Class Three Landfill Run-on and Run-off Control System Plan

Williams Station
Berkeley County, South Carolina

October 2021

Prepared For:

Dominion Energy of South Carolina
2242 Bushy Park Rd
Goose Creek, SC 29445

Prepared By:

TRC
50 International Drive, Suite 150
Greenville, South Carolina 29615

Jonathan Hotstream
Senior Scientist

Nakia Addison, P.E.
Project Manager

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APPENDICES

Revision History

Revision Number	Revision Date	Section Revised	Summary of Revisions
0	07/15/2016		Initial Issue, developed by others
1	10/14/2021	1 through 7	Update for periodic revision

1.0 Background

Dominion Energy of South Carolina (DESC) owns and operates the Williams Station (Station). The Station is located on the Cooper River in Berkeley County, South Carolina near the Town of Goose Creek, see Figure 1. DESC owns and operates a Class Three Landfill (Landfill) approximately 5 miles away from the Station. The Class Three Landfill is an existing coal combustion residuals (CCR) Landfill and is subject to the requirements of the United States Environmental Protection Agency's (USEPA) CCR Rule (Title 40 Code of Federal Regulations (40 CFR) part 257 Subpart D – "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments." The initial run-on and run-off control system plan was developed and placed in the Station's operating record on October 17, 2016. A periodic revision to the run-on and run-off control system plan is required every 5 years pursuant to 40 CFR 257.81(c)(4).

The existing Landfill consists of cells 1 through 4 which were constructed as the first phase of development in 2008. These cells were placed into operation in accordance with an operation plan approval issued by the South Carolina Department of Health and Environmental Control (SC DHEC) in 2010. The proposed Landfill facility considering future lateral expansions is comprised of 12 landfill cells, planned for development in three phases. Run-off from the landfill flows into a Wastewater Pond, which was placed into operation in 2010.

1.1 Purpose

The purpose of this Plan is to document that the Williams Station Class Three Landfill run-on and run-off controls meet the requirements of CCR rule 257.81 – *Run-on and Run-off Controls for CCR Landfills*.

TRC performed the periodic revision by performing a site visit to observe conditions, reviewing the initial run-on and run-off control system plan, reviewing design criteria, and updating calculations.

2.0 Federal Regulations

Pursuant to 40 CFR 257.81, landfills that manage CCR are subject to the following requirements:

(a) The owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill must design, construct, operate, and maintain:

1. A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm; and

2. A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

(b) Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under 40 CFR 257.3-3.

(c) Run-on and run-off control system plan

1. *Content of the Plan.* The owner or operator must prepare initial and periodic run-on and run-off control system plans for the CCR unit every five years. These plans must document how the run-on and run-off control systems have been designed and constructed to meet the applicable requirements of this section. Each plan must be supported by appropriate engineering calculations.

3.0 Run-on Control

CCR landfills are required to have a run-on control system designed, constructed and operated to prevent flow onto the active portion of the CCR unit during peak discharge from a 24-hour, 25-year storm.

Run on controls for the Landfill consist of the perimeter berm, perimeter swales, and an interior stormwater ditch adjacent to the crest of the perimeter berm. The perimeter berm ranges from approximately 10 feet to 20 feet above surrounding grades. Stormwater runoff from areas upgradient of the landfill is collected and conveyed around the landfill perimeter berm by a series of natural and manmade swales and channels. These perimeter swales prevent run-on to the active landfill. Additionally, a ditch is located immediately adjacent to the landfill cells along the crest of the landfill perimeter berm. This ditch collects potential landfill run-on from along the roadway along the crest of the landfill berm and conveys it away from the landfill to receiving stormwater management features.

The existing grades for the Landfill based on topographic survey data collected on July 13, 2021 are provided i. Appendix A presents design drawings for the Class Three Landfill (Garrett & Moore, 2016). Within Appendix A, Sheet 2 shows the permitted footprint of the Landfill considering future lateral expansions, and Sheet 8 presents the details for the perimeter ditches.

The stormwater modeling software HydroCAD, was utilized to estimate peak flow rates and associated velocities for the design 24-hour, 25-year storm event. HydroCAD is largely based on the United States Department of Agriculture Soil Conservation Service's, Technical Release 55 (TR-55) and TR-20 hydrology methods.

Based on the HydroCAD Report, the interior perimeter ditch is sized appropriately for the 24-hour, 25-year storm and manages the peak flow from this storm event, with freeboard. TRC performed the analysis considering the following:

- The precipitation volume for the 24-hour, 25-year storm event is 7.67 inches.
- The drainage area delimited on the Drainage Area Map in Appendix B flows into the interior perimeter ditch.
- The perimeter swales at the outside toe are sufficiently large to convey stormwater away from the landfill.

Calculations for the interior perimeter ditch are provided in Appendix B. The permissible velocity for vegetative linings and the hydraulic capacity of the ditch have been evaluated and found to be acceptable.

Run-On Control Summary

- Perimeter Ditches
  - Maximum Design Flow: 37 cubic feet per second (cfs)
  - Maximum Design Capacity: 508 cfs
  - Peak Velocity: 5.3 feet per second (ft/s), Permissible Velocity: 5.5 ft/s

Given the combination of the perimeter berm, existing drainage features and perimeter ditches, run-on controls are sufficient to manage the peak discharge from a 24-hour, 25-year storm.

4.0 Run-Off Control

CCR landfills are required to have a run-off control system designed, constructed and operated to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

Runoff from the landfill is contained within the CCR placement area by the perimeter berm. Run-off is conveyed from the Landfill to the Wastewater Pond via culverts. Runoff is treated within the Wastewater Pond prior to discharge.

Discharge from the Wastewater Pond is regulated in accordance with a National Pollutant Discharge Elimination System (NPDES) permit issued by the SC DHEC. The permit grants Williams Station permission to discharge from the Landfill to an outfall in accordance with effluent limitations, monitoring requirements, and other conditions. The NPDES permit is issued in accordance with the provisions of the Federal Clean Water Act. Therefore, by complying with the NPDES permit, the discharge from the Wastewater Pond is also being handled in accordance with the applicable surface water requirements. In addition, leachate from the base of the Landfill is collected in a wet well and transferred to the Berkley County municipal wastewater treatment plant for treatment. The discharge from the wastewater plant is regulated by a separate NPDES permit.

Run-off from the active area of the landfill is managed by operational grading, and perimeter ditches within the limits of CCR placement. The perimeter ditches are operational features constructed by grading the CCR; therefore, analysis of these temporary features is not needed. Run-off collected in the active landfill area, delineated on the Drainage Area Map in Appendix C, flows to the wastewater pond. The run-off from this area is conveyed via overland flow and ditches to culverts that convey the run-off to the Wastewater Pond. The Wastewater Pond is designed to manage the volume resulting from the 24-hour, 25-year storm. Relevant engineering calculations for the stormwater management system provided in Appendix C.

Run-Off Control Summary

- Wastewater Pond (Volumes from the Garrett & Moore, 2016)
  - Berm Crest Elevation: 38 ft
  - 24-hour, 25-year water surface elevation: 33 ft
  - Freeboard: 5 ft

The downstream receiving Wastewater Pond exceeds the capacity requirements to collect and control the run-off volume resulting from a 24-hour, 25-year storm.

5.0 Conclusion

The Class Three Landfill adequately manages run-on and run-off in accordance with the requirements of 40 CFR 257.81. Run-off is collected in a Wastewater Pond and treated prior to discharge through an NPDES permitted outfall satisfying the requirements of 40 CFR 257.3-3.

This Plan has been completed in compliance with the requirements set forth in 40 CFR 257.81. This document will be placed in the operating record, posted to the publicly accessible website, and government notifications will be provided.

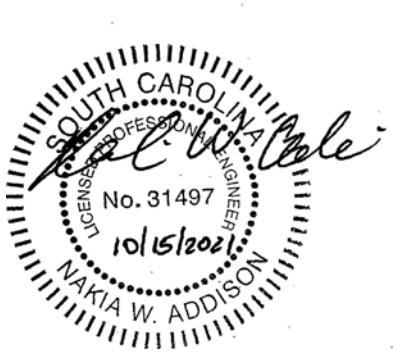
A Run-On and Run-Off Control System Plan must be revised every 5 years. The next periodic revision is required by October 2026.

The Plan must be amended whenever the periodic review period is reached or if changes in site conditions, either intentionally or unintentionally, occur that will sustainably impact the current written plan in effect.

6.0 Certification

I, the undersigned South Carolina Professional Engineer, hereby certify that I am familiar with the technical requirements of 40 CFR 257 Subpart D. I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, that the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of 40 CFR 257.81.

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.



Nakia Addison, P.E.	31479 Professional Engineer License Number
Signature of Professional Engineer	10/15/2021 Date

7.0 References

Garrett & Moore. 2016. Run-On & Run-Off Control Plan for the Williams Station Class Three Landfill. Berkeley County, South Carolina. July 2016.

0 0.5
mile
33.1142, -80.044

Base Map: USGS Topo (Classic)
Data Sources: TRC, Fulcrum

DOMINION
WILLIAMS STATION

SITE LOCATION

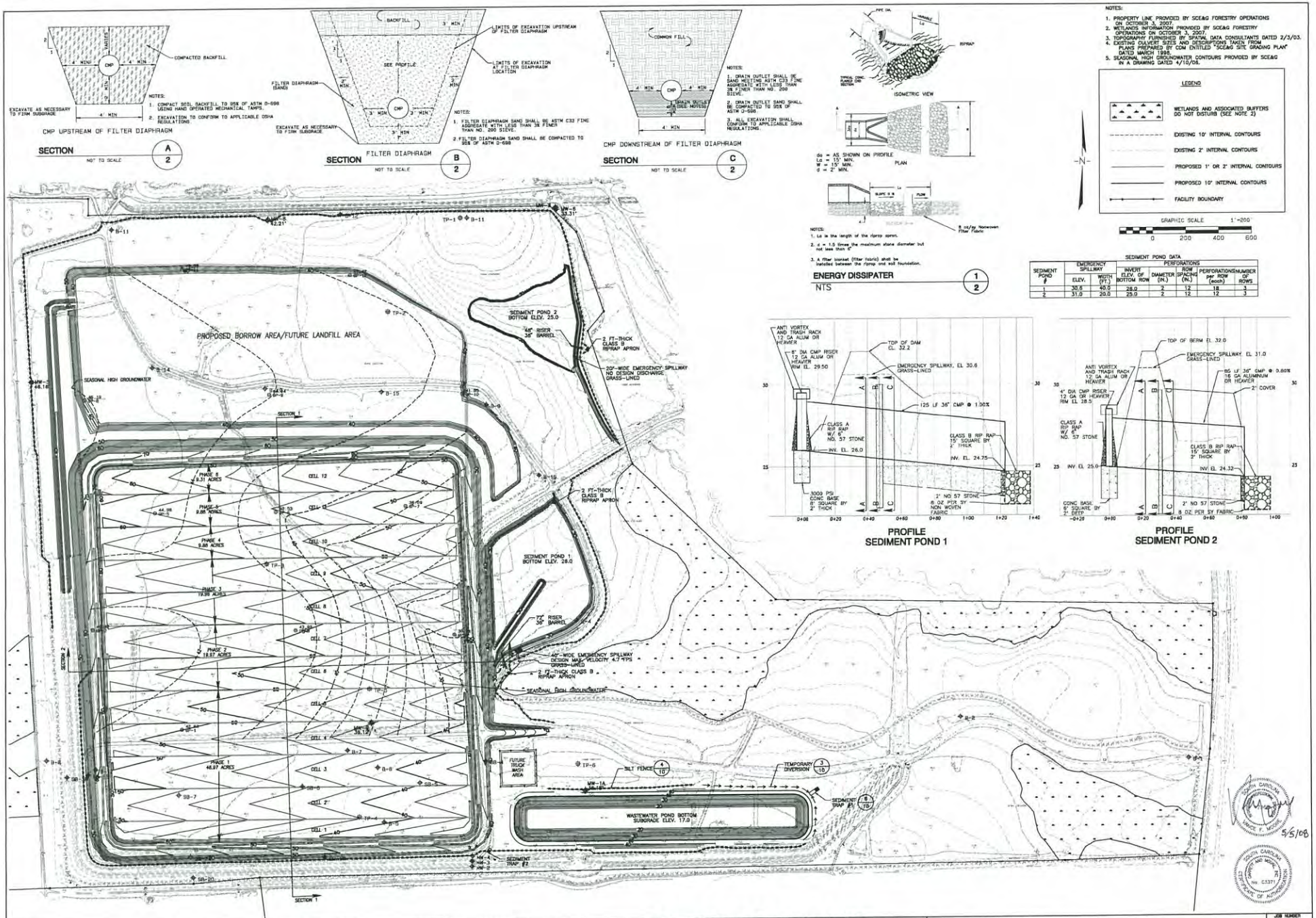
DRAWN BY:	S. EDWARDS	PROJ. NO.:	447435.0000
CHECKED BY:	J. HOTSTREAM		
APPROVED BY:	N. ADDISON		
DATE:	OCT. 2021		

FIGURE 1

TRC
50 INTERNATIONAL DRIVE
SUITE 150
GREENVILLE, SOUTH CAROLINA 29615

FILE: F2C58CB9-F9CF-4CD7-B491-BA0B6C7E8967

Appendix A: Select Permit to Construct Drawings



DATE: APRIL 24, 2007	REVISION	DATE
DESIGNED BY: GARRETT & MOORE	1)	
DRAWN BY: GARRETT & MOORE	2)	
CHECKED BY:	3)	
APPROVED BY:	4)	

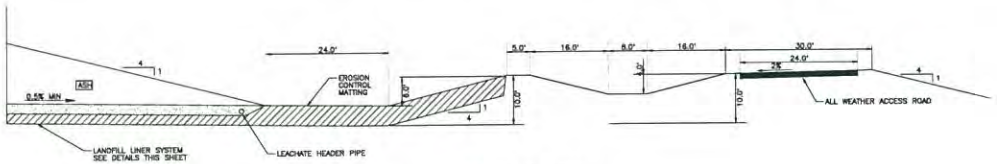
GARRETT & MOORE, INC.
Engineering Services for the Power and Waste Industries

SOUTH CAROLINA ELECTRIC & GAS
HIGHWAY 52 INDUSTRIAL SOLID WASTE LANDFILL

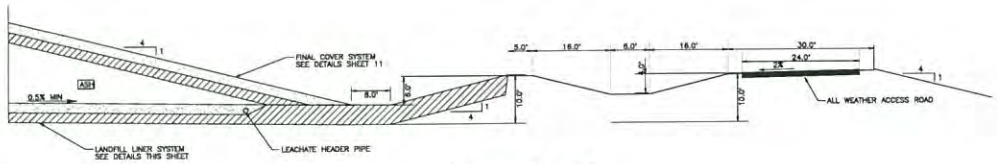
SUBGRADE PLAN

JOB NUMBER

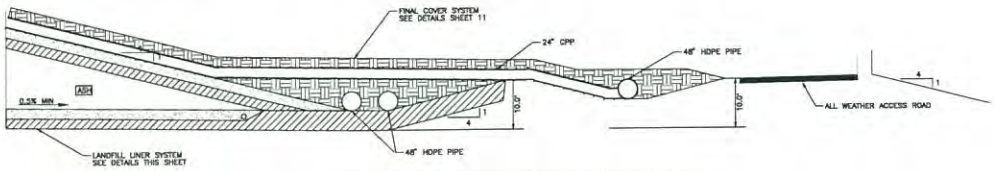
SHEET 2



OPERATIONS PHASE



FINAL CLOSURE PHASE



FINAL CLOSURE WITH STORMWATER SEGREGATION PHASE

LANDFILL PERIMETER BERM DETAIL 1/8
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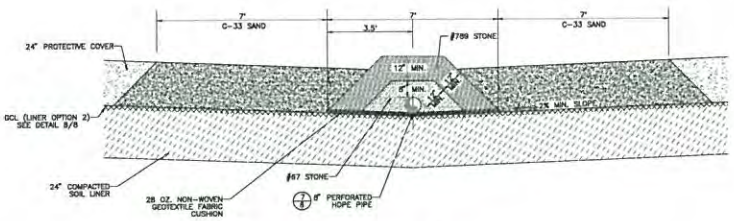
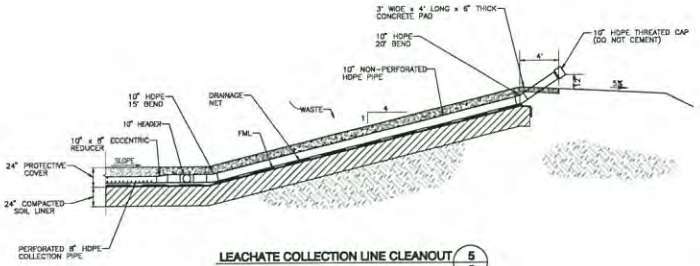


LEACHATE COLLECTION PIPE 4/8
N.T.S.



LEACHATE COLLECTION LINE CLEANOUT 5/8
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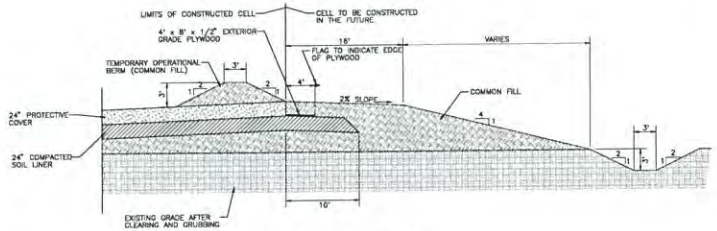

INTERIM ANCHOR BERM DETAIL 2/8
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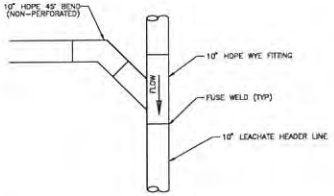
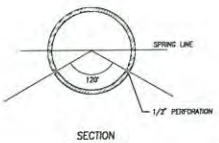


PLAN



SECTION

PERFORATED LEACHATE COLLECTION PIPE 7/8
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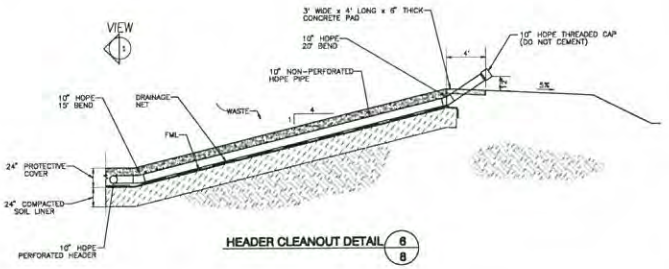
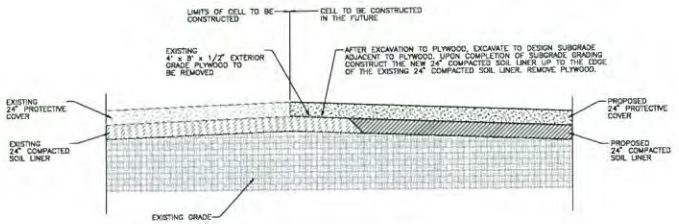


HEADER CLEANOUT DETAIL 6/8



FUTURE TIE-IN AT INTERIM ANCHOR BERM DETAIL 3/8
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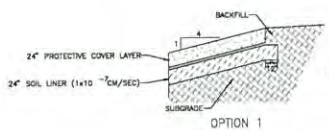
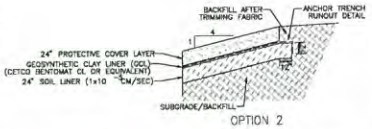


OPTION 1



OPTION 2

NOTES:
1. THE DETAIL REPRESENTS FINAL ANCHOR TRENCH CONSTRUCTION. FABRIC MAY BE INITIALLY INSTALLED WITH MORE THAN ONE FOOT FABRIC IN THE ANCHOR TRENCH AND TRIMMED PRIOR TO BACKFILLING ANCHOR TRENCH. THIS WILL PERMIT FABRIC TO SHRINK AND SWELL PRIOR TO BACKFILLING ANCHOR TRENCH.
2. IMMEDIATELY PRIOR TO BACKFILLING ANCHOR TRENCH, CUT FABRIC/LINER TO FINAL ANCHOR LENGTH.

LANDFILL LINER SYSTEMS OPTIONS 8/8

DATE: APRIL 24, 2007	REVISION	DATE
DESIGNED BY: GARRETT & MOORE	1)	
DRAWN BY: GARRETT & MOORE	2)	
CHECKED BY:	3)	
APPROVED BY:	4)	

GARRETT & MOORE, INC.
Engineering Services for the Power and Waste Industries

SOUTH CAROLINA ELECTRIC & GAS
HIGHWAY 52 INDUSTRIAL SOLID WASTE LANDFILL

DETAILS

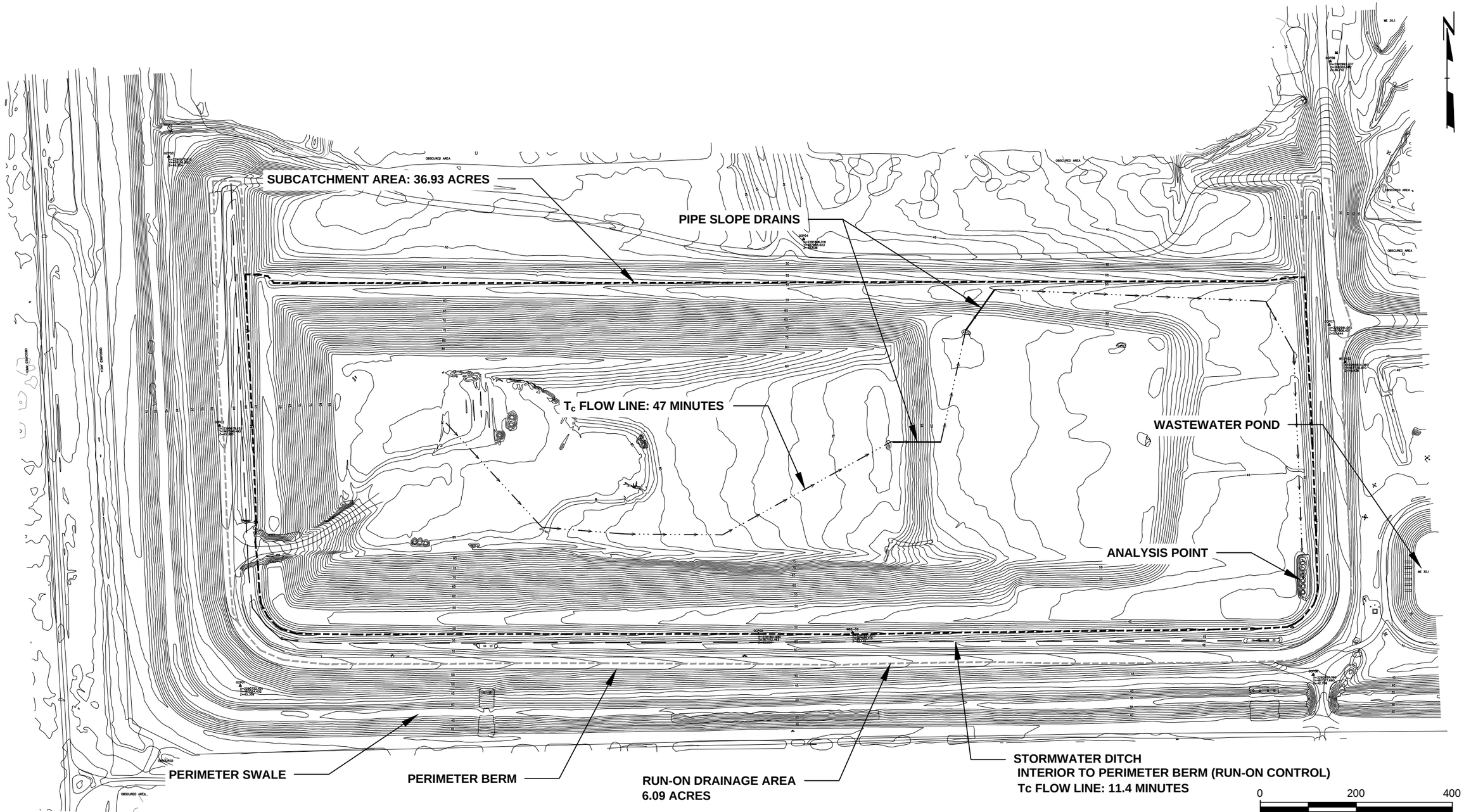
JOB NUMBER

SHEET 8

Appendix B: Run-on Calculations

- Drainage Area Map
- Perimeter Ditch HydroCAD Report
- Perimeter Ditch Trapezoidal Open Channel Calculation

Drainage Area Map



LEGEND:

- SUBCATCHMENT AREA
- T_c FLOW LINE
- DRAINAGE AREA TO PERIMETER DITCH (RUN-ON)

TRC
50 International Drive
Patewood Plaza Three, Suite 150
Greenville, SC 29615
Phone: 864.281.0030

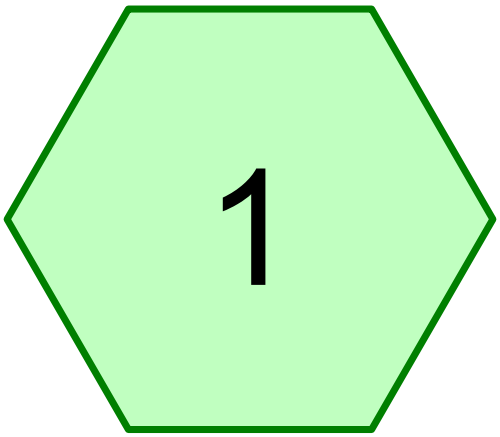
PROJECT:
WILLIAMS STATION CLASS III LANDFILL
RUN-ON/RUN-OFF CONTROL PLAN
BERKLEY COUNTY, SOUTH CAROLINA

TITLE:
DRAINAGE AREA MAP

DRAWN BY:	C. ALONSO
CHECKED BY:	J. HOTSTREAM
APPROVED BY:	N. ADDISON
DATE:	9/14/2021
PROJ. NO.:	447435
FILE:	Williams Area Map.dwg

FIGURE B

Perimeter Ditch HydroCAD Report



Active Landfill Perimeter Ditch

Subcat Reach Pond Link

Routing Diagram for Williams Perimeter Ditch Runoff
Prepared by TRC, Printed 9/16/2021

Summary for Subcatchment 1: Active Landfill Perimeter Ditch

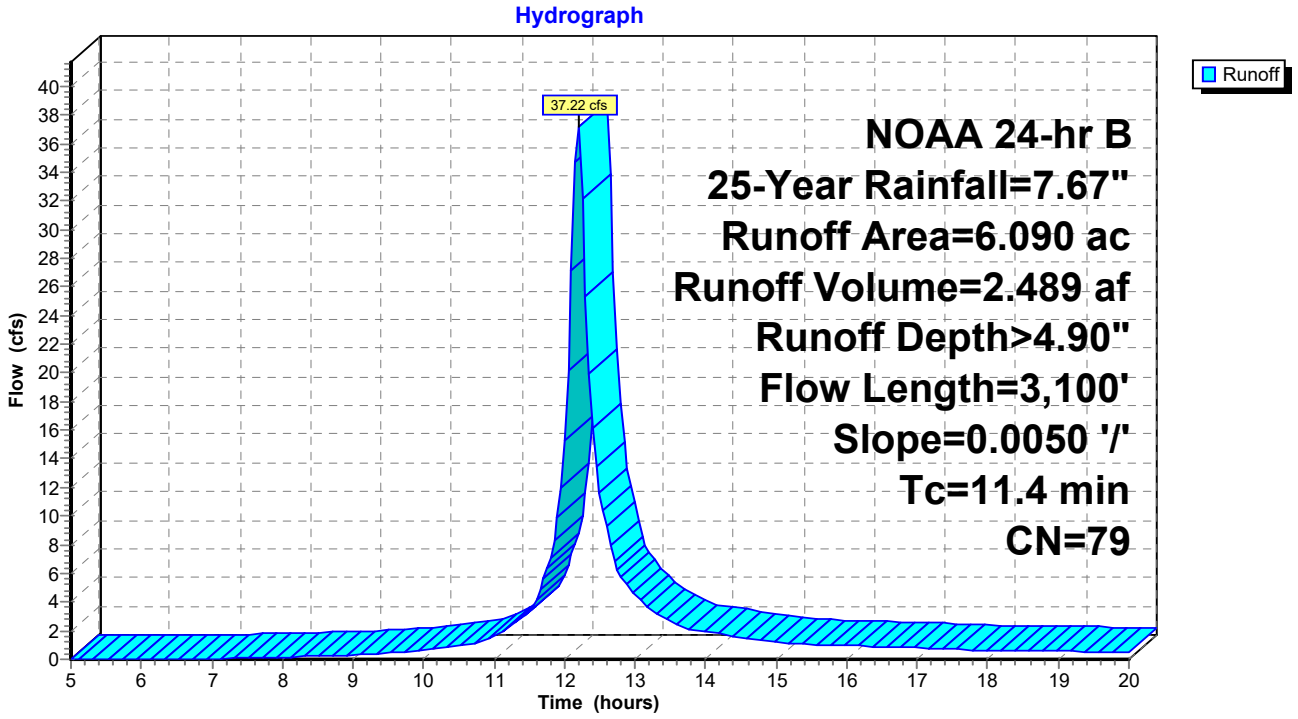
Runoff = 37.22 cfs @ 12.19 hrs, Volume= 2.489 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr B 25-Year Rainfall=7.67"

Area (ac)	CN	Description
6.090	79	50-75% Grass cover, Fair, HSG C
6.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	100	0.0050	0.83		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.54"
9.4	3,000	0.0050	5.29	508.20	**Channel Flow,** Area= 96.0 sf Perim= 41.0' r= 2.34' n= 0.035
11.4	3,100	Total			

Subcatchment 1: Active Landfill Perimeter Ditch



Perimeter Ditch Trapezoidal Open Channel Calculation

PROJECT:	CCR Five Year Assessment - 447435
SUBJECT:	Williams Run-on/Run-off Calculations
COMPUTED BY:	C. Alonso **CHECKED BY:** N. Addison
DATE:	

Channel Section Designation: Perimeter Ditch Mac

Channel Section Description: Maximum Runoff, Shear Stress, and Velocity Check

A. Discharge Q, using Manning's Equation with assigned maximum depth of flow, y.

Input Data

max depth of flow (ft), y:	4
longitudinal slope (ft/ft), S:	0.005
bottom width (ft), b:	8
channel side slope (z:1):	4

TEMPORARY LINING: Bare Channel with North American Green Blanket, C125/C150BN.

roughness coefficient, *n* :	0.025
max. shear stress (psf), Td:	2.25

Permanent lining flow capacity, Q (cfs) = 712

PERMANENT LINING: Tall Fescue

roughness coefficient, *n* :	0.035	
max. velocity of lining (ft/s):	5.5	
retardance class for lining:	D	(From NCDEQ Design Manual Table 8.05c)
VR (max velocity X R):	12.2	(including one retardance class increase)

Permanent lining flow capacity, Q (cfs) = 508 CONTROLS

Channel design controlled by permanent lining flow capacity

A, area (sf)	P, wetted perimeter (ft)	R. hydraulic radius (ft)	S, slope (ft/ft)	Q, flow (cfs)	V. velocity (ft/s)
96.0000	40.98	2.34	0.005	508	5.30

Velocity OK

B. Normal Depth and Shear Stress using Normal-Depth Procedure (known Q)

Discharge (cfs), Q:	37.22	Peak Discharge from HydroCad
longitudinal slope (ft/ft), S:	0.005	
bottom width (ft), b:	8	
channel side slope (m:1)	4	

Input

TEMPORARY LINING:

roughness coefficient, *n* :	0.025
max. shear stress (psf), Td:	2.25

Iterate y to make Zav = Zreq Td=OK

Temp. Lined	y-var (ft)	A (ft)	P (ft)	R (ft)	Zav	Zreq	V (ft/s)	Td (psf)
Channel:	0.9475	11.1710	15.81	0.71	8.86	8.86	3.332	0.30

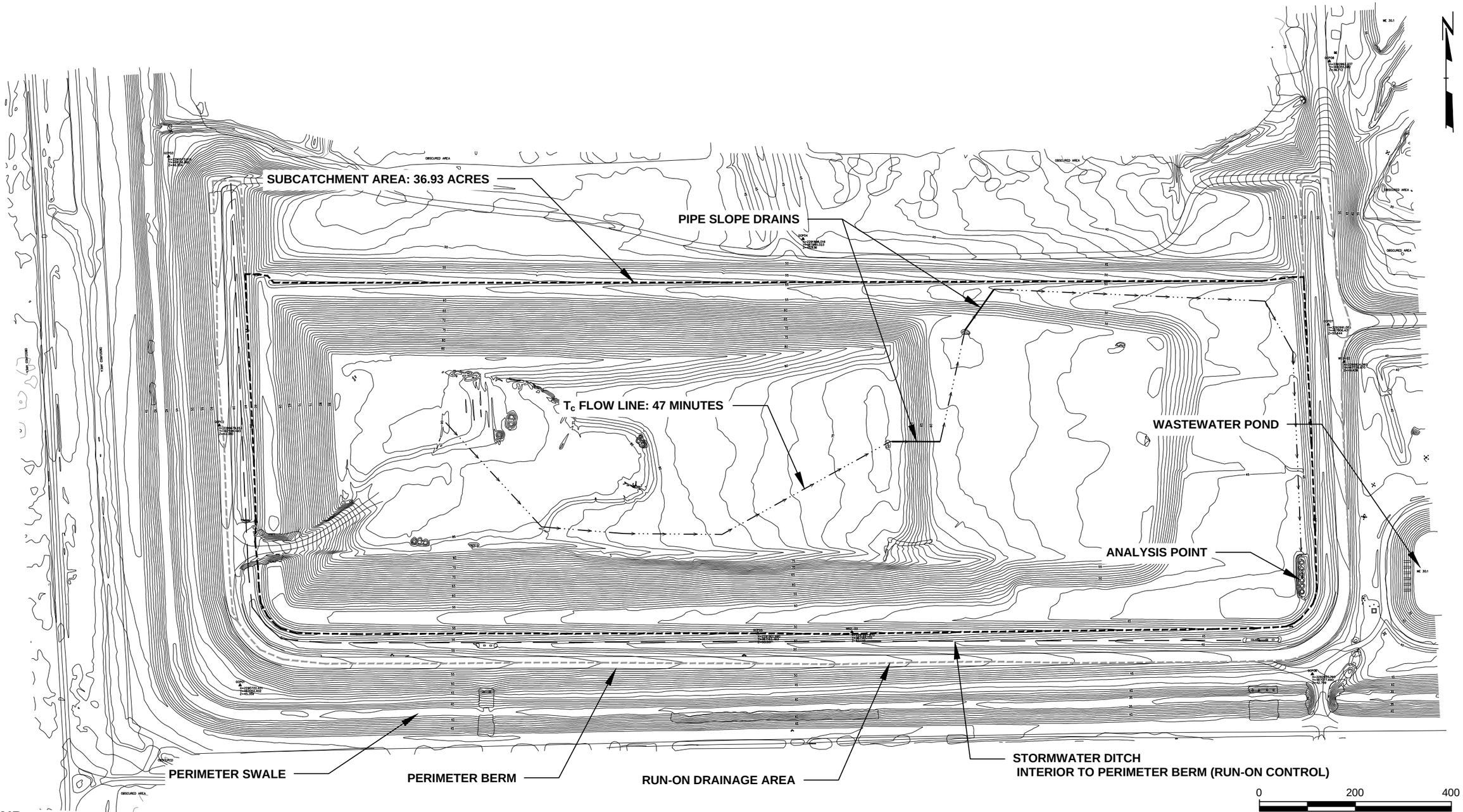
Iterate y to make Zav = Zreq V=OK

Perm. Lined	y-var (ft)	A (ft)	P (ft)	R (ft)	Zav	Zreq	V (ft/s)	Td (psf)
Channel:	1.1319	14.1800	17.33	0.82	12.40	12.40	2.625	0.35

Appendix C: Run-off Calculations

- Drainage Area Map
- Active Landfill Cells to Wastewater Pond HydroCAD Report

Drainage Area Map



LEGEND:

- SUBCATCHMENT AREA
- T_c FLOW LINE
- DRAINAGE AREA TO PERIMETER DITCH (RUN-ON)

TRC
50 International Drive
Patewood Plaza Three, Suite 150
Greenville, SC 29615
Phone: 864.281.0030

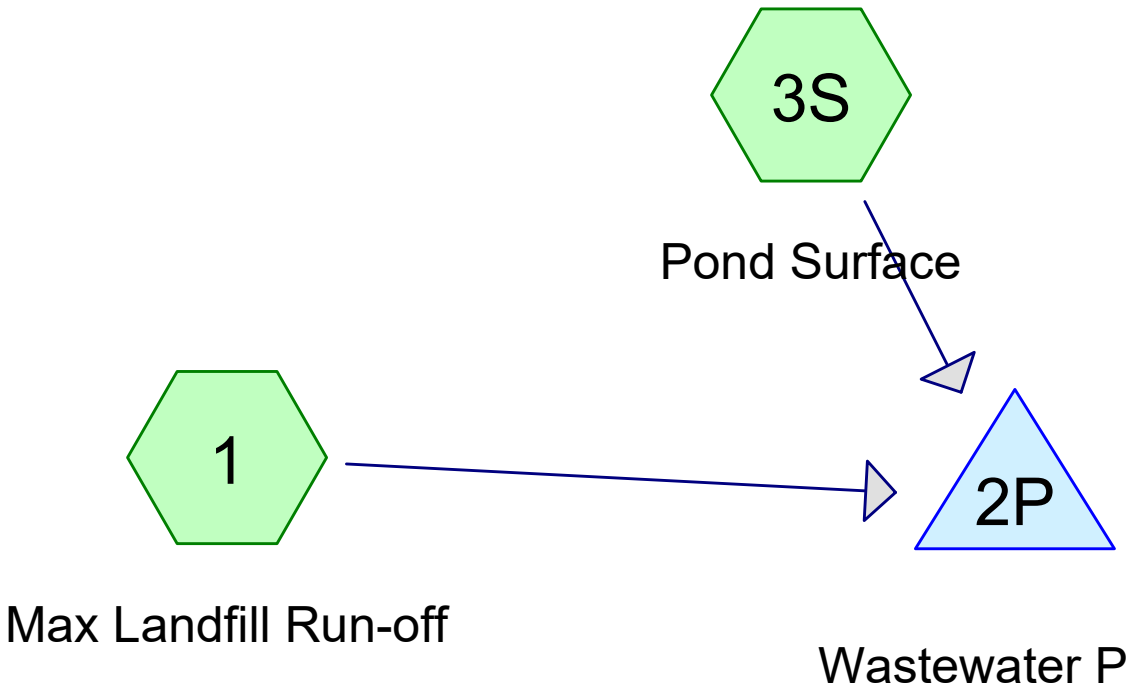
PROJECT:
WILLIAMS STATION CLASS III LANDFILL
RUN-ON/RUN-OFF CONTROL PLAN
BERKLEY COUNTY, SOUTH CAROLINA

TITLE:
DRAINAGE AREA MAP

DRAWN BY:	C. ALONSO
CHECKED BY:	J. HOTSTREAM
APPROVED BY:	N. ADDISON
DATE:	9/14/2021
PROJ. NO.:	447435
FILE:	Williams Area Map.dwg

FIGURE C

Active Landfill Cells to Wastewater Pond HydroCAD Report



Subcat Reach Pond Link

Routing Diagram for Williams Active Cell to Wastewater Pond
Prepared by TRC, Printed 10/14/2021

Summary for Subcatchment 1: Max Landfill Run-off

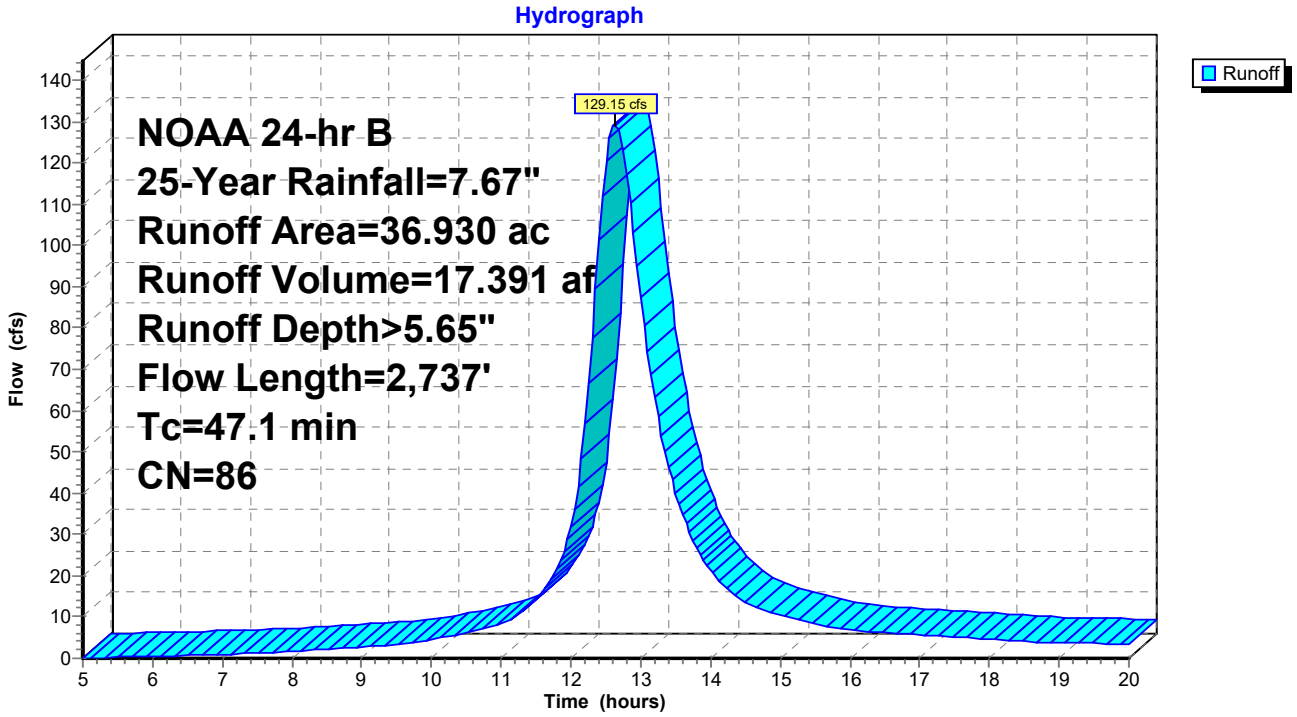
Runoff = 129.15 cfs @ 12.63 hrs, Volume= 17.391 af, Depth> 5.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr B 25-Year Rainfall=7.67"

Area (ac)	CN	Description
36.930	86	<50% Grass cover, Poor, HSG C
36.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.45		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.54"
6.9	1,038	0.0245	2.52		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	100	0.1400	17.51	55.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
5.5	230	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	100	0.1400	17.51	55.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
33.3	1,169	0.0070	0.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
47.1	2,737	Total			

Subcatchment 1: Max Landfill Run-off



Summary for Subcatchment 3S: Pond Surface

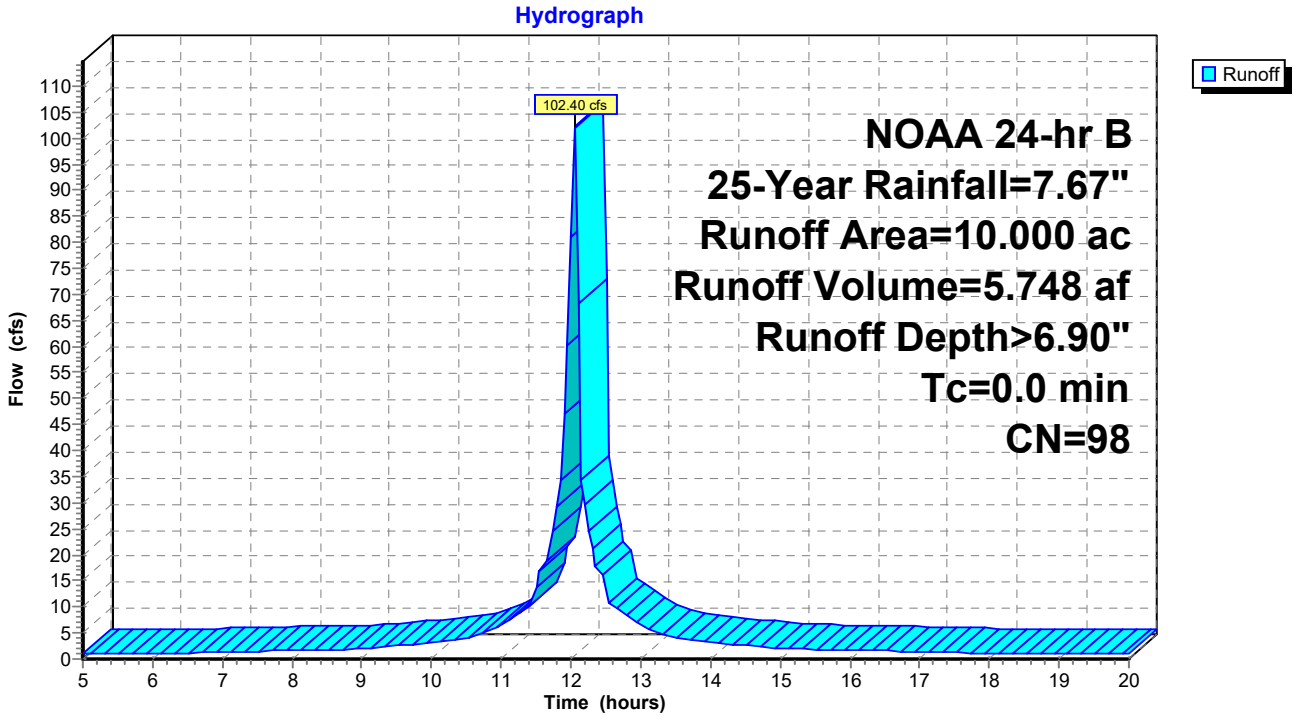
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 102.40 cfs @ 12.04 hrs, Volume= 5.748 af, Depth> 6.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr B 25-Year Rainfall=7.67"

	Area (ac)	CN	Description
*	10.000	98	Water Surface
	10.000		100.00% Impervious Area

Subcatchment 3S: Pond Surface



Summary for Pond 2P: Wastewater Pond

[82] Warning: Early inflow requires earlier time span

Inflow Area = 46.930 ac, 21.31% Impervious, Inflow Depth > 5.92" for 25-Year event
Inflow = 139.43 cfs @ 12.62 hrs, Volume= 23.138 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 32.95' @ 20.00 hrs Surf.Area= 363,575 sf Storage= 1,007,503 cf

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	30.00'	3,037,279 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	319,625	0	0
32.00	349,300	668,925	668,925
34.00	379,357	728,657	1,397,582
36.00	409,826	789,183	2,186,765
38.00	440,688	850,514	3,037,279

Pond 2P: Wastewater Pond