Periodic Update to the Run-on and Run-off Control System Plan Dolet Hills Fly Ash / Scrubber Sludge Landfill

CLECO Corporation

Dolet Hills Power Station
Project No. 135359

Revision 1
10/13/2021

Periodic Update to the Run-on and Run-off Control System Plan Dolet Hills Fly Ash / Scrubber Sludge Landfill

prepared for

CLECO Corporation
Dolet Hills Power Station
DeSoto Parish, Louisiana

Project No. 135359

Revision 1
10/13/2021

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

CLECO Corporation
Periodic Update to the Run-on and Run-off Control System Plan
Dolet Hills Fly Ash / Scrubber Sludge Landfill

Report Index

Certification

I hereby certify, as a Professional Engineer in the state of Louisiana, that the information in this document was assembled under my direct supervisory control. This report is not intended or represented to be suitable for reuse by the CLECO Corporation or others without specific verification or adaptation by the Engineer.

This document has been digitally signed and sealed. October 13, 2021

Jason C. Eichenberger, P.E.
Louisiana License #42246

Date: October 13, 2021

TABLE OF CONTENTS

Page No.

LIST OF TABLES

Page No.

LIST OF FIGURES

Page No.

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ac	Acre
BMcD	Burns & McDonnell
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLECO	CLECO Corporation
CY	cubic yard
Dolet Hills	Dolet Hills Power Station
ELG	Effluent Limitations Guidelines
EPA	Environmental Protection Agency
ft	Feet
GPM	Gallons per Minute
hr	Hour
in	Inch
Landfill	Fly Ash Scrubber Sludge Landfill
LPDES	Louisiana Pollutant Discharge Elimination System
LSU	Louisiana State University
MGD	Million Gallons per Day
min	Minute
NAD 83	North American Datum of 1983
NAVD 88	North American Vertical Datum of 1988

Abbreviation	Term/Phrase/Name
NRCS	Natural Resources Conservation Service
PFDS	Precipitation Frequency Data Server
RCRA	Resource Conservations and Recovery Act
SCS	Soil Conservation Service
U.S.C.	United States Code
USDA	US Department of Agriculture

1.0 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency (EPA) issued the final version of the federal Coal Combustion Residual Rule (CCR Rule) to regulate the disposal of CCR materials generated at coal-fired units. The rule will be administered as part of the Resource Conservation and Recovery Act [RCRA, 42 United States Code (U.S.C.) §6901 et seq.], using the Subtitle D approach.

CLECO Corporation (CLECO) is subject to the CCR Rule and as such must develop a run-on and run-off control system plan for each CCR landfill per 40 Code of Federal Regulations (CFR) §257.81 and prepare periodic plans every five years. This report serves as the periodic update to the initial run-on and run-off control system plan for the Fly Ash / Scrubber Sludge Landfill (the Landfill) at Dolet Hills Power Station (Dolet Hills).

This run-on and run-off control system plan is in addition to, not in place of, any other applicable site permits, environmental standards, or work safety practices.

2.0 PLAN OBJECTIVES

Per 40 CFR §257.81, the run-on and run-off control system plan must contain documentation (including supporting engineering calculations) that the control system has been designed and constructed to:

- Prevent flow onto the active portion of the CCR unit during peak discharge from a 25-year, 24-hour storm,
- Collect and control at least the water volume resulting from a 25-year, 24-hour storm, and
- Handle run-off from the active portion of the CCR landfill in accordance with the surface water requirements under 40 CFR §257.3-3.

Per 40 CFR §257.81(c)(5), CLECO must obtain certification from a qualified professional engineer that the run-on and run-off control system plan, and subsequent updates to the plan, meet the requirements of 40 CFR §257.81. This sealed document serves as that certification.

3.0 EXISTING CONDITIONS

Dolet Hills is located east of Mansfield in DeSoto Parish, Louisiana. Dolet Hills contains one CCR landfill which receives fly ash and scrubber sludge. The site plan is shown in Figure SK-CIVIL-001 in Appendix A.

Run-on and run-off controls were designed by others as part of the Landfill permit application to the Louisiana Department of Environmental Quality (LDEQ). The applicable sections of the permit renewal application prepared by Providence Engineering and Environmental Group LLC. in 2019 are included as Appendix B, along with as-built drawings of the current active landfill cell (Cell 11). The run-on and run-off control system plan provided herein is based on review and assessment of the certified permit information, as well as supplementary design documents and operational characteristics provided by CLECO.

3.1 Existing Design Document Review

The CCR Rule requires that peak stormwater flows from the 25-year, 24-hour storm event be handled by run-on and run-off control measures. The EPA defines run-on as any rainwater, leachate, or other liquid that drains over land onto any part of a CCR landfill or lateral expansion of a CCR landfill. The EPA defines run-off as any rainwater, leachate, or other liquid that drains over land from any part of a CCR landfill or lateral expansion of a CCR landfill. The information included in Appendix B indicates compliance with the CCR Rule run-on and run-off control system plan requirements.

3.1.1 Run-on

The Landfill was sited so that it sits in a stream valley surrounded by ridgelines on three sides which prevent run-off from surrounding watersheds from entering the Landfill area. The Landfill filling sequence is such that filling begins in the southern, closed end of the stream valley and proceeds northward to the open end. As the Landfill is developed, perimeter drainage diversion dikes are configured to prevent outside run-off (non-contact stormwater run-off) from the portion of the Landfill not surrounded by a ridgeline from entering the Landfill cell. Perimeter drainage ditches collect this non-contact stormwater run-off and drain it offsite. The collection ditches have a triangular section with an average bottom slope of 2%, minimum 2-foot depth, and 3H:1V side slopes (see Figure 3-1).

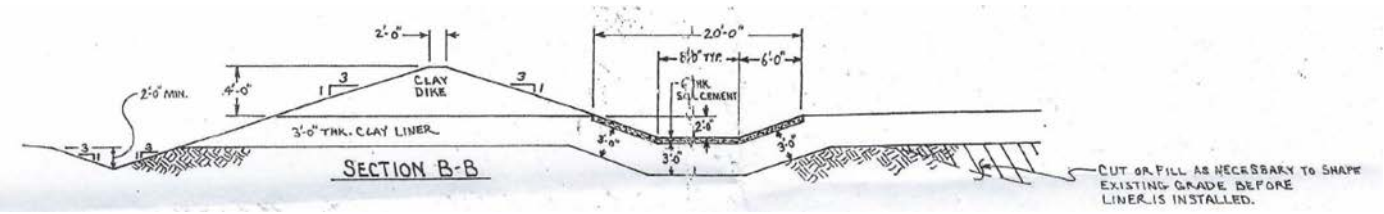


Figure 3-1: Typical run-off collection ditches and diversion dike

Additional diversion dikes are installed to prevent run-off from the closed portion of the Landfill from entering the active area. Run-off from the closed portion of the Landfill is typically drained offsite via natural drainage although some currently drains to the temporary sump as noted in Section 3.1.2.

3.1.2 Run-off

As the Landfill expands to the north, levees are reconstructed along the interface of the closed and open portions of the Landfill as well as around the perimeter of the open portion of the Landfill in order to isolate contact stormwater run-off from non-contact stormwater run-off.

As noted above, run-off from the closed portion of the landfill is collected in perimeter drainage ditches and typically discharged off-site via natural drainage. A series of perimeter drainage ditches within the levee divert contact stormwater run-off to a temporary sump. The perimeter ditches have an approximately trapezoidal section with an 8-foot bottom width, 1% bottom slope, 2-foot minimum depth, and 3H:1V side slopes (see Figure 3-1). At the time of this periodic update, there are currently approximately 10.5 acres of closed landfill that are still contributing to the sump area.

The landfill sump area is reconstructed each time the landfill expands. The sump area consists of a primary sump (i.e., the Cell 11 Sedimentation Pond) which overflows to an auxiliary sump (i.e., the Cell 11 Overflow Sump) via a concrete spillway. From the auxiliary sump, flow is discharged via a 36-inch vertical outlet pipe which ties into a 48-inch collector pipe which gravity drains to the Runoff Pond. The current Cell 11 sump spillway is trapezoidal in shape with a bottom width of 20 feet and 6H:1V side slopes. Refer to Appendix B for existing design drawings.

The Runoff Pond is approximately 4-acres and sits north of the Landfill cell. The pond is partially surrounded by a run-on diversion dike to limit run-off inflow from the surrounding watershed area (see DWG No. DH-123 in Appendix B). The pond is designed to store contact run-off from the 25-year, 24-hour storm and contains an emergency spillway for larger storm events. The concrete spillway was added to the pond in 1998 when the dike was raised and the reinforced concrete wall was installed. The top of dam is now approximately 270 feet.

From the Runoff Pond, run-off may be discharged via a valve-controlled outlet pipe. The valve is normally closed and has an invert elevation of 253 feet. For the purposes of this modeling effort, Burns & McDonnell has assumed that the plant operations team maintains the normal water level (prior to rain events) at or below elevation 259.0. Water stored in the pond may be discharged under the conditions of the discharge permit (LA0062600); consequently, all discharges are permitted and conform to CFR 257.3-3.

4.0 DESIGN BASIS / FLOOD CONTROL SYSTEM

4.1 Capacity Criteria

The CCR Rule discusses that stormwater control systems at CCR landfills must have adequate hydrologic and hydraulic capacity to manage flows for the 25-year, 24-hour storm event. For this analysis, the criteria was interpreted as being that the top of the stormwater conveyance and storage features should not be overtopped during the design storm event.

4.2 Project Mapping

Project mapping for this analysis consisted of an inventory of stormwater assets that contribute to the surface impoundment. Two primary sources of information were utilized: construction record drawings and publicly available LiDAR survey data.

4.2.1 Mapping Sources

Survey data utilized included LiDAR topography from the Louisiana State University (LSU) Atlas LiDAR Downloader, which was posted in February of 2008 and retrieved in January of 2016. Construction record drawings of the Landfill, sump area, and surface impoundment were also utilized in the analysis.

4.2.2 Vertical Datum

Mapping sources referenced were in the North American Vertical Datum of 1988 (NAVD 88).

4.2.3 Horizontal Coordinate System

Data from the LSU Atlas LiDAR which was utilized as the basis for mapping and modeling efforts is in the Louisiana State Plane North, North American Datum of 1983 (NAD 83) coordinate system.

5.0 HYDROLOGIC AND HYDRAULIC CAPACITY

HydroCAD 10.00-24 was used to model drainage area and basin characteristics under the design storm event and FlowMaster V8i was used to model channel characteristics. Inputs to the HydroCAD and FlowMaster models are described in the following sections. For detailed calculations, refer to Appendix C.

5.1 Rainfall Distribution and Depth

The Soil Conservation Service (SCS) Type III rainfall distribution was used for computations associated with this evaluation. Precipitation data was acquired from the NOAA Precipitation Frequency Data Server (PFDS). Precipitation depth for design storm event is 8.16 inches.

5.2 Subbasin Characteristics

5.2.1 Landfill

Stormwater falling over the open portion of the Landfill (see SK-CIVIL-002 in Appendix A for approximate limits) is collected in the contact stormwater run-off ditches which drain to the sump(s) and then to the Runoff Pond via the 48-inch collector pipe. This watershed consists mainly of steeply sloped (3H:1V), compacted CCR material. Calculations for this watershed area were determined based on the parameters shown in Table 5-1.

Table 5-1: Watershed Run-off Calculated Data for Landfill Run-off

Component	Value	Unit
Watershed Area (currently includes 10.5 acres of capped landfill still contributing to sump and runoff pond)	44.1	ac
Weighted Curve Number	85	-
Time of Concentration	16.2	min

5.2.2 Runoff Pond

Drainage into the Runoff Pond (see SK-CIVIL-002 in Appendix A for approximate watershed limits) is minimized, in part, by dikes surrounding the pond. This watershed consists mainly of moderately sloped (8H:1V), undeveloped, forested area with grassy, open areas near the pond limits. Calculations for the Runoff Pond watershed area were determined based on the parameters shown in Table 5-2.

Table 5-2: Watershed Run-off Calculated Data for Runoff Pond

Component	Value	Unit
Watershed Area	7.7	ac
Weighted Curve Number	88	-
Time of Concentration	13.7	min

5.2.3 Outside Run-off

Stormwater falling over the outside run-off area (see SK-CIVIL-002 in Appendix A for approximate watershed limits) is collected in run-off collection ditches which drain offsite. This watershed consists mainly of moderately sloped (8H:1V), undeveloped, forested area with grassy, open areas near the Landfill limits. Calculations for this watershed were determined based on the parameters shown in Table 5-3.

Table 5-3: Watershed Run-off Calculated Data for Outside Run-off

Component	Value	Unit
Watershed Area	4.0	ac
Weighted Curve Number	80	-
Time of Concentration	7.2	min

5.3 Channel Characteristics

Flow calculations were determined based on the channel parameters shown in Table 5-4 (contact stormwater run-off) and Table 5-5 (non-contact stormwater run-off).

Table 5-4: Channel Data for Contact Stormwater Run-off, Flat Bottom Ditch

Component	Value	Unit
Roughness Coefficient, Manning's n	0.012	(geomembrane liner)
Channel Slope	0.01	ft/ft
Left Side Slope	3H:1V	-
Right Side Slope	3H:1V	-
Bottom Width	8.00	ft

Table 5-5: Channel Data for Non-Contact Stormwater Run-off, Triangular Ditch

Component	Value	Unit
Roughness Coefficient, Manning's n	0.025	(earth, clean & winding)
Channel Slope	0.02	ft/ft
Left Side Slope	3H:1V	-
Right Side Slope	3H:1V	-

6.0 RESULTS

6.1 Basins

Ponds were modeled under the 25-year, 24-hour storm event with results as follows:

Table 6-1: Modeled Conditions – Landfill

Component	Property	Value	Unit
Subcatchment Landfill	Runoff Depth	6.37	in
	Peak Runoff	233.81	cfs
Pond Cell 11 Sedimentation Pond	Initial Elevation	286.00	ft
	Peak Inflow	233.81	cfs
	Peak Discharge	229.92	cfs
	Peak Elevation	287.81	ft
	Peak Storage	2.721	ac-ft
Pond Cell 11 Overflow Sump	Initial Elevation	N/A	ft
	Peak Inflow	229.92	cfs
	Peak Discharge	217.41	cfs
	Peak Elevation	285.19	ft
	Peak Storage	0.183	ac-ft

Table 6-2: Modeled Conditions – Runoff Pond

Component	Property	Value	Unit
Subcatchment Watershed	Runoff Depth	6.72	in
	Peak Runoff	44.99	cfs
Pond Runoff Pond	Initial EL	259.0	ft
	Peak Inflow	253.91	cfs
	Peak Discharge	0.00	cfs
	Peak EL	268.52	ft
	Peak Storage	38.913	ac-ft

Table 6-3: Modeled Conditions – Outside Run-off

Component	Property	Value	Unit
Subcatchment Watershed	Runoff Depth	5.78	in
	Peak Runoff	25.38	cfs

The Landfill sumps and the Runoff Pond do not overtop under the modeled conditions; therefore, it can be assumed that they are adequately sized to control run-off the 25-year, 24-hour storm event (as long as the plant operations team maintains a normal water level in the Runoff Pond less than 259.0 ft). After a

significant storm event, excess water collected in the Runoff Pond can be discharged under the conditions of the LPDES permit.

6.2 Stormwater Channels

Under the modeled conditions, the channels were able to control and convey the design storm. The results of the modeled peak conditions are as follows:

Table 6-4: Modeled Channel Conditions

Property	Peak Discharge (cfs)	Normal Depth (in)
Contact Stormwater Run-off ½ Landfill (Open)	116.91	12.2
Non-Contact Stormwater Run-off Outside Run-off	25.38	14.5

6.2.1 Contact Stormwater Run-off (Open Portion of Landfill)

Contact stormwater run-off (run-off from the open portion of the Landfill) from the design storm is conveyed to the sump area via perimeter drainage ditches which are at minimum 2 feet deep, not including the height of the clay diversion dike. At the maximum flow rate, the contact stormwater run-off will have a normal depth of 1.02 feet within the drainage ditch. Because the stormwater channels do not overtop during the design storm event, it can be assumed that they are adequately sized to convey contact stormwater run-off from the 25-year, 24-hour storm event.

6.2.2 Non-Contact Stormwater Run-off (Outside Run-off)

Non-contact stormwater run-off (outside run-off) from the design storm is discharged off-site via perimeter drainage ditches which are at minimum 2 feet deep, not including the height of the clay diversion dike. At the maximum flow rate, the non-contact stormwater run-off will have a normal depth of 1.21 feet within the drainage ditch. Because the stormwater channels do not overtop during the design storm event, it can be determined that they are adequately sized to convey run-off from the 25-year, 24-hour storm event.

7.0 STORMWATER BEST MANAGEMENT PRACTICES

Stormwater best management practices (BMPs) shall be employed at the site to comply with CFR 257.3-3 which, in summary, stipulates that a facility shall not cause a discharge of pollutants, dredged material, or fill material to waters of the United States or cause non-point source pollution of waters of the United States.

Vegetation enhances evapotranspiration and reduces erosion, thus playing an important part in surface water control. Channels not requiring riprap shall be prepared for seeding as they are constructed. Final cover shall be prepared for seeding after it is applied. The use of terrace and downdrain channels for stormwater conveyance provides a means to control run-off velocities and reduce sediment transport.

8.0 PERIODIC ASSESSMENT AND AMMENDMENT

CLECO placed the initial run-on and run-off control system plan in the CCR Operating Record by October 17, 2016. CLECO must prepare periodic run-on and run-off control system plans every five years. This report serves as the first periodic update to the initial run-on and run-off control system plan. CLECO may amend the plan at any time and is required to do so whenever there is a change in conditions which would substantially affect the written plan in effect. Preparing the periodic plans may be achieved by reviewing the current plan in effect and amending the plan as required. In all cases, the date for completing the previous plan is the basis for establishing the deadline to complete the subsequent periodic plan. Each periodic plan shall be certified by a qualified professional engineer in the state of Louisiana. All amendments and revisions must be placed on the CCR public website within a reasonable amount of time following placement in the facility's CCR Operating Record. A record of revisions made to this document is included in Section 9.0.

9.0 REVISIONS AND UPDATES

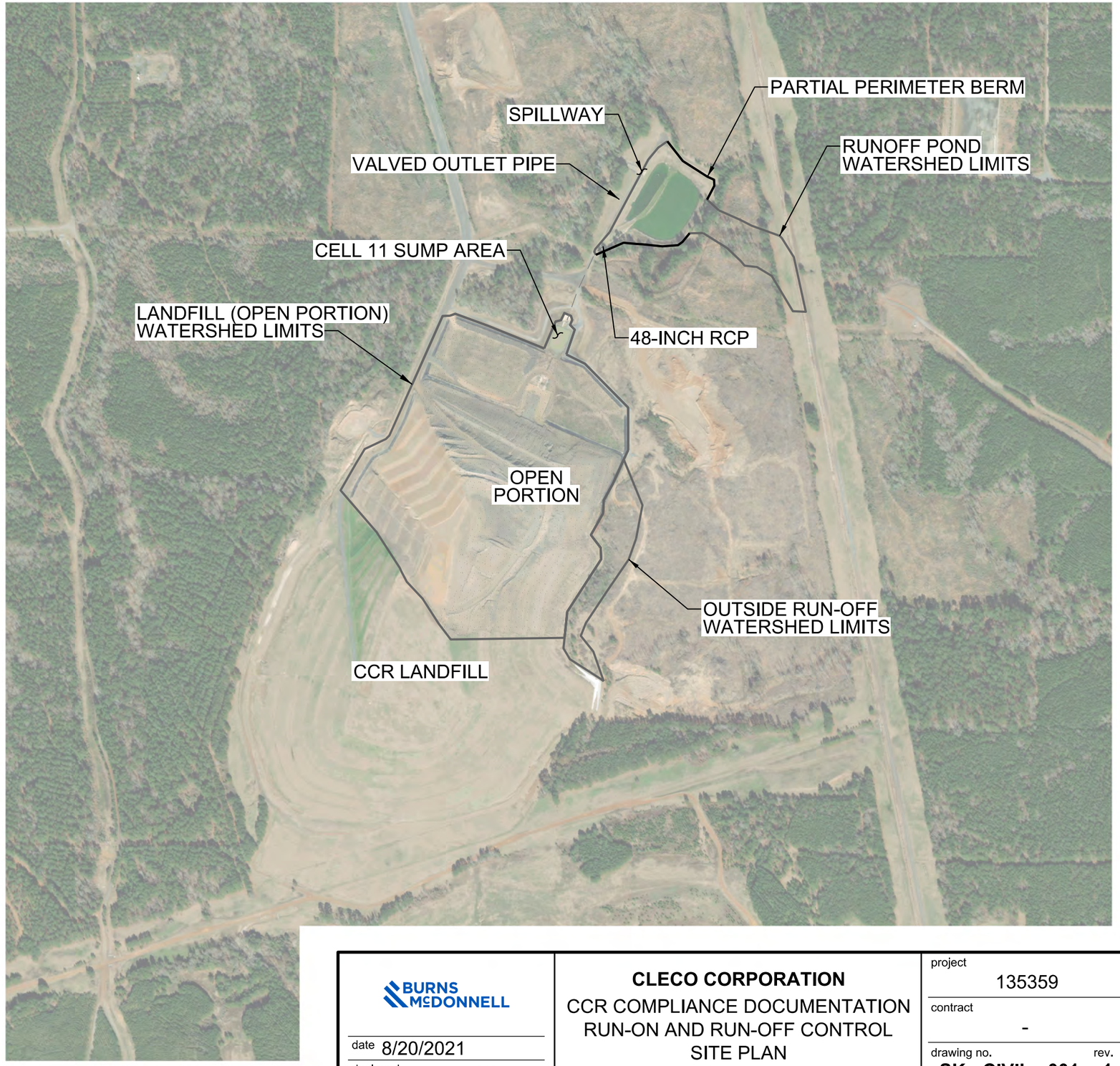
Revision Number	Date	Revisions Made	By Whom
0	10/14/2016	Initial Issue	Burns & McDonnell
1	10/13/2021	Periodic Update to the Initial Plan	Burns & McDonnell

APPENDIX A – SITE PLAN

NOTES:

1. RUN-OFF FROM THE OPEN PORTION OF THE LANDFILL IS ISOLATED FROM RUN-OFF FROM THE CLOSED PORTION OF THE LANDFILL VIA DIVERSION DIKES AND CONVEYED TO SUMP AND RUNOFF POND. RUN-OFF FROM CLOSED PORTION OF LANDFILL WHICH DOES NOT DRAIN TO SUMP IS CONVEYED OFF-SITE VIA NATURAL DRAINAGE.

2. AS THE LANDFILL EXPANDS, ONLY 40 ACRES ARE "OPEN" (OPERATING WITHOUT COVER) AT A GIVEN POINT IN TIME. THE SUMP AREA, DIVERSION DIKES, AND PERIMETER COLLECTION DITCHES ARE RE-CONFIGURED FOR EACH PHASE OF CONSTRUCTION.



N

0 600' 1200'

SCALE IN FEET

BURNS McDONNELL

date 8/20/2021

designed A. MYERS

CLECO CORPORATION

CCR COMPLIANCE DOCUMENTATION
RUN-ON AND RUN-OFF CONTROL
SITE PLAN

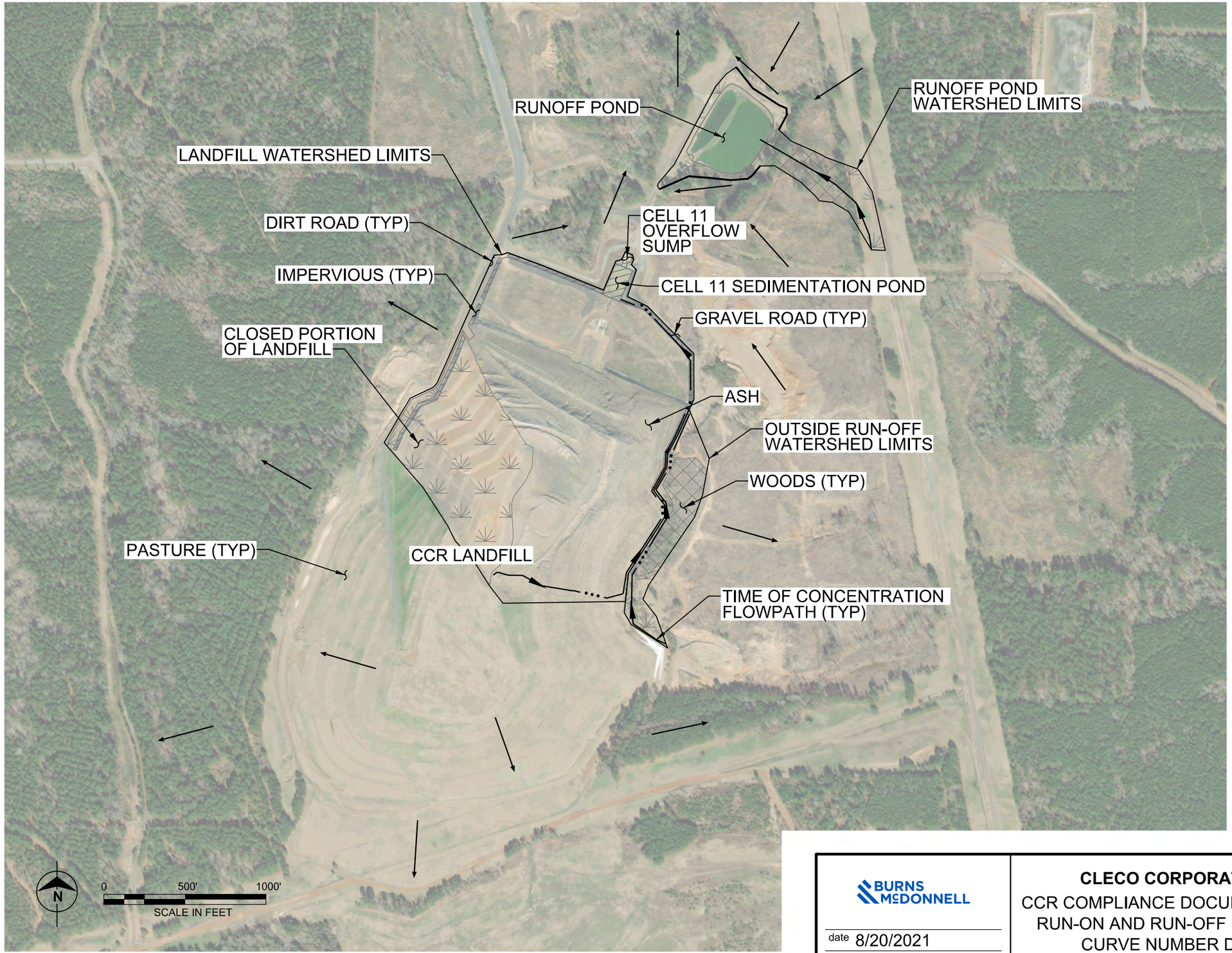
project 135359

contract -

drawing no. **SK - CIVIL - 001**

rev. **1**

10/8/2021 Z:\Clients\ENR\Cleco\90965_CCRDocuments\Design\Civil\Dwgs\Sketches\Run-on and Runoff\RR_Dolet.dgn



BURNS McDONNELL

date 8/20/2021

designed A. MYERS

CLECO CORPORATION

CCR COMPLIANCE DOCUMENTATION
RUN-ON AND RUN-OFF CONTROL
CURVE NUMBER DATA

project 135359

contract -

drawing no. **SK - CIVIL - 002**

rev. **1**

10/11/2021 Z:\Clients\ENR\Cleco\90965_CCRDocuments\Design\Civil\Dwgs\Sketches\Run-on and Runoff\RR_Dolet 2.dgn

APPENDIX B – EXISTING PERMIT INFORMATION / DRAWINGS

ATTACHMENT 22

DESCRIPTION OF FACILITY RUNOFF COLLECTION SYSTEM

ATTACHMENT 22

DESCRIPTION OF FACILITY RUNOFF COLLECTION SYSTEM

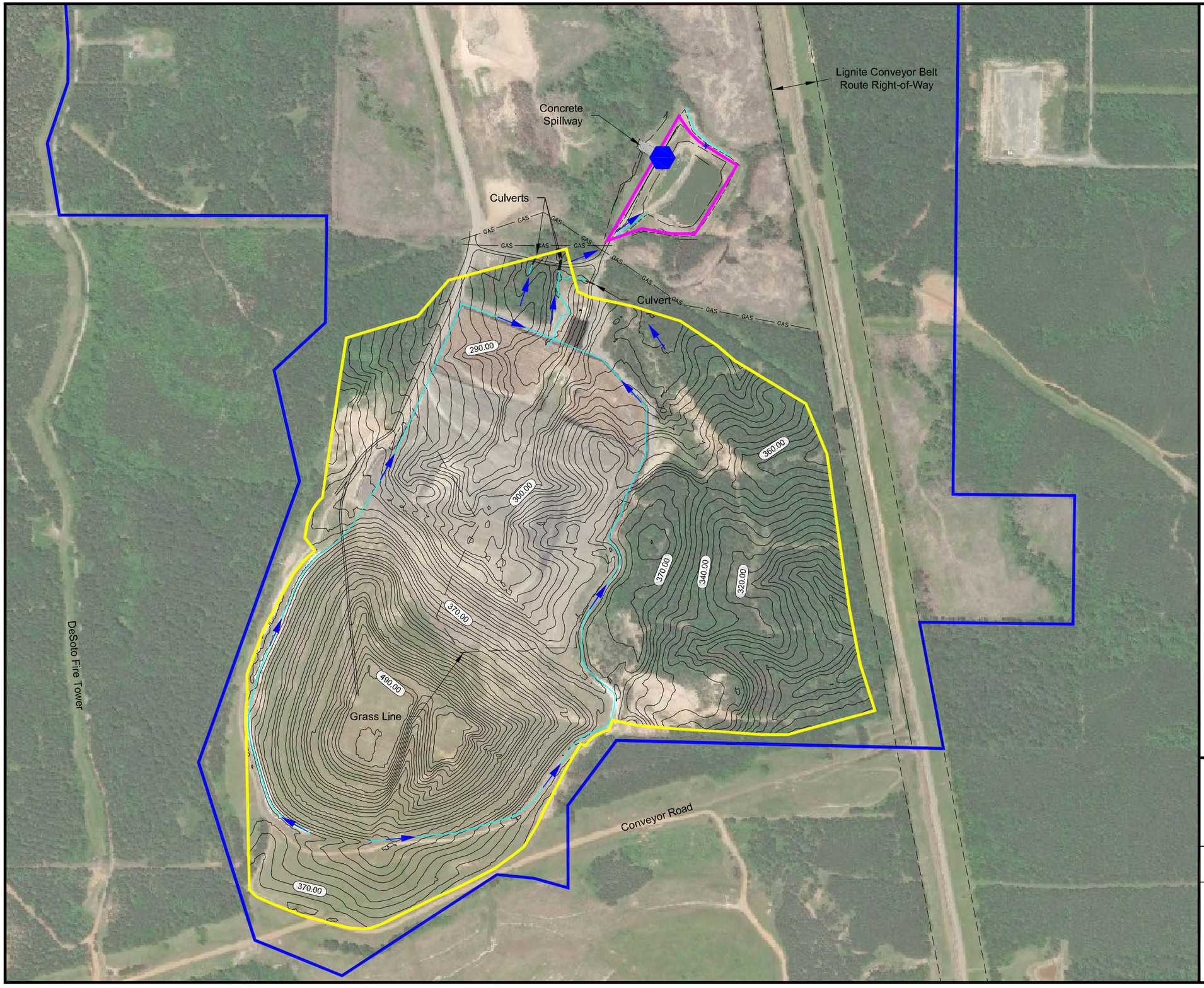
The purpose of the impoundment is to store contact storm water runoff from the active cell(s) of the landfill resulting from the 25-year, 24-hour design storm. The stored runoff will be discharged under conditions of the power station's water discharge permits. **Attachment 22** shows the site runoff collection system. This system consists of levees that will be constructed along the northern edge of the covered cells and down the valley slopes on either side of the active cell. The levee alignment along the valley slope will be such that it will encompass all of the waste placed in the active cells. This levee will segregate non-contact storm water runoff from contact storm water runoff. All rain falling within the levee will flow by gravity to a temporary collection sump located at the lowest end of the active cell area. A dike will be constructed across the valley to prevent any runoff from leaving the site. The collected runoff will then be transferred to the surface impoundment where it will be discharged under the conditions of the power station's water discharge permits. All rainfall that contacts the waste will be collected and transported to the surface impoundment.

Since the waste will have no free liquids nor generate any leachate, the only water that must be removed is rainfall. The system of culverts, levees, swales, sumps, and pumps described previously will be used to dewater the site when necessary.

All rain falling within areas of the landfill that have received certified final cover will be routed to other storm water outfalls.

Waste materials disposed in the expansion area will have no free liquids or generate any leachate. The only water required to be removed from the expansion area is rainfall. A perimeter levee system will be constructed around the expansion area to prevent runon from entering the operational areas of the facility expansion. This perimeter levee will also prevent runoff from leaving the operational areas of the facility expansion. As each disposal cell is constructed in the expansion area, a cell separation berm will be constructed to contain and capture all contact storm water runoff from each active cell. This collected storm water will be pumped from within each active cell and transported via gravity main or force main to the existing surface impoundment.

As final cover is installed in the expansion area, all non-contact storm water runoff from the certified closed areas will be routed to other storm water outfalls.



Legend

- Property Boundary
- Permitted Landfill Limit
- Fly Ash/FGD Landfill Runoff Pond
- Drainage Ditch
- Right-of-Way
- GAS — Gas Pipeline
- 5' Lidar Contours (10/17/19)
- Surface Flow Direction
- Outfall Location

Reference

Base map comprised of Bing aerial imagery 06/18/19 and client provided file name: 13-51 topo.dwg.

500 0 500

Scale: 1" = 500'

Facility Runoff Collection System

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

PROVIDENCE

Drawn By	DSG	10/22/19
Checked By	LMH	10/22/19
Approved By	EKS	10/22/19

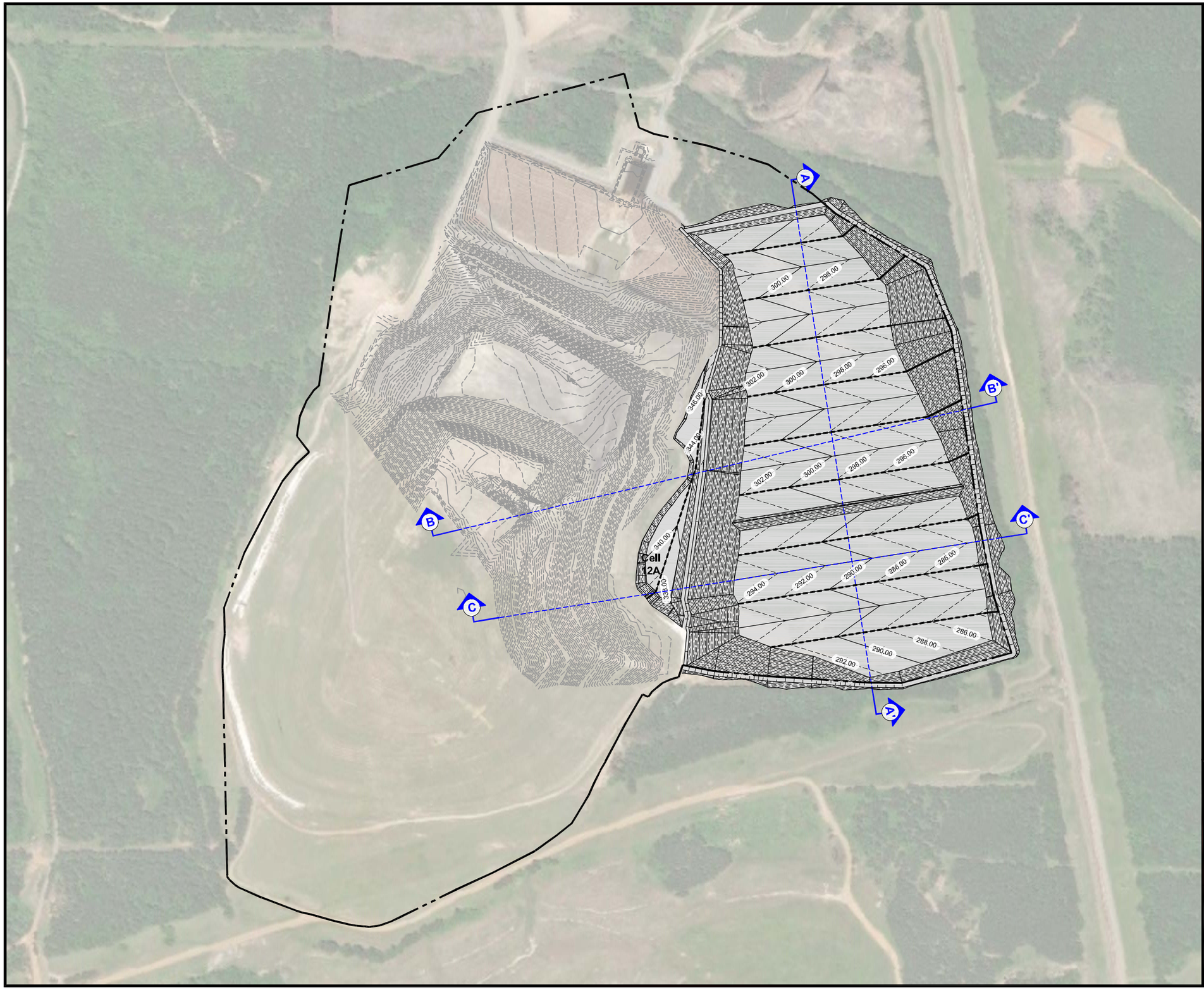
Project Number 002-255

Drawing Number 002-255-B018

22 Attachment

ATTACHMENT 25

PLAN-VIEW DRAWINGS SHOWING ORIGINAL CONTOURS, PROPOSED ELEVATIONS, PROPOSED FINAL CONTOURS, SLOPES, LEVEES, AND OTHER PERTINENT FEATURES



FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Legend

- Permitted Landfill Boundary
- Leachate Riser Pipe
- Leachate Collection Pipe

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2019 Microsoft Corporation and its data suppliers, exported 10/23/19.

400 0 400

Scale: 1" = 400'

Excavation Plan

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

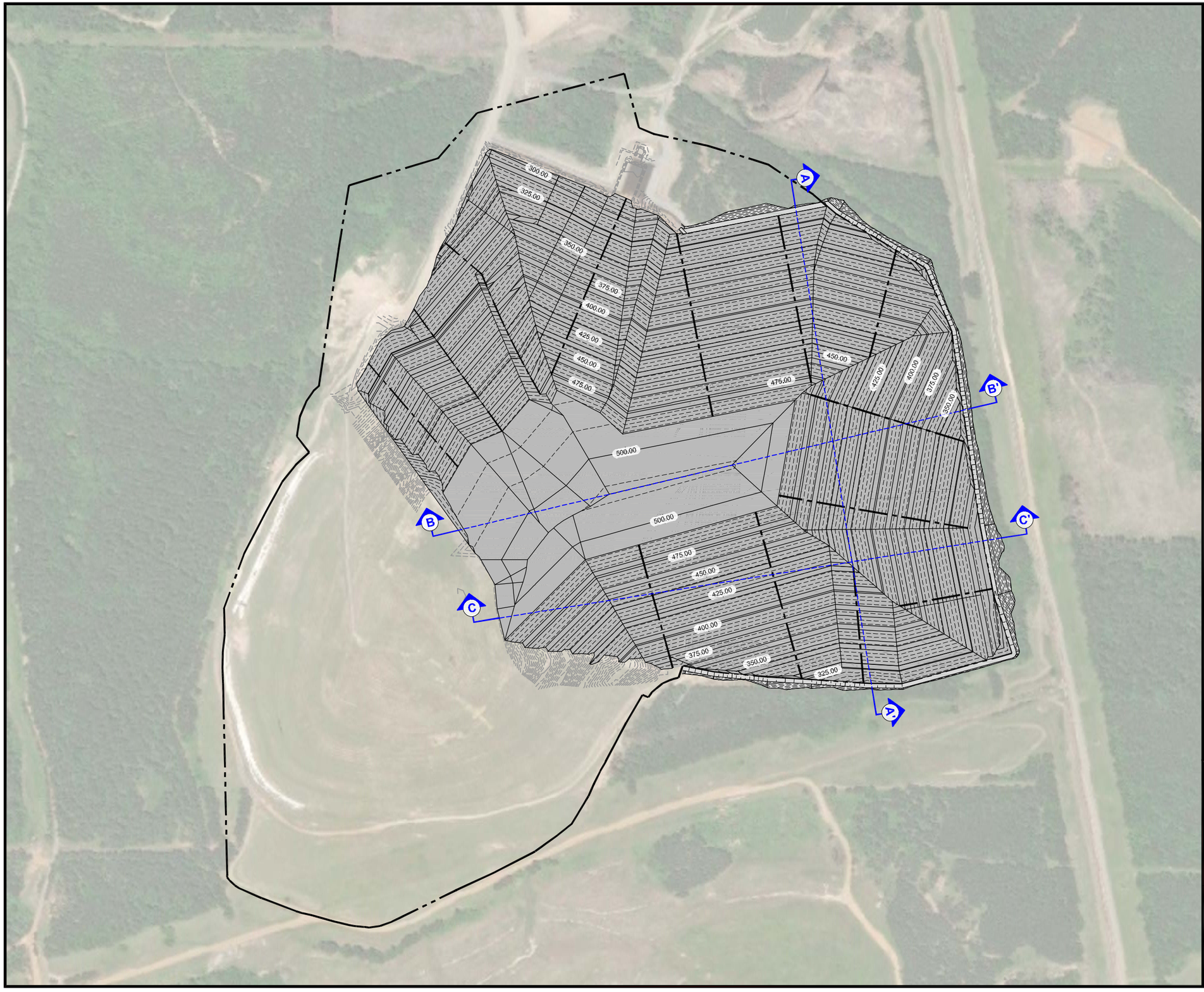
PROVIDENCE

Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

Drawing Number
002-255-B022

25a
Attachment



FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Legend

- Permitted Landfill Boundary
- Letdown Chute

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2019 Microsoft Corporation and its data suppliers, exported 10/23/19.

400 0 400

Scale: 1" = 400'

Final Contours

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

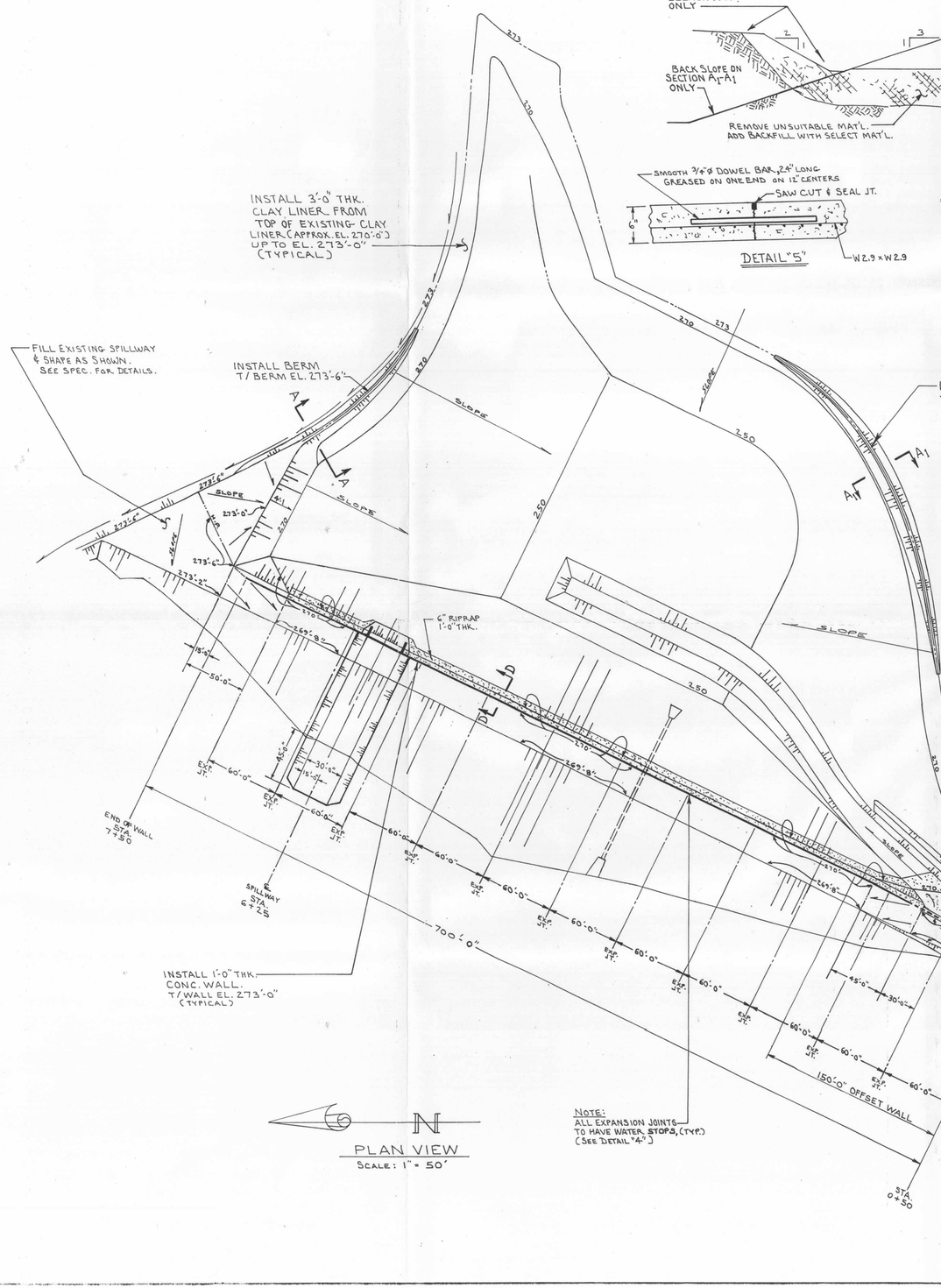
PROVIDENCE

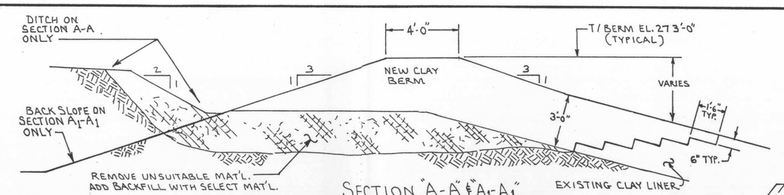
Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

Drawing Number
002-255-B023

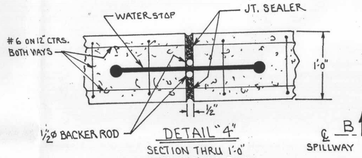
25b
Attachment



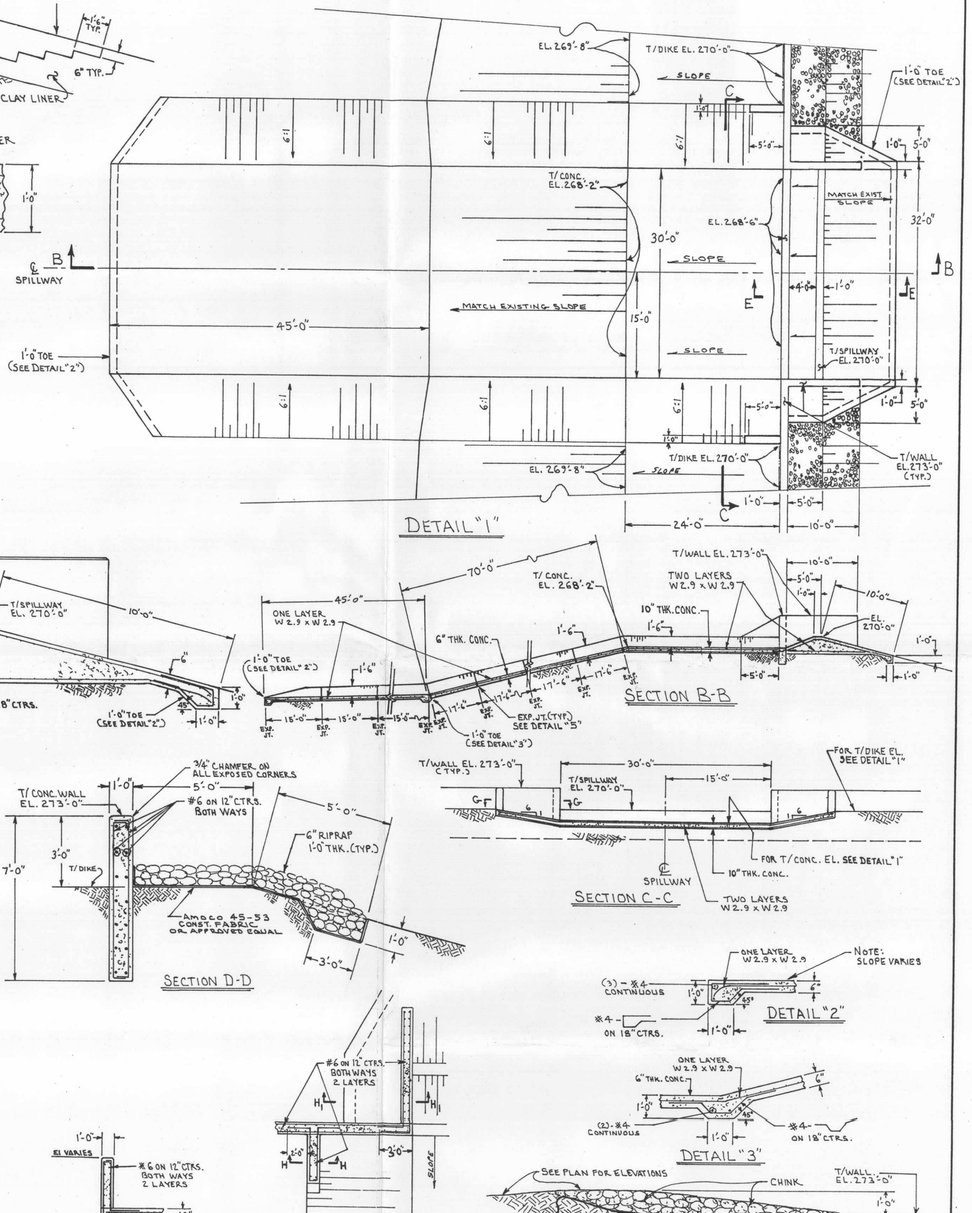


SECTION "A-A" & "A1-A1"
NOT TO SCALE

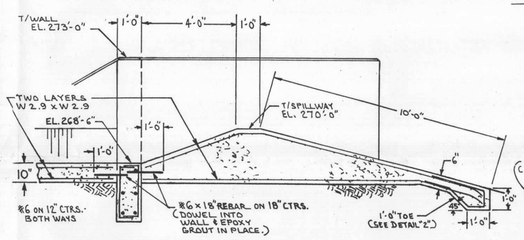
DETAIL "5"



DETAIL "4"
SECTION THRU 1'-0" WALL LOOKING DOWN THRU EXP. JT.



DETAIL "1"



SECTION E-E

SECTION B-B

SECTION D-D

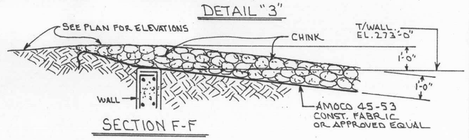
SECTION C-C

SECTION G-G
TYP. BOTH SIDES OF SPILLWAY

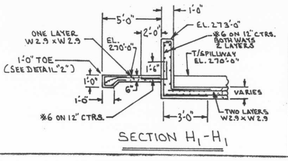
SECTION H-H

DETAIL "2"

DETAIL "3"



SECTION F-F



SECTION H_1-H_1

REV	W.O.	BY	DATE	SUBJECT	APPROVED
		BP	4-1-98	RELEASED FOR BIDS SPEC. # 8320	

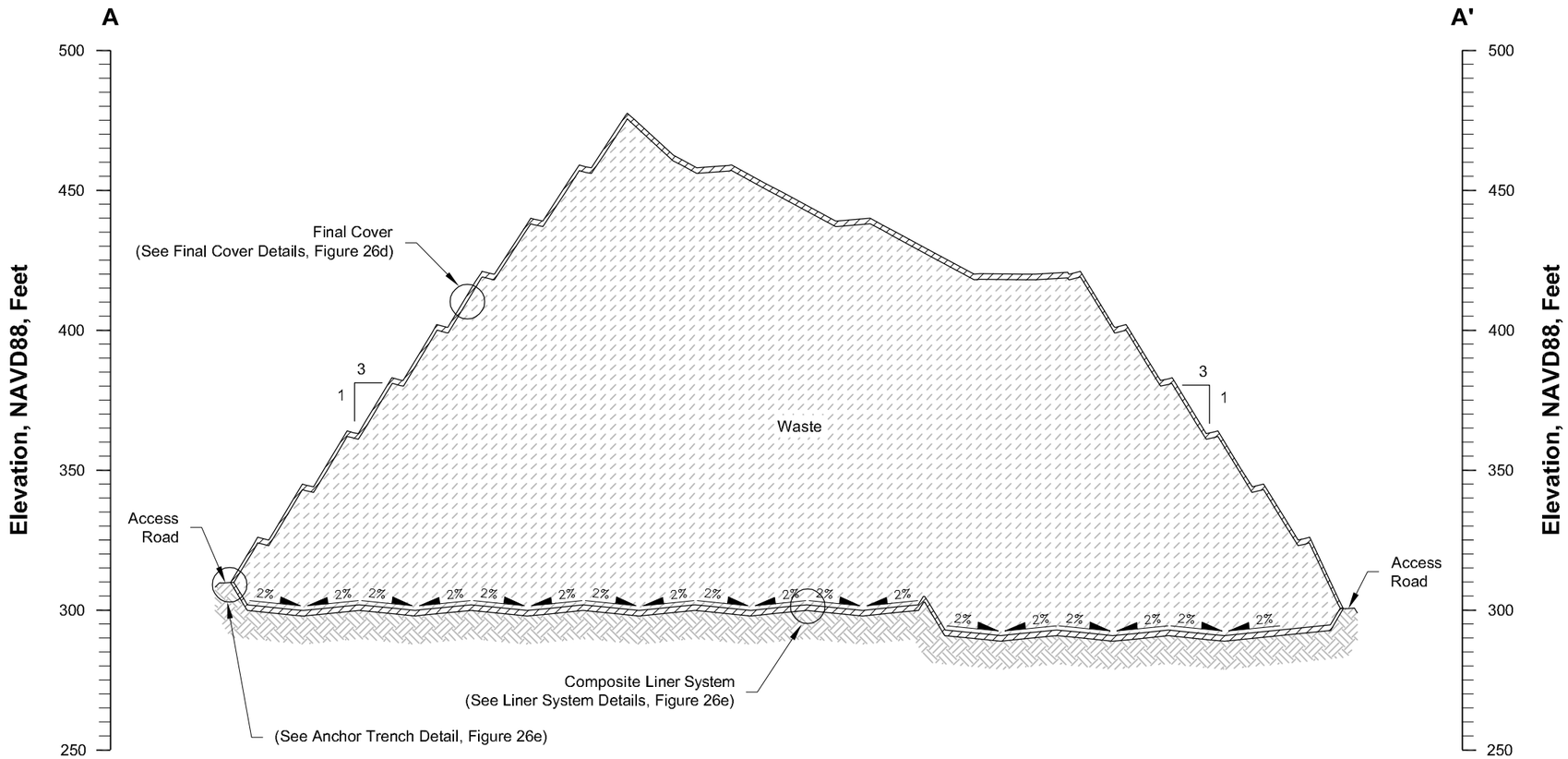
DOLET HILLS POWER PLANT
SCRUBBER SLUDGE DISPOSAL AREA
• MODIFICATIONS TO
SURFACE RUNOFF IMPOUNDMENT

SWEPCO / CLECO

DEPT.	
DIV.	
APPROVED	
DRWN. BY: BP	DATE: 4-1-98
SCALE: As Noted	W.O.
SH. 12	DRWG. NO. DH-123

ATTACHMENT 26

CROSS-SECTIONAL DRAWINGS SHOWING ORIGINAL CONTOURS, ELEVATIONS, DRAINAGE, LOCATION AND TYPE OF LINER, LEACHATE COLLECTION SYSTEM, AND OTHER PERTINENT FEATURES



Section A-A'
Horizontal Scale: 1" = 250'
Vertical Scale: 1" = 50'

FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Horizontal Scale: 1" = 250'
250' 125' 0 250'
50' 25' 0 50'
Vertical Scale: 1" = 50'

Cross Section A-A'

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

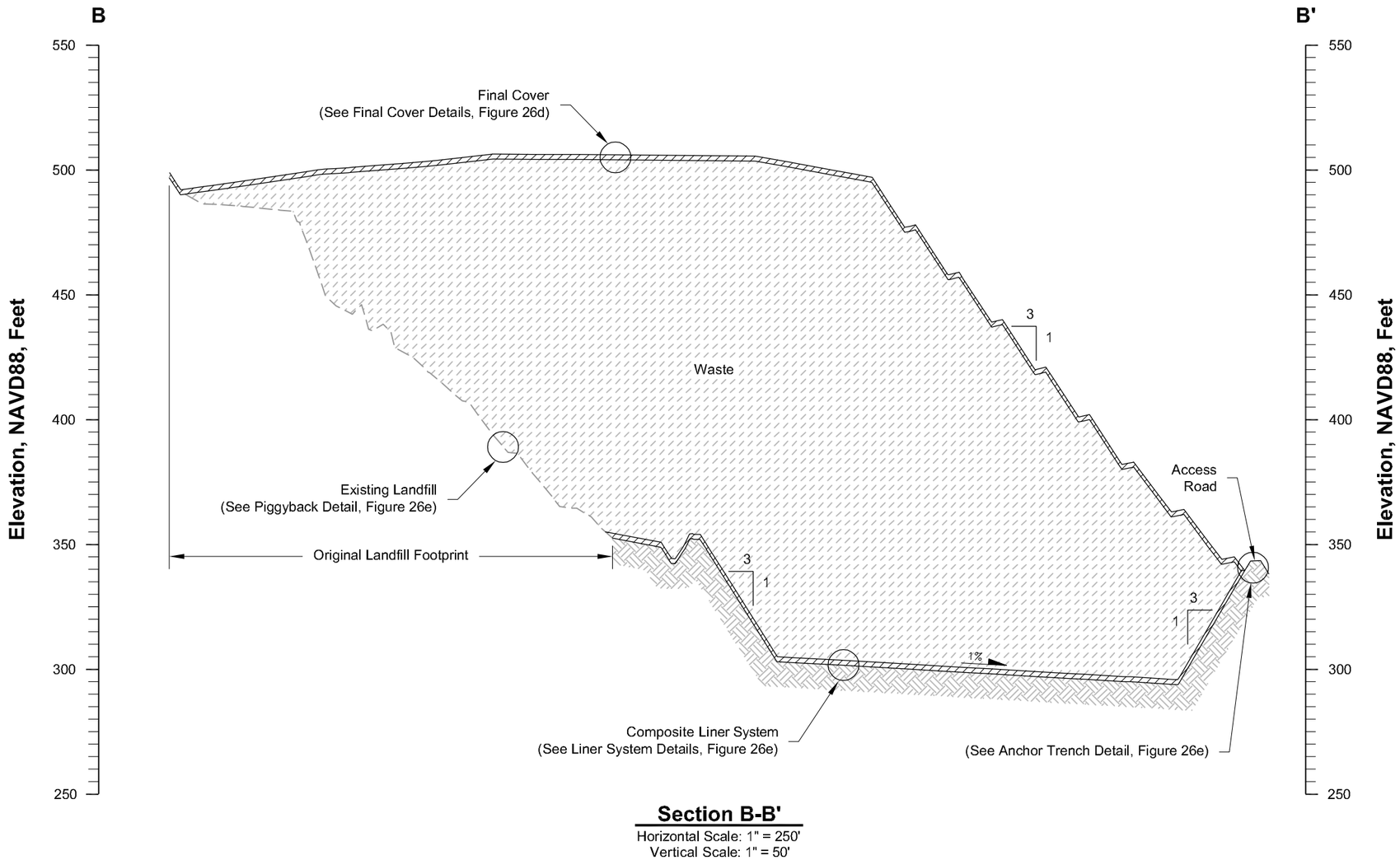
PROVIDENCE

Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

Drawing Number
002-255-B024

26a
Attachment



Section B-B'
Horizontal Scale: 1" = 250'
Vertical Scale: 1" = 50'

FOR PERMITTING PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Horizontal Scale: 1" = 250'
250' 125' 0 250'
50' 25' 0 50'
Vertical Scale: 1" = 50'

Cross Section B-B'

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

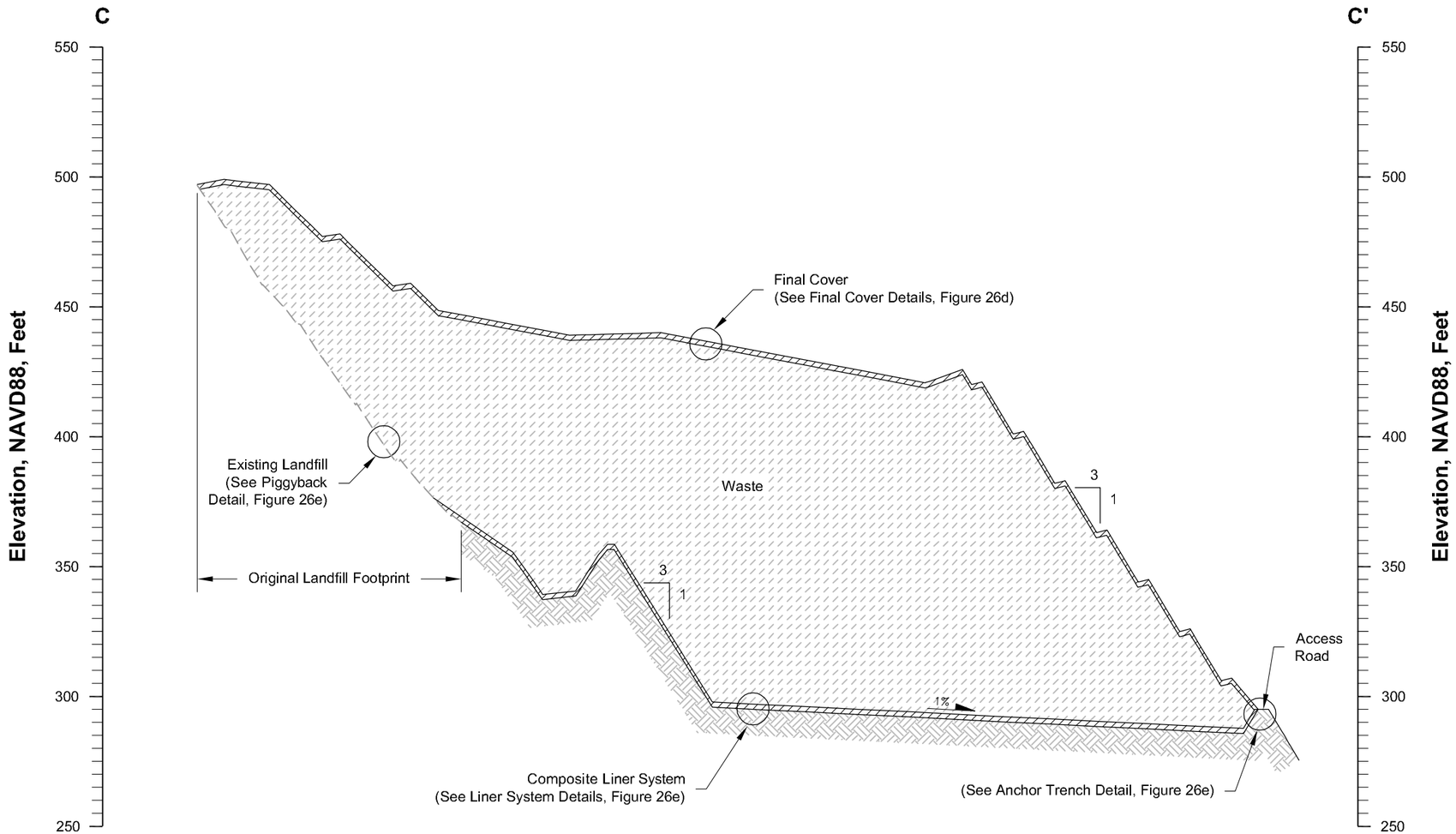
PROVIDENCE

Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

Drawing Number
002-255-B025

26b
Attachment



Section C-C'
Horizontal Scale: 1" = 250'
Vertical Scale: 1" = 50'

FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Horizontal Scale: 1" = 250'
250' 125' 0 250'
50' 25' 0 50'
Vertical Scale: 1" = 50'

Cross Section C-C'

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

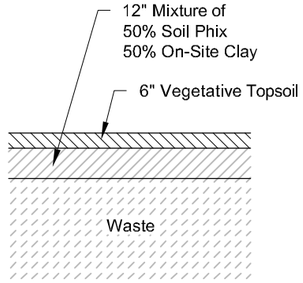
PROVIDENCE

Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

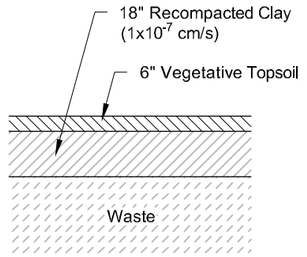
Drawing Number
002-255-B054

26c
Attachment



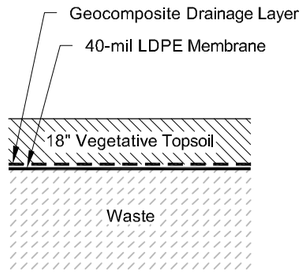
Final Cover Detail (Option A)

Not to Scale



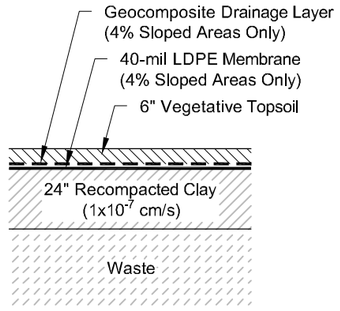
Final Cover Detail (Option B)

Not to Scale



Final Cover Detail (Option C)

Not to Scale



Final Cover Detail (Option D)

Not to Scale

FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Final Cover Details

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

PROVIDENCE

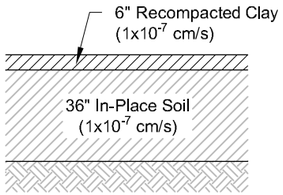
Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

Drawing Number
002-255-B026

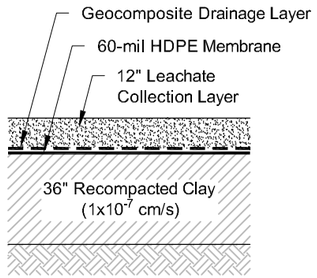
26d
Attachment

Providence Engineering and Environmental Group LLC



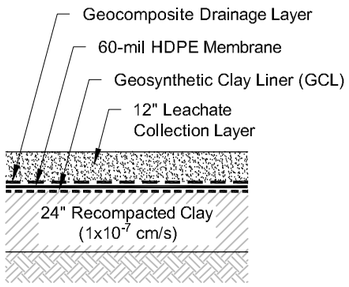
Composite Liner System
(Cell 1-11 - Previously Constructed)

Not to Scale



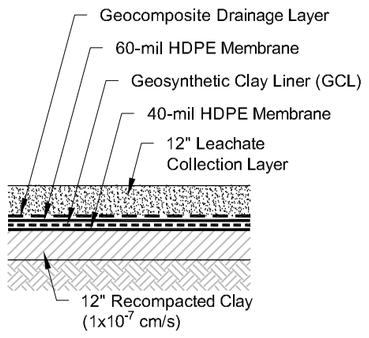
Composite Liner System
(Option A)

Not to Scale



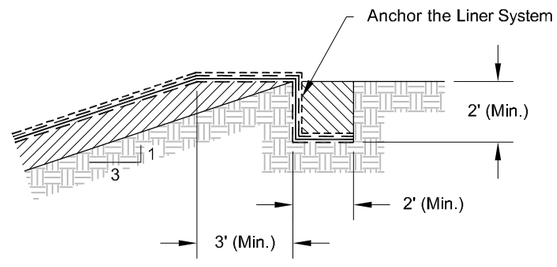
Composite Liner System
(Option B)

Not to Scale



Composite Liner System
(Option C)

Not to Scale



Anchor Trench Detail
(East and South Sides)

Not To Scale

FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Liner System Details

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

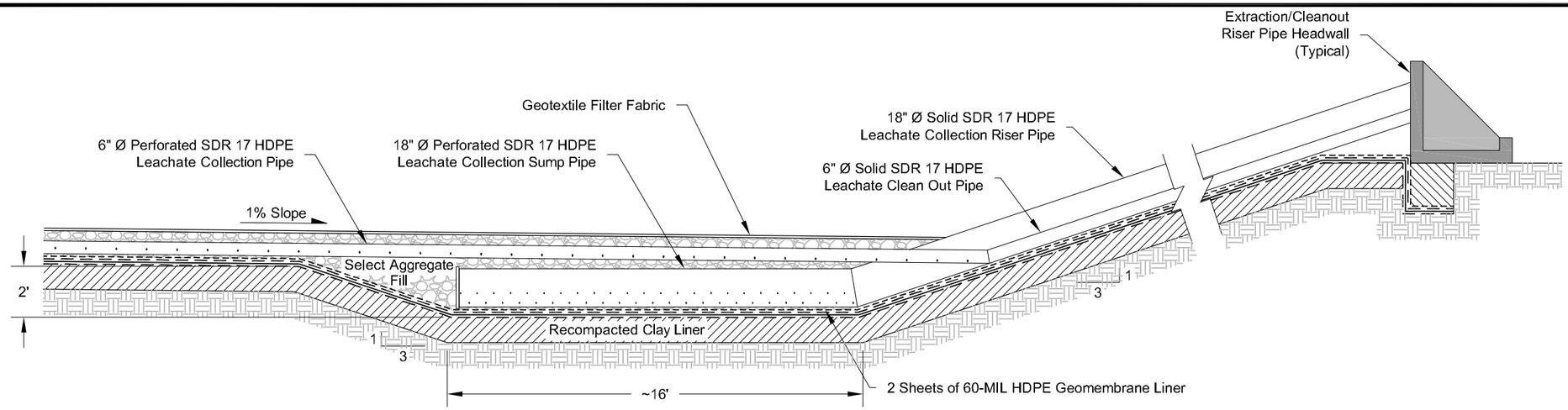
PROVIDENCE

Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

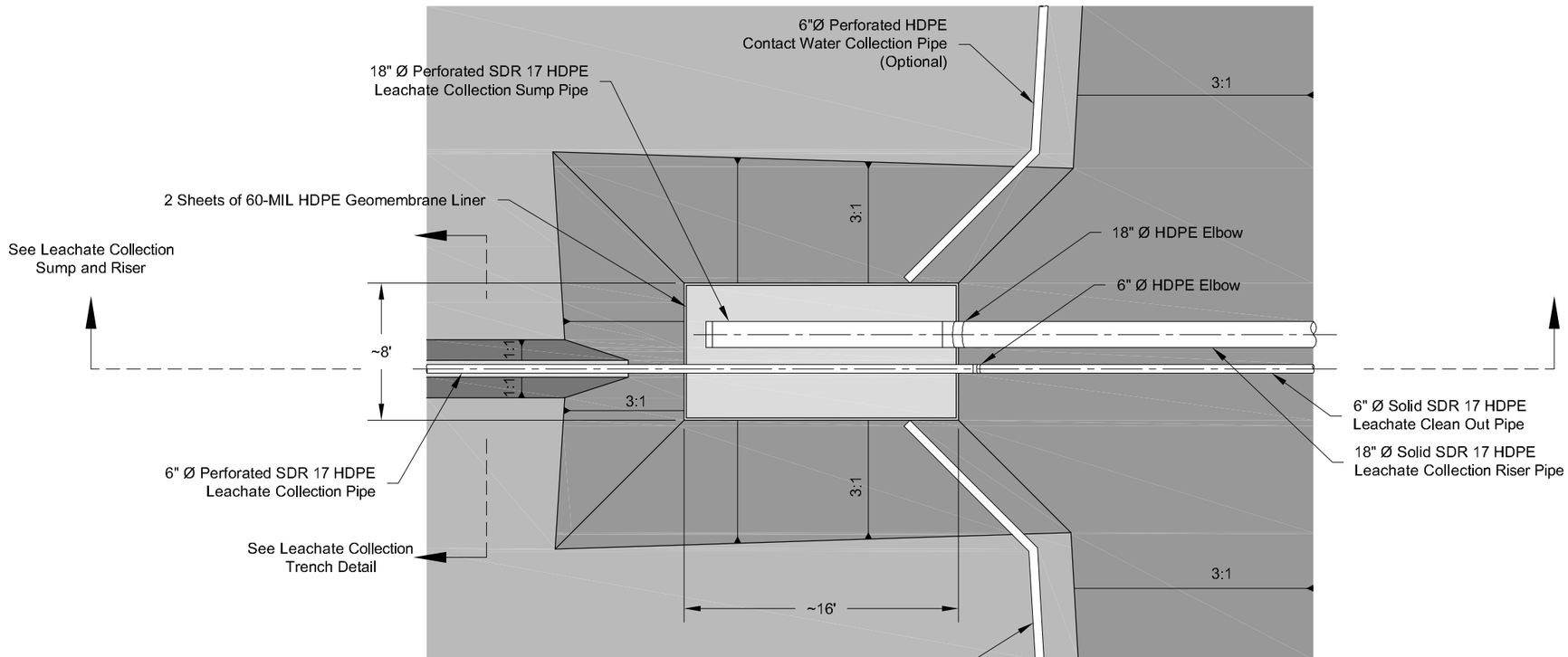
Drawing Number
002-255-B027

26e
Attachment



Leachate Collection Sump and Riser

Not To Scale



Leachate Collection Sump Detail (Plan View)

Not to Scale

FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Leachate Collection Details

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

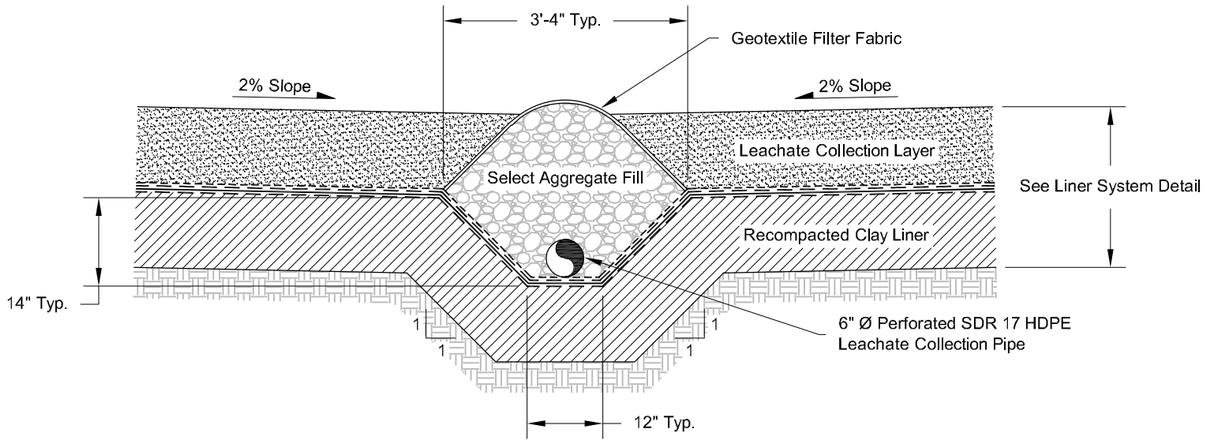
PROVIDENCE

Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

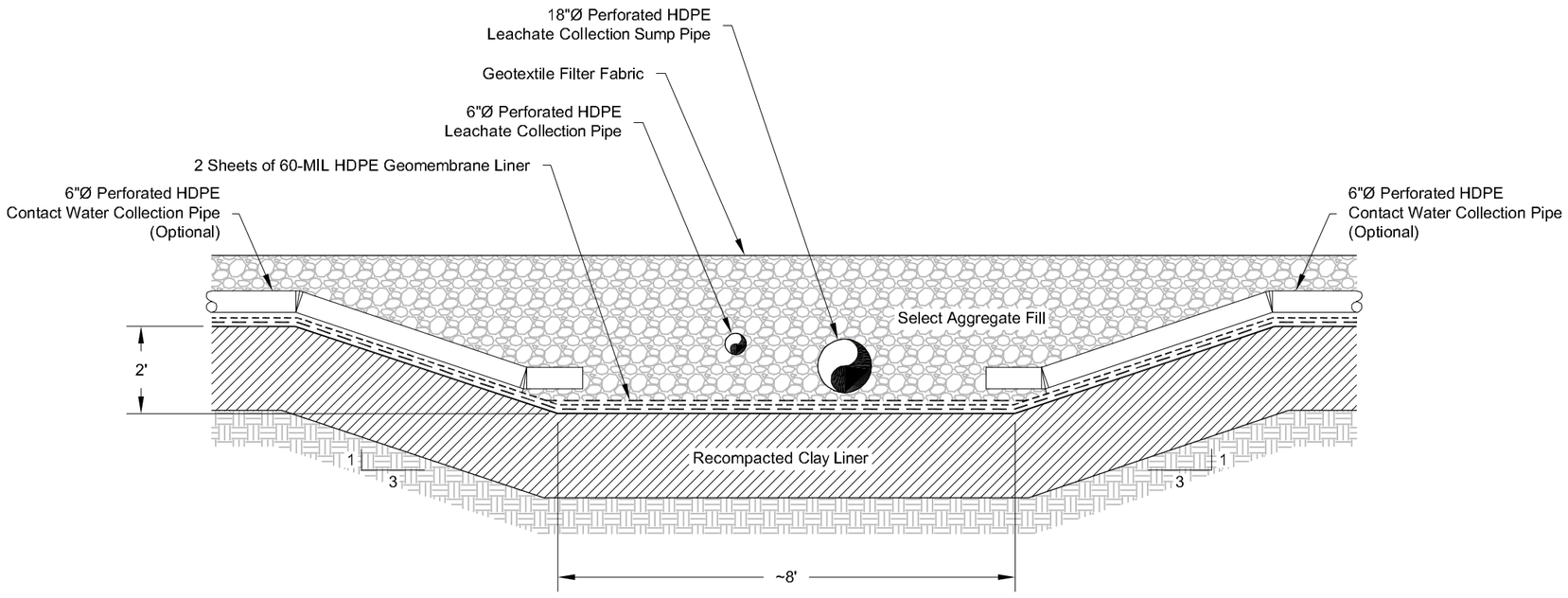
Drawing Number
002-255-B028

26f
Attachment



Leachate Collection Trench Detail

Not To Scale



Leachate Collection Sump

Not to Scale

FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Leachate Collection Details

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

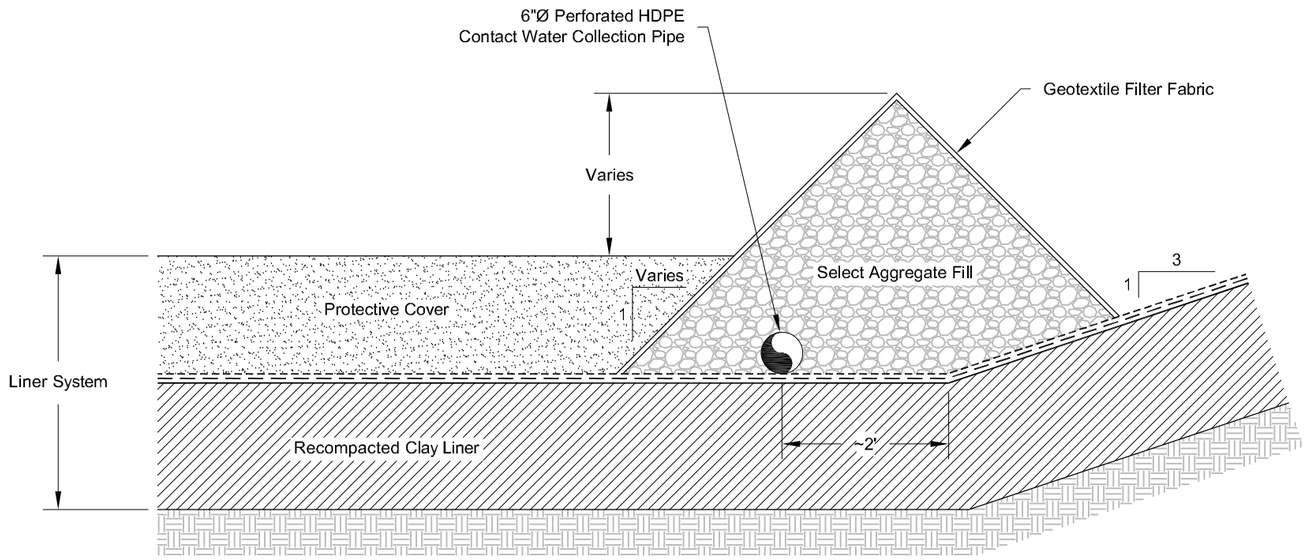
PROVIDENCE

Drawn By	LMH	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

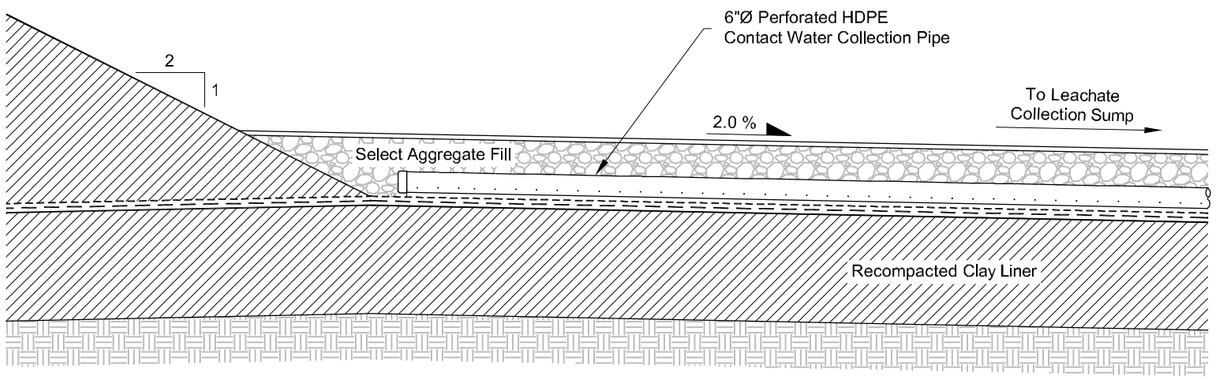
Drawing Number
002-255-B029

26g
Attachment



Contact Water Collection Pipe

Not to Scale



Contact Water Collection Pipe

Not to Scale

FOR PERMITTING PURPOSES ONLY

NOT TO BE USED FOR CONSTRUCTION,
BIDDING, RECORDATION, CONVEYANCE OR SALES.

Contact Water Collection Details

Solid Waste Permit Renewal
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

PROVIDENCE

Drawn By	LMM	10/23/19
Checked By	LMH	10/23/19
Approved By	GJL	10/23/19

Project Number
002-255

Drawing Number
002-255-B030

26h
Attachment

APPENDIX C

AS-BUILT DRAWINGS

Cleco Power LLC

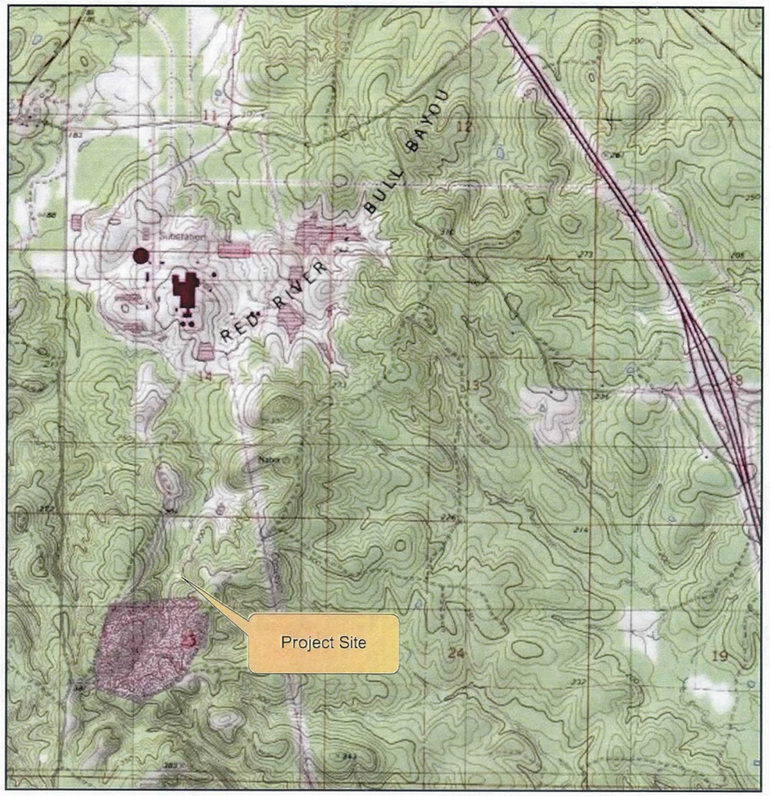
Dolet Hills Power Station — Mansfield, DeSoto Parish, Louisiana

Cell 11 As-Built Drawings

July 2016

Index to Sheets

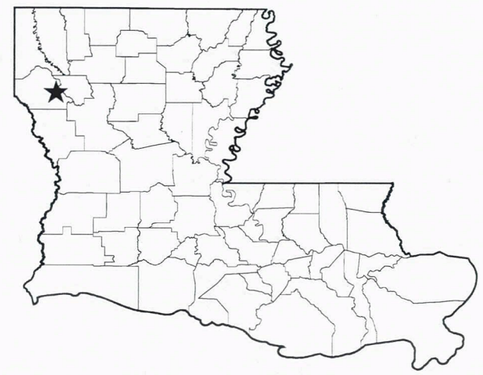
Sheet No.	Description
1	Title Sheet
2	Subgrade Plan
3	Top of Clay
101	Details



Site Location Map

3000 0 3000

Scale: 1" = 3000'



Rev.	Date	Description	By

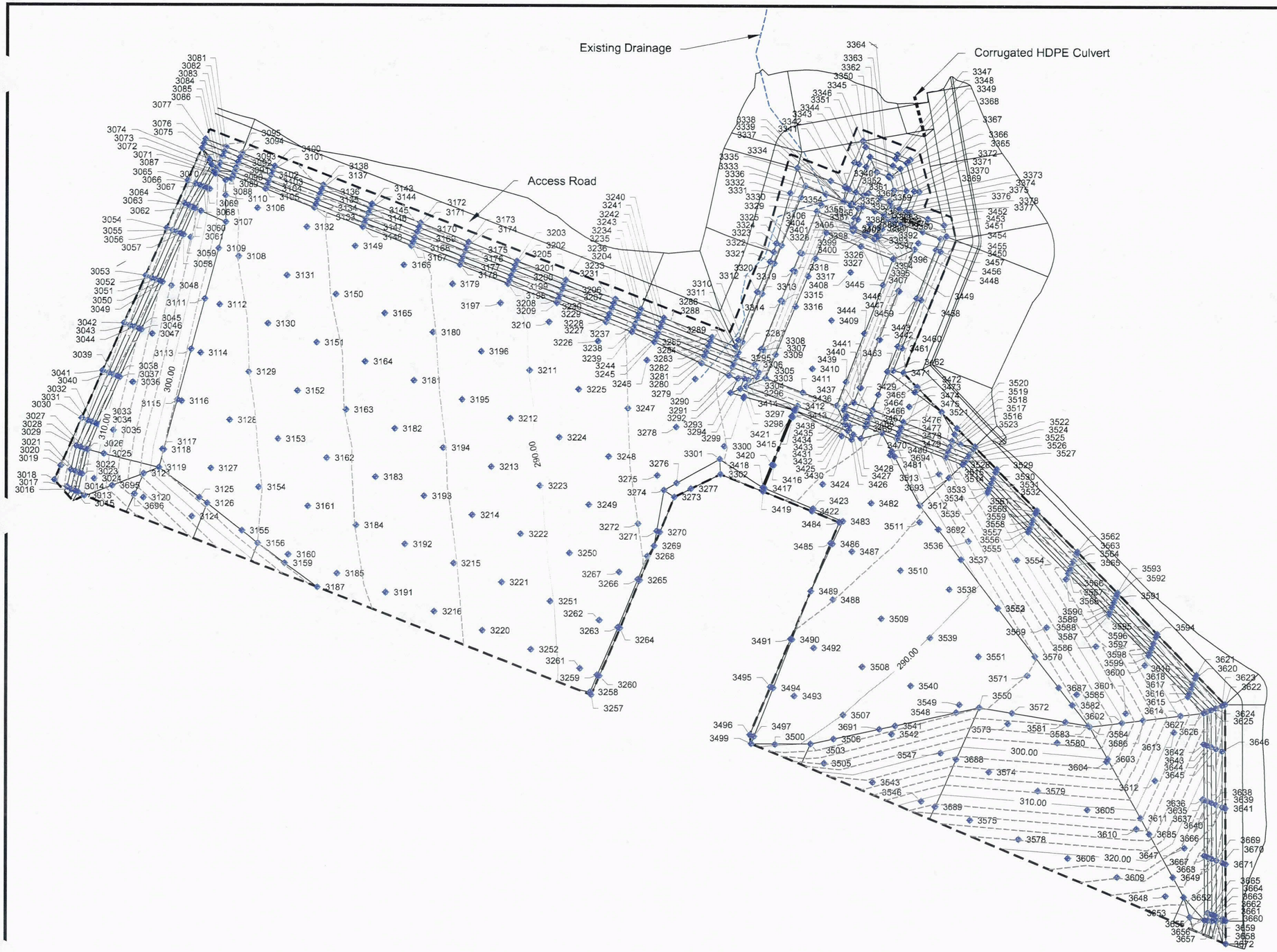
Title Sheet

Cell 11 As-Built Drawings
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

PROVIDENCE

Drawn By	LMM	07/19/16
Checked By	LMH	07/19/16
Approved By	GJL	07/19/16
Project Number 002-171		1 Sheet
Drawing Number 002-171-B021		



N

Legend

- Major Contour (10' Interval)
- Minor Contour (2' Interval)
- Extent of Clay Liner (Cell 11)
- 6" Ø Perforated SDR 17 HDPE Leachate Collection Pipe

Note

All elevations are given in North American Vertical Datum of 1988 (NAVD88), U.S. Survey Feet, all horizontal coordinates are given in North American Datum of 1983 (NAD83), Louisiana State Plane, North Zone, U.S. Survey Feet.

100 0 100

Scale: 1" = 100'

Rev.	Date	Description	By

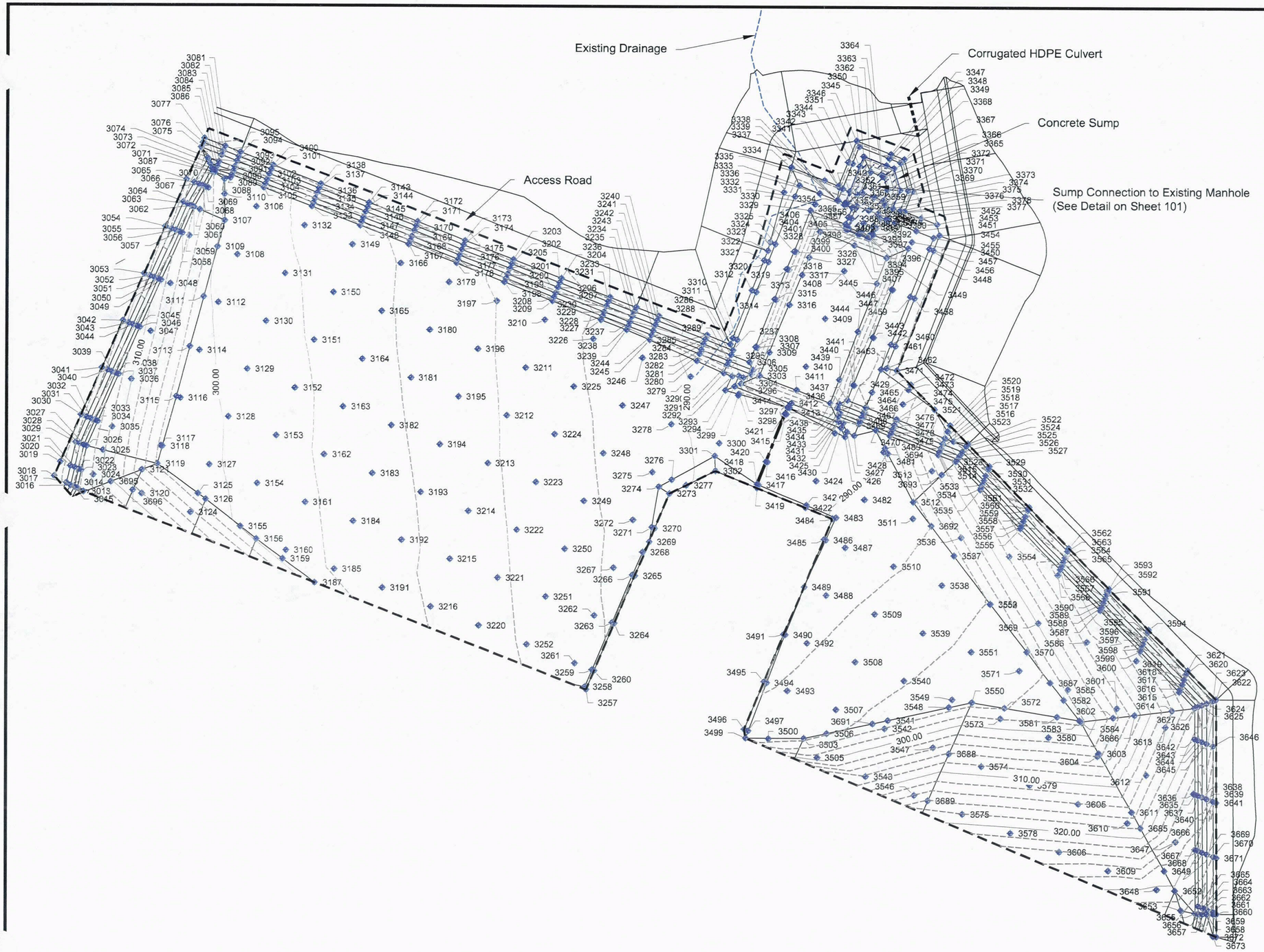
Subgrade Plan

Cell 11 As-Built Drawings
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

PROVIDENCE

Drawn By	LMM	07/19/16
Checked By	LMH	07/19/16
Approved By	GJL	07/19/16
Project Number 002-171		2 Sheet
Drawing Number 002-171-B022		



N

Legend

- Major Contour (10' Interval)
- Minor Contour (2' Interval)
- Extent of Clay Liner (Cell 11)
- 6" Ø Perforated SDR 17 HDPE Leachate Collection Pipe
- Concrete Sump (8" Thick)

Note

All elevations are given in North American Vertical Datum of 1988 (NAVD88), U.S. Survey Feet, all horizontal coordinates are given in North American Datum of 1983 (NAD83), Louisiana State Plane, North Zone, U.S. Survey Feet.

100 0 100

Scale: 1" = 100'

Rev.	Date	Description	By

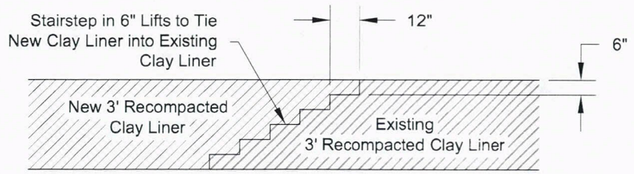
Top of Clay

Cell 11 As-Built Drawings
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

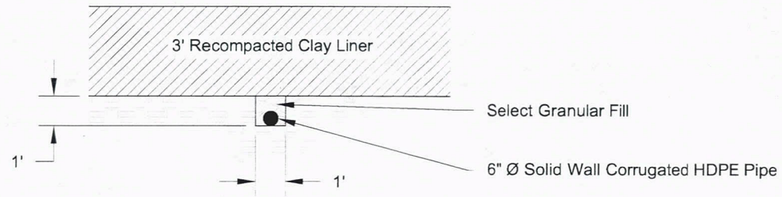
PROVIDENCE

Drawn By	LMM	07/19/16
Checked By	LMH	07/19/16
Approved By	GJL	07/19/16
Project Number 002-171		3
Drawing Number 002-171-B023		Sheet



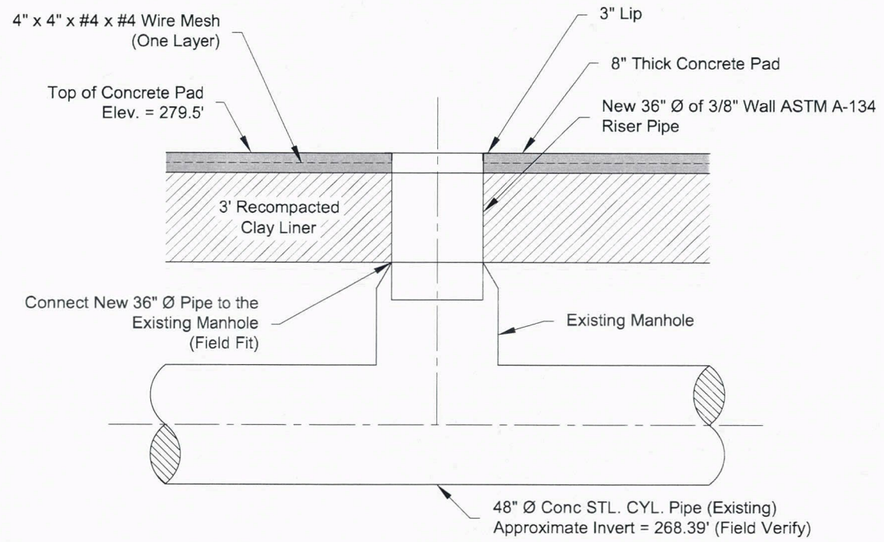
Clay Liner Tie-in Detail

N.T.S.



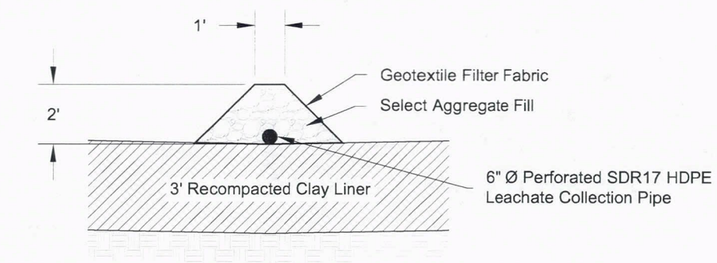
Underdrain Pipe Extension Trench Detail

N.T.S.



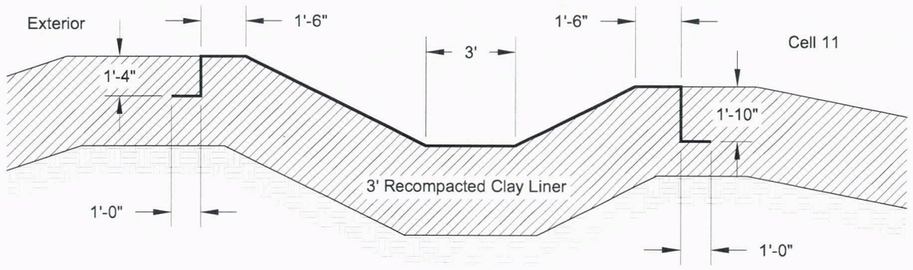
Riser Pipe Detail

N.T.S.



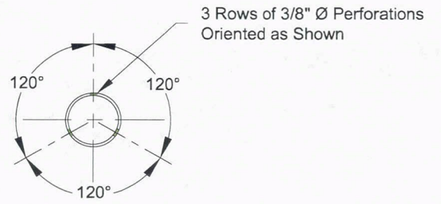
Leachate Collection Trench Detail

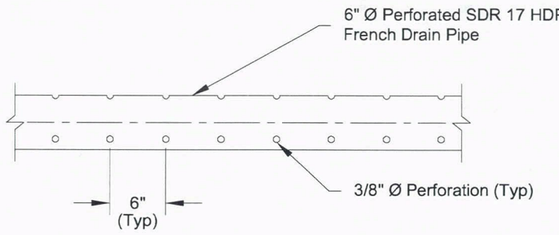
N.T.S.



Ditch Liner Detail

N.T.S.





Leachate Collection Pipe Detail

N.T.S.

Rev.	Date	Description	By

Details

Cell 11 As-Built Drawings
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

PROVIDENCE

Drawn By	LMM	07/19/16
Checked By	LMH	07/19/16
Approved By	GJL	07/19/16
Project Number	002-171	101 Sheet
Drawing Number	002-171-B024	

APPENDIX C – ENGINEERING CALCULATIONS

WORKSHEET TITLE:	Run-off / Run-off - Dolet Hills Landfill	**CALCULATION NO.:**	135359 - C - 001
CREATED:	8/18/2021	**REVISION:**	C
PERFORMED BY:	A. MYERS	**REVIEWED BY:**	J. Eichenberger
OBJECTIVE:	Determine adequacy of existing run-on and run-off controls		

REFERENCES:

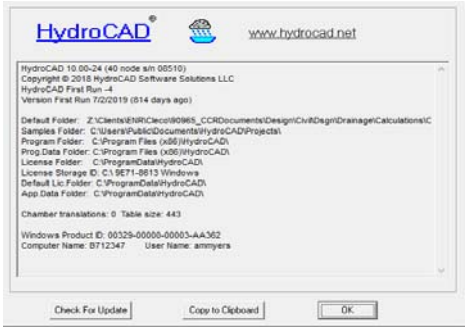
1 Natural Resources Conservation Service (June 1986). TR-55: Urban Hydrology for Small Watersheds.
Retrieved from : www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf

2 US Department of Agriculture. (no date). Custom soils resouces report for DeSoto Parish, LA.
Retrieved from : http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

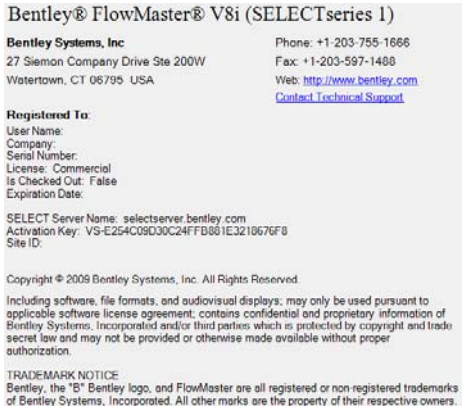
3 National Oceanic and Atmospheric Administration. (2021). NOAA Atlas 14, Volume 9, Version 2. [Point precipitation frequency estimates for Mansfield, LA, Station Mansfield (16-5874), US]. Retrieved from http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=la

SOFTWARE:

1



2



ASSUMPTIONS:

1 Design storm is 25-yr, 24-hr (per CCR Rule)

2 Soils (existing and cover soils) are generally fine sandy loam, Hydrologic Soil Group D — Reference 2

3 CCR material in the open portion of the landfill will be modeled as Hydrologic Soil Group C

4 Half the open landfill area will drain to western contact stormwater drainage channel and half will drain to eastern contact stormwater drainage channel.

MODEL INPUTS (see also HydroCAD report):

1 Establish rainfall data (assume SCS Type III distribution)

SCS Storm	Depth (in)
25yr, 24hr	8.16

Reference 3

2 Input CN data - see SK-CIVIL-002 in Appendix A for land cover assumptions

		Area (ac)		
Land Description	**CN**	**Landfill**	**Runoff Pond**	**Outside Runoff**
Open space, poor condition (ash)	86	31.207		
Open space, good condition (pasture)	80	10.722		
Open space, fair condition (pasture)	84		2.726	2.007
Impervious	98	1.528	3.003	
Gravel Road	96	0.146		
Dirt Road/Bare Soil	94	0.543		
Woods, good condition	77		1.988	2.017
		44.145	7.717	4.024

3 Input pond volume data

Cell 11 Sedimentation Pond	
EL	area* (ac)
280	0.247
282	0.289
284	0.334
286	0.383
288	0.434

*measured in Microstation, estimated based on as-built drawing.

Cell 11 Overflow Sump	
EL	area* (sf)
268.37	7
279.5	7
280	603
285	2,311
286	2,705

*measured in Microstation, estimated based on as-built drawing.

Runoff Pond	
EL	area* (ac)
250	0.832
252	1.016
254	1.219
256	1.434
258	1.661
260	1.898
261	2.259
262	2.652
264	3.003
266	3.334
268	3.716
270	4.143
272	4.396
273	4.525

*measured in Microstation, elevations below the LiDAR water surface elevation were estimated by offsetting contours at 3H:1V.

RESULTS (see also HydroCAD report):

Subcatchment	Weighted CN	Runoff Depth (in)	Peak Runoff (cfs)
1S: Landfill	85	6.37	233.81
2S: Runoff Pond	88	6.72	44.99
3S: Outside Runoff	80	5.78	25.38

Pond	Initial EL (ft)	Peak Elevation (ft)	Peak Inflow (cfs)	Peak Discharge (cfs)	Peak Storage (ac-ft)
2P: Cell 11 Sedimentation Pond	286.00	287.81	233.81	229.92	2.721
3P: Cell 11 Overflow Sump	N/A	285.19	229.92	217.41	0.183
4P: Runoff Pond	259.00	268.52	253.91	0.00	38.913

CONCLUSION:

Under the modeled conditions, the landfill ponds can accept and control inflows from the design flood event without overtopping.

CHECK DITCH CAPACITIES

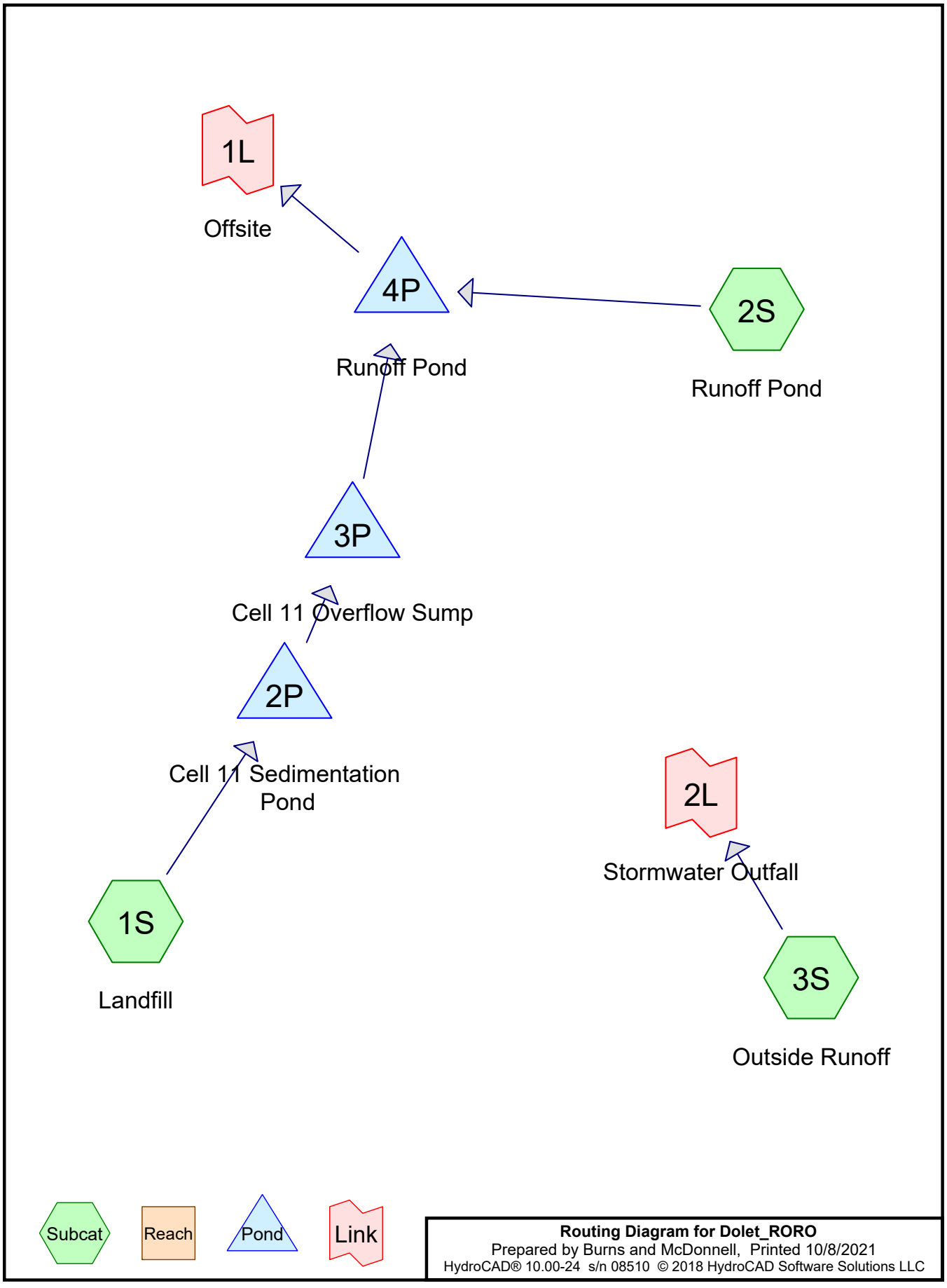
1 Use FlowMaster to determine velocity in the channels using HEC-HMS calculated peak discharge, above. Minimum channel depth is 2ft.
Contact Stormwater Run-off: Assume a trapezoidal channel with roughness coefficient of 0.012 (geomembrane liner), channel slope 1%, bottom width of 8ft, and 3:1 side slopes.
Non-Contact Stormwater Run-off: Assume a triangular channel with roughness coefficient of 0.025 (earth, clean and winding), channel slope 2%, and 3:1 side slopes.

RESULTS:

Component	Discharge (cfs)	Normal Depth (ft)	Channel Velocity (ft/s)
Contact Stormwater Run-off 1/2 Landfill (Open)	116.91	1.02	10.46
Non-Contact Stormwater Run-off Outside Run-off	25.38	1.21	5.80

CONCLUSION:

Under the modeled conditions, the landfill diversion ditches can accept and control inflows from the design flood event without overtopping.



Routing Diagram for Dolet_RORO
Prepared by Burns and McDonnell, Printed 10/8/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.733	84	50-75% Grass cover, Fair, HSG D (2S, 3S)
10.722	80	>75% Grass cover, Good, HSG D (1S)
31.207	86	Ash (1S)
0.543	94	Dirt road/bare soil, HSG D (1S)
0.146	96	Gravel surface, HSG D (1S)
4.531	98	Impervious (1S, 2S)
4.005	77	Woods, Good, HSG D (2S, 3S)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Landfill Runoff Area=44.146 ac 3.46% Impervious Runoff Depth=6.37"
Flow Length=2,506' Tc=16.2 min CN=85 Runoff=233.81 cfs 23.426 af

Subcatchment 2S: Runoff Pond Runoff Area=7.717 ac 38.91% Impervious Runoff Depth=6.72"
Flow Length=880' Tc=13.7 min CN=88 Runoff=44.99 cfs 4.325 af

Subcatchment 3S: Outside Runoff Runoff Area=4.024 ac 0.00% Impervious Runoff Depth=5.78"
Flow Length=1,390' Slope=0.0200 '/' Tc=7.2 min CN=80 Runoff=25.38 cfs 1.937 af

Pond 2P: Cell 11 Sedimentation Pond Peak Elev=287.81' Storage=2.721 af Inflow=233.81 cfs 23.426 af
Outflow=229.92 cfs 23.038 af

Pond 3P: Cell 11 Overflow Sump Peak Elev=285.19' Storage=7,972 cf Inflow=229.92 cfs 23.038 af
48.0" Round Culvert n=0.012 L=460.0' S=0.0069 '/' Outflow=217.41 cfs 23.038 af

Pond 4P: Runoff Pond Peak Elev=268.52' Storage=38.913 af Inflow=253.91 cfs 27.362 af
Outflow=0.00 cfs 0.000 af

Link 1L: Offsite Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 2L: Stormwater Outfall Inflow=25.38 cfs 1.937 af
Primary=25.38 cfs 1.937 af

Summary for Subcatchment 1S: Landfill

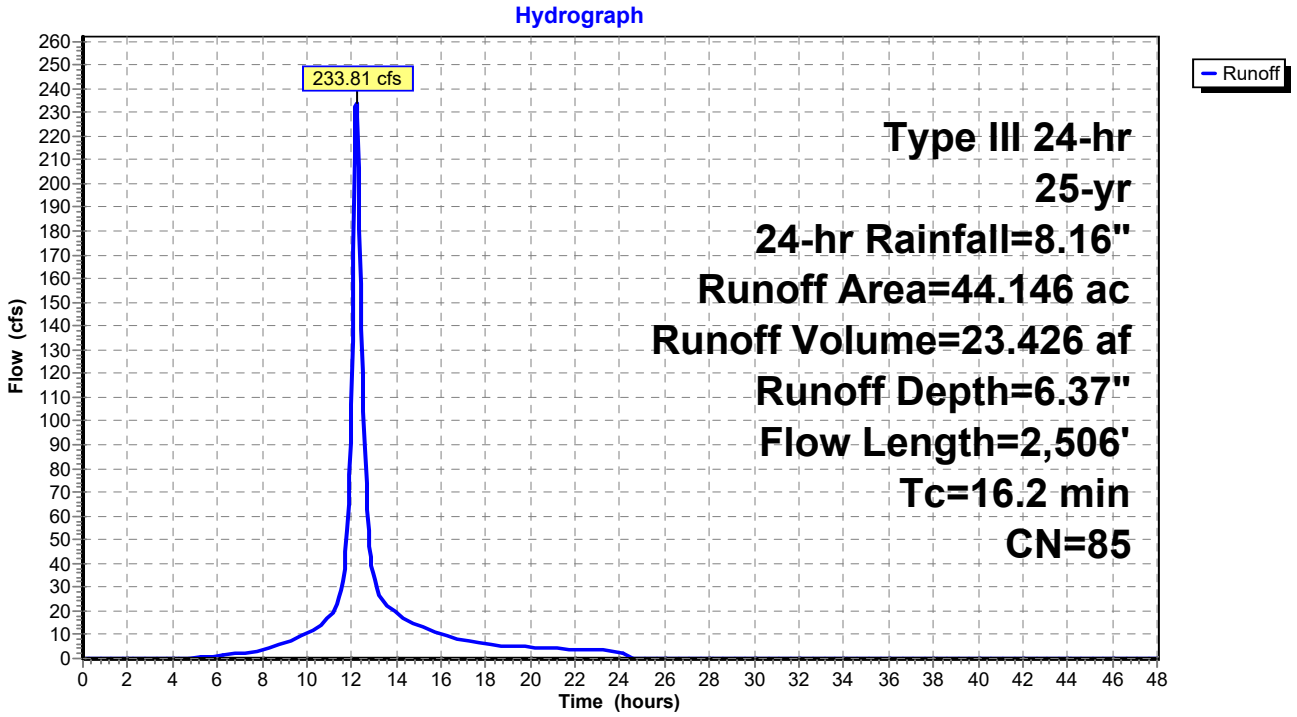
Runoff = 233.81 cfs @ 12.22 hrs, Volume= 23.426 af, Depth= 6.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr, 24-hr Rainfall=8.16"

	Area (ac)	CN	Description
*	31.207	86	Ash
	10.722	80	>75% Grass cover, Good, HSG D
*	1.528	98	Impervious
	0.146	96	Gravel surface, HSG D
*	0.543	94	Dirt road/bare soil, HSG D
	44.146	85	Weighted Average
	42.618		96.54% Pervious Area
	1.528		3.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	31	0.0285	0.44		**Sheet Flow,** Fallow n= 0.050 P2= 4.39"
1.7	169	0.3333	1.64		**Sheet Flow,** Fallow n= 0.050 P2= 4.39"
1.3	457	0.3333	5.77		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
9.1	643	0.0140	1.18		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
2.9	1,206	0.0100	7.01	33.28	**Trap/Vee/Rect Channel Flow,** Bot.W=8.00' D=0.50' Z= 3.0 '/' Top.W=11.00' n= 0.012
16.2	2,506	Total			

Subcatchment 1S: Landfill



Summary for Subcatchment 2S: Runoff Pond

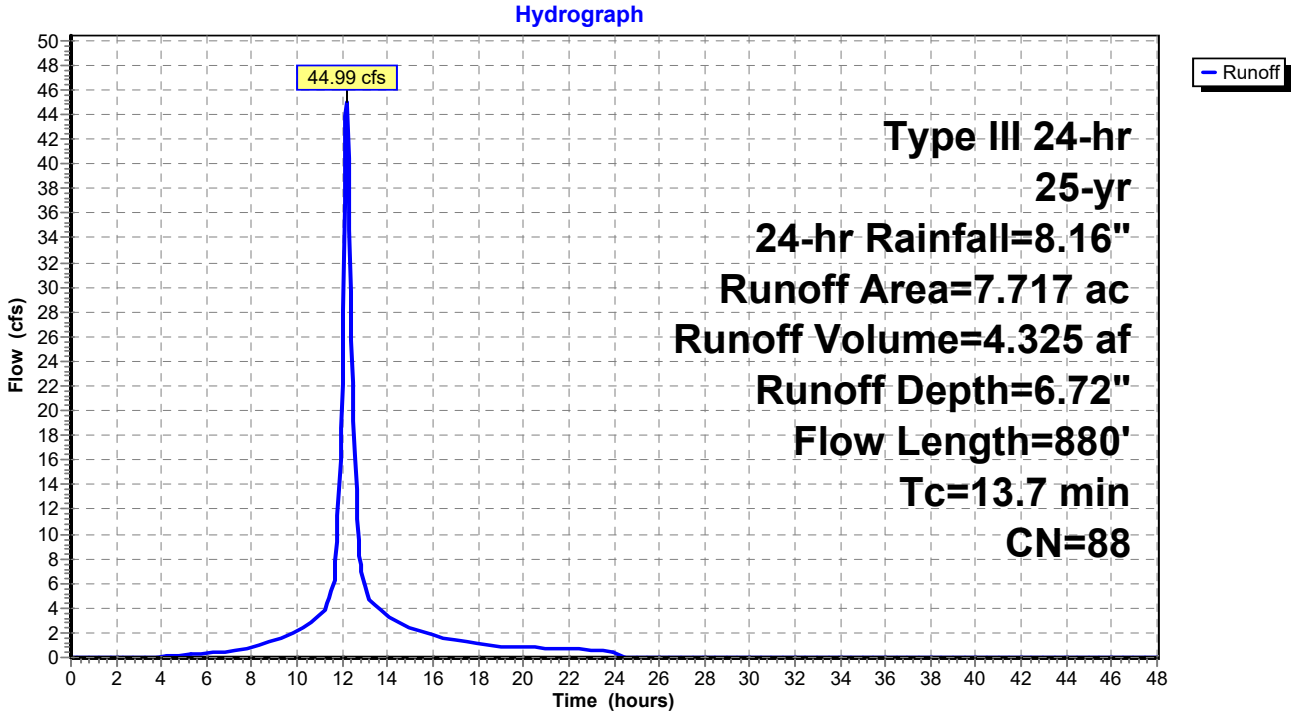
Runoff = 44.99 cfs @ 12.18 hrs, Volume= 4.325 af, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr, 24-hr Rainfall=8.16"

	Area (ac)	CN	Description
	2.726	84	50-75% Grass cover, Fair, HSG D
	1.988	77	Woods, Good, HSG D
*	3.003	98	Impervious
	7.717	88	Weighted Average
	4.714		61.09% Pervious Area
	3.003		38.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	300	0.1250	0.52		**Sheet Flow,** Grass: Short n= 0.150 P2= 4.39"
3.2	425	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	155	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	880	Total			

Subcatchment 2S: Runoff Pond



Summary for Subcatchment 3S: Outside Runoff

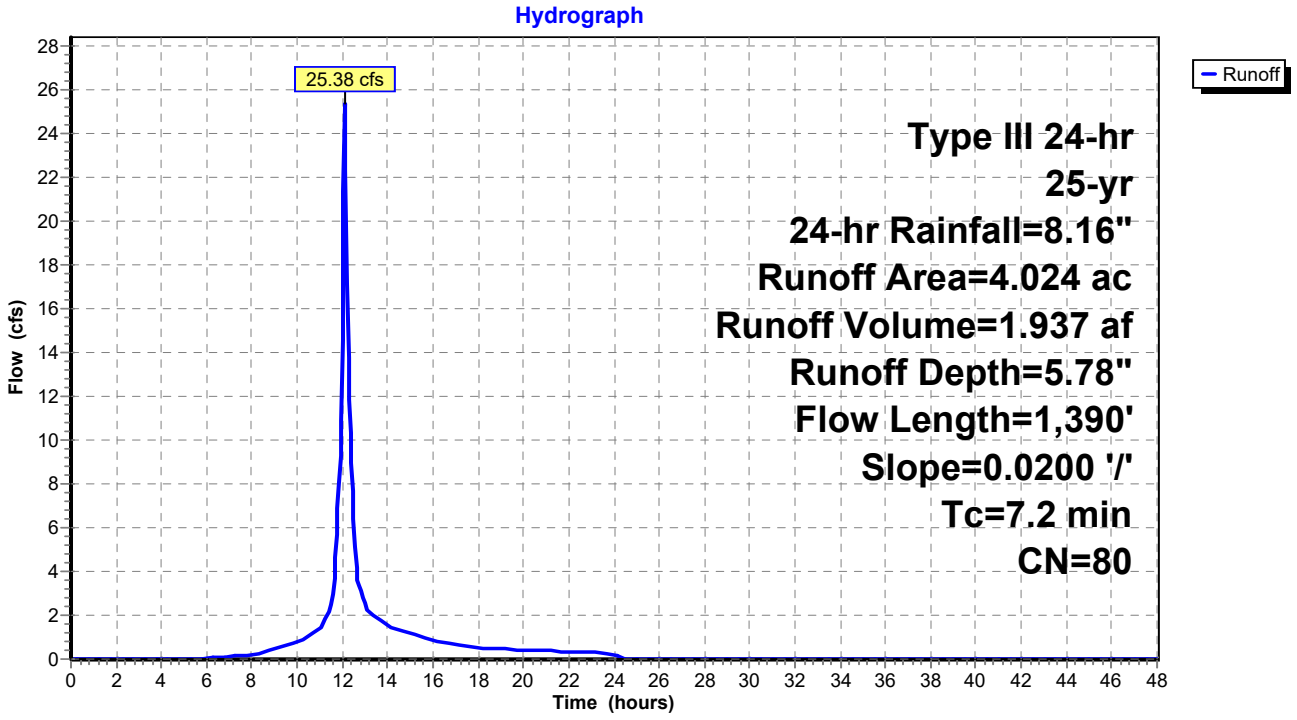
Runoff = 25.38 cfs @ 12.10 hrs, Volume= 1.937 af, Depth= 5.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr, 24-hr Rainfall=8.16"

Area (ac)	CN	Description
2.007	84	50-75% Grass cover, Fair, HSG D
2.017	77	Woods, Good, HSG D
4.024	80	Weighted Average
4.024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	1,390	0.0200	3.22	2.42	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=0.50' Z= 3.0 '/' Top.W=3.00' n= 0.025 Earth, clean & winding

Subcatchment 3S: Outside Runoff



Summary for Pond 2P: Cell 11 Sedimentation Pond

Inflow Area = 44.146 ac, 3.46% Impervious, Inflow Depth = 6.37" for 25-yr, 24-hr event
Inflow = 233.81 cfs @ 12.22 hrs, Volume= 23.426 af
Outflow = 229.92 cfs @ 12.25 hrs, Volume= 23.038 af, Atten= 2%, Lag= 1.9 min
Primary = 229.92 cfs @ 12.25 hrs, Volume= 23.038 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Starting Elev= 285.00' Surf.Area= 0.370 ac Storage= 1.511 af
Peak Elev= 287.81' @ 12.25 hrs Surf.Area= 0.499 ac Storage= 2.721 af (1.210 af above start)
Flood Elev= 288.00' Surf.Area= 0.509 ac Storage= 2.814 af (1.303 af above start)

Plug-Flow detention time= 71.7 min calculated for 21.527 af (92% of inflow)
Center-of-Mass det. time= 12.4 min (811.6 - 799.3)

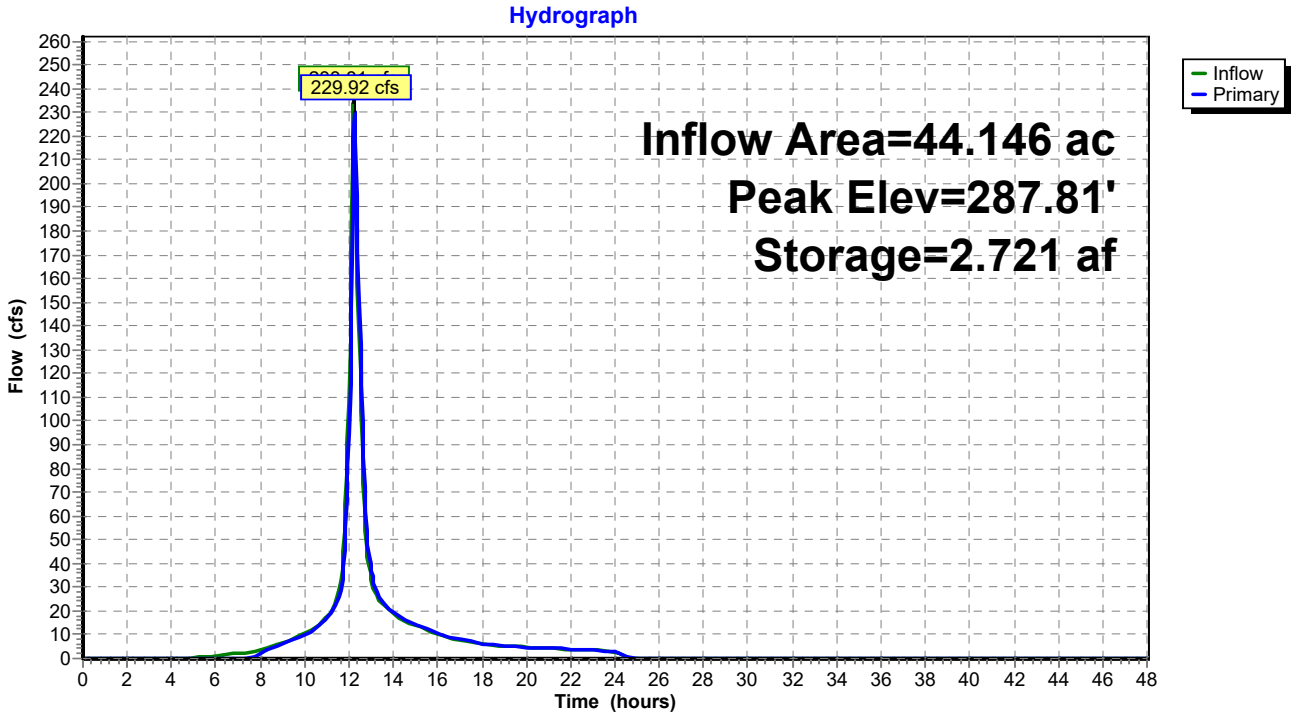
Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	3.832 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
280.00	0.247	0.000	0.000
282.00	0.289	0.536	0.536
284.00	0.334	0.623	1.159
286.00	0.406	0.740	1.899
288.00	0.509	0.915	2.814
290.00	0.509	1.018	3.832

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 2.00 Width (feet) 20.00 44.00

Primary OutFlow Max=229.33 cfs @ 12.25 hrs HW=287.81' TW=284.39' (Dynamic Tailwater)
↑—**1=Custom Weir/Orifice** (Weir Controls 229.33 cfs @ 4.10 fps)

Pond 2P: Cell 11 Sedimentation Pond



Summary for Pond 3P: Cell 11 Overflow Sump

Inflow Area = 44.146 ac, 3.46% Impervious, Inflow Depth = 6.26" for 25-yr, 24-hr event
Inflow = 229.92 cfs @ 12.25 hrs, Volume= 23.038 af
Outflow = 217.41 cfs @ 12.30 hrs, Volume= 23.038 af, Atten= 5%, Lag= 3.2 min
Primary = 217.41 cfs @ 12.30 hrs, Volume= 23.038 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 285.19' @ 12.30 hrs Surf.Area= 2,388 sf Storage= 7,972 cf
Flood Elev= 286.00' Surf.Area= 2,705 sf Storage= 10,023 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (811.7 - 811.6)

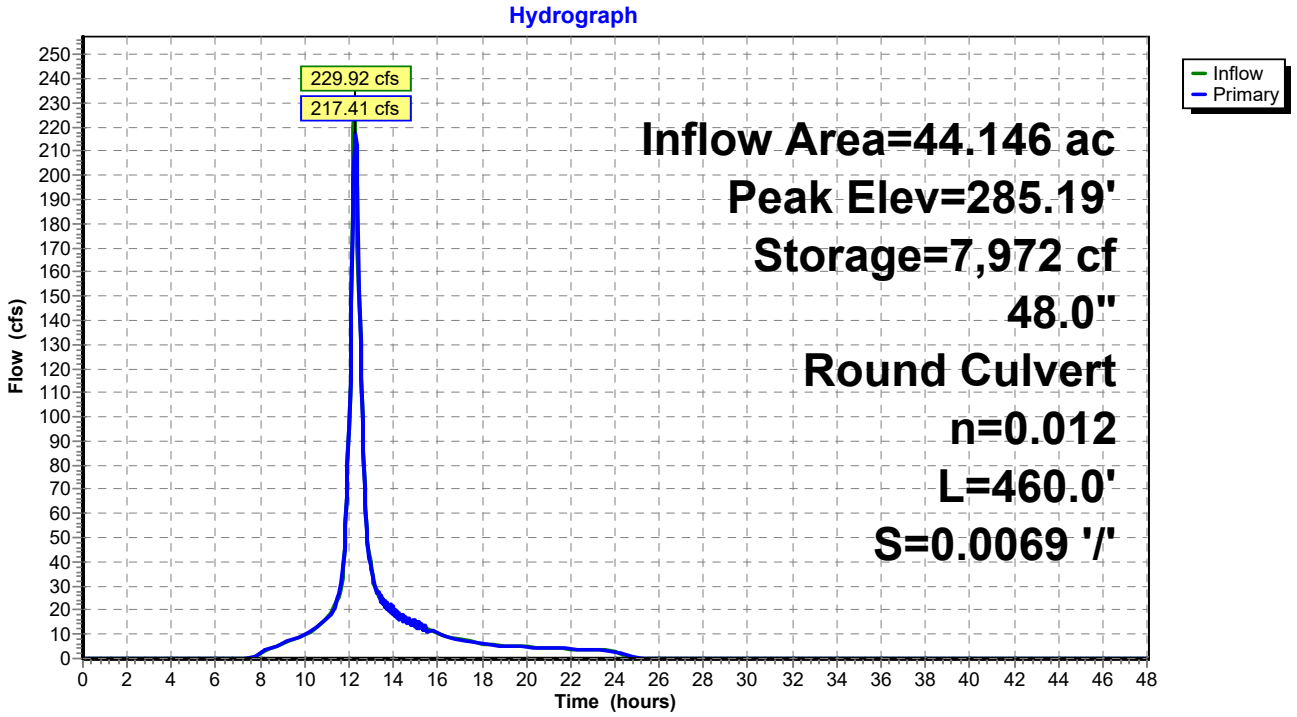
Volume	Invert	Avail.Storage	Storage Description
#1	268.39'	10,023 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.39	7	0	0
279.50	7	78	78
280.00	603	153	230
285.00	2,311	7,285	7,515
286.00	2,705	2,508	10,023

Device	Routing	Invert	Outlet Devices
#1	Primary	268.39'	**48.0" Round Culvert** L= 460.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 268.39' / 265.21' S= 0.0069 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf

Primary OutFlow Max=217.41 cfs @ 12.30 hrs HW=285.19' TW=263.70' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 217.41 cfs @ 17.30 fps)

Pond 3P: Cell 11 Overflow Sump



Summary for Pond 4P: Runoff Pond

Inflow Area = 51.863 ac, 8.74% Impervious, Inflow Depth = 6.33" for 25-yr, 24-hr event
Inflow = 253.91 cfs @ 12.27 hrs, Volume= 27.362 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Starting Elev= 259.00' Surf.Area= 1.780 ac Storage= 11.551 af
Peak Elev= 268.52' @ 48.00 hrs Surf.Area= 3.826 ac Storage= 38.913 af (27.362 af above start)
Flood Elev= 273.00' Surf.Area= 4.525 ac Storage= 57.824 af (46.273 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

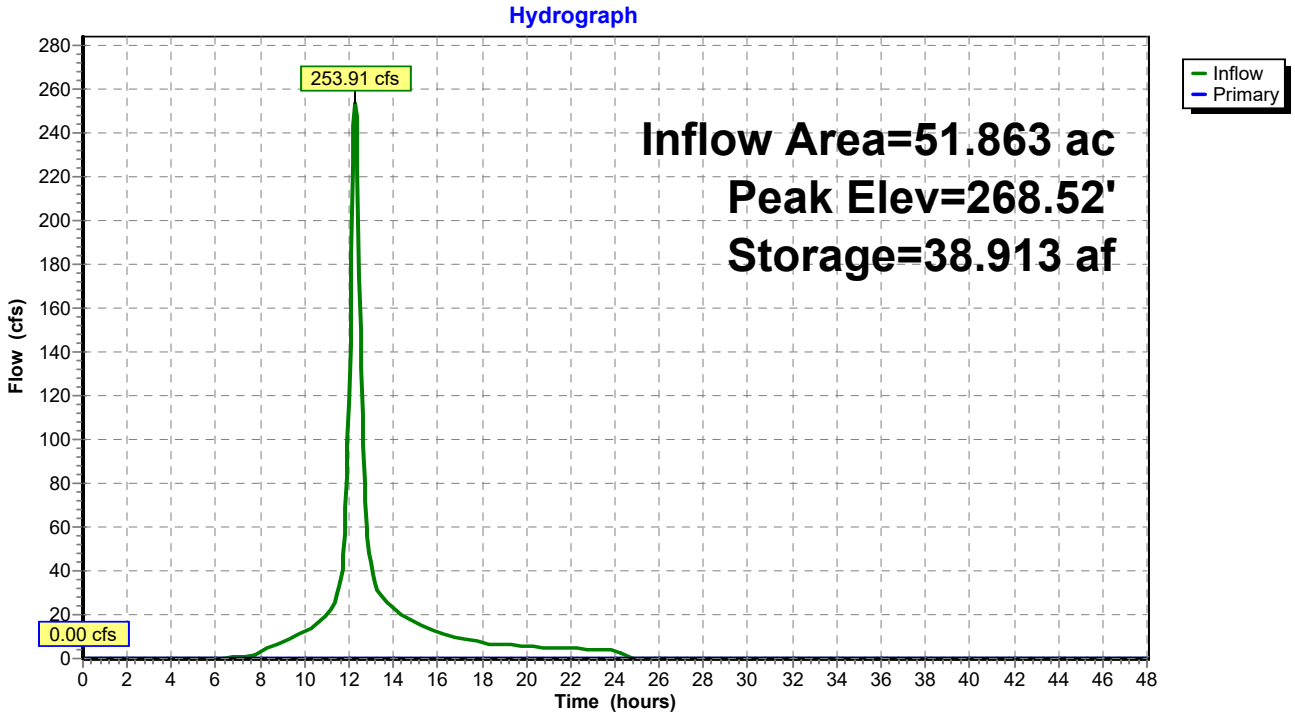
Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	57.824 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
250.00	0.832	0.000	0.000
252.00	1.016	1.848	1.848
254.00	1.219	2.235	4.083
256.00	1.434	2.653	6.736
258.00	1.661	3.095	9.831
260.00	1.898	3.559	13.390
261.00	2.259	2.078	15.468
262.00	2.652	2.455	17.924
264.00	3.003	5.655	23.579
266.00	3.334	6.337	29.916
268.00	3.716	7.050	36.966
270.00	4.143	7.859	44.825
272.00	4.396	8.539	53.364
273.00	4.525	4.460	57.824

Device	Routing	Invert	Outlet Devices
#1	Primary	270.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 3.00 Width (feet) 30.00 30.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=259.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 4P: Runoff Pond

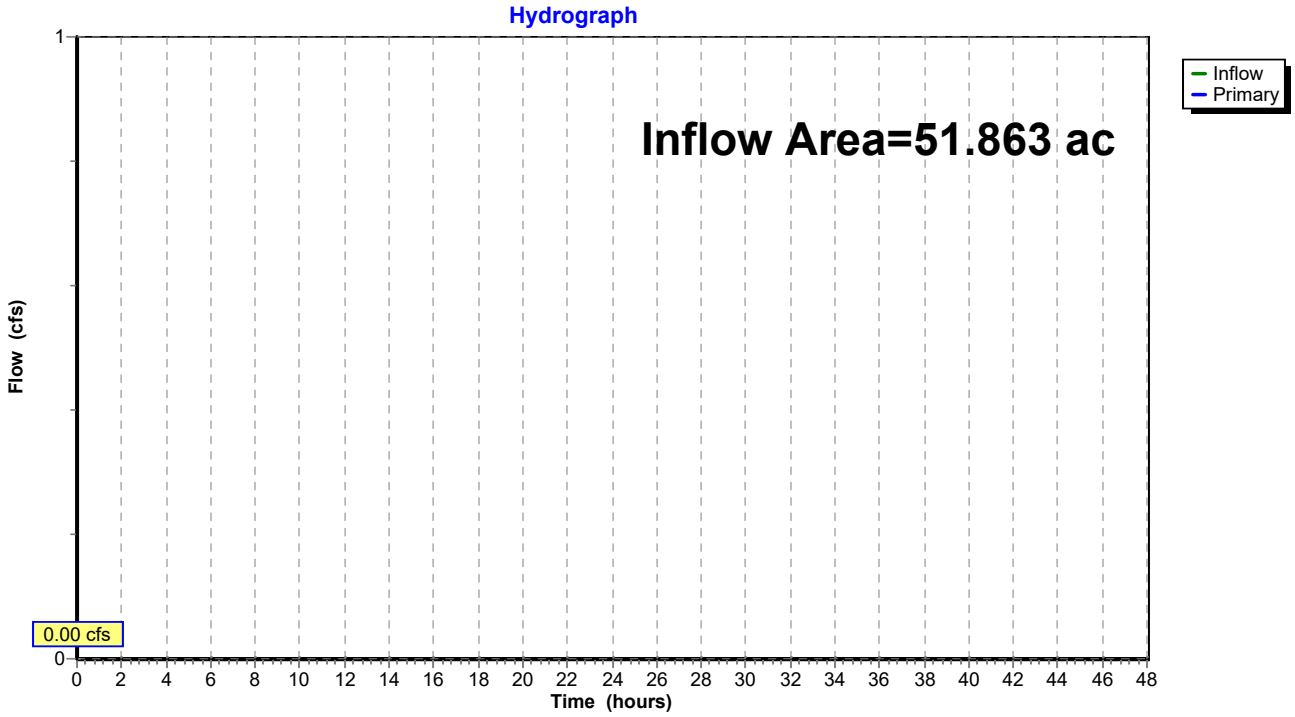


Summary for Link 1L: Offsite

Inflow Area = 51.863 ac, 8.74% Impervious, Inflow Depth = 0.00" for 25-yr, 24-hr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1L: Offsite

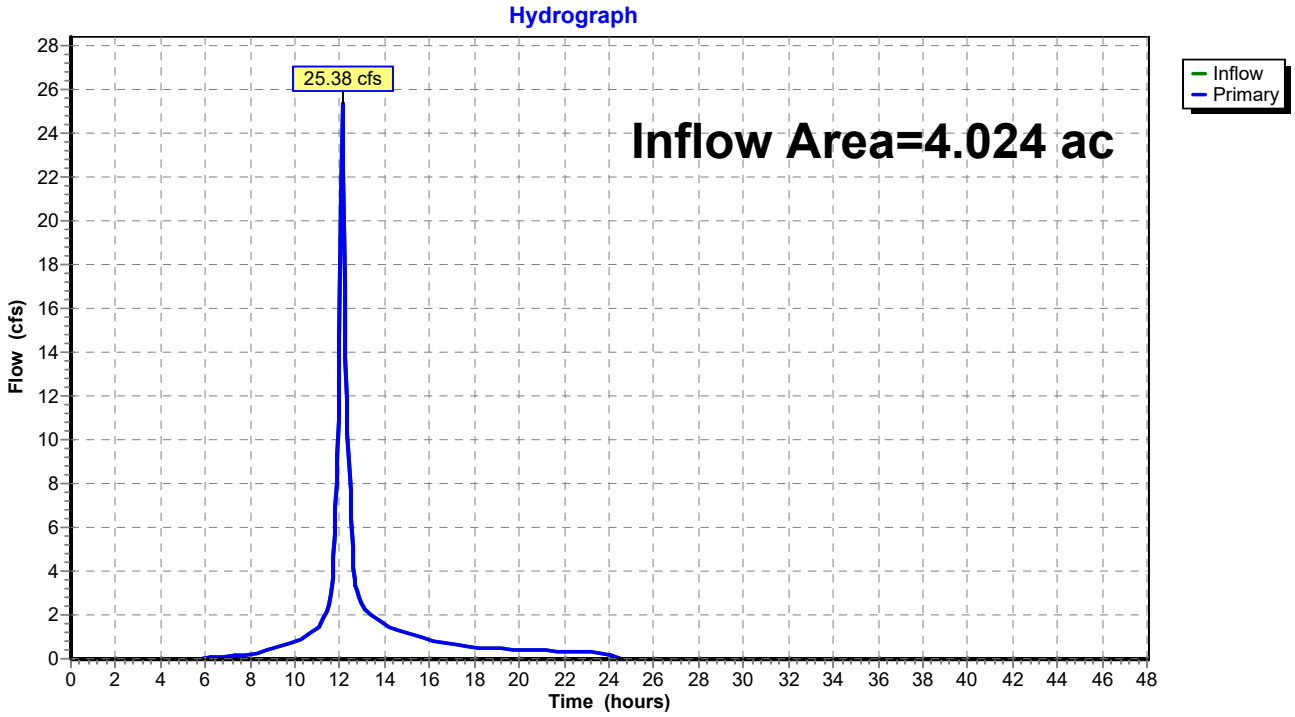


Summary for Link 2L: Stormwater Outfall

Inflow Area = 4.024 ac, 0.00% Impervious, Inflow Depth = 5.78" for 25-yr, 24-hr event
Inflow = 25.38 cfs @ 12.10 hrs, Volume= 1.937 af
Primary = 25.38 cfs @ 12.10 hrs, Volume= 1.937 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 2L: Stormwater Outfall



Worksheet for Landfill Runoff - Trapezoidal Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.012
Channel Slope	0.010
Left Side Slope	3.000
Right Side Slope	3.000
Bottom Width	8.00
Discharge	116.91

Results	
Normal Depth	12.2
Flow Area	11.2
Wetted Perimeter	14.4
Hydraulic Radius	9.3
Top Width	14.08
Critical Depth	18.5
Critical Slope	0.002
Velocity	10.46
Velocity Head	1.70
Specific Energy	2.71
Froude Number	2.068
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	12.2
Critical Depth	18.5
Channel Slope	0.010
Critical Slope	0.002

Worksheet for Outside Runoff - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.025
Channel Slope	0.020
Left Side Slope	3.000
Right Side Slope	3.000
Discharge	25.38

Results	
Normal Depth	14.5
Flow Area	4.4
Wetted Perimeter	7.6
Hydraulic Radius	6.9
Top Width	7.25
Critical Depth	16.2
Critical Slope	0.011
Velocity	5.80
Velocity Head	0.52
Specific Energy	1.73
Froude Number	1.315
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	14.5
Critical Depth	16.2
Channel Slope	0.020
Critical Slope	0.011

BURNS McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com