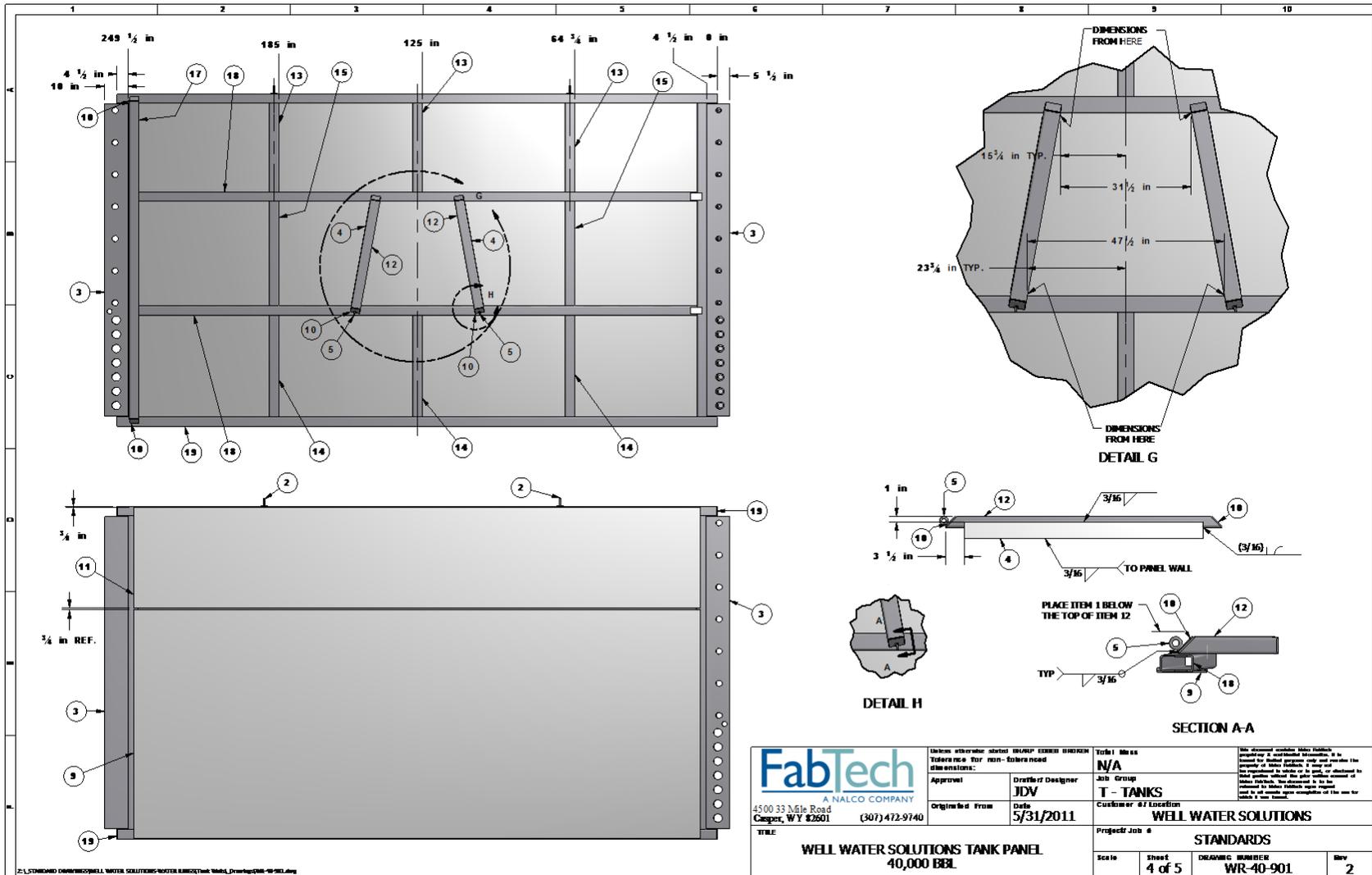
NOTES:
 -THIS DRAWING REFLECTS ONE (1) ASSEMBLY
 -TWENTY THREE (23) PANELS REQUIRED FOR ENTIRE TANK ASSEMBLY

| | | | |
|------------|--|-------------|-----------|
| REV | REVISION | DATE | BY |
| 2 | STANDARDIZE NOTATIONS | 1/17/2012 | JDV |
| 1 | ADDED ITEMS 7, 8, & 16 | 12/09/11 | DSG |
| 0 | FOR CONSTRUCTION REF(11050-901) CHANGED HEIGHT AND LOCATION OF PMS REF(11078-40-901) | 9/1/2011 | CJD |

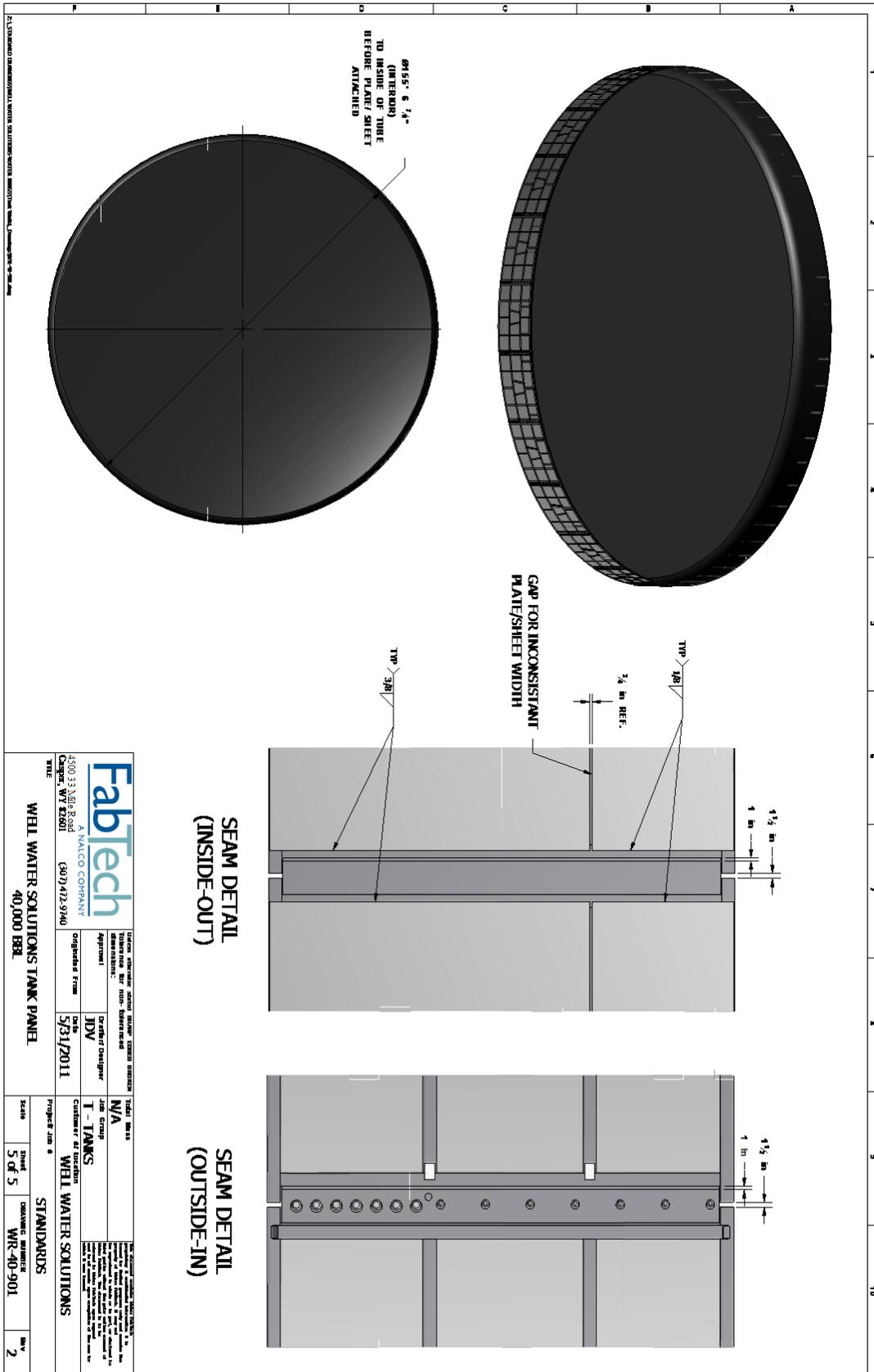
| | | |
|---|---|--|
| FabTech A NALCO COMPANY | Unless otherwise stated DIMENSIONS SHOWN TOLERANCE FOR NON-CRITICAL DIMENSIONS: | Scale N/A |
| 4500 33 Mile Road Casper, WY 82601 Phone: (307)472-9740 | Approval: Drafted by Designer JDV Original From Date 5/31/2011 | Job Group T - TANKS Customer or Location WELL WATER SOLUTIONS |
| Project Job # STANDARDS | | Scale Sheet 1 of 5 |
| WELL WATER SOLUTIONS TANK PANEL 40,000 BBL | | DRAWING NUMBER WR-40-901 |
| | | REV 2 |



| | | | |
|---|--|--|---|
| FabTech A NALCO COMPANY 4500 33 Mile Road Casper, WY 82601 (307) 472-9740 | Unless otherwise stated, ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN INCHES. DIMENSIONS FOR MILLING OPERATIONS ARE IN MILLIMETERS. | Total Mass N/A | See "GENERAL NOTES" for additional information. |
| | Approved: | Drafted/Designer JDV | Job Group T - TANKS |
| Originated From | Date 5/31/2011 | Customer #/Location WELL WATER SOLUTIONS | Project/Job # |
| WELL WATER SOLUTIONS TANK PANEL 40,000 EBR. | | STANDARDS | |
| Scale | Sheet 3 of 5 | DRAWING NUMBER WR-40-901 | Rev 2 |

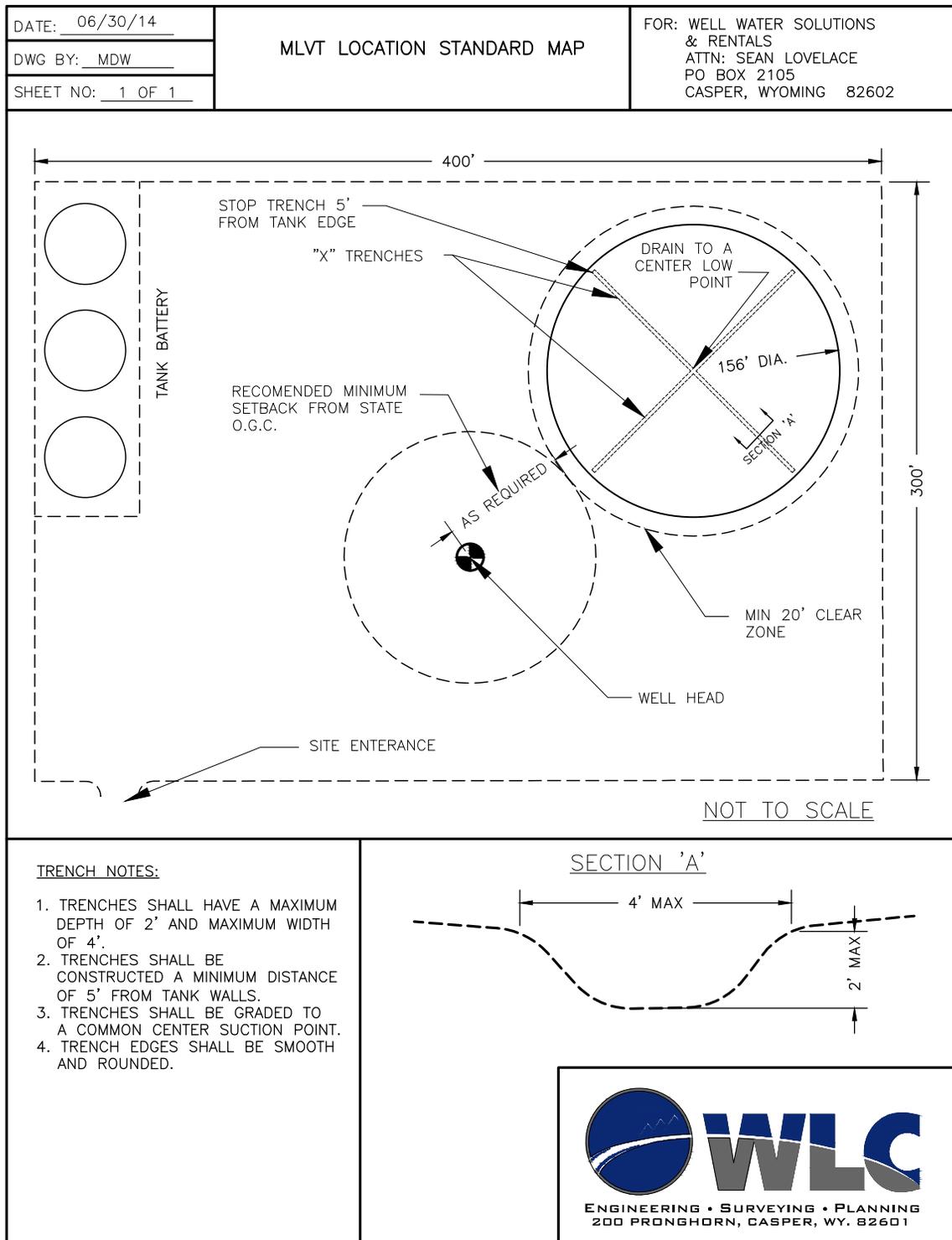


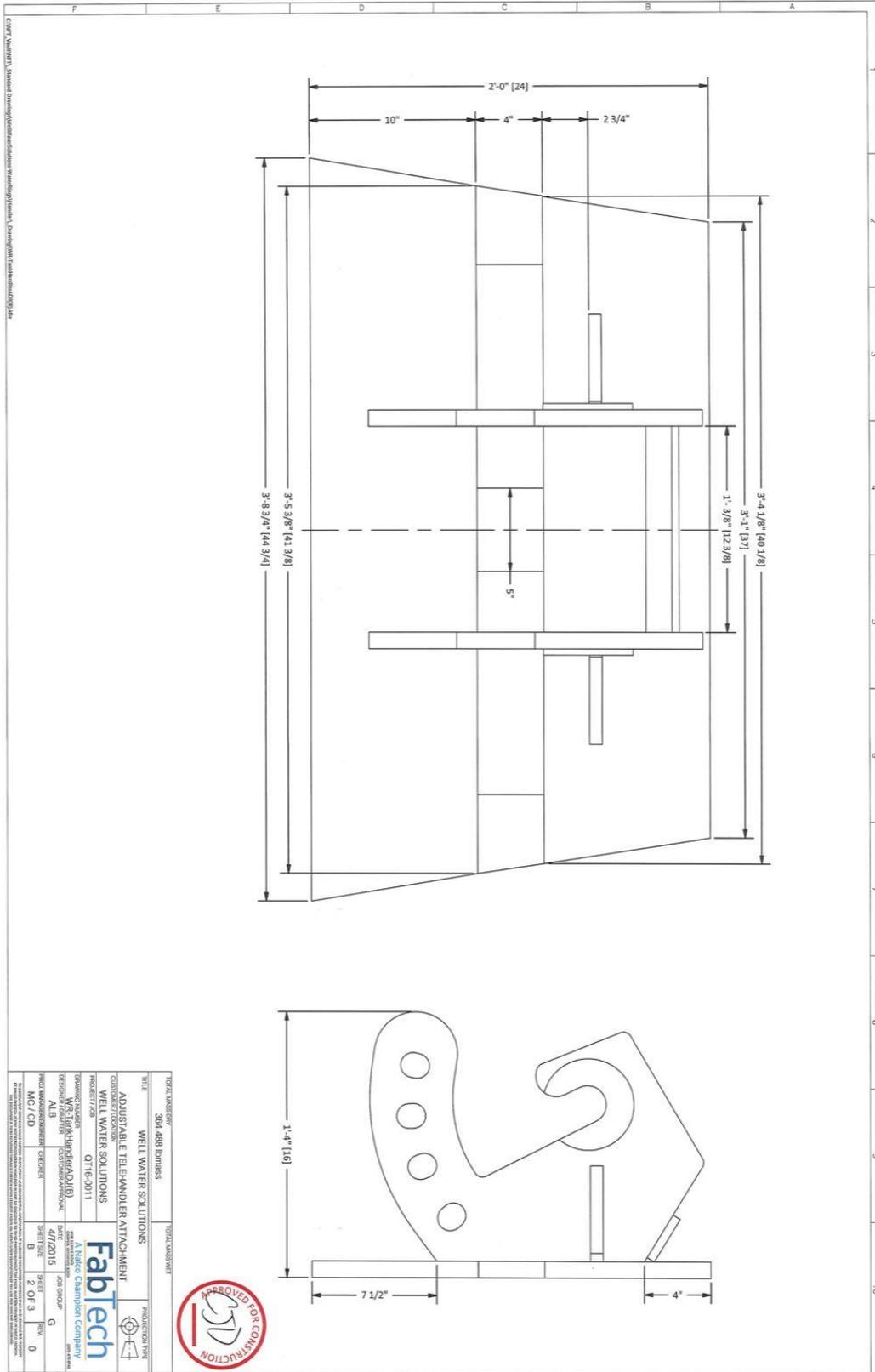
| | | | |
|---|---|--|---|
| FabTech A NALCO COMPANY 4500 33 Mile Road Casper, WY 82601 (307)472-9740 | Unless otherwise stated, DIMENSIONS SHOWN indicate size for non-fabricated dimensions: | Title: N/A Job Group: T - TANKS Customer / Location: WELL WATER SOLUTIONS Project Job #: | See standard material specifications for material and mechanical properties. It is assumed that the purchaser will ensure the material is suitable for the intended use. The purchaser is responsible for ensuring the material is suitable for the intended use. The purchaser is responsible for ensuring the material is suitable for the intended use. |
| | Approved: _____ Drafted/Designer: JDV Originated From: _____ Date: 5/31/2011 | Title: WELL WATER SOLUTIONS TANK PANEL 40,000 BEEL | Scale: _____ Sheet: 4 of 5 DRAWING NUMBER: WR-40-901 Rev: 2 |

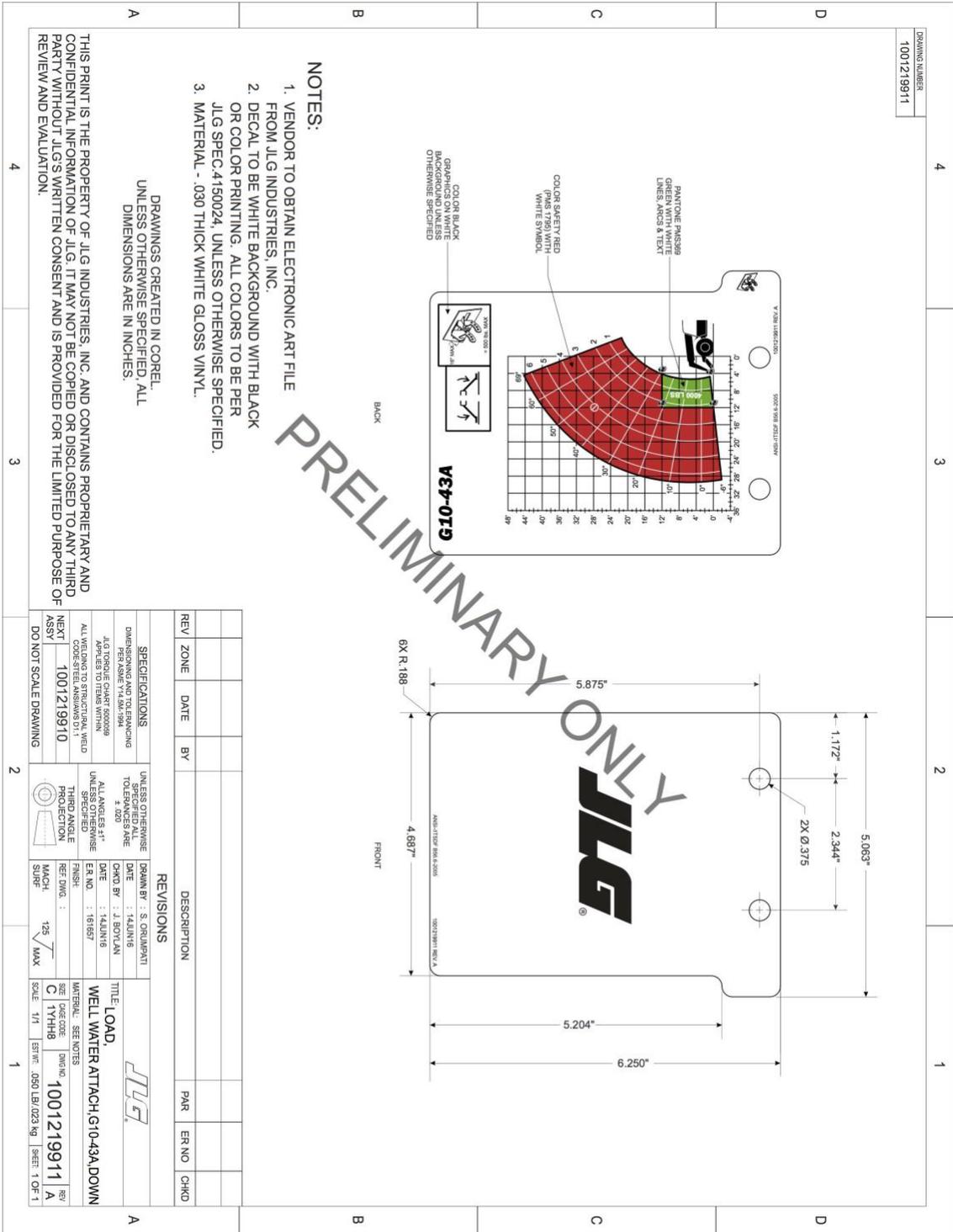


| | | | | | |
|--|--|--|--|---|--|
| FabTech A NALCO COMPANY 4500 2318th Pkwy Casper, WY 82601 (307) 412-9740 | | Fabricator/Manufacturer of Well Water Solutions Approved by: [Signature] Original Date: 5/8/2011 | | Title: WELL WATER SOLUTIONS TANK PANNEI Project No: 40/000 1891 | |
| Total No. of Sheets: N/A Job Group: I - TANKS Customer of Location: WELL WATER SOLUTIONS | | Project No: 40/000 1891 Sheet No: 5 of 5 | | Standards: WIR-40-901 Rev: 2 | |

Section 1.09 Proper AST Setback and Location Sample







DRAWING NUMBER
1001219911

- NOTES:**
1. VENDOR TO OBTAIN ELECTRONIC ART FILE FROM JLG INDUSTRIES, INC.
 2. DECAL TO BE WHITE BACKGROUND WITH BLACK OR COLOR PRINTING. ALL COLORS TO BE PER JLG SPEC 4150024, UNLESS OTHERWISE SPECIFIED.
 3. MATERIAL - .030 THICK WHITE GLOSS VINYL.

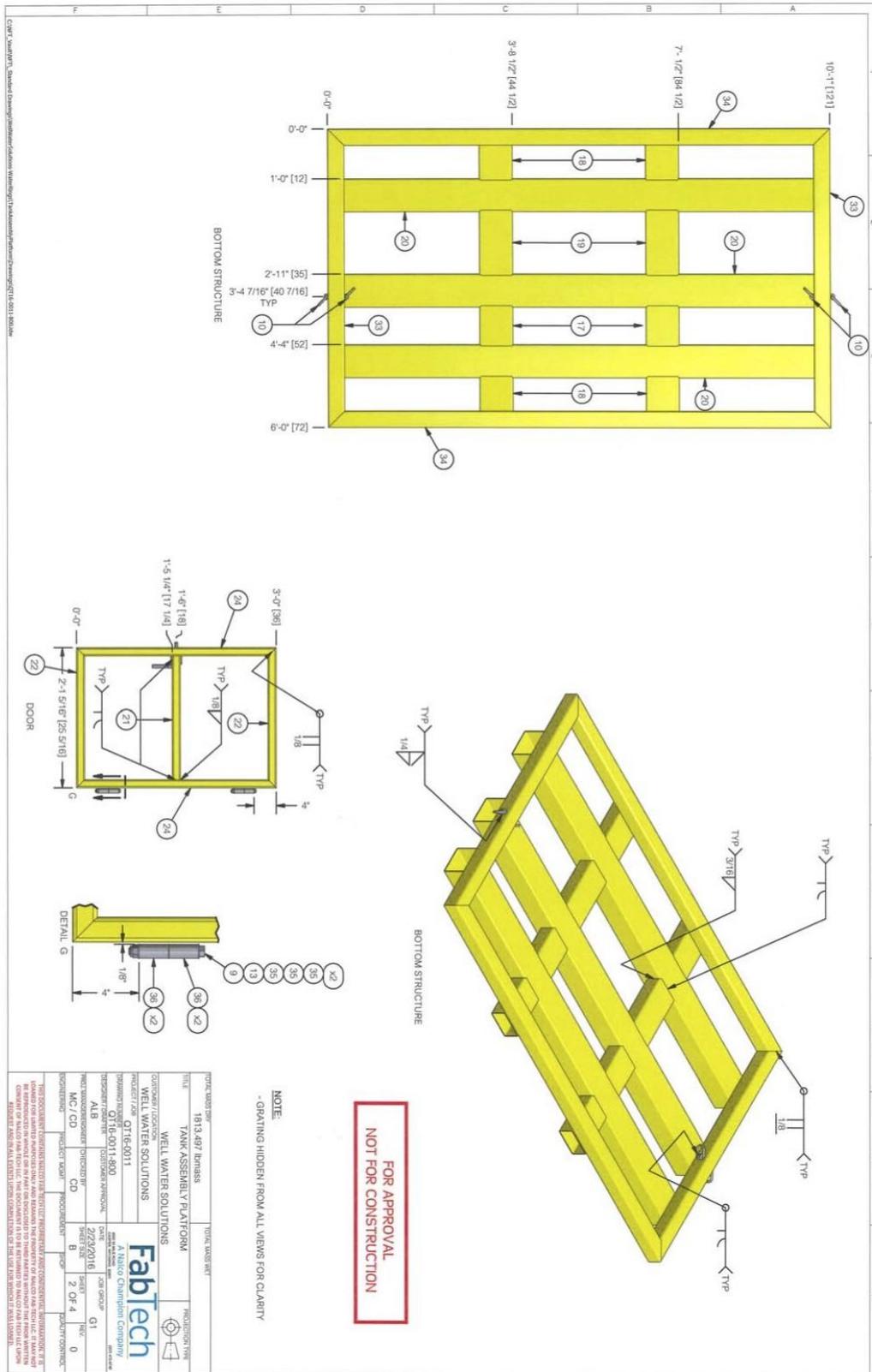
DRAWINGS CREATED IN COREL.
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES.

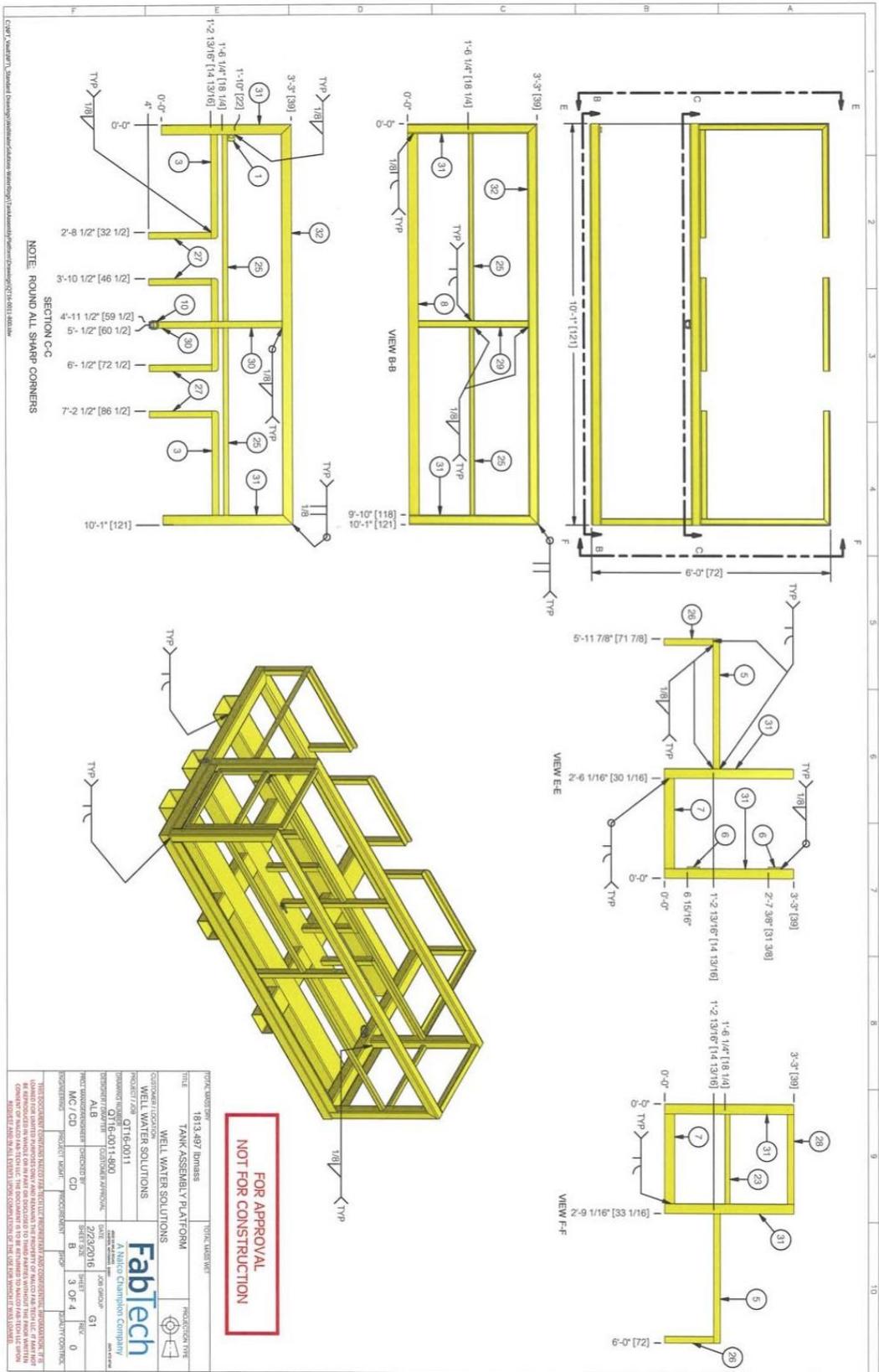
THIS PRINT IS THE PROPERTY OF JLG INDUSTRIES, INC. AND CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION OF JLG. IT MAY NOT BE COPIED OR DISCLOSED TO ANY THIRD PARTY WITHOUT JLG'S WRITTEN CONSENT AND IS PROVIDED FOR THE LIMITED PURPOSE OF REVIEW AND EVALUATION.

| REV | ZONE | DATE | BY | DESCRIPTION | PAR | ER NO | CHKD |
|-----|------|------|----|-------------|-----|-------|------|
| | | | | | | | |

| SPECIFICATIONS | | UNLESS OTHERWISE TOLERANCES ARE ± .020 | | TITLE | |
|--------------------------------------|-------------------------|--|-----------|--------|-------------------|
| DIMENSIONING AND TOLERANCING | AS PER ANSI Y14.5M-2018 | DATE | 14 JUN 18 | DATE | 14 JUN 18 |
| ISO TOPICAL CLASH CHECKING | APPLIES TO ITEMS WITHIN | CHKD BY | J. BOYLAN | DATE | 14 JUN 18 |
| ALL WELDING TO STRUCTURAL WELD CODES | ANSWER 01.1 | EN NO | 161857 | FINISH | |
| NEXT ASSY | 1001219910 | THIRD ANGLE PROJECTION | | MACH | 125 MAX |
| DO NOT SCALE DRAWING | | SCALE | 1/1 | EST WT | .050 LB / 0.23 KG |
| | | | | SHEET | 1 OF 1 |

| REV | ZONE | DATE | BY | DESCRIPTION | PAR | ER NO | CHKD |
|-----|------|------|----|-------------|-----|-------|------|
| | | | | | | | |



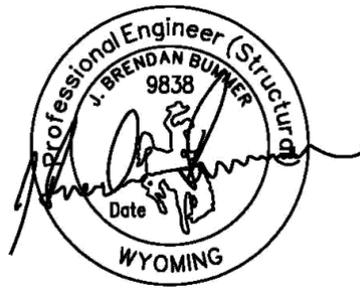


Section 1.12 WWS Man Basket Stamp and SOP

MAN BASKET LOAD RATING

Prepared for: Well Water Solutions and Rental, Inc.
2130 W. 40th Street
Casper, WY 82604

Prepared by: Pillar Structural Engineering



February 3, 2014



1964 E. 1st St.
Casper, WY 82601
P: (307) 265.3900
F: (307) 265.3559

Summary

The purpose of this report is to present the maximum load ratings that resulted from the structural analysis of an existing steel man basket which is currently employed by Well Water Solutions and Rentals, Inc. The man basket is utilized to perform various tasks aiding in the erection of frac tanks and the installation of liner clips on said tanks. The man basket consists of two basket components; the liner clip basket which handles and stores the liner clips, and the man basket which supports the liner clip basket and the human operators. It is our understanding that there are a maximum of two operators allowed to work in the man basket at any given time. The liner clip and man baskets are hoisted and transported with heavy equipment such as a tele-handler or front end loader.

This analysis was performed in accordance with the *American Institute of Steel Construction Inc. – Manual of Steel Construction – Thirteenth Edition*. To complete this analysis, assumptions were made and are listed below.

Scope of Work:

1. Field measure the liner clip and man basket.
2. Perform structural analysis of the liner clip and man basket to determine a safe operating load rating.

Assumptions:

1. Rolled structural steel shapes are assumed to conform to the following specifications:
 - a. Channels, Angles & Plates (C, L, Plate) ASTM A36, 36 ksi yield stress
 - b. Hollow Structural Sections (HSS) ASTM A500, Grade B, 46 ksi yield stress
2. HSS Shapes are assumed to have a constant wall thickness throughout its length. Assumed wall thicknesses and shapes, which were not able to be measured, are listed in the body of the report.
3. For all welded members the provided maximum load ratings are based on all connected members being welded with a minimum of a 3/16" fillet weld, fully welded with an E70 electrode or equivalent submerged arc weld. A certified weld inspector should be consulted to fully verify the properties and quality of these welds.
4. The basket floor and sides consist of flattened expanded metal. Our office was unable to determine the grade and size of the flattened metal. It is assumed that this flattened expanded metal floor is capable of supporting the maximum load rating specified herein.

Limitations and Quality Control:

1. All heavy equipment utilized to hoist and transport the man basket must be capable of safely supporting the weight of the man baskets in addition to the maximum safe operating load.
2. All structural steel must be protected from corrosion by either galvanizing or painting.
3. The man basket shall be periodically inspected for signs of corrosion, defects, overloading and anything else that may indicate a reduction of the load-carrying capacity of the man basket.
4. The baskets have been analyzed to account for a minimum factor of safety of 1.5.





Liner Clip and Man Basket:

Field Label: N.A.

Style: Welded Structural Steel

Maximum Liner Clip Basket Load: 1,200 lbs

Maximum Man Basket Load: 40 psf = 1,100 lbs

Approximate Man Basket Weight: 1,600 lbs

Description: Refer to picture above for clarification.

Primary Vertical Members: HSS 1 ½ x 1 ½ x 1/8

Primary Horizontal Members: Railing - HSS 1 ½ x 1 ½ x 1/8, Floor Support – HSS 1 x 2 x 1/8

Additional Members: Man Basket Floor Perimeter - Angle 3 x 4 x ¼ (LLH), Liner Clip Basket Floor Perimeter – HSS 2 x 2 x 3/16, Man Basket Fork Slots – HSS 10 x 6 x ¼, Liner Clip Basket Fork Slots – HSS 8 x 4 x ¼, Basket Floors and Sides - Flattened Expanded Metal

Member Layout: (All Dimensions are Approximate) The overall length, width and height of the Man Basket is 10'-0" x 6'-0" x 3'-8", respectively. The overall length, width and height of the Liner Basket is 10'-0" x 3'-2" x 30", respectively. Member spacing; primary vertical members = 30", floor supports = 15" (Man Basket), 30" (Liner Clip Basket)

Comments: The quality of construction, based on visual observations only, appears to be good.

Additional Recommendations:

Attachment of Liner Clip Basket to Man Basket: The Liner Clip Basket must be fastened to the Man Basket while in operation. Our office recommends fastening along the intersection of the HSS 1 ½ x 1 ½ x 1/8 railings with 4 bolted steel clamps (placed 1 at each end and spaced equally between).

Attachment of Man Basket to hoisting/transporting equipment: The Man Basket must be fastened to the hoisting/transporting equipment with a steel chain attached to the welded "D-rings". The chain must be rated for a minimum safe working load limit not less than 8,000 lbs. The chain must be secured and tightened with a lever or ratchet chain binder with a minimum safe working load limit not less than 8,000 lbs.



Section 1.13 Geomembrane Fabrication Manual and Testing Chart

MLVT GEOMEMBRANE PANEL FABRICATION MANUAL

Well Water Solutions, Inc.



Colorado Lining International
Parker CO 80138
800-524-8672/303-841-2022
Fax: 303-841-5780
www.coloradolining.com

TERMINOLOGY

The following definitions will be used throughout this document.

Geomembrane Manufacturer- The party responsible for compounding resin into geomembrane roll goods.

Geomembrane Fabricator- The party who is responsible for welding the geomembrane roll goods, through factory fabrication using controlled welding methods, into geomembrane panels. **Colorado Lining International – 800-524-8672**

Geomembrane Installer -The party responsible for placing and/or joining geomembrane panels in the field or on the job site.

Geomembrane Sheet -The product of the Geomembrane manufacturer, provided on rolls to the fabricator.

Geomembrane or Panels or Geomembrane Panels -The term applied to multiple geomembrane sheets that have been welded together, through factory fabrication, under controlled conditions. The actual size of the panels will depend upon weight, mil thickness, and design configurations.

Sample -The piece of liner or seam section taken for testing. It is usually large enough to contain specimens for a series of tests.

Seam -The completed process of welding two geomembrane sheets together.

Specimen -The term applied to an individual part of a sample. Specimens are used to test peel and shear values of a welded seam.

Welding -The process whereby two sheets or panels of geomembrane are joined together.

MLVT – Modular Large Volume Tank

MLVT Geomembrane Liner – One or more factory fabricated Geomembrane Panel(s) for placement inside an engineered containment ring.

1.0 GENERAL

1.1 Products

- A. The geomembrane material shall be 30 to 60 mils thick, as specified. The geomembrane shall be manufactured consisting of first quality ingredients. The finished compound shall be uniform in color, thickness, size and surface texture.

1.2 Markings

- A. In the case of round tanks, panels shall include a highly visible "cross hair" style marking denoting the center point of the panel to coincide with the center point of the tank. Radial spoke-like markings will be painted on the panel surface to assist with field measures to assure vertical alignment up the tank walls.

2.0 Subgrade Preparation

- A. The Earthwork Contractor shall be responsible for preparing and maintaining the subgrade in a condition suitable for installation of MLVT Geomembrane Panel. Any damage to the surface caused by weather conditions or other conditions must be repaired prior to MLVT Geomembrane Panel deployment. The installer will submit, prior to installing the MLVT Geomembrane Panel, written approval of the subgrade surface on which the MLVT Geomembrane Panel will be installed.
- B. All surfaces in contact with the MLVT Geomembrane Panel must be free of sharp stones, stones over 3/8" in diameter, sticks and other debris that can puncture or tear the MLVT Geomembrane Panel. No standing water, mud, snow or excessive moisture should be on the subgrade when the MLVT Geomembrane Panel is deployed. Subgrade should be constructed of a firm stable material compacted to a 95% proctor.

3.0 Deployment of MLVT Geomembrane Panels

- A. The MLVT Geomembrane Panel shall be placed at the edge of the tank layout and be lined up with the centerline of the tank layout. Unroll the MLVT Geomembrane Panel down the centerline of the tank layout. Verify the markings on the MLVT Geomembrane Panel line up with the tank layout. If needed adjust the placement of the MLVT Geomembrane Panel prior to proceeding with installation.
- B. The MLVT Geomembrane Panel is then unfolded in the perpendicular direction to which it was unrolled in one direction. The next step is to unfold the MLVT Geomembrane Panel in the opposite direction of the first unfold direction.
- C. See sketch at end of document for clarification of these steps.

4.0 MLVT Geomembrane Representative Welds

- A. At the start of each day's work and once every 4 hours thereafter, before any welding machine shall be deployed on a liner panel, a sample of a representative seam shall be produced and evaluated for each welding machine to be utilized.

Representative welds shall also be required if there is a change in environmental conditions. Representative samples shall be prepared non-destructively using strips of geomembrane cut from excess sheets of liner being seamed. Peel and shear samples are to be tested with a calibrated tensiometer. Field seam welding shall commence only after successful representative seam test results are achieved by each machine.

- B. Test results shall be representative of subsequently made seams on an actual liner fabricated after the test. There shall be one representative seam evaluation made every four hours and on each machine utilized. Representative welds shall be recorded on the CLI Seam Quality Control Form which shall be available to customers upon request.

5.0 Seam Testing Criterion

Samples shall be non-destructive, not requiring patching of fabricated panels. Four test specimens (2 shear and 2 peel) shall be cut from each seam sample and tensiometer tested for bonded seam strength and peel adhesion. All test results shall be recorded in the Seam Quality Control Form.

- A. Tensiometer Peel Strength Test:

Peel adhesion shall be in accordance with ASTM D 7747. In seam samples when tested in peel, failure shall occur resulting in a Film Tearing Bond (or "FTB"). The tensiometer peel test provides a numerical value for the peel strength achieved in addition to visually inspection for film tearing bonds. Samples should be 1" wide centered over the seam.

- B. Tensiometer Tensile Strength Test:

Samples shall be tested with a tensiometer and evaluated for bonded seam strength (shear) using method ASTM D 7749.

- C. Shear and peel test results shall conform to either GRI GM 19 requirements or to the manufacturer's requirements.
- D. All Field Seams shall be 100% tested by high pressure air lance in accordance with ASTM D 4437.

6.0 Field Thermal Wedge Weld Seaming Procedures

- A. Adjacent MLVT Geomembrane Panels shall be overlapped by approximately 4" for fusion welding. Panel edges to be seamed shall be clean of all foreign matter or debris before seaming commences. Welding can occur once the sheets to be joined have been cleaned and brought into their exact position.
- B. When starting a new weld, the machine shall be manually placed into the overlapped sheet of material.

- C. Welder alignment and temperature shall be monitored during the seaming process and adjustments will be made as necessary. The welded seams must be 100% visually inspected as welding machinery advances.
- D. All cross seams or "T" intersections caused by material roll splices where 3 layers of membrane material occur shall be patched where they intersect with 3" or larger diameter patches of the MLVT Geomembrane material. Patches shall be applied by use of a hand held heat gun and seam roller. All patches and repairs shall be 100% tested by high pressure air lance or vacuum box in accordance with ASTM D 4437 and ASTM D 5641.
- E. Should a defective seam be found, welding shall be ceased until the cause of the defect is determined and rectified and the seam is repaired. Documentation of the defect and repair shall be recorded on the Seam Quality Control Form.

7.0 Fold back of MLVT Geomembrane Panels

- A. Once all field seaming is completed the outer limits of the MLVT Geomembrane Panels need to be folded back on top of themselves far enough to provide enough room for assembly of the steel tank sections without damage to the system.

8.0 MLVT Geomembrane Panel final deployment

- A. Once the steel walls are assembled they need to be inspected for any sharp surfaces that could damage the MLVT Geomembrane Panels and there needs to be a support material placed as a chamfer at the transition from the wall to the subgrade to eliminate the possibility of stressing the MLVT Geomembrane panel at the 90 degree transition. This support material can be sand tubes, precut foam, etc.
- B. Next the MLVT Geomembrane Panels need to be placed up and over the walls. This step is completed with the assistance of equipment used to lift the edge of the MLVT Geomembrane Panel up the height of the steel wall. Enough material should be lifted up and over the wall to create the proper overhang so the liner does not fall back off the wall while the clamping system is installed.
- C. The MLVT Geomembrane Panels shall be protected at all times from damage and all equipment and methods used to lift, place and clamp shall not damage the MVLТ GEomembrane Panel and shall not impart excess stress in the MVLТ GEomembrane Panels and thermally welded seam areas.
- D. ALL tank panel erection, assembly, placement and lifting of MVLТ GEomembrane Panel is by others. CLI shall not be responsible for damages to the MVLТ GEomembrane Panel after delivery / customer pickup or once installation is completed, if performed by CLI.

End of Specification

Section 1.14 Geomembrane Installation Manual

MLVT GEOMEMBRANE PANEL INSTALLATION MANUAL

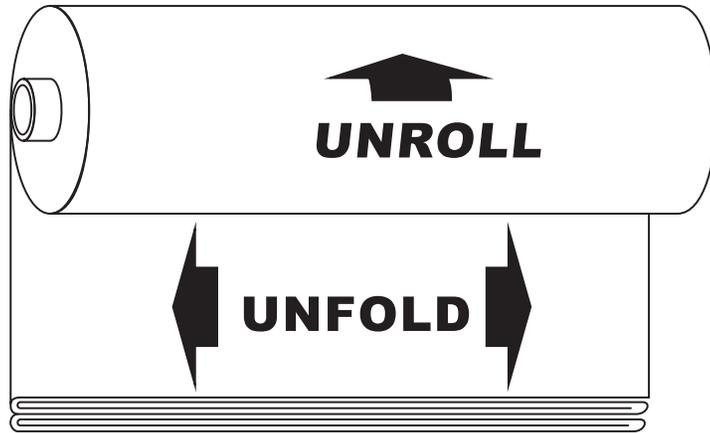
Well Water Solutions, Inc.



Colorado Lining International
Parker CO 80138
800-524-8672/303-841-2022
Fax: 303-841-5780
www.coloradolining.com



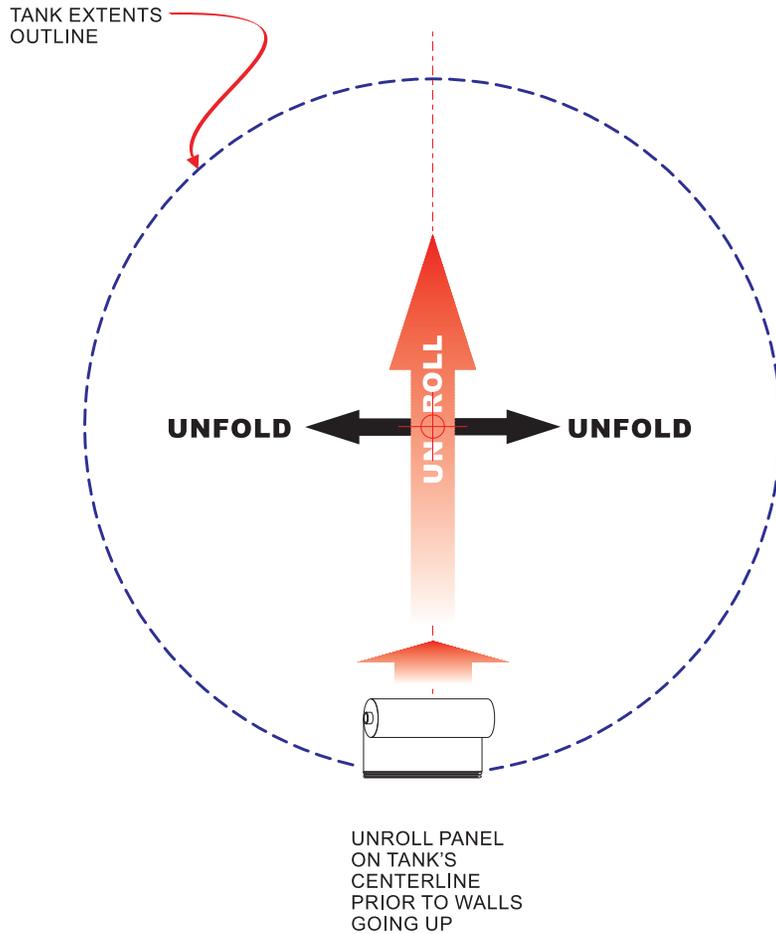
**DEPLOYMENT OF DUAL DIRECTION
ACCORDION FOLDED PANELS**
(SHEET 1 OF 2)

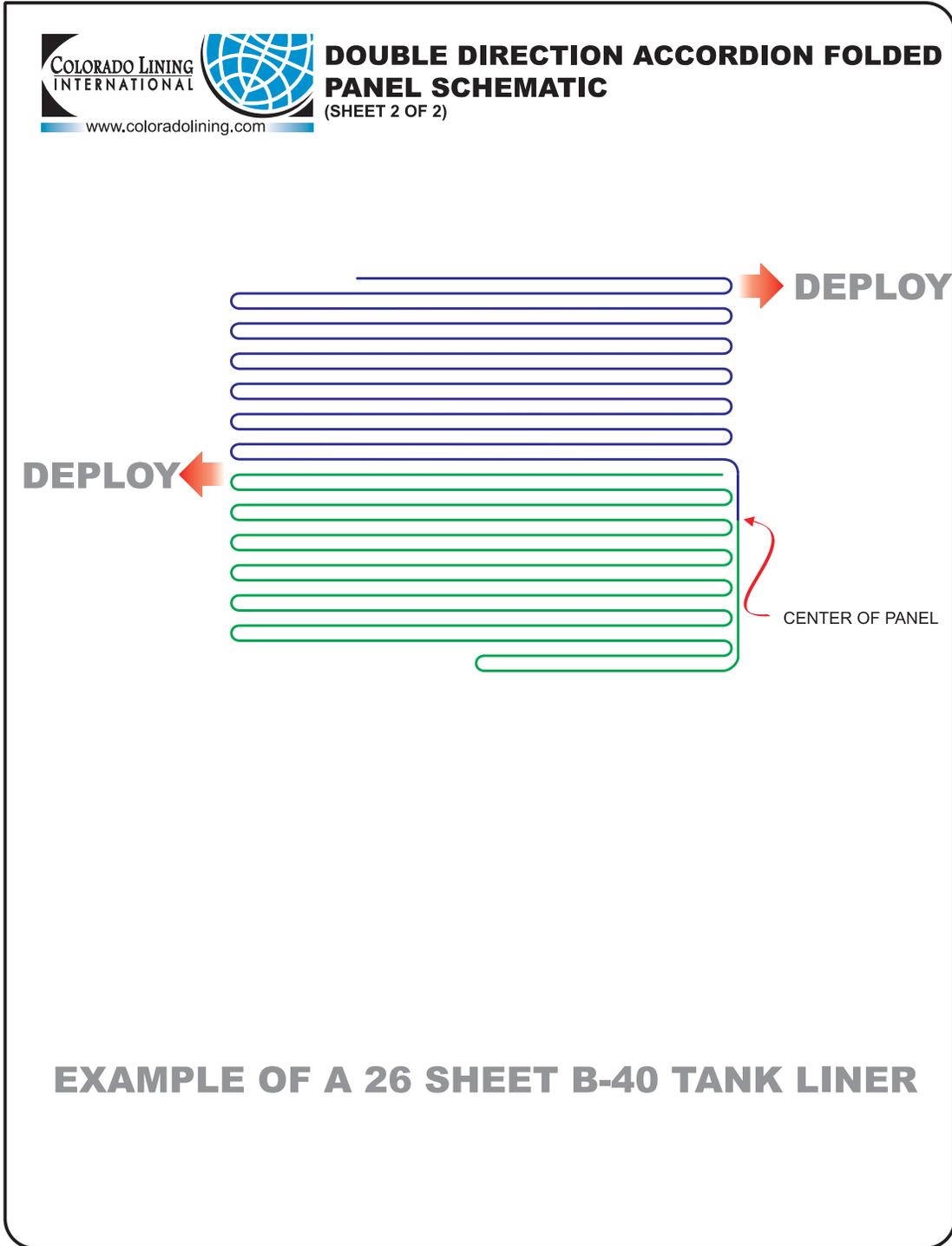




DEPLOYMENT OF DUAL DIRECTION ACCORDION FOLDED PANELS (SHEET 2 OF 2)

CLI FABRICATES FRAC TANK PANEL LINERS AND UNDERLAYMENTS IN A DUAL DIRECTION ACCORDION FOLDED MANNER SO THAT THE PANELS CAN BE DEPLOYED ON THE TANK'S CENTERLINE. AFTER THE INITIAL UN-ROLLING THE PANELS ARE THEN UN-FOLDED IN PERPENDICULAR DIRECTIONS





Section 1.15 WWS Preferred Liner Spec or Comparable Substitute



19103 Gundle Road
Houston, TX 77073
281 230 8650 Fax
www.gseworld.com

January 22, 2018

Western ProLine
184 Hwy 59 North
Miles City, MT 59301

RE: GSE LLDPE Geomembrane Permeability

Certification of Compliance

The undersigned, being qualified and authorized to do so, hereby certifies that GSE High Performance 30 mil Nominal and GSE High Performance 40 mil Nominal UltraFlex LLDPE Geomembranes will meet a permeability of 1×10^{-12} cm/s when tested per ASTM E96.

Sincerely,

A handwritten signature in black ink that reads "Miguel Garcia". The signature is written in a cursive style with a large, prominent "M" and "G".

Miguel Garcia
GSE Technical Support

MG18-0005

TECHNICAL NOTE

Chemical Resistance Chart

GSE is the world's leading supplier of high quality, polyethylene geomembranes. GSE polyethylene geomembranes are resistant to a great number and combinations of chemicals. Note that the effect of chemicals on any material is influenced by a number of variable factors such as temperature, concentration, exposed area and duration. Many tests have been performed that use geomembranes and certain specific chemical mixtures. Naturally, however, every mixture of chemicals cannot be tested for, and various criteria may be used to judge performance. Reported performance ratings may not apply to all applications of a given material in the same chemical. Therefore, these ratings are offered as a guide only.

| Medium | Concentration | Resistance at: | | Medium | Concentration | Resistance at: | |
|-----------------------------|---------------|------------------|-------------------|---------------------------|---------------|------------------|-------------------|
| | | 20° C (68° F) | 20° C (140° F) | | | 20° C (68° F) | 20° C (140° F) |
| A | | | | Copper chloride | sat. sol. | S | S |
| Acetic acid | 100% | S | L | Copper nitrate | sat. sol. | S | S |
| Acetic acid | 10% | S | S | Copper sulfate | sat. sol. | S | S |
| Acetic acid anhydride | 100% | S | L | Cresylic acid | sat. sol. | L | — |
| Acetone | 100% | L | L | Cyclohexanol | 100% | S | S |
| Adipic acid | sat. sol. | S | S | Cyclohexanone | 100% | S | L |
| Allyl alcohol | 96% | S | S | D | | | |
| Aluminum chloride | sat. sol. | S | S | Decahydronaphthalene | 100% | S | L |
| Aluminum fluoride | sat. sol. | S | S | Dextrine | sol. | S | S |
| Aluminum sulfate | sat. sol. | S | S | Diethyl ether | 100% | L | — |
| Alum | sol. | S | S | Diethylphthalate | 100% | S | L |
| Ammonia, aqueous | dil. sol. | S | S | Dioxane | 100% | S | S |
| Ammonia, gaseous dry | 100% | S | S | E | | | |
| Ammonia, liquid | 100% | S | S | Ethanediol | 100% | S | S |
| Ammonium chloride | sat. sol. | S | S | Ethanol | 40% | S | L |
| Ammonium fluoride | sol. | S | S | Ethyl acetate | 100% | S | U |
| Ammonium nitrate sat. sol. | S | S | S | Ethylene trichloride | 100% | U | U |
| Ammonium sulfate | sat. sol. | S | S | F | | | |
| Ammonium sulfide | sol. | S | S | Ferric chloride | sat. sol. | S | S |
| Amyl acetate | 100% | S | L | Ferric nitrate | sol. | S | S |
| Amyl alcohol | 100% | S | L | Ferric sulfate | sat. sol. | S | S |
| B | | | | Ferrous chloride | sat. sol. | S | S |
| Barium carbonate | sat. sol. | S | S | Ferrous sulfate | sat. sol. | S | S |
| Barium chloride | sat. sol. | S | S | Fluorine, gaseous | 100% | U | U |
| Barium hydroxide | sat. sol. | S | S | Fluorosilicic acid | 40% | S | S |
| Barium sulfate | sat. sol. | S | S | Formaldehyde | 40% | S | S |
| Barium sulfide | sol. | S | S | Formic acid | 50% | S | S |
| Benzaldehyde | 100% | S | L | Formic acid | 98-100% | S | S |
| Benzene | — | L | L | Furfuryl alcohol | 100% | S | L |
| Benzoic acid | sat. sol. | S | S | G | | | |
| Beer | — | S | S | Gasoline | — | S | L |
| Borax (sodium tetraborate) | sat. sol. | S | S | Glacial acetic acid | 96% | S | L |
| Boric acid | sat. sol. | S | S | Glucose | sat. sol. | S | S |
| Bromine, gaseous dry | 100% | U | U | Glycerine | 100% | S | S |
| Bromine, liquid | 100% | U | U | Glycol | sol. | S | S |
| Butane, gaseous | 100% | S | S | H | | | |
| 1-Butanol | 100% | S | S | Heptane | 100% | S | U |
| Butyric acid | 100% | S | L | Hydrobromic acid | 50% | S | S |
| C | | | | Hydrobromic acid | 100% | S | S |
| Calcium carbonate | sat. sol. | S | S | Hydrochloric acid | 10% | S | S |
| Calcium chlorate | sat. sol. | S | S | Hydrochloric acid | 35% | S | S |
| Calcium chloride | sat. sol. | S | S | Hydrocyanic acid | 10% | S | S |
| Calcium nitrate | sat. sol. | S | S | Hydrofluoric acid | 4% | S | S |
| Calcium sulfate | sat. sol. | S | S | Hydrofluoric acid | 60% | S | L |
| Calcium sulfide | dil. sol. | L | L | Hydrogen | 100% | S | S |
| Carbon dioxide, gaseous dry | 100% | S | S | Hydrogen peroxide | 30% | S | L |
| Carbon disulfide | 100% | L | U | Hydrogen peroxide | 90% | S | U |
| Carbon monoxide | 100% | S | S | Hydrogen sulfide, gaseous | 100% | S | S |
| Chloracetic acid | sol. | S | S | Lactic acid | 100% | S | S |
| Carbon tetrachloride | 100% | L | U | Lead acetate | sat. sol. | S | — |
| Chlorine, aqueous solution | sat. sol. | L | U | Magnesium carbonate | sat. sol. | S | S |
| Chlorine, gaseous dry | 100% | L | U | Magnesium chloride | sat. sol. | S | S |
| Chloroform | 100% | U | U | Magnesium hydroxide | sat. sol. | S | S |
| Chromic acid | 20% | S | L | Magnesium nitrate | sat. sol. | S | S |
| Chromic acid | 50% | S | L | Maleic acid | sat. sol. | S | S |
| Citric acid | sat. sol. | S | S | Mercuric chloride | sat. sol. | S | S |
| | | | | Mercuric cyanide | sat. sol. | S | S |
| | | | | Mercuric nitrate | sol. | S | S |

Section 1.16 Geo Grid Mesh Spec



SKAPS Industries
 571 Industrial Parkway
 Commerce, GA 30529 (U.S.A.)
 Phone (706) 336-7000 Fax (706) 336-7007
 e-mail: info@skaps.com

**SKAPS TRANSNET™ (TN)
 HDPE GEONET 220**

SKAPS TRANSNET™ Geonet consists of SKAPS GeoNet made from HDPE resin.

| Property | Test Method | Unit | Required Value | Qualifier |
|-----------------------------|--------------------------|----------------------|--------------------|-------------------|
| Geonet | | | | |
| Thickness | ASTM D 5199 | mil. | 220±20 | Range |
| Carbon Black | ASTM D 4218 | % | 2 to 3 | Range |
| Tensile Strength | ASTM D 7179 | lb/in | 45 | Minimum |
| Melt Flow | ASTM D 1238 ³ | g/10 min. | 1 | Maximum |
| Density | ASTM D 1505 | g/cm ³ | 0.94 | Minimum |
| Transmissivity ¹ | ASTM D 4716 | m ² /sec. | 2x10 ⁻³ | MARV ² |

Notes:

1. Transmissivity measured using water at 21 ± 2°C (70 ± 4°F) with a gradient of 0.1 and a confining pressure of 10000 psf between stainless steel plates after 15 minutes. Values may vary between individual labs.
2. MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.
3. Condition 190/2.16

This information is provided for reference purposes only and is not intended as a warranty or guarantee. SKAPS assumes no liability in connection with the use of this information.

Visit our Web site at www.skaps.com

Section 1.17 Patents and Patent Protections



US008376167B2

(12) **United States Patent**
Lovelace et al.

(10) **Patent No.:** **US 8,376,167 B2**

(45) **Date of Patent:** **Feb. 19, 2013**

(54) **PORTABLE RESERVOIR FRAME**

(75) Inventors: **Sean Michael Lovelace**, Casper, WY (US); **Christopher Jason Songe**, Casper, WY (US)

(73) Assignee: **Energy Innovations, LLC**, Casper, WY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/469,883**

(22) Filed: **May 11, 2012**

(65) **Prior Publication Data**

US 2012/0223073 A1 Sep. 6, 2012

Related U.S. Application Data

(63) Continuation of application No. 13/245,492, filed on Oct. 21, 2011.

(51) **Int. Cl.**
B65D 6/00 (2006.01)

(52) **U.S. Cl.** **220/4.17; 220/4.16; 220/693; 220/567; 220/4.12**

(58) **Field of Classification Search** 220/1.6, 220/4.12, 4.16, 4.17, 9.4, 23.9, 495.06, 495.08, 220/567, 681, 693
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,875,666 A * 9/1932 Schwemlein 220/693
3,233,251 A * 2/1966 Barrera 52/245
3,648,303 A * 3/1972 Stewart et al. 52/5
4,124,907 A * 11/1978 Laven 52/169.7

FOREIGN PATENT DOCUMENTS

CA 2692016 7/2010

* cited by examiner

Primary Examiner — Anthony Stashick

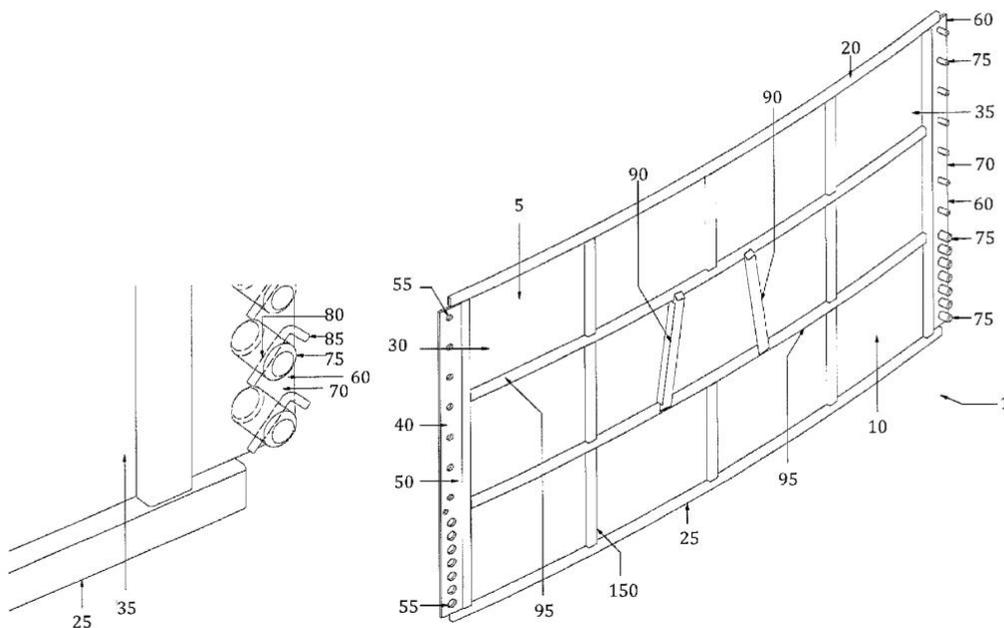
Assistant Examiner — Christopher McKinley

(74) *Attorney, Agent, or Firm* — Gordon Silver, Ltd.; Ronald C. Gorsché

(57) **ABSTRACT**

A portable reservoir frame composed of interlocking panels secured by a series of flanges having holes and pegs. An inner liner to hold liquid inside the reservoir frame is presented.

16 Claims, 11 Drawing Sheets





US008365937B2

(12) **United States Patent**
Lovelace et al.

(10) **Patent No.:** **US 8,365,937 B2**
(45) **Date of Patent:** **Feb. 5, 2013**

(54) **PORTABLE RESERVOIR FRAME**

(75) Inventors: **Sean Michael Lovelace**, Casper, WY (US); **Christopher Jason Songe**, Casper, WY (US)

(73) Assignee: **Energy Innovations, LLC**, Casper, WY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/469,845**

(22) Filed: **May 11, 2012**

(65) **Prior Publication Data**

US 2012/0234829 A1 Sep. 20, 2012

Related U.S. Application Data

(63) Continuation of application No. 13/426,286, filed on Mar. 21, 2012, which is a continuation-in-part of application No. 13/245,492, filed on Oct. 21, 2011.

(51) **Int. Cl.**
B65D 6/00 (2006.01)

(52) **U.S. Cl.** **220/4.17; 220/4.16; 220/693; 220/567; 220/4.12**

(58) **Field of Classification Search** **220/565, 220/567, 1.6, 4.16, 4.12, 9.4, 495.06, 495.08, 220/23.9, 4.17, 693, 681**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,076,382 A * 10/1913 Maloney 220/4.17
1,875,666 A * 9/1932 Schwemlein 220/693

2,123,035 A * 7/1938 Ashley 220/693
2,914,149 A * 11/1959 Walker 52/394
3,233,251 A * 2/1966 Barrera 52/245
3,562,822 A * 2/1971 Wall 52/245
3,648,303 A * 3/1972 Stewart et al. 52/5
3,736,599 A * 6/1973 Kessler et al. 52/169.7
3,793,651 A * 2/1974 Pitti et al. 52/169.7
3,819,079 A * 6/1974 Levens 220/4.13
4,048,773 A * 9/1977 Laven 52/169.7
4,124,907 A * 11/1978 Laven 52/169.7
4,223,498 A * 9/1980 Ventrice 52/249
4,240,562 A * 12/1980 Holschlag 220/565
4,860,914 A * 8/1989 Derni et al. 220/4.28
4,932,558 A * 6/1990 Katavolos 220/666
5,054,135 A * 10/1991 Dallaire et al. 4/506
5,161,264 A * 11/1992 Dugas 4/506
5,294,019 A * 3/1994 Looker 220/683
6,071,213 A * 6/2000 Raasch et al. 482/29
7,311,827 B2 * 12/2007 Clark et al. 210/232
7,766,184 B2 * 8/2010 Avery et al. 220/573.1
7,918,764 B2 * 4/2011 VanElverdinghe 482/27
2009/0127255 A1 * 5/2009 Rood, Jr. 220/1.5

FOREIGN PATENT DOCUMENTS

CA 2692016 7/2010

* cited by examiner

Primary Examiner — Anthony Stashick

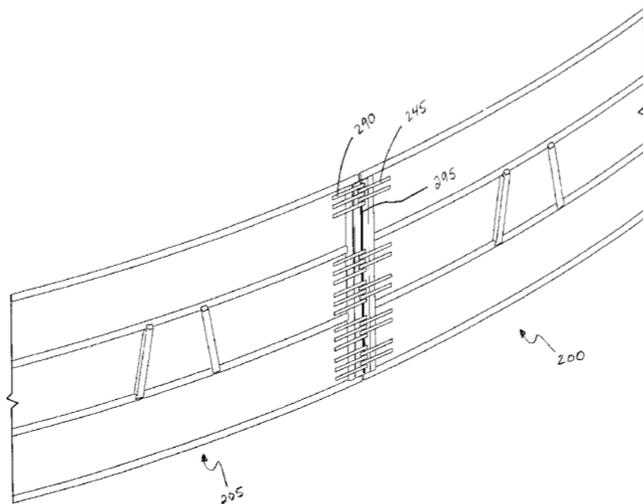
Assistant Examiner — Christopher McKinley

(74) *Attorney, Agent, or Firm* — Gordon Silver Ltd.; Ronald C. Gorsché

(57) **ABSTRACT**

A portable reservoir frame having a number of interlocking panels secured by a plurality of interleaved knuckle members is provided.

20 Claims, 20 Drawing Sheets





June 28, 2023

Ms. Victoria Venegas
New Mexico OCD
(575)-909-0269
victoria.venegas@emnrd.nm.gov

Re: Earthstone Application Addendum

Ms. Venegas,

Enclosed in this document are the requested cross-sections for the AST Leak Detection Systems. Please note that there will be two (2) ASTs placed at this facility. Both ASTs will be constructed the same and will have identical leak detection systems.

These two ASTs will be treated the same as the earthen containments planned for the facility. These ASTs will follow the same operation and maintenance procedures, monitoring and inspection procedures, and will follow the same closure plan.

All necessary C-147 forms and variances for these ASTs were included in the original submission. These ASTs were also included in the Closure Cost Estimate that was originally submitted.

ENVIROTECH ENGINEERING AND CONSULTING INC.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Mitchell Ratke".

Mitchell Ratke, EIT
Project Engineer

COPYRIGHT
This document and the information contained may NOT be reproduced or excerpted from without the express written permission of Envirotech Engineering and Consulting, Inc. Unauthorized copying, disclosure or construction use are prohibited by the copyright law.

| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

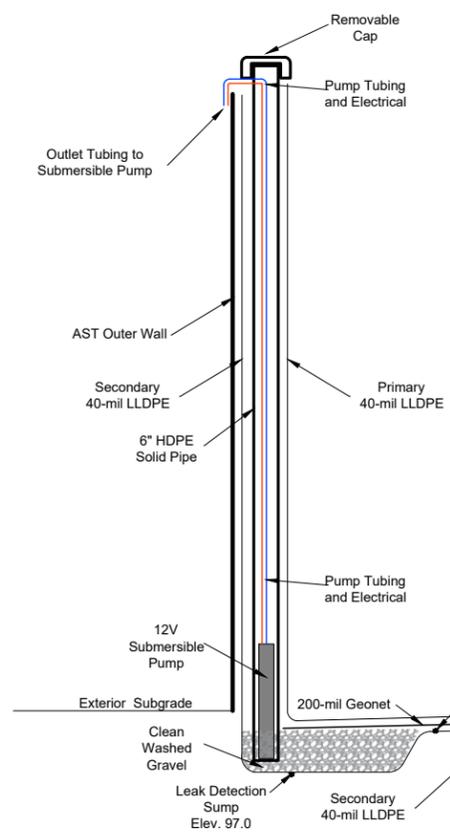
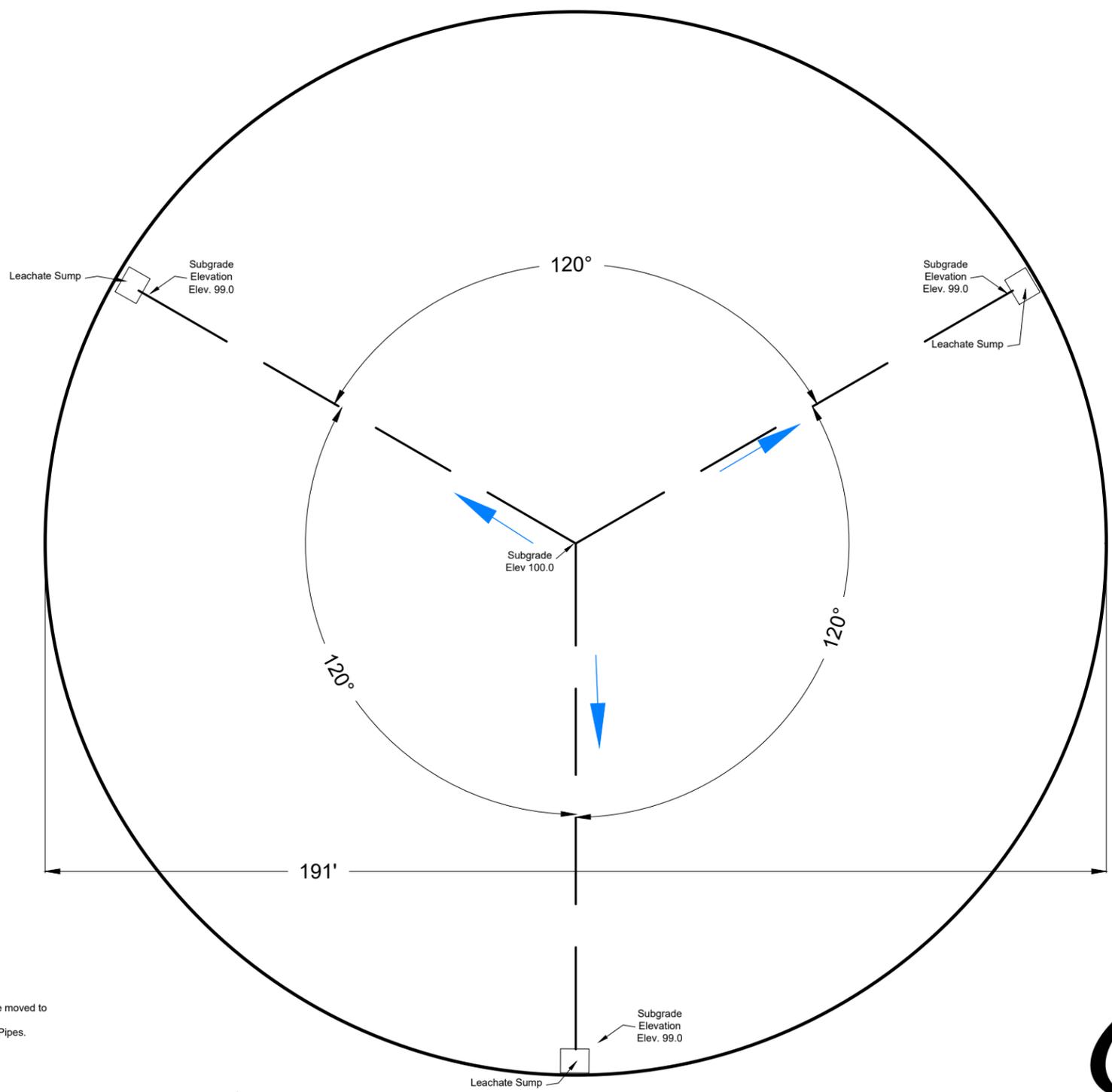


60K AST CONSTRUCTION
Earthstone Recycle
Select Energy
Section 28, Township 19 South, Range 28 East
Lea County, New Mexico

| | |
|--------------|-------------|
| DATE: | June 2023 |
| SCALE: | NTS |
| DESIGNED BY: | M. Ratke |
| DRAWN BY: | M. Ratke |
| CHECKED BY: | T. Williams |
| PROJECT NO.: | 023107-00 |

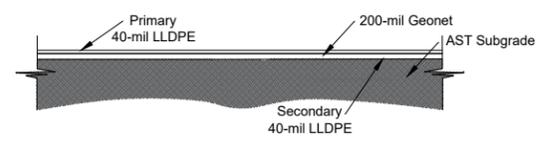
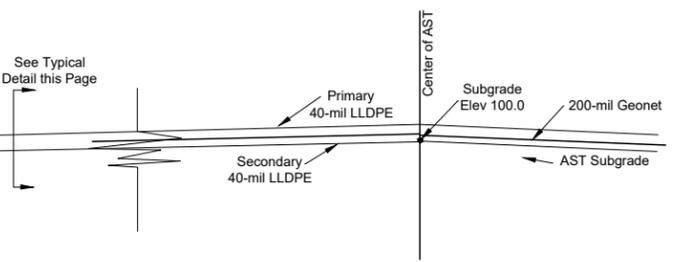
Figure 1

Utilize Leak Detection System below for AST
Leachate Flow Direction



- General Notes:**
- 12v Submersible Pump shall be mobile to be moved to each of the 3 standpipes as need.
 - Level Sensor Probe in 1 of 3 Leak Detection Pipes.
 - All HDPE Piping to be SDR 17

See Typical Detail this Page



Developed in Conjunction With



TYLER JOE WILLIAMS
NEW MEXICO
26432
PROFESSIONAL ENGINEER
6/28/2023

2020



Well Water Solutions and Rentals Inc.

STANDARD OPERATING PROCEDURE (SOP)

WELL WATER SOLUTIONS AND RENTALS INC | 1150 Coyote Bar Nunn, WY 82601

TABLE OF CONTENTS

SECTION 1.01 INTRODUCTION

- 1) ABOUT
- 2) BACKGROUND
- 3) SOP PURPOSE
- 4) EH&S PROGRAMS
- 5) SUMMARY

SECTION 1.02 AST PLANNING AND PREPARATIONS

- 1) PLANNING
- 2) REQUIRED AST ORDER INFORMATION
- 3) SITE MEETING OR SCHEDULING CALL
- 4) SITE SOIL PREPARATION
- 5) PRE-MOBILIZATION ON-SITE MEETING
- 6) CALL BEFORE YOU DIG "811"
- 7) AST MATERIAL DELIVERIES

SECTION 1.03 WWS AST PRE RIG UP REQUIREMENTS

- 1) LOADING REQUIREMENTS
- 2) JOB SAFETY ANALYSIS (JSA)
- 3) CHECK SOIL CONDITIONS
- 4) PROPER TANK POSITIONING
- 5) EQUIPMENT (WWS PROVIDED)
- 6) HAND TOOLS RECOMMENDED

SECTION 1.04 WWS AST RIG UP PROCEDURE

- 1) TANK LAYOUT
- 2) INITIAL TANK ERECTION PROCESS
- 3) SECONDARY CONTAINMENT LINERS AND INSTALLATION
- 4) TANK WALL ERECTION
- 5) PROPER LINER PLACEMENT AND CLAMPING
- 6) INSTALLING TANK ACCESSORIES
- 7) AST COMPLETION STEPS

SECTION 1.05 AST IN USE OPERATIONS

- 1) INSPECTIONS AND MONITORING
- 2) INITIAL LEAK DETECTION AND LINER REPAIR

SECTION 1.06 WWS AST RIG DOWN PROCEDURE

SECTION 1.07 WWS AST ENGINEERING STAMPS

SECTION 1.08 WWS AST ENGINEERING SPECS

SECTION 1.09 PROPER AST SETBACK AND LOCATION SAMPLE

SECTION 1.10 JLG APPROVED TELEHANDLER ATTACHMENT AND LOAD CHART

SECTION 1.11 WWS MAN BASKET UPDATED ENGINEERING DRAWINGS

SECTION 1.12 WWS MAN BASKET STAMP AND SOP

SECTION 1.13 GEOMAMBRANE FABRICATION MANUAL AND TESTING CHART

SECTION 1.14 GEOMEMBRANE INSALLATION

SECTION 1.15 WWS PREFERRED LINER SPEC OR COMPARABLE SUBSTITUTE

SECTION 1.16 GEO GRID MESH SPEC

SECTION 1.17 PATENTS AND PATENT PROTECTIONS

Section 1.01 Introduction

1) About

Well Water Solutions and Rentals Inc. aka (WWS), is the original pioneer of the portable Above Ground Storage Tank industry. The above ground storage tanks or AST's have become an integral part in saving cost in the oil and gas and industrial industries. WWS has been supplying and servicing these portable tanks for longer than any other company in the USA. We have focused our time and experience on providing the best tank products at the highest safety standards. We continue to learn and adapt every-day in our industry to make sure our employees are safe and our customers are happy.

Standard Operating Procedures or (SOPs) are a staple for safety and quality here at WWS. Our SOP for our above ground storage tank (AST) systems including planning, rig up, operations, and rig down. This SOP will discuss steps to be taken to promote the safest process, as well as list the potential hazards that should be identified and reviewed during our JSA prior to beginning the work process.

2) Background

WWS has over 170 AST's that are used for a variety of oil field and industrial applications within the fluid management operations. AST's can be used in place of traditional 500 BBL trailer tank farms and in-ground water impoundments, and are suitable for fresh water as well as production water. WWS tanks have standard sizes, ranging from 6,000 barrel (bbl) capacity to 60,000 bbl capacities. Through intensive design criteria WWS secured a patented design on the strongest possible design for an AST tank. We analyzed many methods to secure the panels together and all other methods failed our criteria. We have also set a standard in the industry for safe movement of the panels with our patented adaptor plate for a quick attach telehandler. We were able to successfully submit engineering documentation to the Oshkosh Corporation, which owns JLG and they have stamped and approved our adaptor plate.

3) SOP Purpose

WWS will extensively review this SOP with all new hire employees to assure proper understanding of all procedures. This SOP will also be reviewed with an employee if his/her responsibilities change under the plan. An electronic copy of this plan will be available at all WWS regional offices.

Training our employees to follow our SOP is the first step to a safe and successful work environment. We also need all our employees to treat everyone with respect and follow the lead of their supervisor to make sure every day is safe.

STOP WORK authority and who has the power to use it is another tool we use to help everyone stay involved in the safety process. We highly encourage all employees to feel comfortable in raising awareness of any unsafe situation happening or providing suggestions to help make any task safer as well. This helps everyone grow to be a stronger team.

This SOP may also be used to inform customers about WWS's typical equipment and procedures for setting up an AST system. This SOP will be reviewed and revised on an ongoing basis to keep pace with best oilfield and industrial practices and applicable OSHA regulations.

4) EH&S Programs

This SOP recognizes that oil and gas operating companies have developed their own health, safety, and environmental (HSE) programs that contractors who work at customer's sites like WWS, must comply with. In addition to this SOP, WWS personnel will strictly observe the policies and procedures of each operating company they are to do work with.

5) Summary

This SOP recognizes that oil and gas operating companies have developed their own health, safety, and environmental (HSE) programs that contractors who work at customer's sites like WWS, must comply with. In addition to this SOP, WWS personnel will strictly observe the policies and procedures of each operating company they are to do work with

Section 1.02 **AST Planning and Preparations**

1) Planning

Proper planning and documentation will help assure a successful AST rig up and rig down. The following steps can be utilized to fully, safely, and accurately perform the tank rig up or rig down:

- AST Order Information
- Customer Meeting
- Soil Conditions and Pad Preparation (Completed by Customer)
- Pre-Mobilization and On-site Meeting
- Notifications
- Job Safety Analysis (JSA)
- AST material requirements for delivery

2) Required AST Order Information

WWS Manager or Field Supervisor will record general AST order information including the following:

- Site location directions and coordinates
- Customer Contact Name, Phone, and Email
- Emergency Medical Contacts
- Special Safety Requirements
- Tank Utilization Dates
- Tank size and Accessories
- Special piping requests

3) Site Meeting or Scheduling Call

Prior to finalizing the delivery schedule, a meeting or conference call is held with WWS and our customers required personnel to make sure all parties are coordinating well and have the same and accurate information.

This meeting is best done in person, but must at least be covered in a phone call, followed up by a brief email confirming the AST order details, delivery schedule, and noting special conditions, safety requirements, verification of pad preparation, etc.

KEY MEETING TOPICS:

- Introduce all WWS key personnel to our customer's key personnel
- Review what tanks are needed and what use they will be needing them for
- Review AST scope of work, what is normally included, what is not
- Confirm AST size(s) to be used
- Assure a 20' working space around each tank for safe working area
- Permitting for AST (as needed)
- Current site conditions and soil preparation requirements
- Site access and truck route requirements, and any weather-related issues that could affect them
- Time line for rig up and rig down of the AST
- Detailed drawings of the location layout for tank and piping placement
- Details on "Fresh Water" source to fill the tank on the day of the set up
- Assure a minimum of 24" of water the day of the setup to quickly and safely complete the job
- Identify what other charges could be incurred by the customer and result in standby time or additional charges
- Confirm customer is responsible for the used liner, residual solids left in the tank, removal of all radioactive NORM materials, and site reclamation
- Review any and all additional safety requirements the customer may have
- WWS to follow up with an email to review all changes made

4) Site Soil Preparation

Preparation of the soils on site is required to form a dependable base for the AST.

Preparation of the tank pad is solely the responsibility of the customer/operating company.

WWS Soil Requirements are:

- Minimum soil compaction of 95% compaction
- Soil testing results shall be shared with WWS if requested
- Site must be cleared and free of debris such as sticks, sharp rocks, and trash etc.
- WWS recommends soil compaction testing to be conducted via Standard Proctor Test (American Society for Testing and Materials {ASTM} Standard D698) or Modified Proctor Test (ASTM Standard D1557)
- Compaction test results must be provided to WWS prior to the commencement of AST construction upon request
- Proof roll testing maybe be used if there is doubt of site compaction standards
- Grade of the inner AST area to be a maximum of .25% or 3" drop per 100' towards sump location
- Site shall be graveled and rolled prior to tank installation, utilizing gravel size 2B or smaller. (3/4" road grade preferred, or coarse sand with minimum thickness of 4 inches)
- *Do Not Use* crushed rock as sharp edges could puncture the tank liner

Completions of all these steps will assure a smooth, safe, and seamless tank set up.

5) Pre-Mobilization Onsite Meeting

WWS's AST team will conduct a pre-mobilization onsite meeting with the customer that documents the customer requirements for the specific pad location and AST system.

6) CALL BEFORE YOU DIG "811"

Even though the customer or their subcontractor may have already called for utility locates for the sump hole, the WWS field supervisor should call the local or state underground utility location service again at least 3 days in advance before construction/digging begins. The ticket or reference number provided by the one-call service will then be documented.

The following web site has contacts for all the states and provinces.

<http://www.call811.com/state-specific.aspx>.

Call **811** in United States

7) AST Material Deliveries

Once the delivery route and schedule are established and the pre-project onsite inspection is completed, the AST materials can be delivered. Updates and notifications will be made as agreed to during the customer meeting. WWS delivery personnel will use a spotter for the equipment driver and should unload all materials safely taking extra care to avoid damage to liners, plates, and all other AST components. Should any problem arise during the scope of operations the WWS field supervisor will notify to correct customer contact to remedy the issue.

Section 1.03 WWS AST Pre Rig Up Requirements

1) Loading Requirements

WWS will have the field supervisor complete a "**Dispatch Load In Load Out Sheet**" before and after the set-up and rig down of the AST system. This sheet will identify all the needed parts and accessories to complete the AST Rig Up. During Rig Down the "Dispatch load in load out sheet" is also filled out to ensure all parts and accessories are accounted for and in good working condition. In the event parts or accessories are missing and/or damaged the customer will assume full responsibility and be billed back for the parts and accessories.

2) Job Safety Analysis (JSA)

A job safety analysis (JSA) must be completed on-site prior to the beginning of any work. The JSA will be completed according to WWS protocol and safety programs. Customer's safety requirements will also be communicated during the JSA. All personnel, third party contractors, and customer representatives are expected to participate and sign the JSA when the JSA is completed.

3) Check Soil Conditions

Preparation of the tank pad is solely the responsibility of the customer.

However, bad weather such as wind, rain, and snow events can change the soil conditions quickly. If soil conditions change the WWS field supervisor will notify the proper customer contact.

4) Proper Tank Positioning

- Check proposed AST site to confirm that a 20' clear work area around the perimeter of the tank is possible to provide access for equipment and laydown area for AST materials and erection equipment

- Check that the minimum setback distances to existing wells, power lines, etc. are met
- Mark out the tank location using WWS marking equipment
- Establish and mark out final location for the fill and suction tube(s) and stairs

5) Equipment (WWS provided)

All equipment is subject to daily inspection. (Check condition, rigging, oil, water, fuel and cleanliness.) Here is a list of the recommended equipment needed to set a tank. Actual equipment used will vary among region and specific projects.

- One 40' and/or 60' extending straight or z boom man-lift
- 10,000 lb. or greater capacity, rough terrain forklift (JGL 10-43A is preferred telehandler)
- Backhoe or small excavator with bucket
- Skid steer

6) Hand Tools Recommended

All hand tools are subject to daily inspection.

- Two 16' ladders
- Four 4 lb. sledgehammers
- 100' or 200' tape measure
- 1 case of marking paint – minimum
- Set of wrenches ¼" – 1 ½"
- Set of sockets ¼" – 1 ½"
- One small pry bar
- 8' rock bar (digging bar)
- Five safety harnesses with retractable tethers
- Five retractable lanyards
- Duct tape
- Covered hook bladed knife
- Three 40' lifting straps (minimum of 5,000 lb capacity)
- Three 20' 3/8" chains (must have visible certification tags)
- Two rolling head pry bars
- Two ½" impact guns
- Two sets of rigging chains
- Patch tape
- Rubbing alcohol
- Patch roller
- Leather gloves
- Wire brush or wheel with 4" angle grinder
- Generator
- Steel toed rubber boots
- All personnel must have Fire retardant clothing (FRs) Safety Hard Hats, Safety Glasses, crush resistant gloves and any safety requirements from customer

Section 1.04 AST Tank Rig Up Procedure

WWS Field Supervisor will double check all paper work and location prior to setup to assure everything is correct and ready to set the AST.

1) Tank Layout

- Determine center of tank and mark with paint. Place a non-abrasive item on the center point; preferably a sandbag. This will be used to find the center of tank after liners have been placed
- Measure and double check minimum distance from tank center to existing wells or other set backs
- Measure and paint a line to mark the circumference of tank for panel placement using WWS special design marking tool
- Also mark 15' outside the tank circumference as this will show where the liner should reach once fully stretched flat. This will assure enough liner is present to go over tank walls once placed

2) Initial Tank Erection Process

- Determine where suction pipe is to be located in the tank
- Dig at least 4' wide x 6' long x 16" deep sump hole for over the wall suction pipe to set into and taper the edges so there are no sharp corners of the excavation. Or dig 3' wide x 12' long x 10" deep sump hole for undermount suction pipe
- Remove any sharp stones and debris for the digging process
- If multiple suction manifolds are required, the sumps should have a minimum of 15' of separation

Attention:

Barricade any sump pit with appropriate cones, tape, equipment, and/or have a hole watch if left open.

- All tank set-ups will utilize a standard 10oz geotextile that will be laid on the grounds surface to act as a padded protector for the liner
- A Standard LLDPE 30 mil or 40 mil liner will then be used as the primary containment, but may also be used as a secondary containment within the tank upon request.
- Check customer specifications and regulatory permitting to assure proper liner and containment requirements are met for ASTs
- Organized crew inspection walks for the entire tank base area will be performed to pick up any sharp stones or other sharp debris that could damage the liner
- The geotextile pad can now be deployed out fully at this point. It should reach beyond the tank circumference paint lines by 1'-4'
- Once geotextile is completed the liner can be fully deployed. Crews will double check that the liner will reach to the 15' marks beyond the tank circumference
- Crews will then perform a visual inspection of the liner and repair any defects as necessary
- Fold the liner towards the middle of the tank until tank circumference paint line is fully exposed

3) Secondary Containment Liners and Installation

- If tank system requires a secondary liner and leak detection system this will be installed on top of the first liner
- WWS Field Supervisor will direct the installation of the various parts and layers of the secondary containment system

- For example, a 220-mil geo grid mesh (Reference Section 1.16 for Spec) or other suitable approved spacer material can be installed between the top and bottom liner layers to provide a separation for to water flow. Installation of inspection pipes into to the designed low points of the tank will later be used for leak inspections
- Install any other customer required components for the leak inspections if needed
- Unroll top liner over geo grid to completed the secondary containment system
- Follow the same setup guidelines for a one liner system for the two-liner system, and make sure to complete the components installation fully once the first liner is clamped.

4) Tank Wall Erection

- Field Supervisor will complete a visual inspection of each panel as it is prepared to be placed
- The first tank panel will be placed and secured using the backhoe bucket
- Once backhoe fully secures the panel the telehandler can then get the next panel. Crews will continuously provide operators with spotters during all operations
- If higher winds exist crews are cautioned to pay special close attention to all operations
- Crews will repeat the panel placement process until entire tank is erected
- Personnel secured on man lift or using a ladder (depending on customer policies) then secure the panels in place with 14 retainer pins per panel.

ATTENTION:

Proper hand and foot placement is crucial when connecting AST panels. Keep hands and feet a safe distance from pinch points. Discuss where these pinch points are located when reviewing the JSA. Keep the joints in mid-range; i.e. palms are located between waist and shoulders. Create an awareness that never goes away and designate one individual to enforce the awareness when setting panels.

- Roll up excess geo pad into minimum 6" diameter cylinders around the inside of the tank ring to help support the liner at the base of the tank wall as the tank is being filled.
- Prior to lifting liner into place against inside panel, add geo strips over all panel connections points and use spray glue to secure in place
- Prior to covering sump with the geo pad or liner, confirm sump excavation has smooth sides and corners, and that no sharp stones are present.

5) Proper Liner Placement and Clamping

- After 3 or more panels are set, and all liner protections are complete, crews inside the tank can begin to hand liner up to crews outside the tank that are in the manlift
- Crew of 2 inside the tank wall unfolds and pulls the liner toward each panel (final connection of last panel will not be made until all liner to that point is pulled and secured to avoid confined space, all personnel must be out of tank before walls are closed)
- The inside crew of 2 works with the manlift crew of 2 located outside to pull the liner up and over the top of each panel. The man lift crew lifts the liner using ropes/straps gently lowered and attached (by the inside crew). The man lift crew lifts a small liner section to

the top of the panel and folds it over the top of the panel, being sure there is enough slack in the liner inside the panel wall

- Proper slack or excess liner on the vertical wall can be tested by the inside crew. The crew will pin the liner to the bottom of the wall with their boot and pull liner at chest level outwards away from the wall. There should be about 3' from wall to liner when being pulled. This is the appropriate amount of slack. If crew ever has doubt that the liner slack may not be enough WWS's experience has proven more slack the better, so just give it a little more slack if needed

NOTE: The crew must allow sufficient slack in the liner at the wall to allow for liner movement during filling and draining.

ATTENTION: Never place hands on the railing of the man basket that faces the AST panel. Proper hand placement would be the side or back rail.

- Once a section of liner is positioned properly (with liner slack inside the tank) and over the top of each panel wall, the man lift crew secures the top of the liner with clamps. (Tools in basket secured with tool lanyards) NOTE: Each clamp is notched where D-rings on the top of each panel are located. This notch acts as an added safety retainer once clamps are fully tightened. Each panel will receive 2 liner clamps
- Crews will continue to clamp until they have reached the final panel. Crews will leave this small area of liner down until all internal piping is completed

6) Installing Tank Accessories

- Install safety stair system, fill piping, and suction piping. Ensure that stair system and piping are appropriately secured to the tank walls with ratchet straps or chains
- Assemble all interior piping and assure any connections or sharp points are fully wrapped in geo material for protection

7) AST Completion Steps

- Close final panel and secure with pins
- Lift liner and secure at the closure point to finish clamping process
- Trim liner and allow approximately 2' of liner to hang over edge of tank.
- Begin to fill the tank with water and monitor filling process
- Inspect all connections and equipment, confirming at least 2 liner clamps are in place on top of each panel
- Have a minimum of 24 inches of water put in the tank to hold liner in place
- Fill tank and monitor
- Perform periodic inspections of the tank to ensure everything is in proper working order
- Every time a tank is fully emptied and refilled, an inspection must be performed
- Water should NEVER go below 12 inches at the LOWEST level in the tank. (Mark liner as a caution).

NOTE: Filling process may begin as early as ¾ of the tank wall panels are set. Only fresh water can be used if filling while personnel is in the tank. Reasons for early filling is to assist with windy days as the water weight help to hold liner in place. It is recommended no personnel be in the tank with more than 6" of water.

Section 1.05 AST In Use Operations

1) Inspections and Monitoring

AST Operation Phase includes periodic AST monitoring, leak detection, and identifying potential hazards that may have developed, change on-site conditions or tank use. If the tank is drained, it should be secured from wind impacts and the liner inspected and re-positioned (to provide sufficient slack during filling) prior to refilling. Specifically, it may be necessary to rearrange the liner folds at the walls prior to refilling if the wind has shifted the liner folds when the tank was empty.

If changes are noted, they should be communicated to the WWS Manager/Field Supervisor.

CAUTION – If conditions are observed that could indicate an imminent tank failure, clear the area immediately. Advise others in the vicinity to do so also and contact the customer to drain the tank.

2) Initial Leak Detection and Liner Repair

In the event of a leak in the tank due to a hole in the liner, the following steps should be followed.

- If there is a question that it is in fact a leak from the AST, a dye test or a pH balance test may need to be performed on both the water in the tank and on the ground using approved dye or a properly calibrated pH meter. Third party test results are recommended.
- If the leak is found to be coming from the tank, narrow down from which panel the leak is originating.
- Use a strap or rope to mark the point where the water is coming out of the tank.
- Determine if the water is coming out high or low on the tank.
- Locate the puncture or hole in the liner.
- Empty the tank to the point of damage in liner if necessary.
- Clean area of liner that needs to be repaired.
- Cut out piece of material (patch or tape) to overlay liner.
- Either weld the patch to the injured area in the liner or stick the tape (2 types – dry or underwater) over the leak.
- Make sure puncture is completely covered.
- Monitor as needed.

Section 1.06 WWS AST Rig Down Procedure

The AST breakdown follows the reverse order of the setup steps presented in the AST Rig Up Procedure above. The sump will be filled in with the same material taken out during excavation.

The customer is responsible for draining and disposing of all liquids and residual solids that have accumulated in the tank. Additionally, the customer is responsible for proper off-site management or recycling of the liner and geo pad materials, and final grading and/or reclamation of AST site.

Customer is responsible for any removal of radioactive NORM materials before WWS crews can rig down any tank.

Section 1.07 WWS AST Engineering Stamps

PILLAR STRUCTURAL ENGINEERING

June 30, 2015

Well Water Solutions and Rental, Inc.
2130 W. 40th
Casper, WY 82604
Attn: Sean Lovelace

Re: Portable Frac Tank Certification – Pinned Seams

Dear Mr. Lovelace:

Per your request our office has performed a structural analysis of the portable frac tanks as well as the associated accessories. This analysis was performed to determine that the tanks meet the required strength criteria under operating conditions according to the AISC Manual of Steel Construction.

The tanks range in diameter from approximately 81 to 190 feet and are 11 feet, 8 inches in height and are designed to store water. They are constructed of individual steel reinforced panels that are connected together with a patent pending steel pin system.

The following tanks sizes were included in the analysis:

- ⊕ 10,000 BBL – Approximately 81'Ø
- ⊕ 20,000 BBL – Approximately 108'Ø
- ⊕ 30,000 BBL – Approximately 135'Ø
- ⊕ 40,000 BBL – Approximately 156'Ø
- ⊕ 50,000 BBL – Approximately 176'Ø
- ⊕ 55,000 BBL – Approximately 183'Ø
- ⊕ 60,000 BBL – Approximately 190'Ø

The tanks are constructed of the following materials:

- ⊕ Tank Panels – ASTM A36, 36 ksi Steel Plate
- ⊕ Horizontal & Vertical Framing – ASTM A500, Grade B, 46 ksi Structural Steel Tubing
- ⊕ Connecting Pins - ASTM A36, 36 ksi Steel Round Bar



1964 East 1st Street
Casper, WY 82601

PHONE (307) 265-3900
FAX (307) 265-3559
WEB SITE <http://www.pillarse.com>

June 30, 2015

Page 2 of 2

Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

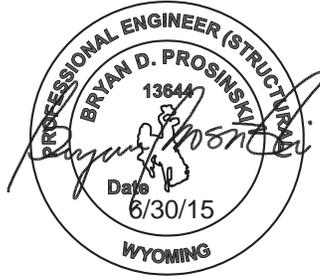
Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

J. Brendan Bummer, P.E.
Pillar Structural Engineering



June 30, 2015
Page 2 of 2

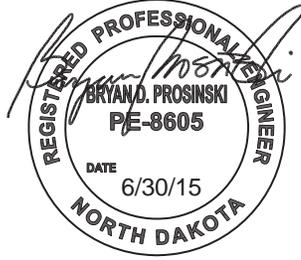
Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

If you have any questions or require additional information please contact our office.

Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering





Box 7866 5014 Industrial Road, Drayton Valley, Ab. T7A 1L5 Ph: (780) 542-3096 Fax: (780) 542-6405

Engineering Compliance

July 6, 2015

KFE Project #151055

Water Well Solutions and Rentals, Inc.
Attn: Scott Sandler
2130 W. 40th
Casper, Wyoming (USA) 82604

Attention: Mr. Scott Sandler

Re: Portable Frac Tank Engineering Review and Compliance – Pinned Seams
Sizes: 10K, 20K, 30K, 40K, 50K, 55K and 60K Tanks

A structural engineering review was conducted by Peter Vann (P. Eng) of Keystone Field Engineering Inc. for the above noted tank sizes. It was determined that the 'pinned' tank panel connections are capable of supporting the operating load conditions; and the panel lift points are of suitable construction according to the Canadian Handbook of Steel Construction (latest addition). The certified liner for the tanks shall have a minimum bonded seam strength of 40 ppi.

If you have any questions, please contact the office at 780-542-3096.

| |
|---|
| PERMIT TO PRACTICE |
| KEYSTONE FIELD ENGINEERING INC |
| Signature <i>Peter Vann</i> |
| Date <i>July 8, 2015</i> |
| PERMIT NUMBER: P 10239 |
| The Association of Professional Engineers, Geologists and Geophysicists of Alberta |



Peter Vann, P. Eng
Structural Engineer

KEYSTONE FIELD ENGINEERING INC.
PVI/kj
Reference:
Drawings completed by Nalco FabTech

www.keystonefieldeng.com

WWS AST Engineering Specs

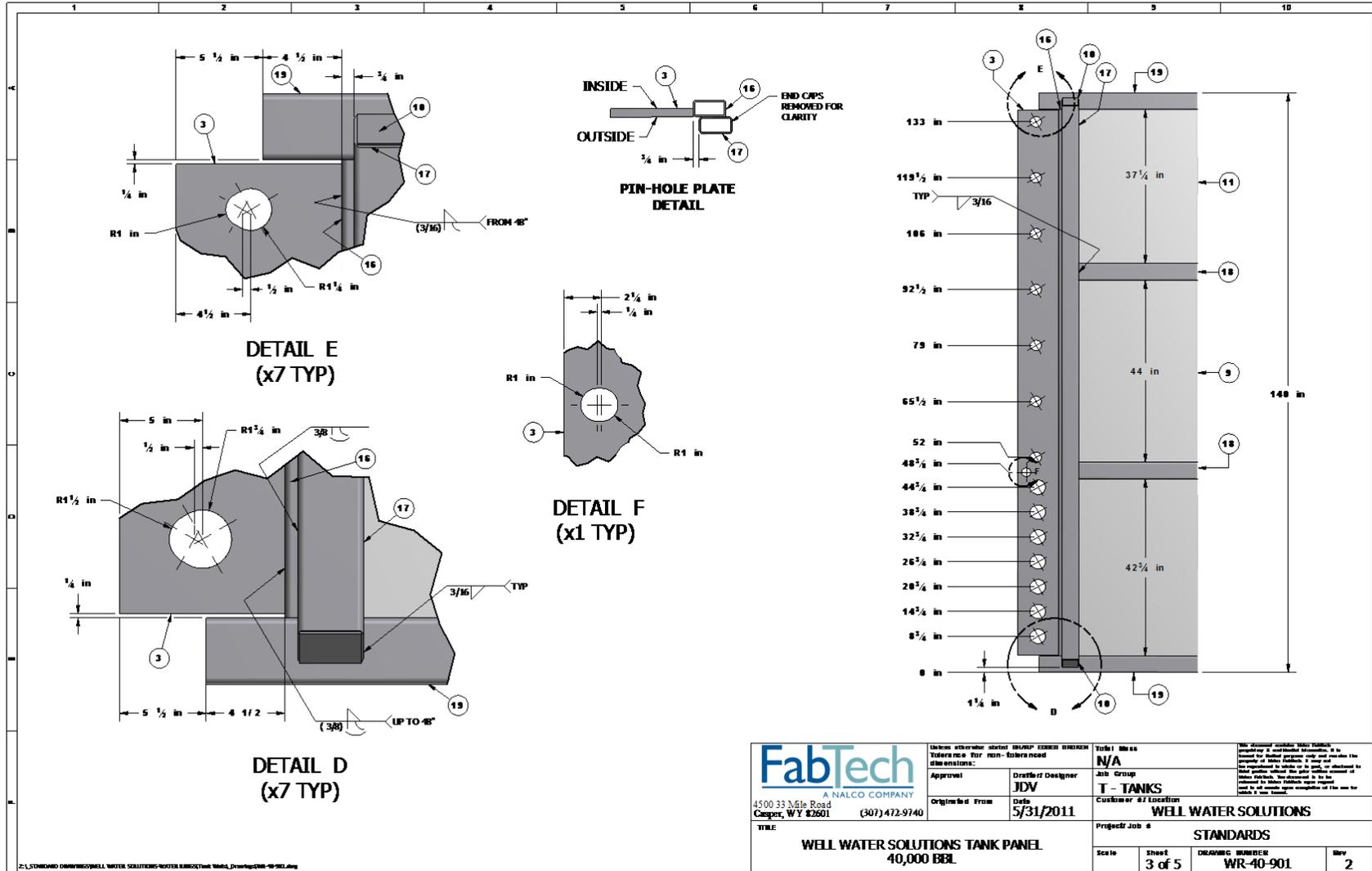
Section 1.08

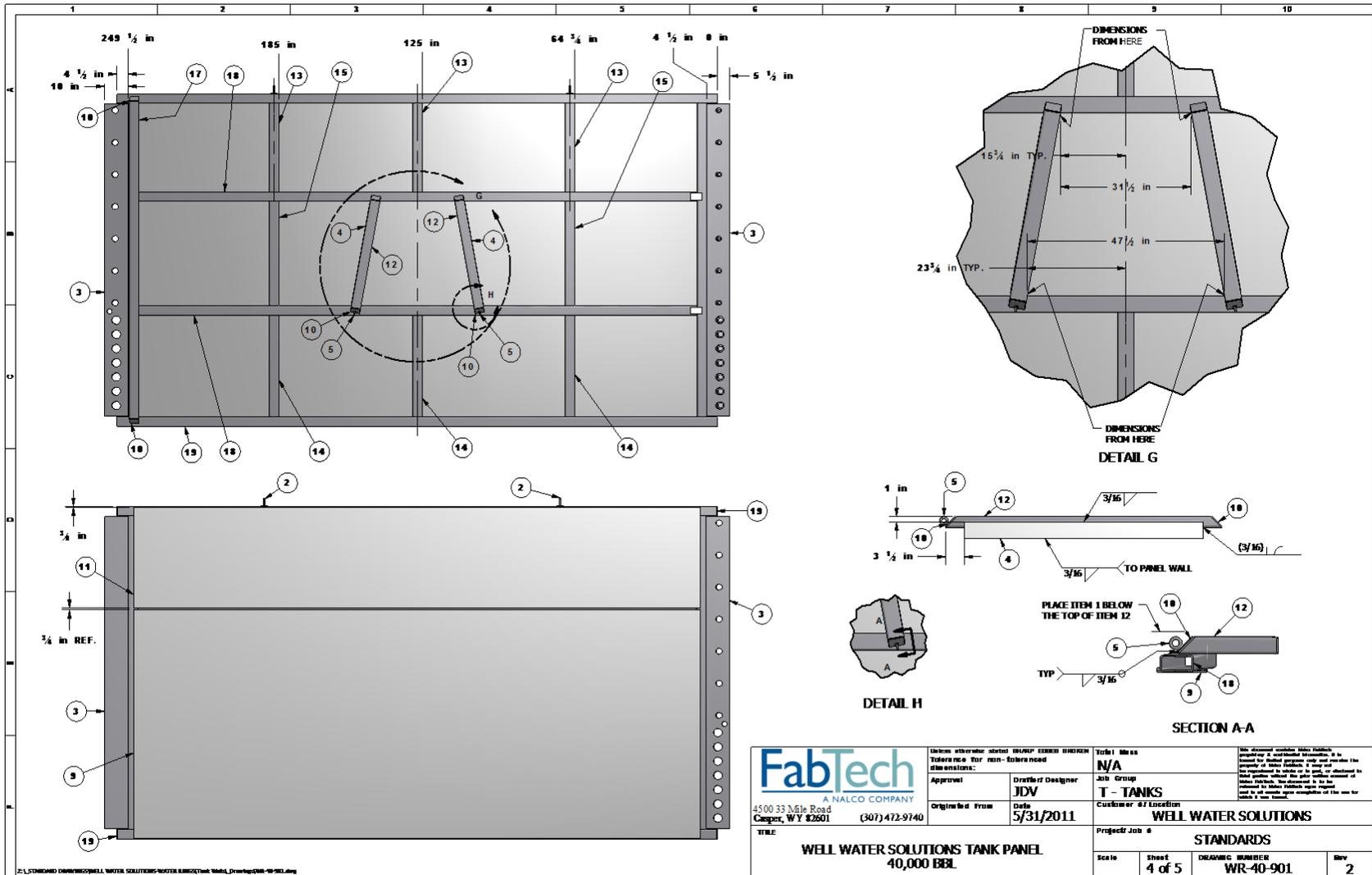
| CK | ITEM | QTY | DESCRIPTION | WIDTH | LENGTH | MATERIAL | CLENGTH (in) | WEIGHT |
|----|------|-----|--|-----------|------------|--|--------------|--------|
| 1 | 14 | | BAR, ROUND, 5/8" (LOCK PIN) | | 6 1/2 in | A36 | 6.50 | |
| 2 | 2 | | D-RING, 1/2" B38, WORKING LOAD 4000 lbs | | | A29/ A29M - 91 1045(C-1045), MODIFIED TO WELD DOWN | | 2 |
| 3 | 2 | | FBAR, 1" | 10 in | 131 1/2 in | A36 | 131.50 | 373 |
| 4 | 2 | | FBAR, 10GA | 3 in | 43 1/8 in | A36 | 86.25 | 99 |
| 5 | 2 | | PAD EYE, #2 | | | CROSBY GROUP, S-264 | | 0 |
| 6 | 7 | | PM, 2" DIA | | 4 1/2 in | KUSTOM KONCEPTS, A1018 | 31.50 | 3 |
| 7 | 7 | | PM, 3" DIA | | 4 1/2 in | KUSTOM KONCEPTS, A1018 | 31.50 | 8 |
| 8 | 2 | | PLATE, 3/16" | 3 in | 5 in | A36 | 10.00 | 2 |
| 9 | 1 | | PLATE, 3/16" | 96 in | 240 in | A36 | 240.00 | 156 |
| 10 | 6 | | SHEET, 10GA | 2 1/2 in | 3 3/4 in | A36 | 22.50 | 3 |
| 11 | 1 | | SHEET, 10GA | 42 1/2 in | 240 in | A36 | 240.00 | 50 |
| 12 | 2 | | TUBE, 4" x 2" x 3/16" (MITER BOTH ENDS) | | 52 in | A500B CLEAN COAT | 104.00 | 55 |
| 13 | 3 | | TUBE, 4" x 2" x 3/16" | | 37 1/4 in | A500B CLEAN COAT | 74.50 | 43 |
| 14 | 3 | | TUBE, 4" x 2" x 3/16" | | 42 3/4 in | A500B CLEAN COAT | 128.25 | 74 |
| 15 | 2 | | TUBE, 4" x 2" x 3/16" | | 44 in | A500B CLEAN COAT | 88.00 | 50 |
| 16 | 2 | | TUBE, 4" x 2" x 3/16" | | 132 in | A500B CLEAN COAT | 264.00 | 151 |
| 17 | 1 | | TUBE, 4" x 2" x 3/16" (MITER BOTH ENDS) | | 137 1/2 in | A500B CLEAN COAT | 137.50 | 78 |
| 18 | 2 | | TUBE, 4" x 2" x 3/16", (ROLL TO 155'-6 7/8" LD.) | | 236 3/8 in | A500B CLEAN COAT | 472.75 | 271 |
| 19 | 2 | | TUBE, 4" x 2" x 3/16", (ROLL TO 155'-6 7/8" LD.) | | 253 7/8 in | A500B CLEAN COAT | 507.75 | 291 |

NOTES:
 -THIS DRAWING REFLECTS ONE (1) ASSEMBLY
 -TWENTY THREE (23) PANELS REQUIRED FOR ENTIRE TANK ASSEMBLY

| REV | REVISION | DATE | BY |
|-----|--|-----------|-----|
| 2 | STANDARDIZE NOTATIONS | 1/17/2012 | JDV |
| 1 | ADDED ITEMS 7, 8, & 16 | 12/09/11 | DSG |
| 0 | FOR CONSTRUCTION REF(11050-901) CHANGED HEIGHT AND LOCATION OF PMS REF(11078-40-901) | 9/1/2011 | CJD |

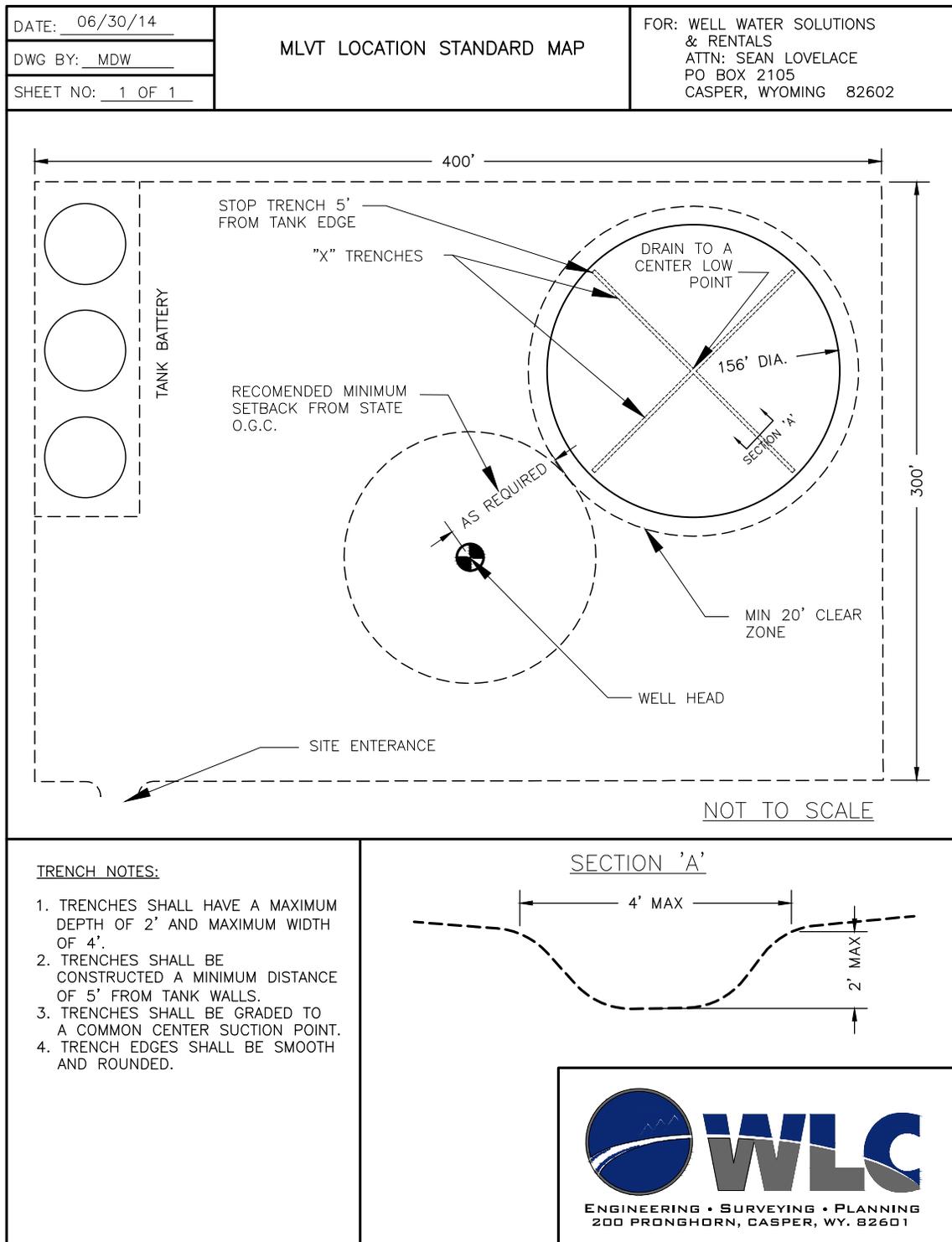
| | | | |
|---|--|--|---|
| FabTech A NALCO COMPANY 4500 33 Mile Road Casper, WY 82601 (307)472-9740 | | Unless otherwise stated DIMENSIONS SHOWN TOLERANCE FOR NON-SHAPE-CAST DIMENSIONS: Approval: _____ Drafted by Designer JDV Original From Date 5/31/2011 | Title/Block N/A Job Group T - TANKS Customer or Location WELL WATER SOLUTIONS Project Job # STANDARDS Scale Sheet 1 of 5 DRAWING NUMBER WR-40-901 Rev 2 |
|---|--|--|---|





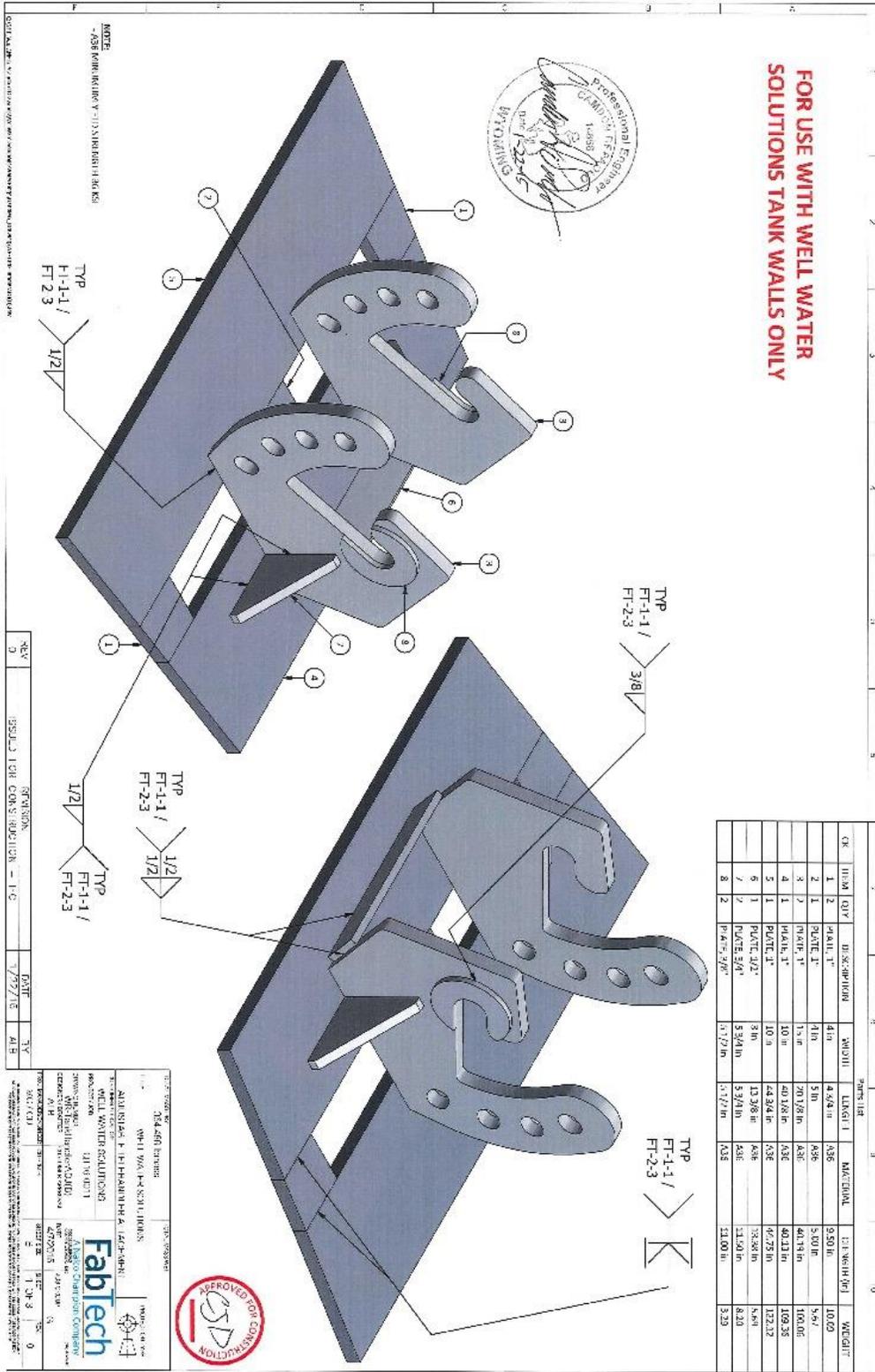
| | | | |
|---|---|--|--|
| A NALCO COMPANY 4500 33 Mile Road Casper, WY 82601 (307) 472-9740 | Unless otherwise stated DIMENSIONS SHOWN indicate size for non-fabricated dimensions: | Title: N/A Job Group: T - TANKS Customer / Location: WELL WATER SOLUTIONS Project Job #: | See drawings for other details. All drawings are the property of FabTech. It is intended for the use of the customer only and shall not be reproduced or transmitted in any form or by any means electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without the prior written permission of FabTech. |
| | Approved: _____ Drafted/Designer: JDV Originated From: _____ Date: 5/31/2011 | Title: WELL WATER SOLUTIONS TANK PANEL 40,000 BEEL | Scale: _____ Sheet: 4 of 5 DRAWING NUMBER: WR-40-901 Rev: 2 |

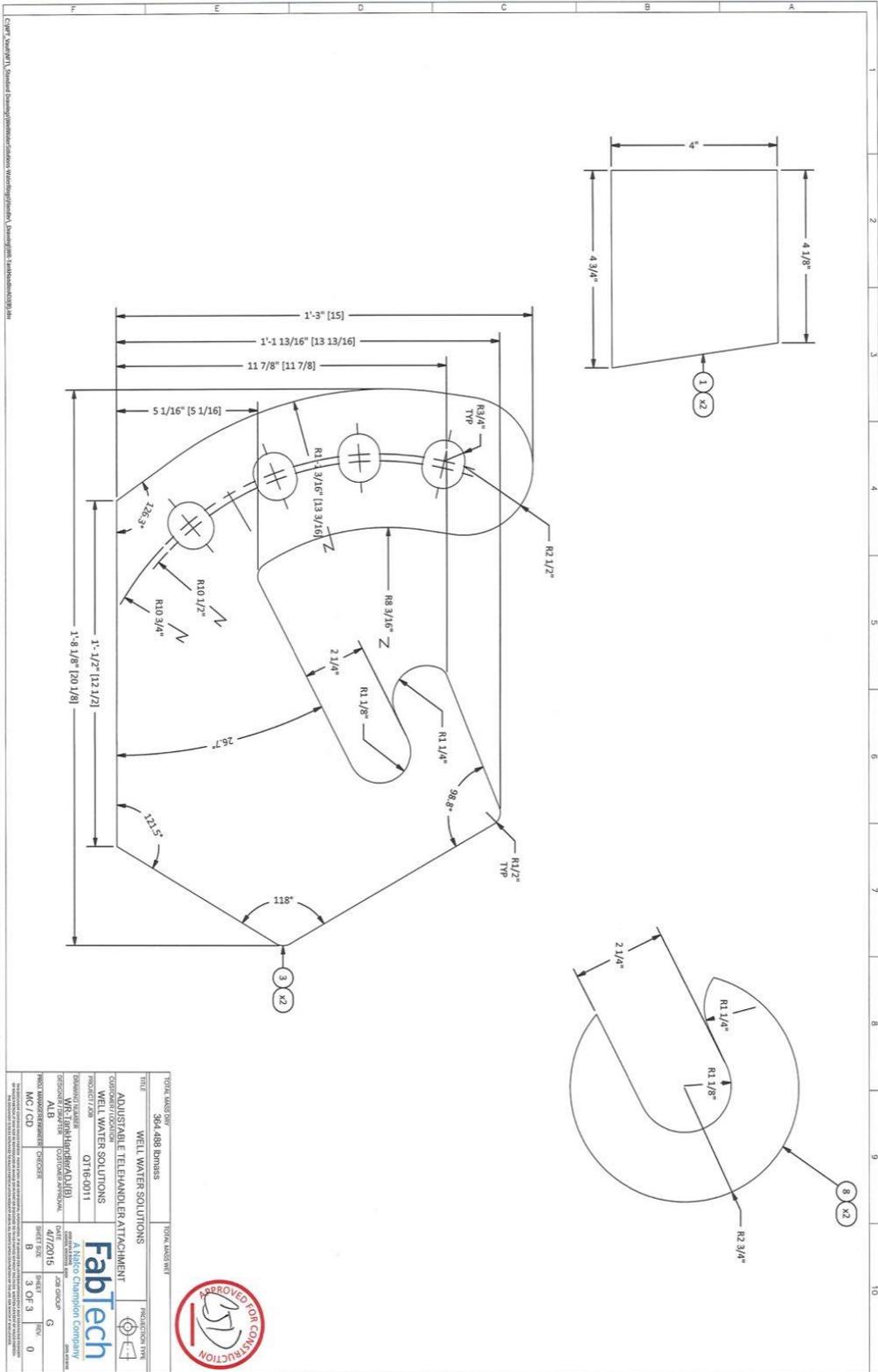
Section 1.09 Proper AST Setback and Location Sample

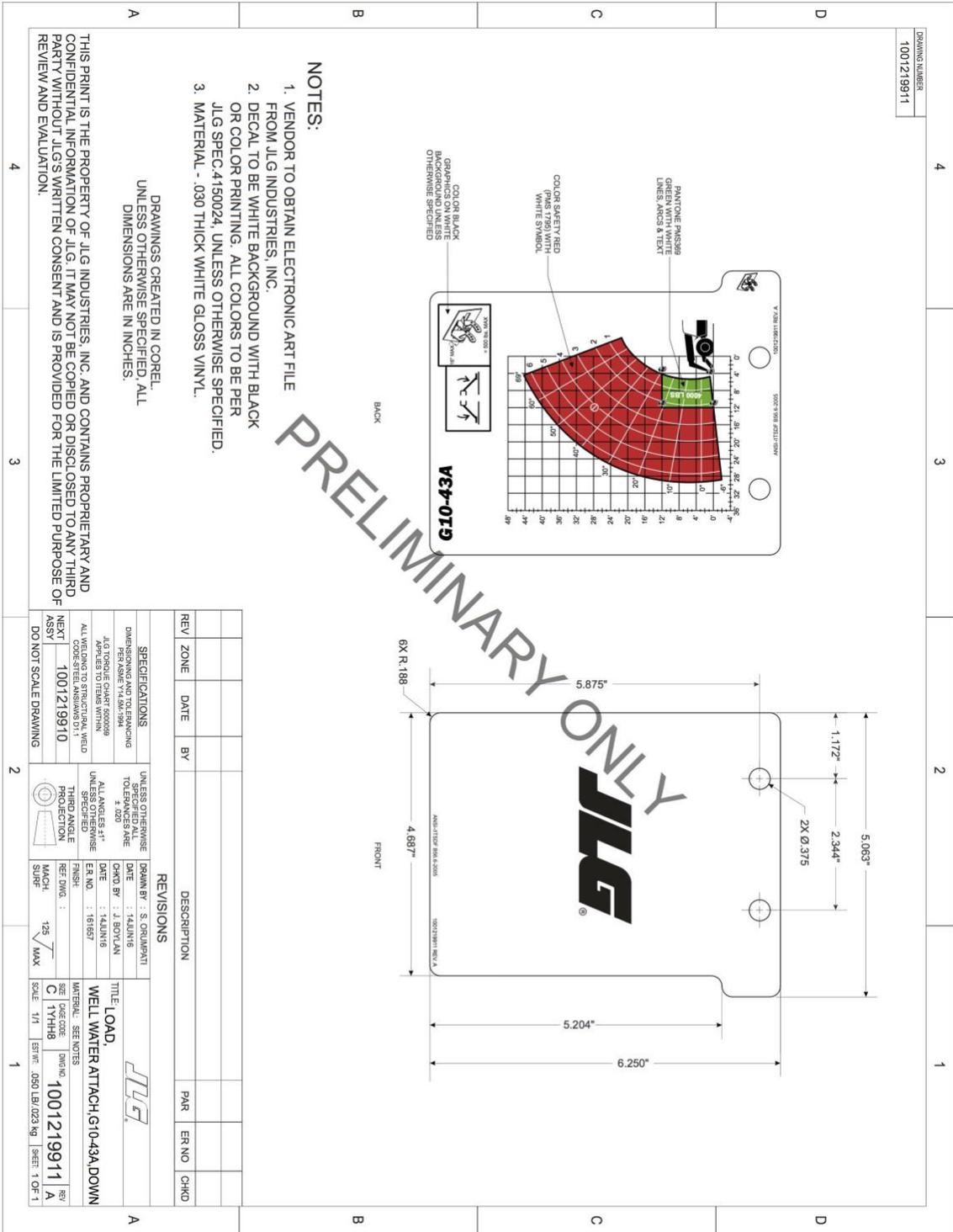


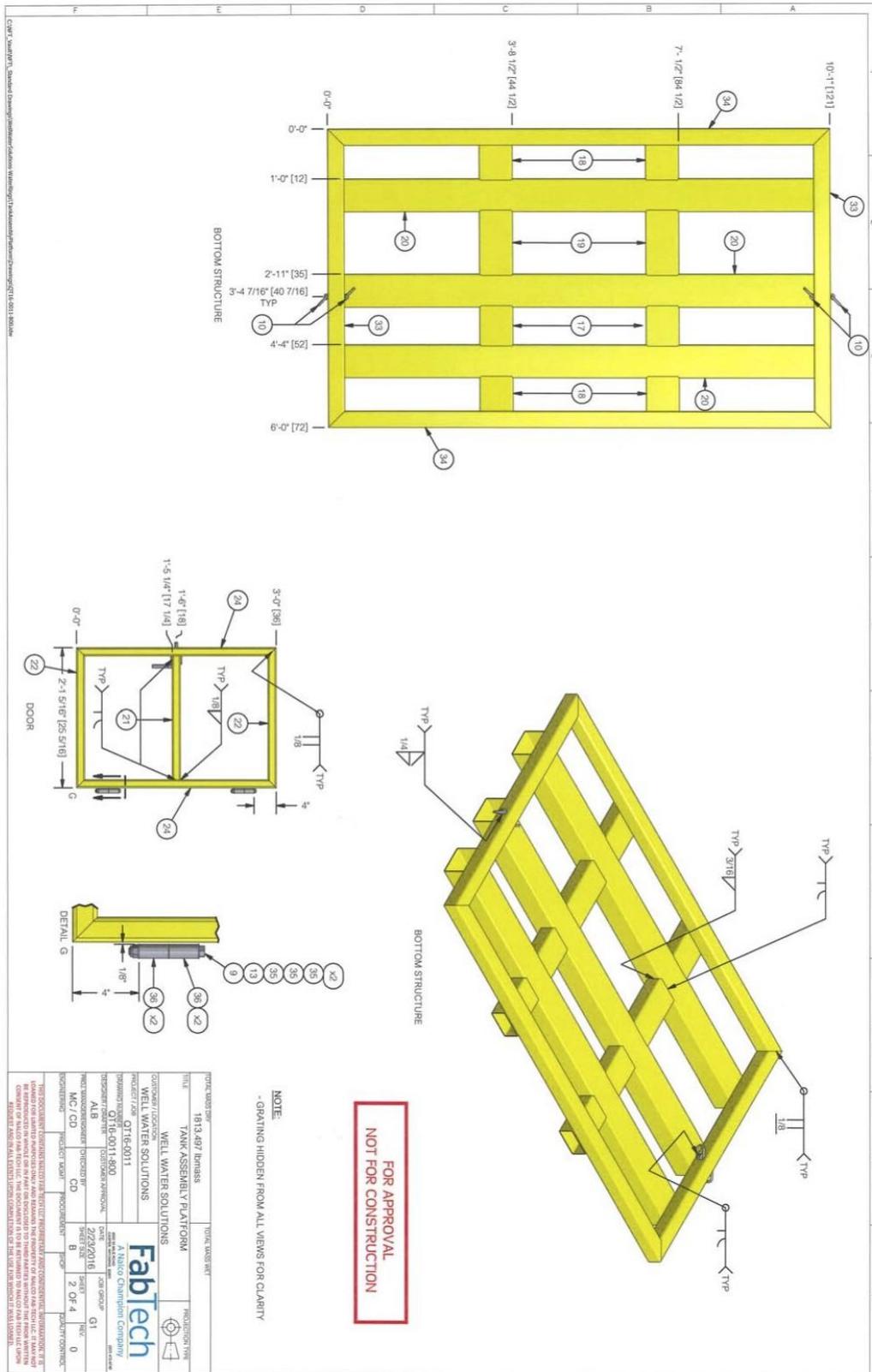
Section 1.10

JGL Approved Telehandler Attachment with Load Chart









Section 1.12 WWS Man Basket Stamp and SOP

MAN BASKET LOAD RATING

Prepared for: Well Water Solutions and Rental, Inc.
2130 W. 40th Street
Casper, WY 82604

Prepared by: Pillar Structural Engineering



February 3, 2014



1964 E. 1st St.
Casper, WY 82601
P: (307) 265.3900
F: (307) 265.3559

Summary

The purpose of this report is to present the maximum load ratings that resulted from the structural analysis of an existing steel man basket which is currently employed by Well Water Solutions and Rentals, Inc. The man basket is utilized to perform various tasks aiding in the erection of frac tanks and the installation of liner clips on said tanks. The man basket consists of two basket components; the liner clip basket which handles and stores the liner clips, and the man basket which supports the liner clip basket and the human operators. It is our understanding that there are a maximum of two operators allowed to work in the man basket at any given time. The liner clip and man baskets are hoisted and transported with heavy equipment such as a tele-handler or front end loader.

This analysis was performed in accordance with the *American Institute of Steel Construction Inc. – Manual of Steel Construction – Thirteenth Edition*. To complete this analysis, assumptions were made and are listed below.

Scope of Work:

1. Field measure the liner clip and man basket.
2. Perform structural analysis of the liner clip and man basket to determine a safe operating load rating.

Assumptions:

1. Rolled structural steel shapes are assumed to conform to the following specifications:
 - a. Channels, Angles & Plates (C, L, Plate) ASTM A36, 36 ksi yield stress
 - b. Hollow Structural Sections (HSS) ASTM A500, Grade B, 46 ksi yield stress
2. HSS Shapes are assumed to have a constant wall thickness throughout its length. Assumed wall thicknesses and shapes, which were not able to be measured, are listed in the body of the report.
3. For all welded members the provided maximum load ratings are based on all connected members being welded with a minimum of a 3/16" fillet weld, fully welded with an E70 electrode or equivalent submerged arc weld. A certified weld inspector should be consulted to fully verify the properties and quality of these welds.
4. The basket floor and sides consist of flattened expanded metal. Our office was unable to determine the grade and size of the flattened metal. It is assumed that this flattened expanded metal floor is capable of supporting the maximum load rating specified herein.

Limitations and Quality Control:

1. All heavy equipment utilized to hoist and transport the man basket must be capable of safely supporting the weight of the man baskets in addition to the maximum safe operating load.
2. All structural steel must be protected from corrosion by either galvanizing or painting.
3. The man basket shall be periodically inspected for signs of corrosion, defects, overloading and anything else that may indicate a reduction of the load-carrying capacity of the man basket.
4. The baskets have been analyzed to account for a minimum factor of safety of 1.5.





Liner Clip and Man Basket:

Field Label: N.A.

Style: Welded Structural Steel

Maximum Liner Clip Basket Load: 1,200 lbs

Maximum Man Basket Load: 40 psf = 1,100 lbs

Approximate Man Basket Weight: 1,600 lbs

Description: Refer to picture above for clarification.

Primary Vertical Members: HSS 1 ½ x 1 ½ x 1/8

Primary Horizontal Members: Railing - HSS 1 ½ x 1 ½ x 1/8, Floor Support – HSS 1 x 2 x 1/8

Additional Members: Man Basket Floor Perimeter - Angle 3 x 4 x ¼ (LLH), Liner Clip Basket Floor Perimeter – HSS 2 x 2 x 3/16, Man Basket Fork Slots – HSS 10 x 6 x ¼, Liner Clip Basket Fork Slots – HSS 8 x 4 x ¼, Basket Floors and Sides - Flattened Expanded Metal

Member Layout: (All Dimensions are Approximate) The overall length, width and height of the Man Basket is 10'-0" x 6'-0" x 3'-8", respectively. The overall length, width and height of the Liner Basket is 10'-0" x 3'-2" x 30", respectively. Member spacing; primary vertical members = 30", floor supports = 15" (Man Basket), 30" (Liner Clip Basket)

Comments: The quality of construction, based on visual observations only, appears to be good.

Additional Recommendations:

Attachment of Liner Clip Basket to Man Basket: The Liner Clip Basket must be fastened to the Man Basket while in operation. Our office recommends fastening along the intersection of the HSS 1 ½ x 1 ½ x 1/8 railings with 4 bolted steel clamps (placed 1 at each end and spaced equally between).

Attachment of Man Basket to hoisting/transporting equipment: The Man Basket must be fastened to the hoisting/transporting equipment with a steel chain attached to the welded "D-rings". The chain must be rated for a minimum safe working load limit not less than 8,000 lbs. The chain must be secured and tightened with a lever or ratchet chain binder with a minimum safe working load limit not less than 8,000 lbs.



Section 1.13 Geomembrane Fabrication Manual and Testing Chart

MLVT GEOMEMBRANE PANEL FABRICATION MANUAL

Well Water Solutions, Inc.



Colorado Lining International
Parker CO 80138
800-524-8672/303-841-2022
Fax: 303-841-5780
www.coloradolining.com

TERMINOLOGY

The following definitions will be used throughout this document.

Geomembrane Manufacturer- The party responsible for compounding resin into geomembrane roll goods.

Geomembrane Fabricator- The party who is responsible for welding the geomembrane roll goods, through factory fabrication using controlled welding methods, into geomembrane panels. **Colorado Lining International – 800-524-8672**

Geomembrane Installer -The party responsible for placing and/or joining geomembrane panels in the field or on the job site.

Geomembrane Sheet -The product of the Geomembrane manufacturer, provided on rolls to the fabricator.

Geomembrane or Panels or Geomembrane Panels -The term applied to multiple geomembrane sheets that have been welded together, through factory fabrication, under controlled conditions. The actual size of the panels will depend upon weight, mil thickness, and design configurations.

Sample -The piece of liner or seam section taken for testing. It is usually large enough to contain specimens for a series of tests.

Seam -The completed process of welding two geomembrane sheets together.

Specimen -The term applied to an individual part of a sample. Specimens are used to test peel and shear values of a welded seam.

Welding -The process whereby two sheets or panels of geomembrane are joined together.

MLVT – Modular Large Volume Tank

MLVT Geomembrane Liner – One or more factory fabricated Geomembrane Panel(s) for placement inside an engineered containment ring.

1.0 GENERAL

1.1 Products

- A. The geomembrane material shall be 30 to 60 mils thick, as specified. The geomembrane shall be manufactured consisting of first quality ingredients. The finished compound shall be uniform in color, thickness, size and surface texture.

1.2 Markings

- A. In the case of round tanks, panels shall include a highly visible "cross hair" style marking denoting the center point of the panel to coincide with the center point of the tank. Radial spoke-like markings will be painted on the panel surface to assist with field measures to assure vertical alignment up the tank walls.

2.0 Subgrade Preparation

- A. The Earthwork Contractor shall be responsible for preparing and maintaining the subgrade in a condition suitable for installation of MLVT Geomembrane Panel. Any damage to the surface caused by weather conditions or other conditions must be repaired prior to MLVT Geomembrane Panel deployment. The installer will submit, prior to installing the MLVT Geomembrane Panel, written approval of the subgrade surface on which the MLVT Geomembrane Panel will be installed.
- B. All surfaces in contact with the MLVT Geomembrane Panel must be free of sharp stones, stones over 3/8" in diameter, sticks and other debris that can puncture or tear the MLVT Geomembrane Panel. No standing water, mud, snow or excessive moisture should be on the subgrade when the MLVT Geomembrane Panel is deployed. Subgrade should be constructed of a firm stable material compacted to a 95% proctor.

3.0 Deployment of MLVT Geomembrane Panels

- A. The MLVT Geomembrane Panel shall be placed at the edge of the tank layout and be lined up with the centerline of the tank layout. Unroll the MLVT Geomembrane Panel down the centerline of the tank layout. Verify the markings on the MLVT Geomembrane Panel line up with the tank layout. If needed adjust the placement of the MLVT Geomembrane Panel prior to proceeding with installation.
- B. The MLVT Geomembrane Panel is then unfolded in the perpendicular direction to which it was unrolled in one direction. The next step is to unfold the MLVT Geomembrane Panel in the opposite direction of the first unfold direction.
- C. See sketch at end of document for clarification of these steps.

4.0 MLVT Geomembrane Representative Welds

- A. At the start of each day's work and once every 4 hours thereafter, before any welding machine shall be deployed on a liner panel, a sample of a representative seam shall be produced and evaluated for each welding machine to be utilized.

Representative welds shall also be required if there is a change in environmental conditions. Representative samples shall be prepared non-destructively using strips of geomembrane cut from excess sheets of liner being seamed. Peel and shear samples are to be tested with a calibrated tensiometer. Field seam welding shall commence only after successful representative seam test results are achieved by each machine.

- B. Test results shall be representative of subsequently made seams on an actual liner fabricated after the test. There shall be one representative seam evaluation made every four hours and on each machine utilized. Representative welds shall be recorded on the CLI Seam Quality Control Form which shall be available to customers upon request.

5.0 Seam Testing Criterion

Samples shall be non-destructive, not requiring patching of fabricated panels. Four test specimens (2 shear and 2 peel) shall be cut from each seam sample and tensiometer tested for bonded seam strength and peel adhesion. All test results shall be recorded in the Seam Quality Control Form.

- A. Tensiometer Peel Strength Test:

Peel adhesion shall be in accordance with ASTM D 7747. In seam samples when tested in peel, failure shall occur resulting in a Film Tearing Bond (or "FTB"). The tensiometer peel test provides a numerical value for the peel strength achieved in addition to visually inspection for film tearing bonds. Samples should be 1" wide centered over the seam.

- B. Tensiometer Tensile Strength Test:

Samples shall be tested with a tensiometer and evaluated for bonded seam strength (shear) using method ASTM D 7749.

- C. Shear and peel test results shall conform to either GRI GM 19 requirements or to the manufacturer's requirements.
- D. All Field Seams shall be 100% tested by high pressure air lance in accordance with ASTM D 4437.

6.0 Field Thermal Wedge Weld Seaming Procedures

- A. Adjacent MLVT Geomembrane Panels shall be overlapped by approximately 4" for fusion welding. Panel edges to be seamed shall be clean of all foreign matter or debris before seaming commences. Welding can occur once the sheets to be joined have been cleaned and brought into their exact position.
- B. When starting a new weld, the machine shall be manually placed into the overlapped sheet of material.

- C. Welder alignment and temperature shall be monitored during the seaming process and adjustments will be made as necessary. The welded seams must be 100% visually inspected as welding machinery advances.
- D. All cross seams or "T" intersections caused by material roll splices where 3 layers of membrane material occur shall be patched where they intersect with 3" or larger diameter patches of the MLVT Geomembrane material. Patches shall be applied by use of a hand held heat gun and seam roller. All patches and repairs shall be 100% tested by high pressure air lance or vacuum box in accordance with ASTM D 4437 and ASTM D 5641.
- E. Should a defective seam be found, welding shall be ceased until the cause of the defect is determined and rectified and the seam is repaired. Documentation of the defect and repair shall be recorded on the Seam Quality Control Form.

7.0 Fold back of MLVT Geomembrane Panels

- A. Once all field seaming is completed the outer limits of the MLVT Geomembrane Panels need to be folded back on top of themselves far enough to provide enough room for assembly of the steel tank sections without damage to the system.

8.0 MLVT Geomembrane Panel final deployment

- A. Once the steel walls are assembled they need to be inspected for any sharp surfaces that could damage the MLVT Geomembrane Panels and there needs to be a support material placed as a chamfer at the transition from the wall to the subgrade to eliminate the possibility of stressing the MLVT Geomembrane panel at the 90 degree transition. This support material can be sand tubes, precut foam, etc.
- B. Next the MLVT Geomembrane Panels need to be placed up and over the walls. This step is completed with the assistance of equipment used to lift the edge of the MLVT Geomembrane Panel up the height of the steel wall. Enough material should be lifted up and over the wall to create the proper overhang so the liner does not fall back off the wall while the clamping system is installed.
- C. The MLVT Geomembrane Panels shall be protected at all times from damage and all equipment and methods used to lift, place and clamp shall not damage the MVLТ GEomembrane Panel and shall not impart excess stress in the MVLТ GEomembrane Panels and thermally welded seam areas.
- D. ALL tank panel erection, assembly, placement and lifting of MVLТ GEomembrane Panel is by others. CLI shall not be responsible for damages to the MVLТ GEomembrane Panel after delivery / customer pickup or once installation is completed, if performed by CLI.

End of Specification

Section 1.14 Geomembrane Installation Manual

MLVT GEOMEMBRANE PANEL INSTALLATION MANUAL

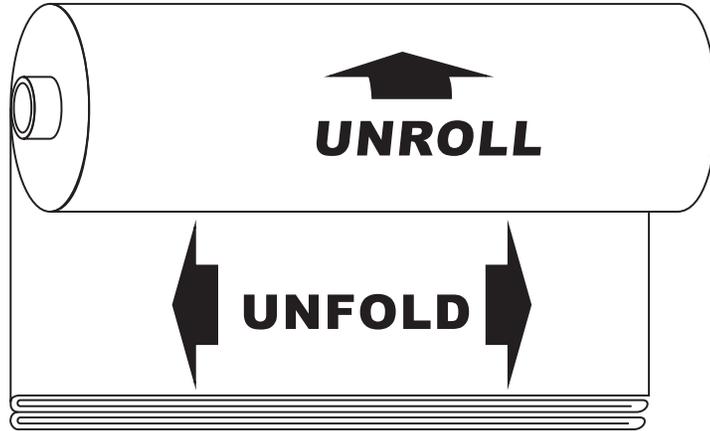
Well Water Solutions, Inc.



Colorado Lining International
Parker CO 80138
800-524-8672/303-841-2022
Fax: 303-841-5780
www.coloradolining.com



**DEPLOYMENT OF DUAL DIRECTION
ACCORDION FOLDED PANELS**
(SHEET 1 OF 2)

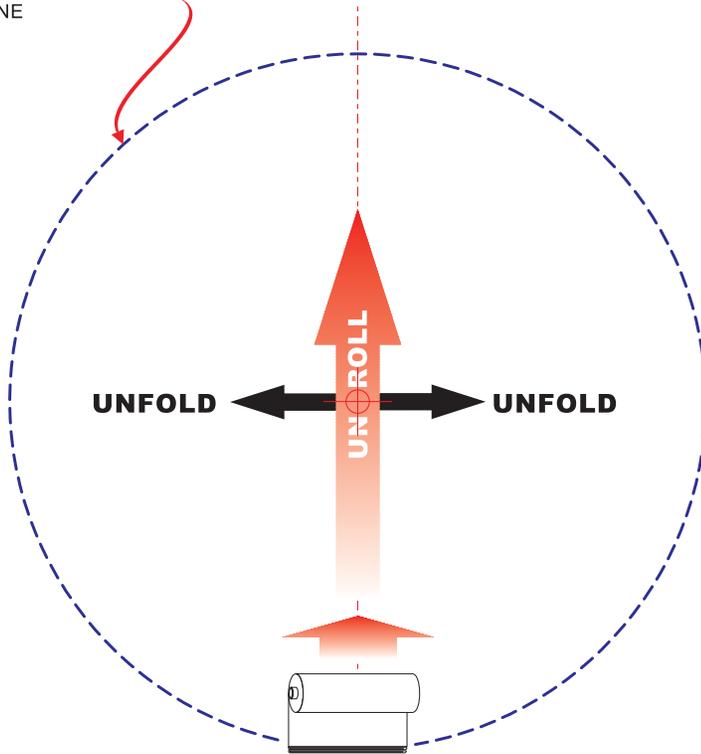




DEPLOYMENT OF DUAL DIRECTION ACCORDION FOLDED PANELS (SHEET 2 OF 2)

CLI FABRICATES FRAC TANK PANEL LINERS AND UNDERLAYMENTS IN A DUAL DIRECTION ACCORDION FOLDED MANNER SO THAT THE PANELS CAN BE DEPLOYED ON THE TANK'S CENTERLINE. AFTER THE INITIAL UN-ROLLING THE PANELS ARE THEN UN-FOLDED IN PERPENDICULAR DIRECTIONS

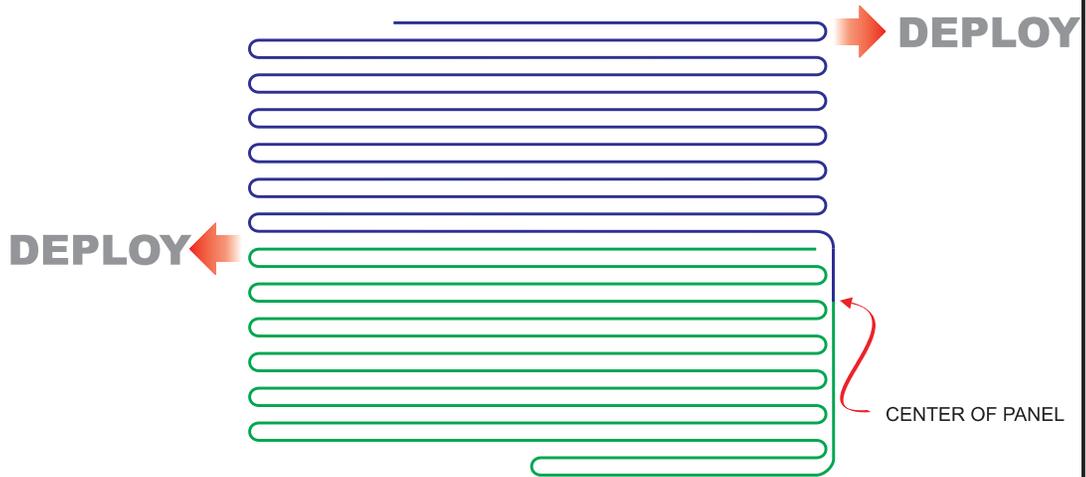
TANK EXTENTS
OUTLINE



UNROLL PANEL
ON TANK'S
CENTERLINE
PRIOR TO WALLS
GOING UP



**DOUBLE DIRECTION ACCORDION FOLDED
PANEL SCHEMATIC**
(SHEET 2 OF 2)



EXAMPLE OF A 26 SHEET B-40 TANK LINER

Section 1.15 WWS Preferred Liner Spec or Comparable Substitute



19103 Gundle Road
Houston, TX 77073
281 230 8650 Fax
www.gseworld.com

January 22, 2018

Western ProLine
184 Hwy 59 North
Miles City, MT 59301

RE: GSE LLDPE Geomembrane Permeability

Certification of Compliance

The undersigned, being qualified and authorized to do so, hereby certifies that GSE High Performance 30 mil Nominal and GSE High Performance 40 mil Nominal UltraFlex LLDPE Geomembranes will meet a permeability of 1×10^{-12} cm/s when tested per ASTM E96.

Sincerely,

A handwritten signature in black ink that reads "Miguel Garcia". The signature is written in a cursive style with a large, prominent "M" and "G".

Miguel Garcia
GSE Technical Support

MG18-0005

TECHNICAL NOTE

Chemical Resistance Chart

GSE is the world's leading supplier of high quality, polyethylene geomembranes. GSE polyethylene geomembranes are resistant to a great number and combinations of chemicals. Note that the effect of chemicals on any material is influenced by a number of variable factors such as temperature, concentration, exposed area and duration. Many tests have been performed that use geomembranes and certain specific chemical mixtures. Naturally, however, every mixture of chemicals cannot be tested for, and various criteria may be used to judge performance. Reported performance ratings may not apply to all applications of a given material in the same chemical. Therefore, these ratings are offered as a guide only.

| Medium | Concentration | Resistance at: | | Medium | Concentration | Resistance at: | |
|-----------------------------|---------------|------------------|-------------------|---------------------------|---------------|------------------|-------------------|
| | | 20° C (68° F) | 20° C (140° F) | | | 20° C (68° F) | 20° C (140° F) |
| A | | | | Copper chloride | sat. sol. | S | S |
| Acetic acid | 100% | S | L | Copper nitrate | sat. sol. | S | S |
| Acetic acid | 10% | S | S | Copper sulfate | sat. sol. | S | S |
| Acetic acid anhydride | 100% | S | L | Cresylic acid | sat. sol. | L | — |
| Acetone | 100% | L | L | Cyclohexanol | 100% | S | S |
| Adipic acid | sat. sol. | S | S | Cyclohexanone | 100% | S | L |
| Allyl alcohol | 96% | S | S | D | | | |
| Aluminum chloride | sat. sol. | S | S | Decahydronaphthalene | 100% | S | L |
| Aluminum fluoride | sat. sol. | S | S | Dextrine | sol. | S | S |
| Aluminum sulfate | sat. sol. | S | S | Diethyl ether | 100% | L | — |
| Alum | sol. | S | S | Diethylphthalate | 100% | S | L |
| Ammonia, aqueous | dil. sol. | S | S | Dioxane | 100% | S | S |
| Ammonia, gaseous dry | 100% | S | S | E | | | |
| Ammonia, liquid | 100% | S | S | Ethanediol | 100% | S | S |
| Ammonium chloride | sat. sol. | S | S | Ethanol | 40% | S | L |
| Ammonium fluoride | sol. | S | S | Ethyl acetate | 100% | S | U |
| Ammonium nitrate sat. sol. | S | S | S | Ethylene trichloride | 100% | U | U |
| Ammonium sulfate | sat. sol. | S | S | F | | | |
| Ammonium sulfide | sol. | S | S | Ferric chloride | sat. sol. | S | S |
| Amyl acetate | 100% | S | L | Ferric nitrate | sol. | S | S |
| Amyl alcohol | 100% | S | L | Ferric sulfate | sat. sol. | S | S |
| B | | | | Ferrous chloride | sat. sol. | S | S |
| Barium carbonate | sat. sol. | S | S | Ferrous sulfate | sat. sol. | S | S |
| Barium chloride | sat. sol. | S | S | Fluorine, gaseous | 100% | U | U |
| Barium hydroxide | sat. sol. | S | S | Fluorosilicic acid | 40% | S | S |
| Barium sulfate | sat. sol. | S | S | Formaldehyde | 40% | S | S |
| Barium sulfide | sol. | S | S | Formic acid | 50% | S | S |
| Benzaldehyde | 100% | S | L | Formic acid | 98-100% | S | S |
| Benzene | — | L | L | Furfuryl alcohol | 100% | S | L |
| Benzoic acid | sat. sol. | S | S | G | | | |
| Beer | — | S | S | Gasoline | — | S | L |
| Borax (sodium tetraborate) | sat. sol. | S | S | Glacial acetic acid | 96% | S | L |
| Boric acid | sat. sol. | S | S | Glucose | sat. sol. | S | S |
| Bromine, gaseous dry | 100% | U | U | Glycerine | 100% | S | S |
| Bromine, liquid | 100% | U | U | Glycol | sol. | S | S |
| Butane, gaseous | 100% | S | S | H | | | |
| 1-Butanol | 100% | S | S | Heptane | 100% | S | U |
| Butyric acid | 100% | S | L | Hydrobromic acid | 50% | S | S |
| C | | | | Hydrobromic acid | 100% | S | S |
| Calcium carbonate | sat. sol. | S | S | Hydrochloric acid | 10% | S | S |
| Calcium chlorate | sat. sol. | S | S | Hydrochloric acid | 35% | S | S |
| Calcium chloride | sat. sol. | S | S | Hydrocyanic acid | 10% | S | S |
| Calcium nitrate | sat. sol. | S | S | Hydrofluoric acid | 4% | S | S |
| Calcium sulfate | sat. sol. | S | S | Hydrofluoric acid | 60% | S | L |
| Calcium sulfide | dil. sol. | L | L | Hydrogen | 100% | S | S |
| Carbon dioxide, gaseous dry | 100% | S | S | Hydrogen peroxide | 30% | S | L |
| Carbon disulfide | 100% | L | U | Hydrogen peroxide | 90% | S | U |
| Carbon monoxide | 100% | S | S | Hydrogen sulfide, gaseous | 100% | S | S |
| Chloroacetic acid | sol. | S | S | Lactic acid | 100% | S | S |
| Carbon tetrachloride | 100% | L | U | Lead acetate | sat. sol. | S | — |
| Chlorine, aqueous solution | sat. sol. | L | U | Magnesium carbonate | sat. sol. | S | S |
| Chlorine, gaseous dry | 100% | L | U | Magnesium chloride | sat. sol. | S | S |
| Chloroform | 100% | U | U | Magnesium hydroxide | sat. sol. | S | S |
| Chromic acid | 20% | S | L | Magnesium nitrate | sat. sol. | S | S |
| Chromic acid | 50% | S | L | Maleic acid | sat. sol. | S | S |
| Citric acid | sat. sol. | S | S | Mercuric chloride | sat. sol. | S | S |
| | | | | Mercuric cyanide | sat. sol. | S | S |
| | | | | Mercuric nitrate | sol. | S | S |

Section 1.16 Geo Grid Mesh Spec



SKAPS Industries
 571 Industrial Parkway
 Commerce, GA 30529 (U.S.A.)
 Phone (706) 336-7000 Fax (706) 336-7007
 e-mail: info@skaps.com

**SKAPS TRANSNET™ (TN)
 HDPE GEONET 220**

SKAPS TRANSNET™ Geonet consists of SKAPS GeoNet made from HDPE resin.

| Property | Test Method | Unit | Required Value | Qualifier |
|-----------------------------|--------------------------|----------------------|--------------------|-------------------|
| Geonet | | | | |
| Thickness | ASTM D 5199 | mil. | 220±20 | Range |
| Carbon Black | ASTM D 4218 | % | 2 to 3 | Range |
| Tensile Strength | ASTM D 7179 | lb/in | 45 | Minimum |
| Melt Flow | ASTM D 1238 ³ | g/10 min. | 1 | Maximum |
| Density | ASTM D 1505 | g/cm ³ | 0.94 | Minimum |
| Transmissivity ¹ | ASTM D 4716 | m ² /sec. | 2x10 ⁻³ | MARV ² |

Notes:

1. Transmissivity measured using water at 21 ± 2°C (70 ± 4°F) with a gradient of 0.1 and a confining pressure of 10000 psf between stainless steel plates after 15 minutes. Values may vary between individual labs.
2. MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.
3. Condition 190/2.16

This information is provided for reference purposes only and is not intended as a warranty or guarantee. SKAPS assumes no liability in connection with the use of this information.

Visit our Web site at www.skaps.com

Section 1.17 Patents and Patent Protections



US008376167B2

(12) **United States Patent**
Lovelace et al.

(10) **Patent No.:** **US 8,376,167 B2**

(45) **Date of Patent:** **Feb. 19, 2013**

(54) **PORTABLE RESERVOIR FRAME**

(75) Inventors: **Sean Michael Lovelace**, Casper, WY (US); **Christopher Jason Songe**, Casper, WY (US)

(73) Assignee: **Energy Innovations, LLC**, Casper, WY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/469,883**

(22) Filed: **May 11, 2012**

(65) **Prior Publication Data**

US 2012/0223073 A1 Sep. 6, 2012

Related U.S. Application Data

(63) Continuation of application No. 13/245,492, filed on Oct. 21, 2011.

(51) **Int. Cl.**
B65D 6/00 (2006.01)

(52) **U.S. Cl.** **220/4.17; 220/4.16; 220/693; 220/567; 220/4.12**

(58) **Field of Classification Search** 220/1.6, 220/4.12, 4.16, 4.17, 9.4, 23.9, 495.06, 495.08, 220/567, 681, 693
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,875,666 A * 9/1932 Schwemlein 220/693
3,233,251 A * 2/1966 Barrera 52/245
3,648,303 A * 3/1972 Stewart et al. 52/5
4,124,907 A * 11/1978 Laven 52/169.7

FOREIGN PATENT DOCUMENTS

CA 2692016 7/2010

* cited by examiner

Primary Examiner — Anthony Stashick

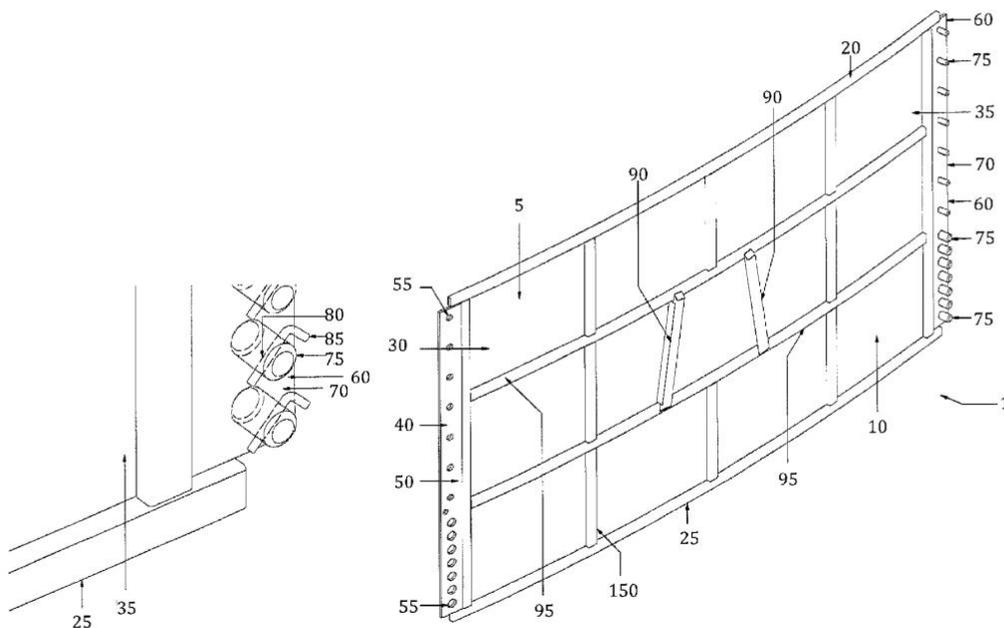
Assistant Examiner — Christopher McKinley

(74) *Attorney, Agent, or Firm* — Gordon Silver, Ltd.; Ronald C. Gorsché

(57) **ABSTRACT**

A portable reservoir frame composed of interlocking panels secured by a series of flanges having holes and pegs. An inner liner to hold liquid inside the reservoir frame is presented.

16 Claims, 11 Drawing Sheets





US008365937B2

(12) **United States Patent**
Lovelace et al.

(10) **Patent No.:** **US 8,365,937 B2**
(45) **Date of Patent:** **Feb. 5, 2013**

(54) **PORTABLE RESERVOIR FRAME**

(75) Inventors: **Sean Michael Lovelace**, Casper, WY (US); **Christopher Jason Songe**, Casper, WY (US)

(73) Assignee: **Energy Innovations, LLC**, Casper, WY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/469,845**

(22) Filed: **May 11, 2012**

(65) **Prior Publication Data**

US 2012/0234829 A1 Sep. 20, 2012

Related U.S. Application Data

(63) Continuation of application No. 13/426,286, filed on Mar. 21, 2012, which is a continuation-in-part of application No. 13/245,492, filed on Oct. 21, 2011.

(51) **Int. Cl.**

B65D 6/00 (2006.01)

(52) **U.S. Cl.** **220/4.17**; 220/4.16; 220/693; 220/567; 220/4.12

(58) **Field of Classification Search** 220/565, 220/567, 1.6, 4.16, 4.12, 9.4, 495.06, 495.08, 220/23.9, 4.17, 693, 681
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,076,382 A * 10/1913 Maloney 220/4.17
1,875,666 A * 9/1932 Schwemlein 220/693

| | | | |
|-------------------|---------|----------------------|-----------|
| 2,123,035 A * | 7/1938 | Ashley | 220/693 |
| 2,914,149 A * | 11/1959 | Walker | 52/394 |
| 3,233,251 A * | 2/1966 | Barrera | 52/245 |
| 3,562,822 A * | 2/1971 | Wall | 52/245 |
| 3,648,303 A * | 3/1972 | Stewart et al. | 52/5 |
| 3,736,599 A * | 6/1973 | Kessler et al. | 52/169.7 |
| 3,793,651 A * | 2/1974 | Pitti et al. | 52/169.7 |
| 3,819,079 A * | 6/1974 | Levens | 220/4.13 |
| 4,048,773 A * | 9/1977 | Laven | 52/169.7 |
| 4,124,907 A * | 11/1978 | Laven | 52/169.7 |
| 4,223,498 A * | 9/1980 | Ventrice | 52/249 |
| 4,240,562 A * | 12/1980 | Holschlag | 220/565 |
| 4,860,914 A * | 8/1989 | Derni et al. | 220/4.28 |
| 4,932,558 A * | 6/1990 | Katavolos | 220/666 |
| 5,054,135 A * | 10/1991 | Dallaire et al. | 4/506 |
| 5,161,264 A * | 11/1992 | Dugas | 4/506 |
| 5,294,019 A * | 3/1994 | Looker | 220/683 |
| 6,071,213 A * | 6/2000 | Raasch et al. | 482/29 |
| 7,311,827 B2 * | 12/2007 | Clark et al. | 210/232 |
| 7,766,184 B2 * | 8/2010 | Avery et al. | 220/573.1 |
| 7,918,764 B2 * | 4/2011 | VanElverdinghe .. | 482/27 |
| 2009/0127255 A1 * | 5/2009 | Rood, Jr. | 220/1.5 |

FOREIGN PATENT DOCUMENTS

CA 2692016 7/2010

* cited by examiner

Primary Examiner — Anthony Stashick

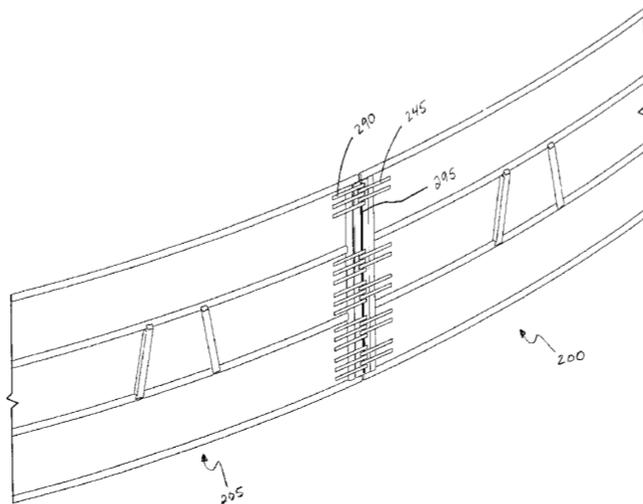
Assistant Examiner — Christopher McKinley

(74) *Attorney, Agent, or Firm* — Gordon Silver Ltd.; Ronald C. Gorsché

(57) **ABSTRACT**

A portable reservoir frame having a number of interlocking panels secured by a plurality of interleaved knuckle members is provided.

20 Claims, 20 Drawing Sheets



Venegas, Victoria, EMNRD

From: Venegas, Victoria, EMNRD
Sent: Thursday, June 29, 2023 8:38 AM
To: Mitchell Ratke; Drew A. Smith; John McGillis
Cc: Jeremy Donaldson
Subject: 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307]
Attachments: C-147 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307].pdf

1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307]

Good morning Mr. Ratke,

NMOCD has reviewed the recycling containment permit application and related documents, submitted by [289068] SELECT ENERGY SERVICES, LLC on June 14, 2023, for 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] in Unit Letter E, Section 28, Township 19S, Range 33E, Lea County, New Mexico. [289068] SELECT ENERGY SERVICES, LLC requested variances from 19.15.34 NMAC for 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307].

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 following variances, specific to the in-ground containments have been 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 following variances, specific to the ASTs containments have been approved:

- The variance to 19.15.34.12.A.(2) NMAC for the no side-slope requirement for the AST containments with vertical walls is approved.
- The variance to 19.15.34.12.A.(3) NMAC for the liners to be anchored to the top of the ASTs steel walls and no anchor trenches 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 variance to 19.15.34.12.A.(4) NMAC for the installation on the AST containment of a 40-mil non-reinforced LLDPE primary liner is approved. The proposed new liner system cross-section for the ASTs is as follows: prepare subgrade, 10 oz. geotextile, 40-mil LLDPE primary liner, 200-mil geonet, 40-mil LLDPE secondary liner.

The form C-147 and related documents for 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] 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-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] consists of three (3) inground containments of 748,200.00 BBL each and two (2) above ground tanks containments (ASTs) of 60,000.00 BBL each. The total fluid capacity of 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] is 2,364,600.00 BBL.
- 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] is approved for five years of operation from the date of the permit application.
- 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] permit expires on June 14, 2028. If [289068] SELECT ENERGY SERVICES, LLC wishes to extend operations past five years, an annual permit extension request must be submitted using form C-147 through [OCD Permitting](#) by May 14, 2028.
- The total closure cost estimated of 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] in the amount of \$2,607,890.00, 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-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] in compliance with NMAC 19.15.34 NMAC.
- [289068] SELECT ENERGY SERVICES, LLC shall notify OCD, through [OCD Permitting](#), when construction of 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] commences.
- [289068] SELECT ENERGY SERVICES, LLC shall notify NMOCD through [OCD Permitting](#) when recycling operations commence and cease at 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307].
- A minimum of 3-feet freeboard must be maintained at 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] 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-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] 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-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] 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 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-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307].

Please reference number 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] in all future communications.

Regards,

Victoria Venegas • Environmental Specialist

Environmental Bureau

EMNRD - Oil Conservation Division

506 W. Texas Ave. Artesia, NM 88210

(575) 909-0269 | Victoria.Venegas@emnrd.nm.gov

<https://www.emnrd.nm.gov/ocd/>



District I
 1625 N. French Dr., Hobbs, NM 88240
 Phone:(575) 393-6161 Fax:(575) 393-0720
District II
 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 227608

CONDITIONS

| | |
|--|---|
| Operator: SELECT ENERGY SERVICES, LLC PO Box 1715 Gainesville, TX 76240 | OGRID: 289068 |
| | Action Number: 227608 |
| | Action Type: [C-147] Water Recycle Long (C-147L) |

CONDITIONS

| Created By | Condition | Condition Date |
|------------|--|----------------|
| venegas | NMOCD has reviewed and approved the recycling containment permit application and related documents, submitted by [289068] SELECT ENERGY SERVICES, LLC on June 14, 2023, for 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307]. • 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] permit expires on June 14, 2028. If [289068] SELECT ENERGY SERVICES, LLC wishes to extend operations past five years, an annual permit extension request must be submitted using form C-147 through OCD Permitting by May 14, 2028. • [289068] SELECT ENERGY SERVICES, LLC shall construct, operate, maintain, close, and reclaim 1RF-505 - EARTHSTONE RECYCLE FACILITY ID [fVV2317950307] in compliance with NMAC 19.15.34 NMAC. | 6/29/2023 |