

BARKER LEMAR


ENGINEERING CONSULTANTS

Con 12-1-1
Doc # 91595

February 20, 2018

Mr. Mick Leat
Iowa Department of Natural Resources
Land Quality Bureau
Wallace State Office Building
502 East 9th Street
Des Moines, Iowa 50319

Re: Response to February 12, 2018 DNR Comments (Emailed)
Request for Approval to Construct Cell FY18
Iowa City Landfill and Recycling Center
Permit No. 52-SDP-01-72P
Project No. IACLF 17007

PLANS AND SPECIFICATIONS APPURTENANT TO	
PERMIT FOR SANITARY DISPOSAL PROJECT	
NO.	<u>52-SDP-01-72</u>
DATED	<u>January 8, 2018</u>
IOWA DEPARTMENT OF NATURAL RESOURCES	
ENVIRONMENTAL SERVICES DIVISION	
By	

Dear Mick:

BARKER LEMAR ENGINEERING CONSULTANTS (BARKER LEMAR), on behalf of Iowa City (City), is submitting responses to the comments from the Iowa Department of Natural Resources (DNR) sent by email on February 12, 2018. DNR comments are provided below in ***bold italics***, followed by our response, along with identification of replacement sections and pages.

February 12, 2018 Comment

I have reviewed the Cell FY 18 design, and in the interest of keeping things moving, I wanted to send you this email regarding the only issue identified.

On the western sideslope of the cell, it is proposed to utilize tire-derived aggregate (TDA) as the leachate drainage media. We presume that the material used will be the standard 2-inch nominal material from Liberty Tire, but we request confirmation of this and revision to the Required Result column of Table 3.2, if appropriate.

Your TDA specification allows up to 5% of the total quantity used to have bead wire that protrudes 1/2-inch or more from the cut edge of the rubber. We are primarily concerned that the 10 oz geotextile that underlies it may not provide sufficient puncture protection to the geomembrane (GM). To address this concern, we offer the following options for your consideration-

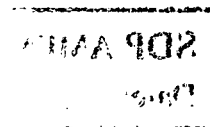
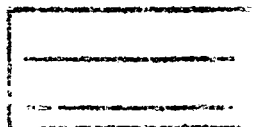
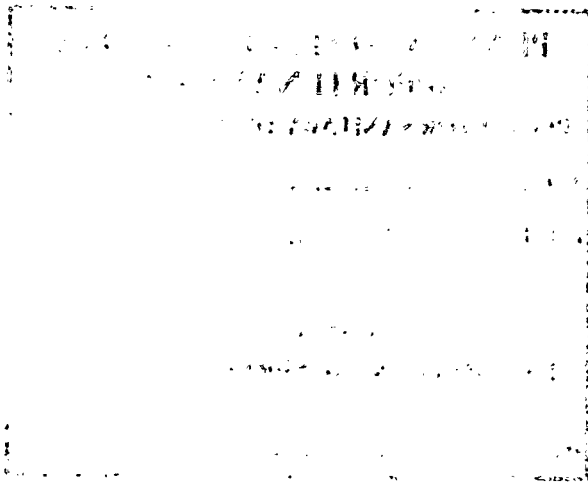
- 1. Submit stress column test results of the TDA with the specified 10oz. geotextile and GM that demonstrates sufficient protection is achieved (inspection for damage to the geotextile or point deformations/punctures of GM).***
- 2. Revise the geotextile specification to utilize a 32 oz geotextile for this application. No stress column testing is required when this weight geotextile is used because of our experience with it. (It was used in 2017 at Dubuque Metro for their new cell.)***

If you have any questions or comments, don't hesitate to call.

Mick

Revision <u>2</u>	
SDP AMENDMENT	
Date:	<u>April 2, 2018</u>

RECEIVED**FEB 23 2018**



BARKER LEMAR
ENGINEERING CONSULTANTS


We have considered the options set forth above and prefer Option 2, replacement of the current 10 oz/sy geotextile with the recommended 32 ounce (oz)/square yard (sy) geotextile. To implement this change, the following documents have been amended:

- Appendix 1.G Puncture protection. The narrative has been changed to specify a 32 oz/sy geotextile over the FML and beneath the FML. A revised page is in Attachment A; please replace pages 1 and 2 of Appendix 1.G.
- Appendix 2 Quality Control and Assurance Program. The QC&A Program was revised to specify a 32 oz/sy geotextile. Please replace pages 2-2, 2-3, 3-1, 3-2, 3-3, and 3-4 with the pages included in Attachment B.
- Appendix 5 – Plan Sheets. Specifications on the appropriate plan sheets have been revised to require 32 oz/sy geotextile beneath areas with TDA. Please replace plan sheets 5 and 6 with plan sheets in Attachment C.

If you have any questions regarding this response, please contact us at (515) 256-8814.

Sincerely,
BARKER LEMAR ENGINEERING CONSULTANTS


David G. Phillips, P.E.
Design Engineer


Dan J. Jensen, E.I.
Project Engineer

copies: Addressee
Jason Havel
Ron Knoche
Jennifer Jordan
Jason Eckrich
File
Electronic File

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ATTACHMENT A

1.G – Geomembrane Puncture Protection

When granular material is placed over a geomembrane, protection may be needed to prevent puncture of the geomembrane by the granular material. For this design, granular bedding material will be placed beneath the leachate collection pipe, which overlies the geomembrane. In addition, drainage media will be placed over the geomembrane layer; however, pursuant to 567 IAC 113.7(5)"b"(7)"1", ...a geotextile cushion over the flexible membrane liner is not required if the granular drainage media is well rounded and less than 3/8 inch in diameter."

Calculations were conducted to select the geotextile thickness required to provide protection of the geomembrane from the overlying granular material layers.

Landfilldesign.com was used to calculate the thickness of geotextile required. For the pipe bedding layer, a geotextile having a mass per unit area of 9.4 ounces per square yard (oz/sy) is required. It is likely that a standard 10 oz/sy will be placed. The output files for the calculation is included in this appendix.

Areas using tire derived aggregate (TDA) for leachate drainage media shall be underlain with a non-woven geotextile fabric meeting the requirements of 32 ounces per square yard, which will be installed directly over the FML.

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ATTACHMENT B

2. *The compacted clay component of the liner system. A minimum of five field density tests per 8-inch lift per acre shall be performed to verify that the correct density, as correlated to permeability by a laboratory analysis, has been achieved. Laboratory hydraulic conductivity testing of Shelby tube samples from the constructed soil liner or field hydraulic conductivity testing of the constructed soil liner or test pad shall be utilized as a QC&A test.*

A survey grid, which shall be furnished by the Engineer to the contractor and QC&A officer prior to commencement of construction, will be used to document vertical thickness of the compacted clay liner. Grid point spacing shall be a maximum of 100 feet. Additional grid points shall also be placed at changes in slope and/or at specific coordinate points shown on the plans. During construction, elevation readings shall be taken with survey equipment at each grid point location prior to compacted clay liner placement and then following completion of placement. The evaluations shall be compared by the QC&A officer to document thickness.

The lower component of the liner system, the compacted clay liner, shall consist of 2 feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters/second (cm/sec). The compacted soil shall be placed in lifts no thicker than 8 inches after compaction. A minimum of five field moisture density tests per 8-inch lift per acre shall be performed to verify that the correct density, as correlated to permeability by a laboratory analysis, has been achieved. For failed tests, a retest shall be conducted. If the retest fails, then the limits of the failed area shall be determined through additional density testing. The failed material shall be removed and replaced or recompacted.

Laboratory hydraulic conductivity testing of 3-inch diameter Shelby tube samples from the constructed soil liner or test pad or field hydraulic conductivity testing (sealed, double-ring infiltrometer) of the constructed soil liner or test pad shall be utilized as a QC&A test. The area to be tested shall be of sufficient size to construct the liner with the same methods used on the remainder of the project. Laboratory hydraulic conductivity tests shall be performed on at least 5 and up to 8 Shelby tube samples or one field hydraulic conductivity test shall be performed on the clay component of the liner system.

If the mean value of the laboratory hydraulic conductivity test results plus 2 standard deviations is equal to or less than the regulatory threshold hydraulic conductivity of 1×10^{-7} cm/sec., statistical significance will be demonstrated. The remaining 3 Shelby tube samples may be analyzed and the results incorporated into the statistics, if needed. The geometric mean (geomean) may be applied instead of the mean. The use of a geomean "normalizes" the number ranges being averaged, so that no range dominates the weighting. For a failed test, the representative area shall be retested. If the retest fails, then the proposed soils and/or the equipment and construction methods need to be modified. Modifications may include the use of different soil that is more suitable for construction or the use of better performing compaction equipment. Once modifications have been applied, the tested area shall be reconstructed or a new test area shall be constructed and the above process repeated.

The clay liner surface shall be smooth, free of foreign and organic material, sharp objects, or debris of any kind. These surfaces shall provide a firm, unyielding foundation without sharp changes or abrupt breaks in grades. Stones or rocks over 1 inch in the largest dimension are not allowed in the top 6 inches of the clay liner.

The liner shall be proof-rolled and inspected for soft spots and/or sharp protrusions. Unacceptable liner soil shall be removed and replaced with suitable material.

The liner must adequately slope toward the leachate collection system pipes to provide drainage of leachate. The leachate collection system, including the "V-ditch" shall have a slope greater than or equal to 2 percent and not exceeding 33 percent. Survey stakes, hubs, lath, blue tops, or other construction staking methods shall be used to confirm that the proper liner elevations have

been reached prior to placing the FML. These checks are the responsibility of the contractor with spot checks by the QC&A officer or his delegate.

2.2.3 Leachate

(2) *The leachate collection, conveyance and storage systems.*

Granular Drainage Layer

If the granular drainage material is well-rounded and less than 3/8 inch in diameter, a geotextile cushion over the FML is not required. Otherwise, a non-woven geotextile fabric meeting the requirements of 10 ounces per square yard will be installed directly over the FML. The granular drainage layer shall be at least 12 inches thick and placed above the FML or geotextile, as required.

The granular material shall have a hydraulic conductivity of at least 1×10^{-2} cm/sec and a fines content of no more than 5% passing the #200 sieve. Gradation and laboratory hydraulic conductivity tests on the granular layer shall be conducted by the contractor prior to incorporation into the project and every 3,000 tons thereafter. The same requirements apply to pipe bedding and backfill material in the cell.

A survey grid, which shall be furnished by the Engineer to the contractor and QC&A officer prior to commencement of construction, will be used to document vertical thickness of the granular drainage layer. Grid point spacing shall be a maximum of 100 feet. Additional grid points shall also be placed at changes in slope and/or at specific coordinate points shown on the plans. During construction, elevation readings shall be taken with survey equipment at each grid point location prior to drainage layer placement and then following completion of placement. The evaluations shall be compared by the QC&A officer to document thickness. As an option to the survey grid requirement, the granular drainage layer thickness may be measured directly.

In lieu of sand for the leachate drainage media, tire derived aggregate (TDA) will be used along the western sideslope and possibly over the entire cell. The TDA material shall have a hydraulic conductivity of at least 1×10^{-2} cm/sec; laboratory hydraulic conductivity tests on the granular layer shall be conducted by the contractor prior to incorporation into the project and every 3,000 tons thereafter. Areas using TDA for leachate drainage media shall be underlain with a non-woven geotextile fabric meeting the requirements of 32 ounces per square yard, which will be installed directly over the FML. The following procedures will be implemented for use of TDA:

- A 5-gallon sample of TDA will be collected by the owner or QC&A representative from the first truckload of TDA. The sample will be sorted and the TDA will bead wire will be separated to determine compliance with TDA specifications.
- The owner or QC&A representative will visually observe the TDA loads and make notes if any observations. If the TDA appears to exceed the specifications for bead wire or does not appear similar to the representative 5-gallon sample, the load will be isolated and not used in the leachate drainage media until further testing.
- Initially, one-gallon samples will be collected from each 100 tons of TDA received. The TDA will be separated and tested for bead wire. If after testing the first 500 tons of TDA and finding that the material complies with the specifications, the testing frequency will be reduced to 1 gallon for every 500 tons.
- Any TDA that is found to exceed the specifications and has more than 5% with bead wire exceeding ½-inch in length from the edge of the rubber, will not be used in the leachate drainage layer. These loads will either be rejected and returned to the supplier, or maintained on site for other uses.

Section 3.0 Testing Summary

Section 3.0 provides a summary of the recommended test methods, frequencies, and required results for the materials (soils, aggregates, and FML) that will be incorporated into the project. This does not include testing of manufactured materials, with the exception of field testing of FML. These recommendations may be modified at the discretion of the QC&A Officer.

3.1 Table 3.1 – Soils and Aggregates Laboratory Testing Methods

Table 3.1 provides the ASTM test methods to be performed on the soils and aggregates that are incorporated into the project.

**Table 3.1
Soils and Aggregates Laboratory Testing Methods**

Test	ID	Standard Number
Moisture/Density (Proctor)	A	ASTM D698
Permeability Hydraulic Conductivity	B	ASTM D2434 ASTM D5084
Atterberg Limits	C	ASTM D4318
Grain Size Sieve Analysis Grain Size Hydrometer Analysis	D	ASTM D6913 ASTM D422
USCS Soil Classification	E	ASTM D2487
Nuclear Density/Moisture Content	F	ASTM D6938

3.2 Table 3.2 – Soils and Aggregates Testing Frequency and Required Results

Table 3.2, on the following page, provides the minimum frequencies and required results of tests required for the soils and aggregates incorporated into the project. The tests are labeled in accordance with the “ID” provided in Table 3.1 above. In Table 3.2, “Source” refers to initial testing required before construction begins. “Ongoing” refers to testing during and after construction.

Table 3.2
Soils and Aggregates Testing Frequency and Required Results

QC&A Testing Program		ID ⁽¹⁾						Frequency	Required Result
		A	B	C	D	E	F		
Subgrade/Grading Layer	Source	X			X			A) 1/soil type D) 1/soil type	A) N/A D) ≤ 3" diameter soil particles
Clay Liner	Source	X	X	X	X	X		A) 1/soil type B) 1/soil type C) 1/soil type D) 1/soil type E) 1/soil type	A) N/A B) ≤ 1X10 ⁻⁷ cm/sec C) PI < 30 D) N/A E) SC, CL, and CH
			X				X	B) 5-8 Shelby tubes post-construction F) 5/acre/lift	B) ≤ 1X10 ⁻⁷ cm/sec ⁽²⁾ F) > 95% of maximum dry density, moisture 0-3% above optimum
			X		X			B) 1/soil type D) 1/soil type	B) ≥ 1X10 ⁻³ cm/sec D) ≤ 5% passing #200 sieve, maximum diameter < 3/8" ⁽³⁾
			X		X			B) 1/3,000 tons D) 1/3,000 tons	B) ≥ 1X10 ⁻³ cm/sec D) ≤ 5% passing #200 sieve, maximum diameter < 3/8" ⁽³⁾
			X		X			B) 1/soil type D) 1/soil type	B) ≤ 1X10 ⁻² cm/sec D) ≤ 5% passing #200 sieve, maximum diameter < 3/8" ⁽³⁾
Sand Leachate Drainage Layer	Source		X		X			B) 1/soil type D) 1/soil type	B) ≤ 1X10 ⁻² cm/sec D) ≤ 5% passing #200 sieve, maximum diameter < 3/8" ⁽³⁾
			X		X			B) 1/3,000 tons D) 1/3,000 tons	B) ≥ 1X10 ⁻² cm/sec D) ≤ 5% passing #200 sieve, maximum diameter < 3/8" ⁽³⁾
	Ongoing		X		X			B) 1/soil type D) 1/soil type	B) ≥ 1X10 ⁻² cm/sec See Note 4 below.
			X		X			B) 1/3,000 tons D) 1/3,000 tons	B) ≥ 1X10 ⁻² cm/sec D) ≤ 5% passing #200 sieve, maximum diameter ≤ 1½" ⁽³⁾
Pipe Bedding and Backfill	Source		X		X			B) 1/soil type D) 1/soil type	B) ≥ 1X10 ⁻² cm/sec D) ≤ 5% passing #200 sieve, maximum diameter ≤ 1½" ⁽³⁾
			X		X			B) 1/3,000 tons D) 1/3,000 tons	B) ≥ 1X10 ⁻² cm/sec D) ≤ 5% passing #200 sieve, maximum diameter ≤ 1½" ⁽³⁾
	Ongoing		X		X			B) 1/soil type D) 1/soil type	B) ≥ 1X10 ⁻² cm/sec See Note 4 below.
			X		X			B) 1/3,000 tons D) 1/3,000 tons	B) ≥ 1X10 ⁻² cm/sec D) ≤ 5% passing #200 sieve, maximum diameter ≤ 1½" ⁽³⁾

Notes:

- 1) A – Moisture/Density (Proctor)
- B – Permeability/Hydraulic Conductivity
- C – Atterberg Limits
- D – Grain Size Sieve Analysis/Grain Size Hydrometer Analysis (Gradation)
- E – USCS Soil Classification

- F – Nuclear Density/Moisture Content
- 2) Mean of the hydraulic conductivities plus 2 standard deviations less than 1×10^{-7} cm/sec.
 - 3) Maximum diameter of 3/8" or greater requires geotextile cushion over FML.
 - 4) TDA shall be standard nominal 2-inch material from Liberty Tire in Des Moines, Iowa. The TDA layer shall be underlain with a 32 oz/sy non-woven geotextile, which shall be placed directly over the FML.

3.3 Table 3.3 – FML Seam Destructive Testing

Table 3.3 provides parameters for destructive seam tests required for the FML utilized for construction of the liner. Testing will be performed on samples taken from the materials during construction of the liner.

Table 3.3
FML Seam Destructive Testing

Property ⁽¹⁾	Field Sample Size	Minimum Test Frequency	Required Result
Shear Strength, Elongation	(5) Samples: 1" along seam, 6" wide	1/500 feet for each welding type	4 of 5 samples meet or exceed GRI GM19 requirements
Peel Strength, Separation	(5) Samples: 1" along seam, 6" wide	1/500 feet for each welding type	4 of 5 samples meet or exceed GRI GM19 requirements

Notes:

- 1) Shear elongation and peel separation performed on same samples as shear strength and peel strength, respectively.

3.4 Table 3.4 – FML Seam Non-Destructive Testing

Table 3.4 provides parameters for non-destructive seam tests required for the FML utilized for construction of the liner. Testing will be performed in-situ during construction of the liner.

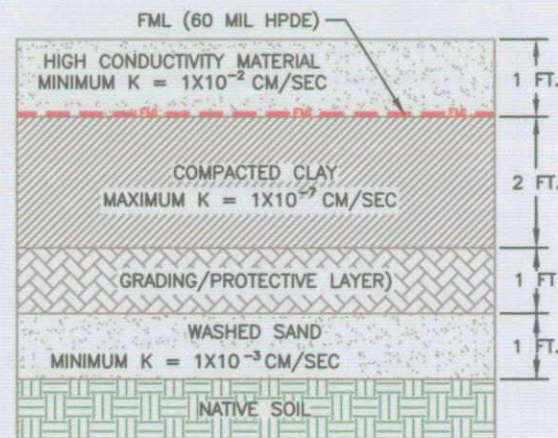
Table 3.4
FML Seam Non-Destructive Testing

Test Method	Field Sample Size	Minimum Test Frequency	Required Result
Air Pressure	N/A	All double-fusion welded seams tested by air pressure	Drop in psi meets GRI Test Method GM6 requirements
Vacuum Test	N/A	All single-track welded seams tested by vacuum	Maintain vacuum for minimum of 10 seconds, no visible bubbles form within viewing port in accordance with ASTM D5641

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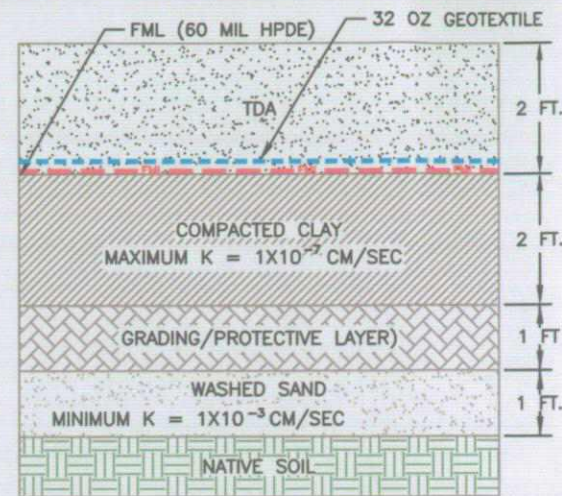
ATTACHMENT C



NOTE:

- 1) THE HIGH CONDUCTIVITY MATERIAL SHALL HAVE FINES CONTENT NO MORE THAN 5% PASSING #200 SIEVE.

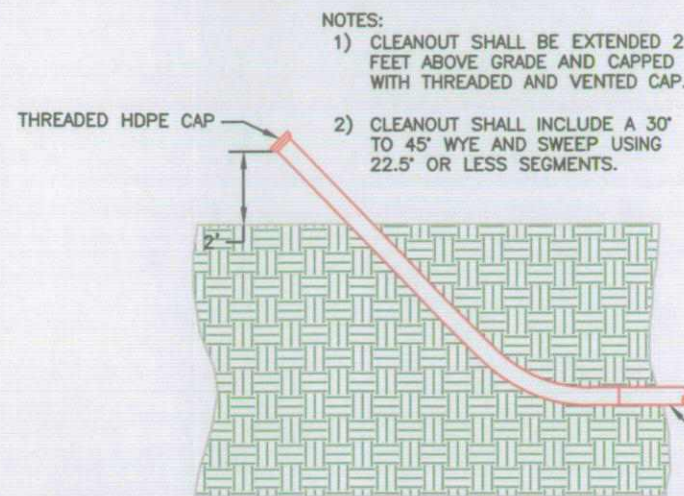
1
5 **BASAL LINER AND LEACHATE COLLECTION DETAIL**
NOT TO SCALE



NOTE:

- 1) 32 OZ GEOTEXTILE ONLY OVER TDA AREA

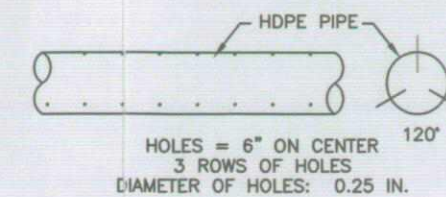
2
5 **WEST SIDE SLOPE (TDA)**
NOT TO SCALE



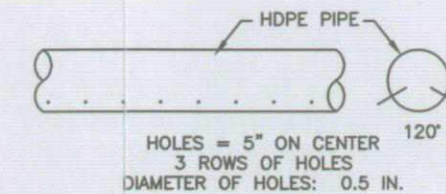
NOTES:

- 1) CLEANOUT SHALL BE EXTENDED 2 FEET ABOVE GRADE AND CAPPED WITH THREADED AND VENTED CAP.
- 2) CLEANOUT SHALL INCLUDE A 30° TO 45° WYE AND SWEEP USING 22.5° OR LESS SEGMENTS.

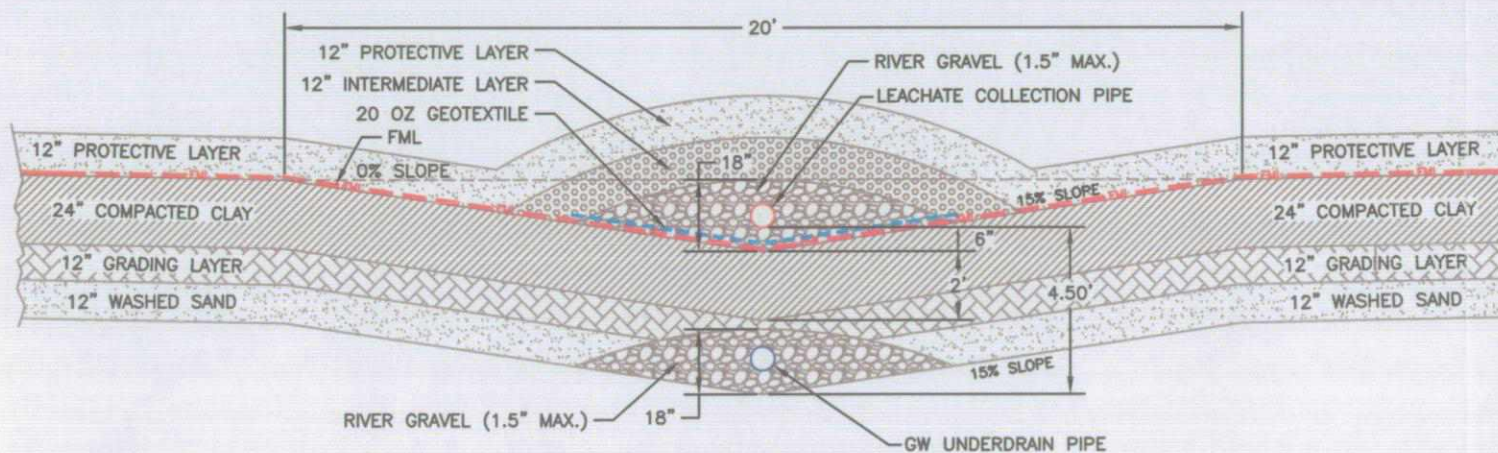
3
5 **TYPICAL CLEANOUT**
NOT TO SCALE



4
5 **PERFORATED PIPE DETAIL**
GROUNDWATER DRAINAGE PIPE)
NOT TO SCALE



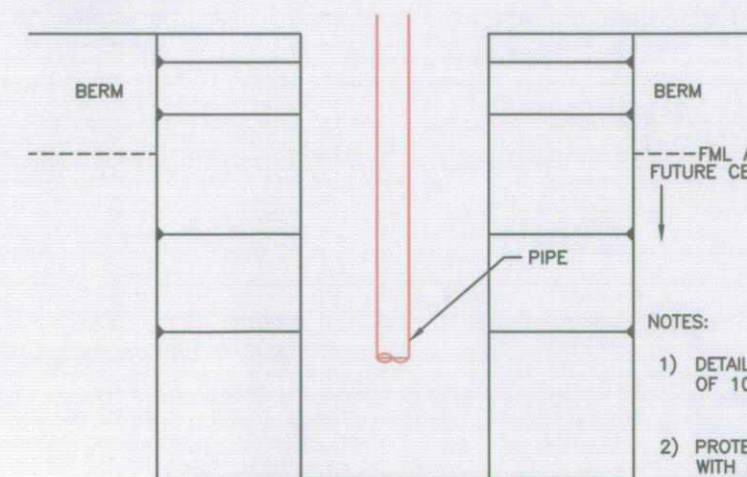
5
5 **PERFORATED PIPE DETAIL**
LEACHATE DRAINAGE PIPE)
NOT TO SCALE



NOTES:

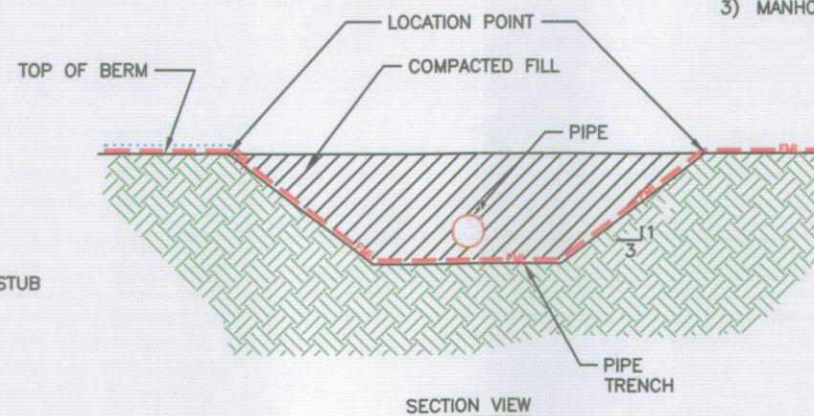
- 1) GEOTEXTILE FABRIC BENEATH RIVER GRAVEL PIPE BEDDING IS TO BE 20 OZ/SY OR 2 X 10 OZ/SY.
- 2) SEE PHASING DETAILS ON SHEETS 6 AND 7 FOR ANCHOR TRENCH.

6
5 **LEACHATE COLLECTION TRENCH DETAIL**
NOT TO SCALE

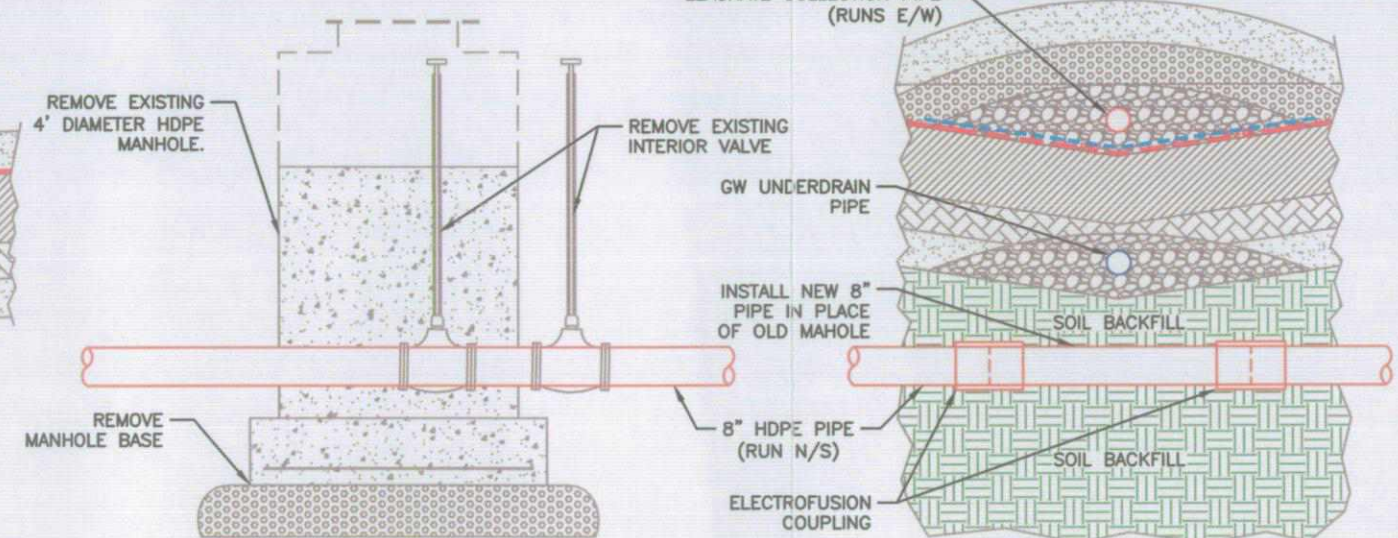


PLAN VIEW

8
5 **LEACHATE PIPE STUB DETAIL**
NOT TO SCALE



SECTION VIEW



NOTES:

- 1) CONTRACTOR SHALL COMPLETELY REMOVE MANHOLE AND CONNECT PIPING WITH NEW PIPE USING FUSED OR MECHANICAL JOINTS.
- 2) ALTERNATIVE JOINTING METHODS MAY BE PROPOSED AND SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL PRIOR TO INSTALLATION.
- 3) MANHOLES ARE APPROXIMATELY 20 TO 30 FEET DEEP.

7
5 **EXISTING LEACHATE MANHOLE CUT-OFF DETAIL**
NOT TO SCALE

GENERAL NOTES:

- 1) END SEALS FOR CLEANOUT SHALL INCLUDE THREADED VENTED CAP UNLESS OTHERWISE NOTED.
- 2) VALVES, CLEANOUTS, AND MEASUREMENT DEVICES SHALL BE IDENTIFIED WITH BRASS OR ALUMINUM TAGS, WHICH SHALL BE Banded OR CLAMPED TO THE VALVE STEM EXTENSION OR PIPING.
- 3) MARKERS ARE TO BE PLACED ON A MINIMUM OF 3 SIDES OF STICKUPS (CLEANOUTS, MEASUREMENT DEVICES, AND VALVES). A MARKER SHALL BE A "T" STEEL FENCE POST WITH A PLASTIC FLUORESCENT ORANGE SLEEVE.

BARKERLEMAR

ENGINEERING CONSULTANTS

1801 Industrial Circle - West Des Moines, Iowa - 50265

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IOWA CITY LANDFILL AND RECYCLING CENTER

IOWA CITY, IOWA

PROJECT NO. IACLF 17007

DRAWING DATE: JANUARY 2018

**LINER & LEACHATE
COLLECTION SYSTEM
DETAILS**

SHEET

5

REVISION: DATE: 2/13/2018

DESCRIPTION: REVISED DETAIL 2/5

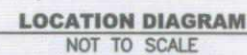


- GROUNDWATER UNDERDRAIN
COLLECTION HEADER

NOT TO SCALE



NOT TO SCALE



NOT TO SCALE

