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

CLECO Corporation

Dolet Hills Power Station
Project No. 90965

Revision 0
10/14/2016

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. 90965

Revision 0
10/14/2016

prepared by

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

INDEX AND CERTIFICATION

CLECO Corporation
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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.

Randell L Sedlacek (signature)

Randell L Sedlacek, P.E.
Louisiana License #38408

Date: 10/14/16

STATE OF LOUISIANA
RANDELL L. SEDLACEK
License No. 38408
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

Randell L Sedlacek (signature)
10/14/16

This document has been digitally sealed and signed. October 14, 2016.

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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
LDOTD	Louisiana Department of Transportation and Development
LPDES	Louisiana Pollutant Discharge Elimination System
LSU	Louisiana State University
MGD	Million Gallons per Day
min	minute
NAD 27	North American Datum of 1927

Abbreviation	Term/Phrase/Name
NAD 83	North American Datum of 1983
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
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. This report serves as the 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 (Part II, Subpart D – Facility Surface Hydrology and Figures 6-12) prepared by Eagle Environmental Services, Inc. in 2010 are included as Appendix B. 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).

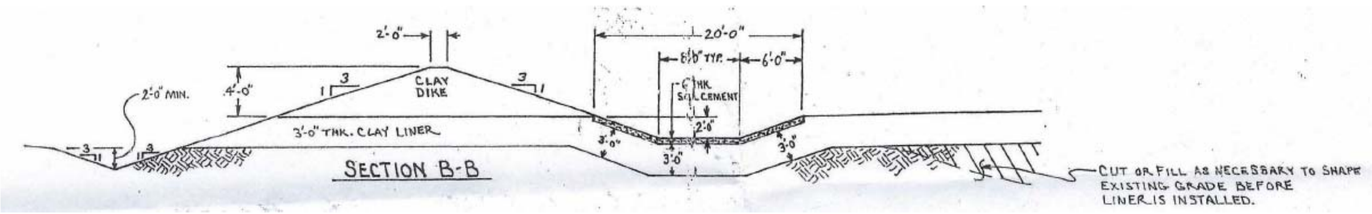


Figure 3-1: Typical run-off collection ditches and diversion dike

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 drained offsite via natural drainage.

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 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, 1.25% bottom slope, 2-foot depth, and 3H:1V side slopes (see Figure 3-1).

The landfill sump area is reconstructed each time the landfill expands northward. The primary sump covers approximately 0.5 acres and overflows to an auxiliary sump via a concrete spillway. From the auxiliary sump, flow is discharged via a 36-inch vertical outlet pipe which connects to a 48-inch collector pipe which gravity drains to the Runoff Pond. The sump spillway is trapezoidal in shape with an elevation of 301.5 feet (2.5 feet below top of sump), bottom width of 20 feet, and 6H:1V side slopes. Refer to Appendix B for existing design drawings, noting the current sump area design and configuration does not exactly match what is shown in Figures 10 and 11. Assumptions were made to adapt the existing design drawings to match what is shown on available aerial imagery and what was observed during a visit to the site.

The Runoff Pond is an approximately 4-acre pond that sits north of the Landfill cell and is partially surrounded by a run-on diversion dike to limit run-off inflow from the surrounding watershed area (see DWG No. 9 in Appendix B). The pond is designed to store 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 reinforced concrete wall was installed (see Exhibit 3 in Appendix B). The top of dam is now approximately 270 feet.

From the Runoff Pond, run-off may be discharged via a valve-controlled outlet pipe under the conditions of the discharge permit (LA0062600). Consequently, all discharges are permitted and conform to CFR 257.3-3. The valve-controlled pipe is normally closed and has an invert elevation of 253 feet.

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 publically 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

Elevations shown on the existing drawings are in the National Geodetic Vertical Datum of 1929 (NGVD 29). Mapping sources referenced were in the North American Vertical Datum of 1988 (NAVD 88) and have been converted to NGVD 29.

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. Existing drawings are based on the plant grid coordinate system with the origin at N 498,700 and E 1,668,230 Louisiana State North, North American Datum of 1927 (NAD 27).

5.0 HYDROLOGIC AND HYDRAULIC CAPACITY

This section provides a verification of the claims made in Subpart II.D of the permit document located in Appendix B. HEC-HMS 4.0 was used to model subbasin and reservoir characteristics under the design storm event and FlowMaster V8i was used to model channel characteristics. Inputs to the HEC-HMS and FlowMaster models were assumed to be as follows. 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 (Open)

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) which drain 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	40.9	ac
SCS Storm Depth: 25-yr, 24-hr	8.16	in
Weighted Curve Number	86	-
Initial Abstraction	0.326	in
Time of Concentration	11.33	min
Basin Lag Time	6.80	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
SCS Storm Depth: 25-yr, 24-hr	8.16	in
Weighted Curve Number	87	-
Initial Abstraction	0.299	in
Time of Concentration	19.34	min
Basin Lag Time	11.60	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	4.3	ac
SCS Storm Depth: 25-yr, 24-hr	8.16	in
Weighted Curve Number	80	-
Initial Abstraction	0.500	in
Time of Concentration	19.34	min
Basin Lag Time	11.60	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	0.010	(plastic lined)
Channel Slope	0.0125	-
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	0.035	(rough earth)
Channel Slope	0.02	-
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 (Open)

Component	Property	Value	Unit
Subbasin Watershed	Peak Discharge	221.9	cfs
	Run-off Volume	6.5	in
Reservoir Sump	Initial EL	300.0	ft
	Peak Inflow	221.9	cfs
	Peak Discharge	216.7	cfs
	Peak EL	303.5	ft
	Peak Storage	1.7	ac-ft
Reservoir Aux. Sump	Initial EL	296.0	ft
	Peak Inflow	216.7	cfs
	Peak Discharge	206.1	cfs
	Peak Elevation	299.6	ft
	Peak Storage	0.1	ac-ft

Table 6-2: Modeled Conditions – Runoff Pond

Component	Property	Value	Unit
Subbasin Watershed	Peak Discharge	31.7	cfs
	Run-off Volume	6.6	in
Reservoir Runoff Pond	Initial EL	253.0	ft
	Peak Inflow	236.1	cfs
	Peak Discharge	0.0	cfs
	Peak EL	266.5	ft
	Peak Storage	27.0	ac-ft

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

Component	Property	Value	Unit
Subbasin Watershed	Peak Discharge	18.9	cfs
	Run-off Volume	5.8	in
Reservoir N/A	Initial EL	-	ft
	Peak Inflow	-	cfs
	Peak Discharge	-	cfs
	Peak EL	-	ft
	Peak Storage	-	ac-ft

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. 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)	Velocity (ft/s)
Contact Stormwater Run-off ½ Landfill (Open)	111.0	0.84	12.6
Non-Contact Stormwater Run-off Outside Run-off	18.9	1.23	4.19

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 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 0.84 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 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 1.23 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 must place the initial run-on and run-off control system plan in the CCR Operating Record by October 17, 2016. 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. CLECO must prepare periodic run-on and run-off control system plans every five years. 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

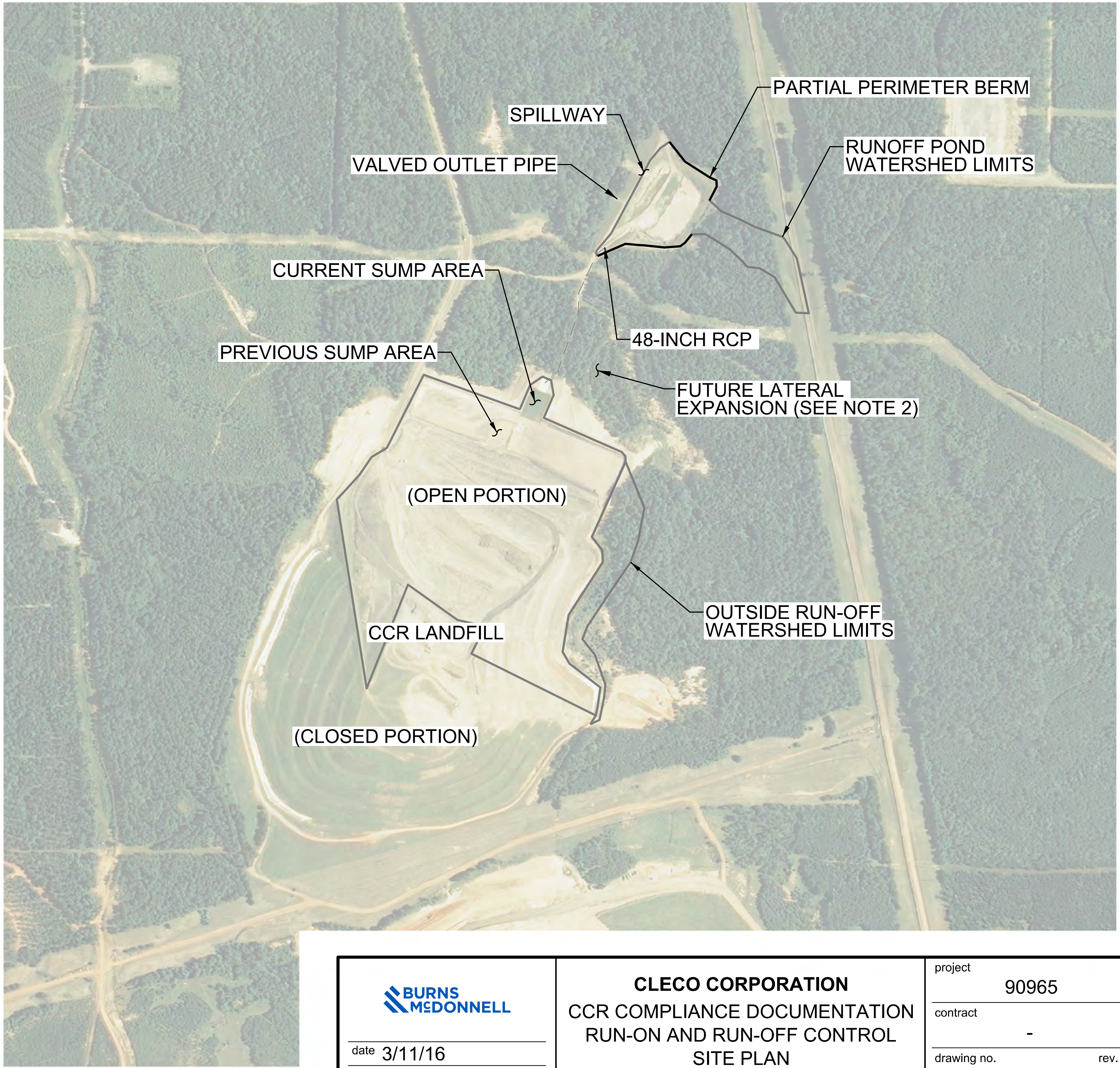
Revision Number	Date	Revisions Made	By Whom
0	10/14/2016	Initial Issue	Burns & McDonnell

APPENDIX A – SITE PLAN

NOTES:

1. RUN-OFF FROM OPEN PORTION OF LANDFILL IS ISOLATED FROM RUN-OFF FROM CLOSED PORTION OF LANDFILL VIA DIVERSION DIKES. SEE SURFACE RUN-OFF DIVERSION/COLLECTION DETAILS DRAWING FROM LANDFILL PERMIT. RUN-OFF FROM OPEN PORTION OF LANDFILL IS CONVEYED TO SUMP AND RUNOFF POND. RUN-OFF FROM CLOSED PORTION OF LANDFILL IS CONVEYED OFF-SITE VIA NATURAL DRAINAGE.

2. AS THE LANDFILL EXPANDS TO THE NORTH, ONLY 40 ACRES ARE "OPEN" (DRAINING TO THE RUNOFF POND) 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 3/11/16

designed A. MYERS

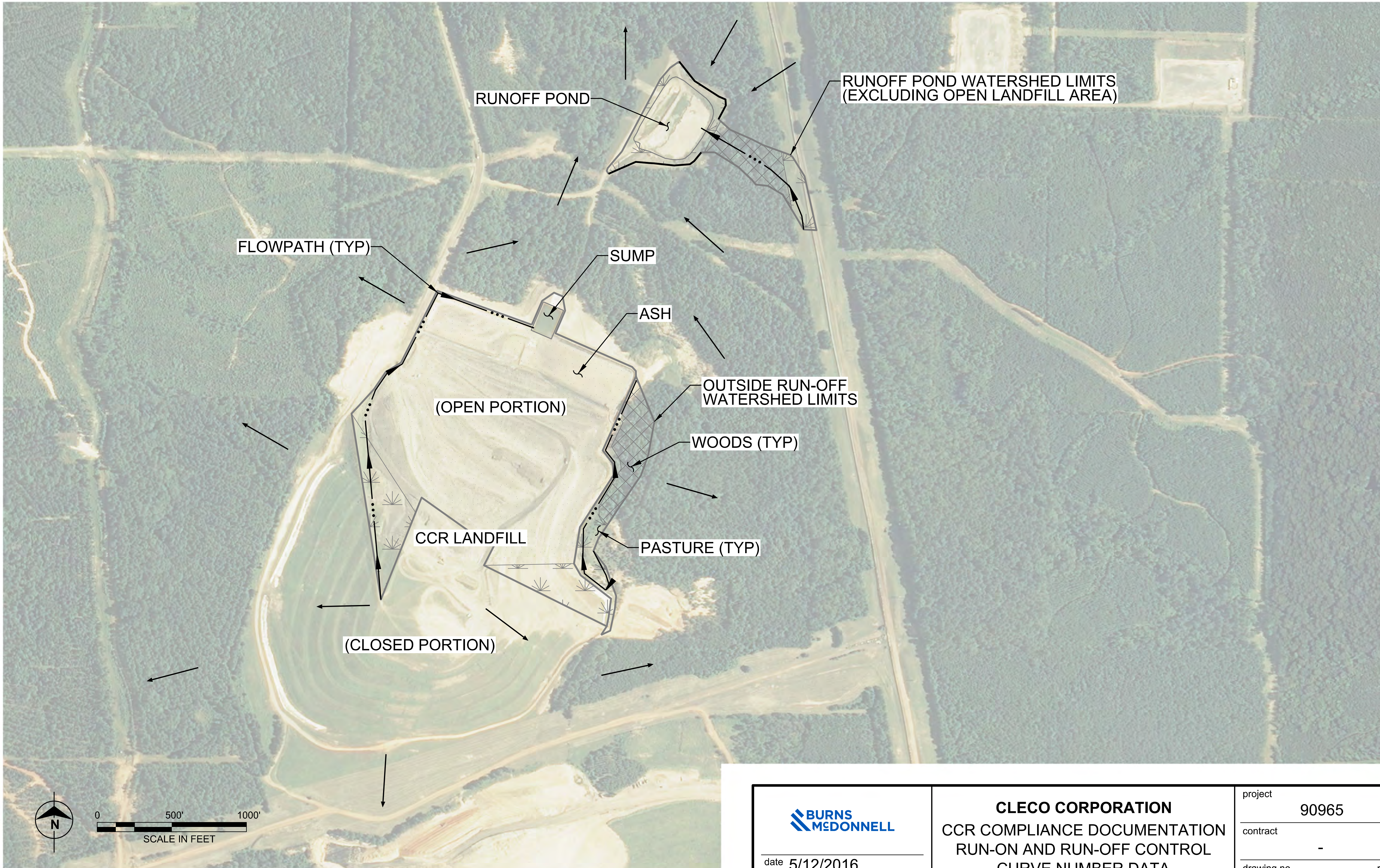
CLECO CORPORATION

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

project 90965

contract -

drawing no. **SK - CIVIL - 001** rev. **0**



BURNS McDONNELL

date 5/12/2016

designed A. MYERS

CLECO CORPORATION

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

project 90965

contract -

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

rev. **0**

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APPENDIX B – EXISTING PERMIT INFORMATION / DRAWINGS

D. Facility Surface Hydrology. Standards governing facility surface hydrology are contained in LAC 33:VII.711.A (Type I and II landfills), LAC 33:VII.713.A (Type I and II surface impoundments), LAC 33:VII.715.A (Type I and II landfarms), LAC 33:VII.717.C (Type I-A and II-A facilities), LAC 33:VII.719.C (Type III facilities), and LAC 33:VII.723.B (composting facilities). The following information is required for all facilities:

1. a description of the method to be used to prevent surface drainage through the operating areas of the facility;

The landfill and surface impoundment site was specifically selected to minimize surface drainage through the site. The landfill will be located in the upper reaches of a stream valley that is surrounded on three sides by ridgelines. These ridgelines form the boundary of the watershed and prevent any runoff from entering the site from adjacent watersheds regardless of rainfall return frequency.

The sequence of filling also helps prevent surface drainage through the landfill site. The filling will begin with Cell 1 in the upper, closed end of the stream valley and proceed down to the lower, open end. By so doing, the amount of runoff that will initially be diverted is minimized. As the landfill is developed, a drainage system will be installed along the perimeter of the plateau that will be adequate to divert rainfall around the active portions of the landfill.

Finally, a system for drainage diversion consisting of levees, drainage culverts, swales, and collection sumps will be constructed to prevent run-on to the landfill and will also collect runoff from the active portions of the landfill. The surface impoundment is lined with 3 feet of clay having a permeability of 1×10^{-7} cm/sec to prevent drainage through the impoundment. Figure 12 (Surface Runoff Diversion/Collection Details) shows the different elements of the system.

2. a description of the facility runoff/run-on collection system;

The purpose of the impoundment is to store contact stormwater runoff from the active cell 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.

Figure 12 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 cell. This levee will segregate non-contact stormwater runoff from contact stormwater 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.

3. **the rainfall amount from a 24-hour/25-year storm event;**
According to "Technical Paper No. 40" of the U.S. Weather Bureau, for a rainfall event with a 24-hour duration and a return period of 25 years, the rainfall would be 8.7 inches. Site rainfall data are as follows:

10-year	24-hour rainfall	7.4 inches
25-year	24-hour rainfall	8.7 inches
100-year	24-hour rainfall	10.7 inches

Source: Technical Paper 40, Rainfall Frequency Atlas of the United States U.S. Weather Bureau, 1961.

4. **the location of aquifer recharge areas in the site or within 1,000 feet of the site perimeter, along with a description of the measures planned to protect those areas from the adverse impact of operations at the facility; and**

The Dolet Hills Power Station is mapped as a moderate recharge potential area for the Carrizo-Wilcox Aquifer System, according to Map #5, "Aquifer Recharge Potential of the Shreveport Quadrangle". This map is part of the "Aquifer Recharge Atlas" (1988), developed by the LDEQ and the Louisiana Geological Survey. A moderate recharge potential area generally consists of moderately to well-drained soils having medium textures and moderate rates of water transmission.

5. **if the facility is located in a flood plain, a plan to ensure that the facility does not restrict the flow of the 100-year base flood or significantly reduce the temporary water-storage capacity of the flood plain, and documentation indicating that the design of the facility is such that the flooding does not affect the integrity of the facility or result in the washout of solid waste.**

The Fly Ash/Scrubber Sludge Landfill and Surface Impoundment are located in the upper reaches of a local drainage basin that includes the power station site. This drainage basin drains under a bridge on the Naborton Cutoff Road and into Mundy Bayou. The location of the bridge, which was installed in

1982 by SWEPCO as part of plant construction, is shown on Figure 2. The area of the drainage basin upstream of the bridge is 6.37 square miles. The 100-year flood level at the upstream end of the bridge is Elevation 186.4 MSL.

E. **Facility Plans and Specifications. Standards governing facility plans and specifications are contained in LAC 33:VII.711.B (Type I and II landfills), LAC 33:VII.713.B (Type I and II surface impoundments), LAC 33:VII.715.B (Type I and II landfarms), LAC 33:717.E (Type I-A and II-A facilities), LAC 33:VII.721.A (Type III construction and demolition debris and woodwaste landfills), LAC 33:VII.723.A (composting facilities), and LAC 33:VII.725.A (Type III separation and woodwaste processing facilities).**

1. **Certification. The person who prepared the permit application shall provide the following certification:**

"I certify under penalty of law that I have personally examined and I am familiar with the information submitted in this permit application and that the facility as described in this permit application meets the requirements of LAC 33:VII.Subpart 1. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment."

Appendix B contains the engineer's certification of the permit application in accordance with LAC 33:VII.521.E.1.

2. **Geotechnical field tests and laboratory tests shall be conducted according to the standards of the American Society for Testing and Materials (ASTM) or the EPA or other applicable standards approved by the administrative authority. The results of these tests may be used for modeling and analysis purposes.**

Geotechnical field tests and laboratory tests will be conducted in accordance with the standards of the American Society for Testing and Materials (ASTM) or other approved applicable standards.

3. **The following information is required for Type I and II facilities:**

a. **detailed plan-view drawings showing original contours, proposed elevations of the base of units prior to installation of the liner system, and proposed final contours (e.g., maximum height);**

Figure 7 (Site Plan – Original Contours) shows the site in its original state prior to landfilling operations. This plan shows original contours and proposed elevations of the base of units prior to installation of the liner system. Figure 8 (Proposed Revision of Landfill Storage Plan) shows the site after it has been fully developed

FIGURE 10

SLUDGE DISPOSAL AREA - CELL 7 DEVELOPMENT PLAN

NOTES:
1. 6"Ø HDPE, FRENCH DRAIN AND COLLECTION HEADER TO BE PAID FOR ON COST PLUS PROVISION OF CONTRACT.
2. FIRST LIFT OF CLAY INSTALLED ABOVE 30 MIL PVC LINER TO BE LAID 18" THK. AND COMPACTED & PROOF ROLLED TO APPROX. 12" THK.

REV	W.O.	BY	DATE	SUBJECT	APPROVED
C		BP	5-6-96	REVISED AND RELEASED FOR CONSTRUCTION, SPEC. #7944	W.H.H.
B		BP	4-19-96	RELEASED FOR CONSTRUCTION SPEC. #7944	W.H.H.
A		BP	3-12-96	FOR CELL 7 BIDS - ADDENDUM #1 SPEC. # 7944	W.H.H.
		BP	2-28-96	FOR CELL 7 BIDS SPEC. # 7944	W.H.H.

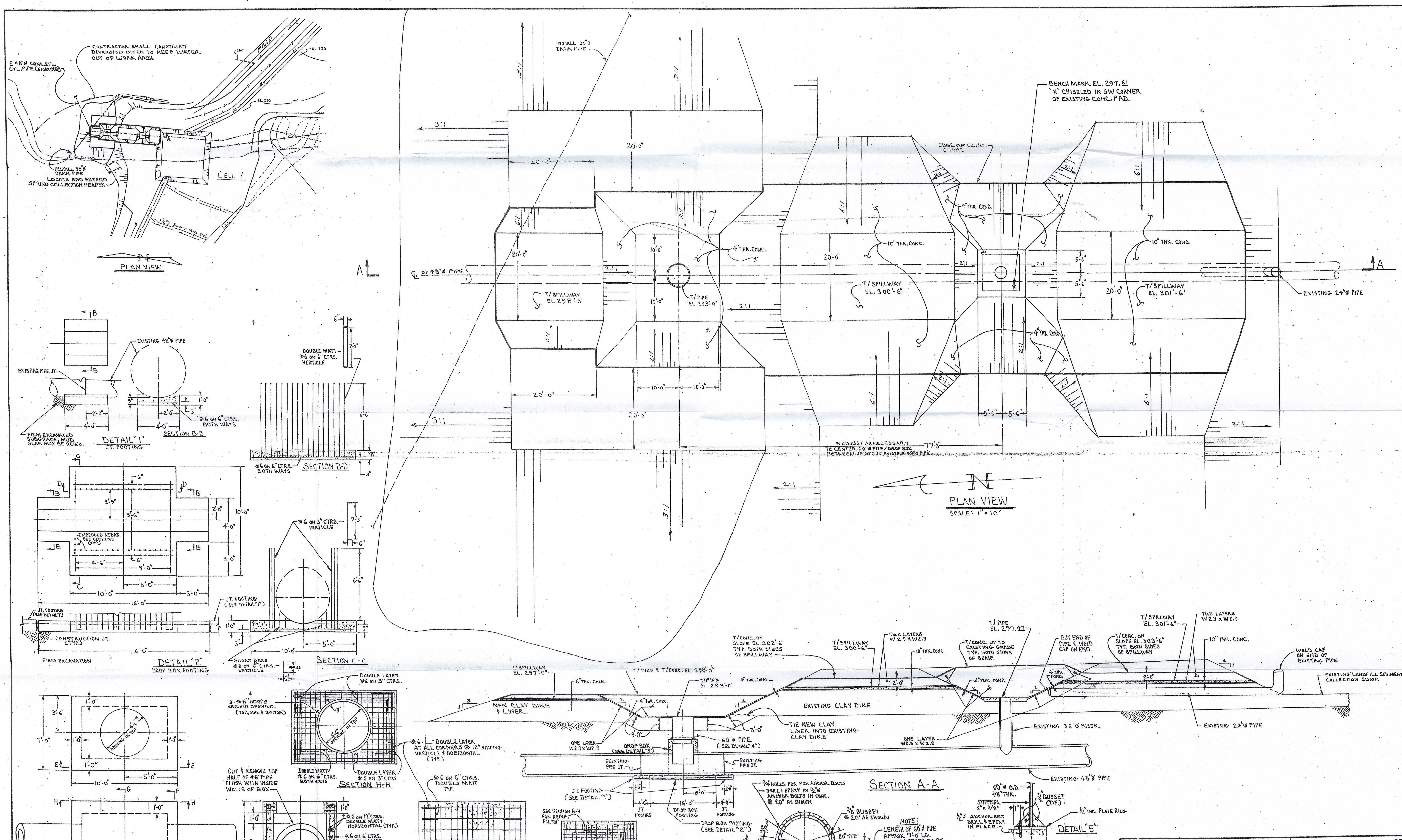
SLUDGE DISPOSAL AREA - CELL 7
DEVELOPMENT PLAN
DOLET HILLS POWER PLANT
CENTRAL LOUISIANA ELECTRIC COMPANY
SOUTHWESTERN ELECTRIC POWER CO.

DRWN. BY: BILL PORTER | DATE: 2-26-96
SCALE: AS NOTED | W.O.
SH. 7 | DRWG. NO. DH-123

5/6/96

FIGURE 11

MODIFICATIONS TO RUNOFF COLLECTION SUMP



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
RUNOFF COLLECTION SUMP

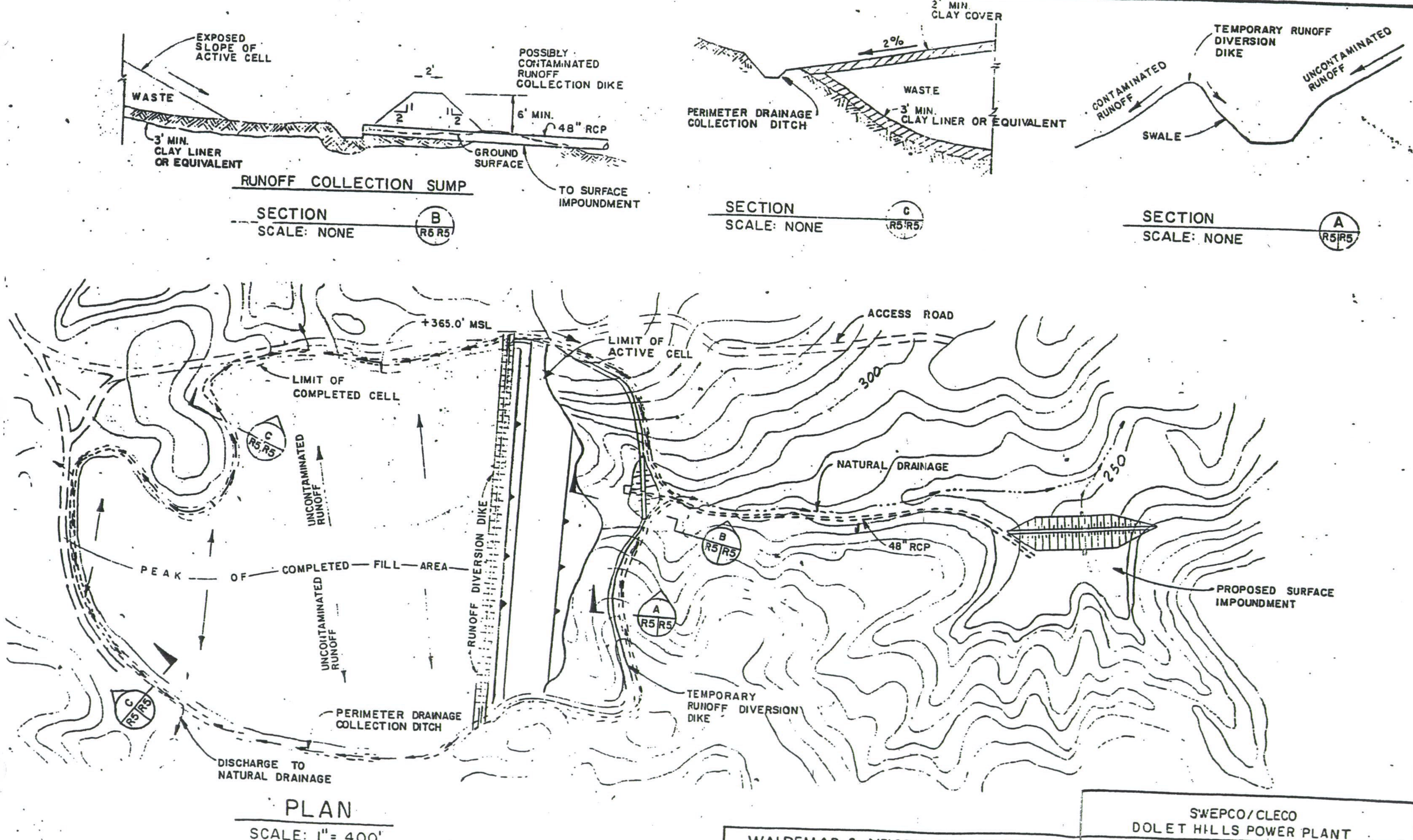
SWEPCO / CLECO

DEPT.
DIV.
APPROVED
DRWN. BY: BP — DATE 4-1-98
SCALE: As Noted — W.O.
SH. 11 — DRWG. NO. DH-123

FIGURE 12

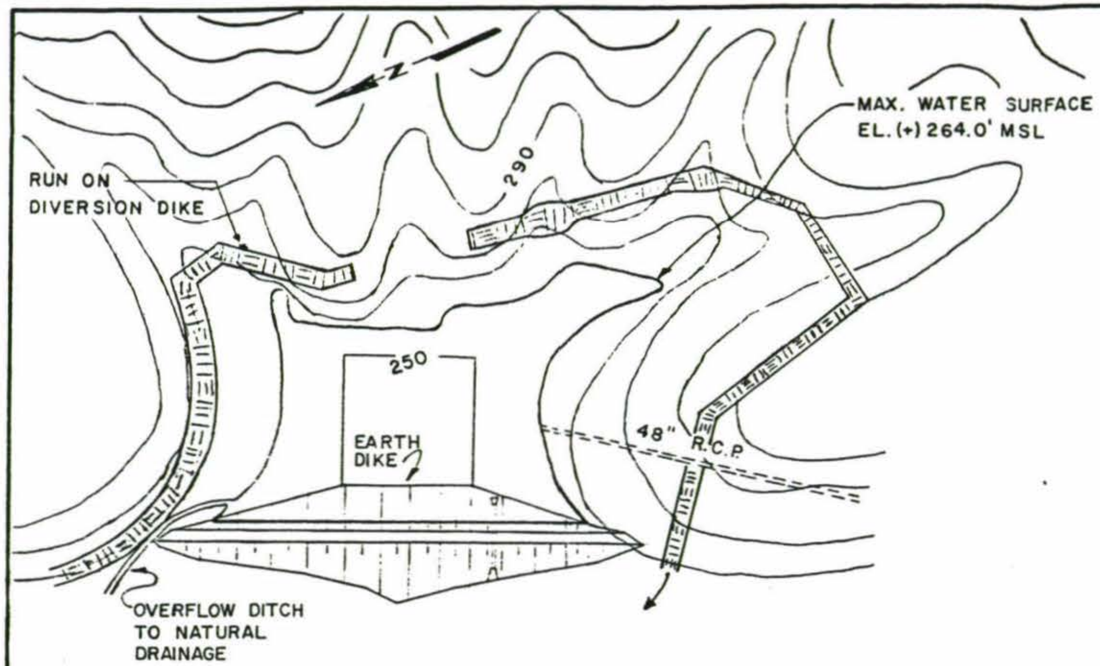
SURFACE RUNOFF DIVERSION/COLLECTION DETAILS

AF 31193



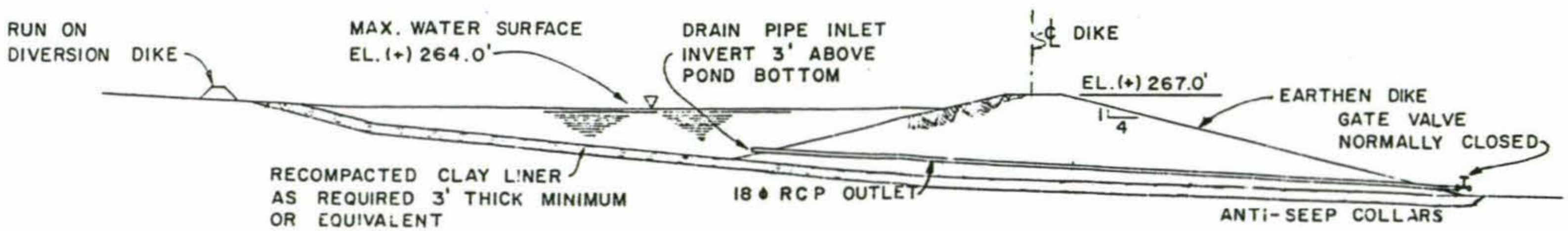
WALDEMAR S. NELSON AND COMPANY
INCORPORATED

SWEPCO/CLECO
DOLET HILLS POWER PLANT
SOLID WASTE PERMIT APPLICATION
SURFACE RUNOFF DIVERSION/COL



PLAN

SCALE : 1" = 200'

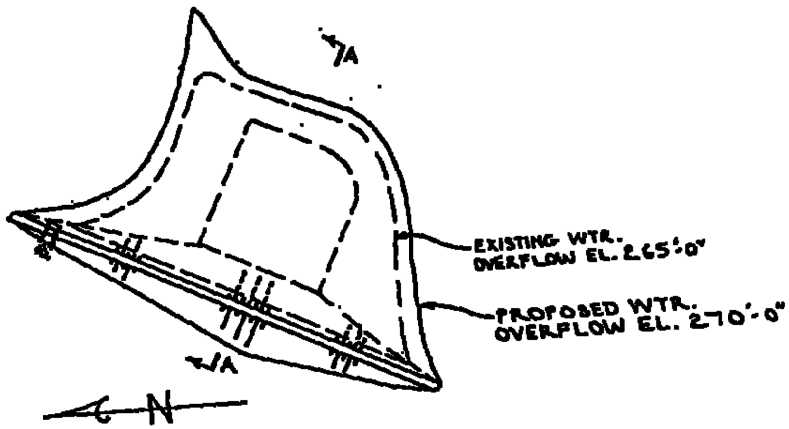


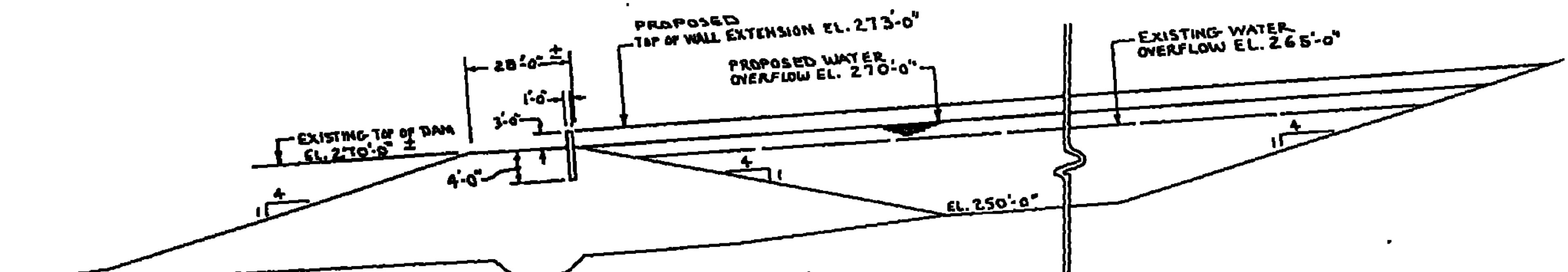
NOTES:

1. ALL CONTOURS ARE SHOWN AT 10' INTERVALS
2. ALL ELEVATIONS ARE MSL

Dolet Hills Power Plant
Unit No. 1
Solid Waste Facility
Surface Impoundment
Typical Cross Sections

Original drawing by W.S. Nelson & Co.	DATE	SCALE	DWG. No.
	1/27/86	Shown	9





SECTION A-A

EXHIBIT "3"

PROPOSED METHOD FOR RAISING IMPOUNDMEN
FOR SCRUBBER SLUDGE LANDFILL RUNOFF

DOLET HILLS POWER PLANT

APPENDIX C – ENGINEERING CALCULATIONS

WORKSHEET TITLE:	Run-off / Run-off - Dolet Hills Landfill	**CALCULATION NO.:**	90965 - C - 001
CREATED:	3/14/2106	**REVISION:**	0
PERFORMED BY:	A. MYERS	**REVIEWED BY:**	J. Eichenberger
OBJECTIVE:	Determine adequacy of existing run-on and run-off controls		

REFERENCES:

1 Lindeburg, M. (2008). Civil engineering reference manual for the PE exam. 11th ed. Belmont, CA: Professional Publications, Inc.

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. (2016). 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

4 United States. Department of Agriculture. Natural Resources Conservation Service. National Engineering Handbook: Part 630 Hydrology, Chapter 15 Time of Concentration. N.p., n.d. Web. 9 Feb. 2016. Retrieved from http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=27002.wba

SOFTWARE:

1 Bentley® FlowMaster® V8i (SELECTseries 1)

Bentley Systems, Inc
27 Siemon Company Drive Ste 200W
Watertown, CT 06795 USA

Phone: +1-203-755-1666
Fax: +1-203-597-1488
Web: http://www.bentley.com
Contact Technical Support

Registered To:
User Name:
Company:
Serial Number:
License: Commercial
Is Checked Out: False
Expiration Date:

SELECT Server Name: selectserver.bentley.com
Activation Key: VS-E254C09D30C24FFB881E3218676F8
Site ID:

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2 **Hydrologic Modeling System (HEC-HMS)**
Version: 4.0 Build: 1542 Date: 31Dec2013 Java: 1.6.0_65

This software is developed primarily to meet the needs of the U.S. Army Corps of Engineers, though we provide a copy free on our website. Funding comes from the Corps' Civil Works Research and Development program and from special projects. To provide feature suggestions, report errors, or request additional information, write to the development team at:

U.S. Army Corps of Engineers
Institute For Water Resources
Hydrologic Engineering Center
609 Second Street
Davis, CA 95616-4620

You can also contact the development team through our website at:
www.hec.usace.army.mil

ASSUMPTIONS:

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

2 Max intensity duration is 5 minutes

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

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

5 Sump and Runoff Pond are half full of sediment at the time of the storm event.

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

EQUATIONS:

1	Rational Method	$Q = CIA_d$	Reference 1, p. 20-13, eq. 20.36
2	Sheet Flow Travel Time	$t_{sheet} = 0.007*(nL)^{0.8}/\sqrt{(P_2)}*S_{decimal}^{0.4}$	Reference 1, p. 20-3, eq. 20.6
3	Shallow Flow Travel Time	$t_{shallow} = L/v_{shallow}$	Reference 1, p. 20-3, section 5
4	Velocity of Shallow Flow	$v_{shallow} = 16.1345\sqrt{(S_{decimal})}$	Reference 1, p. 20-3, eq. 20.7, [unpaved]
5	Channel Flow Travel Time	$t_{channel} = L/v_{channel}$	Reference 1, p. 20-3, section 5
6	Time of Concentration	$t_c = t_{sheet} + t_{shallow} + t_{channel}$	Reference 1, p. 20-3, eq. 20.5
7	Lag Time	$t_{lag} = 0.6*t_c$	Reference 1, p.20-11, eq. 20.27
8	Soil Water Storage Capacity	$S = (1000/CN) - 10$	Reference 1, p. 20-19, eq. 20.43
9	Initial Abstraction	$I_a = 0.2*S$	Reference 1, p. 20-15, eq. 20.38
10	Weighted Curve Number	$CN_W = (CN_i*A_i)/A_T$	
11	Weighted Rational Run-off Coefficient	$C_W = (C_i*A_i)/A_T$	

VARIABLES:

1	Q	peak run-off rate, cfs
2	C	rational run-off coefficient, unitless
3	I	rainfall intensity, in/hr
4	A_d	total drainage area, ac or mi^2
5	t_{sheet}	sheet flow travel time, min
6	n	Manning's roughness coefficient, unitless
7	L	hydraulic length of the watershed, ft
8	P_2	2yr 24hr rainfall, in
9	$S_{decimal}$	slope, ft/ft
10	$t_{shallow}$	shallow concentrated flow travel time, min
11	$v_{shallow}$	shallow velocity, ft/s
12	$t_{channel}$	channel flow travel time, min
13	$v_{channel}$	channel velocity, ft/s
14	t_c	time of concentration, min
15	t_{lag}	lag time, hrs
16	S	soil water storage capacity, in
17	CN	curve number, unitless
18	I_a	initial abstraction, in
19	CN_W	weighted curve number, unitless
20	A_T	total area, ac
21	C_W	weighted rational run-off coefficient, unitless
22	CN_{WT}	total weighted curve number, unitless
23	C_{WT}	weighted rational run-off coefficient, unitless

CALCULATIONS:

1 Establish drainage area

	Landfill (Open)	Runoff Pond	Outside Run-off	
A_d (ac)	40.9	7.7	4.3	Area delineated using LSU Atlas Lidar, adjusted to match current conditions (see SK-CIVIL-001 in Appendix A)
A_d (mi^2)	0.064	0.012	0.007	Conversion from acres to square miles

2 Establish rainfall data (assume SCS Type III distribution)

SCS Storm	Depth (in)	
25yr, 24hr	8.16	Reference 3

3 Establish CN, Percent Impervious Cover, and Initial Abstraction - see SK-CIVIL-002 in Appendix A

	Landfill (Open)			
Land Description	CN_i*	A_i** (ac)	CN_W	
Open space, poor condition (ash)	86	32.1	67	Equation 10
Pond	100	0.5	1	Equation 10
Open space, fair condition (pasture)	84	8.3	17	Equation 10
A_T (ac)		40.9		Sum
CN_{WT}			86	Sum
S (in)			1.63	Equation 8
I_a (in)			0.326	Equation 9

	Runoff Pond			Outside Run-off			
Land Description	CN_i*	A_i** (ac)	CN_W	CN_i*	A_i** (ac)	CN_W	
Open space, fair condition	84	3.4	37	84	1.9	36	Equation 10
Woods, good condition	77	2.0	20	77	2.5	44	Equation 10
Pond	100	2.3	30	100	0.0	0	Equation 10
A_T (ac)		7.7			4.3		Sum
CN_{WT}			87			80	Sum
S (in)			1.49			2.50	Equation 8
I_a (in)			0.299			0.500	Equation 9

*Reference 1, Table 20.4, p. 20-17 and Assumption 3

**Measured in Microstation, see SK-CIVIL-002 in Appendix A

4 Establish Time of Concentration and Basin Lag time for SCS Unit Hydrograph Transform

Subbasin	Landfill (Open)	Runoff Pond	Outside Run-off	
Design Storm	25yr	25yr	25yr	
Sheet Flow				
n	0.13	0.4	0.13	Reference 1, p. 20-3, Table 20.1 - range (natural), woods light underbrush
L* (ft)	300	300	250	Measured in Microstation, see SK-CIVIL-002 in Appendix A
P_2 (in)	4.39	4.39	4.39	Reference 3, 2yr 24hr rainfall
$S^*_{decimal}$ (ft/ft)	0.33	0.125	0.025	Measured in Microstation, see SK-CIVIL-002 in Appendix A
t_{sheet} (hrs)	0.10	0.35	0.24	Equation 2
t_{sheet} (min)	5.83	21.21	14.20	Conversion from hrs to min
Shallow Flow				
$S^*_{decimal}$ (ft/ft)	0.33	0.125	0.000	Measured in Microstation, see SK-CIVIL-002 in Appendix A
$v_{shallow}$ (ft/s)	3.90	0.85	0.00	Reference 4, Figure 15-4
L* (ft)	700	430	0	Measured in Microstation, see SK-CIVIL-002 in Appendix A
$t_{shallow}$ (s)	179.49	505.88	0.00	Equation 3
$t_{shallow}$ (min)	2.99	8.43	0.00	Conversion from s to min
Shallow Flow				
$S^*_{decimal}$ (ft/ft)	0.33	0.200	0.000	Measured in Microstation, see SK-CIVIL-002 in Appendix A
$v_{shallow}$ (ft/s)	5.60	2.25	0.00	Reference 4, Figure 15-4
L* (ft)	400	120	0	Measured in Microstation, see SK-CIVIL-002 in Appendix A
$t_{shallow}$ (s)	71.43	53.33	0.00	Equation 3
$t_{shallow}$ (min)	1.19	0.89	0.00	Conversion from s to min
Channel Flow				
L* (ft)	1000	0.00	1400	Measured in Microstation, see SK-CIVIL-002 in Appendix A
$v_{channel}$ (ft/s)	12.61	0.00	4.54	*Assume 5 min and iteration
$t_{channel}$ (s)	79.30	0.00	308	Equation 5
$t_{channel}$ (min)	1.32	0.00	5.14	Conversion from s to min
Time of Concentration				
t_c (min)	11.33	30.53	19.34	Equation 6 (min assumed tc is 0.10 hour per TR-55)
Lag Time				
t_{lag} (min)	6.80	18.32	11.60	Equation 7

*Measured in Microstation

5 Run HEC-HMS with input parameters: all discharge into ponds (rainfall) is additional flow above assumed initial elevation.
Elevation-area data for the ponds is as noted below. Assume Sump and Runoff Pond are half full of ash at time of storm event.

Sump	
EL	area* (ac)
296	0.153
297	0.169
298	0.185
299	0.202
300	0.220
301	0.238
302	0.257
303	0.295
304	0.345

*Based on design / modified design drawings. EL > 302 include storage within the Contact Stormwater Run-off ditches.

Aux. Sump	
EL	area* (ac)
290	0.00016
291	0.00016
292	0.00016
293	0.00016
294	0.00016
295	0.00016
296	0.009
297	0.013
298	0.018
299	0.024
300	0.030
301	0.037
302	0.044
303	0.053
304	0.062

*Based on design / modified design drawings. EL < 296 include storage in the vertical riser pipe which outlets into the 48-inch collector pipe.

Runoff Pond	
EL	area* (ac)
252	0.86
253	0.90
254	0.94
255	0.98
256	1.02
257	1.06
258	1.10
259	1.14
260	2.18
261	2.37
262	2.56
263	2.75
264	2.95
265	3.14
266	3.33
267	3.52
268	3.72
269	3.91

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

RESULTS:

Component	Subbasin		Reservoir					
Property	Peak Discharge (cfs)	Run-off Volume (in)	Initial EL (ft)	Peak Inflow (cfs)	Peak Discharge (cfs)	Peak Elevation (ft)	Peak Storage (ac-ft)	Time to Drain (hrs)
Landfill (Open)	221.9	6.49	-	-	-	-	-	-
Sump	-	-	300	221.9	216.7	303.5	1.7	25
Aux. Sump	-	-	296	216.7	206.1	299.6	0.1	25
Runoff Pond	31.7	6.61	253	236.1	0.0	266.5	27.0	NA
Outside Run-off	18.9	5.78	-	-	-	-	-	-

CONCLUSION:

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

6 Use FlowMaster to determine velocity in the channels using HEC-HMS calculated peak discharge, above.
Contact Stormwater Run-off: Assume a trapezoidal channel with roughness coefficient of 0.01 (plastic liner - PVC), channel slope 1.25%, bottom width of 8ft, and 3:1 side slopes.
Non-Contact Stormwater Run-off: Assume a triangular channel with roughness coefficient of 0.035 (rough earth), 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)	111.0	0.84	12.61
Non-Contact Stormwater Run-off Outside Run-off	18.9	1.23	4.19

CONCLUSION:

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

Worksheet for Trapezoidal Channel - Contact

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01250	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	8.00	ft
Discharge	111.00	ft³/s

Results

Normal Depth	0.84	ft
Flow Area	8.80	ft²
Wetted Perimeter	13.30	ft
Hydraulic Radius	0.66	ft
Top Width	13.02	ft
Critical Depth	1.49	ft
Critical Slope	0.00147	ft/ft
Velocity	12.61	ft/s
Velocity Head	2.47	ft
Specific Energy	3.31	ft
Froude Number	2.70	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.84	ft
Critical Depth	1.49	ft
Channel Slope	0.01250	ft/ft

Worksheet for Trapezoidal Channel - Contact

GVF Output Data

Critical Slope	0.00147	ft/ft

Worksheet for Triangular Channel - Non-Contact

Project Description

Friction Method	Manning Formula		
Solve For	Normal Depth		

Input Data

Roughness Coefficient		0.035	
Channel Slope		0.02000	ft/ft
Left Side Slope		3.00	ft/ft (H:V)
Right Side Slope		3.00	ft/ft (H:V)
Discharge		18.90	ft³/s

Results

Normal Depth		1.23	ft
Flow Area		4.52	ft²
Wetted Perimeter		7.76	ft
Hydraulic Radius		0.58	ft
Top Width		7.36	ft
Critical Depth		1.20	ft
Critical Slope		0.02272	ft/ft
Velocity		4.19	ft/s
Velocity Head		0.27	ft
Specific Energy		1.50	ft
Froude Number		0.94	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		1.23	ft
Critical Depth		1.20	ft
Channel Slope		0.02000	ft/ft
Critical Slope		0.02272	ft/ft

CREATE AMAZING.

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