

**Koon, Nancy**

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**From:** John Peiserich <John@ppgmrlaw.com>  
**Sent:** Wednesday, June 30, 2021 3:42 PM  
**To:** Water Permit Application; Hicks, Basil  
**Cc:** John Peiserich  
**Subject:** NPDES Permit No 5077-WR-7 - AFIN 70-01210 - Permit Renewal and Modification Application dated 6-30-2021.pdf  
**Attachments:** NPDES Permit No 5077-WR-7 - AFIN 70-01210 - Permit Renewal and Modification Application dated 6-30-2021.pdf

Colby / Brian –

Attached is an electronic copy of the Permit Renewal and Modification for the MidAmerica Environmental Holdings, LLC facility formerly known as SouthArk Disposals. A hard copy with a \$500.00 check is being hand-delivered to DEQ this afternoon.

The ADH acknowledgement/approval document has not yet been received but will be transmitted to your attention upon receipt.

Please feel free to contact me or Owen Carpenter, Terracon, with any questions.

Sincerely,

John

JOHN F. PEISERICH ATTORNEY – <a href="mailto:JOHN@PPGMRLAW.COM">JOHN@PPGMRLAW.COM</a>	
	PPGMR LAW, PLLC 201 E. MARKHAM STREET, SUITE 200   LITTLE ROCK, AR 72201 P.O. BOX 3446   LITTLE ROCK, AR 72203 OFC: (501) 907-8517   FAX: (501) 603-0556   <a href="http://PPGMRLAW.COM">PPGMRLAW.COM</a>

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June 30, 2021

Permits Branch – No Discharge Section  
Office of Water Quality  
Division of Environmental Quality  
5301 Northshore Drive  
North Little Rock, AR 72118-5317

Attention: Mr. Colby Ungerank  
P: (501) 682-0047  
E: [ungerank@adeq.state.ar.us](mailto:ungerank@adeq.state.ar.us)

**Re: Request for Permit Renewal / Modification  
Permit 5077-WR-7, AFIN 70-01210  
Terracon Project No. 35217153**

Dear Mr. Ungerank:

On behalf of MidAmerica Environmental Holdings, LLC, Terracon Consultants, Inc. (Terracon) is submitting an application and request to renew and modify No-discharge Permit 5077-WR-7. Owner William L. White attests to the content of this permit renewal/modification application by his signature below.

The proposed modification includes revisions to the current permit, Waste Management Plan, Closure Plan and Financial Assurance Calculations. Proposed changes are summarized on the modifications summary sheet that follows this letter.

The proposed modifications do not include changes in operational location, addition of property, or land application. The facility proposes to utilize the bulking pits that are already permitted through No-Discharge Permit 5077-WR-7.



Terracon Consultants, Inc. 25809 I-30 South Bryant, Arkansas 72022  
P [501] 847 9292 F [501] 847 9210 [terracon.com](http://terracon.com)

Geotechnical



Environmental



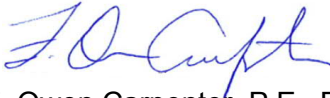
Construction Materials



Facilities

If you have any questions or comments or desire any additional information, please do not hesitate to contact us at [owen.carpenter@terracon.com](mailto:owen.carpenter@terracon.com) or [quin.baber@terracon.com](mailto:quin.baber@terracon.com) or call 501-847-9292.

Sincerely,  

F. Owen Carpenter, P.E., P.G.  
*Senior Engineer*



Quin M. Baber, P.G.  
*Environmental Department Manager*



William L. White, CEO  
*Applicant*

Attachments: Attachment A: Permit Modification Fee  
Attachment B: Permit Application Form  
Attachment C: Disclosure Statement  
Attachment D: Waste Management Plan  
Attachment E: Agency Approval Correspondence  
Attachment F: Financial Assurance Documentation – Closure Plan and Closure Cost Estimate

Copy: Robert E. Blanz, DEQ  
William L. White, Buddy Hall – MidAmerica Environmental Holdings  
John Peiserich, PPGMR

### **Summary of Proposed Modifications to Permit 5077-WR-7**

This modification updates the permit by increasing the number of mobile frac tanks to be used at the site for storage of liquids. The terminology for the partially buried concrete bulking structures has been changed to vats rather than pits. In addition to the constructed and certified bulking vats, up to 25 frac tanks will be used for liquids storage. Therefore, the existing, permitted frac tank containment area along the south side of the operating area is being expanded to hold up to 10 frac tanks and an identical 10 frac tank containment area is proposed along the eastern boundary of the no-discharge permitted area.

The industrial water treatment process has been more fully described and the associated pump and filter units, water piping infrastructure, frac tank secondary containment and liquids routing has been indicated in the permit modification application. A liquid level staff gauge is proposed in the concrete lined sump to visually observe freeboard depth.

# Permit Renewal / Modification Application

**Bulking Facility**  
**MidAmerica Environmental Holdings, LLC**  
**El Dorado, Arkansas**  
**Permit No. 5077-WR-7**  
**AFIN: 70-01210**

June 30, 2021  
Project No. 35217153



**MidAmerica**  
ENVIRONMENTAL HOLDINGS

**Prepared for:**

MidAmerica Environmental Holdings, LLC  
4101 Old Oak Drive  
Little Rock, Arkansas 72212  
(850) 525-8830

**Prepared by:**

Terracon Consultants, Inc.  
25809 Interstate 30 South  
Bryant, Arkansas 72022  
(501) 847-9292

[terracon.com](http://terracon.com)

**Terracon**

Environmental



Facilities



Geotechnical

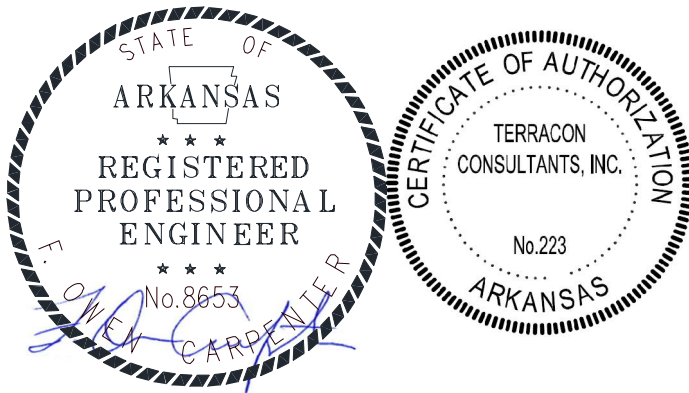


Materials

## PROFESSIONAL ENGINEER'S CERTIFICATION

DEQ No-discharge permit application instructions require that all documents in the application package must be signed and approved by an Arkansas registered professional engineer.

I hereby certify that the information contained in this application package, including the Waste Management Plan, was prepared by me or under my direct supervision using good engineering practices. This is contingent on the fact that all information supplied to the signatory authority as of the date of this certification is unquestionably accurate and provided in good faith.”



---

F. Owen Carpenter, P.E., P.G.  
Arkansas Professional Engineer No. 8653

June 30, 2021

---

Date

## **Attachment A**

### **Permit Modification Fee**

**NOTE:** Check for \$500.00 submitted with original hand-delivered 6/30/2021.

## **Attachment B**

### Permit Application Form

# Arkansas Department of Environmental Quality No-Discharge Section Permit Application

Waste Storage/Land Application for  
Industrial Waste, Biosolids, Water Treatment Residuals, or Domestic Wastewater

Revised: 6/30/2021

Permit No.: 5077-WR-7	AFIN: 70-01210	SIC Code: 1389	NAICS Code: 213112
(Office Use Only)	(Office Use Only)		

**1. Permit Action and Type** *(Please check one of the following):*

Operator Type: <input type="checkbox"/> Corporation (State of Incorporation: _____) <input checked="" type="checkbox"/> Limited Liability Company (State of LLC: <u>Arkansas</u> )	
<input type="checkbox"/> Partnership <input type="checkbox"/> Sole Proprietorship/Private <input type="checkbox"/> Other _____	
<input type="checkbox"/> New Permit <input checked="" type="checkbox"/> Renewal <input checked="" type="checkbox"/> Modification of Permit, Describe: <u>Modification to add storage capacity and processes not included in current permit</u>	
<input type="checkbox"/> Biosolids <input type="checkbox"/> Industrial Waste <input checked="" type="checkbox"/> Oil and Gas Waste <input type="checkbox"/> Treated Effluent Residuals	
<input checked="" type="checkbox"/> Water Treatment Residuals <input checked="" type="checkbox"/> Water Based Drilling Fluids <input checked="" type="checkbox"/> Other <u>Non-hazardous stormwater and industrial water</u>	

**2. Permittee Legal Name and Mailing Address:** *(Must Match Arkansas's Secretary of State)*

Owner Name: MidAmerica Environmental Holdings, LLC		
Address: 4101 Old Oak Drive	Phone Number: (850) 525-8830	
City: Little Rock	State: Arkansas	Zip Code: 72212
Contact Person: Mr. William L. White		Email: <a href="mailto:bwhite@apollowater.tech">bwhite@apollowater.tech</a>
Title: CEO	Phone Number: (850) 525-8830	Cell Number:

**3. Facility Location** *(physical address is required; NO P.O. BOX):*

Facility Name: MidAmerica Environmental Holdings			
Address (911 Address): 101 Warehouse Drive		Phone Number: (850) 525-8830	
City: El Dorado		State: Arkansas	Zip Code: 71730
1/4 Sec.: NE	Section: 35	Township: 17S	Range: 15W
Latitude: <u>33</u> Deg <u>12</u> Min <u>15.3</u> Sec.		Longitude: <u>-92</u> Deg <u>36</u> Min <u>50.6</u> Sec.	
Source Datum: WGS84			
County: Union		Nearest Town: El Dorado	
Nearest Stream: Unnamed Tributary to Boggy Creek		Distance: 110 (ft)	Stream Segment: 2D (Ouachita River)
Licensed Operator Name <i>(if applicable)</i> :		Lic. # and Class:	

**4. Consultant Information:**

Name: F. Owen Carpenter, P.E., P.G.	Consulting Firm: Terracon Consultants, Inc.
Email: owen.carpenter@terracon.com	Phone Number: (501) 847-9292
Address: 25809 I-30 South	Cell Number: (501) 622-0887

City: Bryant	State: Arkansas	Zip Code: 72022
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**Please read the following carefully and sign below.**

**I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, which may include fines and/or imprisonment.**

**SIGNATORY REQUIREMENTS:**

The information contained in this form must be certified by a **responsible official** as defined in the instructions, Part I, Section 3. For example:

**Corporation:** principal officer at least the level of vice president

**Partnership:** a general partner

**Sole Proprietorship:** the proprietor/owner

**Limited Liability Company:** a member or manager as designated by the operating agreement

**Municipal, state, federal, or other public facility:** principal executive officer, or ranking elected official

Responsible Official: William L. White Title: CEO  
 Responsible Telephone: (850) 525-8830 Email: bwhite@apollowater.tech  
 Responsible Signature:  Date: 06 / 30 / 2021

**Cognizant Official** is an individual that is given signature authority from the Responsible Official

Cognizant Official: \_\_\_\_\_ Title: \_\_\_\_\_  
 Cognizant Telephone: \_\_\_\_\_ Email: \_\_\_\_\_  
 Cognizant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**PERMIT REQUIREMENT VERIFICATION** (Please check the following to verify the completion of permit requirements.)

- |                                     |                          |  |
|-------------------------------------|--------------------------|--|
| Yes                                 | No                       |  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Submittal of Complete Application<br>Does the Owner name match the Secretary of State (Corporation or Limited Liability Company)?<br>Does the Responsible Official match the Secretary of State? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Submittal of Waste Management Plan<br>Stamped & Signed by an Arkansas Registered PE/ ADH Designated Representative<br>Are maps and site description included?                                    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Submittal of Closure Plan (Oil and Gas/Water Based Drilling Fluids)<br>Is the cost estimate included?  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Submittal of Disclosure Statement (completed and executed)<br>Not required for public entity   |

- Submittal of Land use Contract/Deed/Lease
- Arkansas Department of Health notification letter (letter transmitting documents to ADH)  
(New permits or modified permits)
- Provide Certificate of Good Standings with the Arkansas Secretary of State  
(If foreign corporation, provide Certificate of Good Standings from the state of Origin)

**Land Use Contract**

I, \_\_\_\_\_, agree to allow \_\_\_\_\_  
Name of Landowner Name of Permittee (matches application & AR SoS)

to land apply \_\_\_\_\_ waste from \_\_\_\_\_  
Type of Waste Waste Source or Type of Waste Facility

to \_\_\_\_\_ acres of my property located in \_\_\_\_\_ County.  
Total Acreage Available County of Application Site

Field ID	New/ Existing	Section	Township	Range	Latitude	Longitude	Available Acreage*

\*Available acreage is the total acreage minus buffer zone areas

I am also aware that the land applicator or the owner of the operation is to apply \_\_\_\_\_ in  
Type of Waste

accordance with the management plan developed and submitted to the Arkansas Department of Environmental Quality (ADEQ) as well as the requirements and conditions set forth in the permit issued by ADEQ. In addition to these guidelines, the following requirements must also be satisfied when land applying to my property:

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The landowner agrees to provide or allow permittee to conduct soil analysis as required by ADEQ for each field listed in this land use contract prior to land application. Additionally, this approval may be terminated with written notice from the landowner.

\_\_\_\_\_  
Permittee's Signature                      Date                      \_\_\_\_\_  
Landowner Signature                      Date

## **Attachment C**

### **Disclosure Statement**

# **INSTRUCTIONS FOR DISCLOSURE STATEMENT**

Arkansas Code Annotated Section 8-1-106 requires that all applicants for the issuance, or transfer of any permit, license, certification or operational authority issued by the Arkansas Department of Environmental Quality (ADEQ) file a disclosure statement with their applications. The filing of a disclosure statement is mandatory. No application can be considered complete without one.

Disclosure statement means a written statement by the applicant that contains:

- The full name and business address of the applicant and all affiliated persons;
- The full name and business address of any legal entity in which the applicant holds a debt or equity interest of at least five percent (5%) or that is a parent company or subsidiary of the applicant, and a description of the ongoing organizational relationships as they may impact operations within the state;
- A description of the experience and credentials of the applicant, including any past or present permits, licenses, certifications, or operational authorizations relating to environmental regulation;
- A listing and explanation of any civil or criminal legal actions by government agencies involving environmental protection laws or regulations against the applicant and affiliated persons in the ten (10) years immediately preceding the filing of the application, including administrative enforcement actions resulting in the imposition of sanctions, permit or license revocations or denials issued by any state or federal authority, actions that have resulted in a finding or a settlement of a violation, and actions that are pending;
- A listing of any federal environmental agency and any other environmental agency outside this state that has or has had regulatory responsibility over the applicant; and
- Any other information the Director of the Arkansas Department of Environmental Quality may require that relates to the competency, reliability, or responsibility of the applicant and affiliated persons.

## **Exemptions:**

The following persons or entities are not required to file a disclosure statement:

- Governmental entities, consisting only of subdivisions or agencies of the federal government, agencies of the state government, counties, municipalities, or duly authorized regional solid waste authorities as defined by § 8-6-702. (This exemption shall not extend to improvement districts or any other subdivision of government which is not specifically instituted by an act of the General Assembly.)
- Applicants for a general permit to be issued by the department pursuant to its authority to implement the National Pollutant Discharge Elimination System for storm water discharge.
- If the applicant is a publicly held company required to file periodic reports under the Securities and Exchange Act of 1934 or a wholly owned subsidiary of a publicly held company, the applicant shall not be required to submit a disclosure statement, but shall submit the most recent annual and quarterly reports required by the Securities and Exchange Commission which provide information regarding legal proceedings in which the applicant has been involved. The applicant shall submit such other information as the director may require that relates to the competency, reliability, or responsibility of the applicant and affiliated persons.

## **Exemptions continued:**

The following permits, licenses, certifications, and operational authorizations are also exempt from submitting a disclosure statement:

- **Hazardous Waste Treatment, Storage, and Disposal Permit Modifications (Class 1, 2, and 3), as defined in Arkansas Pollution Control and Ecology Commission (APC&EC) Regulation 23;**
- **Phase 1 Consultants, as defined in APC&EC Regulation 32;**
- **Certifications for Operators of Commercial Hazardous Waste Facilities, as defined in APC&EC Regulation 23 § 264.16(f);**
- **Regulated Storage Tank Contractor or Individual License Renewals as defined in APC&EC Regulation 12;**
- **Certifications for Persons Operating and Maintaining Underground Storage Tank Systems which Contain Regulated Substances, as defined in APC&EC Regulation 12.701, et. seq.;**
- **Individual Homeowners seeking coverage under General Permit ARG5500000; Wastewater Operator Licenses, as defined in APC&EC Regulation 3;**
- **Water Permit Modifications for permits issued under the authority of the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. §8-4-101, et. seq.);**
- **Solid Waste Permit Modifications for permits issued under APC&EC Regulation 22; Solid Waste Landfill Operator License Renewals, as defined in Regulation No. 27;**
- **Air Permit Modifications for permits issued under APC&EC Regulations 18, 19, and 26; and Asbestos Certification Renewals, as defined in Regulation 21.**

**Deliberate falsification or omission of relevant information from disclosure statements shall be grounds for civil or criminal enforcement action or administrative denial of a permit, license, certification, or operational authorization.**

# ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY DISCLOSURE STATEMENT

## Instructions for the Completion of this Document:

- A. Individuals, firms or other legal entities with no changes to an ADEQ Disclosure Statement, complete items 1 through 5 and 18.**
- B. Individuals who never submitted an ADEQ Disclosure Statement, complete items 1 through 4, 6, 7, and 16 through 18.**
- C. Firms or other legal entities who never submitted an ADEQ Disclosure Statement, complete 1 through 4, and 6 through 18.**

If Not Submitting by ePortal, Mail Original to:

ADEQ

DISCLOSURE STATEMENT

[List Proper Division(s)]

5301 Northshore Drive

North Little Rock, AR 72118-5317

1. APPLICANT: (Full Name)

MidAmerica Environmental Holdings, LLC

2. MAILING ADDRESS: (Number and Street, P.O.Box Or Rural Route)

4101 Old Oak Drive

3. CITY, STATE, AND ZIPCODE:

Little Rock, AR 72212

4a. Applicant Type:

Individual  Corporate or Other Entity

4b. Reason for Submission:

Permit  License  Certification  Operational Authority

New Application  Modification  Renewal Application (If no changes from previous disclosure statement, complete number 5 and 18.)

4c. Programs:

Air  Water  Hazardous Waste  Regulated Storage Tank  Mining  Solid Waste  Used Tire Program

5. Declaration of No Changes:

The violation history, experience and credentials, involvement in current or pending environmental lawsuits, civil and criminal, have not changed since the last Disclosure Statement that was filed with ADEQ on \_\_\_\_\_

6. Describe the experience and credentials of the Applicant, including the receipt of any past or present permits, licenses, certifications or operational authorization relating to environmental regulation. (Attach additional pages, if necessary.)

None. Subject to pending application to the Arkansas Oil & Gas Commission for approval of the transfer of the Hutcheson "B" 2 Commercial Disposal Well.

7. List and explain all civil or criminal legal actions by government agencies involving environmental protection laws or regulations against the Applicant \* in the last ten (10) years including:

1. Administrative enforcement actions resulting in the imposition of sanctions;
2. Permit or license revocations or denials issued by any state or federal authority;
3. Actions that have resulted in a finding or a settlement of a violation; and
4. Pending actions.

(Attach additional pages, if necessary.)

None

\* Firms or other legal entities shall also include this information for all persons and legal entities identified in sections 8-16 of this Disclosure Statement.

**8. List all officers of the Applicant. (add additional pages, if necessary.)**

NAME: William L. White TITLE: CEO

STREET: 6494 Scenic Highway

CITY, STATE, ZIP: Pensacola, FL 32504

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

**9. List all directors of the Applicant. (Add additional pages, if necessary.)**

NAME: William L. White TITLE: CEO

STREET: 6494 Scenic Highway

CITY, STATE, ZIP: Pensacola, FL 32504

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

**10. List all partners of the Applicant. (Add additional pages, if necessary.)**

NAME: None TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

**11. List all persons employed by the Applicant in a supervisory capacity or with authority over operations of the facility subject to this application.**

NAME: Buddy Hall TITLE: Operations Manager

STREET: 111 Archer Avenue

CITY, STATE, ZIP: El Dorado, AR 71730

NAME: Gabi Abdo TITLE: Business Manager

STREET: 4101 Old Oak Drive

CITY, STATE, ZIP: Little Rock, AR 72212

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

12. List all persons or legal entities, who own or control more than five percent (5%) of the Applicant's debt or equity.

NAME: None TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

13. List all legal entities, in which the Applicant holds a debt or equity interest of more than five percent (5%).

NAME: None TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

14. List any parent company of the Applicant. Describe the parent company's ongoing organizational relationship with the Applicant.

NAME: None \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

Organizational Relationship:

15. List any subsidiary of the Applicant. Describe the subsidiary's ongoing organizational relationship with the Applicant.

NAME: None \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

Organizational Relationship:

16. List any person who is not now in compliance or has a history of noncompliance with the environmental law or regulations of this state or any other jurisdiction and who through relationship by blood or marriage or through any other relationship could be reasonably expected to significantly influence the Applicant in a manner which could adversely affect the environment.

NAME: None TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

STREET: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

17. List all federal environmental agencies and any other environmental agencies outside this state that have or have had regulatory responsibility over the Applicant.

None

**18. VERIFICATION AND ACKNOWLEDGEMENT**

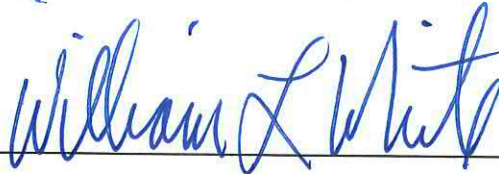
The Applicant agrees to provide any other information the director of the Arkansas Department of Environmental Quality may require at any time to comply with the provisions of the Disclosure Law and any regulations promulgated thereto. The Applicant further agrees to provide the Arkansas Department of Environmental Quality with any changes, modifications, deletions, additions or amendments to any part of this Disclosure Statement as they occur by filing an amended Disclosure Statement.

**DELIBERATE FALSIFICATION OR OMISSION OF RELEVANT INFORMATION FROM DISCLOSURE STATEMENTS SHALL BE GROUNDS FOR CIVIL OR CRIMINAL ENFORCEMENT ACTION OR ADMINISTRATIVE DENIAL OF A PERMIT, LICENSE, CERTIFICATION OR OPERATIONAL AUTHORIZATION.**

**COMPLETE THIS SECTION ONLY IF SUBMITTING OTHER THAN BY EPORTAL:**

I, William L. White, certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violation.

APPLICANT  
SIGNATURE: \_\_\_\_\_



TITLE: Owner/CEO

DATE: 5/13/2021

## **Attachment D**

### **Waste Management Plan**

# Waste Management Plan

**Bulking Facility**  
**MidAmerica Environmental Holdings, LLC**  
**El Dorado, Arkansas**  
**Permit No. 5077-WR-7**  
**AFIN: 70-01210**

June 30, 2021  
Project No. 35217153



**MidAmerica**  
ENVIRONMENTAL HOLDINGS

**Prepared for:**

MidAmerica Environmental Holdings, LLC  
4101 Old Oak Drive  
Little Rock, Arkansas 72212  
(850) 525-8830

**Prepared by:**

Terracon Consultants, Inc.  
25809 Interstate 30 South  
Bryant, Arkansas 72022  
(501) 847-9292

Offices Nationwide  
Employee-Owned

Established in 1965  
[terracon.com](http://terracon.com)

**Terracon**

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

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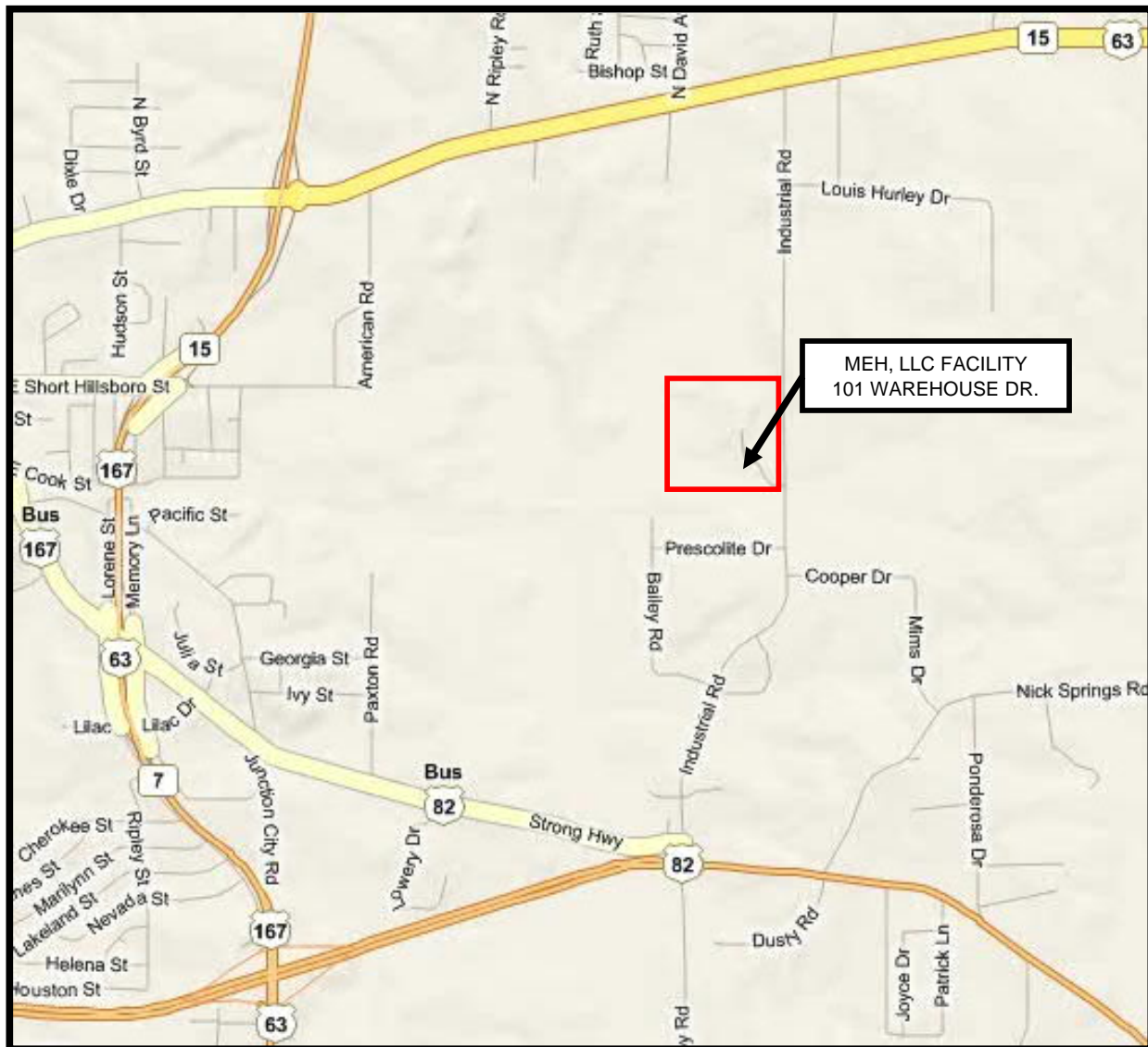
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Appendix B	Warranty Deed
Appendix C	Secondary Containment Calculations
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Appendix G	Paint Filter Test Information

## 1.0 INTRODUCTION

MidAmerica Environmental Holdings, LLC (MEH) currently owns approximately 40-acres near El Dorado, Arkansas. Roughly eight (8) acres are used for the existing bulking facility as indicated in this Waste Management Plan (WMP). The property is located in Section 35, Township 17 South, Range 15 West in Union County, Arkansas. Terracon Consultants, Inc. and MEH have prepared this WMP to describe the following: waste sources and anticipated volumes, storage facilities description and details, and waste disposal processes. A copy of the No-Discharge Permit (5077-WR-7) is presented in **APPENDIX A**. The ownership Warranty Deed is provided in **APPENDIX B**. The location of the facility is shown on **FIGURE 1**.

**FIGURE 1. SITE LOCATION MAP**



## **2.0 PERMIT CHANGES FROM 5077-WR-7**

This modification updates the permit by increasing the number of mobile frac tanks to be used at the site for storage of liquids. The terminology for the partially buried concrete bulking structures has been changed to vats rather than pits. In addition to the constructed and certified bulking vats, up to 25 frac tanks will be used for liquids storage. Therefore, the existing, permitted frac tank containment area along the south side of the operating area is being expanded to hold up to 10 frac tanks.

The industrial water treatment process has been more fully described and the associated pump and filter units, water piping infrastructure, frac tank secondary containment and liquids routing has been indicated in the permit modification application. A liquid level staff gauge is proposed in the concrete lined sump to visually observe freeboard depth.

## **3.0 WASTE GENERATING PROCESS**

### **3.1 Oil and Gas Waste Generation**

Incoming oil and gas sector waste will consist of fresh water, oil-based drilling mud, water-based drilling mud, drill cuttings, produced water, flow-back water, bentonitic clays, chemical additives, barite, foaming agents, lubricants, and emulsifiers produced off-site by natural gas drilling operations located in Arkansas and surrounding states. It is anticipated that as much as 6,500 barrels (273,000 gallons) could be delivered to the site weekly. The waste will be delivered to the site via tanker trucks. Each truck has a capacity of about 5,460 gallons.

### **3.2 Stormwater and Process Water**

Stormwater and process water from various industries, that are considered non-hazardous, will be received for storage, processing and disposal. Prior to waste acceptance, the Facility may request laboratory testing (based on facility type) that will determine if the water is considered non-hazardous and eligible for disposal at a permitted Class 1 Landfill or recycle facility. It is anticipated that as much as 100,800 gallons could be delivered to the site on a daily basis. If it is determined through laboratory testing, the Generator's Material Profile Sheet, SDSs or operational knowledge that the fluids are hazardous, the fluids will be rejected by the Facility.

## **4.0 STORAGE FACILITIES**

The facility is permitted to construct up to six concrete bulking vats. Three of the six bulking vats have been constructed to date, with construction certification from an Arkansas licensed professional engineer submitted during 2010 following installation. Four of the six bulking vats have the approximate dimensions of 20 feet long by 10 feet wide and 11 feet deep with an operating capacity of nearly 9,595 gallons each. Two of these "smaller" vats have been constructed to date. The other two bulking vats have the approximate dimensions of 30 feet long

by 20 feet wide and 11 feet deep with an operating capacity of 44,435 gallons each. One of these “larger” vats has been constructed so that three total vats have been constructed to date. All of the bulking vats will be constructed with reinforced concrete and will be operated to maintain a minimum two-foot freeboard. If any of the remaining three permitted vats is constructed, notification will be provided to the DEQ OWQ and a construction certification signed and stamped by an Arkansas registered professional engineer will be submitted. **FIGURES 2** and **3** provide a detail of the small and large bulking vats, respectively.

Liquid wastes and the recycle water stream will also be stored in up to 25 480-barrel (20,160 gallon) frac tanks set within secondary containment structures made of materials with a maximum permeability of  $1 \times 10^{-7}$  cm/sec and enough capacity to contain the largest storage tank or storage tank series plus precipitation from a 25-year, 24-hour rainfall event. Total frac tank liquids storage at the facility will therefore consist of 504,000 gallons. Total liquids storage at the facility, with currently constructed vat capacity, is 567,625 gallons, not including the concrete lined sump. **FIGURES 4** and **5** illustrate the proposed expanded south storage area containment structure which will increase the currently permitted storage area for four frac tanks to accommodate up to 10 frac tanks. Calculations demonstrating required secondary containment capacity and freeboard for precipitation are included in **APPENDIX C**. Specifications for secondary containment and other construction elements at the facility are included in **APPENDIX D**.

Materials utilized as bulking agents will be stored on-site and protected from precipitation. The bulking agent will consist of fly ash, sawdust, rice hulls or other material suitable for bulking. The bulking agent will be conveyed to the bulking vats with a front-end loader and combined with the liquid waste using a hydraulic excavator.

#### 4.1 Bulking of Oil and Gas Waste

Waste generated from the oil and gas industry will be brought in by tanker trucks and placed in one of the four smaller bulking vats. Once the waste has been unloaded into the bulking vats, the excess liquids will be pumped off into on-site storage tanks. Material remaining in the bulking vats will be processed by one of the following methods:

1. The material will be mixed with a bulking agent before being hauled to a permitted solid waste disposal facility; or
2. The material will be pumped into a centrifuge located adjacent to the bulking vat, where the liquids and solids will be separated. The liquids will be conveyed through piping to an on-site storage tank or one of the bulking vats. The solids will be directed to a temporary “dry material” storage pad. The dry material will be removed from the temporary storage pad and hauled to a permitted solid waste disposal facility.

Loads consisting of primarily liquid waste will be deposited in one of the larger bulking vats. The material will be processed in such a manner that will remove larger particles that will be separated

and bulked in one of the four smaller bulking vats. Liquid waste remaining in the larger vat will be pumped to onsite storage tanks. The liquids will then be further filtered and/or processed and/or transported and disposed of in a permitted Class II, Class V, or appropriate dual-class underground injection control (UIC) well or a POTW. A copy of the UIC well permit used for disposal will be kept in **APPENDIX D** of the WMP. The waste will not be incorporated into the soil.

#### 4.2 Bulking Stormwater and Process Water

Stormwater and/or process water collected at various industrial facilities that are documented to be non-hazardous, will be transported to the facility by tanker trucks and placed in one of the larger bulking vats. The fluids will be mixed with a bulking agent before being hauled to a permitted solid waste disposal facility.

#### 4.3 Recycling Stormwater and Process Water

Alternatively, stormwater and/or process water collected at various industrial facilities, that is documented to be non-hazardous, will be transported to the facility by tanker trucks and placed in a receiving frac tank that is located within the closed-loop bulked material storage and concrete sump process containment area. If needed, an additive treatment is introduced into the first tank and the incoming fluids are allowed to circulate within a frac tank series that includes two subsequent frac tanks for additional residence time. Water is then pumped through a filtration system to remove particles down to around 10-micron size and routed to one of the larger bulking vats. The industrial water then may continue residence time in the larger vat, with fresh water added if needed.

Water from the large vat is then pumped through a mobile filter unit to a holding tank where it is staged to be pumped through a reverse osmosis (RO) unit with an approximately 5-micron pre-filter. Water that is processed through the RO unit is drinking water clear with TDS values below 100 mg/L. The industrial water that has undergone the multi-stage filtering and separation process is then pumped to “fresh water” frac tanks located within secondary containment along the south portion of the site. The recycled water is then returned to the generating industry(ies) to fulfill their environmentally responsible water recycling objectives, or is delivered to a participating municipal POTW for treatment. Incoming and outgoing industrial water will not require regulation, permitting or decals from the Arkansas Oil and Gas Commission.

The RO unit approximately 5-micron pre-filter consists of a poly-spun filter in a pressure canister. When the differential pressure across the filter increases to an unacceptable level, the dirty filter is removed and regenerated or disposed of with the Class 1 wastes and a new filter is installed. All spent filter media and accumulated solids are disposed of with the solid waste at a permitted Class 1 landfill facility. **FIGURE 6** presents process flow diagrams for the bulking facility waste streams. **APPENDIX F** contains the Facility Operation and Maintenance Plan.

#### 4.4 On-site Stormwater Collection

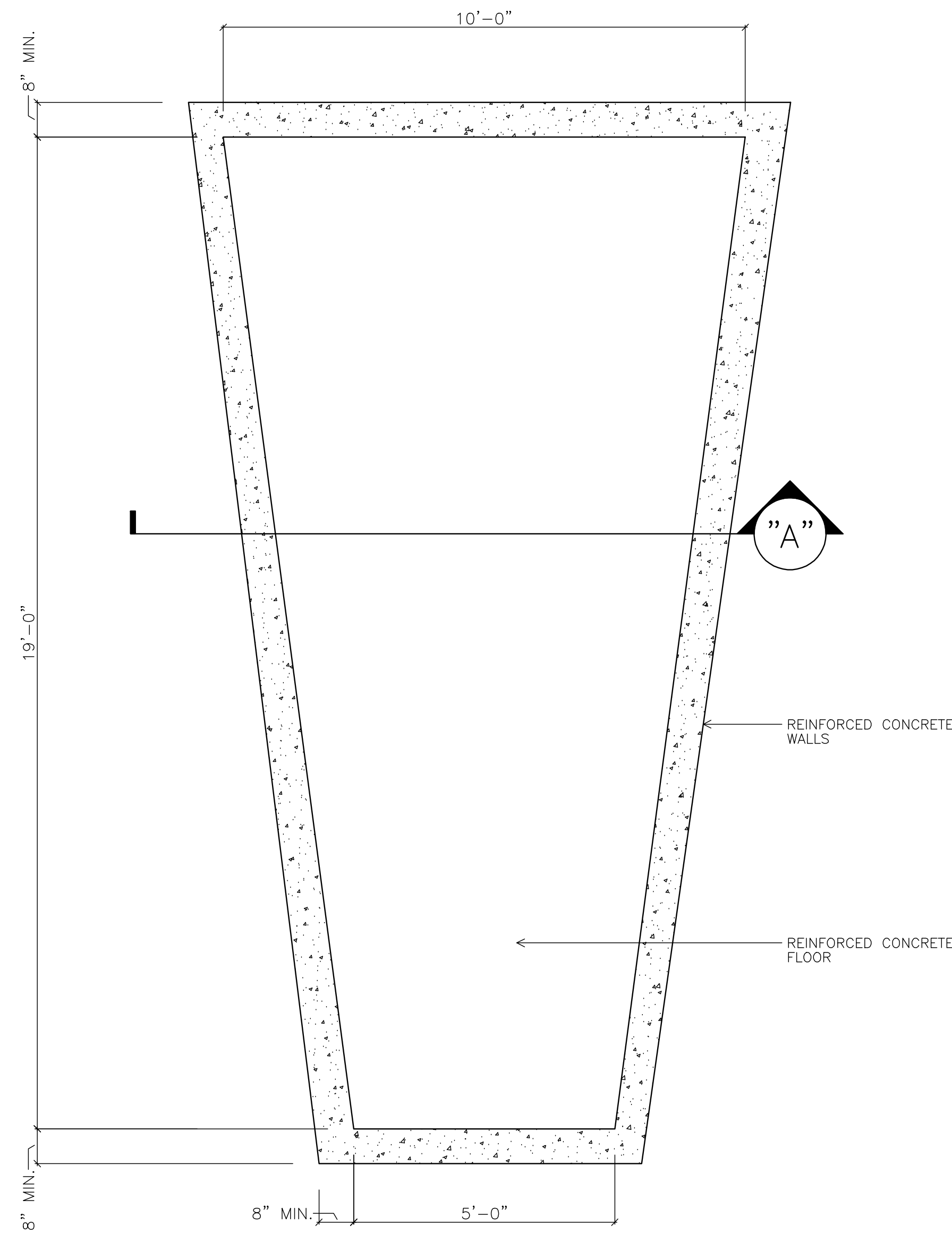
Stormwater collected from outside the processing area will be directed through ditches and swales to a storage basin located on the west side of the facility. This stormwater will be managed in accordance with Industrial General Permit ARR001445 as issued by the DEQ Office of Water Quality. Stormwater collected inside the processing area will be directed to a concrete lined sump with a capacity of approximately 67,245 gallons. The sump will be dewatered and the liquids stored in an onsite frac tank as needed. The water will be processed through the R/O unit and/or transported by truck or in frac tanks and disposed of in a permitted UIC well. This sump is not intended for discharging as stormwater. Discharging from this sump is strictly prohibited. Two feet of freeboard will be maintained in the sump as indicated on an installed staff gauge showing maximum water level.

#### 5.0 WASTE DISPOSAL PROCEDURES

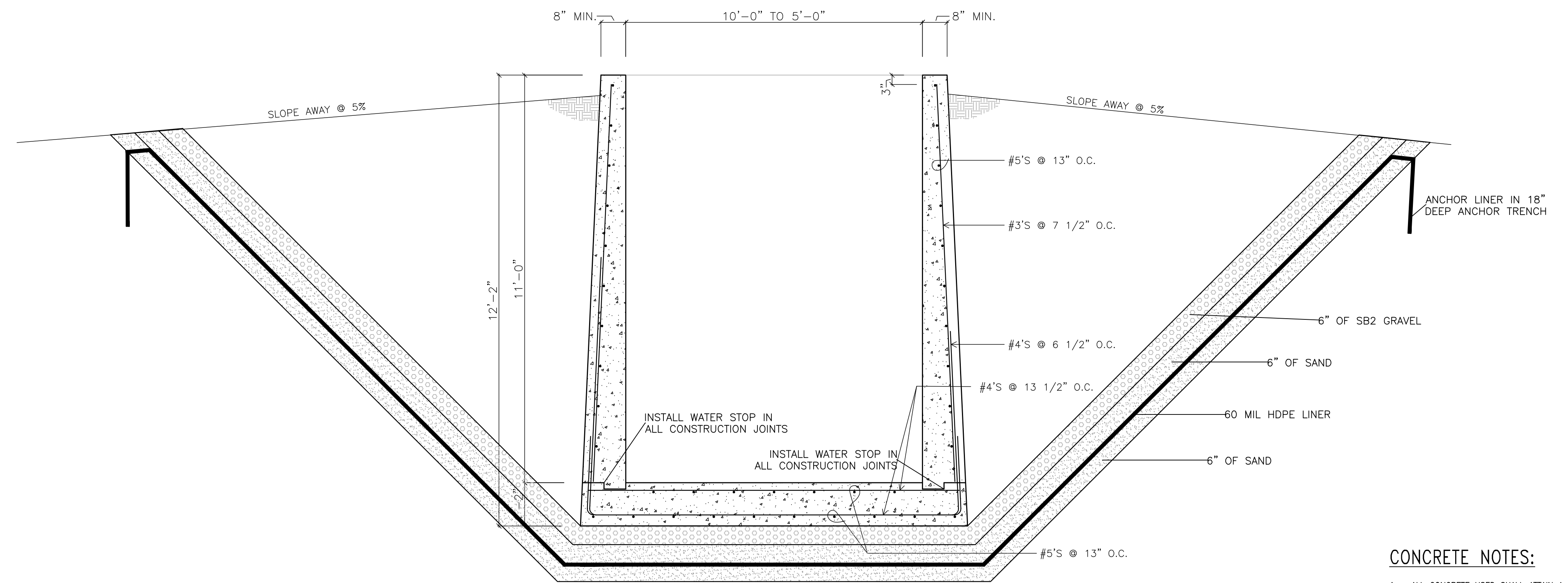
Upon completion of bulking, a paint filter test will be performed to verify the absence of free liquids in the waste. A copy of the test procedures and test results form are provided in **APPENDIX G**. Once the material has passed the paint filter test, it will then be loaded into a haul truck and transported to a permitted solid waste disposal facility. A plan view of the MEH Facility is shown on **FIGURE 7**.

#### 6.0 MAPS

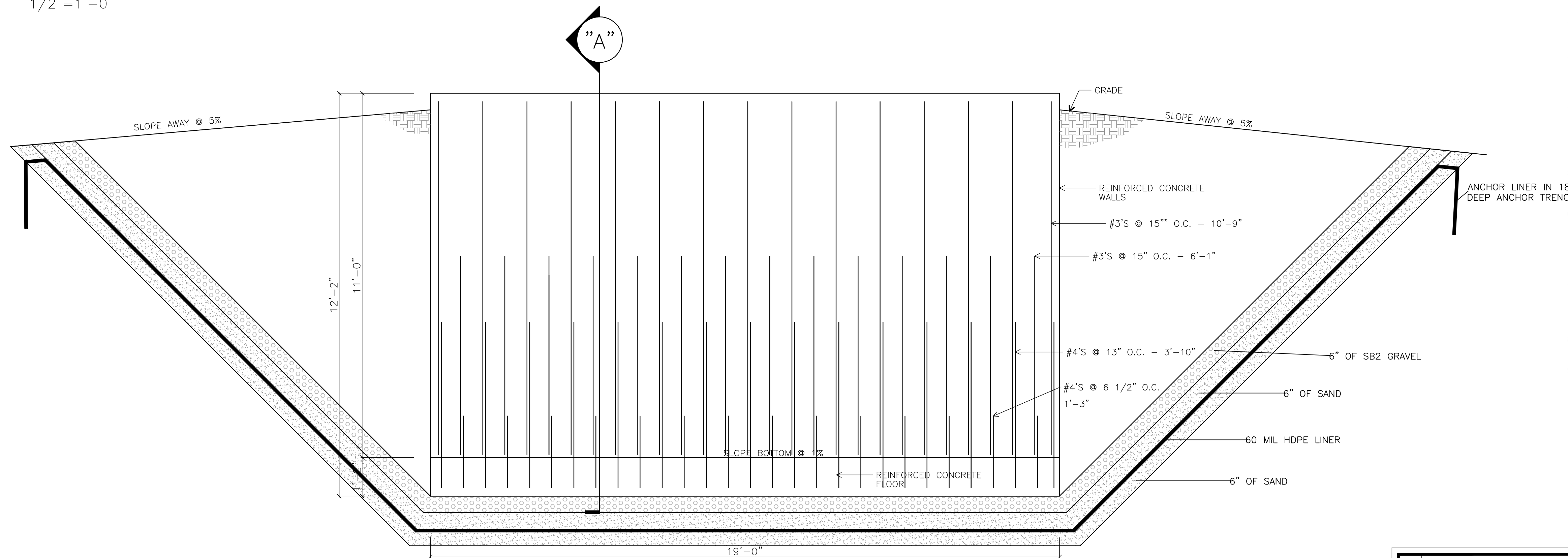
A Flood Insurance Rate Map, Union County map and USGS topographic map (quad sheet) showing the location of the facility, the 100-year flood zones, the nearest potentially affected streams, and directions from the nearest State Highway intersection or community are shown on **FIGURE 8**, **FIGURE 9** and **FIGURE 10**, respectively. Also depicted on the maps are the following: dwellings, property lines, ponds, land use designations for adjacent properties, and the location of the facility by latitude and longitude. The lowest point of the site is at an approximate elevation of 210-feet. The 100-year flood zone reaches an elevation of approximately 204-feet. Therefore, the site is roughly six feet above the 100-year flood elevation.



TOP VIEW  
1/2"=1'-0"



SECTION "A"  
1/2"=1'-0"



SIDE VIEW  
1/2"=1'-0"

**CONCRETE NOTES:**

- ALL CONCRETE USED SHALL ATTAIN A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3500 PSI AT 28 DAYS.
- THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING APPLICABLE TESTING WITH THE GEOTECHNICAL ENGINEER. UPON COMPLETION OF WORK THE GEOTECHNICAL ENGINEER WILL SUBMIT CERTIFICATIONS TO THE OWNER AND OWNER'S ENGINEER STATING THAT ALL REQUIREMENTS HAVE BEEN MET.
- A QUALIFIED TESTING LABORATORY SHALL PERFORM ALL TESTING NECESSARY TO ASSURE COMPLIANCE OF THE IN-PLACE MATERIALS AS REQUIRED BY THE PLANS, THE VARIOUS AGENCIES AND PERMIT CONDITION. SHOULD ANY RETESTING BE REQUIRED DUE TO THE FAILURE OF ANY TESTS TO MEET THE REQUIREMENTS, THE CONTRACTOR WILL BEAR ALL COSTS OF SAID RETESTING.
- NO CONCRETE SHALL BE PLACED WITHOUT PRIOR APPROVAL OF THE ENGINEER. OWNER'S INSPECTOR SHALL BE ON SITE FOR ALL CONCRETE POURS. 48 HOURS PRIOR NOTICE REQUIRED BEFORE ALL CONCRETE POURS.
- ALL CONCRETE JOINTS SHALL BE CLEANED AND SEALED WITH POLYURETHANE OR SILICONE POLYMER JOINT SEALER.
- CONTRACTOR TO PROVIDE A 3/4" BITUMINOUS EXPANSION JOINT MATERIAL WITH SEALER AT ALL CONCRETE EXPANSION JOINTS AND AT ABUTMENT OF CONCRETE AND OTHER MATERIALS (DRAINAGE STRUCTURES, OTHER POURED CONCRETE, ETC.).
- CONCRETE AGGREGATE SHALL CONFORM TO A.S.T.M. C-33.
- ALL REINFORCING BARS SHALL BE NEW BILLET INTERMEDIATE GRADE DEFORMED BARS CONFORMING TO A.S.T.M. A-615 AND SHALL HAVE A MINIMUM YIELD STRENGTH OF 60 KSI.
- REINFORCING BARS AND WELDED WIRE FABRIC (W.W.F.) SHALL BE TIED AND HELD AT POSITIONS SHOWN ON THE DETAILS BY USE OF STEEL WIRE BAR SUPPORTS. SUITABLE BOTTOM PLATES SHALL BE PROVIDED TO PREVENT DISPLACEMENT OF THE SUPPORT FOOT WHERE BAR SUPPORTS ARE USED ON EARTH OR AGGREGATE SUBGRADE.
- EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED.
- REFER TO GRADING PLAN FOR FINISH GRADES AND SUBGRADE PREPARATION REQUIREMENTS.
- REFER TO SITE PLAN FOR SITE DIMENSIONS.

**GENERAL GRADING NOTES:**

- NATIVE MATERIALS OBTAINED FROM SITE EXCAVATIONS MAY BE USED FOR FILL IN PARKING AREAS PROVIDED THAT THEY MEET THE REQUIREMENTS FOR SELECT FILL SPECIFIED HEREIN.
- PRIOR TO STARTING THE GRADING, STRIP TOPSOIL AND STOCKPILE FOR FUTURE USE.
- THE ENTIRE CONSTRUCTION AREA SHALL BE STRIPPED OF TOPSOIL AND ORGANIC MATERIAL AND PROOF ROLLED PRIOR TO PLACEMENT OF FILL. AREAS OF UNSTABLE SOIL SHALL BE REMOVED AND REPLACED AS DIRECTED BY THE ENGINEER.
- SELECT FILL SHALL CONSIST OF HOMOGENOUS SOILS FREE OF ORGANIC MATTER AND DEBRIS AND POSSESSING A PLASTICITY INDEX BETWEEN FIVE (5) AND FIFTEEN (15), WITH A LIQUID LIMIT OF THIRTY-FIVE (35) OR LESS. SELECT FILL SOURCE SHALL BE APPROVED PRIOR TO PLACEMENT OF FILL WITHIN THE SITE.
- SELECT FILL SHALL BE PLACED ON PREPARED SUBGRADE IN 8" LOOSE LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING APPLICABLE TESTING WITH THE SOILS ENGINEER. COMPACTION TESTS WILL BE REQUIRED FOR EACH LIFT. UPON COMPLETION OF WORK THE SOILS ENGINEER WILL SUBMIT CERTIFICATIONS TO THE OWNER AND OWNER'S ENGINEER STATING THAT ALL REQUIREMENTS HAVE BEEN MET.
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- REFER TO THE SITE PLAN FOR DIMENSIONS OF PROPOSED IMPROVEMENTS.

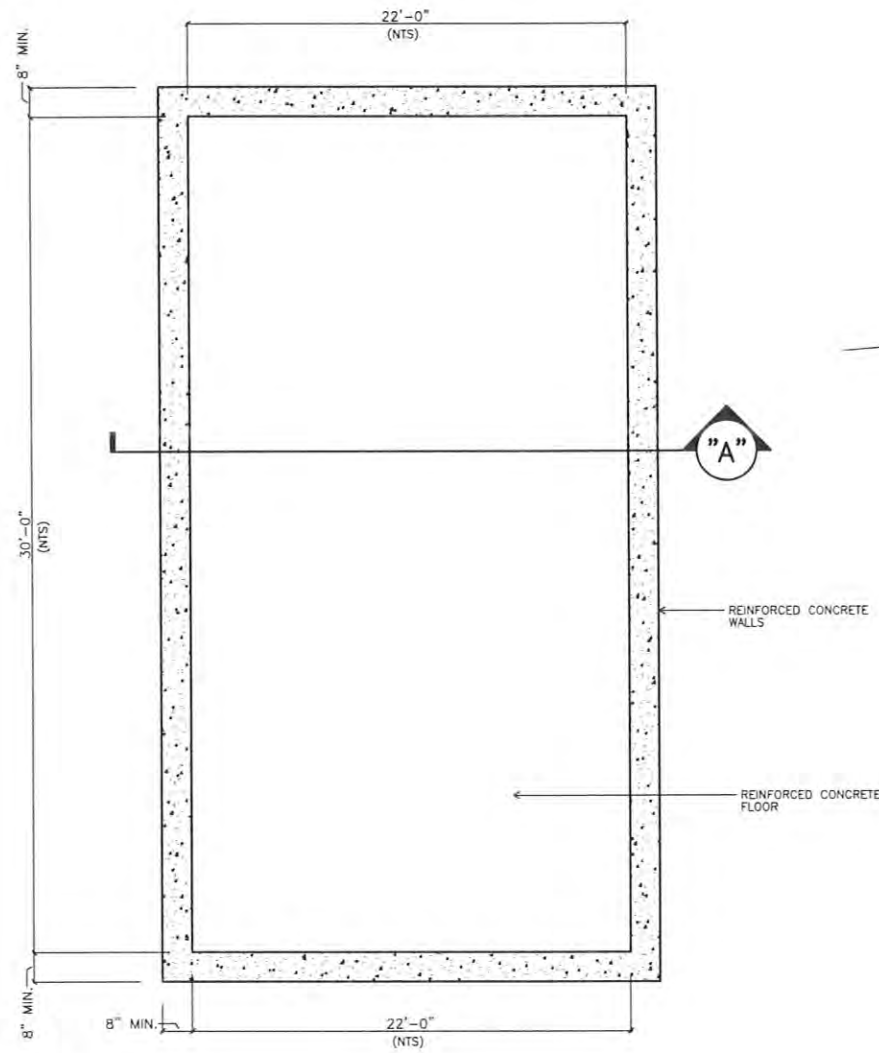


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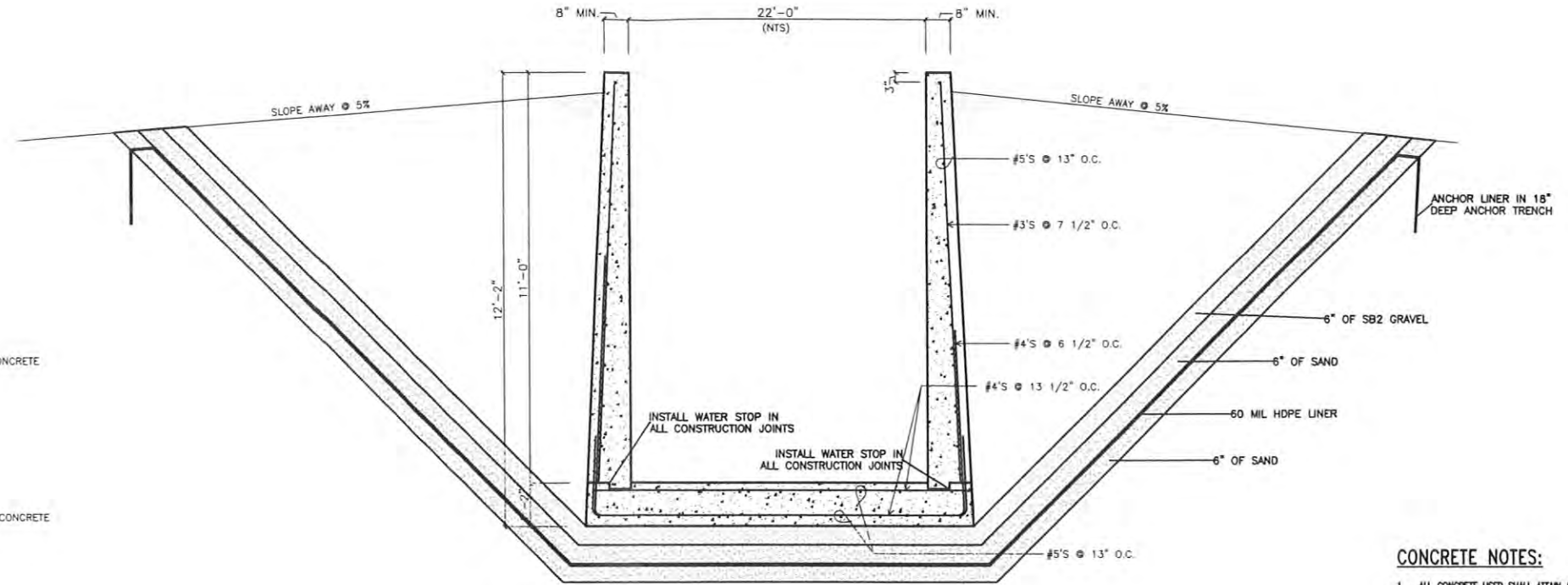
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EL DORADO, ARKANSAS

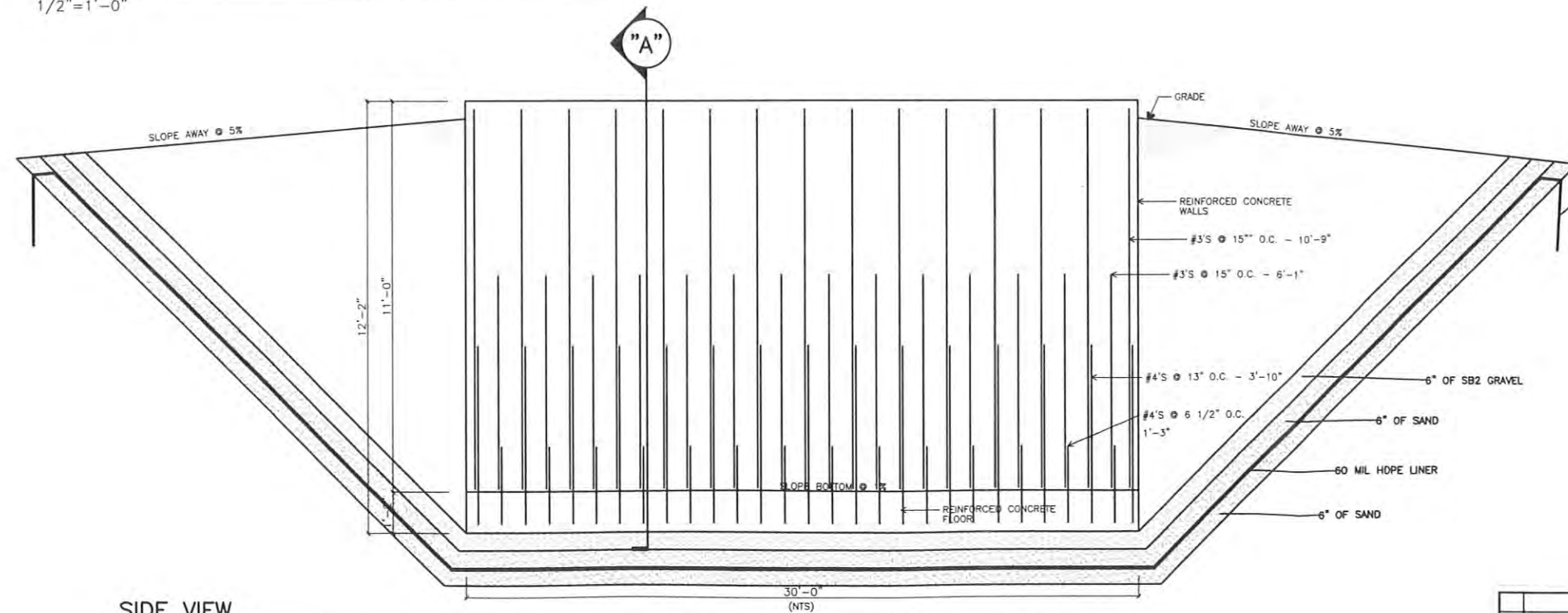
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TOP VIEW  
1/2" = 1'-0"



SECTION "A"  
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SIDE VIEW  
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11. REFER TO GRADING PLAN FOR FINISH GRADES AND SUBGRADE PREPARATION REQUIREMENTS.
12. REFER TO SITE PLAN FOR SITE DIMENSIONS.

**GENERAL GRADING NOTES:**

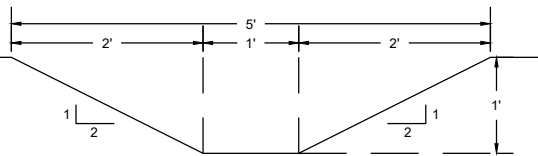
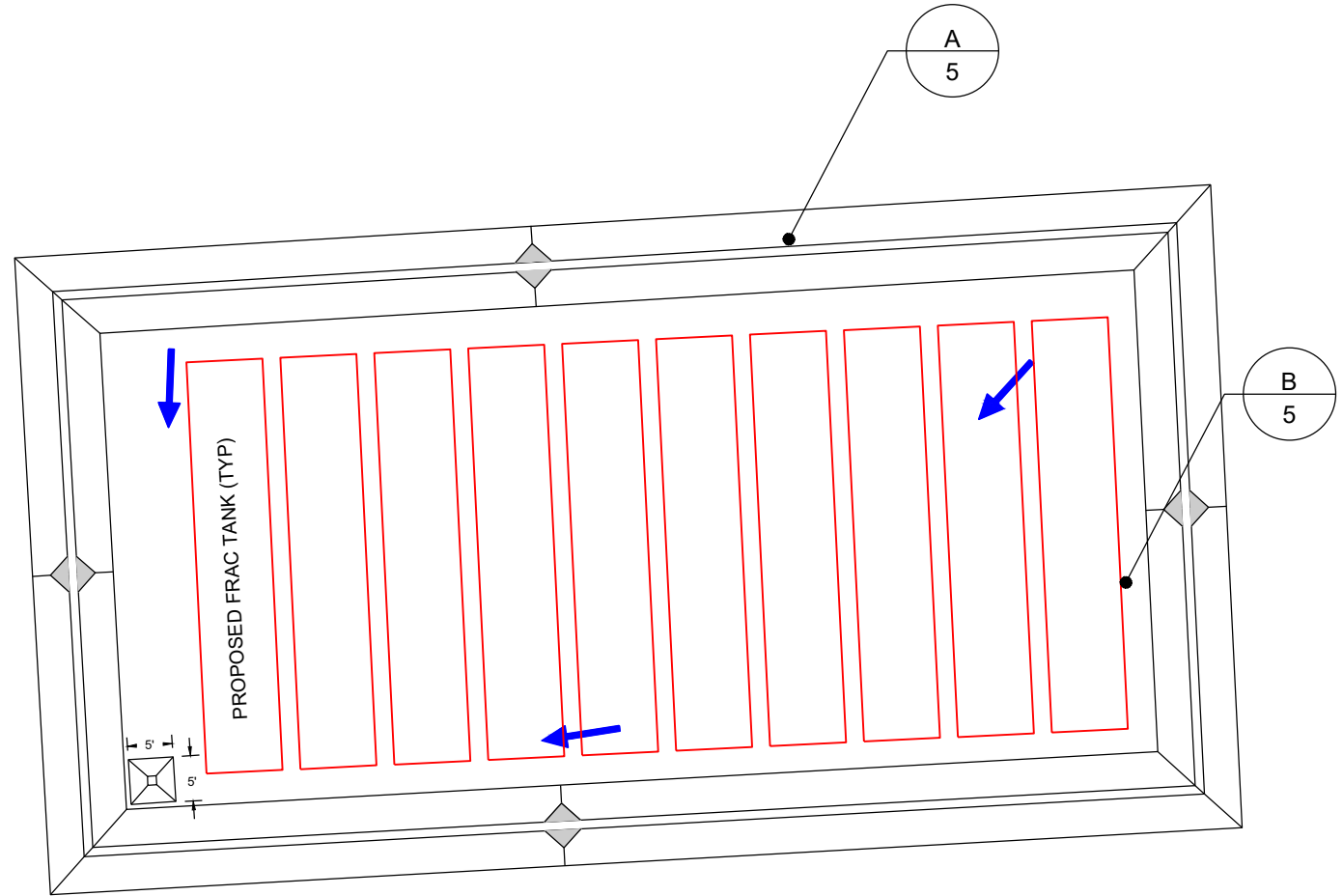
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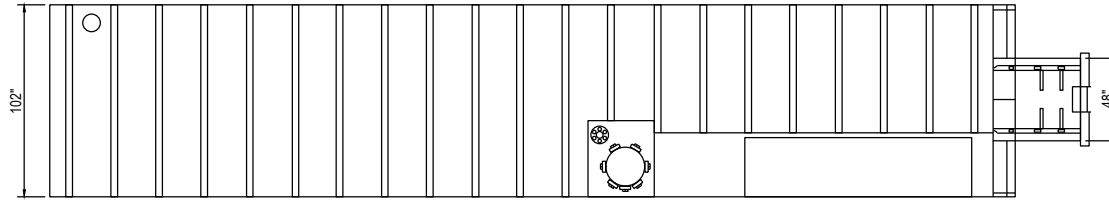


SUMP DIMENSIONS

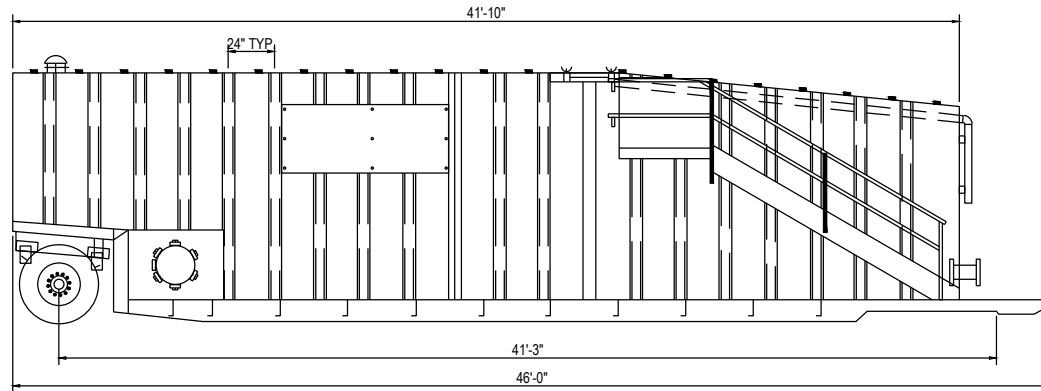
NOTES:  
 PROPOSED STORAGE TANK AREA SHALL BE GRADED TO DRAIN TOWARD SUMP.

SUMP SHALL BE PUMPED AS NEEDED TO REMOVE LIQUIDS FROM CONTAINMENT AREA. LIQUIDS WILL BE PUMPED INTO FRAC TANKS OR BULKING VAT.

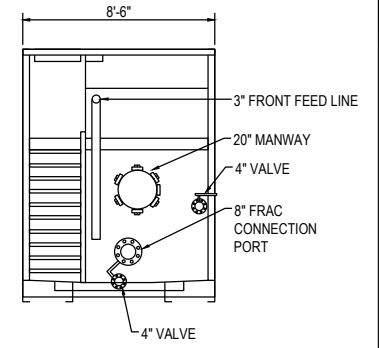
Project Mngr:	FOC	Project No:	341-001-35207162	<b>Terracon</b> Consulting Engineers and Scientists 25809 I-30 SOUTH BRYANT, AR 72022 PH. (501) 847-9292 FAX. (501) 847-9210	PROPOSED FRAC TANK STORAGE AREA LAYOUT WASTE MANAGEMENT PLAN MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC BULKING FACILITY		FIGURE <b>4</b> ARKANSAS
Drawn By:	FOC	Scale:	NTS		EL DORADO		
Checked By:		File No.	002				
Approved By:		Date:	06/09/2021				



TOP VIEW



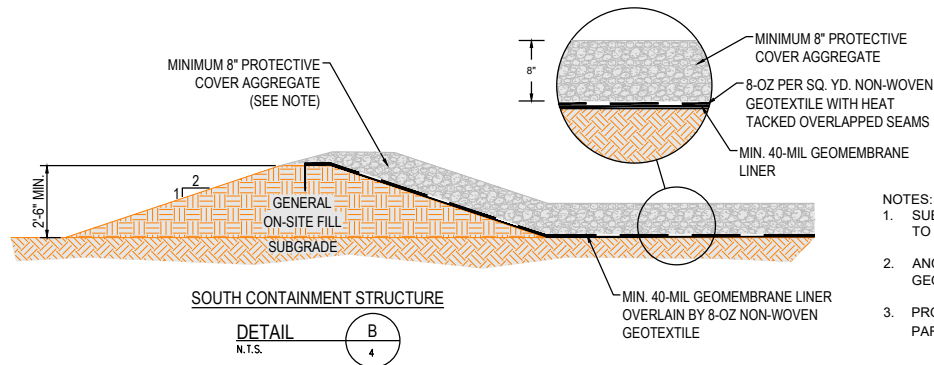
SIDE VIEW



FRONT VIEW

TYPICAL FRAC TANK

DETAIL A  
N.T.S.



SOUTH CONTAINMENT STRUCTURE

DETAIL B  
N.T.S.

NOTES:

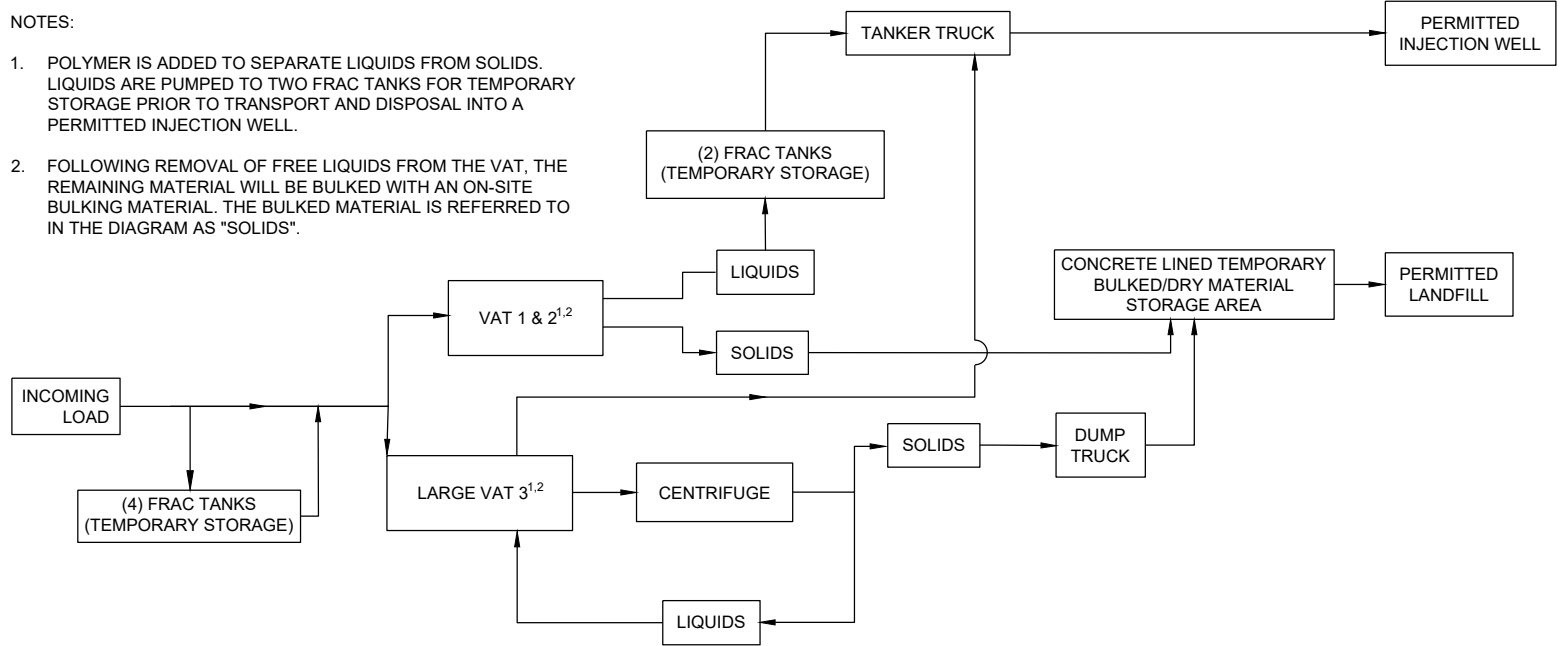
1. SUBGRADE SOILS SHALL BE COMPACTED AND STABLE PRIOR TO PLACEMENT OF GEOMEMBRANE LINER.
2. ANCHOR GEOMEMBRANE LINER AND NON-WOVEN GEOTEXTILE INTO TOP OF GENERAL FILL CONTAINMENT BERM.
3. PROTECTIVE COVER AGGREGATE SHALL BE FREE OF PARTICLES LARGER THAN 1 1/2" DIAMETER.

Project Mngr:	FOC	Project No:	341-001-35117152	<p><b>Terracon</b> Consulting Engineers and Scientists</p> <p>25809 I-30 SOUTH BRYANT, AR 72022 PH. (501) 847-9292 FAX. (501) 847-9210</p>	FRAC TANK STORAGE AREA DETAILS		FIGURE  5
Drawn By:	FOC	Scale:	NTS		WASTE MANAGEMENT PLAN		
Checked By:		File No.	002		MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC		
Approved By:		Date:	06/09/2021		BULKING FACILITY		
					EL DORADO	ARKANSAS	

### OIL AND WATER BASED DRILLING WASTE STREAM

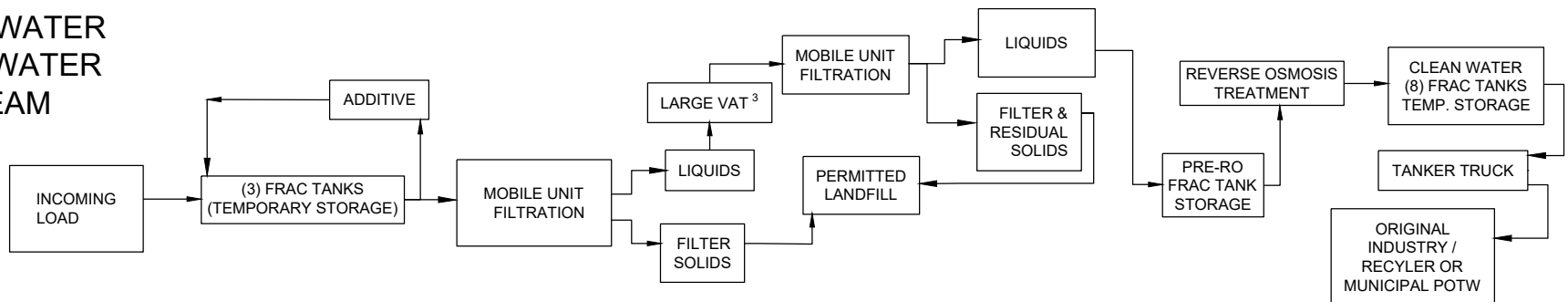
**NOTES:**

1. POLYMER IS ADDED TO SEPARATE LIQUIDS FROM SOLIDS. LIQUIDS ARE PUMPED TO TWO FRAC TANKS FOR TEMPORARY STORAGE PRIOR TO TRANSPORT AND DISPOSAL INTO A PERMITTED INJECTION WELL.
2. FOLLOWING REMOVAL OF FREE LIQUIDS FROM THE VAT, THE REMAINING MATERIAL WILL BE BULKED WITH AN ON-SITE BULKING MATERIAL. THE BULKED MATERIAL IS REFERRED TO IN THE DIAGRAM AS "SOLIDS".

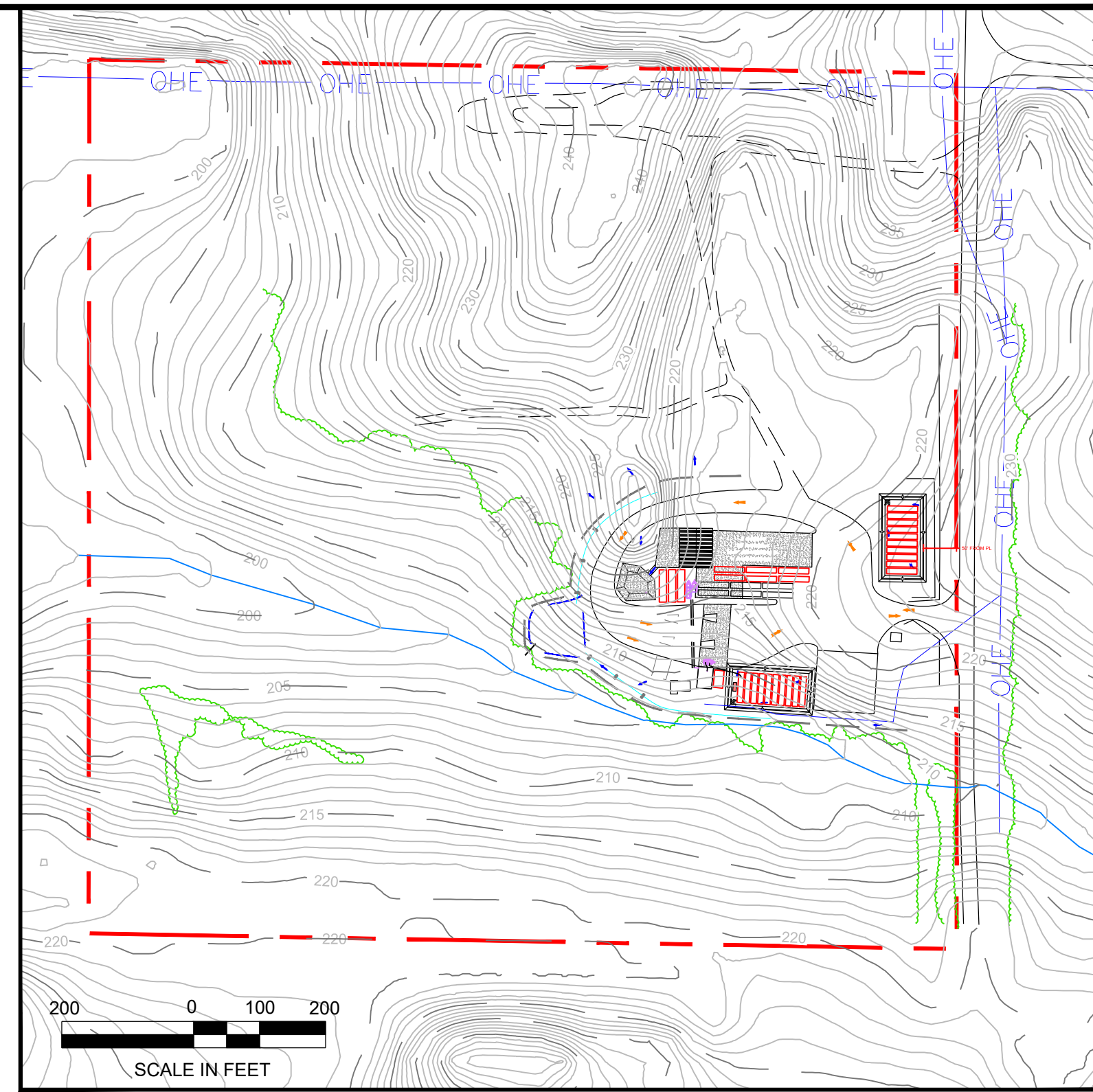
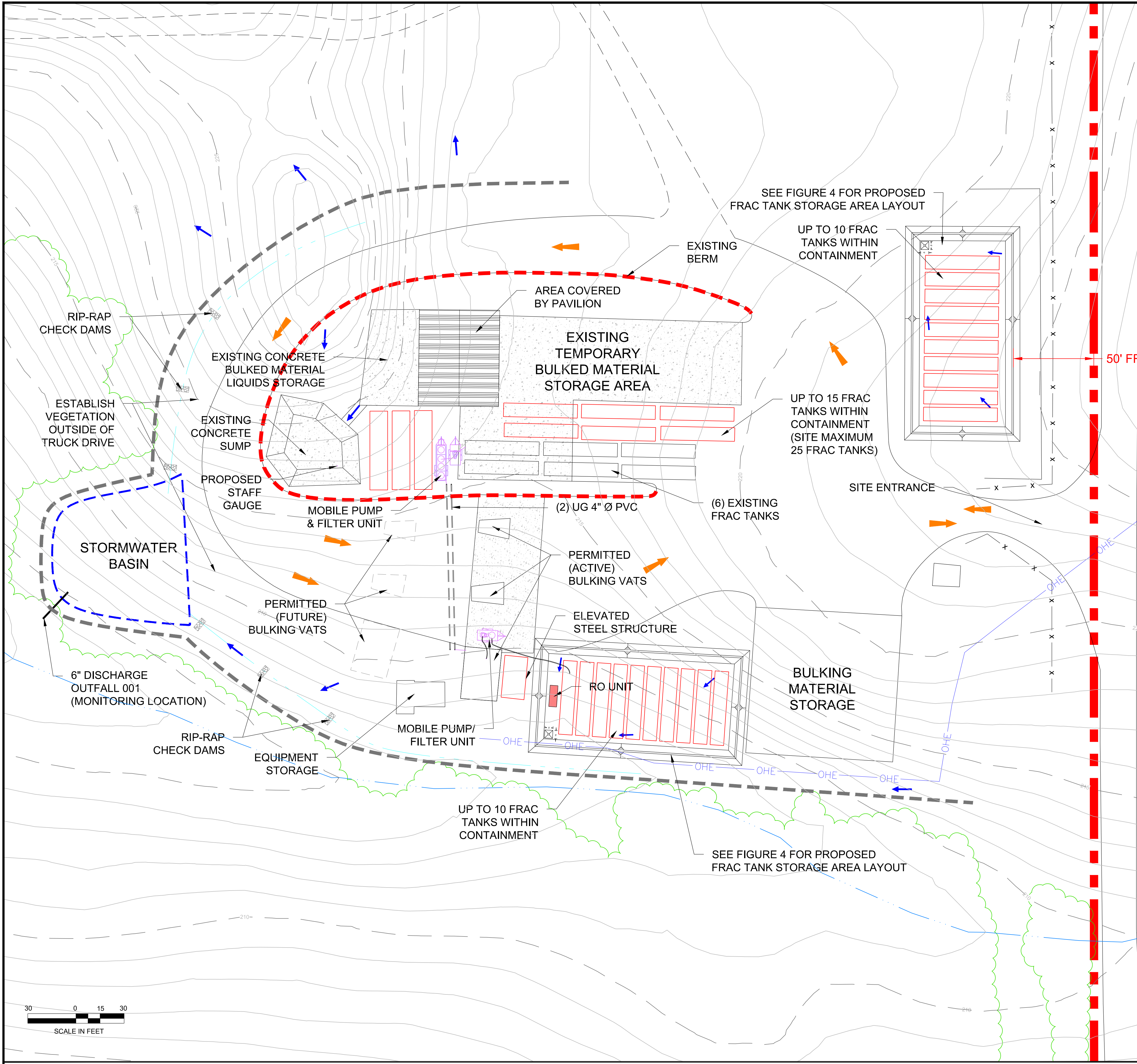


3. FOLLOWING REMOVAL OF FREE LIQUIDS FROM THE VAT, THE REMAINING RESIDUAL SOLIDS WILL LANDFILLED OR BULKED WITH AN ON-SITE BULKING MATERIAL PRIOR TO LANDFILLING.

### INDUSTRIAL WATER AND STORMWATER WASTE STREAM



Project Mngr: FOC	Project No. 341-001-35207162	<b>Terracon</b> Consulting Engineers and Scientists 25809 I-30 SOUTH BRYANT, AR 72022 PH. (501) 847-9292 FAX. (501) 847-9210	PROCESS FLOW DIAGRAM	FIGURE  6
Drawn By: FOC	Scale: NTS		WASTE MANAGEMENT PLAN	
Checked By:	File No. 007		MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC	
Approved By:	Date: 06/29/2021		BULKING FACILITY	
			EL DORADO ARKANSAS	



**SITE LAYOUT**

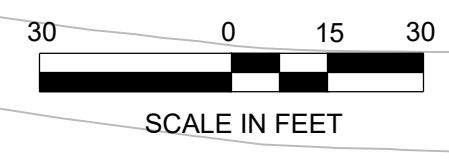


**LEGEND**

- - - - - PROPERTY BOUNDARY
- - - - - EXISTING SOIL BERM
- 210 — EXISTING INDEX CONTOUR
- STORMWATER FLOW
- CONSTRUCTED PERMITTED BULKING PITS
- FUTURE BULKING PITS
- ~ ~ ~ EXISTING TREE LINE
- DIRECTION OF TRAFFIC
- CONTAINMENT BERM SLOPE INDICATOR

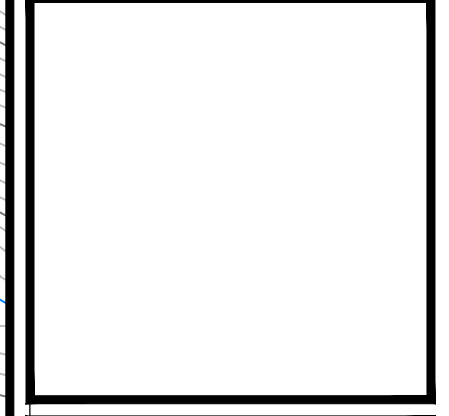
**NOTES:**

1. EXISTING CONTOUR INFORMATION WAS GENERATED BY UTILIZING THE UNITED STATES GEOLOGICAL SURVEY (USGS) NATIONAL MAP DATABASE FOR THE 7.5 MINUTE EL DORADO EAST QUADRANGLE, CREATED JUNE 14, 2007 & DOES NOT REFLECT POST DEVELOPMENT SITE GRADES.



**OPERATIONS AREA**

REV.	DATE	BY	DESCRIPTION



**SITE LAYOUT MAP**  
 WASTE MANAGEMENT PLAN  
**MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC**  
 BULKING FACILITY  
 EL DORADO, ARKANSAS

Consulting Engineers and Scientists  
 BRYANT, AR 72022  
 PH. (501) 847-9282  
 FAX. (501) 847-9210

**FIGURE 7**

DESIGNED BY:	FOC
DRAWN BY:	FOC
APPVD. BY:	
SCALE:	AS SHOWN
DATE:	06/09/2021
JOB NO.:	341-001-35207162
ACAD NO.:	001-SITE LAYOUT
SHEET NO.:	OF

# National Flood Hazard Layer FIRMette



92°37'13"W 33°12'32"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

92°36'36"W 33°12'11"N

USGS The National Map: Orthoimagery: Data refreshed April 2020

## Legend

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

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

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/11/2020 at 1:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

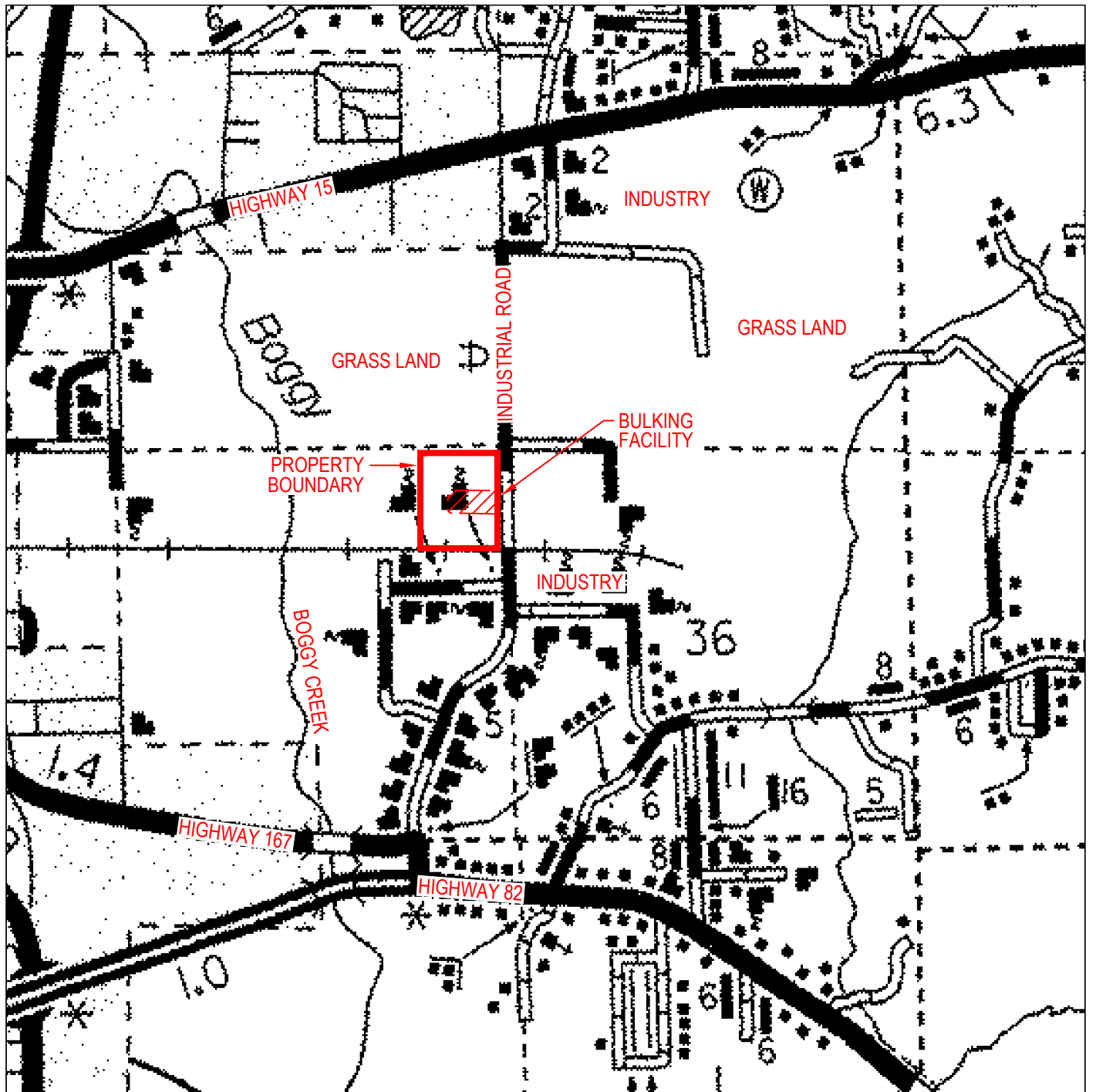
Project Mngr:	FOC	Project No.	341-001-35207162
Drawn By:	FOC	Scale:	AS SHOWN
Checked By:		File No.	004
Approved By:		Date:	06/09/2021

**Terracon**  
Consulting Engineers and Scientists

25809 I-30 SOUTH BRYANT, AR 72022  
PH. (501) 847-9292 FAX. (501) 847-9210

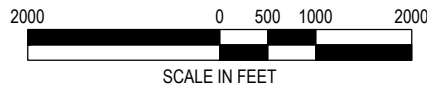
FLOOD INSURANCE RATE MAP	
WASTE MANAGEMENT PLAN	
MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC	
EL DORADO	ARKANSAS

FIG. No.	8
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**LEGEND:**

- - BUILDING / DWELLING
- - - SECTION LINE
- - - OPERATING AREA BOUNDARY



**FACILITY LOCATION\***

SECTIONS	TOWNSHIP	RANGE
NE ¼ NE ¼ SECTION 35	17 S	15 W
	LATITUDE	LONGITUDE
	33.204	-92.614

GENERAL HIGHWAY MAP  
**UNION COUNTY**  
ARKANSAS

PREPARED BY  
ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT  
PLANNING AND RESEARCH DIVISION  
IN COOPERATION WITH  
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

Project Mngr:	FOC
Drawn By:	FOC
Checked By:	
Approved By:	

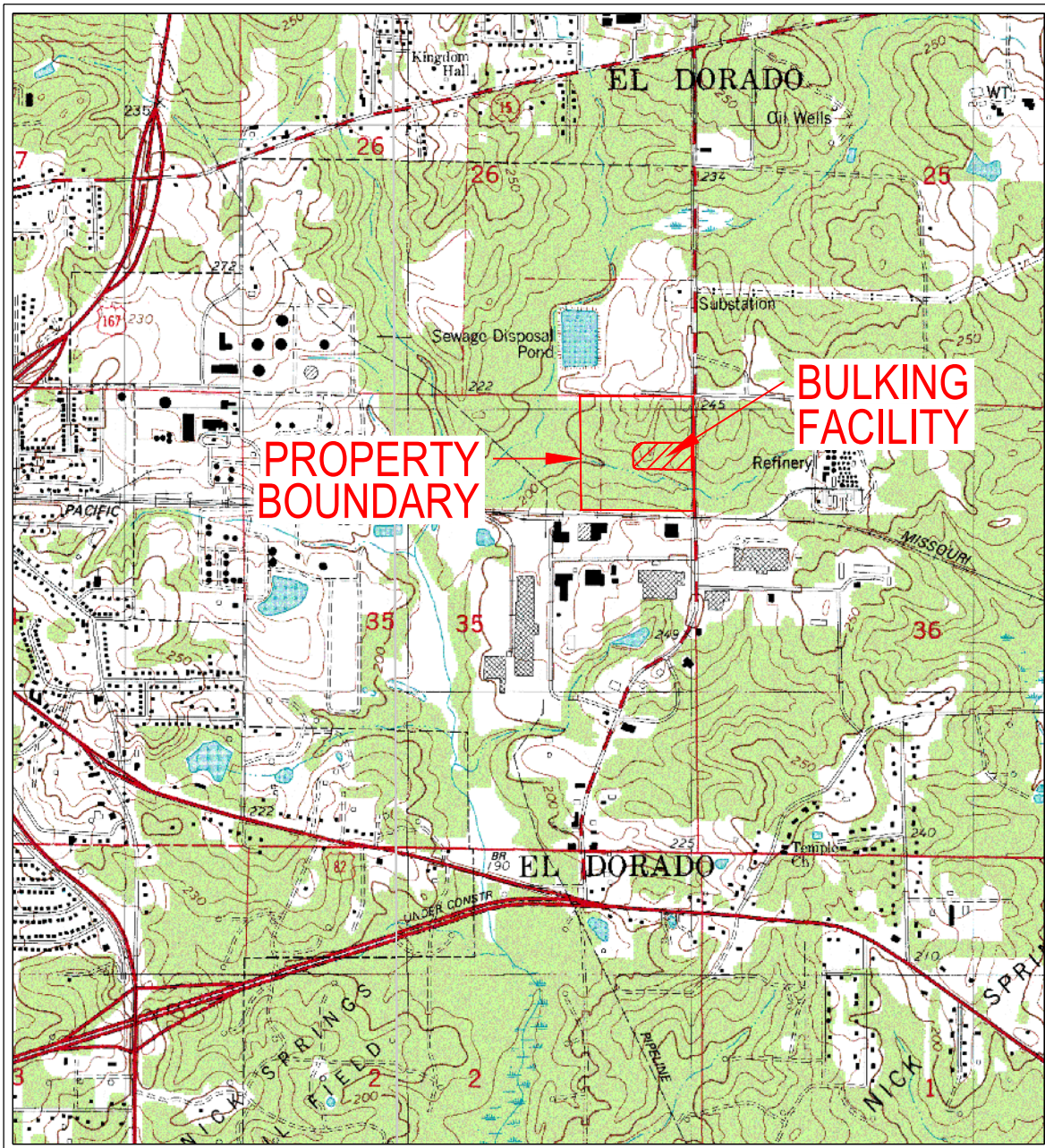
Project No.	341-001-35207162
Scale:	AS SHOWN
File No.	003
Date:	06/09/2021

**Terracon**  
Consulting Engineers and Scientists

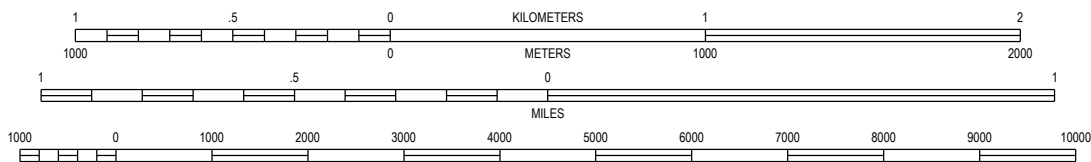
25809 I-30 BRYANT, ARKANSAS 72022  
PH. (501) 847-9292 FAX. (501) 847-9210

GENERAL HIGHWAY MAP WASTE MANAGEMENT PLAN MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC ELDORADO ARKANSAS
---

FIG. No. <b>9</b>
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SCALE 1:24 000



CONTOUR INTERVAL 20 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

EL DORADO WEST & EL DORADO EAST  
QUADRANGLES  
1981  
7.5 MINUTE SERIES (TOPOGRAPHIC)



Project Mngr:	FOC
Drawn By:	FOC
Checked By:	
Approved By:	

Project No.	341-001-35207162
Scale:	AS SHOWN
File No.	006
Date:	06/09/2021

**Terracon**  
Consulting Engineers and Scientists

25809 I-30 SOUTH BRYANT, AR 72022  
PH. (501) 847-9292 FAX. (501) 847-9210

SITE LOCATION MAP  
WASTE MANAGEMENT PLAN  
MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC  
EL DORADO ARKANSAS

FIG. No.	10
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# Appendix A

## Permit No. 5077-WR-7

**AUTHORIZATION FOR A NO-DISCHARGE WATER PERMIT UNDER THE  
ARKANSAS WATER AND AIR POLLUTION CONTROL ACT**

In accordance with the provisions of the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. § 8-4-101, *et seq.*)

**Southark Waste Control, LLC**

is authorized to construct and operate a storage facility for drilling fluids, non-hazardous stormwater, and non-hazardous process water at 101 Warehouse Drive, El Dorado, AR 71730 in Union County, Arkansas. The facility is located at the following coordinates:

Latitude: 33° 12' 14" N; Longitude: 92° 36' 50" W

Operation shall be in accordance with all conditions set forth in this permit.

Effective Date: June 1, 2016

Expiration Date: May 31, 2021



Caleb J. Osborne  
Associate Director, Office of Water Quality  
Arkansas Department of Environmental Quality

5/20/16

Issuance Date:

**Part I**  
**Permit Conditions**

1. The waste storage system shall be constructed and operated in accordance with the February 2015 Waste Management Plan (WMP) and additional information received September 17, 2015. If the WMP is inconsistent with this permit, the waste storage system shall be operated in accordance with the terms of the permit and the WMP shall be revised to conform to the permit conditions.
2. Fluids allowed for storage at the facility include fresh water, oil-based drilling mud, water-based drilling mud, drill cuttings, produced water, flow-back water, bentonitic clays, chemical additives, barite, foaming agents, lubricants, and emulsifiers produced off-site by natural gas drilling operations as well as non-hazardous stormwater and process water from various industries. All wastes accepted for storage under this permit must not be considered hazardous as defined in APC&EC Regulation 23.
3. Waste shall not be discharged from this operation to the waters of the State or onto the land in any manner that may result in runoff to the waters of the State or ponding on the surface of the land. Ponding caused by rainfall/stormwater must not have a visual sheen.
4. Waste storage operations involving newly constructed additions to the facility shall not commence until the permittee has obtained written approval from the Department. After construction of the additional three bulking pits and the four proposed frac tanks in a containment area is complete, the consultant must submit a construction certification, signed and stamped by an Arkansas registered Professional Engineer, to the Department stating that the additions to the facility were constructed according to the final plans approved by the Department. The construction certification must include documentation demonstrating, at a minimum, conformance with the facility's design in the approved Waste Management Plan. After receiving construction certification, the Department may issue a letter of authorization to commence operation of the facility additions. Operation of the new portions of the facility shall not commence until the Department has issued a letter of authorization to operate.
5. The permittee shall keep current records of the solids and liquids that are received and stored as well as shipped from the facility. Incoming waste records must include: volumes of the waste, name of the waste generator, type of waste, transporter Arkansas Oil and Gas Commission (AOGC) permit number and date received. Outgoing waste records must include: volumes of the waste, the name of the entity receiving the waste, type of waste, transporter AOGC permit number and shipping date.
6. Solid material accumulated in the waste storage dike, pits or vessels shall be removed as necessary to maintain the basin's design volume and to protect the storage system. Solids collected in the base shall be disposed of by methods in accordance with the WMP approved by the Department. All concrete storage basins shall maintain a minimum of a two (2) foot freeboard at all time.
7. The permittee is only allowed to store, at the maximum, 500 tons of dry solids and 314,495 gallons of liquid waste at the facility, at any time.
8. The permittee shall maintain adequate financial assurance during the entire permit term.
9. On or before August 15 of each year, the permittee shall submit to the Department for approval a detailed cost estimate to close and restore the permitted facility in accordance with closure plans that have been approved by the Department. (Arkansas Code Annotated § 8-4-203(c)(1)(D)(iii))

10. On or before September 15 of each year, the Department must receive documentation that the required financial assurance mechanism has been renewed beginning October 1 of that year or the Department shall initiate procedures to take possession of the funds guaranteed by the financial assurance and suspend or revoke the facility's permit as defined in Arkansas Code Annotated § 8-4-203(c)(1)(F)(ii)(b).
11. On or before October 1 of each year, the permittee must renew or replace its irrevocable financial mechanism, submit an updated closure plan and detailed cost estimate pursuant to the financial assurance requirements of Arkansas Code Annotated § 8-4-203(c)(1)(B).
12. The permittee must implement and maintain the March 2014 Hazardous Waste Exclusion Plan which was approved by the Department on May 21, 2014, and describes the facility's procedures for detecting and preventing the acceptance of regulated hazardous wastes as defined in APCE&EC Reg. No. 23. This plan shall include, at a minimum:
  - A. Purpose of monitoring and identification of responsible personnel and their roles;
  - B. A written protocol that describes the methods to identify and screen potentially hazardous waste before it enters the facility. The written protocol shall describe the procedures, evaluation criteria, testing requirements, and decision making process that will be followed to determine whether to accept or reject waste before the waste enters the facility;
  - C. A written protocol for random inspections of incoming loads unless the owner or operator takes other steps to ensure that incoming loads do not contain regulated hazardous wastes;
  - D. Training of appropriate facility personnel to recognize regulated hazardous wastes; and
  - E. Notification must be sent to the Department if a regulated hazardous waste is discovered at the facility under the requirements of Condition No. 13 of Part II (Reporting of Violations and Unauthorized Discharges).
13. The permittee shall keep records of random inspections and training performed under the plan in Condition No. 12 of Part I on site for a minimum of three (3) years.
14. Should the facility under this permit cease operations, the permittee shall submit to the Department, for approval, a closure plan for the system storage structures within sixty (60) days of the final day of operation.
15. To utilize bulked or dry material from this facility for beneficial reuse purposes, the permittee must provide written notification and material analysis results to the Department. Department approval is required prior to any reuse of the material, and the permittee must have sufficient evidence that the application of the waste will have no impact to public health safety, welfare, or potential short or long-term environmental impacts.

**Part II**  
**Standard Conditions**

**1. Duty to Comply**

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Arkansas Water and Air Pollution Control Act, Ark. Code Ann. §8-4-101 et seq. and is grounds for civil and administrative enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

**2. Penalties for Violations of Permit Conditions**

The Arkansas Water and Air Pollution Control Act, Ark. Code Ann. 8-4-101 et seq. provides that any person who violates any provisions of a permit issued under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year, or a fine of not more than twenty-five thousand dollars (\$25,000) or both for each day of such violation. Any person who violates any provision of a permit issued under the Act may also be subject to a civil penalty not to exceed ten thousand dollars (\$10,000) for each day of such violation. The fact that any such violation may constitute a misdemeanor shall not be a bar to the maintenance of such civil action.

**3. Permit Actions**

- A. This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to the following:
- i. Violation of any terms or conditions of this permit;
  - ii. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;
  - iii. A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination; or
  - iv. Failure of the permittee to comply with the provisions of Arkansas Pollution Control and Ecology Commission (APC&EC) Regulation No. 9 (Permit fees).
- B. The filing of a request by the permittee for a permit modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

**4. Civil and Criminal Liability**

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Any false or materially misleading representation or concealment of information required to be reported by the provisions of this permit or applicable state statutes or regulations which defeats the regulatory purposes of the permit may subject the permittee to criminal enforcement pursuant to the Arkansas Water and Air Pollution Control Act, Ark. Code Ann. §8-4-101 et seq..

5. **Oil and Hazardous Substance Liability**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act and Section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

6. **State Laws**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation.

7. **Property Rights**

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

8. **Severability**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provisions of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

9. **Permit Fees**

The permittee shall comply with all applicable permit fee requirements (i.e., including annual permit fees following the initial permit fee that will be invoiced every year the permit is active) for wastewater discharge permits as described in APCEC Regulation No. 9 (Regulation for the Fee System for Environmental Permits). Failure to promptly remit all required fees shall be grounds for the Director to initiate action to terminate this permit under the provisions of 40 CFR Parts 122.64 and 124.5(d), as adopted in APCEC Regulation No. 6 and the provisions of APCEC Regulation No. 8.

10. **Proper Operation and Maintenance**

- A. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.
- B. The permittee shall provide an adequate and trained operating staff which is duly qualified to carry out operation, maintenance and testing functions required to insure compliance with the conditions of this permit.

**11. Duty to Mitigate**

The permittee shall take all reasonable steps to prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health, the environment, or the water receiving the discharge.

**12. Removed Substances**

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of waste waters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering the waters of the State.

**13. Reporting of Violations and Unauthorized Discharges**

- A. Any violations to this permit must be reported to the Enforcement Branch of the Department immediately. Any leaks or seeps shall be reported to the Department and appropriately corrected. Any discharge from the fluids storage system such as an overflow, a broken pipe, etc., shall be immediately reported to the Department.
- B. The operator shall visually monitor and report immediately (within 24 hours) to the Enforcement Branch any unauthorized discharge from any facility caused by dike or structural failure, equipment breakdown, human error, etc., and shall follow up with a written report within five (5) days of such occurrence. The written report shall contain the following:
  - i. A description of the permit violation and its cause;
  - ii. The period of the violation, including exact times and dates;
  - iii. If the violation has not been corrected, the anticipated time expected to correct the violation; and
  - iv. Steps taken or planned to reduce, eliminate, and prevent the recurrence of the violation.
- C. Reports shall be submitted to the Enforcement Branch at the following address:

Arkansas Department of Environmental Quality  
Office of Water Quality, Enforcement Branch  
5301 Northshore Dr.  
North Little Rock, Arkansas 72118  
Fax (501) 682-0880

Or

[Water-enforcement-report@adeq.state.ar.us](mailto:Water-enforcement-report@adeq.state.ar.us)

**14. Penalties for Tampering**

The Arkansas Water and Air Pollution Control Act, Ark. Code Ann. § 8-4-101 et seq. provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year or a fine of not more than ten thousand dollars (\$10,000) or by both such fine and imprisonment.

**15. Retention of Records**

The permittee shall retain records of all monitoring information, copies of all reports required by this permit, and records of all data used to complete the application for this permit for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of the Director at any time.

**16. Record Contents**

Records and monitoring information shall include:

- A. The date, exact place, time, and methods of sampling or measurements, and preservatives used, if any;
- B. The individuals(s) who performed the sampling or measurements;
- C. The date(s) the analyses were performed;
- D. The individual(s) who performed the analyses;
- E. The analytical techniques or methods used; and
- F. The measurements and results of such analyses.

**17. Inspection and Entry**

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

- A. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- B. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- C. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit,
- D. Sample, inspect, or monitor at reasonable times, for the purposes of assuring permit compliance any substances or parameters at any location.

**18. Planned Changes**

The permittee shall give notice and provide the necessary information to the Director for review and approval prior to any planned physical alterations or additions to the permitted facility.

**19. Anticipated Noncompliance**

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

**20. Transfers**

The permit is nontransferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Act.

**21. Duty to Provide Information**

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying; revoking and reissuing or terminating this permit; or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit. Information shall be submitted in the form, manner and time frame requested by the Director.

**22. Duty to reapply**

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The complete application shall be submitted at least 180 days before the expiration date of this permit. The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date. Conditions of this permit will continue in effect past the expiration date pending issuance of a new permit, if:

- A. The permittee has submitted a timely and complete application; and
- B. The Director, through no fault of the permittee, does not issue a new permit prior to the expiration date of the previous permit.

**23. Signatory Requirements**

- A. All applications, reports or information submitted to the Director shall be signed and certified. All permit applications shall be signed as follows:
  - i. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
    - a. A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or
    - b. The manager of one or more manufacturing, production, or operation facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including: having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
  - ii. For a partnership or sole proprietorship: by a general partner or proprietor, respectively; or
  - iii. For a municipality, State, Federal, or other public agency; by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:
    - a. The chief executive officer of the agency, or

- b. A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
- B. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
  - i. The authorization is made in writing by a person described above.
  - ii. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
  - iii. The written authorization is submitted to the Director.
- C. Any person signing a document under this section shall make the following certification: “I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

**24. Availability of Reports**

Except for data determined to be confidential under the Arkansas Trade Secrets Act, Ark. Code Ann. § 4-75-601 *et seq.*, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department of Environmental Quality. The name and address of any permit applicant or permittee, permit applications, permits, and effluent data shall not be considered confidential.

**25. Penalties for Falsification of Reports**

The Arkansas Air and Water Pollution Control Act provides that any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this permit shall be subject to civil penalties and/or criminal penalties under the authority of the Arkansas Water and Air Pollution Control Act, Ark. Code Ann. § 8-4-101 *et seq.*

**26. Applicable Federal, State, or Local Requirements**

Permittees are responsible for compliance with all applicable terms and conditions of this permit. Receipt of this permit does not relieve any operator of the responsibility to comply with any other applicable Federal, State, or local statute, ordinance policy, or regulation.

**Part III**  
Definitions

**“Act”** means the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. § 8-4-101 et seq.) as amended.

**“APC&EC”** means the Arkansas Pollution Control and Ecology Commission.

**“Department”** means the Arkansas Department of Environmental Quality (ADEQ).

**“Director”** means the Director of the Arkansas Department of Environmental Quality.

**“Visual sheen”** means a presence of a film or sheen or a discoloration of the surface of the sample fluids.

**“Annual” or “Yearly”** is defined as a fixed calendar year or any portion of the fixed calendar year for a waste characteristic or parameter with a measurement frequency of once/year. A calendar year is January through December, or any portion thereof.

## STATEMENT OF BASIS

This Statement of Basis is for information and justification of the permit limits only and is not enforceable. This permit decision is for renewal of a no-discharge operation under permit number 5077-WR-7 and AFIN 70-01210.

### 1. Permitting Authority

Arkansas Department of Environmental Quality  
Office of Water Quality, Permits Branch  
5301 Northshore Dr.  
North Little Rock, Arkansas 72118-5317

### 2. Applicant

Southark Waste Control, LLC  
4448 Haynesville Hwy.  
El Dorado, AR 71730

### 3. Facility Location

The facility located at: Southark Waste Control, LLC, 101 Warehouse Drive, El Dorado, AR 71730. Location: From El Dorado, go east on Hwy 63 approximately 1.25 miles, turn south on Industrial Rd, go 1.5 miles to the site on right, in Union County, Arkansas. The facility is located at the following coordinates:

Latitude: 33° 12' 14" N Longitude: 92° 36' 50" W

### 4. Waterbody Evaluation

The facility is located in Stream Segment 2D of the Ouachita River basin, which is not in the Nutrient Surplus Area. Surrounding areas were evaluated to determine if any Extraordinary Resource Waters (ERWs), Ecologically Sensitive Waterbodies (ESWs), Natural or Scenic Rivers, or waterbodies in the 2008 ADEQ 303(d) list of impaired waterbodies in the State of Arkansas are near the facility. The facility is approximately 6.7 miles from Bayou de Loutre, which is on the 2008 ADEQ 303(d) list as a Category 5 waterbody impaired for Zinc, Total Dissolved Solids, and Sulfates from Resource Extraction, Industrial Point Source, and Municipal Point Source. Because this facility only stores waste and does not have any discharge, there will be no contribution of pollutants from this site.

### 5. Consultant for this Facility

Brad N. Fureigh, P.E.  
Terracon Consultants, Inc.  
25809 Interstate 30 South  
Bryant, AR 72022

**6. Permit History**

- A. Permit No. 5077-W was issued to Southern Mud Company, LLC and effective August 1, 2010 to construct and operate a new waste storage and disposal facility.
- B. Permit No. 5077-WR-1 was issued to Southern Mud Company, LLC and effective July 1, 2011 for a permit modification to revise the dimensions of one of the bulking pits.
- C. Permit No. 5077-WR-2 was issued to Southern Mud Company, LLC and effective August 1, 2012 for a permit modification to add three additional concrete bulking pits.
- D. Permit No. 5077-WR-3 was issued to Southern Mud Company, LLC and effective May 1, 2013 for a permit modification to include a portion of the facility's stormwater.
- E. Permit No. 5077-WR-4 was issued to Southern Mud Company, LLC and effective February 1, 2014 for a permit modification for the facility to accept non-hazardous stormwater and process water from various industries.
- F. Permit No. 5077-WR-5 was issued to Southern Mud Company, LLC and effective March 1, 2015 to change the Responsible Official and address.
- G. Permit No. 5077-WR-6 was issued to Southark Waste Control, LLC and effective August 1, 2015 for a permit transfer from Southern Mud Company, LLC to Southark Waste Control, LLC.

**7. Previous Permit Activity**

Previous Permit No.: 5077-WR-6  
Effective Date: August 1, 2010  
Modification Effective Date: August 1, 2015  
Expiration Date: July 31, 2015

The permittee submitted a permit renewal application for a No-Discharge permit, which was received on February 2, 2015. Due to a permit transfer, a revised renewal application with the updated permittee information was later submitted on August 26, 2015, with additional information received on September 17, 2015. It is proposed that the renewed water no-discharge permit be reissued for a 5-year term.

Legal Order Review:

There are currently no active Consent Administrative Orders (CAOs) or Notice of Violations (NOVs) for this facility.

Site Visits/Inspections:

The most recent inspection occurred on February 14, 2014. There were several violations noted in the inspection report. The Department received a response on March 6, 2014 which sufficiently addressed all of the violations.

**8. Changes From the Previously Issued Permit**

- A. Condition 7 of Part I has been added to limit the amount of waste that can be stored at the facility and is based on the provided Closure Plan.
- B. Condition 15 of Part I has been added regarding the beneficial reuse of bulked material.

C. This permit covers the operation of three existing concrete reinforced bulking pits and two temporary storage frac tanks as well as the construction of three concrete reinforced bulking pits with the same design as the existing three pits. The construction of these three future bulking pits was approved for the 5077-WR-2 permit modification; however, they have not been constructed at this time. This permit will also cover the construction of a proposed new containment area with four additional frac tanks for temporary storage, as well as the addition of a centrifuge (Alfa Laval DSNX-5855 decanter or equivalent).

#### **9. Applicant Activity**

Under the standard industrial classification (SIC) code 1389 or North American Industry Classification System (NAICS) code 213112, the applicant activities are the operation of a waste storage system.

#### **10. Waste Description**

The wastes that will be stored at this facility will contain fresh water, oil-based drilling mud, water-based drilling mud, drill cuttings, produced water, flow-back water, bentonitic clays, chemical additives, barite, foaming agents, lubricants, and emulsifiers produced off-site by natural gas drilling operations as well as non-hazardous stormwater and process water from various industries.

#### **11. Storage Facility Design**

The facility currently consists of two concrete bulking pits that are approximately 20 feet long by 10 feet wide and 11 feet deep with eight inch thick concrete walls and a capacity of 9,595 gallons each, while maintaining a 2 feet freeboard; and one concrete bulking pit that is approximately 30 feet long by 20 feet wide and 11 feet deep with 8 inch thick concrete walls and an operating capacity of 44,435 gallons each, with a 2 feet freeboard. The facility also has two frac tanks used for temporary storage of liquids at the site. Permit No. 5077-WR-2 was a modification of the previous permit to allow for three additional concrete bulking pits to be constructed. These three bulking pits are designed with to have the same dimensions and capacities of the existing three pits, and the construction of these pits is covered by this permit. With this renewal the facility also proposes to add four frac tanks within a containment area to temporarily store incoming waste.

Waste will be delivered to the facility daily by 5,460 gallon tanker trucks. The trucks will deposit waste into one of three existing concrete reinforced bulking pits. Three additional proposed concrete reinforced bulking pits and four proposed frac tanks may accept waste from the tanker trucks, pending Departmental approval of the finished construction.

Excess fluids from the three existing bulking pits will be pumped off into two existing on-site temporary storage frac tanks. After the fluids are removed from the two smaller bulking pits, the remaining material will be mixed with a bulking agent. The material in the third bulking pit will go into a proposed Alfa Laval Centrifuge to remove additional fluids which will go to the two existing frac tanks. The resulting solids from the bulking process and the centrifuge process will either be hauled to a permitted solid waste disposal facility or utilized for beneficial reuse purposes. The permittee will provide written notice and waste analysis to the Department prior to any beneficial reuse application.

Materials utilized as bulking agents will be stored on-site and protected from precipitation. The bulking agent consists of fly ash, sawdust, rice hulls, or other suitable bulking material. A front end loader will transport the bulking agent to the bulking pits and a hydraulic excavator will mix the waste.

Upon completion of the bulking process, a paint filter test will be administered to verify the absence of free liquids in the waste. Once the material has passed the filter test, the material is loaded into a haul truck and transported to a permitted Class I solid waste landfill facility for disposal. Prior to utilizing any material, laboratory testing will be performed to ensure it is non-hazardous and poses no threat to the environment.

The liquid waste from the two existing frac tanks will be disposed of in a permitted Class II or Class V underground injection controlled (UIC) well. The UIC well is located at 940 Armer Road, El Dorado, AR and is permitted under Permit No. AOGC6507.

Stormwater inside the processing area is directed to a concrete lined sump with a capacity of 67,245 gallons. The sump will be dewatered into an onsite closed-top frac tank as needed. The water will then be transported in the frac tank and disposed of in the permitted UIC well.

## **12. Liner Requirements**

The storage facility's liners and structures shall be maintained to prevent leaking or seepage. The pits at this facility use a 60 mil polyethylene synthetic liner located underneath the concrete pit structure. The frac tank containment area will have a 40 mil geomembrane liner.

## **13. Additional Site Information**

Stormwater collected outside of the processing area is directed through ditches and swells to a stormwater basin located on the west side of the facility. This stormwater is managed in accordance with the Industrial General Permit with tracking number ARR001445.

## **14. Financial Assurance**

Pursuant to Ark. Code Ann. § 8-4-203(c), the permittee was required to submit a Closure Plan to ensure that this facility, which engages in the storage of fluids generated or utilized during exploration of production phases of oil or gas operations, is closed in a manner that ensures protection of human health and the environment. In accordance with Department policy, the Closure Plan has been approved and the facility must obtain and submit a financial mechanism in the amount of \$40,869.87 as stated in the Cost Estimate of the Closure Plan. The financial mechanism must cover the estimated costs of closure for a minimum period of one (1) year with an expiration date of October 1, of each year. On or before August 15 of each year, a detailed cost estimate to close and restore the permitted facility in accordance with the closure plan that has been approved by the Department must be submitted.

**15. Basis for Permit Conditions**

The Arkansas Department of Environmental Quality has made a tentative determination to issue a permit for the no-discharge facility as described in the application and waste management plan. Permit requirements and conditions are based on regulations pursuant to the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. § 8-4-101 et seq. and Ark. Code Ann. § 8-4-201 et seq.) and the Recommended Standards for Wastewater Facilities (Ten State Standards).

Part I - Specific Conditions

Conditions 1-7 were added to make sure the facility does not have any discharge. If the facility has any discharge then the Permittee must apply for a National Pollutant Discharge Elimination System.

Conditions 8-11 were added to the permit in pursuant of Arkansas Code Annotated § 8-4-203(c), Financial Assurance is required for any facility that engages in the storage of fluids generated from oil and gas operation.

Part II - Standard Conditions

Standard Conditions have been included in this permit based on generally accepted scientific knowledge, engineering practices and the authority of the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. § 8-4-101 et seq.).

**16. Prepared By**

The permit was prepared by:

Sarah Cousins  
Engineer  
Permits Branch, Office of Water Quality  
5301 Northshore Drive  
North Little Rock, AR 72118-5317  
501-682-0627  
E-mail: [cousins@adeq.state.ar.us](mailto:cousins@adeq.state.ar.us)

Technical review

Jamal Solaimanian, Ph.D., P.E.  
Engineer Supervisor  
Permits Branch, Office of Water Quality  
5301 Northshore Drive  
North Little Rock, AR 72118-5317  
501-682-0620  
E-mail: [jamal@adeq.state.ar.us](mailto:jamal@adeq.state.ar.us)

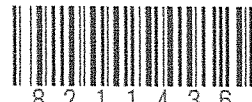
**17. Sources**

The following Sources were used to draft the permit:

- A. Regulation No. 2, Water Quality Standards for Surface Waters of the State of Arkansas, as amended.
- B. Regulation No. 8, Administrative Procedures, as amended.
- C. Regulation No. 9, Fee System for Environmental Permits, as amended.
- D. Ark. Code Ann. § 8-4-101 et seq., Arkansas Water and Air Pollution Control Act.
- E. Ark. Code Ann. § 4-75-601 et seq., Arkansas Trade Secrets Act.
- F. Recommended Standards for Wastewater Facilities: 2004 Edition (Ten State Standards).
- G. Integrated Water Quality and Assessment Report (305(b) Report).
- H. Application No. 5077-WR-7 received February 2, 2015.
- I. Additional information received August 26, 2015 and September 17, 2015.

## **Appendix B**

### **Warranty Deed**



**2021R004305**

RECORDED ON

06/14/2021 02:20:31 PM

CHERYL COCHRAN-WILSON

UNION COUNTY

EL DORADO, AR

REC FEE: 40.00

PAGES: 6

TAMMYE

**WARRANTY DEED  
COVER SHEET**

Grantor: Southark Disposals Group, LLC

Grantee: MidAmerica Environmental Holdings, LLC

Prepared by:

PPGMR Law, PLLC

201 East Markham Street, Suite 200

Little Rock, Arkansas 72201

STATE OF ARKANSAS

COUNTY OF UNION

WARRANTY DEED

BE IT KNOWN that on the date hereinafter set forth, before the undersigned Notary Public, personally came and appeared:

**SOUTHARK DISPOSALS GROUP, LLC**, by and through its Owner, Sherry Barnette, as successor in interest to SouthArk Waste Control, LLC, pursuant to a Transfer Agreement dated January 1, 2019 (hereinafter "SDG")

who declared and acknowledged that for and in consideration of the sum of Ten Dollars (\$10.00) and other good and valuable consideration in hand paid by **MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC**, an Arkansas limited liability company, (hereinafter "MidAmerica") the receipt and sufficiency of which is hereby acknowledged, **SDG** does by these presents, grant, bargain, sell, convey, deliver and warrant unto **MidAmerica** and its successors and assigns forever, the following described real property, together with all improvements and appurtenances thereunto belonging, situated in Union County, Arkansas, to wit:

**Tract #1:** A Tract of Land lying in Part of the Northeast  $\frac{1}{4}$  of Section 35, Township 17 South, Range 15 West, more particularly described as follows:

Commencing at the Northeast Corner of said Section 6, said point being an Existing Nail, lying in the Centerline of Industrial Road, thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 50.00 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 547.72 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point being the POINT OF BEGINNING; thence leaving said Industrial Road, run South 85 degrees 31 minutes 14 seconds West, a distance of 1258.37 feet to a Set  $\frac{3}{4}$ " Capped Rod, PLS #1416; thence South 0 degrees 20 minutes 31 seconds East, a distance of 600.81 feet to an Existing  $\frac{1}{2}$ " Iron Rod, PLS #88; thence South 88 degrees 34 minutes 23 seconds East, a distance of 1253.74 to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point lying in Industrial Road; thence along said Industrial Road, run North 0 degrees 11 minutes 21 seconds West, a distance of 730.31 feet back to the POINT OF BEGINNING; said described tract containing 834,666.526 square feet (19.161 acres), more or less, all lying in Union County, Arkansas.

**Tract #2:** A Tract of Land lying in Part of the Northwest  $\frac{1}{4}$  of Section 16, Township 18 South, Range 16 West, more particularly described as follows:

Commencing at the Northeast Comer of the Northeast Quarter of the Northwest Quarter, Section 16, Township 18 South, Range 16 West, and run West 219.35 feet for a POINT OF BEGINNING; thence West 179.0 feet; thence South 00 degrees 15 minutes West 415.3 feet; thence South 18 degrees 45 minutes East 126.0 feet; thence South 47 degrees 05

minutes\_ West 410.0 feet; thence South 47 degrees 16 minutes East 203.50 feet; thence North 45 degrees 25 minutes East 548.0 feet along the North line of Highway 15; thence North 09 degrees 05 minutes West 553.50 feet to the POINT OF BEGINNING.

**Tract #3:** A Tract of Land lying in Part of the Northwest  $\frac{1}{4}$  of Section 16, Township 18 South, Range 16 West, more particularly described as follows:

Beginning at the Northeast Comer of the Northeast Quarter of the Northwest Quarter, Section 16, Township 18 South, Range 16 West, and run West along its North line of said forty-acre tract 219.35 feet; thence South 07 degrees 36 minutes 50 seconds East 537.8 feet to the Northerly right-of-way of Highway No. 15; thence North 45 degrees 23 minutes 52 seconds East along said right-of-way 211.5 feet; thence North 43 degrees 49 minutes West 263.5 feet; thence North 56 degrees 04 minutes East 194.0 feet; thence North 17 degrees 50 minutes 47 seconds East 25.05 feet; thence North 60.0 feet to the POINT OF BEGINNING.

**Tract #4:** A Tract of Land lying in Part of the Northwest  $\frac{1}{4}$  of Section 16, Township 18 South, Range 16 West, more particularly described as follows:

Commencing at the Northeast Comer of the Northeast Quarter of the Northwest Quarter of the Section 16, Township 18 South, Range 16 West, and run South 60.0 feet; thence South 17 degrees 50 minutes 47 seconds West 25.05 feet for a POINT OF BEGINNING thence South 58 degrees 04 minutes West 194.0 feet; thence South 43 degrees 49 seconds East 263.50 feet; thence North 45 degrees 23 minutes 52 seconds East 61.5 feet; thence North 30 degrees 38 minutes 53 seconds West 173.97 feet thence North 17 degrees 50 minutes 47 seconds East 113.3 feet to the POINT OF BEGINNING.

LESS AND EXCEPT:

A part of the Northeast Quarter of the Northwest Quarter of Section 16, Township 18 South, Range 16 West, Union County, Arkansas, being more particularly described as: Beginning at an existing iron pipe marking, the Northeast Comer of the Northeast Quarter of the Northwest Quarter of said Section 16 and thence South 01 degrees 10 minutes 51 seconds West for a distance of 100.00 feet along the East line of said forty; thence South 48 degrees 00 minutes 54 seconds East for a distance of 206.63 feet to an existing iron pipe; thence South 47 degrees 10 minutes 59 seconds West for a distance of 153.08 feet to an existing iron pipe; thence North 36 degrees 31 minutes 20 seconds West for a distance of 434.33 feet to an existing post on the North line of said forty; thence South 88 degrees 13 minutes 31 seconds East for a distance of 219.35 feet along existing fence and said North line to the Point of Beginning.

Said property contains 1.17 acres more or less.

**TO HAVE AND TO HOLD** the above-described property, together with any improvements and appurtenances thereunto belonging including the buildings located thereon, unto said **MidAmerica**, its successors and assigns, in full ownership, free of any lien, mortgage, privilege or encumbrance whatsoever, with warranty of title to the property and conveys any interest it has in the property by virtue of said title and with full subrogation to all rights of **SDG**.



SOUTHERN GEODETIC LAND SURVEYORS, LLC.  
SAMUEL T. WHITEHEAD, PLS.

UNION COUNTY OFFICE  
525 N. WASHINGTON  
EL DORADO, AR. 71730  
(870) 894-9663 Office  
(870) 894-6505 Fax  
(870) 510-7580 Mobile

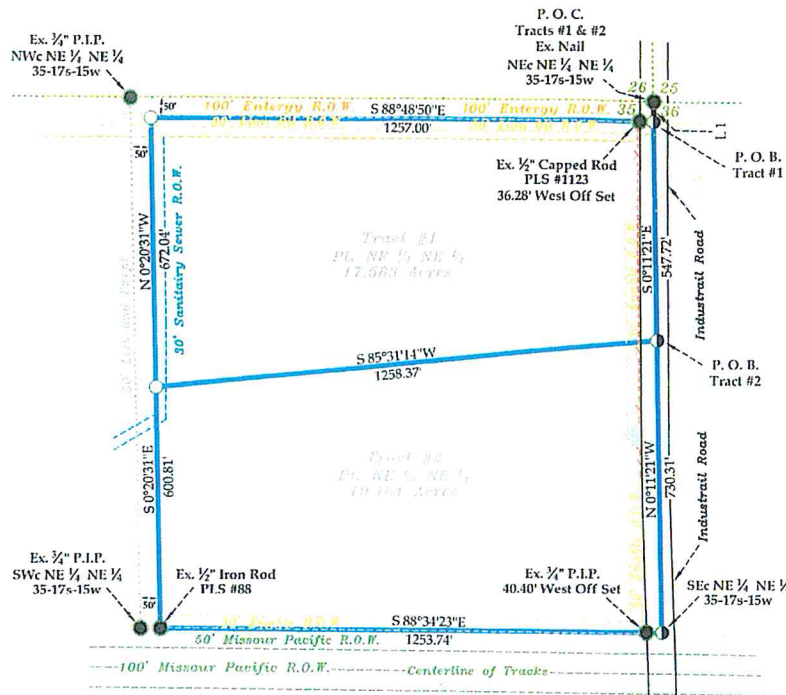
LAFAYETTE COUNTY OFFICE  
17 LAFAYETTE 3202  
TAYLOR, AR. 71861  
(870) 894-6504 Office  
(870) 894-6505 Fax  
(870) 510-7580 Mobile

R 15 W  
Total Aggregate Acres = 36.744

This Survey is Subject to Visible and Non-Visible Easements.

Line	Bearing	Distance
1	S 0°11'21"E	50.00'

- Legend:
- ⊙ = SET 3/4" CAPPED REBAR
  - = SET 5/8" CAPPED RODS (24" IN LENGTH)
  - X— = EXISTING FENCE
  - = EXISTING MONUMENT FOUND (Better Described on Plat)
  - +— = EXISTING ELECTRIC LINES
  - ⊕ = SET MAG NAIL AND STAMPED METAL DISK
  - ⊙ = CALCULATED SUBDIVISION CONTROL
  - ▲ = CALCULATED CONTROL POINTS



Legal Description: (Tract #1) A Tract of Land lying in Part of the Northeast 1/4 of Section 35, Township 17 South, Range 15 West, more particularly described as follows:

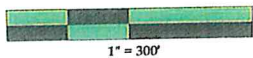
Commencing at the Northeast Corner of said Section 6, said point being an Existing Nail, lying in the Centerline of Industrial Road; thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 50.00 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point being the POINT OF BEGINNING; thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 547.72 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416; thence leaving said Industrial Road, run South 85 degrees 31 minutes 14 seconds West, a distance of 1258.37 feet to a Set 3/4" Capped Rod, PLS #1416; thence North 0 degrees 20 minutes 31 seconds West, a distance of 672.04 feet to a Set 1/2" Capped Rod, PLS #1416; thence South 88 degrees 48 minutes 50 seconds East, a distance of 1257.00 feet back to the POINT OF BEGINNING; said described tract containing 765,900.298 square feet (17.583 acres), more or less, all lying in Union County, Arkansas.

Legal Description: (Tract #2) A Tract of Land lying in Part of the Northeast 1/4 of Section 35, Township 17 South, Range 15 West, more particularly described as follows:

Commencing at the Northeast Corner of said Section 6, said point being an Existing Nail, lying in the Centerline of Industrial Road, thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 50.00 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 547.72 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point being the POINT OF BEGINNING; thence leaving said Industrial Road, run South 85 degrees 31 minutes 14 seconds West, a distance of 1258.37 feet to a Set 3/4" Capped Rod, PLS #1416; thence South 0 degrees 20 minutes 31 seconds East, a distance of 600.81 feet to an Existing 1/2" Iron Rod, PLS #88; thence South 88 degrees 34 minutes 23 seconds East, a distance of 1253.74 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point lying in Industrial Road; thence along said Industrial Road, run North 0 degrees 11 minutes 21 seconds West, a distance of 730.31 feet back to the POINT OF BEGINNING; said described tract containing 834,666.526 square feet (19.161 acres), more or less, all lying in Union County, Arkansas.

T  
17  
S

Surveyors Note:  
See Existing Survey by  
Ball & Paulus Surveyors PLS #88  
for Union County Industrial Board  
Dated 10-16-1998



Note: Basis for Bearings are based on Grid Azimuth System, Arkansas State Plane Coordinate System, NAD-27, Arkansas South Zone (0302). Control Point used and held was an OPUS Corrected Datum Point.

Note: This Plat should not be considered Valid without Inked Surveyor's Stamp and Signature.

## Boundary Survey for Southark Waste Control, LLC.

Located in Part of the Northeast 1/4 of the Northeast 1/4  
of Section 35, Township 17 South, Range 15 West,  
Union County, Arkansas.



Survey Completed 02/10/17  
Job # 2017-Southark Waste Control, LLC-35-17S-15W  
Cogo File: 35-17S-15W.Zak  
PLAT CODE: 500-17S-15W-0-35-110-70-1416



STATE OF ARKANSAS  
 DEPARTMENT OF FINANCE AND ADMINISTRATION  
 MISCELLANEOUS TAX SECTION  
 P.O. BOX 896, LITTLE ROCK, AR 72203-0896

**Real Estate Transfer Tax Stamp**  
 Proof of Tax Paid



**Grantee:** MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC  
**Mailing Address:** 4101 OLD OAK DR  
 LITTLE ROCK AR 722121951

**Grantor:** SOUTHARK DISPOSALS GROUP, LLC  
**Mailing Address:** PO BOX 11436  
 EL DORADO AR 717300010

**Property Purchase Price:** \$40,000.00  
**Tax Amount:** \$132.00

**County:** UNION  
**Date Issued:** 06/14/2021  
**Stamp ID:** 880125952

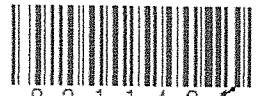
I certify under penalty of false swearing that documentary stamps or a documentary symbol in the legally correct amount has been placed on this instrument

Grantee or Agent Name (printed): \_\_\_\_\_

Grantee or Agent Name (signature): \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_



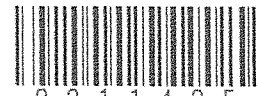
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CHERYL COCHRAN-WILSON  
UNION COUNTY  
EL DORADO, AR  
REC FEE: 30.00  
PAGES: 4  
TAMMYE

**WARRANTY DEED  
COVER SHEET**

Grantor: Southark Disposals Group, LLC  
Grantee: MidAmerica Environmental Holdings, LLC

Prepared by:  
PPGMR Law, PLLC  
201 East Markham Street, Suite 200  
Little Rock, Arkansas 72201



8 2 1 1 4 3 5  
Tx:4093489

STATE OF ARKANSAS

COUNTY OF UNION

2021R004304  
RECORDED ON  
06/14/2021 02:20:30 PM  
CHERYL COCHRAN-WILSON  
UNION COUNTY  
EL DORADO, AR  
REC FEE: 30.00  
PAGES: 4  
TAMMYE

WARRANTY DEED

BE IT KNOWN that on the date hereinafter set forth, before the undersigned Notary Public, personally came and appeared:

**SOUTHARK DISPOSALS GROUP, LLC**, by and through its Owner, Sherry Barnette,

who declared and acknowledged that for and in consideration of the sum of Ten Dollars (\$10.00) and other good and valuable consideration in hand paid by **MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC**, an Arkansas limited liability company, (hereinafter "MidAmerica") the receipt and sufficiency of which is hereby acknowledged, **SDG** does by these presents, grant, bargain, sell, convey, deliver and warrant unto **MidAmerica** and its successors and assigns forever, the following described real property, together with all improvements and appurtenances thereunto belonging, situated in Union County, Arkansas, to wit:

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**TO HAVE AND TO HOLD** the above-described property, together with any improvements and appurtenances thereunto belonging including the buildings located thereon, unto said **MidAmerica**, its successors and assigns, in full ownership, free of any lien, mortgage, privilege or encumbrance whatsoever, with warranty of title to the property and conveys any interest it has in the property by virtue of said title and with full subrogation to all rights of **SDG**.

This sale is made and accepted subject to any and all: (i) restrictive covenants affecting the property; (ii) discrepancies, conflicts or shortages in area or boundary lines, or any encroachments, or any overlapping of improvements; (iii) taxes not yet due and owing; (iv) existing building and zoning



SOUTHERN GEODETIC LAND SURVEYORS, LLC.  
SAMUEL T. WHITEHEAD, PLS.

UNION COUNTY OFFICE  
525 N. WASHINGTON  
EL DORADO, AR. 71730  
(870) 864-9865 Office  
(870) 894-6505 Fax  
(870) 510-7580 Mobile

LAFAYETTE COUNTY OFFICE  
17 LAFAYETTE 5382  
TAYLOR, AR. 71561  
(870) 894-6504 Office  
(870) 594-6505 Fax  
(870) 510-7580 Mobile

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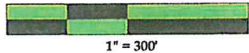
Total Aggregate Acres = 36.744

This Survey is Subject to  
Visible and Non Visible  
Easements.

Line	Bearing	Distance
1	S 0°11'21"E	50.00'

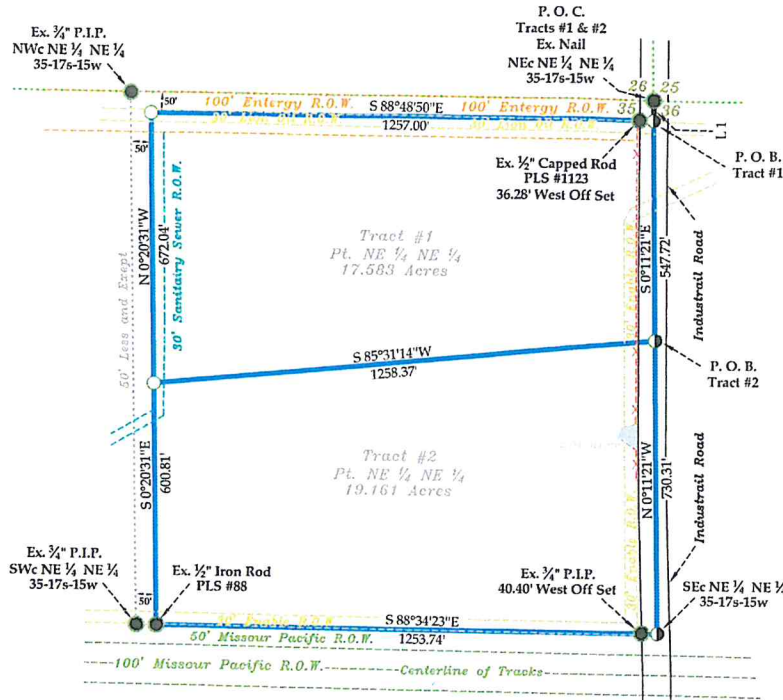
- Legend:
- ⊙ = SET 3/4" CAPPED REBAR
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  - x- = EXISTING FENCE
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  - ⊕ = SET MAG NAIL AND STAMPED METAL DISK
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  - ▲ = CALCULATED CONTROL POINTS

Surveyors Note;  
See Existing Survey by  
Ball & Paulus Surveyors PLS #88  
for Union County Industriail Board  
Dated 10-16-1998



Note: Basis for Bearings are based on Grid Azimuth System, Arkansas State Plane Coordinate System, NAD-27, Arkansas South Zone (0302). Control Point used and held was an OPUS Corrected Datum Point.

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Boundary Survey  
for  
Southark Waste Control, LLC.

Located in Part of the Northeast 1/4 of the Northeast 1/4  
of Section 35, Township 17 South, Range 15 West,  
Union County, Arkansas.

Legal Description: (Tract #1) A Tract of Land lying in Part of the Northeast 1/4 of Section 35, Township 17 South, Range 15 West, more particularly described as follows:

Commencing at the Northeast Corner of said Section 6, said point being an Existing Nail, lying in the Centerline of Industrial Road; thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 50.00 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point being the POINT OF BEGINNING; thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 547.72 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416; thence leaving said Industrial Road, run South 85 degrees 31 minutes 14 seconds West, a distance of 1258.37 feet to a Set 3/4" Capped Rod, PLS #1416; thence North 0 degrees 20 minutes 31 seconds West, a distance of 672.04 feet to a Set 3/4" Capped Rod, PLS #1416; thence South 88 degrees 48 minutes 50 seconds East, a distance of 1257.00 feet back to the POINT OF BEGINNING; said described tract containing 765,900.298 square feet (17.583 acres), more or less, all lying in Union County, Arkansas.

Legal Description: (Tract #2) A Tract of Land lying in Part of the Northeast 1/4 of Section 35, Township 17 South, Range 15 West, more particularly described as follows:

Commencing at the Northeast Corner of said Section 6, said point being an Existing Nail, lying in the Centerline of Industrial Road, thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 50.00 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point being the POINT OF BEGINNING; thence along said Industrial Road, run South 0 degrees 11 minutes 21 seconds East, a distance of 547.72 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point being the POINT OF BEGINNING; thence leaving said Industrial Road, run South 85 degrees 31 minutes 14 seconds West, a distance of 1258.37 feet to a Set 3/4" Capped Rod, PLS #1416; thence South 0 degrees 20 minutes 31 seconds East, a distance of 600.81 feet to an Existing 1/2" Iron Rod, PLS #88; thence South 88 degrees 34 minutes 23 seconds East, a distance of 1253.74 feet to a Set Mag Nail and Stamped Metal Disk, PLS #1416, said point lying in Industrial Road; thence along said Industrial Road, run North 0 degrees 11 minutes 21 seconds West, a distance of 730.31 feet back to the POINT OF BEGINNING; said described tract containing 834,666.526 square feet (19.161 acres), more or less, all lying in Union County, Arkansas.



Survey Completed 02/10/17  
Job # 2017-Southark Waste Control, LLC-35-17S-15W  
Cogo File: 35-17S-15W.Zak

PLAT CODE: 500-17S-15W-0-35-110-70-1416



STATE OF ARKANSAS  
 DEPARTMENT OF FINANCE AND ADMINISTRATION  
 MISCELLANEOUS TAX SECTION  
 P.O. BOX 896, LITTLE ROCK, AR 72203-0896

**Real Estate Transfer Tax Stamp**  
 Proof of Tax Paid



**Grantee:** MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC.  
**Mailing Address:** 4101 OLD OAK DR  
 LITTLE ROCK AR 722121951

**Grantor:** SOUTHARK DISPOSALS GROUP, LLC  
**Mailing Address:** PO BOX 11436  
 EL DORADO AR 717300010

**Property Purchase Price:** \$20,000.00  
**Tax Amount:** \$66.00

**County:** UNION  
**Date Issued:** 06/14/2021  
**Stamp ID:** 1953867776

I certify under penalty of false swearing that documentary stamps or a documentary symbol in the legally correct amount has been placed on this instrument

Grantee or Agent Name (printed): \_\_\_\_\_

Grantee or Agent Name (signature): \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_

## Appendix C

# Secondary Containment Calculations

MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC BULKING FACILITY  
 SOUTH/EAST AREAS SECONDARY CONTAINMENT SIZING - INCIDENTAL PRECIPITATION VOLUME

ASSUMPTIONS:

- Area grading at 0.3% max. (0.35' vertical)
- Direct precipitation from 25-year, 24-hour storm event

SECONDARY CONTAINMENT CALCULATION	VALUE	SOURCE
- Precipitation (25-YEAR/24-HOUR EVENT, INCHES)	7.24	NOAA Atlas 14, Volume 9, Version 2. El Dorado, Arkansas, USA
- Depth of Precipitation Stored in Aggregate and Ignored (in.) (25% of Gravel Depth based on min. 25% porosity)	2.00	
- Depth of Precipitation Stored above Aggregate Cover (in.)	5.24	
<b>VOLUME OF LARGEST CONTAINER</b>		
- Frac Tank Capacity - 480 barrels	20,160	Gallons capacity based on 42 gallons per barrel
	2,695.0	Frac tank capacity in cubic feet
- Area of Secondary Containment Berm	7,601	Square footage from CAD
- Area of Additional Tanks within Secondary Containment	3,060	Square footage 40x8.5 footprint X 9 units
- Depth of tank contents within secondary containment	0.59	Feet of depth within remaining 4,541 square feet available
<b>INCIDENTAL RAINFALL OVER CONTAINMENT AREA</b>		
- Precipitation (25-YEAR/24-HOUR EVENT, INCHES)	0.44	Precipitation depth in feet stored above protective aggregate surface
- Total Volume of Precipitation Stored Above Aggregate	3,319	Cubic feet
- Depth of Precipitation within Secondary Containment	0.73	Feet of depth within remaining 4,541 square feet available
<b>TOTAL DEPTH OF LIQUID</b>		
	1.32	Feet of depth within remaining 4,541 square feet available
	15.9	Inches of depth stored above protective aggregate surface
<b>TOTAL DEPTH OF BERM REQUIRED ABOVE GRADE</b>		
	28.1	Inches of depth for gravel, water storage and slope
<b>BERM HEIGHT (See Facility Waste Management Plan Figure 10)</b>		
	30"	

NOAA Atlas 14, Volume 9, Version 2 EL DORADO

GOODWIN FLD

Station ID: 03-2300

Location name: El Dorado, Arkansas, USA\*

Latitude: 33.2208°, Longitude: -92.8142°

Elevation:

Elevation (station metadata): 252 ft\*\*

\* source: ESRI Maps

\*\* source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.434 (0.349-0.531)	0.497 (0.400-0.609)	0.597 (0.479-0.733)	0.678 (0.540-0.834)	0.786 (0.604-0.983)	0.866 (0.653-1.10)	0.944 (0.689-1.21)	1.02 (0.717-1.34)	1.12 (0.757-1.50)	1.19 (0.788-1.62)
10-min	0.636 (0.512-0.778)	0.728 (0.585-0.891)	0.875 (0.701-1.07)	0.993 (0.791-1.22)	1.15 (0.885-1.44)	1.27 (0.956-1.60)	1.38 (1.01-1.78)	1.49 (1.05-1.96)	1.64 (1.11-2.19)	1.74 (1.15-2.37)
15-min	0.775 (0.624-0.949)	0.888 (0.713-1.09)	1.07 (0.855-1.31)	1.21 (0.965-1.49)	1.40 (1.08-1.76)	1.55 (1.17-1.96)	1.69 (1.23-2.17)	1.82 (1.28-2.39)	2.00 (1.35-2.67)	2.12 (1.41-2.88)
30-min	1.14 (0.916-1.39)	1.32 (1.06-1.61)	1.60 (1.28-1.96)	1.82 (1.45-2.24)	2.12 (1.63-2.65)	2.34 (1.76-2.95)	2.55 (1.86-3.28)	2.76 (1.94-3.61)	3.02 (2.04-4.03)	3.20 (2.12-4.35)
60-min	1.51 (1.22-1.85)	1.75 (1.41-2.15)	2.15 (1.72-2.64)	2.48 (1.98-3.05)	2.93 (2.26-3.68)	3.28 (2.48-4.16)	3.63 (2.65-4.68)	3.98 (2.80-5.24)	4.45 (3.02-5.97)	4.80 (3.18-6.52)
2-hr	1.88 (1.53-2.28)	2.19 (1.78-2.65)	2.70 (2.19-3.28)	3.14 (2.53-3.82)	3.74 (2.93-4.67)	4.22 (3.22-5.32)	4.70 (3.48-6.03)	5.20 (3.70-6.81)	5.88 (4.02-7.85)	6.39 (4.26-8.63)
3-hr	2.13 (1.75-2.56)	2.47 (2.02-2.97)	3.05 (2.50-3.68)	3.56 (2.89-4.31)	4.30 (3.39-5.36)	4.89 (3.77-6.15)	5.51 (4.10-7.05)	6.16 (4.40-8.04)	7.05 (4.85-9.41)	7.76 (5.19-10.4)
6-hr	2.60 (2.16-3.09)	2.99 (2.48-3.55)	3.68 (3.04-4.38)	4.30 (3.54-5.14)	5.24 (4.20-6.51)	6.02 (4.71-7.54)	6.86 (5.18-8.76)	7.77 (5.62-10.1)	9.06 (6.29-12.0)	10.1 (6.80-13.5)
12-hr	3.15 (2.65-3.70)	3.57 (3.00-4.19)	4.33 (3.63-5.11)	5.05 (4.21-5.98)	6.16 (5.02-7.61)	7.11 (5.63-8.85)	8.15 (6.22-10.3)	9.28 (6.78-12.0)	10.9 (7.65-14.4)	12.3 (8.31-16.3)
24-hr	3.72 (3.17-4.32)	4.20 (3.58-4.88)	5.09 (4.32-5.94)	5.94 (5.01-6.94)	7.24 (5.97-8.86)	8.37 (6.70-10.3)	9.59 (7.39-12.1)	10.9 (8.06-14.1)	12.9 (9.10-16.9)	14.5 (9.88-19.1)
2-day	4.29 (3.70-4.92)	4.89 (4.22-5.62)	5.99 (5.15-6.90)	7.00 (5.98-8.10)	8.55 (7.11-10.3)	9.86 (7.97-12.0)	11.3 (8.77-14.0)	12.8 (9.52-16.3)	15.0 (10.7-19.6)	16.8 (11.6-22.1)
3-day	4.70 (4.10-5.37)	5.35 (4.66-6.11)	6.53 (5.66-7.47)	7.61 (6.55-8.74)	9.26 (7.76-11.1)	10.7 (8.67-12.9)	12.2 (9.51-15.1)	13.8 (10.3-17.5)	16.1 (11.5-20.9)	18.0 (12.5-23.6)
4-day	5.05 (4.43-5.74)	5.72 (5.00-6.50)	6.94 (6.04-7.90)	8.05 (6.97-9.21)	9.76 (8.22-11.7)	11.2 (9.16-13.5)	12.8 (10.0-15.8)	14.5 (10.8-18.3)	16.9 (12.1-21.9)	18.9 (13.1-24.6)
7-day	5.90 (5.23-6.64)	6.61 (5.84-7.43)	7.89 (6.95-8.90)	9.10 (7.96-10.3)	10.9 (9.31-13.0)	12.5 (10.3-15.0)	14.3 (11.3-17.4)	16.1 (12.2-20.3)	18.8 (13.6-24.2)	21.1 (14.6-27.3)
10-day	6.65 (5.93-7.43)	7.42 (6.60-8.29)	8.81 (7.81-9.88)	10.1 (8.90-11.4)	12.1 (10.4-14.2)	13.8 (11.5-16.4)	15.6 (12.5-19.0)	17.7 (13.4-22.1)	20.5 (14.9-26.3)	22.9 (16.0-29.6)
20-day	8.86 (8.01-9.78)	9.91 (8.95-11.0)	11.7 (10.6-13.0)	13.4 (11.9-14.9)	15.8 (13.6-18.3)	17.8 (14.9-20.8)	19.9 (16.0-23.9)	22.2 (16.9-27.3)	25.3 (18.4-32.1)	27.8 (19.6-35.7)
30-day	10.8 (9.80-11.8)	12.1 (11.0-13.2)	14.3 (12.9-15.7)	16.2 (14.5-17.9)	18.9 (16.3-21.6)	21.1 (17.7-24.4)	23.3 (18.8-27.7)	25.7 (19.6-31.4)	28.9 (21.1-36.3)	31.4 (22.2-40.1)
45-day	13.2 (12.1-14.4)	14.8 (13.6-16.1)	17.4 (15.9-19.1)	19.6 (17.8-21.5)	22.7 (19.7-25.6)	25.0 (21.1-28.7)	27.3 (22.1-32.2)	29.7 (22.8-36.0)	32.9 (24.0-41.0)	35.2 (25.0-44.8)
60-day	15.3 (14.2-16.6)	17.2 (15.9-18.6)	20.1 (18.5-21.9)	22.5 (20.5-24.6)	25.7 (22.4-28.9)	28.2 (23.9-32.1)	30.5 (24.8-35.7)	32.9 (25.3-39.6)	35.9 (26.3-44.6)	38.1 (27.1-48.3)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

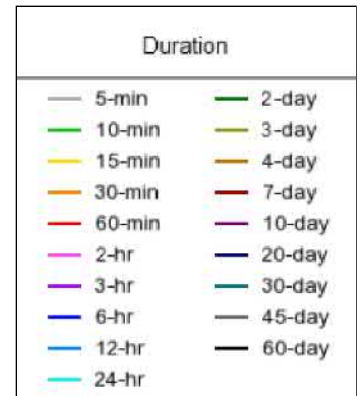
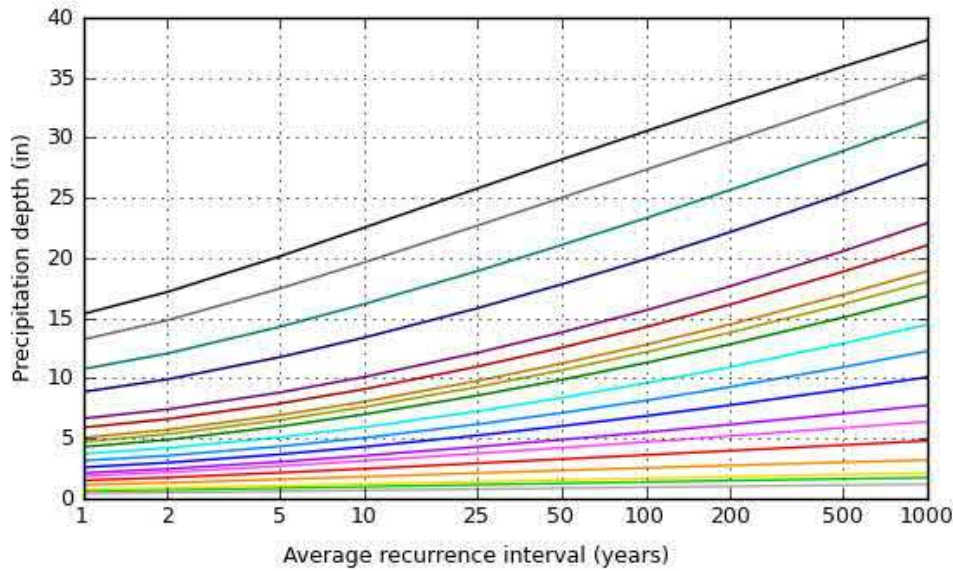
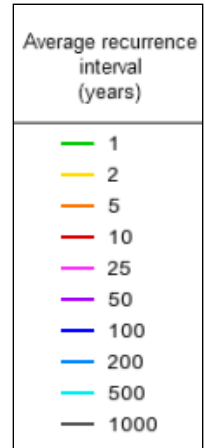
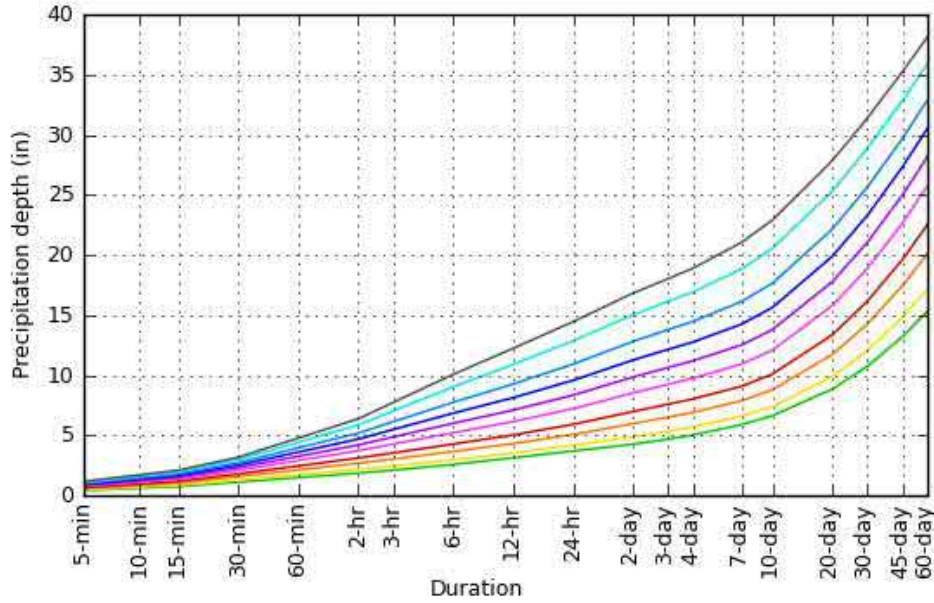
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

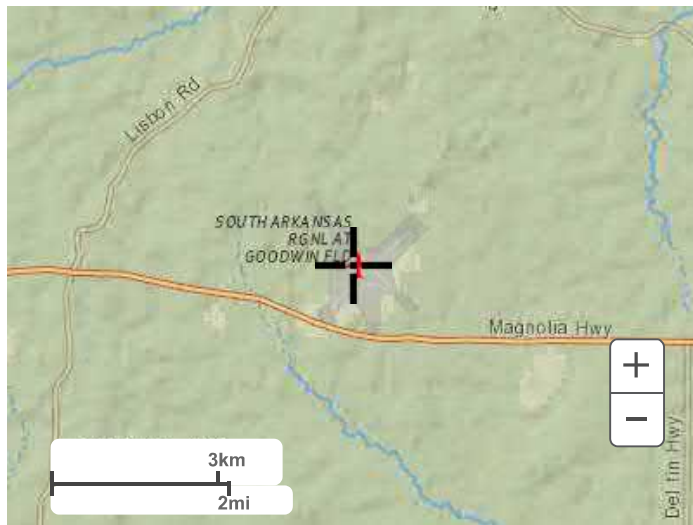
PDS-based depth-duration-frequency (DDF) curves  
 Latitude: 33.2208°, Longitude: -92.8142°



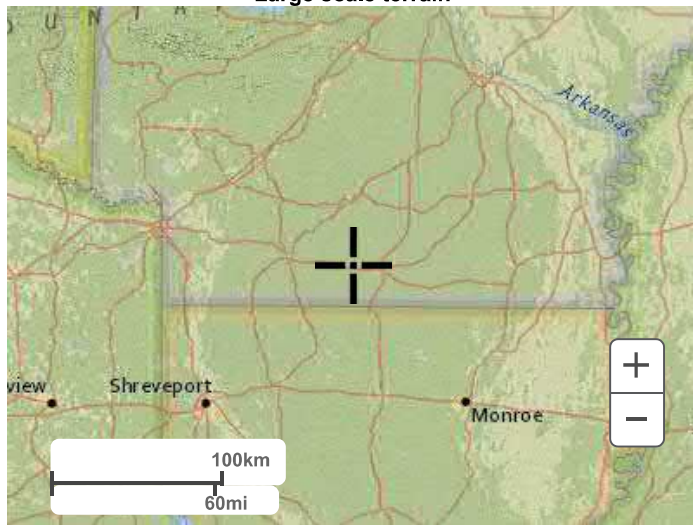
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**Maps & aerials**

**Small scale terrain**



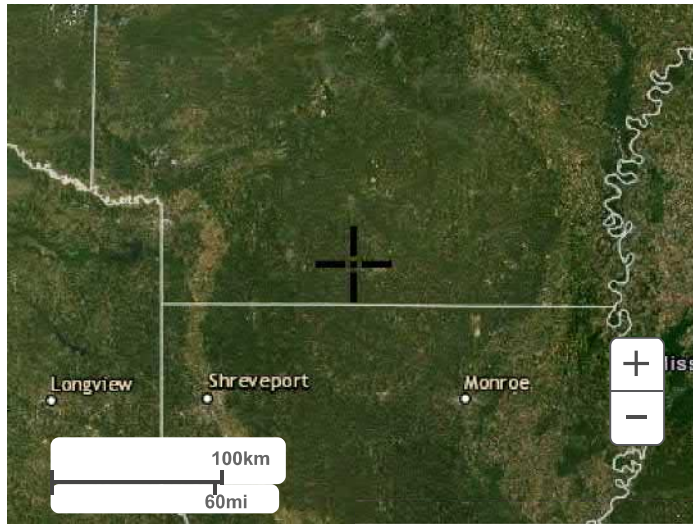
Large scale terrain



Large scale map



Large scale aerial



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## Appendix D

### Injection Well Permit(s)

# Appendix E

## Construction Specifications

## **SECTION 31 05 19.16 GEOMEMBRANE CONTAINMENT BARRIER (LLDPE OR HDPE)**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

Section includes furnishing and installing geomembrane as part of secondary containment system liner construction.

#### **1.02 REFERENCES**

**A. American Society for Testing and Materials (ASTM):**

1. ASTM D 6693, Standard Test Method for Tensile Properties of Plastics.
2. ASTM D 746, Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
3. ASTM D 1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
4. ASTM D 1204, Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
5. ASTM D 1238, Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastomer.
6. ASTM D 1505, Standard "Test Method for Density of Plastics by the Density-Gradient Technique.
7. ASTM D 1603, Standard Test Method for Carbon Black in Olefin Plastics.
8. ASTM D 4437, Standard Practice for Determining the Integrity of Field Seams Used in joining Flexible Polymeric Sheet Geomembranes.
9. ASTM D 5596, Standard Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds.
10. ASTM D 5994, Standard Test Method for Measuring Nominal Thickness of Textured Geomembrane.

11. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
- B. FTM Standard Number 101C, Method 2065, Puncture Resistance and Elongation Test (1/8 inch Radius Probe Method).
- C. GRI Test Method GM6, "Pressurized Air Channel Test for Dual Seamed Geomembranes".
- D. GRI Test Method GM13 "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes".
- E. GRI Test Method GM17 "Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes".
- F. GRI Test Method GM19a "Seam Strength and Related Properties of Thermally Bonded Homogeneous Polyolefin Geomembranes/Barrier".

### 1.03 SUBMITTALS

- A. Submit the following to the CQA Firm, for review and approval, no later than 14 calendar days prior to scheduled shipment of geomembrane:
  1. Documentation of manufacturers' qualifications as specified in subsection 1.04.A of this Section.
  2. Manufacturer's quality control program manual, or descriptive documentation.
  3. List of material properties and samples of the material.
  4. Manufacturers' certification that the products to be furnished will comply with all product specifications in this section.
  5. Documentation of installers' qualifications, as specified below and in subsection 1.04.E of this Section.
    - a. Submit a list of at least ten completed facilities. For each installation, provide: name and type of facility; its location; the date of installation; name and telephone number of Owner, Design Engineer, Manufacturer, Fabricator, if applicable; name and telephone number of contact at the facility; thickness of

geomembrane and surface area of the installed geomembrane;  
and type of seaming, patching, and tacking equipment.

- b. Submit resumes or qualifications of the Installation Supervisor, Master Seamer and all technicians to be assigned to this project.

B. Shop Drawings

1. Submit copies of shop drawings for approval as soon as possible after award of contract. Shop drawings shall show a proposed installation panel layout identifying seams and details. The layout diagram shall indicate the location of pre-assembled panels.
2. Placement of geomembrane will not be allowed to proceed until CQA Firm has received and approved the shop drawings. Any proposed deviation from these documents shall be submitted in writing to the CQA Firm a minimum of one to two working days prior to the scheduled start of geomembrane installation and will be accepted/rejected by the CQA Firm prior to start of installation activities.

C. Submit the following to the CQA Firm for review and approval no later than one calendar day prior to shipment of the products:

1. Origin and quality control certificates from the supplier of the resin used to manufacture the geomembrane, and certification that the properties of the resin meet the requirements for the project.
2. The manufacturers' quality control certifications, including results of source quality control testing of the products, as specified in subsection 2.01 of this Section, to verify that the materials supplied for the project are in compliance with all product specifications in this Section. The certifications shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers, and corresponding shipping information.

- D. No geomembrane shall be deployed until the certifications and quality control certificates are submitted to and approved by the CQA Firm. Should geomembrane material be deployed prior to CQA Firm's approval, it shall be at sole risk of the Geomembrane Installer and Contractor, and if the material does not meet project specifications, it shall be removed from the project at the expense of the Contractor.

- E. Additional Submittals (In-Progress and at Completion):
  - 1. Quality Control test results (refer to subsection (2.01.A.4).
  - 2. Manufacturer's warranty (refer to subsection 1.06).
  - 3. Liner installation guarantee (refer to subsection 1.07).
  - 4. Inventory of geomembrane rolls received on-site (refer to subsection 1.05.C).
  - 5. Daily written acceptance of subgrade surface (refer to subsection 3.01.C).
  - 6. Low temperature-seaming procedures, if applicable (refer to subsection 3.03.A).
  - 7. Pre-qualification test seam samples (refer to subsection 3.05.A.3).
  - 8. Non-destructive field seam test results (refer to subsection 3.05.13.1).
  - 9. Destructive field seam test results (refer to subsection 3.05.C.5).
  - 10. As-built survey drawing, as discussed in subsection 3.06.

#### 1.04 QUALITY CONTROL/QUALITY ASSURANCE

- A. Owner will retain the services of independent inspection and testing firms (Geosynthetics Quality Assurance Firm and Geosynthetics Quality Assurance Laboratory) to perform quality control and to check conformance of the materials and field seaming with the specification.
- B. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction.
- C. Furnish all labor, materials, equipment, services, incidentals and other items necessary for the placement and installation of geomembrane as shown on the Contract Drawings and as specified herein.
- D. Manufacturer's Qualifications: The manufacturer shall be a specialist in the manufacture of geomembrane of the type and shall have at least five years experience in the manufacture of such geomembrane. In addition, the geomembrane manufacturer shall have manufactured at least 10,000,000 square feet of the specified type of geomembrane during the last five years.
- E. Installer's Qualifications
  - 1. The Geomembrane Installer shall be the manufacturer or an approved contractor trained and licensed to install the manufacturers geomembrane.

2. The Geomembrane Installer shall be a specialist in the installation of geomembranes of the type specified and shall have at least five years' experience in the installation of such geomembranes.
3. Installation shall be performed under the constant direction of a single Field Installation Supervisor who shall remain on site and be in responsible charge, throughout the liner installation, for liner layout, seaming, patching, testing, repairs, and all other activities by the Installer.
4. Seaming shall be performed under the direction of a Master Seamer (who may also be the Installation Supervisor or Crew Foreman). The Master Seamer shall have experience in the same type of geomembrane specified, using the same type of seaming apparatus specified in the current project. This Installation Supervisor and/or Master Seamer shall be present whenever seaming is performed.
5. All seaming, patching, other welding operations, and testing shall be performed by qualified technicians trained by the Geomembrane Installer.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Each roll of geomembrane delivered to the site shall be labeled by the manufacturer. The label shall clearly state the manufacturer's name, product identification, lot number, material thickness, roll number, roll dimensions, and roll weight.
- B. Geomembrane shall be protected from mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.
- C. Provide all labor and equipment required to assist the CQA Firm in the observation of materials delivered to the site. Generate, update and submit to the CQA Firm an inventory of geomembrane rolls received on-site from the manufacturer/distributor. The inventory shall include all the information appearing on the label of each roll.
- D. Rolls shall be stored on a prepared surface (not wooden pallets) and shall not be stacked more than two rolls high.

#### 1.06 MATERIAL WARRANTY

- A. Membrane manufacturer shall warrant the membrane material against manufacturing defects and material degradation in the outdoor exposure for a period of 20 years from the date of installation.

- B. The manufacturer shall provide new material to replace, on a prorated basis over the remaining life of the membrane, any material, which fails from the above causes within the warranty period.
- C. The manufacturer shall furnish the CQA Firm with a written warranty covering the requirements of this paragraph.

#### 1.07 LINER INSTALLATION GUARANTEE

- A. Guarantee the membrane installation against defects in installation and workmanship for one year commencing with the date of final acceptance.
- B. The guarantee shall include the services of qualified service technicians and all material required for the repairs at no expense to the Owner.

#### 1.08 GEOMEMBRANE PRE-CONSTRUCTION MEETING

- A. A Geomembrane Pre-Construction Meeting shall be held at the site prior to installation of the geomembrane. As a minimum, the meeting shall be attended by the Geomembrane Installer, Project Manager, CQA Firm and/or his representative, and Contractor.
- B. Topics for this meeting shall include:
  - 1. Responsibilities of each party.
  - 2. Lines of authority and communication.
  - 3. Methods for documenting and reporting, and for distributing documents and reports.
  - 4. Procedures for packaging and storing archive samples.
  - 5. Review of time schedule for all installation and testing.
  - 6. Review of panel layout and numbering systems for panels and seams.
  - 7. Preparation of the as-built panel and seam drawing.
- C. The meeting shall be documented by a person designated at the beginning of the meeting, and minutes shall be transmitted to all parties.

## PART 2 PRODUCTS

### 2.01 SOURCE QUALITY CONTROL

#### A. Manufacturing Quality Control

1. Every effort shall be made to minimize the number of lots of geomembrane needed to complete the work.
2. The following test methods shall be used by the manufacturer for the quality control/quality assurance of the geomembrane prior to delivery.
  - a. Density - ASTM D 1505/D 792 (min. one test per 200,000 lbs);
  - b. Carbon Black Content - ASTM D 1603 or 4218 (min. one test per 20,000 lbs);
  - c. Carbon Black Dispersion - ASTM D 5596 (min. one test per 45,000 lbs);
  - d. Thickness - ASTM D 5194 (min. one test per roll);
  - e. Tensile Properties - ASTM D 6693 (min. one test per 20,000 lbs); and
  - f. Puncture Resistance - ASTM D 4833 (min. one test per 45,000 lbs).
3. Results of environmental stress crack resistance test (ASTM D 5397 - single point). At a minimum, test value shall be 200 hr. and test shall be performed once every resin lot.
4. Quality Control certificates, signed by a responsible party employed by the Manufacturer, shall be submitted to the CQA Firm prior to the installation of the geomembrane. The certificates shall include roll identification numbers, testing procedures, and results of quality control tests.

#### B. Conformance Testing

1. Prior to shipment at the manufacturer, or upon the delivery of the geomembrane rolls to the project site, a qualified representative of the CQA Firm shall obtain samples of the material at a frequency of at least one sample per 100,000 square feet and at least one sample per lot of material shipped, and forward the samples to the Geosynthetics Quality Assurance Laboratory for conformance testing.
2. Samples shall be taken across the entire width of the roll and shall not include the first three feet. Unless otherwise specified, samples shall be three feet

long by the roll width. The CQA Finn representative shall mark the machine direction and inner/outer roll sides on the samples.

3. Conformance testing shall include the following tests, as a minimum:
  - a. Density or Specific Gravity - ASTM D 1505 or ASTM D 792 Method A
  - b. Carbon Black Content - ASTM D 1603 or 4218
  - c. Carbon Black Dispersion - ASTM D 5596
  - d. Thickness - ASTM D 5994 (textured) or ASTM D 5199 (smooth)
  - e. Tensile Properties (Yield Strength, Break Strength, Elongation at Yield and Elongation at Break) - ASTM D 6693, Type IV or GRI-GM-13
  - f. Puncture Resistance – ASTM D 4833
  - g. Tear Resistance - ASTM D 1004, Die C

## 2.02 GEOMEMBRANE

- A. The geomembrane shall consist of new, first quality products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated by prior testing to be suitable and durable for such purposes. The geomembrane shall be an unmodified seamless, linear low-density polyethylene (LLDPE) or high-density polyethylene (HDPE) containing no plasticizers, fillers, chemical additives, or extenders. The geomembrane shall be textured on both sides and shall be supplied as a continuous sheet with no factory seams in rolls. The roll length and width shall be maximized to provide the largest manageable sheet for the fewest field seams.
- B. The geomembrane material shall be produced free of holes, blisters, undispersed raw materials or any signs of contamination by foreign matter. Defects shall be repaired by replacement and by using the extrudate welding technique in accordance with the manufacturer's recommendations.
- C. The geomembrane shall be 40-mil LLDPE or HDPE (textured) for secondary containment area lining.
- D. Physical Properties
  1. Geomembrane for the bottom lining and final cover systems shall meet or exceed the following specifications as shown in Tables 31 05 19.16 – 1 & 2.

TABLE 31 05 19.16 - 1  
 GEOMEMBRANE MATERIAL SPECIFICATIONS

Property	Units	Test Method	40-mil LLDPE Textured	Testing Frequency (minimum)
Thickness <ul style="list-style-type: none"> <li>• Lowest individual for 8 out of 10 values</li> <li>• Lowest individual for any of the 10 values</li> </ul>	mils	ASTM D 5994	Nom. (-5%) -10% -15%	Per roll
Asperity Height (1)	mils	GM 12	10	Every 2 <sup>nd</sup> roll (2)
Density	g/ml	ASTM D 1505/D 792	0.939	200,000 lb
Tensile Properties (3) <ul style="list-style-type: none"> <li>• Break strength</li> <li>• Break elongation</li> </ul>	lb/in %	ASTM D 6693 Type IV	60 250	20,000 lb
2% Modulus	lb/in	ASTM D 5323	2400	Per formulation
Tear Resistance	lb	ASTM D 1004	22	45,000 lb
Puncture Resistance	lb	ASTM D 4833	44	45,000 lb
Axi-Symmetric Break Resistance Strain	%	ASTM D 5617	30	Per formulation
Carbon Black Content	%	ASTM D 1603 (4)	2.0-3.0	45,000 lb
Carbon Black Dispersion	Category	ASTM D 5596	Note (5)	45,000 lb

- (1) Of 10 readings; 8 out of 10 must be  $\geq 7$  mils, and lowest individual reading must be  $\geq 5$  mils; also see Note 9.
- (2) Alternate the measurement side for double sided textured sheet
- (3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction
  - Break elongation is calculated using a gage length of 2.0 in. at 2.0 in./min.
- (4) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
- (5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
  - 9 in Categories 1 or 2 and 1 in Category 3

TABLE 31 05 19.16 - 2  
 GEOMEMBRANE SEAM SPECIFICATIONS

Type of Material	ASTM Method	Peel Extrusion	Peel Fusion	Shear Extrusion	Shear Fusion
40-mil LLDPE Textured	ASTM D 6392	44 PPI and FTB	50 PPI and FTB	60 PPI	60 PPI

Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5<sup>th</sup> specimen can be as low as 80% of listed values

## PART 3 EXECUTION

### 3.01 SUBGRADE PREPARATION

- A. The subgrade shall be prepared as specified in Section 31 23 13. The subgrade shall be smooth and uniform, and free of all trash and debris, prior to installation of the geomembrane.

- B. The Geomembrane Installer and the CQA Firm representative shall walk over the surface to be covered with geomembrane on each day's operations prior to placement of geomembrane.
- C. The Geomembrane Installer shall provide to the CQA Firm written acceptance daily for the surface to be covered by geomembrane in that day's operations. The surface shall be maintained as acceptable during geomembrane installation.
- D. Subgrade damaged by construction equipment during the geomembrane deployment operation shall be repaired prior to placement of the geomembrane. The repairs shall be approved by the CQA Firm or his representative.
- E. Subgrade damaged by erosion, rutting, or other means following geomembrane deployment shall be exposed and the damage repaired. Repairs shall be in accordance with Section 31 23 13. The subgrade shall be re-approved in accordance with subsection 3.01.C of this section.

### 3.02 GEOMEMBRANE PLACEMENT

- A. The geomembrane shall be installed as shown on the Drawings.
- B. Panel Nomenclature
  - 1. A field panel is defined as unit of geomembrane, which is to be seamed in the field. A field panel is a roll or a portion of a roll cut in the field. The CQA Firm shall be responsible to ensure that each field panel is given an identification code (number or letter-number) consistent with the layout plan. This identification code shall be as simple and logical as possible and shall be agreed upon by the Project Manager, Installer and CQA Firm.
  - 2. The CQA Firm shall establish a table or chart showing correspondence between roll numbers and field panel identification codes. The field panel identification code shall be used for all quality assurance records.
- C. Panel Deployment Procedure
  - 1. The CQA Firm shall review the panel deployment progress of the Installer and advise the Project Manager on changes in panel deployment. The CQA Firm shall also review the panel deployment for suitability to actual field condition such as issues relating to wind, rain, soil liner desiccation and other site-specific conditions. The CQA Firm shall verify that the condition of the underlying soil does not change detrimentally during installation. The CQA

Firm shall record the identification code, location, and date of installation of each field panel.

D. Deployment Weather Conditions

1. Geomembrane deployment shall not be undertaken if weather conditions will preclude material seaming following deployment.
2. The normal acceptable weather conditions for seaming are as follows:
  - a. Ambient temperature between 32° F and 104° F.
  - b. Dry conditions (no precipitation or other excessive moisture).
  - c. No excessive winds.
3. Ambient temperature shall be measured and ambient conditions appraised by the CQA Firm in the area in which the panels area to be placed.
4. The CQA Firm shall inform the Project Manager of any weather-related problems, which may not allow geomembrane placement to proceed. The Project Manager will determine if the installation is to be stopped or special procedures are to be used.

E. Method of Deployment

1. Before the geomembrane is handled on site, the CQA Firm shall verify that deployment equipment and method of deployment proposed by the Installer to be used on the site is adequate and does not pose risk of damage to the geomembrane or underlying subgrade. If vehicles are used which must operate on the geomembrane, driver shall proceed with caution during deployment of the geomembrane to prevent spinning of tires, sharp turns and quick stops. During handling, the CQA Firm shall observe and verify that the Installer's personnel handle the geomembrane with care.
2. The CQA Firm shall verify the following:
  - a. Equipment used does not damage the geomembrane or underlying subgrade by handling.
  - b. The prepared surface underlying the geomembrane is acceptable immediately prior to geomembrane placement.

- c. Geosynthetic elements immediately underlying the geomembrane are clean and free of debris.
- d. Personnel do not smoke or wear damaging shoes while working on the geomembrane, or engage in other activities, which could damage the geomembrane.
- e. The method used to unroll the panels does not cause excessive scratches or crimps in the geomembrane and does not damage the supporting roll.
- f. The method used to place the panels minimizes wrinkles especially differential wrinkles between adjacent panels.
- g. Adequate temporary lading and/or anchoring (such as sandbags or tires), not likely to damage the geomembrane, are placed to prevent uplift by wind. In case of high winds, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels.
- h. Direct contact with the geomembrane is minimized, and the geomembrane is protected by geotextiles, extra geomembrane, or other suitable materials, in areas where repeated traffic use may be expected.
- i. Liner has promptly been anchored in trench where applicable.

The CQA Firm shall notify the Project Manager if the above conditions are not fulfilled.

**F. Damage and Defects**

1. Upon delivery to the site, the CQA Firm shall conduct a surface observation of all rolls for defects and for damage. This examination shall be conducted without unrolling rolls unless defects or damages are found or suspected. The CQA Firm shall advise the Project Manager, in writing, of any rolls or portions of rolls, which should be rejected and removed from the site because they have severe flaws, and/or minor repairable flaws.
2. The CQA Firm shall examine each panel, after placement and prior to seaming, for damage and/or defects. The CQA Firm shall advise the Project Manager which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels, or portions of damaged panels, which have been rejected shall be marked and their removal from the work area recorded by the

CQA Firm. Repairs shall be made using procedures described in 3.06 of this section.

G. Writing on the Liner

To avoid confusion, the Installer and the CQA Firm shall each use different colored markers or other materials approved by the Project Manager that are readily visible for writing on the geomembrane. The markers used must be semi-permanent and compatible with the geomembrane. The Installer shall use a white marker to write on the geomembrane while the CQA Firm shall use a yellow marker, unless specified differently during the geomembrane pre-construction meeting.

### 3.03 FIELD SEAMING

A. Seam Layout

1. Before installation begins, the Installer shall provide the Project Manager and the CQA Firm's with a panel layout drawing. The drawing shall present all the proposed seams of the lining system at the facility. The CQA Engineer shall review the panel layout drawing and verify that it is consistent with accepted industry standards.
2. In general, seams should be oriented parallel to the line of maximum slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be less than five feet from the toe or crest of the slope, or from areas of potential stress concentrations, unless otherwise authorized by the Project Manager.
3. Horizontal seams shall be allowed under the following conditions:
  - a. Seams are offset in adjacent panels by one panel width.
  - b. Seams are "shingled" downhill.
4. A seam numbering system compatible with the panel numbering system shall be used by the CQA Firm.

B. Accepted Seaming Methods

1. Approved processes for field seaming are fusion and extrusion welding. Proposed alternate processes shall be documented and submitted by the Installer to the Project Manager for approval. The Project Manager shall

submit all documentation regarding seaming methods to be used to the CQA Firm for review.

## 2. Fusion Process

- a. The CQA Firm shall log ambient, seaming apparatus and geomembrane surface temperatures at appropriate intervals and report any noncompliance to the Project Manager.
- b. The CQA Firm shall also verify that:
  - i. The Installer maintains on-site the number of spare operable seaming apparatus agreed at the pre-construction meeting.
  - ii. Equipment used for seaming is not likely to damage the geomembrane.
  - iii. The electrical generator is placed on a smooth base such that no damage occurs to the geomembrane and any fuel spills are promptly cleaned up. Fuel shall not be stored on the liner surface.
  - iv. A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage such that no damage occurs to the geomembrane.
  - v. A movable protective layer is used as required by the Installer directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets and to prevent debris from collecting around the pressure rollers.
  - vi. In general, the geomembrane panels shall be aligned to have an overlap of four to six inches for fusion welding. In any event, the final overlap shall be sufficient to allow peel tests to be performed on the seam.
  - vii. No solvent or adhesive is used.
  - viii. The geomembrane is protected from damage in heavy traffic areas.

## 3. Extrusion Process

- a. The CQA Firm shall log ambient, seaming apparatus and geomembrane surface temperatures at appropriate intervals and report any noncompliance to the Project Manager.
- b. The CQA Firm shall also verify that:
  - i. The Installer maintains on-site the number of spare operable seaming apparatus agreed at the pre-construction meeting.
  - ii. Equipment used for seaming is not likely to damage the geomembrane.
  - iii. Prior to beginning a seam, the extruder is purged until all heat degraded extrudate has been removed from the barrel.
  - iv. Clean and dry welding rods or extrudate pellets are used.
  - v. The electric generator is placed on a smooth base that no damage occurs to the geomembrane.
  - vi. Grinding is completed no more than one hour prior to seaming.
  - vii. A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage such that no damage occurs to the geomembrane.
  - viii. The geomembrane is protected from damage in heavy traffic areas.
  - ix. Exposed grinding marks adjacent to an extrusion weld shall be minimized. In no instances, shall exposed grinding marks extend more than 1/inch from the finished seamed area.
  - x. In general, the geomembrane panels are aligned to have a nominal overlap of three inches for extrusion welding. In any event, the final overlap shall be sufficient to allow peel tests to be performed on the seam.
  - xi. No solvent or adhesive is used.
  - xii. The procedure use to temporarily bond adjacent panels together does not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any temporary welding apparatus is controlled such that the geomembrane is not damaged.

### C. Seam Preparation

1. The CQA Firm shall verify that prior to seaming; the seam area is clean and free of moisture, dust, dirt, debris or foreign material of any kind. If seam overlap grinding is required, the CQA Firm must ensure that the process is completed according to the Manufacturer's instructions within one hour of the seaming operation, and in a way, that does not damage the geomembrane. The CQA Firm shall also verify that seams are aligned with the fewest number of wrinkles and "fishmouths".

### D. Trial Seams

1. Trial seams shall be made on fragment pieces of geomembrane liner to verify that conditions are adequate for production seaming. Such trial seams shall be made at the beginning of each seaming period, and at least once each five hours, for each production seaming apparatus used that day. Trial seams shall be made under the same conditions as production seams.
2. The trial seam sample shall be at least five feet long by one foot wide (after seaming) with the seam centered lengthwise. Seam overlap shall be as indicated in Section 3.03 B. Three specimens shall be cut from the sample with one-inch wide die.
3. The specimens shall be tested in peel and shear using a field tensiometer. The tensiometer shall be capable of maintaining a constant jaw separation rate of two inches per minute. They should not fail in the seam as described in Section 3.05 E. If a specimen fails, the entire trial seam operation shall be repeated. If the additional specimen fails, the seaming apparatus and seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful trial seams are achieved. The CQA Firm shall observe all trial seam procedures.
4. The remainder of the successful trial seam sample shall be retained until project completion in the CQA Firm's archives for possible laboratory testing. Each sample shall be assigned a number and marked accordingly by the CQA Firm, who shall also log the date, hour, ambient temperature, number of seaming unit, name of seamer, and pass or fail description.
5. If agreed upon by the Project Manager and the CQA Engineer, and documented by the CQA Engineer in his daily report, the remaining portion of the trial seam sample can be subjected to destructive testing as indicated in Section 3.05 F. If a trial seam sample fails a test conducted by the CQA

Laboratory, then a destructive seam test sample shall be taken from each of the seams completed by the seamer during the **shift related the subject trial** seam. These samples shall be forwarded to the CQA Laboratory and, if they fail the tests, the procedure indicated in Section 3.05 G shall apply. The conditions of this paragraph shall be considered satisfied for a given seam if a destructive seam test sample has already been taken.

E. General Seaming Procedures

1. During general seaming, the CQA Firm shall ensure the following:
  - a. Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of six inches beyond the cut in all directions.
  - b. If seaming operations are carried out at night, adequate illumination shall be provided.
  - c. Seaming shall extend to the outside edge of panels placed in the anchor trench.
  - d. All cross-seam tees should be extrusion welded to a minimum distance of four inches on each side of the tee.
  - e. A firm substance may be required to be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.

The CQA Firm shall verify that the above seaming procedures or any other procedures agreed upon and indicated in the project Quality Assurance Plan are followed, and shall inform the Project Manager of any nonconformance.

F. Seaming Weather Conditions

1. Cold Weather Conditions
  - a. To ensure a quality installation, if seaming is conducted when the ambient temperature is below 32° F, the following conditions shall be met:

- i. Geomembrane surface temperatures shall be determined by the CQA Firm at intervals of at least once per 100 feet of seam length to determine if preheating is required. For extrusion welding, preheating is required if the surface temperature of the geomembrane is below 32° F.
- ii. For fusion welding, preheating may be waived by the Project Manager based on a recommendation for the CQA Engineer, if the Installer demonstrates to the CQA Engineer's satisfaction that welds of equivalent quality may be obtained without preheating at the expected temperature of installation.
- iii. If preheating is required, the CQA Firm shall observe all areas of geomembrane that have been preheated by a hot air device prior to seaming, to ensure that they have not been overheated.
- iv. Care shall be taken to conform that wind chill does not adversely affect the pre-heat requirements specified for welding. It may be necessary to provide wind protection for the seam area.
- v. All preheating devices shall be approved prior to use by the Project Manager.
- vi. Sheet grinding may be performed before preheating, if applicable.
- vii. Trial seaming, as described in Section 3.04 D, shall be conducted under the same ambient temperature conditions as the production seams. At the option of the CQA Firm, additional destructive tests may be required for any suspect areas.

### 3.04 NON-DESTRUCTIVE SEAM TESTING

#### A. Concept

The Installer shall nondestructively test all field seams over their full length using an air pressure test (for double fusion seams only), a vacuum test or other approved method. Air pressure testing and vacuum testing are described in Sections 3.04 B and 3.04 C, respectively. The purpose of nondestructive tests is to check the continuity of seams. It does not provide quantitative information on seam strength. Nondestructive testing shall be carried out as the seaming work progresses, not at the completion of all field seaming. For all seams, the CQA Firm shall:

1. Observe nondestructive testing procedures.
2. Record location, data, test unit number, name of tester, and outcome of all testing.
3. Inform the Installer and Project Manager of any required repairs.

B. Air Pressure Testing

1. Air pressure testing is applicable to double fusion welding which produces a double seam with an enclosed space.
  - a. The equipment for air pressure testing shall consist of the following:
    - i. An air pump (manual or motor driven), equipped with pressure gauge and capable of generating and sustaining a pressure between 25 and 30 psi and mounted on a cushion to protect the geomembrane.
    - ii. A rubber hose with fittings and connections.
    - iii. A sharp hollow needle or other pressure feed device, approved by Project Manager.
  - b. The following procedures shall be followed:
    - i. Seal both ends of the seam to be tested.
    - ii. Insert needle or other approved pressure feed device into the air channel created by the fusion weld.
    - iii. Insert a protective cushion between the air pump and the geomembrane.
    - iv. Pressurize the air channel to a pressure of approximately 30 psi. Close valve, allow two minutes for pressure to stabilize, and sustain pressure for at least five minutes.
    - v. If loss of pressure exceeds the maximum permissible pressure differential as outlined in the project specifications or does not stabilize, locate faulty area and repair in accordance with Section 3.06 C.
    - vi. Cut opposite end of tested seam area once testing is completed to verify continuity of the air channel. If air does not escape, locate blockage and retest unpressurized area. Seam the cut end of the air channel.
    - vii. Remove needle or other approved pressure feed device and seal the hole in the geomembrane.

### C. Vacuum Testing

1. Vacuum testing is applicable to extrusion welding and to non-seam areas of the liner.
  - a. The equipment shall consist of the following:
    - i. A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, a porthole or valve assembly, and a vacuum gauge.
    - ii. A pump assembly equipped with a pressure controller and pipe connections.
    - iii. A rubber pressure/vacuum hose with fittings and connections.
    - iv. A soapy solution. (CQA Firm shall ensure solution makes bubbles when air is passed through. Windshield washer fluid shall be used as anti-freeze in cold weather.)
    - v. A bucket and wide paintbrush, or other means of applying the soapy solution.
  - b. The following procedures shall be followed:
    - i. Wet a strip of geomembrane approximately 12 inches by 48 inches with the soapy solution.
    - ii. Place the box over the wetted area.
    - iii. Close the bleed valve and open the vacuum valve.
    - iv. Ensure that a leak-tight seal is created.
    - v. Energize the vacuum/venturi pump and reduce the applied pressure to approximately five psi (10 in of Hg) gauge.
    - vi. For a minimum of ten seconds, apply vacuum with the box placed and maintaining a seal, examine the geomembrane through the viewing window for the presence of soap bubbles.
    - vii. If no bubble appears after ten seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum three inches overlap, and repeat the process.
    - viii. All areas where soap bubbles appear shall be marked and repaired in accordance with Section 3.06 C. D. Test Failure Procedures.
2. The Installer shall complete any required repairs in accordance with Section 3.06. For repairs, the CQA Engineer shall:

- a. Observe the repair and testing of the repair.
- b. Mark on the geomembrane that the repair has been made.
- c. Document the repair procedures and test results.

### 3.05 DESTRUCTIVE SEAM TESTING

#### A. Concept

1. The purpose of destructive tests is to evaluate seam strength. Destructive seam tests shall be performed at two locations on the berm only. No destructive seam specimens shall be cut from the geomembrane seams in the bottom of the containment area. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

#### B. Location and Frequency

1. The CQA Firm shall select where seam samples will be cut out for laboratory testing. The frequency and locations shall be established as follows:
  - a. A minimum frequency of two destructive seam tests
  - b. Test locations shall be determined during seaming at the CQA Firm's discretion. Special consideration shall be given to locations where the potential for imperfect welding, such as overheating, contamination, and offset welds exist.
2. The Installer shall not be informed in advance of the locations where the seam samples will be taken.

#### C. Sampling Procedures

1. The Installer shall cut samples at locations chosen by the CQA Firm as the seaming progresses so that laboratory test results are available before the geomembrane is covered by another material. The CQA Firm shall:
  - a. Observe sample cutting.
  - b. Assign a number to each sample, and mark it accordingly.
  - c. Record sample location on layout drawing.
  - d. Record reason for taking the sample at this location (e.g., statistical routine, suspicious feature of the geomembrane).

2. All holes in the geomembrane resulting from destructive seam sampling shall be repaired in accordance with repair procedures described in Section 3.06 C immediately following receipt of successful test results. The continuity of the new seams in the repaired area shall be tested according to Section 3.04 C.

#### D. Sample Dimensions

1. At each sampling location, two types of samples shall be taken by the Installer. First, two specimens for field-testing should be taken. Each of these samples shall be cut with a one inch wide die, with the seam centered parallel to the width. The distance between these two samples shall be 30 inches. If both samples pass the field test described in Section 3.05 E, a sample for laboratory testing shall be taken.
2. The sample for laboratory testing shall be located between the samples for field-testing. The sample for laboratory testing shall be 12 inches wide by 30 inches long with the seam centered lengthwise. The sample shall be cut into two parts and distributed as follows:
  - a. One 12 inches wide by 18 inches long portion for conformance testing by the CQA Laboratory.
  - b. One 12 inches wide by 12 inches long portion to the CQA Firm.
3. Final determination of the sample sizes shall be made at the pre-construction meeting.

#### E. Field Testing

1. The three one inch wide specimens mentioned in Section 3.03 D and Section 3.05D shall be tested in the field using a tensiometer for peel and shear and shall not fail per the criteria in the project specifications. The tensiometer shall be capable of maintaining a constant jaw separation rate of two inches per minute. If the test passes in accordance with this section, the sample qualifies for testing in the laboratory. If it is non-conforming, the seam should be repaired in accordance with Section 3.05 G. Final judgment regarding seam acceptability, based on the conformance criteria provided in the project specifications, rests with the CQA Engineer.
2. The CQA Firm shall witness all field tests and mark all samples and portions with their number. The CQA Firm shall also log the date and time, ambient temperature, number of seaming unit, name of seamer, welding apparatus temperatures and pressures, and pass or fail description, and attach a copy to each sample portion.

F. Laboratory Testing (on or off-site)

1. Destructive test samples shall be packaged and shipped, if necessary, under the responsibility of the CQA Firm in a manner, which will not damage the test sample. The sample shall be shipped as soon as possible to expedite laboratory testing. The CQA Firm will be responsible for storing the archive samples. Test samples shall be tested by the CQA Laboratory.
2. Testing shall include seam strength and peel adhesion (ASTM D4437). The minimum acceptable values to be obtained in these tests are provided in Section 2.02 D. At least four specimens shall be tested successfully, each in both shear and peel. Specimens shall be selected alternately by test from the samples (i.e., peel, shear, peel, shear). A passing test shall meet the minimum acceptable values in at least four of the five specimens tested for each method.
3. The CQA Laboratory shall provide test results within 24 hours of receiving the samples. The CQA Engineer shall review laboratory test results as soon as they become available, and make appropriate recommendations to the Project Manager.

G. Destructive Test Failure

1. When a sample fails a destructive test, whether that test is conducted by the CQA Laboratory or by field tensiometer, the Installer has two options:
  - a. The Installer can repair the seam between any two passing destructive test locations.
  - b. The Installer can trace the welding path to an intermediate location ten feet minimum from the point of the failed test in each direction and take a sample with a one-inch wide die for an additional field test at each location. If these additional samples pass the test, then full laboratory samples are taken. If these laboratory samples pass the tests, then the seam is repaired between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be repaired.
2. All acceptable repaired seams shall be bound by two locations from which samples passing laboratory destructive tests have been taken. Passing laboratory destructive tests of trial seam samples taken as indicated in Section 3.03 D may be used as a boundary for the failing seam. In cases exceeding

150 feet of repaired seam, a sample taken from the zone in which the seam has been repaired must pass destructive testing. Repairs shall be made in accordance with Section 3.06.

3. The CQA Firm shall document all actions taken in conjunction with destructive test failures.

### 3.06 DEFECTS AND REPAIRS

#### A. Identification

1. All seams and non-seam areas of the geomembrane shall be examined by the CQA Firm for identification of defects, holes, blisters, undispersed raw materials, large wrinkles and any sign of contamination by foreign matter. The geomembrane surface shall be cleaned by the Installer prior to examination if the CQA Firm determines that the amount of dust or mud inhibits examination.

#### B. Evaluation

1. Each suspect location both in seam and non-seam areas shall be nondestructively tested using the methods described in Section 3.04. Each location, which fails the nondestructive testing, shall be marked by the CQA Firm and repaired by the Installer. Work shall not proceed with any materials, which will cover locations, which have been repaired until successful nondestructive and/or laboratory tests are obtained.
2. When seaming of the geomembrane is completed, and prior to placing overlying materials, the CQA Firm shall indicate to the Project Manager any large wrinkles, which should be cut and resealed by the Installer. The number of wrinkles to be repaired should be kept to an absolute minimum. Therefore, wrinkles should be located during the coldest part of the installation period, while keeping in mind the forecasted weather to which the uncovered geomembrane may be exposed. Wrinkles are considered to be large when the geomembrane can be folded over on to itself, which is generally a wrinkle that extends 12 inches from the subgrade. Seams produced while repairing wrinkles shall be nondestructively tested.
3. When placing overlying material on the geomembrane, every effort must be made to minimize wrinkle development. If possible, cover should be placed during the coolest weather. In addition, small wrinkles should be isolated and covered as quickly as possible to prevent their growth. The placement of cover materials shall be observed by the CQA Firm to ensure that wrinkle

formation is minimized and that, in all cases, the geomembrane is not folded over on itself.

#### C. Repair Procedures

1. Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the Project Manager, Installer, Designer, and CQA Firm.
  - a. The repair procedures available include:
    - i. Patching, used to repair holes, tears, undispersed raw materials, and contamination by foreign matter.
    - ii. Spot welding used to repair pinholes, or other minor, localized flaws.
    - iii. Capping, used to repair large lengths of failed seams.
    - iv. Extrusion welding the flap, used to repair areas of inadequate fusion seams which have an exposed edge.
    - v. Removing bad seam and replacing with a strip of new material welded into place.
  - b. For any repair method, the following provisions shall be satisfied:
    - i. Surfaces of the geomembrane which are to be repaired using extrusion methods shall be ground no more than one hour prior to the repair.
    - ii. All surfaces shall be clean and dry at the time of repair.
    - iii. All seaming equipment used in repairing procedures shall meet the requirements of the project Quality Assurance Plan.
    - iv. Patches or caps shall extend at least six inches beyond the edge of the defect and all corners of patches shall be rounded with a radius of approximately three inches.

#### D. Repair Verification

1. The CQA Firm shall observe all nondestructive testing of repairs and shall record the number of each repair, date and test outcome. Each repair shall be nondestructively tested using the methods described in Section 3.04 as appropriate. Repairs, which pass the nondestructive test, shall be taken as an indication of an adequate repair. Repairs more than 150 consecutive feet long require destructive test sampling. Failed tests

require that the repair shall be redone and retested until a passing test result.

### 3.07 GEOMEMBRANE PROTECTION

- A. The quality assurance procedures indicated in this Section are intended only to assure that the installation of adjacent materials does not damage the geomembrane. The quality assurances of the adjacent materials themselves are covered in separate Sections of this manual.
  
- B. Soils
  - 1. A copy of the project specifications prepared by the Designer for placement of soils shall be given to the CQA Engineer by the Project Manager. The CQA Engineer shall verify that these project specifications are consistent with geosynthetic state-of-practice such as:
    - a. Placement of soils on the geomembrane shall not proceed at an ambient temperature below 32° F nor above 104° F unless otherwise specified.
    - b. Placement of soil on the geomembrane should be done during the coolest part of the day to minimize the development of wrinkles in the geomembrane.
    - c. Equipment used for placing soil shall not be driven directly on the geomembrane.
    - d. A minimum thickness of one foot of soil is specified between a light dozer, ground pressure of five-psi or lighter, and the geomembrane.
    - e. In any areas traversed by construction traffic (any vehicles other than deployment equipment approved by the Project Manager) the soil layer shall have a minimum thickness of three feet. This requirement may be waived if provisions are made to protect the geomembrane through an engineered design. Drivers shall proceed with caution when on the overlying soil and prevent spinning of tires or sharp turns.
  
  - 2. The CQA Firm shall measure soil thickness and verify that the required thickness is present. The CQA Firm must also verify that final thickness is consistent with the design and verify that placement of the soil is done in such a manner that geomembrane damage is unlikely. The CQA Engineer shall inform the Project Manager if the above conditions are not fulfilled.

C. Sumps and Appurtenances

1. A copy of the plans and project specifications prepared by the Designer for sumps and appurtenances shall be given by the Project Manager to the CQA Firm. The CQA Firm shall review these plans and verify that:
  - a. Installation of the geomembrane in sump and appurtenant areas, and connection of geomembrane to sumps and appurtenances have been made per project specifications.
  - b. Extreme care is taken while welding around appurtenances since neither non-destructive nor destructive testing may be feasible in these areas.
  - c. The geomembrane has not been visibly damaged while making connections to sumps and appurtenances.
  - d. A representative of the CQA Firm shall be present at all times when the Installer is welding geomembrane to appurtenant structures.
2. The CQA Firm shall inform the Project Manager in writing if the above conditions are not fulfilled.

D. Concrete

1. A copy of the project specifications prepared by the Designer for placement of concrete shall be given by the Project Manager to the CQA Firm. The CQA Firm shall verify that these specifications are consistent with the state-of practice, including the use of geosynthetic layers between concrete and geomembrane. The CQA Firm shall verify that geosynthetic layers are placed between the concrete and the geomembrane according to design specifications. The CQA Firm will also verify that construction methods used are not likely to damage the geomembrane.

E. For field seams, if a laboratory test fails, that shall be considered as an indicator of the possible inadequacy of the entire seamed length corresponding to the test seam. The Geomembrane Installer shall then take more destructive test portions at locations indicated by the CQA Firm and the same laboratory tests required of test seams shall be performed. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of non-adequate seams and all seams represented by the destructive test location shall be repaired with a cap-strip. The cap-strip shall be non-destructively tested and repaired, as required, until adequacy of the seams is achieved.

F. A passing non-destructive test of field seams and repairs shall be considered to indicate the adequacy of field seams and repairs.

### 3.08 ANCHOR TRENCH

Construct as specified in Section 31 23 33.

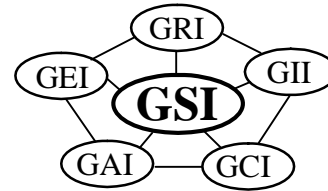
### 3.09 DISPOSAL OF SCRAP MATERIALS

On completion of installation, the Geomembrane Installer shall dispose of all trash and scrap material in a location approved by the Owner, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner. No scrap material shall be allowed to remain on the geomembrane surface.

END OF SECTION

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Revision 5: July 10, 2006  
Revision schedule on pg. 12

## **GRI Test Method GM17\***

Standard Specification for

“Test Methods, Test Properties and Testing Frequency for  
Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes”

This specification was developed by the Geosynthetic Research Institute (GRI), with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

### 1. Scope

- 1.1 This specification covers linear low density polyethylene (LLDPE) geomembranes with a formulated sheet density of 0.939 g/ml, or lower, in the thickness range of 0.50 mm (20 mils) to 3.0 mm (120 mils). Both smooth and textured geomembrane surfaces are included.
- 1.2 This specification sets forth a set of minimum, maximum, or range of physical, mechanical and endurance properties that must be met, or exceeded by the geomembrane being manufactured.
- 1.3 In the context of quality systems and management, this specification represents manufacturing quality control (MQC).

Note 1: Manufacturing quality control represents those actions taken by a manufacturer to ensure that the product represents the stated objective and properties set forth in this specification.

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\*This GRI standard is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version.

- 1.4 This standard specification is intended to ensure good uniform quality LLDPE geomembranes for use in general applications.

Note 2: Additional tests, or more restrictive values for the tests indicated, may be necessary under conditions of a particular application. In this situation, interactions with the manufacturers are required.

Note 3: For information on installation techniques, users of this standard are referred to the geosynthetics literature, which is abundant on the subject.

## 2. Referenced Documents

### 2.1 ASTM Standards

- D 792 Specific Gravity (Relative Density) and Density of Plastics by Displacement
- D 1004 Test Method for Initial Tear Resistance of Plastics Film and Sheeting
- D 1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
- D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
- D 1603 Test Method for Carbon Black in Olefin Plastics
- D 3895 Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis
- D 4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
- D 4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
- D 5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
- D 5323 Practice for Determination of 2% Secant Modulus for Polyethylene Geomembranes
- D 5596 Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
- D 5617 Test Method for Multi-Axial Tension Test for Geosynthetics
- D 5721 Practice for Air-Oven Aging of Polyolefin Geomembranes
- D 5885 Test method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
- D 5994 Test Method for Measuring the Core Thickness of Textured Geomembranes
- D 6693 Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes

### 2.2 GRI Standards

- GM 11 Accelerated Weathering of Geomembranes using a Fluorescent UVA-Condensation Exposure Device

GM 12 Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gage

- 2.3 U. S. Environmental Protection Agency Technical Guidance Document "Quality Control Assurance and Quality Control for Waste Containment Facilities," EPA/600/R-93/182, September 1993, 305 pgs.

3. Definitions

Manufacturing Quality Control (MQC) - A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications.

ref. EPA/600/R-93/182

Manufacturing Quality Assurance (MQA) - A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract specifications for the project.

ref. EPA/600/R-93/182

Linear Low Density Polyethylene (LLDPE), n – A ethylene/ $\alpha$ -olefin copolymer having a linear molecular structure. The comonomers used to produce the resin can include hexane, octane, or methyl pentene. LLDPE resins have a natural density in the range of 0.915 to 0.926 g/ml (ref. Pate, T. J. Chapter 29 in Handbook of Plastic Materials and Technology, I.I. Rubin Ed., Wiley, 1990).

Formulation, n - The mixture of a unique combination of ingredients identified by type, properties and quantity. For linear low density polyethylene geomembranes, a formulation is defined as the exact percentages and types of resin(s), additives and carbon black.

4. Material Classification and Formulation

- 4.1 This specification covers linear low density polyethylene geomembranes with a formulated sheet density of 0.939 g/ml, or lower. Density can be measured by ASTM D1505 or ASTM D792. If the latter, Method B is recommended.
- 4.2 The polyethylene resin from which the geomembrane is made will generally be in the density range of 0.926 g/ml or lower, and have a melt index value per ASTM D1238 of less than 1.0 g/10 min. This refers to the natural, i.e., nonformulated, resin.

4.3 The resin shall be virgin material with no more than 10% rework. If rework is used, it must be of the same formulation (or other approved formulation) as the parent material.

4.4 No post consumer resin (PCR) of any type shall be added to the formulation.

## 5. Physical, Mechanical and Chemical Property Requirements

5.1 The geomembrane shall conform to the test property requirements prescribed in Tables 1 and 2. Table 1 is for smooth LLDPE geomembranes and Table 2 is for single and double sided textured LLDPE geomembranes. Each of the tables are given in English and SI (metric) units. The conversion from English to SI (metric) is “soft”. It is to be understood that the tables refer to the latest revision of the referenced test methods and practices.

Note 4: The tensile strength properties in this specification were originally based on ASTM D 638 which uses a laboratory testing temperature of  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Since ASTM Committee D35 on Geosynthetics adopted ASTM D 6693 (in place of D 638), this GRI Specification followed accordingly. The difference is that D 6693 uses a testing temperature of  $21^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . The numeric values of strength and elongation were not changed in this specification. If a dispute arises in this regard, the original temperature of  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  should be utilized for testing purposes.

Note 5: There are several tests sometimes included in other LLDPE geomembrane specifications which are omitted from this standard because they are outdated, irrelevant or generate information that is not necessary to evaluate on a routine MQC basis. The following tests have been purposely omitted:

- Volatile Loss
- Dimensional Stability
- Coeff. of Linear Expansion
- Resistance to Soil Burial
- Low Temperature Impact
- ESCR Test (D 1693 and D 5397)
- Wide Width Tensile
- Water Vapor Transmission
- Solvent Vapor Transmission
- Water Absorption
- Ozone Resistance
- Hydrostatic Resistance
- Tensile Impact
- Small Scale Burst
- Various Toxicity Tests
- Field Seam Strength

Note 6: There are several tests which are included in this standard (that are not customarily required in other LLDPE geomembrane specifications) because they are relevant and important in the context of current manufacturing processes. The following tests have been purposely added:

- Oxidative Induction Time
- Oven Aging
- Ultraviolet Resistance
- Asperity Height of Textured Sheet

Note 7: There are other tests in this standard, focused on a particular property, which are updated to current standards. The following are in this category:

- Thickness of Textured Sheet
- Tensile Properties, incl. 2% Secant Modulus
- Puncture Resistance
- Axi-Symmetric Break Resistance Strain
- Carbon Black Dispersion (In the viewing and subsequent quantitative interpretation of ASTM D 5596 only near spherical agglomerates shall be included in the assessment).

Note 8: There are several GRI tests currently included in this standard. Since these topics are not covered in ASTM standards, this is necessary. They are the following:

- UV Fluorescent Light Exposure
- Asperity Height Measurement

Note 9: The minimum average value of asperity height does not represent an expected value of interface shear strength. Shear strength associated with geomembranes is both site-specific and product-specific and should be determined by direct shear testing using ASTM D5321/ASTM D6243 as prescribed. This testing should be included in the particular site's CQA conformance testing protocol for the geosynthetic materials involved, or formally waived by the Design Engineer, with concurrence from the Owner prior to the deployment of the geosynthetic materials.

5.2 The values listed in the tables of this specification are to be interpreted according to the designated test method. In this respect they are neither minimum average roll values (MARV) nor maximum average roll values (MaxARV).

5.3 The various properties of the LLDPE geomembrane shall be tested at the minimum frequencies shown in Tables 1 and 2. If the specific manufacturer's quality control guide is more stringent, it must be followed in like manner.

Note 10: This specification is focused on manufacturing quality control (MQC). Conformance testing and manufacturing quality assurance (MQA) testing are at the discretion of the purchaser and/or quality

assurance engineer, respectively. Communication and interaction with the manufacturer is strongly suggested.

## 6. Workmanship and Appearance

- 6.1 Smooth geomembrane shall have good appearance qualities. It shall be free from such defects that would affect the specified properties and hydraulic integrity of the geomembrane.
- 6.2 Textured geomembrane shall generally have uniform texturing appearance. It shall be free from such defects that would affect the specified properties and hydraulic integrity of the geomembrane.
- 6.3 General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.

## 7. MQC Sampling

- 7.1 Sampling shall be in accordance with the specific test methods listed in Tables 1 and 2. If no sampling protocol is stipulated in the particular test method, then test specimens shall be taken evenly spaced across the entire roll width.
- 7.2 The number of tests shall be in accordance with the appropriate test methods listed in Tables 1 and 2.
- 7.3 The average of the test results should be calculated per the particular standard cited and compared to the minimum value listed in these tables, hence the values listed are the minimum average values and are designated as "min. ave."

## 8. MQC Retest and Rejection

- 8.1 If the results of any test do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the manufacturing protocol as set forth in the manufacturer's quality manual.

## 9. Packaging and Marketing

- 9.1 The geomembrane shall be rolled onto a substantial core or core segments and held firm by dedicated straps/slings, or other suitable means. The rolls must be adequate for safe transportation to the point of delivery, unless otherwise specified in the contract or order.
- 9.2 Marking of the geomembrane rolls shall be done in accordance with the manufacturers accepted procedure as set forth in their quality manual.

10. Certification

- 10.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification, together with a report of the test results, shall be furnished at the time of shipment.

**Table 1(a) – Linear Low Density Polyethylene (LLDPE) Geomembrane (SMOOTH)**

Properties	Test Method	Test Value								Testing Frequency (minimum)	
		20 mils	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils		
Thickness - mils (min. ave.) • lowest individual of 10 values	D5199	nom. -10%	nom. -10%	nom. -10%	nom. -10%	nom. -10%	nom. -10%	nom. -10%	nom. -10%	nom. -10%	per roll
Density g/ml (max.)	D 1505/D 792	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	200,00 lb
Tensile Properties (1) (min. ave.) • break strength - lb/in. • break elongation - %	D 6693 Type IV	76 800	114 800	152 800	190 800	228 800	304 800	380 800	456 800		20,000 lb
2% Modulus – lb/in. (max.)	D 5323	1200	1800	2400	3000	3600	4800	6000	7200		per formulation
Tear Resistance - lb (min. ave.)	D 1004	11	16	22	27	33	44	55	66		45,000 lb
Puncture Resistance - lb (min. ave.)	D 4833	28	42	56	70	84	112	140	168		45,000 lb
Axi-Symmetric Break Resistance Strain - % (min.)	D 5617	30	30	30	30	30	30	30	30		per formulation
Carbon Black Content - %	D 1603 (2)	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	45,000 lb
Carbon Black Dispersion	D 5596	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	45,000 lb
Oxidative Induction Time (OIT) (min. ave.) (4) (a) Standard OIT — or — (b) High Pressure OIT	D 3895 D 5885	100 400	100 400	100 400	100 400	100 400	100 400	100 400	100 400	100 400	200,000 lb
Oven Aging at 85°C (5) (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	35 60	35 60	35 60	35 60	35 60	35 60	35 60	35 60	35 60	per formulation
UV Resistance (6) (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs (8)	D 3895 D 5885	N. R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	per formulation

- (1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
  - Break elongation is calculated using a gage length of 2.0 in. at 2.0 in./min.
- (2) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
- (3) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
  - 9 in Categories 1 or 2 and 1 in Category 3
- (4) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
- (5) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
- (6) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
- (7) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
- (8) UV resistance is based on percent retained value regardless of the original HP-OIT value.

**Table 1(b) – Linear Low Density Polyethylene (LLDPE) Geomembrane  
(SMOOTH)**

Properties	Test Method	Test Value								Testing Frequency (minimum)	
		0.50 mm	0.75 mm	1.0 mm	1.25 mm	1.50 mm	2.00 mm	2.5 mm	3.0 mm		
Thickness - mm (min. ave.) • lowest individual of 10 values	D5199	nom.	nom.	nom.	nom.	nom.	nom.	nom.	nom.	nom.	per roll
Density g/ml (max.)	D 1505/D 792	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	90,000 kg
Tensile Properties (1) (min. ave.) • break strength – N/mm • break elongation - %	D 6693 Type IV	13 800	20 800	27 800	33 800	40 800	53 800	66 800	80 800	80 800	9,000 kg
2% Modulus – N/mm (max.)	D 5323	210	370	420	520	630	840	1050	1260	per formulation	
Tear Resistance - N (min. ave.)	D 1004	50	70	100	120	150	200	250	300	20,000 kg	
Puncture Resistance - N (min. ave.)	D 4833	120	190	250	310	370	500	620	750	20,000 kg	
Axi-Symmetric Break Resistance Strain - % (min.)	D 5617	30	30	30	30	30	30	30	30	per formulation	
Carbon Black Content - %	D 1603 (3)	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	20,000 kg
Carbon Black Dispersion	D 5596	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	note (3)	20,000 kg
Oxidative Induction Time (OIT) (min. ave.) (4) (c) Standard OIT — or — (d) High Pressure OIT	D 3895 D 5885	100 400	100 400	100 400	100 400	100 400	100 400	100 400	100 400	100 400	90,000 kg
Oven Aging at 85°C (5) (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	35 60	35 60	35 60	35 60	35 60	35 60	35 60	35 60	35 60	per formulation
UV Resistance (6) (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs (8)	D 3895 D 5885	N. R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	N.R. (7) 35	per formulation

- (1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
  - Break elongation is calculated using a gage length of 50 mm at 50 mm/min.
- (2) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
- (3) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
  - 9 in Categories 1 or 2 and 1 in Category 3
- (4) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
- (5) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
- (6) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
- (7) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
- (8) UV resistance is based on percent retained value regardless of the original HP-OIT value.

**Table 2(a) – Linear Low Density Polyethylene (LLDPE) Geomembrane  
(TEXTURED)**

Properties	Test Method	Test Value								Testing Frequency (minimum)	
		20 mils	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils		
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	per roll
Asperity Height mils (min. ave.) (1)	GM 12	10	10	10	10	10	10	10	10	10	Every 2 <sup>nd</sup> roll (2)
Density g/ml (max.)	D 1505/D 792	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	200,000 lb
Tensile Properties (3) (min. ave.) • break strength – lb/in. • break elongation - %	D 6693 Type IV	30 250	45 250	60 250	75 250	90 250	120 250	150 250	180 250	250	20,000 lb
2% Modulus – lb/in. (max.)	D 5323	1200	1800	2400	3000	3600	4800	6000	7200	7200	per formulation
Tear Resistance – lb (min. ave.)	D 1004	11	16	22	27	33	44	55	66	66	45,000 lb
Puncture Resistance – lb (min. ave.)	D 4833	22	33	44	55	66	88	110	132	132	45,000 lb
Axi-Symmetric Break Resistance Strain - % (min.)	D 5617	30	30	30	30	30	30	30	30	30	per formulation
Carbon Black Content - %	D 1603 (4)	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	45,000 lb
Carbon Black Dispersion	D 5596	note (5)	note (5)	note (5)	note (5)	note (5)	note (5)	note (5)	note (5)	note (5)	45,000 lb
Oxidative Induction Time (OIT) (min. ave.) (6) (e) Standard OIT — or — (f) High Pressure OIT	D 3895 D 5885	100 400	100 400	100 400	100 400	100 400	100 400	100 400	100 400	100 400	200,000 lb
Oven Aging at 85°C (7) (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	35 35 60	35 35 60	35 35 60	35 35 60	35 35 60	35 35 60	35 35 60	35 35 60	35 35 60	per formulation
UV Resistance (8) (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs (10)	D 3895 D 5885	N. R. (9) 35	N.R. (9) 35	N.R. (9) 35	N.R. (9) 35	N.R. (9) 35	N.R. (9) 35	N.R. (9) 35	N.R. (9) 35	N.R. (9) 35	per formulation

- (1) Of 10 readings; 8 out of 10 must be ≥ 7 mils, and lowest individual reading must be ≥ 5 mils; also see Note 9.
- (2) Alternate the measurement side for double sided textured sheet
- (3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.  
• Break elongation is calculated using a gage length of 2.0 in. at 2.0 in./min.
- (4) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
- (5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:  
• 9 in Categories 1 or 2 and 1 in Category 3
- (6) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
- (7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
- (8) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
- (9) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
- (10) UV resistance is based on percent retained value regardless of the original HP-OIT value.

**Table 2(b) – Linear Low Density Polyethylene (LLDPE) Geomembrane  
(TEXTURED)**

Properties	Test Method	Test Value								Testing Frequency (minimum)	
		0.50 mm	0.75 mm	1.0 mm	1.25 mm	1.50 mm	2.00 mm	2.5 mm	3.0 mm		
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	per roll
Asperity Height mm (min. ave.) (1)	GM 12	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	Every 2 <sup>nd</sup> roll (2)
Density g/ml (max.)	D 1505/D 792	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	90,000 kg
Tensile Properties (3) (min. ave.) • break strength – N/mm • break elongation - %	D 6693 Type IV	5 250	9 250	11 250	13 250	16 250	21 250	26 250	31 250	9,000 kg	
2% Modulus – N/mm (max.)	D 5323	210	370	420	520	630	840	1050	1260	per formulation	
Tear Resistance – N (min. ave.)	D 1004	50	70	100	120	150	200	250	300	20,000 kg	
Puncture Resistance – N (min. ave.)	D 4833	100	150	200	250	300	400	500	600	20,000 kg	
Axi-Symmetric Break Resistance Strain - % (min.)	D 5617	30	30	30	30	30	30	30	30	per formulation	
Carbon Black Content - %	D 1603 (4)	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	20,000 kg	
Carbon Black Dispersion	D 5596	note (5)	note (5)	note (5)	note (5)	note (5)	note (5)	note (5)	note (5)	20,000 kg	
Oxidative Induction Time (OIT) (min. ave.) (6) (g) Standard OIT — or — (h) High Pressure OIT	D 3895  D 5885	100  400	100  400	100  400	100  400	100  400	100  400	100  400	100  400	90,000 kg	
Oven Aging at 85°C (7) (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895  D 5885	35  60	35  60	35  60	35  60	35  60	35  60	35  60	35  60	per formulation	
UV Resistance (8) (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs (10)	D 3895  D 5885	N. R. (9)  35	N.R. (9)  35	N.R. (9)  35	N.R. (9)  35	N.R. (9)  35	N.R. (9)  35	N.R. (9)  35	N.R. (9)  35	per formulation	

- (1) Of 10 readings; 8 out of 10 must be ≥ 0.18 mm, and lowest individual reading must be ≥ 0.13 mm; also see Note 9.
- (2) Alternate the measurement side for double sided textured sheet
- (3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
  - Break elongation is calculated using a gage length of 50 mm at 50 mm/min.
- (4) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
- (5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
  - 9 in Categories 1 or 2 and 1 in Category 3
- (6) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
- (7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
- (8) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
- (9) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
- (10) UV resistance is based on percent retained value regardless of the original HP-OIT value.

**Adoption and Revision Schedule  
for  
GRI Test Method GM17**

“Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene  
(LLDPE) Smooth and Textured Geomembranes”

Adopted: April 3, 2000

Revision 1: June 28, 2000: added a new Section 5.2 that the numeric tables values are neither MARV nor MaxARV. They are to be interpreted per the designated test method. Also, corrected typographical error of textured sheet thickness test method designation from D5199 to D5994.

Revision 2: December 13, 2000: added one Category 3 is allowed for carbon black dispersion. Also, unified terminology to “strength” and “elongation”.

Revision 3: June 23, 2003: Adopted ASTM D 6693, in place of ASTM D 638, for tensile strength testing. Also, added Note 4.

Revision 4: February 20, 2006: Added Note 9 on Asperity Height clarification with respect to shear strength.

Revision 5: Removed recommended warranty from specification.

## SECTION 31 05 19.13 NON-WOVEN GEOTEXTILE

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes furnishing and installing geotextile as part of the frac tank storage area secondary containment construction.

#### 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  1. ASTM D 413, Standard Test Methods for Rubber Property - Adhesion to Flexible Substrate.
  2. ASTM D 7179, Standard Test Method for Determining Geonet Breaking Force.
  3. ASTM D 1505, Standard Test Method for Density of Plastics by the Density Gradient Technique.
  4. ASTM D 1603, Standard Test Method for Carbon Black in Olefin Plastics.
  5. ASTM D 7005, Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.
  6. ASTM D 3786, Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Busting Strength Tester Method.
  7. ASTM D 4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
  8. ASTM D 4354, Standard Practice for Sampling of Geosynthetics for Testing.
  9. ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  10. ASTM D 4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
  11. ASTM D 4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

12. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
13. ASTM D 4716, Standard Test Method for Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products.
14. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
15. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
16. ASTM D 5199, Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
17. ASTM D 5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

### 1.03 SUBMITTALS

- A. Submit the following to the CQA Engineer, for review and approval, no later than 14 calendar days prior to scheduled shipment of geotextile:
  1. Documentation of manufacturers' qualifications as specified in subsection 1.04.A of this Section.
  2. Manufacturer's quality control program manual or descriptive documentation.
  3. List of material properties and samples of the material.
  4. Manufacturers' certification that the products to be furnished will comply with all product specifications in this section.
  5. Documentation of installers' qualifications, as specified in subsection 1.04.13 of this Section.
  
- B. Submit the following to the CQA Engineer for review and approval no later than one calendar day prior to shipment of the products:
  1. The manufacturers' quality control certifications, including results of source quality control testing of the products, as specified in subsection 2.01 of this Section, to verify that the materials supplied for the project follow all product specifications in this Section. The certifications shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager.

Certifications shall include lot and roll numbers, and corresponding shipping information.

- C. No geotextile shall be deployed until the manufacturer's quality control certifications are submitted to and approved by the CQA Engineer. Should the material be deployed prior to CQA Engineer's approval, it shall be at sole risk of the Installer and Contractor, and if the material does not meet project specifications, it shall be removed from the project at the expense of the Contractor.

#### 1.04 QUALITY ASSURANCE/QUALITY CONTROL

- A. **Manufacturer's Qualifications:** The manufacturers shall be specialists in the manufacture of geotextile. Geotextile manufacturers shall have at least five years experience in the manufacture of such material.
- B. **Installer's Qualifications**
  - 1. The Installer shall be the manufacturer or an approved contractor trained and licensed (if applicable) to install the manufacturer's product.
  - 2. The Installer shall have at least five years experience in the installation of the product. The Installer shall have installed at least 1 million square feet of the product during the last five years or shall provide to the CQA Engineer satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the product will be installed in a competent, professional manner.
- C. Owner shall retain the services of independent inspection and testing firms (Geosynthetics Quality Assurance Firm and Geosynthetics Quality Assurance Laboratory) to check conformance of the materials and installation with the specifications.
- D. **Codes and Standards:** Perform all work in compliance with applicable requirements of governing authorities having jurisdiction.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Store material off ground, rolled and covered to protect from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.
- B. Rolls shall be marked or tagged with the following information:
  - 1. Manufacturer's name

2. Product identification
  3. Lot number
  4. Roll number
  5. Roll dimensions
- C. Replace defective or torn material at no cost to the Owner.

## PART 2 PRODUCTS

### 2.01 SOURCE QUALITY CONTROL

- A. The following test methods and frequencies shall be used, at a minimum, by the manufacturer for the quality assurance and control of the geotextile prior to shipment of product. Sampling and testing frequency shall conform to ASTM D 4354. Every effort shall be made to minimize the number of lots of each geosynthetic for use in the project.
- B. Geotextile Manufacturing QC
1. Geotextile Tests:
    - a. Mass Per Unit Area - ASTM D 5261
    - b. Grab Tensile Strength and Grab Tensile Elongation - ASTM D 4632
    - c. Thickness – ASTM D5199
    - d. Puncture Resistance - ASTM D 6241
    - e. Apparent Opening Size - ASTM D 4751
    - f. Permittivity - ASTM D 4491
    - g. Trapezoid Tear Strength - ASTM D 4533

Frequency: Minimum of one test per 100,000 square feet and minimum of one test per lot.

- D. For manufacturer's quality control testing of geotextiles, the sample average test results (weaker principle direction for mechanical tests) for a particular property for any individual roll tested within a lot designated as first quality shall meet or exceed the Minimum Average Roll Value indicated in the manufacturer's certification.

## 2.02 GEOTEXTILE

- A. The geotextile shall be a continuous filament polyester or polypropylene nonwoven needle-punched fabric. The fabric shall be inert to commonly encountered chemicals, biological degradation, hydrocarbons, acids, alkalines and mildew. The fabric shall be resistant to rot, ultraviolet light, insects and rodents.
- B. The polyester or polypropylene filaments shall be formed into a stable network such that the filaments retain their relative position.
- C. Geotextile for leachate collection trenches shall conform to the following minimum requirements:

TABLE 31 05 19.13-1  
 GEOTEXTILE PROPERTIES

Fabric Property	Unit	Test Method	Min. Avg. Roll Value *
Fabric Weight	oz/sq yd	ASTM D 5261	≥ 8
Grab Strength	Lbs	ASTM D 4632	220
Grab Elongation	%	ASTM D 4632	50
Trapezoid Tear Strength	Lbs	ASTM D 4533	90
Puncture Resistance	Lbs	ASTM D 6241	130
Permittivity, T	Sec <sup>-1</sup>	ASTM D 4491	1.2
AOS (largest opening size)	Sieve Size	ASTM D 4751	80

\*Weakest Principal Direction

- D. Minimum roll width shall be 12.5 feet. The roll length shall be maximized in order to minimize seams.

## PART 3 EXECUTION

### 3.01 FIELD QUALITY CONTROL

- A. Conformance Testing for Geotextile and Geocomposite Products:
  - 1. Conformance testing samples shall be taken by the independent testing firm upon delivery of each product to site.
  - 2. Samples shall be taken at the following frequency: a minimum of one test per 100,000 square feet and minimum of one test per lot.

3. Samples shall be taken across the entire width of the roll and shall not include the first three feet. Unless otherwise specified, samples shall be three feet long by the roll width.
  4. Each sample shall be identified by manufacturer's name, product identification, lot number, roll dimensions, and roll number. The machine direction and inner/outer roll side shall be noted on the samples with a waterproof marker.
  5. As a minimum, the following tests shall be performed for the geotextile product:
    - a. Fabric Weight - ASTM D 5261
    - b. Grab Strength and Grab Elongation - ASTM D 4632
    - c. Puncture Resistance - ASTM D 4833
    - d. Permittivity - ASTM D 4491
    - e. Apparent Opening Size - ASTM D 4751
- B. The CQA Firm shall ensure that the geotextile is installed per manufacturer recommendations and the Contract Documents. The CQA Firm shall observe and document the installation activities.

### 3.02 PREPARATION

Surfaces to receive geotextile shall be smooth and free of litter, sharp protrusions, and large stones.

### 3.03 GEOTEXTILE INSTALLATION

- A. General
1. All geotextiles shall be weighted with sandbags or the equivalent when required. Such sandbags shall be installed during placement and shall remain until replaced with cover material.
- B. Installation
1. The geotextile shall be placed over the geomembrane where shown on the Drawings, and placed in such a manner that placement of overlying material will not excessively stretch or tear the fabric.
  2. Overlapping of panels with heat tack seaming will be allowed in the secondary containment system.

3. Overlapped seams shall have a minimum overlap of 12 inches.

C. Seaming

1. Seaming shall be by Lyster or similar heat tacking or other approved bonds. Overlaps shall be oriented in the direction of aggregate filling. No horizontal seaming shall be allowed on slopes steeper than 10 horizontal to 1 vertical.

### 3.04 GEOTEXTILE REPAIR

A. Holes or tears in the fabric shall be repaired as follows:

1. On steep slopes (steeper than 10 to 1): A fabric patch shall be sewn into place using a double sewn lock stitch (1/4 inch to 3/4 inch apart and no closer than one inch from any edge). Should any tear exceed 10 percent of the width of the roll, that roll shall be removed from the slope and replaced.
2. Flat Areas (flatter than 10 to 1): A fabric patch shall be spot-seamed in place with a minimum of 36 inches of overlap beyond the perimeter of the tear or damage in all directions.

B. Care shall be taken to remove any soil or other material, which may have penetrated through the torn geotextile.

END OF SECTION

## SECTION 31 23 13 SUBGRADE PREPARATION

### PART 1 - GENERAL

#### 1.01 DESCRIPTION OF WORK

- A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for the construction of the subgrade as specified herein and as shown on the Drawings.
- B. The Contractor shall be prepared to coordinate the construction of the subgrade with other construction activities and subcontractors at the site.
- C. Notwithstanding the prequalification of any material sources for the subgrade, the Contractor shall be entirely responsible for meeting the requirements of this Section.
- D. The work of this Section shall include, but not necessarily be limited to, the construction of the subgrade component of the liner system.

#### 1.02 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) standards:
  - 1. ASTM D 422                      Standard Test Method for Particle-Size Analysis of Soils.
  - 2. ASTM D 698                      Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3  - 3. ASTM D 1140                      Standard Test Method for Amount of Material in Soils Finer than the No. 200 (75- $\mu$ m) Sieve.
  - 4. ASTM D 1556                      Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
  - 5. ASTM D 1557                      Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3  - 6. ASTM D 2216                      Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.
  - 7. ASTM D 2487                      Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  - 8. ASTM D 6938                      Standard Test Methods for Density of Soil and Soil-Aggregate in</sup></sup>

Place by Nuclear Methods (Shallow Depth).

- 9. ASTM D 2937 Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
- 10. ASTM D 4220 Standard Practices for Preserving and Transporting Soil Samples.
- 11. ASTM D 4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- 12. ASTM D 5084 Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible-Wall Permeameter.
- 13. ASTM D 5093 Standard Test Method for Field Measurement of Infiltration Rate Using a Double-Ring Infiltrometer with a Sealed-Inner Ring.

### 1.03 SUBMITTALS

- A. The Contractor shall notify the Owner and CQA Consultant in a minimum of 3 days prior to starting construction of the subgrade. The notice shall state the source of the material to be used, the equipment to be used, the date and time that placement operations shall start, and the name of the person in the field who shall oversee the construction of the subgrade.
- B. If work is interrupted for reasons other than inclement weather, the Contractor shall notify the Owner and CQA Consultant immediately and provide a plan and schedule for resumption of the work.

### 1.04 CONSTRUCTION QUALITY ASSURANCE

- A. The construction of the subgrade shall be monitored by the CQA Consultant as outlined in the CQA Plan.
- B. The Contractor shall be aware of the activities outlined in the CQA Plan and shall account for these activities in the construction schedule.

## PART 2 - PRODUCT

### 2.01 MATERIAL FOR SUBGRADE

- A. All laboratory testing to evaluate the suitability or conformance of soil materials for the subgrade shall be carried out in accordance with the test methods indicated in Part 1.02 of this Section.
- B. The subgrade shall consist of relatively homogeneous, natural soils which are substantially

free of debris, foreign objects, large rock fragments, roots, and organics. The soils selected shall not be gap-graded or susceptible to piping. Any material which is found by the CQA Consultant to be unsuitable shall be removed from the work area by the Contractor.

- C. Soil testing shall be provided by the Owner through the CQA Consultant.

## PART 3 - EXECUTION

### 3.01 FAMILIARIZATION

- A. Prior to implementing any work of this Section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this Section.

### 3.02 SUBGRADE PLACEMENT

- A. The Contractor shall construct the subgrade to the grades, slopes, and elevations shown on the Drawings and as specified in this Section.
- B. No frozen or partially thawed subgrade material shall be placed, spread or compacted.
- C. No compacted subgrade material shall be placed or spread while the surface on which the material is to be placed is frozen or thawing, during unfavorable weather conditions, or during periods of precipitation.
- D. The subgrade surface shall be made smooth and free from ruts or indentations at the end of every working day when precipitation is forecast and/or at the completion of the compaction operations in that area.
- E. The entire area shall be left in a manner to promote runoff at the end of each day.
- F. The final surface of the subgrade shall be compacted if necessary using a smooth drum or pneumatic wheel compactor.
- G. If fill is required, the subgrade material shall be placed in loose lifts which result in a maximum compacted lift thickness of 12 inches.
- H. If fill and compaction are required, the subgrade material shall be compacted to at least 95 percent of the maximum dry unit weight as measured according to ASTM D 698. In all cases the moisture content shall be maintained as close to optimum moisture, as measured according to ASTM D 698, in order to meet the compaction requirements. The dry unit weight and moisture content shall be measured in place in accordance with ASTM D 6938 at the frequencies presented in the CQA Plan.

- I. The subgrade must have sufficient compaction and strength to enable the placement and compaction of the geomembrane and overlying aggregate surface course. The subgrade also must be stable to prevent large differential settlement that would be conducive to damage of the liner system or the pooling of leachate.
- J. The Contractor shall not proceed to the next lift until the current lift has been tested and approved by the CQA representative. The Contractor will be held responsible for proceeding to the next lift without prior approval from the CQA Firm.

### 3.03 FIELD QUALITY CONTROL AND TESTING

#### A. Frequency:

- 1. The frequency of quality control testing is outlined below. The Contractor shall take this testing frequency into account in planning his construction schedule.
  - a. The minimum testing frequencies for material evaluation and construction quality evaluation shall be one per containment area for areas requiring fill.
  - b. Sampling locations shall be selected by the CQA Consultant. If necessary, the location of routine in-place moisture content and dry density tests shall be determined using a non-biased sampling plan.
  - c. A special testing frequency shall be used at the discretion of the Owner and/or the CQA Consultant when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas shall be considered when:
    - i. the rollers slip during rolling operation;
    - ii. the lift thickness is greater than specified;
    - iii. the subgrade soil is at improper and/or variable moisture content;
    - iv. fewer than the specified number of roller passes are made;
    - v. dirt-clogged rollers are used to compact the material;
    - vi. the rollers do not have optimum ballast; or
    - vii. the degree of compaction is doubtful.
  - d. During construction, the frequency of testing may also be increased in the following situations:
    - i. adverse weather conditions;

- ii. breakdown of equipment;
- iii. at the start and finish of grading;
- iv. if the material fails to meet specifications; or
- v. the work area is reduced.

**B. Defective Areas:**

1. If a defective area is discovered in the subgrade, the CQA Consultant shall immediately determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA Consultant shall determine the extent of the defective area by additional tests, observations, a review of records, or other means that the CQA Consultant deems appropriate. If the defect is related to adverse site conditions, such as overly wet soils or surface desiccation, the CQA Consultant shall define the limits and nature of the defect.
2. After determining the extent and nature of a defect, the CQA Consultant shall notify the Contractor and schedule appropriate retests when the work deficiency has been corrected.
3. The Contractor shall correct the deficiency to the satisfaction of the CQA Consultant. The cost of corrective actions shall be borne by the Contractor.
4. All retests recommended by the CQA Consultant must verify that the defect has been corrected before any additional work is performed by the Contractor in the area of the deficiency. The CQA Consultant shall also verify that all installation requirements are met and that all submittals are provided.

**3.04 SURVEY CONTROL**

- A. The contractor shall be responsible for all layout work. Once the subgrade is completed and CQA verified, the Contractor shall be responsible for surveying the location and elevation of the top of subgrade. Final elevations of the top of subgrade surface shall be -0.1 to 0.1 ft. compared to the grades shown on the Construction Drawings.

**3.05 PRODUCT PROTECTION**

- A. The Contractor shall use all means necessary to protect all prior work, including all materials and completed work specified in this and other Sections.
- B. In the event of damage to prior work or work completed as specified in this section, the Contractor shall immediately make all repairs and replacements necessary to the approval

of the Owner and CQA Consultant and at no additional cost to the Owner.

END OF SECTION

## SECTION 31 23 33 TRENCHING AND BACKFILLING

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. This Section addresses excavation, backfill and compaction for installation of underground piping and anchor trenches for geosynthetics installations.

#### 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM).
  1. ASTM D 422, Standard Method for Particle-Size Analysis of Soils.
  2. ASTM D 698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
  3. ASTM D 2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.
  4. ASTM D 2487, Standard Test Method for Classification of Soils for Engineering Purposes.
  5. ASTM D 6938, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

#### 1.03 SUBMITTALS

- A. Submittals shall be submitted under the provisions in Section 01 33 00.
- B. Test Results:
  1. The testing laboratory shall submit written reports of all specified tests, showing conformance of the materials and constructed work with the specifications; and
  2. The test results shall be submitted within three days after samples are obtained.

#### 1.04 QUALITY ASSURANCE/QUALITY CONTROL

- A. Owner will retain the services of an independent inspection and testing firm(s) to determine conformance of the materials and constructed work with the specifications, in accordance with the General Conditions.

#### 1.05 PROJECT CONDITIONS

- A. Work shall be performed in a manner that does not disturb existing environmental monitoring wells or other site facilities not indicated to be removed within the construction limits.

- B. Contractor shall provide temporary controls to prevent erosion as specified in the General Conditions.
- C. The Contractor is solely responsible for excavation slope stability. Excavation work shall follow applicable OSHA regulations.

## PART 2 PRODUCTS

### 2.01 SOURCE QUALITY CONTROL

- A. Proposed materials shall be approved for use on this project by the Engineer as specified, prior to use of the material in the construction.

### 2.02 PIPE BEDDING MATERIAL, HAUNCHING MATERIAL, AND INITIAL TRENCH BACKFILL

- A. Pipe bedding material shall be gravel, having characteristics consistent with GW or GP soils as defined by the Unified Soil Classification System (ASTM D 2487).
- B. Shall be substantially free of sharp edges or corners, and debris. Maximum particle size shall be 3-inch or less.
- C. Testing of Soil:
  - 1. Soil Type (ASTM D 2487): Minimum of one test for each visible change in material.

### 2.03 ANCHOR TRENCH BACKFILL

- A. Soil used for final backfill in anchor trench may be soil excavated from trench except if it is an organic or silt (MH, ML) soil. The soil shall be substantially free of organic matter or other perishable matter, rocks larger than two inches in maximum dimension, pavement material, litter, and topsoil.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Contractor shall establish required lines and levels, and check contours and datum.
- B. Contractor shall remove and replace or compact in-situ soils or compacted fill material softened by surface water as required by the Engineer.
- C. Unsuitable materials shall be removed from within the trench.
- D. Contractor shall provide and operate equipment adequate to keep all excavations free of water as specified in the General Conditions.

- E. Contractor shall maintain benchmarks and other elevation control points; re-establish, if disturbed or destroyed, at no additional cost to the Owner.

### 3.02 TRENCH EXCAVATION

- A. Trenches shall be excavated to the dimensions shown on the Drawings, and as indicated in the following paragraphs.
- B. For pipe installation across existing pavement, cut edge of pavement in a uniform straight alignment on each side of excavation at approximately twelve inches beyond top of excavation. Maintain pavement cuts in good order until pipe installation and pavement patching operations are completed.
- C. If existing material below the trench bottom grade is unsuitable for properly laying pipe, as determined by the Engineer, excavate and remove the unsuitable material to a depth of approximately four inches and replace the same with Pipe Bedding Material (meeting the qualifications of subsection 2.02 of this Section) properly compacted to produce a firm and even bearing surface.
- D. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be backfilled and compacted at no additional cost to the Owner.
- E. Contractor shall remove water from the excavations as required for installation of piping, and placement of backfill and geotextile (if applicable), in accordance with these specifications and the details shown on the Drawings.
- F. Contractor shall notify Engineer before proceeding with installation of fill material or piping.
- G. Cover:
  - 1. Contractor shall provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade:

a. Areas subject to vehicular traffic:	24 inches
b. Areas not subject to vehicular traffic:	12 inches
c. All areas:	
i. Electrical cables:	42 inches
ii. Electrical ducts:	36 inches
  - 2. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, provided it will not interfere with the structural integrity of the slab or pavement.

### 3.04 PIPE INSTALLATION

- A. Engineer must approve pipe bedding prior to placement of piping.

- B. Installation of all pipe and appurtenances shall be subject to the review of the Engineer.
- C. Contractor shall install piping as shown on the Drawings and as specified in Section 02715.

### 3.05 BACKFILL AND COMPACTING FOR GEOSYNTHETIC ANCHOR TRENCH

- A. Contractor shall place general fill material within geosynthetic anchor trench as shown on the Drawings.
- B. Material shall be placed in loose lifts of nine inches.
- C. Contractor shall compact fill with power tamper or wheel roll with proper moisture conditioning to meet 90 percent of the maximum dry density of the material at a maximum of six-inch lifts, being careful not to damage geosynthetic material.

END OF SECTION

## Appendix F

### Operation and Maintenance Plan

# Operation and Maintenance Plan

**Bulking Facility**  
**MidAmerica Environmental Holdings, LLC**  
**El Dorado, Arkansas**  
**Permit No. 5077-WR-7**  
**AFIN: 70-01210**

June 30, 2021  
Project No. 35217153



**Prepared for:**  
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---------	------------------------------

## LIST OF EXHIBITS

Exhibit A	Facility Inspection Forms
-----------	---------------------------

## 1.0 INTRODUCTION

This Operation and Maintenance Plan presents a site-specific Operation and Maintenance schedule for the MidAmerica Environmental Holdings (MEH) Bulking Facility (Facility). Records of inspections and documentation of any maintenance resulting from the inspections will be recorded on Inspection Forms, such as the ones included in **EXHIBIT A** of this document. The inspection forms may be modified as needed. A proposed minimum Operation and Maintenance schedule is included in **TABLE 1** below.

**Table 1. Facility Inspection Schedule**

Site Component	Inspection Frequency	Form
<b>Facility Entrance Gate</b>	Daily	Facility Inspection Checklist
<b>Fueling Station</b>	Daily	Facility Inspection Checklist
<b>Concrete Lined Containment Pond</b>	Daily	Facility Inspection Checklist
<b>Material Moving Equipment</b>	Weekly/As needed	Facility Inspection Checklist
<b>Liquids Piping System</b>	Weekly	Piping Inspection Form
<b>Containment Pond Freeboard</b>	Daily	Facility Inspection Checklist
<b>Stormwater Structures</b> Run-on/run-off Ditches Erosion control structures Berms and secondary containment	Monthly or after a significant rain event	Stormwater Inspection Form
<b>Facility Security/Access</b> Signs Fencing/gates Access roads	Monthly/As Needed	Facility Inspection Checklist
<b>Emergency Response Equipment</b>	Monthly/As needed	Facility Inspection Checklist
<b>Fire Extinguishers</b>	Monthly Inspection/ Annual Test	Facility Inspection Checklist
<b>Stormwater Pond</b> Berms/levees Damage assessment	Quarterly or after a significant rain event	Pond Inspection Form

## 2.0 FACILITY DESCRIPTION

The MidAmerica Environmental Holdings (MEH) Bulking Facility (Facility) consists of approximately eight (8) acres and is designed for the storage of approved oil & gas field wastes and industrial waters. The Facility includes designated areas for oil and gas field water-based drilling wastes, waste handling and storage, bulking, a bulking storage area concrete lined containment pond and a stormwater pond. **Figure 7** in the Waste Management Plan provides the facility layout.

### 2.1 Material Moving Equipment

Material moving equipment is used daily to handle solids at the facility and will be operated by qualified operators. Material moving equipment will be inspected weekly and repaired as needed. If material moving equipment will be disabled for an extended period of time for repairs, additional equipment will be leased or borrowed as necessary to support the Facility. Operators to use the Facility Inspection Checklist Form provided in **Exhibit A**.

### 2.2 Fences and Gates

Integrity of Facility fencing shall be inspected monthly and repaired as necessary. The entrance gate to the Facility shall be inspected daily to assure the locking mechanism is properly functional. Operators to use the Facility Inspection Checklist Form provided in **Exhibit A**.

### 2.3 Facility Roads

Temporary and permanent access roads shall be inspected monthly and maintained as needed to provide access, and to control dust and mud accumulations. The bulking area access roads shall be graded and additional gravel or other surface course applied as necessary to minimize rutting, washboarding, mudding, and dust accumulation. Operators to use the Facility Inspection Checklist Form provided in **Exhibit A**.

### 2.4 Liquids Piping System

The liquids pumping and filtration systems, operated daily by the operations staff will be inspected weekly to ensure proper operation. The waste liquids levels in the collection frac tanks will be monitored daily to insure that tank capacities are not exceeded. Operators to use the Liquid Piping Systems Inspection Form provided in **Exhibit A**.

### 2.5 Stormwater and Surface Water System

Stormwater features including all ditches, temporary and permanent erosion control structures, the sedimentation pond and discharge works shall be inspected monthly or after each significant

rainfall event, whichever is more frequent. Stormwater features shall be cleaned, repaired, or replaced as necessary.

It is very important that the stormwater management system at the Facility be maintained so that it functions properly during a storm event. The following maintenance is recommended:

- Keep all ditches and swales unobstructed;
- Remove sediment from ditches, swales, the sediment pond, and sediment barriers routinely; Sediment controls are most effective when sediment is removed regularly;
- Inspect and clean check dams and outlet control structures of sediment and other materials that may restrict flow;
- Inspect and clean the stormwater system following a major storm event.

Operators to use the Stormwater Inspection Form provided in **Exhibit A**.

## **2.6 Concrete Lined Containment Pond**

The containment pond, located in the western portion of the bulking storage bermed area, has a surface area of approximately 2,500 square feet, a minimum 2-foot freeboard, and a maximum depth of seven feet. The berm surrounding the containment pond provides additional freeboard in the area of the pond. The pond is lined with a layer of 60-mil HDPE and concrete. Berms and pond levees are to be inspected quarterly and after major rainfall or windstorms. Berms will be maintained in such a manner as to prevent erosion.

Operators to use the Inspection Form provided in **Exhibit A**.

## **2.7 Emergency Response Equipment**

Communication equipment, the list of emergency phone numbers, and all first aid kits will be checked monthly or immediately after use. All equipment will be inspected, decontaminated, cleaned and replaced, if necessary, immediately after use. If lost or damaged, equipment will be replaced immediately. The emergency coordinator will verify that equipment has been maintained after an emergency and will be readied for reuse if another emergency or incident occurs.

Fire extinguishers will be tested annually, and condition checked once per month. Operators to use the Facility Inspection Checklist Form provided in **Exhibit A**.

## **3.0 Recordkeeping**

The MEH Bulking Facility has in place an Operating Record System The Facility will maintain these records for a minimum period of three years following the completion of the activity.

### 3.1 Inspection Log

Inspections and maintenance of the overall site, facilities, and operations are performed routinely by the facility manager or facility personnel. Inspections should be performed often enough to identify problems in time to correct them before they harm human health or the environment. Inspections also prevent malfunction, deterioration, and operator error from affecting the performance of the facilities and operations.

The frequency of inspections is noted on the inspection checklist in **Table 1** (Operations Inspection Forms are located in **Exhibit A** of this document). Inspections are also carried out after any major storm event or natural disaster. The inspection records will be kept in the operating record and will be made available to the DEQ on request.

# **EXHIBIT A**

## Facility Inspection Forms

**MidAmerica Environmental Holdings Bulking Facility**

**Facility Inspection Checklist Form**

DISPOSAL ACTIVITIES		Frequency	Description
What Disposal Operations Occuring? (general description)		Daily	
CHECKLIST ITEMS		INSPECTION COMPLETE	COMMENTS OR ACTIONS TAKEN
Litter Control Inspection, Spills in Active Area and Perimeter Fence		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Free Liquids		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Concrete Containment Pond Freeboard at two (2) feet		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Fueling Station		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Material Moving Equipment		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Facility Roads		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Facility Emergency Response Equipment		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Facility Security Fence and Access Gates		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	

**INSPECTION NOTES:**

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(Signed) \_\_\_\_\_

Date \_\_\_\_\_

**MidAmerica Environmental Holdings Bulking Facility**

**Weekly Pumping and Filtration System Inspection**

Inspection Item	Compliance Issue(s) - If deficient; explain	Comments and/or Corrective Actions Taken
-----------------	---	--

**Liquids Pumping and Filtration Systems Integrity**

1) Are flow meters in working condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
2) Are liquids pipes/tubing in proper working condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
3) Are valves in proper working condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
4) Blind flanges/are they in working/sealed condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
5) Are pumps in proper working condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
6) Is south secondary containment area in proper working condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
7) Is bulking storage area secondary containment area in proper working condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
8) Are containment structures free of water, debris, fire hazards, and vegetation?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
9) Is the pond liquid level gauge in proper working condition and indicating two (2) feet of freeboard?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
10) Samples Taken?		

**INSPECTION NOTES:**

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**(Signed)**

Date

Was this a rain event inspection?

Yes  No

**MidAmerica Environmental Holdings Bulking Facility**

**Monthly Stormwater Conveyance Systems Inspection Form**

Inspection Items	Compliance Issue(s) - If deficient; explain	Comments and/or Corrective Actions Taken
------------------	---	--

**Stormwater Conveyance System Integrity**

1) Is there a buildup of silt deposits?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
2) Do culverts have obstructions or washouts?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
3) Do drainage structures have obstructions or erosion damage?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
4) Are the perimeter berms/channels damaged?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
5) Is access road integrity sufficient?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
6) Any damage to vegetation outside operating area?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
7) Are PVC pond discharge pipes and valves damaged?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
8) Any indications of contaminants in stormwater?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
9) Does the vegetation on the pond levee, containment berms and surrounding areas require over-seeding?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	

**INSPECTION NOTES:**

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\_\_\_\_\_  
**(Signed)** Date

Was this a rain event inspection?  Yes  No

## **Appendix G**

### **Paint Filter Test Information**

# PAINT FILTER TEST RESULTS

TEST DATE: \_\_\_\_\_

SAMPLE INFORMATION: TYPE OF WASTE: \_\_\_\_\_

SOLIDIFICATION AGENT USED: \_\_\_\_\_

SAMPLE TAKEN BY: \_\_\_\_\_

TEST INFORMATION: TEST PERFORMED BY: \_\_\_\_\_

TIME OF TEST: START: \_\_\_\_\_

FINISHED: \_\_\_\_\_

RESULTS: \_\_\_\_\_ PASS (no liquid in test cylinder)

\_\_\_\_\_ FAIL (liquid in test cylinder)

ACTION TAKEN: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## METHOD 9095B

### PAINT FILTER LIQUIDS TEST

#### 1.0 SCOPE AND APPLICATION

1.1 This method is used to determine the presence of free liquids in a representative sample of waste.

1.2 The method is used to determine compliance with 40 CFR 264.314 and 265.314.

#### 2.0 SUMMARY OF METHOD

2.1 A predetermined amount of material is placed in a paint filter. If any portion of the material passes through and drops from the filter within the 5-min test period, the material is deemed to contain free liquids.

#### 3.0 INTERFERENCES

3.1 Filter media were observed to separate from the filter cone on exposure to alkaline materials. This development causes no problem if the sample is not disturbed.

3.2 Temperature can affect the test results if the test is performed below the freezing point of any liquid in the sample. Tests must be performed above the freezing point and can, but are not required to, exceed room temperature of 25 °C.

#### 4.0 APPARATUS AND MATERIALS

4.1 Conical paint filter -- Mesh number 60 +/- 5% (fine meshed size). Available at local paint stores such as Sherwin-Williams and Glidden.

4.2 Glass funnel -- If the paint filter, with the waste, cannot sustain its weight on the ring stand, then a fluted glass funnel or glass funnel with a mouth large enough to allow at least 1 in. of the filter mesh to protrude should be used to support the filter. The funnel should be fluted or have a large open mouth in order to support the paint filter yet not interfere with the movement, to the graduated cylinder, of the liquid that passes through the filter mesh.

4.3 Ring stand and ring, or tripod.

4.4 Graduated cylinder or beaker -- 100-mL.

#### 5.0 REAGENTS

5.1 None.

## 6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

A 100-mL or 100-g representative sample is required for the test. If it is not possible to obtain a sample of 100 mL or 100 g that is sufficiently representative of the waste, the analyst may use larger size samples in multiples of 100 mL or 100 g, i.e., 200, 300, 400 mL or g. However, when larger samples are used, analysts shall divide the sample into 100-mL or 100-g portions and test each portion separately. If any portion contains free liquids, the entire sample is considered to have free liquids. If the sample is measured volumetrically, then it should lack major air spaces or voids.

## 7.0 PROCEDURE

7.1 Assemble test apparatus as shown in Figure 1.

7.2 Place sample in the filter. A funnel may be used to provide support for the paint filter. If the sample is of such light bulk density that it overflows the filter, then the sides of the filter can be extended upward by taping filter paper to the inside of the filter and above the mesh. Settling the sample into the paint filter may be facilitated by lightly tapping the side of the filter as it is being filled.

7.3 In order to assure uniformity and standardization of the test, material such as sorbent pads or pillows which do not conform to the shape of the paint filter should be cut into small pieces and poured into the filter. Sample size reduction may be accomplished by cutting the sorbent material with scissors, shears, a knife, or other such device so as to preserve as much of the original integrity of the sorbent fabric as possible. Sorbents enclosed in a fabric should be mixed with the resultant fabric pieces. The particles to be tested should be reduced smaller than 1 cm (i.e., should be capable of passing through a 9.5 mm (0.375 inch) standard sieve). Grinding sorbent materials should be avoided as this may destroy the integrity of the sorbent and produce many "fine particles" which would normally not be present.

7.4 For brittle materials larger than 1 cm that do not conform to the filter, light crushing to reduce oversize particles is acceptable if it is not practical to cut the material. Materials such as clay, silica gel, and some polymers may fall into this category.

7.5 Allow sample to drain for 5 min into the graduated cylinder.

7.6 If any portion of the test material collects in the graduated cylinder in the 5-min period, then the material is deemed to contain free liquids for purposes of 40 CFR 264.314 and 265.314.

## 8.0 QUALITY CONTROL

8.1 Duplicate samples should be analyzed on a routine basis.

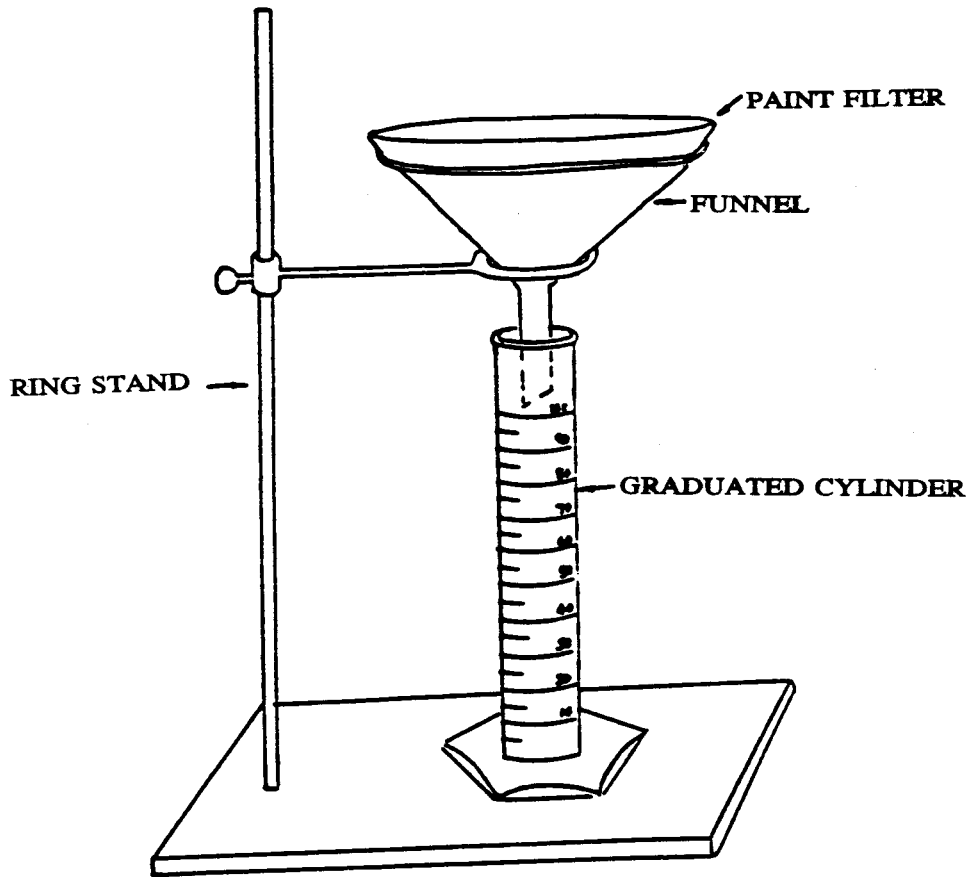
## 9.0 METHOD PERFORMANCE

9.1 No data provided.

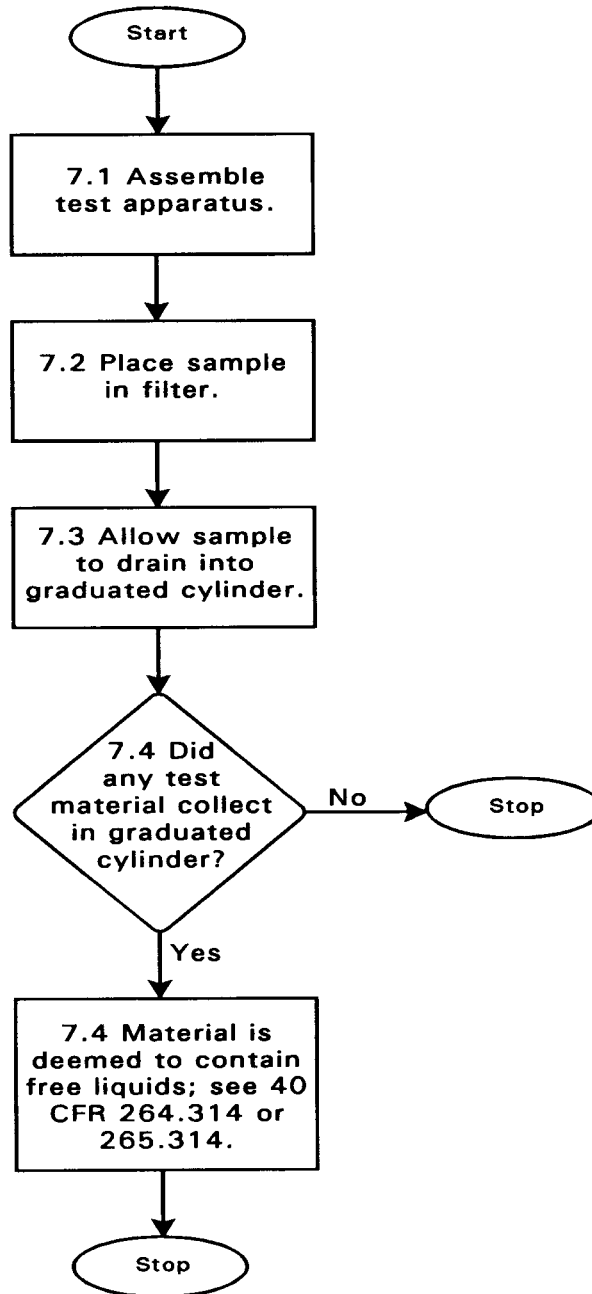
## 10.0 REFERENCES

10.1 None provided.

FIGURE 1  
PAINT FILTER TEST APPARATUS



METHOD 9095B  
PAINT FILTER LIQUIDS TEST



## **Attachment E**

### Agency Approval Correspondence



June 30, 2021

Arkansas Department of Health  
Engineering Division, Slot #37  
4815 West Markham Avenue  
Little Rock, Arkansas 72205-3867

**RE: Notification of Permit Renewal Modification  
MidAmerica Environmental Holdings Bulking Facility  
El Dorado, Arkansas  
AFIN: 70-01210; DEQ Permit No. 5077-WR-7**

To whom it may concern:

MidAmerica Environmental Holdings, LLC with an address of 4101 Old Oak Drive, Little Rock, Arkansas 72212 is submitting to the ADE&E Division of Environmental Quality a permit modification application for their bulking facility located at 101 Warehouse Drive, El Dorado, Arkansas 71730. The application is to modify existing No-Discharge Permit 5077-WR-7. In accordance with DEQ guidelines, a notification must be made to the Arkansas Department of Health regarding the application.

A copy of the Permit Modification application is attached for your review. If you have any questions regarding this submittal or need additional information, please feel free to contact me at your earliest convenience at [owen.carpenter@terracon.com](mailto:owen.carpenter@terracon.com) or (501) 847-9292. Thank you in advance for your attention in this matter.

Sincerely,  
**Terracon Consultants, Inc.**

F. Owen Carpenter, P.E., P.G.  
*Senior Engineer*

Quin M. Baber, P.G.  
*Environmental Department Manager*

Enclosure: Permit Renewal Application for No-Discharge Permit No. 5077-WR-7

Terracon Consultants, Inc. 25809 I-30 South Bryant, Arkansas 72022  
P [501] 847 9292 F [501] 847 9210 [terracon.com](http://terracon.com)

Environmental



Facilities



Geotechnical



Materials

Carpenter, Owen

---

From: ADHNoReply@Arkansas.gov  
Sent: Wednesday, June 30, 2021 11:54 AM  
To: Carpenter, Owen  
Subject: Your Plan for Review (MidAmerica Environmental Holdings Bulking Facility)

Follow Up Flag: Follow up  
Flag Status: Flagged

Your Plan Review Submission has been received. It will be verified and you will receive another e-mail explaining your payment options.

# **Attachment F**

## Financial Assurance Documentation Closure Plan and Closure Cost Estimate

# Closure Plan

**Bulking Facility**  
**MidAmerica Environmental Holdings, LLC**  
**El Dorado, Arkansas**  
**Permit No. 5077-WR-7**  
**AFIN: 70-01210**

June 30, 2021  
Project No. 35217153



**MidAmerica**  
ENVIRONMENTAL HOLDINGS

**Prepared for:**

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---------	----------------------------

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Appendix A	Estimated Closure Cost
Appendix B	Financial Assurance Mechanism

## 1.0 INTRODUCTION

### 1.1 PURPOSE, SCOPE, AND APPLICABILITY

This Closure Plan addresses the activities and schedule required to close the Facility by a third-party contractor as required by the Arkansas Department of Energy & Environment, Division of Environmental Quality (DEQ). This plan includes a description of the steps that will be taken to close the Facility and a general schedule for closure. Information supplemental to this Closure Plan, such as the Facility design, is in the Facility Waste Management Plan (WMP). A copy of the Closure Plan will be placed in the Facility operating record.

### 1.2 FACILITY DESCRIPTION AND DESIGN

MidAmerica Environmental Holdings, LLC (MEH) owns and operates the bulking facility located near El Dorado, Arkansas in accordance with DEQ Permit 5077-WR-7. The site is located in Section 35, Township 17 South, Range 15 West in Union County, Arkansas. The site consists of approximately 40 acres, of which approximately eight acres are designated for the existing bulking facility.

The facility is designed to receive water-based fluids produced off-site by oil and natural gas drilling operations. The fluids allowed for storage are fresh water, water-based drilling mud, drill cuttings, produced water, flow-back water, bentonitic clays, chemical additives, barite, foaming agents, lubricants, and emulsifiers. In addition, stormwater and process water that is documented to be non-hazardous from various industrial facilities may be accepted for recycling or bulking at the MEH Facility. Oil and gas related fluids will be delivered to the site daily by tanker trucks and placed into one of six bulking vats. The fluids will be mixed with a bulking agent before being transported to a permitted solid waste disposal facility. Industrial waters will be delivered to the Facility daily by tanker trucks and placed into a series of three frac tanks for biocide treatment and storage. The liquids then undergo a multiple filtration and separation process before being returned as “clean” water to the industries.

## 2.0 CLOSURE PLAN

This Closure Plan has been developed as a Facility plan and the following sections describe the general layout, design, and operations of the Facility.

### 2.1 GENERAL SITE LAYOUT

The Facility consists of approximately 40 acres, of which approximately eight acres are designated for bulking activities. The bulking facility will consist of up to six reinforced concrete bulking vats; 25 closed top frac tanks for storage of liquids, a bulking agent storage area (under roof), a temporary bulked material storage area, and an equipment storage building. The central part of the site is sloped to drain to a concrete lined sump. Free liquids and contaminated water will be transported in frac tanks and disposed of in a permitted underground injection controlled (UIC) well or POTW. Areas outside the perimeter road will be graded to drain to ditches and swales that are conveyed to a stormwater collection basin. Stormwater is currently managed in accordance with Industrial General Permit ARR001445 as required by the DEQ. A layout map of the Facility is located on **FIGURE 7** of the WMP in **ATTACHMENT D** of the permit modification application.

### 2.2 STORAGE FACILITIES

The Facility will maintain up to six reinforced concrete bulking vats. Four of the bulking vats will have an approximate capacity of 9,595 gallons each and two will have a capacity of about 44,435 gallons each. Four of the bulking vats will have the approximate dimensions of 20 feet long by 10 feet wide and 11 feet deep and will have a one percent slope to one end for the collection of free liquids. The other two bulking vats will have the approximate dimensions of 30 feet long by 20 feet wide and 11 feet deep. A 60-mil HDPE geomembrane liner is to be placed beneath each of the bulking vats to prevent contamination of groundwater. **FIGURE 2** and **FIGURE 3** in the Facility WMP in **ATTACHMENT D** of the permit modification application provide details of the proposed bulking vats. A minimum two-foot freeboard shall be maintained at all times in each of the bulking vats.

Stormwater from outside the processing areas will be directed through ditches and swales to a sedimentation pond located on the west side of the facility. A minimum two foot freeboard shall be maintained at all times. Stormwater from this pond shall be maintained in accordance with the current requirements of Industrial General Permit ARR000000. Stormwater collected inside the north storage area will be directed to a concrete lined sump with a capacity of approximately 67,245 gallons. **FIGURE 4** in the Facility WMP provides details of the proposed concrete lined sump. Stormwater collected inside the south frac tank storage area will be directed to frac tanks or the adjacent large bulking vat.

## 2.3 CLOSURE REQUIREMENTS

The Closure Plan for the Facility includes information necessary to close the facility and remove and dispose of any waste storage structures. The steps that are necessary to close the entire facility at any time during operation include:

- Submit notification of closure to the DEQ;
- Dispose of onsite contaminated liquids;
- Dispose of dry bulked material remaining at the site;
- Remove and dispose remaining bulking materials, discharge pipes and pumps;
- Remove and dispose reinforced concrete bulking vats and concrete sump;
- Remove and dispose geosynthetic liner systems;
- Remove and dispose any identified oil impacted soils;
- Backfill bulking vats, excavations, sump and stormwater basin with clean on-site soils;
- Remove soil berm surrounding bulking facility;
- Fine grading of areas disturbed; and
- Seeding and mulching of areas disturbed.

### 2.3.1 MAXIMUM INVENTORY

The estimated maximum inventory of wastewater on-site at any time during operation is approximately 567,625 gallons. The wastewater will be loaded by tanker truck, hauled and disposed of in a permitted UIC well or a permitted publicly owned treatment works (POTW) facility. All wastewater from the bulking vats must be removed prior to removing the vats and underlying liner system. The estimated maximum amount of dry material that can be stored at the temporary bulked material storage area is roughly 500 tons. This material will be loaded into haul trucks and transported to a permitted solid waste disposal facility.

### 2.3.2 SCHEDULE FOR CLOSURE

The DEQ must be notified at least **sixty (60) days** prior to any planned removal, closure or abandonment of any waste storage structure. An estimated schedule for closure, based on the permitted design of the Facility is presented in **TABLE 1** below.

**TABLE 1. ESTIMATED CLOSURE SCHEDULE**

CLOSURE ACTIVITY/TASK	NUMBER OF DAYS TO COMPLETION
Notification of Closure to DEQ	60
Empty bulking vats & concrete lined sump	15
Dispose of dry bulked material	20
Demolition, removal & disposal of reinforced concrete	15
Removal & disposal of geosynthetic liner systems and oil impacted soils	1
Removal & disposal of remaining bulking materials, discharge pipes and pumps	1
Backfill bulking vats, sump area & stormwater basin with on site soils	5
Remove soil berm surrounding bulking facility	5*
Fine grading of areas disturbed	2
Seeding & mulching of areas disturbed	1
<b>ESTIMATED TOTAL TIME TO COMPLETE CLOSURE</b>	<b>120</b>

\*Note: Days not included in total duration of project.

**2.3.3 CLOSURE PLAN APPROVAL**

Along with the sixty (60) day notice, the Facility will submit the prepared Closure Plan, including any revisions that may be necessary to the DEQ for approval, prior to beginning any closure activities.

**2.3.4 CLOSURE NOTIFICATION AND DOCUMENTATION**

Within 30 days following completion of closure activities, a letter shall be submitted to the DEQ summarizing the closure process. The notification shall include the following:

- Statement that the closure activities were in accordance with this approved closure plan;
- Estimated volume of wastewater disposed;
- Location of wastewater disposal;
- Estimated volume (cubic yards or tons) of dry material disposed;
- Location of dry material disposal;
- Disposal location of reinforced concrete and 60 mil geomembrane liner (must be a permitted disposal facility); and
- Photographs of the site taken periodically during closure and upon completion.

### **2.3.5 ESTIMATED CLOSURE COSTS**

Estimated costs for closing the Facility have been developed based on hiring a third party contractor to close the entire site at any given time during operation. The Estimated Closure Cost for the Facility is included in **Appendix A** of this document.

### **2.3.6 FACILITY RECORDKEEPING AND REPORT REQUIREMENTS**

A copy of the approved Closure Plan will be kept in the Facility's operating record. All Facility records will be permanently maintained in the Facility Operating Record unless destruction of the records is authorized by the Director of the DEQ. The DEQ will be provided with the initial and updated Closure Cost Estimates for the Facility. These estimates will also be placed within the Facility's operating record.

### **2.3.7 FINANCIAL ASSURANCE**

Evidence of a financial assurance mechanism for closure will be placed in the Facility's operating record and provided to the DEQ annually. It is estimated that closure of the Facility will be completed no later than 120 days following the beginning of closure activities. If necessary, due to inclement weather or other circumstances, a request to extend this schedule may be made to the DEQ. A copy of the Facility's financial assurance mechanism is located in **Appendix B**.

## **Exhibit A**

### Estimated Closure Cost

# CLOSURE COST ESTIMATE FOR FINANCIAL ASSURANCE MIDAMERICA ENVIRONMENTAL HOLDINGS, LLC - BULKING FACILITY

Revision Date 6.9.2021

**Total Site Area: 40 Acres**

**Permitted Storage Area: Eight (8) Acres**

Closure Requirements	Quantity	Units	Unit Price <sup>1</sup>	Amount
1) Submit Notification Letter to ADEQ	1	LS	\$ 190.00	\$190.00
2) Bid and Contract Documents	1	LS	\$ 11,000.00	\$11,000.00
3) Hauling of on-site stored wastes to disposal sites	1	LS	\$ 8,600.00	\$8,600.00
4) Dispose of any on-site stored liquids <sup>3</sup>	1	LS	\$ 25,000.00	\$25,000.00
5) Dispose of dry bulked material <sup>4</sup>	1	LS	\$ 17,000.00	\$17,000.00
6) Demolition, removal and disposal of reinforced concrete bulking pits <sup>5</sup>	1	LS	\$ 5,000.00	\$5,000.00
7) Remedial Action Work Plan	1	LS	\$ 2,500.00	\$2,500.00
8) Removal and disposal of potentially oil contaminated surficial soils	1	LS	\$ 8,500.00	\$8,500.00
9) Removal and disposal of geosynthetic liner systems	1	LS	\$ 2,100.00	\$2,100.00
10) Removal and disposal of bulking materials, discharge pipes and pumps	1	LS	\$ 500.00	\$500.00
11) Backfill storage basins and bulking vats with on-site soils	1	CY	\$ 25,000.00	\$25,000.00
12) Remove soil berms surrounding bulking facility and south storage area	1	LS	\$ 2,500.00	\$2,500.00
13) Fine grading of areas disturbed and seeding and mulching	1	LS	\$ 7,500.00	\$7,500.00
14) Closure Letter and documentation	1	LS	\$ 380.00	\$380.00
<b>Total Estimated Facility Closure Costs:</b>				<b>\$115,770.00</b>

**Notes:**

1. All unit costs are based on 2021 dollars and assume 3rd party contracted equipment and labor. Items 3, 4, 5, 6, 8, 9, 10, 11, 12 and 13 are bid totals provided by Bull Construction, 149 Oak Street, Lillie, LA (Chad Elliott 318-478-0157). Contractor states mobilization costs are included in line items.
2. Closure costs shown are based on the design presented in the Facility Waste Management Plan and projected future increases in materials storage.
3. Total projected on-site liquids (oil & gas/industrial) = [(4\*9,595 gal) + (2\*44,435 gal) + 504,000 gal + 67,245 gal] = 698,495 gal.
4. Assumes a maximum of 500 tons remain on temporary dry material storage pad (Items 3 and 5 include hauling & disposal).
5. Contractor is responsible for TCLP testing of metals and TPH on bulking vats to assure material is non-hazardous.

**Exhibit B**  
Financial Assurance Mechanism  
*(provided upon request)*