

Construction Certification for Cell 1 of the Lateral Expansion of the Leland Olds Station Coal Combustion Residual (CCR) Landfill

Leland Olds Station Landfill
Stanton, North Dakota

AECOM Project number: 60545172
December 22, 2017

Prepared for:

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1. Introduction

1.1 §257.70 Citation of Relevant Design Criteria and Construction Certification

(a)(1) New CCR landfills and any lateral expansion of a CCR landfill must be designed, constructed, operated, and maintained with either a composite liner that meets the requirements of paragraph (b) of this section or an alternative composite liner that meets the requirements in paragraph (c) of this section, and a leachate collection and removal system that meets the requirements of paragraph (d) of this section. (2) Prior to construction of an overfill the underlying surface impoundment must meet the requirements of § 257.102(d).

(b) A composite liner must consist of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner (GM), and the lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec). GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. The GM or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component. The composite liner must be: (1) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation; (2) Constructed of materials that provide appropriate shear resistance of the upper and lower component interface to prevent sliding of the upper component including on slopes; (3) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and (4) Installed to cover all surrounding earth likely to be in contact with the CCR or leachate.

(d) The leachate collection and removal system must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and postclosure care period. The leachate collection and removal system must be: (1) Designed and operated to maintain less than a 30-centimeter depth of leachate over the composite liner or alternative composite liner; (2) Constructed of materials that are chemically resistant to the CCR and any non-CCR waste managed in the CCR unit and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste, waste cover materials, and equipment used at the CCR unit; and (3) Designed and operated to minimize clogging during the active life and post-closure care period.

(e) Prior to construction of the CCR landfill or any lateral expansion of a CCR landfill, the owner or operator must obtain a certification from a qualified professional engineer that the design of the composite liner (or, if applicable, alternative composite liner) and the leachate collection and removal system meets the requirements of this section.

(f) Upon completion of construction of the CCR landfill or any lateral expansion of a CCR landfill, the owner or operator must obtain a certification from a qualified professional engineer that the composite liner (or, if applicable, alternative composite liner) and the leachate collection and removal system has been constructed in accordance with the requirements of this section.

1.2 Summary of Construction Certification

This Design Criteria Certification for the lateral expansion at the Basin Electric Power Cooperative Leland Olds Station (LOS) Landfill was completed in accordance with the requirements specified in 40 Code of Federal Regulations (CFR) § 257.70 (USEPA, 2015), which states the CCR Rule requirements for design criteria for new CCR landfills and any lateral expansion of a CCR landfill. The Design Criteria Certification has been posted per the requirements of 40 CFR § 257.70(g).

The following pages provide certification of construction as it relates to 40 CFR § 257.70(f) for Cell 1 of the lateral expansion at the LOS Landfill. For this certification, relevant record drawings are included in Appendix A. Additional documentation of the construction has been provided to the North Dakota Department of Health (AECOM, 2017a).

2. Design Criteria for Composite Liner

2.1 §257.70(b) Citation

A composite liner must consist of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner (GM), and the lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec). GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. The GM or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component. The composite liner must be: (1) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation; (2) Constructed of materials that provide appropriate shear resistance of the upper and lower component interface to prevent sliding of the upper component including on slopes; (3) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and (4) Installed to cover all surrounding earth likely to be in contact with the CCR or leachate.

2.2 §257.70(b): Two Components of Composite Liner

The composite liner specified in the design documents consists of an upper component consisting of a 60-mil high density polyethylene geomembrane liner and a lower component consisting of a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec) (see Appendix A). All permeability testing conducted on the clay liner material during the construction period showed hydraulic conductivity results that met or exceeded the design criteria (AECOM, 2017a).

2.3 §257.70(b)(1): Chemical Properties, Strength, and Thickness of Materials

The composite liner materials specified in the design documents and installed during construction have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation. Geosynthetic clay liner (GCL) was not used.

2.4 §257.70(b)(2): Shear Resistance

The composite liner materials specified in the design documents provide appropriate shear resistance of the upper and lower component interface to prevent sliding of the upper component including on slopes. Shear strength testing of the soil-geosynthetic interface was conducted on field samples of the geosynthetic liner and the clay soils in order to confirm that the soil-geosynthetic interface relationship observed in these materials meets or exceeds the as-designed shear resistance.

2.5 §257.70(b)(3): Foundation or Base for Composite Liner

The base for the composite liner system specified in the design documents is capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift (see Appendix A). Site conditions encountered during construction activities reflected those conditions identified during the geotechnical investigation and used in the analyses for the site characterization (AECOM, 2017b).

2.6 §257.70(b)(4): Limits of Composite Liner

The design limits of the composite liner specified in the design documents cover all surrounding earth likely to be in contact with the CCR or leachate (see Appendix A). No deviations from the design limits of the composite liner were made during construction.

3. Design Criteria for Leachate Collection System

3.1 §257.70(d) Citation

(d) The leachate collection and removal system must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and post-closure care period. The leachate collection and removal system must be: (1) Designed and operated to maintain less than a 30-centimeter depth of leachate over the composite liner or alternative composite liner; (2) Constructed of materials that are chemically resistant to the CCR and any non-CCR waste managed in the CCR unit and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste, waste cover materials, and equipment used at the CCR unit; and (3) Designed and operated to minimize clogging during the active life and post-closure care period.

3.2 §257.70(d): Active Life and Post-Closure Care Period

No deviations from the design were made during construction of the leachate collection and removal system. The leachate collection system was designed and constructed to collect and remove leachate from the landfill during the active life and post-closure care period (see Appendix A).

3.3 §257.70(d)(1): Maximum Depth of Leachate

The leachate collection system specified in the design documents was designed to maintain less than a 30-centimeter depth of leachate over the composite liner (AECOM, 2017c). No deviations to the design were made during construction.

3.4 §257.70(d)(2): Chemical Properties, Strength, and Thickness of Materials

The design documents specify materials for the leachate collection system that are chemically resistant to the CCR and any non-CCR waste managed in the CCR unit and the leachate expected to be generated and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste, waste cover materials, and equipment used at the CCR unit (see Appendix A). No deviations to the design were made during construction.

3.5 §257.70(d)(3): Minimize Clogging

The leachate collection system specified in the design documents was designed to minimize clogging during the active life and post-closure care period. Hydraulic conductivity ratio (HCR) testing was conducted on samples of CCR from the station over samples of the aggregate and bottom ash being used in the leachate collection system to confirm that no clogging issues related to chemistry or relative particle size are anticipated. GSE CoalTex Geotextile was specified to serve as the separation layer between the drainage layer and waste material, and this geotextile is specifically designed for this application.

4. Certification

4.1 §257.70(f) Citation

(f) Upon completion of construction of the CCR landfill or any lateral expansion of a CCR landfill, the owner or operator must obtain a certification from a qualified professional engineer that the composite liner (or, if applicable, alternative composite liner) and the leachate collection and removal system has been constructed in accordance with the requirements of this section.

4.2 Certification

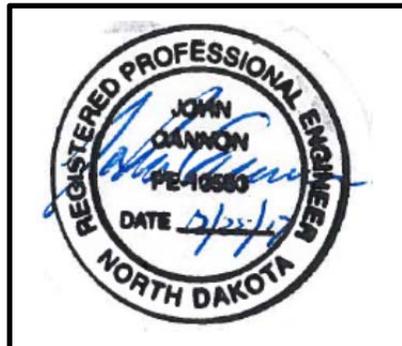
Certification Statement 40 CFR § 257.70(f) – Construction of the Composite Liner and the Leachate Collection and Removal System for the Lateral Expansion of a CCR Landfill.

CCR Unit: Basin Electric Power Cooperative; Leland Olds Station; Ash Landfill Expansion

I, John Cannon, being a Registered Professional Engineer in good standing in the State of North Dakota, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the construction of the composite liner and the leachate collection and removal system is in accordance with the requirements of 40 CFR § 257.70.

John Cannon
Printed Name

December 22, 2017
Date



5. Limitations

Existing permits, recent topographic information, land survey information, as-built drawings from previously constructed landfill cells, and as-built survey information for Cell 1 have been furnished to AECOM by Basin Electric Power Cooperative or its subcontractors, which AECOM has used in preparing the design and construction record documents. AECOM has relied on this information as furnished. The design basis and documents are based on AECOM's understanding of current plant operations, maintenance, storm water handling, and ash handling procedures at the landfill, as provided by Basin Electric Power Cooperative. Changes in any of these operations or procedures may result in deviation from the intended design and operation of the landfill expansion.

The design is based on established engineering principles. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

6. References

U.S. Environmental Protection Agency. (USEPA, 2015). *Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments*, 40 CFR §257. Federal Register, Volume 80, Subpart D, April 17, 2015.

AECOM (2017a). *Cell 1 Construction Certification Report*. December 22, 2017.

AECOM (2017b). *Supplemental Site Characterization Report – Ash Landfill Expansion, Leland Olds Station*. March 23, 2017.

AECOM (2017c). *Engineering Report – Ash Landfill Expansion, Leland Olds Station*. March 23, 2017.

Appendix A Record Drawings

LELAND OLDS STATION ASH LANDFILL CONSTRUCTION CERTIFICATION REPORT CELL 1/LEACHATE POND LINER

BASIN ELECTRIC POWER COOPERATIVE
MERCER COUNTY, NORTH DAKOTA

DECEMBER 2017

INDEX OF DRAWINGS

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5	C-4	CELL 1A LEACHATE COLLECTION SYSTEM
6	C-5	CELL 1 B LEACHATE COLLECTION SYSTEM
7	C-6	LEACHATE POND LEACHATE MANAGEMENT SYSTEM
8	D-1	LINER DETAILS
9	D-2	LEACHATE COLLECTION SYSTEM DETAILS
10	D-3	LEACHATE COLLECTION SYSTEM DETAILS
11	D-4	LEACHATE COLLECTION SYSTEM DETAILS

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POWER
COOPERATIVE

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STATE MAP
NTS



PROJECT LOCATION
NTS

CONSTRUCTION CERTIFICATION REPORT
CELL 1/LEACHATE POND LINER

PROJECT NUMBER
60545172

SHEET NUMBER
G-1

COVER SHEET

LEGEND

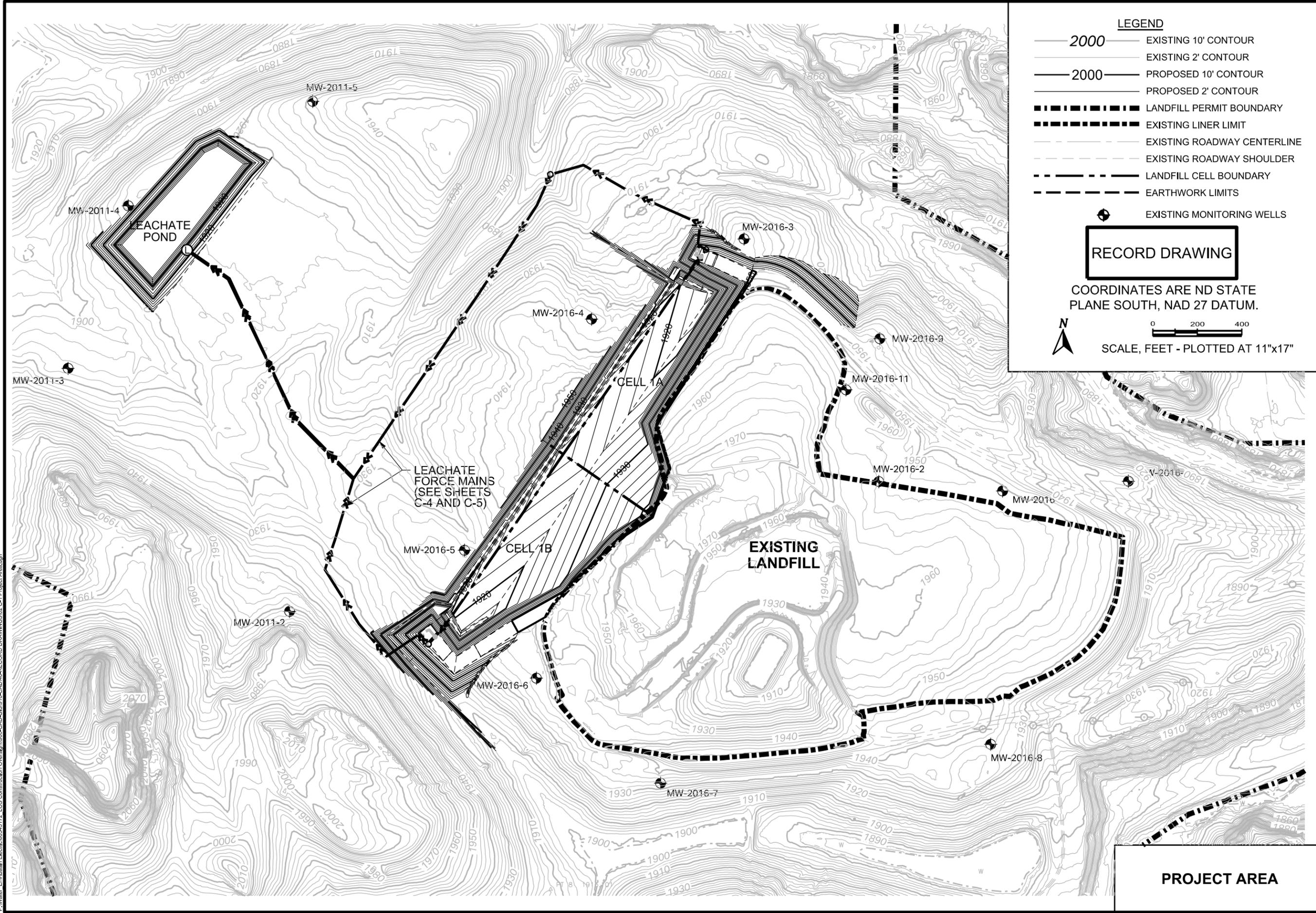
- 2000 — EXISTING 10' CONTOUR
- 2' CONTOUR — EXISTING 2' CONTOUR
- 2000 — PROPOSED 10' CONTOUR
- 2' CONTOUR — PROPOSED 2' CONTOUR
- ▬▬▬▬▬▬ LANDFILL PERMIT BOUNDARY
- ▬▬▬▬▬▬ EXISTING LINER LIMIT
- — — — — EXISTING ROADWAY CENTERLINE
- — — — — EXISTING ROADWAY SHOULDER
- - - - - LANDFILL CELL BOUNDARY
- - - - - EARTHWORK LIMITS
- EXISTING MONITORING WELLS

RECORD DRAWING

COORDINATES ARE ND STATE
PLANE SOUTH, NAD 27 DATUM.

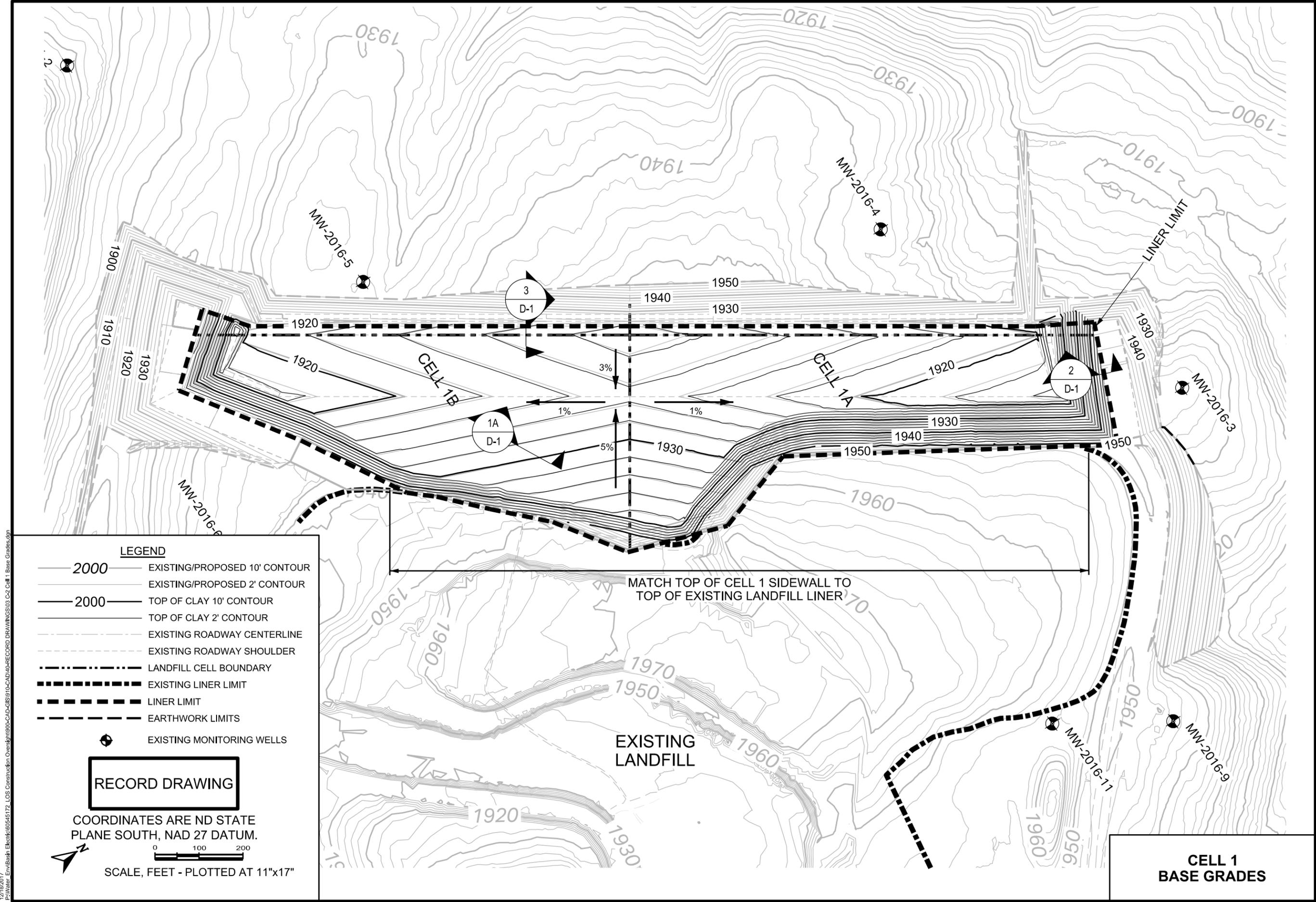


SCALE, FEET - PLOTTED AT 11"x17"



12/18/2017 P:\Water_Env\Basin_Electric\60545172_LoS_Construction_Oversight\900-CAD-CLIS\910-CAD-4D-RECORD_DRAWINGS\02 C-1 Project Area.dgn

PROJECT AREA



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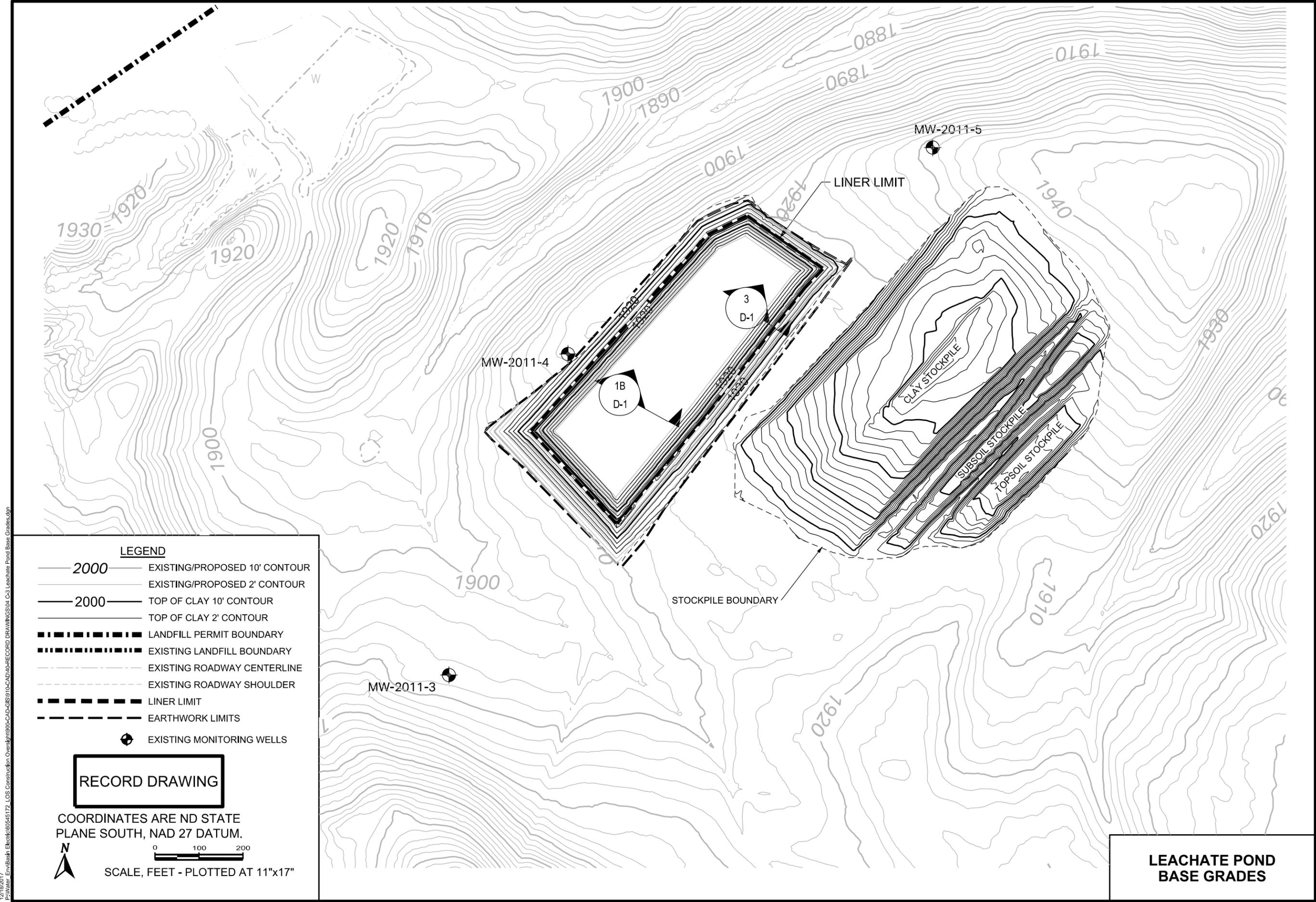
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- 2000 — EXISTING/PROPOSED 2' CONTOUR
- 2000 — TOP OF CLAY 10' CONTOUR
- 2000 — TOP OF CLAY 2' CONTOUR
- - - - - EXISTING ROADWAY CENTERLINE
- - - - - EXISTING ROADWAY SHOULDER
- - - - - LANDFILL CELL BOUNDARY
- - - - - EXISTING LINER LIMIT
- - - - - LINER LIMIT
- - - - - EARTHWORK LIMITS
- EXISTING MONITORING WELLS

RECORD DRAWING

COORDINATES ARE ND STATE
PLANE SOUTH, NAD 27 DATUM.

SCALE, FEET - PLOTTED AT 11"x17"

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LEGEND

- 2000 — EXISTING/PROPOSED 10' CONTOUR
- 2000 — EXISTING/PROPOSED 2' CONTOUR
- 2000 — TOP OF CLAY 10' CONTOUR
- 2000 — TOP OF CLAY 2' CONTOUR
- — LANDFILL PERMIT BOUNDARY
- — EXISTING LANDFILL BOUNDARY
- — EXISTING ROADWAY CENTERLINE
- — EXISTING ROADWAY SHOULDER
- — LINER LIMIT
- — EARTHWORK LIMITS
- EXISTING MONITORING WELLS

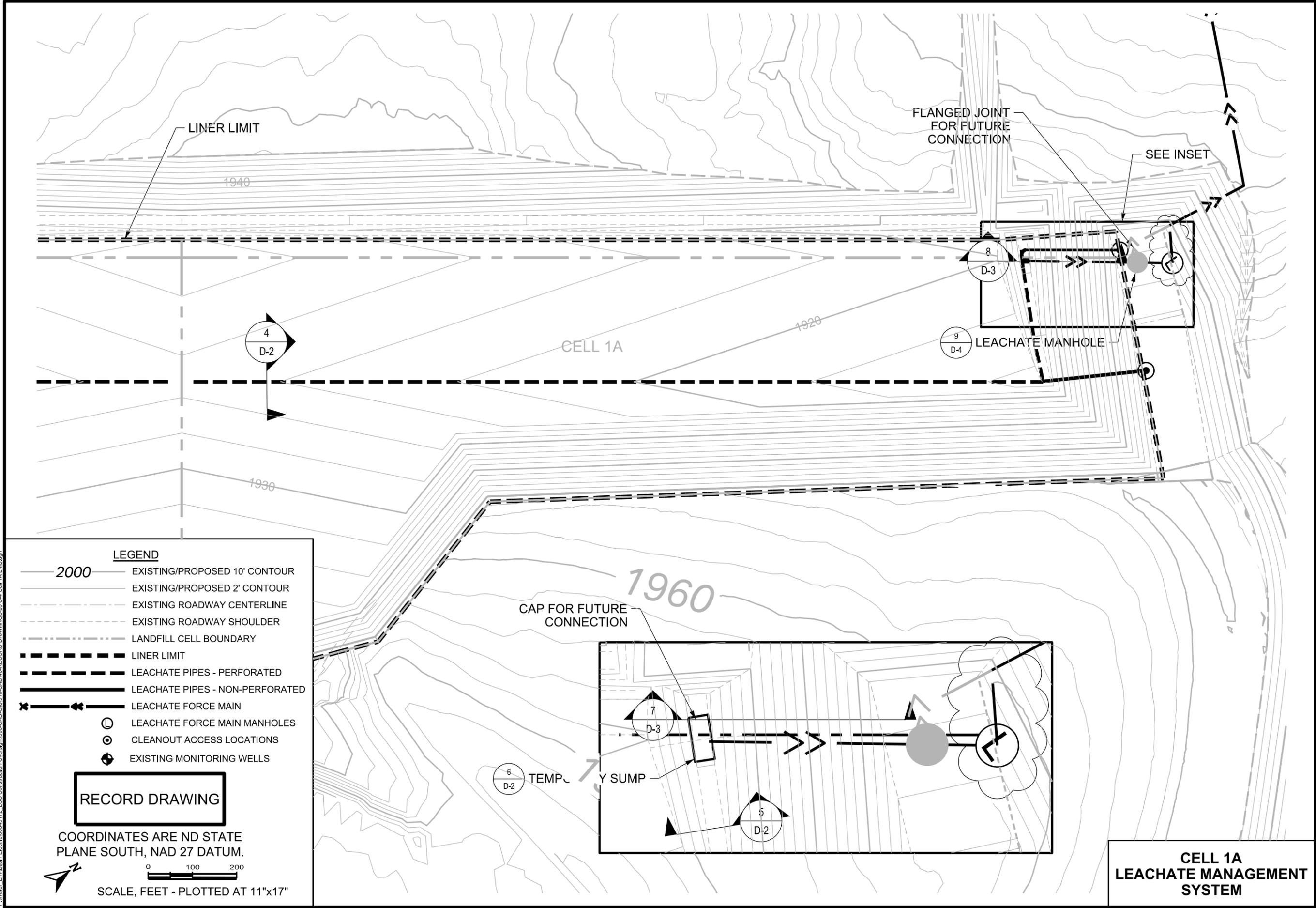
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PLANE SOUTH, NAD 27 DATUM.



**LEACHATE POND
BASE GRADES**

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LEGEND

- 2000 — EXISTING/PROPOSED 10' CONTOUR
- — EXISTING/PROPOSED 2' CONTOUR
- - - - EXISTING ROADWAY CENTERLINE
- - - - EXISTING ROADWAY SHOULDER
- - - - LANDFILL CELL BOUNDARY
- - - - LINER LIMIT
- - - - LEACHATE PIPES - PERFORATED
- - - - LEACHATE PIPES - NON-PERFORATED
- > LEACHATE FORCE MAIN
- ⊙ LEACHATE FORCE MAIN MANHOLES
- ⊙ CLEANOUT ACCESS LOCATIONS
- ⊙ EXISTING MONITORING WELLS

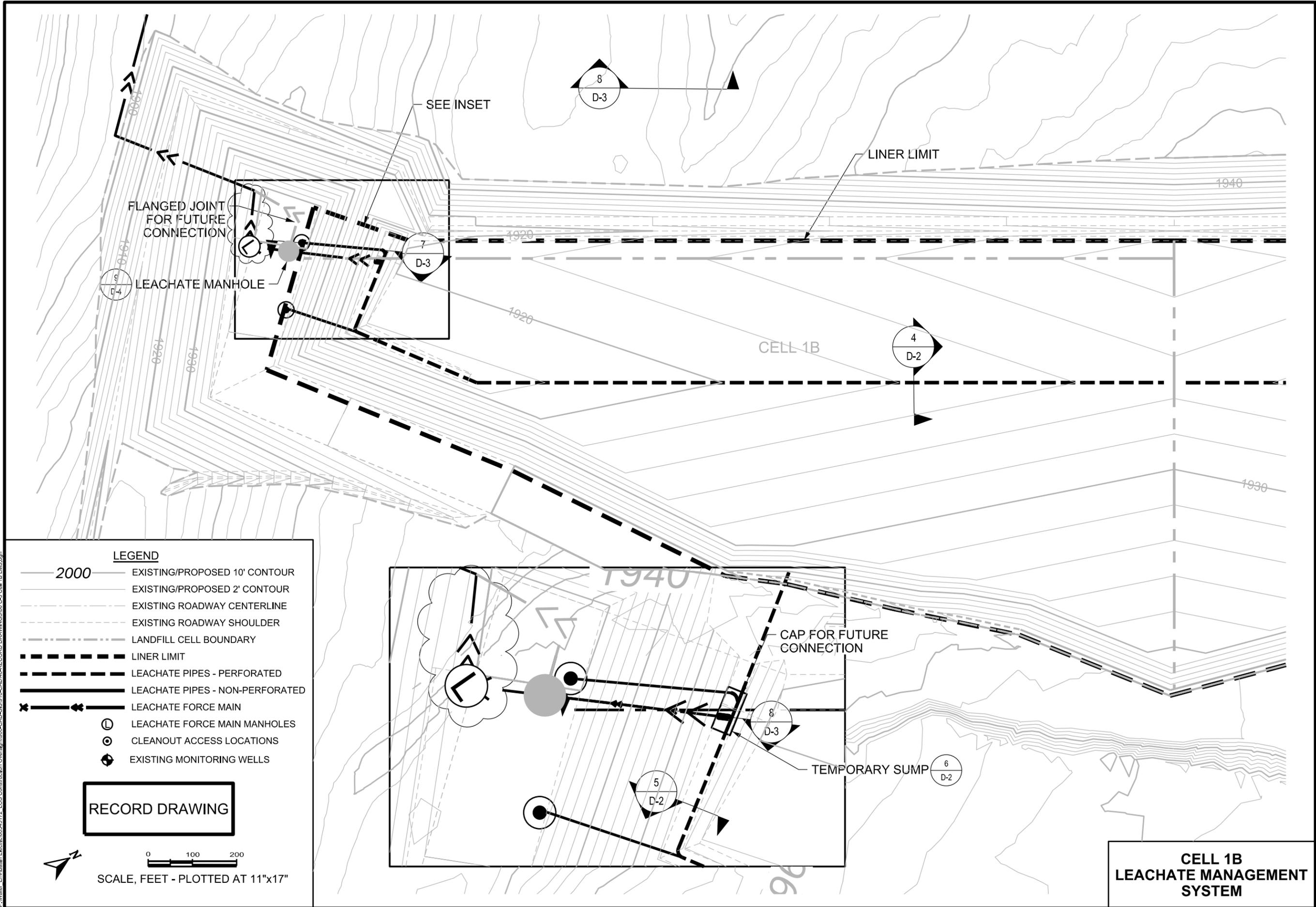
RECORD DRAWING

COORDINATES ARE ND STATE
PLANE SOUTH, NAD 27 DATUM.



**CELL 1A
LEACHATE MANAGEMENT
SYSTEM**

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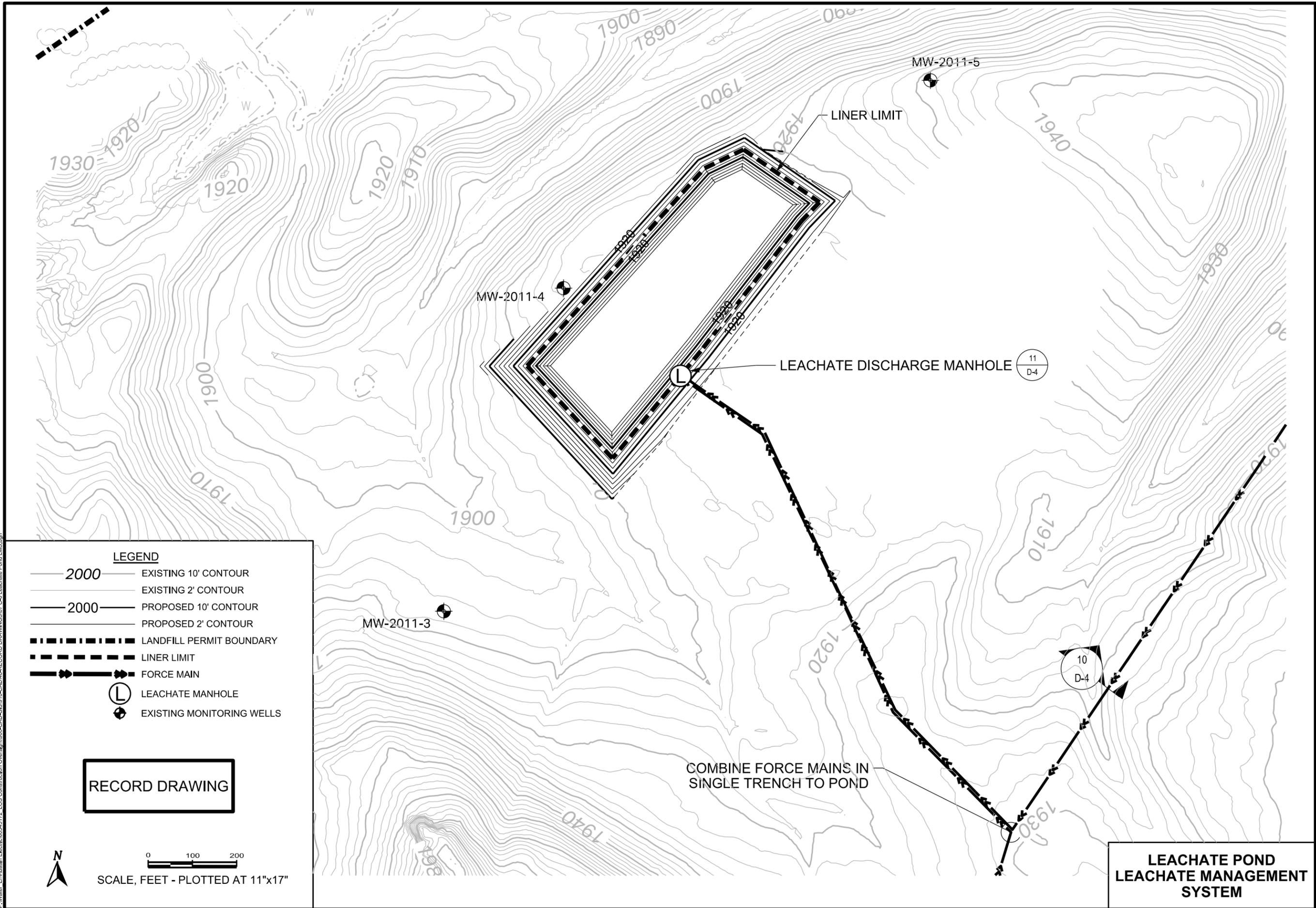


- LEGEND**
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 - — EXISTING/PROPOSED 2' CONTOUR
 - - - - EXISTING ROADWAY CENTERLINE
 - - - - EXISTING ROADWAY SHOULDER
 - - - - LANDFILL CELL BOUNDARY
 - - - - LINER LIMIT
 - - - - LEACHATE PIPES - PERFORATED
 - — LEACHATE PIPES - NON-PERFORATED
 - > LEACHATE FORCE MAIN
 - ⊙ LEACHATE FORCE MAIN MANHOLES
 - ⊙ CLEANOUT ACCESS LOCATIONS
 - ⊙ EXISTING MONITORING WELLS

RECORD DRAWING

SCALE, FEET - PLOTTED AT 11"x17"

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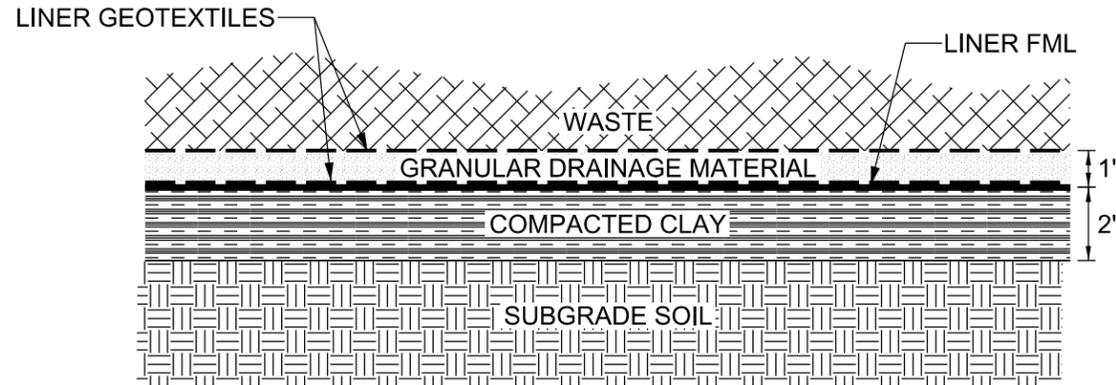
- 2000 — EXISTING 10' CONTOUR
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- 2000 — PROPOSED 10' CONTOUR
- 2000 — PROPOSED 2' CONTOUR
- LANDFILL PERMIT BOUNDARY
- LINER LIMIT
- FORCE MAIN
- ⊕ LEACHATE MANHOLE
- ⊕ EXISTING MONITORING WELLS

RECORD DRAWING



**LEACHATE POND
LEACHATE MANAGEMENT
SYSTEM**

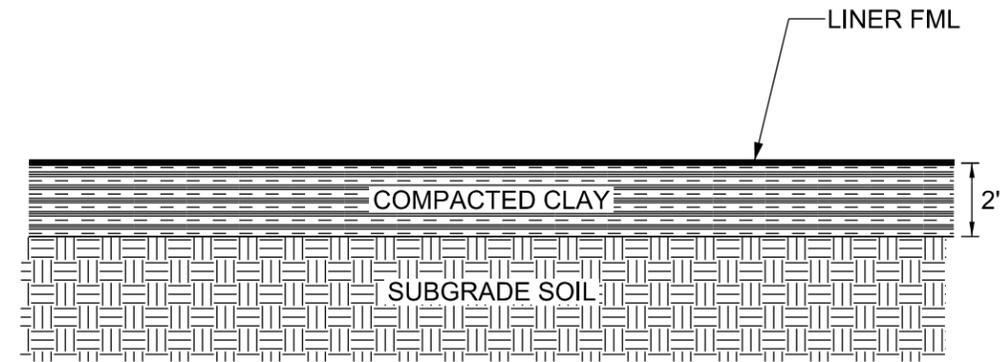
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1A BASE LINER SECTION
C-2.0 NOT TO SCALE

NOTES:

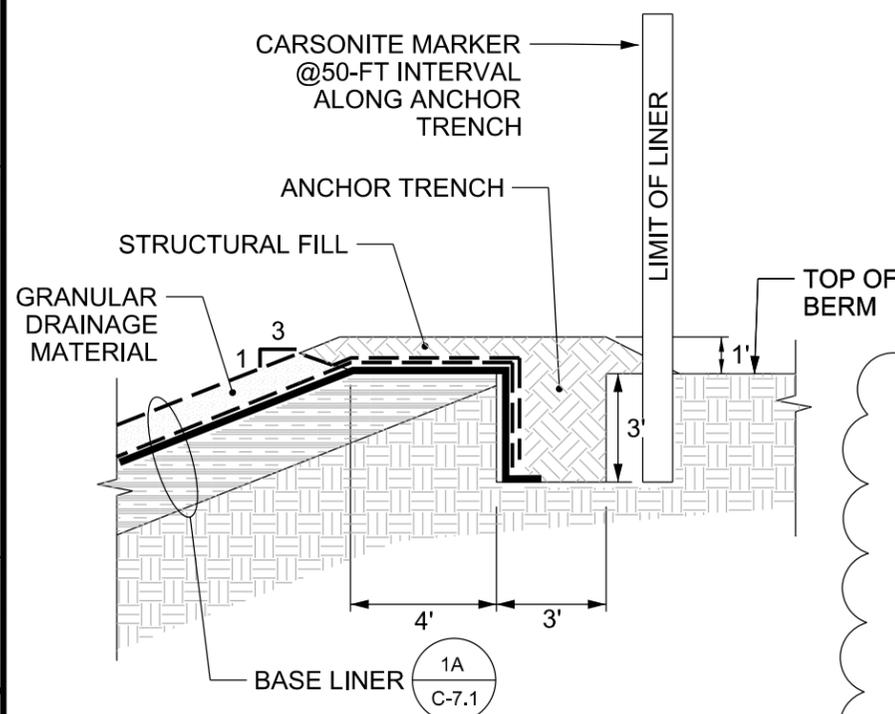
1. LINER FML TO BE TEXTURED 60-MIL HIGH DENSITY POLYETHYLENE (HDPE).
2. CLAY TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY, MAX. PERMEABILITY = 1.0×10^{-7} CM/SEC.
3. GRANULAR DRAINAGE MATERIAL TO BE UNIT 2 BOTTOM ASH, MIN. PERMEABILITY = 1.0×10^{-3} CM/SEC.
4. LINER GEOTEXTILES TO BE 8 OZ. NON-WOVEN POLYETHYLENE.



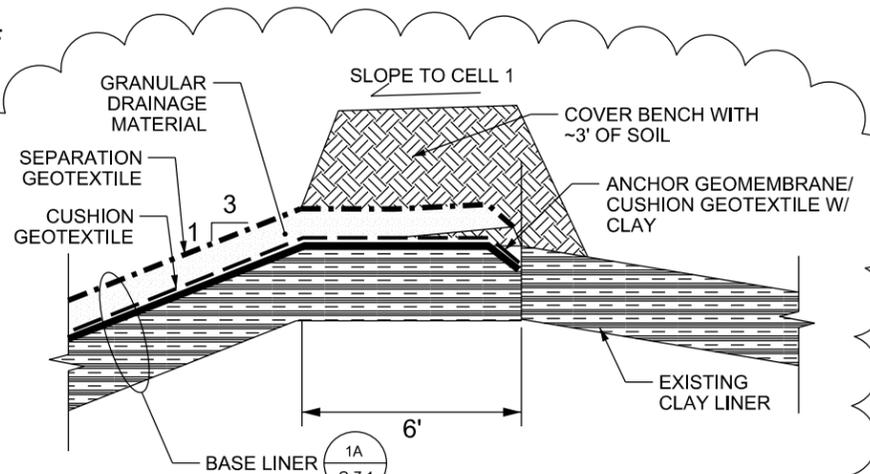
1B LEACHATE POND LINER SECTION
C-3 NOT TO SCALE

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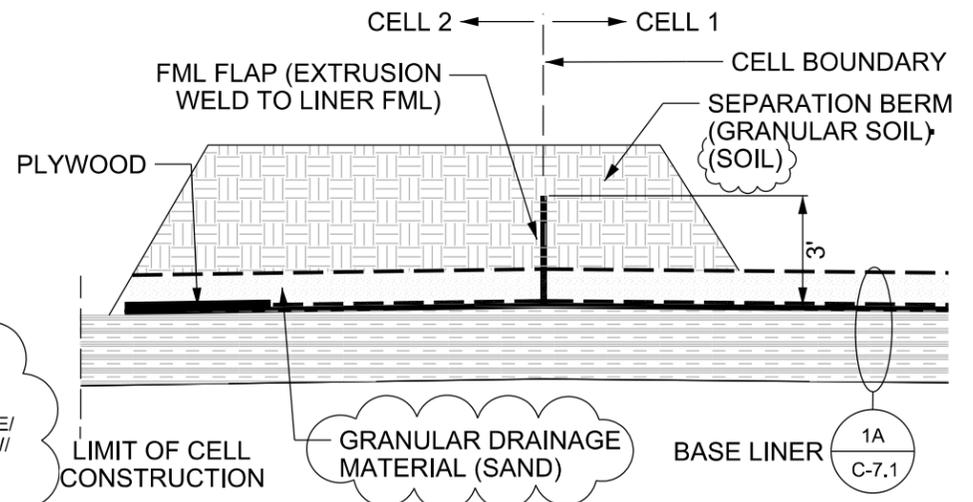
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2. CLAY TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY, MAX. PERMEABILITY = 1.0×10^{-7} CM/SEC.



2 ANCHOR TRENCH
C-2.0 NOT TO SCALE



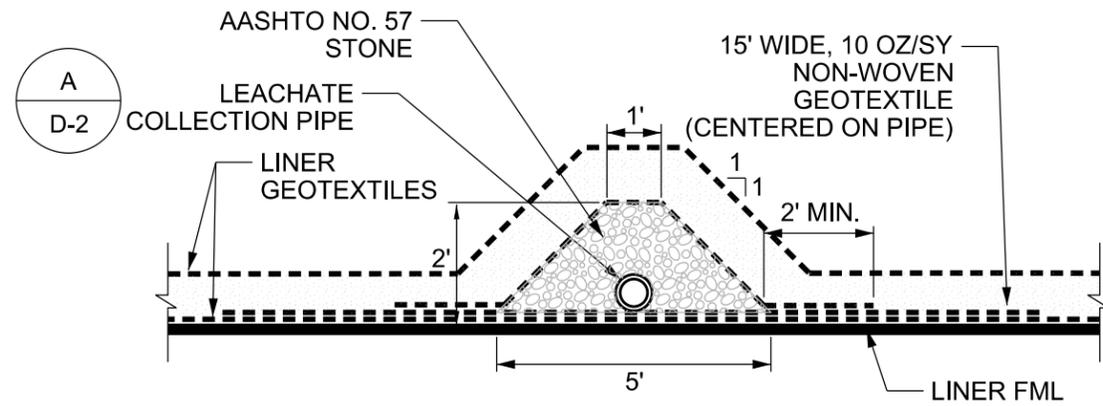
2A LINER CONNECTION TO EXISTING
C-2.0 NOT TO SCALE



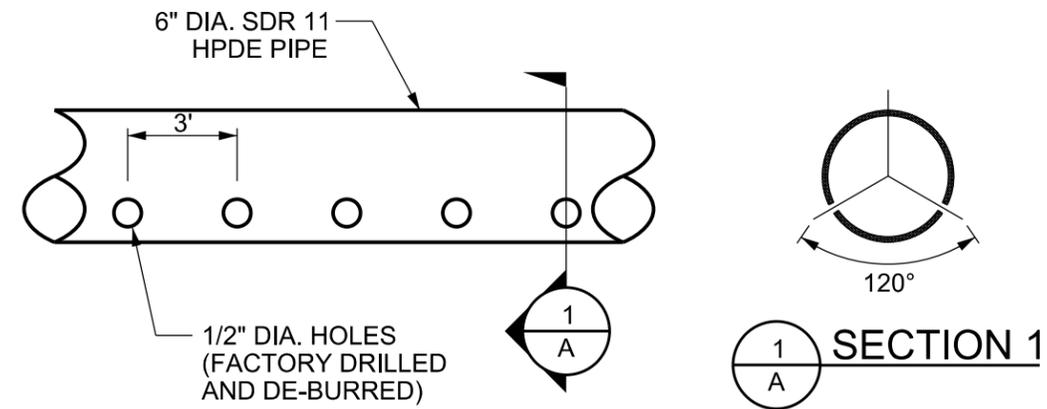
3 CELL SEPARATION BERM
C-2.0 NOT TO SCALE

DETAILS

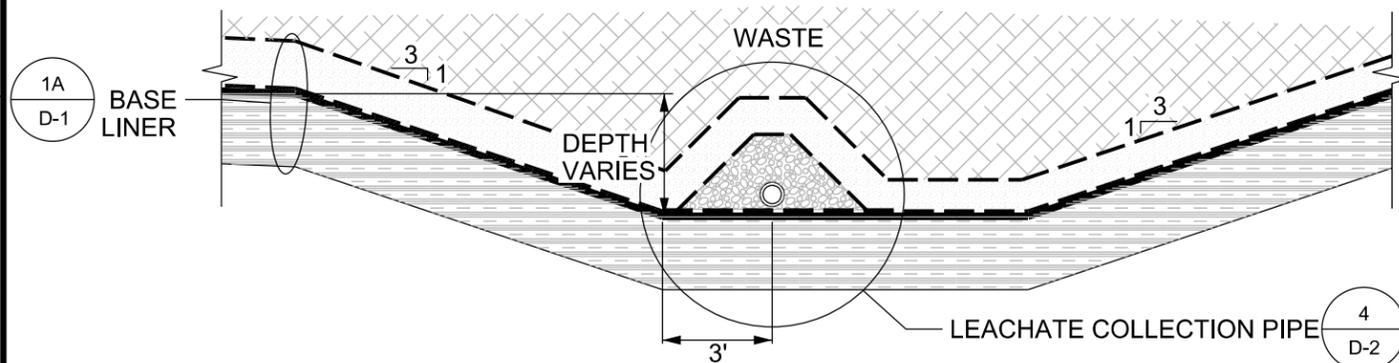
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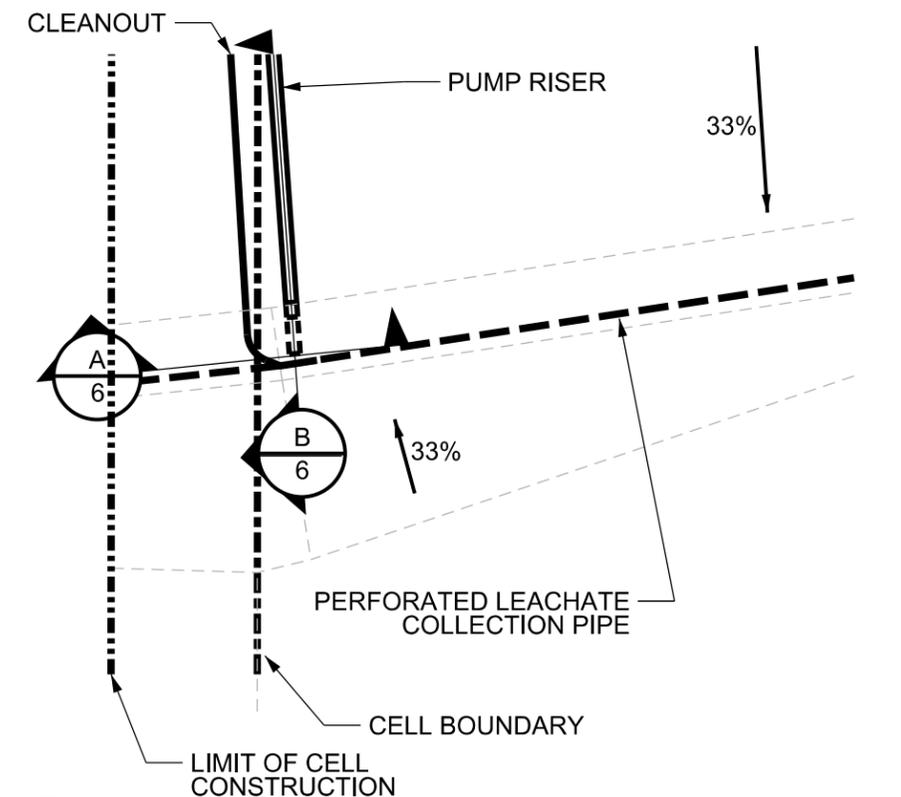
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C-4/5 NOT TO SCALE



A LEACHATE COLLECTION PIPE
4 NOT TO SCALE



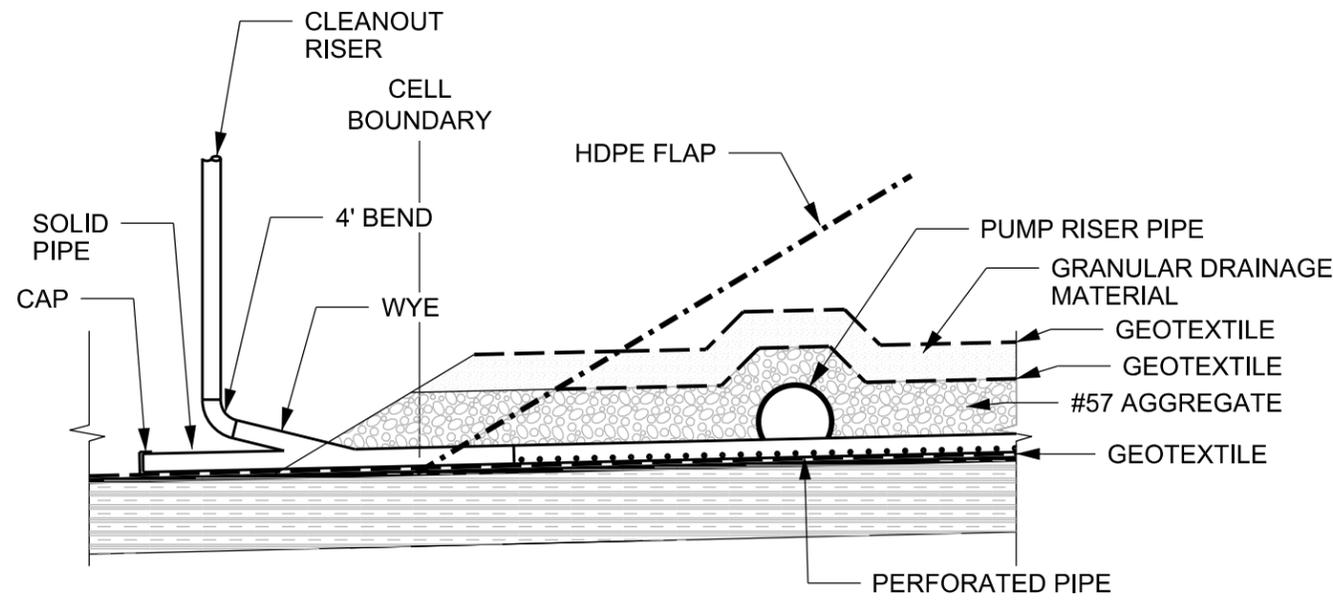
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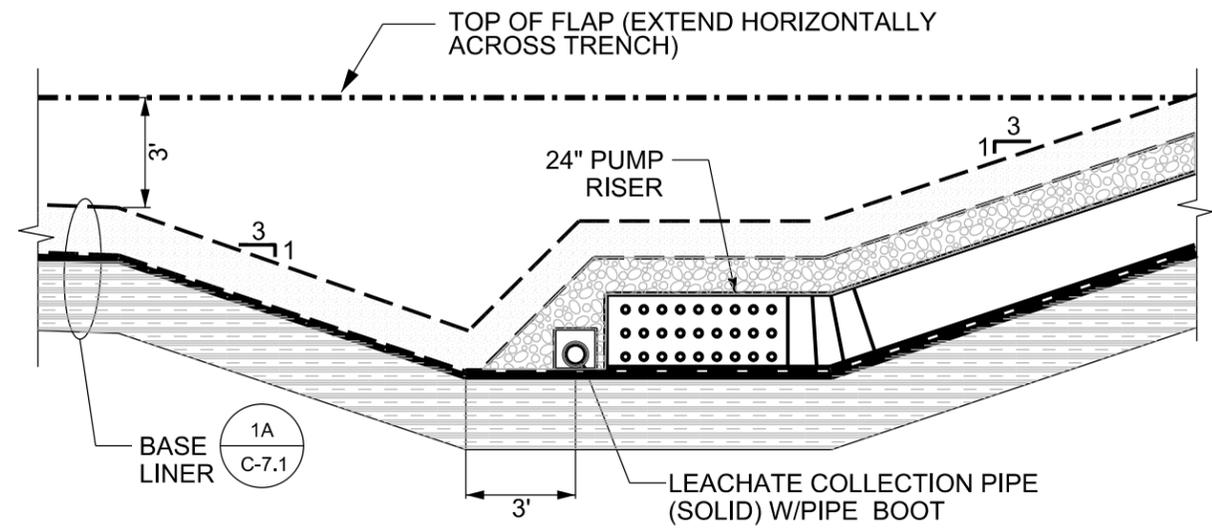
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C-4/5 NOT TO SCALE

DETAILS

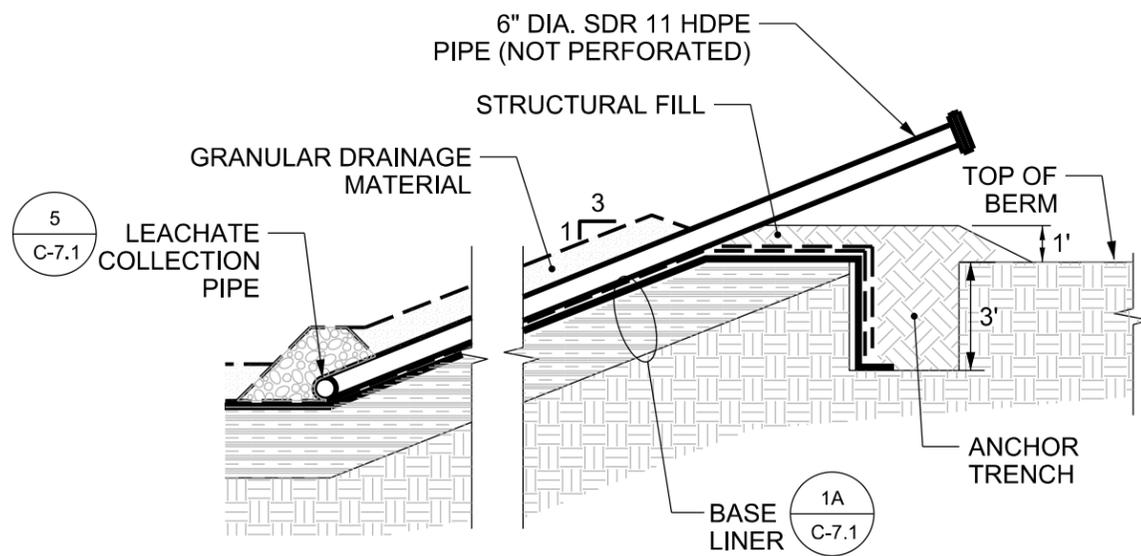
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A
6 SECTION A

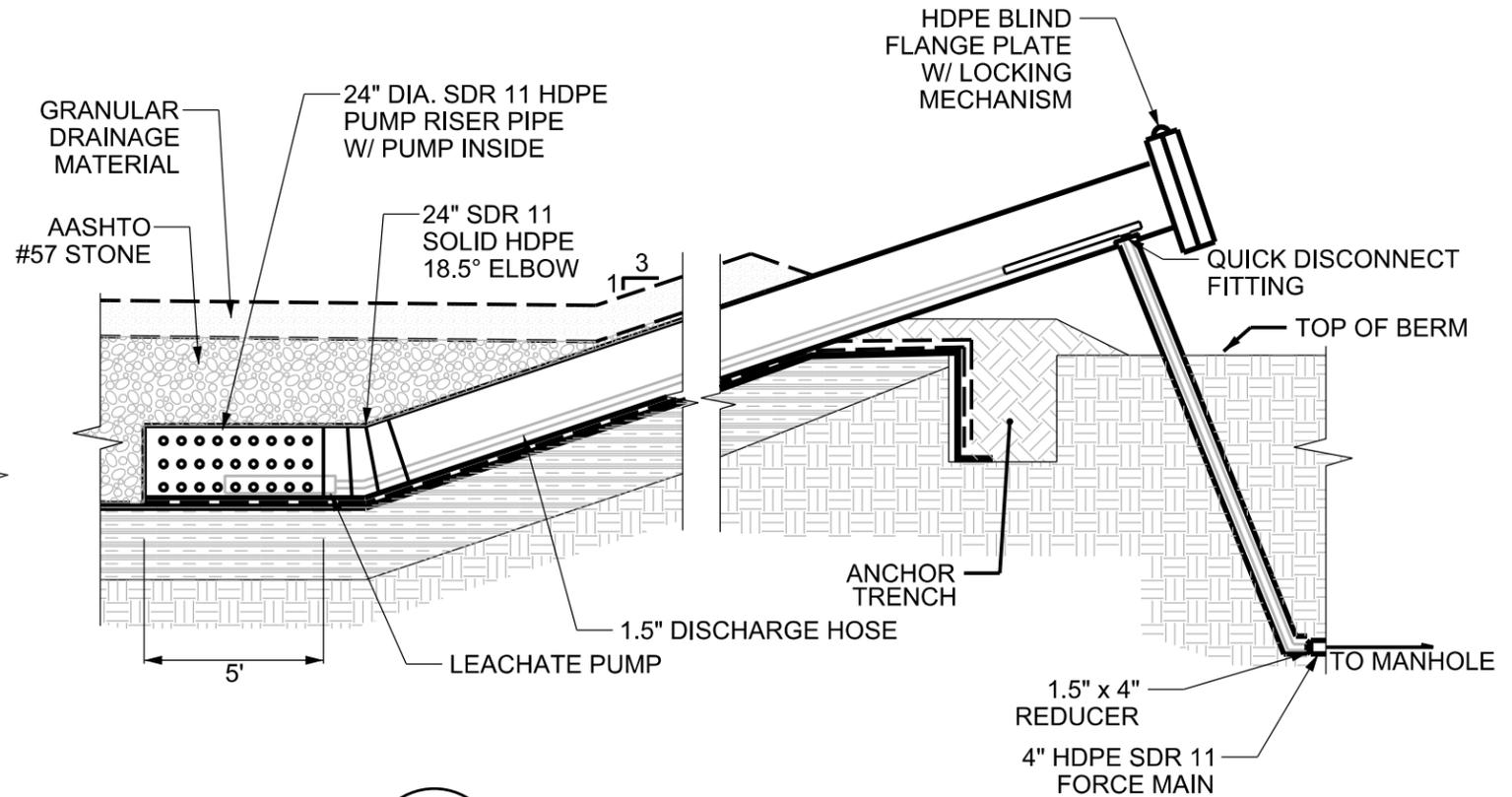


B
6 SECTION B



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C-7.1

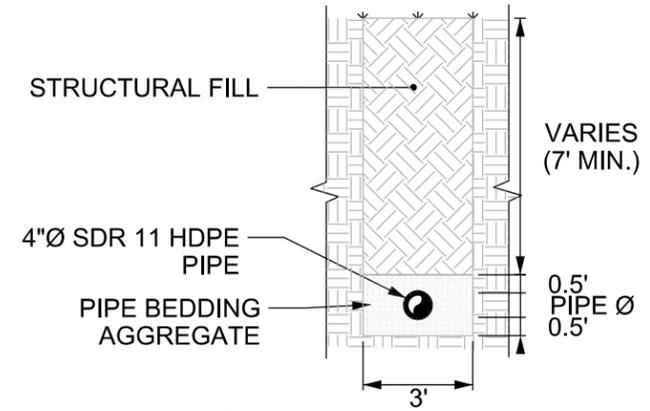
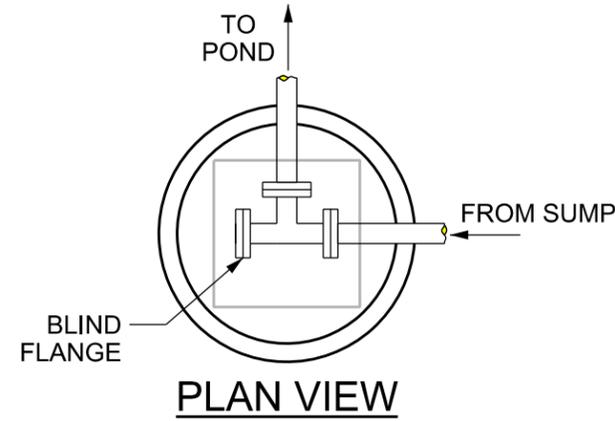
7
C-4/5 COLLECTION PIPE CLEANOUT (TYP.)
NOT TO SCALE



8
C-4/5 LEACHATE PUMP DISCHARGE
NOT TO SCALE

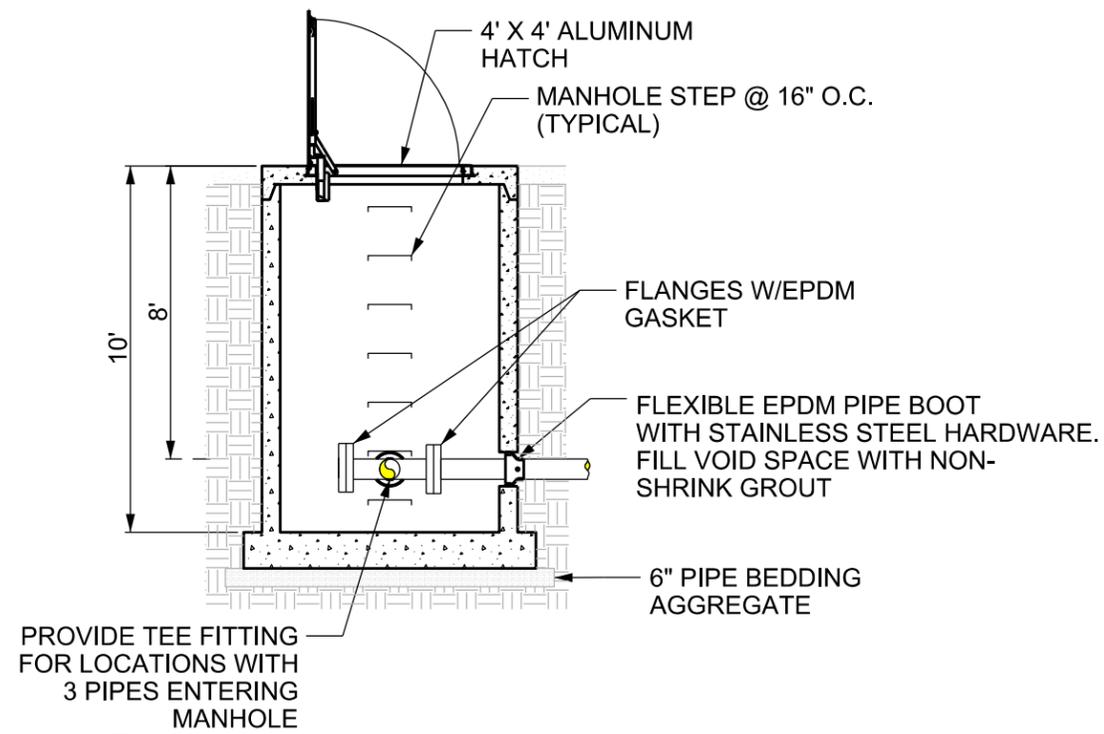
DETAILS

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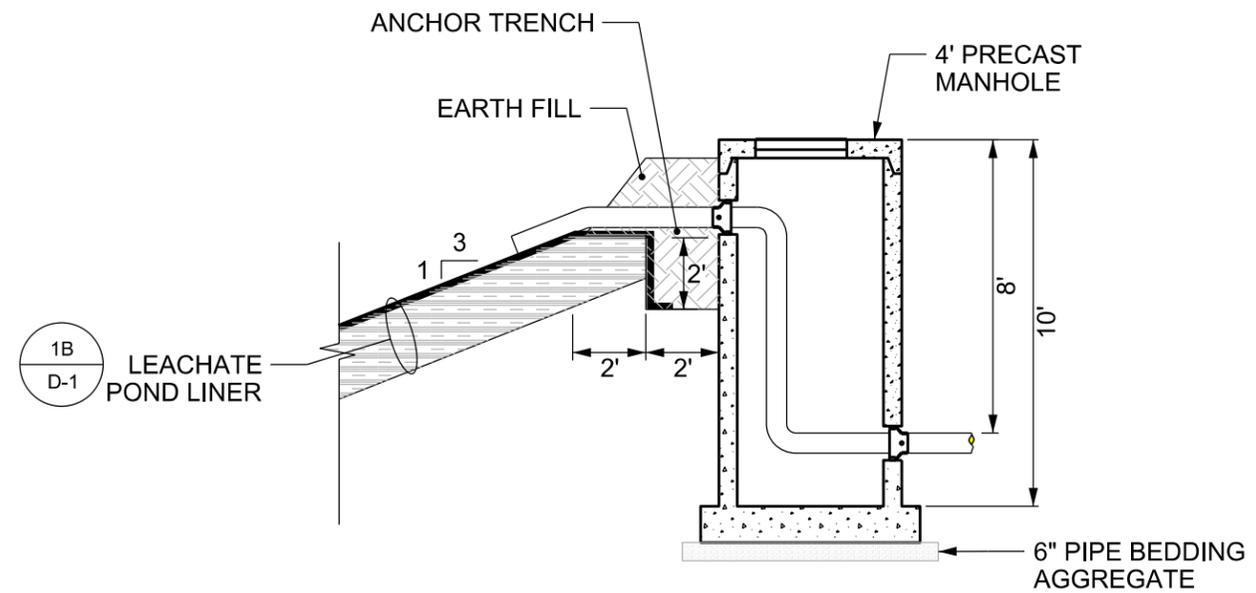


NOTE:
COMBINE BOTH FORCE MAINS WHERE INDICATED ON SHEET C-6.

10 FORCE MAIN SECTION
C-6 NOT TO SCALE



9 LEACHATE MANHOLE (TYP.)
C-4/5 NOT TO SCALE



11 LEACHATE DISCHARGE MANHOLE (TYP.)
C-6 NOT TO SCALE

DETAILS

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